**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**

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Authors: Ojala, N., Valtonen, K., Minkkinen, J., Kuokkala, V.
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- Scopus rating (2015): SJR 1.527 SNIP 2.017 CiteScore 2.73
- Scopus rating (2014): SJR 1.715 SNIP 2.38 CiteScore 2.46
- Scopus rating (2013): SJR 1.319 SNIP 2.416 CiteScore 2.37
- Scopus rating (2012): SJR 1.36 SNIP 2.178 CiteScore 1.85
- Scopus rating (2011): SJR 1.547 SNIP 2.865 CiteScore 2.43
- Scopus rating (2010): SJR 1.509 SNIP 2.153
- Scopus rating (2009): SJR 1.684 SNIP 2.07
- Scopus rating (2008): SJR 1.597 SNIP 1.863
- Scopus rating (2007): SJR 1.286 SNIP 1.889
- Scopus rating (2006): SJR 1.435 SNIP 2.036
- Scopus rating (2005): SJR 1.473 SNIP 2.007
- Scopus rating (2004): SJR 1.335 SNIP 1.965
- Scopus rating (2003): SJR 1.104 SNIP 1.788
- Scopus rating (2002): SJR 0.958 SNIP 1.365
- Scopus rating (2001): SJR 0.937 SNIP 1.47
- Scopus rating (2000): SJR 1.069 SNIP 1.149
- Scopus rating (1999): SJR 0.848 SNIP 1.338

Original language: English
ASJC Scopus subject areas: Metals and Alloys, Materials Science(all), Polymers and Plastics
Keywords: Wear testing, Steel, Elastomers, Edge effect, Particle embedment, Mining, Mineral processing

Electronic versions:
- Ojala_Full_paper_NordTrib2016 to Wear_PRE-PRINT
- 10.1016/j.wear.2017.06.004
- https://authors.elsevier.com/a/1ViB59q8Nca16 (Available for free until Oct. 30th 2017 with this link)

Research output: Scientific - peer-review › Article

**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
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Ministry of Education publication type: A1 Journal article-refereed
Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Biomaterials and Tissue Engineering Group, BioMediTech, University of Tampere, BioMediTech
Authors: Teymouri, S., Calejo, M. T., Hiltunen, M., Sorkio, A. E., Juutila-Uusitalo, K., Skottman, H., Kellomäki, M.
Publication date: 6 Mar 2017
Peer-reviewed: Yes

Publication information
Journal: Cogent Chemistry
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Electronic versions:
Collagen immobilized polyimide membranes for retinal pigment epithelial cell adherence and proliferation
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10.1080/23312009.2017.1292593
Links:
Research output: Scientific - peer-review › Article

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, BioMediTech, University of Tampere, BioMediTech, University of Tampere
Authors: Calejo, M. T., Ilmarinen, T., Vuorimaa-Laukkanen, E., Talvitie, E., Hakola, H. M., Skottman, H., Kellomäki, M.
Publication date: 20 Feb 2017
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ISSN (Print): 1742-7061
Ratings:
Scopus rating (2016): CiteScore 6.66 SJR 1.789 SNIP 1.921
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.

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Organisations: Department of Materials Science, Research group: Materials Characterization
Authors: Ojala, N.
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ASJC Scopus subject areas: Mechanics of Materials, Metals and Alloys, Polymers and Plastics, Industrial and Manufacturing Engineering
Keywords: Wear testing, Application oriented, Steels, Polymer, Mining, mineral processing, Field test
Links:
https://www.researchgate.net/publication/310160912_Application_oriented_wear_testing_of_wear_resistant_steels_in_mining_industry

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.
Number of pages: 13
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Keywords: Slurry erosion, Wear testing, Steel, Elastomers, Edge effect
ASJC Scopus subject areas: Metals and Alloys, Polymers and Plastics
Research output: Professional › Conference contribution

**Tuntemalla olosuhteet voit optimoida materiaalit kulutussovelluksissa**

**General information**
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Materials Science, Research group: Materials Characterization
Authors: Ratia, V., Ojala, N., Valtonen, K., Heino, V.
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Original language: Finnish
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ASJC Scopus subject areas: Materials Science(all), Engineering(all)
Electronic versions:
proMAINT_julkaistu
Links:
http://urn.fi/URN:NBN:fi:ttly-201606134230
Research output: Professional › Article

**Synthesis and Characterization of Linear and Tri-Block PLLA-PEG-PLLA Blends**
This study was conducted to synthesize poly(L-Lactide)--poly(ethylene glycol)--poly(L-Lactide) triblock copolymer (PEGLA) with different PLLA block length, and explore its applicability in a blend with linear PLLA (3051D NatureWorks) with the intention of improving heat-seal and adhesion properties at extrusion coating on paperboard. PLLA-PEG-PLLA was obtained by ring opening polymerization (ROP) of L-lactide using PEG (molecular weight 6000 g mol−1) as an initiator and stannous octoate as catalyst. The structures of the PEGLAs were characterized by proton nuclear magnetic resonance spectroscopy (1H-NMR). The melt flow and thermal properties of all PEGLAs and their blends were evaluated using dynamic rheology, and differential scanning 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.
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

Host publication information
Title of host publication: Proceedings of the SAMPE Europe Conference
ISBN (Electronic): 978-90-821727-4-4
Research output: Scientific › Conference contribution

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
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.
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

