International Conference on Nanotechnology 2012 (ICONT 2012)

30 May 2012 - 1 June 2012

MS Garden Hotel, Kuantan, Pahang, Malaysia

Organized by Faculty of Industrial Sciences & Technology, Universiti Malaysia Pahang

Co-Organizers:

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INTERNATIONAL CONFERENCE ON NANOTECHNOLOGY 2012 (ICONT 2012)

PROGRAM BOOK
&
COMPILATION OF ABSTRACTS

30 May – 1 June 2012
M.S. Garden Hotel, Kuantan

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Message
Chairman, Pahang State Committee for Information, Science, Technology and Innovation

On behalf of the Pahang State Government, I welcome you to Kuantan, the scenic east cost of Peninsular Malaysia and the capital city of Pahang Darul Makmur!

The science and technology of nanomaterials has gone a long way since its inception. Together with information technology, nanotechnology brought dramatic changes in the quality of human life with unimaginary speed that was unprecedented in the human history. Nano devices with ultrahigh sensitivity, data storage capacity, energy conversion and storage capacity, water filtration and other environmental remediation, advanced health care products, and so on have been entered in the market. The nanotechnological products and services are predicted to be worth US$1.5 Trillion by 2015; therefore, nanotechnology offers numerous opportunities for the further economic growth and advancement in social life.

To take active part in this emerging science and technology area, Malaysian government has established the National Nanotechnology Directorate under its Ministry of Science and Technology in 2010. Our nanotechnology Roadmap proposes that nanotechnology research in Malaysia should focus on the development of nano-lab-on-chip, nanosensor, and nanodelivery system.

A number of other initiations are require to meet the challenges in nanotechnology such as long term stability as well as improving the functionality in addition to overcome the issues of potential health hazards of nanomaterials. I am happy that the Universiti Malaysia Pahang (UMP) is taking lead role in developing a platform to bring the world leaders in nanoscience and technology together with emerging young researchers and share and discuss recent knowledge in this science and technology area. I hope that the International Conference on Nanotechnology 2012 (ICONT 2012) would certainly be one of the best avenues to discuss the initiations required to solve those unsolved issues.

Congratulations to the Universiti Malaysia Pahang for successfully organizing this conference and I wish all the participants a fruitful event!

Best Wishes,

DATO' HAJI MOHD SHARKAR BIN HAJI SHAMSUDIN, DSAP, DIMP

Message
Vice Chancellor, Universiti Malaysia Pahang & Patron of the Conference

Greetings from the Universiti Malaysia Pahang!

Universiti Malaysia Pahang (UMP) welcomes all delegates to the International Conference on Nanotechnology (ICONT) 2012.

Progress in the nanoscience and technology has been spectacular. A wide range of materials with close control of compositions and in various sizes and shapes were synthesized in nano-dimensions and scrutinized for their applicability in advanced electronics and photonics, displays, magnetic storage, energy conversion and storage, packaging, healthcare and environmental remediation.

In recent years, new developments have emerged that allowed for cost competitive and controllable production of nanomaterials suitable for the above applications. In addition, owing to the possibility of designing nanomaterials with different physical, electrical, chemical and biological characteristics compared to their bulk counterparts, various innovative architectures are being conceived to miniaturise products with more efficient functional properties.

Exceedingly high number of seminars, conferences, and symposia being organized globally to address broad impact of nanoscience and technology and to further explore new application areas that require immediate attention such as energy and water security. Thus, ICONT 2012 is UMP's contribution to the global partnership on nanoscience and technology.

I thank you for joining ICONT 2012 and wish you an astonishing experience in sharing and exchanging ideas and knowledge. I would also like to extend my heartiest congratulations to the Chair and the Organizing Committee for their relentless efforts and commitment in the course of organizing this conference. My special appreciation is dedicated to the sponsors and co-organizers for their support in making ICONT 2012 a successful event.

Best Wishes,

PROFESSOR DATO' DR. DAING NASIR IBRAHIM

Message
Dean, Faculty of Industrial Sciences & Technology & Advisor of the Conference

The advent of nanotechnology heralds an era of change in the way research and development are conducted and in the way we live. We have seen numerous important discoveries in all areas of nanotechnology, since ICONT 2011 notwithstanding.

Although these scientific discoveries are extremely impressive, perhaps equally impressive are the technological advances based on our ever-increasing understanding of the basic science of nanotechnology along with our increasing ability to tailor composition and structure. The tools and capabilities available to scientists and engineers to manipulate matter at atomic and molecular scale have been greatly expanded, affecting rapid discoveries in diverse disciplines including energy, biotechnology, IT, food and agriculture, materials, defence, environment and medicine.

Rapid changes in this field require frequent engagement of the multidiscipline. On behalf of the Faculty of Industrial Sciences & Technology and as advisor of ICONT 2012, I welcome all delegates and thank the speakers for sharing their latest findings at this conference. I would also like to congratulate the organizing committee for their dedication and continuous effort in ensuring the smooth running of this important event.

PROFESSOR DR. MASHITAH MOHD. YUSOFF

Message
Chairman, ICONT 2012

Dear Colleagues,
Welcome aboard!

The ICONT 2012 has been organized to provide a platform for the world-class academicians, researchers and engineers to assemble and share the recent knowledge on as well as to discuss the initiations required for this rapidly growing field of nanoscience and technology. Response to this conference notification has been overwhelming and world-leaders of nanotechnology are with us for ICONT2012.

