Edge and particle embedment effects in low- and high-stress slurry erosion wear of steels and elastomers

Slurry transportation via pumping is an increasingly viable alternative for the conventional fine particle pumping, but there are also many applications involving larger particles. However, most of the published studies on slurry erosion have been conducted with fine particle sizes. In this work, also large particle slurry erosion of commercial wear resistant materials is studied. A high speed slurry-pot wear tester was used with edge protected samples to simulate the wear conditions in industrial slurry applications where edge wear is minimal. Two wear resistant steels together with natural rubber and polyurethane lining materials were tested, and the results were compared with the results of the same materials tested without sample edge protection. The tests were performed using 15 m/s speed, two sample angles, and slurry concentrations with particle size ranging from large 8/10 mm granite to fine 0.1/0.6 mm quartz. In all conditions, the steel samples showed stable wear behavior, whereas the elastomers gave notably inconsistent results in different test conditions. In general, steels exhibited better wear performance with large particles and elastomers with fine particles, and the wear losses were 40-95 % lower when edge wear was inhibited. With increasing abrasive size, the edge wear becomes more dominant and the particle embedment decreases.
Pyrolysed cellulose nanofibrils and dandelion pappus in supercapacitor application

Dandelion pappus and wood based nanocellulose fibrils were combined to form films that were subsequently pyrolyzed under low-pressure conditions in a carbon monoxide (CO) rich atmosphere to make supercapacitor electrode material. The electrodes were prepared from these materials and pyrolysed under low-pressure conditions in a carbon monoxide-rich atmosphere. The electrode materials and assembled supercapacitors were electrically and structurally characterized. The assembled six supercapacitors showed specific capacitances per electrode ranging from 1 to 6 F/g and surface resistance of pyrolyzed electrodes ranging from 30 to 170 Ω/□. Finally, equivalent series resistance and leakage current measurements were conducted for three samples, resulting values from 125 to 500 Ω and from 0.5 to 5.5 µA, respectively.

General information
State: E-pub ahead of print
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Faculty of Biomedical Sciences and Engineering, Research area: Microsystems, Electronics and Communications Engineering, Materials Science, Research group: Plastics and Elastomer Technology, Research group: Plastics and Elastomer Technology, Research area: Measurement Technology and Process Control, Research group: Sensor Technology and Biomeasurements (STB), BioMediTech Institute and Faculty of Biomedical Sciences and Engineering
Authors: Virtanen, J., Pammo, A., Keskinen, J., Sarlin, E., Tuukkanen, S.
Keywords: (Supercapacitor, Nanocellulose, Dandelion, Pyrolysis)
Number of pages: 11
Publication date: 24 May 2017
Peer-reviewed: Yes

Publication information
Journal: Cellulose
ISSN (Print): 0969-0239
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.126 1.144
Publication Forum (2016): 2
Web of Science (2015): 3.195 3.741 4.6 0.521 0.01196 0.722
Publication Forum (2015): 2
Scopus rating (2014): 1.071 1.334
Web of Science (2014): 3.573 4.285 4.6 0.655 0.00994 0.773
Publication Forum (2014): 2
Scopus rating (2013): 1.127 1.48
Publication Forum (2013): 2
Scopus rating (2012): 1.179 1.71
Publication Forum (2012): 2
Scopus rating (2011): 1.354 1.795
Scopus rating (2010): 0.873 1.384
Scopus rating (2009): 1.038 1.219
Some bacterial strains such as Komagataeaibacter xylinus are able to produce cellulose as an extracellular matrix. In comparison to wood-based cellulose, bacterial cellulose (BC) holds interesting properties such as biodegradability, high purity, water-holding capacity, and superior mechanical and structural properties. Aiming toward improvement in BC production titer and tailored alterations to the BC film, we engineered K. xylinus to overexpress partial and complete bacterial cellulose synthase operon that encodes activities for BC production. The changes in cell growth, end metabolite, and BC production titers from the engineered strains were compared with the wild-type K. xylinus. Although there were no significant differences between the growth of wild-type and engineered strains, the engineered K. xylinus strains demonstrated faster BC production, generating 2–4-fold higher production titer (the highest observed titer was obtained with K. xylinus-bcsABCD strain producing 4.3 ± 0.46 g/L BC in 4 days). The mechanical and structural characteristics of cellulose produced from the wild-type and engineered K. xylinus strains were analyzed with a stylus profilometer, in-house built tensile strength measurement system, a scanning electron microscope, and an X-ray diffractometer. Results from the profilometer indicated that the engineered K. xylinus strains produced thicker BC films (wild type, 5.1 μm, and engineered K. xylinus strains, 6.2–10.2 μm). Scanning electron microscope revealed no principal differences in the structure of the different type BC films. The crystallinity index of all films was high (from 88.6 to 97.5%). All BC films showed significant piezoelectric response (5.0–20 pC/N), indicating BC as a promising sensor material.
Aspects of moisture ingress in polymer housed surge arresters

Polymers have been extensively applied in the industry, especially in energy system e.g. due to their good processability and insulation properties. However, all polymers are permeable in different extent, which requires a good knowledge about the process of permeation through these materials. In this study the moisture dynamics of four different surge arresters were studied in several ways,—at first by analysing the moisture diffusion properties of the housing polymers and finally by testing the full arrester structures against moisture ingress. Housing polymer composites were evaluated using thermogravimetric analysis and differential scanning calorimetry while the polymers' ability to withstand moisture diffusion was studied by water vapor transmission rate measurements. Moisture ingress behavior of the full surge arresters was examined by daily measurements of internal resistive leakage current along 30 days immersion test. Although correlations were found between the material composition and the diffusivity through the polymer, the moisture dynamic is deemed to be much more complex in the full surge arrester. Moisture permeation through separate housing material samples was typically high compared to internal leakage current formed in real arresters which highlights the main conclusion drawn,—internal structures and long term quality of interfaces are the key issues in preventing moisture induced degradation in metal oxide surge arresters.
Collagen-immobilized polyimide membranes for retinal pigment epithelial cell adherence and proliferation

Degenerative retinal diseases are a leading cause of visual loss and irreversible blindness, particularly in the developed world. Retinal pigment cell (RPE) transplantation is nowadays considered the most promising therapeutic approach for certain retinal diseases, and the presence of a supportive scaffold has been considered essential to ensure the success of the implant. In this work, collagen IV was covalently immobilized to the surface of polyimide membranes, with the purpose of developing scaffold materials for RPE cell culture. The covalent modification method involved four steps: argon-plasma treatment, acrylic acid graft polymerization, surface activation, and finally immobilization of collagen type IV. Collagen-modified membranes did not become more rough but became significantly more hydrophilic than the unmodified and dip-coated controls. ARPE-19 cell morphology and attachment were studied by immunofluorescence staining and confocal microscopy. Covalently modified surfaces showed cell attachment and cell properties comparable to the uncoated and dip-coated controls. This work demonstrated the potential of collagen IV-immobilized polyimide membranes as substrates for the growth of ARPE-19 cells.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Biomaterials and Tissue Engineering Group, University of Tampere, BioMediTech
Authors: Teymouri, S., Calejo, M. T., Hiltunen, M., Sorkio, A. E., Juuti-Uusitalo, K., Skottman, H., Kellomäki, M.
Keywords: (Polyimide, Retinal pigment epithelial cell, SURFACE MODIFICATION, tissue engineering)
Publication date: 6 Mar 2017
Peer-reviewed: Yes

Publication information
Journal: Cogent Chemistry
Volume: 3
Issue number: 1
ISSN (Print): 2331-2009
Ratings:
Publication Forum (2017): 0
Original language: English
Electronic versions:
Collagen immobilized polyimide membranes for retinal pigment epithelial cell adherence and proliferation
DOIs:
10.1080/23312009.2017.1292593
Links:
Research output: Scientific - peer-review › Article
Investigation of the structural anisotropy in a self-assembling glycinate layer on Cu(100) by scanning tunneling microscopy and density functional theory calculations

Self-assembling organic molecule-metal interfaces exhibiting free-electron like (FEL) states offers an attractive bottom-up approach to fabricating materials for molecular electronics. Accomplishing this, however, requires detailed understanding of the fundamental driving mechanisms behind the self-assembly process. For instance, it is still unresolved as to why the adsorption of glycine ([NH₂(CH₂)COOH]) on isotropic Cu(100) single crystal surface leads, via deprotonation and self-assembly, to a glycinate ([NH₂(CH₂)COO−]) layer that exhibits anisotropic FEL behavior. Here, we report on bias-dependent scanning tunneling microscopy (STM) experiments and density functional theory (DFT) calculations for glycine adsorption on Cu(100) single crystal surface. We find that after physical vapor deposition (PVD) of glycine on Cu(100), glycinate self-assembles into an overlayer exhibiting c(2x4) and p(2x4) symmetries with non-identical adsorption sites. Our findings underscore the intricacy of electrical conductivity in nanomolecular organic overlayers and the critical role the structural anisotropy at molecule-metal interface plays in the fabrication of materials for molecular electronics.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Photonics, Research group: Surface Science, Department of Physics and Astronomy, Russian Acad Sci, Ioffe Physical Technical Institute, Russian Academy of Sciences, Ioffe Phys Tech Inst
Authors: Kuzmin, M., Lahtonen, K., Vuori, L., Sánchez-de-Armas, R., Hirsimäki, M., Valden, M.
Keywords: (Cu(100), STM, Glycine, Glycinate, DFT, Self-assembly, Nanoscience)
Number of pages: 6
Pages: 111-116
Publication date: 4 Mar 2017
Peer-reviewed: Yes
ASJC Scopus subject areas: Surfaces and Interfaces, Condensed Matter Physics, Metals and Alloys

Publication information
Journal: Applied Surface Science
Volume: 409
ISSN (Print): 0169-4332
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.951 1.225
Publication Forum (2016): 1
Scopus rating (2015): 0.914 1.3
Web of Science (2015): 3.15 2.982 4.9 0.677 0.08258 0.574
Publication Forum (2015): 1
Scopus rating (2014): 0.958 1.477
Web of Science (2014): 2.711 2.735 5.3 0.507 0.07467 0.549
Publication Forum (2014): 2
Scopus rating (2013): 0.965 1.488
Publication Forum (2013): 2
Scopus rating (2012): 0.918 1.373
Publication Forum (2012): 2
Scopus rating (2011): 0.908 1.402
Scopus rating (2010): 0.924 1.141
Scopus rating (2009): 0.842 1.023
Scopus rating (2008): 0.899 1.087
Scopus rating (2007): 0.795 0.945
Scopus rating (2006): 0.852 1.052
Scopus rating (2005): 0.679 0.946
Scopus rating (2004): 0.964 1.126
Scopus rating (2003): 0.988 1.027
Scopus rating (2002): 0.921 0.954
Scopus rating (2001): 0.841 0.796
Scopus rating (2000): 0.866 0.772
Scopus rating (1999): 1.064 0.907
Original language: English
Electronic versions:
Pre-print Manuscript
Langmuir-Schaefer film deposition onto honeycomb porous films for retinal tissue engineering

Age-related macular degeneration (AMD) is the leading cause of vision loss in senior citizens in the developed world. The disease is characterised by the degeneration of a specific cell layer at the back of the eye – the retinal pigment epithelium (RPE), which is essential in retinal function. The most promising therapeutic option to restore the lost vision is considered to be RPE cell transplantation. This work focuses on the development of biodegradable biomaterials with similar properties to the native Bruch’s membrane as carriers for RPE cells. In particular, the breath figure (BF) method was used to create semi-permeable microporous films, which were thereafter used as the substrate for the consecutive Langmuir-Schaefer (LS) deposition of highly organised layers of collagen type I and collagen type IV. The newly developed biomaterials were further characterised in terms of surface porosity, roughness, hydrophilicity, collagen distribution, diffusion properties and hydrolytic stability. Human embryonic stem cell-derived RPE cells (hESC-RPE) cultured on the biomaterials showed good adhesion, spreading and morphology, as well as the expression of specific protein markers. Cell function was additionally confirmed by the assessment of the phagocytic capacity of hESC-RPE. Throughout the study, microporous films consistently showed better results as cell culture materials for hESC-RPE than dip-coated controls. This work demonstrates the potential of the BF-LS combined technologies to create biomimetic prosthetic Bruch’s membranes for hESC-RPE transplantation.

General information

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Ministry of Education publication type: A1 Journal article-refereed
Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Biomaterials and Tissue Engineering Group, Chemistry and Bioengineering, Research group: Supramolecular photochemistry, BioMediTech, University of Tampere, BioMediTech, University of Tampere
Authors: Calejo, M. T., Ilmarinen, T., Vuorimaa-Laukkanen, E., Talvitie, E., Hakola, H. M., Skottman, H., Kellomäki, M.
Keywords: (Biomaterials, Tissue Engineering, Films, Retinal pigment epithelial cell, Langmuir-Schaefer film)
Publication date: 20 Feb 2017
Peer-reviewed: Yes

Publication information

Journal: Acta Biomaterialia
ISSN (Print): 1742-7061
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.789 1.921
Publication Forum (2016): 2
Web of Science (2015): 6.008 6.383 4.3 1.208 0.05394 1.462
Publication Forum (2015): 2
Scopus rating (2014): 1.814 2.324
Web of Science (2014): 6.025 6.589 3.9 1.337 0.05183 1.417
Publication Forum (2014): 2
Scopus rating (2013): 1.963 2.269
Publication Forum (2013): 2
Scopus rating (2012): 1.904 2.125
Publication Forum (2012): 2
Scopus rating (2011): 1.808 1.91
Scopus rating (2010): 1.794 1.964
Scopus rating (2009): 1.399 1.662
Scopus rating (2008): 1.404 1.981
Scopus rating (2007): 1.199 1.493
Scopus rating (2006): 0.837 1.131
Original language: English
DOIs:
10.1016/j.actbio.2017.02.035
Research output: Scientific - peer-review › Article
Multi-wavelength mid-IR light source for gas sensing

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Publication date: 20 Feb 2017

Host publication information
Title of host publication: Proc. SPIE 10110 : Photonic Instrumentation Engineering IV
Volume: 10110
Publisher: SPIE
Article number: 101100P
ISBN (Print): 9781510606616
ISBN (Electronic): 9781510606623

Publication series
Name: Proceedings of SPIE
Volume: 10110
ISSN (Print): 0277-786X
ISSN (Electronic): 1996-756X
DOIs: 10.1117/12.2249126
Research output: Scientific - peer-review » Conference contribution

31% European InGaP/GaAs/InGaNAs Solar Cells For Space Application

We report a triple junction InGaP/GaAs/InGaNAs solar cell with efficiency of ~31% at AM0, 25 °C fabricated using a combined molecular beam epitaxy (MBE) and metal-organic chemical vapour deposition (MOCVD) processes. The prototype cells comprise of InGaNAs (Indium Gallium Nitride Arsenide) bottom junction grown on a GaAs (Gallium Arsenide) substrate by MBE and middle and top junctions deposited by MOCVD. Repeatable cell characteristics and uniform efficiency pattern over 4-inch wafers were obtained. Combining the advantages offered by MBE and MOCVD opens a new perspective for fabrication of high-efficiency space tandem solar cells with three or more junctions. Results of radiation resistance of the sub-cells are also presented and critically evaluated to achieve high efficiency in EOL conditions.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Photonics, Research group: ORC
Authors: Campesato, R., Tukiainen, A., Aho, A., Gori, G., Isoaho, R., Greco, E., Guina, M.
Publication date: 2017

Host publication information
Title of host publication: Proceedings of the 11th European Space Power Conference 2016
Publisher: EDP Sciences
Article number: 03003

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Name: E3S Web of Conferences
Volume: 16
ISSN (Electronic): 2267-1242
Electronic versions: e3conf_espc2017_03003
DOIs: 10.1051/e3conf/20171603003
Links: http://urn.fi/URN:NBN:fi-tyy-201706201604
Research output: Scientific - peer-review » Conference contribution
Improved corrosion properties of Hot Dip Galvanized Steel by nanomolecular silane layers as hybrid interface between zinc and top coatings

Thin organic coatings (TOC) or paints on hot dip galvanized steel (HDGS) improve the corrosion properties and create visually pleasing surfaces. Delamination of these coatings lead to corrosion and peeling of the paints. Hence, a novel method for improved adhesion and corrosion properties for HDGS surfaces is introduced. It is shown how the fabrication of a nanomolecular silane film as an interfacial layer between the HDGS and TOC or paint improves the corrosion properties of HDGS in different pH regimes. Understanding the corrosion behavior of ultra-thin silane layers under differing pH is crucial as subsequent coatings have different pHs. By varying the silanization parameters two different nanomolecular surface structures of aminopropyl trimethoxysilane (APS) on HDGS were fabricated: well-ordered monolayers with approximately 1 nm thickness and highly clustered APS films with a thickness in the range of 5-8 nm. To verify the nanomolecular APS structures, photoelectron spectroscopy (PES) and contact angle (CA) measurements were employed. The corrosion properties of HDGS and silanized HDGS were studied with linear sweep voltammetry (LSV) and electrochemical impedance spectroscopy (EIS). It is shown that at pH 5 and 7 passivation behavior is observed on silanized samples but the most significant improvement in corrosion resistance is found at pH 10 where the corrosion currents of silanized samples are up to two orders of magnitude lower than on uncoated metallic samples. Also, it is demonstrated that the corrosion inhibition of APS is not only dependent on the thickness of the silane film, but also the molecular ordering at the surface. The thin, well-ordered APS monolayer is more resistant towards corrosion in NaCl solution (pH 7) than thicker clustered APS layer. This indicates that the highly ordered nanomolecular surface structure protects the HDGS-silane interface from the Cl- adsorption better than the thicker, but more randomly ordered APS layers. Nanomolecular interfacial silane films for enhanced corrosion and adhesion properties on HDGS are transferrable to industrial production lines providing a low cost and environmentally friendly method for improved HDGS products.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Surface Science, MAX IV Laboratory, Lund University
Authors: Vuori, L., Ali-Löytty, H., Lahtonen, K., Hannula, M., Lehtonen, E., Niu, Y., Valden, M.
Publication date: 2017
Peer-reviewed: Yes
ASJC Scopus subject areas: Surfaces and Interfaces, Surfaces, Coatings and Films, Electrochemistry

Publication information
Journal: Corrosion
Volume: 73
Issue number: 2
ISSN (Print): 0010-9312
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.093 1.465
Publication Forum (2016): 2
Scopus rating (2015): 0.864 1.506
Web of Science (2015): 1.391 1.308 >10.0 0.429 0.00231 0.318
Publication Forum (2015): 2
Scopus rating (2014): 0.469 0.841
Web of Science (2014): 0.93 0.967 >10.0 0.25 0.00188 0.264
Publication Forum (2014): 2
Scopus rating (2013): 0.493 1.194
Publication Forum (2013): 2
Scopus rating (2012): 0.479 0.886
Publication Forum (2012): 2
Scopus rating (2011): 0.586 1.404
Scopus rating (2010): 0.707 1.387
Scopus rating (2009): 0.912 1.573
Scopus rating (2008): 0.793 1.056
Scopus rating (2007): 0.983 1.199
Scopus rating (2006): 0.89 1.229
Scopus rating (2005): 1.104 1.421
Scopus rating (2004): 1.122 1.441
Novel Concepts for High-efficiency lightweight space solar cells
One of the key issues in the design and development of a satellite Photovoltaic Assembly (PVA) is the trade-off to be made between the available volume located to the PVA, its mass and the total amount of power that the solar panels have to guarantee to the spacecraft. The development of high-efficiency, flexible, lightweight solar cells is therefore instrumental to the design of future satellites providing enhanced missions and services. Based on the consolidated development of GaAs-based single junction and lattice matched triple-junction solar cells, several research efforts are being pursued worldwide to further increase the efficiency and reduce mass. Promising approaches include thin-film technologies such as Inverted Metamorphic and Epitaxial Lift-Off (ELO), and the use of nanostructures or highly mismatched alloys grown by MBE. We propose here an alternative path towards the development of lightweight GaAs-based solar cells with the potential to exceed the Shockley-Queisser (SQ) limit of single junction cells. Our approach is based on the synergistic combination of thin-film design, quantum dots (QDs) absorption, and photonic nanostructures. Challenges and opportunities offered by the use of QDs are discussed. A cost-effective and scalable fabrication process including ELO technology and nanoimprint lithography is outlined. Finally, a proof-of-concept design, based on rigorous electromagnetic and physics-based simulations, is presented. Efficiency higher than 30% and weight reduction close to 90% - owing to the substrate removal - makes the proposed device to rank record power-to-weight ratio, with the potential to become a cost-effective, attractive option for next generation space solar cells.
Chlorine-Induced High Temperature Corrosion of Inconel 625 Sprayed Coatings Deposited with Different Thermal Spray Techniques

Ni-based coatings of the type Inconel 625 sprayed with high-kinetic spray processes are applied as protective coatings in many industrial fields where high corrosion resistance is required. Among the high-kinetic spray processes HVOF (High-Velocity Oxygen-Fuel) is an affirmed technology while HVAF (High-Velocity Air-Fuel) and cold spray are promising technologies for the deposition of thick and dense coatings, able to extend the service life of components subjected to harsh corrosive conditions. This study aims to assess the effect of the different high-kinetic spray technologies on the chlorine-induced high temperature corrosion behaviour of the coatings. The coatings were exposed to the test condition of 550°C in the presence of KCl salt deposits under air flow with 12 % of specific humidity for 168 h. The corrosion behaviour of the coatings was evaluated and compared with a reference wrought Inconel 625. Corrosion products and coatings were analysed and characterised in order to define the corrosion/oxidation mechanisms.

General information
State: E-pub ahead of print
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Surface Engineering, Valmet Technologies Oy
Authors: Fantozzi, D., Matikainen, V., Uusitalo, M., Koivuluoto, H., Vuoristo, P.
Keywords: (chlorine, high temperature corrosion, Thermal spray, HVOF, HVAF, cold spray, arc spray)
Publication date: 23 Dec 2016
Peer-reviewed: Yes

Publication information
Journal: Surface and Coatings Technology
ISSN (Print): 0257-8972
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.874 1.359
Publication Forum (2016): 1
Scopus rating (2015): 0.871 1.415
Web of Science (2015): 2.139 2.417 8.5 0.402 0.0356 0.527
Publication Forum (2015): 1
Scopus rating (2014): 0.998 1.681
Web of Science (2014): 1.998 2.374 8.2 0.307 0.03477 0.517
Publication Forum (2014): 2
Scopus rating (2013): 1.057 1.859
Publication Forum (2013): 2
Scopus rating (2012): 1.049 1.658
Publication Forum (2012): 2
Scopus rating (2011): 1.053 1.851
Enhancement of Photocurrent in GaInNAs Solar Cells using Ag/Cu Double-Layer Back Reflector

General information
State: E-pub ahead of print
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Research group: Nanophotonics
Authors: Aho, T., Aho, A., Tukiainen, A., Polojärvi, V., Salminen, T., Raappana, M., Guina, M.
Publication date: 22 Dec 2016
Peer-reviewed: Yes

Publication information
Volume: 109
Article number: 251104
ISSN (Print): 0003-6951
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.132 0.996
Publication Forum (2016): 2
Scopus rating (2015): 1.085 0.983
Web of Science (2015): 3.142 3.293 7.9 0.673 0.38389 1.045
Publication Forum (2015): 2
Scopus rating (2014): 1.799 1.462
Web of Science (2014): 3.302 3.569 7.4 0.655 0.42671 1.125
Publication Forum (2014): 2
Scopus rating (2013): 2.149 1.652
Publication Forum (2013): 2
Scopus rating (2012): 2.554 1.754
Publication Forum (2012): 2
Scopus rating (2011): 2.805 1.94
Scopus rating (2010): 2.926 1.789
Scopus rating (2009): 2.857 1.848
Scopus rating (2008): 2.934 1.83
Scopus rating (2007): 3.039 1.913
Scopus rating (2005): 3.709 2.382
Scopus rating (2004): 3.904 2.38
Scopus rating (2003): 3.765 2.27
Enhancement of photocurrent in GaInNAs solar cells using AgCu double-layer back reflector

Original language: English
Electronic versions:
DOI: 10.1063/1.4972850
Research output: Scientific - peer-review › Article

Thermal Modification of ALD Grown Titanium Oxide Ultra Thin Film for Photoanode Applications

General information
State: Published
Organisations: Optoelectronics Research Centre, Research group: Surface Science
Authors: Hannula, M. K., Lahtonen, K. T., Isotalo, T. J., Saari, J. S., Valden, M. O.
Keywords: (Titanium dioxide, titanium silicide, Atomic layer deposition (ALD), photoemission electron microscopy, PEEM, hydrogen energy)
Publication date: 15 Dec 2016
Peer-reviewed: Unknown
ASJC Scopus subject areas: Renewable Energy, Sustainability and the Environment, Surfaces, Coatings and Films, Surfaces and Interfaces, Atomic and Molecular Physics, and Optics
Event: Paper presented at Symposium on Future Prospects for Photonics, Tampere, Finland.
Research output: Scientific › Paper, poster or abstract

Evaluation of Rotary Screen Printed High Density Interconnects for R2R Fabricated Hybrid Systems
With the burgeoning development of the internet of everything (IoE), research involving high-speed, low cost, and large volume electronics manufacturing is highly attractive. Hybrid electronic systems, involving flexible printed and traditional silicon components, present early enablers for the large scale fabrication of printed electronics with a high level of computational power. With this possibility, there may be a way to produce the trillions of sensors needed for the fruition of the IoE.

Of particular interest, is the ease at which rotary screen printing can be utilized in the roll-to-roll (R2R) fabrication process of electronic devices. However, there are challenges to be overcome regarding the printed line resolution and hybrid integration utilizing high speed rotary screen printed backplanes. Our study, focused on R2R screen printed high density interconnects on PET, utilizing commercially available silver pastes. To evaluate the hybrid integration, we designed symmetrical daisy chain bare dies with 80 pads and varying pitch sizes of 150, 175, and 200 µm. Initially we investigated the use of anisotropically conductive adhesives and the comparison of native and gold stud bumped chips. Subsequently, we investigated the optimization of the printed traces via calendaring in an effort to improve the flip-chip attachment. The R2R calendaring was used to increase the line height uniformity of the printed traces and decrease the interconnects surface roughness.

General information
State: Published
Organisations: Department of Electronics and Communications Engineering, Research group: Laboratory for Future Electronics, VTT Technical Research Centre of Finland Ltd, Oulu, Finland
Authors: Kraft, T., Kololuoma, T., Hast, J., Mäntysalo, M.
Publication date: 28 Nov 2016
Peer-reviewed: Unknown
Links: https://www.mrs.org/fall2016/fall-2016-symposia/?code=PM5 (Online abstract.)
Research output: Scientific › Paper, poster or abstract

VECSEL systems for the generation and manipulation of trapped magnesium ions
Experiments in atomic, molecular, and optical (AMO) physics rely on lasers at many different wavelengths and with varying requirements on the spectral linewidth, power, and intensity stability. Vertical external-cavity surface-emitting lasers (VECSELs), when combined with nonlinear frequency conversion, can potentially replace many of the laser systems currently in use. Here, we present and characterize VECSEL systems that can perform all laser-based tasks for quantum information processing experiments with trapped magnesium ions. For the photoionization of neutral magnesium, 570.6 nm light is generated with an intracavity frequency-doubled VECSEL containing a lithium triborate crystal. External
frequency doubling produces 285.3 nm light for a resonant interaction with the $1S_0 \rightarrow 1P_1$ transition of neutral Mg. Using an externally frequency-quadrupled VECSEL, we implement Doppler cooling of Mg$^{25+}$ on the 279.6 nm $2S_1/2 \rightarrow 2P_3/2$ cycling transition, repumping on the 280.4 nm $2S_1/2 \rightarrow 2P_1/2$ transition, coherent state manipulation, and resolved sideband cooling close to the motional ground state. Our systems serve as prototypes for applications in AMO requiring single-frequency, power-scalable laser sources at multiple wavelengths.

**General information**

State: Published

Ministry of Education publication type: A1 Journal article-refereed

Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, National Institute of Standards and Technology, Time and Frequency Division, Boulder, Colorado


Keywords: (Semiconductor lasers, Lasers, frequency doubled, Laser cooling, Quantum information and processing, Spectroscopy, high-resolution, Spectroscopy, trapped ion)

Number of pages: 6

Pages: 1294-1299

Publication date: 8 Nov 2016

Peer-reviewed: Yes

ASJC Scopus subject areas: Atomic and Molecular Physics, and Optics

**Publication information**

Journal: Optica

Volume: 3

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Scopus rating (2016): 5.003 3.77

Publication Forum (2016): 1

Scopus rating (2015): 2.943 4.669

Web of Science (2015): 5.205 5.205 1.2 1.544 0.00307 2.781

Publication Forum (2015): 1

Publication Forum (2014): 1

Original language: English

DOIs: 10.1364/OPTICA.3.001294

Research output: Scientific - peer-review › Article

**Application oriented wear testing of wear resistant steels in mining industry**

Tampere Wear Center have developed several high-stress wear testers that utilize large sized abrasive particles of natural origin and thus are able to simulate demanding applications of the mining industry. In this work, a versatile high speed slurry-pot wear tester was developed. Research questions studied are: 1) How to set up a wear test method for simulating the real applications?, 2) What are the wear mechanisms in high-stress wear?, and 3) What is the role of microstructure and chemical composition on wear performance of wear resistant steels?

The high speed slurry-pot tester was developed for application oriented erosion wear testing of materials used in mineral handling and processing. It enables tests in demanding high-stress abrasive and erosive environments simulating wear, for example, in slurry pumps, tanks and pipes, dredging, mineral crushing and grinding, screening, loader buckets, and rock drilling. The key design features of the test method are the possibility to use up to 10 millimeter sized large abrasives and sample speeds up to 20 m/s in conditions ranging from wet slurry environments to dry sand or gravel.

The work has been done in FIMECC DEMAPP and DIMECC BSA projects, the focus is in the application oriented wear testing of materials intended for demanding wear related applications.

**General information**

State: Published
The effect of computational parameters on the performance of a combined CZM-VCCT method

General information
State: Published
Organisations: Research group: Plastics and Elastomer Technology, Department of Materials Science
Authors: Kanerva, M., Jokinen, J.
Keywords: (fracture, cohesive zone modelling, virtual crack closure technique)
Number of pages: 4
Pages: 1-4
Publication date: 26 Oct 2016
Peer-reviewed: Unknown
Event:

Bibliographical note
October 26-28, ISSN 1652-8549
Source: Bibtex
Source-ID: urn:357de723d566c0c58f764fd8ad766295
Research output: Scientific › Paper, poster or abstract

Elastic-Plastic Transition in MBE-Grown GaSb Semiconducting Crystal Examined by Nanoindentation

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Univ Helsinki, University of Helsinki, Dept Phys, Aalto University, Department of Materials Science and Engineering, Institute of Materials Science, University of Silesia, 75 Pułku Piechoty 1, 45-500 Chorzów, Poland, Institute of Physics, University of Silesia, 75 Pułku Piechoty 1, 45-500 Chorzów, Poland
Authors: Majtyka, A., Trębala, M., Tukiainen, A., Chrobak, D., Borgiel, W., Räisänen, J., Nowak, R.
Number of pages: 3
Pages: 1131-1133
Publication date: 1 Oct 2016
Peer-reviewed: Yes

Publication information
Journal: Acta Physica Polonica A
Volume: 130
Issue number: 4
ISSN (Print): 0587-4246
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.235 0.411
Publication Forum (2016): 1
Scopus rating (2015): 0.267 0.493
Web of Science (2015): 0.525 0.54 4.6 0.111 0.00516 0.113
Publication Forum (2015): 1
Scopus rating (2014): 0.276 0.614
Web of Science (2014): 0.53 0.497 4.3 0.068 0.00523 0.118
Publication Forum (2014): 1
Modelling and Simulation of Radial Spruce Compression to Optimize Energy Efficiency in Mechanical Pulping

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mechanical Engineering and Industrial Systems, Department of Automation Science and Engineering, Research area: Dynamic Systems, Research area: Measurement Technology and Process Control
Authors: Moilanen, C., Björkqvist, T., Ovaska, M., Koivisto, J., Miksic, A., Engberg, B., Salminen, L., Saarenrinne, P., Alava, M.
Number of pages: 18
Pages: 53-70
Publication date: 26 Sep 2016

Host publication information
Title of host publication: 2016 International Mechanical Pulping (IMPC) Conference Proceedings, Monday, September 26 - Wednesday, September 28, Jacksonville, Florida, USA
Place of publication: USA
Publisher: TAPPI
Article number: 1.3
ISBN (Print): 978-1-59510-250-7
Research output: Scientific - peer-review » Conference contribution

Plastic deformation of powder metallurgy tungsten alloy foils for satellite enclosures
Radiation shielding is one of the most crucial features of enclosure materials in spacecraft. The attenuation of electron radiation in hybrid materials, which consist mainly of carbon-fiber-reinforced plastics (CFRP), can be improved by laminating thin tungsten foils between the CFRP layers. In this paper, we study tensile behavior of thin foils to understand the plastic deformation of pure tungsten (W) foils and sintered tungsten heavy alloy (WHA) foils. The performed tests are simulated using the finite element (FE) method. Full 3-D FE models of tungsten and CFRP hybrids are generated to study the non-linearity response of different tungsten material models.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology, Aalto University, School of Engineering, Department of Mechanical Engineering
Hot-Dip Galvanized Press Hardening Steels

General information
State: Published
Organisations: Department of Materials Science, Research group: Metals Technology
Authors: Järvinen, H.
Publication date: 15 Aug 2016
Peer-reviewed: Unknown
Research output: Scientific › Paper, poster or abstract

Menetelmä ja laitteisto selluloosapitoisten materiaalien fibrilloimiseksi; Förfarande och anordning för fibrillering av cellulosahaltiga materialer

General information
State: Published
Ministry of Education publication type: H1 Granted patent
Authors: Björkqvist, T., Gustafsson, H., Koskinen, T., Nuopponen, M., Vehniäinen, A., Fredrikson, A.
Publication date: 15 Aug 2016

Publication information
IPC: D21D 1/20, D21B 1/04, D21H 11/18
Patent number: FI126206
Priority date: 23/06/11
Priority number: FI20110005667
Original language: Finnish
Links:
https://patent.prh.fi/patdocs/certificate.jsp?app=20115667
Source: espacenet
Source-ID: FI20115667
Research output: Scientific › Patent

Improved antifouling properties and selective biofunctionalization of stainless steel by employing heterobifunctional silane-polyethylene glycol overlayers and avidin-biotin technology

A straightforward solution-based method to modify the biofunctionality of stainless steel (SS) using heterobifunctional silane-polyethylene glycol (silane-PEG) overlayers is reported. Reduced nonspecific biofouling of both proteins and bacteria onto SS and further selective biofunctionalization of the modified surface were achieved. According to photoelectron spectroscopy analyses, the silane-PEGs formed less than 10 Å thick overlayers with close to 90% surface coverage and reproducible chemical compositions. Consequently, the surfaces also became more hydrophilic, and the observed non-specific biofouling of proteins was reduced by approximately 70%. In addition, the attachment of E. coli was reduced by more than 65%. Moreover, the potential of the overlayer to be further modified was demonstrated by successfully coupling biotinylated alkaline phosphatase (bAP) to a silane-PEG-biotin overlayer via avidin-biotin bridges. The activity of the immobilized enzyme was shown to be well preserved without compromising the achieved antifouling properties. Overall, the simple solution-based approach enables the tailoring of SS to enhance its activity for biomedical and biotechnological applications.
Fabrication of topographically microstructured titanium silicide interface for advanced photonic applications

We present a widely scalable, high temperature post-growth annealing method for converting ultra-thin films of TiO$_2$ grown by atomic layer deposition to topographically microstructured titanium silicide (TiSi). The photoemission electron microscopy results reveal that the transformation from TiO$_2$ to TiSi at 950 °C proceeds via island formation. Inside the islands, TiO$_2$ reduction and Si diffusion play important roles in the formation of the highly topographically microstructured TiSi interface with laterally nonuniform barrier height contact. This is advantageous for efficient charge transfer in Si-based heterostructures for photovoltaic and photoelectrochemical applications.
Hybrid Stick-it-on Devices: Enablers of the Internet of Everything

General information
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Electronics and Communications Engineering, Research group: Laboratory for Future Electronics
Authors: Kraft, T., Mäntysalo, M.
Number of pages: 1
Pages: 33
Publication date: Jul 2016
Peer-reviewed: Unknown

Publication information
Journal: Organic and Printed Electronics Journal
Volume: 6
Issue number: 16/2016
ISSN (Print): 2366-8040
Original language: English
Links:
http://www.c2-magazines.com/digital_issue/opejournal/#32
Research output: Professional » Article
Optically Enhanced GaInNAs Solar Cell

General information
State: Published
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications
Authors: Aho, T. A., Aho, A., Tukiainen, A., Polojärvi, V., Raappana, M., Guina, M.
Publication date: 20 Jun 2016
Peer-reviewed: Unknown
Research output: Scientific > Paper, poster or abstract

High-efficiency GaInP/GaAs/GaInNAs solar cells grown by combined MBE-MOCVD technique
Triple-junction GaInP/GaAs/GalnNAs solar cells with conversion efficiency of ~29% at AM0 are demonstrated using a combination of molecular beam epitaxy (MBE) and metal-organic chemical vapor deposition (MOCVD) processes. The bottom junction made of GalnNAs was first grown on a GaAs substrate by MBE and then transferred to an MOCVD system for subsequent overgrowth of the two top junctions. The process produced repeatable cell characteristics and uniform efficiency pattern over 4-inch wafers. Combining the advantages offered by MBE and MOCVD opens a new perspective for fabrication of high-efficiency tandem solar cells with three or more junctions.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, CESI S.p.A.
Authors: Tukiainen, A., Aho, A., Gori, G., Polojärvi, V., Casale, M., Greco, E., Isoaho, R., Aho, T., Raappana, M., Campesato, R., Guina, M.
Keywords: (multijunction solar cells, molecular beam epitaxy, metal-organic chemical vapor deposition, dilute nitride semiconductors)
Number of pages: 6
Pages: 914-919
Publication date: 17 Jun 2016
Peer-reviewed: Yes

Publication information
Journal: Progress in Photovoltaics: Research and Applications
Volume: 24
Issue number: 7
Article number: PIP2784
ISSN (Print): 1062-7995
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 2.224 2.694
Publication Forum (2016): 2
Scopus rating (2015): 2.78 3.33
Web of Science (2015): 7.365 7.27 4.4 2.548 0.01705 1.924
Publication Forum (2015): 2
Scopus rating (2014): 3.279 3.874
Publication Forum (2014): 2
Scopus rating (2013): 3.974 5.653
Publication Forum (2013): 2
Scopus rating (2012): 3.478 5.082
Publication Forum (2012): 2
Scopus rating (2011): 3.251 5.999
Scopus rating (2009): 3.18 3.256
Scopus rating (2008): 2.537 2.473
Scopus rating (2007): 1.711 2.124
Scopus rating (2006): 1.55 2.881
Potential Ways to Manufacture Wearable Metal Electrodes for the Long-term Biosignal Monitoring

Currently in wearable welfare and healthcare products are used textile and polymer electrodes. Thus these soft electrodes are easy to integrate, product maintaining is simple and they are reasonably comfortable to wear, their measurement reliability will deteriorate over time. They are vulnerable to motion artefacts, the conductive material wears out in washings, and in addition material wetting causes signal changes. In this study, similar electrodes than in common heart rate straps were manufactured. The aim was to find a substitute material for the reliable long-term electrode. We chose untreated and micro-etched steel, silver, electroplated platinum, gold, rhodium and screen-printed silver and compared them with commercial available textile and polymer electrodes. Different non-textile material choices and manufacturing methods for the electrodes are discussed. According to our research, metal electrodes have the potential to act as long-term monitoring electrodes; materials keep moisture on the skin and the electrode interface, without irritating skin.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Research group: Personal Electronics Group
Authors: Kaappa, E., Halme, A., Vanhala, J. J.
Number of pages: 8
Publication date: 8 Jun 2016

Development of Magnetic Losses During Accelerated Corrosion Tests for Nd-Fe-B Magnets Used in Permanent Magnet Generators

Sintered Nd-Fe-B magnets are critical components in permanent magnet wind generators. They are the strongest permanent magnets available and thus enable the construction of light and effective devices, but their stability in corrosive environments is limited. In this work, the formation of corrosion losses in two types of Nd-Fe-B alloys was studied. Magnets were in a magnetized state during the corrosion test, enabling monitoring of the development of losses in magnetic flux along with those in weight. Parallel flux and weight loss measurements conducted during corrosion tests showed that percentage weight losses were lower than the total flux losses. Scanning electron microscope studies of corroded specimens disclosed that the magnets first underwent dissolution of the grain-boundary phase, followed by the detachment and movement of the loosened grains in the magnetic field. The degradation was accelerated by oxidation of the matrix phase, which introduced further damage by volume expansion.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Materials Characterization, VTT Technical Research Centre of Finland
Authors: Isotahdon, E., Huttunen-Saarivirta, E., Kuokkala, V.
Keywords: (Corrosion, Corrosion losses, Highly accelerated stress test (HAST test), Improved corrosion resistance sintered Nd-Fe-B magnets, Improved stability sintered Nd-Fe-B magnets, Nd-Fe-B, Permanent magnet, Scanning electron microscopy, Thermal losses, Wind power)
Number of pages: 10
Pages: 732-741
Publication date: 1 Jun 2016
Comparison of laboratory wear test results with the in-service performance of cutting edges of loader buckets

The in-service cutting edge of a mining loader bucket was investigated and its wear behavior compared with samples tested in the laboratory to assess how well the wear testing methods correlate with the in-service conditions. The examined in-service cutting edge of a bucket had been run in an underground mine with quarry gravel and it was made of wear resistant steel. The wear behavior of the cutting edge was simulated in the laboratory scale with several application oriented abrasive and impact-abrasive wear testing methods. In addition to the contact mode, high loads, large abrasive size, abrasive type, and the comminution of the abrasive formed the basis for the design of the laboratory experiments. The wear surfaces and cross-sections of the original cutting edge and the test samples were characterized, and the wear behaviors were compared with each other. Work hardening of the steel occurred in all cases, but the amount of plastic deformation and the depth of the wear scars varied.
Correlation of wear and work in dual pivoted jaw crusher tests
A laboratory sized jaw crusher with uniform movement of the jaws, the Dual Pivoted Jaw Crusher (DPJC), was used to
determine the relationship between wear and work. Wear was concentrated on the jaw plates opposing each other and
was measured as mass loss of the specimens. Work was measured directly from the force and the displacement of the
instrumented jaw, which allowed work to accumulate only from the actual crushing events. The tests were conducted with
several jaw geometries and with two motional settings, where the relation of compressive and sliding motion between the
jaws was varied.
The comminution of rock is presumed to be irreversible, meaning that the energy used for crack formation in the rock
particles eventually results in the fracture of the particles. Therefore, the amount of energy needed to comminute rock
particles should be roughly constant and not dependent on the loading conditions, if the speed of the loading contact is not
changed. The DPJC test method allows the separation of work components into comminution specific work and sliding
specific work. The results can be used to compare the crushability of minerals without the influence of the used test
geometry or the selected jaw plate materials. The sliding work can be used for the comparison of the wear of the jaw plate
materials.

Edge effect in high speed slurry erosion wear tests of steels and elastomers
While the slurry transportation via pumping is an increasingly viable alternative for the conventional fine particle pumping,
there are also many applications involving larger particles. However, the published studies on slurry erosion have mainly
been conducted with fine particle sizes. In this work, both fine and large particle high speed slurry erosion of commercial
wear resistant materials is studied.
The high speed slurry-pot wear tester was used with edge protected samples to simulate the wear conditions in industrial
slurry applications, such as tanks and pipelines. Two quenched wear resistant steels together with natural rubber and
polyurethane lining materials were tested, and the results were compared with the results of the same materials tested
without sample edge protection. The tests were performed using 15 m/s speed, 45° and 90° sample angles, and 9 wt%
and 33 wt% slurry concentrations with particle size ranging from large 8/10 mm granite to fine 0.1/0.6 mm quartz.
With or without edge protection, the steel samples showed stable wear behavior, whereas the elastomers gave notably
inconsistent results in different test conditions. Steels exhibited better wear performance with large particles and
elastomers with fine particles. In general, the wear losses were 40 – 95 % lower without edge wear, except for elastomers
tested with fine quartz at the 45° sample angle, which yielded 25 – 75 % higher weight losses when the sample edges
were protected. With increasing abrasive size, the edge wear becomes more dominant.
Erosive and abrasive wear performance of carbide free bainitic steels – comparison of field and laboratory experiments

Carbide free bainitic (CFB) steels have been tested in two heat treated conditions and compared with currently used quenched and tempered (QT) steel in an industrial mining application subjected to erosive-abrasive wear. A conventional sliding abrasion and a new application oriented high-stress erosion wear tests were performed in laboratory. The results of the erosion and the field tests were compared. The microstructural changes were investigated by optical and scanning electron microscopy. The hardness and hardness profiles of the steels were measured. The results showed that in the laboratory tests, the abrasion and erosion wear rates of the CFB steels were 35 and 45 % lower respectively in comparison to the QT steel. In the field test, the mass losses of the CFB steels were about 80 % lower in comparison with the QT steel. The improved wear resistance of the CFB steel can be explained by its higher hardness and higher work hardening. The erosion wear test was able to simulate the work hardening effect and the wear mechanisms observed in the field test samples.
Processing and Wear Testing of Novel High-Hardness Wear-Resistant Steel

Novel high-hardness medium carbon martensitic laboratory steel has been produced and tested for wear resistance. Different finish rolling temperatures (FRT) and quenching finish temperatures (QFT) were utilized. Composition was selected based on earlier experiments and carbon content was set to 0.35 % to obtain surface hardness of approximately 600 HB. FRT was varied to investigate the effect of prior austenite deformation on the mechanical properties. Direct quenching was implemented in the laboratory rolling trials. Plates were either quenched to room temperature or quenching was finished at 250 °C. The interrupted quenching was tested in order to improve the toughness of the steel via autotempering and possible austenite retention without drastic loss of hardness. The steel samples were tested for hardness and impact toughness. Material characterization included SEM and optical microscopy for microstructural inspection. Direct quenched steel samples exceeded the desired 600 HB surface hardness, but interrupted quenching to 250 °C resulted in lower hardness values. In contrast, the impact toughness was improved with latter quenching method. Impact-abrasion wear testing was conducted for the experimental steels to understand the effect of rolling and quenching parameters on wear resistance. Impeller-tumbler tests were carried out at Tampere Wear Center using natural granite as the abrasive. The results indicate that surface hardness is the main controlling factor of wear, and samples with the highest surface hardness showed the lowest mass loss.

General information

State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Materials Science, Research group: Materials Characterization, University of Oulu, Faculty of Technology, SSAB
Authors: Haiko, O., Miettunen, I., Porter, D., Ojala, N., Ratia, V., Heino, V., Kemppainen, A.
Keywords: (Wear, Steel, Impact wear, Abrasive wear, Hardness, Microstructure)
Number of pages: 15
Publication date: Jun 2016

Host publication information

Title of host publication: The 17th Nordic Symposium on Tribology - NORDTRIB 2016 14th - 17th June 2016 Aulanko, Hämeenlinna, Finland
ASJC Scopus subject areas: Metals and Alloys
Research output: Professional > Conference contribution

High-Power Tapered Distributed Bragg Reflector Laser Diodes Emitting at 1550 nm

Compact LIDAR systems work in the near infrared (NIR) area, more specifically at wavelengths around 800 nm to 900 nm. In adverse weather the measurement range decreases dramatically as the light is attenuated by rain drops or fog. The penetration length can be improved by increasing the optical peak power of the lasers, but in the NIR spectral range the maximum emission power permitted due to eye safety is very limited and almost reached by the current systems. A significantly higher optical power can be used in the short wave infrared (SWIR) range. LIDAR systems working, for example, at 1550 nm are employed in military applications. However, these LIDAR systems are very bulky. This paper presents a compact high-power single-mode 1.55 µm laser diode for LIDAR applications.

The AlGaInAs/InP distributed Bragg reflector (DBR) lasers comprise a passive DBR section, an active ridge waveguide (RWG) section and tapered gain-guided sections of different lengths and have been fabricated without regrowth. Measurements indicate that the output power scales with the length of the tapered section and hint that one of the limiting factors for power scaling with the tapered section length is the non-uniform heating of the chip. According to thermal simulations, the non-uniform heating seems to cause devices with a long tapered section to roll-over at a much lower average power density than devices with a shorter tapered section.

Typical devices emit up to 560 mW in single-mode continuous wave operation at room temperature with a high spectral purity (38 dB side-mode suppression ratio, SMR, at maximum power). By changing the length of the tapered section from 0.5 mm to 4.0 mm the maximum power could be increased from 125 mW to 560 mW. The tapered section and the RWG section are driven with separate currents. The maximum power was achieved with 10 A current to the tapered
section and 350 mA current to the RWG section. The peak emission wavelength can be tuned by more than 2 nm either by changing the tapered section current (at a rate of about 0.4 nm/A) or by changing the temperature (at a rate of about 0.1 nm/ºC, between 10 ºC to 40 ºC).

**General information**

State: Published
Organisations: Optoelectronics Research Centre, Research group: Nanophotonics, Research group: Semiconductor Technology and Applications, University of Turku
Publication date: 18 May 2016
Peer-reviewed: Unknown
Event: Paper presented at Optics and Photonics days, Tampere, Finland.
Research output: Scientific › Paper, poster or abstract

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**High-resolution x-ray diffraction and photoluminescence study of high-quality self-catalyzed GaAs nanowires**

**General information**

State: Published
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications
Authors: Koivusalo, E. S., Hakkarainen, T. V., Guina, M.
Keywords: (GaAs nanowires, Self-catalyzed, X-ray diffraction, Photoluminescence)
Publication date: 17 May 2016
Peer-reviewed: Unknown
Event: Paper presented at Optics and Photonics days, Tampere, Finland.
Research output: Scientific › Paper, poster or abstract

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**Articular cartilage repair with recombinant human type II collagen/poly lactide scaffold in a preliminary porcine study**

The purpose of this study was to investigate the potential of a novel recombinant human type II collagen/poly lactide scaffold (rhCo-PLA) in the repair of full-thickness cartilage lesions with autologous chondrocyte implantation technique (ACI). The forming repair tissue was compared to spontaneous healing (spontaneous) and repair with a commercial porcine type I/III collagen membrane (pCo). Domestic pigs (4-month-old, n = 20) were randomized into three study groups and a circular full-thickness chondral lesion with a diameter of 8 mm was created in the right medial femoral condyle. After 3 weeks, the chondral lesions were repaired with either rhCo-PLA or pCo together with autologous chondrocytes, or the lesion was only debrided and left untreated for spontaneous repair. The repair tissue was evaluated 4 months after the second operation. Hyaline cartilage formed most frequently in the rhCo-PLA treatment group. Biomechanically, there was a trend that both treatment groups resulted in better repair tissue than spontaneous healing. Adverse subchondral bone reactions developed less frequently in the spontaneous group (40%) and the rhCo-PLA treated group (50%) than in the pCo control group (100%). However, no statistically significant differences were found between the groups. The novel rhCo-PLA biomaterial showed promising results in this proof-of-concept study, but further studies will be needed in order to determine its effectiveness in articular cartilage repair.

**General information**

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Biomaterials and Tissue Engineering Group, Research group: Computational Biophysics and Imaging Group, BioMediTec
Pages: 745-753
Publication date: 1 May 2016
Peer-reviewed: Yes

**Publication information**
Journal: Journal of Orthopaedic Research
Volume: 34
Issue number: 5
ISSN (Print): 0736-0266
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.212 1.082
Publication Forum (2016): 2
Scopus rating (2015): 1.509 1.365
Web of Science (2015): 2.807 3.151 9.1 0.489 0.01996 0.999
Strain rate change tests with the Split Hopkinson Bar method

In this paper, methods to produce rapid strain rate changes for strain rate sensitivity measurements in Split Hopkinson Bar arrangements are presented and discussed. Two different cases are considered: a strain rate change test within the high strain rate region in compression, and a tension test incorporating a large strain rate jump directly from the low strain rate region to high strain rates. The former method is based on the loading wave amplitude manipulation, while the latter method is based on the incorporation of a low strain rate loading device into a Tensile Split Hopkinson Bar apparatus.
Synthesis and Characterization of Linear and Tri-Block PLLA-PEG-PLLA Blends

This study was conducted to synthesize poly(L-Lactide)-poly(ethylene glycol)-poly(L-Lactide) triblock copolymer (PEGLA) with different PLLA block length, and explore its applicability in a blend with linear PLLA (3051D NatureWorks) with the intention of improving heat-seal and adhesion properties at extrusion coating on paperboard. PLLA-PEG-PLLA was obtained by ring opening polymerization (ROP) of L-lactide using PEG (molecular weight 6000 g mol⁻¹) as an initiator and stannous octoate as catalyst. The structures of the PEGLAs were characterized by proton nuclear magnetic resonance spectroscopy (¹H-NMR). The melt flow and thermal properties of all PEGLAs and their blends were evaluated using dynamic rheology, and differential scanning calorimetric (DSC). All blends containing 10 wt% of PEGLAs displayed similar zero shear viscosities to neat PLLA, while blends containing 30 wt% of PEGLAs showed slightly higher zero shear viscosity. However, all blends displayed higher shear thinning and increased melt elasticity (based on tan delta). No major changes in thermal properties were distinguished from differential scanning calorimetric studies. High molecular weight PEGLAs could be used in extrusion coating with 3051D without problems.
Modeling of Hysteresis Losses in Ferromagnetic Laminations under Mechanical Stress

A novel approach for predicting magnetic hysteresis loops and losses in ferromagnetic laminations under mechanical stress is presented. The model is based on combining a Helmholtz free energy-based anhysteretic magnetoelastic constitutive law to a vector Jiles-Atherton hysteresis model. This paper focuses only on unidirectional and parallel magnetic fields and stresses, albeit the model is developed in full 3-D configuration in order to account also for strains perpendicular to the loading direction. The model parameters are fitted to magnetization curve measurements under compressive and tensile stresses. Both the hysteresis loops and losses are modeled accurately for stresses ranging from −50 to 80 MPa.
Wear resistance of HVOF sprayed coatings from mechanically activated thermally synthesized Cr3C2–Ni spray powder

In the current study a Cr3C2–Ni spray powder was produced by mechanically activated thermal synthesis. The following aspects were studied: (a) production and characteristics of spray powders, (b) spraying and characteristics of coatings by HVOF, and (c) abrasive wear resistance. A HVOF spray system Diamond Jet Hybrid 2700 (propane hybrid gun from Sulzer Metco) was used for deposition. Coating thickness was approximately 350–400 μm. The structure and composition of the coatings were determined by SEM and the phase composition by XRD methods. Coating surface hardness and
Microhardness in the cross-section were measured. Abrasive rubber-wheel wear (ARWW) and abrasive erosive wear (AEW) were tested. The wear resistance of the coatings produced from an experimental powder was comparable to that of a similar commercial one.

**General information**

**State:** Published

**Ministry of Education publication type:** A1 Journal article-refereed

**Organisations:** Department of Materials Science, Research group: Surface Engineering, Tallinn University of Technology, Department of Materials Engineering, Tallinn University of Technology, Centre for Materials Research

**Authors:** Sarjas, H., Kulu, P., Juhani, K., Viljus, M., Matikainen, V., Vuoristo, P.

**Pages:** 101-106

**Publication date:** 22 Feb 2016

**Peer-reviewed:** Yes

**Publication information**

**Journal:** Proceedings of the Estonian Academy of Sciences

**Volume:** 65

**Issue number:** 2

**ISSN (Print):** 1736-6046

**Publication Forum (2017):** 1

**Scopus rating (2016):** 0.238 0.45

**Publication Forum (2016):** 1

**Scopus rating (2015):** 0.195 0.863

**Web of Science (2015):** 0.584 0.521 9.6 0.152 6.6E-4 0.223

**Publication Forum (2015):** 1

**Scopus rating (2014):** 0.198 0.581

**Web of Science (2014):** 0.455 0.494 8.6 0.854 4.4E-4 0.158

**Scopus rating (2013):** 0.218 0.671

**Scopus rating (2012):** 0.199 0.474

**Scopus rating (2011):** 0.312 0.644

**Scopus rating (2010):** 0.289 0.438

**Scopus rating (2009):** 0.19 0.246

**Scopus rating (2008):** 0.104 0.185

**Scopus rating (2007):** 0.104 0.192

**Original language:** English

**Electronic versions:** proc-2016-2-101-106

**Links:**


**Research output:** Scientific - peer-review › Article

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**Kitka ja kuluminen haastavat koneensuunnittelijat**

**General information**

**State:** Published

**Ministry of Education publication type:** D1 Article in a trade journal

**Organisations:** Department of Materials Science, Research group: Materials Characterization, Research group: Tribology and Machine Elements

**Authors:** Valtonen, K., Lehtovaara, A.

**Number of pages:** 2

**Pages:** 29-30

**Publication date:** 16 Feb 2016

**Peer-reviewed:** Unknown

**Publication information**

**Journal:** Materia

**Volume:** 2016

**Issue number:** 1

**ISSN (Print):** 1459-9694

**Ratings:**
High strain rate radial compression of Norway spruce earlywood and latewood
The mechanical properties of Norway spruce were studied and a compression model for mechanical pulping was developed. The split-Hopkinson pressure bar technique was combined with high-speed photography to analyse local radial compression. Data analysis focussed on the differences between mechanical properties of earlywood and latewood. Measurements were conducted at both room temperature and 135 °C. The effect of pre-fatigue treatment was also studied. A simple material model was defined linearly in parts and fitted to the measurement data to quantify the differences. New results were found on the differences in inelastic behaviour of earlywood and latewood at large deformations. In addition, other results were in line with previously published results.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mechanical Engineering and Industrial Systems, Research area: Applied Mechanics, Department of Automation Science and Engineering, Research area: Measurement Technology and Process Control
Authors: Moilanen, C. S., Björkqvist, T., Engberg, B. A., Salminen, L. I., Saarenrinne, P.
Keywords: (Norway spruce, radial compressio, split-Hopkinson pressure bar, high speed photography, local strain)
Number of pages: 17
Pages: 873-889
Publication date: 1 Feb 2016
Peer-reviewed: Yes
Early online date: 26 Nov 2015

Publication information
Journal: Cellulose
Volume: 23
Issue number: 1
ISSN (Print): 0969-0239
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.126 1.144
Publication Forum (2016): 2
Web of Science (2015): 3.195 3.741 4.6 0.521 0.01196 0.722
Publication Forum (2015): 2
Scopus rating (2014): 1.071 1.334
Web of Science (2014): 3.573 4.285 4.6 0.655 0.00994 0.773
Publication Forum (2014): 2
Scopus rating (2013): 1.127 1.48
Publication Forum (2013): 2
Scopus rating (2012): 1.179 1.71
Publication Forum (2012): 2
Scopus rating (2011): 1.354 1.795
Scopus rating (2010): 0.873 1.384
Scopus rating (2009): 1.038 1.219
Scopus rating (2008): 0.926 1.123
Scopus rating (2007): 0.754 1.034
Scopus rating (2006): 0.699 1.15
Scopus rating (2005): 1.112 1.318
Scopus rating (2004): 0.855 1.072
Scopus rating (2003): 0.81 1.02
Scopus rating (2002): 0.649 0.689
Corrosion testing of anisotropic conductive adhesive interconnections on FR4, liquid crystal polymer and polyimide substrates

Anisotropic conductive adhesive films (ACF) have been widely studied for numerous applications. However, their resistance to corrosion in highly corrosive environments has been studied only very little. This study investigated the reliability and behaviour of ACFs in corrosive salt spray environment. ACF was used to attach flip chip (FC) components on FR4, liquid crystal polymer (LCP) and polyimide (PI) substrates and the FC packages were subjected to a salt spray test lasting 3000 h. The FC packages had daisy chain structures which were measured continuously in real time during testing. After testing cross sections of the tested packages were examined using an optical microscope and a scanning electron microscope (SEM). Most components failed during the test and the results showed significant differences between the various substrate materials. The LCP substrate performed considerably better than the other substrates and the PI substrate proved to have the poorest reliability. Corrosion of the pads on the substrates as well as open joints was seen in all substrate materials. The corrosion behaviour as well as the differences between the substrates showed that the substrate structure and material are critical factors in corrosive environments and should be carefully considered. The reliability of the ACF FC package with the LCP substrate was found to be good, as the test was very severe and no failures occurred during the first 625 h of testing and only 20% failed during the first 1000 h.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electrical Engineering, Research area: Reliability
Authors: Parviainen, A., Kokko, K., Frisk, L.
Keywords: Anisotropic conductive adhesive, Flip chip, Salt spray test, Corrosion, Polyimide, Liquid crystal polymer, FR4
Number of pages: 7
Pages: 114-120
Publication date: 12 Jan 2016
Peer-reviewed: Yes
Early online date: 21 Nov 2015

Publication information
Journal: Microelectronics Reliability
Volume: 56
ISSN (Print): 0026-2714
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.47 0.976
Publication Forum (2016): 1
Scopus rating (2015): 0.618 1.193
Web of Science (2015): 1.202 1.285 5.4 0.167 0.01019 0.352
Publication Forum (2015): 1
Scopus rating (2014): 0.601 1.432
Web of Science (2014): 1.433 1.336 5.8 0.154 0.00964 0.351
Publication Forum (2014): 1
Scopus rating (2013): 0.594 1.264
Publication Forum (2013): 1
Scopus rating (2012): 0.586 1.414
Publication Forum (2012): 1
Scopus rating (2011): 0.621 1.382
Scopus rating (2010): 0.602 1.114
Scopus rating (2009): 0.736 1.176
Exact modeling of finite temperature and quantum delocalization effects on reliability of quantum-dot cellular automata

A thorough simulation study is carried out on thermal and quantum delocalization effects on the feasibility of a quantum-dot cellular automata (QCA) cell. The occupation correlation of two electrons is modeled with a simple four-site array of harmonic quantum dots (QD). QD sizes range from 20 nm to 40 nm with site separations from 20 nm to 100 nm, relevant for state-of-the-art GaAs/InAs semiconductor technology. The choice of parameters introduces QD overlap, which is only simulated properly with exact treatment of strong Coulombic correlation and thermal equilibrium quantum statistics. These are taken into account with path integral Monte Carlo approach. Thus, we demonstrate novel joint effects of quantum delocalization and decoherence in QCA, but also highly sophisticated quantitative evidence supporting the traditional relations in pragmatic QCA design. Moreover, we show the effects of dimensionality and spin state, and point out the parameter space conditions, where the 'classical' treatment becomes invalid.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research group: Semiconductor Technology and Applications, Optoelectronics Research Centre, Research area: Computational Physics, Research group: Electronic Structure Theory Authors: Tiihonen, J., Schramm, A., Kylänpää, I., Rantala, T. T.
Keywords: (path integral Monte Carlo, quantum dot cellular automata, semiconductor quantum dots)
Publication date: 11 Jan 2016
Peer-reviewed: Yes

Publication information
Volume: 49
Issue number: 6
Article number: 065103
ISSN (Print): 0022-3727
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.645 0.917
Publication Forum (2016): 1
Scopus rating (2015): 0.693 1.046
Web of Science (2015): 2.772 2.76 7.5 0.529 0.05347 0.838
Publication Forum (2015): 1
Scopus rating (2014): 1.069 1.383
Web of Science (2014): 2.721 2.711 7.0 0.632 0.06141 0.817
Publication Forum (2014): 2
Scopus rating (2013): 1.18 1.469
Publication Forum (2013): 2
Scopus rating (2012): 1.244 1.394
Publication Forum (2012): 2
Scopus rating (2011): 1.257 1.399
Color Bricks: Building Highly Organized and Strongly Absorbing Multicomponent Arrays of Terpyridyl Perylenes on Metal Oxide Surfaces

Terpyridine-substituted perylenes containing cyclic anhydrides in the peri position were synthesized. The anhydride group served as an anchor for assembly of the terpyridyl-crowned chromophores as monomolecular layers on metal oxide surfaces. Further coordination with Zn2+ ions allowed for layer-by-layer formation of supramolecular assemblies of perylene imides on the solid substrates. With properly selected anchor and linker molecules it was possible to build high quality structures of greater than ten successive layers by a simple and straightforward procedure. The prepared films were stable and had a broad spectral coverage and high absorbance. To demonstrate their potential use, the synthesized dyes were employed in solid-state dye-sensitized solar cells, and electron injection from the perylene antennas to titanium dioxide was observed.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Optoelectronics Research Centre, Research group: Surface Science, Optoelectronics Research Centre, Tampere University of Technology
Pages: 1501-1510
Publication date: Jan 2016
Peer-reviewed: Yes
Early online date: 3 Dec 2015

Publication information
Journal: Chemistry: A European Journal
Volume: 22
Issue number: 4
ISSN (Print): 0947-6539
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 2.247 1.046
Publication Forum (2016): 2
Scopus rating (2015): 2.416 1.184
Web of Science (2015): 5.771 5.572 4.6 1.338 0.19837 1.407
Publication Forum (2015): 2
Scopus rating (2014): 2.487 1.219
Web of Science (2014): 5.731 5.635 4.4 1.255 0.19743 1.433
Publication Forum (2014): 3
Scopus rating (2013): 2.604 1.239
Publication Forum (2013): 3
Scopus rating (2012): 2.884 1.294
1550 nm high-power tapered DBR-laser diodes

This paper reports the DBR-RWG surface grating design, the fabrication process, and the output characteristics of tapered DBR laser diodes for applications such as LIDAR and range finding that require eye-safe high-power single-mode coherent light sources. The regrowth-free AlGaInAs/InP DBR lasers exhibited a CW output power as high as 560 mW in single-mode operation at room temperature. At maximum output power the SMSR was 38 dB. By changing the length of the tapered section from 0.5 mm to 4.0 mm, the maximum CW power could be scaled from 125 mW to 560 mW at room temperature.

