Hybrid matrices of TiO2 and TiO2–Ag nanofibers with silicone for high water flux photocatalytic degradation of dairy effluent

TiO2 and TiO2–Ag nanofibers were produced by electrospinning technique and surface coated on silicone elastomer (diameter: 10.0 mm; thickness: 2.0 mm) by dipcoating method. These coated hybrid nanoporous matrices were characterized by various morphological and physicochemical techniques (like SEM, TEM, XRD, FTIR, EDS and UV). These characterizations reveal that the surface morphology of electrospun nanofibers remain intact by the dipcoating technique. The produced hybrid matrices of TiO2 and TiO2–Ag silicone were utilized as photocatalysts to degrade dairy waste water with an efficient water flux and water photosplitting properties.

General information
Publication status: Published
Contributors: Kanjwal, M. A., Alm, M., Thomsen, P., Barakat, N. A., Chronakis, I. S.
Pages: 142-149
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: Journal of Industrial and Engineering Chemistry
Volume: 33
ISSN (Print): 1226-086X
Ratings:
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.3 SJR 1.148 SNIP 1.494
Web of Science (2016): Impact factor 4.421

Hybrid matrices of ZnO nanofibers with silicone for high water flux photocatalytic degradation of dairy effluent

Zinc oxide (ZnO) nanofibers were produced by electrospinning technique and surface coated on silicone elastomer substrate (diameter: 10.0 mm; thickness: 2.0 mm) by a dipcoating method. The obtained hybrid nanoporous matrices were investigated by scanning and transmission electron microscopy (SEM, TEM), X-ray diffraction (XRD) and Fourier transformation infrared techniques (FTIR). These characterizations reveal that the surface morphology of electrospun nanofibers remained intact by the dipcoating technique. The produced hybrid matrices showed high water flux of 9407 L/m²h, 38% removal rate of dairy effluent (DE) and 2298 ml/g h rate of hydrogen production. (C) 2016 Elsevier B.V. All rights reserved.

General information
Publication status: Published
Contributors: Kanjwal, M. A., Shawabkeh, A. Q., Alm, M., Thomsen, P., Barakat, N. A. M., Chronakis, I. S.
Number of pages: 6
Pages: 495-500
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: Materials Chemistry and Physics
Volume: 181
ISSN (Print): 0254-0584
Ratings:
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.14 SJR 0.651 SNIP 0.91
Web of Science (2016): Impact factor 2.084
Electrospun NiO, ZnO and composite NiO–ZnO nanofibers/photocatalytic degradation of dairy effluent

Among the food wastes, the dairy effluent (DE) is considered to be the most polluting one because of the large volume of wastewater generated and its high organic load. Photocatalytic degradation of DE and organic dye methylene blue (MB) was studied using Zinc oxide nanofibers (ZnO NFs), Nickel oxide nanofibers (NiO NFs) and composite Zinc oxide–Nickel oxide nanofibers (ZnO–NiO NFs). These nanomembranes were characterized in SEM, TEM, XRD and UV studies. The pristine nanofiber membranes were smooth and continuous, with an average diameter of about 400nm, and held their nanofibrous morphology even after calcination of 600°C and more than 3h of photocatalytic degradation of DE and MB dye. The ZnO NFs and NiO NFs were effective materials for degradation of DE and MB dye. NiO NFs and ZnO NFs showed a maximum degradation of 70% and 75% in DE and 50% and 60% in MB dye respectively, after 3h. The significant enhancement of degradation in the composite ZnO–NiO NFs is attributed to the photoactivity of material under visible light irradiation. The composite ZnO–NiO NFs eliminated 40% of DE and 65% of MB dye, after 1h and maximum degradation of 80% DE after 3h and 100% MB dye after 90min. Overall, this study also shows that the nanofibrous morphology strongly enhances the surface activity of the ZnO–NiO photocatalyst when utilized to degrade DE and MB dye at room temperature.

Hybrid nanofibers of TiO2-silicone and TiO2-Ag-silicone for high water flux photocatalytic degradation of dairy effluent

Hybrid nanofibers of TiO2-silicone and TiO2-Ag-silicone for high water flux photocatalytic degradation of dairy effluent
Photocatalytic degradation of dairy effluent using AgTiO2 nanostructures/polyurethane nanofiber membrane

