Diamond and Carbon & Graphene 2017

Joint Conference

International Conference on

DIAMOND AND CARBON MATERIALS & GRAPHENE AND SEMICONDUCTORS

July 17-18, 2017 Chicago, USA

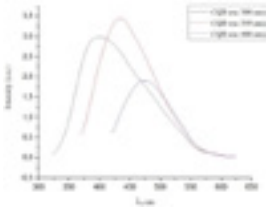
Posters

Svetlana A Smagulova et al., J Material Sci Eng 2017, 6:6(Suppl)
DOI: 10.4172/2169-0022-C1-077

Synthesis of carbon quantum dots with tunable luminescence

Svetlana A Smagulova, Alexandra E Tomskaya, Marfa N Egorova and **Albert N Kapitonov**
North-Eastern Federal University, Russia

Chemically synthesized graphene oxide (GO) has fluorescent properties due to the presence of oxygen functional groups. The presence of those groups such as carboxyl, hydroxyl, epoxy, etc. contributes to the appearance of structural defects and opening of band gap in GO. In this regard GO fluoresces in the range of wavelengths from ultraviolet to near infrared region. There are some methods of modifying the structure of the GO that change the photoluminescence spectrum and give rise to electroluminescence, for example, some authors associate the appearance of the electroluminescence with the formation of quantum dots of GO. Change of the emission wavelength depending on the photoexcitation energy has great potential for the creation of OLED phosphors, because modern phosphors can emit only a specific wavelength. But obtaining electroluminescence of GO is difficult due to structural defects on the plane and the edges of GO flakes, which prevent efficient charge transport. Current interest is the synthesis of new carbon material, which would have the same fluorescent properties as well as GO and have the defect-free structure. In this paper we report the synthesis of carbon quantum dots (CQDs) by hydrothermal treatment of the carbon precursor (glucose, citric acid, and gelatin) in the aqueous ammonia. The synthesized CQDs solution has oxygen groups that are drawn into the mechanism of luminescence of the GO. CQDs with lateral sizes around ~ 30-100 nm were obtained using a special method of hydrothermal treatment. The luminescent properties of CQDs change with a decrease of the lateral size of flakes and with the increasing of oxidation degree: The increasing of intensity of the emission spectrum and narrowing of the emission spectrum is observed. The photoluminescence spectrum CQDs with increasing of excitation wavelength shifts towards the red wavelengths. Furthermore, the analysis of growth of CQDs depending of the processing time, the concentration of the original solution and temperature was carried for finding optimal luminescent characteristics of CQDs.



Biography

Svetlana A Smagulova is the Chief Scientist, Head of "Graphene Nanotechnology" Laboratory at Institute of Physics and Technologies of North-Eastern Federal University, Yakutsk and her field of scientific interests are the creation and research of new materials based on graphene: A suspension of (graphene oxide, graphene, fluorographene), film, paper, layered structures, hybrid material, graphene structures with quantum dots, composite materials (polymers, rubber with the addition of graphene oxide). Also, the development of technologies for the creation of electronic devices based on graphene: Humidity sensor based on graphene and graphene oxide, electric double layer capacitors, strain gauges. The use of graphene in medicine: Development of test systems for DNA diagnostics of hereditary diseases based on graphene oxide; working out and creation of graphene-based aptasensor for rapid analysis of thrombin in the blood.

smagulova@mail.ru

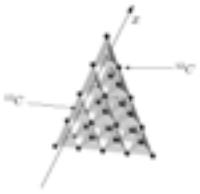
Notes:

Gustavo Lopez Velazquez, J Material Sci Eng 2017, 6:6(Suppl)
DOI: 10.4172/2169-0022-C1-077

Quantum computation in a solid state diamond C^{12} with a chain of C^{13} atoms

Gustavo Lopez Velazquez
Universidad de Guadalajara, Mexico

Quantum computation is one of latest hard goal in computer science and technology to perform algorithm that cannot be solved during our lifetime by a classical computer. The secret of this powerful machine is based on the exponential parallelism of calculations that it can make due to principle of superposition of the quantum mechanics, where the main elements which give us the information is called qubit (made up of the superposition of two states). However the difficulties found to have a workable quantum computer with significant number of qubits (say, 1000) are looked far away, due to decoherence and technological problems. We are proposing a new solid state quantum computer based on diamond estructure where one removes a C^{12} atom (spin zero) and replace it by a C^{13} atom (spin one half) forming a linear chain of C^{13} atoms. We show here that this in quantum sys- tem we can have an arbitrary single spin rotation of a qubit, a Controlled-Not (CNOT) quantum gate formed with two qubits, and a Controlled-Controlled-Not (CC- NOT) quantum gate with three qubits. This is enough to demonstrate that a full quantum computer can be constructed with this model. Parameters of the design are determined by the behavior of these quantum gates.



Biography

Gustavo Lopez Velazquez has completed his BS, MS, and PhD at the Universidad Nacional Autonoma de M´exico (UANM). He did a post-doc at Texas Accelerator Center, USA for about two years and went to Leon, Guanajuato, M´exico to help in the formation of the Instituto de F´ısica de la Universidad de Guanajuato (IFUG). Then, he went back to Texas, USA, to form part of the team who has spent six years trying to design and construct the Superconducting Super Collider Accelerator (SSC) in Waxahachie, Texas. After this, he went back to M´exico (Guadalajara, Jalisco) in 1994 to help a team of researchers in Physics, where he has collaboration with Los Alamos National Laboratory (LANL) in quantum computer research.

gulopez@cencar.udg.mx

Notes:

conferenceseries.com Joint Conference

International Conference on

DIAMOND AND CARBON MATERIALS & GRAPHENE AND SEMICONDUCTORS

July 17-18, 2017 Chicago, USA

Preparation and mechanical properties of carbon nanotube reinforced aluminum matrix composites

H Erdem Çamurlu, Aynur Kazaz, M Ayşe Dere and **Harun Evlek**
Akdeniz University, Turkey

Carbon nanotube (CNT) reinforced aluminum (unalloyed) matrix composites were produced by hot pressing powder metallurgical technique. Composites containing 0.25 – 3 wt. % CNT were obtained. Mixing was performed both by conventional ball milling (CBM) and high energy ball milling (HEBM). In CBM, which was performed solely for mixing purposes, zirconia balls having 2 mm diameter were used and milling was conducted for 15 minutes. In HEBM, a Retsch PM100 unit with tungsten carbide balls of 5 mm diameter was utilized, where mixing and grinding was conducted for 90 minutes at 150 rpm under argon atmosphere. Hot pressing of the composites was performed at 600°C for 30 minutes. Densities of the obtained composites were over 97% of theoretical. In the microstructure of the composites obtained by CBM, carbon nanotubes were in the form of agglomerates and clusters. Thus, it was seen that conventional mixing was not sufficient for a good dispersion of CNT in Al. Hardness values were about 32.5 HB10 and did not change with the addition of CNT. 3 point bending strength of unreinforced sample was 295 MPa. There was a slight decrease in the strength and strain with increasing CNT content. In the composites obtained by HEBM, CNTs were seen to be well dispersed in the microstructure of the composites. Hardness was seen to be higher, as a result of the application of HEBM instead of CBM. Hardness of unreinforced Al increased to 42.5 HB10. Hardness of the composite containing 3 wt. % CNT reached a hardness value of 81.5 HB10. 3 point bending strength values were about 320 MPa and were not affected by the addition of CNT. Strain values of the composites were lower, as compared to unreinforced sample..