General information
State: Published
Organisations: Optoelectronics Research Centre, Research group: Nanophotonics, Research group: Semiconductor Technology and Applications
Publication date: 2016
Peer-reviewed: Unknown
DOIs:
10.1109/LO.2016.7550029
Research output: Scientific › Paper, poster or abstract

Accelerated deactivation studies of the natural-gas oxidation catalyst—Verifying the role of sulfur and elevated temperature in catalyst aging

Accelerated deactivation, caused by thermal aging (TA) and/or sulfur+water poisoning (SW), of the PtPd/γ-Al₂O₃ natural-gas oxidation catalyst was studied. Thermal aging and poisoning treatments were performed separately and with varied combinations and comprehensive characterization of the catalyst was carried out after each step. The fresh catalyst has small, oxidized PtPd particles (<5nm) uniformly distributed in the γ-alumina washcoat. After the SW-treatment, a small amount of bulk aluminum sulfate was observed near the slightly grown noble metal particles. During the thermal aging, γ-alumina changed to δ-/θ- and α-alumina. In addition, total decomposition of oxidized Pt and partly decomposition of oxidized Pd occurred resulting in the formation of the grown noble metal particles with a bimetallic PtPd core and a polycrystalline PdO shell. Also few, small (∼5nm) bimetallic PtPd particles were still detected. In the TA+SW-treated catalyst with grown noble metal particles, a small amount of bulk aluminum sulfate was detected and it was randomly distributed over the noble metal particles and washcoat. The activity in the terms of methane conversion over the TA-, SW-, and SW+TA-treated catalysts was similar but it was decreased compared to the fresh catalyst. The activity of the TA+SW-treated catalyst was drastically decreased compared to the fresh catalyst due to significant morphological changes and aluminum sulfate formation.
A novel micro-robotic approach to study the environmental degradation of matrix and fibre materials

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Corrosion Behavior of WC-FeCrAl Coatings Deposited by HVOF and HVAF Thermal Spraying Methods

The present work compares the mechanical properties and corrosion resistance of WC-FeCrAl coatings manufactured using high-velocity oxygen fuel (HVOF) technology equipped with DJ2700 spraying gun and high-velocity air fuel (HVAF) equipment using M3 supersonic spraying gun. The results indicated that decarburization of carbide phase occurred in both. It was found out that the deposition velocity is an important factor influencing the density of the coating and thus the amount of porosity. The HVAF sprayed WC-FeCrAl coating revealed the lowest degree of porosity, higher hardness and lower degree of decarburization, achieving the best properties in terms of electrochemical corrosion resistance compared to HVOF sprayed coating.

Corrosion Losses in Sintered (Nd,Dy)-Fe-B Magnets vs. Magnet geometry

Sintered Nd-Fe-B magnets with cube and flat geometries were exposed to pressurized heat-humidity corrosion tests for the durations of 96 and 240 hours. Parallel measurements of weight and flux losses were performed after the corrosion tests. The corroded specimens were further characterized using scanning electron microscopy and optical profilometry. The microcrystalline anisotropy of sintered magnets gave rise to heterogeneous corrosion behavior, where the pole faces degraded preferentially to the side faces. The magnetic field by the magnet itself thus contributed to the amount and location of detached ferromagnetic grains. The magnets with cube geometry suffered greater losses than the flat magnets, even though the flat magnets had a higher relative amount of the pole face. The higher total flux (due to a larger volume) of the cube-shaped magnets led to the higher overall losses. In the flat magnets, the corrosion concentrated heavily on areas near the corners.
Corrosion propagation phase studies on Finnish reinforced concrete facades

This work discusses a research project on active corrosion as a part of the service life of concrete facade panels in Nordic climate. The objective of the studies was to contribute to the knowledge on the corrosion propagation phase in these structures under actual long term weather exposure and to generate data for its modelling purposes. The project combined statistical analysis of a large database of condition investigation data to the more in-depth analysis of twelve case buildings and field measurement data on reinforcement corrosion. Corrosion rate was tied to long term weather data representing the geographical location of the buildings. As one of the results it was shown that, although carbonation resistance remains as the primary factor in ensuring proper service life, the modelling of active corrosion may provide a considerable extension to it.

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Civil Engineering, Research group: Service Life Engineering of Structures, Department of Materials Science, Research group: Materials Characterization
Authors: Köliö, A., Honkanen, M., Lahdensivu, J.
Number of pages: 24
Pages: 75-98
Publication date: 2016

Host publication information
Title of host publication: New Approaches to Building Pathology and Durability
Volume: 6
Publisher: Springer Science+Business Media
Editor: Delgado, J.
ISBN (Print): 978-981-10-0647-0

Publication series
Name: Building pathology and rehabilitation
ISSN (Print): 2194-9832
DOIs:
10.1007/978-981-10-0648-7_4
Research output: Scientific - peer-review › Chapter

Determination of environmental degradation of matrix and fibre materials with a novel, statistically reliable micro-robotic approach

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology, Department of Automation Science and Engineering, Outotec Research Center
Dilute Nitride Four-Junction Solar Cell

General information
State: Published
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Optoelectronics Research Centre, Tampere University of Technology
Publication date: 2016
Peer-reviewed: Unknown
Event: Paper presented at 12th International Conference on Concentrator Photovoltaics (CPV-12), Freiburg, Germany.
Electronic versions:
CPV-12_Guina_MBE-MOCVD_update
Research output: Scientific › Paper, poster or abstract

Dilute nitride solar cells fabricated by combined MBE-MOCVD epitaxy

General information
State: Published
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications
Publication date: 2016
Peer-reviewed: Unknown
Event: Paper presented at 12th International Conference on Concentrator Photovoltaics (CPV-12), Freiburg, Germany.
Electronic versions:
CPV-12_Guina_MBE-MOCVD_update
Research output: Scientific › Paper, poster or abstract

Electrical isolation of dilute nitride solar cells by wet etching

General information
State: Published
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications
Publication date: 2016
Peer-reviewed: Unknown
Event: Paper presented at Optics and Photonics days, Tampere, Finland.
Research output: Scientific › Paper, poster or abstract

Electrical isolation of high-efficiency dilute nitride multijunction solar cells

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications
Authors: Raappana, M., Polojärvi, V., Aho, T., Aho, A., Tukiainen, A., Hytönen, L., Isoaho, R., Guina, M.
Publication date: 2016

Host publication information
Title of host publication: Physics days 2016 : Proceedings of the 50th annual conference of the Finnish Physical Society
Place of publication: Oulu
Publisher: Finnish Physical Society

Bibliographical note
INT=orc,"Hytönen, Lauri"
Experimental Investigation of the Internal Heating of Metals in a Wide Range of Strain Rates Using Simultaneous Digital Image Correlation and High Speed Infrared Imaging

Internal heating of plastically deforming materials has been studied quite extensively, in particular to determine the fractions of external work energy that are converted to heat or stored in the internal defect structure of the material. For the fraction of the energy converted to heat, the results from both theoretical considerations and experimental studies range widely from some tens of percent to full 100%, depending on the studied material, applied methodologies and experimental techniques, and assumptions and simplifications made in the calculations and manipulation of the experimental data. As recently many of the experimental techniques used in materials research have developed enormously, completely new possibilities for the research of the above mentioned questions now exist. In this work, the plastic deformation behavior and related thermal response of austenitic stainless steels were studied using simultaneous full-field digital image correlation and thermal mapping of the surface strains and temperatures of the specimens.
Failure analysis of a leaching reactor made of glass-fiber reinforced plastic

This paper reports a failure analysis of a leaching reactor in a zinc plant that suffered from a catastrophic failure after less than two years of operation. During normal operation the bottom of the reactor fell out suddenly, releasing the contents, a high-temperature acidic solution, into the surroundings in an uncontrollable manner. The reactor was made of glass-fiber reinforced plastic. Microscopy, thermal analysis, mechanical testing and finite element analyses were employed to investigate the causes of the failure. There were several contributing factors but the root cause was poor adhesion between the bottom and the joint laminate, which was caused by insufficient grinding during the surface preparation stage of the joint.
**Functionalizing Surface Electrical Potential of Hydroxyapatite Coatings**

**General information**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Materials Science, Research group: Surface Engineering, Riga Technical University, University of Adelaide
Authors: Pluduma, L., Freimanis, E., Gross, K., Koivuluoto, H., Algate, K., Haynes, D., Vuoristo, P.
Number of pages: 6
Pages: 12-17
Publication date: 2016

**Host publication information**
Title of host publication: 11th International Conference Medical Applications of Novel Biomaterials and Nanotechnology
Volume: 102
ISBN (Print): 978-3-0357-1125-7

**Publication series**
Name: Advances in Science and Technology
Volume: 102
ISSN (Print): 1661-819X

**Bibliographical note**
JUFOID=75599
Research output: Scientific • peer-review › Conference contribution

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**HCl-based wet etching of III–V dilute nitride materials for multijunction solar cells**

**General information**
State: Published
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications
Publication date: 2016
Peer-reviewed: Unknown
Research output: Scientific • Paper, poster or abstract

**High efficiency dilute nitride solar cells: Simulations meet experiments**
Parameter extraction procedure and simulation of dilute nitride solar cells are reported. Using PC1D simulation and fitting to experimental current-voltage and external quantum efficiency data, we retrieve the phenomenological material parameters for GaInNAs solar cells. Based on these, we have constructed a model that can explain the changes in short circuit current and open circuit voltage of n-i-p solar cells subjected to rapid thermal annealing. The model reveals that non-annealed MBE-grown GaInNAs material has an n-type doping that evolves to p-type upon rapid thermal annealing. The change of doping type and the shift of the physical location of the pn-junction were confirmed by Kelvin-probe force microscopy. The PC1D modelling was found to work well also for GaInNAs p-i-n solar cells with opposite polarity. It was also found that the GaInNAs lower doping levels in p-i-n solar cells grown at lowered As/III flux ratios were associated with increased carrier lifetimes.

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications
Authors: Tukiainen, A., Aho, A., Polojärvi, V., Ahorinta, R., Guina, M.
High-efficiency III-V solar cells: From drawing board to real devices

The record solar cell conversion efficiency of 46% at concentrated sunlight has been demonstrated by direct bonding technique [1]. Regardless of the high efficiencies obtained using the direct wafer bonding technique, the conventional monolithic approach used in commercial solar cell production has several benefits, including production technology and cost-related factors. And yet, there is a high unused potential, particularly in new materials that can be grown lattice-matched onto GaAs or Ge substrates. For example, by utilizing dilute nitride materials in multijunction solar cell structures with more than three junctions and by carefully optimizing structural elements and manufacturing technology, efficiencies exceeding 50% is a realistic target [2]. Here we review our theoretical and experimental work carried out on development of various parts of high-efficiency multijunction solar cells based on GaInNAsSb-based materials, i.e., dilute nitrides. First of all, we have developed a molecular beam epitaxy process for GaInNAsSb sub-junction with very high external quantum efficiency exceeding 90%. This building block is essential for achieving high conversion efficiency for GaInP/GaAs/GaInNAsSb triple-junction solar cells. Secondly, the use of a variety of electro-optical simulation tools such as Crosslight APSYS, Silvaco TCAD, PC1D, Essential MacLeod and semi-empirical analytical models combined with experimental work on numerous test samples have helped in fabricating ultra-low specific resistivity tunnel junctions and high-quality sub-junctions based on conventional III-V materials such as GaInP and GaAs to be integrated with the dilute nitride sub-junction. Thirdly, we have also extracted important material specific physical parameters such as carrier lifetimes, mobilities and concentrations for dilute nitrides by matching the simulations to experimental solar cell device characteristics [3]. The extracted parameters are used for refining the simulation models which provide deeper understanding of the device physics. The work done so far has led to a rapid increase in conversion efficiency of our GaInP/GaAs/GaInNAsSb triple-junction solar cells – at a pace of ~5 %-points/year since 2012. High-efficiency solar cells with efficiencies of 29% and 31% at one sun (AM0 and AM1.5G, respectively) and 36–39% under concentrated sunlight (at ~70 suns) have already been demonstrated [4,5]. Additionally, the effects of various optical and structural design elements related to fabrication of real III-V multijunction solar cells will be critically reviewed. Especially, we will concentrate on the pros and cons of backside reflector structure architectures – including various planar reflector types and Lambertian scatterers – and nanostructured antireflection coatings [6] which are currently widely employed for solar cell photon management. The consequences of adding such elements to the fabrication process and impact on improving the conversion efficiency towards >50% efficiency are assessed.

General information
State: Published
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications
Authors: Tukiainen, A., Aho, A., Polojarvi, V., Aho, T., Raappana, M., Isoaho, R., Guina, M.
High performance corrosion resistant coatings by novel coaxial cold- and hot-wire laser cladding methods

In the last few years, coaxial laser heads have been developed with centric wire feeding equipment, which enables the laser processing of complex-shaped objects in various applications. These newly developed laser heads are being used particularly in laser brazing experiments in the automotive industry. This study presents experimental results of using a coaxial laser head for cold- and hot-wire cladding application. The coaxial wire cladding method has significant improvements compared with the off-axis wire cladding method such as independence of the travel direction, alignment of the wire to the laser beam, and a reduced number of controlling parameters. These features are important to achieve high quality coatings. Cladding tests were conducted on mild steel with a coaxial laser wire welding head using Ni-based Inconel 625 and Theramanit 2509 super duplex stainless steel solid wires in order to determine the properties of the cladding process and the coatings deposited. The corrosion resistance of the obtained coatings was examined by long-term acetic acid salt spray (AASS) and electrochemical critical pitting temperature tests. The test results showed that by using the coaxial wire cladding method, defect-free high quality and corrosion resistant Inconel 625 and super duplex stainless steel coatings with low dilution were achieved. The average pitting temperature for Theramanit 2509 duplex coating was 75 °C in 1M NaCl solution, which was comparable to wrought 2507 duplex stainless steel. Low diluted Inconel 625 coating survived the AASS test for 2000 h without signs of corrosion.

General information

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Surface Engineering, Tampere University of Technology, Technology Centre Ketek Ltd.
Authors: Pajukoski, H., Näkki, J., Thieme, S., Tuominen, J., Nowotny, S., Vuoristo, P.
Keywords: (coaxial wire feed, hot-wire laser cladding, Inconel 625, super duplex stainless steel)
Publication date: 2016
Peer-reviewed: Yes
Early online date: 8 Dec 2015
ASJC Scopus subject areas: Atomic and Molecular Physics, and Optics, Electronic, Optical and Magnetic Materials, Biomedical Engineering, Instrumentation

Publication information
Journal: Journal of Laser Applications
Volume: 28
Issue number: 1
Article number: 012011
ISSN (Print): 1042-346X
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.648 1.097
Publication Forum (2016): 1
Scopus rating (2015): 0.489 1.143
Web of Science (2015): 1.078 1.422 8.2 0.212 0.001 0.369
Publication Forum (2015): 1
Scopus rating (2014): 0.7 1.298
Web of Science (2014): 1.798 1.356 8.2 0.108 0.00129 0.466
Publication Forum (2014): 1
Scopus rating (2013): 0.672 0.964
Publication Forum (2013): 1
Scopus rating (2012): 0.245 0.685
Publication Forum (2012): 1
Scopus rating (2011): 0.321 0.801
Scopus rating (2010): 0.422 0.852
Scopus rating (2009): 0.576 1.069
Scopus rating (2008): 0.378 0.73
Scopus rating (2007): 0.498 1.099
Increasing the quantum efficiency of GaInNAs solar cells by advanced optical design

General information
State: Published
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications
Authors: Aho, T. A., Aho, A., Tukiainen, A., Polojärvi, V., Raappana, M., Guina, M.
Publication date: 2016
Peer-reviewed: Unknown
Event: Paper presented at Optics and Photonics days, Tampere, Finland.
Research output: Scientific › Paper, poster or abstract

Influence of age-precipitation of Nb-Ti stabilized FeCr alloy on the initial stages of oxide film formation at 650 °C

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Optoelectronics Research Centre, Research group: Surface Science, MAX IV Laboratory, Lund University
Authors: Ali-Löytty, H., Hannula, M., Niu, Y., Zakharov, A., Valden, M.
Publication date: 2016

Publication information
Publisher: Lund University, MAX IV Laboratory
Original language: English
Links:
https://www.maxlab.lu.se/cmis/display?id=workspace%3A%2F%2FSpacesStore%2Fbd7dec7f-b5c5-478a-af1e-8fbe1d875fe7
Links:
https://www.maxlab.lu.se/node/2032#I311-PEEM_
Research output: Professional › Commissioned report

Influence of multiwalled carbon nanotubes on the processing behavior of epoxy powder compositions and on the mechanical properties of their fiber reinforced composites

This study reports the preparation of advanced carbon fiber composites with a nanocomposite matrix prepared by dispersing multiwall carbon nanotubes (CNTs) in a powder type epoxy oligomer with two different processing techniques (1) master batch dilution technique and (2) direct mixing (with the help of twin-screw extruder in both cases). The master batch technique shows a better efficiency for the dispersion of the CNTs aggregates. The rheological results demonstrate that the incorporation of the CNTs into the epoxy oligomer leads, as expected, to a marked increase in the viscosity and of the presence of a yield stress point that also depends on the processing technique adopted. Carbon fiber (CFRP) and glass fiber (GFRP) composite materials were produced by electrostatic spraying of the epoxy matrix formulations on the carbon and glass fabric, respectively, followed by calendering and mold pressing. The mechanical properties of the obtained epoxy/CNT-matrix composite materials, such as interlaminar fracture toughness, flexural strength, shear storage and loss moduli are discussed in terms of the processing techniques and fabric material. The incorporation of 1 wt% CNTs in the epoxy matrix results in a relevant increase of the fracture toughness, flexural strength and modulus of both CFRP and GFRP. POLYM. COMPOS., 2015. © 2015 Society of Plastics Engineers
Influence of temperature-induced copper diffusion on degradation of selective chromium oxy-nitride solar absorber coatings

Temperature-induced copper diffusion process and its influences on optical degradation and long-term stability of solar absorber coatings on copper substrates were investigated at intermediate temperatures of 248-500 °C. The studied absorbers were sputtered chromium oxy-nitride absorbers having tin oxide anti-reflection coatings. The absorbers were aged by means of thermal accelerated ageing studies and short-period heat treatments up to 500 °C for two hours. Ageing mechanisms and degradation of the absorbers were analysed before and after the ageing studies by optical measurements (solar absorptance with a UV/Vis/NIR spectrophotometer and thermal emittance by FTIR spectrophotometry), microstructural analysis using a field-emission scanning electron microscope (FESEM) equipped with an energy dispersive X-ray spectrometer (EDS) and a transmission electron microscope (TEM) with an EDS, composition by time-of-flight elastic recoil detection analysis (TOF-ERDA) and an X-ray photoelectron spectrooscope (XPS), and
adhesion by tensile test. The relation between optical degradation and diffusion mechanisms was studied using optical modelling and simulation. The results clearly revealed the mechanism of outward copper diffusion: diffusion of copper substrate atoms into the coating and through the coating to the surface, formation of copper oxide islands on the surface of the coating, and formation of voids in the substrate surface. The relation between the diffusion mechanisms and increase in thermal emittance of the absorber surface was demonstrated.

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Surface Engineering, Research group: Materials Characterization, University of Helsinki
Authors: Kotilainen, M., Honkanen, M., Mizohata, K., Vuoristo, P.
Keywords: (Coating, Copper, Diffusion mechanisms, Solar absorber, Thermal diffusion, Void growth)
Number of pages: 10
Pages: 323-332
Publication date: 2016
Peer-reviewed: Yes
ASJC Scopus subject areas: Renewable Energy, Sustainability and the Environment, Electronic, Optical and Magnetic Materials, Surfaces, Coatings and Films

**Publication information**
Journal: Solar Energy Materials and Solar Cells
Volume: 145
ISSN (Print): 0927-0248
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.587 1.71
Publication Forum (2016): 2
Web of Science (2015): 4.732 5.016 5.9 1.476 0.04281 1.16
Publication Forum (2015): 2
Scopus rating (2014): 2.204 2.396
Web of Science (2014): 5.337 5.755 5.6 1.042 0.04651 1.288
Publication Forum (2014): 2
Scopus rating (2013): 2.174 2.582
Publication Forum (2013): 2
Scopus rating (2012): 2.435 2.707
Publication Forum (2012): 2
Scopus rating (2011): 2.175 2.638
Scopus rating (2010): 2.524 2.121
Scopus rating (2009): 1.991 1.977
Scopus rating (2008): 1.654 1.458
Scopus rating (2007): 1.359 1.488
Scopus rating (2005): 1.141 1.619
Scopus rating (2004): 0.932 1.178
Scopus rating (2003): 0.992 1.34
Scopus rating (2002): 1.042 1.114
Scopus rating (2001): 0.896 1.235
Scopus rating (2000): 0.828 0.986
Scopus rating (1999): 0.701 0.75
Original language: English
DOI:
10.1016/j.solmat.2015.10.034
Source: Scopus
Source-ID: 84947314887
Research output: Scientific - peer-review › Article
In vivo genotoxic effects of uncoated and coated CeO2 NPs administrated to mice by pharyngeal aspiration

General information
State: Published
Organisations: Department of Materials Science, Research group: Materials Characterization, Työterveyslaitos, University of Zaragoza, Leitat Tecnologigal Center
Authors: Catalan, J., Aimonen, K., Hartikainen, M., Vippola, M., Moreno, C., Cabellos, J., Janer, G., Vazquez-Campos, S., Wolff, H., Savolainen, K., Norppa, H.
Number of pages: 1
Publication date: 2016
Peer-reviewed: Unknown
Research output: Scientific : Paper, poster or abstract

Machine-coated starch-based dispersion coatings prevent mineral oil migration from paperboard
Mineral oil migration through paperboard presents a safety risk in modern food packaging. This study aimed to enhance the safety of fiber-based packaging by utilizing a bio-based composite barrier layer to protect against mineral oil. Starch-clay composite coatings on paperboard were created via dispersion coating. Thermal analysis of the coating components and field emission scanning electron microscopy imaging were performed to ascertain the physicochemical properties and morphology of the coatings. Coating functionality was evaluated using contact angles and transmission rate (water and oxygen) measurements. The packaging safety focus was implemented by measuring the gas phase migration of heptane and analyzing the migration of liquid mineral oil through the coated paperboards with FTIR. The functional properties of the coated paperboards were maintained or improved. The studied coatings were effective barriers against the migration of mineral oil and could hence improve the barrier properties and safety of fiber-based primary food packaging.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Paper Converting and Packaging
Authors: Koivula, H. M., Jalkanen, L., Saukkonen, E., Ovaska, S., Lahti, J., Christophiesm, H., Mikkonen, K. S.
Keywords: ( Mineral oil migration; Barrier; Dispersion coating; Paperboard; Food packaging)
Pages: 173-181
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: Progress in Organic Coatings
Volume: 99
ISSN (Print): 0300-9440
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.852 1.3
Publication Forum (2016): 1
Scopus rating (2015): 0.849 1.39
Web of Science (2015): 2.632 2.808 6.6 0.627 0.00789 0.462
Publication Forum (2015): 1
Scopus rating (2014): 0.992 1.566
Web of Science (2014): 2.358 2.6 6.9 0.536 0.00837 0.493
Publication Forum (2014): 1
Scopus rating (2013): 1.03 1.663
Publication Forum (2013): 1
Scopus rating (2012): 1.043 1.862
Publication Forum (2012): 1
Scopus rating (2011): 0.884 1.606
Scopus rating (2010): 0.983 1.537
Scopus rating (2009): 0.867 1.333
Scopus rating (2008): 0.829 1.298
Scopus rating (2007): 1.08 1.362
Scopus rating (2006): 1.243 1.598
Scopus rating (2005): 0.928 1.168
Modelling and Analysis of Elastic and Thermal Deformations of a Hydrodynamic Radial Journal Bearing

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Tribology and Machine Elements
Authors: Linjamaa, A., Lehtovaara, A., Kallio, M., Söchting, S.
Number of pages: 6
Pages: 127-132
Publication date: 2016
Peer-reviewed: Yes
Early online date: 1 Jan 2015

Publication information
Journal: Key Engineering Materials
Volume: 674
ISSN (Print): 1013-9826
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.163 0.253
Publication Forum (2016): 1
Scopus rating (2015): 0.171 0.228
Publication Forum (2015): 1
Scopus rating (2014): 0.212 0.349
Publication Forum (2014): 1
Scopus rating (2013): 0.19 0.308
Publication Forum (2013): 1
Scopus rating (2012): 0.172 0.377
Publication Forum (2012): 1
Scopus rating (2011): 0.176 0.441
Scopus rating (2010): 0.183 0.295
Scopus rating (2009): 0.211 0.246
Scopus rating (2008): 0.192 0.285
Scopus rating (2007): 0.191 0.36
Scopus rating (2006): 0.221 0.411
Scopus rating (2005): 0.222 0.369
Scopus rating (2004): 0.214 0.414
Scopus rating (2003): 0.206 0.289
Scopus rating (2002): 0.202 0.223
Scopus rating (2001): 0.24 0.326
Scopus rating (2000): 0.295 0.325
Scopus rating (1999): 0.262 0.301
Original language: English
DOIs:
10.4028/www.scientific.net/KEM.674.127
Research output: Scientific - peer-review › Article
Normal displacements in non-Coulomb friction conditions during fretting

Normal displacements in non-Coulomb friction conditions during fretting may occur in gross sliding fretting conditions, in which the tangential force increases as the fretting movement approaches its extreme position and produces ‘hooked’ fretting loops. Uncertainties in frictional behaviour make the design of highly loaded contacts against fretting a challenging task. Experiments were made with quenched and tempered steel, and cyclic normal displacements were discovered during non-Coulomb friction conditions. Normal displacement and non-Coulomb friction were caused by tangential fretting scar interactions between protrusions and depressions formed by material transfer. Tangential interlocking leads to inclined sliding conditions, which produce loading components in both tangential and normal directions; this explains most non-Coulomb friction.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Tribology and Machine Elements, Research and Development, Wärtsilä Finland
Authors: Hintikka, J., Lehtovaara, A., Määttä, A.
Keywords: (Fretting, Friction, Wear)
Pages: 633-639
Publication date: 2016
Peer-reviewed: Yes
Early online date: 1 Nov 2015
ASJC Scopus subject areas: Mechanical Engineering, Mechanics of Materials, Surfaces, Coatings and Films, Surfaces and Interfaces

Publication information
Journal: Tribology International
Volume: 94
ISSN (Print): 0301-679X
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.382 2.094
Publication Forum (2016): 2
Scopus rating (2015): 1.437 2.04
Web of Science (2015): 2.259 2.352 6.8 0.542 0.0138 0.688
Publication Forum (2015): 2
Scopus rating (2014): 1.545 2.5
Web of Science (2014): 1.936 2.094 7.1 0.456 0.01304 0.635
Publication Forum (2014): 2
Scopus rating (2013): 1.473 2.793
Publication Forum (2013): 2
Scopus rating (2012): 1.406 2.331
Publication Forum (2012): 2
Scopus rating (2011): 1.247 2.209
Scopus rating (2010): 1.394 2.159
Scopus rating (2009): 1.294 2.09
Scopus rating (2008): 1.365 1.823
Scopus rating (2007): 1.195 1.766
Scopus rating (2006): 1.082 1.744
Scopus rating (2005): 0.916 1.809
Scopus rating (2004): 1.062 1.541
Scopus rating (2003): 1.256 1.567
Scopus rating (2002): 0.68 1.137
Scopus rating (2001): 0.768 1.041
Scopus rating (2000): 0.731 0.966
Scopus rating (1999): 0.778 0.985
Original language: English
DOIs: 10.1016/j.triboint.2015.10.029
Optimizing iron alloy catalyst materials for photoelectrochemical water splitting: Passivation of FeCr alloy surface by water vapour using near-ambient-pressure photoelectron spectroscopy

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Optoelectronics Research Centre, Research group: Surface Science, MAX IV Laboratory, Lund University
Authors: Lahtonen, K., Hannula, M., Ali-Löytty, H., Hirsimäki, M., Urpelainen, S., Valden, M.
Keywords: (Synchrotron, Steel, photoelectrochemical water splitting, Passivation, near-ambient-pressure photoelectron spectroscopy, APXPS)
Number of pages: 2
Publication date: 2016

Performance of a Polymer-Based Sensor Package at Extreme Temperature
There is an increasing need for inexpensive packaging structures for demanding industrial electronics applications. This paper studies the usability of a polymer-based sensor package at very high temperatures. Resistance-based temperature sensors were attached with polymer-based electrically conductive adhesives (ECAs) onto flexible polyimide (PI) printed circuit boards (PCB). The materials used in the structure were not specifically designed for high temperature use. However, they were all commercial materials, easily available and typically reliable under normal use conditions of consumer electronics. The samples were aged at 240°C and electrically monitored during the test. Electrically, the sensor samples were observed to fail after 100 h of aging. However, material characterisation revealed that the materials started to degrade much earlier. The adhesive layer in the PI PCB and the ECA materials started to degrade after just 30 h of aging at 240°C, and mechanically the materials were observed to become brittle, making them prone to cracking and delamination. The results showed that such a polymer package is usable at 240°C for relatively short exposure times, but under longer exposure times the mechanical reliability of the package deteriorates and this needs to be taken into account.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electrical Engineering, Research area: Reliability, Department of Materials Science, Research group: Plastics and Elastomer Technology
Authors: Lahokallio, S., Hoikkanen, M., Marttila, T., Vuorinen, J., Kiilunen, J., Frisk, L.
Number of pages: 17
Pages: 1184-1200
Publication date: 2016
Peer-reviewed: Yes
Early online date: 1 Jan 2015
A new design for permanent, low-cost, and planar fluidic channels on TiO2 nanoparticle coated paperboard is demonstrated. Initially superhydrophobic TiO2 nanoparticle coatings can be converted to hydrophilic by ultraviolet (UVA) light, and fluidic channels can be generated. A simple water treatment after the UVA illumination converts the channels permanent when nanoparticles are removed from the illuminated and wetted areas as shown by water contact angle, FE-SEM, XPS, and ToF-SIMS analysis. This suggests new routes for inexpensive, easy to use point-of-care diagnostics based on planar fluidic channels.

Planar fluidic channels on TiO2 nanoparticle coated paperboard
A new design for permanent, low-cost, and planar fluidic channels on TiO2 nanoparticle coated paperboard is demonstrated. Initially superhydrophobic TiO2 nanoparticle coatings can be converted to hydrophilic by ultraviolet (UVA) light, and fluidic channels can be generated. A simple water treatment after the UVA illumination converts the channels permanent when nanoparticles are removed from the illuminated and wetted areas as shown by water contact angle, FE-SEM, XPS, and ToF-SIMS analysis. This suggests new routes for inexpensive, easy to use point-of-care diagnostics based on planar fluidic channels.
Site-controlled InAs Quantum Dots for Plasmonics

We present site-controlled epitaxy of InAs quantum dots (QD) for plasmonics and report QD-plasmon coupling in a hybrid structure consisting of site-controlled InAs/GaAs QD chains in the proximity of an Ag film.

The Characterization of Flame Cut Heavy Steel – The Residual Profiling of Heat Affected Surface Layer

Flame cutting is commonly used thermal cutting method in metal industry when processing thick steel plates. Cutting is performed with controlled flame and oxygen jet, which burns steel and forms cutting edge. Flame cutting process is based on controlled chemical reaction between steel and oxygen at elevated temperature. Flame cutting of thick wear-resistant steels is challenging while it can result in cracks on and under the cut edge. Flame cutting causes uneven temperature distribution in the plate, which can introduce residual stresses. In addition, heat affected zone (HAZ) is formed and there both volume and microstructural changes as well as hardness variations are taking place. Therefore flame cutting always causes thermal stress, shape changes and consequently residual stresses to the material. Material behaviour under thermal and mechanical loading depends on the residual stress state of the material. Due to this, it is important to be able to measure the residual stresses. The aim of this study was to examine residual stresses on the cutting edge as a function of flame cutting parameters. Also resulting microstructures and hardness values were verified. Varying parameters were the cutting speed, preheating and post heating procedures. Flame cut samples were investigated with X-ray diffraction method to produce residual stress profiles of the heat affected surface layer. Results indicated that different cutting parameters provide different residual stress profiles and that these profiles can be modified by changing the cutting speed and pre- or post-treatment procedures. Cutting parameters also affect the depth of the reaustenized region in the surface. The results correlate well with the actual industrial flame cutting and thus they provide an effective tool for optimizing the flame cutting process parameters.

The Characterization of Flame Cut Heavy Steel – The Residual Profiling of Heat Affected Surface Layer

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The effects of microstructure on erosive-abrasive wear behavior of carbide free bainitic and boron steels

The wear resistance of carbide free bainitic (CFB) microstructures have shown to be excellent in sliding, sliding-rolling and erosive-abrasive wear. Whereas, boron steels are often an economically favorable alternative used in applications subjected to erosive and abrasive wear. In this study the erosive-abrasive wear resistance of CFB and boron steels with different heat treatments were compared and the effect of microstructure on wear was investigated. An application oriented dry-pot laboratory test method with 8-10 mm granite gravel was used to produce erosive-abrasive wear environment. The tested materials were CFB and boron steels. The CFB steels had hardness values of 500 and 600 HV. The boron steels, both quenched and quenched and tempered, had a hardness of 500 HV. The influence of the microstructures on wear was studied by wear test results as well as by optical and scanning electron microscopy. The phase compositions were determined by XRD. The effect of wear, in addition to weight loss was also characterized by surface profilometry, hardness and hardness profile determinations. The wear resistance of the steels was compared with results achieved in a field test in an industrial mining application. Moreover, the effect of the different microstructures on wear behavior is discussed. The carbide free bainitic steels showed better wear performance than the martensitic boron steels. The boron steels were subjected to microcutting and microploughing, whereas the CFB steels exhibited more shallow impact craters with thin platelets.
The role of microstructure in high stress abrasion of white cast irons

The abrasion wear resistance of white cast irons can be controlled primarily by adjusting the size, size distribution, and volume fraction of the carbide phase. The main physical property of white cast irons correlating with abrasion resistance is hardness. This study concentrates on the evaluation of hardened and stress relieved, normalized, self-hardened, and as-cast states of high chromium white cast irons in high stress abrasion. The correct size and orientation of the carbides were found to be crucial for the wear resistance of white cast irons in high stress abrasive conditions. The different annealing procedures affected the formation of the carbide structure and its distribution, as well as the microstructure of the matrix. The austenite-to-martensite ratio together with a beneficial carbide structure was found to have a strong effect on the abrasion wear resistance of WCI specimens.

Towards material excellence: Evaluation of Tekes' programmes on materials

Publication information
Publisher: Tekes
Original language: English
Links: http://www.tekes.fi/tekes/julkaisut1/towards-material-excellence--42016/
Research output: Professional › Commissioned report

Transformation of ALD grown TiO2 film to topographically microstructured titanium silicide for photonics applications

Publication information
Publisher: Lund University, MAX IV Laboratory
Original language: English
Links: https://www.maxlab.lu.se/cmis/display?id=workspace%3A%2F%2FSpacesStore%2F80e2da54-8373-4d0c-a4af-8b53b81b0ca3
Three-dimensional, fibrous scaffolds can be easily fabricated from polylactide (PLA) using melt spinning and textile techniques. However, the surface properties of PLA scaffolds are not ideal for tissue engineering purposes. Furthermore, electrically conducting scaffolds are required to deliver electrical stimulation to cells. In this study, uniform, electrically conducting polypyrrole (PPy) coatings were fabricated on biodegradable PLA fibers. Biopolymer dopants-hyaluronic acid (HA) and chondroitin sulfate (CS)-were compared, and a PPy/CS composition was analyzed further. The effect of the oxidative polymerization conditions on the PLA fibers and CS counterion was studied. Furthermore, the initial molecular weight of CS and its degree of polymerization were determined. Our experiments showed that the molecular weight of CS decreases under oxidizing conditions but that the decay is not significant with the short polymerization process we used. The coating process was transferred to nonwoven PLA fabrics, and the stability of PPy/CS coating was studied during in vitro incubation in phosphate buffer solution at physiological temperature. The conductivity and surface roughness of the coating decayed during the 20-day incubation. The mechanical strength, however, remained at the initial level. Thus, the fabricated structures are suitable for short-term electrical stimulation adequate to promote cell functions in specific cases.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Biomaterials and Tissue Engineering Group, BioMediTech, VTT Technical Research Centre of Finland
Authors: Hiltunen, M., Pelto, J., Ellä, V., Kellomäki, M.
Keywords: (Coating(s), Scaffolds, Stability, Surface characterization, Tissue engineering)
Pages: 1721–1729
Publication date: 2016
Peer-reviewed: Yes
ASJC Scopus subject areas: Biomedical Engineering, Biomaterials

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Volume: 104
Issue number: 8
ISSN (Print): 1552-4973
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.688 0.981
Publication Forum (2016): 1
Scopus rating (2015): 0.797 1.094
Web of Science (2015): 2.881 2.85 6.5 0.711 0.01077 0.685
Publication Forum (2015): 1
Scopus rating (2014): 0.742 1.176
Web of Science (2014): 2.759 2.902 5.8 0.597 0.01285 0.675
Publication Forum (2014): 2
Scopus rating (2013): 0.815 1.163
Publication Forum (2013): 2
Scopus rating (2012): 0.893 1.156
Publication Forum (2012): 2
Scopus rating (2011): 0.877 1.039
Scopus rating (2010): 0.906 1.048
Scopus rating (2009): 0.847 1.052
Scopus rating (2008): 0.856 1.044
Scopus rating (2007): 0.866 1.032
Scopus rating (2006): 0.921 1.09
Scopus rating (2005): 0.609 1.019
Scopus rating (2004): 0.426 0.867
Original language: English
DOIs:
10.1002/jbm.b.33514
Wear and impact behaviour of High Velocity Air-Fuel sprayed Fe-Cr-Ni-B-C alloy coatings

The tribological properties of High Velocity Air-Fuel sprayed Fe-31Cr-12Ni-3.6B-0.6C (wt%) coatings are studied as a function of the deposition parameters. At room temperature, ball-on-disk sliding against Al₂O₃ is controlled by abrasive grooving and interlamellar cracking, with some tribo-oxidation. Interlamellar crack propagation also controls the coatings response to cavitation erosion and cyclic impact tests. Coatings deposited with higher powder feed rate exhibit poorer performance under all conditions, because of weaker interlamellar cohesion. At 700 °C, sliding wear rates are levelled out, and they are one order of magnitude higher than at room temperature, because of severe abrasive grooving.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Surface Engineering, University of Modena and Reggio Emilia
Authors: Bolelli, G., Milanti, A., Lusvarghi, L., Trombi, L., Koivuluoto, H., Vuoristo, P.
Keywords: (Cavitation damage, Impact wear, Sliding contact, Thermally-sprayed coating)
Pages: 372-390
Publication date: 2016
Peer-reviewed: Yes
Early online date: 30 Nov 2015
ASJC Scopus subject areas: Mechanical Engineering, Mechanics of Materials, Surfaces, Coatings and Films, Surfaces and Interfaces

Publication information
Journal: Tribology International
Volume: 95
ISSN (Print): 0301-679X
Ratings:
  - Publication Forum (2017): 2
  - Scopus rating (2016): 1.382 2.094
  - Publication Forum (2016): 2
  - Web of Science (2015): 2.259 2.352 6.8 0.542 0.0138 0.688
  - Publication Forum (2015): 2
  - Scopus rating (2014): 1.545 2.5
  - Web of Science (2014): 1.936 2.094 7.1 0.456 0.01304 0.635
  - Publication Forum (2014): 2
  - Scopus rating (2013): 1.473 2.793
  - Publication Forum (2013): 2
  - Scopus rating (2012): 1.406 2.331
  - Publication Forum (2012): 2
  - Scopus rating (2011): 1.247 2.209
  - Scopus rating (2010): 1.394 2.159
  - Scopus rating (2009): 1.294 2.09
  - Scopus rating (2008): 1.365 1.823
  - Scopus rating (2007): 1.195 1.766
  - Scopus rating (2006): 1.082 1.744
  - Scopus rating (2005): 0.916 1.809
  - Scopus rating (2004): 1.062 1.541
  - Scopus rating (2003): 1.256 1.567
  - Scopus rating (2002): 0.68 1.137
  - Scopus rating (2001): 0.768 1.041
  - Scopus rating (2000): 0.731 0.966
  - Scopus rating (1999): 0.778 0.985
Original language: English
DOIs:
Wear performance of quenched wear resistant steels in abrasive slurry erosion

Three commercially available quenched wear resistant steel grades were compared with a structural steel and four elastomer materials to reveal the differences in their behavior in slurry erosion conditions and to find the best solutions for demanding applications. A slurry-pot tester, allowing simulation of various wear conditions with different minerals, particle sizes (up to 10 mm), abrasive concentrations, and sample angles were used to simulate different industrial slurry applications. In this study, granite and quartz with concentrations of 9 and 33 wt% were used as abrasives in tests conducted at 45° and 90° sample angles. The performance of the studied steels was evaluated with respect to their material properties such as hardness and microstructure. Furthermore, the cross-sections and wear surfaces of the test samples were analyzed to reveal the possible differences in the mechanical behavior of the materials during slurry erosion. The wear surface analyses show that abrasion is the dominating wear mechanism already for the smallest particle size of 0.1/0.6 mm. In low-stress abrasive slurry erosion with the smallest particles, the elastomers showed better wear resistance than the steels, whereas in demanding high-stress abrasive slurry erosion conditions the quenched wear resistant steels can well compete with elastomers in wear resistance. The relative wear performance of the steels increased with increasing abrasive size, while for the elastomers it decreased.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Materials Characterization, SSAB
Authors: Ojala, N., Valtonen, K., Antikainen, A., Kemppainen, A., Minkkinen, J., Oja, O., Kuokkala, V.
Keywords: (Slurry erosion, Wear testing, steel, elastomers, Mining, mineral processing, polymers)
Number of pages: 11
Pages: 21-31
Publication date: 2016
Peer-reviewed: Yes
ASJC Scopus subject areas: Metals and Alloys, Polymers and Plastics

Publication information
Journal: Wear
Volume: 354-355
ISSN (Print): 0043-1648
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.558 2.071
Publication Forum (2016): 1
Scopus rating (2015): 1.527 2.017
Web of Science (2015): 2.323 2.395 >10.0 0.37 0.01794 0.645
Publication Forum (2015): 1
Scopus rating (2014): 1.715 2.38
Web of Science (2014): 1.913 2.109 >10.0 0.347 0.01937 0.601
Publication Forum (2014): 2
Scopus rating (2013): 1.319 2.416
Publication Forum (2013): 2
Scopus rating (2012): 1.36 2.178
Publication Forum (2012): 2
Scopus rating (2011): 1.547 2.865
Scopus rating (2009): 1.684 2.07
Scopus rating (2008): 1.597 1.863
Scopus rating (2007): 1.286 1.889
Scopus rating (2006): 1.435 2.036
Scopus rating (2005): 1.473 2.007
Scopus rating (2004): 1.335 1.965
Scopus rating (2003): 1.104 1.788
ZnFe Coated 22MnB5 Steels in Direct Press Hardening: the Relationships between Coating Structure and Process Parameters

Abstract. Two types of press hardening experiments were carried out to investigate the behavior of ZnFe coated 22MnB5 steel in direct press hardening process. The coating properties were studied using variable process temperatures and times with a flat-die and a forming tool. Coatings were analyzed with optical and scanning electron microscopes. The results indicated that steels that have low coating weights (40/40 and 50/50 g/m2) may be processed successfully with short dwell times. For high coating weights (70/70 and 80/80 g/m2) a significantly longer dwell time is needed. The behavior of ZnFe coating in hot press forming experiments was in line with literature and the findings of the flat-die experiments. Thus, the feasibility of the experimental press hardening equipment was confirmed.
SESAM mode-locked Tm:CALGO laser at 2 µm
GaSb-based SESAM is successfully employed for passive mode locking of a Tm3+:CaGdAlO4 laser operating near 2 µm. The pulse duration is around 650 fs at a repetition rate ~100 MHz.

Laser sintering of copper nanoparticles on top of silicon substrates
This study examines the sintering of inkjet printed nanoparticle copper ink in a room environment using a laser as a high speed sintering method. Printed patterns were sintered with increasing laser scanning speed up to 400 mm s⁻¹. The resistivities of the sintered structures were measured and plotted against the scanning speeds. Increased resistivity seems to correlate with increased scanning speed. A selection of analytical methods was used to study the differences in microstructure and composition of the sintered structures. Based on the results, no discernable difference in the microstructure was noticed between the structures sintered using 20 mm s⁻¹ to 400 mm s⁻¹ scanning speeds; only the structure scanned using 5 mm s⁻¹ speed showed a vastly different microstructure and no resistivity was measurable on this structure. Compositional studies revealed that, apart from the structure scanned with 5 mm s⁻¹ speed which
contained the highest oxygen, the rest of the structures showed a steady oxygen increase with increased scanning speed.
Thermal Cycling Reliability Analysis of an Anisotropic Conductive Adhesive Attached Large-Area Chip with Area Array Configuration

The reliability of adhesive flip chip attachments was studied. A large-area chip with a great number of contacts was attached onto a flexible polyimide substrate using an anisotropic conductive adhesive film (ACF). The test samples were manufactured using various bonding forces and the reliability of the assemblies was examined using a thermal cycling test. Two temperature change rates were used in the cycling test to study the effect of the change rate on the observed failure times and modes. The results show that the ACF flip chip attachment of large-area chips with matrix array interconnections is an applicable technique. Furthermore, a significant increase in the reliability of the assemblies was obtained by increasing the bonding force. However, early failures were observed in all the samples, especially in the outermost adhesive interconnections. Failure analysis performed on the samples exhibiting early failures showed signs of adhesive delamination and silicon chip cracking. No clear differences in the results between the two temperature cycling tests used were observed. However, the faster temperature change rate seemed to cause a higher number of early failures.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electrical Engineering, Research area: Reliability
Authors: Kiilunen, J., Lahokallio, S., Frisk, L.
Number of pages: 6
Publication date: 2 Dec 2015

Host publication information
Title of host publication: 17th Electronics Packaging Technology Conference
Publisher: IEEE
ISBN (Electronic): 978-1-4673-7268-8
DOIs: 10.1109/EPTC.2015.7412380
Research output: Scientific - peer-review » Conference contribution

Thermal flow permeametry - A rapid method for finding local changes in flow channels
Solid bodies with flow channels can have very heterogeneous structure, whose local variations are difficult to analyze. Yet, this can play an important role affecting characteristics, such as, fluid flow property, strength and heat conductivity. This article presents a method named thermal flow permeametry (TFP) that is applicable for a quick analysis of variations in flow channels, even in meter-sized structures. For illustrating the method, we analyzed the local permeability levels of a large and extremely complex fiber structure. In TFP, hot air is ejected through a structure, while thermal camera measures local surface temperature variations during heating. Gray values of the thermal image are then plotted versus the structures local thickness, density and permeability. We showed that gray values link with local permeability, affected by thickness, density and flow channel tortuousness. We also found out that TFP is very sensitive to local changes in flow channels.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Ceramic materials, Engineering materials science and solutions (EMASS), Tampere University of Technology
Authors: Järveläinen, M., Keskinen, L., Heinonen, S., Kaleva, A., Levänen, E.
Keywords: (B. Anisotropy, B. Physical properties, B. Porosity, D. Non-destructive testing)
Number of pages: 8
Pages: 138-145
Publication date: 1 Dec 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Ceramics and Composites, Mechanics of Materials

Publication information
Journal: Composites part a: applied science and manufacturing
Volume: 79
ISSN (Print): 1359-835X
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.402 2.053
Corrosion products of carbonation induced corrosion in existing reinforced concrete facades

Active corrosion in reinforced concrete structures is controlled by environmental conditions and material properties. These factors determine the corrosion rate and type of corrosion products which govern the total achieved service life. The type and critical amount of corrosion products were studied by electron microscopy and X-ray diffractometry on concrete and reinforcement samples from existing concrete facades on visually damaged locations. The corrosion products in outdoor environment exposed concrete facades are mostly hydroxides (Feroxyhite, Goethite and Lepidocrocite) with a volume ratio to Fe of approximately 3. The results can be used to calibrate calculation of the critical corrosion penetration of concrete facade panels.
Enhanced pre-treatment of cellulose pulp prior to dissolution into NaOH/ZnO

As a result of the constantly growing demand for textile fibres interest in utilising cellulose pulps for manufacturing regenerated cellulose fibres is growing. One promising water-based process for the manufacture of regenerated cellulosic products is the Biocelsol process based on an NaOH/ZnO solvent system. The drawback of the Biocelsol process is the need for pre-treatment of the pulp, i.e. long mechanical pre-treatment (up to 5 h) followed by a 2–3-h enzymatic hydrolysis utilising a rather high amount of cellulolytic enzymes. In this work more efficient conditions to carry out the pre-treatment of cellulose pulp prior to dissolution into NaOH/ZnO are presented. Based on the results, cellulase treatment, when carried out in an extruder, can be used to effectively open up and fibrillate the fibres without completely destroying the fibre structure. The molar mass of the pulp treated enzymatically in an extruder was 14 % lower as compared to the state-of-the-art-treated cellulose. As a consequence, the alkaline solutions prepared from the pulp treated enzymatically in an extruder had clearly lower dope viscosities regarding the cellulose content than the solutions prepared from the state-of-the-art-treated pulp. This enabled increasing the cellulose content in the dope up to 7 % (w/w) without increasing the dope viscosity.
Polypyrrole coating on poly-(lactide/glycolide)-β-tricalcium phosphate screws enhances new bone formation in rabbits

Polypyrrole (PPy) has gained interest as an implant material due to its multifunctional properties and its high compatibility with several cell and tissue types. For the first time, the biocompatibility and osteointegration of PPy coating, incorporated with chondroitin sulfate (CS), were studied in vivo by implanting PPy-coated bioabsorbable bone fixation composite screws of poly-(lactide/glycolide) copolymer (PLGA) and β-tricalcium phosphate (TCP) into New Zealand white rabbits. Uncoated bioabsorbable polymer composite screws and commercially available stainless steel cortical screws were used as reference implants. The rabbits were euthanized 12 and 26 weeks after the implantation. The systemic effects were evaluated from food and water consumption, body weight, body temperature, clinical signs, blood samples, internal organ...
weights, and histological examination. Local effects were studied from bone tissue and surrounding soft tissue histology. New bone formation was evaluated by micro-computed tomography, tetracycline labeling and torsion tests. Torsion tests were performed in order to capture the peak value of the torsion force during the course of the screw’s loosening. The coated screws induced significantly more bone formation than the uncoated screws. In addition, none of the implants induced any systemic or local toxicity. The results suggest that PPy is biocompatible with bone tissue and is a potential coating for enhancing osteointegration in orthopedic implants.

**General information**

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Computational Biophysics and Imaging Group, Research group: Biomaterials and Tissue Engineering Group, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE), Fudan University, University of Wollongong, VTT Technical Research Centre of Finland, Tampere University Hospital, University of Oulu, Univ Helsinki, Helsinki University Central Hospital, University of Helsinki, Cent Hosp, Dept Med, Div Nephrol, University of Twente
Authors: Zhao, M. D., Björninen, M., Cao, L., Wang, H. R., Pelto, J., Li, X. Q., Hyttinen, J., Jiang, Y. Q., Kellomäki, M., Miettinen, S., Sándor, G. K., Seppänen, R., Haimi, S., Dong, J.

Keywords: (absorbable screw, biocompatibility, in vivo, osteointegration, polypyrrole (PPy))
Publication date: 27 Nov 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Bioengineering, Biomaterials, Biomedical Engineering

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Volume: 10
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Article number: 065016
ISSN (Print): 1748-6041
Ratings:
Publication Forum (2017): 1
Publication Forum (2016): 1
Scopus rating (2015): 0.936 0.877
Web of Science (2015): 3.361 3.132 5.1 0.338 0.00419 0.686
Publication Forum (2015): 1
Scopus rating (2014): 0.935 1.025
Web of Science (2014): 3.697 3.281 4.8 0.447 0.00496 0.719
Publication Forum (2014): 1
Scopus rating (2013): 0.741 0.75
Publication Forum (2013): 1
Scopus rating (2012): 0.652 0.742
Publication Forum (2012): 1
Scopus rating (2011): 0.578 0.828
Scopus rating (2010): 0.383 0.776
Scopus rating (2009): 0.279 0.782
Scopus rating (2008): 0.178 0.581
Scopus rating (2007): 0.145 0.376
Scopus rating (2006): 0.101
Scopus rating (2005): 0.101
Scopus rating (2004): 0.101
Scopus rating (2003): 0.101 0.0
Scopus rating (2002): 0.101 0.0
Scopus rating (2001): 0.101 0.0
Scopus rating (2000): 0.101
Scopus rating (1999): 0.105
Original language: English
DOIs:
10.1088/1748-6041/10/6/065016

**Bibliographical note**
EXT="Pelto, Jani"
Cracking resistance of Cr₃C₂–NiCr and WC–Cr₃C₂–Ni thermally sprayed coatings under tensile bending stress

The cracking behaviour of Cr₃C₂–25(Ni20Cr) and WC–20Cr₃C₂–7Ni thermally sprayed coatings during tensile load in 3-point bending tests was studied by Acoustic Emission (AE) monitoring and microstructure post-analysis. The AE monitoring reveals a superior resistance against cracking in the WC–Cr₃C₂–Ni coatings compared to Cr₃C₂–NiCr. The incorporation of tungsten carbides beneficially affects the residual stress state of the coatings and has an impact on the detailed fracture mode. The results hold for both as-sprayed as well as ground and polished coatings.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science
Authors: Mayrhofer, E., Janka, L., Mayr, W. P., Norpoth, J., Rodriguez Ripoll, M., Gröschl, M.
Keywords: (Acoustic emission, HVOF thermal spray coating, Cr₃C₂, WC, Bending test, Cracking)
Number of pages: 7
Pages: 169-175
Publication date: 15 Nov 2015
Peer-reviewed: Yes

Publication information
Journal: Surface and Coatings Technology
Volume: 281
ISSN (Print): 0257-8972
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.874 1.359
Publication Forum (2016): 1
Scopus rating (2015): 0.871 1.415
Web of Science (2015): 2.139 2.417 8.5 0.402 0.0356 0.527
Publication Forum (2015): 1
Scopus rating (2014): 0.998 1.681
Web of Science (2014): 1.998 2.374 8.2 0.307 0.03477 0.517
Publication Forum (2014): 2
Scopus rating (2013): 1.057 1.859
Publication Forum (2013): 2
Scopus rating (2012): 1.049 1.658
Publication Forum (2012): 2
Scopus rating (2011): 1.053 1.851
Scopus rating (2010): 1.155 1.66
Scopus rating (2008): 1.479 1.564
Scopus rating (2007): 1.165 1.509
Scopus rating (2006): 1.276 1.709
Scopus rating (2005): 1.252 1.666
Scopus rating (2004): 1.269 1.498
Scopus rating (2003): 1.276 1.516
Scopus rating (2002): 1.208 1.183
Scopus rating (2001): 1.115 1.181
Scopus rating (2000): 0.981 1.03
Scopus rating (1999): 1.062 1.167
Original language: English
DOIs:
10.1016/j.surfcoat.2015.09.002
Links:
Behavior of Martensitic Wear Resistant Steels in Abrasion and Impact Wear Testing Conditions

Wear is a complex phenomenon present in both small and large scale in the industry, but also in our everyday life. The ability of a material to resist wear is not an intrinsic mechanical property, as it depends on the tribosystem as a whole, including all the environmental and operational factors. One of the aims of this work is to analyze the wear testing methods used for abrasive, impact, and impact-abrasive wear performance assessment of materials and thus to add to the current understanding of the wear testing in such conditions.

In this work, wear tests with various test devices were conducted on wear resistant martensitic steels. The tests include high-stress abrasive wear tests with crushing pin-on-disc and uniaxial crusher, impact-abrasive tests with impeller-tumbler, and impact tests with single and continuous impact testers. The impeller-tumbler method was analyzed in more detail by examining the effects of sample angle and test duration as well as the effects of testing procedures on the test results. In high-stress wear tests, the amount of wear was determined through mass loss measurements, while in the impact tests measurements of the impact scars were made. The wear surfaces were characterized with optical and electron microscopy, optical profilometry and residual stress measurements. Moreover, the behavior and changes in the subsurface and microstructure of the materials were studied from prepared cross sections with optical and electron microscopy, microhardness measurements and electron backscatter diffraction.

In wear testing, selection of correct parameters is important, as they affect the wear mechanisms present on the sample surfaces. In abrasive wear, abrasive properties and even indirect counterparts have an influence on the forming wear mechanisms, which finally govern the severity of material removal. On the other hand, some similarities in the wear behavior of wear resistant steels in different abrasive contact conditions of sliding, gouging and impacting could be observed: the harder steels presented more scratching, which can be correlated to their lower ability of plastic deformation and higher amount of cutting. To ensure reaching the correct (steady) state of wear, tests should be of adequate duration, as the response of materials to many contact conditions may be nonlinear and reveal certain evolution of microstructures only after longer exposure.

Wear tests enable the comparison of materials in controlled conditions, but close attention on the test procedures must be paid also when conducting seemingly robust wear tests, especially when the differences to be detected are small. As the tests themselves constitute a tribosystem, local changes in the conditions due to the test procedures, such as sample placement, must be properly understood in order to obtain reliable results. Understanding the concept of a tribosystem and the major interdependencies involved is essential for all wear testing methods and proper analysis of the experimental test results.

