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.

General information
State: E-pub ahead of print
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Materials Science, Research group: Materials Characterization
Authors: Ojala, N., Valtonen, K., Minkkinen, J., Kuokkala, V.
Keywords: (Wear testing, Steel, Elastomers, Edge effect, Particle embedment, Mining, Mineral processing)
Number of pages: 10
Publication date: 15 Jun 2017
Peer-reviewed: Yes
ASJC Scopus subject areas: Metals and Alloys, Materials Science(all), Polymers and Plastics

Publication information
Journal: Wear
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
Electronic versions:
Ojala_Full_paper_NordTrib2016 to Wear_PRE-PRINT
DOIs:
10.1016/j.wear.2017.06.004
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

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
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, Chemistry and Bioengineering, Research group: Supramolecular photochemistry, BioMediTech, University of Tampere, BioMediTech, University of Tampere
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
Organisations: Department of Materials Science, Research group: Materials Characterization
Authors: Ojala, N.
Keywords: (Wear testing, Application oriented, Steels, Polymer, Mining, mineral processing, Field test)
Publication date: Nov 2016
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.

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Materials Science, Research group: Materials Characterization
Authors: Ojala, N., Valtonen, K., Minkkinen, J., Kuokkala, V.
Keywords: (Slurry erosion, Wear testing, Steel, Elastomers, Edge effect)
Number of pages: 13
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, Polymers and Plastics
Research output: Professional › Conference contribution
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 (\(^{1}\)H-NMR). The melt flow and thermal properties of all PEGLAs and their blends were evaluated using dynamic rheology, and differential scanning calorimeter (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.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Paper Converting and Packaging, Tampere University of Technology
Authors: Kuusipalo, J., Khajeheian, M., Kotkamo, S., Rosling, A.
Number of pages: 12
Pages: 379-390
Publication date: 3 Mar 2016
Peer-reviewed: Yes
Early online date: 3 Nov 2015

Publication information
Journal: Polymer-Plastics Technology and Engineering
Volume: 55
Issue number: 4
ISSN (Print): 0360-2559
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.389 0.57
Publication Forum (2016): 1
Scopus rating (2015): 0.481 0.66
Web of Science (2015): 1.511 1.297 4.9 0.093 0.00328 0.196
Publication Forum (2015): 1
Scopus rating (2014): 0.663 1.129
Publication Forum (2014): 1
Scopus rating (2013): 0.597 1.089
Publication Forum (2013): 1
Scopus rating (2012): 0.624 1.027
Publication Forum (2012): 1
Scopus rating (2011): 0.464 0.881
Scopus rating (2010): 0.335 0.594
Scopus rating (2009): 0.288 0.526
Scopus rating (2008): 0.277 0.559
Scopus rating (2007): 0.243 0.425
Scopus rating (2006): 0.252 0.67
Scopus rating (2005): 0.321 0.588
Scopus rating (2004): 0.305 0.679
Scopus rating (2003): 0.331 0.554
Scopus rating (2002): 0.356 0.757
Scopus rating (2001): 0.46 0.978
Scopus rating (2000): 0.253 0.536
Scopus rating (1999): 0.307 0.553
Original language: English
DOIs:
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
Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology, Department of Automation Science and Engineering, Research area: Microsystems, Outotec Research Center
Authors: Sarlin, E., Essen von, M., Lindgren, M., Kallio, P., Vuorinen, J.
Publication date: 2016

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
Authors: Sarlin, E., Essen von, M., Palola, S., Lindgren, M., Kallio, P., Vuorinen, J.
Number of pages: 8
Publication date: 2016

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.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology, Outotec Research Center, Bergman Polymer Corrosion AB, Outotec (Finland) Oy, Aalto University
Authors: Lindgren, M., Bergman, G., Kakkonen, M., Lehtonen, M., Jokinen, J., Wallin, M., Saarela, O., Vuorinen, J.
Keywords: (Composites, Environmental interaction, Failure analysis, Process-plant failures, Tank)
Pages: 117-136
Publication date: 2016
Peer-reviewed: Yes
Early online date: 17 Nov 2015
ASJC Scopus subject areas: Materials Science(all), Engineering(all)
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

