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Poster Presentations

Tamara Florian et al., Res. Rev. J Mat. Sci. 2017, 5:7
DOI: 10.4172/2321-6212-C1-012

Online monitoring of the filling behavior of highly-filled polymeric materials during the injection molding process

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In the field of micro systems technology, e.g. for sensors or actuator applications, polymeric materials with functional properties (e.g. electrical conductivity or magnetic properties) are an interesting alternative to common metallic materials due to their high-efficient fabrication techniques. The desired functional property spectrum is often realized by addition of functional fillers, which inevitably influences the injection molding process. Especially the flow-ability and the mold filling behavior change dramatically due to the fillers. This behavior is critical for the quality of the final part, but cannot be predicted sufficiently until now. At present, the current standard process monitoring technologies are not adequate to provide enough information to analyze and optimize the filling behavior. In the presented study, the flow behavior of the highly-filled polymeric materials is characterized with a glass-insert mold which is designed for direct visual analysis of the flow phenomena. The investigation is carried out using polyamide (PA 6) with ferrite micro particles of 150µm size. These particles are admixed to the polymer matrix with filler contents of 50 vol.-%, 60 vol.-% and 65 vol.-%, respectively. The flow front is observed during the filling stage with a high-speed camera. The filling behavior is simulated with commercial software (Mold Flow®), and validated with the real experiment. Based on these investigations, the process ability of highly filled polymer melts are characterized both by experiment and simulation, with evaluation of the conventional simulation tools for application in highly-filled polymeric materials.

Biography

Tamara Florian graduated 2010 at the Munich University of Applied Sciences in the field of process engineering. Since then, she is working at the Institute of Polymer Materials and Plastics Engineering in the field of processing and functionalization of thermoplastic materials. She is mainly concerned with the development of new, functional materials and their processing properties in the injection molding process. Apart from the consideration of the properties in conventional injection molding, Ms. Florian is particularly concerned with the micro-injection molding technique.

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Notes:

Hae Jin Kim et al., Res. Rev. J Mat. Sci. 2017, 5:7
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Angiogenesis depression effect; a cure for glioblastoma multiforme through oral administration by lactoferrin-glycyrrhizin conjugate, as HMGB1 antagonist

Hae Jin Kim[1], **Yong-Kyu Lee**[2], **In-Kyu Park**[3] and **Dong Yun Lee**[1]
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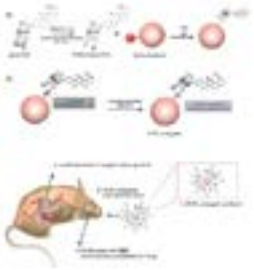
[2]Korea National University of Transportation, Republic of Korea
[3]Chonnam National University Medical School, Republic of Korea

Glioblastoma multiforme (GBM) is one of the most common and aggressive brain tumors in humans. Recently, to cure GBM clinically, antiangiogenic therapy with medications such as Avastin is tried to slow the GBM growth. However, this drug can induce some side effects like stroke and kidney problem. To improve this problem, we newly developed an orally absorbable glycyrrhizin (GL) that can bind to HMGB1 and overexpression of HMGB1 induces angiogenesis on the tumor tissue. Also, we conjugated GL with Lactoferrin (Lf) for oral administration, Lf can be absorbed by receptor (Lf-R) that is expressed on the small intestine, blood-brain barrier (BBB) and glioma cell. We expected potential of GBM region targeting and anti-angiogenesis via HMGB1 capturing, when the lactoferrin and glycyrrhizin (Lf-GL) was orally administered. Through this research, we confirmed that conjugation between the Lf-GL, which had increasing HMGB1 binding affinity. In addition, this material showed effect that is growth inhibition of GBM spheroid and anti-angiogenesis and vascular regression on the in vitro model. And then, we preferentially confirmed effect of LF-GL on cancer tissue in the xenograft mouse model and proceeded experiments to confirm anti-angiogenesis and possibility of orally absorbable in the GBM orthotopic mouse model. consequently, these results demonstrated that the Lf-GL would be a novel drug for the effective treatment of brain tumor.



Biography

Hae Jin Kim graduated from Sejong University, Department of Bioengineering at the age of 24, and progressed to master's course in Hanyang University. She is mainly working on cancer. In particularly, she studies the development of newly drug for the treatment of brain cancer and improving the method of administration. She has identified that the prognosis of disease is poor because drug delivery to the brain was difficult by blood-brain barrier. To improve this problem, she synthesized novel material for convenient administration method and targeting effect to the brain.

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Sijin Park et al., Res. Rev. J Mat. Sci. 2017, 5:7
DOI: 10.4172/2321-6212-C1-012

Colorimetric contact lens type sensor consisting of cerium oxide nanoparticles and glucose oxidase for tear glucose detection

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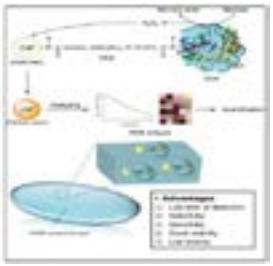
A contact lens is ideal to monitor glucose levels in tear. We designed a contact lens-based biosensor comprised of glucose oxidase (GOX) and cerium oxide nanoparticle (CNP) to detect glucose levels in tear. GOX catalyzes the oxidation of glucose to hydrogen peroxide (H_2O_2) and gluconolactone. Then, CNP catalyzes the reduction of H_2O_2. At this moment, Ce^{3+} being colorless shift to Ce^{4+} state that is shown yellow color. Glucose levels can be determined by analyzing the change of color. B value of RGB color is used to determine glucose levels, being shown the correlation with glucose concentration. To confirm the synthesized CNP structure, we perform the XPS, XRD, HR-TEM. GOX is immobilized on a modified-CNP using PEG spacer; it is CNP-PEG-GOX. The formation of CNP-PEG-GOX is determined via quantitative analysis of GOX. The contact lens sensor maintains its mechanical properties compared with HEMA contact lens. and has correlation with glucose levels in buffer and artificial tear.



Biography

Sijin Park graduated from Hanyang University, Department of Bioengineering at the age of 24, and progressed to master's course. She is mainly working on diabetes. In particularly, she studies the development of glucose sensors for the management of blood glucose in diabetic patients. She has identified the disadvantages of the Fingerprick test, which is currently the most commonly used method, and invented a breakthrough method to overcome the drawbacks. Instead of measuring blood in the fingertips, she has developed a method for sensing blood glucose non-invasively through glucose concentration in the tear.

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Notes:

A. Barnabe et al., Res. Rev. J Mat. Sci. 2017, 5:7
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Periodic nanostructures obtained by spinodal decomposition at low temperature on $Co_{1.7}Fe_{1.3}O_4$ thin films prepared by radio frequency sputtering

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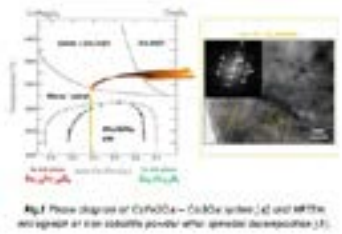
Inside a miscibility gap of a phase diagram, a homogeneous solid solution is not stable and progressively broken down into two different phases either by nucleation/growth or spinodal decomposition. Spinodal transformation which only operates in a limited area of the gap, can induce periodic microstructures at a submicronic scale. When they contain at least a magnetic ordered phase, such microstructures could then be a key step in the quest for materials with original properties such as giant magnetoresistance, and/or magnonic crystal which are likely to find new technological applications. In the $CoFe_2O_4$–Co_3O_4 phase diagram there is a miscibility gap in which spinodal decomposition can lead to regular alternation of ordered magnetic phases made of spinel oxides. This was mainly observed in powders. In the context of potential future applications, it is however necessary to be able to prepare thin films and to induce in them spinodal decomposition at low temperatures. The purpose of this study is devoted to 1) the preparation of $Co_{1.7}Fe_{1.3}O_4$ spinel iron cobaltite thin films on cheap substrate, 2) the structuration at the nanoscale by spinodal transformation at moderate temperatures and 3) the characterization at the nanoscale on the spinodal transformation. Pure thin films of $Co_{1.7}Fe_{1.3}O_4$ spinel iron cobaltites were prepared by rf sputtering. The two-phase spinels obtained through the spinodal transformation were evidenced after annealing in air at low temperature by XRD/TEM/Raman/Mossbauer/electrical measurements studies. Specific in-plane sections elaborated by FIB were carried out and analyzed by high resolution TEM studies coupled with EELS/EDS/STEM elemental analysis at the atomic scale. From the present work it can then be concluded that the preparation of $Co_{1.7}Fe_{1.3}O_4$ thin films structured by spinodal transformation could be obtained at temperatures compatible with the use of cheap substrates.



Biography

A. Barnabé is a professor at the CIRIMAT laboratory (Mixed Oxide Valency research group), Paul Sabatier University, France. He received his PhD degree in chemistry of materials from University de Caen-Basse Normandie (France) in 1999. He held a post-doctoral position in Northwestern University, Evanston (USA), in 2000. His current research interests are mainly focused in functional metal oxide powders, ceramics and thin films prepared by PVD technique. He first worked on TEM characterization of giant magnetoresistance manganites then moves to complex oxides with new optoelectronic properties. For the last decade, he has developed transparent conductive oxides (n- and p-type) and gas-sensing layers for the CO_2 detection sputtered oxide thin films. He's in charge on the SEM/TEM/EPMA/SIMS characterization center R. CASTAING in Toulouse. To date, all these works have led to 63 publications, 2 patents, and more than 80 communications (hindex = 22, sum of the times cited > 1400).

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Notes:

Chung Wung Bark et al., Res. Rev. J Mat. Sci. 2017, 5:7
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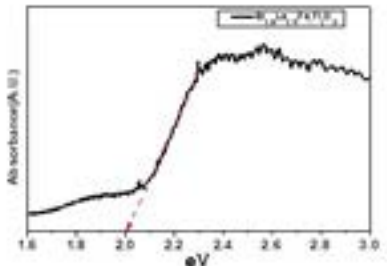
Effects of doping ratio of Cobalt and Iron on the structure and optical properties of ferroelectric bismuth titanates

Chung Wung Bark and **Sangmo Kim, Sung Kwan Shin** and **Hyung Wook Choi,**
Gachon University, Republic of Korea

The wide band gap of complex oxides is one of the major obstacles limiting their use in photovoltaic cells. Tunability of the bandgap for ferroelectric complex oxides is one of the key issues for photovoltaic applications. We report doped ferroelectric oxides with narrow bandgaps and photovoltaic effect. To identify an effective route for tailoring the band gap of complex oxides, this study examined the effects of cobalt and iron doping on lanthanum-modified $Bi_4Ti_3O_{12}$-based oxides synthesized using a solid reaction. The structural and optical properties were analyzed by X-ray diffraction and ultraviolet-visible absorption spectroscopy. As a result, the optimal iron to cobalt doping ratio in bismuth titanate powder resulted in ~1.94eV decrease in the optical band gap. In the film form, the optical bandgaps of Co-doped $Bi_{3.25}$ $La_{0.25}$ Ti_4O_{12} (BLT) and Fe, Co- doped BLT films was narrower than that of non-doped BLT by more than 1 eV. Correlated with the bandgap reduction, the Fe,Co-doped BLT film shows largely enhanced the photocurrent density by 25 times that of than BLT films. The density functional theory (DFT) calculation confirms that intermixed transition metal dopants (Fe, Co) in BLT generate novel energy states under conduction band. This new route to reduce the optical bandgap can be adapted to the synthesis of other complex oxides. This approach to tune the bandgap by simple doping could be applied to other wide-bandgap materials, which have the potential to be used in solar energy conversion or optoelectronic applications.