On behalf of the organizing committee, I thank our Patron, the Vice-Chancellor of UMP, YH Prof. Dato' Dr. Daing Nasir Ibrahim. Many thanks to the Pahang State Government, especially its Chairman for Information, Science, Technology and Innovation headed by YH Dato' Hj Mohd Sharkar Bin Hj Shamsudin for giving us tremendous support. Solidarity from the Universiti Malaysia Pahang (UMP) has been awesome, especially from our advisors. I am also thankful to the co-chair of this conference, Dr. Abdul Kadir Masrom of SIRIM and his colleagues for their invaluable support. Also, thanks are due to the international advisory board whose timely suggestions paved the way for the success of the conference. I am thankful to the support from the public sectors including Academy of Sciences Malaysia (ASM), National Nanotechnology Directorate (NND), Malaysia Nanotechnology Association (MNA) and Ministry of Higher Education (MOHE). Many thanks for the corporate sector participants including Bruker (M) Sdn Bhd, who co-organize this event. I hope you would be benefitted immensely from the items/services displayed at the booths. Many thanks for them who supported us financially by giving advertisements in the conference digest.

My team, the organizing committee of the ICONT 2012, has been working relentlessly from the conference call to the registration desk to make the ICONT 2012 a memorable event. They were passionate and those services are beyond comparison. I acknowledge them with deep sense of gratitude and love.

I wish you a fruitful stay at the ICONT 2012! Once again, I thank you, on behalf of the organizing committee for your participation and support.

Best Regards,

PROFESSOR DR. JOSE RAJAN

ICONT 2012 OVERVIEW

ICONT 2012 is the the third event in this series, and this year, Universiti Malaysia Pahang was given a previlages to organized the conference with collaboration of Pahang State Government, SIRIM Berhad, Academy of Sciences Malaysia, National Nanotechnology Directorate, Malaysia Nanotechnology Association, Ministry of Higher Education and Bruker (M) Sdn Bhd. The conference will have total of 148 papers comprising six plenary, two keynotes, eight invited 98 orals and 34 posters, with participation from 16 countries.

In recent years new developments have emerged which allowed for cost competitive and controllable production of nanomaterials suitable for the above applications. In addition, owing to the possibility of designing nanomaterials with different physical, electrical, chemical and biological characteristics compared to their bulk counterparts, various innovative architectures are being conceived to miniaturise products with more efficient functional properties. As a result, many researchers around the world have become active in science and engineering of nanomaterials.

The main goal of ICONT 2012 is to provide a platform for world-class researchers and engineers to assemble to share recent knowledge as well as to discuss the initiations required for this rapidly growing field and papers covering the latest results achieved in all areas of nanoscience and technology are presented. Topics that will be discussed in the conference are as follows:

- Recent advances in the science and engineering of Nanomaterials
- Nanomaterials with tailored chemical compositions and long-term stability
- Synthesis and processing of Nanomaterials via innovative techniques
- Novel approaches for the Nanomaterials characterization
- Mechanical, electronic, chemical, thermal and biological properties of Nanomaterials
- Novel approaches for embodiment of Nanomaterials into/onto existing structures
- Applications of Nanomaterials

ICONT 2012 Organizing Committee

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ICONT-2012 PROGRAM	
(29th May 2012)	
14:00	Registration (Lobby MS Garden Hotel)
Day 1 (30th May 2012)	
08:00	Registration (Lobby MS Garden Hotel)
10:20	Welcoming Ceremony (Perdana Ballroom, Ground Floor) • Recitation of Du'a
10:30-11:15	Plenary 1 - Prof. Dr. Halimaton Hamdan, MOSTI (Perdana Ballroom, Ground Floor) (Session chair: Prof. Dr. Mashitah Mohd Yusoff, Universiti Malaysia Pahang) *NanoMalaysia Programme: The Growth Engine of New Economy*
11:15-11:45	Tea break
11:45-12:30	Plenary 2 - Prof. Dr. Seeram Ramakrishna, NUS, Singapore (Perdana Ballroom, Ground Floor) (Session Chair: Assoc. Prof. Dr. Adrian Lowe, Australian National University) *Functional Nanomaterials by Electrospinning – from Basic Research to Applications*
12:30-14:00	Lunch break
14:00-14:45	Plenary 3 - Prof. Dr. Lachezar Komitov, University of Gothenburg, Sweden (Perdana Ballroom, Ground Floor) (Session chair: Prof. Dr. Seeram Ramakrishna, National University of Singapore) *Magnification of Nano-Scale Effects by the Long Range Molecular Order in Liquid Crystals*

	Parallel Session		
	Nano-synthesis and Characterization (Perdana Ballroom, Ground Floor)	**Application of Nanotechnology/ Nanomaterial (Ballroom 5 & 6, Mezzanine Floor)**	**Bio-nanomaterial/ Nanocomposite (Ballroom 7, Mezzanine Floor)**
Chairperson	Dr. M.V. Reddy *National University of Singapore*	Dr. Tan Ling Ling, *Universiti Malaysia Pahang*	Dr. G.P. Maniam *Universiti Malaysia Pahang*
14:45-15:00	**O1 Fatiha Ismail** *Universiti Teknologi Malaysia* Surface Mechanism of New Hybrid Catalysts for the Synthesis of Controlled Production of High Density and High Quality Carbon Nanotubes	**O2 Mazlina Mat Darus** *Universiti Pendidikan Sultan Idris* The Synthesis of Silver and Titania Core-shell Structure Nanocomposites as UV Photocatalyst	**O3 Mazlina Mustafa Kamal** *RRIM Research Station* Flocculation of Nano-Silica in Epoxidised Natural Rubber Compound
15:00-15:15	**O4 Fatirah Fadil** *Universiti Teknologi Malaysia* Influence of Surfactants on the Dispersion of Carbon Nanotubes in Aqueous	**O5 Irma Nurfitri** *Universiti Malaysia Pahang* Nano CaO from Waste Shells as a Catalyst in Transesterification of Palm Olein	**O6 Nur Humairah A.R** *International Islamic University Malaysia* Characterizations of Compression Moulding Sago Starch-Nanoclay Biocomposites
15:15-15:30	**O7 Nabihah Abdullah** *TATI University College* Synthesis and Structure Control of Graphene by Sonication of Graphite Nanoparticles (GNP)	**O8 Nurul Ain Ramli** *Universiti Malaysia Pahang* Green Catalytic Hydrogenation of Natural Rubber Latex (NRL) by Nanocatalyst	**O9 Dayang Habibah** *RRIM Research Station* Effect of Nano-silica in Combination with Aluminium Hydroxides on Flame and Mechanical Properties of Epoxidized Natural Rubber (ENR)

