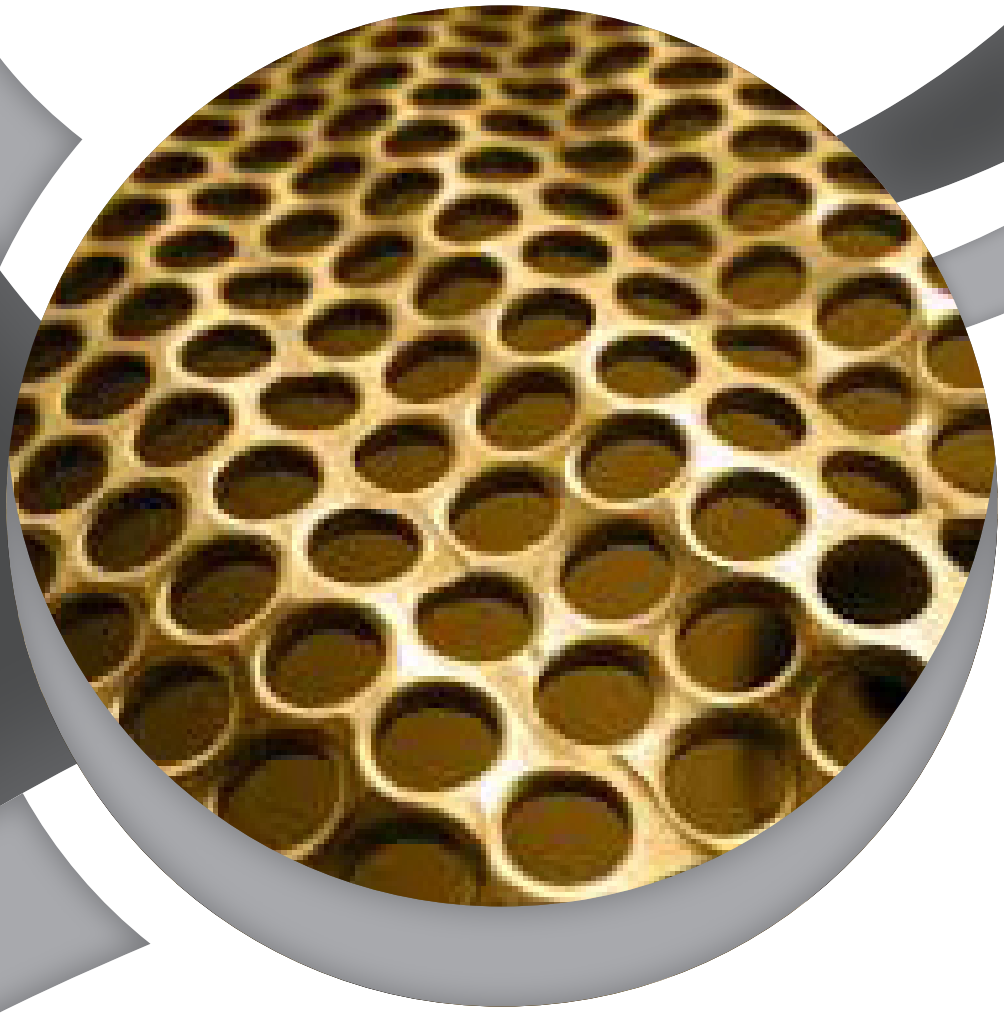


22nd International Conference on

Advanced Materials and Nanotechnology

September 19-21, 2018 Tokyo, Japan

Posters

Jaroslaw Serafinczuk et al., Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Characterization of the ZrS_2 van der waals crystal using AFM and optical spectroscopy methods

Jaroslaw Serafinczuk, Magdalena Tamulewicz, Robert Kudrawiec and Teodor Gotszalk
Wroclaw University of Science and Technology, Poland

ZrS_2 is a group IVB Transition Metal Dichalcogenides (TMD) material and one of the van der Waals crystals which can be exfoliated to a single monolayer. This 2D material has rarely been studied but can have superior electrical properties showing n-type transport behavior with an estimated mobility of $0.1^{-1}.1$ cm^2 V^{-1} s^{-1}. But most of these material parameters were calculated theoretically. In this paper, we want to present our technology which allowed us to obtain single ZrS_2 monolayer and results of the microscopic and optical characterization of obtained flakes. We used X-ray diffractometry for structure definition of the investigated ZrS_2 bulk crystals, AFM microscopy for measurement of the exfoliated flakes topography which allowed us to estimate the number of layers in the obtained flake and Kelvin Probe Force Microscopy (KPFM) for the work function of surface mapping. For 20 layer thick flakes the contact potential difference was about -0.20 V and it changes with the thickness of the sample. Optical spectroscopy methods defined ZrS_2 as a semiconductor with an indirect band gap of about 1.70 eV for bulk crystals.

Biography

Jaroslaw Serafinczuk has completed his PhD in 2006 from Wroclaw University of Science and Technology (WRUST). He is the Head of X-ray Diffraction Laboratory of Faculty of Microsystem Electronic and Photonics of WRUST. He has published more than 48 papers in reputed journals. His main topic of the research is connected to the X-ray diffractometry, structural study of materials, 2D materials and their characterization using microscopic methods.

jaroslaw.serafinczuk@pwr.edu.pl

Notes:

Katharina Dabow, Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Measuring nanoscale dynamics of grafted RAFT polymer using metal-induced energy transfer

Katharina Dabow
Georg-August-Universität Göttingen, Germany

Tethered polymer chains on a flat surface dramatically change the hydrodynamics of a fluid flow close to the surface. Simulations even predict a cyclic motion of the grafted chains that results in a backflow due to an applied shear flow. To get an insight into the molecular dynamics of a polymer chain on a surface being exposed to an external stimulus, Fluorescence Lifetime Correlation Spectroscopy (FLCS) has proven to be an excellent means. A detailed study in an experimental aspect requires an efficient and flexible synthesis route to produce a homogeneous polymer layer with an adjustable grafting density from the mushroom regime up to a high density brush. Surface-Initiated Reversible Addition-Fragmentation chain Transfer (SI-RAFT) offers the requisite set of properties. We have first conducted Metal-Induced Energy Transfer (MIET) FLCS measurements of a labeled poly (DMAEMA) high density brush. Via MIET experiments the brush height could be determined for the samples in a dry state and a swollen state in water. Additional dynamic MIET experiments yielded a correlation lifetime of t=600 ns for the swollen poly (DMAEMA) brush in water.