Dairy effluent (DE) is environmentally toxic and needs special attention. Photocatalytic degradation of DE was studied using novel polyurethane (PU)-based membranes. Typically, silver-titanium dioxide nanofibers (AgTiO2 NFs) and silver-titanium dioxide nanoparticles (AgTiO2 NPs) were individually incorporated in PU electrospun nanofibers to overcome the mandatory sophisticated separation of the nanocatalysts, which can create a secondary pollution, after the treatment process. These nanomembranes were characterized in SEM, TEM, XRD and UV studies. The polymeric electrospun nanofibers were smooth and continuous, with an average diameter of about 550 nm, and held their nanofibrous morphology even after more than 2 h of photocatalytic degradation of DE, due to the good stability of PU in the aqueous solutions, which indicates good imprisoning of the functional photocatalysts. The PU-AgTiO2 NPs and PU-AgTiO2 NFs were effective materials for degradation of DE, even after two successive cycles. PU-AgTiO2 NPs and PU-AgTiO2 NFs showed a maximum degradation of 75% and 95%, respectively, after 2 h. The significant enhancement of degradation in the PU-Ag-TiO2 NPs and PU-Ag-TiO2 NFs is attributed to the photoactivity of Ag-TiO2 material under visible light irradiation.
In this study, the influence of the temperature on the photodegradation process using Ag-doped TiO2 nanostructures was investigated. Two morphologies were used; nanoparticles and nanofibers. The nanofibers were synthesized by electrospinning of a sol–gel consisting of titanium isopropoxide, silver nitrate and poly(vinyl acetate). The silver nitrate amount was changed to produce nanofibers having different silver contents. Typically, sol–gels containing 0.5, 1.0, 1.5, 2.0 and 2.5 wt% silver nitrate were utilized. Calcination of the electrospun mats at 700 °C led to produce well morphology Ag-doped TiO2 nanofibers for all formulations. The nanoparticles were prepared from the same sol–gels, however, instead of spinning the gels were dried, ground and sintered at 700 °C. Photodegradation under UV irradiation for the rhodamine B at 5, 15, 25, 45 and 55 °C were performed. For the nanoparticles, increasing the temperature has positive impact as the best degradation was obtained at 55 °C. In contrast to the known influence of the temperature on the chemical reactions, in case of the nanofibrous morphology, the temperature has negative impact as the experimental work indicated that the optimum temperature is 25 °C. The observed strange effect of the temperature in case of the nanofibrous morphology indicates instant degradation of the dye molecules in the active zones surrounding the nanofibers. Therefore, the increase of temperature results in increase the kinetic energy of the dye molecules so the molecules escape from the active thin film surrounding the photocatalyst. Overall, this study shows that the nanofibrous morphology strongly enhances the surface activity of the photocatalyst which generates negative influence of the temperature.
Influence of temperature on the photodegradation process using Ag-doped TiO2 nanostructures: Negative impact with the nanofibers

In this study, the influence of the temperature on the photodegradation process using Ag-doped TiO2 nanostructures was investigated. Two morphologies were used; nanoparticles and nanofibers. The nanofibers were synthesized by electrospinning of a sol–gel consisting of titanium isopropoxide, silver nitrate and poly(vinyl acetate). The silver nitrate amount was changed to produce nanofibers having different silver contents. Typically, sol–gels containing 0.5, 1.0, 1.5, 2.0 and 2.5 wt% silver nitrate were utilized. Calcination of the electrospun mats at 700 °C led to produce well morphology Ag-doped TiO2 nanofibers for all formulations. The nanoparticles were prepared from the same sol–gels, however, instead of spinning the gels were dried, ground and sintered at 700 °C. Photodegradation under UV irradiation for the rhodamine B at 5, 15, 25, 45 and 55 °C were performed. For the nanoparticles, increasing the temperature has positive impact as the best degradation was obtained at 55 °C. In contrast to the known influence of the temperature on the chemical reactions, in case of the nanofibrous morphology, the temperature has negative impact as the experimental work indicated that the optimum temperature is 25 °C. The observed strange effect of the temperature in case of the nanofibrous morphology indicates instant degradation of the dye molecules in the active zones surrounding the nanofibers. Therefore, the increase of temperature results in increase the kinetic energy of the dye molecules so the molecules escape from the active thin film surrounding the photocatalyst. Overall, this study shows that the nanofibrous morphology strongly enhances the surface activity of the photocatalyst which generates negative influence of the temperature.

General information
Publication status: Published
Organisations: National Food Institute, Division of Industrial Food Research, Chonbuk National University
Number of pages: 1
Publication date: 2013
Peer-reviewed: Yes
Electronic versions:
Abstract_Book_Final.pdf

Influences of Morphology and Doping on the Photoactivity of TiO2 Nanostructures

General information
Publication status: Published
Organisations: National Food Institute, Division of Industrial Food Research, Chonbuk National University
Contributors: Barakat, N. A. M., Kanjwal, M. A.
Pages: 105-141
Publication date: 2013

Host publication information
Title of host publication: Structural Nanocomposites : Perspectives for Future Applications
Place of publication: London
Publisher: Springer
Editor: Njuguna, J.
ISBN (Print): 978-3-642-40321-7
ISBN (Electronic): 978-3-642-40322-4
Source: dtu
Source ID: u::10736

A simple approach for synthesis, characterization and bioactivity of bovine bones to fabricate the polyurethane nanofiber containing hydroxyapatite nanoparticles

In the present study, we had introduced polyurethane (PU) nanofibers that contain hydroxyapatite (HAp) nanoparticles (NPs) as a result of an electrospinning process. A simple method that does not depend on additional foreign chemicals had been employed to synthesize HAp NPs through the calcination of bovine bones. Typically, a colloidal gel consisting of HAp/PU had been electrospun to form nanofibers. In this communication, physicochemical aspects of prepared nanofibers were characterized by FE-SEM, TEM and TEM-EDS, which confirmed that nanofibers were well-oriented and good dispersion of HAp NPs, over the prepared nanofibers. Parameters, affecting the utilization of the prepared nanofibers in various nano-biotechnological fields have been studied; for instance, the bioactivity of the produced nanofiber mats was investigated while incubating in simulated body fluid (SBF). The results from incubation of nanofibers, indicated that incorporation of HAp strongly activates the precipitation of the apatite-like particles, because of the HAp NPs act as seed,
that accelerate crystallization of the biological HAp from the utilized SBF.