15:30-15:45	**O10 M.S. Azmina** *Universiti Pendidikan Sultan Idris* I-V Characteristics of Carbon Nanotube from Palm Oil Precursor with Au, Pt and Pd as Metal Contact using Thermal Chemical Vapour Deposition Method	**O11 Nugroho Dewayanto** *Universiti Malaysia Pahang* Bio-oil from decanter Cake and Its Upgrading through Catalytic Hydrogenation over Pd Nanoparticles: Some Preliminary Results	**O12 Shadpour Mallakpour** *Isfahan University of Technology, Iran* High performance bionanocomposites based on chiral poly(amide-imide) and reactive organoclay with tyrosine amino acid
15:45-16:00	Tea break		
16:00-16:15	**O13 Abdullah Al Mamun** *International Islamic University Malaysia* Kinetics of Cadmium Adsorption by CNTs Grown on PACs	**O14 B. Rezaei** *Isfahan University of Technology, Iran* Electropolymerized biosensor based on multi walled carbon nanotube and imprinted polymer film	**O15 Meor Yusoff M.S** *Malaysian Nuclear Agency* Study on the Use of Nanosized Alpha Alumina from Scheduled Waste as Formulation in Thermal Insulation Paint
16:15-16:30	**O16 Haiza Haroon** *Universiti Sains Malaysia* Green synthesis of silver nanoparticles using local honey	**O17 Naser M. Ahmed** *Universiti Sains Malaysia* Light Extraction from GaN using Microcavity Structure	**O18 Noorasikin Samat** *International Islamic University Malaysia* Mechanical and Flammability Properties of PVC Reinforced with Nano-sized ATH Particles
16:30-16:45	**O19 N.Victor Jaya** *Anna University, India* Fabrication of ZnO Nanofiber by Electrospinning Method for Sensor Applications	**O20 S. K. Ghoshal** *Universiti Teknologi Malaysia* Enhanced Luminescence from Erbium-doped Tellurite Glass: Effect of Silver Nanoparticles	**O21 Ika Dewi Ana** *Universitas Gadjah Mada Indonesia* Nanotechnology Applied in Bone Reconstructive Surgery: The Role of Nano-scaffold and Biological Factors

16:45-17:00	**O22 Alahmadi Sana Mohammad** *Almadina Almonwara, Saudi Arabia* Physico-chemical characterization of Mesoporous silica MCM-41 grafted calix[4]arene derivatives	**O23 Saifful Kamaluddin Muzakir** *Universiti Malaysia Pahang* *Ab Initio* DFT Studies on Electrons Injection from CdSe Quantum Dots Semiconductor to Ligand	**O24 Elham Vatankhah** *Isfahan University of Technology, Iran* Structural Characterization of PCL-Gelatin Nanofibrous Composite Scaffolds Electrospun with Different Solvent Systems
19:30-22:30	Dinner and Officiating Ceremony (Astana Grand Ballroom, 5th Floor)		
Day 2 (31st May 2012)			
09:00-09:45	Plenary 4 – Prof. Dr. Yoshinobu Baba, Nagoya University , Japan (Perdana Ballroom, Ground Floor) (Session Chair: Prof. Emeritus Dato' Dr. Muhammad Yahaya, Universiti Kebangsaan Malaysia) *Nanobiodevice-Based Single Biomolecule and Cell Sensing for Cancer Diagnosis and in vivo Imaging for Stem Cell Therapy*		
09:45-10:30	Plenary 5 – Prof. Dr. Arunava Gupta, Alabama University, USA (Perdana Ballroom, Ground Floor) (Session Chair: Prof. Emeritus Dato' Dr. Muhammad Yahaya, Universiti Kebangsaan Malaysia) *Synthesis and Properties of Magnetic and Semiconducting Oxide and Chalcogenide Nanocrystals*		
10:30-10:45	Tea break		
Chairperson	Assoc. Prof. Dr Ika Dewi Ana *Universitas Gadjah Mada Indonesia*	Dr. Chong Kwok Feng *Universiti Malaysia Pahang*	Assoc. Prof. Dr. Adrian Lowe *Australian National University*
10:45-11:15	Invited 1 - Yee-Wei Lau *Perkin Elmer* Thermal Analysis for the Characterization of Nanocomposites	Invited 2- Prof. Dr. SRS Prabaharan *Manipal International University, Malaysia.* Intercalation Nanotechnologies as Applied to Advanced Energy Storage Devices	Invited 3 - Dr. Arun Gupta *Universiti Malaysia Pahang, Malaysia* Use of Multiwall Carbon Nanotubes to Enhance the Physical and Mechanical Properties of Wood Composites