General information

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology
Authors: Vaganov, G., Yudin, V., Vuorinen, J., Molchanov, E.
Pages: 2377-2383
Publication date: 2016
Peer-reviewed: Yes
Early online date: 1 Jan 2015
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., Christophliemk, H., Mikkonen, K. S.
Keywords: (Mineral oil migration; Barrier; Dispersion coating; Paperboard; Food packaging)
Pages: 173-181
Publication date: 2016
Peer-reviewed: Yes
Towards material excellence: Evaluation of Tekes' programmes on materials

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology, Virebit Oy
Authors: Timonen, J., Antikainen, M., Das, A., Sarlin, E., Vuorinen, J.
Number of pages: 61
Publication date: 2016

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

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.
Characterization of thermally aged polyetheretherketone fibres: Mechanical, thermal, rheological and chemical property changes

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: Mylläri, 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
Ratings:
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
Scopus rating (2003): 0.922 1.24
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.
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.

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), Leibniz-Institut für Polymerforschung Dresden E.V.
Authors: Das, A., Sallat, A., Böhme, F., Suckow, M., Basu, D., Wießner, S., Stöckelhuber, K. W., Voit, B., Heinrich, G.
Keywords: (bromobutyl rubbers, elastomers, ionic associations, network structures, self-healing)
Number of pages: 8
Pages: 20623-20630
Publication date: 23 Sep 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Materials Science(all)

Publication information
Journal: ACS Applied Materials and Interfaces
Volume: 7
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.

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, Research area: Sustainable Machine Systems, Department of Mechanical Engineering and Industrial Systems, Tampere Univ Technol, Tampere University of Technology, Dept Chem & Bioengn
Authors: Mylläri, V., Ruoko, T., Syrjälä, S.
Keywords: (aging, degradation, rheology, thermoplastics, PHOTOOXIDATION, FILMS, PHOTOLYSIS)
Number of pages: 6
Publication date: 1 Jul 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: 28
Article number: 42246
ISSN (Print): 0021-8995
Ratings:
Publication Forum (2017): 1
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 repellant 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.

General information
State: Published
Ministry of Education publication type: G4 Doctoral dissertation (monograph)
Organisations: Department of Materials Science
Authors: Ilen, E.
Number of pages: 165
Publication date: 26 Jun 2015

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
Volume: 1305
ISSN (Print): 1459-2045
Electronic versions:
ilen_1305
Links:

Bibliographical note
Awarding institution:Tampere University of Technology
Versio ok 14.12.2015
Research output: Monograph › Doctoral Thesis

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.

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), Aalto Univ, Aalto University, Sch Engn, Dept Appl Mech, Aalto University
Authors: Kanerva, M., Sarlin, E., Hoikkanen, M., Rämö, K., Saarela, O., Vuorinen, J.
Keywords: (Surface modification, Interfaces, Durability, Composites, PLY SURFACE-TREATMENT, UNSATURATED POLYESTER, EPOXY-RESIN, ADHESION, REINFORCEMENT, STRENGTH, WATER)
Number of pages: 13
Pages: 40-52
Publication date: Jun 2015
Peer-reviewed: Yes

Publication information
Journal: International Journal of Adhesion and Adhesives
Volume: 59
ISSN (Print): 0143-7496
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.904 1.487
Publication Forum (2016): 1
Scopus rating (2015): 1.006 1.393
Web of Science (2015): 1.956 2.199 6.9 0.254 0.00509 0.526
Publication Forum (2015): 1
Scopus rating (2014): 1.048 1.889
Web of Science (2014): 1.773 2.418 7.4 0.39 0.0047 0.531
Publication Forum (2014): 1
Scopus rating (2013): 1.22 2.212
Publication Forum (2013): 1
Scopus rating (2012): 1.062 2.348
Publication Forum (2012): 1
Scopus rating (2011): 1.313 2.344
Scopus rating (2010): 1.452 2.432
Scopus rating (2009): 0.888 1.955
Scopus rating (2008): 1.195 1.61
Scopus rating (2007): 0.878 1.522
Scopus rating (2006): 0.918 1.699
Scopus rating (2005): 0.598 1.113
Scopus rating (2004): 0.692 1.136
Scopus rating (2003): 1.224 1.134
Scopus rating (2002): 0.621 1.254
Scopus rating (2001): 0.551 0.835
Scopus rating (2000): 0.567 0.821
Scopus rating (1999): 0.39 0.787
Original language: English
DOIs:
10.1016/j.ijadhadh.2015.01.016