Biography

H Erdem Çamurlu has completed his PhD in 2006 from Middle East Technical University, Ankara, Turkey. Currently, he is an Associate Professor in the Mechanical Engineering Department of Akdeniz University, Antalya, Turkey. He has published more than 35 papers in reputed journals.

erdemcamurlu@gmail.com

Notes:

Pinar Camurlu et al., J Material Sci Eng 2017, 6:6(Suppl)
DOI: 10.4172/2169-0022-C1-077

Fabrication of electroactive nanofibers

Pinar Camurlu and **Merih Zeynep Çetin**
Akdeniz University, Turkey

Electroactive nanofibers, which are highly promising for sensor applications, have been receiving great attention due to their high electrical conductivity, surface area and porosity. Electrospinning has become one of the leading approaches for preparation of polymer nanofibers, owing to its superior attributes such as being simple, fast and relatively cheap. Focus of this study is to develop electroactive nanofibers based on conducting polymers which contain carbon nanotube (CNT). The electroactive nanofibers, which were constituted from polyacrylonitrile (PAN), CNT and PEDOT, were fabricated by combining electrospinning and chemical vapor polymerization methods. The nanofiber mats were prepared by electrospinning of a PAN and CNT mixture in DMF. Later, these mats were subjected to chemical vapor polymerization of EDOT in the presence of $FeCl_3$. The resultant electroactive nanofibers were characterized by SEM, FTIR, CV and four point probe conductivity studies. The collective results have shown that the prepared mats contain conducting, homogeneous, electroactive PEDOT coatings on the surface of the PAN/CNT nanofibers, which are expected to be promising candidates for the fabrication of amperometric biosensors.

Biography

Pinar Camurlu received her BSc (1999), MSc (2001) and PhD (2006) degrees from Department of Chemistry at Middle East Technical University in Ankara, Turkey. She has been working in Department of Chemistry at Akdeniz University (Antalya, Turkey), since 2007. Her research is focused on the design and synthesis of functional conjugated polymers and their applications such as; electrochromic devices, light emitting diodes, biosensors. She has published more than 45 papers in SCI journals and took part as a co-author for three international scientific book chapters.

pinarcamurlu@gmail.com

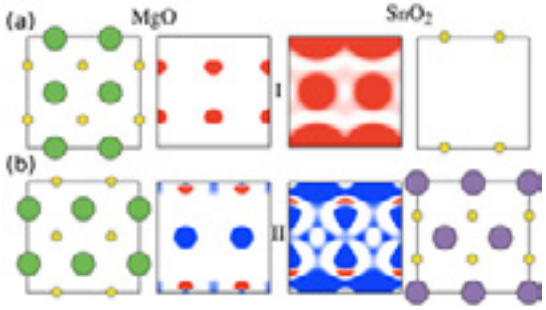
Notes:

Arwa Albar et al., J Material Sci Eng 2017, 6:6(Suppl)
DOI: 10.4172/2169-0022-C1-077

Polar catastrophe at the MgO(100)/SnO_2(110) interface

Arwa Albar and **Udo Schwingenschlogl**
King Abdullah University of Science and Technology, Saudi Arabia

First principles calculations, based on density functional theory, are used to investigate the structural and electronic properties of the epitaxial MgO(100)/SnO_2(110) interface of wide band gap insulators. Depending on the interface termination, nonmagnetic metallic and half-metallic interface states are observed. The formation of these states is explained by a polar catastrophe model for nonpolar–polar interfaces. Strong lattice distortions and buckling develop in SnO_2, which influence the interface properties as the charge discontinuity is partially screened. Already a single unit cell of SnO_2 is sufficient to drive the polar catastrophe scenario.



Biography

In April 2017, Dr. Arwa Albar earned her Ph.D degree in Material Science and Engineering from King Abdullah University of Science and Technology, Saudi Arabia. Her research is based on Density functional theory calculation that is used to investigate the electronic, magnetic, and structural properties of oxide materials under defects and interfaces. She is also a staff in the Physics Department of King AbdulAziz University since 2004.

arwa.albar@kaust.edu.sa

Notes:

Diamond and Carbon & Graphene 2017

Joint Conference

International Conference on

DIAMOND AND CARBON MATERIALS & GRAPHENE AND SEMICONDUCTORS

July 17-18, 2017 Chicago, USA

e-Posters

Ervin Šest et al., J Material Sci Eng 2017, 6:6(Suppl)
DOI: 10.4172/2169-0022-C1-077

Enhanced characteristics of solar absorber coating based on platelets graphene

Ervin Šest[1, 3], **Goran Dražič**[1, 3], **Boštjan Genorio**[2] and **Ivan Jerman**[1]
[1]National institute of Chemistry, Slovenia
[2]Faculty of Chemistry and Chemical Technology, Slovenia
[3]Jozef Stefan International Postgraduate School, Slovenia

When developing new, commercially available products, nanostructured materials are receiving an increasing amount of interest. Transition from fossil fuel to sustainable sources of energy is essential. Solar energy is a promising alternative energy source that can address this challenge. Platelets graphene as flake like material is one of the nanomaterials suitable for improvement of spectrally selective coatings. Synthesized platelets graphene was used as a corrosion protection agent while also serving as a solar absorbing pigment. The main obstacle in the synthesis of platelets graphene is agglomeration of the particles, thus they have to be functionalized. With the functionalization of the particles the application of the prepared dispersions is simple and infusion of platelets graphene less evident. High absorptivity is expected due to the platelets graphene structure. The latter is also a candidate for an improvement of the corrosion inhibition effect. Raman spectroscopy, atomic force microscopy and transmission electron microscopy were used to characterize prepared platelets graphene (especially for the definition of the layers) and coatings. In addition to the proposed techniques, the Fourier Transformation Infrared Spectroscopy and UV-Vis spectroscopy were introduced to characterize optical properties of the coating. The presented results demonstrate improvements of spectrally selective coatings for low temperature application.

Biography

Ervin Šest has his expertise in evaluation and passion in improving the sustainable energy resources. He is developing and preparing innovative paint coatings for solar application. He is also evaluating the prepared materials and applied coatings. He obtained a degree in the field of dye sensitized cells and developed effective method of sintering TiO2 as the working electrode. Now, he is a Young Researcher at the National Institute of Chemistry Slovenia and studying Nanosciences and Nanotechnologies at the Josef Stefan International Postgraduate School. His research interests include sol-gel thin films; modification of pigments for spectrally selective paint coatings; surface treatments and nanocoatings; dye sensitized solar cells; electron microscopy, sample preparation.

ervin.sest@ki.si

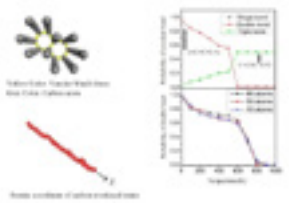
Notes:

C H Wong et al., J Material Sci Eng 2017, 6:6(Suppl)
DOI: 10.4172/2169-0022-C1-077

Thermal expansion, elastic modulus and phase transition of carbyne: A stochastic model of chemical bonds distribution

C H Wong[1], **E A Buntov**[1], **V N Rychkov**[1], **M B Guseva**[2] and **A F Zatsepin**[1]
[1]Ural Federal University, Russia
[2]Moscow State University, Russia

In the present work, we develop a powerful Monte Carlo algorithm of the carbon nanowires ordered into 3D hexagonal array. A new routine has been developed to probe the phase transition between the alpha and beta carbyne based on the chemical bond and atomic distributions. Our model confirms that the cumulene is the more preferable phase at low temperatures, but it is switched into polyvne phase at high temperatures. The bond softening temperature across Peierls transition is observed at 480 K. The higher Peierls transition temperature is observed in the presence of interstitial doping despite the transition temperature shows length-independence. The elastic modulus of the carbon chains is 1.7 TPa at 5 K and the thermal expansion is +70 μ K-1 at 300 K via. monitoring the collective atomic vibrations and chemical bond distributions. Thermal fluctuation in terms of heat capacity as a function of temperatures shows that the melting point is around 3800 K. The carbon atoms along the carbon nanowire arranged in relaxed state is unveiled at the end.