11:15-11:30	**O25 A. N Falina** *Universiti Teknologi MARA* Synthesis of Carbon Nanotubes on a Silicon Substrate from Waste Cooking Palm Oil using Nickel, Iron and Cobalt Catalyst	**O26 Ahmed S. Hussein** *Universiti Putra Malaysia* Controlled Drug Release and Degradation of Linamarin-loaded PLGA Submicron Particles	**O27 M. R. Sahar** *Universiti Teknologi Malaysia* Thermal and Photoluminescence Properties of Nd^{3+} doped Te_2O-MgO-Na_2O Nanoglass
11:30-11:45	**O28 S.V. Savilov** *Lomonosov Moscow State University* Light Atoms Mapping on the Surface of Carbon Nanomaterials by EELS and HAADF Techniques of Transmission Electron Microscopy	**O29 Mardhiah Mohd Nor** *Universiti Kebangsaan Malaysia* Investigation On Enzyme-Glucose Reaction for Biosensing Application	**O30 Asmahani Awang** *Universiti Teknologi Malaysia* Optical Properties of Tellurite Glass with Manipulated Growth of Metallic Nanoparticles
11:45-12:00	**O31 Nor Aziah Buang** *Universiti Teknologi Malaysia* Evolution of Magnetic Properties in New Hybrid Catalysts for the Synthesis of Carbon Nanotubes	**O32 A. Alimadadi** *Amirkabir University of Technology, Iran* Grafting of poly[1-(N,N-bis-carboxymethyl)amino-3-allylglycerol codimethylacrylamide] Copolymer onto Nano Graphite Support for Preconcentration and Determination of Ephedrine in Human Plasma and Biological Samples	**O33 Raja J. Amjad** *Universiti Teknologi Malaysia* Structural and Optical Investigation of Er:Ag co-Doped Magnesium-Phosphate Nanoglass
12:00-12:15	**O34 Abdo Meftah** *Universiti Putra Malaysia* Synthesis and characterization of PANI- Ni nanoparticles in PVA films by gamma radiation	**O35 Johari Md Salleh** *Universiti Teknologi Malaysia* Role of Unique Structures of Nano Particle Manganese Dioxide on the Production of Fatty Acid Methyl Ester	**O36 N. Hasim** *Universiti Teknologi Malaysia* The Optical Properties of the Congruent Lithium Niobate and Neodymium Doped Lithium Niobate

	technique	for Biofuel Formulation	Single Crystal
12:15-12:30	**O37 P.H.Khani** *Imam Hossein University, Iran* Structural Characterization of ZnSe and ZnSe:Te Nanoparticles Synthesized by Microwave Heating Process	**O38 Fathima Shahitha** *Universiti Malaysia Pahang* Electrospun Nanofibers for Bone Tissue Regeneration	**O39 Fakhra Nawaz** *Universiti Teknologi Malaysia* Optical and Structural Properties of Sm^{3+}/Yb^{3+}Co-doped Sodium Tellurite Glasses
12:30-12:45	**O40 Trevor P Almeida** *University of Nottingham, UK* Hydrothermal Synthesis and Magnetic Properties of Core / Shell Co_xNi_1-xFe_2O_4 Nanoparticles	**O41 Mahdi E. M** *Universiti Malaya* Synthetic Rutile as Precursor for Nano-TiO_2 Particle Synthesis: A Comparative Study	**O42 N. A. F. Abdullah** *Universiti Teknologi Malaysia* Silver Nanoparticles Induced Surface Plasmon Enhanced Emission in Sm^{3+}-doped Tellurite Glass
12:45-13:00	**O43 P. H. Khani** *Imam Hossein University, Iran* Characterization of Ce-doped Polycrystal-multi Phase ZnO Particles Prepared by Micelle Method	**O44 Noor Hindryawati** *Universiti Malaysia Pahang* Current State of Nanocatalyst in the Production of Biodiesel: A Review	**O45 N. A. Azmi** *Universiti Teknologi Malaysia* Photoluminescence Spectroscopy of Nd^{3+} Doped Tellurite Glass Containing Silver Nanoparticles
13:00-13:15	**O46 A. Alimadadi** *Amirkabir University of Technology, Iran* Synthesis of Disc-shaped Polymer Nanoparticles using Seeded Dispersion Polymerization in the Presence of Various Saturated Hydrocarbons	**O47 Mehdi Rahimi-Nasrabadi** *Imam Hossein University, Iran* Optimization of Reaction Conditions of the Synthesis, Structure Characterization and Catalytic Activity of Some Metal Tungestate Nanoparticle	**O48 M. R. Sahar** *Universiti Teknologi Malaysia* The Influence Erbium Doped on TeO_2 -ZnO-Na_2O of Nanoglass

13:15-14:00	Lunch Break		
14:00-14:45	Keynote 1: Dr. S.K. Prasad, Centre for Soft Matter Research, India (Perdana Ballroom, Ground Floor) (Session Chair: Prof. Dr. Lachezar Komitov, University of Gothenburg, Sweden) *Liquid Crystal-Nanoparticle Hybrids: Realization of Restricted Geometries and Enhanced Electrical Properties*		
Chairperson	Dr. M.V. Reddy *National University of Singapore*	Prof. Dr. S.R.S. Prabaharan *Manipal International University*	Dr. S.K. Prasad *Centre for Soft Matter Research*
14:45-15:15	Invited 4 - Assoc. Prof. Dr. Engr. Mohamad Rusop Mahmood *Universiti Teknologi MARA* Preparation and Characterization of Aluminium-Doped Zinc Oxide Nanorods for Ultra-Violet Photoconductive Sensors	**O50 Husnen R. Abd** *Universiti Malaysia Perlis* Comparative Study of Fabrication Poroussiliconusing Alternative and Direct Current Methods	**O51 Abdullah Ahmed Ali Ahmed** *Universiti Putra Malaysia* Synthesis and Dielectric Properties of Zinc-Aluminium Layered Double Hydroxide Nanocomposite
		O53 Hafizuddin W.Yussof *Universiti Malaysia Pahang* Characterization of Nano-Structure Synthesized Ion Exchange Resins (SIERs)	**O54 M.S. Shareena** *Universiti Malaysia Pahang* Bisphenol A MIP Fabrication using the Application of Factorial Design Analysis
15:15-15:30	**O49 Noor Sheeraz Che Zulkifli** *Universiti Sains Malaysia* Optimization in Synthesis of Hybrid Spherical Silica Particles from Agricultural Waste via Sol-Gel Technique	**O56 Azhar Fakharuddin** *Universiti Malaysia Pahang* An Experimental Study on Dependency of Charge Particle's Kinetics in DSSC to the Photoelectrode Area	**O57 Noor Fariza Subari** *Universiti Teknologi Malaysia* Anodic Aluminiun Oxide Templates Synthesized by Electrodeposition for High Aspect Ratio of Nanowires