Bibliographical note
INT=mol,"Rämö, Kosti"
Source: WOS
Source-ID: 000353006100006
Research output: Scientific - peer-review › Article
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.

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.
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
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science
Authors: Fatarelle, E., Mylläri, V., Ruzzante, M., Pogni, R., Baratto, M. C., Skrifvars, M., Syrjälä, S., Järvelä, P.
Keywords: (Blends, Photochemistry, Polyolefins)
Publication date: 1 Feb 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: 8
Article number: 41509
ISSN (Print): 0021-8995
Ratings:
Binary TiO2/SiO2 nanoparticle coating for controlling the wetting properties of paperboard

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 1600 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.
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.

General information
State: Published
Ministry of Education publication type: B2 Part of a book or another research book
Organisations: Department of Materials Science, Research group: Fibre Materials
Authors: Varheenmaa, M.
Number of pages: 7
Pages: 154-161
Publication date: 2015

Host publication information
Title of host publication: Arctic Wears - Perspectives on Arctic Clothing
Editors: Konola, S., Kähkönen, P.
ISBN (Print): 978-952-316-085-9
ISBN (Electronic): 978-952-316-086-6

Publication series
Name: Liiketoiminta ja yrittäjyys Sarja B. Raportit ja selvitykset 10/2015
Publisher: Lapland University of Applied Sciences
Research output: Scientific > Chapter

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
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), AC2T Research GmbH
Authors: Molnar, W., Nugent, S., Lindroos, M., Apostol, M., Varga, M.
Keywords: (Ballistic impact, Conveyor belt, Rubber, Simulation, Tribology)
Number of pages: 7
Pages: 1-7
Publication date: 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Organic Chemistry, Polymers and Plastics

Publication information
Journal: Polymer Testing
Volume: 42
ISSN (Print): 0142-9418
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.82 1.582
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.
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.

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), Department of Applied Mechanics, Aalto University
Authors: Pärnänen, T., Kanerva, M., Sarlin, E., Saarela, O.
Keywords: (Debonding, Fibre metal laminates, Fracture, Impact, Interface)
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
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., Suihkonen, 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=BJk14rEQqP

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
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

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.
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
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.
Publication date: 2015
Peer-reviewed: Unknown
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. 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/m² of titanium dioxide on the paperboard.
Tampere University of Technology, 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: 2015
Peer-reviewed: Unknown

**Bibliographical note**
poster
Research output: Scientific • Paper, poster or abstract

**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


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.
Keywords: (Wear testing, Wear resistant steel, Application oriented, Materials, Material characterization, Wear, Polymer, Ceramic, Coatings, mining)
Publication date: Nov 2014
Peer-reviewed: Unknown
ASJC Scopus subject areas: Materials Science(all)
Electronic versions:

**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 LPDE 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 polyactic 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 polyamide (PA) TFC membranes. All the coated membranes indicated an enhancement in bacteria-repellence. 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
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.
**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
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 knit-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.
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.
8 Erityisalueita. 8.1. Tiivistimet

**General information**

State: Published
Ministry of Education publication type: B2 Part of a book or another research book
Organisations: Department of Materials Science
Authors: Miettinen, J.
Number of pages: 14
Pages: 405-417
Publication date: 2014

**Host publication information**

Title of host publication: Koneenosien suunnittelu
Place of publication: Helsinki
Publisher: Sanoma Pro Oy