Biography

Katharina Dabow is pursuing her PhD in Macromolecular Chemistry from the Georg-August-Universität Göttingen, Germany. Her research focuses on the molecular dynamics of grafted polymer chains on flat surfaces measured by fluorescence lifetime correlation spectroscopy.

katharina.dabow@stud.uni-goettingen.de

Notes:

Yingying Cai, Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Silica-coated magnetite nanoparticles carrying a high density polymer brush shell of hydrophilic polymer

Yingying Cai
Georg-August-Universität Göttingen, Germany

Possessing inherently favorable superparamagnetic properties, magnetite nanoparticles (MNPs<20 nm) have attracted much research interest over recent years for extensive applications. Integrating the properties of MNPs and high-density polymer brushes in one structure requires sophisticated synthetic designs and effective chemical approaches. We present a simple and straightforward strategy for the fabrication of hydrophilic-polymer-capped magnetite-core–silica-shell nanohybrids with well-defined structure employing reverse microemulsion technique and surface-initiated Reversible Addition-Fragmentation chain Transfer (RAFT) polymerization. The high density polymer brushes allow a precise patterning of the magnetic nanohybrids with a tunable interparticle distances ranging from 20 nm to 80 nm by controlling the molecular weight of polymer. The high structural precision provides a near stand-alone state of the MNPs in the nanohybrids with effectively inhibited magnetic interaction as shown by SQUID measurements.

Biography

Yingying Cai is pursuing her PhD in Macromolecular Chemistry from the Georg-August-Universität Göttingen, Germany. Her research focuses on the development of novel silica coated nanomaterials incorporating surface chemistry and polymerization for various applications.

caiyingying.custom@gmail.com

Notes:

Se-Hun Kwon et al., Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Synthesis and functionalization of nano-catalysts for using a fluidized-bed reactor type powder atomic layer deposition

Se-Hun Kwon[1], Ji-Hoon Ahn[2], Chang-Min Kim[1] and Cheol Min Hyun[2]
[1]Pusan National University, Republic of Korea
[2]Korea Maritime and Ocean University, Republic of Korea

Functional nano-catalysts have been received a great attention due to its technological and economical importance in water splitting and purification, fuel cells, energy storages, etc. One of the major challenge in those areas is to find a practical way to lower the use of expensive noble metals, while maintaining or improving its catalytic properties. Among various synthesis techniques, Atomic Layer Deposition (ALD) is recently focused on these areas. ALD has many inherent merits such as an excellent thickness control at the sub-angstrom scale, high conformality even on nano-sized complex structues with high aspect ratios. When ALD process is utilized to deposit metals such as Pt, Ru, Ir, etc, it is possible to produce very small sized nanoparticles during the initial growth stage. Using this initial growth stage of ALD, many researchers have tried to use ALD in the application of catalysts. And, recently developed ALD technique, which is called as powder-ALD, enables this practical application.In this presentation, we introduce our recent research of Fluidized-Bed Reactor (FBR) type powder ALD for Pt based nano-catalyst of polymer electrolyte fuel cells. With an optimized process condition, we showed that lower Pt loaded nano-catalyst, compared with commercial one, can be succesfully prepared and can exhibit an improved catalytic properties due to its higher electrochemical surface area.

Biography

Se-Hun Kwon has received his BS, MS, PhD and Post-doctoral Associate from Department of Materials Science and Engineering from Korea Advanced Institute of Science and Technology (KAIST). His group is focusing on the design and synthesis of functional materials using Atomic Layer Deposition (ALD) techniques and on the fabrication of nanostructures for semiconductors, photovoltaic devices and nanodevices by utilizing a hybrid bottom-up and top-down fabrication approaches.

sehun@pusan.ac.kr

Notes:

Doo-Hyeb Youn et al., Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Transition metal dichalcogenide based electrospun fibers formation as a potential for gas sensor

Doo-Hyeb Youn[1], Bong-Jun Kim[2], Hongkyw Choi[1], Changbong Yeon[1,3] and Sun Jin Yun[1,3]
[1]Electronics and Telecommunications Research Institute, Republic of Korea
[2]Mobrik Co. Ltd., Republic of Korea
[3]University of Science and Technology, Republic of Korea

With the rapid development of industry, the hazardous gases have become a serious problem which is harmful to human health and safety. NO_2, as one kind of toxic gases, can cause photo chemical smog and acid rain. In addition, it could affect human health even at Part Per Million (ppm) levels, such as respiratory system and nerve system. Thus, there is a strong demand for developing cheap, reliable and sensitive gas sensors targeting NO_2. Recently, gas sensors with hybrid of one dimensional fibers and nanostructure such as a wire, tube, and fiber have attracted much attention owing to their high sensitivity, low cost and high response. In these studies, we fabricate the electro spun MoS_2 and WS_2 fibers with hierarchical flower-like structures. We applied WS_2 fibers in gas sensors using their high surface-to-volume ratio and unusual electrical properties. There is no report on the fabrication of sensors of MoS_2 and WS_2 fibers consisting of WS_2 fiber and high crystalline nanostructures (sheets) attract more interest due to their less gas diffusion length and higher mobility. In addition to the one dimensional fiber structure, we designed and fabricated high surface-to-volume ratio 3D hierarchical flower-like structures for increasing the gas-sensitivity. Effects of annealing temperature under sulfur flow on the morphological changes of MoS_2 and WS_2 fibers are reported and will be discussed.

Biography

Doo-Hyeb Youn has received his BS and MS degrees in Solid-State Physics from Pusan National University, Republic of Korea . He has received his PhD in Materials Science from Tokushima National University, Japan in 1999. He has joined the Electronics and Telecommunications Research Institute, Daejeon, Republic of Korea , in 2001. His research interests include growth and process of III-V nitrides blue light-emitting diodes (AlGaN, GaN) and HEMTs, analysis of III-V compound semiconductor devices. He is a Member of the Japan Society of Applied Physics.

dhyoun@etri.re.kr

Notes:

H S Song et al., Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Development of Neighborhood Electric Vehicle (NEV) light weight body based on substantiation

H S Song[1], S Y Lee[1], Y S Lee[1], H S Jung[2] and W H Choi[2]
[1]Ulsan technoPark, Republic of Korea
[2]TOPIND, Republic of Korea

As global fossil fuel depletion, greenhouse gas emission regulations, and fuel economy regulations are strengthened, domestic and overseas automakers are accelerating the development of eco-friendly cars. Competition for pre-emption in the early market is accelerating with the launch of various line-ups from high-end electric cars to low-cost electric cars. In this research project, based on frame body design technology specialized in low speed electric vehicle (NEV), 1.7GPa hot stamping part molding technology, 1.0GPa cold forming technology, skin part vacuum molding technology, assembly technology, and inspection tool manufacturing technology to secure the commercialization technology of electric vehicle and autonomous vehicle. We evaluated the basic properties of hot stamping parts which have not been applied to existing parts, developed joint properties and evaluation techniques, and conducted structural stiffness and torsional stiffness tests to verify the frame body manufactured on the basis of structural analysis. With the development of a small-sized electric vehicle equipped with a lightweight frame body with safety, it is expected that the technology that has been focused on the development of existing urban electric vehicles and high-speed electric vehicles can be diversified industrially.