15:30-15:45	**O52 Izazi Azzahidah Amin** *Universiti Kebangsaan Malaysia* Synthesizing of Trehalose Based Alkyldiglucosides on Mesoporous Silica Sol-Gel Catalyst	**O59 Tan Ling Ling** *Universiti Malaysia Pahang* The Effect of Multilayer Gold Nanoparticles on the Electrochemical Response of Ammonium Ion Biosensor Based on Alanine Dehydrogenase Enzyme	**O60 Shadpour Mallakpour** *Isfahan University of Technology, Iran* Preparation and Morphology Investigation of Novel Heat Stable Zirconia-reinforced Nanocomposites Containing Chlorinated Poly(amide-imide)
15:45-16:00	**O55 Jinan B. Aldabbagh** *Universiti Malaysia Pahang* Magnetic and Structural Properties of Nanocrystalline	**O61 Wong Poh Sum** *Universiti Teknologi Malaysia* Luminescence Studies on Lithium-Calcium Borophosphate Glasses doped with Fe^{2+}, Ni^{2+} and Zn^{2+} ions	**O63 Samer Hasan Hussein Al Alia** *Universiti Putra Malaysia* Angiotensin-converting enzyme inhibitor and controlled release properties of perindopril erbumine-layered double hydroxide nanocomposite
16:00-16:15	**O58 W. H. Azmi** *Universiti Malaysia Pahang* Influence of operating temperature on turbulent heat transfer coefficients of TiO_2 nanofluid in base liquid water	**O62 M. N. A. Jamaludin** *Universiti Teknologi Malaysia* Luminescence of Er^{3+} – doped Tellurite Glass Containing Silver Nanoparticles	**O98 Nur Ubaidah Saidin** *Malaysian Nuclear Agency* Fabrication and Characterization of Porous Alumina Membranes
16:15-17:30	Tea break and poster session		
	Day 3 (1st June 2012)		
09:00-09:45	Plenary 6 - Prof. Emeritus Dato' Dr. Muhammad Yahaya, Universiti Kebangsaan Malaysia (Session Chair: Prof. Dr. Arunava Gupta, Alabama University, USA) *Research Progress in Nanotechnology: University's perspective* (Perdana Ballroom, Ground Floor)		

09:45-10:30	Keynote 2- Dr. M. V. Reddy, National University of Singapore (Session Chair: Prof. Dr. Arunava Gupta, Alabama University, USA) *Nanostructured Materials for Lithium Ion Batteries* (Perdana Ballroom, Ground Floor)		
10:30-1045	Tea break		
Chairperson	Dr. Gurumurthy Hegde, *Universiti Malaysia Pahang*	Dr. Arun M. Isloor, *National Institute Technology Karnataka, India*	Dr. G.P. Maniam, *Universiti Malaysia Pahang*
10:45-11:15	Invited 5 – Prof. K.V. Sharma *Universiti Malaysia Pahang* Nanofluid properties and conditions for heat transfer enhancements	Invited 6 - Assoc. Prof. Dr. Adrian Lowe, *Australian National University* Electroceramics Research at the ANU	Invited 7 - Dr. Fahmi bin Samsuri *Universiti Malaysia Pahang* Bioimprint reproduction of cancer cells for analysis under Atomic Force Microscopy
11:15-11:30	**O64 A. Alimadadi** *Amirkabir University of Technology, Iran* Preparation of Saucer-Like Polymeric Nanoparticles via Seeded Dispersion Polymerization in the Presence of Saturated Hydrocarbon Droplets	**O65 M. R. Dousti** *Universiti Teknologi Malaysia* Up-conversion Enhancement in Erbium Doped Tellurite Glass: Plasmonic Coupling	**O66 T. V. V. L. N. Rao** *Universiti Teknologi PETRONAS* Analysis of Nanoparticle Additive Three-layered Journal Bearing
11:30-11:45	**O67 Abdulwahab. S. Z. Lahewil** *Universiti Malaysia Perlis* Structural and Morphological Studies of CdS Nanostructures	**O72 N. A. Zulkifeli** *Universiti Teknologi Malaysia* Morphological and Optical Properties of Erbium Doped Phosphate Glass Containing Metallic Nanoparticles	**O69 Shadpour Mallakpour** *Isfahan University of Technology, Iran* A novel bionanocomposite from functionalized multiwalled carbon nanotubes with an amino acid-based poly(amide-imide)