Biography

Chung Wung Bark has completed his PhD from POSTECH, Korea and postdoctoral studies from University of Wisconsin-Madison, USA. He has published more than 150 papers in SCI journals and has been serving as a guest editorial board member.

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Hyung Wook Choi et al., Res. Rev. J Mat. Sci. 2017, 5:7
DOI: 10.4172/2321-6212-C1-012

Characterization and analysis of phosphor condition with electrode of perovskite solar cells

Hyung Wook Choi and **Jeong Hun Ma**
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Nowadays, solar cells of silicon have reached efficiencies of up to 25% for single crystal Si. But, the production of such material requires energetically demanding processes and relatively expensive production. Recently, a new class of perovskite was introduced as light harvesting material, showing strong absorption in a broad region of the visible spectrum, good electron and hole conductivity, delivering also high open circuit voltages in photovoltaic devices. The main advantage of such an organic-inorganic hybrid material is a high absorption coefficient, excellent long distance carriers to move the hole diffusion length. Mixed halide perovskite materials, which electron hole diffusion length is ten times longer than those only containing iodide. Which presents efficient charge transport, low recombination rates and also good pore filling of the TiO_2 layer enhancing device performance with respect to Spiro-OMeTAD (HTM). Trivalent rare-earth (RE) ions activated materials have kept booming in the past decades owing to their wonderful applications in phosphor-converted white light-emitting diodes (WLEDs), solar cells, temperature sensors, and drug deliveries. RE ion-doped inorganic phosphors revealed intense luminescent properties and showed potential applications in WLEDs. The conversion luminescence of a phosphor from the ultraviolet region to the visible region can enhance the light harvesting in Perovskite solar cells (PSCs), because many perovskites can only absorb visible light. In this work, to explore the influence of phosphor additives on the conversion efficiency of PSC, we introduce the YAG:Ce^{3+} phosphor layer. The samples were characterized by XRD, SEM, UV–vis, PL and IV-curves. Photoelectrode DSSC with light-to-electric energy conversion efficiency was achieved under a simulated solar light irradiation of 100 mW/cm^2 (AM 1.5).

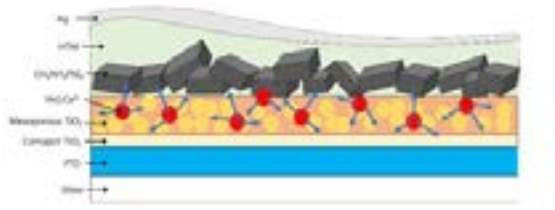

Fig. 1 Schematic illustration of the perovskite phosphor

Biography

Hyung Wook Choi has completed his PhD from Yonsei University, Korea and postdoctoral studies from Pennsylvania State University, USA. He has published more than 100 papers in SCI journals.

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Notes:

Takumi Namba et al., Res. Rev. J Mat. Sci. 2017, 5:7
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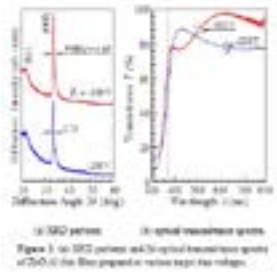
Preparation of oxide semiconductors thin films for the transparent electrode by helicon-wave excited plasma sputtering method

Takumi Namba and **Shizutoshi Ando**
Tokyo University of Science, Japan

Silicon (Si)-based solar cells have a market share of more than 90%, and are expanding in this market. However, high purity Si is very expensive and would be the risks of short supply and price fluctuation. Recently, Cu(In.Ga)Se_2(CIGS) based thin film solar cells have been attracted as high conversion efficiency as a high efficiency thin film solar cell of the next generation and achieved the highest conversion efficiency of 20% over. The top electrode material for CICS based solar cell is widely used ZnO:Al and is required to be low resistivity (under 10^{-3} Ωcm) and optical transparency (larger than 80% in transmittance). Moreover, the preparation of good crystallinity ZnO:Al thin films is expected for improvement of the conversion efficiency of CIGS based solar cells. In this study, we tried to prepare ZnO:Al thin films with good crystallinity by helicon wave excited magnetron sputtering method and aimed to establish conditions for preparation. ZnO:Al thin films prepared by this method were evaluated for crystallinity, optical transmittance, and thickness by X-ray diffraction (XRD), recording spectrophotometer, and stylus surface profiler. Figure1 shows (a) XRD patterns and (b) optical transmittance spectra of ZnO:Al thin films prepared at various the target bias voltages. RF power, substrate temperature, and deposition time were 400 W, 200^{0}c, and 3 hours, respectively. ZnO:Al thin film prepared at -300 V exhibited the wurtzite structure (α-ZnO), optical absorption edge of 360 nm (3.37 eV) and good optical transparency.



Biography

Takumi Namba was received the Bachelar of Engineering degree in electrical engineering from Tokyo University of Science, Tokyo Japan, in 2016. He is now a master course student of Graduate School of Engineering in Tokyo University of Science. His research interest iclude development of oxide compound thin film solar cells as the earth eco-friendly next generation solar cells.

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Yu-Shan Lee et al., Res. Rev. J Mat. Sci. 2017, 5:7
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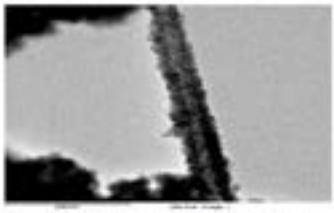
Characterizations of ZnO nanorods and ZnO/ZnS core/shell nanorods on copper grids

Yu-Shan Lee, Chen-Hao Hung and **Hsiang Chen**
National Chi Nan University, Taiwan

Zinc oxide is a n-type semiconductor which has wide and a direct band gap of 3.37ev with large exciton binding energy of 60meV. In addition, ZnO is also accessible material, which has many applications, such as transductors, gas sensors, and optical devices. However, zinc oxide has large band gap, which contributes to the efficiency of photovoltaic devices. Thus, we incorporate ZnS into ZnO structures because zinc sulfide is able to modulate band gap. In this study, we electroplate the ZnO seed layer to cover on the copper grid as the first step. Secondly, we adopt the hydrothermal method to grow the ZnO nanorods, and then prepare the solution of zinc sulfide to do the hydrothermal method for the second time. In order to characterize the material properties, several analytical methods such as FESEM, TEM, PL and so forth have been conducted. The TEM images indicate that ZnO nanorods are completely covered by ZnS layer. The Photoluminescence (PL) analysis illustrates that this nanocomposite materials contain good optical property. In this research, to conduct the TEM analyze directly, we attempt to fabricate ZnO/ZnS core/shell nanostructure on the copper grid. This paper provides a simple three-step process to synthesize ZnO/ZnS core/shell nanostructure and also affords a possibility to apply to optical sensor, solar cell, gas sensor and so on.



Biography

Yu-Shan Lee is a graduate student at National Chi Nan University from Taiwan and her research focus is on nano-materials. She has researched methods of growing nanorods on different substrates since she was a collage student. Owing to improvements of material properties of nanostructures novel fabrication of nanostructures may advance device technology, such as senor, panel, semiconductor and so on. In addition, she would like to acknowledge more academic researches by attending this conference. It is possible to inspire her to do more in depth investigation.

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Ji Hyeon Choi et al., Res. Rev. J Mat. Sci. 2017, 5:7
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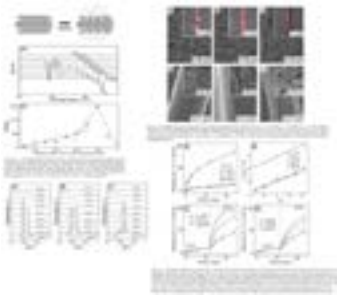
Fatty acid-based electrospun fiber for temperature-controlled drug release

Ji Hyeon Choi, Se Jeong Hwang, Hyun Jin Oh, Dong Gug Kang and **Dong Choon Hyun**
Kyungpook National University, Republic of Korea

This paper explains fatty acid-based electrospun fibers for temperature-controlled drug release. The polymer fibers have core-sheath structure. Rhodamine B-loaded polymer particles are enclosed in the core while the sheath contains biodegradable polymer and mixture of fatty acids. The mixture consists of two fatty acids with different melting points. At a specific composition, the mixture represents a single melting point 38-40°C which is slightly higher the normal human body temperature. This controllable melting of the mixture allows the temperature-regulated release of the dye from the fibers. Below its melting point, the mixture of fatty acids incorporated into the sheath will be in a solid state to restrict the passing of the dye molecules pre-loaded in the core whereas the molecules can be released instantly through the pores over the melting point. The release profiles of the dye molecules can be further manipulated by varying the amount of the mixture contained in the fibers.



Biography

Ji Hyeon Choi is a first year master course student in polymer science and engineering at Kyungpook national university in Republic of Korea under professor Dong Choon Hyun. She received her B.S. degree in polymer science and engineering from the same university..

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Ju Hyang Park et al., Res. Rev. J Mat. Sci. 2017, 5:7
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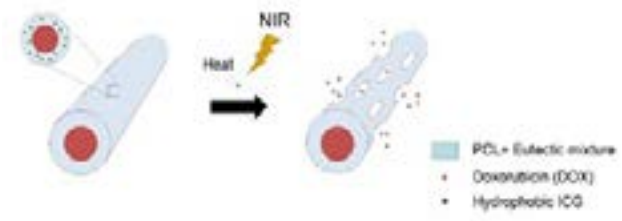
NIR light-triggered, localized anti-cancer drug delivery using poly (ε-caprolactone) (PCL) fibers incorporated with indocyanine green and phase-changeable fatty acid

Ju Hyang Park, Se Jeong Hwang, Hyun Jin Oh, Dong Choon Hyun and **Dong Gug Kang**
Kyungpook National University, Republic of Korea

This paper explains a new system for NIR light-triggered release of drugs. The system consists of poly(ε-caprolactone) (PCL)-based fibers having a core loaded with doxorubicin (DOX) and a sheath incorporated with indocyanine green (ICG) as a NIR-absorbing agent together with a phase-changeable fatty acid. Upon NIR irradiation, the photothermal agent will generate heat to raise the local temperature of the fibers. When the temperature is above the melting point of the fatty acid, nano-pores will be produced in the fibers. This response to NIR irradiation allows the instant release of DOX from the fibers through the pores, leading to the significant enhancement of anticancer activity in combination with the hyperthermia effect arising from the photothermal agent.