Biography

H S Song is student at Ulsan TechnoPark, Republic of Korea . Her research experience includes various programs, contributions and participation in different countries for diverse fields of study. She is a recipient of many awards and grants for Her valuable contributions and discoveries in major area of research. Her research interests lie in Major areas of Study. She is committed to highest standards of excellence and it proves through her work and experience.

wonsoo4214@utp.or.kr

Notes:

Junghoon Kim et al., Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Multifunctional superhydrophobic surfaces with carbon nanotubes by direct patterning of conducting pastes

Junghoon Kim, Joon Young Cho, Hee Jin Jeong, Seung Yol Jeong, Seon Hee Seo, Geon Woong Lee and Joong Tark Han
Korea Electrotechnology Research Institute, Republic of Korea

Carbon nanomaterials have been used in various applications like electro-wetting, static charge dissipation and electrical circuits. Carbon nanomaterials such as Carbon Nanotubes (CNTs), graphene, graphite and carbon fibers have been utilized to fabricate electrically conducting and superhydrophobic surfaces because of their ability to remove the static charges accumulated on surfaces. The directly printed superhydrophobic surfaces containing conducting nanomaterials can be used for a wide range of applications in terms of non-wetting, anisotropic wetting, and electrical conductivity. Here, we demonstrated that direct-printable and flexible superhydrophobic surfaces were fabricated on flexible substrates via with an ultra-facile and scalable screen printing with Carbon Nanotube (CNT)-based conducting pastes. A polydimethylsiloxane (PDMS)-Polyethylene Glycol (PEG) copolymer was used as an additive for conducting pastes to realize the printability of the conducting paste as well as the hydrophobicity of the printed surface. The screen-printed conducting surfaces showed a high water contact angle (WCA) (>150°) and low contact angle hysteresis (WCA <5°) at 25 wt% PDMS-PEG copolymer in the paste, and they have an electrical conductivity of over 1000 S m-1. Patterned superhydrophobic surfaces also showed sticky superhydrophobic characteristics and were used to transport water droplets. Moreover, fabricated films on metal meshes were used for an oil/water separation filter.

Biography

Junghoon Kim has completed his Master's degree from Kumoh National Institute of Technology, Republic of Korea . Currently, he is a Researcher of Korea Electrotechnology Research Institute.

kjh40210@keri.re.kr

Notes:

Jihyun Bae et al., Shi-Ru et al., Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

A study on gas adsorption using surface-modified porous carbon composite materials

Jihyun Bae, Seongho Choi, Seungho Lee and Woonjung Kim
Hannam University, Republic of Korea

Attention of Volatile Organic Compounds (VOC), which are generated by air pollution such as fine dust because of the rapid increase of automobiles and the consumption of oil and organic solvents are increasing. In particular, the aromatic compounds (e.g., benzene) can cause serious harm to the body's immune system and must be removed prior to release. Types of VOC removal using catalysts include transition metal oxidation catalysts, TiO_2 photocatalysts and complex catalysts comprising TiO_2 and activated carbon. In the case of the removal of VOC using catalyst, new byproducts are generated due to the catalytic reaction and the possibility of secondary pollution sources is very high. In this study, a porous carbon composite material was prepared for the purpose of replacing catalyst type (TiO_2). In order to solve the limitation of adsorption removal of VOC pollutants with various molecular weights and morphologies, we studied a framework to manufacture porous carbon composite materials with various sizes of pores on controlling the porous nano-size through surface modification. As a result, the gas adsorption amount was seven times higher in the cylindrical shape than in the spherical shape. Also, the adsorption amount of the gas increased as the concentration of the diazonium salt increased on the surface of the carbon composite material. It is possible to control the pore conditions according to the shape and surface modification conditions of the carbon composite material and to propose a new method of increasing the adsorption capacity of the gas by maximizing the surface area.

Biography

Jihyun Bae has earned his undergraduate degree in Chemistry at Hannam University, Republic of Korea in 2017. Presently he is a graduate student of Chemistry at the same university.

jbae0723@gmail.com

Notes:

Jihyun Bae et al., Shi-Ru et al., Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Preparation of metal-complexed mesoporous carbon membrane using monodispersed silica nanoparticles

Jihyun Bae[1], Seongho Choi[1], Kyongeun Yu[2], Seungho Lee[2] and Woonjung Kim[1]
[1]Hannam University, Republic of Korea
[2]Chemtree Co. Ltd, Republic of Korea

Mesoporous materials have been applied in various fields such as catalysts, supports for nanomaterials, adsorption and separation, and sensors. One of the important points for some applications is to control the pore size or the pore structure depending on the purpose. It is necessary to control the size of the pores according to the size of the molecules or substances entering the pores of the mesoporous material. Also, it is very important that the change of the material constituting of the skeleton and the properties of the mesoporous material depending on the purpose of use. The mesoporous carbon material is expected to be applied in fields such as electrode materials of a fuel cell because it has a surface area of 1,000 to 2,000 m2/g, excellent thermal stability, absorption and performance as a carrier. Especially, mesoporous materials are mostly utilized as catalysts or adsorbents because they have uniform nanopores. Despite its many advantages, the carbon material is weak in strength depending on the orientation and is easily cracked and has a low applicability in general. In this study, a mesoporous carbon membrane based on silica nanoparticle was prepared. Various synthesis parameters were systematically investigated to study the effects on the size and the size distribution of silica nanoparticles. The silica nanoparticles were pressurized into a disk and then calcinated to obtain mesoporous carbon membrane. Then the membrane was chemically treated with COOH group, and Ag was complexed on the surface of the membrane. In addition, our study suggests a new method to fix the metal to the surface of the mesoporous carbon membrane as well as to increase the strength of them.

Biography

Jihyun Bae has earned his undergraduate degree in Chemistry at Hannam University, Republic of Korea in 2017. Presently he is a graduate student of Chemistry at the same university.

jbae0723@gmail.com

Notes:

Hak Jun Do et al., Shi-Ru et al., Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Development of QCM sensor based on β-CD with thiol functional group for sensing 2-nonenal

Hak Jun Do and Seong Ho Choi
Hannam University, Republic of Korea

Human body odor consists of various kinds of odor components. Among them, 2-nonenal which is representative material of old man odor occurs by oxidation of skin secretion. In order to measure 2-nonenal, Gas Chromatography-Mass Spectrometer (GC-MS) can be used as odor analyzer, but this analysis is difficult because of its very expensive cost, long measurement time, and sampling odor directly. On the other hand, Quartz Crystal Microbalance (QCM), sensor can easily be used for sensing human body odor because of cheap cost, short response time and without sampling. However, in order to use QCM sensor, the host compound, which is the selective compound of human body odor, is need for preparing QCM sensor. So, we have selected the β-cyclodextrin (βCD) as host compound in order to sensing 2-nonenal as guest compound. To deposit βCD on QCM sensor, we introduced thiol functional group in the βCD, and then the thiol functional group introduced βCD (βCD-SH) was modified on QCM electrode in DMSO/H2O (3:1, v/v) mixed solution of βCD-SH. Successful synthesis of βCD-SH was characterized via H-NMR, FT-IR and MS. Preparation of the QCM sensor based on βCD was characterized via X-ray Photoelectron Spectroscopy (XPS), Energy Dispersive Spectroscopy (EDS) and contact angle. Also, reliability of measured data was compared with GC-MS data. Finally, we measured the adsorption and desorption properties according to concentration of 2-nonenal by QCM analyzer.