General information
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Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Materials Science, Research group: Materials Characterization
Authors: Ratia, V.
Number of pages: 86
Publication date: 6 Nov 2015

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Original language: English

Publication series
Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
Volume: 1342
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Bibliographical note
Awarding institution: Tampere University of Technology
Research output: Collection of articles › Doctoral Thesis
Processing and characterization of phosphate glasses containing CaAl$_2$O$_4$:Eu$^{2+}$,Nd$^{3+}$ and SrAl$_2$O$_4$:Eu$^{2+}$,Dy$^{3+}$ microparticles

In this paper, phosphate based glasses with persistent luminescence properties were processed using standard melting process in air by adding SrAl$_2$O$_4$:Eu$^{2+}$,Dy$^{3+}$ or CaAl$_2$O$_4$:Eu$^{2+}$,Nd$^{3+}$ in the glass batch before melting. All produced glasses were characterized using SEM/EDXA, Raman spectroscopy and photoluminescence. We discuss the effect of melting conditions (temperature and duration of the melting) on the persistent luminescence properties of the microparticles containing glasses. It is demonstrated that the melting in air allows for the preparation of glasses with persistent luminescence if the melting conditions are carefully controlled.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Biomaterials and Tissue Engineering Group, Frontier Photonics, Integrated Technologies for Tissue Engineering Research (ITTE), Turun Yliopisto/Turun Biomateriaalikeskus, Johan Gadolin Process Chemistry Centre, Åbo Akademi University, University of Turku, Institute of Low Temperature and Structure Research Polish Academy of Sciences, Wroclaw, Poland, Turku University Centre for Materials and Surfaces (MatSurf), Turku, Finland
Authors: Massera, J., Gaussiran, M., Gluchowski, P., Lastusaari, M., Hupa, L., Petit, L.
Keywords: (Persistent luminescence, Phosphate glasses, SrAl$_2$O$_4$:Eu$^{2+}$,Dy$^{3+}$ and CaAl$_2$O$_4$:Eu$^{2+}$,Nd$^{3+}$ microparticles)
Number of pages: 9
Pages: 3863-3871
Publication date: 1 Nov 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Ceramics and Composites, Materials Chemistry

Publication information
Journal: Journal of the European Ceramic Society
Volume: 35
Issue number: 14
ISSN (Print): 0955-2219
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.135 1.776
Publication Forum (2016): 2
Scopus rating (2015): 1.15 1.841
Web of Science (2015): 2.933 3.01 7.9 0.9 0.02203 0.674
Publication Forum (2015): 2
Scopus rating (2014): 1.187 2.099
Web of Science (2014): 2.947 3.0 7.7 0.688 0.02233 0.672
Publication Forum (2014): 2
Scopus rating (2013): 1.122 1.794
Publication Forum (2013): 2
Scopus rating (2012): 1.305 2.244
Publication Forum (2012): 2
Scopus rating (2011): 1.343 2.217
Scopus rating (2010): 1.392 1.945
Scopus rating (2009): 1.381 1.724
Scopus rating (2008): 1.146 1.645
Scopus rating (2007): 1.22 1.76
Scopus rating (2006): 1.191 1.67
Scopus rating (2005): 1.084 1.637
Scopus rating (2004): 1.037 1.747
Scopus rating (2003): 1.129 1.497
Scopus rating (2002): 1.04 1.181
Scopus rating (2001): 1.238 1.597
Scopus rating (2000): 0.99 1.182
A survey of printable piezoelectric sensors

Availability of solution-processable piezoelectric sensor and electrode materials enable low-cost and high-throughput fabrication of fully printable piezoelectric sensors. Results obtained with piezoelectric polymer (polyvinylidenefluoride, PVDF), cellulose nanofibril (CNF) and cellulose nanocrystal (CNC) films as sensor materials are presented here. These sensor materials can be processed in solution and used in combination with printed electrodes to obtain full printability of the sensors. A commercial PVDF film and in-house fabricated CNF and CNC film are used as sensor materials. In addition, conducting polymer, graphene and carbon nanotube (CNT) based inks are used as solution-processable electrode materials in the sensors, whereas conventional metallic electrodes are used as reference electrode material. The sensor operation of the fabricated sensors is evaluated through piezoelectric sensitivity measurements. The sensor sensitivity measurements revealed mean sensitivities from 2 pC/N to 42 pC/N in transverse direction, depending on set of the sensor and electrode materials used.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Authors: Tuukkanen, S., Rajala, S.
Number of pages: 4
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Publication date: 27 Oct 2015

Host publication information
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Publisher: IEEE
ISBN (Electronic): 978-1-4799-8202-8
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DOIs:
10.1109/ICSENS.2015.7370542
Links:
http://urn.fi/URN:NBN:fi:ttly-201603183701

Bibliographical note
Versio ja lupa kunnossa 14.1.2016 KK
Research output: Scientific - peer-review › Article

Digital image correlation method in hydro turbine shaft torque and vibration monitoring

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Department of Mechanical Engineering and Industrial Systems, Research group: Kokeellinen virtaustekniikka, Research area: Applied Mechanics, Department of Materials Science, Research group: Tribology and Machine Elements, Fortum Power and Heat Oy
Authors: Saarenrinne, P., Miettinen, J., Ylönen, M., Kokko, V.
Number of pages: 8
Publication date: 27 Oct 2015

Host publication information
Title of host publication: Proceedings of the Hydro 2015 Bordeaux 26-28 October 2015
Publisher: Hydro Power & Dams
Article number: 08.06
Links:
http://www.hydropower-dams.com/index.php#nogo
Organic Molecular Films as Light-Emitting and Light-Confining Material in Rolled-Up AlInP Semiconductor Microtube Resonators

A hybrid inorganic/organic microcavity system is presented in which an AlInP-based rolled-up microtube resonator is combined with a thin film of naphthyl end-capped bithiophene molecules. The film is laterally structured into stripes on top of the AlInP layer system before the roll-up process. During the process, the strained bilayer together with the organic molecular stripes rolls up, and a hybrid microtube is formed. The stripes act as visible-light emitters inside the otherwise passive microtube. Furthermore, they induce a light confinement in the axial direction of the microtube, additional to the radial and azimuthal confinement that is intrinsic to a microtube. As the organic material defines the cavity and represents the emitter at the same time, an efficient light coupling into the three-dimensionally confined optical modes of the microtube resonator is ensured. The hybrid microtubes open up the opportunity for novel experiments on the light–molecule interaction as well as their application in optical components.
Comparison of laboratory rolling-sliding wear tests with in-service wear of nodular cast iron rollers against wire ropes

The present work describes the wear behaviour of nodular cast iron in rolling-sliding contact with steel wire ropes and steel wires in laboratory and in-service conditions. In each of the studied examples, the wear had proceeded through a surface fatigue process, in which inter-nodular crack propagation and simultaneous deformation in a thin sub-surface zone had resulted in the formation of ferrous scales consisting of material from the metal matrix of the cast iron. The scale layers of the wear surface were oriented towards the direction of the sliding component of the motion, and the spalling of the scales was identified as the dominating mechanism for material removal from the wear surface. The initiation
behaviour of the inter-nodular cracks was analysed by crack measurements and statistical analysis of the depths and
initiation angles of the cracks in relation to the wear surface. The initiation depths of the cracks increased with increasing
contact pressure. Roller samples from in-service and from the component wear tests showed closely similar distributions
of the crack depths and crack initiation angles. The sample from the twin-disc test showed aspects of cracking behaviour
that were typical of both the rolling and the sliding direction of the roller samples.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: Materials Characterization, Department of Materials Science, Tampere University of
Technology, Research group: Tribology and Machine Elements, Engineering materials science and solutions (EMASS),
VTT Technical Research Centre of Finland
Authors: Oksanen, V., Valtonen, K., Andersson, P., Vaajoki, A., Laukkanen, A., Holmberg, K., Kuokkala, V. T.
Keywords: (Contact mechanics, Nodular cast iron, Rolling contact fatigue, Rolling-sliding, Wear testing, Wire rope)
Number of pages: 9
Pages: 73-81
Publication date: 15 Oct 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Condensed Matter Physics, Surfaces and Interfaces, Materials Chemistry, Surfaces,
Coatings and Films, Mechanics of Materials

Publication information
Journal: Wear
Volume: 340-341
ISSN (Print): 0043-1648
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.558 2.071
Publication Forum (2016): 1
Scopus rating (2015): 1.527 2.017
Web of Science (2015): 2.323 2.395 >10.0 0.37 0.01794 0.645
Publication Forum (2015): 1
Scopus rating (2014): 1.715 2.38
Web of Science (2014): 1.913 2.109 >10.0 0.347 0.01937 0.601
Publication Forum (2014): 2
Scopus rating (2013): 1.319 2.416
Publication Forum (2013): 2
Scopus rating (2012): 1.36 2.178
Publication Forum (2012): 2
Scopus rating (2011): 1.547 2.865
Scopus rating (2009): 1.684 2.07
Scopus rating (2008): 1.597 1.863
Scopus rating (2007): 1.286 1.889
Scopus rating (2006): 1.435 2.036
Scopus rating (2005): 1.473 2.007
Scopus rating (2004): 1.335 1.965
Scopus rating (2003): 1.104 1.788
Scopus rating (2002): 0.958 1.365
Scopus rating (2001): 0.937 1.47
Scopus rating (2000): 1.069 1.149
Scopus rating (1999): 0.848 1.338
Original language: English
DOIs:
10.1016/j.wear.2015.07.006
Links:
http://www.scopus.com/inward/record.url?scp=84939528862&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source-ID: 84939528862
Research output: Scientific - peer-review › Article
We demonstrate 1.5 W of output power at the wavelength of 750 nm by intracavity frequency doubling a wafer-fused semiconductor disk laser diode-pumped at 980 nm. An optical-to-optical efficiency of 8.3% was achieved using a bismuth borate crystal. The wavelength of the doubled emission could be tuned from 720 to 764 nm with an intracavity birefringent plate. The beam quality parameter $M^2$ of the laser output was measured to be below 1.5 at all pump powers. The laser is a promising tool for biomedical applications that can take advantage of the large penetration depth of light in tissue in the 700–800 nm spectral range.
This paper investigates the effects of thermal degradation on polyetheretherketone (PEEK) fibres. PEEK samples were aged at a constant temperature of 250 °C for 1-128 days and characterized with mechanical tests, FTIR (Fourier Transform Infrared Spectroscopy), DSC (Differential Scanning Calorimetry), rheology, TGA (Thermogravimetric Analysis), SEM (Scanning Electron Microscopy), and UV-Vis diffuse reflectance spectroscopy. The short-term thermal annealing had a positive effect on the mechanical properties, due to the formation and growth of secondary crystals. Crosslinking in the material was verified by rheological inspections. The crosslinking increased the mechanical strength and modulus but reduced the elongation at break of the fibres. FTIR tests showed that carbonyl and hydroxyl groups were slowly formed on the surface of the fibres while ring opening reactions took place. The thermal ageing reduced the thermal stability of PEEK. The decreased stability was observed in the decomposition onset temperature after 8 d and in the melting point and the glass transition temperature after 32 d. The first signs of degradation, crosslinking, embrittlement, and reduced thermal stability, were visible roughly after 8 d of ageing, whereas the deterioration in general usability occurred after 64 d.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology, Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Engineering materials science and solutions (EMASS)
Authors: Mylärä, V., Ruoko, T., Vuorinen, J., Lemmetyinen, H.
Keywords: (Fibre, PEEK, Thermal degradation)
Number of pages: 8
Pages: 419-426
Publication date: 1 Oct 2015
Peer-reviewed: Yes
Early online date: 6 Aug 2015

Publication information
Journal: Polymer Degradation and Stability
Volume: 120
ISSN (Print): 0141-3910
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Publication Forum (2017): 1
Scopus rating (2016): 1.029 1.582
Publication Forum (2016): 1
Scopus rating (2015): 1.22 1.634
Web of Science (2015): 3.12 3.553 8.3 0.507 0.01691 0.688
Publication Forum (2015): 1
Scopus rating (2014): 1.278 1.888
Web of Science (2014): 3.163 3.722 8.0 0.348 0.01798 0.725
Publication Forum (2014): 2
Scopus rating (2013): 1.341 2.12
Publication Forum (2013): 2
Scopus rating (2012): 1.423 2.105
Publication Forum (2012): 2
Scopus rating (2011): 1.347 2.099
Scopus rating (2010): 1.237 1.642
Scopus rating (2009): 1.349 1.623
Scopus rating (2008): 1.281 1.745
Scopus rating (2007): 1.451 1.557
Scopus rating (2006): 1.367 1.787
Scopus rating (2005): 1.197 1.461
Scopus rating (2004): 1.062 1.43
Erbium-doped borosilicate glasses containing various amounts of P2O5 and Al2O3: Influence of the silica content on the structure and thermal, physical, optical and luminescence properties

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: Biomaterials and Tissue Engineering Group, Department of Electronics and Communications Engineering, BioMediTech, Frontier Photonics, Integrated Technologies for Tissue Engineering Research (ITTE), Politecnico di Torino, DISAT, Istituto di Ingegneria e Fisica dei Materiali, Corso Duca degli Abruzzi 24, I-10129 Torino, Italy, BioMediTec, Åbo Akademi University, Process Chemistry Centre, nLIGHT Corporation, Sorroninne 9, FI-08500 Lohja, Finland, CNRS, Université de Bordeaux, ISM, 351Cours de la Libération, F-33405 Talence, France, CNRS, Université de Bordeaux, ICMCB, 87 Avenue du Dr Schweitzer, F-33608 Pessac, France
Authors: Bourhis, K., Massera, J., Petit, L., Koponen, J., Fargues, A., Cardinal, T., Hupa, L., Hupa, M., Dussauze, M., Rodríguez, V., Ferraris, M.
Keywords: (Glasses, Infrared spectroscopy, Luminescence, Luminescence and optical properties, Photoelectron spectroscopy)
Number of pages: 8
Pages: 47-54
Publication date: 1 Oct 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Materials Science(all), Condensed Matter Physics, Mechanical Engineering, Mechanics of Materials

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Journal: Materials Research Bulletin
Volume: 70
ISSN (Print): 0025-5408
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.71 0.855
Publication Forum (2016): 1
Scopus rating (2015): 0.733 0.976
Web of Science (2015): 2.435 2.38 6.7 0.611 0.0211 0.441
Publication Forum (2015): 1
Scopus rating (2014): 0.774 1.051
Web of Science (2014): 2.288 2.368 6.6 0.603 0.02066 0.458
Publication Forum (2014): 1
Production of sulfonated polyetheretherketone/polypropylene fibers for photoactive textiles

New photocatalytic fibers made of sulfonated polyetheretherketone (SPEEK)/polypropylene (PP) are melt compounded and melt spun, first on laboratory scale and then on a semi-industrial scale. Fiber spinnability is optimized and the fibers are characterized using mechanical testing, electron paramagnetic resonance (EPR) spectroscopy, and scanning electron microscopy (SEM). According to the results, the fiber spinnability remains at a good level up to 10 wt % SPEEK concentration. Optimal processing temperature is 200°C due to the thermal degradation at higher temperatures. EPR measurements show good and long-lasting photoactivity after the initial irradiation but also decay in the radical intensity during several irradiation cycles. Mechanical tenacity of the SPEEK/PP 5:95 fiber is approximately 20% lower than for otherwise similar PP fiber. The fiber is a potential alternative to compete against TiO2-based products but more research needs to be done to verify the real-life performance.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology, Department of Mechanical Engineering and Industrial Systems, Research area: Sustainable Machine Systems, University College of Borås, Högskolan i Borås, Next Technology Tecnotessile Società Nazionale di Ricerca S.r.l., Department of Biotechnology, Chemistry and Pharmacy, University of Siena
Authors: Mylläri, V., Fatarella, E., Ruzzante, M., Pogni, R., Baratto, M. C., Skrifvars, M., Syrjälä, S., Järvelä, P.
Keywords: (blends, fibers, functionalization of polymers, photochemistry, textiles)
Publication date: 1 Oct 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Materials Chemistry, Polymers and Plastics, Surfaces, Coatings and Films, Chemistry(all)

Publication information
Journal: Journal of Applied Polymer Science
Volume: 132
Issue number: 39
Article number: 42595
ISSN (Print): 0021-8995
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.532 0.724
Publication Forum (2016): 1
Scopus rating (2015): 0.574 0.827
Web of Science (2015): 1.866 1.647 8.9 0.485 0.0441 0.315
Adhesive Behavior Study Between Cellulose and Borosilicate Glass Using Colloidal Probe Technique

Cellulose-glass fiber hybrid composites have been introduced to introduce weight and price benefits compared to glass composites. However, the interactions between glass and cellulose have not been extensively studied. Understanding the interactions between these two materials will help to improve the mechanical properties of the cellulose hybrid composites. In this paper, by employing the colloidal probe technique, we investigated the interaction forces between glass and cellulose material. A silicon probe with a borosilicate glass microsphere attached as the probe tip was implemented into an atomic force microscope (AFM) to complete the task. Cellulose membranes were used as experiment samples. By pressing and releasing the colloidal probe against the cellulose membrane, the adhesion force and the adhesion energy were directly obtained through the measurements. The interfacial energy was revealed by applying the Johnson-Kendall-Roberts (JKR) model, and a theoretical calculation of the material stiffness was conducted.

General Information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Research area: Microsystems, Research area: Measurement Technology and Process Control
Authors: Lai, Y., Sugano, Y., Bobacka, J., Kallio, P.
Number of pages: 5
Pages: 85-89
Publication date: Oct 2015

Host publication information
Title of host publication: Proceedings of the Fifth International Conference on Manipulation, Manufacturing and Measurement on the Nanoscale (3M-NANO)
Publisher: IEEE
ISBN (Print): 978-1-4673-9625-7
Kolloidisten suspensioiden online -analysointi: tutkimuksesta liiketoimintaa

General information
State: Published
Organisations: Department of Materials Science, Research group: Ceramic materials, Department of Automation Science and Engineering, Research area: Measurement Technology and Process Control, Research area: Microsystems, Research area: Dynamic Systems
Authors: Järveläinen, M., Yli-Hallila, T., Salpavaara, T., Verho, J., Vilkko, M., Levänen, E.
Number of pages: 4
Pages: 54-57
Publication date: Oct 2015
Peer-reviewed: Unknown

Publication information
Journal: Materia
Issue number: 5/2015
ISSN (Print): 1459-9694
Original language: Finnish
Electronic versions: Materia 5-2015_kolloidisten
Links:
http://urn.fi/URN:NBN:fi:ttv-201705191418
Research output: Professional › Article

Suomen keraaminen seura - Keramiska sällskapet i Finland
An Article about the history and present state of the Finnish ceramic society

General information
State: Published
Organisations: Department of Materials Science, Research group: Ceramic materials
Authors: Frankberg, E. J.
Keywords: (Ceramic, society, Finland)
Number of pages: 1
Pages: 58-58
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Peer-reviewed: Unknown

Publication information
Journal: Materia
Volume: 5
ISSN (Print): 1459-9694
Original language: Finnish
Links:
http://www.vuorimiesyhdistys.fi/julkaisut/materia
Research output: Professional › Article
The Effect of Phosphorus Exposure on Diesel Oxidation Catalysts—Part II: Characterization of Structural Changes by Transmission Electron Microscopy

Phosphorus poisoning and its effect on the diesel oxidation catalysts morphology was studied by transmission electron microscopy (TEM). The studied catalyst samples were PtPd or Pt supported on the alumina-based washcoat including additives. The laboratory-scale phosphorus exposures were carried out with two different phosphorus concentrations. The cross-sectional TEM samples were prepared from the fresh and phosphorus-treated catalysts. After phosphorus exposures, significant structural changes were observed compared to the fresh catalysts. The shape of the noble metal particles had changed from irregular to more spherical-shaped particles. In addition, phosphorus was detected throughout the catalyst TEM samples but the amount varied depending on the local composition of the support. Phosphorus accumulated mainly in the alumina-containing areas of the support and indications of dense and amorphous aluminium phosphates were found. Based on the results gained, cross-sectional TEM characterization is essential to observe these kinds of morphological changes in the catalysts caused e.g. by phosphorus exposures. In addition, cross-sectional TEM samples are needed to study the effect of local variation in the support composition on the phosphorus accumulation.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Materials Characterization, Univ Oulu, University of Oulu, Fac Technol Mass & Heat Transfer Proc Engn, Aalto University, Dinex Ecocat Oy
Authors: Honkanen, M., Kärkkäinen, M., Heikkinen, O., Kallinen, K., Kolli, T., Huuhtanen, M., Lahtinen, J., Keiski, R. L., Lepistö, T., Vippola, M.
Keywords: (Diesel oxidation catalyst, Phosphorus poisoning, Structural characterization, Transmission electron microscopy, 3-WAY CATALYST, DEACTIVATION, MECHANISMS, EXHAUST, IMPACT)
Number of pages: 6
Pages: 971-976
Publication date: Oct 2015
Peer-reviewed: Yes

Publication information
Journal: Topics in Catalysis
Volume: 58
Issue number: 14
ISSN (Print): 1022-5528
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.974 0.878
Publication Forum (2016): 1
Scopus rating (2015): 0.945 0.789
Web of Science (2015): 2.355 2.681 6.9 0.54 0.00915 0.679
Publication Forum (2015): 1
Scopus rating (2014): 0.989 0.862
Web of Science (2014): 2.365 2.739 6.4 0.682 0.01103 0.707
Publication Forum (2014): 2
Scopus rating (2013): 1.125 0.837
Publication Forum (2013): 2
Scopus rating (2012): 1.196 0.851
Publication Forum (2012): 2
Scopus rating (2011): 1.346 0.977
Scopus rating (2010): 1.492 0.91
Scopus rating (2009): 1.269 0.907
Scopus rating (2008): 1.225 1.015
Scopus rating (2007): 1.522 1.382
Scopus rating (2005): 1.444 1.17
Scopus rating (2004): 1.374 1.136
Scopus rating (2003): 1.229 0.915
Scopus rating (2002): 1.233 0.874
Scopus rating (2001): 1.451 1.087
Scopus rating (2000): 2.482 1.684
Scopus rating (1999): 1.43 1.163
Detecting lateral composition modulation in dilute Ga(As,Bi) epilayers

The ability to characterize a structure into the finest details in a quantitative manner is a key issue to understanding and controlling nanoscale phase separation in novel nanomaterials. In this work, we consider the detectability of lateral composition modulation (LCM), a type of nanoscale phase separation in GaAs$_{1-x}$Bi$_x$ epilayers, by x-ray diffraction (XRD). We show that the satellite peaks due to LCM are hardly detectable in reasonable time with a lab x-ray diffractometer for GaAs$_{1-x}$Bi$_x$ samples with an average $x$ up to 25% and relative modulation up to 50%. This is in contrast to LCM reported in other III-V combinations, where the intensity of the satellite peak is relatively high and can be easily detected. Our theoretical considerations are complemented experimentally using highly brilliant synchrotron radiation. The results are in good agreement with the predictions. This work provides a guideline for the systematic characterization of LCM in zincblende III-V semiconductor epilayers and points to the critical role of quantitative characterization of nanoscale phase separation.

General information
State: Published

Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Frontier Photonics

Authors: Wu, M., Hanke, M., Luna, E., Puustinen, J., Guina, M., Trampert, A.
Publication date: 30 Sep 2015
Peer-reviewed: Yes

Publication information
Journal: Nanotechnology
Volume: 26
Issue number: 42
Article number: 425701
ISSN (Print): 0957-4484

Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.096 0.814
Publication Forum (2016): 2
Scopus rating (2015): 1.18 0.966
Web of Science (2015): 3.573 3.611 6.1 0.819 0.07276 0.961
Publication Forum (2015): 2
Scopus rating (2014): 1.465 1.258
Web of Science (2014): 3.821 3.885 5.5 0.678 0.09114 1.041
Publication Forum (2014): 3
Scopus rating (2013): 1.585 1.244
Publication Forum (2013): 3
Scopus rating (2012): 1.846 1.306
Publication Forum (2012): 3
Scopus rating (2011): 1.892 1.461
Scopus rating (2010): 1.844 1.259
Scopus rating (2009): 1.819 1.28
Scopus rating (2008): 1.875 1.333
Scopus rating (2007): 1.91 1.36
Scopus rating (2005): 1.925 1.445
Scopus rating (2004): 1.849 1.477
Scopus rating (2003): 1.427 1.371
Scopus rating (2002): 0.962 0.993
Scopus rating (2001): 0.901 0.94
Strontium- and calcium-containing, titanium-stabilised phosphate-based glasses with prolonged degradation for orthopaedic tissue engineering

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Biomaterials and Tissue Engineering Group, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE), BioMediTech - Institute of Biosciences and Medical Technology, Adult Stem Cell Group, CREST - University College London, Division of Biomaterials and Tissue Engineering, UCL Eastman Dental Institute, Faculty of Mathematical and Physical Sciences, Department of Nanobiomedical Science, BK21 Plus NBM Global Research Center for Regenerative Medicine, Dankook University, Institute of Tissue Regeneration Engineering, College of Dentistry, Unit of Orthodontics, Department of Craniofacial Growth and Development
Authors: Al Qaysi, M., Walters, N. J., Foroutan, F., Owens, G. J., Kim, H. W., Shah, R., Knowles, J. C.
Keywords: (biomaterial, calcium, Phosphate-based glass, strontium, tissue engineering)
Number of pages: 11
Pages: 300-310
Publication date: 24 Sep 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Biomedical Engineering, Biomaterials

Publication information
Journal: Journal of Biomaterials Applications
Volume: 30
Issue number: 3
ISSN (Print): 0885-3282
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.554 0.76
Publication Forum (2016): 1
Scopus rating (2015): 0.634 0.755
Web of Science (2015): 1.988 2.124 4.2 0.464 0.00277 0.455
Publication Forum (2015): 1
Scopus rating (2014): 0.659 1.004
Web of Science (2014): 2.197 2.559 4.4 0.464 0.00248 0.521
Publication Forum (2014): 1
Scopus rating (2013): 0.72 1.026
Publication Forum (2013): 1
Scopus rating (2012): 0.792 0.958
Publication Forum (2012): 1
Scopus rating (2011): 0.804 1.089
Scopus rating (2010): 0.921 1.068
Scopus rating (2009): 0.67 1.082
Scopus rating (2008): 0.603 0.758
Scopus rating (2007): 0.682 0.801
Scopus rating (2006): 0.585 0.823
Scopus rating (2005): 0.327 0.591
Scopus rating (2004): 0.354 0.446
Scopus rating (2003): 0.436 0.514
Scopus rating (2002): 0.597 0.875
Ionic Modification Turns Commercial Rubber into a Self-Healing Material

Invented by Charles Goodyear, chemical cross-linking of rubbers by sulfur vulcanization is the only method by which modern automobile tires are manufactured. The formation of these cross-linked network structures leads to highly elastic properties, which substantially reduces the viscous properties of these materials. Here, we describe a simple approach to converting commercially available and widely used bromobutyl rubber (BIIR) into a highly elastic material with extraordinary self-healing properties without using conventional cross-linking or vulcanising agents. Transformation of the bromine functionalities of BIIR into ionic imidazolium bromide groups results in the formation of reversible ionic associates that exhibit physical cross-linking ability. The reversibility of the ionic association facilitates the healing processes by temperature- or stress-induced rearrangements, thereby enabling a fully cut sample to retain its original properties after application of the self-healing process. Other mechanical properties, such as the elastic modulus, tensile strength, ductility, and hysteresis loss, were found to be superior to those of conventionally sulfur-cured BIIR. This simple and easy approach to preparing a commercial rubber with self-healing properties offers unique development opportunities in the field of highly engineered materials, such as tires, for which safety, performance, and longer fatigue life are crucial factors.
Wear Properties of Thermally Sprayed Tungsten-Carbide Coatings in Paper Machine Environments

Thermally sprayed tungsten-carbide (WC) coatings have proven to be one of the most wear resistant coatings available and a respectable replacement for hard-chromium coatings. They are used in paper machine parts such as calender rolls. However, improved lifetime and performance are continuing considerations, as well as finding more economical alternatives. This study researched the wear phenomena of tungsten-carbide coatings in a paper machine environment. To achieve this, five different feedstock materials and coatings manufactured from these were compared by electron microscopy as well as dry abrasion-, high-speed slurry abrasion- and cavitation erosion tests. Improvements in ductility by changing the matrix material were found, while changing the particle strength had no effect on the behavior of the coatings. The findings suggest further research on altering the matrix of the feedstock could lead to overall improvements in coating quality and component lifetime.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Surface Engineering, Valmet Technologies Oy
Authors: Kiilakoski, J., Eronen, V., Vuoristo, P.
Number of pages: 35
Pages: 29
Publication date: 21 Sep 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Surfaces, Coatings and Films, Materials Science (miscellaneous)

Publication information
Journal: Tribologia
Volume: 33
Issue number: 2
ISSN (Print): 0780-2285
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.141 0.076
Publication Forum (2016): 1
Scopus rating (2015): 0.101 0.0
Publication Forum (2015): 1
Scopus rating (2014): 0.316 0.126
Publication Forum (2014): 1
Scopus rating (2013): 0.118 0.019
Publication Forum (2013): 1
Scopus rating (2012): 0.24 0.312
Publication Forum (2012): 1
Scopus rating (2011): 0.237 0.103
Scopus rating (2010): 0.125 0.055
Scopus rating (2009): 0.459 0.37
Scopus rating (2008): 0.13 0.228
Scopus rating (2007): 0.126 0.186
Scopus rating (2006): 0.159 0.438
Scopus rating (2005): 0.181 0.429
Scopus rating (2004): 0.104 0.479
Scopus rating (2003): 0.227 0.277
Scopus rating (2002): 0.101 0.0
Scopus rating (2001): 0.221 0.0
Scopus rating (2000): 0.238
Scopus rating (1999): 0.119
Original language: English
Influence of application method and sintering temperature on porosity and thermal conductivity of two commercial silicon carbide based castables

Information about thermal conductivity of refractory castables is crucial in heat conducting structures. Two commercial castables were studied to find out the effect of silicon carbide content (58-67 %) and installation method on thermal conductivity. One castable was designed to be installed by casting and the other one was shotcreting. The shotcrete castable was casted and shotcreted in to metal mold sized 200x200x50 mm. The other castable was casted in laboratory conditions and on site. Porosities and thermal conductivities were measured from samples after heat treatment at 400, 600, 800 and 1000 °C. Thermal conductivities were measured by transient plane source method, porosities were measured by Archimedes’ method and microstructures were characterized by scanning electron microscopy. Thermal conductivities varied from 6.8-16.3 W/mK and porosities 12.74-21.92 %. Thermal conductivity of measured samples increased with SiC content and higher heat treatment temperature as expected. Porosities and thermal conductivities in castables casted in laboratory and on site varied only slightly. In shotcrete castable applied by casting the porosity and thermal conductivity were higher than in shotcreted sample. So the interconnection between low porosity and high thermal conductivity was not as clear as expected.

Validity of traditional barrier-testing methods to predict the achievable benefits of the new generation water based barrier coatings for packaging materials

In the study, Next Gen WBBC materials were evaluated both in laboratory and pilot scale. Analyses were done for KIT, oxygen, water vapour, grease and oil barrier. The applicability of the testing methods was tested and compared to PE-coated ice cream boxes and fluorocarbon coated quick food packages, which both have different barrier demands.

As a result, some of the test methods did not characterize well enough the barrier properties of WBBC materials. The Next Gen WBBC solutions had excellent grease and water vapour resistance even with low KIT values. For example the behaviour of WBBC materials in the oil resistance test was different compared to fluorocarbon coated packages, which also creates a need to further develop the test method and target setting.

The Next Gen WBBC materials can be used to replace PE-coatings, waxes and fluorocarbons in some of the common packaging applications. The future challenge is to commonly agree on and develop the accepted test methods for novelty WBBC products to evidence their performance and achievable benefits in barrier application areas.
Effect of spraying parameters on the microstructural and corrosion properties of HVAF-sprayed Fe-Cr-Ni-B-C coatings

Thermally sprayed Fe-based coatings have been extensively studied as future solution in order to replace more expensive, harmful and environmentally dangerous Ni- and WC-based coatings for several industrial applications where high corrosion and wear resistance are required. The aim of the present study is to investigate the effect of spraying parameters on the microstructure and the corrosion resistance of Fe-based coatings manufactured with the High Velocity Air Fuel (HVAF) thermal spray process. Six sets of thermal spraying parameters have been chosen and their effect on the overall quality of coatings was investigated. All HVAF coatings showed comparably dense microstructure with near-zero oxidation, proving the high quality of the deposition process. However, higher anti-corrosion and mechanical properties were achieved by increasing the spraying air pressure and decreasing the particle feeding rate without altering the thickness and the overall deposition rate. Powder feeding rate was reported to have a remarkable effect on microstructure and corrosion properties. Coatings with beneficial compressive residual stresses were successfully obtained by increasing air pressure during spraying which resulted in improved microstructural and corrosion properties.
Wet-spinning of cellulosic fibres from water-based solution prepared from enzyme-treated pulp

The demand for textile fibres is increasing constantly due to the growing population and improving standard of living. Currently, 64 % of the fibres produced globally are synthetic man-made fibres from oil-based raw materials, 29 % is cotton and the rest are man-made cellulosic fibres, wool and other natural fibres. The production of synthetic fibres and cotton cannot be increased in the future, thus creating a gap between the fibre demand and the production. One candidate to fill the gap is the viscose fibre which production covers currently 96 % of the man-made cellulosic fibres. However, the viscose process is challenging due to the occupational health and environmental issues relating to the use of carbon disulphide.

As a consequence, there is a need of such fibres that are made from the renewable resources (vs. oil), do not compete with the food production (as cotton) and do not need hazardous chemicals (as viscose).

This work introduces a new cellulosic fibre process which attempts to respond the need described. In the process, a dissolving grade wood pulp is treated with enzymes, dissolved in water-based solvent and regenerated to fibres using a wet spinning method. Thus the raw material is renewable, which growth does not use arable land, and the carbon disulphide needed in the viscose process is here replaced with enzymes.

Dissolution of the enzyme-treated pulp into aqueous sodium zincate and the regeneration of the solution into cellulosic fibres were demonstrated first. Thereafter, the preparation of the spin dope and the wet spinning of the fibres were studied in more detailed. The enzyme-treated cellulose was dissolved either by mixing-procedure or by freezing-thawing cycle. Both methods resulted in high quality solution for the spinning trials. However, the alkali ratio of the solution prepared by freezing-thawing cycle was lower (1.1 vs. 1.3) thus requiring less sulphuric acid during the coagulation. The spinneret draw ratio and the stretching ratio during the spinning exhibited negative correlation. This was due to the rapid coagulation of the solution. The coagulation rate decreased significantly when the sulphuric acid spin bath was replaced with an acetic acid bath. Equally, the stretching ratio of the fibres increased, but unexpectedly the tenacity of the fibres did not increase. It was found that the acetic acid spun fibres shrunk during the drying and thus the orientation gained during the stretching was lost.

Another route to modify the fibre properties was explored through the chemical modification of enzyme-treated cellulose with allyl glycidyl ether. The treatment resulted in the pulp with low amount of 3-allyloxy-2-hydroxypropyl groups (DSA 0.05) which had higher solubility in aqueous sodium zincate than the un-substituted enzyme-treated pulp. The 100 % solution from the modified pulp did not form fibres in acidic bath, thus the fibres were spun from the solutions containing 25 % and 10 % of the modified pulp. The 3-allyloxy-2-hydroxypropyl groups provide reactive C=C double bonds in the fibre structure, thus allowing the further functionalization to gain new properties for the fibres.

It was shown that the production of regenerated cellulosic fibres in an environmental manner is possible, thus providing one option to fill the gap between the fibre demand and the production in the following decades.

General information
State: Published
Enhanced photoactive and photoelectrochemical properties of TiO2 sol-gel coated steel by the application of SiO2 intermediate layer

Photocatalysis is a promising solution for purifying air and water from pollutants, yet more efficient photocatalytic materials are needed. A new approach is proposed in this paper for enhancing the photoactive and photoelectrical properties of anatase TiO2 films by applying an intermediate SiO2 film between the TiO2 film and the stainless steel substrate. TiO2 and SiO2 coatings are synthesized by a sol-gel method and the thickness of TiO2 film is varied in order to obtain improved understanding on the role of thickness in photocatalytic and electrochemical performance. The obtained coatings are systematically characterized in terms of microstructure using such techniques as field-emission scanning electron microscopy (FE-SEM), Raman spectroscopy and X-ray diffraction (XRD), that demonstrate, e.g., the anatase phase structure of the TiO2 films. The enhanced photocatalytic properties of SiO2/TiO2 coatings as compared to TiO2 films are verified using methylene blue (MB) discoloration tests, while the improved photoelectrochemical properties are shown by...
potentiodynamic i-V scans, open circuit potential (OCP) monitoring and electrochemical impedance spectroscopy (EIS). We attribute the beneficial effect of the intermediate SiO$_2$ film on the photocatalytic and photoelectrochemical performance to the high electrical resistance of the SiO$_2$ that imposes a high-energy barrier for electron transfer and, therefore, (partly) insulates the TiO$_2$ film from the substrate and acts as a capacitor for photo-generated electrons under illumination. The presented results show an effective way of enhancing the photocatalytic performance of anatase TiO$_2$ films.

**General information**

State: Published

Ministry of Education publication type: A1 Journal article-refereed

Organisations: Department of Materials Science, Research group: Ceramic materials, Optoelectronics Research Centre, Research group: Nanophotonics, Research group: Surface Engineering, Research group: Materials Characterization, Engineering materials science and solutions (EMASS), Frontier Photonics, Optoelectronics Research Centre, Tampere University of Technology, VTT Technical Research Centre of Finland


Keywords: (Electrical resistance, Electrochemical impedance spectroscopy, Photocatalysis, Substrate, Titanium dioxide)

Number of pages: 11

Pages: 533-543

Publication date: 1 Sep 2015

Peer-reviewed: Yes

ASJC Scopus subject areas: Catalysis, Process Chemistry and Technology, Environmental Science(all)

**Publication information**

Journal: Applied Catalysis B-Environmental

Volume: 174-175

ISSN (Print): 0926-3373

Ratings:

Publication Forum (2017): 3

Scopus rating (2016): 2.583 2.12

Publication Forum (2016): 3

Scopus rating (2015): 2.26 2.081

Web of Science (2015): 8.328 8.142 5.2 3.377 0.05722 1.508


Scopus rating (2014): 2.232 2.164

Web of Science (2014): 7.435 7.49 5.3 2.539 0.05334 1.477

Publication Forum (2014): 3

Scopus rating (2013): 2.345 2.134

Publication Forum (2013): 3

Scopus rating (2012): 2.629 2.236

Publication Forum (2012): 3

Scopus rating (2011): 2.585 2.345

Scopus rating (2010): 2.461 1.895

Scopus rating (2009): 2.301 2.232

Scopus rating (2008): 2.455 2.275

Scopus rating (2007): 2.493 2.5

Scopus rating (2006): 2.284 2.229

Scopus rating (2005): 2.095 2.233

Scopus rating (2004): 2.393 2.41

Scopus rating (2003): 1.979 2.259

Scopus rating (2002): 2.304 1.847

Scopus rating (2001): 2.781 2.441

Scopus rating (2000): 2.687 2.13

Scopus rating (1999): 2.18 1.874

Original language: English

DOIs:

10.1016/j.apcatb.2015.03.014

Links:

http://www.scopus.com/inward/record.url?scp=84937762118&partnerID=8YFLogxK (Link to publication in Scopus)
Highly Nonlinear Dispersion Increasing Fiber for Femtosecond Pulse Generation
The optical pulse evolution in a highly nonlinear normal dispersion-increasing fiber has been considered, both experimentally and theoretically. It was found that large spectral broadening in tapered waveguides could occur without temporal instabilities and impose the linear frequency modulation, i.e., chirp, required for high-quality pulse compression. The pedestal-free pulses have been demonstrated after dechirping in a standard single-mode fiber.
Unintentional boron contamination of MBE-grown GaInP/AlGaInP quantum wells
The effects of unintentional boron contamination on optical properties of GaInP/AlGaInP quantum well structures grown by molecular beam epitaxy (MBE) are reported. Photoluminescence and secondary-ion mass spectrometry (SIMS) measurements revealed that the optical activity of boron-contaminated quantum wells is heavily affected by the amount of boron in GaInP/AlGaInP heterostructures. The boron concentration was found to increase when cracking temperature of the phosphorus source was increased. Boron incorporation was enhanced also when aluminum was present in the material.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Frontier Photonics, VTT Technical Research Centre of Finland
Authors: Tukiainen, A., Likonen, J., Toikkanen, L., Leinonen, T.
Pages: 60-63
Publication date: 1 Sep 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Condensed Matter Physics, Materials Chemistry, Inorganic Chemistry

Publication information
Journal: Journal of Crystal Growth
Volume: 425
ISSN (Print): 0022-0248
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.735 1.175
Publication Forum (2016): 1
Scopus rating (2015): 0.716 1.174
Web of Science (2015): 1.462 1.481 >10.0 0.369 0.022 0.389
Publication Forum (2015): 1
Scopus rating (2014): 0.795 1.184
Web of Science (2014): 1.698 1.632 9.9 0.363 0.02509 0.401
Publication Forum (2014): 1
Scopus rating (2013): 0.831 1.221
Publication Forum (2013): 1
Scopus rating (2012): 0.956 1.246
Publication Forum (2012): 1
Scopus rating (2011): 0.96 1.425
Scopus rating (2010): 1.163 1.206
Scopus rating (2009): 1.068 1.202
Scopus rating (2008): 1.161 1.236
Scopus rating (2007): 1.237 1.32
Scopus rating (2006): 1.001 1.211
Scopus rating (2005): 1.105 1.403
Scopus rating (2004): 1.211 1.292
Scopus rating (2003): 0.956 1.11
Scopus rating (2002): 1.16 1.262
Scopus rating (2001): 1.108 1.067
Automated Microrobotic Manipulation of Paper Fiber Bonds

This paper presents a novel method for automated manipulation of individual paper fiber bonds using a microrobotic platform, a computer vision algorithm and a robotic software framework. This is a challenging task due to the three-dimensional, heterogeneous and complex morphology of the fiber bonds. The goal is to automatically grasp the fiber bond, and break it by pulling apart the fibers it consists of. We present the components of the microrobotic platform, and the different rules utilized in detecting suitable grasp points from a 3D reconstruction of the bond generated from an image pair. We demonstrate the functionality of the approach with bond breaking experiments of seven fiber bonds. The time required for grasping and breaking of a bond is 10 – 15 seconds making the approach much faster than the current state-of-the-art testing, which is based on manual manipulation. The success rate of the tests is as high as 80%.

Effects of surface cracks and strain rate on the tensile behavior of Balmoral Red granite

This paper presents an experimental procedure for studying the effects of surface cracks on the mechanical behavior of Balmoral Red granite under dynamic and quasi-static loading. Three different thermal shocks were applied on the surface of the Brazilian Disc test samples by keeping a flame torch at a fixed distance from the sample surface for 10, 30, and 60 seconds. Microscopy clearly shows that the number of the surface cracks increases with the duration of the thermal shock. After the thermal shock, the Brazilian Disc tests were performed using a servohydraulic materials testing machine and a compression Split Hopkinson Pressure Bar (SHPB) device. The results show that the tensile strength of the rock decreases and the rate sensitivity of the rock increases as more cracks are introduced to the structure. The DIC analysis of the Brazilian disc tests shows that the fracture of the sample initiates at the center of the samples or slightly closer to the incident bar contact point. This is followed by crushing of the samples at both contact points with the stress bars.
Er3+-Al2O3 nanoparticles doping of borosilicate glass

Novel borosilicate glasses were developed by adding in the glass batch Er3+-Al2O3 nanoparticles synthetized by using a soft chemical method. A similar nanoparticle doping with modified chemical vapour deposition (MCVD) process was developed to increase the efficiency of the amplifying silica fibre in comparison to using MCVD and solution doping. It was shown that with the melt quench technique, a Er3+-Al2O3 nanoparticle doping neither leads to an increase in the Er3+ luminescence properties nor allows one to control the rare-earth chemical environment in a borosilicate glass. The site of Er3+ in the Er3+-Al2O3 nanoparticle containing glass seems to be similar as in glasses with the same composition prepared using standard raw materials. We suspect the Er3+ ions to diffuse from the nanoparticles into the glass matrix. There was no clear evidence of the presence of Al2O3 nanoparticles in the glasses after melting.
Effects of thinning and heating for TiO2/AlInP junctions

TiO2/AlInP junctions are used to construct the antireflection coatings for solar cells and to passivate III-V nanostructure surfaces. The thickness of AlInP epilayer affects light absorption and appropriate Al composition determining further the energy barrier for carriers. We report on reducing the AlInP thickness by dry etching down to 10 nm without introducing harmful defect states at TiO2/AlInP interface and AlInP/GaInP interface below, according to photoluminescence. Synchrotron-radiation photoelectron spectroscopy reveals that increased oxidation of phosphorus is not harmful to TiO2/AlInP and that post heating of the material enhances AlInP oxidation and group III element segregation resulting in decreased material homogeneity.
Bringing High-Performance GaInNAsSb/GaAs SOAs to True Data Applications

We experimentally demonstrate the high-speed data processing capabilities of a GaInNAsSb semiconductor optical amplifier operating at 1.55 μm. The investigated structure exhibits good thermal characteristics and fast gain dynamics with 10%-90% recovery time of 55 ps. Successful wavelength conversion of 10-Gb/s signals is reported. A maximum power penalty of <2.4 dB for return to zero formatting and of 1.9 dB for nonreturn to zero is demonstrated.

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Evaluation of crushing strength of spray-dried MgAl$_2$O$_4$ granule beds

The crushing strengths of four different experimental magnesium aluminate spinel (MgAl$_2$O$_4$) granule beds were monitored with the axial die pressing test after heat treatments. Precursor, magnesium hydroxide (Mg(OH)$_2$) and magnesium oxide (MgO) as Mg precursor and aluminium oxide hydroxide Al(O)OH and α-Al$_2$O$_3$ as Al precursor, were used for experimental granules, which were manufactured via a dispersion manufacturing and spray-drying process. After spray-drying, granules were heat treated in air at 1000, 1100, 1200, 1300 and 1400 °C. In order to understand the potential effect of precursor, phase structure, morphology, particle size distribution and density of granules on crushing strength behaviour, scanning X-ray diffraction (XRD) was used together with electron microscopy (SEM) and laser diffraction (LDPA) for characterisation. All precursor mixtures formed spherical granules during the spray-drying process and pure spinel phase structure during heat treatment. The crushing strength test results indicated that the Al precursor clearly affected the crushing strength behaviour of experimental granule beds. The highest strength was observed for granule beds with Al(O)OH as Al and Mg(OH)$_2$ as Mg precursor.
Dual-Mode Multi-Section Lasers with Nanoscale Surface Gratings

Dual-mode multi-section distributed-feedback lasers with surface gratings have been fabricated using UV nanoimprint lithography. Frequency differences from 14GHz to 1.3THz for different longitudinal structures and frequency difference modulation speed up to 500MHz have been measured.

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Microrobotic platform with integrated force sensing microgrippers for characterization of fibrous materials: Case study on individual paper fibers

Mechanical characterization of micro-scale fibrous materials determines the key parameters which affect the quality of products such as composites, textile and paper. The current laboratory tests are mainly based on bulk measurements. This thesis introduces a microrobotic platform to handle and to characterize micro-scale fibers (MF), with the dimensions of few micrometers to hundreds of micrometers, at individual fiber level. The platform facilitates handling and specimen preparation of micro-scale fibrous material. A major challenge in mechanical characterization of MF is lack of proper force sensing microgrippers in the market. MF do not need a lot of force to manipulate, but their ultimate tensile strength is high and relatively large forces are required to perform a micro-tensile test. In this thesis, three force sensing microgrippers are developed and they are integrated into the mentioned microrobotic platform. Two of them are developed to measure the bonding forces between individual pulp fibers, normal to the bonded area (Z-direction) and parallel to the bonded area (shear-mode). Their force sensing solution is based on bending polyvinylidene fluoride (PVDF) films and their force range is up to 10mN. The third one, with the force range of 20mN, is developed to perform micro-tensile tests on MF. It uses a microspring and a magnetic encoder to measure the force. The force range of this force sensing microgripper can easily be increased by changing its microspring to a stiffer one. This feature makes the proposed force sensing approach adaptable to a wide range of MF. Even though pulp and paper fibers are used as a case study in this thesis, the applications of microrobotic solutions presented here are not limited to pulp and paper fibers for the following reason: pulp and paper fibers are natural fibers with random morphology, therefore if a microrobotic solution is capable of handling these morphologically challenging fibers, it is easily adaptable to synthetic fibers which have uniform morphology. The prototypes of all three force sensing microgrippers are calibrated and their performance are validated.
Improved dimensional stability with bioactive glass fibre skeleton in poly(lactide-co-glycolide) porous scaffolds for tissue engineering

Abstract Bone tissue engineering requires highly porous three-dimensional (3D) scaffolds with preferable osteoconductive properties, controlled degradation, and good dimensional stability. In this study, highly porous 3D poly(d,l-lactide-co-glycolide) (PLGA) - bioactive glass (BG) composites (PLGA/BG) were manufactured by combining highly porous 3D fibrous BG mesh skeleton with porous PLGA in a freeze-drying process. The 3D structure of the scaffolds was investigated as well as in vitro hydrolytic degradation for 10 weeks. The effect of BG on the dimensional stability, scaffold composition, pore structure, and degradation behaviour of the scaffolds was evaluated. The composites showed superior pore structure as the BG fibres inhibited shrinkage of the scaffolds. The BG was also shown to buffer the acidic degradation products of PLGA. These results demonstrate the potential of these PLGA/BG composites for bone tissue engineering, but the ability of this kind of PLGA/BG composites to promote bone regeneration will be studied in forthcoming in vivo studies.

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Authors: Haaparanta, A., Uppstu, P., Hannula, M., Ellä, V., Rosling, A., Kellomäki, M.
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Scopus rating (2006): 0.656 0.976
Scopus rating (2005): 0.747 1.009
Lithography-free oxide patterns as templates for self-catalyzed growth of highly uniform GaAs nanowires on Si(111)

We report self-catalyzed growth of GaAs nanowires (NWs) on Si/SiO\textsubscript{x} patterns fabricated by a lithography-free method. The patterns are defined using droplet epitaxy of GaAs nanocrystals, spontaneous oxidation, and thermal annealing. We investigate the influence of the size and density of the nucleation sites on the NW growth process and show that this approach enables the fabrication of highly uniform GaAs NWs with controllable density. The pattern fabrication and NW growth process are studied and discussed in relation to the surface morphology and chemical properties of the Si/SiO\textsubscript{x} patterns. Furthermore, the optical quality of the NWs is investigated by photoluminescence experiments performed for GaAs-AlGaAs core-shell NWs.
Bioactive glass ions as strong enhancers of osteogenic differentiation in human adipose stem cells

Bioactive glasses are known for their ability to induce osteogenic differentiation of stem cells. To elucidate the mechanism of the osteoinductivity in more detail, we studied whether ionic extracts prepared from a commercial glass S53P4 and from three experimental glasses (2-06, 1-06 and 3-06) are alone sufficient to induce osteogenic differentiation of human adipose stem cells. Cells were cultured using basic medium or osteogenic medium as extract basis. Our results indicate that cells stay viable in all the glass extracts for the whole culturing period, 14 days. At 14 days the mineralization in osteogenic medium extracts was excessive compared to the control. Parallel to the increased mineralization we observed a decrease in the cell amount. Raman and Laser Induced Breakdown Spectroscopy analyses confirmed that the mineral consisted of calcium phosphates. Consistently, the osteogenic medium extracts also increased osteocalcin production and collagen Type-I accumulation in the extracellular matrix at 13 days. Of the four osteogenic medium extracts, 2-06 and 3-06 induced the best responses of osteogenesis. However, regardless of the enhanced mineral formation, alkaline phosphatase activity was not promoted by the extracts. The osteogenic medium extracts could potentially provide a fast and effective way to differentiate human adipose stem cells in vitro.
Application of Biopolymer Doped Polypyrroles in Biomedical Implants and Electrical Stimulation Devices

Organic conductive polymers are emerging new materials for biomedical engineering. They offer surface properties which are attractive for many biomedical applications, such as surface coatings on metallic or biodegradable polymeric implants, tissue engineering scaffolds, implantable electronic tissue stimulation devices and microelectromechanical systems for the manipulation of single living cells in vitro, for example. Owing to the proven compatibility with tissues and cells, conductive polypyrrole (PPy) has been intensively investigated for bone and neural stimulation applications. A salient feature of PPy is its easy modification with bioactive molecules and macromolecules, such as the extracellular matrix (ECM) components of animal tissues. This work assessed the ECM components hyaluronic acid (HA) and chondroitin sulfate (CS) as dopants, which we incorporated into the PPy during the syntheses by electrochemical and oxidative chemical polymerization.

Biopolymer doped PPys have been earlier reported to be good substrates for cell cultures. Furthermore, preceding implantation studies have shown promising results. However, considering clinical application and registration of PPy as a biomaterial in commercial cell culturing or tissue engineering products, there are still many practical aspects requiring more attention, such as the establishment of feasible synthetic routes, sterilizability, preservation of the electronic properties during storage and during the incubation in physiological conditions, possible biodegradation mechanisms, stability and biological elimination of the degradation products in vivo, for example. Mass spectroscopy of the hydrolysis products of polylactide (PLA) fibers coated with layer of PPy, suggested that the PPy was biostable in water at neutral pH. Electrical conductivity measurements and Raman spectroscopy showed that the PPy chain was prone to de-doping, and hence the lost its conductivity under biological conditions, but these effects were partly reversible by acid doping and positively biased electrochemical potential. The electrochemical redox activity and electromechanical actuation property of the biopolymer doped PPys was thoroughly studied. It was shown that the biopolymer doped PPy had significant and reversible redox activity, which could be potentially utilized in microelectromechanical stimulation of cells and implantable microscopic actuators.

Practical and reproducible polymerization protocols were developed during this work. We took novel approaches and suggested a relatively simple “one-pot” chemical polymerization scheme, avoiding the complications of biological functionalization using potentially toxic click-chemistry. The developed methods were successfully applied in the deposition of electrically conductive, biopolymer doped PPy coatings on polylactide (PLA) nonwoven tissue engineering scaffolds and commercial poly(lactide-co-glycolide)-β-tricalcium phosphate (PLGA-β-TCP) bone fixation screws.

The physical properties and cell response of HA and CS doped PPys (PPyHA and PPyCS) electrode coatings were investigated by atomic force microscopy (AFM) and electrochemical methods. Drastically different behaviour of adipose stem cells (hASC) was found on the different electrode coatings, highlighting the sensitivity of the hASCs on the nanoscopic and microscopic surface properties of the PPy substrate, such as surface roughness, elasticity and surface potential distribution, factors which could be engineered during the synthesis and affected by external stimuli during incubation in cell culture medium.

In conclusion, the results of this thesis supported the use of PPy coatings in bone tissue engineering. The
electropolymerized films and also the chemically polymerized PPYHA and PPyCS coatings on bioabsorbable polymer were highly compatible with hASCs, supported cell adhesion and could be utilized in delivering direct electrical stimulation in vitro. There is also future potential in designing permanently implantable scaffolds and microstimulation devices, but still further insight into the biodegradation mechanism and biological elimination of PPY in vivo is needed.

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Fretting-induced friction and wear in large flat-on-flat contact with quenched and tempered steel
Fretting may cause severe surface damage and lead to unexpected fatigue failure. Our test apparatus was designed based on reciprocating, large, annular flat-on-flat contact without any edge effects in the direction of the fretting movement. Fretting wear tests were run with quenched and tempered steel with different normal pressures and sliding amplitudes under gross sliding conditions. The development of the friction coefficient and total wear mass depended mostly on the accumulated sliding distance. Initially, friction and wear were highly adhesive but gradually changed to abrasive due to third body accumulation in the interface.

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A comparison of rheology and FTIR in the study of polypropylene and polystyrene photodegradation

Rheology and FTIR spectroscopy are compared as methods to study the degree of photodegradation in polypropylene (PP) and polystyrene (PS) sheets. The materials are hot pressed, artificially photo-aged with fluorescent lights for 4-2048 h and then measured with a rotational rheometer and FTIR. Both materials show a tendency for chain scission which can be seen as a reduction in viscosity. Changes in PP can be observed with both methods after 256 h of irradiation. Changes in PS become significant in rheology after 64 h but in FTIR only after 1024 h of irradiation. Due to the different chemical nature of the materials, the degradation of PS is rather linear with exposure, whereas the degradation of PP is more exponential. Using the zero shear viscosities obtained through extrapolations of the Cole-Cole and Carreau-Yasuda models, relative molecular weights are estimated with the aid of the power-law relationship between these two. These results are compared with the carbonyl indices determined from the FTIR spectra. Rheology is found to be a viable alternative for FTIR in certain situations.
Effects of thermal aging on the characteristic breakdown behavior of Nano-SiO2-BOPP and BOPP films

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Authors: Ritamäki, M., Rytöluoto, I., Lahti, K., Karttunen, M.
Decontamination of Wearable Textile Electrodes for Medical and Health Care Applications

In the medical and health care environment ‘intelligent’ clothing must endure all the same treatments and procedures as standard hospital textile; that is laundry, disinfection and sterilization. The decontamination level depends on the end-use of the product. The smart garment system for long term body monitoring must be like any other technical underwear; fit well, be comfortable, elastic, vapor permeable, and have easy-care properties capable of enduring multiple cycles of laundry washing. Thus the use of man-made fibers, instead of traditionally used natural fibers, in a body monitoring garment would be more reasonable.

The research focuses on disinfected and sterilized textile electrodes which are applicable for long term body monitoring. As high elasticity, comfort and good vapor permeability are needed, the research concentrates on the electrical and mechanical properties of knitted sensors after sterilization, disinfection and water-repellent treatment. The most important mechanical features of elastic textile electrodes are elongation recovery and dimensional stability. Before sterilization the textile must be cleaned properly from body fluids like blood and sweat. Improving the easy-clean properties would consequently be desirable. By improving the stain repellent or easy cleaning properties, the need for washing can be decreased and a more protective, lower temperature program during laundry washing can be used. These factors not only save energy but also lengthen the lifetime of textile electronics.

The textile surface electric resistance, abrasion resistance, dimensional change and elastic properties following decontamination processes were studied, including the evaluation of water repellent-treated electrode properties. In addition, the mechanical properties of conventional knits and elastic woven bands were observed after treatment in order to assess their use in smart wearable systems.

In addition to electrodes, the research results can be applied to many other textile electronics components such as conductors, antennae, heat elements, switchers and detectors, because all these components can be achieved with same elements; conventional textile fibers combined with conductive fibers or coatings. The obvious application areas for body monitoring by using textile electrodes are hospitals, health care centers and medical research centers. The textile electrodes are more comfortable and invisible for long time body monitoring which is needed, for example, in rehabilitation after surgery or detection of chronic diseases, where they are more effective than conventional gel (Ag / AgCl) electrodes.

In conclusion it can be stated that silver-plated PA fiber in a knitted or woven structure with added repellent treatment provides a highly conductive and durable solution for wearable electronics in medical and health care applications. The steel fiber and textile mixture cannot tolerate mechanical stress caused by disinfection, washing, or repellent treatment. The knitted textile with silver coating cannot tolerate sterilization, either electrically or mechanically. Based on the results of the study, the use of woven bands as an electrode would be recommended instead of knitted material because they are dimensionally more stable. The electrode dimensional changes might negatively affect the measurement quality. On the other hand, the knitted electrodes have additional useful properties like softness and flexibility, thus compromises must be made in using textile electrodes in wearable technology. All materials in the study, woven and knitted, elastic and inelastic, coated and non–coated showed clear shrinkage in the sterilization process. However, using only one heat treatment makes them much more stable. For this reason it can be assumed that man-made fibers are more useful for medical products as they are more resistant to being sterilized or disinfected than are natural fibers. The elastane fiber can be used for improving bi-directional textile material recovery, but the unrecovered elongation as a function of sterilization must be considered. The variation in unrecovered elongation (stretching) might be extremely high and success depends on raw materials and textile structures.
The influence of SrO and CaO in silicate and phosphate bioactive glasses on human gingival fibroblasts

In this paper, we investigate the effect of substituting SrO for CaO in silicate and phosphate bioactive glasses on the human gingival fibroblast activity. In both materials the presence of SrO led to the formation of a CaP layer with partial Sr substitution for Ca. The layer at the surface of the silicate glass consisted of HAP whereas at the phosphate glasses it was close to the DCPD composition. In silicate glasses, SrO gave a faster initial dissolution and a thinner reaction layer probably allowing for a continuous ion release into the solution. In phosphate glasses, SrO decreased the dissolution process and gave a more strongly bonded reaction layer. Overall, the SrO-containing silicate glass led to a slight enhancement in the activity of the gingival fibroblasts cells when compared to the SrO-free reference glass, S53P4. The cell activity decreased up to 3 days of culturing for all phosphate glasses containing SrO. Whereas culturing together with the SrO-free phosphate glass led to complete cell death at 7 days. The glasses containing SrO showed rapid cell proliferation and growth between 7 and 14 days, reaching similar activity than glass S53P4. The addition of SrO in both silicate and phosphate glasses was assumed beneficial for proliferation and growth of human gingival fibroblasts due to Sr incorporation in the reaction layer at the glass surface and released in the cell culture medium.

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Authors: Massera, J., Kokkari, A., Närhi, T., Hupa, L.
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Publication Forum (2015): 1
Scopus rating (2014): 0.739 1.348
Web of Science (2014): 2.587 2.831 6.6 0.466 0.01394 0.585
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High power GaInNAs VECSEL emitting at 1230/615 nm
We report a frequency-doubled VECSEL operating at 1230/615 nm. The gain chip was grown by plasma-assisted MBE and comprised 10 GaInNAs quantum wells. Preliminary experiments show an output power of >8 W at 615 nm.

Fabrication of Single Wall Carbon Nanotube Saturable Absorber in the Micro-grooved Single Mode Fiber
We describe technological solution for fabrication of single wall carbon nanotube (SWCNT) based saturable absorber. The mode-locking of Tm/Ho fiber laser with the fiber-integrated SWCNT saturable absorber was confirmed.
Passive resonance sensor based method for monitoring particle suspensions

Control of particle suspensions is needed in several modern industrial processes. A reason for the difficulty in this task has been the lack of a fast and reliable measurement. In this study, we tested the measurement of particle suspension by using a method based on a passive resonance sensor. The relative amounts of dispersing agent and aluminium oxide in the suspension were varied. The studied method yielded signals which depended on the complex permittivity of the suspension. The results indicated that we were able to measure information that can be used as feedback for the suspension preparation process. In addition, the tested instrumentation was simple and robust and thus this method may allow online measurements directly from the industrial processes.

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Scopus rating (2002): 1.086 1.07
Formability of paper and its improvement

Paper and paperboard are the most utilized packaging materials in the world. This position has been achieved due to several advantageous features of paper such as: renewability, biodegradability, recyclability, and unmatched printability. Paper can be produced anywhere in the world, using local resources and at relatively low cost, which also makes it the most sustainable packaging material. Despite these beneficial features, paper packaging is in tough competition with plastic materials. The competitiveness of paper is mitigated by barrier properties, sensitivity to moisture, and limited ability to be converted into advanced 3D shapes with added functionality. The ability of paper and paperboard to be formed into 3D shapes is described as formability, or sometimes, mouldability.

Formability can be defined as the ability of paper to be formed into 3D shapes without defects in appearance and functionality. Formability as a mechanical property represents a group of parameters which vary according to the type of forming process used. The primary objective of this thesis is to improve the formability of paper by increasing its extensibility. An additional objective is the characterization of formability as a mechanical property of paper and the development of a testing platform for the evaluation of formability.

It was found that the formability of paper in fixed blank forming processes is governed by the extensibility and tensile strength of paper. On the other hand, in sliding blank forming processes, it is dependent on the compressive properties of paper, elastic recovery, and the paper-to-metal coefficient of friction. The criteria of good formability are also different in these two cases, as fixed blank process formability is evaluated via the maximum depth of the shape, i.e. the deeper the shape, the better the formability. In the sliding blank process, formability is evaluated via the visual appearance of the shapes, i.e. the shapes with less profound compressive wrinkles and defects reflect good formability of paper. These results were established by comprehensive investigation of different forming processes and comparison of the outcome with the mechanical properties of paper.

Taking into account the hypothesis that the formability of paper is governed by the extensibility of paper, a set of methods for its improvement was suggested. These methods included combined high- and low-consistency treatment of fibres, spraying of agar and gelatine, in-plane compaction of paper and unrestrained drying. High-consistency treatment of fibres under elevated temperature induces permanent deformations to fibres such as microcompressions and dislocations, which in turn may decrease the axial stiffness of fibres, promoting shrinkage of paper and fibres. The low-consistency treatment straightens the fibres and induces the fibrillation of fibres to promote bonding, while microcompressions in fibres still exist. The spraying of agar and gelatine is likely to modify the character of the fibre joints by making them more deformable, and the drying shrinkage is also increased due to polymer addition. Finally, the fibre network was subjected to in-plane compaction and drying shrinkage which lead to buckling and fibre and network compression.

As a result of these treatments, the extensibility of unrestrained dried paper was increased from 4% points (untreated fibres) to 15–18% points (mechanical treatment and addition of polymers). The extensibility can be increased further by up to 30% points in one direction by compaction. This corresponds to tray-like shapes with a depth of 2–3 cm, depending on the curvature. Such values of formability are the highest reported so far in the scientific literature. The approach for the production of formable paper developed in this thesis work allows the production of a paper-based material with unmatched formability, which can replace certain types of plastic packaging. Replacement of plastics with paper improves the sustainability of packaging in general, and reduces the harmful environmental impact of non-degradable and non-renewable packaging.
Optimising polylactide melt spinning using real-time monitoring

Polylactide (PLA) is a synthetic biodegradable polyester and it is usually processed into fibres by two-step melt spinning, which comprises of (i) melting the raw material and pushing the melt through small orifices and (ii) stretching and heat treating the fibre to increase its mechanical properties. However, processing biodegradable polymers is challenging because the polymer degrades thermally which narrows the choice of the processing parameters. Real-time monitoring allows monitoring of the key properties of the material during the production of the fibre.

There were two objectives for this work: (i) upscaling the production of 4-filament PLA fibre with an updated set-up with real-time monitoring and (ii) studying the hydrolytic degradation of PLA fibres manufactured with the conventional set-up. The updated set-up comprised of high-speed spinning plants and a twin-screw extruder equipped with a slit die for later real-time monitoring of parameters related to thermal degradation of the polymer. The processing conditions of polylactide melt spinning were optimised by two sets of trials; initial trials with a packaging grade PLA and a second set of trials with GMP grade poly(L/D)lactide with an L/D ratio of 96/4.

The obtained fibres were characterised by tensile testing and the temperature-induced chain scission was evaluated by inherent viscosity (i.v.) measurements. Goal values were established to enable the post-processing of the fibres. Mechanically adequate fibre was produced in the initial trials regarding the material used and the filament diameters fulfilled the requirements. The packaging grade PLA did not degrade during extrusion but the i.v. of the GMP grade PLA was decreased by one third. The filament diameter and the strain values were at an acceptable level in half of the spools produced in the GMP grade trials. In the initial trials there was a problem with the fluctuation of the filament diameters but it was largely solved by a change of the feeding equipment in the GMP grade trials. There is a need for further optimisation of the mechanical properties. This should be done by increasing the draw ratio. However, the ultimate tensile strength of the fibre was close to the required value.

In addition a 48-week hydrolysis study was conducted on the fibre produced with the conventional set-up. The molecular, rheological, thermal and mechanical properties of gamma irradiated and non-irradiated fibres were measured. The molecular weights and inherent viscosities of both fibres decreased steadily, but the irradiated fibre degraded more prominently. The mechanical performance of the non-irradiated fibre showed no changes but the irradiated fibre could no longer be tested after 28 weeks. In conclusion, the results of the hydrolytic degradation studies were mainly in line with earlier studies. These results can be used as a reference for the future hydrolytic degradation studies for the fibre manufactured with the upgraded set-up.
A method for stereoscopic strain analysis of the right ventricle by digital image correlation during coronary bypass surgery: Short communication

Perioperative cardiosurgical management of volume therapy remains one of the challenging tasks in cases of patients with severe heart disease. Early detection of congestive cardiac failure prevents subsequent low output and worse outcome. An effective method for controlling extracorporeal circulation is created by developing a non-invasive intraoperative method for right ventricular strain analysis through digital image contrast correlation.

Chitosan membranes in a rat model of full-thickness cutaneous wounds: Healing and IL-4 levels

Objective: The aim of this study was to examine the effect of chitosan membrane on wound healing. Method: The effect of chitosan membranes was evaluated in an experimental rat model. On day 0, circular full-thickness skin sections were excised from the scalps of rats. The wounds were then measured and the surrounding area tattooed. Rats were sacrificed either immediately after excision, or randomised into control and chitosan groups and followed up on day 3, 7, 14 or 21. Control group wounds were covered with Aquacel (wound dressing). Chitosan group wounds were covered with chitosan membranes and the wound dressing. Wounds and the distances between the tattooed marks were measured on follow-up, the wound sites were harvested and histologically examined, and serum interleukin (IL-4) levels were analysed.