11:45-12:00	**O68 Alam Abedini** *Universiti Putra Malaysia* The mechanism of core-shell formation of Cu-Al bimetallic nanoparticles under gamma irradiation	**O75 E. Jaafar** *Universiti Teknologi Malaysia* Optical Absorption Of Erbium Doped Zinc Tellurite Glass Embedded Gold Nanoparticles	**O70 Nor Azreen Abu Bakar** *Universiti Teknologi MARA* Effect of Nanofiller on Puncture Resistance of High Strength Coated Woven Fabric
12:00-12:15	**O71 M.R. Othman** *Universiti Sains Malaysia* Preparation and Characterization of Mesoporous Alumina Membrane Containing Iron Oxide Nanocrystallites using Sol-Gel Method	**O78 Latha Nataraj** *U.S. Army Research Laboratory* Germanium Nanocrystals with Enhanced Optical Properties	**O73 Z. Ismail** *Universiti Malaysia Pahang* A Comparison Study on the Effect of Adiabatic Extrusion by Twin-Screw Extruder to the Thermal Stability Behavior and Morphology of Layered Silicates in Nylon 6-Nanocomposite
12:15-12:30	**O74 Leny Yuliati** *Universiti Teknologi Malaysia* Visible Light Active Tantalum (V) Nitride Nanoparticles Prepared from Mesoporous Carbon Nitride Template for Oxygen Evolution	**O81 M.S. Michael** *Anna University, India* Asymmetric Redox Supercapacitors based on Nanostructured $Ni_xCo_yCu_zO_4$	**O76 A. Alimadadi** *Amirkabir University of Technology* Preparation of the Reinforced Nanocomposites Based on Epoxy, Silicone Rubber and Multi-wall Carbon Nanotube by Melt Blending
12:30-14:30	Lunch break		
Chairperson	Assoc. Prof. Dr. Jinan Aldabbagh *Universiti Malaysia Pahang*	Prof. Dr. K.V. Sharma *Universiti Malaysia Pahang*	Dr. Fahmi Samsuri *Universiti Malaysia Pahang*
14:30-14:45	**O77 Jining Xie** *Singapore* Stereomicroscopy: Reviewing the Third Dimension from Imaging Pairs By SEM	Invited 8 - Assoc. Prof Dr. Arun M. Isloor *National Institute of Technology Karnataka, India*	**O79 C. Holzer** *Montanuniversitaet Leoben, Austria* Enhancement of PLA Property Profile using Nanoscaled Organoclays

14:45-15:00	**O80 Wan Ming Hua** *Universiti Teknologi Malaysia* Structural Study on Lithium-Calcium Borophosphate Glasses Doped with Transition Metal Ions using Infrared Spectroscopy	Preparation, Characterization of Chitosan/modified Chitosan Novel Blends and its Nanofiltration Membranes for Desalination Application	**O82 Siti Fairus Mohd Yusoff** *Universiti Kebangsaan Malaysia* End-to-End Coupling of Cylindrical Block Copolymer Micelles with a Crystalline Polyferrocenylsilane Core
15:00-15:15	**O83 Nurul Sabihah Zakaria** *Universiti Sains Malaysia* Imaging of Colloidal Gold Nanoparticle using Atomic Force Microscope	**O84 Hendrik O. Lintang** *Universiti Teknologi Malaysia* Novel Mesoporous Silica Film Composites for Phosphorescent Nanosensors of Silver Ions	**O85 A. Alimadadi** *Amirkabir University of Technology* Preparation of Raspberry-like Composite Polymeric Nanoparticles via Seeded Dispersion Polymerization
15:15-15:30	**O86 Pek–Lan Toh** *Universiti Sains Malaysia* Density Functional Theory Studies of Electronic Structures and Hyperfine Interactions for Muonium in Tetraphenylsilane	**O87 Wan Mahmood Mat Yunus** *Universiti Putra Malaysia* Structural and Thermal Properties of Silicon Nanorods Prepared on Porous Silicon	**O88 N. Sharip** *Universiti Teknologi Malaysia* The Mechanical Properties of Erbium Doped Tellurite Glass Rod
15:30-15:45	**O89 Yayuk Astutia** *Newcastle University, UK* Functionalised Nanodiamonds: Raman and Photoluminescence Spectroscopy Study	**O90 Arash Dehzangi** *Universiti Putra Malaysia* Fabrication and Characterization of *p*-type Double Gate and Single Gate Junctionless Silicon Nanowire Transistor by Atomic Force Microscopy Nanolithography	**O91 Noraini Marsi** *Universiti Kebangsaan Malaysia* Design of Silicon Carbide (SiC) Capacitive Pressure Sensor Diaphragm

15:45-16:00	**O92 Sabar D. Hutagalung** *Universiti Sains Malaysia* Pinch-off Effect in *p*-type Double Gate and Single Gate Junctionless Silicon Nanowire Transistor Fabricated by Atomic Force Microscopy Nanolithography	**O93 Hafzaliza Erny Zainal Abidin** *Universiti Kebangsaan Malaysia* Capacitance Performances of Planar and Double Stacked Supercapacitor Designs	**O94 Saja Jaafar** *Universiti Malaysia Sabah* Nanofiber Membrane to Improve Membrane Distillation Performance in Geothermal Water Desalination
16:00-16:15	**O95 N. Victor Jaya** *Anna University, India* Preparation and Characterization of Erbium Doped TiO_2 Nanofibers using Electrospinning Technique for Thermophotovoltaic Applications	**O96 M. Mahendran** *Universiti Malaysia Pahang* Performance Evaluation of Solar Evacuated Tube Collector using Water based Alumina (Al_2O_3) Nanofluid	**O97 Muhammad Imran Anwar** *Universiti Teknologi Malaysia* Double diffusive free convection flow of nanofluid past a power law stretching sheet
16:15-17:00	Tea break, closing remarks, awards for posters		(Perdana Ballroom, Ground Floor)