Biography

Hak-Jun Do has completed his Bachelor's degree from Hannam University and he is currently pursuing his Master's degree at the same university. He has studied on QCM sensor for sensing of human body odor. His research interests are piezoelectric phenomenon and host-guest compound.

ehgkrwns123@naver.com

Notes:

Eon Ju Lee et al., Shi-Ru et al., Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Synthesis and characterization of highly conductive nanoparticle copper ink for inkjet printing

Eon Ju Lee, Ho Young Jun and Si Ok Ryu
Yeungnam University, Republic of Korea

Many industries are focused on the nanoparticle metallic inks for the fabrication of electronic devices. Silver ink is a typical metallic ink having high conductivity and thermal stability. However, there is a limitation to use it in the fabrication due to its high material cost. Copper is considered as a substitute material for silver, but copper ink has an oxidation issue under atmospheric conditions. Cost effective, highly conductive and oxidation-free copper nanoparticle ink was synthesized in this study. Copper complexes and copper nanoparticles were used in the synthesis to prevent its oxidation. Expanding its application to various substrates, the synthesized nanoparticles were thermally treated at relatively low temperatures in the range of 50~400 oC. The prepared copper ink was printed on the silicon substrates and the printed films were then characterized. Each particle of copper complexes and copper nanoparticles was analyzed by Thermogravimetric Analyzer (TGA). Sheet-resistance was measured by four point probe. Surface morphology of the prepared electrode was also analyzed using Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM). From our results, the synthesized copper ink showed the suitable properties to apply to inkjet printing process for the fabrication of various electronic devices.

Biography

Eon Ju Lee has completed her Bachelor's degree in Chemical Engineering from Yeungnam University and currently pursuing her Master's degree at Yeungnam University. Her main research topic is the synthesis and application of highly conductive nanoparticle copper ink.

tpfkaksp@naver.com

Notes:

Ho Young Jun et al., Shi-Ru et al., Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Influence of black phosphorus thin films deposited by inkjet printing process for optoelectronics

Ho Young Jun, Eon Ju Lee and Si Ok Ryu
Yeungnam University, Republic of Korea

Black Phosphorus (BP), the most stable allotrope of phosphorus, is a material stacking individual atomic layers together through Van der Waals interactions. The band gap of BP is tunable from 0.3 eV for bulk BP to 2.0 eV for phosphorene (monolayer BP) depending on the number of stacked layers. Two-dimensional black phosphorus (phosphorene) dispersed in a solution is obtained by the solvent exfoliation. Among various solvents, N-Methylpyrrolidone (NMP) is found to provide stable, highly concentrated BP dispersions. However, its instability under ambient conditions leads to material deposition options for device fabrication. Black phosphorous thin films were deposited on the substrates using inkjet printing method. Physical properties of the films were systematically characterized by Atomic Force Microscope (AFM), Scanning Electron Microscopy (SEM), Photoluminescence (PL), Transmission Electron Microscope (TEM) and Raman spectroscopy. In this study, the stable, highly concentrated, electronic-grade phosphorous thin films were successfully deposited by combining the solvent exfoliation with the inkjet printing deposition method. Considering our result obtained in this study, it is believed that the black phosphorene prepared in this study could be applied to large-area, high-performance phosphorene devices.

Biography

Ho Young Jun has completed his Master's degree from Yeungnam University and currently he is a PhD student at Yeungnam University School of Chemical Engineering. He is working on 2D materials, optoelectronics and solar cells. He has published more than three papers in reputed journals.

jhy1848@naver.com

Notes:

Sheng-Chuan Hsu et al., Shi-Ru et al., Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Improved electrochromic performance of tungsten-oxide electrode film deposited by vacuum cathodic arc plasma

Sheng-Chuan Hsu, Po-Wen Chen, Meng-Hsin Chen, Jin-Yu Wu and Der-Jun Jan
Institute of Nuclear Energy Research, Taiwan

This paper reports on fabrication of tungsten-oxide (WO3) electrode films on a transparent conducting coated glass substrate by cathodic arc plasma (CAP) technique. The influences of various oxygen deliveries on structural, optical and electrochemical properties of WO_3 electrode films were investigated. X-Ray Diffraction (XRD) analysis indicated that the crystal structures of WO_3 electrode film were amorphous which porous and columnar form exhibited high-rate ion injection/extraction into/out of WO_3 electrode films. We have demonstrated better Electrochromic Device (ECD) performance based on prepared WO_3 electrode film with O_2/Ar=5, that enhanced electrochromic properties in terms of shorter coloration/bleaching response times and better cycling durability. The impressive colored/bleached cycle, good ion diffusion coefficient ($4.5^2 \times 10^{-9}$ cm^2/s), high optical transmittance difference (~74%), high deposition rate (~15 nm/min) and fast coloration and bleaching times (7 s and 6 s) are suggesting that columnar arrays of WO_3 electrode film deposited by the CAP technique is the promising smart window for potential electrochromic application.

Biography

Sheng-Chuan Hsu has completed his Master's degree from National Tsing Hua University and presently he is working in Division of Physics, Institute of Nuclear Energy Research. He is interested in optical materials.

powen@iner.gov.tw

Notes:

Ewa Klimiec et al., Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Research of piezopolymer cells from polypropylene and mineral fillers for their application to sensors and harvesting energy

Ewa Klimiec[1], Monika Machnik[1], Grzegorz Kolszczynski[1], Jacek Piekarski[1], Halina Kaczmarek[2] and Boguslaw Krolikowski[3]
[1]Institute of Electron Technology, Poland
[2]Nicolaus Copernicus University in Torun, Poland
[3]Institute for Engineering of Polymer Materials and Dyes, Poland

The development of low power electronic systems requires searching for the cheap materials for mechanical to electrical energy converters that would be used for power supply. One of such materials are polymer films made of isotactic polypropylene with a high degree of crystallinity that are filled with aluminosilicate mineral or glass beads. These films are characterized by a cellular structure that allows obtaining a permanent electret after the polarization process in an electric field ~100 V/μm at a temperature of ~85 °C. The structure of the film was examined using SEM and XRD. A high impact of kaolin on the mechanical strength of the film was observed. The polymer filling the plate structure of the filler affects the good mechanical strength of the film. Young's modulus is above 1000 MPa and is therefore close to or even greater than the value for pure i-PP. Electrets used in transducers must be characterized by a long depolarization time. This is favored by the resistivity of the film, which is 10^{17} Ωm. The durability of the electrets was investigated with aid of TSDC analysis. The temperature Tm exceeds 70 °C and the approximate activation energy is up to 6 eV. The piezoelectric coefficient d33 ranges from 200 to 70 pC/N, which indicates the high sensitivity of the film. The film was placed in a shoe insole to determine the amount of harvesting energy during the walk. The maximum power that can be obtained from one film layer was a few to a dozen or so μW.