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Journal: Polymer Composites
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Ratings:
Scopus rating (2016): SJR 0.562 SNIP 0.887 CiteScore 1.88
Scopus rating (2015): SJR 0.593 SNIP 0.811 CiteScore 1.7
Scopus rating (2014): SJR 0.624 SNIP 0.955 CiteScore 1.58
Scopus rating (2013): SJR 0.654 SNIP 1.053 CiteScore 1.58
Scopus rating (2012): SJR 0.684 SNIP 1.025 CiteScore 1.56
Scopus rating (2011): SJR 0.571 SNIP 0.992 CiteScore 1.4
Scopus rating (2010): SJR 0.541 SNIP 0.764
Scopus rating (2009): SJR 0.626 SNIP 0.854
Scopus rating (2008): SJR 0.554 SNIP 0.804
Scopus rating (2007): SJR 0.827 SNIP 1.358
Scopus rating (2006): SJR 0.708 SNIP 1.25
Scopus rating (2005): SJR 0.518 SNIP 0.695
Scopus rating (2004): SJR 0.578 SNIP 0.821
Scopus rating (2003): SJR 0.85 SNIP 1.019
Scopus rating (2002): SJR 0.931 SNIP 0.94
Scopus rating (2001): SJR 0.709 SNIP 1.067
Scopus rating (2000): SJR 1.153 SNIP 1.277
Scopus rating (1999): SJR 0.743 SNIP 1
Original language: English
DOIs: 10.1002/pc.23419
Source: Bibtex
Source-ID: urn:017f4ad9eea3a92c6d7ea3eb8ae36fa1
Research output: Scientific - peer-review › Article

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., Christophliek, H., Mikkonen, K. S.
Pages: 173-181
Publication date: 2016
Peer-reviewed: Yes

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Ratings:
Scopus rating (2016): SJR 0.852 SNIP 1.3 CiteScore 2.89
Scopus rating (2015): SJR 0.849 SNIP 1.39 CiteScore 2.84
Scopus rating (2014): SJR 0.992 SNIP 1.566 CiteScore 2.8
Scopus rating (2013): SJR 1.03 SNIP 1.663 CiteScore 2.58
Scopus rating (2012): SJR 1.043 SNIP 1.862 CiteScore 2.39
Scopus rating (2011): SJR 0.884 SNIP 1.606 CiteScore 2.34
Scopus rating (2010): SJR 0.983 SNIP 1.537
Scopus rating (2009): SJR 0.867 SNIP 1.333
Scopus rating (2008): SJR 0.829 SNIP 1.298
Scopus rating (2007): SJR 1.088 SNIP 1.362
Scopus rating (2006): SJR 1.243 SNIP 1.598
Scopus rating (2005): SJR 0.928 SNIP 1.168
Scopus rating (2004): SJR 0.692 SNIP 1.121
Scopus rating (2003): SJR 0.604 SNIP 1.497
Scopus rating (2002): SJR 1.037 SNIP 1.312
Scopus rating (2001): SJR 0.619 SNIP 0.92
Scopus rating (2000): SJR 0.857 SNIP 1.132
Scopus rating (1999): SJR 0.723 SNIP 1.167
Original language: English
Keywords: Mineral oil migration; Barrier; Dispersion coating; Paperboard; Food packaging
DOIs:
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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
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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.

General information
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Organisations: Department of Materials Science, Research group: Materials Characterization, SSAB
Authors: Ojala, N., Valtonen, K., Antikainen, A., Kemppainen, A., Minkkinen, J., Oja, O., Kuokkala, V.
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ASJC Scopus subject areas: Metals and Alloys, Polymers and Plastics
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10.1016/j.wear.2016.02.019
Links:
Bibliographical note
INT=mol,"Antikainen, Atte"
Research output: Scientific - peer-review › Article
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.
Number of pages: 8
Pages: 419-426
Publication date: 1 Oct 2015
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Early online date: 6 Aug 2015

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Journal: Polymer Degradation and Stability
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Ratings:
Scopus rating (2016): SJR 1.029 SNIP 1.582 CiteScore 3.57
Scopus rating (2015): SJR 1.22 SNIP 1.634 CiteScore 3.48
Scopus rating (2014): SJR 1.278 SNIP 1.888 CiteScore 3.37
Scopus rating (2013): SJR 1.341 SNIP 2.12 CiteScore 3.35
Scopus rating (2012): SJR 1.423 SNIP 2.105 CiteScore 3.25
Scopus rating (2011): SJR 1.347 SNIP 2.099 CiteScore 3.17
Scopus rating (2010): SJR 1.237 SNIP 1.642
Scopus rating (2009): SJR 1.349 SNIP 1.623
Scopus rating (2008): SJR 1.281 SNIP 1.745
Scopus rating (2007): SJR 1.451 SNIP 1.557
Scopus rating (2006): SJR 1.367 SNIP 1.787
Scopus rating (2005): SJR 1.197 SNIP 1.461
Scopus rating (2004): SJR 1.062 SNIP 1.43
Scopus rating (2003): SJR 0.922 SNIP 1.24
Scopus rating (2002): SJR 0.821 SNIP 1.058
Scopus rating (2001): SJR 0.93 SNIP 1.151
Scopus rating (2000): SJR 0.685 SNIP 1.077
Scopus rating (1999): SJR 0.75 SNIP 1.194
Original language: English
Keywords: Fibre, PEEK, Thermal degradation
Electronic versions: Characterization of thermally aged polyetheretherketone fibres_pre-print
DOIs: 10.1016/j.polymdegradstab.2015.08.003
Links:
Production of sulfonated polyetheretherketone/polypropylene fibers for photoactive textiles