Biography

C H Wong has his expertise in Monte Carlo simulation and ab-initio calculation in Material Science. He has passion in searching for 300 K superconductors. He admitted in an experimental physics group and was trained to conduct AC calorimetry in the resolution better than 5 decimal places during his Doctoral degree in Hong Kong. He made contributions in capturing tiny superconducting signals in nanostructured materials and also discovered more fundamental physics of superconductors based on the ultra-weak heat capacity anomaly. After he graduated in 2015, he explores in theoretical condensed matter physics as a Post-doctoral Researcher in Russia, in order to design high temperature superconductors from theoretical point of view. He has constructed a stochastic model for carbon nanowire carrying extremely large Debye frequency and proposes the algorithm towards stabilized carbon nanowires array.

ch.kh.vong@urfu.ru

Notes:

Diamond and Carbon & Graphene 2017

Joint Conference

International Conference on

DIAMOND AND CARBON MATERIALS & GRAPHENE AND SEMICONDUCTORS

July 17-18, 2017 Chicago, USA

Accepted Abstracts

J Material Sci Eng 2017, 6:6(Suppl)
DOI: 10.4172/2169-0022-C1-077

Encapsulation and real life reproducibility of graphene devices

Abhay A Sagade
University of Cambridge, UK

As many graphene-based electronic and optoelectronic device concepts begin to make the transition from the research laboratory into real world applications it is imperative that factors such as long term stability and large area reproducibility are addressed. Graphene is inherently highly sensitive to environmental factors such as ambient air, lithography resists and polymers used in the transfer process which cause unintentional, generally p-type, doping and hysteretic behavior in field effect devices. Many of the graphene field devices need ambi-polarity. To overcome these issues device encapsulation and passivation is required. Atomic layer deposition (ALD) of oxides provides two-fold benefits. Firstly, Al_2O_3 act as a moisture barrier which adds long term stability and protection of devices from humidity and other atmospheric effects. Secondly, the ALD process has been shown to effectively passivate charge trap sites such as silanol (SiOH-) groups at the SiO_2—graphene interface which are responsible for much of the observed unintentional doping and hysteretic device behavior. We have developed two different routes to enhance the nucleation of ALD oxides on hydrophobic graphene surface. In first approach an ex-situ nucleation layer of 2 nm Al film was deposited with appropriate amount of oxygen control by e-beam evaporation. While in second route an *in-situ* nucleation was created by pulsing water precursor in the ALD chamber. In both the methods highly-air stable and reproducible GFETs are obtained. We have shown continuous hundreds of DC measurements in ambient which do not show any hysteresis and shifts of Dirac points with negligible doping concentration in graphene channel. It paves the way to speed up the production of graphene devices for real life applications.

aas_phy@aol.in

Graphene and boron nitride-based nanocomposites with enhanced thermal properties

Pradip Majumdar[2] and **Amartya Chakrabarti**[1]
[1]Applied Material Systems Engineering Inc., USA
[2]Northern Illinois University, USA

Polymer composites with a high thermal conductivity are always desired for different applications. Improved thermal conductivity of polymers can be obtained via dispersion of metal particles in a polymer matrix. However a good dispersion and thermal coupling cannot be achieved. We have designed and developed a formulation with enhanced thermal conductivity of silicone and epoxy-based resin systems using graphene and boron nitride-based nanomaterials synthesized in our laboratories. The nanocomposites are characterized thoroughly and excellent thermal conductivity improvement was observed. A detailed data analysis with different characterization techniques will be discussed and demonstrated.

pdmajumdar@gmail.com

J Material Sci Eng 2017, 6:6(Suppl)
DOI: 10.4172/2169-0022-C1-077

Ferrites/reduced graphene oxide (RGO) in supercapacitors: $MnZnFe_2O_4$/RGO- based supercapacitors with superior performance and high stability

Ibrahim Ismail and **Fatma Moustafa**
Zewail City for Science and Technology, Egypt

Owing to the rapidly increasing demand for energy conversion devices, energy storage platforms have become significantly attractive more than any instance in the past. Indeed, supercapacitors are considered one of the most promising energy storage devices, due to their excellent reversibility, rapid charge/discharge, high power density, in addition to long-life and cyclic stability compared to the analogous electrochemical energy storage devices. Typically, supercapacitors can be classified into two basic categories, pseudo capacitors, and electrochemical double layer capacitors (EDLC). On the other hand, graphene-based materials are given much consideration as effective electrode materials owing to their high specific surface area, excellent chemical stability, electrical and mechanical properties, and the feasibility for large-scale production of chemically-modified graphene (CMGs). To this end, the Hummers' method is widely used to produce graphene oxides (GO). Herein, the electrochemical performance of the $MnZnFe_2O_4$/RGO colloidal nano needle-based supercapacitors is investigated. Cyclic voltammetry, galvanostatic charge–discharge and cycle stability have been investigated. The obtained results reveal that, the $MnZnFe_2O_4$/RGO colloidal nanorods have a superior specific capacitance higher than $MnZnFe_2O_4$. The $MnZnFe_2O_4$/RGO based- supercapacitors using H_2SO_4 electrolyte demonstrated the best cycle stability among all the supercapacitors.

imohamed@zewailcity.edu.eg

Behavior of elastic modulus of nano filled epoxy resin under dynamic mechanical and nano hardness analysis

Vijay K Srivastava
Indian Institute of Technology-BHU, India

A carbon nano material such as multi-walled carbon nanotubes (MWCNTs) and graphene nano platelets (GnPs) has attracted considerable interest over recent years due to its intrinsic mechanical, thermal and electrical properties. Incorporation of small quantity of nano fillers into polymer can create novel nano composites with improved structural and functional properties. The properties of polymers, as reflected by their response to externally applied stresses, are dependent on both time and temperature. The dynamic mechanical analysis (DMA) of polymer-based MWCNT/epoxy resin and GnP/epoxy resin nano composites provides important insight into the intimate conformation of the polymer chains in the sample, as well as the interactions of these chains with MWCNT and GnP components in the composite system. Therefore, dynamic mechanical and nano hardness measurements of MWCNT/epoxy resin and GnP/epoxy resin nano composite were used to evaluate the effect of temperature on dynamic elastic modulus. These provide direct information on various other characteristic structural parameters, such as dynamic viscoelastic behavior, glass transition temperature (Tg), storage and loss moduli, and tan δ. The results of these measurements for all samples were compared, and allowed the evaluation of the effect of a magnetic field on the MWCNT/epoxy resin and GnP/epoxy resin nano composites. It can be seen that the storage modulus decreased with the increase of temperature, whereas loss modulus increased with increase of temperature. At low temperatures, all the samples show a very high value of the storage elastic modulus, followed by gradual drops due to second order transactions between 40°C to 110°C. The principal drop, due to the glass transaction, is evident for all samples in the range 130°C to 140°C. But, tanδ curves show a peak value 150°C to 160°C of temperature range indication glass transaction temperature. This indicates that the addition of nano filler improves the elastic properties of the epoxy system at elevated temperatures in the rubbery region. The loss modulus indicates that the energy has been converted into heat and can thus be used as a measurement of viscous component or unrecoverable oscillation energy dissipated per cycle. It may be further concluded that the nano hardness increases with increase of elastic modulus, as shown in figure.

vijayks210@gmail.com

J Material Sci Eng 2017, 6:6(Suppl)
DOI: 10.4172/2169-0022-C1-077

Rare earth doped ZnO nanoparticles:Gas sensing and photocatalytic application

Neha Verma[1], Sonik Bhatia[1], RK Bedi[2]
[1]Kanya Maha Vidyalaya, India
[2]Satyam Institute of Engineering and Technology, India

Statement of the Problem: Nowadays, advanced industrialization has expanded the demand for synthesis of chemical used in daily life. Growing industries promoting the environmental danger, which is an alarming threat to ecosystem. For safeguard of environment, detection of poisonus gases and release of colored waste water is required for eutrophication pollution. Researchers around the globe are trying their best efforts to save the environment. For this remediation advanced oxidation process is used for potential applications. ZnO is an important semiconductor photocatalyst with high photocatalytic and gas sensing activities. For an efficient photocatalytic and gas sensing properties, it is necessary to prepare rare earth doped ZnO compound to decrease the electron-hole recombination rates. However, rare earth doped metal oxide is seldom studied for photocatalytic and gas sensing applications. The purpose of this study is to describe best photocatalyst for photo degradation of dyes and gas sensing properties.