Biography

Ewa Klimiec has completed her MSc degree in Ceramics Chemistry from AGH University of Science and Technology, Faculty of Materials Science and Ceramics, Krakow, Poland and PhD degree in Electronics from AGH University of Science and Technology, Faculty of Electrical Engineering, Automatics, Computer Science and Electronics, Krakow, Poland. She has worked as a Designer of Resistors in electronic components factory, Telpod, Krakow, Poland from 1973-1976. She has been working at Institute of Electron Technology, Krakow Division, Poland. She is co-author of more than 60 scientific papers. Her research field comprises materials for electronics, suppression resistors, piezopolymer electret transducers, energy harvesters and sensors for medical applications.

eklimiec@ite.waw.pl

Notes:

Grzegorz Kolaszczynski et al., Shi-Ru et al., Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Durability of composite polyethylene electrets: A way of calculating the activation energy of depolarization processes

Grzegorz Kolaszczynski[1], Ewa Klimiec[1], Halina Kaczmarek[2], Boguslaw Krolikowski[3] and Monika Machnik[1]
[1]Institute of Electron Technology, Poland
[2]Nicolaus Copernicus University in Torun, Poland
[3]Institute for Engineering of Polymer Materials and Dyes, Poland

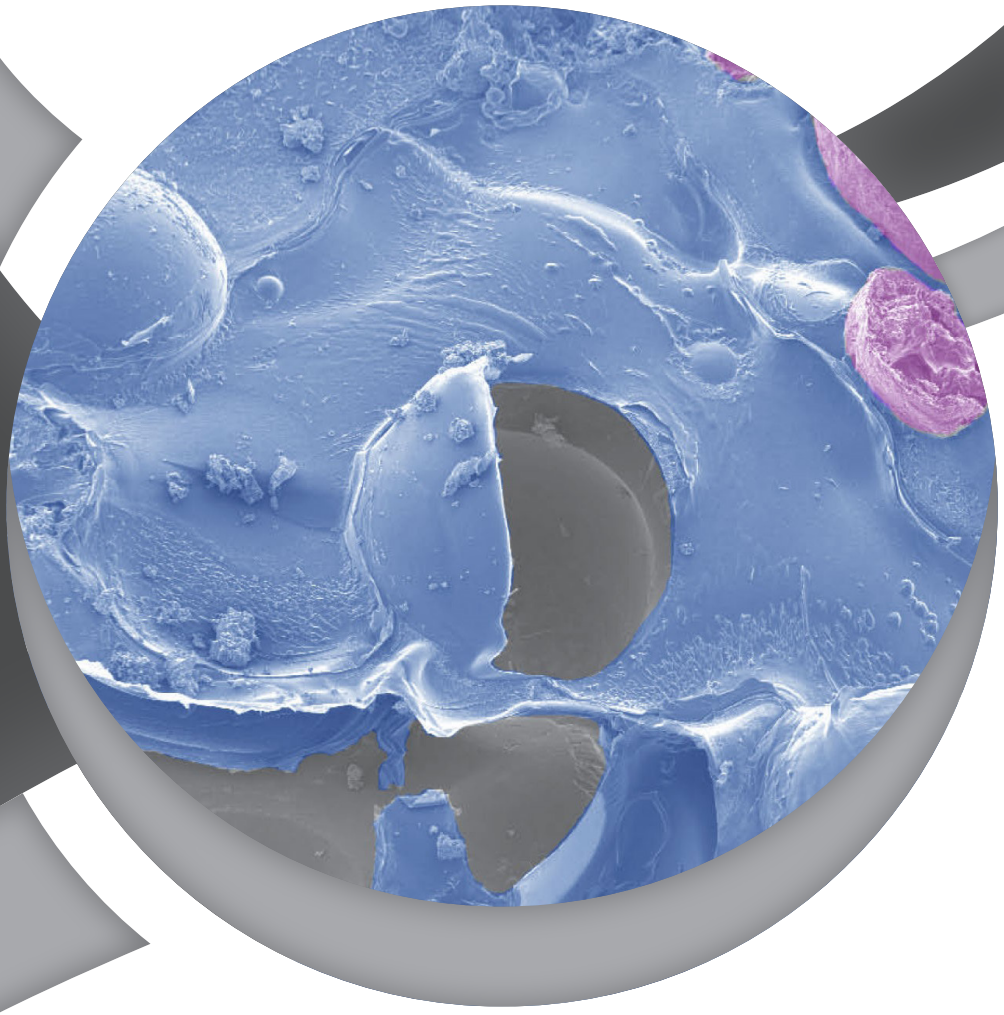
Most polymers exhibit piezoelectric properties after the polarization process, but only those for which the depolarization process takes at least several years are suitable. There is a need to look for cheap materials, with uncomplicated manufacturing technology, so that they can find wide range of applications as pressure sensors. These include high and medium density polyethylene and its composites with mineral fillers. Composite foils with cellular structure were obtained in the extrusion process. The structure and phase composition of the samples were examined using a scanning microscope and X-Ray diffractometer. In order to obtain electrets, the film was polarized in an electric field with an intensity of 60 to 100 V/μm. The durability of electrets, which is the basic feature taken into account in practical applications was determined in Thermostimulated Discharge Current (TSDC) studies. Activation energy was calculated by using the Arrhenius equation. However, depolarization of electrets often consists of several overlapping processes and a significant error occurs affecting current density values both at the initial rise temperature and around the temperature Tm of maximum depolarization current density. For this purpose, the initial rise method was extended by statistical methods and a correction of the current density curve was introduced in order to calculate more accurately the activation energy. Obtained activation energy ranges from 2 to 4 eV and the value of the piezoelectric coefficient is above 70 pC/N, which confirm that polyethylene is suitable for mechano-electric transducers for general use.

Biography

Grzegorz Kolaszczynski obtained his MSc degree in electrotechnics from Cracow University of Technology, Faculty of Electrical and Computer Engineering, Cracow, Poland in 2006. In the same year he started gaining his expierence at Calibration Specialists Ltd (Ireland) where he was creating manual and automatic calibration systems and procedures. At 2014 he started working at Institute of Electron Technology, Division in Krakow where he working as hardware and software developer for embedded systems. For several years, he has been involved in research in the field of materials engineering, working on activation energy, the durability of electrets and sensors for medical applications.

kolaszczynski@ite.waw.pl

Notes:



22nd International Conference on

Advanced Materials and Nanotechnology

September 19-21, 2018 Tokyo, Japan

e-Posters

Yusuke Hayashi et al., Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Thin film coating of CFRP for improved surface property

Yusuke Hayashi and Petros Abraha
Meijo University, Japan

The frictional heat and wear volume of Carbon Fiber Reinforced Plastics (CFRP) is evaluated with regards to usage as a material for sliding/rolling mechanical parts. CFRP is a carbon fiber reinforced polymer matrix with high strength-to-weight ratio that is commonly used as material for structural components. However, usage as a material for sliding/rolling mechanical parts has been limited due to friction and wear behavior which is significantly affected by interface temperatures. Frictional heating can cause surface temperatures to reach the melting or softening temperature of polymers, and this results in a drastic change in the friction and wear behavior of the surface. In this research, the CFRP surface is coated with a Diamond-Like-Carbon (DLC) thin film, a hard material with a low friction coefficient, to protect the polymer matrix from the excessive frictional heat and to reduce the wear volume. The coated surfaces are then tested with a reciprocating sliding friction tester and ring on disc friction tester to determine friction coefficient and wear volume and frictional heat, respectively. The results show that the DLC thin film protected the carbon fibers and thus reduced the friction coefficient and the frictional heat. Moreover, the increased surface hardness produced lower wear volume opening the way for application of CFRP material for use in sliding mechanical parts.