Results: A total of 54 rats were examined and all time points included 6 control and 6 chitosan treated animals, except for day 0 which consisted of control animals only. On day 3, wounds in the chitosan group were significantly (p<0.05) smaller.
(60 ± 6% versus 78 ± 19% of the original wound area) than in the control group. Chitosan membranes were found to degrade at the wound sites between days 7 and 14. Leukocyte counts were lower in the chitosan group than in the control group on day seven (p<0.05). IL-4 levels were significantly higher on day 7 (p<0.001) and 14 (p<0.001) in the chitosan group. Conclusion: According to our results chitosan membrane may promote early wound healing, reduce inflammation and affect the IL-4 pathway, however, the membrane degrades at the wound site after day 7.

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Biomaterials and Tissue Engineering Group, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE), Tampere University Hospital, BioMediTech, Department of Plastic Surgery
Authors: Nordback, P. H., Miettinen, S., Kääriäinen, M., Haaparanta, A. M., Kellomäki, M., Kuokkanen, H., Seppänen, R.
Keywords: (Chitosan, Chitosan membrane, Full-thickness, IL-4, Wound healing)
Number of pages: 7
Pages: 245-251
Publication date: 1 Jun 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Nursing (miscellaneous), Fundamentals and skills

**Publication information**
Journal: Journal of Wound Care
Volume: 24
Issue number: 6
ISSN (Print): 0969-0700
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.526 0.725
Publication Forum (2016): 1
Scopus rating (2015): 0.509 1.085
Web of Science (2015): 1.205 1.62 6.8 0.253 0.00242 0.402
Publication Forum (2015): 1
Scopus rating (2014): 0.527 0.964
Publication Forum (2014): 1
Scopus rating (2013): 0.655 1.129
Publication Forum (2013): 1
Scopus rating (2012): 0.943 1.576
Publication Forum (2012): 1
Scopus rating (2011): 0.759 1.087
Scopus rating (2010): 0.573
Scopus rating (2009): 0.281
Scopus rating (2008): 0.332
Scopus rating (2007): 0.301
Scopus rating (2006): 0.283
Scopus rating (2005): 0.214
Scopus rating (2004): 0.143
Scopus rating (2003): 0.132
Scopus rating (2002): 0.139
Scopus rating (2001): 0.146
Scopus rating (2000): 0.154
Scopus rating (1999): 0.144
Original language: English
DOIs:
10.12968/jowc.2015.24.6.245
Source: Scopus
Source-ID: 84931436829
Research output: Scientific - peer-review › Article
Mechanical characterization of fiber ceramics: Effect of temperature

Fibrous ceramic structures are used in thermal insulators and filters in high-temperature processes. Their mechanical properties are surprisingly complex, being governed by force fields transmitting in the net of fibers. Examining how the fibers link to each other sheds light to this quandary. Extent of linking is defined by the fiber free length (deep red), which is the distance between the closest contact points (green) of a fiber. Decrease of free length, as neighboring fibers (blue) develop contacts, explains why these structures turn rigid with heat. When analyzed with grit blasting, this can be used to discover the structure's thermal history.
Dissolution of enzyme-treated cellulose using freezing thawing method and the properties of fibres regenerated from the solution

The rapid coagulation of NaOH-based cellulose solution during the wet spinning process leads to a low stretching ratio and, consequently, the low mechanical properties of the fibres. The aim of this work was to slow down the coagulation by replacing the sulphuric acid spin bath with an acetic acid bath. The spin dope was prepared by dissolving the enzyme-treated dissolving pulp in aqueous sodium zincate using a freezing thawing method. The optimal zinc oxide and sodium hydroxide concentrations were studied first. The most thermally stable cellulose solution contained 6.5 wt% NaOH and 1.3 wt% ZnO with 6 wt% enzyme-treated dissolving pulp. The spin dope was prepared accordingly. Coagulation of the cellulose solution slowed down in the acetic acid bath, resulting in a significantly higher stretching ratio for the fibres than with the sulphuric acid bath. However, the acetic acid spun fibres shrunk strongly during drying, and the possibly aligned order of the molecular chains due to the high stretch was partly lost. As a consequence, the high stretch was not transferred to high tenacity of the fibres in this study. However, the result suggests attractive potential to develop processing conditions to increase fibre tenacity.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Authors: Vehviläinen, M., Kamppuri, T., Gronqvist, S., Rissanen, M., Maloney, T., Honkanen, M., Nousiainen, P.
Keywords: (Cellulose dissolution, Dissolving pulp, Enzymatic treatment, Wet spinning, Regenerated fibres, Biocelsol, NAOH/UREA AQUEOUS-SOLUTION, SODIUM-HYDROXIDE, DISSOLVING PULP, WET-SPUN, TEMPERATURE, MULTIFILAMENT, CARBAMATE, MECHANISM, SYSTEM)
Number of pages: 22
Pages: 1653-1674
Publication date: Jun 2015
Peer-reviewed: Yes

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Journal: Cellulose
Volume: 22
Issue number: 3
ISSN (Print): 0969-0239
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.126 1.144
Publication Forum (2016): 2
Web of Science (2015): 3.195 3.741 4.6 0.521 0.01196 0.722
Publication Forum (2015): 2
Scopus rating (2014): 1.071 1.334
Web of Science (2014): 3.573 4.285 4.6 0.655 0.00994 0.773
Publication Forum (2014): 2
Scopus rating (2013): 1.127 1.48
Publication Forum (2013): 2
Scopus rating (2012): 1.179 1.71
Publication Forum (2012): 2
Scopus rating (2011): 1.354 1.795
Scopus rating (2010): 0.873 1.384
Scopus rating (2009): 1.038 1.219
Scopus rating (2008): 0.926 1.123
Scopus rating (2007): 0.754 1.034
Scopus rating (2006): 0.699 1.15
Scopus rating (2005): 1.112 1.318
Scopus rating (2004): 0.855 1.072
Scopus rating (2003): 0.81 1.02
Scopus rating (2002): 0.649 0.689
Dual-Mode Behavior in Multi-Section DFB Semiconductor Lasers with Laterally-Coupled Ridge-Waveguide Surface Gratings

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Research group: Nanophotonics
Authors: Uusitalo, T., Virtanen, H., Viheriäliä, J., Salmi, J. O., Aho, A., Dumitrescu, M.
Publication date: Jun 2015

Host publication information
Title of host publication: The European Conference on Lasers and Electro-Optics 2015
Publisher: OSA - The Optical Society
Article number: CB_P_26
ISBN (Electronic): 978-1-4673-7475-0
Research output: Scientific › Conference contribution

Education and Materials Joining Research methods at Tampere University of Technology
At Tampere University of Technology (TUT), education and research related to joining technologies are performed by two university departments, the Department of Materials Science (DMS) and the Department of Mechanical Engineering and Industrial Systems (MEI). Many of the research activities are conducted via close collaboration between these two units.

General information
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Materials Science, Research group: Metals Technology, Research group: Surface Engineering, Department of Mechanical Engineering and Industrial Systems, Research group: Laser
Authors: Peura, P., Vuoristo, P., Vihinen, J.
Number of pages: 4
Pages: 73-76
Publication date: Jun 2015
Peer-reviewed: Unknown

Publication information
Journal: Hitsautekniikka
Volume: 65
Issue number: 2-3/2015
ISSN (Print): 0437-6056
Ratings:
Publication Forum (2017): 0
Publication Forum (2016): 0
Publication Forum (2015): 0
Original language: English

Bibliographical note
ORG=mol,0.5
ORG=mei,0.5
Research output: Professional › Article
Effect of Strain Rate on the Martensitic Transformation During Plastic Deformation of an Austenitic Stainless Steel

The effect of strain rate on the plastic deformation and phase transformation behavior of metastable austenitic stainless steel EN 1.4318 was studied. Strain rate jump tests were used to distinguish the direct effects of strain rate from the effects of adiabatic heating. Test results are analyzed from the viewpoint of both stress- and strain-induced martensitic transformation.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Materials Characterization, Engineering materials science and solutions (EMASS), Ernst Mach Inst, Fraunhofer Gesellschaft, Fraunhofer Inst High Speed Dynam
Authors: Isakov, M., Hiermaier, S., Kuokkala, V.
Keywords: (MECHANICAL-BEHAVIOR, STATE)
Number of pages: 4
Pages: 2352-2355
Publication date: Jun 2015
Peer-reviewed: Yes

Publication information
Volume: 46A
Issue number: 6
ISSN (Print): 1073-5623
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.179 1.179
Publication Forum (2016): 1
Scopus rating (2015): 1.231 1.332
Web of Science (2015): 1.749 1.951 >10.0 0.352 0.02455 0.661
Publication Forum (2015): 1
Scopus rating (2014): 1.671 1.877
Web of Science (2014): 1.73 1.983 >10.0 0.33 0.02431 0.703
Publication Forum (2014): 2
Scopus rating (2013): 1.481 1.63
Publication Forum (2013): 2
Scopus rating (2012): 1.419 1.706
Publication Forum (2012): 2
Scopus rating (2011): 1.508 1.703
Scopus rating (2010): 1.688 1.802
Scopus rating (2009): 1.608 1.53
Scopus rating (2008): 1.505 1.536
Scopus rating (2007): 1.314 1.544
Scopus rating (2006): 1.397 1.653
Scopus rating (2005): 1.183 1.414
Scopus rating (2004): 1.078 1.607
Scopus rating (2002): 2.057 1.992
Scopus rating (2001): 1.878 1.784
Scopus rating (2000): 1.844 1.809
Scopus rating (1999): 2.028 1.905
Original language: English
DOIs:
10.1007/s11661-015-2862-z
Source: WOS
Source-ID: 000353236700004
Research output: Scientific - peer-review » Article

Impact of mechanical and enzymatic pretreatments on softwood pulp fiber wall structure studied with NMR spectroscopy and X-ray scattering
Dissolution of wood pulp can be enhanced by applying certain pretreatments before exposing the fibers to solvents. We have analyzed effect of mechanical and enzymatic pretreatments on softwood fiber wall structure using nuclear magnetic resonance (NMR) spectroscopic methods, small and wide angle X-ray scattering (SAXS, WAXS). NMR diffusometry was used to estimate the effect of pretreatments on average pore sizes at micrometer size scale and for the connectivity of the porous network. A proton NMR experiment was used to quantify the nonfreezing water content inside the fiber wall, and solid state NMR C-13 cross polarization (CP) magic angle spinning (MAS) spectroscopy was used to observe the effect of pretreatments on crystallinity and lateral fibril dimensions of cellulose fibrils, and in combination with fiber saturation point measurement to calculate the average pore size at nanometer size scale. Both WAXS and CP MAS NMR experiments confirmed that there were no changes in crystallinity nor in fibril lateral dimensions due to pretreatments. The pretreatments caused an increase in the amount of nonfreezing water, suggesting an opening of the pore system. According to diffusion experiments there are only minor changes in micrometer scale pore network due to pretreatments. SAXS results indicated that enzymatic treatment increased the microfibrillar distance, and there was also an increase in cross relaxation rate of magnetization from water to cellulose protons as observed by NMR. These were interpreted to be due to opening of microfibrillar bundles, leading to an increased accessibility of water.

General information
State: Published

Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: Fibre Materials, Department of Materials Science, Univ Helsinki, University of Helsinki, Dept Phys, Aalto Univ, Aalto University, Sch Chem Technol, Dept Forest Prod Technol, VTT Tech Res Ctr Finland, VTT Technical Research Center Finland, Univ Helsinki, University of Helsinki, Polymer Chem Lab
Authors: Virtanen, T., Penttilä, P. A., Maloney, T. C., Grönqvist, S., Kamppuri, T., Vehviläinen, M., Serimaa, R., Maunu, S. L.
Keywords: (Softwood pulp, NMR spectroscopy, Diffusion, Enzymatic hydrolysis, SAXS, WAXS, CELLULOSE FIBRIL AGGREGATION, NUCLEAR-MAGNETIC-RESONANCE, SELF-DIFFUSION, DISSOLVING PULP, POROUS-MEDIA, WOOD FIBERS, FIELD GRADIENT, CHEMICAL PULP, IONIC LIQUIDS, KRAFT PULP)

Number of pages: 12
Pages: 1565-1576
Publication date: Jun 2015
Peer-reviewed: Yes

Publication information
Journal: Cellulose
Volume: 22
Issue number: 3
ISSN (Print): 0969-0239
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.126 1.144
Publication Forum (2016): 2
Web of Science (2015): 3.195 3.741 4.6 0.521 0.01196 0.722
Publication Forum (2015): 2
Scopus rating (2014): 1.071 1.334
Web of Science (2014): 3.573 4.285 4.6 0.655 0.00994 0.773
Publication Forum (2014): 2
Scopus rating (2013): 1.127 1.48
Publication Forum (2013): 2
Scopus rating (2012): 1.179 1.71
Publication Forum (2012): 2
Scopus rating (2011): 1.354 1.795
Scopus rating (2010): 0.873 1.384
Scopus rating (2009): 1.038 1.219
Scopus rating (2008): 0.926 1.123
Scopus rating (2007): 0.754 1.034
Scopus rating (2006): 0.699 1.15
Scopus rating (2005): 1.112 1.318
Scopus rating (2004): 0.855 1.072
Scopus rating (2003): 0.81 1.02
Scopus rating (2002): 0.649 0.689
Interface modification of glass fibre-polyester composite-composite joints using peel plies

This work includes an investigation of six different surface treatments for joining composites by overlamination. The durability of the pre-treated glass fibre-unsaturated polyester composite joints is investigated accounting for a 200-day water immersion at 64 +/- 1 degrees C. Degradation due to accelerated aging, by water and elevated temperature, is analysed using Fourier transform infrared spectroscopy (FTIR), water absorption measurement, tensile testing and a systematic sequence of four different fracture test methods. Based on the fracture tests, the mechanical abrading treatment outperformed all other treatments yet suffered an adverse effect due to the combined moisture and elevated temperature. We observed irreversible chemical degradation in the bulk composite in terms of permanent 23% weight loss. The softening and plasticization of the polyester matrix seemed to have played a fundamental role in the rupture of adhesion at the peel ply and tear ply pre-treated overlamination interfaces. However, the adhesion loss was partly reversible and it was concluded to signify the domination of mechanical interlocking at peel ply and tear ply modified interfaces. (C) 2015 Elsevier Ltd. All rights reserved.
Microchip laser Q-switched with GaInNAs/GaAs SESAM emitting 204 ps pulses at 1342 nm

A 1342 nm Nd:YVO₄ microchip laser is reported, Q-switched with a dilute nitride GaInNAs/GaAs saturable absorber mirror. The laser produced optical pulses as short as 204 ps with 2.3 MHz repetition rate and 24 mW average output power. In comparison to conventional InP-based saturable absorber mirrors, the advantage of the proposed approach is the availability of excellent Bragg mirror materials that enable high reflectivity and more flexibility in designing the nonlinear parameters owing to the use of lattice matched GaInNAs/GaAs quantum wells.
The Role of Groove Periodicity in the Formation of Site-Controlled Quantum Dot Chains

Structural and optical properties of InAs quantum dot (QD) chains formed in etched GaAs grooves having different periods from 200 to 2000 nm in [010] orientation are reported. The site-controlled QDs were fabricated by molecular beam epitaxy on soft UV-nanoimprint lithography-patterned GaAs(001) surfaces. Increasing the groove periods decreases the overall QD density but increases the QD size and the linear density along the groove direction. The effect of the increased QD size with larger periods is reflected in ensemble photoluminescence measurements as redshift of the QD emission. Furthermore, we demonstrate the photoluminescence emission from single QD chains.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: Semiconductor Technology and Applications, Optoelectronics Research Centre, Augmented Human Activities (AHA), Frontier Photonics
Authors: Schramm, A., Hakkarainen, T. V., Tommila, J., Guina, M.
Keywords: (III-V semiconductors, InAs Quantum dots, Site-controlled quantum dots, Molecular beam epitaxy, Nanoimprint lithography, PHOTON TURNSTILE, EMISSION, GROWTH, DEVICE)
Number of pages: 6
Pages: 1-6
Publication date: 28 May 2015
Peer-reviewed: Yes

Publication information
Journal: Nanoscale Research Letters
Volume: 10
Article number: 242
ISSN (Print): 1556-276X
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.589 0.746
Publication Forum (2016): 1
Scopus rating (2015): 0.538 0.653
Web of Science (2015): 2.584 2.85 3.8 0.391 0.02704 0.644
Publication Forum (2015): 1
Scopus rating (2014): 0.748 1.019
Web of Science (2014): 2.779 3.008 3.3 0.324 0.02502 0.677
Publication Forum (2014): 1
Scopus rating (2013): 0.79 0.967
Publication Forum (2013): 1
Scopus rating (2012): 1.049 1.073
Publication Forum (2012): 1
Microrobotic system for multi-rate measurement of bio-based fibres Z-directional bond strength

The core content of this study is micro-testing of microscale objects - an emerging application area for microrobotics - where microrobotics has been used in paper industry for measuring properties at the single fibre level. Pulp and paper scientists are interested to have experimental data of single fibre-fibre bond strength distribution of paper/board products in different loading modes and rates. Meeting this demand is quite challenging since the system should be able to measure the bond strength i) in the individual fibre level, ii) in different loading modes, and iii) in different loading rates. The current methods of measurement do not satisfy all these three requirements. Among the four different loading modes, the Z-directional behaviour of paper/board products is a matter of high significance for papermaking and paper converting companies. The Z-directional properties influence compressive properties, and accordingly the performance of structural paper/board products. According to the literature, there is not any reported method to facilitate the measurement of Z-directional strength at the single fibre level in different loading rates. This paper reports an in-depth study of a measurement method for experimental evaluation of Z-directional individual fibre-fibre bond strength in multiple loading rates using microrobotics and a Polyvinylidene fluoride (PVDF) film microforce sensor. The results from the measurement system are promising. In summary, the first concept for multi-rate measurement of Z-directional bond strength at the individual fibre level is developed during this work which has a high practical impact on the fibre characterization research field.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Research area: Microsystems, Research area: Measurement Technology and Process Control
Authors: Latifi, S. K., Saketi, P., Kallio, P.
Keywords: (Microrobotics , Micro-testing , Multi-rate microforce sensing, Polyvinylidene fluoride (PVDF) , Z-directional strength)
Number of pages: 14
Pages: 13-26
Publication date: 24 May 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Engineering(all)

Publication information
Journal: Journal of Micro-Bio Robotics
Volume: 10
Issue number: 1
Article number: 1
ISSN (Print): 2194-6418
Ratings:
Scopus rating (2017): 0
Scopus rating (2016): 0.352 0.646
Scopus rating (2015): 0.336 1.025
Scopus rating (2014): 0.105 0.02
Original language: English
DOIs:
10.1007/s12213-015-0080-9
Research output: Scientific - peer-review › Article
Compression model for radial compression of Norway spruce earlywood and latewood

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Authors: Moilanen, C., Björkqvist, T., Saarenrinne, P.
Publication date: 19 May 2015

Host publication information
Title of host publication: 9th International Mechanical Pulping Research Seminar
Place of publication: Trondheim, Norway

Bibliographical note
ORG=mei,0.7
ORG=ase,0.3
Research output: Professional › Conference contribution

High temperature oxidation tests for the high velocity solution precursor flame sprayed manganese-cobalt oxide spinel protective coatings on SOFC interconnector steel
High velocity solution precursor flame spray process was used to deposit MnCo1.9Fe0.1O4 and Mn1.5Co1.5O4 coatings on Crofer 22 APU ferritic stainless steel samples. The solution precursors were manufactured by diluting metal nitrates into deionized water. The as-sprayed coatings were oxidized at 850 degrees C for 500 h to evaluate Cr-barrier and electrical properties.
The post-mortem studies were performed with various qualitative and quantitative elemental analysis methods and a four-point measurement was used for the area specific resistance studies. The as-sprayed coatings were formed of single crystallite nanoparticles (10-20 nm) and polycrystalline sub-micron particles (100-500 nm). The small particle and crystallite size showed strong sintering behavior during the oxidation cycle. Cr-migration was fully prevented thought the oxidized coatings. The surface topography and grain growth dominated the electrical properties during the test cycle.
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General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Surface Engineering, Research group: Materials Characterization, Research group: Ceramic materials, Engineering materials science and solutions (EMASS), Univ Toronto, University of Toronto, Dept Mat Sci & Engn, Univ Toronto, University of Toronto, Dept Mech & Ind Engn
Authors: Puranen, J., Laakso, J., Honkanen, M., Heinonen, S., Kylmälähti, M., Lugowski, S., Coyle, T. W., Kesler, O., Vuorio, P.
Keywords: (High velocity solution precursor flame spray, SOFC interconnect, Protective coating, FUEL-CELLS, ELECTRICAL-CONDUCTIVITY, SOLID-SOLUTION, MN)
Number of pages: 12
Pages: 6216-6227
Publication date: 18 May 2015
Peer-reviewed: Yes

Publication information
Volume: 40
Issue number: 18
ISSN (Print): 0360-3199
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.142 1.286
Publication Forum (2016): 1
Scopus rating (2015): 1.294 1.319
Web of Science (2015): 3.205 3.419 4.6 0.651 0.08996 0.619
Publication Forum (2015): 1
Scopus rating (2014): 1.212 1.494
Web of Science (2014): 3.313 3.659 4.3 0.539 0.08226 0.619
Publication Forum (2014): 3
Microstructure-based thermo-mechanical modelling of thermal spray coatings

This paper demonstrates how microstructure-based finite element (FE) modelling can be used to interpret and predict the thermo-mechanical behaviour of thermal spray coatings. Validation is obtained by comparison to experimental and/or literature data.

Finite element meshes are therefore constructed on SEM micrographs of high velocity oxygen-fuel (HVOF)-sprayed hardmetals (WC-CoCr, WC-FeCrAl) and plasma-sprayed Cr2O3, employed as case studies. Uniaxial tensile tests simulated on high-magnification micrographs return micro-scale elastic modulus values in good agreement with depth-sensing Berkovich micro-indentation measurements. At the macro-scale, simulated and experimental three-point bending tests are also in good agreement, capturing the typical size-dependency of the mechanical properties of these materials. The models also predict the progressive stiffening of porous plasma-sprayed Cr2O3 due to crack closure under compressive loading, in agreement with literature reports.

Refined models of hardmetal coatings, accounting for plastic behaviours and failure stresses, predict crack initiation locations as observed by indentation tests, highlighting the relevance of stress concentrations around microstructural defects (e.g. oxide inclusions).

Sliding contact simulations between a hardmetal surface and a small spherical asperity reproduce the fundamental processes in tribological pairings. The experimentally observed "wavy" morphologies of actual wear surfaces are therefore explained by a mechanism of micro-scale plastic flow and matrix extrusion. (C) 2015 Elsevier Ltd. All rights reserved.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Surface Engineering, Engineering materials science and solutions (EMASS), Univ Modena & Reggio Emilia, Universita di Modena e Reggio Emilia, Dept Engn Enzo Ferrari
Authors: Bolelli, G., Candeli, A., Koivuluoto, H., Lusvarghi, L., Manfredini, T., Vuoristo, P.
Keywords: (Thermal spray, Coatings, Finite element simulation, Microstructure based model, Elastic properties, Contact simulation, METAL-MATRIX COMPOSITES, DUAL-PHASE STEEL, BARRIER COATINGS, ALUMINA COATINGS, ELASTIC-MODULUS, BEHAVIOR, MECHANISMS, INDENTATION, CONDUCTIVITY, SIMULATION)
Number of pages: 15
Pages: 20-34
Publication date: 15 May 2015
Peer-reviewed: Yes

Publication information
Journal: Materials and Design
Volume: 73
ISSN (Print): 0264-1275
Ratings:
We report on the spontaneous formation of lateral composition modulations (LCMs) in Ga(As, Bi) epiayers grown by low-temperature (<300 degrees C) molecular beam epitaxy (MBE) on GaAs(001). Both cross-section and plan-view transmission electron microscopy techniques are used to investigate the nature of the LCMs, consisting of Bi-rich cylinder-like nanostructures lying along the [001] growth direction. The observed LCMs are the consequence of a two-dimensional phase separation process occurring at the surface of the growing epiayers, and their columnar nature is consistent with a surface-directed spinodal decomposition process. Although LCMs are thermodynamically driven, we show how they can be kinetically controlled, in particular, through the As/Ga flux ratio and the substrate temperature. This is a result of LCMs developing from surface atomic diffusion processes, since the atomic dimer configurations on the surface alter adatom diffusivity. The significant role of the surface reconstructions is also discussed. (c) 2015 AIP Publishing LLC.
Characterization Of High-Velocity Single Particle Impacts On Thermally Sprayed Ceramic Coatings

High-velocity impact wear may have a significant effect on the lifetime of thermally sprayed coatings in multiple applications, e.g. in process- and aero industries. An experimental impact study was performed on thermally sprayed coatings with a high velocity particle impactor (HVPI) in oblique angles to investigate the damage, failure and deformation of the coating. The impact site was characterized with a profilometer, optical microscopy and SEM. Furthermore, the connection between the microstructural details and impact behaviour were studied to reveal the damage and failure characteristics in a more comprehensive level. Additionally, traditional dry-erosion behaviour with small particles and different angles was compared with the high-velocity single particle impact phenomena. Differences in wear volume and deformation of the impact site and in absorbance of kinetic energy were also studied, focusing on the effect of material properties as well as the impact characteristics.

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Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Materials Science, Research group: Surface Engineering, Research group: Materials Characterization
Authors: Kiilakoski, J., Lindroos, M., Matikainen, V., Apostol, N., Koivuluoto, H., Vuoristo, P.
Publication date: 13 May 2015
Regeneration of fibres from alkaline solution containing enzyme-treated 3-allyloxy-2-hydroxypropyl substituted cellulose

The aim of this study was to regenerate fibres from the alkaline cellulose solution containing 3-allyloxy-2-hydroxypropyl substituents. Enzyme-treated cellulose was modified in alkaline aqueous tert-butanol (tBuOH) using allyl glycidyl ether (AGE) as the modification reagent. 3-allyloxy-2-hydroxypropyl substituted (AHP) enzyme-treated cellulose with DS\textsubscript{A} 0.05 was obtained. Enzyme-treated cellulose without (reference) and with substituents were dissolved in sodium zincate using the freezing-thawing cycle. The reference solution alone and the mixture solutions containing 10 or 25 % of the AHP cellulose were regenerated into cellulosic fibres using the wet spinning technique. The solutions containing 100 or 50 % of the AHP cellulose did not form fibres in acidic bath. The 10 % share of AHP cellulose did not affect the mechanical properties of the fibres (1.5 cN dtex\textsuperscript{−1}), while the 25 % share decreased the tenacity slightly (1.3 cN dtex\textsuperscript{−1}). Elongation of the fibres ranged from 18 to 22 %. The 10 and 25 % shares of AHP cellulose increased the water holding ability of fibres by 12 and 33 %, respectively. According to FESEM the fibre structures are composed of nanosized fibrils.
Photoelastic Stress Evaluation and Mechanical Testing of Hybrids

To produce parts having complicated geometry with low cost and fast processing hybrid structures of metals embedded in polymer offer advantages. Such structures which can be regarded as macrocomposites need good understanding of the interfacial properties and residual stresses in order to be used in demanding applications. We used photoelastic stress analysis and strain gauge measurements to examine internal stresses in a stainless steel-epoxy hybrid component, internal stresses include both the residual stresses due to cure shrinkage of the resin and the changing internal stress state during mechanical loading. The effect of adhesion between steel inserts and epoxy on the durability under static and impact loading was studied. Internal digital image correlation (DIC) technique was also developed and used to evaluate deformation behavior and fracture mechanisms of the hybrids. We used epoxy block samples with thin stainless steel plate inserts that were fabricated by resin casting into flexible molds fabricated from a 3D-printed model of needed geometry.

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Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology, Engineering materials science and solutions (EMASS)
Authors: Orell, O., Kakkonen, M., Vuorinen, J.
Pages: 1913-1924
Publication date: May 2015

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Source: Scopus
Source-ID: 84987617947
Research output: Scientific - peer-review › Conference contribution

Wear and corrosion resistant laser coatings for hydraulic piston rods

Hydraulic piston rods on oil & gas drilling platforms, hydro-power stations, chemical plants and underground mines are exposed to severe tribo-corrosive conditions under static and dynamic mechanical loads. Piston rods made of carbon, quenched & tempered (QT) and stainless steels are frequently surface coated with methods such as thermal spraying, hard chrome plating and overlay welding. Unfortunately, several premature failures have been reported particularly in marine applications due to insufficient coating properties. Laser cladding has recently drawn lot of attention in this field due to high coating quality and significant improvements in productivity. In this study, several potential Fe-, Ni- and Co-based alloys were laser clad on carbon and QT steels. Their corrosion and mechanical performances were explored in long-term salt spray, immersion, hardness, abrasive wear and 4-point bending fatigue tests. Most of the laser coatings outperformed hard chrome in corrosion properties but hardness values were somewhat lower. In single point abrasion tests (scratch tests), the hardest laser coatings, however, outperformed hard chrome due to brittle nature of hard chrome layers. Post-machining induced significant superficial hardness increase in laser coatings, which was the main reason for good wear performance. Fatigue performance was strongly dependent on material pairs, presence of cladding defects and applied loads.
Engineered nanomaterials reduce but do not resolve life cycle environmental impacts of power capacitors

Abstract Engineered nanomaterials are used to improve the properties of products. Often this results in size reduction or increased functionality, which may result in reduced environmental impacts. At the same time the manufacturing and disposal of the nanomaterials increases the life cycle impacts of the product. In this study the effects of using nano-silica polymers in power capacitors were investigated through life cycle assessment (LCA). The analysis was based on existing production technology which was modified to represent a prototype using nanomaterials. Based on the results, the nanomaterials would reduce impacts by c.a. 20% in the most relevant environmental life cycle impact categories. The
main impact categories of the power capacitors were in metal depletion, land transformation and ecotoxicity. Although the nanomaterial based capacitor had slightly lower impacts, it did not resolve the main problems in these categories. Contribution analysis revealed that most of the impact is caused by only a few processes in the life cycle, especially raw materials supply for tin solders and waste treatment of insulating oil. Ecodesign alternatives for targeting the identified environmental hotspots are discussed.
Dissolution behavior of the bioactive glass S53P4 when sodium is replaced by potassium, and calcium with magnesium or strontium

The initial dissolution behavior of glasses based on bioactive glass S53P4 was studied with a dynamic measurement setup in a Tris-buffered solution. The glass composition was modified systematically on a molar basis by replacing sodium oxide with potassium oxide (0-100% K) and calcium oxide with magnesium (0-18% Mg) or strontium oxide (0-100% Sr). The concentrations of the ions dissolving from the glasses were measured continuously on-line in the fluid flow for 15 to 25 min using an inductively coupled plasma emission optical spectrometer. This method enabled attainment of detailed information on the initial dissolution mechanisms without the, for bioactive glasses typical, interference of apatite layer formation. The results showed that initial dissolutions of sodium and potassium were markedly higher from the mixed alkali oxide glasses than from the compositions containing only one alkali oxide. Introducing MgO in S53P4 caused a minor decrease in the dissolution rates of all ions. The glass containing 3 mol% of MgO showed the best chemical durability. In contrast, replacing CaO gradually with SrO increased the dissolution rates of all ions. The glasses with the highest replacement of CaO with SrO showed rapid release of both Sr and Na ions. The results corroborate the overall knowledge of glass durability and can be utilized to design bioactive glasses with controlled ion release rate for tissue engineering applications.

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Authors: Hupa, L., Fagerlund, S., Massera, J., Björkvik, L.
Keywords: (Bioactive glass, Chemical durability, Dynamic solution, Ion dissolution)
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ASJC Scopus subject areas: Condensed Matter Physics, Ceramics and Composites, Electronic, Optical and Magnetic Materials, Materials Chemistry

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Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.692 1.163
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Web of Science (2015): 1.825 1.787 >10.0 0.746 0.0174 0.428
Publication Forum (2015): 1
Scopus rating (2014): 0.803 1.194
Web of Science (2014): 1.766 1.707 >10.0 0.433 0.01902 0.438
Publication Forum (2014): 2
Scopus rating (2013): 0.822 1.19
Publication Forum (2013): 2
Scopus rating (2012): 0.758 1.124
Publication Forum (2012): 2
Scopus rating (2011): 0.836 1.272
Scopus rating (2010): 0.911 1.128
Scopus rating (2009): 0.924 0.993
Scopus rating (2008): 0.957 1.2
Scopus rating (2007): 0.95 1.082
Scopus rating (2006): 0.887 1.158
Scopus rating (2005): 0.986 1.149
Scopus rating (2004): 0.992 1.216
Scopus rating (2003): 1.362 1.308
Scopus rating (2002): 0.861 1.051
Erosive wear of various stainless steel grades used as impeller blade materials in high temperature aqueous slurry
Two austenitic stainless steel grades, 316L and 904L, and three duplex stainless steel grades, LDX 2101, 2205, and 2507, were erosion tested as impeller blade materials for hydrometallurgical applications. Samples were attached to the pressure and suction sides of an impeller and were tested for 72 h at 80 °C and 95 °C in a small-scale reactor using quartz sand slurry. Based on the mass losses measured, the steel grades could be ranked into two distinct categories; LDX 2101 and 2507 comprising the category with the better erosion resistance. The categories were the same for the pressure and suction side tests even though the erosion mechanism differed. In most cases, erosion was more severe in the suction side samples, which has practical implications for wear protection design. In the pressure side samples, the variation in the erosion mass loss with different experimental parameters was in line with earlier reported findings. In contrast, in the suction side samples, under some experimental conditions, increasing tip speed and increasing particle size were found to reduce erosion mass loss. This emphasizes the fact that the erosivity of particles for the impeller suction side cannot be deduced solely based on particle size. The reasons for the observed behavior are discussed.
The effect of impact conditions on the wear and deformation behavior of wear resistant steels

The deformation and wear behavior of four high strength wear resistant steels were studied in various impact conditions to evaluate their performance in applications involving heavy impacts and impact-abrasion. In the normal direction impacts, the studies were conducted with single and repeated (multiple) drop tests. To better simulate the actual application conditions, the samples were positioned at an angle relative to the impact direction in the tests with the high velocity particle impactor (HVPI) device. The effect of strain rate was investigated using constant size projectiles made from materials with different density but keeping the impact energy constant by varying the incident projectile velocity. The effect of surface hardening on the wear resistance of the high strength steels was determined by impacting the same surface area multiple times at a constant velocity using spherical high velocity projectiles. Regardless of the rather similar hardness of the studied three martensitic steel grades, the impact behavior showed differences in wear rate and damage mechanisms in each case due to the microstructural characteristics of the materials. The adiabatic shear bands forming in the martensitic steels at higher loading rates were found to increase the wear rate. Moreover, the carbide reinforced steel performed in general better than the martensitic grades but showed more brittle behavior and generation of crack networks that can affect the wear performance of the material.

General information
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Organisations: Department of Materials Science, Research group: Materials Characterization, Computational Science X (CompX), Engineering materials science and solutions (EMASS), AC2T Research GmbH, VTT Technical Research Centre of Finland
Authors: Lindroos, M., Ratia, V., Apostol, M., Valtonen, K., Laukkanen, A., Molnar, W., Holmberg, K., Kuokkala, V. T.
Keywords: (Adiabatic shear bands (ASB), High strength steel, High velocity impact, Wear testing)
Number of pages: 9
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Peer-reviewed: Yes
ASJC Scopus subject areas: Condensed Matter Physics, Surfaces and Interfaces, Materials Chemistry, Surfaces, Coatings and Films, Mechanics of Materials

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Scopus rating (2016): 1.558 2.071
Publication Forum (2016): 1
Scopus rating (2015): 1.527 2.017
Web of Science (2015): 2.323 2.395 >10.0 0.37 0.01794 0.645
Publication Forum (2015): 1
Scopus rating (2014): 1.715 2.38
Web of Science (2014): 1.913 2.109 >10.0 0.347 0.01937 0.601
Publication Forum (2014): 2
193-GHz 53-W Subpicosecond Pulse Source

We present a light source that can generate a pulse train with an extremely high repetition rate, tens of watts of average output power, and a low-divergence output beam. This unique combination of system characteristics is achieved with single-stage amplification of a passively harmonically mode-locked semiconductor disk laser in a tapered Yb-doped double-clad fiber. With the short-length tapered fiber amplifier an amplification factor $>17$ dB is reached, while preserving the 930-fs pulse duration of the semiconductor disk laser. The demonstrated pulse source with a beam quality factor
Effect of rheological properties of dissolved cellulose/microfibrillated cellulose blend suspensions on film forming

Enzymatically treated cellulose was dissolved in a NaOH/ZnO solvent system and mixed together with microfibrillated cellulose (MFC) in order to find the threshold in which MFC fibers form a percolation network within the dissolved cellulose solution and in order to improve the properties of regenerated cellulose films. In the aqueous state, correlations between the rheological properties of dissolved cellulose/MFC blend suspensions and MFC fiber concentrations were investigated and rationalized. In addition, rheological properties of diluted MFC suspensions were characterized and a correlation with NaOH concentration was found, thus partly explaining the flow properties of dissolved cellulose/MFC blend suspensions. Finally, based on results from Dynamic Mechanical Analysis (DMA), MFC addition had strengthening/plasticizing effect on regenerated cellulose films if low concentrations of MFC, below the percolation threshold (5.5-6 wt%, corresponding to 0.16-0.18 wt% of MFC in the blend suspensions), were used.
Corrosion mechanisms of sintered Nd-Fe-B magnets in the presence of water as vapour, pressurised vapour and liquid

Corrosion behaviour of three commercial sintered Nd-Fe-B magnets exposed to environments containing water as vapour, pressurised vapour, and liquid was investigated in order to understand their overall corrosion performance under a range of conditions. Two types of heat humidity exposure tests, namely the 85/85 and pressure cooker test, and the immersion test combined with electrochemical measurements were used as corrosion tests. It was observed that varying the temperature, pressure, and the prevailing state of water in the exposure tests, different corrosion mechanisms were detected on the surface of Nd-Fe-B magnets. The surface finish of the magnet had an effect on the initiation of corrosion.
in mild heat-humidity exposure. Immersion in liquid water resulted in a corrosion topography where the Nd-rich grain-boundary phase did not corrode selectively as in the other accelerated corrosion tests but was retained intact while the matrix phase underwent corrosion. These results and the dominant corrosion mechanisms of sintered Nd-Fe-B magnets in different environments are presented and discussed in this paper.

**General information**

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Organisations: Department of Materials Science, Research group: Ceramic materials, Research group: Materials Characterization, Engineering materials science and solutions (EMASS), Prizztech Magnet Technology Centre, VTT Technical Research Centre of Finland
Authors: Isotahdon, E., Huttunen-Saarivirta, E., Heinonen, S., Kuokkala, V. T., Paju, M.
Keywords: (Corrosion, Electrochemical impedance spectroscopy, Permanent magnets, Rare-earth alloys and compounds, Scanning electron microscopy, SEM)
Number of pages: 11
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Peer-reviewed: Yes
ASJC Scopus subject areas: Mechanical Engineering, Mechanics of Materials, Materials Chemistry, Metals and Alloys
Monolithic GaInNAsSb/GaAs VECSEL Operating at 1550 nm

The first monolithic GaAs-based vertical-external-cavity surface-emitting laser (VECSEL) operating at 1550 nm is reported. The VECSEL operation is based on a gain mirror which was grown in a single growth run by plasma-assisted molecular beam epitaxy. The gain mirror comprised eight GaInNAsSb/GaAs quantum wells with a photoluminescence peak at 1505 nm and an AlAs/GaAs distributed Bragg reflector ensuring high reflectivity. The VECSEL chip was pumped with an 808-nm diode laser that had a large quantum defect in respect to the lasing wavelength. An output power of 80 mW in continuous wave mode and 210 mW in pulsed pump mode are demonstrated close to room temperature.

General information
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Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Frontier Photonics
Authors: Korpijärvi, V., Kantola, E. L., Leinonen, T., Isoaho, R., Guina, M.
Publication date: 20 Mar 2015
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Publication Forum (2017): 2
Scopus rating (2016): 1.139 1.322
Publication Forum (2016): 2
Scopus rating (2015): 1.449 1.393
Web of Science (2015): 3.466 3.231 6.5 1.22 0.01938 1.214
Publication Forum (2015): 2
Scopus rating (2014): 1.889 2.072
Web of Science (2014): 2.828 3.387 6.3 1.914 0.02115 1.312
Publication Forum (2014): 2
Scopus rating (2013): 2.258 2.38
Publication Forum (2013): 2
Scopus rating (2012): 2.742 2.661
Publication Forum (2012): 2
Scopus rating (2011): 2.367 2.845
Scopus rating (2010): 2.217 2.599
Scopus rating (2009): 2.964 2.869
Scopus rating (2008): 2.476 2.433
Scopus rating (2007): 2.428 1.746
Scopus rating (2006): 2.131 2.383
Scopus rating (2005): 2.93 2.594
Scopus rating (2004): 2.827 2.62
Scopus rating (2003): 3.121 3.103
Scopus rating (2002): 2.664 2.508
Scopus rating (2001): 2.251 1.926
Scopus rating (2000): 2.37 1.335
Scopus rating (1999): 3.466 1.611
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Bibliographical note
AUX=orc,"Isoaho, Riku"
Research output: Scientific - peer-review › Article
Scaling the Power and Tailoring the Wavelength of Semiconductor Disk Lasers

Optically pumped semiconductor disk lasers (SDLs) provide a unique combination of high output power, high beam quality and possible emission wavelengths spanning from the ultraviolet to the mid-infrared spectral range. In essence, SDLs combine the wavelength versatility of semiconductor gain media with the power scaling principles of optically pumped solid state disk lasers. The emission wavelength of SDLs can be tailored to match the desired application simply by altering the composition of the gain material. High power operation, however, requires efficient thermal management, which can be realized using thin structures that are integrated with industrial diamond heat spreaders. The main objective of this thesis was to develop methods for increasing the output power of optically pumped SDLs, especially in challenging wavelength regions. The work included integrating SDL gain elements onto diamond heat spreaders using thin intermediate gold layers. This configuration enabled 45–50 % higher output powers than conventional bonding with indium solder. In addition, the reflectivity of the SDL gain mirror was enhanced using a semiconductor-dielectric-metal compound mirror. This procedure enabled 30 % thinner mirror structures when compared with the conventional design, where the reflectivity of the semiconductor mirror is enhanced with a metal layer. Finally, thin GaAs-based semiconductor mirrors were integrated with InP-based active regions. Such integration is necessary for high power operation in the spectral range 1.3–1.6 µm, because InP-based compounds for a highly reflective thin mirror section are not available. The configuration enabled record-high output powers of 6.6 W and 4.6 W at the wavelengths of 1.3 µm and 1.58 µm, respectively. The second objective of this thesis was to generate high output powers in single-frequency operation and via intracavity frequency-doubling. In single-frequency operation, record-high output powers of 4.6 W and 1 W were demonstrated at the wavelengths of 1.05 µm and 1.56 µm, respectively. Such light sources are required for numerous applications including free-space communications and high resolution spectroscopy. In addition, second-harmonic generation was demonstrated with SDLs emitting at 1.3 µm and 1.57 µm. The output powers reached 3 W at 650 nm and 1 W at 785 nm, which represent record-high output powers from SDLs in this wavelength range. These types of lasers could be especially useful in biophotonics and medical applications.
This paper provides a comprehensive assessment of the sliding and abrasive wear behaviour of WC-10Co4Cr hardmetal coatings, representative of the existing state-of-the-art. A commercial feedstock powder with two different particle size distributions was sprayed onto carbon steel substrates using two HVOF and two HVAF spray processes. Mild wear rates of \( <10^{-7} \text{mm}^3/(\text{Nm}) \) and friction coefficients of \( \approx 0.5 \) were obtained for all samples in ball-on-disk sliding wear tests at room temperature against \( \text{Al}_2\text{O}_3 \) counterparts. WC-10Co4Cr coatings definitely outperform a reference electrolytic hard chromium coating under these test conditions. Their wear mechanisms include extrusion and removal of the binder matrix, with the formation of a wavy surface morphology, and brittle cracking. The balance of such phenomena is closely related to intra-lamellar features, and rather independent of those properties (e.g. indentation fracture toughness, elastic modulus) which mainly reflect large-scale inter-lamellar cohesion, as quantitatively confirmed by a principal component analysis. Intralamellar dissolution of WC into the matrix indeed increases the incidence of brittle cracking, resulting in slightly higher wear rates. At 400°C, some of the hardmetal coatings fail because of the superposition between tensile residual stresses and thermal expansion mismatch stresses (due to the difference between the thermal expansion coefficients of the steel substrate and of the hardmetal coating). Those which do not fail, on account of lower residual stresses, exhibit higher wear rates than at room temperature, due to oxidation of the WC grains. The resistance of the coatings against abrasive wear, assessed by dry sand-rubber wheel testing, is related to inter-lamellar cohesion, as proven by a principal component analysis of the collected dataset. Therefore, coatings deposited from coarse feedstock powders suffer higher wear loss than those obtained from fine powders, as brittle inter-lamellar detachment is caused by their weaker interparticle cohesion, witnessed by their systematically lower fracture toughness as well.
Oxidation of the GaAs semiconductor at the Al2O3/GaAs junction

Atomic-scale understanding and processing of the oxidation of III-V compound-semiconductor surfaces are essential for developing materials for various devices (e.g., transistors, solar cells, and light emitting diodes). The oxidation-induced defect-rich phases at the interfaces of oxide/III-V junctions significantly affect the electrical performance of devices. In this study, a method to control the GaAs oxidation and interfacial defect density at the prototypical Al2O3/GaAs junction grown via atomic layer deposition (ALD) is demonstrated. Namely, pre-oxidation of GaAs(100) with an In-induced c(8 × 2) surface reconstruction, leading to a crystalline c(4 × 2)-O interface oxide before ALD of Al2O3, decreases band-gap defect density at the Al2O3/GaAs interface. Concomitantly, X-ray photoelectron spectroscopy (XPS) from these Al2O3/GaAs interfaces shows that the high oxidation state of Ga (Ga2O3 type) decreases, and the corresponding In2O3 type phase forms when employing the c(4 × 2)-O interface layer. Detailed synchrotron-radiation XPS of the counterpart c(4 × 2)-O oxide of InAs(100) has been utilized to elucidate the atomic structure of the useful c(4 × 2)-O interface layer and its oxidation process. The spectral analysis reveals that three different oxygen sites, five oxidation-induced group-III atomic sites with core-level shifts between -0.2 eV and +1.0 eV, and hardly any oxygen-induced changes at the As sites form during the oxidation process. These results, discussed within the current atomic model of the c(4 × 2)-O interface, provide insight into the atomic structures of oxide/III-V interfaces and a way to control the semiconductor oxidation.
Bioabsorbable fabrics for musculoskeletal scaffolds

This chapter discusses how woven, braided, and knitted scaffolds have been used in bone, cartilage, tendon, and ligament tissue engineering (TE). First, we describe the different steps for manufacturing filaments, yarns, and bioabsorbable textiles. Then we discuss issues related to the characterization and modelling of fabrics and scaffolds. In separate sections, we also consider four different applications of experimental TE using textile scaffolds, and we list currently available commercial products.

General information

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Authors: Kellomäki, M., Laine, K., Ellä, V., Annala, T.
Keywords: (Bioabsorbable fabric, Bone, Cartilage, Ligament, Tendon, Textile scaffold)
Number of pages: 24
Pages: 67-90
The internet of Bio-Nano things

The Internet of Things (IoT) has become an important research topic in the last decade, where things refer to interconnected machines and objects with embedded computing capabilities employed to extend the Internet to many application domains. While research and development continue for general IoT devices, there are many application domains where very tiny, concealable, and non-intrusive Things are needed. The properties of recently studied nanomaterials, such as graphene, have inspired the concept of Internet of NanoThings (IoNT), based on the interconnection of nanoscale devices. Despite being an enabler for many applications, the artificial nature of IoNT devices can be detrimental where the deployment of NanoThings could result in unwanted effects on health or pollution. The novel paradigm of the Internet of Bio-Nano Things (IoBNT) is introduced in this paper by stemming from synthetic biology and nanotechnology tools that allow the engineering of biological embedded computing devices. Based on biological cells, and their functionalities in the biochemical domain, Bio-NanoThings promise to enable applications such as intra-body sensing and actuation networks, and environmental control of toxic agents and pollution. The IoBNT stands as a paradigm-shifting concept for communication and network engineering, where novel challenges are faced to develop efficient and safe techniques for the exchange of information, interaction, and networking within the biochemical domain, while enabling an interface to the electrical domain of the Internet.

General information

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Organisations: Department of Electronics and Communications Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno, Wireless Communications and Positioning (WICO), University of Nebraska, Georgia Institute of Technology
Authors: Akyildiz, I. F., Pierobon, M., Balasubramaniam, S., Koucheryavy, Y.
Number of pages: 9
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Peer-reviewed: Yes
ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications, Computer Networks and Communications

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Scopus rating (2016): 2.827 4.807
Publication Forum (2016): 2
Web of Science (2015): 5.125 5.194 4.9 0.729 0.0403 2.538
Publication Forum (2015): 2
Scopus rating (2014): 2.678 4.808
Web of Science (2014): 4.007 4.756 5.3 0.901 0.0384 2.428
Publication Forum (2014): 3
Scopus rating (2013): 2.584 5.643
Publication Forum (2013): 3
High speed slurry-pot erosion wear testing with large abrasive particles

One of the testing methods used to simulate slurry erosion in laboratory conditions is the slurry-pot method. In this work, a novel high speed slurry-pot type erosion wear tester was constructed for testing of materials used in mining and other mineral handling applications. In the tester, the samples are attached to a vertical rotating shaft on four levels in a pin mill configuration. High speeds up to 20 m/s at the sample tip can be achieved also with large abrasive size up to 10 mm. In the tests, the equipment proved to be functional and durable even with the high loads created by the high speeds and large abrasive sizes. There are, however, variations in the slurry concentrations inside the pot during testing, leading to different wear rates at the different sample levels. Therefore, a sample rotation test method was developed. By rotating the samples evenly through all sample levels, the overall deviations between samples will be minimized. Furthermore, with the sample rotation method up to eight materials can be tested simultaneously. The slurry-pot is suitable for testing various materials, such as steels and rubbers.

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Organisations: Department of Materials Science, Research group: Materials Characterization
Authors: Ojala, N., Valtonen, K., Kivikytö-Reponen, P., Vuorinen, P., Kuokkala, V.
Keywords: (Wear testing, Slurry erosion, Slurry-pot, Mining, mineral processing, Steel, Rubber)
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ASJC Scopus subject areas: Metals and Alloys, Materials Science (miscellaneous)

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Publication Forum (2016): 1
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Publication Forum (2015): 1
Scopus rating (2014): 0.316 0.126
Temperature-induced ageing of solar absorbers on plain and anodized aluminium substrates

The temperature-induced ageing mechanisms and long-term stability of solar thermal absorbers having aluminium substrate with and without anodized aluminium oxide layer were investigated. A thin Al layer was used to act as an IR reflector on anodized aluminium oxide layer. The absorbers studied were industrial, sputtered chromium-based absorber coatings. The absorbers were aged by means of prolonged and extended thermal accelerated ageing studies at 248-308 degrees C.

The ageing mechanisms and degradation of the absorbers were analysed by optical measurements (solar absorptance with a UV/Vis/NIR spectrophotometer and thermal emittance by FTIR spectrophotometry), microstructural analysis using transmission electron microscope (TEM) equipped with an energy dispersive X-ray spectrometer (EDS), composition by time-of-flight elastic recoil detection analysis (TOF-ERDA), and crystal structure by grazing incidence X-ray diffraction (XRD) before and after the ageing studies. The relation between optical degradation and ageing mechanisms was studied using optical modelling and simulation with CODE Coating Designer. The results clearly demonstrated the effect of substrate material on the long-term stability of the absorber at intermediate temperatures. (C) 2014 Elsevier B.V. All rights reserved.
A Method and an Apparatus for Producing Nanocellulose

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Source-ID: EP2659061
Research output: Scientific › Patent

Hydrofluoric-nitric-sulphuric-acid surface treatment of tungsten for carbon fibre-reinforced composite hybrids in space applications
Hybrid material systems, such as combinations of tungsten foils and carbon fibre-reinforced plastic (CFRP), are replacing metal alloy concepts in spacecraft enclosures. However, a good adhesion between the tungsten oxide scale and the epoxy resin used is required. Here, the effects of a hydrofluoric-nitric-sulphuric-acid (HFNS) treatment on tungsten oxides
and subsequent adhesion to CFRP are analysed using atomic force microscopy (AFM), X-ray photoelectron spectroscopy (XPS) and fracture testing. The work shows that HFNS treatment results in decreased oxygen content, over 50% thinner tungsten trioxide (WO3) layer and increased nano-roughness on thin tungsten foils. Fracture testing established a 39% increase in the average critical strain for tungsten-CFRP specimens after HFNS treatment was carried out on tungsten. The effect of the oxide scale modification regarding the critical strain energy release rate was $\Delta G_c \approx 8.4 \text{ J/m}^2$. (C) 2014 Elsevier By. All rights reserved.
Advanced coatings by novel high-kinetic thermal spray processes

Thermal spraying includes a group of coating processes in which metallic and non-metallic materials are spray deposited as fine particles in a molten or semi-molten condition, or even in fully solid state to form a coating. Thermal spraying allows deposition of relatively thick coatings, from some tens of micrometers up to several millimeters in thickness. Thermally sprayed coatings are used in different applications including protective and functional coatings in mechanical engineering, energy technology, biomedical, steel, automotive and aerospace technologies and in many other industrial sectors. Novel high-kinetic spray processes, e.g., the high velocity air-fuel (HVAF) technology are the latest developments in the area and therefore they are actively studied in the framework of the Hybrid Materials research program in collaboration with Finnish industrial and research partners. Novel multifunctional coatings are under development for specific industrial applications.

Method and an Apparatus for Producing Nanocellulose

Described herein is nanocellulose produced by introducing a mixture of cellulose based fiber raw material and water through a refining gap, having a width smaller than 0.1 mm. In the refining gap, the fiber raw material is subjected to processing forces varying in the direction of introducing said mixture, by means of refining zones provided in the gap one after each other in the feeding direction, whereby the refining surfaces differ in surface patterning and/or surface roughness. The mixture of fiber raw material and water is guided past the refining surfaces in the feeding direction to different locations in the refining zone by by-pass channels provided in the stator. The width of the refining gap is maintained by the combined effect of the feeding pressure of the mixture of fiber raw material and water fed into the refining gap and the axial force of the rotor.
Design, fabrication, and testing of a low AC-loss conduction-cooled cryostat for magnetization loss measurement apparatus

Conduction cooling has become a viable alternative for cooling superconducting devices. However, the thermal pathways of a conduction-cooled cryostat can be problematic for applications where time-varying magnetic fields are present. Such alternating magnetic fields are present, e.g., in a magnetization ac-loss measurement system. The losses in the thermal pathways are unwanted as they increase the heat load into the cryostat and interfere with the measurement. To solve this challenge, a conduction-cooled cryostat with special attention in limiting eddy-current losses in the cryostat structures was constructed. The design process is illustrated in detail starting from the specifications and proceeding through the fabrication of individual components. The loss dissipated in the cryostat is experimentally examined, and the finished conduction-cooled magnetization loss measurement system is demonstrated by characterizing a multifilamentary $\text{MgB}_2$ conductor.

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Organisations: Department of Electrical Engineering, Research area: Electromagnetics, Lappeenranta University of Technology, LUT Energy, Slovak Academy of Sciences
Authors: Järvelä, J., Lyly, M., Stenvall, A., Juntunen, R., Souc, J., Mikkonen, R.
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ASJC Scopus subject areas: Electrical and Electronic Engineering, Condensed Matter Physics, Electronic, Optical and Magnetic Materials

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Scopus rating (2016): 0.395 1.031
Publication Forum (2016): 1
Scopus rating (2015): 0.35 0.935
Web of Science (2015): 1.092 0.903 5.3 0.629 0.01158 0.229
Publication Forum (2015): 1
Scopus rating (2014): 0.47 1.113
Web of Science (2014): 1.235 1.001 5.3 0.371 0.01307 0.229
Publication Forum (2014): 1
Scopus rating (2013): 0.431 1.171
Publication Forum (2013): 1
Scopus rating (2012): 0.575 1.27
Publication Forum (2012): 1
Scopus rating (2011): 0.364 1.063
Scopus rating (2010): 0.468 1.073
Scopus rating (2009): 0.452 1.033
Scopus rating (2008): 0.878 0.987
Scopus rating (2007): 0.611 1.104
Scopus rating (2006): 0.731 0.935
Scopus rating (2005): 0.645 0.996
Scopus rating (2004): 0.867 0.9
Scopus rating (2003): 0.494 1.045
Scopus rating (2002): 0.849 1.024
Sulfonated polyetheretherketone/polypropylene polymer blends for the production of photoactive materials

Sulfonated polyetheretherketone (SPEEK) was synthesized via a mono-substitution reaction of PEEK in concentrated sulphuric acid and was blended with polypropylene (PP) in 2-10%w/w concentration to be used for the production of photoactive thermoplastic products. SPEEK and SPEEK/PP blends were characterized using FTIR, DSC, TGA, NMR, rheology, SEM, and EPR. Under UV-Vis irradiation, stable benzophenone ketyl (BPK) radicals were generated by hydrogen extraction from PP. By increasing the amount of SPEEK in the polymer blend a linear increase in the BPK radicals was achieved according to the EPR data. DSC and TGA tests indicated weaknesses in the thermal stability of SPEEK but according to the rheological tests this should not have a major effect on processability. The optimal amount of SPEEK in the blend was obtained at 5%w/w. This concentration provided a good compromise between radical concentration, material processability, and cost.

General information
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Organisations: Department of Materials Science
Authors: Fatarelle, E., Mylläri, V., Ruzzante, M., Pogni, R., Baratto, M. C., Skrifvars, M., Syrjälä, S., Järvelä, P.
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Publication Forum (2015): 1
Scopus rating (2014): 0.658 0.964
Web of Science (2014): 1.768 1.662 8.5 0.378 0.04912 0.323
Publication Forum (2014): 2
Scopus rating (2013): 0.628 1.085
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Scopus rating (2012): 0.658 1.081
Publication Forum (2012): 2
Scopus rating (2011): 0.601 0.965
Scopus rating (2010): 0.679 0.909
Scopus rating (2009): 0.697 0.825
Scopus rating (2008): 0.647 0.822
Scopus rating (2007): 0.678 0.931
Scopus rating (2006): 0.782 1.145
Scopus rating (2005): 0.779 0.912
Scopus rating (2004): 0.774 0.962
GaSb-based SESAM mode-locked Tm: YAG ceramic laser at 2 μm

Tunable and mode-locked laser operation near 2 μm based on different Tm-doped YAG ceramics, 4 at.% and 10 at.%, is demonstrated. Several designs of GaSb-based surface-quantum-well SESAMs are characterized and studied as saturable absorbers for mode-locking. Best mode-locking performance was achieved using an antireflection-coated near-surface quantum-well SESAM, resulting in a pulse duration of ∼3 ps and ∼150 mW average output power at 89 MHz. All mode-locked Tm:YAG ceramic lasers operated at 2012 nm, with over 133 nm demonstrated tuning for continuous-wave operation.
Effect of Multiple Impacts on the Deformation of Wear-Resistant Steels

More durable materials enable reducing the downtime and maintenance costs by decreasing the number of replaced core components in various industrial applications. In this study, the behavior of three wear-resistant quenched martensitic steel grades and the S355 structural steel was examined in controlled impact conditions. The materials’ impact behavior was investigated by several methods including residual stress measurements and electron backscatter diffraction. For all studied materials, the size and depth of the impact marks correlate via a logarithmic function to the number of impacts mostly due to work hardening. The underlying deformation behavior of the material depends on the mechanical properties and microstructure of the material. At high impact counts, softer martensitic steel was found to behave differently when compared to the other tested materials as it underwent severe changes in its microstructure and exhibited marked hardening.

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Organisations: Department of Materials Science, Research group: Materials Characterization, Engineering materials science and solutions (EMASS), AC2T Research GmbH
Authors: Ratia, V., Rojacz, H., Terva, J., Valtonen, K., Badisch, E., Kuokkala, V. T.
Keywords: (Deformation, EBSD, Impact, Martensite, Residual stresses, Steel)
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ASJC Scopus subject areas: Mechanical Engineering, Mechanics of Materials, Surfaces, Coatings and Films, Surfaces and Interfaces

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Publication Forum (2015): 1
Scopus rating (2014): 1.306 1.639
Web of Science (2014): 1.739 2.088 6.1 0.457 0.00876 0.666
Publication Forum (2014): 2
Scopus rating (2013): 1.404 1.727
Publication Forum (2013): 2
We introduce a flame based aerosol method to fabricate thin films consisting of binary TiO2/SiO2 nanoparticles deposited directly from the flame onto the paperboard. Nanocoatings were prepared with Liquid Flame Spray (LFS) in a roll-to-roll process with the line speed of 50 m/min. Surface wetting behavior of nanocoated paperboard was studied for different Ti/Si ratios in the precursor, affecting TiO2/ SiO2 ratio in the coating. Wettability could be adjusted to practically any water contact angle between 10 and 160° by setting the Ti/Si ratio in the liquid precursor. Structure of the two component nanocoating was analysed with FE-SEM, TEM, EDS, XPS and XRD. The porous thin film coating was concluded to consist of ca. 10 nm sized mixed oxide nanoparticles with segregated TiO2 and SiO2 phases. Accumulation of carbonaceous compounds on the surface was seen to be almost linearly dependent on the Ti/Si ratio, indicating of each species being exposed in corresponding amount. However, wetting of the surface was observed to follow merely an S-shaped curve, caused by the roughness of the nanocoated surface. Reasons for the observed superhydrophobicity and superhydrophilicity of these binary nanocoatings on paperboard are discussed. (C) 2014 Elsevier B.V. All rights reserved.
Fatigue behaviour of nickel- and cobalt-based laser cladded coatings on steel bars

Laser cladding allows the manufacturing of thick, dense and fusion bonded low diluted coatings, permitting its application in industry fields that require wear and corrosion protection. On the other hand, large residual stresses on the coating layer and noticeable changes in the substrate material may affect mechanical properties and fatigue strength. In this study, high load four-point bending fatigue tests were conducted, comparing the results to those of the substrate material alone and post-weld heat treated components. The fatigue test results were displayed with Wöhler curves. Two different substrate/coating couples are studied in this work: mild steel S355-J2 coated with Stellite21cobalt based hard-facing alloy, and low-alloy steel 42CrMo4 coated with Inconel625 nickel based super alloy. In order to better define how the features of the materials change with the cladding direction and the post weld heat treatment, the specimens were analysed by SEM/EDS; verifying the presence of defects, and how dilution changes along the cladding direction. Chemical etched samples were observed by optical microscope to assess the effect of the laser treatment on materials microstructures. Hardness measurements and depth sensing nanoindentations are performed to evaluate mechanical properties of coatings, HAZ and substrate. After fatigue failure, every fractured surface was separated from the fatigue specimen and analysed by stereo microscope, SEM and EDS in order to identify the reasons and the mechanisms of the failure.
High performance wear and corrosion resistant coatings by novel cladding techniques

In the field of surface engineering, cladding or overlay welding is a group of coating methods used in manufacturing fusion-bonded thick metallic and metal matrix composite (MMC) coatings on a wide variety of metallic base materials with varying degree of deposition rate, dilution and heat input. Growing demands for more material-, energy- and cost-effective overlay welding processes as well as sustainable solutions for performance-critical applications have boosted to develop methods that are capable of producing low diluted and fusion-bonded single layer coatings with high deposition rates. Such novel cladding methods include for instance laser-based high power laser cladding, coaxial hot-wire laser cladding, laser-arc hybrid cladding, non-laser-based Cold Metal Transfer (CMT) cladding and methods that utilize high intensity infrared (IR) light. This paper introduces some of such highly innovative cladding techniques and highlights some microstructural and geometrical features, abrasion and sliding wear, and wet corrosion properties of Fe-, Ni- and Co-based metallic coatings manufactured by novel laser and CMT cladding methods. The research results evidence that with the choice of optimal processing parameters, novel cladding techniques are capable of manufacturing high performance weld overlays with the properties equivalent or near to corresponding wrought alloys and reference overlays with net deposition rates of approximately 5 kg/h and more. Overall, the presented work suggests that discussed methods have high potential in surfacing of new and remanufacturing of service-damaged surfaces in high value components, in building up complex features on existing components and also in near net shape additive manufacturing of functional 3D objects.