General information
Publication status: Published
Organisations: Division of Industrial Food Research, National Food Institute, University of Texas-Pan American, Chonbuk National University
Pages: 41-53
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Express Polymer Letters
Issue number: 1
ISSN (Print): 1788-618X
Ratings:
Scopus rating (2012): CiteScore 2.1 SJR 0.915 SNIP 1.597
Web of Science (2012): Impact factor 2.294
ISI indexed (2012): ISI indexed yes
Original language: English
Keywords: Nanomaterials, Biocompatible polymers
Electronic versions:
Express new pap.pdf
DOIs:
10.3144/expresspolymlett.2012.5
Source: orbit
Source ID: 286553
Research output: Contribution to journal › Journal article – Annual report year: 2012 › Research › peer-review

Oxidative stress-mediated cytotoxicity and apoptosis induction by TiO2 nanofibers in HeLa cells
Titanium dioxide nanoparticles are increasingly being used in pharmaceutical and cosmetic products. The high aspect ratio of fibrous nanomaterials, such as carbon nanotubes and TiO2 nanofibers (TiO2NFs), similar to the one used in this study makes them an attractive structural material and has attracted a lot of attention due to their possible negative health effects as suggested by their morphological similarities with asbestos. In the present study, therefore, toxicity of TiO2NFs was evaluated in human cervical adenocarcinoma HeLa cells. The TEM and XRD analyses showed that TiO2NFs used in this study are pure with uniform diameter of around 200 nm, and their length to width aspect ratio ranged between 5 and 15. Exposure of HeLa cells to TiO2NFs induced significant cytotoxicity even at doses as low as 2 μg/ml. The intracellular uptake of TiO2NFs in cells was shown by Alizarin Red S (ARS) labeled nanofibers. The mechanism of toxicity is mainly due to the induction of cellular oxidative stress, as revealed by elevated ROS levels, reduced antioxidant levels, and increased lipid peroxidation leading to apoptosis. The cell cycle analysis indicated G2/M cell cycle arrest in the cells exposed to TiO2NF. TiO2NFs treatment to HeLa cells resulted in increased expression of proapoptotic proteins Bax with an increase in cytosolic Cytochrome-C and inhibition of anti-apoptotic protein Bcl-2. Our results revealed the potential mechanism of cellular effects of TiO2NFs.

General information
Publication status: Published
Organisations: National Food Institute, Division of Industrial Food Research, Stanford University, Anna University, Madurai Kamaraj University
Contributors: Ramkumar, K. M., Manjula, C., GnanaKumar, G., Kanjwal, M. A., Sekar, T. V., Paulmurugan, R., Rajaguru, P.
Pages: 324-333
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: European Journal of Pharmaceutics and Biopharmaceutics
Volume: 81
Issue number: 2
ISSN (Print): 0939-6411
Ratings:
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 5.15 SJR 1.99 SNIP 1.934
Web of Science (2012): Impact factor 3.826
Preparing photochromic nanofibers and animal cells using a photochromic compound of 1′,3′,3′-trimethyl-6-nitrospiro (2H-1-benzopyran-2,2′-indoline)

In this work, the photochromic compound 1′,3′,3′-trimethyl-6-nitrospiro (2H-1-benzopyran-2,2′-indoline) (NOSP) was synthesized by a two step process. The photochromic properties of NOSP were investigated by ultraviolet–visible (UV–Vis) spectrophotometry. The results showed that NOSP was very sensitive to UV irradiation with absorption peaks at about 336nm and 567nm. Our hypothesis was that both photochromic nanofibers and photochromic living animal cells could be obtained by combining them with NOSP. To test the hypothesis, photochromic nanofibers were fabricated by electrospinning from various mixed solutions of NOSP and polymers (including a synthetic polymer of poly(methyl methacrylate) and a natural polymer of gelatin); NOSP/ethanol solution was dissolved in culture medium to stain pig iliac endothelial cells (PIEC) and endow them with photochromic capability. Polymer nanofibers from electrospinning were characterized by water contact angle measurements, ultraviolet–visible (UV–Vis) spectrophotometry and fluorescence microscopy. Morphology of photochromic PIEC was observed by fluorescence microscopy after being irradiated. It was shown that nanofibers from electrospun polymers and NOSP-treated PIEC had photochromic properties. The bio-toxicity of the photochromic compound was also evaluated and it was shown that ~50% of PIEC remained viable for at least 20min. The photochromic compound NOSP could be a potentially powerful tool for development of multi-functional nanofibers and biological applications.

Preparing poly (caprolactone) micro-particles through solvent-induced phase separation

Poly (caprolactone) (PCL) particles with the size distribution from 1 to 100 μm were prepared through solvent-induced phase separation, in which polyvinyl-alcohol (PVA) was used as the matrix-forming polymer to stabilize PCL particles. The cloud point data of PCL-acetone-water was determined by the titration method. PCL-acetone and PVA-water solutions, PCL-PVA gel, and PCL particles suspension were recorded by a digital camera. The morphology of PCL-PVA suspension and PCL particles were observed by optical microscopy and scanning electron microscopy, respectively. The size distribution of PCL particles was investigated by a particle size analyzer. Results from differential scanning calorimeter indicated that the main interaction between PCL and PVA were mediated through hydrogen bonding.
Titanium Dioxide Nanofibers and Microparticles Containing Nickel Nanoparticles

General information
Publication status: Published
Organisations: National Food Institute, Division of Industrial Food Research, University of Texas-Pan American, Chonbuk National University
Number of pages: 8
Pages: 816474
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: ISRN Nanomaterials
Volume: 2012
ISSN (Print): 2090-8741
Ratings:
ISI indexed (2012): ISI indexed no
Original language: English
DOIs:
10.5402/2012/816474
Source: dtu
Source ID: n:oat:DTIC-ART:doaj/376568391::24527
Research output: Contribution to journal › Journal article – Annual report year: 2012 › Research › peer-review

Zinc oxide’s hierarchical nanostructure and its photocatalytic properties

In this study, a new hierarchical nanostructure that consists of zinc oxide (ZnO) was produced by the electrospinning process followed by a hydrothermal technique. First, electrospinning of a colloidal solution that consisted of zinc nanoparticles, zinc acetate dihydrate and poly(vinyl alcohol) was performed to produce polymeric nanofibers embedding solid nanoparticles. Calcination of the obtained electrospun nanofiber mats in air at 500 °C for 90 minutes produced pure ZnO nanofibers with rough surfaces. The rough surface strongly enhanced outgrowing of ZnO nanobranches when a specific hydrothermal technique was used. Methylene blue dihydrate was used to check the photocatalytic ability of the produced nanostructures. The results indicated that the hierarchical nanostructure had a better performance than the other form.