Biography

Yusuke Hayashi has completed his Bachelor's degree from Meijo University and currently pursuing his Master's degree course.

173430018@ccalumni.meijo-u.ac.jp

Notes:

Shinichiro Kitamoto et al., Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Development of a simulation tool for a plasma generation based on the dual property of electrons

Shinichiro Kitamoto and Petros Abraha
Meijo University, Japan

This research presents the development of a simulation tool that characterizes and optimizes the plasma characteristics of a new plasma device based on the dual property of electrons. The device is specifically tailored to produce uniform and large-volume plasma that can harden the surface of large-sized or large-number of mechanical parts. The thin nitride layer is formed by the diffusion of interstitial nitrogen atoms to within a few tens of micrometers into the bulk material. Evaluation of the performance of the plasma device in attaining uniform and large-volume treated materials requires extensive experimental work, modeling and numerical simulation in addition to plasma diagnostics. In this research, the principle of the plasma generation and the operating conditions of the plasma device, are considered in constructing the simulation tool that illustrates the qualitative relations between the plasma parameters and the magnitude and uniformity of the plasma. Numerical simulation of three sequential regions namely, particle, wave and particle regions are modeled to give the total framework. In the two particle regions, Particle-In-Cell and Monte-Carlo-Collusion methods are carried out to determine the particle energy and position within the plasma chamber. While in the wave region, Fresnel theory is used to determine the diffracted electron intensity distribution. In combining the results of the particle and wave regions, the plasma characteristic of the device is holistically determined.

Biography

Shinichiro Kitamoto has completed his Bachelor's degree from Meijo University School of Mechanical Engineering and currently pursuing his graduation at Meijo University School of Mechanical Engineering.

173430010@ccalumni.meijo-u.ac.jp

Notes:

Ewa Klimiec et al., Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Research of piezopolymer cells from polypropylene and mineral fillers for their application to sensors and harvesting energy

Ewa Klimiec[1], Monika Machnik[1], Grzegorz Kolszczynski[1], Jacek Piekarski[1], Halina Kaczmarek[2] and Boguslaw Krolikowski[3]
[1]Institute of Electron Technology, Poland
[2]Nicolaus Copernicus University in Torun, Poland
[3]Institute for Engineering of Polymer Materials and Dyes, Poland

The development of low power electronic systems requires searching for the cheap materials for mechanical to electrical energy converters that would be used for power supply. One of such materials are polymer films made of isotactic polypropylene with a high degree of crystallinity that are filled with aluminosilicate mineral or glass beads. These films are characterized by a cellular structure that allows obtaining a permanent electret after the polarization process in an electric field ~100 V/μm at a temperature of ~85 °C. The structure of the film was examined using SEM and XRD. A high impact of kaolin on the mechanical strength of the film was observed. The polymer filling the plate structure of the filler affects the good mechanical strength of the film. Young's modulus is above 1000 MPa and is therefore close to or even greater than the value for pure i-PP. Electrets used in transducers must be characterized by a long depolarization time. This is favored by the resistivity of the film, which is 1017 Ωm. The durability of the electrets was investigated with aid of TSDC analysis. The temperature Tm exceeds 70 °C and the approximate activation energy is up to 6 eV. The piezoelectric coefficient d33 ranges from 200 to 70 pC/N, which indicates the high sensitivity of the film. The film was placed in a shoe insole to determine the amount of harvesting energy during the walk. The maximum power that can be obtained from one film layer was a few to a dozen or so μW.

Biography

Ewa Klimiec has completed her MSc degree in Ceramics Chemistry from AGH University of Science and Technology, Faculty of Materials Science and Ceramics, Krakow, Poland and PhD degree in Electronics from AGH University of Science and Technology, Faculty of Electrical Engineering, Automatics, Computer Science and Electronics, Krakow, Poland. She has worked as a Designer of Resistors in electronic components factory, Telpod, Krakow, Poland from 1973-1976. She has been working at Institute of Electron Technology, Krakow Division, Poland. She is co-author of more than 60 scientific papers. Her research field comprises materials for electronics, suppression resistors, piezopolymer electret transducers, energy harvesters and sensors for medical applications.

eklimiec@ite.waw.pl

Notes:

Grzegorz Kolaszczynski et al., Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Durability of composite polyethylene electrets: A way of calculating the activation energy of depolarization processes

Grzegorz Kolaszczynski[1], Ewa Klimiec[1], Halina Kaczmarek[2], Boguslaw Krolikowski[3] and Monika Machnik[1]
[1]Institute of Electron Technology, Poland
[2]Nicolaus Copernicus University in Torun, Poland
[3]Institute for Engineering of Polymer Materials and Dyes, Poland