High Temperature 3-body Abrasive Wear of HVOF and HVAF Sprayed Cr3C2-NiCr Coatings

Wear protection is used in the industry to increase the lifetime of tribologically loaded components. One of the most widely applied wear protection is hard coating technology to protect the surface of a component from harsh wear conditions. Among them, thermal spraying is commonly adopted technique to deposit wear-resistant surface layers.

For wear protection at high service temperatures, chromium carbide based coatings deposited with high velocity oxy-fuel (HVOF) and high velocity air-fuel HVAF techniques are most suitable.

In this study, various Cr3C2-NiCr powders were sprayed with both HVOF and HVAF processes. The microstructure, porosity level and hardness values of the deposited coatings were measured. In addition, three-body abrasive wear resistance of these coatings was tested at 300°C, 500°C and 700°C. The wear tracks and cross sections of tested
coatings were studied with scanning electron microscopy (SEM), in order to characterize the wear mechanisms at high temperatures.

The results show that at lower testing temperatures, powder selection and spraying process defines the wear rate of the coating. However, at maximum testing temperature, the differences in wear rates between tested coatings decreases. This is due to microstructural changes in coating at high temperatures.

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Organisations: Department of Materials Science, Research group: Surface Engineering, AC2T Research GmbH

Authors: Janka, L., Ripoll, M. R., Matikainen, V., Vuoristo, P.

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ISBN (Print): 978-81-926196-1-3

Research output: Scientific - peer-review » Conference contribution

**Microstructural and abrasion wear characteristics of tool steel coatings manufactured by laser cladding**

Tool steels are a class of complex carbon and alloy steels that are widely available as powders over a wide compositional range. In this work, several different tool steel grades were deposited on mild steel by the laser cladding process using a continuous wave 4.4 kW Nd:YAG laser in combination with a coaxial powder feeding technique. With bidirectional scanning pattern, most of the grades were deposited crack-free with hardness up to 1000 HV without additional preheating. A comparative study of 3-body abrasion and single point scratch wear behaviour was conducted on the obtained coatings. In a 3-body abrasion wear study, the laser clad Ralloy WR6 with significant portion of retained austenite exhibited superior abrasive wear resistance compared with the fully martensitic tool steel coatings (M2, M4, H13, HS-23, HS-30) and the reference material, Raex Ar500 wear resistant steel. The abrasion wear resistance of austenitic-martensitic WR6 tool steel was further enhanced by the external addition of 20% volume percentage of relatively large (45-106 µm) vanadium carbides. In single point scratch tests, fully martensitic tool steels outperformed austenitic-martensitic tool steels and Raex Ar500 wear resistant steel. The differences in wear performances were explained by different wear mechanisms and types of contact between the abrasive and the surface. These results show the potential of laser cladding in depositing hard and wear resistant tool steel coatings on easier to fabricate and less expensive base materials or remanufacturing of wear resistant steel grades for enhancing the service life of various components. Examples of such components are, for instance, rock and ground drilling bits in mining and construction and various blades and knives in pulp & paper industries.

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Organisations: Department of Materials Science, Research group: Surface Engineering, Technology Centre Ketek Ltd.

Authors: Tuominen, J., Näkki, J., Pajukoski, H., Peltola, T., Vuoristo, P.

Keywords: (Laser cladding, Abrasion, Tool steel, Wear resistant steel, Remanufacturing, Additive manufacturing)

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**Bibliographical note**

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Research output: Scientific - peer-review » Conference contribution

**Study of worn weld deposit with added tungsten carbide particles**

Nowadays we can see the application of special protective surface layers, which perform many different functions. These protective layers are applied and used to protect components against wear that occurs in various forms in the
construction, mining and metal industries. Among these so-called protective layers we can include special hard-facing, using metal matrix (in the context of this article alloyed iron matrix) in combination with tungsten carbide particles that can be assigned to a group of composite materials. High hardness of the carbides combined with the use of relatively tough matrix allows us to get high wear resistance. This resistance then considerably increases the service life of machine parts and significantly contributes to reducing the expenses of industrial companies to repair or replacement of the worn parts. The main focus of this article is to study characteristics of generated weld deposit with tungsten carbide reinforced iron matrix on common structural steel S235JR substrate. This includes the evaluation of hardness of formed layer and its resistance to the abrasive wear. Lower wear resistance of high boron A864 M layer with externally incorporated tungsten carbide particles was observed compared to standard F-Durit G iron based layer with microscopic tungsten carbide particles included in cored wire. This is the result of the fact that most of big tungsten carbide particles were placed on the bottom of the weld deposit and do not protect the surface of the weld deposit effectively.

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Authors: Hlavaty, I., Kozak, J., Tuominen, J.
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The Role of Graphite in Sliding Bearing Braze Claddings
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Organisations: Department of Materials Science, Research group: Tribology and Machine Elements, Research group: Materials Characterization
Authors: Ruusila, V., Kallio, M. H., Uusitalo, M. A., Valtonen, K., Krappitz, H., Kuokkala, V., Lehtovaara, A.
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Wear and Corrosion Behavior of HVAF Sprayed WC-10Ni and WC-20Cr3C2-6Ni Coatings
WC-10Ni and WC-20Cr3C2-6Ni coatings deposited by High Velocity Air-Fuel (HVAF) spraying were studied and compared in the present paper. A series of tribological tests and electrochemical measurements were carried out in order to examine the effect of coating composition on the abrasion, sliding wear and corrosion behavior. The experimental results revealed that the overall wear and corrosion resistance of the WC-10Ni coatings was superior to that of WC-20Cr3C2-6Ni due to denser microstructure, high hardness, and fewer microcracks which act in the coatings as infiltration path for the electrolyte. It was found out that the chemical composition, homogeneity and bonding between splats are important factors influencing the corrosion properties and impermeability of HVAF sprayed WC cermet based coatings in 3,5 wt.% NaCl solution.

General information
State: Published
Organisations: Department of Materials Science, Research group: Surface Engineering, Politehnica University of Timisoara
Authors: Hulka, I., Serban, V., Utu, D., Duteanu, N., Matikainen, V., Niemi, K., Vuoristo, P.
Pages: 55-65
We report on the development of a high-power vertical-external-cavity surface-emitting laser (VECSEL) emitting around 1180 nm. The laser emitted 50 W of output power when the mount of the gain chip was cooled to -15°C. The output power was measured using a 97% reflective cavity end-mirror. The VECSEL was arranged to form an L-shaped cavity with a length of ~100 mm; the gain chip and a curved dielectric mirror (RoC=150) acting as cavity end mirrors. The gain chip was grown by molecular beam epitaxy (MBE) and incorporated 10 GaInAs/GaAs quantum wells. For efficient heat extraction, the chip was capillary bonded to a diamond heat spreader which was attached to a TEC-cooled copper mount. The maximum optical-to-optical conversion efficiency of 28% was achieved for 42 W of output power and -15°C mount temperature.

Keywords: (continuous wave, frequency doubling, heat management, high power, infrared, power scaling, SDL, VECSEL)

50 W VECSEL emitting at 1180 nm
We report a 50 W VECSEL emitting at 1180 nm. The gain chip was grown by MBE and TEC-cooled. The maximum power was measured for a mount temperature of -15°C.
Advisory Professorship Model as a Tool for Practice-Based Regional University-Industry Cooperation

Abstract: The growing importance of “practice-based innovation models” has challenged the current consensus on the role of universities as main drivers of regional innovation systems. New models are needed to ensure the efficiency of cooperation between the region and universities. In this article, we present and analyse the effects of one practice-based innovation tool, the advisory professorship model, developed in the Lahti region, Finland. The Lahti region is relatively big by Finnish standards, but has no university of its own, which makes new types of knowledge transfer necessary. The empirical analysis is based on interviews of the companies that participated in the materials technology advisory professorship programme, developed and operated by Tampere University of Technology. In the analysis, we utilize the conceptual framework and analytical matrix developed by Tura et al. [(2008) Breaking inside the black box: Towards a dynamic evaluation framework of regional innovative capability, Science and Public Policy, 35(10), pp. 733–744] in the measuring of regional innovation capability. The study approach is based on regional and industrial viewpoints. In the light of the study, the programme had positive impacts on the innovation capability and innovation processes of companies. The advisory professorship model can be considered a useful practice-based innovation tool for regional university–industry co-operation with some limitations.
A new generation sweating thermal manikin for the evaluation of the thermal comfort of protective clothing in Arctic Conditions

Working or staying in cold conditions set high demands for the garments to sustain the thermal comfort of the wearer. The high thermal insulation needed in cold conditions, like in Arctic areas, can cause heat stress when working in high intensity and post exercise chill while the remaining moisture in the clothing layers due to sweating increases heat loss. The thermoregulatory properties of textiles from material level to garment level can be determined with a wide selection of test methods. Hot plates, water vapour permeability tests and a sweating thermal cylinder are used for planar textiles to determine thermal comfort properties on material level to be able to select the most suitable candidates for the garments for the required end use conditions. For garment level testing, the non-movable or movable thermal or sweating thermal manikins offer the most sophisticated objective methods. They simulate human body heat and sweat production and body movements in controlled ambient conditions for determining the thermal comfort properties either of a piece of garment or the whole clothing systems. The effect of garment design can be determined in addition to material properties.
A Novel Coaxially Laser-Assisted (COLA) Cold Spray System

Laser-assisted cold-spray has been recognized for over a decade as a technique capable of depositing high quality coatings. By laser heating (and hence softening) the surface being coated, deposition can occur at particle velocities lower than those normally associated with the cold spray process. This can be used to increase deposition rate. However, it can also be used to facilitate the deposition of higher hardness material combinations, normally more out of the reach of the conventional cold spray process. Laser heating can also reduce the requirements of the process on gas usage and gas heating for a given combination, making it more cost-effective. In the work reported below, the capability of a novel coaxially laser-assisted system (COLA) to deposit higher hardness materials, relevant to a range of different industrial applications, has been evaluated. This system can be retro-fitted to cold spray equipment.

Applying the digital image correlation method to fretting contact for slip measurement

Fretting is a consequence of small relative oscillatory movement between contacting parts and can cause serious damage to machine components. This paper describes the implementation of digital image correlation method to a fretting test device to measure the relative movement, i.e. slip, between the contacting parts. A complete contact fretting test device is used, in which two flat fretting pads are clamped against a cyclically loaded flat fretting specimen. The material used is quenched and tempered steel. Digital image correlation, equipped with a microscope, is employed to measure the local displacement field at the contact edge. The micrometer-level slip amplitude and the length of the slip region are determined at specific time intervals during a fretting fatigue test. Both of these quantities appear to decrease and stabilize during fretting fatigue testing. The slip decreases markedly during the initial cycles.
Ballistic and numerical simulation of impacting goods on conveyor belt rubber

Impact loading is an important process in the transport industry as it causes wear and failure of critical components. Conveyor belts are of particular importance as they are used in practically every industry where large quantities of goods are moved over short (<10 m) or long distances (>1 km). To investigate stress levels inside the material during impact loading, a gas gun was utilized to shoot 9 mm spherical steel balls onto the surface of a rubber conveyor belt. A high speed video recording system was employed in order to determine penetration depth and dissipated energy of the steel ball. Maximal penetration depths of up to 3.9 mm and maximal dissipated energies of up to 86.8 % were measured. Additionally, a numerical simulation using smooth particle applied mechanics was conducted and compared to the experimental results obtained with the gas gun. The calculated von Mises stresses affected the conveyor belts up to a maximum depth of 8.8 mm with at least 20 MPa. Maximum von Mises stresses were calculated to reach 60 MPa.

General information
Barkhausen Noise Measurements for Detecting Surface Changes during Grinding Process

General information
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Authors: Santa-aho, S., Sorsa, A., Hakanen, M., Leiviskä, K., Lepistö, T. K., Vippola, M. S.
Behavior of Humidity Sensors Attached with Anisotropic Electrically Conductive Adhesives in Corrosive Environment

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Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electrical Engineering, Research area: Reliability
Authors: Mostofizadeh, M., Parviainen, A., Frisk, L.
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Publication Forum (2016): 1
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Web of Science (2015): 1.151 1.297 7.8 0.132 0.00804 0.457
Publication Forum (2015): 1
Scopus rating (2014): 0.612 1.472
Web of Science (2014): 1.18 1.264 7.5 0.157 0.00799 0.429
Publication Forum (2014): 1
Scopus rating (2013): 0.546 1.611
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Scopus rating (2012): 0.435 1.485
Publication Forum (2012): 1
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Research output: Scientific - peer-review › Article

Biodegradable passive resonance sensor: Fabrication and initial testing
Biodegradable resonance circuits were studied. The circuits have a novel two-layer resonator structure without galvanic through hole vias. A patterned magnesium layers were evaporated on biodegradable PLA sheets by using a 3D printed mask. The circuits were assembled by heat sealing two magnesium patterned sheets together to encapsulate the circuit structure. An inductive link is used to wirelessly detect the resonance frequency of the circuit. The circuits were tested when immersed in de-ionised water and saline. According to the tests, the designed resonator structure can be measured in aqueous environment. The resonance of the tested circuit was observable at least for 51 hours. The concept still needs more development to extend degradation time and to increase the stability during immersion.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Characterisation of novel regenerated cellulosic, viscose, and cotton fibres and the dyeing properties of fabrics

There is a global demand for constant increase in the production of textile fibres. Currently, the market for cellulosic fibres is dominated by cotton and viscose fibres. However, new alternative cellulosic fibres are being sought to meet the growing
demand. The dyeing properties of novel fibres aiming at the marketplace are among the properties that determine their applicability to textiles. Recently, a novel process for producing cellulosic fibres, the Biocelsol process, has been scaled up so that the spinning of yarn from Biocelsol fibres is now possible. In this study, the reactive dye Levafix CA Blue was applied to cellulosic fabrics made from viscose, cotton, and Biocelsol yarns. The crystalline structure and morphology of the fibres were studied by Fourier transform infrared spectroscopy and field-emission scanning electron microscopy. The crystalline structure and morphology of the Biocelsol fibres resembled those of viscose fibres, but, owing to higher water absorption, the Biocelsol fabric had a higher dye exhaustion. The colour yield of the Biocelsol fabric was 62% and 41% higher than that of cotton and viscose fabrics respectively, suggesting that less dye is needed to gain a shade in Biocelsol fabric than in viscose and cotton fabrics.

**General information**

State: Published

Ministry of Education publication type: A1 Journal article-refereed

Organisations: Department of Materials Science, Research group: Fibre Materials, Research group: Materials Characterization, Engineering materials science and solutions (EMASS)

Authors: Kamppuri, T., Vehviläinen, M., Puolakka, A., Honkanen, M., Vippola, M., Rissanen, M.

Number of pages: 7

Pages: 396-402

Publication date: 2015

Peer-reviewed: Yes

ASJC Scopus subject areas: Chemistry (miscellaneous), Chemical Engineering(all), Materials Science (miscellaneous)

**Publication Information**

Journal: Coloration Technology

Volume: 131

Issue number: 5

ISSN (Print): 1472-3581

Ratings:

Publication Forum (2017): 1

Scopus rating (2016): 0.432 0.761

Publication Forum (2016): 1

Scopus rating (2015): 0.428 0.979

Web of Science (2015): 1.127 1.19 7.5 0.164 9.6E-4 0.214

Publication Forum (2015): 1

Scopus rating (2014): 0.419 0.838

Web of Science (2014): 1.262 1.251 7.0 0.15 0.00103 0.229

Publication Forum (2014): 1

Scopus rating (2013): 0.515 1.03

Publication Forum (2013): 1

Scopus rating (2012): 0.325 0.714

Publication Forum (2012): 1

Scopus rating (2011): 0.396 0.921

Scopus rating (2010): 0.742 1.004

Scopus rating (2009): 0.945 1.022

Scopus rating (2008): 0.855 0.775

Scopus rating (2007): 0.509 0.797

Scopus rating (2006): 0.506 0.872

Scopus rating (2005): 0.555 0.927

Scopus rating (2004): 1.135 1.17

Scopus rating (2003): 0.668 1.013

Scopus rating (2002): 0.214 1.339

Scopus rating (2001): 0.547 1.552

Scopus rating (2000): 0.466 0.975

Scopus rating (1999): 0.227 0.682

Original language: English

DOIs:

10.1111/cote.12163

Links:

http://www.scopus.com/inward/record.url?scp=84941702129&partnerID=8YFLogxK (Link to publication in Scopus)
Comparison of Some Data-Driven Modelling Techniques Applied to Barkhausen Noise Data Sets

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Materials Science, Research group: Materials Characterization, Univ Oulu, University of Oulu, Fac Technol, Environm & Chem Engn
Authors: Sorsa, A., Santa-aho, S., Vippola, M., Leiviskä, K.
Keywords: (Barkhausen noise)
Number of pages: 11
Publication date: 2015

Host publication information
Title of host publication: 11th International Conference on Barkhausen Noise and Micromagnetic Testing on June 18-21, 2015, in Aydin, Kusadasi, Turkey in conjunction with the 8th International Conference and Exhibition on Design and Production of Machines and Dies/Molds, DIEMOLD
Research output: Scientific › Conference contribution

Corrosion propagation phase studies on Finnish reinforced concrete facades

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Civil Engineering, Research group: Service Life Engineering of Structures, Department of Materials Science, Research group: Materials Characterization
Authors: Köliö, A., Honkanen, M., Lahdensivu, J.
Publication date: 2015

Host publication information
Title of host publication: 1st International Symposium on Building Pathology : ISBP 2015
Place of publication: Porto
Publisher: FEUP Edicoes (Faculdade de Engenharia da Universidade do Porto Edicoes)
ISBN (Print): 978-972-752-174-6

Bibliographical note
ORG=ruk,0.5
ORG=mol,0.5
Research output: Scientific › peer-review › Conference contribution

DC ramp rate effect on the breakdown response of SiO2-BOPP nanocomposites
The effect of voltage ramp rate on the short-term dielectric breakdown strength of polymer nanocomposites is not well-documented. In this paper, the effect of DC field ramp rate on the large-area breakdown performance of melt-extruded bi-axially oriented polypropylene (BOPP) films incorporating 4.5 wt-% of nano-silica is studied. By utilizing a self-healing multi-breakdown measurement method with a variable DC voltage ramp rate, a statistically large amount of breakdown data was obtained from a large total sample film area as a function of DC field ramp rate (0.1–50 Vs−1µm−1)). With a decreasing ramp rate, Weibull statistical analysis of the breakdown data suggests a systematically decreasing trend in the breakdown strength (Weibull α) and an increase in the Weibull shape parameter of time (>1) for the nanocomposite. The observed behavior is speculated to be attributable to highly altered internal charge dynamics of the silica-BOPP nanocomposite. The results exemplify the importance of careful breakdown strength assessment when dielectric films of more complex internal structure are studied.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electrical Engineering, Research area: Power engineering, Smart Energy Systems (SES), VTT Technical Research Centre of Finland
Authors: Rytöluoto, I., Ritamäki, M., Lahti, K., Karttunen, M.
Number of pages: 4
Pages: 496-499
Debonding and impact damage in stainless steel fibre metal laminates prior to metal fracture
An experimental drop-weight impact investigation was performed for stainless steel fibre metal laminates (FMLs) containing carbon-fibre and glass-fibre-reinforced epoxy layers. The purpose was to study the dependence of metal-composite debonding on the metal's surface morphology, as well as the interaction between debonding and internal damage caused to a composite. Three different steel surface morphologies were studied for the steel-carbon FMLs. Force-contact time and deflection profile measuring, as well as ultrasonic scanning and scanning electron microscopy imaging, were used for impact damage evaluation. Debonding was found to proceed either at the metal and adhesive film interface or cohesively inside the adhesive film. The steel's surface condition did not significantly influence impact response. The research also revealed that debonding between the lower metal sheet and composite part proceeded as mixed mode (I/II) fracture. Debonding was connected to the composite damages by several shear cracks located in the uppermost composite layer.
Dielectric Breakdown Strength of Thermally Sprayed Ceramic Coatings: Effects of Different Test Arrangements

Dielectric properties (e.g., DC resistivity and dielectric breakdown strength) of insulating thermally sprayed ceramic coatings differ depending on the form of electrical stress, ambient conditions, and aging of the coating, however, the test arrangements may also have a remarkable effect on the properties. In this paper, the breakdown strength of high velocity oxygen fuel-sprayed alumina coating was studied using six different test arrangements at room conditions in order to study the effects of different test and electrode arrangements on the breakdown behavior. In general, it was shown that test arrangements have a considerable influence on the results. Based on the results, the recommended testing method is to use embedded electrodes between the voltage electrode and the coating at least in DC tests to ensure a good contact with the surface. With and without embedded electrodes, the DBS was 31.7 and 41.8 V/µm, respectively. Under AC excitation, a rather good contact with the sample surface is, anyhow, in most cases acquired by a rather high partial discharge activity and no embedded electrodes are necessarily needed (DBS 29.2 V/µm). However, immersion of the sample in oil should strongly be avoided because the oil penetrates quickly into the coating affecting the DBS (81.2 V/µm).
Diffusion of acidic solution through rubber at high temperature and its effect on metal-rubber interface degradation

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology, Teknikum Oy, Outotec Research Center
Authors: Sarlin, E., Rosling, A., Mustakangas, M., Laihonen, P., Lindgren, M., Vuorinen, J.
Publication date: 2015

Host publication information
Title of host publication: Proceedings of SAMPE Europe Conference
ISBN (Electronic): 978-90-821727-3-7
Research output: Scientific › Conference contribution

Effect of alkali and silane surface treatments on regenerated cellulose fibre type (Lyocell) intended for composites
Cellulose fibres have significant importance and potential for polymer reinforcement. It is essential to modify the surface of the fibre to obtain good fibre-matrix interface. Surface treatments can increase surface roughness of the fibre, change its chemical composition and introduce new moieties that can effectively interlock with the matrix, resulting in good mechanical properties in the composites. This is mainly due to improved fibre-matrix adhesion. The treatments may also reduce the water absorption rate by converting part of the hydroxyl groups on the fibre surface into other functional groups. Chemical modification of the surface of a regenerated cellulose fibre of the Lyocell type was carried out by alkali and silane treatments, which significantly changed the properties of the Lyocell fibres. Three parameters were considered when the fibre surface treatment was done: concentration (2–15 wt%), temperature (25 and 50 °C) and time (30 min–72 h). Fourier transform infrared spectroscopy and Raman spectroscopy were used for chemical analysis and qualitative analysis of the cellulose crystallinity due to the surface treatments; subsequently, mechanical strength of the fibres was tested by tensile testing. Weight loss, moisture regain and swelling measurements were taken before and after treatments, which showed the obvious changes in fibre properties on treatment. Heat capacity of the fibres was measured for untreated and treated fibres, and thermal degradation of fibres was examined to see the stability of fibres at elevated temperatures. Wettability and surface energies were measured using dynamic contact angle method in three wetting mediums. Scanning electron microscopy was used to study the morphological properties of the fibres.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Fibre Materials, University College of Borås, Högskolan i Borås, Swedish Centre for Resource Recovery
Passive UHF radio-frequency identification (RFID) tags are used for object identification in various environmental conditions, which may affect the reliability of these tags. The effects of different environmental stresses can be studied with accelerated life tests (ALT). Choosing the most suitable test may be challenging: The results are needed as fast as possible, but the failure mechanisms must replicate those occurring in the real operating environment. Here the effects of different temperature cycling profiles were studied by altering temperature ranges, extreme temperatures, soak times to extreme temperatures and transition times between extreme temperatures. Failure times clearly differed between the tests. The test with the fastest transition time and the shortest soak time seemed to have the most acceleration. It was also observed that the different temperature cycling profiles affected the failure mechanisms detected. Cracking of the antenna was observed with lower temperature extremes or shorter soak and transition times. However, with longer soak and transition times, cracks were seen in the RFID interconnections. Both cases led to changes in the impedance.
matching and consequently to failures. The totally different failure mechanisms clearly demonstrate the importance of carefully determining the test parameters in order to achieve the correct failure mechanism.

**General information**

State: Published

Ministry of Education publication type: A1 Journal article-refereed

Organisations: Department of Electrical Engineering

Authors: Lahokallio, S., Saarinen-Pulli, K., Frisk, L.

Number of pages: 8

Pages: 93-100

Publication date: 2015

Peer-reviewed: Yes

**Publication information**

Journal: Microelectronics Reliability

Volume: 55

Issue number: 1

ISSN (Print): 0026-2714

Ratings:

- Publication Forum (2017): 1
- Scopus rating (2016): 0.47 0.976
- Publication Forum (2016): 1
- Scopus rating (2015): 0.618 1.193
- Web of Science (2015): 1.202 1.285 5.4 0.167 0.01019 0.352
- Publication Forum (2015): 1
- Scopus rating (2014): 0.601 1.432
- Web of Science (2014): 1.433 1.336 5.8 0.154 0.00964 0.351
- Publication Forum (2014): 1
- Scopus rating (2013): 0.594 1.264
- Publication Forum (2013): 1
- Scopus rating (2012): 0.586 1.414
- Publication Forum (2012): 1
- Scopus rating (2011): 0.621 1.382
- Scopus rating (2010): 0.602 1.114
- Scopus rating (2009): 0.736 1.176
- Scopus rating (2008): 0.932 1.235
- Scopus rating (2007): 0.743 1.228
- Scopus rating (2006): 0.716 1.153
- Scopus rating (2005): 0.514 1.009
- Scopus rating (2004): 0.537 0.823
- Scopus rating (2003): 0.472 0.786
- Scopus rating (2002): 0.592 0.756
- Scopus rating (2001): 0.411 0.694
- Scopus rating (2000): 0.349 0.382
- Scopus rating (1999): 0.22 0.562

Original language: English

DOIs:

10.1016/j.microrel.2014.09.032

**Bibliographical note**

Available online 24 October 2014 (Volume 55, Issue 1, January 2015, Pages 93-100)<br>
Contribution: organisation=dee,FACT1=1<br>
Portfolio EDEND: 2014-12-30<br>
Publisher name: Pergamon Press<br>
Source: researchoutputwizard<br>
Source-ID: 861<br>
Research output: Scientific - peer-review › Article

**Enhanced in-line detection, cleaning and repair of nano-scale defects in thin-films used for flexible photovoltaic and food packaging applications**
General information
State: Published
Organisations: Department of Materials Science, Research group: Paper Converting and Packaging
Authors: Lahti, J.
Publication date: 2015
Peer-reviewed: Unknown

Bibliographical note
poster
Research output: Scientific › Paper, poster or abstract

Enhanced in-line detection, cleaning and repair of nano-scale defects in thin-films used for flexible photovoltaic and food packaging applications

General information
State: Published
Organisations: Department of Materials Science, Research group: Paper Converting and Packaging
Authors: Lahti, J. M. K.
Publication date: 2015
Peer-reviewed: Unknown

Bibliographical note
poster
Research output: Scientific › Paper, poster or abstract

Enhanced In-line detection, cleaning and repair of nano-scale defects in thin-films used for flexible photovoltaic and food packaging applications

General information
State: Published
Organisations: Department of Materials Science, Research group: Paper Converting and Packaging
Authors: Lahti, J. M. K.
Publication date: 2015
Peer-reviewed: Unknown

Bibliographical note
poster
Research output: Scientific › Paper, poster or abstract

Erosion testing of filled and/or reinforced vinyl ester composites in water medium at elevated temperature

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology, Outotec Research Center
Authors: Siljander, S., Kiviniemi, M., Sarlin, E., Lindgren, M., Suikkonen, R., Vuorinen, J.
Number of pages: 10
Publication date: 2015

Host publication information
Title of host publication: Proceedings of the 20th International Conference on Composite Materials
Links:
http://iccm20.org/fullpapers/file?f=BJk14rE MQP

Bibliographical note
ISBN kysytty, ei löydy / TL
Research output: Professional › Conference contribution
Erosion wear of glass fibre reinforced vinyl ester
This study evaluates the slurry-erosion wear of glass fibre reinforced vinyl ester composites (VE-FRP) using a high speed slurry-pot type wear tester. The wear rates of VE-FRP were compared using different abrasives, namely quartz, chromite, copper ore, zinc concentrate, and tailings. Furthermore, the effect of abrasive particle size and slurry concentration on the VE-FRP wear was studied. The erosion wear results of VE-FRP were compared to natural rubber (NR) and bromobutyl rubber (BIR) as well as to few common thermoplastics, such as polypropylene (PP) and polyvinyl chloride (PVC). Moreover, the failure characteristics of VE-FRP were analyzed. The results demonstrated that coarse quartz produced the largest wear rates on VE-FRP samples, while the zinc concentrate showed the lowest wear. Minor changes in the abrasive particle size had no effect on the wear results, only when the particle size was markedly raised, the wear started to increase. When comparing the wear rates of different materials, it was concluded that with all abrasive types, tested rubbers and thermoplastics had lower wear rates than VE-FRP.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology, Research group: Materials Characterization, Outotec Research Center
Authors: Suihkonen, R., Perolainen, J., Lindgren, M., Valtonen, K., Ojala, N., Sarlin, E., Vuorinen, J.
Keywords: (Slurry erosion, Wear, Composite, Slurry-pot)
Number of pages: 9
Pages: 11-19
Publication date: 2015
Peer-reviewed: Yes

Publication Information
Journal: Tribologia
Volume: 33
Issue number: 2
ISSN (Print): 0780-2285
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.141 0.076
Publication Forum (2016): 1
Scopus rating (2015): 0.101 0.0
Publication Forum (2015): 1
Scopus rating (2014): 0.316 0.126
Publication Forum (2014): 1
Scopus rating (2013): 0.118 0.019
Publication Forum (2013): 1
Scopus rating (2012): 0.24 0.312
Publication Forum (2012): 1
Scopus rating (2011): 0.237 0.103
Scopus rating (2010): 0.125 0.055
Scopus rating (2009): 0.459 0.37
Scopus rating (2008): 0.13 0.228
Scopus rating (2007): 0.126 0.186
Scopus rating (2006): 0.159 0.438
Scopus rating (2005): 0.181 0.429
Scopus rating (2004): 0.104 0.479
Scopus rating (2003): 0.227 0.277
Scopus rating (2002): 0.101 0.0
Scopus rating (2001): 0.221 0.0
Scopus rating (2000): 0.238
Scopus rating (1999): 0.119
Original language: English
Electronic versions:
Tribologia2015_manuscript_Suihkonen_Revised
Links:
Evaluation of repellency and cleanability properties of the multifunctional protective textiles treated with nanosol-based finishings

Rescue team workers in extreme weather conditions, in wildland fires and in first aid medical tasks confront various hazards in varying ambient conditions. Multifunctional properties in protective garments are needed such as waterproofness, mechanical durability, extended service life and self-cleaning. Flood waters may contain various contaminant agents like household chemicals, sewage, microbes and petroleum products. First aid workers are exposed to a wide variety of soils and liquids like blood, disinfectant agents, mud and oil based stains. Barrier properties of the materials prevent the liquid and particle penetration while the repellency and antimicrobial properties prevent the surface wetting and soiling and ease up cleaning thus extending the service life of the protective garment. In SAFEPROTEX project the aim was to develop protective garments for rescue team workers imparting protection against multiple hazards with enhanced mechanical parameters and maintaining physiological comfort. Hydrofobic, self-cleaning and antimicrobial properties were achieved by applying alkoxysilane nanosol based finishing on selected fabric substrates for the protective prototypes. The repellency, self-cleaning and soil removal properties were tested using standard test method for spray test, roll-off angle test and an inhouse test for staining and cleanability receiving good and satisfactory results. This paper presents the staining and cleanability test method using the end user specific staining agents and discusses the results.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Materials Science, Research group: Fibre Materials, INOTEX, De Montfort University
Authors: Varheenmaa, M., Martinkova, L., Shen, J.
Number of pages: 477
Pages: 469
Publication date: 2015

Experimental study on the behavior of wear resistant steels under high velocity single particle impacts

High velocity solid particle erosion may cause severe damage and high wear rates in materials used for wear protection. An experimental work on the behavior of wear resistant steels, including three high-strength martensitic alloys and a carbide-reinforced metal matrix composite, was performed in high rate single impact conditions. Characterization of the mechanical behavior of the materials at high strain rates was conducted using the Hopkinson Split Bar technique to identify the effects of strain rate on strain hardening and the prevailing failure mechanisms. The high velocity impact experiments using spherical projectiles were carried out at various impact angles and projectile velocities. The effects of impact energy and impact angle were studied and discussed. Wear was analyzed as volume loss from the surface, but it was also presented in a more precise way by taking into account the actual energy spent on the plastic deformation and wear. In-situ high speed photography and post impact characterization of the impact craters were used to reveal the prevailing failure and wear mechanisms. Depending on the impact angle and impact energy, different wear mechanisms of plastic deformation, cutting, shear banding and fracture were identified. The martensitic steels exhibited adiabatic shear banding in the microstructure at high strain rates and impact velocities, which may accelerate the wear. The carbide reinforced steel was found susceptible to catastrophic fracturing especially at high impact angles.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Materials Characterization, Computational Science X (CompX), Engineering materials science and solutions (EMASS), VTT Technical Research Centre of Finland, Ruukki Metals Inc.
Authors: Lindroos, M., Apostol, M., Kuokkala, V. T., Laukkonen, A., Valtonen, K., Holmborg, K., Oja, O.
Keywords: (Adiabatic shear band, High strain rate, High strength steel, Impact wear)
Number of pages: 14
Pages: 114-127
Publication date: 2015
Experimental study on the behavior of wear resistant steels under high velocity single particle impacts. Embargo ended: 26/12/16

DOIs: 10.1016/j.ijimpeng.2014.12.002

Fabrication and characterization of superluminescent diodes for 2–3 µm wavelength

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Optoelectronics Research Centre, Research group: Nanophotonics, Research group: Semiconductor Technology and Applications, Optoelectronics Research Centre, Tampere University of Technology
Authors: Zia, N., Viheriälä, J., Koskinen, R., Koskinen, M., Suomalainen, S., Guina, M.
Publication date: 2015
Graphene–Rubber Nanocomposites

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology
Authors: Das, A., Heinrich, G.
Number of pages: 4
Pages: 894-897
Publication date: 2015

Host publication information
Title of host publication: Encyclopedia of Polymeric Nanomaterials
Place of publication: Berlin, Heidelberg
Publisher: Springer
Editors: Kobayashi, S., Müllen, K.
ISBN (Print): 978-3-642-29648-2
DOIs:
10.1007/978-3-642-36199-9_293-1
Research output: Scientific - peer-review › Chapter

>8W GaInNAs VECSEL emitting at 615 nm
We report a high-power VECSEL emitting <8W around 615 nm. The gain chip of the laser was grown by plasmaassisted molecular beam epitaxy and it comprised 10 GaInNAs quantum wells. The VECSEL cavity had a V-shaped geometry and a 10-mm-long non-critically phase-matched LBO crystal for second harmonic generation. The cavity incorporated also an etalon and a birefringent filter for controlling the output wavelength. With the aid of the secondharmonic output and the infrared light leaking out from the laser cavity, the single-pass conversion efficiency of the crystal was estimated to have a value of 0.75%.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Frontier Photonics
Authors: Leinonen, T., Penttinen, J. P., Korpijärvi, V. M., Kantola, E., Guina, M.
Keywords: (frequency doubling, high power visible laser, OPSL, orange-red VECSEL, SDL, SHG)
Publication date: 2015

Host publication information
Title of host publication: Proceedings of SPIE : Vertical External Cavity Surface Emitting Lasers (VECSELs) V
Volume: 9349
Publisher: SPIE
Article number: 934909
ISBN (Print): 9781628414394
DOIs:
10.1117/12.2079162
Source: Scopus
Source-ID: 84925597620
Research output: Scientific - peer-review › Conference contribution

High-gain 1.3 μm GaInNAs semiconductor optical amplifier with enhanced temperature stability for all-optical signal processing at 10 Gb/s
We report on the complete experimental evaluation of a GaInNAs/GaAs (dilute nitride) semiconductor optical amplifier that operates at 1.3 μm and exhibits 28 dB gain and a gain recovery time of 100 ps. Successful wavelength conversion operation is demonstrated using pseudorandom bit sequence 2<sup>7</sup>-1 non-return-to-zero bit streams at 5 and 10 Gb/s, yielding error-free performance and showing feasibility for implementation in various signal processing functionalities. The operational credentials of the device are analyzed in various operational regimes, while its nonlinear performance is examined in terms of four-wave mixing. Moreover, characterization results reveal enhanced temperature stability with almost no gain variation around the 1320 nm region for a temperature range from 20°C to 50°C. The
operational characteristics of the device, along with the cost and energy benefits of dilute nitride technology, make it very attractive for application in optical access networks and dense photonic integrated circuits.

**General information**

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Frontier Photonics, University of Milan Bicocca, Department of Informatics, Aristotle University of Thessaloniki, Aristotle University of Thessaloniki, School of Electrical and Computer Engineering, National Technical University of Athens, Information Technologies Institute, Center for Research and Technology Hellas
Number of pages: 7
Pages: 46-52
Publication date: 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Atomic and Molecular Physics, and Optics

**Publication information**

Journal: Applied Optics
Volume: 54
Issue number: 1
ISSN (Print): 1559-128X
Ratings:
- Publication Forum (2017): 1
- Scopus rating (2016): 0.633 1.095
- Scopus rating (2015): 0.826 1.225
- Web of Science (2015): 1.598 1.613 >10.0 0.388 0.03815 0.439
- Scopus rating (2014): 1.066 1.534
- Web of Science (2014): 1.784 1.745 >10.0 0.347 0.04113 0.474
- Scopus rating (2013): 0.991 1.616
- Scopus rating (2012): 1.046 1.496
- Scopus rating (2011): 1.044 1.777
- Scopus rating (2010): 1.082 1.636
- Scopus rating (2009): 1.222 1.71
- Scopus rating (2008): 1.334 1.711
- Scopus rating (2007): 1.216 1.613
- Scopus rating (2006): 1.135 1.748
- Scopus rating (2005): 1.192 1.767
- Scopus rating (2004): 1.053 1.889
- Scopus rating (2003): 1.236 1.679
- Scopus rating (2002): 1.221 1.922
- Scopus rating (2001): 1.424 1.724
- Scopus rating (2000): 1.102 1.04
- Scopus rating (1999): 2.032 0.99
Original language: English
DOIs:
10.1364/AO.54.000046

**Bibliographical note**

Siirretään Portfolio15<br/>Contribution: organisation=orc,FACT1=1<br/>Portfolio EDEND: 2015-01-08<br/>Publisher name: Optical Society of America
Source: researchoutputwizard
Source-ID: 5
Research output: Scientific - peer-review › Article
High power yellow-orange-red VECSELs for medical applications

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications
Authors: Kantola, E. L., Leinonen, T. P., Penttinen, J., Korpijärvi, V., Guina, M.
Publication date: 2015

Host publication information
Title of host publication: Northern Optics & Photonics 2015, 1.-4.6.2015, Saimaa, Finland: Oral presentation in Northern Optics & Photonics 2015, 1.-4.6.2015, Saimaa, Finland

Bibliographical note
Research output: Scientific - peer-review > Conference contribution

High-temperature slurry erosion of vinylester matrix composites – The effect of test parameters
Glass fibre (GF) reinforced vinylester composites (VE-FRP) are commonly used materials in hydrometallurgical reactors, the pulp and paper industry and waste water treatment plants, due to their excellent chemical resistance combined with good mechanical performance. In these applications, materials can be subjected to erosion, elevated temperatures (as high as 95 °C) and various chemical environments. However, studies on the slurry erosion of vinylester-based composites at high temperatures have not yet been reported. In this study, the erosion resistance of GF reinforced VE-FRP was investigated with a pilot-scale reactor. The effect of slurry concentration, erodent particle kinetic energy and slurry temperature was studied. The dominating wear mechanism was found to be abrasive wear. The VE-FRP structure was found to be prone to erosive turbulent flow and cavitation. Moreover, an increase in the erodent concentration of the slurry (10-20. wt%) or in the total kinetic energy of the erodent particles (30-770. kJ) increased the wear rate of the material markedly (up to 6 times higher weight loss). However, the total effect of different interrelated parameters was found to be complex. Consequently, it is recommended that predictions of the erosion rate of VE-FRP components are based on tests carried out in conditions that simulate the actual service environment.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology, Engineering materials science and solutions (EMASS), Outotec Research Center
Authors: Sarlin, E. L., Lindgren, M., Suihkonen, R. J., Siljander, S. M. K., Kakkonen, M. M. S., Vuorinen, J. E.
Keywords: (Vinylester, FRP, Glass fibre, Erosion, Slurry)
Number of pages: 10
Pages: 488-497
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Wear
Volume: 328-329
ISSN (Print): 0043-1648
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.558 2.071
Publication Forum (2016): 1
Scopus rating (2015): 1.527 2.017
Web of Science (2015): 2.323 2.395 >10.0 0.37 0.01794 0.645
Publication Forum (2015): 1
Scopus rating (2014): 1.715 2.38
Web of Science (2014): 1.913 2.109 >10.0 0.347 0.01937 0.601
Publication Forum (2014): 2
Scopus rating (2013): 1.319 2.416
Publication Forum (2013): 2
Scopus rating (2012): 1.36 2.178
High-Temperature Storage Testing of ACF Attached Sensor Structures

**General information**

**State:** Published  
**Ministry of Education publication type:** A1 Journal article-refereed  
**Organisations:** Department of Electrical Engineering, Research area: Reliability, Department of Materials Science, Research group: Plastics and Elastomer Technology, Engineering materials science and solutions (EMASS)  
**Authors:** Lahokallio, S., Hoikkanen, M., Vuorinen, J., Frisk, L.  
**Pages:** 8641-8660  
**Publication date:** 2015  
**Peer-reviewed:** Yes  

**Publication information**

**Journal:** Materials  
**Volume:** 8  
**Issue number:** 12  
**ISSN (Print):** 1996-1944  
**Ratings:**  
Publication Forum (2017): 1  
Scopus rating (2016): 0.834 1.497  
Publication Forum (2016): 1  
Scopus rating (2015): 0.852 1.495  
Web of Science (2015): 2.728 3.3 3.3 0.356 0.01592 0.77  
Publication Forum (2015): 1  
Scopus rating (2014): 0.777 1.256  
Web of Science (2014): 2.651 3.35 3.6 0.353 0.01273 0.796  
Publication Forum (2014): 1  
Scopus rating (2013): 0.998 1.673  
Publication Forum (2013): 1  
Scopus rating (2012): 0.838 1.471  
Publication Forum (2012): 1  
Scopus rating (2011): 0.65 1.239  
Scopus rating (2010): 0.394 0.99  
Original language: English  
**DOIs:**

10.1016/j.wear.2015.03.021

[Links](http://urn.fi/URN:NBN:fi:tty-201606134243). Embargo ended: 30/03/17
High Temperature Tension HSB Device Based on Direct Electrical Heating

The effects of strain rate and temperature on the mechanical properties of various engineering materials have been extensively studied within the past few decades. However, the high temperature high strain rate tension Hopkinson Split Bar (HSB) testing is still quite challenging to perform due to the need to fix the sample to the stress bars. Mechanical fixing of a sheet material sample is not very convenient and can produce low quality results. Therefore, the sheet samples are typically glued directly to the stress bars. This glue joint, however, loses strength rapidly if the temperature of the glue joint increases above room temperature, which makes the high temperature testing more difficult. In this paper, we present a tension Hopkinson Split Bar device with a high temperature system that allows the sample to be heated while keeping the glue joint at or close to room temperature. The sample is rapidly heated by a powerful low voltage high amperage DC pulse. When testing stainless steels, test temperatures between 400 and 800 °C are reached in less than one second, and even the melting temperature of the material is reached in less than 2 s. The system is fully computer controlled allowing accurate timing and control of the different actions during the test including heating of the sample, pneumatic manipulation of the heating electrodes, releasing of the striker bar, and recording of the test results. The results obtained with the current high temperature system are high quality and the obtained high temperature stress strain curves are essentially oscillation free. © The Society for Experimental Mechanics, Inc. 2015.
The properties of wood must be considered when designing mechanical pulping machinery. The composition of wood within the annual ring is important. This paper proposes a novel image-based method to measure stress and planar strain distribution in soft, heterogeneous materials. The main advantage of this method in comparison to traditional methods that are based on strain gauges is that it captures local strain gradients and not only average strains. Wood samples were subjected to compression at strain rates of 1000-2500 s⁻¹ in an encapsulated split-Hopkinson device. High-speed photography captured images at 50 000-100 000 Hz and different magnifications to achieve spatial resolutions of 2.9 to 9.7 μm pixels⁻¹. The image-based analysis utilized an image correlation technique with a method that was developed for particle image velocimetry. The image analysis gave local strain distribution and average stress as a function of time. Two stress approximations, using the material properties of the split-Hopkinson bars and the displacement of the transmitter bar/sample interface, are presented. Strain gauges on the bars of the split-Hopkinson device give the reference average stress and strain. The most accurate image-based stress approximation differed from the strain gauge result by 5%.
Improving the extensibility of paper: Sequential spray addition of gelatine and agar

High extensibility of paper is of key importance for production of novel 3D-packaging materials. The application of agar onto a wet web has been shown to significantly improve the extensibility of dry paper as a result of shrinkage during drying while addition of gelatine strengthens inter-fibre bonding. In this work, these two bio-based materials were applied sequentially to yield paper with higher extensibility compared to that obtained by single component application. We studied the interactions between agar, gelatine and cellulose by using quartz crystal micro-gravimetry and atomic force microscopy. Agar adsorption was significantly improved after priming the cellulose surface with gelatine. This synergistic effect on extensibility only occurred if the protein was added first. It is hypothesized that the gelatine strengthens the interfibre bonds while the polysaccharide forms a film on the web surface, and reinforces it. The extensibility of webs treated with gelatine (4%) and agar (4%) was ca. 15% after unrestrained drying. Such remarkable level of extensibility allows production of tray-like shapes via conventional thermoforming machine to depths of up to 2 cm. Overall, a protocol based on the sequential application of two abundant biopolymers is proposed to enhance formability of paper.
Influence of Diffusion Barriers on Thermal Ageing Behaviour of Solar Absorber Coatings on Copper

The thermal stability of magnetron sputtered and electroplated solar absorber coatings were investigated at elevated temperatures of 200-500°C. Diffusion barriers of aluminium and nickel were studied towards thermal diffusion of copper substrate atoms.

The diffusion barriers studied were experimental magnetron sputtered Al layers and an industrial electroplated Ni layer between a Cu substrate and an absorber coating. The thicknesses of Al barriers were 0.1 µm and 0.5 µm, and a Ni barrier was 3 µm thick. As absorber coatings, magnetron sputtered chromium-based coatings and industrially electroplated black chromium coatings, were studied. The sputtered absorbers were a 3-layer stack of CrOx/Cr/CrOx with layer thicknesses of 0.05/0.03/0.05 µm, respectively. The electroplated black chromium coating had a thickness of 0.2 µm. Copper was used as a substrate for all of the absorbers studied.

The degradation of the absorber surfaces and influence of diffusion barriers were analysed by optical measurements (solar absorptance with a UV/Vis/NIR spectrophotometer and thermal emittance with a FTIR spectrophotometer), microstructural analyses were performed using a field-emission scanning electron microscope (FESEM). The absorbers were aged by means of heat treatments in a circulating air furnace at 200, 300, 400 and 500°C for two hours. The experimental analyses were performed before and after the ageing studies.

The results showed that without a barrier coating copper substrate atoms can diffuse into the absorber coating and through the coating to the surface of the coating and form CuO islands on the surface. These phenomena degraded optical selectivity of the absorber surface. The diffusion can be prevented or retarded with a diffusion barrier layer between the Cu substrate and the absorber coating. The 3-µm-thick Ni barrier prevented Cu diffusion and retained optical selectivity up to 500°C for two hours and the 0.5-µm-thick Al layer up to 400°C.

General information

State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Materials Science, Research group: Surface Engineering
Authors: Kotilainen, M., Vuoristo, P.
Keywords: (Thermal ageing, Thin films, Absorber coating, Aluminium barrier, Copper substrate, Diffusion barrier, Magnetron sputtering, Stability)
Number of pages: 11
Pages: 481-491
Publication date: 2015

Host publication information

Title of host publication: Surface Modification Technologies XXVIII : Tampere University of Technology Tampere, Finland
June 16-18, 2014
ISBN (Print): 978-81-926196-1-3
Research output: Scientific - peer-review › Conference contribution
Influence of the Spray Gun Type on Microstructure and Properties of HVAF Sprayed Fe-Based Corrosion Resistant Coatings

The aim of this study is to evaluate the microstructural details and corrosion properties of novel Fe-based coatings prepared using two different generations of HVAF spray guns. These two generations of HVAF guns are Activated Combustion HVAF (AC-HVAF, 2nd generation) M2 gun and Supersonic Air Fuel HVAF (SAF, 3rd generation) M3 gun. Structural details were analysed using x-ray diffractometry and field-emission scanning electron microscope. Higher denseness with homogeneous microstructure was achieved for Fe-based coating deposited by the M3 process. Such coatings exhibit higher particle deformation and lower oxide content compared to coatings manufactured with M2 gun. Corrosion properties were studied by open-cell potential measurements and electrochemical impedance spectroscopy. The lower porosity and higher interlamellar cohesion of coating manufactured with M3 gun prevent the electrolyte from penetrating through the coating and arriving to the substrate, enhancing the overall corrosion resistance. This can be explained by the improved microstructures and coating performance.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Surface Engineering, Engineering materials science and solutions (EMASS)
Authors: Milanti, A., Koivuluoto, H., Vuoristo, P.
Keywords: (corrosion behavior, Fe-based coatings, HVAF, structure)
Number of pages: 11
Pages: 1312-1322
Publication date: 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Condensed Matter Physics, Materials Chemistry, Surfaces, Coatings and Films

Publication information
Journal: Journal of Thermal Spray Technology
Volume: 24
Issue number: 7
ISSN (Print): 1059-9630
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.593 0.911
Publication Forum (2016): 1
Scopus rating (2015): 0.741 0.949
Web of Science (2015): 1.568 1.93 6.7 0.309 0.00408 0.391
Publication Forum (2015): 1
Scopus rating (2014): 0.848 1.718
Web of Science (2014): 1.344 1.849 6.6 0.235 0.00395 0.394
Publication Forum (2014): 1
Scopus rating (2013): 0.933 1.394
Publication Forum (2013): 1
Scopus rating (2012): 0.962 1.261
Publication Forum (2012): 1
Scopus rating (2011): 0.854 1.382
Scopus rating (2010): 0.872 1.229
Scopus rating (2009): 0.925 0.69
Scopus rating (2008): 0.793 0.799
Scopus rating (2007): 0.764 0.958
Scopus rating (2006): 0.928 1.344
Scopus rating (2005): 1.007 1.23
Scopus rating (2004): 0.853 1.482
Scopus rating (2003): 0.59 1.197
Scopus rating (2002): 0.712 1.24
Scopus rating (2001): 1.047 1.413
Scopus rating (2000): 1.364 1.594
Scopus rating (1999): 0.669 1.428
In situ hybridization of pulp fibres using Mg-Al layered double hydroxides
Inorganic Mg2+ and Al3+ containing layered double hydroxide (LDH) particles were synthesised in situ from aqueous solution onto chemical pulp fibers of pine (Pinus sylvestris). High super saturated (hss) solution with sodium carbonate produced LDH particles with an average diameter of 100–200 nm. Nano-size (70 nm) LDH particles were found from fibers external surface and, to a lesser degree, from the S2 cell wall after synthesis via low super saturated (lss) route. The synthesis via slow urea hydrolysis (Uhyd) yielded micron and clay sized LDH (2–5 µm) and enabled efficient fiber densification via mineralization of S2 fiber wall layer as indicated by TEM and compliance analysis.

The Uhyd method decreased fiber compliance up to 50%. Reduction in the polymerization degree of cellulose was observed with capillary viscometry. Thermogravimetric analysis showed that the hybridization with LDH reduced the exothermic heat, indicating, that this material can be incorporated in flame retardant applications. Fiber charge was assessed by adsorption experiments with methylene blue (MB) and metanil yellow (MY). Synthesis via lss route retained most of the fibres original charge and provided the highest capacity (10 µmol/g) for anionic MY, indicating cationic character of hybrid fibers. Our results suggested that mineralized fibers can be potentially used in advanced applications such as biocomposites and adsorbent materials.

Layered Double Hydroxide (LDH)-Based Rubber Nanocomposites
General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology
Authors: Basu, D., Das, A., Heinrich, G.
Number of pages: 6
Pages: 1050-1055
Publication date: 2015

Host publication information
Title of host publication: Encyclopedia of Polymeric Nanomaterials
Place of publication: Berlin, Heidelberg
Publisher: Springer
Editors: Kobayashi, S., Müllen, K.
ISBN (Print): 978-3-642-29648-2
Local cleaning method for micron-sized particle contamination in thin film processing

General information
State: Published
Organisations: Department of Materials Science, Research group: Paper Converting and Packaging
Authors: Lahti, J.
Publication date: 2015

Publication information
Year: 2015
Original language: English
Links: http://nanomend.eu/

Bibliographical note
Public flyer published by EU project NanoMend

Manufacturing of Calibration Samples for Barkhausen Noise Measurements with Temperature Controlled Laser Processing

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Materials Science, Research group: Materials Characterization, Department of Mechanical Engineering and Industrial Systems, Stresstech Oy
Authors: Santa-aho, S., Sorsa, A., Latokartano, J., Leiviskä, K., Suominen, L., Vippola, M.
Keywords: (Barkhausen noise)
Publication date: 2015

Host publication information
Title of host publication: 11th International Conference on Barkhausen Noise and Micromagnetic Testing on June 18-21, 2015, in Aydin, Kusadasi, Turkey in conjunction with the 8th International Conference and Exhibition on Design and Production of Machines and Dies/Molds, DIEMOLD
Research output: Scientific › Conference contribution

MBE GROWN GaInNAsSb MULTIJUNCTION SOLAR CELLS: PATH TOWARDS 50% EFFICIENCY

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications
Authors: Aho, A. J., Polojärvi, V. V., Aho, T. A., Raappana, M. J. S., Tukiainen, A. K., Guina, M. D.
Publication date: 2015

Host publication information
Title of host publication: 18th European Molecular Beam Epitaxy Workshop. Canazei, Italy
ASJC Scopus subject areas: Energy(all)

Bibliographical note
Research output: Professional › Conference contribution
Mechanical performance and CO2 uptake of ion-exchanged zeolite A structured by freeze-casting

Zeolite 4A has been freeze-cast into highly porous monoliths with a cylindrical shape. The brittle monoliths, with lamellar or columnar pores and wall thicknesses between 8 and 35μm, show a compressive mechanical response along the main pore axis that could be modeled by a buckling behavior. The failure strength is proportional to the density and the amount of transverse bridging across lamella, which was shown to be related to the pore cross-sectional aspect ratio. Monoliths with highly anisotropic pores with a cross-sectional aspect ratio higher than 3 yielded sequentially from the top surface, whereas monoliths with a pore aspect ratio lower than 3 were found to delaminate into longitudinal splinters. The freeze-cast monoliths show a sharp gas breakthrough front with a 1:9 mixture of CO<sub>2</sub> and N<sub>2</sub>, indicating rapid uptake kinetics of the lamellar structures.

General information

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Ceramic materials, Department of Signal Processing, Engineering materials science and solutions (EMASS), Workshop for Research in Artistic Technologies, RATS, Stockholm University, Sweden, Luleå University of Technology, Department of Materials and Environmental Chemistry, Berzelii Center EXSELENT on Porous Materials, Division of Materials Science
Authors: Ojuva, A., Järveläinen, M., Bauer, M., Keskinen, L., Valkonen, M., Akhtar, F., Levänen, E., Bergström, L.
Keywords: (Freeze-casting, Laminate, Mechanical strength, Porous ceramics, Zeolite A)
Number of pages: 12
Pages: 2607-2618
Publication date: 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Ceramics and Composites, Materials Chemistry

Publication information

Journal: Journal of the European Ceramic Society
Volume: 35
Issue number: 9
ISSN (Print): 0955-2219
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.135 1.776
Publication Forum (2016): 2
Scopus rating (2015): 1.15 1.841
Web of Science (2015): 2.933 3.01 7.9 0.9 0.02203 0.674
Publication Forum (2015): 2
Scopus rating (2014): 1.187 2.099
Web of Science (2014): 2.947 3.0 7.7 0.688 0.02233 0.672
Publication Forum (2014): 2
Scopus rating (2013): 1.122 1.794
Publication Forum (2013): 2
Scopus rating (2012): 1.305 2.244
Publication Forum (2012): 2
Scopus rating (2011): 1.343 2.217
Scopus rating (2010): 1.392 1.945
Scopus rating (2009): 1.381 1.724
Scopus rating (2008): 1.146 1.645
Scopus rating (2007): 1.22 1.76
Scopus rating (2006): 1.191 1.67
Scopus rating (2005): 1.084 1.637
Scopus rating (2004): 1.037 1.747
Scopus rating (2003): 1.129 1.497
Scopus rating (2002): 1.04 1.181
Scopus rating (2001): 1.238 1.597
Scopus rating (2000): 0.99 1.182
Scopus rating (1999): 1.141 1.156
Original language: English
DOIs: 10.1016/j.jeurceramsoc.2015.03.001
Micro- and nano-scale defect detection, cleaning and repair techniques to improve the quality of nanoscale barrier coatings

General information
State: Published
Organisations: Department of Materials Science, Research group: Paper Converting and Packaging
Authors: Lahti, J. M. K.
Publication date: 2015
Peer-reviewed: Unknown

Bibliographical note
poster
Research output: Scientific › Paper, poster or abstract

Microstructural analysis of high-pressure cold-sprayed Ni, NiCu and NiCu + Al2O3 coatings
Cold spraying has shown its potential to produce metallic and composite coatings with high quality and performance. For instance, the impermeability of the coatings is the criterion for the corrosion resistance and thus, fully dense coatings can act as real corrosion barrier coatings. Our previous study has demonstrated the good corrosion properties of high-pressure cold-sprayed (HPCS) Ni and NiCu coatings whereas the present study focuses on the analysis of structural characteristics behind the dense coatings. Microstructures of as-sprayed and heat-treated HPCS Ni, Ni20Cu and Ni20Cu+Al2O3 coatings have been evaluated with FESEM from top-view direction. This revealed clearly particle deformation and particle boundaries whereas particle bonding was evaluated with cavitation-erosion test. Density was proven with Corrodkote test and impermeable HPCS NiCu+Al2O3 coating structures were achieved. Furthermore, cavitation-erosion resistance of NiCu coating was improved by heat treatment.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Koivuluoto, H., Bolelli, G., Milanti, A., Lusvarghi, L., Vuoristo, P.
Number of pages: 6
Pages: 224-229
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Surface and Coatings Technology
Volume: 268
ISSN (Print): 0257-8972
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.874 1.359
Publication Forum (2016): 1
Scopus rating (2015): 0.871 1.415
Web of Science (2015): 2.139 2.417 8.5 0.402 0.0356 0.527
Publication Forum (2015): 1
Scopus rating (2014): 0.998 1.681
Web of Science (2014): 1.998 2.374 8.2 0.307 0.03477 0.517
Publication Forum (2014): 2
Scopus rating (2013): 1.057 1.859
Publication Forum (2013): 2
Scopus rating (2012): 1.049 1.658
Publication Forum (2012): 2
Scopus rating (2011): 1.053 1.851
Scopus rating (2010): 1.155 1.66
Scopus rating (2008): 1.479 1.564
Scopus rating (2007): 1.165 1.509
Modelling of Material Properties Using Frequency Domain Information from Barkhausen Noise Signal

Frequency spectrum, bispectrum and bicoherence which are computed from Barkhausen noise (BN) signal are used to model material properties. The use of frequency domain information can be a significant addition to the more common time domain data analysis of the BN signals. The frequency spectrum shows the magnitude of the spectral components present in the signal. These components can also have interaction which is revealed only by the higher-order spectra. Third order spectrum can be used to detect the quadratic phase coupling phenomenon, which is a result of nonlinearity in the signal. In this study, a special attention is paid on the segment biphase to distinguish the quadratic phase coupling from constant non-zero biphase. Partial least squares regression models are made to model the surface hardness and residual stress properties from a set of carburizing case-hardened steel samples.
Monolithic GaInNAsSb/GaAs VECSEL emitting at 1550 nm

We report the first monolithic GaAs-based vertical external-cavity surface-emitting laser (VECSEL) operating at 1550 nm. The VECSEL is based on a gain mirror which was grown by plasma-assisted molecular beam epitaxy and comprises 8 GaInNAsSb/GaAs quantum wells and an AlAs/GaAs distributed Bragg reflector. When pumped by an 808 nm diode laser, the laser exhibited an output power of 80 mW for a mount temperature of 16 °C.

Muraglitazar-Eluting Bioabsorbable Vascular Stent Inhibits Neointimal Hyperplasia in Porcine Iliac Arteries

Purpose To evaluate the biocompatibility of a new muraglitazar-eluting polylactide copolymer stent and investigate its ability to prevent the formation of intimal hyperplasia.

Materials and Methods Ten self-expandable muraglitazar-eluting poly-96l/4d-lactic acid (PLA96) stents and 10 self-expandable control PLA96 stents were implanted into porcine common iliac arteries. After 28 days follow-up, all stent-implanted iliac arteries were harvested and prepared for quantitative histomorphometric analysis.

Results Angiographic analysis revealed that one control PLA96 stent had occluded and one had migrated. Histomorphometric analysis demonstrated that, with the control PLA96 stent, the luminal diameter and area were decreased versus the muraglitazar-eluting PLA96 stents (means ± standard error of the mean, 3.58 mm ± 0.34 vs 4.16 mm ± 0.14 and 9.83 mm2 ± 2.41 vs 13.75 mm2 ± 0.93, respectively). The control PLA96 stent induced more intimal hyperplasia than the bioactive muraglitazar-eluting PLA96 stent (557 μm ± 122 vs 361 μm ± 32). Vascular injury scores demonstrated only mild vascular trauma for both stents (muraglitazar-eluting, 0.68 ± 0.07; control, 0.75 ± 0.08). Inflammation scores also showed mild inflammation for both stents (muraglitazar-eluting, 1.05 ± 0.17; control, 1.23 ± 0.19).