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

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology, Department of Mechanical Engineering and Industrial Systems, Research area: Sustainable Machine Systems, University College of Borås, Högskolan i Borås, Next Technology Tecnotessile Società Nazionale di Ricerca S.r.l., Department of Biotechnology, Chemistry and Pharmacy, University of Siena
Authors: Myllärä, V., Fatarella, E., Ruzzante, M., Pogni, R., Baratto, M. C., Skrifvars, M., Syrjälä, S., Järvelä, P.
Publication date: 1 Oct 2015
Peer-reviewed: Yes

Publication information
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Article number: 42595
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Scopus rating (2015): SJR 0.574 SNIP 0.827 CiteScore 1.74
Scopus rating (2014): SJR 0.658 SNIP 0.964 CiteScore 1.76
Scopus rating (2013): SJR 0.628 SNIP 1.085 CiteScore 1.71
Scopus rating (2012): SJR 0.658 SNIP 1.081 CiteScore 1.57
Scopus rating (2011): SJR 0.601 SNIP 0.965 CiteScore 1.45
Scopus rating (2010): SJR 0.679 SNIP 0.909
Scopus rating (2009): SJR 0.697 SNIP 0.825
Scopus rating (2008): SJR 0.647 SNIP 0.822
Scopus rating (2007): SJR 0.678 SNIP 0.931
Scopus rating (2006): SJR 0.782 SNIP 1.145
Scopus rating (2005): SJR 0.779 SNIP 0.912
Scopus rating (2004): SJR 0.774 SNIP 0.962
Scopus rating (2003): SJR 0.816 SNIP 1.067
Scopus rating (2002): SJR 0.866 SNIP 1.084
Scopus rating (2001): SJR 0.964 SNIP 1.157
Scopus rating (2000): SJR 0.864 SNIP 1.157
Scopus rating (1999): SJR 0.978 SNIP 1.277
Original language: English
Keywords: blends, fibers, functionalization of polymers, photochemistry, textiles
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 vulcanizing 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.

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Authors: Das, A., Sallat, A., Böhme, F., Suckow, M., Basu, D., Wießner, S., Stöckelhuber, K. W., Voit, B., Heinrich, G.
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Scopus rating (2011): SJR 2.017 SNIP 1.396 CiteScore 4.41
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A comparison of rheology and FTIR in the study of polypropylene and polystyrene photodegradation

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

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Authors: Mylläri, V., Ruoko, T., Syrjälä, S.
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http://www.scopus.com/inward/record.url?scp=84928363110&partnerID=8YFLogxK (Link to publication in Scopus)
Decontamination of Wearable Textile Electrodes for Medical and Health Care Applications

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

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

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

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

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

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Authors: Ilen, E.
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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.
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.
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 160° by setting the Ti/Si ratio in the liquid precursor. Structure of the two component nanocoating was analysed with FE-SEM, TEM, EDS, XPS and XRD. The porous thin film coating was concluded to consist of ca. 10 nm sized mixed oxide nanoparticles with segregated TiO2 and SiO2 phases. Accumulation of carbonaceous compounds on the surface was seen to be almost linearly dependent on the Ti/Si ratio, indicating of each species being exposed in corresponding amount. However, wetting of the surface was observed to follow merely an S-shaped curve, caused by the roughness of the nanocoated surface. Reasons for the observed superhydrophobicity and superhydrophilicity of these binary nanocoatings on paperboard are discussed. (C) 2014 Elsevier B.V. All rights reserved.

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Authors: Haapanen, J., Aromaa, M., Teisala, H., Tuominen, M., Stepien, M., Saarinen, J. J., Heikkila, M., Toivakka, M., Kuusipalo, J., Mäkelä, J.
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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.

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Authors: Eerola, S., Tura, T., Harmaakorpi, V., Järvelä, P.
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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.

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Authors: Varheenmaa, M.
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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.
Characterisation of novel regenerated cellulosic, viscose, and cotton fibres and the dyeing properties of fabrics

There is a global demand for constant increase in the production of textile fibres. Currently, the market for cellulosic fibres is dominated by cotton and viscose fibres. However, new alternative cellulosic fibres are being sought to meet the growing demand. The dyeing properties of novel fibres aiming at the marketplace are among the properties that determine their applicability to textiles. Recently, a novel process for producing cellulosic fibres, the Biocelsol process, has been scaled up so that the spinning of yarn from Biocelsol fibres is now possible. In this study, the reactive dye Levafix CA Blue was applied to cellulosic fabrics made from viscose, cotton, and Biocelsol yams. 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.

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Scopus rating (2003): SJR 0.668 SNIP 1.013
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Research output: Scientific - peer-review > Article
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.

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Scopus rating (2012): SJR 1.867 SNIP 2.838 CiteScore 2.85
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Scopus rating (2006): SJR 1.08 SNIP 1.894
Scopus rating (2005): SJR 1.233 SNIP 1.647
Scopus rating (2004): SJR 1.022 SNIP 1.484
Scopus rating (2003): SJR 0.977 SNIP 1.101
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Research output: Scientific - peer-review › Article
Enhanced in-line detection, cleaning and repair of nano-scale defects in thin-films used for flexible photovoltaic and food packaging applications

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

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Research output: Professional › Conference contribution

Erosion wear of glass fibre reinforced vinyl ester
This study evaluates the slurry-erosion wear of glass fibre reinforced vinyl ester composites (VE-FRP) using a high speed slurry-pot type wear tester. The wear rates of VE-FRP were compared using different abrasives, namely quartz, chromite, copper ore, zinc concentrate, and tailings. Furthermore, the effect of abrasive particle size and slurry concentration on the VE-FRP wear was studied. The erosion wear results of VE-FRP were compared to natural rubber (NR) and bromobutyl rubber (BIIR) 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.