Biography

Ju Hyang PARK is a first year doctoral course student in polymer science and engineering at kyungpook national university in republic of korea under professor Dong Choon Hyun. She received her M.S. degree and her B.S. degree in polymer science and engineering from the same university. The topic of her PhD research is "smart drug delivery system using electrospinning.

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Notes:

Yu-Chen Fa et al., Res. Rev. J Mat. Sci. 2017, 5:7
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Chitosan-coated magnetic nanoparticles modified with folate use for doxorubicin released

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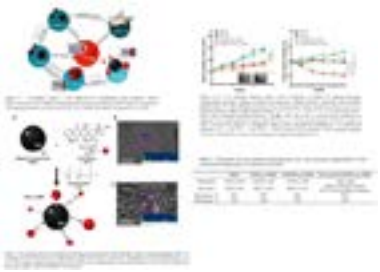
In clinical tumor therapy, chemotherapeutic routes have caused severe side effects; current delivery methods are unsatisfactory. Successful design of a remotely folate (FA)-grafted chitosan (CS)-coated magnetic nanoparticle (MNP) with low toxicity, has been achieved (Figure 1). A chemotherapeutic drug such as doxorubicin (DOX), is loaded in the MNP-based matrix (FA-grafted CS-DOX-TPP-MNP), which is coated by an activated target tumor molecule of FA-grafted CS biopolymer with the inclusion of tripolyphosphate (TPP) as a linker (Figure 2). The resultant nanocomplexes exhibited random aggregates (~240 nm) and zeta potential (– 24.9 mV) (Table 1). In vivo experiments using athymic BALB/c nude mice with human glioblastoma U87 cells in a subcutaneous tumor model revealed that magnetic guidance of FA-grafted CS-DOX-TPP-MNP, injected via the tail vein, significantly decreased tumor growth (Figure 3). This manuscript demonstrates the feasibility of magnetizing control of FA-grafted CS-DOX-TPP-MNP to enhance the localization of drug release.



Biography

Yu-Chen Fa is studying in Institute of Medical Science and Technology, National Sun Yat-sen University. She will obtain a master's degree in June 2018. Her research focuses on the development of drug delivery devices, drug control release, remote delivery, tumor associated environment and tumor therapy. Yu-Chen Fa has her expertise in evaluation and passion in improving the clinical tumor therapy. She successfully designs a magnetic nanoparticle with low toxicity and using in tumor therapy. She also completed her research in localized photodynamic therapy to overcome multidrug resistance in breast cancer cells. The research results have been published in Bioconjugate Chemistry, 2017.

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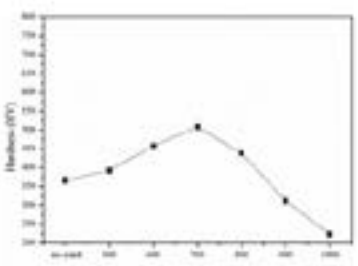
Age heat treatments of the $CoCrFeNiTi_{0.3}$ high-entropy alloy

Tao-Tsung Shun, Cheng-Ying Hsieh, Wei-Jhe Hung and **Che-Fu Lee**
Feng Chia University, Taiwan

Unlike traditional alloys constituted by one or two principal elements, the high-entropy alloys are constructed by at least multi-principal elements, each with concentrations between 5 at.% and 35 at.%. These alloys exhibit good wear resistance, thermal stability, and high-temperature compressive strength, which render them promising for use as tools, molds, die, and furnace parts. Previously, we proposed that the $CoCrFeNiTi_{0.3}$ high-entropy alloy was promising for the development of a ductile, high-strength alloy owing to its high compressive stress of 1529 MPa and good fracture strain of 0.60. To further understand microstructure evolution as well as the age-hardening phenomena of this alloy, the effects of age heat treatments for 24-144 h at 500-1000^{0}C on the hardness and microstructure of as-cast $CoCrFeNiTi_{0.3}$ high-entropy alloy were reported in this paper. The results showed that the as-cast alloy displayed a dendritic structure which dendrite was a Ti-lean face-centered cubic solid solution phase (FCC1) and interdendrite consisted of three phases including a Ti-rich face-centered cubic solid solution phase (FCC2) and a mixture of (Ni,Ti)-rich h phase and (Cr,Fe)-rich s phase. After 144 h aging treatment, age-hardening was apparently observed at temperature of 600-800 ^{0}C due to the transformation of FCC2 phase to h+s phases. The optimum hardness was obtained at an aging temperature of 700 ^{0}C which made the hardness increase from HV366 to HV508. However, age-softening occurred at 900-1000^{0}C due to the dissolution of h+s phases. The s phase completely dissolved into FCC1 matrix at 1000^{0}C which brought the alloy hardness to the minimum HV223.



Biography

Tao-Tsung Shun received PhD degrees from University of Utah in Metallurgical Engineering at the age of 30 years. He had worked as a senior engineer for 3 years and a researcher for 10 years in Walsin Lihwa Stainless steel Co. and Industrial Technology Research Institute, respectively. Currently, he is an associate professor in the Department of Materials Science and Engineering, Feng Chia University, Taiwan. His present research interests are in developing ductile, high strength high-entropy alloys.

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Thermal, mechanical properties of modified poly (lactic-acid) / poly (butylene-adipate-co-terephthalate) blends

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Poly (lactic-acid) (PLA) and poly(butylene-adipate-co-terephthalate) (PBAT) are bio-based polymers which aid to replace petroleum-based polymers in future applications. In this study, Biodegradable PLA/PBAT blends were prepared with varying ratio of peroxide, isocyanate, and multi-epoxy groups by reactive blending. The effect of chain-extenders on the thermal behavior, mechanical properties and morphology of the modified PLA/PBAT blends were investigated. Peroxide and isocyanate chain extender were found to be more reactive to PBAT than PLA. But multi-epoxy chain extender was more reactive to PLA. The viscosity change of PLA/PBAT blends was significantly indicated when adding isocyanate or multi-epoxy chain extender whereas the tensile strength and elongation were improved with peroxide or isocyanate. As a result, the compatibility between the PLA and PBAT partially improved in the presence of the chain-extenders and thus it was confirmed that softening of PLA was possible.

Biography

Gi Hong Kim is a second year doctoral course student in polymer science and engineering at kyungpook national university in republic of korea under professor Kwan Ho Seo. He received his M. S. degree and B. S. degree in polymer science and engineering from the same university. The topic of his PhD research is “Modified PLA materials”.

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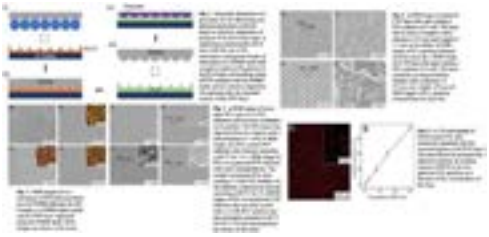
Jin Ho Son et al., Res. Rev. J Mat. Sci. 2017, 5:7
DOI: 10.4172/2321-6212-C1-012

Fabrication of poly(ε-caprolactone) (PCL) particles with non-spherical geometries via selective dewetting and deposition of the polymer

Jin Ho Son, Hyung Ju Ahn, Se Jeong Hwang, Hyun Jin Oh, Dong Choon Hyun and **Dong Gug Kang**
Kyungpook National University, Republic of Korea

This paper explains a simple, inexpensive method for the fabrication of non-spherical polymeric particles. This method involves the use of a mechanical rubbing-assisted colloidal crystal to generate a substrate with an array of dimples on its surface, followed by selectively depositing a polymer into the dimples. As a proof-of-concept experiment, we demonstrated the fabrication of poly (ε-caprolactone) (PCL) particles with non-spherical shape. The shape of the polymer particles could be controlled from disk to hemisphere by changing the surface structure and property of the substrate and the concentration of the polymer solution. When functional components including drug molecules and inorganic NPs were used together with the polymer, we could easily obtain the non-spherical particles loaded with the components. In addtion, non-spherical particles with a hollow structure were formed with the use of immiscible polymer blend consisting of PCL and poly(ethylene oxide) (PEO).



Biography

Jin Ho Son is a first year master course student in polymer science and engineering at Kyungpook national university in Republic of Korea under professor Dong Choon Hyun. He received his bachelor's degree in polymer science and engineering from the same university.

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Daniela Rusu et al., Res. Rev. J Mat. Sci. 2017, 5:7
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Innovative superhydrophobic nano coatings for durable applications

Daniela Rusu[1], **Gaëtan Garreffa**[1], **Sophie Bistac**[1], **Christelle Delaite**[1] and **David Portet**[2]
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[2]Surfactis Technologies, France

Statement of the Problem: Nowadays, superhydrophobic surfaces (Figure 1) are a hot topic of coatings research, due to their water-repellent and self-cleaning potential, first observed on lotus leaves. Biomimetic artificial coatings intend bringing together the double/multiple roughness of the natural self-cleaning surfaces and a hydrophobic coating that could mimic the wax properties covering the lotus leaves. The roughness of the surface plays an important role in obtaining high contact angles (> 150°); otherwise, it is impossible to exceed angles of 120°. This work proposes an innovative method to produce durable superhydrophobic coating films with self-cleaning features.

Methodology & Theoretical Orientation: This method uses raspberry-like silica-modified nanoparticles (Figure 1) for texturing the substrate surface and it is particularly suitable for thermosensitive and/or transparent surfaces, since the temperature of the coating process remains below 100°C.

Findings: The method comprises several steps: (1) texturing the surface, via deposition of innovative silica-modified nanoparticles of different sizes, (2) crosslinking the textured surface, via a crosslinking agent, and optionally, (3) surface modification by hydrophobic molecules. The coating hydrophobicity can be enhanced by optimizing the preparation process. Preliminary coating tests on transparent substrates confirm the efficiency of the applied strategy: water droplets in contact with such a textured surface are almost spherical, indicating a Cassie-Baster state, where the liquid is in direct contact only with the upper points of the roughness and with air pockets trapped between the liquid and the lower roughness points of the solid coating.