Conclusions This new muraglitazar-eluting PLA96 stent was shown to be biocompatible with a tendency for better patency and less intimal hyperplasia compared with the control PLA96 stents.
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE), Prostate cancer research center (PCRC)
Authors: Uurto, I., Hämäläinen, M., Suominen, V., Laurila, M., Kotsar, A., Isotalo, T., Tammela, T. L., Kellomäki, M., Salenius, J.
Number of pages: 7
Pages: 124-130
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Journal of Vascular and Interventional Radiology
Volume: 26
Issue number: 1
ISSN (Print): 1051-0443
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.121 1.246
Publication Forum (2016): 1
Scopus rating (2015): 1.25 1.442
Web of Science (2015): 2.57 2.538 7.2 0.429 0.01305 0.732
Publication Forum (2015): 1
Scopus rating (2014): 1.089 1.299
Web of Science (2014): 2.409 2.355 7.1 0.479 0.01249 0.678
Publication Forum (2014): 1
Scopus rating (2013): 1.092 1.27
Publication Forum (2013): 1
Scopus rating (2012): 1.182 1.272
Publication Forum (2012): 1
Scopus rating (2011): 1.159 1.318
Scopus rating (2010): 1.105 1.245
Scopus rating (2009): 1.206 1.397
Scopus rating (2008): 1.434 1.45
Scopus rating (2006): 1.297 1.553
Scopus rating (2005): 1.226 1.471
Scopus rating (2004): 1.147 1.182
Scopus rating (2003): 1.097 1.263
Scopus rating (2002): 1.039 1.049
Scopus rating (2001): 1.146 1.15
Scopus rating (2000): 1.092 1.052
Scopus rating (1999): 0.993 1.222
Original language: English
DOIs:
10.1016/j.jvir.2014.10.005

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-12-09<br/>Publisher name: Elsevier
Source: researchoutputwizard
Source-ID: 1674
Research output: Scientific - peer-review › Article

Nanoscale surface modification and barrier coatings for packaging materials

General information
State: Published
Organisations: Department of Materials Science, Research group: Paper Converting and Packaging
Authors: Lahti, J.
Publication date: 2015
New alternative route for the preparation of phosphate glasses with persistent luminescence properties

In this paper, we investigate a new alternative route for the preparation of phosphate glasses with persistent luminescence properties. Phosphate glasses within the P2O5-Na2O-CaO and P2O5-Na2O-SrO systems were prepared by a standard melting process in air by adding Sr4Al14O25:Eu2+,Dy3+ microparticles in the glass batch before melting. We found that all the investigated glasses show persistent luminescence. It is clearly shown that conventional melting in air of Sr4Al14O25:Eu2+,Dy3+ microparticles in phosphate glass batch can be a new technique to prepare phosphate glasses with persistent luminescence properties.
New routes from cellulose to textile fiber and ready products

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Materials Science, Research group: Fibre Materials, Aalto University, VTT Tech Res Ctr Finland, VTT Technical Research Center Finland
Authors: Nousiainen, P., Rissanen, M., Michud, A., Sixta, H., Hummel, M., Setälä, H.
Publication date: 2015

Host publication information
Title of host publication: Proceedings of 15th AUTEX World Textile Conference, June 10-12, 2015, Bucharest, Romania
ISBN (Print): 9786066852760
Research output: Scientific - peer-review › Conference contribution

Optical properties and thermionic emission in solar cells with InAs quantum dots embedded within GaNAs and GaInNAs
The optical properties of p-i-n solar cells comprised of InAs quantum dots embedded within GaNAs and GaInNAs quantum wells are reported. Strain compensating and mediating GaNAs and GaInNAs layers shift the photoluminescence emission as well as absorption edge of the quantum dots to longer wavelengths. GaNAs and GaInNAs quantum wells contribute also to extending the absorption edge. In addition, the use of GaNAs and GaInNAs layers enhances the thermal escape of electrons from QDs by introducing steps for electrons to the GaAs conduction band.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Augmented Human Activities (AHA), Frontier Photonics, Faculty of Exact Sciences and Engineering, Hyperion University
Authors: Polojärvi, V., Pavelescu, E., Schramm, A., Tukiainen, A., Aho, A., Puustinen, J., Guina, M.
Keywords: (Quantum dot, Quantum well, Solar cell, Strain engineering, Thermal escape)
Number of pages: 4
Pages: 122-125
Publication date: 2015
Peer-reviewed: Yes
Early online date: 19 Jun 2015
ASJC Scopus subject areas: Materials Science(all), Condensed Matter Physics

Publication information
Journal: Scripta Materialia
Volume: 108
ISSN (Print): 1359-6462
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 1.901 1.696
Publication Forum (2016): 3
Scopus rating (2015): 2.3 1.876
Web of Science (2015): 3.305 3.436 7.9 0.84 0.04412 1.23
Scopus rating (2014): 2.744 2.124
Web of Science (2014): 3.224 3.323 7.3 0.775 0.04862 1.169
Publication Forum (2014): 3
Scopus rating (2013): 2.347 1.975
Publication Forum (2013): 3
Scopus rating (2012): 2.309 2.022
Publication Forum (2012): 3
Scopus rating (2011): 2.333 2.108
Scopus rating (2010): 2.445 2.125
Piezoelectric sensitivity measurements of cellulose nanofibril sensors

Piezoelectric sensitivity of cellulose nanofibril (CNF) film sensors was measured using a mechanical shaker and charge amplifier setup. In-house fabricated CNF film sensors showed 5-7 pC/N sensitivity in ambient conditions. The CNF film used here contained randomly oriented fibrils, and the piezoelectric response is expected to increase remarkably after film polarization and fibril alignment. The results obtained in this study suggest that nanocellulose film is a suitable sensor material for applications in various fields such as material sciences, electronics and biomedical diagnostics.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Authors: Rajala, S., Vuoriluoto, M., Rojas, O., Franssila, S., Tuukkanen, S.
Number of pages: 5
Publication date: 2015

Host publication information
Title of host publication: IMEKO XXI World Congress, Proceedings, August 30 - September 4, 2015, Prague, Czech Republic
Editor: Holub, J.
ISBN (Electronic): 978-80-01-05793-3

Bibliographical note
xoa ei tarkistettu
Research output: Scientific - peer-review » Conference contribution

Pigment-Cellulose Nanofibril Composite and Its Application as a Separator-Substrate in Printed Supercapacitors

Pigment-cellulose nanofibril (PCN) composites were manufactured in a pilot line and used as a separator-substrate in printed graphene and carbon nanotube supercapacitors. The composites consisted typically of 80% pigment and 20% cellulose nanofibrils (CNF). This composition makes them a cost-effective alternative as a substrate for printed electronics at high temperatures that only very special plastic films can nowadays stand. The properties of these substrates can be varied within a relatively large range by the selection of raw materials and their relative proportions. A semi-industrial scale pilot line was successfully used to produce smooth, flexible, and nanoporous composites, and their performance was tested in a double functional separator-substrate element in supercapacitors. The nanostructural carbon films printed on the
composite worked simultaneously as high surface area active electrodes and current collectors. Low-cost supercapacitors made from environmentally friendly materials have significant potential for use in flexible, wearable, and disposable low-end products.

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Laboratory for Future Electronics, Department of Automation Science and Engineering, Augmented Human Activities (AHA), VTT
Authors: Torvinen, K., Lehtimäki, S., Keränen, J. T., Sievänen, J., Vartiainen, J., Hellén, E., Lupo, D., Tuukkanen, S.
Keywords: (cellulose nanofibrils (CNF), graphene, carbon nanotubes, supercapacitors, separator, substrate)
Number of pages: 8
Pages: 1040-1047
Publication date: 2015
Peer-reviewed: Yes

**Publication information**
Journal: Electronic Materials Letters
Volume: 11
Issue number: 6
ISSN (Print): 1738-8090
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 0.519 0.872
Publication Forum (2016): 2
Scopus rating (2015): 0.609 1.106
Web of Science (2015): 2.057 1.901 2.5 0.368 0.00326 0.368
Publication Forum (2015): 2
Scopus rating (2014): 0.694 1.328
Web of Science (2014): 1.98 1.881 2.3 0.33 0.00237 0.343
Publication Forum (2014): 1
Scopus rating (2013): 1.235 2.54
Publication Forum (2013): 1
Scopus rating (2012): 0.602 1.012
Publication Forum (2012): 1
Scopus rating (2011): 0.529 0.992
Scopus rating (2010): 0.461 0.799
Scopus rating (2009): 0.494 0.513
Original language: English
Electronic versions:
Torvinen_2015_EML_pre-print
DOIs:
10.1007/s13391-015-5195-6
Links:
http://urn.fi/URN:NBN:fi:tty-201606134233

**Bibliographical note**
Versio ja lupa ok 12.1.2016 /KK
ORG=elt,0.5
ORG=ase,0.5
Research output: Scientific - peer-review › Article

**Power and wavelength scaling using semiconductor disk laser - bismuth fiber MOPA systems**
We present a master oscillator power amplifier (MOPA) system that comprises a mode-locked semiconductor disk laser (SDL) emitting at 1.33 μm and a bismuth-doped fiber amplifier. The mode-locked SDL was fabricated by wafer bonding an InP-based gain section with a GaAs-based distributed Bragg reflector (DBR) using (3-Mercaptopropyl)trimethoxysilane. The bismuth-doped fiber amplifier was pumped with a continuous wave SDL emitting at 1.18 μm. The MOPA system produced pulses at a repetition rate of 827 MHz with a pulse energy of 0.62 nJ, which corresponds to an average output power of more than 0.5 W.
Quantum dot semiconductor disk laser at 1.3 μm

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Ultrafast and intense lasers, Frontier Photonics, Ioffe Institute, Polytekhnicheskaya str. 26, Saint-Petersburg 194021, Saint-Petersburg Polytechnical University, Saint-Petersburg 195251
Number of pages: 4
Pages: 3400-3403
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Optics Letters
Volume: 40
Issue number: 14
ISSN (Print): 0146-9592
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.864 1.658
Publication Forum (2016): 2
Scopus rating (2015): 2.142 1.642
Web of Science (2015): 3.04 2.97 6.8 0.717 0.11996 0.971
Publication Forum (2015): 2
Scopus rating (2014): 2.497 2.056
Web of Science (2014): 3.292 3.208 6.6 0.798 0.12713 1.041
Publication Forum (2014): 2
Scopus rating (2013): 2.458 2.095
Publication Forum (2013): 2
Scopus rating (2012): 2.596 1.95
Recent progress in wafer-fused VECSELs emitting in the 1310 nm waveband

Over the last years we have continuously improved the performance of 1300 nm band VECSELs with wafer fused gain mirrors in the intra-cavity diamond and the flip-chip heat dissipation configurations. In this work we present recent results for gain mirrors that implement both heat-dissipation schemes applied to the same fused gain mirror structure. We demonstrate record high output powers of 7.1 W in the intra-cavity diamond heat-spreader configuration and 6.5 W in the flip-chip heat dissipation scheme. These improvements are achieved due to optimization of the wafer fused gain mirror structure based on AlGaInAs/InP-active region fused to AlAs-GaAs distributed Bragg reflector (DBR) and application of efficient methods of bonding semiconductor gain mirror chips to diamond heatspreadsers.

Research on icing behavior and ice adhesion testing of icephobic surfaces

Surface engineering shows potential to provide sustainable approach to icing problems. Currently several passive anti-ice mechanisms adoptable to coatings are known but further research is required to proceed for practical applications. Icing wind tunnel and centrifugal ice adhesion test equipment enable the evaluation and development of anti-ice and icephobic coatings for e.g., wind turbine applications but also other growing players in arctic environment e.g. oil, extractive and...
logistic industries. This research is focused on the evaluation of icing properties of various surfaces.

**General information**
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Materials Science, Research group: Surface Engineering
Authors: Koivuluoto, H., Stenroos, C., Ruohomaa, R., Bolelli, G., Lusvarghi, L., Vuoristo, P.
Number of pages: 6
Pages: 183-188
Publication date: 2015

**Host publication information**
Title of host publication: 16th International Workshop on Atmospheric Icing of Structures, IWAIS 2015, June 28-July 3, 2015, Uppsala, Sweden
Links: http://iwais.org/
Research output: Scientific › Conference contribution

**Roll-to-roll coating by liquid flame spray nanoparticle deposition**
Nanostructured coatings have been prepared on a flexible, moving paperboard using deposition of ca. 10-50-nm-sized titanium dioxide and silicon dioxide nanoparticles generated by a liquid flame spray process, directly above the paperboard, to achieve improved functional properties for the material. With moderately high production rate (~ g/min), the method is applicable for thin aerosol coating of large area surfaces. LFS-made nanocoating can be synthesized e.g. on paper, board or polymer film in roll-to-roll process. The degree of particle agglomeration is governed by both physicochemical properties of the particle material and residence time in aerosol phase prior to deposition. By adjusting the speed of the substrate, even heat sensitive materials can be coated. In this study, nanoparticles were deposited directly on a moving paperboard with line speeds 50-300 m/min. Functional properties of the nanocoating can be varied by changing nanoparticle material; e.g. TiO2 and SiO2 are used for changing the surface wetting properties. By adjusting the speed of the substrate, even heat sensitive materials can be coated. In this study, nanoparticles were deposited directly on a moving paperboard with line speeds 50-300 m/min. Functional properties of the nanocoating can be varied by changing nanoparticle material; e.g. TiO2 and SiO2 are used for changing the surface wetting properties. If the liquid precursors are dissolved in one solution, synthesis of multi component nanoparticle coatings is possible in a one phase process. Here, we present analysis of the properties of LFS-fabricated nanocoatings on paperboard. The thermophoretic flux of nanoparticles is estimated to be very high from the hot flame onto the cold substrate. A highly hydrophobic coating was obtained by a mass loading in the order of 50-100 mg/m<sup>2</sup> of titanium dioxide on the paperboard.

**General information**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Physics, Research area: Aerosol Physics, Research group: Aerosol Synthesis, Department of Materials Science, Research group: Paper Converting and Packaging, Engineering materials science and solutions (EMASS), Abo Akad Univ, Abo Akademi University, Dept Phys
Authors: Mäkelä, J. M., Haapanen, J., Aromaa, M., Teisala, H., Tuominen, M., Stepien, M., Saarinen, J. J., Toivakka, M., Kuusipalo, J.
Number of pages: 6
Pages: 37-42
Publication date: 2015

**Host publication information**
Title of host publication: Materials Research Society Symposium Proceedings
Volume: 1747
Publisher: MATERIALS RESEARCH SOCIETY
ISBN (Print): 9781510806245
ASJC Scopus subject areas: Materials Science(all), Condensed Matter Physics, Mechanical Engineering, Mechanics of Materials
DOIs: 10.1557/opl.2015.530
Links: http://www.scopus.com/inward/record.url?scp=84938922555&partnerID=8YFLogxK (Link to publication in Scopus)

**Bibliographical note**
ORG=fys,0.5
ORG=mol,0.5
Source: Scopus
Source-ID: 84938922555
Research output: Scientific - peer-review › Conference contribution
Simulated and Experimental Performance of High Efficiency GaInNAsSb Solar Cells

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications
Authors: Aho, A. J., Tukiainen, A. K., Polojarvi, V. V., Aho, T., Raappana, M. J. S., Isoaho, R., Guina, M. D.
Publication date: 2015

Host publication information
Title of host publication: 31st European Photovoltaic Solar Energy Conference and Exhibition

Bibliographical note
xpresentation
Research output: Professional › Conference contribution

Te-doping of self-catalyzed GaAs nanowires
Tellurium (Te)-doping of self-catalyzed GaAs nanowires (NWs) grown by molecular beam epitaxy is reported. The effect of Te-doping on the morphological and crystal structure of the NWs is investigated by scanning electron microscopy (SEM) and high-resolution transmission electron microscopy (TEM). The study reveals that the lateral growth rate increases and
The axial growth rate decreases with increasing Te doping level. The changes in the NW morphology can be reverted to some extent by changing the growth temperature. At high doping levels, formation of twinning superlattice is observed alongside with the (111)-faceted sidewalls. Finally, the incorporation of Te is confirmed by Raman spectroscopy.

**General information**

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Research group: Nanophotonics, Department of Materials Science, Research group: Materials Characterization, Engineering materials science and solutions (EMASS), Frontier Photonics
Authors: Suomalainen, S., Hakkarainen, T. V., Salminen, T., Koskinen, R., Honkanen, M., Luna, E., Guina, M.
Publication date: 2015
Peer-reviewed: Yes

**Publication information**

Volume: 107
Article number: 012101
ISSN (Print): 0003-6951
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.132 0.996
Publication Forum (2016): 2
Scopus rating (2015): 1.085 0.983
Web of Science (2015): 3.142 3.293 7.9 0.673 0.38389 1.045
Publication Forum (2015): 2
Scopus rating (2014): 1.799 1.462
Web of Science (2014): 3.302 3.569 7.4 0.655 0.42671 1.125
Publication Forum (2014): 2
Scopus rating (2013): 2.149 1.652
Publication Forum (2013): 2
Scopus rating (2012): 2.554 1.754
Publication Forum (2012): 2
Scopus rating (2011): 2.805 1.94
Scopus rating (2010): 2.926 1.789
Scopus rating (2009): 2.857 1.848
Scopus rating (2008): 2.934 1.83
Scopus rating (2007): 3.039 1.913
Scopus rating (2005): 3.709 2.382
Scopus rating (2004): 3.904 2.38
Scopus rating (2003): 3.765 2.27
Scopus rating (2002): 3.917 2.365
Scopus rating (2001): 4.111 2.212
Scopus rating (2000): 4.277 2.013
Scopus rating (1999): 4.35 2.11
Original language: English
DOIs:
10.1063/1.4926494

**Bibliographical note**

ORG=orc,0.85
ORG=mol,0.15
Research output: Scientific - peer-review › Article

**Temperature coefficients for GaInP/GaAs/GaInNAsSb solar cells**

We report the temperature coefficients for MBE-grown GaInP/GaAs/GaInNAsSb multijunction solar cells and the corresponding single junction sub-cells. Temperature-dependent current-voltage measurements were carried out using a solar simulator equipped with a 1000W Xenon lamp and a three-band AM1.5D simulator. The triple-junction cell exhibited an efficiency of 31% at AM1.5G illumination and an efficiency of 37-39% at 70x real sun concentration. The external
quantum efficiency was also measured at different temperatures. The temperature coefficients up to 80°C, for the open circuit voltage, the short circuit current density, and the conversion efficiency were determined to be -7.5mV/°C, 0.040mA/cm²/°C, and -0.09%/°C, respectively.

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Frontier Photonics
Authors: Aho, A., Isoaho, R., Tukiainen, A., Polojärvi, V., Aho, T., Raappana, M., Guina, M.
Publication date: 2015
Peer-reviewed: Yes

**Publication information**
Journal: AIP Conference Proceedings
Volume: 1679
Article number: 050001
ISSN (Print): 0094-243X
Ratings:
- Publication Forum (2017): 1
- Scopus rating (2016): 0.163 0.236
- Publication Forum (2016): 1
- Scopus rating (2015): 0.179 0.217
- Publication Forum (2015): 1
- Scopus rating (2014): 0.165 0.191
- Scopus rating (2013): 0.16 0.173
- Scopus rating (2012): 0.17 0.176
- Scopus rating (2011): 0.153 0.141
- Scopus rating (2010): 0.16 0.144
- Scopus rating (2009): 0.157 0.137
- Scopus rating (2008): 0.162 0.112
- Scopus rating (2007): 0.157 0.125
- Scopus rating (2006): 0.157 0.121
- Scopus rating (2005): 0.157 0.187
- Scopus rating (2004): 0.122 0.0
- Scopus rating (2003): 0.416 0.765
- Scopus rating (2002): 2.677 1.594
Original language: English
DOIs:
- 10.1063/1.4931522

**Bibliographical note**
AUX=orc,"Isoaho, Riku"
Source: Bibtex
Source-ID: urn:867478cc8930806f3957c4d46e9ba17
Research output: Scientific - peer-review › Article

**Temperature Effect on Breakdown Performance of Insulating Polymer Thin Films**

**General information**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electrical Engineering, Research area: Power engineering
Authors: Ritamäki, M., Rytöluoto, I., Lahti, K.
Number of pages: 4
Pages: 75-79
Publication date: 2015

**Host publication information**
Title of host publication: 24th Nordic Insulation Symposium on Materials, Components and Diagnostics, Proceedings
ISBN (Print): 978-82-321-0274-7
The deformation, strain hardening, and wear behavior of chromium-alloyed hadfield steel in abrasive and impact conditions

The alloying of Hadfield steels aims at enhanced mechanical properties and improvements in the wear resistance. In this work, the impact and abrasive properties of a chromium-alloyed high-manganese Hadfield steel were experimentally studied using a wide variety of testing techniques and characterization methods. In addition, an in-service sample was characterized to identify the wear and hardening mechanisms in a real application (jaw crusher). The dynamic mechanical behavior of the steel was determined using the Hopkinson split bar technique. The abrasion properties were studied with three-body abrasion tests using several different natural abrasives. The effects of existing plastic strain and normal loading on the surface hardening and wear rate were further investigated with scratch testing. High-velocity impact testing was performed to evaluate the effect of pre-strain on the impact wear behavior of the material. It was shown that the dynamic loading affects both the yield behavior and the strain hardening rate of the studied steel. The connection between pre-strain, hardness, and wear rate in abrasion was established. In impact conditions, plastic straining of the surface layer first has a positive effect on the wear resistance, but when strain hardening reached the observed ductility limit, it showed an adverse effect on the material's performance. The addition of chromium and an increase in the manganese content from the nominal ASTM Hadfield composition provided some improvements in the strength, ductility, and surface hardening of the studied steel.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Materials Characterization, Computational Science X (CompX), Engineering materials science and solutions (EMASS), VTT Technical Research Centre of Finland
Authors: Lindroos, M., Apostol, M., Heino, V., Valtonen, K., Laukkanen, A., Holmberg, K., Kuokkala, V. T.
Keywords: (Abrasive wear, Hadfield manganese steel, High strain rate, Impact wear, Plasticity, Work hardening)
Publication date: 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Mechanical Engineering, Mechanics of Materials, Surfaces, Coatings and Films, Surfaces and Interfaces
Publication information
Journal: Tribology Letters
Volume: 57
Issue number: 3
Article number: 24
ISSN (Print): 1023-8883
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.016 1.278
Publication Forum (2016): 1
Scopus rating (2015): 1.03 1.202
Web of Science (2015): 1.758 1.997 6.0 0.318 0.00659 0.615
Publication Forum (2015): 1
Scopus rating (2014): 1.306 1.639
Web of Science (2014): 1.739 2.088 6.1 0.457 0.00876 0.666
Publication Forum (2014): 2
Scopus rating (2013): 1.404 1.727
Publication Forum (2013): 2
Scopus rating (2012): 1.33 1.569
Publication Forum (2012): 2
Scopus rating (2011): 1.199 1.581
Scopus rating (2010): 1.139 1.389
Scopus rating (2009): 0.982 1.348
Scopus rating (2008): 1.218 1.248
Scopus rating (2007): 1.228 1.353
Scopus rating (2006): 1.019 1.135
Scopus rating (2005): 0.941 1.253
Scopus rating (2004): 1.098 1.287
Scopus rating (2003): 1.093 1.44
The effect of coupling agents on silicate-based nanofillers/carbon black dual filler systems on the properties of a natural rubber/butadiene rubber compound

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Poikelispää, M., Das, A., Dierkes, W., Vuorinen, J.
Number of pages: 15
Pages: 738-752
Publication date: 2015
Peer-reviewed: Yes
Early online date: 1 Jan 2014

Publication information
Journal: Journal of Elastomers and Plastics
Volume: 47
Issue number: 8
ISSN (Print): 0095-2443
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.278 0.533
Publication Forum (2016): 1
Scopus rating (2015): 0.243 0.481
Web of Science (2015): 0.671 0.942 6.5 0.083 5.4E-4 0.205
Publication Forum (2015): 1
Scopus rating (2014): 0.208 0.471
Web of Science (2014): 0.773 0.777 6.9 0.152 3.6E-4 0.144
Publication Forum (2014): 1
Scopus rating (2013): 0.404 0.592
Publication Forum (2013): 1
Scopus rating (2012): 0.307 0.782
Publication Forum (2012): 1
Scopus rating (2011): 0.375 0.553
Scopus rating (2010): 0.252 0.557
Scopus rating (2009): 0.46 1.005
Scopus rating (2008): 0.368 0.572
Scopus rating (2007): 0.336 0.748
Scopus rating (2006): 0.397 0.925
Scopus rating (2005): 0.37 0.635
Scopus rating (2004): 0.307 0.61
Scopus rating (2003): 0.149 0.301
Scopus rating (2002): 0.296 0.345
The effect of physical adhesion promotion treatments on interfacial adhesion in cellulose-epoxy composite

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology, Research group: Paper Converting and Packaging
Number of pages: 10
Publication date: 2015

Host publication information
Title of host publication: Proceedings of the 20th International Conference on Composite Materials
Links:
http://iccm20.org/fullpapers/file?f=WM39KAy5r2

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-10-09<br/>Publisher name: Sage
Source-ID: 1285
Research output: Scientific - peer-review › Article

The effect of physical adhesion promotion treatments on interfacial adhesion in cellulose-epoxy composite

The effect of the outermost fibre layers on solubility of dissolving grade pulp

Dissolving pulps are used to manufacture various cellulose derived products through cellulose dissolution. Solubility of cellulose pulp has been claimed to be strongly dependent on the porosity development, the degree of polymerisation and the pulp viscosity. The removal of external cell walls has been proposed to have a key role in the pulp solubility. In this paper, the effect of the outermost surface layers on the solubility of a dissolving grade pulp was studied. Furthermore the effect of mechanical peeling and combined mechanical and enzymatic treatment on pulp solubility was compared. Based on the results combined mechanical and enzymatic treatment efficiently opens up the fibre structure and has a clear positive effect on the solubility of dissolving pulp. It seems that long fibre fraction is less accessible to solvent chemicals than the other pulp fractions. Mechanical peeling of outer fibre layers does not improve fibre dissolution to NaOH/ZnO. Thus, it seems that peeling alone is not a sufficient pre-treatment prior to dissolution. The results also revealed that the peeling treatment does not enhance the effects of enzymes as the studied mechanical treatment does.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Fibre Materials, Department of Forest Products Technology, VTT Technical Research Centre of Finland, Latvian State Institute of Wood Chemistry, Aalto University
Authors: Grönqvist, S., Treimanis, A., Kamppuri, T., Maloney, T., Skute, M., Grinfelds, U., Vehviläinen, M., Suurnäkki, A.
Keywords: (Cellulose dissolution, Dissolving pulp, Enzymatic hydrolysis, Hydromechanical peeling, Porosity, Solute exclusion)
Number of pages: 11
Pages: 3955-3965
Publication date: 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Polymers and Plastics

Publication information
Journal: Cellulose
Volume: 22
Issue number: 6
ISSN (Print): 0969-0239
Thermal cycling reliability of Sn-Zn lead-free solders in sensor application

There is a demand for low melting temperature solder in some applications (e.g., sensor attachment) where the components being soldered are temperature-sensitive. However, the same solder needs to meet the life cycle reliability requirements for the entire product. Among low temperature lead-free solders, eutectic Sn-9\%Zn (wt.\%) lead-free solder offers good mechanical reliability and low melting temperature. However, the presence of Zn makes it susceptible to oxidation especially at elevated temperatures. In this paper, the reliability of sensor attachments using Sn-9\%Zn solder and capillary underfills was studied under thermal shock. Three different underfill materials were used with two of them containing fillers. The thermal shock test results showed that the underfills substantially improved the lifetime of the solder joints, and the underfills with fillers provided the best mechanical support to the solder joints. The reliability of the Sn-9\%Zn solder joints with underfills was found to be comparable to that of the Sn-Pb-2\%Ag solder joints. Failure analysis revealed that a uniform distribution of the underfill was critical to achieve a reliable sensor attachment.
Thermal Management in Long-Wavelength Flip-Chip Semiconductor Disk Lasers

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Ultrafast and intense lasers, Research group: Laboratory for Future Electronics, Department of Electronics and Communications Engineering, Research group: Surface Science, Frontier Photonics
Authors: Rantamäki, A., Saarinen, E. J., Lyytikäinen, J., Heikkinen, J., Kontio, J. M., Lahtonen, K., Valden, M., Okhotnikov, O.
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: IEEE Journal of Selected Topics in Quantum Electronics
Volume: 21
Issue number: 6
ISSN (Print): 1077-260X
Original language: English

Bibliographical note
ORG=orc,0.5
ORG=elt,0.5
Thermomechanical properties of overmold epoxies in MEMS packaging

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Electrical Engineering, Research area: Reliability
Authors: Fard Sanei, M. A., Kiilunen, J., Pippola, J., Lahokallio, S., Frisk, L.
Number of pages: 5
Pages: 175-179
Publication date: 2015

Host publication information
Title of host publication: Proceedings of the IMAPS Nordic Annual Conference, June 8-9, 2015, Helsingør, Denmark
Publisher: IMAPS Nordic
ISBN (Print): 9781510808133
Research output: Scientific » Conference contribution

Towards high power flip-chip long-wavelength semiconductor disk lasers

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Research group: Ultrafast and intense lasers, Research group: Surface Science, Frontier Photonics
Authors: Rantamäki, A., Saarinen, E., Lyytikäinen, J., Heikkinen, J., Lahtonen, K., Valden, M., Okhotnikov, O.
Publication date: 2015

Host publication information
Title of host publication: Proceedings of SPIE
Volume: 9349
Publisher: SPIE
ISBN (Electronic): 9781628414394
DOIs: 10.1117/12.2076795
Research output: Scientific » Conference contribution

Ultra barrier protection for paper packaging using atomic layer deposition

General information
State: Published
Organisations: Department of Materials Science, Research group: Paper Converting and Packaging
Authors: Lahti, J.
Publication date: 2015

Publication information
Year: 2015
Original language: English
Links:
http://nanomend.eu/

Bibliographical note
Public flyer published by EU project NanoMend
Research output: Scientific » Other contribution

Ultrathin Polyimide Membrane as Cell Carrier for Subretinal Transplantation of Human Embryonic Stem Cell Derived Retinal Pigment Epithelium

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Computational Biophysics and Imaging Group, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE), Univ Tampere,
Using finite element method and genetic algorithm to improve critical current and AC-loss characteristics of NbTi wires

General information
State: Published
Ministry of Education publication type: G4 Doctoral dissertation (monograph)
Organisations: Department of Electrical Engineering, Research area: Electromagnetics
Authors: Lyly, M.
Publication date: 2015

Publication information
Publisher: Tampere University of Technology
Original language: English

Publication series
Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
Volume: 1292
ISSN (Print): 1459-2045
Research output: Monograph › Doctoral Thesis

VECSELs: Innovative light sources for PDT
Photodynamic therapy (PDT) with porphyrins and red light (610–630 nm) is finding increasing clinical application for both the eradication of relatively small tumors and the palliation of inoperable or obstructive tumors. PDT also shows some promise for the sterilization of the tumor bed after surgical removal of neoplastic masses. Optically pumped vertical external-cavity surface-emitting lasers (VECSELs) appear to be a very innovative and efficient technology in this specific wavelength range. Furthermore, VECSELs are power scalable and wavelength tunable, and are an appealing light source for PDT.
Wear behavior and work hardening of high strength steels in high stress abrasion

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Computational Science X (CompX), Engineering materials science and solutions (EMASS)
Authors: Lindroos, M., Valtonen, K., Kemppainen, A., Laukkanen, A., Holmberg, K., Kuokkala, V.
Number of pages: 9
Pages: 32-40
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Wear
Volume: 322-323
ISSN (Print): 0043-1648
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.558 2.071
Publication Forum (2016): 1
Scopus rating (2015): 1.527 2.017
Web of Science (2015): 2.323 2.395 >10.0 0.37 0.01794 0.645
Publication Forum (2015): 1
Scopus rating (2014): 1.715 2.38
Web of Science (2014): 1.913 2.109 >10.0 0.347 0.01937 0.601
Publication Forum (2014): 2
Scopus rating (2013): 1.319 2.416
Publication Forum (2013): 2
Scopus rating (2012): 1.36 2.178
Publication Forum (2012): 2
Scopus rating (2011): 1.547 2.865
Scopus rating (2009): 1.684 2.07
Scopus rating (2008): 1.597 1.863
Scopus rating (2007): 1.286 1.889
Scopus rating (2006): 1.435 2.036
Wood compression model for radial compression of earlywood and latewood

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Authors: Moilanen, C., Björkqvist, T., Saarenrinne, P.
Number of pages: 6
Pages: 261-266
Publication date: 2015

Host publication information
Title of host publication: Proceedings of the XII Finnish Mechanics Days
Publisher: Rakenteiden Mekaniikan Seura ry
ISBN (Print): 978-952-93-5608-9
Links:

Bibliographical note
ORG=mei,0.5
ORG=ase,0.5
Research output: Scientific › Conference contribution

X-ray Diffraction based Residual Stress Profiling of Heat Affected Surface Layer in Flame Cut Heavy Steels

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Materials Science, Research group: Materials Characterization, Research group: Metals Technology
Authors: Saarinen, T., Jokiaho, T., Santa-aho, S., Vippola, M., Peura, P.
Number of pages: 13
Pages: 595-607
Publication date: 2015

Host publication information
Title of host publication: Proceedings of the Twenty Eighth International Conference on Surface Modification Technologies
Publisher: Valardocs
Edition: 1st edition
ISBN (Print): 978-81-926196-1-3
Yellow-orange-red VECSELs: Emergence of a compact and versatile laser platform for medical applications: ePoster

**General information**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications
Authors: Guina, M., Kantola, E. L., Leinonen, T. P., Penttinen, J., Mordon, S. R.
Publication date: 2015

**Host publication information**
Title of host publication: 2015 annual conference of the American Society for Laser Medicine & Surgery, Florida, USA.

**Bibliographical note**
Research output: Scientific - peer-review  Conference contribution

Yellow-orange semiconductor disk lasers for medical applications

**General information**
State: Unpublished
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Research group: Ultrafast and intense lasers
Publication date: 2015

**Host publication information**
Title of host publication: Poster in Symposium on Future Prospects for Photonics, November 5.-6. 2015, Tampere, Finland

**Bibliographical note**
xposter
Research output: Scientific - peer-review  Conference contribution

Älytekstiilien standardisointityö jo hyvässä vauhdissa

**General information**
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Materials Science, Research group: Fibre Materials
Authors: Varheenmää, M.
Keywords: (smart textiles)
Number of pages: 1
Pages: 14-14
Publication date: 2015
Peer-reviewed: Unknown

**Publication information**
Journal: Tekstiililehti
Issue number: 4
ISSN (Print): 0040-2370
Original language: Finnish
Research output: Professional  Article

Mode-locked 1.33 μm semiconductor disk laser with a bismuth-doped fiber amplifier

**General information**
State: Published
Nanofabrication and Adsorption Studies of Organic Molecules on Metal and Metal Alloy Surfaces as Templates for Biofunctional Applications

The nanofabrication of organic layers on metal and metal alloy surfaces was studied in this thesis by employing photoelectron spectroscopy (PES) as the main analysis method. The motivation for this research is to introduce new properties to metal and metal alloy surfaces via self-assembly driven adsorption processes of organic molecules. Trimesic acid (TMA) and glycine adsorption on single crystal Cu(100) surface was investigated with PES and scanning tunnelling microscopy (STM). TMA on Cu(100) exhibits coverage dependent surface phases with drastic changes in the molecular orientation. The mobile TMA molecules at low coverage transform into Cu atom coordinated TMA networks and finally into carboxyl (COOH) functionalized, densely packed TMA monolayers. This is enabled due to three equivalent COOH groups symmetrically around a rigid benzene ring. Homo- and heterochiral surface phases of achiral glycine on Cu(100) were observed, and a new structural model for glycine bonding on Cu(100) based on STM and density functional theory calculations is presented. The coadsorption of aminopropyl trimethoxysilane (APS) and mercaptopropyl trimethoxysilane (MPS) on stainless steel was studied with an aim to incorporate MPS in APS matrix with tuneable distribution. In addition to the determination of elemental and chemical states at the surface, PES data was also used to determine the surface morphology by employing inelastic electron energy-loss background analysis. Synchrotron radiation mediated PES enabled the study of the in-depth distribution of the chemical states in non-destructive manner. The functionality of the APS/MPS overlayers on stainless steel was studied with chemical derivatization. The studies of TMA and glycine on Cu(100) provide important knowledge of the adsorption behaviour of small molecules on surfaces, which is crucial for understanding the adsorption phenomena of larger molecules, such as proteins on more complex substrates. The fabricated surface structures may also be applicable to molecular electronics or catalytic surfaces. The bifunctional silanization of stainless steel, on the other hand, is directly transferrable to industrial scale processes. The bifunctional APS/MPS nanomolecular layer on stainless steel works as a template, to which biomolecules can be covalently coupled with tuneable distribution. Hence, the stainless steel surface can be biofunctionalized for a range of applications, depending on the properties of the biomolecules.
Versatile erosion wear testing with the high speed slurry-pot
The high speed slurry-pot tester was developed for application oriented erosion wear testing of materials used in mineral handling and processing. It enables tests in demanding high stress abrasive and erosive environments simulating wear, for example in slurry pumps, tanks and pipes, mineral crushing and grinding, loader buckets, dredging, and drilling. The key design features of the test method are the possibility to use up to 10 millimeter sized particles and sample speeds up to 20 m/s in conditions ranging from wet slurry environments to dry sand or gravel.

The tester has been used to test many different material types, including conventional steels, surface treated steels, cast irons, thick and thin coatings, ceramics, hybrid materials, polymers and elastomers. With the high speed slurry-pot tester, samples of various types and sizes can be tested.

In the FIMECC BSA/P2/SP3 project, the focus is in the testing of materials intended for demanding wear related applications. Moreover, the test system is further developed for various wear conditions, including slurry-erosion, grinding abrasion, and sub-zero temperatures.

General information
State: Published
Organisations: Department of Materials Science, Research group: Materials Characterization
Authors: Ojala, N., Heino, V., Valtonen, K., Kuokkala, V.
Polymer Hybrid Thin-Film Composites with Tailored Permeability and Anti-Fouling Performance

Composites and hybrid materials are new material combinations which can provide added value for existing products or create novel multifunctional properties. This thesis aimed at fabricating and modifying thin-film composites (TFC) by using various coating technologies. Moreover, the target was to tailor the permeability or to create anti-fouling performance. Inorganic, inorganic-organic and organic coating layers were made by atmospheric plasma deposition (APD), sol-gel (SG), atomic-layer-deposition (ALD) or polyvinyl alcohol (PVA) dispersion coating methods. Coatings were deposited using either roll-to-roll or batch process. APD method was used to create an inorganic silicon oxide (SiOx) coating layer on a low-density polyethylene (LDPE) coated board. In addition, atmospheric plasma was used for pre-treatment of LDPE surface prior SG coatings. The SiOx coatings did not show a significant improvement in barrier performance using the specific roll-to-roll process. Therefore, SG coating method was studied instead in order to form a barrier layer on LDPE-board by using the roll-to-roll process. SG coatings reduced the surface roughness and made the polymer surfaces either hydrophilic or hydrophobic. In addition, the coating chemistry had an effect on the oxygen and grease barrier performances. The highly cross-linked SG coating gave a better oxygen barrier performance, while the other SG coating revealed an enhancement in the grease barrier. Plasma activation of the LDPE surface enhanced the wettability and adhesion of both SG coatings. In addition, SG coating was applied on a polylactic acid (PLA) coated board. The SG coating created favourable, smooth and hydrophilic primer layer on PLA-board, which was further coated with an inorganic aluminium oxide (Al2O3) skin layer by using ALD. The particular TFC structure based on ALD and SG coatings gave a slightly better barrier performance compared to a plain ALD coating. PVA and ALD based antifouling coatings increased the hydrophilicity and surface polarity of the polyanime (PA) TFC membranes. All the coated membranes indicated an enhancement in bacteria-repelling. Indeed, the improvement in the bacterial anti-adhesion performance of coated membranes was due to an increase in surface polarity. The biocide-modified PVA coatings enhanced further the anti-fouling performance due to their antimicrobial activity. As expected, in comparison to the uncoated membrane, the PVA-coated membranes tend to increase the salt rejection and to reduce the water and salt permeability. However, the biocide-modified PVA coatings decreased the water permeability and showed also a minor decline on the salt rejection. The ALD coatings increased the water and salt permeability and furthermore, reduced the salt rejection.

General information
State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Materials Science
Authors: Nikkola, J.
Number of pages: 84
Publication date: 31 Oct 2014

Publication information
Place of publication: Espoo
Publisher: VTT
ISBN (Print): 978-951-38-8163-4
Original language: English

Publication series
Name: VTT Science
Publisher: VTT
Volume: 66
ISSN (Print): 2242-119X
ISSN (Electronic): 2242-1203
Electronic versions:
nikkola.pdf
Links:
http://urn.fi/URN:NBN:fi:ttv-201609134498
Effects of composition and microstructure on the abrasive wear performance of quenched wear resistant steels

Wear resistant steels are commonly categorized by their hardness, and in the case of quenched wear resistant steels, their Brinell hardness grades are widely considered almost as standards. In this study, the abrasive wear performance of 15 commercially available 400 HB grade quenched wear resistant steels from all over the world were tested with granite gravel in high stress conditions. The aim was to evaluate the real wear performance of nominally similar steels. Also properties such as hardness, hardness profiles, microstructures and chemical compositions of the steels were studied and reasons for the differences in their wear performance further discussed. In terms of mass loss, over 50% differences were recorded in the abrasive wear performance of the studied steels. Variations in the chemical compositions were linked to the auto-tempered microstructures of the steels, and the microstructural characteristics were further linked to their ultimate wear behavior. © 2014 Elsevier B.V.
Development of chip-surface stimulus electrode array for fully-implantable subretinal prosthesis chip

In this study, we have developed a chip-surface stimulus electrode array for fully-implantable subretinal prosthesis chip. To realize visual restoration with high resolution, stimulus electrodes should be miniaturized and arrayed with high density. When we miniaturize them, however, their electrochemical impedances become higher and their amount of charge injection become smaller. Additionally, as the number of electrodes increases, it becomes difficult to make electrical connection to each pixel of the retinal prosthesis chip and each electrode by electrical wiring. To overcome these problems, we have developed the stimulus electrodes that have low electrochemical impedances and large charge injection capacities, and established a fabrication process of chip-surface stimulus electrode array. We fabricated the stimulus electrodes made of extremely porous platinum which had large-surface-area compared with conventional Pt. We also fabricated the chip-surface stimulus electrodes array on the subretinal prosthesis chip which surface was rough and covered with insulator film.
Development of Si neural probe module with adjustable gain amplifier for neuronal signal recording

In recent years, lots of research on biomedical technologies directly using bio-signals such as BMI (Brain Machine Interface) have been performed intensively. Among bio-signals, ECoG (Electrocorticogram), LFP (Local Field Potential), and AP (Action Potential) are usually recorded especially for diagnosis, treatment, and prevention of brain diseases. These bio-signals have different amplitudes and frequency bandwidths, and the signal intensities vary accordingly with recording electrode conditions and individual variation. Therefore, a multiple bio-signals recording system having adjustable gain and bandwidth is strongly required. In this study, we designed the adjustable gain amplifier appropriate for the system, and fabricated the module composed of the amplifier and a Si neural probe for the multiple bio-signal recording in the deep brain. Additionally, we verified fundamental functions of the module by in vitro experiments.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Biomaterials and Tissue Engineering Group, Research group: Computational Biophysics and Imaging Group, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE), Graduate School of Engineering, Electrical and Electronics Engineering Department, Department of Bioengineering and Robotics, Tohoku University, Nagasaki Institute of Applied Science
Authors: Tani, T., Naganuma, H., Harashima, T., Iwagami, T., Kino, H., Kiyoyama, K., Kellomäki, M., Hyttinen, J., Tanaka, T.
Keywords: (Adjustable gain amplifier, Multiple bio-signal recording, Si neural probe)
Pages: O-377-O-378
Publication date: 17 Aug 2014
Peer-reviewed: Yes
ASJC Scopus subject areas: Biomedical Engineering

Publication information
Journal: Transactions of Japanese Society for Medical and Biological Engineering
Volume: 52
ISSN (Print): 1347-443X
Ratings:
Publication Forum (2017): 0
Scopus rating (2016): 0.101 0.024
Publication Forum (2016): 0
Scopus rating (2015): 0.1 0.0
Publication Forum (2015): 0
Scopus rating (2014): 0.124 0.013
Scopus rating (2013): 0.103 0.393
Scopus rating (2012): 0.105 0.149
Scopus rating (2011): 0.104 0.198
Scopus rating (2010): 0.103 0.193
Scopus rating (2006): 0.101 0.043
Scopus rating (2005): 0.106 0.126
Scopus rating (2004): 0.103 0.487
Scopus rating (2003): 0.111 0.167
Scopus rating (2002): 0.112 0.052
Scopus rating (2001): 0.106 0.283
Scopus rating (2000): 0.122 0.194
University-Industry Co-operation Using a Practice-based Innovation Tool: Case Advisory Professorship Programme in Materials Technology

In the thesis the usability and effectiveness of a practice-based innovation tool for university–industry co-operation, the advisory professorship model, is evaluated. The research material was collected by applying the tool with a materials technological emphasis in the regional co-operation network in 2008–2012. The inputs, functions and internal dynamics of the innovation environment, as well as the results and effects of innovation activities in the materials technology advisory professorship programme (MTAP) network, are analysed qualitatively using a conceptual framework for the evaluation of regional innovative capability and the Network-Based Innovative Capability (NBIC) matrix. In the network of the MTAP programme, new practice-based innovation processes, concentrated in practice-based problems and development targets in companies products, operational environment or markets were created. The role of the university was especially in producing of information in the front-end phases of innovation processes, related mostly to properties and processing knowledge of materials, the feasibility of development ideas and in searching of new R&D opportunities. The nature of university based research inputs was typically fast and short-termed. Some innovation processes ended up as new products or product improvements. New knowledge, information and knowledge networks were created. The advisory professorship model can be considered a useful practice-based innovation tool for regional university–industry cooperation with some limitations. In the thesis the materials technology related regional resources, infrastructure and needs from both private and public sectors are also studied and levels of regional availability, access and delivery options for materials technological research are analysed in the Lahti region. Based on this information, it is suggested how the knowledge, network and innovation system related to materials technology should be developed further by public policies and strategies in the region.

General information
State: Published
Ministry of Education publication type: G4 Doctoral dissertation (monograph)
Organisations: Department of Materials Science
Authors: Eerola, S.
Number of pages: 208
Publication date: 6 Jun 2014

Publication Information
Place of publication: Tampere
Publisher: Tampere University of Technology
Original language: English

Publication series
Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
No.: 1216
ISSN (Print): 1459-2045
Electronic versions:
eerola.pdf
Links:

Bibliographical note
Awarding institution: Tampere University of Technology
Source: researchoutputwizard
Source-ID: 274
Research output: Monograph › Doctoral Thesis

Switchable water absorption of paper via liquid flame spray nanoparticle coating

Surface wetting/anti-wetting and liquid absorption are relevant properties of many porous solids including paper and other cellulose-based materials. Here we demonstrate how surface wetting by water and water absorption of commercially available kraft paper can be altered by thin nanoparticle coatings fabricated by liquid flame spray in facile and continuous one-step process. Surface wettability and absorption properties of paper increased with silica and decreased with titania.
(TiO2) nanoparticle coatings. Moreover, the water-repellent (superhydrophobic) TiO2 nanoparticle coated paper could be switched to superhydrophilic and water absorbing by ultraviolet illumination. The experiments revealed that although surface wetting and liquid absorption of nanoparticle coated paper are strongly related to each other, they are two distinct phenomena which do not necessarily correlate. We propose wetting regimes on the nanoparticle coated paper samples on the basis of the experimental observations.

**General information**

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Paper Converting and Packaging, Department of Physics, Research area: Aerosol Physics, Research group: Aerosol Synthesis, Engineering materials science and solutions (EMASS), Abo Akad Univ, Abo Akademi University, Ctr Funct Mat, Lab Paper Coating & Converting
Authors: Teisala, H., Tuominen, M., Haapanen, J., Aromaa, M., Stepień, M., Mäkelä, J. M., Saarinen, J. J., Toivakka, M., Kuusipalo, J.
Number of pages: 11
Pages: 2033-2043
Publication date: Jun 2014
Peer-reviewed: Yes

**Publication information**

Journal: Cellulose
Volume: 21
Issue number: 3
ISSN (Print): 0969-0239
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.126 1.144
Publication Forum (2016): 2
Web of Science (2015): 3.195 3.741 4.6 0.521 0.01196 0.722
Publication Forum (2015): 2
Scopus rating (2014): 1.071 1.334
Web of Science (2014): 3.573 4.285 4.6 0.655 0.00994 0.773
Publication Forum (2014): 2
Scopus rating (2013): 1.127 1.48
Publication Forum (2013): 2
Scopus rating (2012): 1.179 1.71
Publication Forum (2012): 2
Scopus rating (2011): 1.354 1.795
Scopus rating (2010): 0.873 1.384
Scopus rating (2009): 1.038 1.219
Scopus rating (2008): 0.926 1.123
Scopus rating (2007): 0.754 1.034
Scopus rating (2006): 0.699 1.15
Scopus rating (2005): 1.112 1.318
Scopus rating (2004): 0.855 1.072
Scopus rating (2003): 0.81 1.02
Scopus rating (2002): 0.649 0.689
Scopus rating (2001): 0.602 0.785
Scopus rating (2000): 0.583 0.773
Scopus rating (1999): 0.67 1.14
Original language: English
DOIs: 10.1007/s10570-014-0223-5

**Bibliographical note**

Contribution: organisation=mol,FACT1=0.5<br/>Contribution: organisation=fys,FACT2=0.5<br/>Portfolio EDEND: 2014-08-06<br/>Publisher name: Springer Netherlands; Cellulose Division
Source: researchoutputwizard
Source-ID: 1610
Textile-Based Sensors and Smart Clothing System for Respiratory Monitoring

Long-term respiratory monitoring provides valuable information for diagnostic and clinical treatment. Traditional measures of respiration require a mouthpiece or a mask, neither of which can be used as ubiquitous healthcare equipment. Using a smart clothing system seems to be a better alternative. Researchers in the field of smart textiles have focused on the development of health-related products since the 1990s, and textile-based sensors used for respiratory measurements have been discussed in several projects. Although the soft and flexible characteristics of textile-based sensors make them attractive, the flexibility of the materials also affects the signal quality. In a laboratory situation, where each sensor is tested as a single element, this is not as critical as in a user situation, where the sensor is integrated into the clothing and worn by different users engaging in different activities. The principal objective of this thesis was to explore the possibility of performing reliable respiratory monitoring using a clothing platform. The research began by investigating the possible methods and materials that can be used to produce textile-based sensors for respiratory monitoring applications. The aim was to determine the most suitable method for integrating the sensing function into the clothing system. Study results have shown that sensors made with a conductive coating demonstrated superior performance in terms of sensitivity, stability, and reliability. Therefore, five prototype systems based on conductive coating technique were developed. Sensor placement, signal collection techniques, and the clothing system configuration were the main concerns, while issues related to the sensor wearability, maintenance, and aesthetic appearance, as well as the environment and health, were also discussed. Knitting was found to be the most economical method for producing the textile-based sensors; however, sensors made of knit fabric do not perform as well as the coated ones. Therefore, elastic-conductive hybrid yarns have been created to improve the electro-mechanical properties of knitted-based sensors, and eventually, a prototype with two sensors and a built-in data bus was made by fully-fashion knitting technique. Two smart clothing system prototypes, based on conductive coating technique, were tested systematically by ten subjects. The first prototype consisted of one sensing element, and the results show that the smart clothing system could successfully monitor the subjects’ breathing patterns during sitting, standing, and different forms of running. The system has also proven to be useful in the observation of sleep apnea disorder symptoms. The second prototype consisted of two sensing elements. Apart from all the characteristics of the first prototype system, a system with two sensing elements can be used to determine the relationship between the rib cage and abdomen compartments, which provides information for certain diseases, e.g., cardiac arrhythmias. The second smart clothing system prototype was compared with a conventional respiratory belt for validation. Signals from the clothing system and the respiratory belt were collected simultaneously with a self-designed LabVIEW program, and further processed with MATLAB. Quantitative analyses were conducted based upon different comparison techniques, such as Pearson’s correlation, ANOVA and Fast Fourier Transform analysis. The results demonstrate that the smart clothing system can provide reliable respiratory measurements, with signals of comparable quality to the conventional respiratory belt. In addition, the wearability and user acceptance were studied by means of a survey. The survey results indicate that users were more comfortable with the smart clothing system and that most believe that using a smart clothing system will improve both health condition and quality of life.
A 1.33 μm picosecond pulse generator based on semiconductor disk mode-locked laser and bismuth fiber amplifier

We demonstrate that a combination of ultrafast wafer bonded semiconductor disk laser and a bismuth-doped fiber amplifier provides an attractive design for high power 1.33 μm tandem hybrid systems. Over 0.5 W of average output power was achieved at a repetition rate of 827 MHz that corresponds to a pulse energy of 0.62 nJ. (C) 2014 Optical Society of America

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Ultrafast and intense lasers, Research group: Semiconductor Technology and Applications, Frontier Photonics, Russian Acad Sci, Russian Academy of Sciences, Fiber Opt Res Ctr
Authors: Heikkinen, J., Gumenyuk, R., Rantamäki, A., Leinonen, T., Melkumov, M., Dianov, E. M., Okhotnikov, O. G.
Keywords: (VERTICAL-CAVITY LASERS, AVERAGE OUTPUT POWER, WAFER FUSION, SUPERCONTINUUM GENERATION, EMITTING LASER, FS PULSES, NM, SURFACE, VECSEL, WAVELENGTH)
Number of pages: 10
Pages: 11446-11455
Publication date: 19 May 2014
Peer-reviewed: Yes
ASJC Scopus subject areas: Atomic and Molecular Physics, and Optics

Publication information
Journal: Optics Express
Volume: 22
Issue number: 10
ISSN (Print): 1094-4087
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.487 1.589
Publication Forum (2016): 2
Web of Science (2015): 3.148 3.25 4.8 0.72 0.22975 0.967
Publication Forum (2015): 2
Scopus rating (2014): 2.349 2.166
Web of Science (2014): 3.488 3.499 4.4 0.727 0.24951 1.052
Publication Forum (2014): 2
Scopus rating (2013): 2.358 2.226
Publication Forum (2013): 2
Scopus rating (2012): 2.587 2.145
Publication Forum (2012): 2
Scopus rating (2011): 2.579 2.606
Scopus rating (2010): 2.943 2.466
Scopus rating (2009): 3.092 2.669
Scopus rating (2008): 3.195 2.393
Scopus rating (2007): 3.27 2.032
Scopus rating (2005): 3.334 2.379
Scopus rating (2004): 2.833 2.499
Scopus rating (2003): 2.688 2.193
Scopus rating (2002): 1.547 1.673
Scopus rating (2001): 1.442 1.39
Scopus rating (2000): 1.246 0.714
Scopus rating (1999): 1.381 0.838
Original language: English
DOIs: 10.1364/OE.22.011446
Characterisation of Novel Corrosion Resistant Stainless Steel/Rubber/Composite Hybrid Structures

Last decade has shown an increasing interest in hybrid materials and structures. With hybrids there is not only potential to create high strength low weight structures, but also to tailor the properties of the final product in a way that is unattainable by any single material alone. Simpler manufacturing process, increased functional integration, improved sound and vibration damping properties, enhanced crack propagation resistance and protection against collapse in a crash are just some examples of possible advantages of hybrid materials. However, before implementation in industrial application, adequate adhesion between the material components of a hybrid must be ensured. Also, from industrial point of view the required manufacturing method should not increase substantially the costs of the product. Although many established adhesion procedures exist, there is still lack of functioning joining methods for certain material combinations. Especially, the adhesive joining of polymeric materials to stainless steel is demanding, as the conventional methods require laborious manufacturing steps. In this study, the possibility to bond stainless steel to fibre reinforced epoxy composite with an ethylene propylene diene terpolymer (EPDM) based rubber is studied. Two different rubber compounds are used to create stainless steel/rubber/composite hybrids and a mild steel/rubber/composite structure is used as a reference. Both geometry-dependent peel tests together with environmental testing and geometry-independent single cantilever beam test are used to study the adhesion of the structure's interfaces. Scanning electron microscopy and transmission electron microscopy are used to characterise the nature of the interfaces of the hybrids. In addition, the effect of the rubber on the energy absorption properties of the hybrid structure was of interest. This was studied by non-destructive vibration damping test and by high velocity impact test. In these tests, both sample geometry (rubber thickness) and test parameters were varied to investigate their effect on the hybrid's behaviour. It was found that the studied method to bond stainless steel and epoxy composite by EPDM rubber enables the use of a simple manufacturing process and it furthermore results in well-bonded hybrid structure. The stainless steel/composite bond strength is defined by the cohesive strength of the rubber and the bond maintains its strength in harsh environments. This enables the evaluation of the stainless steel/composite bond's strength by using the rubber's bulk properties instead of the substrate/rubber interfacial properties, which are difficult to define in a reliable manner. The stainless steel/rubber/composite structure has significantly better vibration damping properties than an all-metal structure. In addition, the rubber improves significantly the damage tolerance of the structure when compared to a corresponding structure which has been conventionally bonded. Thus, the approach of joining stainless steel to fibre reinforced epoxy composite with rubber has potential for industrial applications and the hybrid structure would offer a lighter and better damping solution when compared to all-metallic ones.
Composition dependent growth dynamics in molecular beam epitaxy of GaInNAs solar cells

We have investigated the role of the nitrogen content, the growth parameters, and the annealing processes involved in molecular beam epitaxy of GaInNAs solar cells lattice-matched to GaAs. The nitrogen composition was varied between 1% and 5%. The influence of the growth temperature was assessed by performing photoluminescence, atomic force microscopy, X-ray diffraction, reflection high-energy electron diffraction, quantum efficiency and light-biased current-voltage measurements. The growth temperature ensuring the best cell parameters was found to be 440 °C. At this temperature we were able to incorporate up to 4% of nitrogen and achieve a good material quality. Further increase of the N composition to 5% led to phase separation. For the lattice matched samples grown within the optimal temperature range, we have identified a clear (1×3) surface reconstruction. Using the optimized growth we have demonstrated a GaInNAs p-i-n solar cell structure containing 4% nitrogen, that exhibited a short-circuit current density as high as 33.8 mA/cm² in respect to effective area illuminated. These measurements have been performed under real sun AM1.5 (~1000 W/m²) illumination. © 2014 Elsevier B.V.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Frontier Photonics, Department of Physics and Astronomy, University of Turku, Turun Yliopisto/Turun Biomateriaalikeskus
Authors: Aho, A., Polojärvi, V., Korpijärvi, V. M., Salmi, J., Tukiainen, A., Laukkanen, P., Guina, M.
Keywords: (Concentrated photovoltaics, Dilute nitrides, GaInNAs, Multi-junction solar cells, Plasma-assisted molecular beam epitaxy)
Number of pages: 9
Pages: 150-158
Publication date: May 2014
Peer-reviewed: Yes
ASJC Scopus subject areas: Renewable Energy, Sustainability and the Environment, Electronic, Optical and Magnetic Materials, Surfaces, Coatings and Films

Publication information
Journal: Solar Energy Materials and Solar Cells
Volume: 124
ISSN (Print): 0927-0248
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.587 1.71
Publication Forum (2016): 2
Web of Science (2015): 4.732 5.016 5.9 1.476 0.04281 1.16
Publication Forum (2015): 2
Scopus rating (2014): 2.204 2.396
Web of Science (2014): 5.337 5.755 5.6 1.042 0.04651 1.288
Publication Forum (2014): 2
Scopus rating (2013): 2.174 2.582
Publication Forum (2013): 2
Scopus rating (2012): 2.435 2.707
Publication Forum (2012): 2
Scopus rating (2011): 2.175 2.638
Scopus rating (2010): 2.524 2.121
Scopus rating (2009): 1.991 1.977
Scopus rating (2008): 1.654 1.458
Scopus rating (2007): 1.359 1.488
Scopus rating (2005): 1.141 1.619
Scopus rating (2004): 0.932 1.178
Scopus rating (2003): 0.992 1.34
Process for producing microfibrillated cellulose
A process for treating cellulosic fibers comprises mechanically pre-treating the fibers followed by treating the fibers with an enzyme and thereafter mixing the fibers with a solution comprising an alkali metal hydroxide followed by mechanically treating the fibers to form microfibrillated cellulose. In this way it is possible to produce microfibrillated cellulose (MFC) in an improved and energy efficient way.

General information
State: Published
Ministry of Education publication type: H1 Granted patent
Organisations: Research group: Fibre Materials, Department of Materials Science, Stora Enso Oyj, Imatran tehtaat, 12.05.2005, Lappeenranta University of Technology
Authors: Vehviläinen, M., Kamppuri, T. H., Nousiainen, T. P., Heiskanen, I., Backfolk, K.
Keywords: (Microfibrillated cellulose)
Publication date: 11 Feb 2014

Site-Controlled Epitaxy and Fundamental Properties of InAs Quantum Dot Chains
Self-assembled InAs/GaAs quantum dots (QD) are artificial atoms which exhibit extremely high optical and structural quality and enable tailoring of the quantum confinement by adjusting their size, shape, and chemical composition. However, a disadvantage of the self-assembled formation process is that the QDs are randomly located on the GaAs surface. The ability to determine the positions of the QDs at the moment of nucleation, i.e. site-controlled growth, is essential for the new generation of photonic applications including single- and entangled-photon sources and nanophotonic integrated circuits. The purpose of this thesis is to introduce a new nanomaterial system composed of site-controlled InAs quantum dot chains (QDC) grown by molecular beam epitaxy in nanoimprint lithography prepared grooves. A thorough investigation of the structural and optical properties of QDCs is also presented. The thesis demonstrates that, regardless of the inherent anisotropy of the GaAs(100) surface, QDCs having similar density, size, and emission energy can be grown simultaneously on nanopatterns with different orientations by carefully selecting the growth parameters. However, the in-plane optical polarization of the spontaneous emission from the QDCs depends on their orientation. In more general perspective, this thesis reveals that the nanopattern on which the site-controlled QDs are grown has a strong influence on their morphological properties, including shape, size, strain profile, and composition profile. These properties are strongly cross-correlated and they all influence the electronic and optical characteristics of the QDs. For example, the growth of QDs in the grooves increases their oscillator strength for the vertically polarized spontaneous emission, which is the polarization component that can be coupled to surface plasmons in a metal film. This polarization property accompanied by the possibility of deterministic lateral positioning makes the site-controlled QDCs potential building blocks for plasmonic and nanophotonic waveguides.