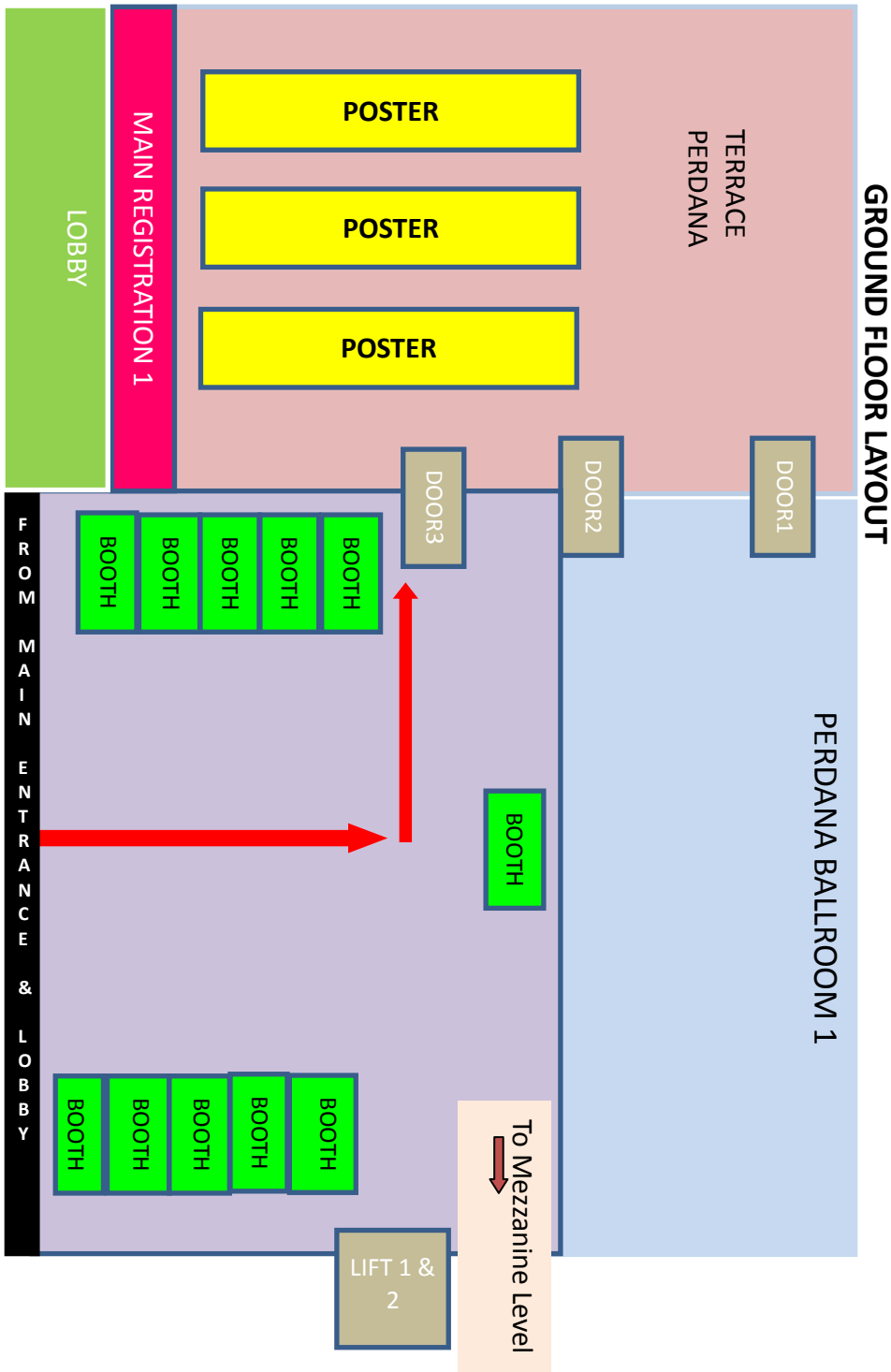
Poster	
P1	**Siti Hajar Alias** *Universiti Teknologi MARA* Aspirin Adsorption on Functionalized Multiwalled Carbon Nanotubes and Its Release Characteristics in Simulated Body Fluid
P2	**Julia Tan Meihua** *Universiti Putra Malaysia* Synthesis of Nano Drug Delivery System using Functionalized Carbon Nanotubes
P3	**M.S. Azmina** *Universiti Pendidikan Sultan Idris* Characterization of Schottky Barrier Carbon Nanotube from Bio-hydrocarbon Precursors
P4	**Nur Elida M.Z.** *Ajou University* Physicochemical Properties of SWNT Dispersed using Poloxamer 407 Surfactant for Nanotoxicity Study
P5	**A.N. Falina** *Universiti Pendidikan Sultan Idris* Recycling of Waste Cooking Palm Oil for the Production of Carbon Nanotubes: Effect of Synthesis Temperature
P6	**Chong Kwok Feng** *Universiti Malaysia Pahang* Natural Reduction to Obtain Graphene from Graphene Oxide
P7	**Siew Ling Lee** *Universiti Teknologi Malaysia* Properties and Photocatalytic Behaviour of Nanocrystalline Bismuth Titanate in Cubic *Fm3m* Phase
P8	**Siew Ling Lee** *Universiti Teknologi Malaysia* Enhanced Photocatalytic Removal of Methylene Blue using Visible Light-driven Cr- and V- Doped TiO_2

P9	**Leny Yuliatib** *Universiti Teknologi Malaysia* Novel Metal Free Mesoporous Carbon Nitride for Photocatalytic Removal of Toxic Salicylic Acid
P10	**Sanaz Abdolmohammadi** *Universiti Putra Malaysia* Synthesis of Novel Biocompatible Chitosan/ZnS:Mn^{2+} Quantum Dots by Microwaves Radiation
P11	**Malihe Ostovar** *Amirkabir University of Technology* Study of the Effect of Lauroyl Peroxide (LPO) Initiator and Various Stabilizers on the Size of PS Seed Nanoparticles
P12	**Toibah Abdul Rahim** *Universiti Teknikal Malaysia Melaka* Calcium Phosphate Ceramics Prepared from Natural Waste Materials
P13	**Seung Yun Lee** *Ajou University* A Variety of Nano-sized Silica using Langmuir-Blodgett Films Induced Differentiation of Osteoblast–like Cells
P14	**Irfan Ahmed** *Universiti Malaysia Pahang* Fabrication of Porous Hydroxyapatite Forms for a Bone Regeneration System
P15	**Zunariah Buyong** *International Islamic University Malaysia* Application of Hydroxyapatic Granules in Prosterolateral Intertransverse Lumbar Spinal Fusion
P16	**Mansour Ghaffari Moghaddam** *University of Zabol* Application of Silver Nanoparticles for Extraction of Cobalt from the Food Samples
P17	**Nur Azmina Roslan** *Universiti Teknologi Malaysia* Mild Phenol Removal over Magnetic Separable Iron Oxides Nanoparticles