**Bibliographical note**

Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-12-02

8 Erityisalueita, 8.5 Mekatroniikka

**General information**

State: Published
Ministry of Education publication type: B2 Part of a book or another research book
Organisations: Department of Materials Science
Authors: Miettinen, J.
Number of pages: 8
Pages: 485-492
Publication date: 2014

**Host publication information**

Title of host publication: Koneenosien suunnittelu
Place of publication: Helsinki
Publisher: Sanoma Pro Oy

**Bibliographical note**

Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-12-02

**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 Technical Research Institute of Sweden
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)
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
Original language: English
DOIs:
10.3183/NPPRJ-2014-29-02-p271-279

Bibliographical note
Contribution: organisation=mol,FACT1=0.5<br/>
Contribution: organisation=fys,FACT2=0.5<br/>
Portfolio EDEND: 2014-08-04<br/>
Publisher name: Svenska Pappers- och Cellulosaingenioersfoereningen
Source: researchoutputwizard
Source-ID: 1655
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

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
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
Scopus rating (2015): 0.305 0.476
Scopus rating (2014): 0.362 0.38
Scopus rating (2013): 0.247 0.312
Scopus rating (2012): 0.333 0.376
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.0000000065

Bibliographical note
Contribution: organisation=mol,FACT1=1 Portfolio EDEND: 2014-11-28 Publisher name: Maney Publishing; Institute of Materials, Minerals and Mining
Source: researchoutputwizard
Source-ID: 442
Research output: Scientific - peer-review › Article

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
Erosion wear of glass fibre reinforced vinylester

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: Suihkonen, R., Perolainen, J., Lindgren, M., Valtonen, K., Ojala, N., Vuorinen, J.
Number of pages: 6
Pages: 1-6
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
Portfolio EDEND: 2014-08-13
Publisher name: Sage
Source: researchoutputwizard
Source-ID: 1337
Research output: Scientific - peer-review › Article
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
Scopus rating (2004): 2.606 1.691
Scopus rating (2003): 2.497 1.635
Scopus rating (2002): 2.793 1.71
Scopus rating (2001): 2.782 1.745
Scopus rating (2000): 2.631 2.054
Scopus rating (1999): 2.801 2.014
Original language: English
DOIs:
10.1021/ma500240v

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-06-26<br/>Publisher name: American Chemical Society
Source: researchoutputwizard
Source-ID: 150
Research output: Scientific - peer-review › Article
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
Scopus rating (2000): 1.313 1.307
Scopus rating (1999): 1.214 1.539
Original language: English
DOIs:
10.1016/j.ces.2013.12.035

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-05-27<br/>Publisher name: Pergamon
Source: researchoutputwizard
Source-ID: 604
Research output: Scientific - peer-review › Article

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
Organisations: Department of Materials Science
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
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
Scopus rating (2011): 0.517 1.007
Scopus rating (2010): 0.571 0.968
Scopus rating (2009): 0.396 0.683
Scopus rating (2008): 0.249 0.502
Scopus rating (2007): 0.432 0.472
Scopus rating (2006): 0.606 1.016
Scopus rating (2005): 0.219 0.201
Original language: English
DOIs:
10.1007/s11998-014-9584-9

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-05-27<br/>Publisher name: Springer
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: Tekstiililehti
Issue number: 2
ISSN (Print): 0040-2370
Original language: Finnish
Links:
http://www.tekstiililehti.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

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
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-06-26<br/>Publisher name: Muoviyhdistys
Source: researchoutputwizard
Source-ID: 578
Research output: Professional 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
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
Authors: Baghaei, B., Skrifvars, M., Rissanen, M., Ramamoorthy, S. K.
Number of pages: 10
Pages: 1-10
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Applied Polymer Science
Volume: 131
Issue number: 15
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
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
Publication Forum (2013): 2
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
Scopus rating (2003): 0.816 1.067
Scopus rating (2002): 0.866 1.084
Scopus rating (2001): 0.964 1.157
Scopus rating (2000): 0.864 1.157
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:
Scopus rating (2017): 1
Scopus rating (2016): 0.297 0.464
Scopus rating (2015): 0.305 0.476
Scopus rating (2014): 0.362 0.38
Scopus rating (2013): 0.247 0.312
Scopus rating (2012): 0.333 0.376
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