General information
Publication status: Published
Organisations: Division of Industrial Food Research, National Food Institute, University of Texas-Pan American, Chonbuk National University
A new hierarchical nanostructure that consists of cobalt oxide (Co3O4) and zinc oxide (ZnO) was produced by the electrospinning process followed by a hydrothermal technique. First, electrospinning of a colloidal solution that consisted of zinc nanoparticles, cobalt acetate tetrahydrate and poly(vinyl alcohol) was performed to produce polymeric nanofibers embedding solid nanoparticles. Calcination of the obtained electrospun nanofiber mats in air at 600°C for 1h, produced Co3O4 nanofibers with rough surfaces containing ZnO nanoparticles (i.e., ZnO-doped Co3O4 nanofibers). The rough surfaced nanofibers, containing ZnO nanoparticles (ZnNPs), were then exploited as seeds to produce ZnO nanobranches using a specific hydrothermal technique. Scanning electron microscopy (SEM), and transmission electron microscopy (TEM) were employed to characterize the as-spun nanofibers and the calcined product. X-ray powder diffractometry (XRD) analysis was used to study the chemical composition and the crystallographic structure.
Co$_3$O$_4$, ZnO, Co$_3$O$_4$-ZnO Nanofibers and Their Properties

General information
Publication status: Published
Organisations: National Food Institute, Division of Industrial Food Research, University of Texas-Pan American, Chonbuk National University
Contributors: Kanjwal, M. A., Sheikh, F. A., Barakat, N. A. M., Li, X., Yong Kim, H., Chronakis, I. S.
Pages: 196-202
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Journal of Nanoengineering and Nanomanufacturing
Volume: 1
Issue number: 2
Original language: English
Keywords: Cobalt oxide, Zinc oxide, Nanofibers, Photocatalyst, Mechanical properties, Electrospinning
Electronic versions:
28764d01.pdf
DOIs:
10.1166/jnan.2011.1016

Fabrication of Mineralized Collagen from Bovine Waste Materials by Hydrothermal Method as Promised Biomaterials

In the present study, we aimed to produce mineralized-collagen by hydrothermal process. A simple method not depending on additional foreign chemicals has been employed to isolate the mineralized-collagen fibers from bovine waste. The process of extraction involves the use of hydrothermal method from available bovine bones. The structural and morphological properties of the collagen fibers were characterized by using scanning electron microscopy and transmission electron microscopy. These results indicated well received collagen fibers, having a diameter less than 1 m and with established mineral content in the individual fibers. The X-ray diffraction showed the crystalline feature of the obtained nano-compounds. The thermo gravimetric analysis was used to differentiate between the collagen and mineral parts of obtained product. Overall, the results generously indicated production of well received collagen fibers from bovine bones.

General information
Publication status: Published
Organisations: Division of Industrial Food Research, National Food Institute, University of Texas-Pan American, Eindhoven University of Technology, Chonbuk National University
Pages: 194-197
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Journal of Biomaterials and Tissue Engineering
Volume: 1
ISSN (Print): 2157-9083
Original language: English
DOIs:
10.1166/jbt.2011.1017
Source: orbit
Source ID: 318450

Fabrication of poly(caprolactone) nanofibers containing hydroxyapatite nanoparticles and their mineralization in a simulated body fluid

General information
Publication status: Published
Organisations: University of Texas-Pan American, Myongji University, Chonbuk National University
Influences of Silver-Doping on the Crystal Structure, Morphology and Photocatalytic Activity of TiO2 Nanofibers

Doping of titanium dioxide nanofibers by silver nanoparticles revealed distinct improvement in the photocatalytic activity; however other influences have not been investigated. In this work, effect of silver-doping on the crystal structure, the nanofibrous morphology as well as the photocatalytic activity of titanium oxide nanofibers has been studied. Silver-doped TiO2 nanofibers having different silver contents were prepared by calcination of electrospun nanofiber mats consisting of silver nitrate, titanium isopropoxide and poly(vinyl acetate) at 600°C. The results affirmed formation of silver-doped TiO2 nanofibers composed of anatase and rutile when the silver nitrate content in the original electrospun solution was more than 3 wt%. The rutile phase content was directly proportional with the AgNO3 concentration in the electrospun solution. Negative impact of the silver-doping on the nanofibrous morphology was observed as increase the silver content caused to decrease the aspect ratio, i.e. producing nanorods rather nanofibers. However, silver-doping leads to modify the surface roughness. Study of the photocatalytic degradation of methylene blue dye clarified that increase the silver content strongly enhances the dye oxidation process.