Methodology and theoretical orientation: Economical framework has to be used for synthesis of ZnO. Indepth literature survey, simple heat tretament method is utilized for gas sensing and photocatalytic activities.

Findings: Rare earth doped ZnO nanoparticles were best photocatalyst for photodegradation of organic dyes and different gas sensing applications by varying various factors such as pH, aging time, different concentrations of doping and co-doping metals in ZnO. Complete degradation of dye was observed only in min. Gas sensing nanodevice showed better response and quick recovery time for doped/co-doped ZnO.

Conclusion & Significance: In order to prevent the air and water pollution, well crystalline ZnO nanoparticles were synthesized by rapid and economic method which is used as photocatalyst for photodegradation of organic dyes and gas sensing applications to sense release of hazardous gases from the environment.

nv0027@gmail.com

Electrochemical property of carbon- based materials: first-principles and experiment

Zijun Shi, Yanfang Gao
University of Science and Technology Beijing, China

Electric double layer capacitors, also called supercapacitors, ultracapacitors, and electrochemical capacitors, are gaining increasing popularity in high power energy storage applications. Carbon nanotubes (CNT) are carbon allotropes with cylindrical 1-D structure. CNT are consisted of either one rolled-up graphitic sheet (single- walled CNT) or several coaxial ones (multiwalled CNT). Graphene oxide (GO), an oxidized form of graphene that can be dispersed in water in single-sheet form for large-scale production, is selected as the precursor for the formation of graphene nanostructures.Reduced graphene oxide (rGO) nanosheets are extremely attractive due to their large lateral size after processing, which results in a much lower percolation threshold and fewer junctions in a continuous film, giving rise to high electrical conductivity. In this work, we make the best of the theoretical calculation demonstrated that rGO electrochemical performance is better than CNT and GO. Reported the electrochemical performance of carbon- based materials by first-principles calculation, which based on DFT were performed using CASTEP and DOML3 program (Materials Studio7.0). Additionally, we also by experiment proved rGO electrochemical performance is best. What is more, we through theoretical calculation reported that rGO is a great influence to electrochemical properties due to the abundant epoxy groups on its basal plane and the carboxyl groups at the sheet edges (Figure 1). For these purpose, rGO with unique structure and outstanding properties will become the intriguing carbon materials in supercapacitors, owing to (1) avoid π-π stacking and van der Waals interactions; (2) the application of electrochemical may be controlled by adjusting content of oxygen;(3) contain tiny amounts band gap can vastly enhance the potential in various applications.

yf_gao@imut.edu.cn

J Material Sci Eng 2017, 6:6(Suppl)
DOI: 10.4172/2169-0022-C1-077

Advances in graphene materials photonics and optoelectronics

Mohammed Khenfouch, Bakang M Mothudi, Mokhotjwa S Dhlamini, Vijaya V Srinivasu and **Malek Maaza**
University of South Africa, South Africa

Carbon-based nanomaterials are well known for their innumerable applications in all fields of science and technology. One of the most incredible carbon-based nanomaterial's in recent years is graphene, due to its amazing properties. Owning to its unique physical and chemical properties, this material is set to revolutionize the 21st century for its wide practical uses, such as, nano electronics, sensors, capacitors, solar cells, fuel cells, Li ion batteries, photo catalysis, electro catalysis, drug delivery and plasmonics. Since graphene was isolated by mechanical exfoliation in 2004, many promising properties have been reported, such as extremely high electron mobility. Furthermore, graphene's strong interactions with photons and electrons and chemical functionalization ability could add more functions to photoactive composites. Their optical properties can be easily modulated via many processes, treatments and/or interaction with other compounds. In this sense, the rise of graphene and its based materials in photonics and optoelectronics is shown by several recent results, ranging from solar cells and light-emitting devices to touch screens, photodetectors and ultrafast lasers. This work is reporting on the photonic and optoelectronic properties of graphene materials including discussions on the interaction between the different compounds based on the study of a couple of examples. Hence, graphene materials are suitable for many optical and optoelectronic applications including organic solar cells donor-acceptor systems.

khenfouch@yahoo.fr

Laser induced graphene as electrode for 3rd generation solar cells

Basma EL Zein[1], Mohamad Alkhatab[1], Ulrich Buttner[2], Hatim Abuhimid[3], Mohamad Dosari[3], Enrico Traversa[4] and **Jean-Pierre Vilcot[5]**
[1]University of Business and Technology, Saudi Arabia
[2]King Abdullah University of Science and Technology, Saudi Arabia
[3]King Abdul-Aziz City for Science and Technology, Saudi Arabia
[4]University of Electronic Science and Technology of China, China
[5]University of Lille, France

Graphene has recently emerged as an alternative to ITO substrate as an electrode in solar cells structure. With its remarkable electrical, physical and chemical properties, and high degree of flexibility and transparency; it is considered as an ideal candidate for flexible 3rd generation solar cells, the graphene solar cells an eco-green technology is getting to the same level of ITO based solar cells. Laser Induced Graphene (LIG) method has been used and characterized on flexible substrate for flexible quantum dots sensitized solar cells. The Flexible quantum dots sensitized solar cells is composed of LIG as electrode and active layer combining a metal oxide layer for electron collection and quantum dots layer for light absorption and carrier generation. In this presentation, the role of LIG graphene in flexible solar cells will be presented.

b.elzein@ubt.edu.sa

J Material Sci Eng 2017, 6:6(Suppl)
DOI: 10.4172/2169-0022-C1-077

New catalytic application of modified graphene in synthesis of biologically active heterocycles

Saeid Khodabakhshi
IMDEA Nano Science Institute, Spain

So far, various heterogenous catalysts have been used for organic reactions, but metal-free catalysts have attracted much attention in recent years. Metal-free carbon-based catalysts have some advantages over metal catalysts, such as high efficiency, environmental compatibility, low energy consumption, and corrosion resistance. Among metal-free materials having catalytic properties, carbon-based catalysts such as modified graphene and nanotubes are emerging. Using graphene oxide (GO) as non-oxidative catalysts to promote and facilitate organic reactions in particular the condensations of the active methylenes is a new area with outstanding potential. In fact, the acidic nature of GO provides active sites to promote organic reactions which need the mild acidic conditions. GO and its related materials have some advantages over many common catalysts including stability, safety, insolubility in common solvents, and recyclability make them recyclable catalysts for many chemical reactions. However, the catalytic application of graphene has focused primarily on the use of these materials as a support for catalytically active transition metals. Despite the merits of graphene materials, their application as catalyst in synthetic chemistry remains unexplored. Accordingly, here we explain the use of GO as a metal-free, eco-friendly and recyclable catalyst for the convenient synthesis of some biologically active compounds containing aryloyl group in green conditions. The reaction of 4-hydroxycoumarin with aryl glyoxals and malononitrile in the presence of graphene oxide provides a simple one-pot entry to the synthesis of some biscoumarins and pyranocoumarins of potential pharmaceutical and synthetic interest. The present methods have some advantages such as the use of a safe and recyclable catalyst, avoidance of toxic solvents, high product yields, short reaction times, and an easy work-up procedure.