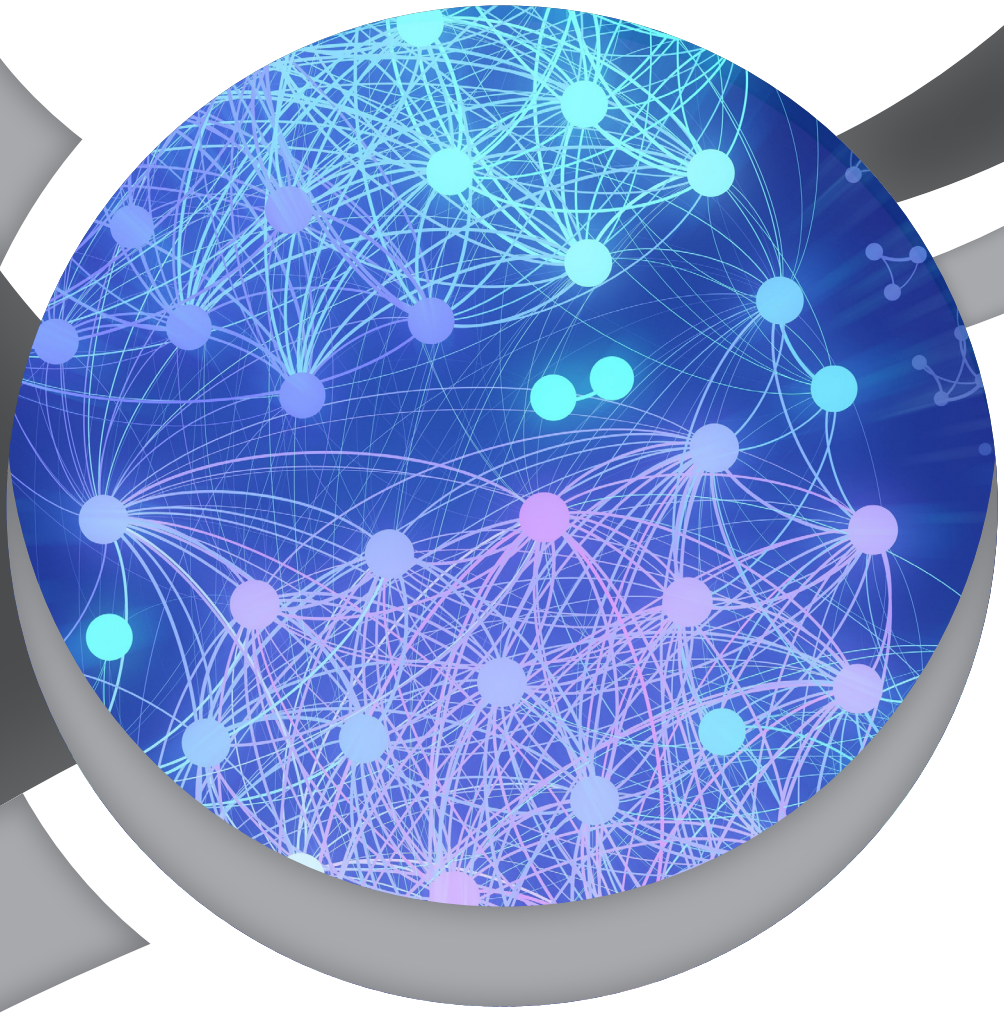
Most polymers exhibit piezoelectric properties after the polarization process, but only those for which the depolarization process takes at least several years are suitable. There is a need to look for cheap materials, with uncomplicated manufacturing technology, so that they can find wide range of applications as pressure sensors. These include high and medium density polyethylene and its composites with mineral fillers. Composite foils with cellular structure were obtained in the extrusion process. The structure and phase composition of the samples were examined using a scanning microscope and X-Ray diffractometer. In order to obtain electrets, the film was polarized in an electric field with an intensity of 60 to 100 V/μm. The durability of electrets, which is the basic feature taken into account in practical applications was determined in Thermostimulated Discharge Current (TSDC) studies. Activation energy was calculated by using the Arrhenius equation. However, depolarization of electrets often consists of several overlapping processes and a significant error occurs affecting current density values both at the initial rise temperature and around the temperature Tm of maximum depolarization current density. For this purpose, the initial rise method was extended by statistical methods and a correction of the current density curve was introduced in order to calculate more accurately the activation energy. Obtained activation energy ranges from 2 to 4 eV and the value of the piezoelectric coefficient is above 70 pC/N, which confirm that polyethylene is suitable for mechano-electric transducers for general use.

Biography

Grzegorz Kolaszczynski obtained his MSc degree in electrotechnics from Cracow University of Technology, Faculty of Electrical and Computer Engineering, Cracow, Poland in 2006. In the same year he started gaining his expierence at Calibration Specialists Ltd (Ireland) where he was creating manual and automatic calibration systems and procedures. At 2014 he started working at Institute of Electron Technology, Division in Krakow where he working as hardware and software developer for embedded systems. For several years, he has been involved in research in the field of materials engineering, working on activation energy, the durability of electrets and sensors for medical applications.

kolaszczynski@ite.waw.pl

Notes:



22nd International Conference on

Advanced Materials and Nanotechnology

September 19-21, 2018 Tokyo, Japan

Accepted Abstracts

conferenceseries.com

Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Graphene based cathode cold-field emission sources

Anjam Khursheed and Xiuyuan Shao

Over the past decades, the extensive research work carried out on carbon-based cathodes for cold field emission, such as Carbon Nanotubes (CNTs), has not as yet, led to new viable electron sources for electron microscopy/lithography. Their most successful layout has typically been in the form of dots, arrays for large area field emission applications. Nano size emitter single point cathodes have proven to have even more severe problems than conventional single-crystal tungsten cathodes: Unmanageably stringent UHV requirements, relatively large current stabilities and rapid emission decay. These difficulties have prevented the widespread use of cold field emission electron sources for electron microscopy/lithography applications. Recently, the research group at the National University of Singapore, led by Anjam Khursheed, has succeeded in using graphene field emission cathodes for electron microscopy/lithography applications. They have obtained stable field emission from a freestanding graphene ring structure, 5 μm in diameter and a wall thickness of around 3 nm. Another development is the discovery that graphene coated on a Ni sharpened tip dramatically lowers the work function of graphene (by over a factor of 4), enabling it to both provide stable field emission at cathode-tip electric field strengths as low as 0.5 V/nm, an order of magnitude lower than conventional single crystal tungsten point cathodes. This makes it possible to operate the cathode in HV conditions (4×10-8 Torr) and use relatively large cathode-tip sizes (micron sizes). These developments are expected to greatly extend the use of cold field emission electron sources for electron microscopy and lithography applications.

eleka@nus.edu.sg

conferenceseries.com

Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Super-extendable fibers for transmission line and artificial muscle

Changsoon Choi
DGIST Scholar-Smart Textile Convergence Group, Republic of Korea

Highly deformable and electrically conductive fibers are needed for diverse applications. Here, we report the supercoil structure (coiling of a coil) inspired, highly elastic, and electrically conducting fibers. The supercoiled fibers were fabricated by inserting giant twist into the carbon nanotube sheath wrapped spandex core fibers. The resulting supercoiled fibers show highly ordered and compact structure along fiber direction and provide structural strain, which enables super-elasticity up to 1000%. The supercoiled fiber exhibited stretch-invariant electrical property that only 4.2% resistance increase is observed for a full stretch when overcoated by passivation layer. Thanks to this performances, the supercoiled fibers can be effective extendable transmission lines that electrical square wave signal (30 Hz) transmitted by the supercoiled fiber showed 92% amplitude retention at fully stretch. The supercoiled fibers also could be electrothermally actuating artificial muscles generating a contracting actuation when electrical voltage applied for Joule heating.

cschoi@dgist.ac.kr

Notes:

conferenceseries.com

Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Synthesis mechanism of MoS_2 layered crystals by chemical vapor deposition using MoO_3 and sulfur powders

Ji-Hoon Ahn[1], Se-Hun Kwon[2], Cheol Min Hyun[1], Jeong-Hun Choi[1], Seung Won Lee[1] and Chang-Min Kim[2]
[1]Korea Maritime and Ocean University, Republic of Korea
[2]Pusan National University, Republic of Korea

Monolayer MoS_2 layered crystals have attracted significant attention owing to their potential applicability in emerging devices and Chemical Vapor Deposition (CVD) is the best method so far to obtain monolayer MoS_2 single crystals. Although many studies have been published on MoS_2 monolayer crystals grown by CVD, there is a lack of understanding of its synthesis pathway. Therefore, in this study, we investigated the mechanism of the synthesis pathway when monolayer MoS_2 crystals are synthesized by a conventional CVD method using MoO_3 and sulfur powders. By analyzing the synthesized crystals and byproducts, we discovered that MoS_2 crystals are synthesized on a substrate in 2D form by an intermediate phase of solid MoO_2 produced by the reduction of MoO_3 by sulfur, rather than being synthesized directly from vaporized MoO_3 and sulfur. Based on our observations, we propose two possible reaction mechanisms for MoS_2 synthesis by CVD using MoO_3 and sulfur powders. First, MoS_2 crystals could be mainly synthesized via reaction of MoO_2 and sulfur vapors. MoO_3 powder contained in the crucible would be reduced to MoO_2 rather than sulfurized to MoS_2 by sulfur vapor. Then, vaporized MoO_2 could react with sulfur vapor to form MoS_2 crystals on the substrate. Moreover, we found that MoS_2 layered crystals can also be formed from pre-formed MoO_2 crystals on the substrate. The two mechanisms could be occurring concurrently and the role of an intermediate phase of MoO_2 is very important in both processes.