General information
Publication status: Published
Organisations: Division of Industrial Food Research, National Food Institute, Chonbuk National University, King Saud University
Contributors: Barakat, N. A. M., Kanjwal, M. A., Al-Deyab, S. S., Chronakis, I. S.
Pages: 1188-1193
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Materials Sciences and Applications
Issue number: 2
ISSN (Print): 2153-117X
Ratings:
ISI indexed (2011): ISI indexed no
Original language: English
Keywords: Electrospinning, Crystal Structure, Nanostructured Ceramics, Inorganic Materials, Titanium Oxide Nanofibers
DOIs: 10.4236/msa.2011.29160
Source: orbit
Source ID: 286337
Research output: Contribution to journal › Journal article – Annual report year: 2011 › Research › peer-review

Nanobiotechnology approach to fabricate polycaprolactone nanofibers containing solid titanium nanoparticles as future implant materials

In this study, a good combination of electrospun poly(caprolactone) nanofibers incorporated with high purity titanium nanoparticles is introduced for hard tissue engineering applications. A simple approach to utilize the colloidal properties of poly(caprolactone) and titanium nanoparticles are exploited to form nanofibers by the simple electrospinning process. The prepared colloidal solutions were characterized using dynamic light scattering and electrophoretic light scattering which
indicated unimodal size distribution and negative zeta potential. To investigate the bioactivity of the resultant nanofiber mats, they were incubated in simulated body fluid at 37 °C for 10 days. Field emission scanning electron microscopy in combination with energy-dispersive X-ray spectroscopy indicated that incorporation of titanium strongly activates precipitation of the apatite-like materials from the utilized simulated body fluid. Moreover, in-vivo experiments using experimental dogs revealed that nanofibers can yield good tissue regeneration on the surfaces of nanofibers.

General information
Publication status: Published
Organisations: Division of Industrial Food Research, National Food Institute, University of Texas-Pan American, Chonbuk National University
Contributors: Sheikh, F. A., Kanjwal, M. A., Cha, J., Kim, N., Barakat, N. A. M., Yong Kim, H.
Pages: 1481-1487
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: International Journal of Materials Research
Volume: 102
Issue number: 12
ISSN (Print): 1862-5282
Ratings:
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 0.82 SJR 0.504 SNIP 0.581
Web of Science (2011): Impact factor 0.83
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
Original language: English
Keywords: Titanium, Nanofibers, Electrospinning, Implant, Nanoparticles
DOIs:
10.3139/146.110620
Source: orbit
Source ID: 316018
Research output: Contribution to journal › Journal article – Annual report year: 2011 › Research › peer-review

Point-Bonded electrospun polystyrene fibrous mats fabricated via the addition of poly (butylacrylate) adhesive
Because of poor mechanical strength, applications of electrospun polystyrene (PS) fibrous mats are quite limited. The introduction of various concentrations of poly (butylacrylate) adhesives (PBAs) into PS solutions led to the fabrication of point-bonded electrospun PS fibrous mats with good mechanical strength. The morphologies of PS/PBA fibers with varying PBA content (0-50 wt%) were investigated using scanning electron microscopy (SEM), and the results were compared with pure PS and PBA fibers fabricated with various solvents. SEM images indicated that point-bonded PS/PBA fibers were uniformly distributed with an average diameter of 1-2. On increasing concentration of PBA up to 20 wt%, porous PS/PBA fibrous mats were obtained. However, solid films were formed at very high concentrations of PBA. The Young's modulus and tensile strength of PS/PBA fibrous mats increased up to 52.4 and 2.7 MPa, respectively. The resultant enhancement of the mechanical properties of PS fibrous mats on addition of PBA increases the number of potential applications of these materials. POLYM. ENG. SCI., 51:894-901, 2011. (C) 2011 Society of Plastics Engineers

General information
Publication status: Accepted/In press
Organisations: Chonbuk National University
Pages: 894-901
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Polymer Engineering and Science
Volume: 51
Issue number: 5
ISSN (Print): 0032-3888
Ratings:
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 1.5 SJR 0.654 SNIP 1.054
Web of Science (2011): Impact factor 1.302
Polyurethane nanofibers containing copper nanoparticles as future materials

In the present study, we aimed to represent a novel approach to fabricate polyurethane nanofibers containing copper nanoparticles (NPs) by simple electrospinning process. A simple method, not depending on additional foreign chemicals, has been employed to utilize prepared copper NPs in polyurethane nanofibers. Typically, a colloidal gel consisting of copper NPs and polyurethane has been electrospun. SEM-EDX and TEM results confirmed well oriented nanofibers and good dispersion of pure copper NPs. Copper NPs have diameter in the range of 5–10nm. The thermal stability of the synthesized nanofibers was examined for identifying the proper settlement of copper NPs among the nanofibers, according to the concentrations used in original solutions. Furthermore, XRD results well demonstrated crystalline feature of copper NPs. Model microorganisms Escherichia coli and Bacillus subtilissus had been used to check the antimicrobial efficacy of these nanofiber mats. Subsequently, antimicrobial tests have indicated that the prepared nanofibers do possesses good bactericidal effect. Accordingly, it is noted that the obtained nanofiber mats can be used as future filter membranes with good antimicrobial activities.

Synthesis and characterization of bovine femur bone hydroxyapatite containing silver nanoparticles for the biomedical applications

Synthesis and characterization of bovine femur bone hydroxyapatite containing silver nanoparticles for the biomedical applications
Effects of silver content and morphology on the catalytic activity of silver-grafted titanium oxide nanostructure

As titanium oxide is a well-known photocatalyst, we investigated the effects of silver content and nanostructural morphology on the photocatalytic degradation of two dyes, methylene blue and rhodamine B. Two nano-formulations were utilized, including nanofibers and nanoparticles. Silver-grafted titanium oxide nanofibers were synthesized using the electrospinning of silver nitrate/titanium isopropoxide/poly(vinyl acetate) sol-gel. The nanoparticulate form was obtained by calcination of a ground powder prepared from the same electrospun sol-gel. The results affirmed the advantage of the silver-grafted titanium oxide nanostructures over the silver-free ones. Increasing the silver content in the nanofibers led to increases in their surface area, which is an important parameter in heterogeneous catalytic chemical reactions. Therefore, the results strongly suggest the use of silver-grafted titanium oxide in a nanofibrous form. These results further support utilizing Ag-loaded titanium oxide nanofibers as a photocatalyst.