saeidkhm@yahoo.com

Bio-inspired synthesis and self-assembly of few layer graphene

Izabela Janowska
Institute of Chemistry and Processes for Energy, Environment and Health, France

The future development of advanced materials depends on several aspects, which are first of all linked to synthesis and then exploitation of the materials in an efficient way. This concerns also the graphene based materials and despite the huge number of efforts devoted to the synthesis of graphene and few layer graphene (FLG) there is still luck of the methods allowing their high scale production together with environment respect. Their efficient use in composites, polymers and films in order to provide or enhance graphene-related properties such as high conductivity, transparency, flexibility, mechanical resistance will depend on the way these "nano" materials are arranged in the macroscopic media. Herein, the bio-compatible, high yield production of solution processable FLG is presented together with a new approach of bio-inspired FLG self-assemblies into fractal like patterns (presently under patent application). Such FLG self-assemblies reduce the percolation threshold between FLG flakes allowing the percolation at lower amount of FLG for a given surface if compared to the random arrangement (fig.1). This can find the application in transparent conductive films (TCF), where the FLG self-assemblies patterns can be optimized in order to achieve variable transparency-conductivity properties according to the TCF final use. This interesting finding recalls the natural tendency of matter to self-organize into functional systems. The fractal like, branched structures are commonly observed in numerous natural systems being in charge of transport function, such as river beds, trees or neural system.

janowskai@unistra.fr

J Material Sci Eng 2017, 6:6(Suppl)
DOI: 10.4172/2169-0022-C1-077

Synthesis and characterization of graphene using PECVD and its field emission applications

Mushahid Husain
M J P Rohilkhand University, India

Graphene is a two dimensional structure of sp2 hybridised carbon atoms arranged in a hexagonal honeycomb like pattern. Its extraordinary and exciting electrical, optical and mechanical properties have made it a focal point of contemporary research in material science and have earned it the status of wonder material of 21st century. Our objective is to synthesis graphene sheets in a controlled manner in terms of number of layers and to observe for its properties like electrical conductivity, absorbance, transmittance and field emission which could be exploited in development of modern age opto-electronic devices. We have successfully synthesised high quality graphene on copper (Cu) coated silicon (Si) substrate at very large area using plasma enhanced chemical vapour deposition (PECVD) method at temperature as low as 600°C. SEM and TEM images showed the surface morphology of as grown samples is quite uniform having single layered graphene (SLG) to few layered graphene (FLG). The G and G' peaks of stokes phonon energy shift obtained in Raman spectroscopy confirmed that the sample consisted of a number of SLG's and FLG's. The field emission characteristics of as-grown graphene samples studied in planar diode configuration at room temperature depict that the as grown graphene is good field emitter with low turn-on field, higher field amplification factor and long term emission current stability. Other techniques such as low pressure chemical vapour deposition (LPCVD) and modified Hummer's methods have also been employed for successful synthesis of graphene and r-GO (reduced graphene oxide). The optical studies of these samples show that our samples had more than 90% optical transparency to visible light making it useful for opto-electronic applications.

mush_phys@rediffmail.com

Graphene based heterostructures used for high performance broadband photodetectors

Shaojuan Li
Soochow University, China

Graphene has recently emerged as a potential candidate to address the shortcomings of traditional IV and III-V semiconductors for fast and broadband photodetectors. Graphene photodetectors can convert light into electrical signal over a broad electromagnetic spectrum from ultraviolet (UV) to terahertz (THz) range. However, the intrinsic optical responsivity of pure graphene-based transistors is usually poor (~10-2 AW-1) due to its relatively low absorption cross-section, fast recombination rate and the absence of gain mechanism. This has led to the formation of heterostructures of graphene with other gain materials that have a band gap, owing to the enhanced device performance in terms of photoresponsivity and photoconductive gain in these hybrid structures. Here, we reported novel photodetectors based on graphene-Bi_2Te_3, graphene-M_0Te_2, and graphene-black phosphorus heterostructures and their application for broadband photodetectors. Our results show that the graphene-Bi_2Te_3 photodetector not only shows greatly enhanced responsivity (up to 35 AW-1 at 532 nm) and an ultra-high photoconductive gain, but also has the capability for broadband photodetection from visible to near-infrared (NIR) wavelengths. We also demonstrated that graphene-M_0Te_2 hetero structure photodetector achieves a high responsivity of ~970.82 AW-1 (at 1064 nm) and broadband photodetection (visible-1064 nm). Additionally, flexible devices based on the graphene-M_0Te_2 hetero structure also retains a good photodetection ability after thousands of times bending test (1.2% tensile strain), with a high responsivity of ~60 AW-1 at 1064 nm. Finally, we show that the graphene-black phosphorus heterostructure photodetector shows an ultrahigh responsivity of 3.3×103 AW-1, high photoconductive gain (1.13×109), ultrafast charge transfer (41 fs), polarization dependent photocurrent response, and long term stability at telecommunication band of 1550 nm wavelength. The high performance in NIR range demonstrated in this work paves the way for practical applications in remote sensing, biological imaging and environmental monitoring using 2D materials.

sjli@suda.edu.cn

J Material Sci Eng 2017, 6:6(Suppl)
DOI: 10.4172/2169-0022-C1-077

Design and development of graphene sand composite using traditional and advanced synthesis

Shahid Hussain Abro
Qassim University, Saudi Arabia

Graphene sand composite was prepared as part of the final year project through biosynthesized process from the sugar anchoring on sand particles without any binder resulting in a composite, referred to as graphene sand composite (GSC), which is used in water filtration. River sand was firstly treated with 0.1 M nitric acid to remove impurities, washed with deionized water and dried at 100±3°C. 20 gm of sand was added in 1 M sugar solution, magnetically stirred for 5 hours at 85oC and then allowed to get dried. Then the mixture was placed in the crucible and covered with activated charcoal and heat treated in muffle furnace for 6 hours, with specified cycle, subsequently powder was treated with concentrated sulfuric acid and washed with deionized water. Later this powder was dried at 120°C on a hot plate, which resulted in a black powder, known as graphene sand composite. The morphology and composition of the synthesized Graphene Sand Composite (GSC) was investigated by means of X-ray powder diffraction (XRD), Scanning Electron Microscopy (SEM), Fourier Transform Infra-Red Spectroscopy (FTIR). SEM images show wrinkly edges and this is the characteristic of graphene morphology. Filter of GSC was made and different samples were analyzed by UV-Visible spectroscopy and different tests were taken to analyze drinkability of filtered water.

drabro@qec.edu.sa

The excellent performance of amorphous M_0O_3, V_2O_5 and graphene oxide in fructose conversion into 5-hydroxymethylfurfural