Multifunctional superhydrophobic nanoparticle coatings for cellulosebased substrates by liquid flame spray

General information
State: Published
Ministry of Education publication type: D1 Article in a trade journal
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-Aliabadi, 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
Nanoparticle Deposition 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., Stepień, M., Mäkelä, J. M., Saarinen, J. J., Toivakka, M., Kuusipalo, J.
Number of pages: 13
Pages: 331-343
Publication date: 2014

Host publication information
Title of host publication: Recent Advances in Adhesion Science and Technology
Place of publication: Boca Raton
Publisher: CRC Press
Editors: Gutowski, W. (., Dodiuk, H.
ISBN (Print): 978-90-04-20173-6

Bibliographical note
Contribution: organisation=mol,FACT1=0.5<br/>Portfolio EDEND: 2014-08-30
Source: researchoutputwizard
Source-ID: 1609
Research output: Scientific - peer-review › Chapter

Novel Regenerated Cellulose Fibers with High Water Absorption Properties

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

Host publication information
Title of host publication: Ambience 14&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
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
Publication Forum (2016): 2
Scopus rating (2015): 2.299 1.568
Web of Science (2015): 7.145 7.332 2.4 1.18 0.1479 1.462
Publication Forum (2015): 2
Scopus rating (2014): 2.126 1.64
Web of Science (2014): 6.723 6.813 2.3 0.991 0.09406 1.373
Publication Forum (2014): 1
Scopus rating (2013): 1.979 1.543
Publication Forum (2013): 1
Scopus rating (2012): 2.18 1.309
Publication Forum (2012): 1
Scopus rating (2011): 2.017 1.396
Scopus rating (2010): 1.571 0.931
Original language: English
DOIs:
10.1021/am5055806

Bibliographical note
Contribution: organisation=mol,FACT1=0.5<br/>
Contribution: organisation=fys,FACT2=0.5<br/>
Portfolio EDEND: 2014-12-30<br/>
Publisher name: American Chemical Society
Source: researchoutputwizard
Source-ID: 1538
Research output: Scientific - peer-review › Article

Research Institutes Representative’s Review

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Materials Science
Authors: Vuorinen, J., Porter, D.
Number of pages: 1
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.
Surface modification of thin film composite polyamide membrane using atomic layer deposition method
Tekstiiliteollisuuden uudet innovaatiot

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
Publication date: 2014
Peer-reviewed: Unknown

Publication information
Journal: Tekstiililehti
Issue number: 2
ISSN (Print): 0040-2370
Original language: Finnish

Bibliographical note
Contribution: organisation=mol,FACT1=1
Portfolio EDEND: 2014-05-27
Publisher name: Suomen Tekstiiliteknillinen Liitto r. y.
Source: researchoutputwizard
Source-ID: 1306
Research output: Professional › Article

Tekstiiliteollisuuden uudet innovaatiot

General information
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Materials Science
Authors: Rissanen, M.
Number of pages: 2
Pages: 12-13
Publication date: 2014
Peer-reviewed: Unknown

Publication information
Journal: Tekstiililehti
Issue number: 5-6
ISSN (Print): 0040-2370
Original language: Finnish

Bibliographical note
Contribution: organisation=mol,FACT1=1
Portfolio EDEND: 2014-12-19
Publisher name: Suomen tekstiiliteknillinen liitto
Source: researchoutputwizard
Source-ID: 1385
Research output: Professional › Article

Tekstiiliteollisuuden uudet innovaatiot

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: Rissanen, M.
Number of pages: 2
Pages: 26-27
Publication date: 2014
Peer-reviewed: Unknown