Conclusion & Significance: An innovative strategy for preparing textured superhydrophobic surfaces was presented. This method is inexpensive and simple to apply and it is particularly suitable for industrial applications needing self-cleaning coating features applied on thermosensitive and/or transparent surfaces/materials.

Biography

Daniela Rusu (M.Sci., Ph.D., HDR in Materials Science) is a Polymer Scientist at the Université de Haute-Alsace, Laboratoire de Photochimie et d'Ingénierie Macromoléculaires (LPIM), Mulhouse, France. Her research and teaching activities focuses on multiphase polymer systems (polymer blends, nanostructured materials, gels, composites…), in understanding the processing-structure-properties relationships and tailoring these complex polymer materials for targeted applications (biomedical applications, food packaging, transport, coatings…). Her current research focuses on advanced polymeric materials for coating and biodegradable polymers for medical and industrial applications. She co-authored 10 book chapters and over 100 articles on multiphase polymer systems in different peer-reviewed journals and proceedings. She is an active reviewer for peer-reviewed journals and a scientific expert for EU Framework Program Horizon 2020 for Research and Innovation.

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Christelle Delaite et al., Res. Rev. J Mat. Sci. 2017, 5:7
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Random poly (ε-Caprolactone-L-Alanine) by direct melt copolymerization

Christelle Delaite[1] and **Slim Salhi**[2]
[1]Université de Haute Alsace, Mulhouse, France
[2]Université de Sfax, Tunisie

During recent years, many research works have been directed to the preparation of biodegradable and biocompatible polymeric materials with controlled chemical, physical, and biological properties for a wide range of biomedical applications in the fields of surgical implants, surgical sutures, artificial skin, resorbable bone plates, tissue engineering scaffolds and carrier system for controlled release of drogue and genes. Various synthetic strategies can be used for the preparation of amino acid-based poly (ester amide) s (AA-PEAs) presenting block, alternating or random structures. Random PEAs can be prepared by simple procedures that do not require the use of solvents or expensive monomers like α-amino acid N-carboxyanhydrides (NCAs). Some studies have reported the synthesis of Random AA–PEAs by the direct reaction of amino acids with cyclic esters or by the direct bulk polycondensation of amino acids and α-hydroxyacids. The aim of the present work is to study the synthesis and properties of random polyesteramides prepared by the bulk copolymerization of inexpensive ε-caprolactone and L-alanine, using a simple one-step procedure. A series of random polyesteramideswithin a range of molar composition from 90/10 to 50/50 were synthesized by a direct melt polycondensation. Their structure was fully characterized by FTIR and NMR spectroscopy. The resulting copolymers are completely amorphous with the exception of PEA-90/10 which possess a semi-crystalline structure. These PEAs present increasing glass transition temperatures at increasing L-alanine contents, and exhibit fairly good thermal stability with 10 % mass loss temperatures reaching 315°C.

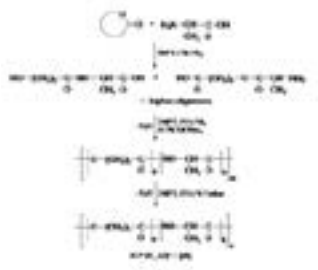

Figure 1. Synthesis of PEA-ε/ε copolymer

Biography

Christelle Delaite is professor at the Université de Haute-Alsace, Laboratoire de Photochimie et d'Ingénierie Macromoléculaires (LPIM), Mulhouse, France. Her research and teaching activities focuse on macromolecular synthesis, (nano)composites elaboration and in the evaluation of the relationship between structure and physical properties of (co)polymers. This work is a collaboration with Slim Salhi who is assistant professor at the Université of Sfax, Laboratoire de Chimie Appliquée, Sfax-Tunisie. His research and teaching activities focuse on macromolecular synthesis, elaboration and characterization of amino-acid biosourced copolymers and chemical modification of polymers.

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Jee-Woo Yang et al., Res. Rev. J Mat. Sci. 2017, 5:7
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Thermal and humid influence on the interfacial aging of polyurethane coated polyketone fabrics

Jee-Woo Yang, Hani Jo, Hyeon Soo Lim and **Seung Goo Lee**
Chungnam National University, South Korea

This study analyzed the effect of heat and moisture on the polyketone-polyurethane coating system and proposed a predictable relationship based on the analysis. Polyketone is an environmentally friendly material because it uses carbon monoxide as a raw material and is inexpensive to produce. Also, it has excellent heat resistance, impact resistance, and chemical resistance, and thus is highly applicable to industrial fabrics such as waterproof fabric. On the other hand, polyurethane is a coating material excellent in abrasion resistance, weather resistance and oil resistance in addition to waterproofness. The waterproof properties of the waterproof fabric depend on the occurrence of defects on the coated surface and the adhesion strength between the coating and the fabric. The interfacial adhesion strength that can overcome external forces is determined by the bonding method and bonding force of the lamination system, which affects the life of the waterproof fabric.

In order to improve the durability of the waterproof fabric, polyketone fabric was used instead of the polyester or nylon fabric used in the past, and polyurethane generally used for waterproof coating was used. Environmental impacts, including temperature and humidity, affect the polyketone-polyurethane coating system from the fabric surface. Therefore, the surface properties were observed using SEM, and the hydrostatic head test of the fabric was used to determine the level of defect on the coated surface. Tensile and adhesion strength were tested to determine the mechanical properties of the coated fabric. The chemical changes after aging were qualitatively analyzed using FTIR, and the chemical changes of the polymer network by decomposition were measured from the results of weight reduction. The degree of damage due to the degradation of the coated surface was confirmed by weight loss value according to temperature, humidity and exposure time. The adhesion characteristics of polyketone - polyurethane coating system according to exposure environment were evaluated from the peeling strength results. Also, the behavior of adhesive force could be predicted.

In conclusion, we found that temperature, moisture, and exposure time affect the interfacial adhesion of polyketone-polyurethane coating systems, and the interrelationships were partially confirmed by analyzing the results.

Biography

Jee-Woo Yang has her expertise in fiber reinforced composites. She is working on improving the bonding performance of reinforcing materials and matrix of fiber reinforced composites. The results of the research on the thermal insulation properties of composite materials have been presented and the analysis model of aerogels also has been presented by her.

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Deok-Won Lee et al., Res. Rev. J Mat. Sci. 2017, 5:7
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Can alendronate-eluting biphasic calcium phosphate (BCP) scaffolds stimulate osteogenic differentiation?

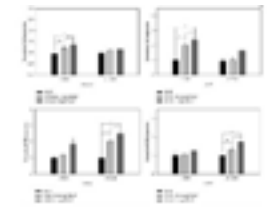
Deok-Won Lee[1] and **Sung ok Hong**[2]
[1]Kyung Hee University, South Korea
[2]Catholic Kwandong University, South Korea

Introduction: This study was to investigate whether ALN/BCP scaffolds can effectively improve in-vitro osteoblast activity, osteogenic differentiation and to demonstrate whether ALN/BCP scaffolds have great potential for bone regeneration.

Methods & Materials: We developed ALN-eluting BCP (ALN/BCP) scaffolds as local delivery system for improving bone formation. Since ALN has a high binding affinity to the bone mineral hydroxyapatite (HAp), we fabricated ALN/BCP scaffolds by simply mixing BCP scaffolds with ALN. The coating of ALN on BCP scaffolds was confirmed by Scanning Electron Microscopy (FE-SEM), Energy-Dispersive X-ray Spectroscopy (EDS), and Attenuated Total Reflectance-Fourier Transform Infrared Spectroscopy (ATR-FTIR).

Results: An in-vitro release study showed that release of ALN from ALN-eluting BCP scaffolds was sustained for up to 28 days. In-vitro results revealed that MG-63 cells grown on ALN-eluting BCP scaffolds exhibited increased ALP activity and calcium deposition and upregulated gene expression of Runx2, ALP, OCN, and OPN compared with the BCP scaffold alone.

Conclusion: This study suggests that ALN-eluting BCP scaffolds have the potential to effectively stimulate osteogenic differentiation.



Biography

Deok-Won Lee is an Oral and Maxillofacial Surgery Specialist and Associate Professor of Kyung Hee University College of Dentistry. His expertise is in treating and improving the oral and maxillofacial health and wellbeing of people. His research on dental implant materials creates new pathways for improving healthcare. He is continually building and investigating on adequate material for implantation through in-vivo and in-vitro models based on years of experience in research, evaluation, teaching and administration both in hospital and education institutions.

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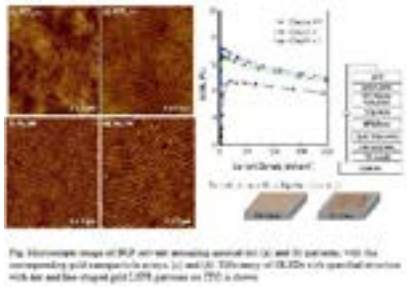
Ohyoung Kim et al., Res. Rev. J Mat. Sci. 2017, 5:7
DOI: 10.4172/2321-6212-C1-012

Scattering and plasmonic phenomena of nanoparticle self-assembled arrays in the thin-film organic lighting devices and photovoltaics

Ohyoung Kim, Sung min Jo, Mei Meng, Byung Doo Chin, Dong-Eun Lee and **Dong Hyun Lee**
Dankook University, Korea

The approach using localized surface plasmon resonance (LSPR) from metallic nanoparticles is attractive as one of the promising method to enhance the internal quantum efficiency of an organic light emitting diode (OLED) or power conversion efficiency of an organic solar cell (OSC), where the various shapes and geometrical arrangements of the nanoparticle and the nanostructures affects their performances. LSPR increases electromagnetic density of states which contribute to more efficient light emission of OLEDs. In order to investigate the light extraction from metallic nanoparticle array, we have compared the monodispersed silver nanoparticles (randomly dispersed onto substrates by spin-coating) with the ordered gold metallic arrays (formed by the phase separation of block copolymer; BCP). Gold nanoparticles arrays were given a particular morphology, which is driven by self-assembly of polystyrene-block-poly (2-vinyl pyridine) BCP thin film by solvent-annealing process. Controlling the annealing time and solvent type of the block copolymer results in the various nano-morphologies. In case of OLED, light emission efficiency (internal quantum yield) shows notable improvement (about 43.8%) in terms of current efficiency for line patterns of Au nanoparticles array developed by BCP self-assembly. Those plasmonic nanostructures of gold were almost similar scales of BCP patterns, formed at the on the surface of anode (ITO) at both OLED and OSC, showing notable enhancements of the light extraction and power conversion efficiency. The size and the anisotropy of gold nano-patterns were changed from a simple dispersion of dot through an integrated dot-line pattern, finally to a contour line pattern with higher percolation of particle array.