Abbas Teimouri and Shukuh Delzendeh
Payame Noor University, Iran

Nowadays, due to the reduction of fossil fuels, the use of renewable energy sources is highly regarded. Here upon, a growing interest has recently been devoted to fuels and chemicals from the sustainable biomass resource, which not only reduce the consumption of fossil resources, but environmental pollution will be prevented. In this context, 5-Hydroxymethyl furfural (HMF), which is a dehydration product of carbohydrates such as fructose, glucose, inulin is considered to have particularly high potential as one of the most usable platforms chemicals and can be used as a various precursor for the production of fine chemicals, plastics, pharmaceuticals and liquid fuels. In recent years, toward other raw materials, there is growing focus on the synthesis of HMF from fructose, because the fructofuranoic structure of fructose cause of acid-promoted dehydration be more facile. Therefore, fructose has been desired feedstock to compare the efficiency of catalytic systems for biomass conversion. In this respect, preparation of highly active catalyst for the conversion is very important. Hence, Graphene oxide (GO) prepared from Hummer,s method was proven to be a green and efficient carbocatalyst for the dehydration of fructose into 5-hydroxymethylfurfural (HMF). The most common approach to maximizing surface area of catalysts, is using a support, the materials over which the catalysts are spread. The metal-containing catalysts often give a relative high yield. In continuing previous report, we study V_2O_5/M_0O_3 based on GO as nanocatalyst in the dehydration process of fructose and turns to 5-HMF. Ease of handling, greater selectivity, simple workup, and recoverability of catalysts and high yield are advantages of this reaction.

a_teimoory@yahoo.com

J Material Sci Eng 2017, 6:6(Suppl)
DOI: 10.4172/2169-0022-C1-077

Superior functionality and luminescence of nanodiamonds for sensoric and diagnostic applications by targeted high temperature gas-solid reactions and electron beam irradiation

Bernd Abel
University of Leipzig, Germany

Nanodiamonds have excellent mechanical and optical properties, high surface areas and tunable functional surfaces. They are also non-toxic, which makes them well suited for biomedical applications. Here we highlight an integrated and scalable surface functionalization by a high temperature gas-solid phase reaction protocol monitored via thermogravimetry for very controlled and precise degraphitization, as well as hydrogen, oxygen and nitrogen (-NH2) functionalization in a high temperature reactor. In particular, we discuss the rational and precise control of chemical functionalization through introduction of functional groups and of an increased photoluminescence from additional nitrogen-vacancy defects (NV-centers) produced via controlled electron beam irradiation. We have shown that multiple surface analytical methods such as IR-, Raman, photoelectron spectroscopy, light scattering, and electron microscopies allow for quality control of the surface functionalization.

bernd.abel@iom-leipzig.de

(Non-van der Waal) Functionalization of graphene with retained trigonal lattice and charge carrier mobility

Songwei Che[1], **Kabeer Jasuja**[2], **Sanjay Behura**[1], **Phong Nguyen**[1], **T S Sreeprasad**[3] and **Vikas Berry**[1]
[1]University of Illinois at Chicago, USA
[2]Indian Institute of Technology, India
[3]Clemson University, USA

To widen the spectrum of its applications, it is important to functionalize graphene, while preserving its superior properties, and retaining its planar lattice (for high mobility) and its carbons' sp2 hybridized state (for high carrier density). Such a functionalization mechanism, when conducted in compliance to the needs of semiconductor manufacturing processes will enable graphene's incorporation into diverse applications. Here, we develop a unique eta-6 organometallic approach to functionalize graphene in a vapor-phase process, which retains the structural and electrical properties, while offering chemical sites for interaction and interfacing with other chemical or biochemical systems. In contrast to other functionalization processes, the eta6-functionalized graphene maintained its high charge carrier mobility (1000 cm2V-1s-1 at 300 K). We will discuss the mechanism of charge transfer in eta-6 functionalization of chromium carbonyl on graphene. The chemical groups were utilized for subsequent chemistry via an *in-situ* formation of silver nanoparticles at functionalization sites. We show that this graphene-eta-6-Ag structure enables an ~11-fold plasmonic enhancement in the efficiency of graphene/n-Si solar cells (1.24%) to exemplify the potential of this functionalization. This process will unveil graphene's previously unknown potential to hierarchically interface with physical and biological components to produce novel systems and applications. Results will also facilitate gate-fabrication for FETs via atomic- layer-deposition (currently a major challenge).

vikasb@uic.edu

J Material Sci Eng 2017, 6:6(Suppl)
DOI: 10.4172/2169-0022-C1-077

Gold and Diamond-bearing astropipes of mongolia (Neologism and new scientific discovery)

D. Dorjnamjaa, B. Enkhbaatar, G. Altanshagai
Mongolian Academy of Sciences, Mongolia

In this paper we present summation of eighteen year's investigation of the all gold and diamond-bearing astropipes of Mongolia. Four astropipe structures are exemplified by the Agit Khangay (10 km in diameter, 470 38' N; 960 05' E), Khuree Mandal (D=11 km; 460 28' N; 980 25' E), Bayan Khuree (D=1 km; 440 06' N; 1090 36' E), and Tsenkher (D=7 km; 980 21' N; 430 36' E) astropipes of Mongolia. Detailed geological and gas-geochemical investigation of the astropipe structures show that diamond genesis is an expression of collision of the lithospheric mantle with the explosion process initiated in an impact collapse meteor crater. The term "astropipes" (Dorjnamjaa et al., 2010, 2011) is a neologism and new scientific discovery in Earth science and these structures are unique in certain aspects. The Mongolian astropipes are genuine "meteorite crater" structures but they also contain kimberlite diamonds and gold. Suevite-like rocks from the astropipes contain such minerals, as olivine, coesite, moissanite (0,6 mm), stishovite, coesite, kamacite,tektite, khamaravaevite (mineral of meteorite titanic carbon), graphite-2H, khondrite, picroilmenite, pyrope, phlogopite, khangaite (tektite glass, 1,0-3,0 mm in size), etc. Most panned samples and hand specimens contain fine diamonds with octahedrol habit (0, 2-2,19 mm, 6,4 mg or 0,034-0,1 carat) and gold (0,1-5 g/t). Of special interest is the large amount of the black magnetic balls (0,05-5,0 mm) are characterized by high content of Ti, Fe, Co, Ni, Cu, Mn, Mg, Cd, Ga, Cl, Al, Si, K. Meanwhile, shatter cones (size approx. 1.0 m) which are known from many meteorite craters on the Earth as being typical of impact craters were first described by us Khuree Mandal and Tsenkher astropipe structures. All the described meteorite craters posses reliable topographic, geological, mineralogical, geochemical, and aerospace mapping data, also some geophysical and petrological features (especially shock metamorphism) have been found, all of which indicate that these structures are a proven new type of gold-diamond-bearing impact structure, termed here "astropipes". The essence of the phenomenon is mantle manifestation and plume of a combined nuclear-magma-palingenesis interaction.

ddorj2001@yahoo.com

Hierarchical porous carbon nanostructures for energy storage

Jian-Gan Wang
Northwestern Polytechnical University, China

Hierarchical porous carbon nanostructures offer a promising avenue to effectively address energy and environmental problems. In this talk, we would introduce two recent work regarding porous carbon nanotubes and nitrogen-doped ordered mesoporous carbon spheres. First, we developed a totally green synthesis route for fabricating hierarchically porous carbon nanotubes without the assistance of any soft/hard templates and activation procedures, thereby rendering the new synthesis route highly recyclable, eco-friendly, and scalable. The as-prepared porous carbon materials exhibit a high specific surface area of 1500 m2 g-1. The porous carbon can be served as excellent electrode materials for high-performance supercapacitors, delivering a high specific capacitance of 281 F g-1 at 0.1 A g-1 along with outstanding rate and cyclic performance. In the second section, we will report a facile one-pot soft-templating and one-step pyrolysis method to fabricate nitrogen-doped ordered mesoporous carbon spheres (N-OMCS). The as-obtained N-OMCS possesses an average diameter of around 300 nm, a moderate specific surface area of 439 m2 g-1 and uniform mesopore size at 3.2 nm. Owing to the ordered meso-structure and nitrogen doping, the N-OMCS materials, when used as supercapacitor electrodes, delivers a high specific capacitance of 288 F g-1 at a current density of 0.1 A g-1. More remarkably, the N-OMCS electrode shows excellent rate capability with 66% capacitance retention at an ultrahigh current density of 50 A g-1 and outstanding cycling stability with almost no degradation over 25000 cycles. The two work would open up new avenues to synthesize highly porous carbon nanostructures with unique architecture and surface chemistry, such as hollow/meso structure and nitrogen doping for high efficient energy storage applications.