General information
State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Optoelectronics Research Centre
1.33 um MOPA system based on ultrafast semiconductor disk laser and bismuth fiber amplifier

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Optoelectronics Research Centre
Authors: Heikkinen, J., Gumenyuk, R., Rantamäki, A., Leinonen, T., Melkumov, M., Dianov, E. M., Okhotnikov, O. G.
Number of pages: 1
Pages: 32-32
Publication date: 2014

Host publication information
Title of host publication: Optics and Photonics Days 2014, OPD2014 Proceedings, 20-22 May, 2014, Turku, Finland
Publisher: Finnish Optical Society
ISBN (Print): 978-952-12-3055-4

Publication series
Name: Optics and Photonics Days

Bibliographical note
Oral, Session 6.Ultrafast optics and microscopy<br/>&nbsp;Contribution: organisation=orc,FACT1=1<br/>&nbsp;Portfolio EDEND: 2014-10-24<br/>&nbsp;Publisher name: Finnish Optical Society
Source: researchoutputwizard
Source-ID: 430
Research output: Scientific ▶ Conference contribution

1.55 μm GaInNAsSb/GaAs ridge waveguide lasers and semiconductor optical amplifiers for photonic integrated circuits

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Korpijärvi, V., Giannoulis, G., Mäkelä, J., Viheriälä, J., Iliadis, N., Avramopoulos, H., Laakso, A., Guina, M.
Number of pages: 2
Pages: 151-152
Publication date: 2014

Host publication information
50-ps Passively Mode-Locked Red Praseodymium Laser

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Gaponenko, M., Metz, P. W., Härkönen, A., Heuer, A., Leinonen, T., Guina, M., Südmeyer, T., Huber, G., Kränkel, C.
Number of pages: 3
Pages: 1-3
Publication date: 2014

Host publication information
Title of host publication: International conference on advanced solid-state lasers, ASSL 2014, 16-21 November, 2014, Shanghai, China
Publisher: Optical Society of America
ISBN (Print): 978-1-55752-822-3

Publication series
Name: International conference on advanced solid-state lasers
DOIs: 10.1364/ASSL.2014.ATh2A.35

Bibliographical note
Contribution: organisation=orc,FACT1=1<br/>Portfolio EDEND: 2014-12-31<br/>Publisher name: Optical Society of America
Source: researchoutputwizard
Source-ID: 331
Research output: Scientific - peer-review › Conference contribution

55 um GaInNASb/GaAs ridge waveguide lasers and semiconductor optical amplifiers

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Optoelectronics Research Centre
Authors: Mäkelä, J., Korpijärvi, V., Viheriälä, J., Giannoulis, G., Iliadis, N., Avramopoulos, H., Guina, M.
Number of pages: 1
Pages: 66-66
Publication date: 2014

Host publication information
Title of host publication: Optics and Photonics Days 2014, OPD2014 Proceedings, 20-22 May, 2014, Turku, Finland
Publisher: Finnish Optical Society
ISBN (Print): 978-952-12-3055-4

Publication series
Name: Optics and Photonics Days
Abrasion and compression resistance of liquid-flame-spray-deposited functional nanoparticle coatings on paper

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Materials Science, Research group: Paper Converting and Packaging, Department of Physics, Research area: Aerosol Physics, Research group: Aerosol Synthesis, Engineering materials science and solutions (EMASS), Abo Akad Univ, Abo Akademi University, Dept Phys, Paper and Fibre Research Institute (PFI), SP
Abrasion, Erosion and Cavitation Erosion Wear Properties of Thermally Sprayed Alumina Based Coatings

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science
Authors: Matikainen, V., Niemi, K., Koivuluoto, H., Vuoristo, P.
Number of pages: 19
Pages: 18-36
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Coatings
Volume: 4
Issue number: 1
ISSN (Print): 2079-6412
Ratings:
Publication Forum (2017): 0
Publication Forum (2016): 0
Publication Forum (2015): 0
Publication Forum (2014): 1
Publication Forum (2013): 1
Original language: English
DOI:
10.3390/coatings4010018

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-12-01<br/>Publisher name: M D P I AG
Source: researchoutputwizard
Source-ID: 1051
Research output: Scientific - peer-review › Article

Absorption recovery dynamics in 2 um GaSb-based SESAMs

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Paajaste, J., Suomalainen, S., Härkönen, A., Griebner, U., Steinmeyer, G., Guina, M.
Number of pages: 6
Adjustable wetting of Liquid Flame Spray (LFS) TiO2-nanoparticle coated board: Batch-type versus roll-to-roll Stimulation methods

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Department of Physics, Engineering materials science and solutions (EMASS)
Authors: Tuominen, M., Teisala, H., Haapanen, J., Aromaa, M., Mäkelä, J. M., Stepien, M., Saarinen, J. J., Toivakka, M., Kuusipalo, J.
Number of pages: 9
Pages: 271-279
Publication date: 2014
Peer-reviewed: Yes

Publication information
Volume: 29
Issue number: 2
ISSN (Print): 0283-2631
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.385 0.652
Publication Forum (2016): 1
Scopus rating (2015): 0.375 0.787
Web of Science (2015): 1.062 0.918 8.8 0.457 0.00134 0.235
Publication Forum (2015): 1
Scopus rating (2014): 0.444 0.823
Web of Science (2014): 1.016 0.927 8.4 0.775 0.00126 0.224
Publication Forum (2014): 1
Scopus rating (2013): 0.389 0.684
Publication Forum (2013): 1
Scopus rating (2012): 0.628 1.281
Publication Forum (2012): 1
Scopus rating (2011): 0.582 0.902
Scopus rating (2010): 0.658 0.764
Scopus rating (2009): 1.167 0.984
Scopus rating (2008): 0.928 0.857
Scopus rating (2007): 2.018 1.035
Scopus rating (2006): 1.002 0.951
Scopus rating (2005): 1.181 0.997
Scopus rating (2004): 2.08 1.354
Scopus rating (2003): 2.952 1.129
Scopus rating (2002): 1.836 1.145
Scopus rating (2001): 1.12 1.147
Scopus rating (2000): 1.086 1.154
Scopus rating (1999): 1.086 1.001
Analytic modeling of temperature dependence of 2D carrier mobility in as-grown and annealed GaInNAs/GaAs quantum well structures

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Donmez, O., Sarcan, F., Lisesivdin, S., Vaughan, M., Erol, A., Gunes, M., Arikan, M., Puustinen, J., Guina, M.
Number of pages: 13
Pages: 1-13
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Semiconductor Science and Technology
Volume: 29
Article number: 125009
ISSN (Print): 0268-1242
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.632 0.866
Publication Forum (2016): 1
Scopus rating (2015): 0.675 0.977
Web of Science (2015): 2.098 2.037 8.5 0.364 0.01288 0.693
Publication Forum (2015): 1
Scopus rating (2014): 0.991 1.088
Web of Science (2014): 2.19 1.911 8.3 0.423 0.01346 0.669
Publication Forum (2014): 1
Scopus rating (2013): 1.173 1.133
Publication Forum (2013): 1
Scopus rating (2012): 1.051 0.982
Publication Forum (2012): 1
Scopus rating (2011): 1.01 1.08
Scopus rating (2010): 0.82 0.88
Scopus rating (2009): 0.886 0.914
Scopus rating (2007): 1.252 1.161
Scopus rating (2005): 1.216 1.133
Scopus rating (2004): 1.42 1.142
Scopus rating (2003): 1.235 0.981
Scopus rating (2002): 0.996 0.925
Scopus rating (2001): 0.962 0.845
Scopus rating (2000): 1.193 0.811
Scopus rating (1999): 1.193 0.874
Original language: English
DOIs:
10.1088/0268-1242/29/12/125009
A new Generation Sweating Thermal Manikin for the Evaluation of the Thermoregulation Properties of Protective Clothing

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Materials Science
Authors: Varheenmaa, M.
Number of pages: 5
Pages: 1-5
Publication date: 2014

Host publication information
Title of host publication: Ambience14&10i3m, Tampere Hall, Tampere, Finland 7-9 September 2014
Editor: Varheenmaa, M.

Publication series
Name: Proceedings of Ambience, Scientific Conference for Smart Textiles
ISSN (Electronic): 2342-4540

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-10-16
Source: researchoutputwizard
Source-ID: 1703
Research output: Scientific - peer-review › Conference contribution

Antibacterial properties and chemical stability of superhydrophobic silver-containing surface produced by sol-gel route

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Heinonen, S., Huttunen-Saarivirta, E., Nikkanen, J., Raulio, M., Priha, O., Laakso, J., Strogårds, E., Levänen, E.
Number of pages: 13
Pages: 149-161
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Colloids and Surfaces A: Physicochemical and Engineering Aspects
Volume: 453
ISSN (Print): 0927-7757
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.797 1.104
Publication Forum (2016): 1
Scopus rating (2015): 0.803 1.116
Web of Science (2015): 2.76 2.834 7.5 0.581 0.02955 0.592
Publication Forum (2015): 1
Scopus rating (2014): 0.843 1.252
Web of Science (2014): 2.752 2.832 7.3 0.573 0.02898 0.607
Publication Forum (2014): 2
Scopus rating (2013): 0.811 1.255
Publication Forum (2013): 2
Scopus rating (2012): 0.841 1.189
Apparent Fracture Toughness Versus Micro-Scale Fracture Toughness of Interfaces-The Challenge of Critical Values

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Engineering materials science and solutions (EMASS), Department of Materials Science, Research group: Plastics and Elastomer Technology, Aalto University
Authors: Kanerva, M., Jokinen, J., Sarlin, E., Saarela, O.
Pages: 173-188
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Materials Performance and Characterization
Volume: 3
Issue number: 3
ISSN (Print): 2165-3992
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.205 0.323
Publication Forum (2016): 1
Scopus rating (2015): 0.296 0.145
Publication Forum (2015): 1
Scopus rating (2014): 0.35 0.132
Scopus rating (2013): 0.111 0.104
Original language: English
DOIs:
10.1520/MPC20130068

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-09-23<br/>Publisher name: A S T M International
Source: researchoutputwizard
Source-ID: 647
Research output: Scientific - peer-review › Article
Application of DIC technique for studies of Kuru Granite rock under static and dynamic loading

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Materials Science
Authors: Fourmeau, M., Gomon, D., Vacher, R., Hokka, M., Kane, A., Kuokkala, V.
Number of pages: 7
Pages: 691-697
Publication date: 2014

Host publication information
Title of host publication: 20th European Conference on Fracture (ECF20), Fracture at all scales, 30th June - 4th July, 2014, Trondheim

Publication series
Name: Procedia Materials Science
Volume: 3
ISSN (Print): 2211-8128
DOIs: 10.1016/j.mspro.2014.06.114

Bibliographical note
Contribution: organisation=mol,FACT1=1
Source: researchoutputwizard
Source-ID: 314
Research output: Scientific - peer-review › Conference contribution

Applications of supercritical carbon dioxide in materials processing and synthesis

General information
State: Published
Ministry of Education publication type: A2 Review article in a scientific journal
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Zhang, X., Heinonen, S., Levänen, E.
Number of pages: 17
Pages: 1-16
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: RSC Advances
Issue number: xx
ISSN (Print): 2046-2069
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.875 0.743
Publication Forum (2016): 1
Scopus rating (2015): 0.959 0.837
Web of Science (2015): 3.289 3.485 1.8 0.676 0.13014 0.628
Publication Forum (2015): 1
Scopus rating (2014): 1.114 0.965
Web of Science (2014): 3.84 3.907 1.7 0.597 0.0623 0.747
Publication Forum (2014): 1
Scopus rating (2013): 1.117 0.903
Publication Forum (2013): 1
Scopus rating (2012): 0.863 0.603
Original language: English
DOIs: 10.1039/C4RA10662H

Bibliographical note
Contribution: organisation=mol,FACT1=1
Publisher name: The Royal Society of Chemistry
Atomistic investigation on the structure-property relationship during thermal spray nanoparticle impact

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science
Authors: Goel, S., Faisal, N. H., Ratia, V., Agrawal, A., Stukowski, A.
Number of pages: 12
Pages: 163-174
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: COMPUTATIONAL MATERIALS SCIENCE
ISSN (Print): 0927-0256
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.926 1.259
Publication Forum (2016): 1
Scopus rating (2015): 0.993 1.348
Web of Science (2015): 2.086 2.182 6.4 0.587 0.02786 0.659
Publication Forum (2015): 1
Scopus rating (2014): 1.129 1.677
Web of Science (2014): 2.131 2.188 6.0 0.583 0.02665 0.67
Publication Forum (2014): 2
Scopus rating (2013): 0.965 1.337
Publication Forum (2013): 2
Scopus rating (2012): 1.022 1.647
Publication Forum (2012): 2
Scopus rating (2011): 0.996 1.46
Scopus rating (2010): 0.961 1.257
Scopus rating (2009): 0.978 1.308
Barkhausen noise-magnetizing voltage sweep measurement in evaluation of residual stress in hardened components

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Santa-aho, S., Sorsa, A., Hakanen, M., Leiviskä, K., Vippola, M., Lepistö, T.
Number of pages: 6
Pages: 1-6
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Measurement Science and Technology
Volume: 25
Issue number: 8
ISSN (Print): 0957-0233
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 0.668 1.173
Publication Forum (2016): 2
Scopus rating (2015): 0.687 1.303
Web of Science (2015): 1.492 1.537 8.2 0.3 0.01728 0.505
Publication Forum (2015): 2
Scopus rating (2014): 0.657 1.319
Web of Science (2014): 1.433 1.534 7.9 0.302 0.01783 0.499
Publication Forum (2014): 2
Scopus rating (2013): 0.555 1.244
Publication Forum (2013): 2
Scopus rating (2012): 0.716 1.529
Publication Forum (2012): 2
Scopus rating (2011): 0.844 1.703
Scopus rating (2010): 0.679 1.462
Scopus rating (2009): 0.919 1.573
Scopus rating (2008): 0.881 1.494
Scopus rating (2007): 0.823 1.492
Scopus rating (2006): 0.744 1.58
Scopus rating (2005): 0.82 1.584
Behaviour of ferritic-martensitic steel and aluminium base coatings under demanding elevated temperature conditions

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Huttunen-Saarivirta, E., Metsäjoki, J., Kuokkala, V.
Number of pages: 8
Pages: 57-64
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Tribology: Materials, Surfaces and Interfaces
Volume: 8
Issue number: 2
ISSN (Print): 1751-5831
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.297 0.464
Publication Forum (2016): 1
Scopus rating (2015): 0.305 0.476
Publication Forum (2015): 1
Scopus rating (2014): 0.362 0.38
Publication Forum (2014): 1
Scopus rating (2013): 0.247 0.312
Publication Forum (2013): 1
Scopus rating (2012): 0.333 0.376
Publication Forum (2012): 1
Scopus rating (2011): 0.276 0.363
Scopus rating (2010): 0.353 0.261
Scopus rating (2009): 0.155 0.114
Scopus rating (2008): 0.122 0.0
Original language: English
DOIs:
10.1179/1751584X13Y.0000000055

Bibliographical note
Contribution: organisation=mol,FACT1=1
Portfolio EDEND: 2014-09-29
Publisher name: IOP Publishing
Source: researchoutputwizard
Source-ID: 1451
Research output: Scientific - peer-review › Article
Biofunctional hybrid materials: bimolecular organosilane monolayers on FeCr alloys

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Surface Science, Frontier Photonics, Multi-scaled biodata analysis and modelling (MultiBAM)
Authors: Vuori, L., Leppiniemi, J., Hannula, M., Lahtonen, K., Hirsimäki, M., Nömmiste, E., Costelle, L., Hytönen, V. P., Valden, M.
Number of pages: 10
Pages: 1-10
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Nanotechnology
Volume: 25
Issue number: 43
Article number: 435603
ISSN (Print): 0957-4484
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.096 0.814
Publication Forum (2016): 2
Scopus rating (2015): 1.18 0.966
Web of Science (2015): 3.573 3.611 6.1 0.819 0.07276 0.961
Publication Forum (2015): 2
Scopus rating (2014): 1.465 1.258
Web of Science (2014): 3.821 3.885 5.5 0.678 0.09114 1.041
Publication Forum (2014): 3
Scopus rating (2013): 1.585 1.244
Publication Forum (2013): 3
Scopus rating (2012): 1.846 1.306
Publication Forum (2012): 3
Scopus rating (2011): 1.892 1.461
Scopus rating (2010): 1.844 1.259
Scopus rating (2009): 1.819 1.28
Scopus rating (2008): 1.875 1.333
Scopus rating (2007): 1.91 1.36
Scopus rating (2005): 1.925 1.445
Scopus rating (2004): 1.849 1.477
Scopus rating (2003): 1.427 1.371
Scopus rating (2002): 0.962 0.993
Scopus rating (2001): 0.901 0.94
Scopus rating (2000): 0.881 0.891
Scopus rating (1999): 1.131 0.953
Original language: English
DOIs:
10.1088/0957-4484/25/43/435603

Bibliographical note
Contribution: organisation=orc,FACT1=1
Portfolio EDEND: 2014-10-17
Publisher name: Institute of Physics
Source: researchoutputwizard
Source-ID: 1773
Research output: Scientific - peer-review › Article

Biorefinery products. Initial process piloting and material prototype production in the case of barriers, 3D-mouldable packaging and filters
General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Materials Science
Number of pages: 17
Publication date: 2014

Publication information
Publisher: Finnish Bioeconomy Cluster FIBIC
ISBN (Print): 978-952-67969-6-3
ISBN (Electronic): 978-952-67969-7-0
Original language: English

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2015-01-08
Source: researchoutputwizard
Source-ID: 40
Research output: Professional › Commissioned report

Case-Depth Verification of Hardened Samples with Barkhausen Noise Sweeps

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Santa-aho, S., Vippola, M., Lepistö, T., Sorsa, A., Leiviskä, K., Hakanen, M.
Number of pages: 8
Pages: 1307-1314
Publication date: 2014

Host publication information
Publisher: American Institute of Physics
ISBN (Print): 978-073541211-8

Publication series
Name: AIP Conference Proceedings
Publisher: American Institute of Physics
Volume: 1581
ISSN (Print): 0094-243X
ISSN (Electronic): 1551-7616
DOIs:
10.1063/1.4864972

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-08-30
Source: researchoutputwizard
Source-ID: 1452
Research output: Scientific › Conference contribution

Cavity-enhanced single photon emission from site-controlled In(Ga)As quantum dots fabricated using nanoimprint lithography

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Augmented Human Activities (AHA), Frontier Photonics
Authors: Tommila, J., Belykh, V., Hakkarainen, T. V., Heinonen, E., Sibeldin, N., Schramm, A., Guina, M.
Number of pages: 4
Pages: 1-4
Characterisation of novel corrosion resistant stainless steel/rubber/composite hybrid structures

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology, Department of Electrical Engineering, Research area: Reliability, Research group: Materials Characterization
Publication date: 2014

Host publication information
Title of host publication: Proceedings of the SAMPE Europe 9th International Technical Conference & Forum
Comparison of metallic and organic corrosion protective coatings for sintered Nd-Fe-B magnets

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Materials Science, Research group: Materials Characterization
Authors: Isotahdon, E., Huttunen-Saarivirta, E., Kuokkala, V., Paju, M.
Number of pages: 2
Pages: 612-613
Publication date: 2014

Host publication information
Title of host publication: IEEE International Magnetics Conference, Dresden, Germany, May 4-8, 2014
Links:
http://intermag2014.ifw-dresden.de/

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-06-27
Source: researchoutputwizard
Source-ID: 547
Research output: Scientific › Conference contribution

Computational multiscale modelling concept and supporting experimental testing procedures for material wear behaviour under severe environments

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Materials Science
Number of pages: 4
Pages: 1-4
Publication date: 2014

Host publication information
Title of host publication: The 16th Nordic Symposium on Tribology - NORDTRIP 2014, 10th - 13th June, Aarhus, Denmark
Publisher: Danish technological institute
ISBN (Print): 978-87-92765-26-0

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-12-17
Source: researchoutputwizard
Source-ID: 894
Research output: Scientific › Conference contribution

Controlling the synergetic effects in (3-aminopropyl) trimethoxysilane and (3-mercaptopropyl) trimethoxysilane coadsorption on stainless steel surfaces

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Surface Science, Frontier Photonics
Number of pages: 11
Pages: 856-866
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Applied Surface Science
Control of emitted light polarization in a 1310nm dilute nitride spin-vertical cavity surface emitting laser subject to circularly polarized optical injection

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Alharti, A., Hurtado, A., Al Seyab, R., Korpijärvi, V., Guina, M., Henning, I., Adams, M.
Number of pages: 5
Pages: 1-5
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: APPLIED PHYSICS LETTERS
Volume: 105
Issue number: 18
Article number: 181106
ISSN (Print): 0003-6951
Ratings:
Control of the Emitted Polarization in a 1310 nm spin-VCSEL Subject to Circularly Polarized Optical-Injection

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Alharti, S., Hurtado, A., Korpipäärvi, V., Guina, M., Henning, I., Adams, M.
Number of pages: 2
Pages: 1-2
Publication date: 2014

Host publication information
Title of host publication: Conference on Lasers and Electro-Optics, CLEO: Science and Innovations, June 8-13, 2014, San Jose, CA, USA
Publisher: Optical Society of America
ISBN (Print): 978-1-55752-999-2

Publication series
Name: Conference on Lasers and Electro-Optics
DOIs: 10.1364/CLEO_SI.2014.SF1G.7
Deep levels in 1 eV bandgap dilute nitride antimonide solar cells

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre
Authors: Polojärvi, V., Tukiainen, A., Aho, A., Raappana, M., Aho, T., Schramm, A., Guina, M.
Number of pages: 3
Pages: 1-3
Publication date: 2014

Host publication information
Title of host publication: Proceedings of the 29th European Photovoltaic Solar Energy Conference and Exhibition, EU PVSEC 2014, September 22-26, 2014, Amsterdam, the Netherlands
Publisher: European Environment Agency
ISBN (Print): 3-936338-34-5

Publication series
Name: European photovoltaic solar energy conference

Bibliographical note
Proceedings can be downloaded via EU PVSEC website: https://www.eupvsec-proceedings.com/proceedings/dvd.html
Contribution: organisation=orc,FACT1=1
Portfolio EDEND: 2014-05-27
Publisher name: Elsevier
Source-ID: 786
Research output: Scientific - peer-review › Article

Degradation mechanisms of bioresorbable polyesters. Part 1. Effects of random scission, end scission and autocatalysis
Degradation mechanisms of bioresorbable polyesters. Part 2. Effects of initial molecular weight and residual monomer
Design driven world of cellulose—from bulk to luxury?
Tekes—the Finnish Funding Agency for Innovation has granted funding 4.5 million funding for a project targeting on new approaches for use of wood-based cellulose. Project “Design Driven Value Chains in The World of Cellulose” (DWoC) launched by VTT Technical Research Centre of Finland, Aalto University and Tampere University of Technology integrates design and design processes into the strategic development of businesses operating in the field. The aim is to create a business ecosystem to serve both existing industry and a new, growing cellulose-based industry, and to brand Finland as a producer of refined, cellulose-based products. This manuscript summarises the future visions and background aspects and facts that have led to the initiation of the project. The presentation based on the manuscript also presents some of the first demonstrator processes and products developed during the first operational year of the project. These demonstrators include: Fibre yarn process that produces yarn from cellulose pulp fibres without traditional spinning process using novel wet extrusion technique (figure on right). Foam forming method for manufacturing well-formed foamed structures for new product applications 3D-printing technology enabling customisable on demand production of fibre structures and components using modified cellulosic raw materials.
Determination of the functionality of monolayers of aminopropyl trimethoxy silane and mercaptopropyl trimethoxy silane on stainless steel with SR-PES and chemical derivatization

**General information**
State: Published
Ministry of Education publication type: B2 Part of a book or another research book
Organisations: Optoelectronics Research Centre, Research group: Surface Science
Authors: Vuori, L., Hannula, M., Hirsimäki, M., Tönisoo, A., Nömmiste, E., Valden, M.
Number of pages: 2
Pages: 1-2
Publication date: 2014

**Host publication information**
Place of publication: Lund, Sweden
Publisher: MAX-LAB
Links: https://www.maxlab.lu.se/node/1913

**Bibliographical note**
Contribution: organisation=orc,FACT1=1<br/>Portfolio EDEND: 2014-12-15
Source: researchoutputwizard
Source-ID: 1771
Research output: Scientific › Chapter

Dilute Nitride Space Solar Cells: Towards 4 Junctions

**General information**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre
Authors: Aho, A., Tukiainen, A., Polojarvi, V., Guina, M.
Number of pages: 3
Pages: 1-3
Publication date: 2014

**Host publication information**
Title of host publication: 10th European Space Power Conference ESPC 2014, 13-17 April, 2014, Noordwijkhout, the Netherlands
Publisher: European Space Agency
ISBN (Print): 978-92-9221-283-4

**Publication series**
Name: European Space Agency - Special Publication (ESA - SP)
Volume: 719
ISSN (Print): 1609-042X

**Bibliographical note**
ESA SP-719<br/>Contribution: organisation=orc,FACT1=1<br/>Portfolio EDEND: 2014-09-18<br/>Publisher name: European Space Agency
Source: researchoutputwizard
Source-ID: 60
Research output: Scientific › peer-review › Conference contribution
Direct laser writing of microstructures for the growth guidance of human pluripotent stem cell derived neuronal cells

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Biomaterials and Tissue Engineering Group, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Turunen, S., Käpylä, E., Lähteenmäki, M., Ylä-Outinen, L., Narkilahti, S., Kellomäki, M.
Number of pages: 8
Pages: 197-204
Publication date: 2014
Peer-reviewed: Yes
ASJC Scopus subject areas: Biomaterials

**Publication information**
Journal: Optics and Lasers in Engineering
Volume: 55
ISSN (Print): 0143-8166
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.959 1.79
Publication Forum (2016): 1
Scopus rating (2015): 1.056 1.872
Web of Science (2015): 2.319 2.209 5.3 0.954 0.00914 0.574
Publication Forum (2015): 1
Scopus rating (2014): 0.975 2.146
Web of Science (2014): 2.237 2.139 4.8 0.908 0.00854 0.536
Publication Forum (2014): 1
Scopus rating (2013): 0.867 1.901
Publication Forum (2013): 1
Scopus rating (2012): 0.863 2.121
Publication Forum (2012): 1
Scopus rating (2011): 0.937 2.331
Scopus rating (2010): 0.764 1.815
Scopus rating (2009): 0.687 1.518
Scopus rating (2008): 0.584 1.536
Scopus rating (2007): 0.595 1.386
Scopus rating (2006): 0.512 1.382
Scopus rating (2005): 0.624 1.447
Scopus rating (2004): 0.702 1.48
Scopus rating (2003): 0.671 1.396
Scopus rating (2002): 0.457 1.243
Scopus rating (2001): 0.376 1.084
Scopus rating (2000): 0.305 0.475
Scopus rating (1999): 1.833 0.533
Original language: English
DOI: 10.1016/j.optlaseng.2013.11.003

**Bibliographical note**
Contribution: organisation=elt,FACT1=1
Portfolio EDEND: 2014-02-15
Publisher name: Elsevier
Source: researchoutputwizard
Source-ID: 1662
Research output: Scientific - peer-review › Article

Direct laser writing of synthetic poly(amino acid) hydrogels and poly(ethylene glycol) diacrylates by two-photon polymerization
Dynamics of time-resolved photoluminescence in GaInNAs and GaNAsSb solar cells

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Effect of abrasive properties on the high-stress three-body abrasion of steels and hard metals

Authors: Gubanov, A., Polojärvi, V., Aho, A., Tukiainen, A., Tkachenko, N. V., Guina, M.
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Nanoscale Research Letters
Volume: 9
Article number: 80
ISSN (Print): 1931-7573
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.589 0.746
Publication Forum (2016): 1
Scopus rating (2015): 0.538 0.653
Web of Science (2015): 2.584 2.85 3.8 0.391 0.02704 0.644
Publication Forum (2015): 1
Scopus rating (2014): 0.748 1.019
Web of Science (2014): 2.779 3.008 3.3 0.324 0.02502 0.677
Publication Forum (2014): 1
Scopus rating (2013): 0.79 0.967
Publication Forum (2013): 1
Scopus rating (2012): 1.049 1.073
Publication Forum (2012): 1
Scopus rating (2011): 1.04 1.124
Scopus rating (2010): 1.062 1.007
Scopus rating (2009): 1.063 1.01
Scopus rating (2008): 0.828 0.632
Scopus rating (2007): 1.458 0.71
Original language: English
DOIs:

Bibliographical note
Contribution: organisation=orc,FACT1=0.7<br/>Contribution: organisation=keb,FACT2=0.3<br/>Portfolio EDEND: 2014-04-29<br/>Publisher name: SpringerOpen
Source: researchoutputwizard
Source-ID: 371
Research output: Scientific - peer-review › Article

Effect of abrasive properties on the high-stress three-body abrasion of steels and hard metals

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Ratia, V., Heino, V., Valtonen, K., Vippola, M., Kemppainen, A., Siitonen, P., Kuokkala, V.
Number of pages: 18
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Tribologia
Volume: 32
Issue number: 1
ISSN (Print): 0780-2285
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.141 0.076
Publication Forum (2016): 1
Scopus rating (2015): 0.101 0.0
Effect of quartzite and granite in wear surfaces on dry sliding

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Materials Characterization, Engineering materials science and solutions (EMASS)
Authors: Heino, V., Valtonen, K., Kuokkala, V.
Number of pages: 5
Pages: 85-89
Publication date: 2014
Peer-reviewed: Yes

**Publication information**
Journal: Tribology: Materials, Surfaces and Interfaces
Volume: 8
Issue number: 2
ISSN (Print): 1751-5831
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.297 0.464
Publication Forum (2016): 1
Scopus rating (2015): 0.305 0.476
Publication Forum (2015): 1
Scopus rating (2014): 0.362 0.38
Publication Forum (2014): 1
Scopus rating (2013): 0.247 0.312
Publication Forum (2013): 1
Scopus rating (2012): 0.333 0.376
Effect of test parameters on large particle high speed slurry erosion testing

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Number of pages: 7
Pages: 98-104
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Tribology: Materials, Surfaces and Interfaces
Volume: 8
Issue number: 2
ISSN (Print): 1751-5831

Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.297 0.464
Publication Forum (2016): 1
Scopus rating (2015): 0.305 0.476
Publication Forum (2015): 1
Scopus rating (2014): 0.362 0.38
Publication Forum (2014): 1
Scopus rating (2013): 0.247 0.312
Publication Forum (2013): 1
Scopus rating (2012): 0.333 0.376
Publication Forum (2012): 1
Scopus rating (2011): 0.276 0.363
Scopus rating (2010): 0.353 0.261
Scopus rating (2009): 0.155 0.114
Scopus rating (2008): 0.122 0.0
Original language: English

Electronic versions:
Paper for Tribology journal_POST-PRINT_Niko Ojala
DOIs:
10.1179/1751584X14Y.0000000066
Links:
http://urn.fi/URN:NBN:fi:ttty-201605133985

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-04-29<br/>Publisher name: W. S. Maney & Son
Source: researchoutputwizard
Effect of viscose fabric modification on the mechanical and water absorption properties of composites prepared through vacuum infusion

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science
Authors: Rajan, R., Riihivuori, J., Rainasalo, E., Skrifvars, M., Järvelä, P.
Number of pages: 15
Pages: 1-15
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Reinforced Plastics and Composites
ISSN (Print): 0731-6844
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.418 0.648
Publication Forum (2016): 1
Scopus rating (2015): 0.489 0.846
Web of Science (2015): 0.901 1.088 7.0 0.156 0.00364 0.237
Publication Forum (2015): 1
Scopus rating (2014): 0.686 1.021
Web of Science (2014): 1.503 1.323 5.9 0.128 0.00428 0.261
Publication Forum (2014): 1
Scopus rating (2013): 0.6 1.027
Publication Forum (2013): 1
Scopus rating (2012): 0.53 0.872
Publication Forum (2012): 1
Scopus rating (2011): 0.415 0.768
Scopus rating (2010): 0.421 0.91
Scopus rating (2009): 0.508 0.857
Scopus rating (2008): 0.477 0.724
Scopus rating (2007): 0.358 0.765
Scopus rating (2006): 0.328 0.682
Scopus rating (2005): 0.312 0.601
Scopus rating (2004): 0.363 0.658
Scopus rating (2003): 0.344 0.479
Scopus rating (2002): 0.585 0.637
Scopus rating (2001): 0.575 0.785
Scopus rating (2000): 0.653 0.773
Scopus rating (1999): 0.548 0.777
Original language: English
DOIs:
10.1177/0731684414534748

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-08-13<br/>Publisher name: Sage
Source: researchoutputwizard
Source-ID: 1337
Research output: Scientific - peer-review › Article

Effects of cyclic pre-straining on mechanical properties of an austenitic microalloyed high-Mn twinning-induced plasticity steel
Erosion wear of glass fibre reinforced vinylester

Evaluation of thermal Comfort Properties of Prototypte Uniforms for Rescue Team Workers
Evidence for an in Situ Developed Polymer Phase in Ionic Elastomers

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Number of pages: 15
Pages: 3436-3450
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Macromolecules
Volume: 47
Issue number: 10
ISSN (Print): 0024-9297
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 2.557 1.507
Publication Forum (2016): 2
Scopus rating (2015): 2.407 1.638
Web of Science (2015): 5.554 5.599 9.5 1.056 0.10802 1.274
Publication Forum (2015): 2
Scopus rating (2014): 2.534 1.721
Web of Science (2014): 5.8 5.654 9.0 1.155 0.12018 1.279
Publication Forum (2014): 3
Scopus rating (2013): 2.576 1.754
Publication Forum (2013): 3
Scopus rating (2012): 2.779 1.58
Publication Forum (2012): 3
Scopus rating (2011): 2.556 1.593
Scopus rating (2010): 2.51 1.51
Scopus rating (2009): 2.962 1.533
Scopus rating (2008): 2.819 1.54
Scopus rating (2007): 3.102 1.613
Scopus rating (2006): 2.987 1.714
Scopus rating (2005): 2.579 1.654
Extruded polymer films for optimal enzyme-catalyzed oxygen scavenging

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Johansson, K., Kotkamo, S., Rotabakk, T. B., Johansson, C., Kuusipalo, J., Jönsson, L. J., Jörnström, L.
Number of pages: 9
Pages: 1-8
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Chemical Engineering Science
Volume: 108
ISSN (Print): 0009-2509
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.037 1.442
Publication Forum (2016): 2
Scopus rating (2015): 1.038 1.606
Web of Science (2015): 2.75 2.948 10.0 0.777 0.0354 0.772
Publication Forum (2015): 2
Scopus rating (2014): 1.115 1.642
Web of Science (2014): 2.337 2.674 9.7 0.47 0.03532 0.719
Publication Forum (2014): 3
Scopus rating (2013): 1.157 1.866
Publication Forum (2013): 3
Scopus rating (2012): 1.189 1.847
Publication Forum (2012): 3
Scopus rating (2011): 1.205 1.685
Scopus rating (2010): 1.319 1.708
Scopus rating (2009): 1.293 1.759
Scopus rating (2008): 1.299 1.6
Scopus rating (2007): 1.347 1.523
Scopus rating (2006): 1.308 1.553
Scopus rating (2005): 1.445 1.801
Scopus rating (2004): 1.301 1.858
Scopus rating (2003): 1.7 1.676
Scopus rating (2002): 1.675 1.279
Scopus rating (2001): 1.706 1.734
Fatigue behavior of laser clad round steel bars

Laser cladding is an overlay welding method to manufacture high performance, fusion bonded metal, and metal matrix composite coatings on metallic substrates with low dilution. Owing to steep thermal gradients, rapid solidification, and possible mismatch in coefficients of thermal expansion between the coating and the substrate, laser cladding induces large tensile residual stresses in coating layer, potentially affecting the service life of clad component under external load-induced stresses. In this study, four-point bending and torsion fatigue tests were conducted on relatively large round laser clad steel bars to determine the effect of laser cladding on fatigue strength. Quenched and tempered 42CrMo4 steel clad with Inconel 625 and S355 structural steel clad with Stellite 21 were subjected to various stress levels for relatively large number of cycles with and without postweld heat treatment (PWHT). The results indicated that Stellite 21 decreased the fatigue life of S355 at all the applied loads, whereas Inconel 625 increased the fatigue life of 42CrMo4 at high loads but decreased at low loads. Applied PWHT did not show any positive influence on fatigue life.
Flexor tendon healing within the tendon sheath using bioabsorbable poly-l/d-lactide 96/4 suture. A histological in vivo study with rabbits

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Viinikainen, A., Göransson, H., Taskinen, H., Röyttä, M., Kellomäki, M., Törmälä, P., Rokkanen, P.
Number of pages: 7
Pages: 1319-1325
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Materials Science: Materials in Medicine
Volume: 25
Issue number: 5
ISSN (Print): 0957-4530
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.533 0.739
Publication Forum (2016): 1
Scopus rating (2015): 0.738 0.952
Web of Science (2015): 2.272 2.592 7.2 0.401 0.01207 0.557
Publication Forum (2015): 1
Scopus rating (2014): 0.739 1.348
Web of Science (2014): 2.587 2.831 6.6 0.466 0.01394 0.585
Publication Forum (2014): 1
Scopus rating (2013): 0.825 1.349
Publication Forum (2013): 1
Scopus rating (2012): 0.861 1.305
Publication Forum (2012): 1
Scopus rating (2011): 1.006 1.228
Scopus rating (2010): 0.949 1.06
Scopus rating (2009): 0.817 0.996
Scopus rating (2008): 0.686 0.997
Scopus rating (2007): 0.803 0.979
Scopus rating (2006): 0.724 1.034
Scopus rating (2005): 0.548 1.046
Scopus rating (2004): 0.465 0.955
Formation and phase transformation of Bi-containing QD-like clusters in annealed GaAsBi

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Wu, M., Luna, E., Puustinen, J., Guina, M., Trampert, A.
Number of pages: 10
Pages: 1-10
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Nanotechnology
Volume: 25
Issue number: 20
Article number: 205605
ISSN (Print): 0957-4484
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.096 0.814
Publication Forum (2016): 2
Scopus rating (2015): 1.18 0.966
Web of Science (2015): 3.573 3.611 6.1 0.819 0.07276 0.961
Publication Forum (2015): 2
Scopus rating (2014): 1.465 1.258
Web of Science (2014): 3.821 3.885 5.5 0.678 0.09114 1.041
Publication Forum (2014): 3
Scopus rating (2013): 1.585 1.244
Publication Forum (2013): 3
Scopus rating (2012): 1.846 1.306
Publication Forum (2012): 3
Scopus rating (2011): 1.892 1.461
Scopus rating (2010): 1.844 1.259
Scopus rating (2009): 1.819 1.28
Scopus rating (2008): 1.875 1.333
Scopus rating (2007): 1.91 1.36
Scopus rating (2005): 1.925 1.445
Scopus rating (2004): 1.849 1.477
Scopus rating (2003): 1.427 1.371
Scopus rating (2002): 0.962 0.993
Scopus rating (2001): 0.901 0.94
Fretting corrosion: Analysis of the failure mechanism for low voltage drives applications

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electrical Engineering
Authors: Mengotti, E., Duarte, L., Pippola, J., Frisk, L.
Number of pages: 6
Pages: 2109-2114
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Microelectronics Reliability
Volume: 54
Issue number: 9-10
ISSN (Print): 0026-2714
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.47 0.976
Publication Forum (2016): 1
Scopus rating (2015): 0.618 1.193
Web of Science (2015): 1.202 1.285 5.4 0.167 0.01019 0.352
Publication Forum (2015): 1
Scopus rating (2014): 0.601 1.432
Web of Science (2014): 1.433 1.336 5.8 0.154 0.00964 0.351
Publication Forum (2014): 1
Scopus rating (2013): 0.594 1.264
Publication Forum (2013): 1
Scopus rating (2012): 0.586 1.414
Publication Forum (2012): 1
Scopus rating (2011): 0.621 1.382
Scopus rating (2010): 0.602 1.114
Scopus rating (2009): 0.736 1.176
Scopus rating (2008): 0.932 1.235
Scopus rating (2007): 0.743 1.228
Scopus rating (2006): 0.716 1.153
Scopus rating (2005): 0.514 1.009
Scopus rating (2004): 0.537 0.823
Scopus rating (2003): 0.472 0.786
Scopus rating (2002): 0.592 0.756
Scopus rating (2001): 0.411 0.694
Scopus rating (2000): 0.349 0.382
Scopus rating (1999): 0.22 0.562
Original language: English
DOIs:
Garment fit by Numbers: Statistical Identification of a Garment’s Misfit

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organizations: Department of Materials Science
Authors: Hernandez, N., Mattila, H., Berglin, L.
Number of pages: 6
Pages: 1-6
Publication date: 2014

Host publication information
Title of host publication: Ambience14&10i3m, Tampere Hall, Tampere, Finland 7-9 September 2014
Place of publication: Tampere
Publisher: Tampere University of Technology
Editor: Varheenmaa, M.

Publication series
Name: Proceedings of Ambience, Scientific Conference for Smart Textiles
Publisher: Tampere University of Technology
No.: 1
ISSN (Print): 2342-4540

GaSb-based SESAM Mode-Locked Tm,Ho:KLuW Laser at 2060 nm

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organizations: Optoelectronics Research Centre, Frontier Photonics
Number of pages: 3
Pages: 1-3
Publication date: 2014

Host publication information
Title of host publication: International conference on advanced solid-state lasers, ASSL 2014, 16-21 November, 2014, Shanghai, China
Publisher: Optical Society of America
ISBN (Print): 978-1-55752-822-3

Publication series
Name: International conference on advanced solid-state lasers
DOIs:
10.1364/ASSL.2014.ATu2A.52
Green (In,Ga,Al)P-GaP light-emitting diodes grown on high-index GaAs surfaces

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Ledentsov, N., Shchukin, V., Lyytikäinen, J., Okhotnikov, O., Shernyakov, Y., Payusov, A., Gordeev, N., Maximov, M., Schlichting, S., Nippert, F., Hoffmann, A.
Number of pages: 5
Pages: 1-5
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: APPLIED PHYSICS LETTERS
Volume: 105
Issue number: 18
Article number: 181902
ISSN (Print): 0003-6951
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.132 0.996
Publication Forum (2016): 2
Scopus rating (2015): 1.085 0.983
Web of Science (2015): 3.142 3.293 7.9 0.673 0.38389 1.045
Publication Forum (2015): 2
Scopus rating (2014): 1.799 1.462
Web of Science (2014): 3.302 3.569 7.4 0.655 0.42671 1.125
Publication Forum (2014): 2
Scopus rating (2013): 2.149 1.652
Publication Forum (2013): 2
Scopus rating (2012): 2.554 1.754
Publication Forum (2012): 2
Scopus rating (2011): 2.805 1.94
Scopus rating (2010): 2.926 1.789
Scopus rating (2009): 2.857 1.848
Scopus rating (2008): 2.934 1.83
Scopus rating (2007): 3.039 1.913
Scopus rating (2005): 3.709 2.382
Scopus rating (2004): 3.904 2.38
Scopus rating (2003): 3.765 2.27
Scopus rating (2002): 3.917 2.365
Scopus rating (2001): 4.111 2.212
Scopus rating (2000): 4.277 2.013
Scopus rating (1999): 4.35 2.11
Original language: English
DOIs:
10.1063/1.4900938

Bibliographical note
Contribution: organisation=orc,FACT1=1<br/>Portfolio EDEND: 2014-11-11<br/>Publisher name: American Institute of Physics AIP
Source: researchoutputwizard
Source-ID: 903
Research output: Scientific - peer-review › Article
Hard nanodiamonds in soft rubbers: Past, present and future - A review

General information
State: Published
Ministry of Education publication type: A2 Review article in a scientific journal
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Shakun, A., Vuorinen, J., Hoikkanen, M., Poikelispää, M., Das, A.
Number of pages: 11
Pages: 49-69
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Composites part a: applied science and manufacturing
Issue number: 6
ISSN (Print): 1359-835X
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.402 2.053
Publication Forum (2016): 2
Scopus rating (2015): 1.53 2.18
Web of Science (2015): 3.719 4.213 7.4 0.831 0.01725 0.965
Publication Forum (2015): 2
Scopus rating (2014): 1.67 2.538
Web of Science (2014): 3.071 4.045 7.1 0.617 0.0183 0.995
Publication Forum (2014): 2
Scopus rating (2013): 1.59 2.828
Publication Forum (2013): 2
Scopus rating (2012): 1.559 2.706
Publication Forum (2012): 2
Scopus rating (2011): 1.443 2.499
Scopus rating (2010): 1.553 2.241
Scopus rating (2009): 1.536 1.976
Scopus rating (2008): 1.388 1.853
Scopus rating (2007): 1.222 2.188
Scopus rating (2006): 1.208 2.268
Scopus rating (2005): 1.109 2.103
Scopus rating (2004): 1.159 1.671
Scopus rating (2003): 1.132 1.411
Scopus rating (2002): 1.308 1.512
Scopus rating (2001): 1.426 1.33
Scopus rating (2000): 1.273 1.298
Scopus rating (1999): 0.824 1.104
Original language: English
DOIs:
10.1016/j.compositesa.2014.04.014

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-10-09<br/>Publisher name: Pergamon
Source: researchoutputwizard
Source-ID: 1482
Research output: Scientific - peer-review  Review Article

High-accuracy method for sample positioning in tightly focused nonlinear reflectivity measurement systems for semiconductor saturable absorber mirrors

General information
High-efficiency tunable yellow-orange VECSEL with an output power of 20 W

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Kantola, E., Leinonen, T., Ranta, S., Tavast, M., Guina, M.
Number of pages: 7
Pages: 1-7
Publication date: 2014

Host publication information
Title of host publication: Photonics West 2014, Vertical External Cavity Surface Emitting Lasers (VECSELs) IV, February 1-6, 2014, San Fransisco, CA, USA. Proceedings of SPIE
Publisher: SPIE
Article number: 89660D
ISBN (Print): 978-0-8194-9879-3

Publication series
Name: SPIE conference proceedings
High gain 1.3-μm GaInNAs SOA with fast gain dynamics and enhanced temperature stability

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Fitsios, D., Giannoulis, G., Iliadis, N., Korpijärvi, V., Viheriälä, J., Laakso, A., Dris, S., Spyropoulou, M., Avramopoulos, H., Kanellos, G., Pleros, N., Guina, M.
Number of pages: 6
Pages: 1-6
Publication date: 2014

Host publication information
Publisher: SPIE
ISBN (Print): 978-0-8194-9895-3

Publication series
Name: SPIE conference proceedings
Volume: 8982
ISSN (Print): 0277-786X
ISSN (Electronic): 1996-756X
DOIs:
10.1117/12.2037904

Bibliographical note
Contribution: organisation=orc,FACT1=1<br/>Portfolio EDEND: 2014-08-31<br/>Publisher name: SPIE - International Society for Optical Engineering
Source: researchoutputwizard
Source-ID: 653
Research output: Scientific - peer-review › Conference contribution

High performance wafer-fused semiconductor disk lasers emitting in the 1300 nm waveband

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Frontier Photonics
Number of pages: 6
Pages: 29398-29403
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Optics Express
Volume: 22
Issue number: 24
ISSN (Print): 1094-4087
Ratings:
High power cavity-adjusted semiconductor disc lasers emitting in the 1310 nm waveband

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Research group: Ultrafast and intense lasers, Frontier Photonics
Authors: Sirbu, A., Rantamäki, A., Iakovlev, V., Mereuta, A., Lyytikäinen, J., Caliman, A., Okhotnikov, O., Kapon, E.
Number of pages: 2
Publication date: 2014

Host publication information
Title of host publication: ISLC 2014, IEEE 24th International Semiconductor Laser Conference, 7 - 10 September, 2014, Mallorca, Spain
Publisher: IEEE
ISBN (Print): 978-1-4799-5721-7

Publication series
Name: IEEE International Semiconductor Laser Conference
DOIs: 10.1109/ISLC.2014.231

Bibliographical note
High-power flip-chip semiconductor disk laser in the 1.3 \mu m wavelength band

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Rantamäki, A., Sirbu, A., Saarinen, E. J., Lyytikäinen, J., Mereuta, A., Iakovlev, V., Kapon, E., Okhotnikov, O. G.
Number of pages: 4
Pages: 4855-4858
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Optics Letters
Volume: 39
Issue number: 16
ISSN (Print): 0146-9592
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.864 1.658
Publication Forum (2016): 2
Scopus rating (2015): 2.142 1.642
Web of Science (2015): 3.04 2.97 6.8 0.717 0.11996 0.971
Publication Forum (2015): 2
Scopus rating (2014): 2.497 2.056
Web of Science (2014): 3.292 3.208 6.6 0.798 0.12713 1.041
Publication Forum (2014): 2
Scopus rating (2013): 2.458 2.095
Publication Forum (2013): 2
Scopus rating (2012): 2.596 1.95
Publication Forum (2012): 2
Scopus rating (2011): 2.518 2.475
Scopus rating (2010): 2.669 2.293
Scopus rating (2009): 3.167 2.665
Scopus rating (2008): 3.408 2.378
Scopus rating (2007): 3.489 2.102
Scopus rating (2005): 3.251 2.483
Scopus rating (2004): 3.521 2.718
Scopus rating (2003): 3.708 2.573
Scopus rating (2001): 3.62 2.244
Original language: English
DOIs: 10.1364/OL.39.004855

Bibliographical note
Contribution: organisation=orc,FACT1=1
Portfolio EDEND: 2014-08-31
Publisher name: Optical Society of America
Source: researchoutputwizard
Source-ID: 1351
Research output: Scientific - peer-review › Article
High power semiconductor disk laser with a semiconductor-dielectric-metal compound mirror

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Ultrafast and intense lasers, Research group: Surface Science, Frontier Photonics
Authors: Rantamäki, A., Saarinen, E. J., Lyytikäinen, J., Lahtonen, K., Valden, M., Okhotnikov, O. G.
Number of pages: 4
Pages: 1-4
Publication date: 2014
Peer-reviewed: Yes

**Publication information**
Journal: APPLIED PHYSICS LETTERS
Volume: 104
Issue number: 10
Article number: 101110
ISSN (Print): 0003-6951
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.132 0.996
Publication Forum (2016): 2
Scopus rating (2015): 1.085 0.983
Web of Science (2015): 3.142 3.293 7.9 0.673 0.38389 1.045
Publication Forum (2015): 2
Scopus rating (2014): 1.799 1.462
Web of Science (2014): 3.302 3.569 7.4 0.655 0.42671 1.125
Publication Forum (2014): 2
Scopus rating (2013): 2.149 1.652
Publication Forum (2013): 2
Scopus rating (2012): 2.554 1.754
Publication Forum (2012): 2
Scopus rating (2011): 2.805 1.94
Scopus rating (2010): 2.926 1.789
Scopus rating (2009): 2.857 1.848
Scopus rating (2008): 2.934 1.83
Scopus rating (2007): 3.039 1.913
Scopus rating (2005): 3.709 2.382
Scopus rating (2004): 3.904 2.38
Scopus rating (2003): 3.765 2.27
Scopus rating (2002): 3.917 2.365
Scopus rating (2001): 4.111 2.212
Scopus rating (2000): 4.277 2.013
Scopus rating (1999): 4.35 2.11
Original language: English
DOIs:
10.1063/1.4868535

**Bibliographical note**
Contribution: organisation=orc,FACT1=1
Portfolio EDEND: 2014-04-29
Publisher name: American Institute of Physics
Source: researchoutputwizard
Source-ID: 1349
Research output: Scientific - peer-review › Article
High Power Wafer-Fused Flip Chip Semiconductor Disk Laser at 1.27 μm

General information
State: Published
Organisations: Optoelectronics Research Centre, Research group: Ultrafast and intense lasers, École Polytechnique Fédérale de Lausanne, Laboratory of Physics of Nanostructures, CH-1015 Lausanne, Switzerland
Authors: Rantamäki, A., Sirbu, A., Saarinen, E., Lyytikäinen, J., Iakolev, V., Kapon, E., Okhotnikov, O.
Publication date: 2014

High-speed Sliding Friction of Laser-textured Silicon Nitride in Water against Rubber
The effects of a specific laser patterning on friction of silicon nitride bulk ceramic in water against rubber were investigated. A dimple-like patterning was applied to the surfaces of silicon nitride bulk ceramic blocks with pulsed laser drilling. Friction measurements were conducted with a special device designed for high-velocity sliding wear and friction testing of hard materials in wet conditions. Sliding velocities in the water-lubricated test ranged from 3.3 to 33 m/s and the load was 80 N. Anomalies in friction behaviour were observed in 8.3 and 16.7 m/s, which can only partially be explained with test equipment characteristics.

High temperature reliability of electrically conductive adhesive attached temperature sensors on flexible polyimide substrates

General information
State: Published
Organisations: Department of Electrical Engineering
Authors: Lahokallio, S., Kilunen, J., Frisk, L.
Number of pages: 6
Pages: 2017-2022
Publication date: 2014
Peer-reviewed: Yes

Improving the extensibility, wet web and dry strength of paper by addition of agar

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science
Authors: Vishtal, A., Retulainen, E.
Number of pages: 10
Pages: 434-443
Publication date: 2014
Peer-reviewed: Yes

Publication information
Volume: 29
Issue number: 3
ISSN (Print): 0283-2631
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.385 0.652
Incorporation model of N into GaInNAs alloys grown by radio-frequency plasma-assisted molecular beam epitaxy

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Aho, A., Korpijärvi, V., Tukiainen, A., Puustinen, J., Guina, M.
Number of pages: 6
Pages: 1-6
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Applied Physics
Volume: 116
Article number: 213101
ISSN (Print): 0021-8979
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.632 0.815
Publication Forum (2016): 1
Scopus rating (2015): 0.618 0.84
Web of Science (2015): 2.101 2.126 >10.0 0.446 0.20483 0.637
Publication Forum (2015): 1
Scopus rating (2014): 1.005 1.18
Web of Science (2014): 2.183 2.276 9.5 0.452 0.22991 0.682
Influence of powder composition and manufacturing method on electrical and chromium barrier properties of atmospheric plasma sprayed spinel coatings prepared from MnCo2O4 and Mn2CoO4 + Co powders on Crofer 22 APU interconnectors

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Optoelectronics Research Centre, Engineering materials science and solutions (EMASS), Frontier Photonics
Number of pages: 12
Pages: 17246-17257
Publication date: 2014
Peer-reviewed: Yes

Publication information
Volume: 39
Issue number: 30
ISSN (Print): 0360-3199
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.142 1.286
Publication Forum (2016): 1
Scopus rating (2015): 1.294 1.319
Web of Science (2015): 3.205 3.419 4.6 0.651 0.08996 0.619
Publication Forum (2015): 1
Scopus rating (2014): 1.212 1.494
Web of Science (2014): 3.313 3.659 4.3 0.539 0.08226 0.619
Publication Forum (2014): 3
Influence of substrate contamination, web handling, and pretreatments on the barrier performance of aluminum oxide atomic layer-deposited BOPP film

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Lahtinen, K., Lahti, J., Johansson, P., Seppänen, T., Cameron, D. C.
Number of pages: 10
Pages: 1-10
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Coatings Technology and Research
Volume: 11
Issue number: 3
ISSN (Print): 1547-0091
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.409 0.614
Publication Forum (2016): 1
Scopus rating (2015): 0.421 0.83
Publication Forum (2015): 1
Scopus rating (2014): 0.51 1.062
Publication Forum (2014): 1
Scopus rating (2013): 0.534 1.077
Publication Forum (2013): 1
Scopus rating (2012): 0.572 1.364
Publication Forum (2012): 1
Influence of surface hydroxylation on the oxidation of FeCr in O2 and air

**General information**
State: Published
Ministry of Education publication type: B2 Part of a book or another research book
Organisations: Optoelectronics Research Centre, Research group: Surface Science
Authors: Hirsimäki, M., Hannula, M., Lahtonen, K., Urpelainen, S., Valden, M.
Number of pages: 2
Pages: 1-2
Publication date: 2014

**Host publication information**
Title of host publication: Max-Lab Activity Report 2013. Reports 2013 Synchroton Radiation. Beamline I511-1
Place of publication: Lund, Sweden
Publisher: MAX-LAB
Links:
https://www.maxlab.lu.se/node/1913

**Bibliographical note**
Contribution: organisation=orc,FACT1=1<br/>Portfolio EDEND: 2014-12-15
Source: researchoutputwizard
Source-ID: 480
Research output: Scientific › Chapter

Influence of the powder morphology and plasma play process parameters on the structure and properties of Al2O3 based plasma sprayed coatings

**General information**
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Materials Science
Authors: Matikainen, V., Koivuluoto, H., Vuorio, P., Larjo, J.
Number of pages: 6
Pages: 130-135
Publication date: 2014

**Host publication information**
Title of host publication: International Thermal Spray Conference, ITSC2014, 21-23 May, 2014, Barcelona, Spain
ISBN (Print): 978-3-87155-574-9

**Publication series**
Name: DVS-Berichte
Volume: 302
ISSN (Print): 1341-3074

**Bibliographical note**
Influence of the spray gun type on microstructure and properties of HVAF sprayed Fe-based corrosion resistant coatings

**General information**
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Materials Science
Authors: Milanti, A., Koivuluoto, H., Vuoristo, P.
Number of pages: 6
Pages: 334-339
Publication date: 2014

**Host publication information**
Title of host publication: International Thermal Spray Conference, ITSC2014, 21-23 May, 2014, Barcelona, Spain
ISBN (Print): 978-3-87155-574-9

**Publication series**
Name: DVS-Berichte
Volume: 302
ISSN (Print): 1341-3074

**Bibliographical note**
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-08-30
Source: researchoutputwizard
Source-ID: 1084
Research output: Scientific › Conference contribution

Innovatiiviset materiaali- ja rakenneratkaisut hyttystorjunnassa

**General information**
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Materials Science
Authors: Jylhä, K.
Number of pages: 1
Pages: 13-13
Publication date: 2014
Peer-reviewed: Unknown

**Publication information**
Journal: Tekstiillilehti
Issue number: 2
ISSN (Print): 0040-2370
Original language: Finnish
Links: http://www.tekstiillilehti.fi/binary/file/-/id/12/fid/337/

**Bibliographical note**
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-05-27<br/>Publisher name: Suomen tekstiiliteknillinen liitto
Source: researchoutputwizard
Source-ID: 626
Research output: Professional › Article

In vitro bioluminescence used as a method for real-time inhibition zone testing for antibiotic-releasing composites

Aims: This study describes the potential of real-time bioluminescence imaging in evaluating the antibiotic efficiency of two cylinder-shaped bioabsorbable antibiotic-releasing composites by in vitro inhibition zone tests. The bacterial infections of bone tissue can cause extensive hard and soft tissue damage and decrease the efficiency of oral antibiotic therapy due to the poor blood circulation in the infected area. To overcome this problem, new, locally antibiotic-releasing biodegradable composites have been developed. Study Design & Methodology: The two composites evaluated in this study were composed of poly(L-lactide-co-ε-caprolactone) matrix, β-tricalcium phosphate ceramic and either ciprofloxacin or
rifampicin antibiotic. The composites were tested with genetically modified model pathogens of osteomyelitis (Pseudomonas aeruginosa and Staphylococcus epidermidis) in vitro in inhibition zone tests using a method of real-time bioluminescence. Results: The first signs of the effect of the released ciprofloxacin or rifampicin became visible after four hours of incubation and were seen as changed bioluminescence around the composite pellet on a culture dish. Both of the composite types showed excellent effects against the sensor bacteria within the diffusion area. Bioluminescence measurements suggested that no survivor bacteria capable of evolving resistant strains were left inside the inhibition zones. The S. epidermidis bacterial strain was an inhibition sensor and P. aeruginosa was a stress sensor. Conclusion: These results highlight the potential of the composite materials against the pathogens of osteomyelitis. The approach allows continuous visual inspection of the efficacy of the antibiotics against the bacteria.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Department of Chemistry and Bioengineering
Authors: Männistö, N. M., Ahola, N., Karp, M. T., Veiranto, M., Kellomäki, M.
Number of pages: 20
Pages: 235-254
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: British Microbiology Research Journal
Volume: 4
Issue number: 2
ISSN (Print): 2231-0886
Ratings:
Publication Forum (2017): 0
Publication Forum (2016): 0
Publication Forum (2015): 0
Publication Forum (2014): 1
Original language: English
Electronic versions:
mannisto_in_vitro_bioluminescence_used_as_a_method.pdf
DOIs:
10.9734/BMRJ/2014/6661
Links:
http://urn.fi/URN:NBN:fi:tty-201401301069

Bibliographical note
Contribution: organisation=keb,FACT1=0.5<br/>Contribution: organisation=elt,FACT2=0.5<br/>Portfolio EDEND: 2014-02-15<br/>Publisher name: Sciencedomain International
Source: researchoutputwizard
Source-ID: 1026
Research output: Scientific - peer-review › Article

Kestomuovien modifiointi seostamalla; Tietoisku

General information
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Materials Science
Authors: Järvelä, P.
Number of pages: 2
Pages: 30-31
Publication date: 2014
Peer-reviewed: Unknown

Publication information
Journal: Muovi - Plast
Issue number: 1
ISSN (Print): 0788-8430
Original language: Finnish

Bibliographical note
Kestävämpi teräksiä kulumistutkimuksella

General information
State: Published
Ministry of Education publication type: E1 Popularised article, newspaper article
Organisations: Department of Materials Science
Authors: Ratia, V.
Publication date: 2014
Peer-reviewed: Unknown

Publication information
Journal: TES - Tekniikan edistämissäätiö
Original language: Finnish
Links:
http://www.tekniikanedistamissaatio.fi/rahotettua-tutkimusta

Bibliographical note
Contribution: organisation=mol,FACT1=1
Portfolio EDEND: 2014-12-31
Source: researchoutputwizard
Source-ID: 1360
Research output: General public Article

Kilpailukykyä pk-sektorin yrityksille; Tietoisku

General information
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Materials Science
Authors: Järvelä, P.
Number of pages: 2
Pages: 26-27
Publication date: 2014
Peer-reviewed: Unknown

Publication information
Journal: Muovi - Plast
Issue number: 2
ISSN (Print): 0788-8430
Original language: Finnish

Bibliographical note
Contribution: organisation=mol,FACT1=1
Portfolio EDEND: 2014-06-26
Source: researchoutputwizard
Source-ID: 579
Research output: Professional Article

Köyhänavustusta design-pakkaukseksi. Äitiyspakkuksen sukupuu

General information
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Materials Science
Authors: Mustonen, M.
Number of pages: 1
Pages: 18-18
Publication date: 2014
Peer-reviewed: Unknown

Publication information
Life Cycle Assessment on Personal Protective Equipments

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Materials Science
Authors: Fatarella, E., Parisi, L., Varheenmaa, M., Talvenmaa, P., Pavlidou, S.
Number of pages: 8
Pages: 1-8
Publication date: 2014

Host publication information
Title of host publication: Ambience14&10i3, Tampere Hall, Tampere, Finland 7-9 September 2014
Place of publication: Tampere
Publisher: Tampere University of Technology
Editor: Varheenmaa, M.