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Authors: Suihkonen, R., Perolainen, J., Lindgren, M., Valtonen, K., Ojala, N., Sarlin, E., Vuorinen, J.
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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
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Authors: Basu, D., Das, A., Heinrich, G.
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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

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

Micro- and nano-scale defect detection, cleaning and repair techniques to improve the quality of nanoscale barrier coatings

General information
State: Published
Organisations: Department of Materials Science, Research group: Paper Converting and Packaging
Authors: Lahti, J. M. K.
Publication date: 2015
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Micro- and nano-scale defect detection, cleaning and repair techniques to improve the quality of nanoscale barrier coatings

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

Nanoscale surface modification and barrier coatings for packaging materials

General information
State: Published
Organisations: Department of Materials Science, Research group: Paper Converting and Packaging
Authors: Lahti, J.
Publication date: 2015
Peer-reviewed: Unknown
Event: Paper presented at Co-operation in plasma and material sciences, Brno, Czech Republic.

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.

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

Host publication information
Title of host publication: Materials Research Society Symposium Proceedings
Volume: 1747
Publisher: MATERIALS RESEARCH SOCIETY
ISBN (Print): 9781510806245
ASJC Scopus subject areas: Materials Science(all), Condensed Matter Physics, Mechanical Engineering, Mechanics of Materials
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
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Ratings:
Scopus rating (2016): SJR 0.278 SNIP 0.533 CiteScore 0.76
Scopus rating (2015): SJR 0.243 SNIP 0.481 CiteScore 0.61
Scopus rating (2014): SJR 0.208 SNIP 0.471 CiteScore 0.6
Scopus rating (2013): SJR 0.404 SNIP 0.592 CiteScore 0.75
Scopus rating (2012): SJR 0.307 SNIP 0.782 CiteScore 0.75
Scopus rating (2011): SJR 0.375 SNIP 0.553 CiteScore 0.72
Scopus rating (2010): SJR 0.252 SNIP 0.557
Scopus rating (2009): SJR 0.46 SNIP 1.005
Scopus rating (2008): SJR 0.368 SNIP 0.572
Scopus rating (2007): SJR 0.336 SNIP 0.748
Scopus rating (2006): SJR 0.397 SNIP 0.925
Scopus rating (2005): SJR 0.37 SNIP 0.635
Scopus rating (2004): SJR 0.307 SNIP 0.61
Scopus rating (2003): SJR 0.149 SNIP 0.301
Scopus rating (2002): SJR 0.296 SNIP 0.345
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.
Polymer Hybrid Thin-Film Composites with Tailored Permeability and Anti-Fouling Performance

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

General information
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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

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ISBN (Print): 978-951-38-8163-4
Original language: English

Publication series
Name: VTT Science
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Electronic versions: nikkola.pdf
Links:
http://urn.fi/URN:NBN:fi:ttv-201609134498

Bibliographical note
Awarding institution: Tampere University of Technology
Source: researchoutputwizard
Source-ID: 1146
Research output: Collection of articles › Doctoral Thesis
University-Industry Co-operation Using a Practice-based Innovation Tool: Case Advisory Professorship Programme in Materials Technology

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

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

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

Publication series
Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
No.: 1216
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Electronic versions:
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Bibliographical note
Awarding institution:Tampere University of Technology
Source: researchoutputwizard
Source-ID: 274
Research output: Monograph › Doctoral Thesis

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

General information
Textile-Based Sensors and Smart Clothing System for Respiratory Monitoring

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

General information
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Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Materials Science
Authors: Guo, L.
Number of pages: 87
Publication date: 23 May 2014

Publication information
Place of publication: Tampere
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Original language: English

Publication series
Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
No.: 1210
ISSN (Print): 1459-2045
Electronic versions:
guo.pdf
Links:

Bibliographical note
Awarding institution:Tampere University of Technology
Source: researchoutputwizard
Source-ID: 381
Research output: Collection of articles › Doctoral Thesis

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.
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
Authors: Stepień, M., Chinga-Carrasco, G., Saarinen, J. J., Teisala, H., Tuominen, M., Haapanen, J., Kuusipalo, J., Mäkelä, J. M., Toivakka, M.
Number of pages: 15
Pages: 68-82
Publication date: 2014

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Publisher: TAPPI Press
ISBN (Print): 9781510801295
ASJC Scopus subject areas: Materials Chemistry, Electrical and Electronic Engineering
Links:
http://www.scopus.com/inward/record.url?scp=84942588921&partnerID=8YFLogxK (Link to publication in Scopus)

Bibliographical note
ORG=mol,0.5
ORG=fys,0.5
Source: Scopus
Source-ID: 84942588921
Research output: Scientific - peer-review › Conference contribution

Adjustable wetting of Liquid Flame Spray (LFS) TiO2-nanoparticle coated board: Batch-type versus roll-to-roll Stimulation methods

General information
State: Published
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
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/

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
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Scopus rating (2015): SJR 0.305 SNIP 0.476 CiteScore 0.51
Scopus rating (2014): SJR 0.362 SNIP 0.38 CiteScore 0.36
Scopus rating (2013): SJR 0.247 SNIP 0.312 CiteScore 0.32
Scopus rating (2012): SJR 0.333 SNIP 0.376 CiteScore 0.27
Scopus rating (2011): SJR 0.276 SNIP 0.363 CiteScore 0.3
Scopus rating (2010): SJR 0.353 SNIP 0.261
Scopus rating (2009): SJR 0.155 SNIP 0.114
Scopus rating (2008): SJR 0.122 SNIP 0
Original language: English
DOIs:
10.1179/1751584X14Y.0000000065
Effect of viscose fabric modification on the mechanical and water absorption properties of composites prepared through vacuum infusion