Biography

Prof. Ohyoung Kim has expertise in biomedical polymer, environmental-friendly polymer as well as various functional nanomaterials and polymers for electronic application. He received his B.S. and M.S. degree at Seoul National Univ., and Ph.D. degree from Univ. of Massachusetts at Lowell (polymer science). From 1997, he has been served as a professor at department of polymer science and engineering, Dankook University, Gyeonggi, Korea, with special contributions as a head of industry-university cooperation foundation, office of planning, and secretary's office of President of Dankook University. He is currently a dean of faculty for college of engineering and graduate school of information technology & intellectual property.

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Deok-Won Lee et al., Res. Rev. J Mat. Sci. 2017, 5:7
DOI: 10.4172/2321-6212-C1-012

Osteogenic differentiation enhancement by nano-layered growth and differentiation factor-5 coated onto zirconia

Deok-Won Lee[1] and **Sung ok Hong**[2]
[1]Kyung-Hee University, South Korea
[2]Catholic Kwandong University, South Korea

Introduction: Zirconia (Zr) is also known as a biocompatible material with favorable mechanical properties as well as low plaque adhesion. In this study, we examined the efficacy of Zr coated with growth and differentiation factor-5 (GDF-5) bonded via click reaction as a substrate to support osteogenic differentiation of MC3T3-E1 cells.

Method & Materials: Pristine and surface-modified Zr surfaces were characterized by scanning electron microscopy (SEM) and X-ray photoelectron spectroscopy (XPS), resulting that GDF-5 was successfully coated to the pristine Zr surface. GDF-5 coated to Zr surfaces was released for 28 days in a sustained manner.

Results: New bone formation onto GDF-5 coated Zr (Zr/GDF-5) surface was confirmed by in vitro test including cell proliferation, alkaline phosphatase activity and calcium deposition assays, and in vivo test including real-time polymerase chain reaction (qPCR) assay including osterix (OSX), runt-related transcription factor 2 (Runx 2), COL 1 (type I collagen) and osteocalcin (OC). Cell proliferation, alkaline phosphatase activity, and calcium deposition of MC3T3-E1 cells were significantly enhanced when the cells were cultured on Zr/GDF-5. Additionally, the results of qPCR revealed that genes related with osteogenic differentiation were up regulated when the cells were cultured on Zr/GDF-5.

Conclusion: Our findings demonstrate that Zr/GDF-5 could be used as a material for enhancing the efficacy of osteogenic differentiation.

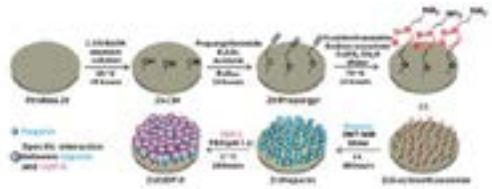

Fig. 1. Synthetic routes for Zr/GDF-5 preparation.

Biography

Deok-Won Lee is an Oral and Maxillofacial Surgery Specialist and Associate Professor of Kyung Hee University College of Dentistry. His expertise is in treating and improving the oral and maxillofacial health and wellbeing of people. His research on dental implant materials creates new pathways for improving healthcare. He is continually building and investigating on adequate material for implantation through in-vivo and in-vitro models based on years of experience in research, evaluation, teaching and administration both in hospital and education institutions.

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Xiyue Zhou et al., Res. Rev. J Mat. Sci. 2017, 5:7
DOI: 10.4172/2321-6212-C1-012

A new conductive material for energy efficient window applications

Xiyue Zhou, Yucen Liu and **Guowen Ding**
De Anza College, California, USA

Silver-based and TiN based thin film glass coatings with thicknesses of tens of nanometers are widely used in today's energy-efficient building windows. However, there is no Ag-Ti alloy thin film coating on optical coating applications reported. In this study, Ag-Ti alloy from 10nm to 40nm thin film was deposited by a co-sputter technique at a magnetron sputter system with three sputtering target guns in a high vacuum chamber. The chamber base pressure is $4x10^{-7}$ Torr, and the films were deposited at 3 mTorr. The Ag to Ti ratio in AgTi alloy was controlled by the two independent pulsed-DC power suppliers, from 50W to 200W during the sputtering deposition. The Ag-Ti alloy single thin film refractive index (n,k) were measured by a Woollam ellipsometer combined with a Shimadzu 3700 UV-Vis-NIR spectrometer (300nm to 2500nm), and the optical properties of the new nanoscale thin film materials Ag-Ti alloys are the first time reported. The alloy Ag-Ti refractive index was strongly dependent on its resistivity, which was calculated from the resistance measured by a four-point probe and the film thickness measured by the ellipsometer. The third target in the chamber is Si target, which is used for the thin film Si_3N_4 deposition by reactive sputtering Si target under Ar-N_2 mixed gas at 3 mTorr. The thin film stack of Si_3N_4/Ag-Ti/Si_3N_4 on glass was simulated for the optical performance optimization to guide the experiments, and the transmittance of (40 nm Si_3N_4 / 20 nm Ag-Ti / 12 nm Si_3N_4 / glass) on glass could be 40%~50%, and those performances are comparable to many energy efficient window products on the market today, on the other hand, such a tri-layer simple stack showed the potential benefits of lower production costs.

Biography

Xiyue Zhou and Yucen Liu are students at De Anza College, California, USA. They used a modern nano-thin film deposition research system to study new conductive materials, and characterized the optical properties of these new materials, which were the first reported, and could be used other optical applications; under the guidance of Dr. Ding, they used these new materials to develop new energy-efficient windows prototype products.

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Deok-Won Lee et al., Res. Rev. J Mat. Sci. 2017, 5:7
DOI: 10.4172/2321-6212-C1-012

rhBMP-2-immobilized titanium via click reaction enhances MC3T3-E1 osteogenic differentiation

Deok-Won Lee[1] and **Sung okHong** [2]
[1]Kyung Hee University, South Korea
[2]Catholic Kwandong University, South Korea

Introduction: We report about the efficacy of titanium surface-immobilized with bone morphogenetic protein-2 (BMP-2) via click reaction on enhanced osteogenic differentiation of MC3T3-E1 cells.

Methods & Materials: Surface propargylation (Ti-3), surface heparinization (Ti-6) was done. Scanning electron microscope observation, static contact angle measurements, surface chemical composition measurements, quantitative analysis of heparin, practical immobilizing amount of rhBMP-2 on Ti-6, release kinetics of rhBMP-2 from Ti-6, MC3T3-E1 cell proliferation assay, alkaline phosphatase (ALP) activity assay, calcium deposition assay, and real-time polymerase chain reaction (RT-PCR) were initiated. All experiments were carried out three times.

Results: The surface was characterized by static contact angles and XPS measurements, which indicated that pristine titanium (Ti-1) was successfully surface-modified via click chemistry (aminated titanium, Ti-4). By quantitative analysis of heparin immobilized on aminated titanium (Ti-4), we found that the Ti-4 can be used as a good candidate to immobilize biomolecules such as heparin. BMP-2 from titanium immobilized with BMP-2 (Ti-6) was released for a period of 28 days in a sustained manner. The highest proliferation rate of MC3T3-E1 cells was observed in Ti-6.

Conclusion: Through in-vitro tests including alkaline phosphatase (ALP) activity, calcium deposition and real-time polymerase chain reaction (RT-PCR), we found that Ti-6 can be used as a good implant to enhance the osteogenic differentiation of MC3T3-E1 cells.

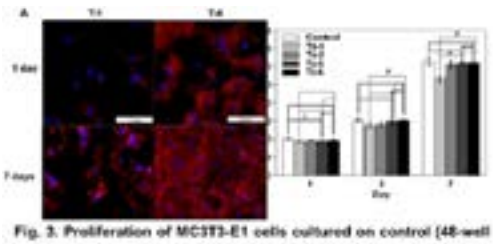

Fig. 3. Proliferation of MC3T3-E1 cells cultured on control (48-well plate), Ti-1–2, and Ti-5–6 for 1, 3 and 7 days, examined by (A) fluorescence microscope and (B) CCK-8assays.

Biography

Deok-Won Lee is an Oral and Maxillofacial Surgery Specialist and Associate Professor of Kyung Hee University College of Dentistry. His expertise is in treating and improving the oral and maxillofacial health and wellbeing of people. His research on dental implant materials creates new pathways for improving healthcare. He is continually building and investigating on adequate material for implantation through in-vivo and in-vitro models based on years of experience in research, evaluation, teaching and administration both in hospital and education institutions.

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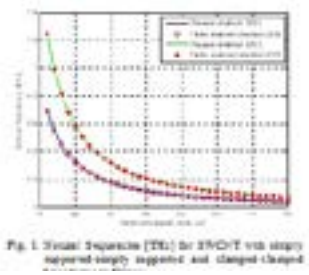
Notes:

Tai-Ping Chang, Res. Rev. J Mat. Sci. 2017, 5:7
DOI: 10.4172/2321-6212-C1-012

Vibration and buckling analysis of single-walled carbon nanotube under magnetic field based on meshless method

Tai-Ping Chang
National Kaohsiung First University of Science and Technology, Taiwan

In the present study, the meshless Petrov–Galerkin (MLPG) method is adopted to study the free vibration and axial buckling characteristics of single-walled carbon nanotube (SWCNT) subject to magnetic field. In particular, a nonlocal shell model accounting for the small scale effect is utilized. In the theoretical formulations, a variational form of the Donnell shell equations is constructed over a local sub-domain which leads to derivation of the mass, stiffness and geometrical stiffness matrices. The resonant frequencies and critical axial buckling loads of SWCNT are presented. The influences of boundary conditions, nonlocal parameter and geometrical parameters on the mechanical behavior of SWCNT are investigated and discussed completely. Finally, the numerical results based on the present study are checked by finite element method, they show excellent agreement.



Biography

Tai-Ping Chang received PhD degree in Civil Engineering and Engineering Mechanics from Columbia University, NYC, USA, in 1985. Since 2002, he has been working as a professor and chairman (2002-2008) of Construction Engineering department at National Kaohsiung First University of Science and Technology, Taiwan. His current research interests include Structural Dynamics, Random Vibration, Finite Element Methods, Computational Mechanics, Nano Mechanics, Fluid-Structure Interaction, Disaster Prevention and Mitigation and Hazard Risk Assessment.