ajh1820@kmou.ac.kr

conferenceseries.com

Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Ultra high pulse repetition frequency laser irradiation for in-depth melting and subsequent flawless solidification of semiconducting material

Jong Kab Park
AP Systems Inc., Republic of Korea

An Ultra High Pulse Repetition Frequency (UHPRF) or Quasi Continuous Wave (QCW) laser was elaborately controlled and irradiated on semiconductor layer steering bottomless melting of the void material to eventually aim at dense solidification. A massive deposition of amorphous semiconductor, interconnection purpose for instant leads great number of defects and sizable voids which would result in degradation of electrical performances of the device. There are numerous trials to remove or minimize such drawback by means of physically trampling flaws by deposition of heavier atomic material otherwise pulsed laser irradiation which intends to do fully packed solid transformation of the molten layer during solidification. In the case of photonic way, it is crucial to secure sufficient laser pulse duration with energetic intensity simultaneously which is contradictory since high pulse energy from the laser is the outcome of extraction of laser light in very short period of time. Either insufficient light intensity or short of pulse duration will cause shortage in melt volume, so the defects and voids may not fully be covered. On the other hands, UHPRF laser emits selected wavelength of light ranging from ultra violet to green with the pulsing period of 10 nanoseconds to 50 nanoseconds. Laser pulses come out extremely fast, so there is no time allowed the material to undergo cooling and on the contrary, accumulation of successive laser energy while the material is remained yet in liquid phase would effectively work to homogenously melt the entire material in depth. We have demonstrated complete melting followed by firm recrystallization result originally starting from 400 nm a-Si via cross section TEM and diffraction pattern measurement which proves dense transformation. Carefully manipulating key parameters would contribute for taking good control of melt depth, melt degree, surface roughness, etc. Melting, annealing and recrystallization sort of semiconductor heat treatments can be appropriately applicable with it.

jonkpark1@apsystems.co.kr

Notes:

conferenceseries.com

Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Shot blasting highly polished surface for enhanced nitriding operation

Kohei Yamagiwa
Meijo University, Japan

This research presents an innovative shot-blasting technology that maintains the surface conditions of a highly polished, mirror-finished surface, within nanometric precision and yet imparts a beneficial layer for an enhanced nitriding operation. The shot-blasting media is composed of an elastic polymer core (0.5 mm) coated with a 1 μm thick hard diamond material. The media particles are propelled to obtain a high kinetic energy and strike the target. This generates high pressure on the surface, which propagates into the subsurface producing a layer of refined grain-size with an increased dislocation density. The characteristics of metals to deform plastically depend on the ability of dislocations to move and the existence of actual barriers to slip. Therefore, the refined grains and increased dislocation density give way to a strengthened layer. In this experiment, the kinetic energy of the media is varied by changing the speed and type of media materials. The effect of the kinetic energy on the diffusion rate of nitrogen atoms and eventually the nitriding time required to attain a hardened layer is evaluated. Here, Electron Beam Excited Plasma (EBEP) was used to nitride SKD 61 tool steel. The nitriding treatment was performed for 3 hours at 500 oC. The underlying influence of shot blasting pre-treatment on nitriding operation was observed based on the micro-hardness test, corrosion test and surface roughness measurement.

173430021@ccalumni.meijo-u.ac.jp

conferenceseries.com

Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Protein-templated biomimetic synthesis of luminescent noble metal nanocluster for biomedical applications

Meegle S Mathew and Kuruvilla Joseph
Indian Institute of Space Science and Technology, India

Recently, protein-directed biomimetic mineralization has been demonstrated to be an efficient and promising strategy for synthesis of metal nanocluster for biomedical applications. This method is found to be bio-inspired, straightforward and environmentally benign. It can produce intense emitting fluorescent nanocluster with good stability, excellent biocompatibility, high water solubility and rich surface functional groups for further bio-conjunction. Fluorescent noble metal quantum clusters are composed of several tens of atoms and are distinctly different from bulk and metallic nanoparticles. They have sub-nanometer core size with discreet energy levels and show molecule like optical properties. Their easy one step and green synthesis make them particularly attractive. We have prepared protein directed synthesis of gold, silver, copper and gold-silver alloy quantum clusters. The formed highly stable quantum clusters showed intense fluorescence emission and were characterized using UV-Vis spectroscopy, fluorescence, FTIR spectroscopy, Transmission Electron Microscopy (TEM) and X-ray Photoelectron Spectroscopy (XPS). These quantum clusters further can be used for biomedical application including biosensing, such as sensing of biomolecules including neurotransmitter-acetylcholine, creatinine, bilirubin and detection of a toxic metal ion, mercury and the utilization of metal nanocluster for contraceptive applications.

meeglesmathew@gmail.com

Notes:

conferenceseries.com

Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-024

Room temperature hydrogen sensitivities of Pd nanorings/TiO_2 nanotubes composite structures

Xiongbang Wei, Xiaohui Yang, Tao Wu, Guodong Lv and Hanying Pang
University of Electronic Science and Technology of China, China

A novel composite hydrogen sensor consisting of Pd nanorings distributed on TiO_2 nanotube arrays was fabricated and evaluated at room temperature. The layer of Pd nanorings was deposited on top surface of the nanotube arrays by using a direct current (DC) magnetron sputtering method. Effects of the TiO_2 nanotube's diameter size, Pd nanorings' thickness on the sensors' hydrogen response characteristics were investigated. Time dependence of resistance of the Pd nanorings/TNTs composite structure on various hydrogen concentrations was also carried out and demonstrated good room temperature hydrogen sensitive characteristics. Microstructure of the sensor was characterized by Scanning Electron Microscope (SEM) and it showed that the Pd nanoclusters were deposited on the top of TiO_2 nanotubes in isolation. Crystalline structure of composite analyzing was characterized by X-Ray Diffraction (XRD) and it showed that amorphous TiO_2 has been converted into anatase and rutile completely after annealing at 500 °C. The hydrogen sensing characteristic was tested in series of hydrogen concentration at room temperature and it revealed that the sensor has excellent response performance. Optimized experiments demonstrated that the hydrogen sensor composed of 25 nm thickness Pd nanorings distributed on the 77 nm diameter TiO_2 nanotube showed a fast response time (3.8 s) and high sensitivity (92.05%) at 0.8 vol% H_2. A hydrogen sensitive characteristic model is proposed and the Pd nanorings' important role in the hydrogen sensitive mechanisms is described. The hydrogen sensor's excellent hydrogen sensitive characteristic is ascribed to the Pd nanorings' quick and continual formation and breakage of multiple passages due to absorption and desorption of hydrogen atoms, so that the composite hydrogen sensors have promising hydrogen sensitivity at room temperature.

weixiongbang@outlook.com