General information
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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
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ISSN (Print): 0731-6844
Ratings:
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Scopus rating (2015): SJR 0.489 SNIP 0.846 CiteScore 1.32
Scopus rating (2014): SJR 0.686 SNIP 1.021 CiteScore 1.58
Scopus rating (2013): SJR 0.6 SNIP 1.027 CiteScore 1.35
Scopus rating (2012): SJR 0.53 SNIP 0.872 CiteScore 1
Scopus rating (2011): SJR 0.415 SNIP 0.768 CiteScore 0.86
Scopus rating (2010): SJR 0.421 SNIP 0.91
Scopus rating (2009): SJR 0.508 SNIP 0.857
Scopus rating (2008): SJR 0.477 SNIP 0.724
Scopus rating (2007): SJR 0.358 SNIP 0.765
Scopus rating (2006): SJR 0.328 SNIP 0.682
Scopus rating (2005): SJR 0.312 SNIP 0.601
Scopus rating (2004): SJR 0.363 SNIP 0.658
Scopus rating (2003): SJR 0.344 SNIP 0.479
Scopus rating (2002): SJR 0.585 SNIP 0.637
Scopus rating (2001): SJR 0.575 SNIP 0.785
Scopus rating (2000): SJR 0.653 SNIP 0.773
Scopus rating (1999): SJR 0.548 SNIP 0.777
Original language: English
DOIs:
10.1177/0731684414534748

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

Erosion wear of glass fibre reinforced vinyl ester

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
Evidence for an In Situ Developed Polymer Phase in Ionic Elastomers

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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:
Scopus rating (2016): SJR 2.557 SNIP 1.507 CiteScore 5.76
Scopus rating (2015): SJR 2.407 SNIP 1.638 CiteScore 5.82
Scopus rating (2014): SJR 2.534 SNIP 1.721 CiteScore 5.83
Scopus rating (2013): SJR 2.576 SNIP 1.754 CiteScore 6.09
Scopus rating (2012): SJR 2.779 SNIP 1.58 CiteScore 5.35
Scopus rating (2011): SJR 2.556 SNIP 1.593 CiteScore 5.15
Scopus rating (2010): SJR 2.51 SNIP 1.51
Scopus rating (2009): SJR 2.962 SNIP 1.533
Scopus rating (2008): SJR 2.819 SNIP 1.54
Scopus rating (2007): SJR 3.102 SNIP 1.613
Scopus rating (2006): SJR 2.987 SNIP 1.714
Scopus rating (2005): SJR 2.579 SNIP 1.654
Scopus rating (2004): SJR 2.606 SNIP 1.691
Scopus rating (2003): SJR 2.497 SNIP 1.635
Scopus rating (2002): SJR 2.793 SNIP 1.71
Scopus rating (2001): SJR 2.782 SNIP 1.745
Scopus rating (2000): SJR 2.631 SNIP 2.054
Scopus rating (1999): SJR 2.801 SNIP 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
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

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Journal: Composites part a: applied science and manufacturing
Issue number: 6
ISSN (Print): 1359-835X
Ratings:
Scopus rating (2016): CiteScore 4.82 SJR 1.402 SNIP 2.053
Scopus rating (2015): SJR 1.53 SNIP 2.18 CiteScore 4.09
Scopus rating (2014): SJR 1.67 SNIP 2.538 CiteScore 4.08
Scopus rating (2013): SJR 1.59 SNIP 2.828 CiteScore 3.92
Scopus rating (2012): SJR 1.559 SNIP 2.706 CiteScore 3.36
Scopus rating (2011): SJR 1.443 SNIP 2.499 CiteScore 3.23
Scopus rating (2010): SJR 1.553 SNIP 2.241
Scopus rating (2009): SJR 1.536 SNIP 1.976
Scopus rating (2008): SJR 1.388 SNIP 1.853
Scopus rating (2007): SJR 1.222 SNIP 2.188
Scopus rating (2006): SJR 1.208 SNIP 2.268
Scopus rating (2005): SJR 1.109 SNIP 2.103
Scopus rating (2004): SJR 1.159 SNIP 1.671
Scopus rating (2003): SJR 1.132 SNIP 1.411
Scopus rating (2002): SJR 1.308 SNIP 1.512
Scopus rating (2001): SJR 1.426 SNIP 1.33
Scopus rating (2000): SJR 1.273 SNIP 1.298
Scopus rating (1999): SJR 0.824 SNIP 1.104
Original language: English
DOI:
10.1016/j.compositesa.2014.04.014

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-10-09<br/>Publisher name: Pergamon
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

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Journal: Journal of Coatings Technology and Research
Volume: 11
Issue number: 3
ISSN (Print): 1547-0091
Ratings:
Scopus rating (2016): SJR 0.409 SNIP 0.614 CiteScore 1.44
Scopus rating (2015): SJR 0.421 SNIP 0.83 CiteScore 1.45
Scopus rating (2014): SJR 0.51 SNIP 1.062 CiteScore 1.5
Scopus rating (2013): SJR 0.534 SNIP 1.077 CiteScore 1.46
Scopus rating (2012): SJR 0.572 SNIP 1.364 CiteScore 1.39
Scopus rating (2011): SJR 0.517 SNIP 1.007 CiteScore 1.24
Scopus rating (2010): SJR 0.571 SNIP 0.968
Scopus rating (2009): SJR 0.396 SNIP 0.683
Scopus rating (2008): SJR 0.249 SNIP 0.502
Scopus rating (2007): SJR 0.432 SNIP 0.472
Scopus rating (2006): SJR 0.606 SNIP 1.016
Scopus rating (2005): SJR 0.219 SNIP 0.201
Original language: English
DOI: 10.1007/s11998-014-9584-9