Boron Nitride Nanofibers by the Electrospinning Technique

General information
Publication status: Published
Organisations: Chonbuk National University, Minia University
Pages: 551
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Macromolecular Research
Volume: 18
Original language: English
Source: orbit
Source ID: 276272
Research output: Contribution to journal › Journal article – Annual report year: 2010 › Research › peer-review

CoNi Bimetallic Nanofibers by Electrospinning: Nickel-Based Soft Magnetic Material with Improved Magnetic Properties

General information
Publication status: Published
Electronic characterization and photocatalytic properties of TiO2/CdO electrospun nanofibers

Electrospun Titanium Dioxide Nanofibers Containing Hydroxyapatite and Silver Nanoparticles as Future Implant Materials
Fabrication of titanium dioxide nanofibers containing hydroxyapatite nanoparticles

In the present study, we introduce titanium dioxide (TiO(2)) nanofibers that contain hydroxyapatite (HAp) nanoparticles (NPs) as a result of an electrospinning process. A simple method that does not depend on additional foreign chemicals has been employed to synthesize HAp NPs through calcination of bovine bones. Typically, a colloidal gel consisting of titanium isopropoxide/HAp was prepared to produce nanofibers embedded with solid NPs by electrospinning process. The SEM results confirmed well oriented nanofibers and good dispersion of HAp NPs over the nanofibers. XRD results demonstrated well crystalline feature of both TiO(2) and HAp. Physiochemical aspects of prepared nanofibers were characterized for TEM and TEM-EDS which confirmed nanofibers were well oriented and had good dispersion of HAp NPs. Accordingly, these results strongly recommend the use of obtained nanofiber mats as a future candidate for hard tissue engineering applications. (C) 2010 Elsevier B.V. All rights reserved.

General information
Publication status: Published
Organisations: Myongji University, Chonbuk National University
Pages: 296-301
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Applied Surface Science
Volume: 257
Issue number: 1
ISSN (Print): 0169-4332
Ratings:
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.922 SNIP 1.112
Web of Science (2010): Impact factor 1.795
Web of Science (2010): Indexed yes
Original language: English
DOI:
10.1016/j.apsusc.2010.06.090
Source: orbit
Source ID: 276322

Research output: Contribution to journal › Journal article – Annual report year: 2010 › Research › peer-review

Fabrication of titanium oxide nanofibers containing silver nanoparticles

General information
Publication status: Published
Organisations: National Food Institute, University of Texas-Pan American, Myongji University, Chonbuk National University
Pages: 685-691
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Journal of Ceramic Processing Research
Volume: 11
Issue number: 6
ISSN (Print): 1229-9162
Ratings:
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.284 SNIP 0.462
Web of Science (2010): Impact factor 0.484
Web of Science (2010): Indexed yes
Original language: English
Source: orbit
Source ID: 276326

Research output: Contribution to journal › Journal article – Annual report year: 2010 › Research › peer-review
Functionalization of Electrospun Titanium Oxide Nanofibers with Silver Nanoparticles: Strongly Effective Photocatalyst

In the present study, we are introducing silver-doped titanium oxide nanofibers produced by electrospinning technique. Calcination of dry nanofiber mats consisting of silver nitrate-titanium isopropoxide/PVAc in air at 600 degrees C for 1h leads to produce Ag-doped titania nanofibers. Two dyes have been invoked to check the photocatalytic ability of the produced nanofibers; methylene blue dihydrate and methyl red. The obtained results indicated that the silver-doped titanium oxide nanofibers can eliminate >92% of the methylene blue dye within 10 min only. In a case of methyl red, almost the dye was decayed (93%) within 3 h.

Gallium arsenide (GaAs) nanofibers by electrospinning technique as future energy server materials

In this study, a new hierarchical nanostructure consisting of zinc oxide (ZnO) and titanium dioxide (TiO2) was prepared by an electrospinning process followed by a hydrothermal technique for use as a photocatalyst for dye degradation. First, the electrospinning of a colloidal solution consisting of titanium isopropoxide/poly(vinyl acetate)zinc nanoparticles was performed to produce polymeric nanofibers embedded in solid nanoparticles. Calcination of the obtained electrospun...
nanofiber mats in air at 600 A degrees C produced TiO2 nanofibers containing ZnO nanoparticles (i.e., ZnO-doped TiO2 nanofibers). The ZnO nanoparticles formed were then exploited as seeds to produce the outgrowth ZnO branches around the TiO2 nanofibers using the hydrothermal technique. Photodegradation of methyl red and rhodamine B (RB) dyes was examined individually using four photocatalysts: ZnO nanoparticles prepared by the same hydrothermal technique, pristine TiO2 nanofibers, ZnO-doped TiO2 nanofibers and the produced nanostructure. The results showed that the introduced ZnO-TiO2 hierarchical nanostructure can eliminate all the methyl red dye within 90 min and the rhodamine B dye within 105 min. However, the other three nanostructures could not totally remove any of the dyes, even after 3 h. Therefore, the introduced nanostructure has higher photocatalytic activity than any of its ingredients individually, which highlights the advantages of synthesizing this novel structure.