wangjiangan@nwpu.edu.cn

J Material Sci Eng 2017, 6:6(Suppl)
DOI: 10.4172/2169-0022-C1-077

Hybrid electrode materials built on vertically aligned carbon nanofibers arrays for high-performance electrical energy storage

Jun Li, Steven Klankowski, Gaind Pandey and **James Emery Brown**
Kansas State University, USA

Today's high-performance electrochemical energy storage (EES) devices are represented by the high energy capacity of lithium-ion batteries (LIBs) and the high power and long cycle life of supercapacitors. At present, they are not able to be integrated into one system due to the distinct electrochemical mechanisms. The performance of the conventional electrodes is limited by the low electrical conductivity and slow ion diffusion in the electrode materials. In recent studies, we have demonstrated an effective approach to overcome these two issues using a three-dimensional nanostructured core-shell architecture consisting of ~100 – 200 nm thick coaxially coated electroactive materials (such as Si, TiO_2, $LiCoO_2$, V_2O_5, and MnO_2) on a highly conductive nanostructured current collector, i.e. vertically aligned carbon nano fiber arrays. This hybrid electrode structure allows effectively mitigating the slow Li+ diffusion by shortening the diffusion length in solid electrode materials. With proper deposition techniques, the shell materials can form secondary mesoporous structures which further reduce the ion diffusion path length down to ~10 nanometers in solid electrode materials. In addition, it provides another benefit due to the significant pseudo capacitive contribution associated with fast faradaic reactions at or near the electrode surface. As a result, these electrodes present the features of a battery-super capacitor hybrid based on Li chemistry. The EES devices based on such hybrid materials offer high specific energy at very high power rates that are comparable to supercapacitors. These studies demonstrated the potential for multi-scale nanostructured EES electrodes to achieve stable long charge-discharge cycles in the super capacitor power regime (i.e. completing charging or discharging in less than 1 min.) while maintaining the battery-like high energy capacity. Such hybrid structure also significantly improves the mechanical stability of the electrode materials, particularly for future batteries involving larger ions such as Na^+ and Mg^{2+}.

junli@ksu.edu

New class of porous and metal-free electrocatalyst for oxygen reduction reaction by enhanced amide functionalization on graphene

Mohammad Shamsuddin Ahmed and Young-Bae Kim
Chonnam National University, Republic of Korea

In the meantime, considerable effort has been focused to search for sustainable and renewable sources of green and clean energy because of the increasing demands and environmental impact of traditional energy resources, such as fossil fuels. Fuel cells (FCs) obtain significant attention as next generation energy sources because of their superior energy conversion efficiency and potential to provide clean energy. Metal-free electrocatalysts for oxygen reduction reaction (ORR) in FCs are an interesting research topic due to low cost much stable and tolerance to crossover effect than that of expensive noble metals. However, a porous graphene catalyst has been prepared with 1,4-diaminobutane (DAB) through amide functionalization, and has been used as a metal-free electrocatalyst for ORR in alkaline fuel cells. DAB has been used as a junction among functionalized graphene layers to impart electrocatalytic activity for the ORR resultant from the interlayer charge transfer. The successful amidation in the process of catalyst preparation have been confirmed. A hierarchical porous structure has also been confirmed through surface morphological analysis. The BET specific surface area and thermal stability have increased after successful amide functionalization. The as-prepared catalyst has been proven an efficient metal-free electrocatalyst with better electrocatalytic activity, stability, and tolerance to crossover effect than commercially available Pt/C for ORR via a direct four-electron involved pathway. This report will encourage preparing many more carbon-based electrocatalysts for other electrochemical applications including catalysis and sensing.

suddin_bcsir@yahoo.com

J Material Sci Eng 2017, 6:6(Suppl)
DOI: 10.4172/2169-0022-C1-077

Ferro chemistry, its laws and carbon with the relativistic emergence of luminous quantum mechanics from super luminous classical mechanics with local violation of 2nd law of thermodynamics

Reginald B Little
Stillman College, USA

Carbon is unique among the elements. The bosonic, low-shielded 12C nucleus and fermionic, highly charged, half-filled electronic shell and subshell contribute to different, metastable hybrid quantum fields for chemical bonding: with resulting difficult autocatalyzed rehybridization dynamics; with consequent special natures and applications of carbon's allotropes and polymorphs and the myriad of important chemical compounds for possible complex mixtures for life; and with chemical history of the struggle to transform and transport among these elements, compounds and mixtures. This plenary highlights the journey of RBL since 2000 to establish a new chemistry of ferrochemistry on basis of the Little Effect (spin and magnetic alterations of orbitals) for new solutions of special importance to carbon chemical transformations with broad relevance to other elements. This presentation further outlines consequent discoveries: Laws of Ferrochemistry; ferromagnetic carbon; magnetic, electric and luminous nature of wavefunctions; spatial nature of fields, field nature of particles and hidden superluminous quantum continua for quanta to magnetic to gravitational to electrical to thermal field transformations and transports (locally violating laws of classical thermodynamics for the emergence of quantum from classical mechanics relativistically); spinrotorbitals and spinrevorbitals for time crystallization and accelerated temporal patterns for recrystallizing time, respectively; single domain ferrochemistry with distinct decomposition and composition chemistry at different magnetic poles with possible superfluidity and superconductivity between the poles via large exchange gradients; selective preparations of various spin rotorbitals and changing spin rotorbitals for spin revorbitals for ferro chemistry for the first, correct free standing graphene formation and stability in plasma at over 3000 Celsius on magnetic field lines, for macroscopic single crystal diamond synthesis under stronger magnetization, and for driving alterations of spin rotorbitals (time crystals) via microwaves, strong magnetic fields, radiofrequency waves and complex chemical fields and waves as in mixtures of weak acids weak bases (as in biochemicals for physics of life).

redge_little@yahoo.com

Fabrication and mechanical properties of Al-SiC-B4C metal matrix composite via powder metallurgy

Saif Wakeel, Sajjad Arif and **M.Arif Siddique**
Aligarh Muslim University, India

The Aluminium metal matrix has wide application in automobile, aerospace, sports and structure. Generally Al metal matrix composites are formed by powder metallurgy and direct casting technique. The powder metallurgy is a method in which composites are formed by mixing the elements with different chemical properties in metal matrix. This technique provides a good chemical homogeneity to final product, huge potential saving in case of mass production, high production rate and excellent wear resistant properties of component produced. Now in this research the three samples powder with following composition i.e (90% Al 7% SiC 3% B4C, 90% Al 5% SiC 5% B4C , 90% Al 3% SiC 7% B4C) with proper mixing and compacting by taking three compaction load of 3,4 and 5 ton, were taken for the evaluation of mechanical properties such as green and sintered densities, hardness, XRD etc. after analyzing the different properties it is seen that both green and sintered densities increases with increase in amount of Boron carbide but these are found to be maximum for 90% Al 5% SiC 5% B4C composition. XRD analysis is also done that showed equiaxed powder structure.