Bibliographical note
online first<br/>Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-05-27<br/>Publisher name: Springer
Source: researchoutputwizard
Source-ID: 864
Research output: Scientific - peer-review › Article

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: Tekstiiliiehti
Issue number: 2
ISSN (Print): 0040-2370
Original language: Finnish
Links:
http://www.tekstiiliiehti.fi/binary/file/-/id/12/fid/337/
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
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 (2016): SJR 0.297 SNIP 0.464 CiteScore 0.64
Scopus rating (2015): SJR 0.305 SNIP 0.476 CiteScore 0.51
Scopus rating (2014): SJR 0.362 SNIP 0.38 CiteScore 0.36
Multifunctional superhydrophobic nanoparticle coatings for cellulose-based substrates by liquid flame spray

General information
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Materials Science
Authors: Teisala, H.
Number of pages: 1
Pages: 59
Publication date: 2014
Peer-reviewed: Unknown

Publication information
Journal: Materia
Issue number: 1
ISSN (Print): 1459-9694
Original language: Finnish
Links:
http://www.vuorimiesyhdistys.fi/sites/default/files/materia/pdf/Materia%201-2014_0.pdf

Bibliographical note
Contribution: organisation=mol,FACT1=1
Portfolio EDEND: 2014-12-13
Publisher name: Maney Publishing; Institute of Materials, Minerals and Mining
Source: researchoutputwizard
Source-ID: 730
Research output: Scientific - peer-review › Article

Nanofibrous Chitosan-Polyethylene Oxide Engineered Scaffolds: A Comparative Study between Simulated Structural Characteristics and Cells Viability

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science
Authors: Kazemi Pilehrood, M., Dilamian, M., Mirian, M., Sadeghi-Aliaabadi, H., Maleknia, L., Nousiainen, P., Harlin, A.
Number of pages: 9
Pages: 1-9
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: BioMed Research International
Volume: 2014
Article number: 438065
ISSN (Print): 2314-6133
Ratings:
Scopus rating (2016): SJR 0.843 SNIP 0.875 CiteScore 2.32
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., Stepien, 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=1
Portfolio EDEND: 2015-01-22
Publisher name: Hindawi Publishing Corporation
Source: researchoutputwizard
Source-ID: 697
Research output: Scientific - peer-review » Article

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: Kamppuri, T., Vehviläinen, M., Grönqvist, S., Rissanen, M.
Number of pages: 5
Pages: 1-5
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:
Scopus rating (2016): CiteScore 7.6 SJR 2.524 SNIP 1.528
Scopus rating (2015): SJR 2.299 SNIP 1.568 CiteScore 7.38
Scopus rating (2014): SJR 2.126 SNIP 1.64 CiteScore 6.88
Scopus rating (2013): SJR 1.979 SNIP 1.543 CiteScore 6.05
Scopus rating (2012): SJR 2.18 SNIP 1.309 CiteScore 4.94
Scopus rating (2011): SJR 2.017 SNIP 1.396 CiteScore 4.41
Scopus rating (2010): SJR 1.571 SNIP 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
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.
Scopus rating (2009): SJR 1.167 SNIP 0.984
Scopus rating (2008): SJR 0.928 SNIP 0.857
Scopus rating (2007): SJR 2.018 SNIP 1.035
Scopus rating (2006): SJR 1.002 SNIP 0.951
Scopus rating (2005): SJR 1.181 SNIP 0.997
Scopus rating (2004): SJR 2.08 SNIP 1.354
Scopus rating (2003): SJR 2.952 SNIP 1.129
Scopus rating (2002): SJR 1.836 SNIP 1.145
Scopus rating (2001): SJR 1.12 SNIP 1.147
Scopus rating (2000): SJR 1.086 SNIP 1.154
Scopus rating (1999): SJR 1.086 SNIP 1.001

Original language: English
Keywords: Cellulose, Functional coating, Liquid flame spray, Nanoparticle coating, Review, Superhydrophobic

DOIs:
10.3183/NPPRJ-2014-29-04-p747-759

Links:
http://www.scopus.com/inward/record.url?eid=2-s2.0-84914820253&partnerID=tZOtx3y1

Bibliographical note
Contribution: organisation=mol,FACT1=0.5<br/>Contribution: organisation=fys,FACT2=0.5<br/>Portfolio EDEND: 2014-12-30<br/>Publisher name: Svenska Pappers- och Cellulosaingenioersfoereningen
Source: researchoutputwizard
Source-ID: 1611

Research output: Scientific - peer-review › Review Article

Rubber Nanocomposites

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology
Authors: Das, A., Basu, D., Heinrich, G.
Number of pages: 5
Pages: 1-5
Publication date: 2014

Host publication information
Title of host publication: Encyclopedia of Polymeric Nanomaterials
Place of publication: Berlin, Heidelberg
Publisher: Springer
Editors: Kobayashi, S., Mülken, K.
ISBN (Print): 978-3-642-36199-9
DOIs:
10.1007/978-3-642-36199-9_306-1
Source: Bibtex
Source-ID: urn:93b2051c50ea63b4fc5eeac4af66ef03
Research output: Scientific - peer-review › Chapter