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DOI: 10.4172/2321-6212-C1-012

Osteoblast and osteoclast differentiation between magnesium and machined surfaced titanium

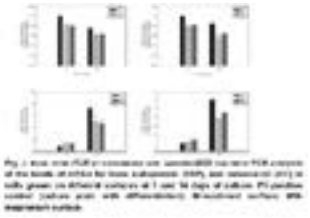
Deok-Won Lee[1] and **Sung Ok Hong** [2]
[1]Kyung Hee University, South Korea
[2]Catholic Kwandong University, South Korea

Introduction: This study focused on in vitro cell differentiation and surface characteristics in a magnesium coated titanium surface implanted on using a plasma ion source.

Methods & Materials: 40 commercially made pure titanium discs were prepared to produce Ti oxide machined surface (M) and Mg-incorporated Ti oxide machined surface (MM). Surface properties were analyzed using a scanning electron microscopy (SEM). On each surface, alkaline phosphatase (ALP) activity, alizarin red S staining for mineralization of MC3T3-E1 cells, and quantitative analysis of osteoblastic gene expression, were evaluated. Actin ring formation assay and gene expression analysis of TRAP and GAPDH performing RT-PCR were performed to characterize osteoclast differentiation on mouse bone marrow-derived macrophages (BMMs).

Results: MM showed similar surface morphology and surface roughness with M, but was slightly smoother after ion implantation at the micron scale. M was more hydrophobic than MM. No significant difference between surfaces on ALP activity at 7 and 14 days were observed. Real-time PCR analyses showed similar levels of mRNA expression of the osteoblast phenotype genes; osteopontin (OPN), osteocalcin (OCN), bone sialoprotein (BSP), and collagen 1 (Col 1) in cell grown on MM at 7, 14 and 21 days. Alizarin red S staining at 21 days showed no significant difference. BMMs differentiation increased in M and MM. Actin ring formation assay and gene expression analysis of TRAP showed osteoclast differentiation to be more active on MM.

Conclusion: Both M and MM have a good effect on osteoblastic cell differentiation, but MM may speed the bone remodeling process by activating on osteoclast differentiation.



Biography

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G. M. Wu, Res. Rev. J Mat. Sci. 2017, 5:7
DOI: 10.4172/2321-6212-C1-012

Preparation and characterization of low temperature nanostructured perovskite solar cells

G. M. Wu
Chang Gung University, Taiwan

Statement of the Problem: Reliable energy is essential in providing the much needed sustainable economical development for a modern society. Inevitably, due to the limitation in natural energy resources and the growing concern for environmental protection, alternative power generation technologies have become very important. The recent discovery of organic-inorganic perovskites offers promising routes for the development of low-cost, solar-based clean energy solutions for the future. Thin-film solar cells provide promising technology for cost-competitive solar power via reduced material and fabrication costs as compared to the prevailing crystalline silicon photovoltaic system. Such systems make use of high absorption of photons.

Methodology & Theoretical Orientation: Organic–inorganic hybrid solar cells that combine a mesoporous scaffold, a perovskite light absorber and an organic hole transporter have emerged at the forefront of solution-processable photovoltaic devices. However, they require high processing temperature of up to 500°C to sinter the mesoporous metal-oxide support. Here, we used different powder and solution spin coatings on the glass substrates to observe the different film-forming characteristics.

Findings: We demonstrated two low-temperature processes that could be stable with more than 10% conversion efficiency. In addition, we used dimethylsulfoxide (DMSO) instead of the common N, N-dimethylmethanamide (DMF) to dissolve PbI2 and to fabricate PbI2 films. This strategy overcame the problem of incomplete conversion and uncontrolled particle size of perovskite in the absence of mesoporous scaffolds, which greatly increased the film reproducibility.

Conclusion & Significance: After the parameters have been optimized, long time stability characterization could be carried out for the new high efficient solar cell system.

Biography

G.M. Wu has completed his PhD from the University of Delaware, USA and had been a visiting professor at the University of California at Los Angeles, USA. He is in charge of the Electro-Optical Engineering Laboratory of Chang Gung University in Taiwan. He has published more than 50 papers in reputed journals and served as technical consultants for a broad range of industrial companies. This study was supported in part by the Ministry of Science and Technology under research grants MOST105-2221-E182-059-MY3 and NERPD2E0481.

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Effect of Li concentration on the optical band gap of undoped and Li doped Zno nanorods

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Li doped and undoped Zinc oxide thin film by sol-gel method and spin coated on glass substrate, and the effect of doping on structural, optical and stress properties have been investigated. X-ray diffraction analysis showed that all the films are polycrystalline with hexagonal wurtzite structure. For a low amount of Li up to 12%, the texture coefficient increases with the Li amount ensuring an improvement of the c-axis orientation and the crystallinity. The crystallite size seems slightly affected and ranged in the nanometer range. Beyond this, Li amount value, the texture coefficient decreases drastically showing deterioration in the growth of ZnO along c-axis. Scanning Electron Microscopy (SEM) images show that the morphology of films was highly influenced by Li incorporation. For Li amount exceeding 12%, SEM images show the appearance of some cracks. The optical results revealed an improvement of the total transmission when increasing the Li amount up to 12%. A linear decrease of band gap energy with the Li content was observed. The stress was calculated and founded depending on the Li amount analogously to the band gap energy. Thus, the band gap energy and the stress are correlated.

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Characterization of microstructure evolution of tungsten-copper alloys obtained by pm method

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The differences lines of researches within of the Engineering and Materials Sciences have developed new materials, which can be applied in different industrial sectors, Energy, Health and Transportation. For nuclear industry for example, the W alloy, is of great interest because of their excellent mechanical properties, excellent corrosion resistance and high cross sections to γ radiation. The tungsten and cooper, has great chemical affinity with oxygen and nitrogen, oxides and nitrides may form during the sintering process and heat treatment, changing the physic-chemical properties of material. This experiment work shows the results of microstructure evolution of the W20Cu alloy obtained by powder metallurgy method, where it was possible to obtain the crystallographic parameters and confirmation of the absence of formation of oxides and nitrides on the alloy as excellent homogeneity of the phases and great distribution of porous, confirming the reliability of sintering and heat treatment process experimental of the W20Cu alloy which can be used on sector nuclear industry in device manufacturing to transport radioactive substance.

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Spectroscopic interaction of TiO_2 NPs with a novel biologically active 3(*2H*)-pyridazinone derivative: A Fluorescence Quenching Study

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The effect of titanium dioxide (TiO_2) nanoparticles (NPs) concentrations on spectroscopic measurements for a novel 3(2H)-pyridazinone; 5-(5-bromo-2-hydroxy-phenyl)-2-phenyl-2H-pyridazin-3-one (BHP) molecule in ethanol solvent has been investigated using UV-Visible spectrophotometer, fluorescence spectrophotometer and time correlated single photon counting techniques at room temperature. The values of absorption, fluorescence intensity and fluorescence lifetime of BHP molecule decreases with increase in TiO_2 NPs concentration. The association constant (k_a) of BHP molecule with TiO_2 NPs in the ground state is estimated using the Benesi–Hildebrand relation. A linear Stern–Volmer (S-V) plot is obtained in steady state and transient state studies. In addition, we have estimated the binding constant and number of binding sites. Results revealed that there is a strong interaction between investigated molecule with TiO_2 NPs, fluorescence quenching in the said system is purely dynamic in nature and also there exist one binding site in BHP molecule for TiO_2 NPs. Furthermore, we studied the energy transfer in fluorescence quenching by the Forster's non-radiative energy transfer (FRET) theory it reveals that there is an energy transfer from BHP molecule to TiO_2 NPs. The results of present investigations may shine in variety of applications, such as to sensitize the TIO_2 for solar energy conversion and biological sensing etc.

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Synthesis of $Li_3V_2(PO_4)_3$/C nanocomposites as positive electrode for Lithium-ion hybrid Supercapacitors

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Now-a-days lithium-ion hybrid supercapacitors (LIHSs) by virtue of a higher energy density and longer cycle life by the electrical and electronic industry wide attention. Because LIHSs special intercalation structure, it combines the lithium-ion battery and supercapacitor energy storage advantages. However LIHSs still face many challenges, such as poor rate capability and limited long-term cycling stability. Lithium vanadium phosphate ($Li_3V_2(PO_4)_3$) has a higher Li^+ diffusion coefficient, higher discharge voltage, higher energy density , higher specific capacity, it is the one of has great potential in the future Electrode material. In this work, we find that $Li_3V_2(PO_4)_3$ is the three-dimensional (3D) network that is built from the slightly distorted VO_6 octahedra and PO_4 tetrahedra sharing oxygen vertexes, because of this special structure will make the interlayer spacing of $Li_3V_2(PO_4)_3$ expand, reduce the resistance of the intercalation/de-intercalation of cations (e.g. Li^+) in the bulk of active materials, more conducive to reflect the intercalation pseudocapacitive behaviour. However the phosphate family has been known to have poor conductivity. Carbon based nanocomposites have been broadly studied in electrochemical energy storage. We prepared the carbon-coated $Li_3V_2(PO_4)_3$ by hydrothermal method is one more time widen the interlayer spacing in the material, providing a wider channel for the rapid intercalation of cations, thus improving the electronic conductivity of the material and enhancing the overall performance of the lithium-ion hybrid supercapacitor. In addition, hydrothermal method uses water as the main reaction medium; it's easy to obtain, in line with the concept of green chemistry.

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Analysis and characterization of perovskite solar cells effected by film thickness of $CH_3NH_3PbI_{3-x}Cl_x$ Layer

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Introduction: At present, the photovoltaic market is dominated by solar cells made of crystalline silicon. However, even in light of the major decrease in the price of crystalline silicon, the high production and installation costs lead to long payback times in most regions, decreasing the economic feasibility of widespread use. As such, there has been a concerted effort to find a cheaper alternative to silicon solar cells.

Abstract: Recently, a new class of hybrid organic halide perovskite was introduced as light harvesting material, showing strong absorption in a broad region of the visible spectrum, good electron and hole conductivity, delivering also high open circuit voltages in photovoltaic devices. The perovskite absorber was initially used as the sensitizer to replace dye molecules in the dye-sensitized solar cell by using the liquid of iodide-based electrolyte. The solution-based device fabrication in solid-state perovskite solar cell (PSC) is very attractive advantage of manufacturing compared with other solar cell. PSCs are consist of $CH_3NH_3PbX_3$ loaded on a mesoporous TiO_2 layer in conjunction with the hole transporting material between the two electrodes.

The PSCs based on $CH_3NH_3PbX_3$ thin films processed by various methods show quite different device performances. High power conversion efficiency was observed from PSCs based on high quality deposited $CH_3NH_3PbX_3$ thin films. Moderate power conversion efficiency was observed from PSCs based on low quality solution-processed $CH_3NH_3PbI_3-_xCl_x$ layer.