General information
Publication status: Published
Organisations: Chonbuk National University
Pages: 233-240
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Macromolecular Research
Volume: 18
Issue number: 3
ISSN (Print): 1598-5032
Ratings:
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.557 SNIP 0.682
Web of Science (2010): Impact factor 1.639
Web of Science (2010): Indexed yes
Original language: English
DOIs:
10.1007/s13233-010-0303-9
Source: orbit
Source ID: 275929
Research output: Contribution to journal › Journal article – Annual report year: 2010 › Research › peer-review

Physiochemical characterizations of electrospun (ZnO-GeO2) nanofibers and their optical properties

General information
Publication status: Published
Organisations: Minia University, Chonbuk National University
Pages: 3833
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Journal of Materials Science
Volume: 45
ISSN (Print): 0022-2461
Ratings:
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.957 SNIP 1.09
Web of Science (2010): Impact factor 1.859
Web of Science (2010): Indexed yes
Original language: English
Source: orbit
Source ID: 275891
Research output: Contribution to journal › Journal article – Annual report year: 2010 › Research › peer-review

Polymeric nanofibers containing solid nanoparticles prepared by electrospinning and their applications

Generally, polymer solution or sol-gel is used to produce electrospun nanofibers via the electrospinning technique. In the utilized sol-gel, the metallic precursor should be soluble in a proper solvent since it has to hydrolyze and polycondensate in the final solution; this strategy straitens the applications of the electrospinning process and limits the category of the electrospinnable materials. In this study, we are discussing electrospinning of a colloidal solution process as an alternative
strategy. We have utilized many solid nanopowders and different polymers as well. All the examined colloids have been successfully electrospun. According to the SEM and FE SEM analyses for the obtained nanofiber mats, the polymeric nanofibers could imprison the small nanoparticles; however, the big size ones were observed attaching the nanofiber mats. Successfully, the proposed strategy could be exploited to prepare polymeric nanofibers incorporating metal nanoparticles which might have interesting properties compared with the pristine. For instance, PCL/Ti nanofiber mats exhibited good bioactivity compared with pristine PCL. The proposed strategy can be considered as an innovated methodology to prepare a new class of the electrospun nanofiber mats which cannot be obtained by the conventional electrospinning technique. (C) 2009 Elsevier B. V. All rights reserved.
Pages: 1481
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: European Journal of Inorganic Chemistry
ISSN (Print): 1434-1948
Ratings:
  BFI (2010): BFI-level 1
  Scopus rating (2010): SJR 1.173 SNIP 0.788
  Web of Science (2010): Impact factor 2.91
  Web of Science (2010): Indexed yes
Original language: English
Source: orbit
Source ID: 276245
Research output: Contribution to journal › Journal article – Annual report year: 2010 › Research › peer-review

Titanium oxide nanofibers attached to zinc oxide nanobranches as a novel nanostructure for lithium ion batteries applications

General information
Publication status: Published
Organisations: Chonbuk National University, Minia University
Pages: 437
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Journal of Ceramic Processing Research
Volume: 11
Original language: English
Source: orbit
Source ID: 275928
Research output: Contribution to journal › Journal article – Annual report year: 2010 › Research › peer-review

Core-Sheath typed gallium arsenide/PVA composite nanofiber and method of manufacturing the same

General information
Publication status: Published
Organisations: Chonbuk National University
Publication date: 2009

Publication information
Patent number: 10-2009-0017984
Filing date: 03/03/2009
Original language: English
Source: orbit
Source ID: 275884

Effects of silver content and morphology on the catalytic activity of silver-grafted titanium oxide nanostructure

General information
Publication status: Published
Organisations: Minia University, Chonbuk National University, Myongji University
Publication date: 2009
Peer-reviewed: Yes
Event: Paper presented at 22nd International Symposium on Ceramics in Medicine (BIOCERAMICS 22), Hotel Inter-Burgo, Daegu, South Korea, Oct 26-29-Oct 2009.,
Electrospun Antimicrobial Polyurethane Nanofibers Containing Silver Nanoparticles for Biotechnological Applications

General information
Publication status: Published
Organisations: Minia University, Chonbuk National University
Pages: 688
Publication date: 2009
Peer-reviewed: Yes

Publication information
Journal: Macromolecular Research
Volume: 17
Original language: English
Source: orbit
Source ID: 276241
Research output: Contribution to journal › Journal article – Annual report year: 2009 › Research › peer-review

Functionalization of Electrospun Titanium Oxide Nanofibers with Silver Nanoparticles: Strongly Effective Photocatalyst

General information
Publication status: Published
Organisations: Chonbuk National University
Contributors: Kanjwal, M. A.
Publication date: 2009
Peer-reviewed: Yes
Source: orbit
Source ID: 275819
Research output: Contribution to conference › Paper – Annual report year: 2009 › Research › peer-review

Functionalization of Electrospun Titanium Oxide Nanofibers with Silver Nanoparticles: Strongly Effective Photocatalyst

General information
Publication status: Published
Organisations: Minia University, Chonbuk National University
Publication date: 2009
Peer-reviewed: Yes
Event: Paper presented at Spring Conference of Korean Fiber Society, At Center, Seoul, South Korea, 16-17-April 2009, .
Source: orbit
Source ID: 275879
Research output: Contribution to conference › Paper – Annual report year: 2009 › Research › peer-review

Novel self-assembled amphiphilic poly(ε-caprolactone)-grafted-poly(vinyl alcohol) nanoparticles: hydrophobic and hydrophilic drugs carrier nanoparticles

General information
Publication status: Published
Organisations: University of Wisconsin-Milwaukee, Minia University, Chonbuk National University
Pages: 821
Publication date: 2009
Peer-reviewed: Yes

Publication information
Journal: Journal of Materials Science: Materials in Medicine
Volume: 20
ISSN (Print): 0957-4530
Photocatalytic activity of ZnO-TiO$_2$ Hierarchical nanostructure prepared by combined electrospinning and hydrothermal techniques

General information
Publication status: Published
Organisations: Unknown
Contributors: Kanjwal, M. A.
Publication date: 2009
Peer-reviewed: Yes
Source: orbit
Source ID: 275882
Research output: Contribution to conference › Poster – Annual report year: 2009 › Research › peer-review