Publication information
Journal: Siivoustaito
Issue number: 7
Original language: Finnish
Research output: Professional › Article
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
Web of Science (2014): 3.318 3.5 5.7 0.825 0.02625 0.884
Publication Forum (2014): 2
Scopus rating (2013): 2.017 2.937
Publication Forum (2013): 2
Scopus rating (2012): 1.867 2.838
Publication Forum (2012): 2
Scopus rating (2011): 1.683 2.581
Scopus rating (2010): 1.583 2.367
Scopus rating (2009): 1.652 2.076
Scopus rating (2008): 1.447 1.761
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.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Tampere University of Technology
Authors: Mylläri, V., Ruoko, T. P., Järvelä, P.
Keywords: (PEEK, Fibre, Ultraviolet, Rheology, POLY(ETHER ETHER KETONE), STRUCTURE/DEGRADABILITY RELATIONSHIPS, SCANNING CALORIMETRY, THERMAL-DEGRADATION, POLYPROPYLENE, PHOTODEGRADATION, POLYMERS, PHOTOOXIDATION, CRYSTALLINITY)
Number of pages: 7
Pages: 278-284
Publication date: 2014
Peer-reviewed: Yes

Publication Information
Journal: Polymer Degradation and Stability
Volume: 109
ISSN (Print): 0141-3910
Ratings:
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
Tiekartta-projektin yhteenveto

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: 1
Pages: 13-13
Publication date: 2014
Peer-reviewed: Unknown

Publication information
Journal: Tekstiililehti
Issue number: 4
ISSN (Print): 0040-2370
Original language: Finnish

Bibliographical note
Contribution: organisation=mol,FACT1=1
Portfolio EDEND: 2014-10-09
Publisher name: Suomen Tekstiiliteknillinen Liitto
Source: researchoutputwizard
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
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.604.87

Bibliographical note
Contribution: organisation=mol,FACT1=1
Portfolio EDEND: 2014-12-18
Publisher name: Trans Tech Publications
Source: researchoutputwizard
Source-ID: 1679
Research output: Scientific - peer-review › Article

Vanerin pinnollattaminen muovilla

General information
State: Published
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-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
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:ttty-201606204287
Research output: Scientific - peer-review › Conference contribution

Muovien uusiokäyttö ja kierrätys
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: 24-25
Publication date: 2013
Peer-reviewed: Unknown

Publication information
Journal: Muovi - Plast
Issue number: 6
ISSN (Print): 0788-8430
Muovin sulatyöstöprosessin hallinta, 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: 24-25
Publication date: 2013
Peer-reviewed: Unknown

Publication information
Journal: Muovi - Plast
Issue number: 3
ISSN (Print): 0788-8430
Original language: Finnish

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-06-26<br/>Publisher name: Muoviyhdistys
Source: researchoutputwizard
Source-ID: 2401
Research output: Professional › Article

Muovitekniiikka ja ongelmat; 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: 2013
Peer-reviewed: Unknown

Publication information
Journal: Muovi - Plast
Issue number: 1
ISSN (Print): 0788-8430
Original language: Finnish

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-06-26<br/>Publisher name: Muoviyhdistys
Source: researchoutputwizard
Source-ID: 2402
Research output: Professional › Article

Muovitekniiikka ja osaaminen; 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

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-06-26<br/>Publisher name: Muoviyhdistys
Source: researchoutputwizard
Source-ID: 2403
Research output: Professional › Article
Muovituotteen kustannuksiiin vaikutaminen

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: 24-25
Publication date: 2013
Peer-reviewed: Unknown

Publication information
Journal: Muovi - Plast
Issue number: 5
ISSN (Print): 0788-8430
Original language: Finnish

Bibliographical note
Contribution: organisation=mol,FACT1=1
Portfolio EDEND: 2014-06-26
Publisher name: Muoviyhdistys
Source: researchoutputwizard
Source-ID: 2405
Research output: Professional › Article

Nanoscale Surface Processing of Extrusion Coated Substrates with Atmospheric Plasma Technology

General information
State: Published
Organisations: Department of Materials Science, Research group: Paper Converting and Packaging, Engineering materials science and solutions (EMASS)
Authors: Lahti, J.
Publication date: 2013
Peer-reviewed: Unknown
Event: Paper presented at 14th TAPPI. European Place Conference 6-8 May 2013 Swissotel Dresden, Germany.
Research output: Scientific › Paper, poster or abstract