In this study, we studied the correlations between the efficiencies of PSCs and the film thicknesses of $CH_3NH_3PbI_{3-x}Cl_x$ layers. We investigate the device performance of X-ray diffraction (XRD) patterns, atomic force microscopy (AFM) and scanning electron microscopy (SEM) images of $CH_3NH_3PbI_3$−xClx films. The incident photocurrent conversion efficiency was measured using a solar simulator (100 mW/cm^2).

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Synthesis, characterization and reduction of graphene oxide for its application in photovoltaic solar cells

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In this paper, the graphene oxide (GO) was prepared by variations of the Tour using natural graphite powder as starting material. The GO was synthesis procedure is described as follows: for oxidation stage, a mixture of concentred sulfuric acid and boric acid (H_2SO_4/H_3BO_3, 10-30 ml) was added to a mixture of graphite powder (0.1-0.3 g) and potassium permanganate ($KMnO_4$, 0.6-0.8 g), producing a slight exotherm. The reaction was stirred for 30-90 min to 20-30 °C and then was heated to 40-55°C. For exfoliation stage, deionized (DI) water (20-30 ml) was added to the suspension and then was heated to 80-90°C and stirred for 15-45 min. The reaction was then finished by adding hydrogen peroxide (H_2O_2 50%, 10-30 ml). The resulting product has a brown/yellowish color and was separated by centrifugation from the solution. The resulting GO was washed 3-5 times with diluted HCl (20%, 50-100 ml) and DI water (150-200 ml); for each wash, the mixture was centrifuged (6000 rpm for 10-20 min) and the supernatant decanted away. The solid obtained was dried overnight to 50-60°C, obtaining 30-40 mg. For reduction stage, GO was suspended in DI water and sonicated for 1-2 h, yielding an aqueous GO dispersion (10-20 mg/ 100 ml). This dispersion was treated with ascorbic acid (1-2 mM) and stirred for 1-2 h to 70-80°C under reflux. The resulting product has a dark color and was separated by centrifugation from the solution. The solid obtained was dried overnight to 50-60°C, obtaining 5-10 mg of product. To study the chemical composition, presence of functional groups, exfoliation level, number of layers, oxidation degree, and the samples were characterized by different techniques such as UV-Visible, FT-IR, SEM, TEM and XPS. The designed synthesis is to looking for an alternative approach for large scale production of GO.

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Feasibility of *Terminalia catappa L.* fruit fhells (TCF) to treat nickel-laden water

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Introduction: In recent years, research interest in nickel has grown due to its increasing industrial significance and the growing environmental concerns regarding industrial effluents. Nickel (Ni^{2+}) contamination of water bodies have led to efforts for the development of various treatment technologies for its removal. This paper characterized and utilized *Terminalia catappa L.* Fruit Shells (TCF) in adsorbing Ni^{2+} in synthetic wastewater at varying pH conditions.

Experimental Detail: TCF preparation involved drying at 100^{0}C for 12 hours. The obtained powder was then sieved to 149 microns and was characterized using a scanning electron microscope (SEM) and Fourier-transform infrared spectroscopy (FTIR).

Batch adsorption was employed using 25 ppm Ni^{2+} solutions, which were adjusted to pH 2, 4, 6, and 8.A constant 120 rpm rate was maintained for 3 hours. Effluents were then characterized using inductively coupled plasma optical emission spectrometry (ICP-OES) to determine Ni^{2+} concentrations.

Results and Discussion: FTIR analysis revealed the presence of ideal adsorption sites such as hydroxyl (3360.44 cm^{-1}), methyl (2920.20 cm^{-1}), carboxylic (1736.27 cm^{-1}), and aromatic (1649.01 cm^{-1}) groups on the surface of TCF. The SEM image (Figure 1) at 500x reveals the non-homogenous distribution of particle size and the fibrous nature of the TCF shells.

From Fig. 2, it can be seen that Ni^{2+}removal increases as the solution pH increases. At lower pH, the surface charge of TCF is positive due to the excess protons thereby inhibiting the adsorption of Ni (II) ions. The reported increase in removal at pH 8 is due to its decreased solubility and precipitation at pH greater than 7.

Conclusions: TCF was found to have a fibrous structure with functional groups suitable as adsorption sites. It has been shown to be effective in the adsorption of Ni(II) in aqueous solution yielding a maximum removal of 77.70% at pH 8, which is attributed to both adsorption and precipitation.

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High-temperature corrosion in incinerators of medical waste - A review

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Statement of Problem: Medical Waste Incinerators are used in destroying medical waste such as blood-drenched bandages, culture containers, abandoned surgical equipment's, needles, removed body organs, lancets, surgical gloves and removed body organs. If not incinerated properly they are capable of transmitting diseases such as HIV, Hepatitis, and life taking infections. Medical waste being rich in high calorific value and chlorine, on combustion these wastes produces chlorides of sodium and chlorides which attacks the metallic parts of incinerators. The purpose of this study is to summarize the results of available research for prevention of high-temperature corrosion in incinerators.

Methodology: This paper describes various thermal spray coating processes adopted by researchers to combat the high-temperature corrosion in medical waste boilers with particular emphasis on super nickel alloys.

Findings: Hot corrosion is a severe problem in medical waste incinerators which causes a shutdown of heat exchangers plants used for extracting heat of flue gasses produced by waste.

Conclusion & Significance: Hot corrosion can be mitigated to some extent by altering the material used for making superheater tubes and by separating the surfaces of metals from corrosive environments by spraying thermal coatings.

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Optimized ordered nanoprinting using focused ion beam

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Focused ion beam (FIB) is receiving great attention in nanopatterning due to its advantages such as direct milling and deposition. Like conventional lithography methods, dose is still the determining factor of pattern conformity in FIB. However, dose is also determined by many parameters such as ion beam current, pixel size and number of pixels of the bitmap file. In this work, we studied the effect of above parameters on dose per unit area, and thus on the pattern conformity. It was found that a dose approximately of 7.5—8.6 pC/ìm^2 or a bitmap file corresponding to 4000— 5000 pixels/ìm^2 at a beam current of 30 pA is reasonable in order to obtain well-separated nanohole arrays. Although direct pattern designing on FIB working field yields better conformity, it is not practical for large scale patterning. Finally, a relatively larger scale nanoholes arrays with diameter and spacing of 100 nm was achieved by using a dose of 8.6 pC/ìm^2. This work offers a few guidelines for nanopatterning on silicon substrate for photonic applications.

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Characterization of air quenched valve seat insert obtained with AISI M3:2 high-speed steel

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This work is focused on the characterization of sintered valve seat insert (VSI) after heat treatment. Such VSI was obtained by powder metallurgy technique and fulfilled the requirement to replace cobalt and lead, used in the original alloy, due to their high cost and toxicological effect, respectively. The studied VSI is composed of a high-speed steel (AISI M3:2) powder admixed with iron powder and additives such as manganese sulphide, zinc stearate, graphite, carbides and copper, which was added through the metallic infiltration process. These powders characterization were carried out analyzing its particle size distribution and morphological aspects. The VSI was air quenched, and after that, it was double tempered at seven equidistant different temperatures, ranging from 100 °C until 700 °C. The VSI physical and mechanical properties were determined by means of its apparent hardness, apparent density and radial crush strength tests. The microstructural evaluation was performed etching the samples with Nital and then evaluating it with the support of the optical microscopy, scanning electron microscopy and energy dispersive spectroscopy. The chemical composition of the VSI was determined using the energy dispersive X-ray fluorescence spectrometer. The VSI best results was achieved, regarding its final application, by air quenching and double tempering it at 600 °C.

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Cu_2O thin films obtained from CuO films treated under an argon/dry-air microwave plasma

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Cu_2O is a promising material for solar cells, its synthesis is generally complicated, however. Pure Cu_2O thin films can be obtained from CuO films using an argon/dry-air plasma treatment. CuO is reduced to a form of metastable metallic copper that readily oxidizes to Cu_2O. Depending on different process conditions, the crystallite size of Cu_2O can be increased and controlled. Different groups of CuO samples, obtained by sol-gel deposition on glass, were annealed at different temperatures (*TA*), from 350 °C to 550. To obtain Cu_2O, CuO thin films were treated for 15, 20, 25 or 30 s, under an argon/dry-air plasma. The treatment took place at low pressure (15 mbar), inside a quartz chamber in a home-made equipment consisting of a 1500 W microwave oven modified for this purpose. The samples were placed on a ceramic plate that allowed both substrate sides to receive the same plasma treatment. Fluxes of argon (60 SSCM) and dry air (60 SCCM) were controlled by mass controllers and injected continuously before, during and, after the plasma treatment. Depending on the CuO films TA's, gas flows and time of plasma treatment, Cu_2O, Cu or a mixture of both were obtained. Interestingly, pure Cu_2O was produced only from a metastable form of metallic copper and only after the plasma treatment, this by oxygen availability. To our knowledge, this phenomenon has not been reported before. CuO annealing temperatures showed that Cu_2O crystallite sizes tended to be bigger when lower TA's were used; wide variations in crystallite size were observed. Pure Cu2O films of 100 nm in thickness with bandgap of 2.17 eV were obtained by a plasma treatment of 30 s. Some of the advantages of this plasma processing are its simplicity, short time of treatment and, low cost of the home-made equipment.

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A model of clearness index using atmospheric parameter for solar energy applications in Offa environment, Nigeria

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Solar energy is the radiant energy from the sun that is harnessed using a range of ever- evolving technologies such as photovoltaic, solar architecture and solar thermal energy. It is a source of renewable energy and its technologies are broadly characterized as passive or active solar techniques depending on how it is obtained and distributed as solar energy or converted to solar power. Clearness index reflects the meteorological variations and climatic changes depending on the location. This study is based on the formulation of a model for clearness index using ambient temperature for solar energy applications in Offa environment (lat.8.90N, lon4.20E).The atmospheric parameter was obtained from FEDPOFFA meteorological station at, Offa for a period of five months; from 1ST June to 30TH October. 2016. The performance of this correlated model as global radiation estimator was evaluated by comparing the predicted and measured values. Different statistical analyses were employed to examine the mathematical model. The quadratic equation obtained fits well with the measured data. The quadratic equation obtained was well correlated with the measurement when further comparisons were carried out with the existing equations for tropical environment. The importance of empirical models for obtaining accurate solar radiation is not an over emphasized as accurate data base for solar radiation is virtually not available in Nigeria and there is need to develop solar energy systems for rural applications.