Sliding Wear of Quartzite and Granite Surfaces

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Materials Science
Authors: Heino, V., Valtonen, K., Kuokkala, V.
Number of pages: 6
Publication date: 2014

Host publication information
Surface modification of thin film composite polyamide membrane using atomic layer deposition method

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Nikkola, J., Sievänen, J., Raulio, M., Jing, W., Vuorinen, J., Tang Y., C.
Number of pages: 7
Pages: 174-180
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Membrane Science
Volume: 450
ISSN (Print): 0376-7388
Ratings:
Scopus rating (2016): SJR 2.062 SNIP 1.72 CiteScore 6.13
Scopus rating (2015): SJR 2 SNIP 1.771 CiteScore 5.89
Scopus rating (2014): SJR 2.433 SNIP 1.935 CiteScore 5.42
Scopus rating (2013): SJR 2.452 SNIP 2.001 CiteScore 5.38
Scopus rating (2012): SJR 2.201 SNIP 1.968 CiteScore 4.37
Scopus rating (2011): SJR 1.82 SNIP 1.726 CiteScore 4.29
Scopus rating (2010): SJR 1.802 SNIP 1.821
Scopus rating (2009): SJR 1.638 SNIP 1.693
Scopus rating (2008): SJR 1.461 SNIP 1.805
Scopus rating (2007): SJR 1.474 SNIP 1.578
Scopus rating (2006): SJR 1.812 SNIP 2.444
Scopus rating (2005): SJR 1.745 SNIP 1.823
Scopus rating (2004): SJR 1.559 SNIP 1.668
Scopus rating (2003): SJR 1.472 SNIP 1.666
Scopus rating (2002): SJR 1.208 SNIP 1.856
Scopus rating (2001): SJR 1.301 SNIP 1.644
Scopus rating (2000): SJR 1.104 SNIP 1.715
Scopus rating (1999): SJR 1.39 SNIP 1.522
Original language: English
DOI:
10.1016/j.memsci.2013.09.005

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-12-15<br/>Publisher name: Elsevier
Source: researchoutputwizard
Source-ID: 1147
Research output: Scientific - peer-review › Article

Suurien muovituotteiden valmistus; Tietoisku

General information
State: Published
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<br/>Portfolio EDEND: 2014-12-19<br/>Publisher name: Suomen tekstiliteknillinen liitto
Source: researchoutputwizard
Source-ID: 1385
Research output: Professional › Article

Tekstiilit metsäbiotalouden tiekartalla

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

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

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: 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:
Scopus rating (2016): CiteScore 4.45 SJR 2.13 SNIP 2.033
Scopus rating (2015): SJR 2.247 SNIP 2.236 CiteScore 4.25
Scopus rating (2014): SJR 2.331 SNIP 2.524 CiteScore 4.03
Scopus rating (2013): SJR 2.017 SNIP 2.937 CiteScore 3.7
Scopus rating (2012): SJR 1.867 SNIP 2.838 CiteScore 2.85
Scopus rating (2011): SJR 1.683 SNIP 2.581 CiteScore 2.68
Scopus rating (2010): SJR 1.583 SNIP 2.367
Scopus rating (2009): SJR 1.652 SNIP 2.076
Scopus rating (2008): SJR 1.447 SNIP 1.761
Scopus rating (2007): SJR 1.336 SNIP 2.006
Scopus rating (2006): SJR 1.08 SNIP 1.894
Scopus rating (2005): SJR 1.233 SNIP 1.647
Scopus rating (2004): SJR 1.022 SNIP 1.484
Scopus rating (2003): SJR 0.977 SNIP 1.101
Scopus rating (2002): SJR 1.347 SNIP 0.958
Scopus rating (2001): SJR 0.695 SNIP 1.151
Scopus rating (2000): SJR 0.896 SNIP 0.879
Scopus rating (1999): SJR 0.864 SNIP 0.868

Original language: English

Electronic versions:
Sarlin_2014_CS_2
DOIs:
10.1016/j.compstruct.2014.03.049
Links:
http://urn.fi/URN:NBN:fi:ttty-201605033919

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.
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:
Scopus rating (2016): SJR 1.029 SNIP 1.582 CiteScore 3.57
Scopus rating (2015): SJR 1.22 SNIP 1.634 CiteScore 3.48
Scopus rating (2014): SJR 1.278 SNIP 1.888 CiteScore 3.37
Scopus rating (2013): SJR 1.341 SNIP 2.12 CiteScore 3.35
Scopus rating (2012): SJR 1.423 SNIP 2.105 CiteScore 3.25
Scopus rating (2011): SJR 1.347 SNIP 2.099 CiteScore 3.17
Scopus rating (2010): SJR 1.237 SNIP 1.642
Scopus rating (2009): SJR 1.349 SNIP 1.623
Scopus rating (2008): SJR 1.281 SNIP 1.745
Scopus rating (2007): SJR 1.451 SNIP 1.557
Scopus rating (2006): SJR 1.367 SNIP 1.787
Scopus rating (2005): SJR 1.197 SNIP 1.461
Scopus rating (2004): SJR 1.062 SNIP 1.43
Scopus rating (2003): SJR 0.922 SNIP 1.24
Scopus rating (2002): SJR 0.821 SNIP 1.058
Scopus rating (2001): SJR 0.93 SNIP 1.151
Scopus rating (2000): SJR 0.685 SNIP 1.077
Scopus rating (1999): SJR 0.75 SNIP 1.194
Original language: English
Keywords: PEEK, Fibre, Ultraviolet, Rheology, POLY(ETHER ETHER KETONE), STRUCTURE/DEGRADABILITY RELATIONSHIPS, SCANNING CALORIMETRY, THERMAL-DEGRADATION, POLYPROPYLENE, PHOTODEGRADATION, POLYMERS, PHOTOOXIDATION, CRYSTALLINITY
Electronic versions:
The_effects_of_UV_irradiation_pre-print
DOIs:
10.1016/j.polymdegradstab.2014.08.003
Links:
http://urn.fi/URN:NBN:fi:tty-201612024839
Bibliographical note
Contribution: organisation=mol,FACT1=0.8<br/>Contribution: organisation=keb,FACT2=0.2<br/>Portfolio EDEND: 2014-09-10<br/>Publisher name: Elsevier Ltd
Source: researchoutputwizard
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<br/>Portfolio EDEND: 2014-10-09<br/>Publisher name: Suomen Tekstiiliteknillinen Liitto
Source: researchoutputwizard
Source-ID: 1158
Research output: Professional wizard Article