Preparation of nanofibers consisting of MnO/Mn$_3$O$_4$ by using the electrospinning technique: Nanofibers do have two band gap energies

General information
Publication status: Published
Organisations: Minia University, Chonbuk National University
Pages: 769
Publication date: 2009
Peer-reviewed: Yes

Publication information
Journal: Journal of Applied Physics A
Volume: 95
Original language: English
Source: orbit
Source ID: 276271
Research output: Contribution to journal › Journal article – Annual report year: 2009 › Research › peer-review

Spider-net within the N6, PVA and PU electrospun nanofiber mats using salt addition: Novel strategy in the electrospinning process

Electrospun nanofibers are promising candidates in the nanotechnological applications due to the advantages of the nanofibrous morphology. Therefore, many attempts were reported to modify the electrospun mats to gain more beneficial properties. In the present study, we are introducing a strategy to synthesize electrospun polymeric nanofiber mats containing spider-net binding the main nanofibers. Addition with long stringing time of a metallic salt having tendency to ionize rather than formation of sol-gel in the host polymer solution reveals to synthesize a spider-net within the electrospun nanofibers of the utilized polymer. Nylon6, polyurethane and poly(vinyl alcohol) have been utilized; NaCl, KBr, CaCl$_2$ and H$_2$PtCl$_6$, have been added to the polymeric solutions. In the case of nylon6 and poly(vinyl alcohol), addition of the inorganic salts resulted in the formation of multi-layers spider-network within the electrospun nanofibers mats. The synthesized spider-nets were almost independent on the nature of the salt; the optimum salt concentration was 1.5 wt%. The metallic acid led to form trivial spider-nets within both of nylon6 and poly(vinyl alcohol) nanofibers. In a case of polyurethane, few spider-nets were formed after salt addition due to the low polarity of the utilized solvents. According to TEM analysis, the synthesized spider-net consisted of joints; the later issued from the main nanofibers at Taylor's cone zone. The spider-net improved the mechanical properties and the wetability of the nylon6 nanofiber mats, accordingly a mat having amphiphilic feature has been prepared. (C) 2009 Elsevier Ltd. All rights reserved.

General information
Publication status: Published
Organisations: Chonbuk National University
Synthesis of polyvinyl alcohol (PVA) nanofibers incorporating hydroxyapatite nanoparticles as future implant materials

General information
Publication status: Published
Organisations: Minia University, Chonbuk National University
Pages: 59
Publication date: 2009
Peer-reviewed: Yes

Zinc oxide-titanium oxide nanofibers and method of manufacturing the same

General information
Publication status: Published
Organisations: Unknown
Publication date: 2009

Nanofiber web with network structure and method of manufacturing

General information
Publication status: Published
Organisations: Chonbuk National University
Publication date: 2008
Physiochemical characterizations of nano-belts consisting of three mixed oxides (Co$_3$O$_4$, CuO and MnO$_2$) prepared by electrospinning technique

General information
Publication status: Published
Organisations: Unknown
Contributors: Kanjwal, M. A.
Publication date: 2008
Peer-reviewed: Yes
Source: orbit
Source ID: 275815
Research output: Contribution to conference → Paper – Annual report year: 2008 → Research → peer-review

Physiochemical characterizations of nanobelts consisting of three mixed oxides (Co$_3$O$_4$, CuO and MnO$_2$) prepared by electrospinning technique

General information
Publication status: Published
Organisations: Unknown
Contributors: Kanjwal, M. A.
Publication date: 2008
Peer-reviewed: Yes
Source: orbit
Source ID: 275816
Research output: Contribution to conference → Paper – Annual report year: 2008 → Research → peer-review

Physiochemical characterizations of nanobelts consisting of three mixed oxides (Co$_3$O$_4$, CuO, and MnO$_2$) prepared by electrospinning technique

General information
Publication status: Published
Organisations: Unknown
Publication date: 2008
Peer-reviewed: Yes

Publication information
Journal: Journal of Materials Science
ISSN (Print): 0022-2461
Ratings:
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.68 SNIP 0.772
Web of Science (2008): Indexed yes
Original language: English
Source: orbit
Source ID: 275930
Research output: Contribution to journal → Journal article – Annual report year: 2008 → Research → peer-review

Silver doped electrospun Titanium Oxide Nanofibers Strongly Effective Photocatalyst

General information
Publication status: Published
Organisations: Unknown
Surface plasmon resonances, optical properties and electrical conductivity thermal hysteresis of silver nanofibers produced by electrospinning technique

General information
Publication status: Published
Organisations: Minia University, Jeonju National University of Education, Chonbuk National University
Contributors: Barakat, N. A., Woo, K., Kanjwal, M. A., Choi, K. E., Khil, M. S., Kim, H. Y.
Pages: 11982
Publication date: 2008
Peer-reviewed: Yes

Publication information
Journal: Langmuir
Volume: 24
ISSN (Print): 0743-7463
Ratings:
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 2.389 SNIP 1.31
Web of Science (2008): Indexed yes
Original language: English
Source: orbit
Source ID: 276270
Research output: Contribution to journal › Journal article – Annual report year: 2008 › Research › peer-review

Mixed oxide consisting of three mixed oxides (Co3O4, CuO and MnO2) prepared by electrospinning technique

General information
Publication status: Published
Organisations: Unknown
Contributors: Kanjwal, M. A.
Publication date: 2007
Peer-reviewed: Yes
Source: orbit
Source ID: 275880
Research output: Contribution to conference › Poster – Annual report year: 2007 › Research › peer-review