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Synthesis of ZrS_2/ZnS nano photocatalyst and palladium-graphite modified electrode and its application in antibacterial, antimitotic and electrochemical degradation for waste water

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Nanocomposites of ZrS_2/ZnS were prepared by simple electrochemical method. Pd/graphite modified electrode has been synthesized by electrodeposition of Pd on graphite. The structural, composition and optical property of these materials were characterized by XRD, SEM(EDAX), UV-Vis and IR techniques. The energy gap and size of the nanoparticles were calculated. Photocatalytic degradation for Indigo Carmine dye and industrial effluents by nanoparticles were studied. Electrochemical degradation for Acridine orange dye was studied by Pd/graphite modified electrode. The kinetics of photodegradation and electrochemical degradation was studied. ZrS_2/ZnS showed very good antibacterial and antimitotic activity. These results indicate that the synthesized nanocomposites and modified electrodes would be promising materials for photocatalytic, electrochemical and biological applications.

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Synergistic effect of UV light photocatalytic on ytterbium doped titanium dioxide nanoparticles against Gram strain bacteria's

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A novel Up-conversion ytterbium material was doped with titanium dioxide (YbT) nanoparticles (NPs) for to analyze the effect on antibacterial activities in two conditions (without UV-irradiated and with UV-irradiated) against two Gram strain bacteria's (*Staphylococcus aureus and Escherichia coli*). For the synthesis of YbT NPs, we have employed a bottom-up approach in that the green route was adopted. In the green route, there are a number of bioreductants were used due to their potentiality. In our synthetic route, a novel Piper Betel leaf extract was chosen due to their rich constituents (Phytochemicals). In order to confirm their optical, functional, surface morphological, structural and thermal stability observations, YbT NPs was subjected to various characterization techniques. The obtained results were signified that they having an absorption maximum around at 373 nm, the presence of N-H, C-H, C=O and C-O on YbT FT-IR spectrum indicates that the possible presence of bioreductants which are responsible for the reduction and stabilizing the YbT NPs. The size of the particles was in nano nature and they consist size of about 7 nm. They are having a tetragonal crystal structure, later compared the crystalline size from Scherrer's and Williamson-Hall (W-H) methods, this may signify that estimated crystalline size from the W-H method is more appropriate for the TEM image as compared to the Scherrer's method. The YbT NPs are thermally stable. After the satisfactory results, we have further studies their antibacterial activities. The obtained results may indicate that YbT NPs have shown more potent antibacterial activities against *Staphylococcus aureus and Escherichia coli* bacteria in both the conditions. But we have got more zone of inhibition for with UV-irradiated YBT NPs. So this may indicate that YbT NPs can be used for various biological activities. Furthermore, this synthesis route can be utilized for the mass productions of NPs; it may help for the industrial uses.

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Thermal conductivity of epoxy resin composites filled with combustion synthesized AlN and h-BN powders

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Epoxy resin composites filled with combustion synthesized aluminum nitride (AlN) and hexagonal boron nitride (h-BN) powders were fabricated and their thermal conductivities were compared. The thermal conductivity of AlN-filled composites increases with increasing filler content but that h-BN filled composites increases with increasing filler content to a maximum then decrease with filler content further increased. There are considered to be caused by more randomly oriented h-BN particles at low filler contents but more horizontally at high filler contents. When comparing composites filled with AlN and h-BN particles with a similar size, the h-BN filled composites possess higher thermal conductivities than the AlN filled composites do in low filler content regions but the opposite was observed in high filler content regions.

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Investigating computational methods to predict redox potentials for quinones

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Due to an ongoing pursuit to replace fossil fuels with renewable energy sources, there is a high demand for large-scale electrical grid storage. Computational chemistry methods can be used to predict redox potentials of benzoquinones and hydroquinone's; the potentials of which can be tailored by the addition of electron withdrawing groups and electron donating groups. Quinones are an attractive organic material for aqueous flow batteries because they are low cost and undergo a reversible two-electron, two-proton redox reaction. Therefore, these organic species can be stored as chemical energy in electrolyte tanks, and be pumped into a regenerative fuel cell to undergo oxidation and reduction, when electric power is needed. This study has two objectives: 1) find a theory and functional pair that accurately predicts redox potentials, 2) find potential organic species for an aqueous flow battery. This presentation will report geometry optimizations using different theories and functionals, to determine which experimental set up most accurately predicts redox potentials. Quantum chemical calculations were performed using the 2012 MOLPRO software package. Accuracy is measured by the linear correlation between calculated potentials and experimental potentials. Experimental values are from Wedege's 2016 scientific report, *Organic Redox Species in Aqueous Flow Batteries: Redox Potentials, Chemical Stability and Solubility.* Quantum chemical methods can thus aid electrochemists in the effort to make an all organic aqueous flow battery, provided accurate redox potentials are ensured by calculations.

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Use carbon nanotubes/carbon composite counter electrodes as whole transport layer for efficient methylammonium lead bromide perovskite solar cells

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Organic–inorganic metal halide perovskites, especially methylammonium lead halide or mixed halide, have attracted significant attention as promising materials for photovoltaic applications due to their high absorption coefficients, excellent carrier transport, chemical and structural diversity, and proper band gap. Most efficient perovskite solar cell devices employ organic charge transfer materials, such as an organic hole transport material (HTM) of 2,2',7,7'-tetrakis-(N,N-di-p-methoxy phenylamine)-9,9' -bifluorene (spiro-MeOTAD) or an electron transport material of phenyl-C61-butyric acid methyl ester in combination with metal electrodes. The utilization of organic electronic components not only raises devices cost but also affects their long-team stability. Thus, it is highly desirable to develop perovskite photovoltaics which are free of organic materials. Carbon materials, due to their excellent stability, low cost and facile process ability, have been used to replace the expensive HTM and noble metal electrode in perovskite solar cells and achieved reliable efficiency and impressive stability carbon nanotubes being a promising candidate due to their extraordinary electrical and mechanical properties. Here we focused different carbon materials such as commercial graphite, carbon black, commercial hard coal, biochar and active carbon, thus can find a better material for the improvement of the perovskite solar cells. The semi-transparent, high voltage MAPbBr3/CNT solar cells will show great potential in solar cell windows, tandem solar cells and solar fuels applications. Carbon nanotubes are excellent electronic transporting materials due to their exceptional charge transport feature as well as their chemical stability and hydrophobicity. Carbon nanotubes have become one of the promising components in perovskite solar cells.

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Self-assembled pectin-conjugated multi-arm-polyethylene glycol nanoparticles loading dihydroartemisinin for anticancer combination therapy

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Single-drug therapy for cancer is greatly hampered by its poor water-solubility, difficulties in controlling and predicting the drug release, and non-specific delivery to the target tissue that limited to the clinical application. In order to overcome these limitations, a novel self-assembled nanoparticle platform based on pectin-multi-arm-polyethylene glycol-dihydroartemisinin conjugate (Pec-Multiarm-PEG-DHA) was first presented. This conjugate was synthesized by introducing hydrophobic drugs dihydroartemisinin to hydrophilic polymer molecules eight-arm polyethylene glycol, and then was linked to pectin via ester linkages. Moreover, another anticancer drug hydroxycamptothecin (HCPT) was encapsulated into the self-assembled nanoparticles (Pec-Multiarm-PEG-DHA/HCPT NPs). The obtained nanoparticles possessed appropriate size (~ 85 nm), high drug-loaded efficiency (~9.12 wt% DHA), encapsulation efficiency (~ 12.11 wt% HCPT), good stability and pH-dependent. The time-dependent cytotoxic of the Pec-Multiarm-PEG-DHA/HCPT NPs was only 4% 4T1 cell and 2% MCF-1 cell survived after 72 h. Pec-Multiarm-PEG-DHA/HCPT NPs exhibited a higher cytotoxicity, longer blood retention time of free drug (8.0-fold DHA, 7.4-fold HCPT) and more effective cellular uptake than free drugs. 4T1 tumor-bearing mice treated with the nanoparticles also showed a 90.6% survival advantage in comparison with 15.5% free DHA and14.1% free HCPT. In addition, it is clearly an elaborate certification that nanoparticles could reduce the risk of hypersensitivity reactions substantially. Therefore, Pec-Multiarm-PEG-DHA/HCPT NPs is a promising potential for anticancer combination therapy.

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Influence of performance of a molten hydroxide direct carbon fuel cell

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The direct carbon fuel cell (DCFC) is a power generation device that converts carbonic chemical energy directly into electricity by electrochemical oxidation. Because of well-known characteristics of coal-fired power plants, such as relatively low efficiencies, considerable contributions to greenhouse gas emissions, acid rain, and particulate and heavy metal pollution, improvement in coal utilization technology remains an important issue. The direct carbon fuel cell has some advantages such as the high theoretical efficiency, concentrated CO2 product off-gas, and the high energy density of solid carbon fuel. The molten hydroxide direct carbon fuel cell is a kind of the direct carbon fuel cell. Compared to other direct carbon fuel cells, the molten hydroxide direct carbon fuel cell has more superiorities and it will become a research trend in the future. The performance and characterization of a batch direct carbon fuel cell employing molten hydroxide electrolytes will be affected by many factors. For example, temperature, different carbonaceous fuels, the type of catalysts and the proportion of molten hydroxide electrolytes will have a significant impact. At present, some research groups have started this research. I believe that it will have more space of development and benefit to human in the near future. Because of catalytic oxidation of carbon in the process, I will do some research about catalytic performance. Efficiency of the direct carbon fuel cell with molten alkaline electrolyte can be obviously improved.

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A control strategy for stabilization of microgrid system base on the new energy storage

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This paper proposes a design of robust intelligent control for stabilization of grid-connected microgrid (MG) system, consisting of photovoltaic (PV), wind power (WP), Lithium-ion super capacitor. The fast variations of wind speed during extreme wind gusts result in fluctuations in both generated power and the voltage of power systems connected to wind energy conversion system (WECS) and its electrical output is difficult to predict and subject to factors outside the control of the operating company, these result in power fluctuations in a MG. To stabilize power fluctuations, an intelligent controller was proposed that the developed control strategy for mitigating wind power generation transients using Lithium-ion supercapacitor energy storage with active and reactive power support. The WECS includes squirrel cage induction generator (SCIG) with shunt connected capacitor bank to improve the power factor .The Lithium-ion supercapacitor energy storage system consists of step down transformer, power conditioning unit, DC–DC chopper. Fuzzy logic controller (FLC) is used with the DC–DC chopper to control the power transfer between the grid and energy storage. The Lithium-ion super capacitor energy storage system, coupled in a wind turbine generator to smooth wind power, is studied by real-time HIL simulation. The prototype controller is embedded in one real-time simulator, while the rest of the system is implemented in another independent simulator. After the simlulation it is found that the designed control scheme enhances the stability.

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