Tribological Testing and Modelling of Elastomeric Materials

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Vaajoki, A., Laukkanen, A., Waudby, R., Kivistö-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:
Scopus rating (2016): CiteScore 0.24 SJR 0.163 SNIP 0.253
Scopus rating (2015): SJR 0.171 SNIP 0.228 CiteScore 0.21
Scopus rating (2014): SJR 0.212 SNIP 0.349 CiteScore 0.23
Scopus rating (2013): SJR 0.19 SNIP 0.308 CiteScore 0.21
Scopus rating (2012): SJR 0.172 SNIP 0.377 CiteScore 0.19
Scopus rating (2011): SJR 0.176 SNIP 0.441 CiteScore 0.22
Scopus rating (2010): SJR 0.183 SNIP 0.295
Scopus rating (2009): SJR 0.211 SNIP 0.246
Scopus rating (2008): SJR 0.192 SNIP 0.285
Scopus rating (2007): SJR 0.191 SNIP 0.36
Scopus rating (2006): SJR 0.221 SNIP 0.411
Scopus rating (2005): SJR 0.222 SNIP 0.369
Scopus rating (2004): SJR 0.214 SNIP 0.414
Scopus rating (2003): SJR 0.206 SNIP 0.289
Scopus rating (2002): SJR 0.202 SNIP 0.223
Scopus rating (2001): SJR 0.24 SNIP 0.326
Vanerin pinnoltaminen muovilla

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Materials Science
Authors: Järvelä, P., Järvelä, P.
Number of pages: 10
Publication date: 2014

Publication information
Publisher: Lahden ammattikorkeakoulun julkaisusarjat
ISBN (Print): 978-951-827-198-0
Original language: Finnish

Publication series
Name: Lahden ammattikorkeakoulun julkaisu. Sarja C, Artikkelikokoelmat, raportit ja muut ajankohtaiset julkaisut
No.: 150
ISSN (Print): 1457-8328

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-06-26
Source: researchoutputwizard
Source-ID: 581
Research output: Professional › Commissioned report

Wear modelling and material testing of elastomers

General information
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Materials Science
Authors: Kivikytö-Reponen, P., Laukkanen, A., Valtonen, K., Apostol, M.
Number of pages: 3
Pages: 27-29
Publication date: 2014
Peer-reviewed: Unknown

Publication information
Journal: Kumiviesti
Issue number: 1
Original language: English
Links:
http://www.teknikum.com/yritys/kumiviestit

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-12-31<br/>Publisher name: Teknikum-yhtiöt
Source: researchoutputwizard
Source-ID: 731
Research output: Professional › Article
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.
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

Publication series
Name: Tribology - Materials, Surfaces & Interfaces
Volume: 8
No.: 2
ISSN (Print): 1751-5831
ASJC Scopus subject areas: Metals and Alloys, Polymers and Plastics
Keywords: Slurry erosion, high speed slurry-pot, pin mill, particle size
Electronic versions:
Paper for ITS 2013_Niko Ojala
Links:
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
Original language: English

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

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: 2402
Research output: Professional › Article

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

Publication information
Journal: Muovi - Plast
Issue number: 2
ISSN (Print): 0788-8430
Original language: Finnish

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-06-26<br/>Publisher name: Muoviyhdistys
Source: researchoutputwizard
Source-ID: 2404
Research output: Professional › Article

Muovituotteen kustannuksiin vaikuttaminen

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<br/>Portfolio EDEND: 2014-06-26<br/>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)
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
Title of host publication: Composites Week, Leuven and TexComp-11 conference, 16-20 Semptember 2013
Links:
http://www.mtm.kuleuven.be/English/research/compositesweek/program/papers

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-12-01
Source: researchoutputwizard
Source-ID: 3065
Research output: Scientific › Conference contribution

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
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Journal: Muovi - Plast
Issue number: 4
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Original language: Finnish

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-06-23<br/>Publisher name: Muoviyhdistys
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
Digital Printing of Polymer-coated Paper or Board

General information
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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
IPC: G03G 7/00 A I
Patent number: AT465436T
Priority date: 16/06/05
Priority number: WO2005FI00282
Original language: English
Source: espacenet
Source-ID: AT465436T
Research output: Scientific › Patent

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 acrylate 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.
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
Authors: Lahti, J., Penttinen, T., Räsänen, J., Kuusipalo, J., Savolainen, A.
Publication date: 1 Sep 2004

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IPC: G03G 7/ 00 A I
Patent number: EP1451644
Priority date: 5/12/02
Priority number: WO2002FI00994
Original language: English
Source: espacenet
Source-ID: EP1451644
Research output: Scientific › Patent