saifwakeel@gmail.com

J Material Sci Eng 2017, 6:6(Suppl)
DOI: 10.4172/2169-0022-C1-077

Abrasive superhard composite materials based on diamond and cubic boron nitride structured by nanocarbon binder at subatmospheric pressures intended for grinding and polishing tools and pastes

Poltoratskyi V.G
V.Bakul Institute of Superhard Materials, Ukraine

The results of work on the development of abrasive superhard composite materials based on diamond and cubic boron nitride due to structuring the powder material by carbon binder at subatmospheric pressures are presented in the paper. The use of new material results in increase of efficiency of grinding and polishing tools and pastes based on superhard materials. It was first found that during the formation of the carbon binder from carbon-containing gas (CH_4) on the surface of particles in the diamond and cubic boron nitride compacts the filamentous carbon particles (whiskers), which bind the particles together, are formed under such conditions: temperature gas flow rate – 3.1 10-5 - 4.7 10-5 m3/s. It was ascertained that the formation in the structure of the compacts, specifically in space between the grains of initial SHM, globular and filamentous carbon results in increased thermal stability of the compacts, the strength of the compacts is not decreased at heating to 1474 K in argon. It was found that just addition to initial powders the micron powders of diamond or cBN of grain sizes: 3/2, 2/1, 1/0 results in increase of strength of composite by 20 % due to decrease of pore size of the composite. Experimental-industrial test showed advantages of the composite materials, a increase of durability of the grinding tool by 1.5 -3.0 times and a increase of abrasive abilityof pastes by 1.3 - 1.5 times.

vg.poltoratsky@gmail.com

The effect of carbon materials on the performance of a direct carbon fuel cell with molten hydroxide electrolyte

Xiaofeng Li and **Yanfang Gao**
Inner Mongolia University of Technology, P.R. China

The direct carbon fuel cells (DCFCs) belong to new generation of energy conversion devices that are characterized by much higher efficiencies and lower emission of pollutants than conventional coal-fired power plants.[1]Over the past several decades fuel cell technologies have been treated as promising candidates for various utility applications.Today fuel cells are still considered an environmentally friendly and highly efficient electricity generating systems and extensive research has been conducted worldwide to improve this technology.The direct carbon fuel cell (DCFC) is a unique type of fuel cell able to convert efficiently the chemical energy of solid carbonaceous fuels directly into electricity without the combustion of the fuels. The theoretical maximum efficiency of carbon conversion in the DCFC is 100%,but practical efficiencies have been demonstrated at roughly 80% [2]. The direct carbon fuel cell (DCFC) can be used to generate electricity directly from almost any carbonaceous fuel, including carbonaceous waste materials, graphite, charcoals,carbon blacks, carbon fiber, and coals.[3]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 molten hydroxide direct carbon fuel cell. Biomass carbon sources with an inter-connected multirole pore or beneficial element through a green route are a new generation of electrode, which is rapidly expanding research area. The extraordinary synthetic approach presented here opens the door of green chemistry for biomass-based the direct carbon fuel cell, which considers various pore geometries and dipping of element to design electrode materials with improved battery performance. Above all, the routes used to synthesize this carbon-based electrode are readily scalable to industrial levels.

yf_gao@imut.edu.cn

J Material Sci Eng 2017, 6:6(Suppl)
DOI: 10.4172/2169-0022-C1-077

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

Xiaohui Liu and **Yanfang Gao**
Inner Mongolia University of Technology, P.R. China

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.[1]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.[2] Carbon materials, due to their excellent stability, low cost and facile processability, have been used to replace the expensive HTM and noble metal electrode in perovskite solar cells and achieved reliable efficiency and impressive stability. [3]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 are nanotubesexcellent 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.

yf_gao@imut.edu.cn

Rapid room-temperature synthesis of doped carbon materials via polymer dehalogenation for electrochemical applications

Xiaoming Sun and Guoxin Zhang
Beijing University of Chemical Technology, China

Sustainable developments of human society rely on the efficient utilization of clean energy, which are now urging effective, low-cost key materials to build up new technologies. Among those promising candidates, carbon materials have been long tested to be effective in widely spread fields. However, their synthesis are currently going through a few drawbacks; for instance, the defunctionalization and carbonizations of carbon raw materials often require high-temperature pyrolysis which emits large amount of gases. And, in most cases, those gaseous byproducts are hazardous. We proposed a facile route to synthesize carbon materials under mild conditions (such as room temperature) via. the defunctionalization of halogenated polymers (such as PVDF, PVDC, and PVC) by strong alkaline (such as KOH). XPS characterization revealed over 75.0 at% carbon presenting in resulted carbon. Meanwhile, synthetic routes to heteroatom doped carbon were also established via. the strategy of polymer dehalogenation. No gaseous byproducts were formed, instead, non-hazardous, easy-to-handle alkali metal-halogen salts were obtained. The underneath mechanism was investigated. Halogen functionalities are easy to leave upon mild activation, as written in text books. The dehalogenated carbon sites are highly reactive that could rapidly couple any adjacent atoms, if carbon, forming C-C, if heteroatom, forming C-X (X represents N, S, P, B and so forth). The strategy of dehalogenation can be also extended to "2D" halogenated polymer: graphite fluoride (GF). GF could be also defunctionalized at room temperature using strong alkaline and in situ functionalized with O, if applying KOH, or N, if applying NaNH2, leading the formation of water soluble O- or N-doped graphene, respectively. Above mentioned routes to carbon materials, especially, water soluble graphene are benign, environment-friendly, and easy-to-operate, which hold great potentials for practical applications.

sunxm@mail.buct.edu.cn

J Material Sci Eng 2017, 6:6(Suppl)
DOI: 10.4172/2169-0022-C1-077

Graphene- an advanced nanomaterial

T.Theivasanth
Kalasalingam University, India

This work mainly deals with an advanced nanomaterial,"low cost graphene"- its synthesis, characterization and applications. Discovery of this carbon material plays key roles in nano-science and technology. Many literatures are describing that this material is the thinnest, lightest, strongest, extremely flexible and almost transparent material. It has many attractive / intrinsic properties like mechanical, thermal, electrical, acoustical etc. But, its higher price acts as the main barrier which prevents its usages at various levels of industries particularly mass level applications like paints, cements & concrete works. Production of this material at very low cost price will be helpful to utilise the entire extra-ordinary properties material properly.

This lecture also discusses about the characterization of graphene using various tools like XRD, SEM, FT-Raman, UV-Vis and FT-IR. Characters like crystal structure analysis, morphology analysis - 2D nature, number of layer calculation, graphene plasmonics, optical transparency and Pauli blocking in interband region are explored from these tools. The number of layers influences the magnetic properties of graphene. If the number of layers is less, enormous magnetization emerges from graphene. Controlling of magnetism in graphene will be helpful in the development of sensors and spintronics. VSM analysis is a useful tool to differentiate the graphene from diamagnetic material graphite.

Applications of graphene are myriad. Metallic impurities absence and 2D nature of graphene makes it suitable and preferable material for micro/nano fabrication. Incorporation of small quantity of graphene fillers into polymer creates novel nano-composites with improved structural and functional properties for utilisations in applications ranging from transportation, biomedical systems, sensors, electrodes for solar cells and electromagnetic interference.

It is also discussed about the lubrication and high thermal conducting properties of graphene. It cools tiny electron devices more efficiently than copper and other thermal conductors. Nano size, high specific surface area to volume ratio, catalytic properties of graphene exchanges the heat between water and air quickly. Graphene coated copper facilitates heat exchange / heat transfer enhancement between water and air. Hence, it can be utilized in air-cooler.

Keywords: graphene, nanofiller, lubrication, thermal conductivity

ttheivasanthi@gmail.com