Photoelastic Stress Evaluation and Mechanical Testing of Stainless Steel-Epoxy Hybrid

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Materials Science
Authors: Orell, O., Kakkonen, M., Vuorinen, J.
Number of pages: 7
Pages: 1-7
Publication date: 2013

Host publication information
Ruiskuvalumuotin kustannuksista; 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: 28-29
Publication date: 2013
Peer-reviewed: Unknown

Publication information
Journal: Muovi - Plast
Issue number: 4
ISSN (Print): 0788-8430
Original language: Finnish

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-06-23<br/>Publisher name: Muoviyhdistys
Source: researchoutputwizard
Source-ID: 2406
Research output: Professional › Article

Impresión digital de papel o cartón estucado con polímeros

General information
State: Published
Ministry of Education publication type: H1 Granted patent
Organisations: Department of Materials Science, Department of Energy and Process Engineering, Stora Enso Oyj, Imatran tehtaat, 12.05.2005
Authors: Räsänen, J., Lahti, J., Savolainen, A., Kuusipalo, J.
Publication date: 28 May 2010

Publication information
IPC: G03G 7/ 00 A I
Patent number: ES2340049T
Priority date: 17/06/04
Priority number: FI2004000840
Original language: English
Source: espacenet
Source-ID: ES2340049T
Research output: Scientific › Patent

Digital Printing of Polymer-coated Paper or Board

General information
State: Published
Ministry of Education publication type: H1 Granted patent
Organisations: Department of Materials Science
Authors: Räsänen, J., Lahti, J., Savolainen, A., Kuusipalo, J.
Publication date: 15 May 2010

Publication information
Un procedimiento de impresión digital y uso de un papel o cartón aplicable al mismo

General information
State: Published
Ministry of Education publication type: H1 Granted patent
Organisations: Department of Materials Science, Department of Energy and Process Engineering, Stora Enso Oyj, Imatran tehtaat, 12.05.2005
Authors: Lahti, J., Penttinen, T., Räsänen, J., Kuusipalo, J., Savolainen, A.
Publication date: 1 Feb 2009

Publication information
IPC: B41M 5/52 A I
Patent number: ES2311069T
Priority date: 7/12/01
Priority number: FI20010002413
Original language: English
Source: espacenet
Source-ID: ES2311069T
Research output: Scientific › Patent

Digital printing method and a paper or board applicable thereto

The invention relates to a digital printing method and a paper or board applicable thereto. In digital printing, the surface of a paper or board is charged electrically, toner particles are brought to the surface in an electric field in accordance with the printing, and the particles are melted fast to the surface with the help of heat for forming the printing. According to the invention, the paper or board (2) is provided with a coating layer (3) containing an electrically chargeable acrylic copolymer of ethylene, which receives the toner that is fused to the coating with the help of infra red radiation. Suitable coating polymers are especially methyl, ethyl and butyl acrylate copolymers of ethylene (EMA, EEA and EBA). Especially in packaging boards, besides the digitally printable layer, the polymer coatings can comprise a water vapour or oxygen barrier layer for protecting the packed product, and a heat-sealable layer on the opposite side of the board for sealing the package.

General information
State: Published
Ministry of Education publication type: H1 Granted patent
Organisations: Department of Materials Science, Department of Energy and Process Engineering, STORA ENSO OYI, Stora Enso Oyj, Imatran tehtaat, 12.05.2005
Authors: Lahti, J., Penttinen, T., Räsänen, J. P., Kuusipalo, J., Savolainen, A.
Publication date: 30 Aug 2007

Publication information
IPC: G03G 7/00 A I
Patent number: US2007202308
Priority date: 15/03/07
Priority number: US20070724538
Original language: English
Source: espacenet
Source-ID: US2007202308
Research output: Scientific › Patent

Digital printing method and a paper or board applicable thereto

General information
State: Published
Ministry of Education publication type: H1 Granted patent
Organisations: Department of Materials Science, Department of Energy and Process Engineering, Stora Enso Oyj, Imatran tehtaat, 12.05.2005