Publication series
Name: Proceedings of Ambience, Scientific Conference for Smart Textiles
Publisher: Tampere University of Technology
No.: 1
ISSN (Print): 2342-4540

Magnetotransport study on as-grown and annealed n- and p-type modulation-doped GaInNAs/GaAs strained quantum well structures

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Dönmez, Ö., Sarcan, F., Erol, A., Gunes, M., Cetin Arikan, M., Puustinen, J., Guina, M.
Number of pages: 6
Pages: 1-6
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Nanoscale Research Letters
Volume: 9
Article number: 141
ISSN (Print): 1931-7573
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.589 0.746
Mapping of stress raising in laser clad components depending on geometry and defects

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Mechanical Engineering and Industrial Systems, Department of Materials Science
Keywords: (Laser cladding, Fatigue, Finite element method (FEM))
Pages: 1-14
Publication date: 2014

Host publication information
Electronic versions:
AK IIW C IV 2014
Links:

Mechanical and Thermal Characterization of Compression Moulded Polylactic Acid Natural Fiber Composites Reinforced with Hemp and Lyocell Fibers

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science
Metallographic Studies of Electron Beam Welded Copper Lid: Macroscopic Studies and Hardness Measurements of the Cross-Section of XKO49 at 323deg
Metallographic Studies of Electron Beam Welded Copper Lids: EBSD Studies of the Cross-Section of XKO49 at 323°

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Materials Science
Authors: Karhula, T.
Number of pages: 40
Publication date: 2014

Publication information
Place of publication: Olkiluoto
Publisher: Posiva
Original language: English

Publication series
Name: Posiva Working Report
Publisher: Posiva
No.: 24
Electronic versions:
Posiva_WR2014_24_Karhula_XK049_323_macro_hardness
Links:

Bibliographical note
myös MOL 214.<br/>Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-12-19
Source: researchoutputwizard
Source-ID: 660
Research output: Professional › Commissioned report

Metallographic Studies of Electron Beam Welded Copper Plates: EBSD Studies of the Cross-Sections and Determination of EBSD Reference Curves by EB-Welded Tensile Test Samples

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Materials Science
Authors: Karhula, T.
Number of pages: 241
Publication date: 2014

Publication information
Place of publication: Olkiluoto
Publisher: Posiva
Original language: English

Publication series
Name: Posiva Working Report
Publisher: Posiva
No.: 23
Electronic versions:
Posiva_WR2014_23_Karhula_XK049_323_EBSD
Links:

Bibliographical note
myös MOL 214.<br/>Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-12-20
Source: researchoutputwizard
Source-ID: 661
Research output: Professional › Commissioned report
Microstructural Characteristics and Tribological Behavior of HVOF-Sprayed Novel Fe-Based Alloy Coating

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science
Authors: Milanti, A., Koivuluoto, H., Vuoristo, P., Bolelli, G., Bozza, F., Lusvarghi, L.
Number of pages: 23
Pages: 98-120
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Coatings
Volume: 4
Issue number: 1
ISSN (Print): 2079-6412
Ratings:
Publication Forum (2017): 0
Publication Forum (2016): 0
Publication Forum (2015): 0
Publication Forum (2014): 1
Publication Forum (2013): 1
Original language: English
DOIs: 10.3390/coatings4010098

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-05-27
Source: researchoutputwizard
Source-ID: 662
Research output: Professional › Commissioned report

Modeling of MBE-Grown GaInNAs Solar Cells

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre
Authors: Tukiainen, A., Aho, A., Polojärvi, V., Guina, M.
Number of pages: 4
Pages: 1-4
Publication date: 2014

Host publication information
Title of host publication: 10th European Space Power Conference ESPC 2014, 13-17 April, 2014, Noordwijkhout, the Netherlands
Modelling and testing of elastomer impact deformation under high strain rates

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Kivikytö-Reponen, P., Laukkanen, A., Waudby, R., Andersson, T., Helle, A., Apostol, M., Valtonen, K., Kuokkala, V.
Number of pages: 7
Pages: 48-54
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Tribology: Materials, Surfaces and Interfaces
Volume: 8
Issue number: 1
ISSN (Print): 1751-5831
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.297 0.464
Publication Forum (2016): 1
Scopus rating (2015): 0.305 0.476
Publication Forum (2015): 1
Scopus rating (2014): 0.362 0.38
Publication Forum (2014): 1
Scopus rating (2013): 0.247 0.312
Publication Forum (2013): 1
Scopus rating (2012): 0.333 0.376
Publication Forum (2012): 1
Scopus rating (2011): 0.276 0.363
Scopus rating (2010): 0.353 0.261
Scopus rating (2009): 0.155 0.114
Scopus rating (2008): 0.122 0.0
Original language: English
DOIs:
10.1179/1751584X14Y.0000000067

Bibliographical note
Contribution: organisation=orc,FACT1=1
Portfolio EDEND: 2014-12-31
Publisher name: European Space Agency
Source: researchoutputwizard
Source-ID: 1646
Research output: Scientific - peer-review › Conference contribution
Moth eye antireflection coated GaInP/GaAs/GaInNAs solar cell

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre
Authors: Aho, A., Tommila, J., Tukiainen, A., Polojärvi, V., Niemi, T., Guina, M.
Number of pages: 4
Pages: 33-36
Publication date: 2014

Host publication information
Title of host publication: CPV-10 Proceedings, 10th International Conference on Concentrator Photovoltaic Systems, April 7-9, 2014, Albuquerque, NM, USA. AIP Conference Proceedings
Publisher: American Institute of Physics

Publication series
Name: AIP Conference Proceedings
Volume: 1616
ISSN (Print): 0094-243X
ISSN (Electronic): 1551-7616
DOIs:
10.1063/1.4897022

Bibliographical note
Contribution: organisation=orc,FACT1=1<br/>Portfolio EDEND: 2014-10-08<br/>Publisher name: American Institute of Physics
Source: researchoutputwizard
Source-ID: 59
Research output: Scientific - peer-review › Conference contribution

Multifunctional superhydrophobic nanoparticle coatings for cellulose-based substrates by liquid flame spray

General information
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Materials Science
Authors: Teisala, H.
Number of pages: 1
Pages: 59
Publication date: 2014
Peer-reviewed: Unknown

Publication information
Journal: Materia
Issue number: 1
ISSN (Print): 1459-9694
Ratings:
Publication Forum (2017): 0
Publication Forum (2016): 0
Publication Forum (2015): 0
Original language: Finnish
Links:
http://www.vuorimiesyhdistys.fi/sites/default/files/materia/pdf/Materia%201-2014_0.pdf

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-09-05<br/>Publisher name: Vuorimiesyhdistys
Source: researchoutputwizard
Source-ID: 1608
Research output: Professional › Article
Nanofibrous Chitosan-Polyethylene Oxide Engineered Scaffolds: A Comparative Study between Simulated Structural Characteristics and Cells Viability

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science
Authors: Kazemi Pilehrood, M., Dilamian, M., Mirian, M., Sadeghi-Aliaabadi, H., Maleknia, L., Nousiainen, P., Harlin, A.
Number of pages: 9
Pages: 1-9
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: BioMed Research International
Volume: 2014
Article number: 438065
ISSN (Print): 2314-6133
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.843 0.875
Publication Forum (2016): 1
Scopus rating (2015): 0.822 0.756
Web of Science (2015): 2.134 2.149 1.8 0.303 0.04512 0.53
Publication Forum (2015): 1
Scopus rating (2014): 0.753 0.716
Web of Science (2014): 1.579 1.593 1.4 0.265 0.0121 0.367
Publication Forum (2014): 1
Scopus rating (2013): 1.086 0.876
Scopus rating (2012): 0.998 0.771
Scopus rating (2011): 0.853 0.668
Scopus rating (2010): 0.514 0.468
Scopus rating (2009): 0.947 0.817
Scopus rating (2008): 1.225 0.778
Scopus rating (2007): 0.967 0.869
Scopus rating (2006): 0.725 0.876
Scopus rating (2005): 0.614 0.83
Scopus rating (2004): 0.656 0.469
Scopus rating (2003): 0.337 0.358
Scopus rating (2002): 0.185 0.242
Original language: English
DOIs:
10.1155/2014/438065

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2015-01-22<br/>Publisher name: Hindawi Publishing Corporation
Source: researchoutputwizard
Source-ID: 697
Research output: Scientific - peer-review › Article

Nanoparticle Depositon on Packaging Materials by Liquid Flame Spray: Generation of Superhydrophilic and Superhydrophobic Coatings

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Materials Science, Department of Physics
Authors: Teisala, H., Tuominen, M., Aromaa, M., Stepien, M., Mäkelä, J. M., Saarinen, J. J., Toivakka, M., Kuusipalo, J.
Number of pages: 13
Negative and positive magnetoresistance in GaInNAs/GaAs modulation-doped quantum well structures

Novel Regenerated Cellulose Fibers with High Water Absorption Properties
Observation of atomic ordering of triple-period-A and -B type in GaAsBi

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Wu, M., Luna, E., Puustinen, J., Guina, M., Trampert, A.
Number of pages: 4
Pages: 1-4
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: APPLIED PHYSICS LETTERS
Volume: 105
Article number: 041602
ISSN (Print): 0003-6951
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.132 0.996
Publication Forum (2016): 2
Scopus rating (2015): 1.085 0.983
Web of Science (2015): 3.142 3.293 7.9 0.673 0.36389 1.045
Publication Forum (2015): 2
Scopus rating (2014): 1.799 1.462
Web of Science (2014): 3.302 3.569 7.4 0.655 0.42671 1.125
Publication Forum (2014): 2
Scopus rating (2013): 2.149 1.652
Publication Forum (2013): 2
Scopus rating (2012): 2.554 1.754
Publication Forum (2012): 2
Scopus rating (2011): 2.805 1.94
Scopus rating (2010): 2.926 1.789
Scopus rating (2009): 2.857 1.848
Scopus rating (2008): 2.934 1.83
Scopus rating (2007): 3.039 1.913
Scopus rating (2005): 3.709 2.382
Scopus rating (2004): 3.904 2.38
Scopus rating (2003): 3.765 2.27
Scopus rating (2002): 3.917 2.365
Scopus rating (2001): 4.111 2.212
Optical gain in 1.3 μm electrically-driven dilute nitride VCSOAs

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Lisevdin, S. B., Khan, N. A., Mazzucato, S., Balkan, N., Adams, M. J., Korpijärvi, V., Guina, M., Mezosi, G., Sorel, M.
Number of pages: 5
Pages: 1-5
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Nanoscale Research Letters
Volume: 9
Article number: 22
ISSN (Print): 1931-7573
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.589 0.746
Publication Forum (2016): 1
Scopus rating (2015): 0.538 0.653
Web of Science (2015): 2.584 2.85 3.8 0.391 0.02704 0.644
Publication Forum (2015): 1
Scopus rating (2014): 0.748 1.019
Web of Science (2014): 2.779 3.008 3.3 0.324 0.02502 0.677
Publication Forum (2014): 1
Scopus rating (2013): 0.79 0.967
Publication Forum (2013): 1
Scopus rating (2012): 1.049 1.073
Publication Forum (2012): 1
Scopus rating (2011): 1.04 1.124
Scopus rating (2010): 1.062 1.007
Scopus rating (2009): 1.063 1.01
Scopus rating (2008): 0.828 0.632
Scopus rating (2007): 1.458 0.71
Original language: English
DOIs:

Bibliographical note
Contribution: organisation=orc,FACT1=1<br/>Portfolio EDEND: 2014-02-15<br/>Publisher name: SpringerOpen
Source: researchoutputwizard
Source-ID: 956
Research output: Scientific - peer-review › Article
Optical projection tomography as a tool for 3D imaging of hydrogels

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Number of pages: 7
Pages: 3443-3449
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Biomedical Optics Express
Volume: 5
Issue number: 10
ISSN (Print): 2156-7085
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.315 1.526
Publication Forum (2016): 1
Scopus rating (2015): 1.432 1.647
Web of Science (2015): 3.344 3.383 3.1 0.655 0.01953 0.995
Publication Forum (2015): 1
Scopus rating (2014): 1.754 1.798
Web of Science (2014): 3.648 3.752 2.8 0.656 0.01633 1.083
Publication Forum (2014): 1
Scopus rating (2013): 1.549 1.827
Publication Forum (2013): 1
Scopus rating (2012): 1.301 1.662
Publication Forum (2012): 1
Scopus rating (2011): 0.846 1.757
Original language: English
DOIs:
10.1364/BOE.5.003443

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-09-10<br/>Publisher name: Optical Society of America
Source: researchoutputwizard
Source-ID: 298
Research output: Scientific - peer-review › Article

Optical projection tomography can be used to investigate spatial distribution of chondrocytes in three-dimensional biomaterial scaffolds for cartilage tissue engineering

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Jarvinen, E., Muhonen, V., Haaparanta, A., Kellomaki, M., Kiviranta, I.
Number of pages: 5
Pages: 1549-1553
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Bio-Medical Materials and Engineering
Volume: 24
Ormocomp-Modified Glass Increases Collagen Binding and Promotes the Adherence and Maturation of Human Embryonic Stem Cell-Derived Retinal Pigment Epithelial Cells

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Optoelectronics Research Centre, Research group: Surface Science, Frontier Photonics, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Käpylä, E., Sorkio, A., Teymouri, S., Lahtonen, K., Vuori, L., Valden, M., Skottman, H., Kellomäki, M., Juutis-Uusitalo, K.
Number of pages: 11
Pages: 1-11
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Langmuir
ISSN (Print): 0743-7463
Ratings:
Publication Forum (2017): 2

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-06-30<br/>Publisher name: IOS Press
Source: researchoutputwizard
Source-ID: 589
Research output: Scientific - peer-review » Article

10.3233/BME-140959
Paper-based microfluidics: Fabrication technique and dynamics of capillary driven surface flow

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Department of Physics, Engineering materials science and solutions (EMASS)
Authors: Songok, J., Tuominen, M., Teisala, H., Haapanen, J., Mäkelä, J. M., Kuusipalo, J., Toivakka, M.
Number of pages: 7
Pages: 20060-20066
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: ACS Applied Materials and Interfaces
Volume: 6
Issue number: 22
ISSN (Print): 1944-8244
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 2.524 1.528
Performance assessment of multijunction solar cells incorporating GaInNAsSb

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Aho, A., Tukiainen, A., Polojärvi, V., Guina, M.
Number of pages: 7
Pages: 1-7
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Nanoscale Research Letters
Volume: 9
Article number: 61
ISSN (Print): 1931-7573
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.589 0.746
Publication Forum (2016): 1
Scopus rating (2015): 0.538 0.653
Web of Science (2015): 2.584 2.85 3.8 0.391 0.02704 0.644
Publication Forum (2015): 1
Scopus rating (2014): 0.748 1.019
Web of Science (2014): 2.779 3.008 3.3 0.324 0.02502 0.677
Publication Forum (2014): 1
Scopus rating (2013): 0.79 0.967
Publication Forum (2013): 1
Scopus rating (2012): 1.049 1.073
Publication Forum (2012): 1
Scopus rating (2011): 1.04 1.124
Scopus rating (2010): 1.062 1.007
Scopus rating (2009): 1.063 1.01
Scopus rating (2008): 0.828 0.632
Performance of Electrically Conductive Adhesive Attached Sensors in High Temperature Cycling

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electrical Engineering
Authors: Lahokallio, S., Frisk, L.
Number of pages: 6
Pages: 698-703
Publication date: 2014

Host publication information
Title of host publication: The 16th Electronics Packaging Technology Conference, EPTC 2014, 3-5 December 2014, Marina Bay Sands, Singapore
Place of publication: Piscataway, NJ
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4799-6994-4
Links:
http://www.eptc-ieee.net/

Bibliographical note
Contribution: organisation=dee,FACT1=1<br/>Portfolio EDEND: 2014-12-30
Source: researchoutputwizard
Source-ID: 858
Research output: Scientific - peer-review › Conference contribution

Performance of passive RFID tags in a high temperature cycling test

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electrical Engineering
Authors: Lahokallio, S., Kiilunen, J., Frisk, L.
Number of pages: 5
Pages: 1-5
Publication date: 2014

Host publication information
Title of host publication: ESTC 2014, 5th Electronics System-Integration Technology Conference, September 16-18, 2014, Helsinki, Finland
Place of publication: Piscataway, NJ
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4799-4026-4
DOIs:
10.1109/ESTC.2014.6962848

Bibliographical note
Contribution: organisation=dee,FACT1=1<br/>Portfolio EDEND: 2014-11-30
Source: researchoutputwizard
Source-ID: 860
Research output: Scientific - peer-review › Conference contribution
Physicochemical characterization of segmented polyurethanes prepared with glutamine or ascorbic acid as chain extenders and their hydroxyapatite composites

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Cetina-Diaz, S., Chan-Chan, L., Vargas-Coronado, R., Cervantes-Uc, J., Quintana-Owen, P., Paakinaho, K., Kellomäki, M., Di Silvio, L., Deb, S., Cauich-Rodriguez, J.
Number of pages: 11
Pages: 1966-1976
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Materials Chemistry B
Volume: 2
Issue number: 14
ISSN (Print): 2050-750X
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.46 1.014
Publication Forum (2016): 2
Scopus rating (2015): 1.566 1.163
Web of Science (2015): 4.872 4.879 1.9 0.985 0.02307 0.971
Publication Forum (2015): 2
Scopus rating (2014): 1.331 1.007
Web of Science (2014): 4.726 4.729 1.4 0.98 0.00974 0.871
Publication Forum (2014): 3
Publication Forum (2013): 3
Original language: English
DOIs:
10.1039/c3tb21500h

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-04-29<br/>Publisher name: RSC Publications
Source: researchoutputwizard
Source-ID: 213
Research output: Scientific - peer-review › Article

Polarization switching and bistability in a 1300 nm spin-VCSEL Subject to Circularly Polarized Optical Injection

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Alharti, A., Hurtado, A., Korpijärvi, V., Guina, M., Henning, I., Adams, M.
Number of pages: 2
Pages: 95-96
Publication date: 2014

Host publication information
Title of host publication: IEEE Photonics Conference, IPC 2014, 12 - 16 October, 2014, San Diego, California, USA
Publisher: IEEE
ISBN (Print): 978-1-4577-1504-4

Publication series
Name: IEEE Photonics Conference
DOIs:
10.1109/IPCon.2014.6995228
Links:
http://www.ipc-ieee.org/
Post-mortem evaluation of oxidized atmospheric plasma sprayed Mn-Co-Fe oxide spinel coatings on SOFC interconnectors

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Number of pages: 11
Pages: 17284-17294
Publication date: 2014
Peer-reviewed: Yes

Publication information
Volume: 39
Issue number: 30
ISSN (Print): 0360-3199
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.142 1.286
Publication Forum (2016): 1
Scopus rating (2015): 1.294 1.319
Web of Science (2015): 3.205 3.419 4.6 0.651 0.08996 0.619
Publication Forum (2015): 1
Scopus rating (2014): 1.212 1.494
Web of Science (2014): 3.313 3.659 4.3 0.539 0.08226 0.619
Publication Forum (2014): 3
Scopus rating (2013): 1.278 1.467
Publication Forum (2013): 3
Scopus rating (2012): 1.515 1.729
Publication Forum (2012): 3
Scopus rating (2011): 1.456 1.837
Scopus rating (2010): 1.589 1.871
Scopus rating (2009): 1.333 1.885
Scopus rating (2008): 1.401 2.096
Scopus rating (2007): 1.279 2.201
Scopus rating (2006): 1.073 2.161
Scopus rating (2005): 1.107 1.787
Scopus rating (2004): 1.225 1.626
Scopus rating (2003): 1.003 1.319
Scopus rating (2002): 0.763 1.157
Scopus rating (2001): 0.487 1.185
Scopus rating (2000): 0.518 0.866
Scopus rating (1999): 0.382 0.897
Original language: English
DOIs:
10.1016/j.ijhydene.2014.08.105

Bibliographical note
Contribution: organisation=orc,FACT1=1<br/>Portfolio EDEND: 2014-12-31<br/>Publisher name: IEEE
Source: researchoutputwizard
Source-ID: 89
Research output: Scientific - peer-review › Conference contribution

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-10-30<br/>Publisher name: Elsevier
Source: researchoutputwizard
Properties and microstructure of HVOF thermally sprayed carbide based coatings

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Iosif, H., Utu, I., Serban, V., Vuoristo, P., Niemi, K., Koivuluoto, H.
Number of pages: 6
Pages: 261-266
Publication date: 2014

Host publication information
Title of host publication: 5th International Conference on Advanced Materials and Structures, AMS 2013; Timisoara; Romania; 24 October 2013 through 25 October 2013
Publisher: Scitec Publications Ltd.
ISBN (Print): 978-303835212-9

Publication series
Name: Solid State Phenomena
Volume: 216
ISSN (Print): 1012-0394
ISSN (Electronic): 1662-9779
DOI: 10.4028/www.scientific.net/SSP.216.261

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2015-01-22<br/>Publisher name: Scitec Publications Ltd.
Source-ID: 539
Research output: Scientific - peer-review › Conference contribution

Properties of GaAsBi with Bi-rich clusters

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Optoelectronics Research Centre
Authors: Puustinen, J., Wu, M., Luna, E., Hilsk, J., Guina, M.
Number of pages: 1
Pages: 58-58
Properties of WC-FeCrAl coatings manufactured by different high velocity thermal spray processes

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Bolesh, G., Hulka, I., Koivuluoto, H., Lusvarghi, L., Milanti, A., Niemi, K., Vuoristo, P.
Number of pages: 16
Pages: 74-89
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Surface and Coatings Technology
Volume: 247
ISSN (Print): 0257-8972
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.874 1.359
Publication Forum (2016): 1
Scopus rating (2015): 0.871 1.415
Web of Science (2015): 2.139 2.417 8.5 0.402 0.356 0.527
Publication Forum (2015): 1
Scopus rating (2014): 0.998 1.681
Web of Science (2014): 1.998 2.374 8.2 0.307 0.347 0.517
Publication Forum (2014): 2
Scopus rating (2013): 1.057 1.859
Publication Forum (2013): 2
Scopus rating (2012): 1.049 1.658
Publication Forum (2012): 2
Scopus rating (2011): 1.053 1.851
Scopus rating (2010): 1.155 1.66
Scopus rating (2008): 1.479 1.564
Scopus rating (2007): 1.165 1.509
Scopus rating (2006): 1.276 1.709
Scopus rating (2005): 1.252 1.666
Scopus rating (2004): 1.269 1.498
Scopus rating (2003): 1.276 1.516
Scopus rating (2002): 1.208 1.183
Scopus rating (2001): 1.115 1.181
Scopus rating (2000): 0.981 1.03
Scopus rating (1999): 1.062 1.167
Protective coatings of electronics under harsh thermal shock

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electrical Engineering
Authors: Pippola, J., Marttila, T., Frisk, L.
Number of pages: 5
Pages: 2048-2052
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Microelectronics Reliability
Volume: 54
Issue number: 9-10
ISSN (Print): 0026-2714
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.47 0.976
Publication Forum (2016): 1
Scopus rating (2015): 0.618 1.193
Web of Science (2015): 1.202 1.285 5.4 0.167 0.01019 0.352
Publication Forum (2015): 1
Scopus rating (2014): 0.601 1.432
Web of Science (2014): 1.433 1.336 5.8 0.154 0.00964 0.351
Publication Forum (2014): 1
Scopus rating (2013): 0.594 1.264
Publication Forum (2013): 1
Scopus rating (2012): 0.586 1.414
Publication Forum (2012): 1
Scopus rating (2011): 0.621 1.382
Scopus rating (2010): 0.602 1.114
Scopus rating (2009): 0.736 1.176
Scopus rating (2008): 0.932 1.235
Scopus rating (2007): 0.743 1.228
Scopus rating (2006): 0.716 1.153
Scopus rating (2005): 0.514 1.009
Scopus rating (2004): 0.537 0.823
Scopus rating (2003): 0.472 0.786
Scopus rating (2002): 0.592 0.756
Scopus rating (2001): 0.411 0.694
Scopus rating (2000): 0.349 0.382
Scopus rating (1999): 0.22 0.562
Original language: English
DOIs:
10.1016/j.microrel.2014.07.106
Pulsed high-power yellow-orange VECSEL
We report on the development of a pulsed high-power frequency doubled vertical-external-cavity surface-emitting laser (VECSEL) with a peak output power of 14 W and emission spectrum near 588 nm. The semiconductor gain chip was grown by molecular beam epitaxy and comprised 10 GaInAs quantum wells. The gain structure was designed to be antiresonant at 1180 nm. The fundamental wavelength was frequency doubled to the yellow-orange spectral range using a 10-mm long critically phase matched lithium triborate nonlinear crystal, situated at the mode waist of the V-shaped laser cavity. The emission spectrum was narrowed down to FWHM of < 0.2 nm by employing a 1.5 mm birefringent filter and a 100-μm-thick etalon inside the cavity. By directly modulating the pump laser of the VECSEL, we were able to produce pulse widths down to 570 ns with average and peak output power of 81 mW and 14 W, respectively. The repetition rate was kept constant at 10 kHz throughout the measurements. The maximum peak power obtained was pump power limited. In comparison, at the same coolant temperature, a maximum of 8.5 W was achieved in continuous wave. The maximum optical-to-optical conversion efficiency (absorbed peak pump power to peak output power) was calculated to be 20-21 %.

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Reliability of adhesive joined thinned chips on flexible substrates under humid conditions
We report on the development of a pulsed high-power frequency doubled vertical-external-cavity surface-emitting laser (VECSEL) with a peak output power of 14 W and emission spectrum near 588 nm. The semiconductor gain chip was grown by molecular beam epitaxy and comprised 10 GaInAs quantum wells. The gain structure was designed to be antiresonant at 1180 nm. The fundamental wavelength was frequency doubled to the yellow-orange spectral range using a 10-mm long critically phase matched lithium triborate nonlinear crystal, situated at the mode waist of the V-shaped laser cavity. The emission spectrum was narrowed down to FWHM of < 0.2 nm by employing a 1.5 mm birefringent filter and a 100-μm-thick etalon inside the cavity. By directly modulating the pump laser of the VECSEL, we were able to produce pulse widths down to 570 ns with average and peak output power of 81 mW and 14 W, respectively. The repetition rate was kept constant at 10 kHz throughout the measurements. The maximum peak power obtained was pump power limited. In comparison, at the same coolant temperature, a maximum of 8.5 W was achieved in continuous wave. The maximum optical-to-optical conversion efficiency (absorbed peak pump power to peak output power) was calculated to be 20-21 %.

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Review of railway track applications of Barkhausen noise and other magnetic testing methods

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Civil Engineering, Department of Materials Science, Engineering materials science and solutions (EMASS), Life Cycle Effectiveness of the Built Environment (LCE@BE)
Authors: Santa-aho, S., Sorsa, A., Numikolu, A., Vippola, M.
Number of pages: 7
Pages: 657-663
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Insight
Volume: 56
Issue number: 12
ISSN (Print): 1354-2575
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.362 0.584
Publication Forum (2016): 1
Scopus rating (2015): 0.3 0.666
Web of Science (2015): 0.536 0.581 8.3 0.081 0.00112 0.211
Publication Forum (2015): 1
Scopus rating (2014): 0.402 0.629
Web of Science (2014): 0.535 0.562 8.5 0.058 0.00105 0.191
Publication Forum (2014): 1
Scopus rating (2013): 0.44 0.87
Publication Forum (2013): 1
Scopus rating (2012): 0.37 0.675
Publication Forum (2012): 1
Scopus rating (2011): 0.349 0.748
Scopus rating (2010): 0.417 0.882
Scopus rating (2009): 0.39 0.8
Scopus rating (2008): 0.382 0.752
Scopus rating (2007): 0.413 0.787
Scopus rating (2006): 0.48 0.692
Scopus rating (2005): 0.414 0.865
Scopus rating (2004): 0.387 0.843
Scopus rating (2003): 0.462 0.778
Scopus rating (2002): 0.271 0.915
Review on Liquid Flame Spray in paper converting: Multifunctional superhydrophobic nanoparticle coatings

Wettability of a solid surface by a liquid plays an important role in several phenomena and applications, for example in adhesion, printing, and coating. Especially, wetting of rough surfaces has attracted a considerable scientific interest in recent decades. Superhydrophobic surfaces, which possess extraordinary water repellency properties due to their low surface energy chemistry and specific nano- and microscale roughness, are of particular interest due to the great variety of potential applications ranging from self-cleaning surfaces to microfluidic devices. Here we examine functional superhydrophobic and superhydrophilic nanoparticle coatings fabricated by liquid flame spray (LFS) on cellulose-based substrate materials. The article is a review of earlier papers with some new results and conclusions added. LFS has proved itself straightforward and versatile one-step method to fabricate broad range of functional nanoparticle coatings on various substrate materials in an atmospheric roll-to-roll process. It has established itself among the most potential candidates for large-scale production of superhydrophobic coatings on affordable cellulose-based substrates.

General information
State: Published
Ministry of Education publication type: A2 Review article in a scientific journal
Organisations: Department of Materials Science, Department of Physics, Research area: Aerosol Physics, Research group: Aerosol Synthesis, Engineering materials science and solutions (EMASS)
Authors: Teisala, H., Tuominen, M., Haapanen, J., Aromaa, M., Stepien, M., Mäkelä, J. M., Saarinen, J. J., Toivakka, M., Kuusipalo, J.
Keywords: (Cellulose, Functional coating, Liquid flame spray, Nanoparticle coating, Review, Superhydrophobic)
Number of pages: 13
Pages: 747-759
Publication date: 2014
Peer-reviewed: Yes

Publication information
Volume: 29
Issue number: 4
ISSN (Print): 0283-2631
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.385 0.652
Publication Forum (2016): 1
Scopus rating (2015): 0.375 0.787
Web of Science (2015): 1.062 0.918 8.8 0.457 0.00134 0.235
Publication Forum (2015): 1
Scopus rating (2014): 0.444 0.823
Web of Science (2014): 1.016 0.927 8.4 0.775 0.00126 0.224
Publication Forum (2014): 1
Scopus rating (2013): 0.389 0.684
Publication Forum (2013): 1
Scopus rating (2012): 0.628 1.281
Publication Forum (2012): 1
Scopus rating (2011): 0.582 0.902
Scopus rating (2010): 0.658 0.764
Scopus rating (2009): 1.167 0.984
Rolling-sliding wear of nodular cast iron followers against wire ropes

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Materials Science
Authors: Oksanen, V., Valtonen, K., Andesson, P., Vaajoki, A., Laukkanen, A., Holmberg, K., Kuokkala, V.
Number of pages: 6
Pages: 1-6
Publication date: 2014

Host publication information
Title of host publication: The 16th Nordic Symposium on Tribology - NORDTRIP 2014, 10th - 13th June, Aarhus, Denmark
Publisher: Danish technological institute
ISBN (Print): 978-87-92765-26-0

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-12-02
Source: researchoutputwizard
Source-ID: 1189
Research output: Scientific › Conference contribution

Rubber Nanocomposites

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology
Authors: Das, A., Basu, D., Heinrich, G.
Number of pages: 5
Pages: 1-5
Publication date: 2014

Host publication information
Title of host publication: Encyclopedia of Polymeric Nanomaterials
Place of publication: Berlin, Heidelberg
Sedimentation stability and rheological properties of ionic liquid-based bidisperse magnetorheological fluids

The sedimentation stability and rheological properties of ionic liquid-based magnetorheological fluids comprising a mixture of micron- and nano-sized particles were experimentally studied. Three different fluids with the same total particle concentration of 15 vol% were prepared for testing: one containing only microparticles and two others in which 5 or 10 wt% of the microparticles were replaced by nanoparticles. The nanoparticles were surface stabilized against oxidation. For comparison purposes, silicon oil-based magnetorheological fluids with similar solid fractions were also prepared and tested. The results indicate that, with ionic liquid as a carrier fluid, the addition of nanoparticles at 10 wt% reduces the sedimentation rate almost by an order of magnitude from that without nanoparticles, while the reduction in the dynamic yield stress is only marginal. The ionic liquid-based fluids also had a better dispersion of particles.
Selective morphologies of MgO via nanoconfinement on y-Al2O3 and reduced graphite oxide (rGO): improved CO2 capture capacity at elevated temperatures

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Zhang, X., Qui, K., Levänen, E., Guo, X. Z.
Number of pages: 7
Pages: 8825-8831
Publication date: 2014
Peer-reviewed: Yes
Semiconductor disk lasers for precision spectroscopic applications

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Optoelectronics Research Centre
Authors: Leinonen, T., Chen, M., Alford, W. J., Shirakawa, A., Fetzer, G. J., Sandolphon, A., Tavast, M., Ranta, S., Guina, M.
Number of pages: 1
Pages: 30-30
Publication date: 2014

Host publication information
Title of host publication: Optics and Photonics Days 2014, OPD2014 Proceedings, 20-22 May, 2014, Turku, Finland
Publisher: Finnish Optical Society
ISBN (Print): 978-952-12-3055-4

Publication series
Name: Optics and Photonics Days

Bibliographical note
Invited talk

Semiconductor disk laser with a semiconductor dielectric-metal mirror

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Research group: Ultrafast and intense lasers, Research group: Surface Science, Frontier Photonics
Authors: Rantamäki, A., Saarinen, E. J., Lyytikäinen, J., Lahtonen, K., Valden, M., Okhotnikov, O. G.
Number of pages: 1
Pages: 1-1
Publication date: 2014

Host publication information
Title of host publication: 16th International Conference on Laser Optics 2014, June 30 - July 4, 2014, St. Petersburg, Russia
Publisher: IEEE
ISBN (Print): 978-1-4799-3884-1
ISBN (Electronic): 978-1-4799-3885-8

Publication series
Name: International Conference on Laser Optics
DOIs: 10.1109/LO.2014.6886292

Bibliographical note
Talk TuR3-16

Research output: Scientific - peer-review › Article
Sequential stress combinations in product level reliability testing of industrial electronics

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electrical Engineering
Authors: Pippola, J., Marttila, T., Frisk, L.
Number of pages: 5
Pages: 738-742
Publication date: 2014

Host publication information
Title of host publication: The 16th Electronics Packaging Technology Conference, EPTC 2014, 3-5 December 2014, Marina Bay Sands, Singapore
Place of publication: Piscataway, NJ
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4799-6994-4
Links:
http://www.eptc-ieee.net/

Bibliographical note
Contribution: organisation=dee,FACT1=1<br/>Portfolio EDEND: 2014-12-30
Source: researchoutputwizard
Source-ID: 1277
Research output: Scientific - peer-review › Conference contribution

SESAM Mode-Locked Red Praseodymium Laser

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Gaponenko, M., Metz, P., Härkönen, A., Heuer, A., Leinonen, T., Guina, M., Südmeyer, T., Huber, G., Kränkel, C.
Number of pages: 3
Pages: 6939-6941
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Optics Letters
Volume: 39
Issue number: 24
ISSN (Print): 0146-9592
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.864 1.658
Publication Forum (2016): 2
Scopus rating (2015): 2.142 1.642
Web of Science (2015): 3.04 2.97 6.8 0.717 0.11996 0.971
Publication Forum (2015): 2
Scopus rating (2014): 2.497 2.056
Web of Science (2014): 3.292 3.208 6.6 0.798 0.12713 1.041
Publication Forum (2014): 2
Scopus rating (2013): 2.458 2.095
Publication Forum (2013): 2
Scopus rating (2012): 2.596 1.95
Publication Forum (2012): 2
Scopus rating (2011): 2.518 2.475
Scopus rating (2010): 2.669 2.293
Silane-modified substratum improves cell attachment of human embryonic stem cell-derived retinal pigment epithelial cells

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Electronics and Communications Engineering, Research group: Biomaterials and Tissue Engineering Group, Optoelectronics Research Centre, Research group: Surface Science, Univ Tampere, University of Tampere, BioMediTech, BMT FM5, BioMediTech
Authors: Juuti-Uusitalo, K., Sorkio, A. E., Käpylä, E. M. K., Teymouri, S., Lahtonen, K. T., Vuori, A. M., Valden, M. O., Skottman, H., Kellomäki, M. A. E.
Pages: 3996
Publication date: 2014

Host publication information
Title of host publication: Investigative Ophthalmology & Visual Science
Volume: 55
Publisher: Association for Research in Vision and Ophthalmology
Edition: 13
Article number: 3996 - D0055
ISBN (Print): 0146-0404
ISBN (Electronic): 1552-5783
Links:
http://iovs.arvojournals.org/article.aspx?articleid=2269472&resultClick=1

Bibliographical note
xabstract
Research output: Scientific › Conference contribution

Single-frequency 1178 nm SDL/Yb-PBGF MOPA with an output power of 31 W

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Leinonen, T., Chen, M., Fan, X., Kantola, E., Shirakawa, A., Guina, M.
Number of pages: 6
Pages: 1-6
Publication date: 2014

Host publication information
Single site-controlled quantum dot in micropillar cavity

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Optoelectronics Research Centre
Authors: Hakkarainen, T. V., Tommila, J., Belykh, V., Heinonen, E., Schramm, A., Guina, M.
Number of pages: 1
Pages: 17-17
Publication date: 2014

Host publication information
Title of host publication: Optics and Photonics Days 2014, OPD2014 Proceedings, 20-22 May, 2014, Turku, Finland
Publisher: Finnish Optical Society
ISBN (Print): 978-952-12-3055-4

Publication series
Name: Optics and Photonics Days

Bibliographical note
Contribution: organisation=orc,FACT1=1<br/>Oral, Session 3, Integrated optics<br/>Portfolio EDEND: 2014-10-24<br/>Publisher name: Finnish Optical Society
Source-ID: 393
Research output: Scientific - peer-review › Conference contribution

Sliding Wear of Quartzite and Granite Surfaces

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Materials Science
Authors: Heino, V., Valtonen, K., Kuokkala, V.
Number of pages: 6
Publication date: 2014

Host publication information
Title of host publication: The 16th Nordic Symposium on Tribology - NORDTRIB 2014, 10th - 13th June, Aarhus, Denmark
Publisher: Danish technological institute
ISBN (Print): 978-87-92765-26-0

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-12-18
Slurry pot investigation of the influence of erodent characteristics on the erosion resistance of austenitic and duplex stainless steel grades

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science
Authors: Lindgren, M., Perolainen, J.
Number of pages: 11
Pages: 38-48
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Wear
Issue number: 319
ISSN (Print): 0043-1648
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.558 2.071
Publication Forum (2016): 1
Scopus rating (2015): 1.527 2.017
Web of Science (2015): 2.323 2.395 >10.0 0.37 0.01794 0.645
Publication Forum (2015): 1
Scopus rating (2014): 1.715 2.38
Web of Science (2014): 1.913 2.109 >10.0 0.347 0.01937 0.601
Publication Forum (2014): 2
Scopus rating (2013): 1.319 2.416
Publication Forum (2013): 2
Scopus rating (2012): 1.36 2.178
Publication Forum (2012): 2
Scopus rating (2011): 1.547 2.865
Scopus rating (2009): 1.684 2.07
Scopus rating (2008): 1.597 1.863
Scopus rating (2007): 1.286 1.889
Scopus rating (2006): 1.435 2.036
Scopus rating (2005): 1.473 2.007
Scopus rating (2004): 1.335 1.965
Scopus rating (2003): 1.104 1.788
Scopus rating (2002): 0.958 1.365
Scopus rating (2001): 0.937 1.47
Scopus rating (2000): 1.069 1.149
Scopus rating (1999): 0.848 1.338
Original language: English
DOIs: 10.1016/j.wear.2014.07.006

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-10-30<br/>Publisher name: Elsevier
Stakeholders’ perspectives Shok’n´ Roll - from Science to Solutions

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Materials Science
Authors: Kuokkala, V.
Number of pages: 2
Publication date: 2014

Publication information
Place of publication: Tampere
Publisher: Fimecc
ISBN (Print): 978-952-238-132-3
ISBN (Electronic): 978-952-238-133-0
Original language: English

Publication series
Name: Fimecc Publications Series
No.: 3
ISSN (Print): 2342-2688
ISSN (Electronic): 2342-2696
Links:
http://hightech.fimecc.com/system/attachments/files/000/000/027/original/FIMECC_LIGHT.pdf?1414761940

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-12-31<br/>Publisher name: Fimecc
Source: researchoutputwizard
Source-ID: 831
Research output: Professional › Commissioned report

Strain-induced martensitic transformation in EN 1.4318 during successive high and low strain rate loadings

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Materials Science
Authors: Isakov, M., Östman, K., Kuokkala, V.
Number of pages: 4
Pages: 1-3
Publication date: 2014

Host publication information
Title of host publication: Proceedings of the 4th International Conference on Impact Loading of Lightweight Structures (ICILLS 2014), Cape Town, South Africa, January 12-16, 2014
Links:
http://icills2014.org/?page_id=519

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-10-30
Source: researchoutputwizard
Source-ID: 543
Research output: Scientific › Conference contribution

Surface modification of thin film composite polyamide membrane using atomic layer deposition method

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Nikkola, J., Sievänen, J., Raulio, M., Jing, W., Vuorinen, J., Tang Y., C.
Number of pages: 7
Pages: 174-180
Publication date: 2014
Peer-reviewed: Yes
Surface Modifications and Analysis Methods at Molecular Level

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Research group: Surface Science, Department of Physics, Research group: Ultrafast and intense lasers, Research group: Nanophotonics
Publication date: 2014

Host publication information
Title of host publication: Abstracts of the 28th International Conference on Surface Modification Technologies, STM28, Tampere University of Technology, Tampere, Finland, June 16-18, 2014
Place of publication: Tampere
Publisher: Tampere University of Technology
Links:
Surface Processing of Zirconia Ceramics by Laser
The aim of this study was to investigate phase transformations and glazing of zirconia bulk ceramic as a function of laser processing parameters. Zirconia-based ceramics have good material properties for a variety of applications. The main advantage of zirconia compared to other structural ceramics, like silicon-based ceramics and alumina, is its high fracture toughness (typically over 10MPa√m). This property is largely based on partial stabilization of zirconia, where a portion of the material is in metastable phase, enabling instantaneous phase transformation under mechanical load. This consumes energy otherwise provided to crack propagation. The stable phase of zirconia to exist in room temperature is monoclinic; therefore a rapid cycle of heating and cooling is necessary for achieving metastable tetragonal phase. Pulsed laser processing offers just the right type of thermal cycle for the aforementioned phase transformation to occur. In this study a nanosecond pulsed laser was used for surface processing of zirconia ceramic blocks.

During laser processing high energy can be concentrated into small area, causing sudden local heating, which in turn causes material to melt and vaporize instantly. However, heat dissipation remains small due to the short pulse length, leading to the desirable cycle. Temperatures in the process correlate with several parameters: pulse width, peak energy, repetition rate, pulse overlap, material properties and wavelength. Zirconia is a tough material to process in terms of material removal with laser ablation, since it tends to melt rather than evaporate.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mechanical Engineering and Industrial Systems, Department of Materials Science, Research group: Ceramic materials, Research group: Laser, Research area: Manufacturing and Automation, Tampere University of Technology
Authors: Kumpulainen, T., Ismailov, A., Hyvärinen, L., Levänen, E., Vihinen, J.
Keywords: (Laser, Zirconia, Ceramic)
Number of pages: 10
Pages: 275-284
Publication date: 2014

Host publication information
Title of host publication: Proceedings of the Twenty Eighth International Conference on Surface Modification Technologies
ISBN (Print): 978-81-926196-1-3
Electronic versions:
surface_processing_of_zirconia
Links:

Bibliographical note
ORG=mol,0.5
ORG=mei,0.5
AUX=orc,"Hyvärinen, L."
Research output: Scientific - peer-review › Conference contribution

Surface segregation of microalloying elements on Ti–Nb stabilized FeCr alloy

General information
State: Published
Ministry of Education publication type: B2 Part of a book or another research book
Organisations: Optoelectronics Research Centre, Research group: Surface Science
Authors: Ali-Löytty, H., Hannula, M., Valden, M.
Number of pages: 2
Pages: 1-2
Publication date: 2014

Host publication information
Title of host publication: Max-Lab Activity Report 2013. Reports 2013 Synchrotron Radiation. Beamline I311-XPS
Place of publication: Lund, Sweden
Publisher: MAX-LAB
Links:
Suurien muovituotteiden valmistus; Tietoisku

General information
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Materials Science
Authors: Järvelä, P.
Number of pages: 2
Pages: 30-31
Publication date: 2014
Peer-reviewed: Unknown

Publication information
Journal: Muovi - Plast
Issue number: 3
ISSN (Print): 0788-8430
Original language: Finnish

Synthesis and Characterization of Layered Tin Monoxide Thin Films with Monocrystalline Structure on III-V Compound Semiconductor

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Frontier Photonics
Number of pages: 5
Pages: 1-5
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Advanced Materials Interfaces
Volume: 1
Issue number: 2
ISSN (Print): 2196-7350
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.451 0.819
Publication Forum (2016): 1
Scopus rating (2015): 1.131 0.63
Web of Science (2015): 3.365 3.365 1.4 0.758 0.00261 1.013
Publication Forum (2015): 1
Publication Forum (2014): 1
Original language: English
DOIs:
10.1002/admi.201300022
Synthesis of carbon nanotubes on $\text{Fe}_x\text{O}_y$ doped $\text{Al}_2\text{O}_3$–$\text{ZrO}_2$ nanopowder

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Aerosol Physics, Department of Materials Science, Department of Physics, Research group: Materials Characterization, Engineering materials science and solutions (EMASS)
Number of pages: 7
Pages: 106-112
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Powder Technology
Volume: 266
ISSN (Print): 0032-5910
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.983 1.482
Publication Forum (2016): 1
Scopus rating (2015): 0.965 1.598
Web of Science (2015): 2.759 2.825 6.3 0.582 0.0252 0.587
Publication Forum (2015): 1
Scopus rating (2014): 0.89 1.649
Web of Science (2014): 2.349 2.437 6.2 0.605 0.02185 0.538
Publication Forum (2014): 2
Scopus rating (2013): 0.901 1.875
Publication Forum (2013): 2
Scopus rating (2012): 0.854 1.826
Publication Forum (2012): 2
Scopus rating (2011): 0.921 1.86
Scopus rating (2010): 0.94 1.547
Scopus rating (2009): 0.98 1.65
Scopus rating (2008): 0.911 1.597
Scopus rating (2007): 0.854 1.316
Scopus rating (2006): 1.118 1.324
Scopus rating (2005): 1.253 1.399
Scopus rating (2004): 0.867 1.341
Scopus rating (2003): 1.348 1.489
Scopus rating (2001): 1.11 1.292
Scopus rating (2000): 0.925 1.196
Scopus rating (1999): 0.614 1.201
Original language: English
DOIs:
10.1016/j.powtec.2014.06.020

Bibliographical note
Contribution: organisation=mol,FACT1=0.6<br/>Contribution: organisation=fys,FACT2=0.4<br/>Portfolio EDEND: 2014-09-30<br/>Publisher name: Elsevier
**Tampere Wear Center panostaa kulumistutkimukseen**

**General information**
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Materials Science
Authors: Valtonen, K.
Number of pages: 2
Pages: 22-23
Publication date: 2014
Peer-reviewed: Unknown

**Publication information**
Journal: Ohutlevy-lehti
Issue number: 2
ISSN (Print): 1239-4122
Original language: Finnish
Links:
http://www.ohutlevy.com

**Bibliographical note**
Contribution: organisation=mol,FACT1=1
Portfolio EDEND: 2014-12-31
Publisher name: Teknologiateollisuus
Source: researchoutputwizard
Source-ID: 1696
Research output: Professional › Article

**Teknisten tekstiilien tulevaisuus; Osa 1. Kasvunäkymät ja yleiskatsaus**

**General information**
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Materials Science
Authors: Nousiainen, P.
Number of pages: 2
Pages: 24-25
Publication date: 2014
Peer-reviewed: Unknown

**Publication information**
Journal: Tekstiililehti
Issue number: 3
ISSN (Print): 0040-2370
Original language: Finnish

**Bibliographical note**
Contribution: organisation=mol,FACT1=1
Portfolio EDEND: 2014-06-26
Publisher name: Suomen tekstiiliteknillinen liitto
Source: researchoutputwizard
Source-ID: 1156
Research output: Professional › Article

**Tekstiilien testaus on olemuksen osa tekstiilidiplomi-insinöörin koulutusta**

**General information**
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Materials Science
Authors: Puolakka, A., Rissanen, M., Varheenmaa, M.
Number of pages: 1
Pages: 14-14
The effect of test parameters in the impact resistance of a stainless steel/rubber/composite hybrid structure

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Computational Science X (CompX), Engineering materials science and solutions (EMASS)
Authors: Sarlin, E., Lindroos, M., Apostol, M., Kuokkala, V., Vuorinen, J., Lepistö, T., Vippola, M.
Number of pages: 7
Pages: 469-475
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Composite Structures
Volume: 113
ISSN (Print): 0263-8223
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 2.13 2.033
Publication Forum (2016): 2
Scopus rating (2015): 2.247 2.236
Web of Science (2015): 3.853 3.874 5.5 0.738 0.02985 0.909
Publication Forum (2015): 2
Scopus rating (2014): 2.331 2.524
The effects of UV irradiation to polyetheretherketone fibres: Characterization by different techniques

The effects of UV irradiation on polyetheretherketone (PEEK) fibres were investigated in this study. PEEK fibres were manufactured with a melt spinning system and then artificially aged with simulated solar UV light. Fibres were then characterized by mechanical tests, Fourier transform infrared spectroscopy (FTIR), differential scanning calorimetry (DSC), rheology, thermogravimetric analysis (TGA) and scanning electron microscopy (SEM). PEEK, best known for its excellent thermal stability, suffered greatly from the effects of UV irradiation. The low UV stability manifested as embrittlement of the fibres in the mechanical tests, increased crosslinking rate in the rheological tests, formation of carbonyl and hydroxyl groups and changes in the nature of the carbon-hydrogen bonds in the FTIR, diminished thermal properties in TGA, and transverse cracks in the SEM photos. DSC was found to be an inaccurate technique for estimating the degradation level of PEEK fibres, whereas the carbonyl index measured by FTIR was found to be the most convenient technique. © 2014 Elsevier Ltd. All rights reserved.
Thermally grown oxide films and corrosion performance of ferritic stainless steels under simulated exhaust gas condensate conditions

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Huttunen-Saarivirta, E., Kuokkala, V., Pohjanne, P.
Number of pages: 22
Pages: 344-365
Thermal spray coating processes

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Vuoristo, P.
Pages: 229-276
Publication date: 2014

Host publication information
Title of host publication: Comprehensive materials processing, 1st edition Volume 4: Coatings and films
Publisher: Elsevier
Editor: Cameron, D.
The role of surface modification by photosphating in corrosion protection of sintered Nd-Fe-B magnets

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Materials Science, Research group: Materials Characterization
Authors: Isotahdon, E., Huttunen-Saarivirta, E., Kuokkala, V.
Number of pages: 10
Publication date: 2014

Host publication information
Title of host publication: EUROCORR 2014 European Corrosion Congress, 8-12 September 2014 Pisa Italy
Place of publication: Frankfurt am Main
Publisher: DECHEMA and AIM - Associazione Italiana
ISBN (Print): 978-3-89746-159-8

Topically applied ZnO nanoparticles suppress allergen induced skin inflammation but induce vigorous IgE production in the atopic dermatitis mouse model

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Ilves, M., Palomäki, J., Vippola, M., Lehto, M., Savolainen, K., Savinko, T., Alenius, H.
Number of pages: 12
Tribological behavior of HVOF- and HVAF-sprayed composite coatings based on Fe-Alloy + WC-12% Co
Scopus rating (2016): 0.874 1.359
Publication Forum (2016): 1
Scopus rating (2015): 0.871 1.415
Web of Science (2015): 2.139 2.417 8.5 0.402 0.0356 0.527
Publication Forum (2015): 1
Scopus rating (2014): 0.998 1.681
Web of Science (2014): 1.998 2.374 8.2 0.307 0.0347 0.517
Publication Forum (2014): 2
Scopus rating (2013): 1.057 1.859
Publication Forum (2013): 2
Scopus rating (2012): 1.049 1.658
Publication Forum (2012): 2
Scopus rating (2011): 1.053 1.851
Scopus rating (2010): 1.155 1.66
Scopus rating (2008): 1.479 1.564
Scopus rating (2007): 1.165 1.509
Scopus rating (2006): 1.276 1.709
Scopus rating (2005): 1.252 1.666
Scopus rating (2004): 1.269 1.498
Scopus rating (2003): 1.276 1.516
Scopus rating (2002): 1.208 1.183
Scopus rating (2001): 1.115 1.181
Scopus rating (2000): 0.981 1.03
Scopus rating (1999): 1.062 1.167
Original language: English
DOIs:
10.1016/j.surfcoat.2014.03.037

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-06-26<br/>Publisher name: Elsevier
Source: researchoutputwizard
Source-ID: 181
Research output: Scientific - peer-review › Article

Tribological Testing and Modelling of Elastomeric Materials

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Vaajoki, A., Laukkanen, A., Waudby, R., Kivikytö-Reponen, P., Valtonen, K., Kuokkala, V.
Number of pages: 4
Pages: 87-90
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Key Engineering Materials
Volume: 604
ISSN (Print): 1013-9826
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.163 0.253
Publication Forum (2016): 1
Scopus rating (2015): 0.171 0.228
Publication Forum (2015): 1
Scopus rating (2014): 0.212 0.349
Ultrahigh precision nonlinear reflectivity measurement system for saturable absorber mirrors with self-referenced fluence characterization

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Orsila, L., Härkönen, A., Hyyti, J., Guina, M., Steinmeyer, G.
Number of pages: 4
Pages: 4384-4387
Publication date: 2014
Peer-reviewed: Yes

Publication Information
Journal: Optics Letters
Volume: 39
Issue number: 15
ISSN (Print): 0146-9592
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.864 1.658
Publication Forum (2016): 2
Scopus rating (2015): 2.142 1.642
Web of Science (2015): 3.04 2.97 6.8 0.717 0.11996 0.971
Publication Forum (2015): 2
Scopus rating (2014): 2.497 2.056
Web of Science (2014): 3.292 3.208 6.6 0.798 0.12713 1.041
Publication Forum (2014): 2
Scopus rating (2013): 2.458 2.095
Utilization of Frequency-Domain Information of Barkhausen Noise Signal in Quantitative Prediction of Material Properties

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Santa-aho, S., Vippola, M., Lepistö, T., Sorsa, A., Leiviskä, K.
Number of pages: 8
Pages: 1256-1263
Publication date: 2014

Host publication information
Publisher: American Institute of Physics
ISBN (Print): 978-073541211-8

Publication series
Name: AIP Conference Proceedings
Publisher: American Institute of Physics
Volume: 1581
ISSN (Print): 0094-243X
ISSN (Electronic): 1551-7616
DOIs: 10.1063/1.4864965

Bibliographical note
Contribution: organisation=orc,FACT1=1<br/>Portfolio EDEND: 2014-08-06<br/>Publisher name: Optical Society of America
Source: researchoutputwizard
Source-ID: 1198
Research output: Scientific › peer-review › Article
Vanerin pinnoittaminen muovilla

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Materials Science
Authors: Järvelä, P., Järvelä, P.
Number of pages: 10
Publication date: 2014

Publication information
Publisher: Lahden ammattikorkeakoulun julkaisusarjat
ISBN (Print): 978-951-827-198-0
Original language: Finnish

Publications
Name: Lahden ammattikorkeakoulun julkaisusarjat
Publisher: Lahden ammattikorkeakoulun julkaisusarjat
No.: 150
ISSN (Print): 1457-8328

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-06-26
Source: researchoutputwizard
Source-ID: 581
Research output: Professional › Commissioned report

Wafer-fused VECSELs emitting in the 1310nm waveband

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Frontier Photonics
Number of pages: 8
Pages: 1-8
Publication date: 2014

Host publication information
Title of host publication: Photonics West 2014, Vertical External Cavity Surface Emitting Lasers (VECSELs) IV, February 1-6, 2014, San Fransisco, CA, USA. Proceedings of SPIE
Publisher: SPIE
ISBN (Print): 978-0-8194-9879-3

Publication series
Name: SPIE Conference Proceedings
Volume: 8966
ISSN (Print): 0277-786X
DOIs: 10.1117/12.2039692

Bibliographical note
Invited Paper<br/>Contribution: organisation=orc,FACT1=1<br/>Portfolio EDEND: 2014-04-29<br/>Publisher name: SPIE - International Society for Optical Engineering
Source: researchoutputwizard
Source-ID: 1518
Research output: Scientific - peer-review › Conference contribution

Wafer fused, wavelength controlled 1300 nm vertical external cavity surface emitting lasers

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Research group: Ultrafast and intense lasers, École Polytechnique Fédérale de Lausanne, Laboratory of Physics of Nanostructures, CH-1015 Lausanne, Switzerland
Wear modelling and material testing of elastomers

General information
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Materials Science
Authors: Kivikytö-Reponen, P., Laukkanen, A., Valtonen, K., Apostol, M.
Number of pages: 3
Pages: 27-29
Publication date: 2014
Peer-reviewed: Unknown

Publication information
Journal: Kumiviesti
Issue number: 1
Original language: English
Links:
 http://www.teknikum.com/yritys/kumiviestit

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-12-31<br/>Publisher name: Teknikum-yhtiöt
Source: researchoutputwizard
Source-ID: 731
Research output: Professional › Article

Yarn to Fabric: Intelligent Textiles

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Materials Science
Authors: Mattila, H.
Number of pages: 22
Pages: 355-376
Publication date: 2014

Host publication information
Title of host publication: Textiles and Fashion, Materials, Design and Technology
Publisher: Woodhead Publishing
Editor: Sinclair, R.
ISBN (Print): 978-1-84569-931-4

Publication series
Name: Woodhead Publishing Series in Textiles
Publisher: Woodhead Publishing
DOIs:
10.1016/B978-1-84569-931-4.00015-5

Bibliographical note
Available online 19 November 2014<br/>Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-12-30
Source: researchoutputwizard
Source-ID: 1055
Research output: Scientific - peer-review › Chapter
The effect of test parameters on large particle slurry erosion testing

Understanding the effect of testing parameters is important for getting the test environment as close as possible to real applications and for understanding the processes that are involved in the testing itself. A pin mill type slurry-pot wear tester was developed for heavy-duty testing with high speed and large abrasive size [1]. This study focuses on the effect of different testing parameters on large particle slurry testing. Parameters such as rotation speed of the samples, particle size and slurry concentration were varied.

Round steel samples and slurry with water and granite gravel were used for testing. The test parameter variations were 4 to 10 mm for granite particle size, up to 23 wt% for slurry concentration and up to 20 m/s for sample tip speed. The relationship between the particle size, slurry concentration, and the amount of particles are discussed. Also the role of the kinetic energy of the abrasive particles is considered for large particle sizes.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Materials Science, Research group: Materials Characterization
Authors: Ojala, N., Valtonen, K., Siitonen, P., Kuokkala, V.
Keywords: (Slurry erosion, high speed slurry-pot, pin mill, particle size)
Number of pages: 8
Publication date: 19 Mar 2013

Host publication information
Title of host publication: 3rd International Tribology Symposium of IFToMM
Place of publication: Luleå, Sweden
ASJC Scopus subject areas: Metals and Alloys, Polymers and Plastics

Publication series
Name: Tribology - Materials, Surfaces & Interfaces
Volume: 8
No.: 2
ISSN (Print): 1751-5831
Electronic versions:
Paper for ITS 2013_Niko Ojala
Links:
http://urn.fi/URN:NBN:fi:tty-201606204287
Research output: Scientific - peer-review › Conference contribution

1180 nm VECSEL with output power beyond 20 W

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Ranta, S., Tavast, M., Leinonen, T., Van Lieu, N., Fetzer, G., Guina, M.
Number of pages: 2
Pages: 59-60
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Electronics Letters
Volume: 49
Issue number: 1
ISSN (Print): 0013-5194
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.442 0.882
Publication Forum (2016): 1
Scopus rating (2015): 0.497 1.011
Web of Science (2015): 0.854 0.914 >10.0 0.114 0.02494 0.354
Publication Forum (2015): 1
Scopus rating (2014): 0.522 1.061
1.56 μm 1 watt single frequency semiconductor disk laser

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Rantamäki, A., Rautiainen, J., Sirbu, A., Mereuta, A., Kapon, E., Okhotnikov, O. G.
Number of pages: 6
Pages: 2355-2360
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Optics Express
Volume: 21
Issue number: 2
ISSN (Print): 1094-4087
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.487 1.589
Publication Forum (2016): 2
Web of Science (2015): 3.148 3.25 4.8 0.72 0.22975 0.967
Publication Forum (2015): 2
Scopus rating (2014): 2.349 2.166
Web of Science (2014): 3.488 3.499 4.4 0.727 0.24951 1.052
Publication Forum (2014): 2
Scopus rating (2013): 2.358 2.226
1 Watt from 1.56 µm Single Frequency Semiconductor Disk Laser

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre
Authors: Rantamäki, A., Rautiainen, J., Sirbu, A., Mereuta, A., Kapon, E., Okhotnikov, O. G.
Number of pages: 1
Pages: 1-1
Publication date: 2013

Host publication information
Title of host publication: 2013 Conference on Lasers and Electro-Optics Europe and International Quantum Electronics Conference, CLEO/EUROPE - IQEC 2013, 12-16 May 2013, Munich, Germany
Place of publication: Piscataway, NJ
Publisher: IEEE

Publication series
Name: European Conference on Lasers and Electro-Optics and the International Quantum Electronics Conference

Bibliographical note
Contribution: organisation=orc,FACT1=1<br/>Portfolio EDEND: 2013-09-29<br/>Publisher name: IEEE
Source: researchoutputwizard
Source-ID: 3226
Research output: Scientific - peer-review › Conference contribution

Actively Mode-Locked Semiconductor Disk Laser Using Vertical Cavity Modulator

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Rautiainen, J., Rantamäki, A., Tavast, M., Okhotnikov, O. G.
An in vitro study of composites of poly(L-lactide-co-ε-caprolactone), β-tricalcium phosphate and ciprofloxacin intended for local treatment of osteomyelitis

Osteomyelitis is a bacterial disease that can become chronic, and treatment often includes a surgical operation to remove infected bone. The aim of this study was to develop and investigate in vitro bone filling composite materials that release ciprofloxacin to kill any remaining bacteria and contain bioceramic to help the bone to heal. Three composites of poly(L-lactide-co-ε-caprolactone), β-tricalcium phosphate and ciprofloxacin were compounded using twin-screw extrusion and sterilized by gamma irradiation. Drug release and degradation of the composites were investigated in vitro for 52 weeks. The composite with 50 wt% of β-TCP had the most promising ciprofloxacin release profile. The ceramic component accelerated the drug release that occurred in three phases obeying first-order kinetics. Inhibition zone testing using bioluminescence showed that the released ciprofloxacin had effect in eradicating a common osteomyelitis causing bacteria Pseudomonas aeruginosa. During the in vitro degradation test series, molar weight of the polymer matrix of the composites decreased rapidly. Additionally, 1H-NMR analysis showed that the polymer had blocky structure and the comonomer ratio changed during hydrolysis. The tested composites showed great potential to be developed into bone filler materials for the treatment of osteomyelitis or other bone related infections.
Control of the absorption recovery time in GaSb SESAMs

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Paajaste, J., Suomalainen, S., Härkönen, A., Griebner, G., Steinmeyer, G., Guina, M.
Number of pages: 1
Pages: 1-1
Publication date: 2013

Host publication information
Title of host publication: 2013 Conference on Lasers and Electro-Optics Europe and International Quantum Electronics Conference, CLEO/EUROPE - IQEC 2013, 12-16 May 2013, Munich, Germany
Place of publication: Piscataway, NJ
Publisher: IEEE

Publication series
Name: European Conference on Lasers and Electro-Optics and the International Quantum Electronics Conference

Bibliographical note
Contribution: organisation=elt,FACT1=0.7<br/>Portfolio EDEND: 2013-07-29<br/>Publisher name: Landes Bioscience
Source: researchoutputwizard
Source-ID: 1886
Research output: Scientific - peer-review Article

Department of Materials Science, Paper Converting and Packaging Technology

General information
State: Published
Organisations: Department of Materials Science, Research group: Paper Converting and Packaging
Authors: Lahti, J.
Publication date: 2013
Peer-reviewed: Unknown
Event: Paper presented at 14th TAPPI. European Place Conference 6-8 May 2013 Swissotel Dresden, Germa,

Bibliographical note
poster
Research output: Scientific Poster, Paper, poster or abstract

Effect of neutron irradiation on the capacitance hysteresis in GaAs Schottky diodes with self-assembled InAs quantum dots

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Augmented Human Activities (AHA), Frontier Photonics
Authors: Gubanov, A., Schramm, A., Polojarvi, V., Guina, M.
Number of pages: 5
Pages: 1-5
Effects of 7-MeV electron irradiation on photoluminescence from 1-eV GaInNAs-on-GaAs epilayers
Enhancement in photoluminescence from 1 eV GaInNAs epilayers subject to 7 MeV electron irradiation

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Pavelecsu, E., Kudrawiec, R., Baltateanu, N., Spanulescu, S., Dumitrescu, M., Guina, M.
Number of pages: 5
Pages: 1-5
Publication date: 2013
Peer-reviewed: Yes
Formation of surface layers during laser cladding using a powerful fiber laser

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science
Authors: Zemljakov, E., Tuominen, J., Pozdeeva, E., Turichin, G., Komarova, E.
Number of pages: 6
Pages: 231-236
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Nauchno-Tekhnicheskiye Vedomosti
ISSN (Print): 1994-2354
Ratings:
Publication Forum (2017): 0
Publication Forum (2016): 0
Publication Forum (2015): 0
Original language: Russian
Electronic versions:
GaAs n-i-p-i solar cells with ion implanted selective contacts

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Royall, B., Mazzucato, S., Ketlhwaafetse, R., Balkan, N., Puustinen, J., Guina, M., Smith, A.
Number of pages: 4
Pages: 581-584
Publication date: 2013
Peer-reviewed: Yes

Publication information
Volume: 10
Issue number: 4
ISSN (Print): 1862-6351
Ratings:
Publication Forum (2014): 1
Publication Forum (2013): 1
Publication Forum (2012): 1
Original language: English
DOI: 10.1002/pssc.201200481

Bibliographical note
Contribution: organisation=orc,FACT1=1<br/>Publisher name: Wiley-VCH
Source: researchoutputwizard
Source-ID: 3292
Research output: Scientific - peer-review › Article

Growth and properties of crystalline barium oxide on the GaAs(100) substrate

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Frontier Photonics
Number of pages: 4
Pages: 1-4
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: APPLIED PHYSICS LETTERS
Volume: 103
Article number: 191601
ISSN (Print): 0003-6951
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.132 0.996
High current generation in dilute nitride solar cells grown by molecular beam epitaxy

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Aho, A., Tukiainen, A., Polojärvi, V., Salmi, J., Guina, M.
Number of pages: 6
Pages: 1-6
Publication date: 2013

Host publication information
Title of host publication: Physics, Simulation, and Photonic Engineering of Photovoltaic Devices II. SPIE Photonic West O PTO 2013, Feb 2-7, 2013, San Fransisco, CA, U.S.A.
Place of publication: Bellingham, WA
Publisher: SPIE
Article number: 8620-55
ISBN (Print): 978-0-8194-9389-7

Publication series
Name: SPIE Conference Proceedings
Volume: 8620
No.: 55
ISSN (Print): 0277-786X
DOIs:
High-efficiency yellow VECSEL with an output power of about 12 W

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Kantola, E., Leinonen, T., Ranta, S., Tavast, M., Guina, M.
Number of pages: 1
Pages: 1-1
Publication date: 2013

Host publication information
Title of host publication: 2013 Conference on Lasers and Electro-Optics Europe and International Quantum Electronics Conference, CLEO/EUROPE - IQEC 2013, 12-16 May 2013, Munich, Germany
Place of publication: Piscataway, NJ
Publisher: IEEE

Publication series
Name: European Conference on Lasers and Electro-Optics and the International Quantum Electronics Conference

Bibliographical note
Contribution: organisation=orc,FACT1=1<br/>Portfolio EDEND: 2013-09-29<br/>Publisher name: IEEE
Source: researchoutputwizard
Source-ID: 2494
Research output: Scientific - peer-review › Conference contribution