P18	**Dena Dorniani** *Universiti Putra Malaysia* Preparation, Characterization and Synthesis of Fe_3O_4 Magnetic Nanoparticles using for Drug Delivery
P19	**Farzaneh Farid** *Amirkabir University of Technology* Preparation of Raspberry-like Poly styrene/Methyl Methacrylate Particles via Seeded Dispersion Polymerization
P20	**Donya Ramimoghadama** *Universiti Putra Malaysia* Synthesis and Characterization of ZnO Nanoparticles using Surfactants and Hydrothermal Method
P21	**Jiawey Yong** *Swinburne University of Technology* Synthesis and Characterization of Amino-functionalized Gold-silica Core-shell Nanoparticles
P22	**Hamed Rashidi** *Ferdowsi University of Mashhad* A Novel and Facile Synthesis of ZnO Nanoparticles using $H_3[PW_{12}O4_0]$
P23	**S.N. Zahari** *Universiti Teknologi Malaysia* The Effects of Substrate Doping Concentration to the Nano nLDD-MOSFET Electrical Parameter Characterization
P24	**Hajar Mohammadpour Kachlami** *Jahad Agriculture Organization* Nanopaper Innovation at Paper and Packaging Industry
P25	**Ahmad Alabqari M.R.** *Universiti Tun Hussein Onn Malaysia* Silicon Etching using RIE for Micro Pillars Fabrication
P26	**Shahrul Ainliah Alang Ahmad** *Universiti Putra Malaysia* Studies of Surface Modification of Silane-coated TiO_2 for Photocatalytic Activity of 4-Chloromethylphenyltrichlorosilane (CMPS) on Silicon Nanostructures

P27	**So-Hee Sung** *Ajou University* 2D Array Nanosphere Lithography For Sensitivity Enhancement of Surface Plasmon Resonance Sensor
P28	**Gurumurthy Hegde** *Universiti Malaysia Pahang* Photo Alignment Effects on Nano layers: Characteristic Properties and Applications
P29	**Pek–Lan Toh** *Universiti Sains Malaysia* First Principle Investigations of the Rotational Barrier and Hyperfine Interactions of Muonium in Tetraphenylgermane
P30	**N.W. Zainal** *Universiti Teknologi Malaysia* The Growth and the Structural Properties of the Pure Lithium Niobate and Neodymium Doped Lithium Niobate Single Crystal
P31	**Mahdi Gilani** *Iran Polymer and Petrochemical Institute* A Novel Acrylamide-Anatase Hybrid Nanocomposite
P32	**Babak Lotfizadeh** *Universiti Malaya* Preparation and thermal conductivity of alumina nanoparticles dispersed in a mixture of ethylene glycol and water
P33	**Wan Mahmood Mat Yunus** *Universiti Putra Malaysia* Structural and Thermal Properties of Gold Nanoparticles Prepared on n-type Silicon
P34	**Ali Bavi** *Amirkabir University of Technology, Iran* Synthesis of Nano-Hamburger Polymer Particles and the Effect of Solvent Concentration on It

Hotel Floor Plan



PLENARY PAPERS

Plenary 1

Professor Dr. Halimaton Hamdan

Hali is an academic at Universiti Teknologi Malaysia for 30 years and is currently leading the NanoMalaysia Programme as the Head of National Nanotechnology Directorate at MOSTI, Putrajaya. She received her PhD in Physical Chemistry from University of Cambridge UK in 1989, MSc degree from Marshall University, USA (1981) and BSc degree from Indiana University, USA (1979). She pioneered the Zeolites and Nanostructured Materials Research in Malaysia. Her invention, Maerogel; silica aerogel from rice husk, the lightest solid and insulation system is being commercialized. She owns 8 patents on zeolites and mesoporous materials. Her current research include probing of new generation hybrid, chiral, bifunctional and functionalized heterogeneous catalysts, drug delivery systems, nanostructured materials, nanofibers and aerogel focused on improved efficiency in the production of alternative energy and manufacturing of fine chemicals.

NanoMalaysia Programme: The Growth Engine of New Economy

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ABSTRACT

Nanotechnology has been identified as a key engine of growth to the New Economic Model; focusing on innovation towards generation of knowledge, wealth creation and sustainable well-being. Nanotechnology not only enables further technical and scientific advancement of existing technologies, rather creates new technology and imposes drastic impact on industries, economy and society in the coming decades. This means that investment in nanotechnologies is imperative for a developing nation like Malaysia in order to remain competitive and ensure a future growth industry in its own right. The National Nanotechnology Initiatives of Malaysia (NNIM) was officially launched in 2006 with the mission: Nanotechnology for sustainable national development of science, technology, industry and economy. The National Nanotechnology Directorate (NND) was established in 2010 under Ministry of Science Technology and Innovation (MOSTI).

The main task of NND is to spearhead and coordinate nanotechnology activities and initiatives. Accordingly, the Directorate has drawn up the NanoMalaysia Programme for a ten year period. Some of the initiatives to be implemented include drafting of NanoMalaysia Policy, strategic action plan, nanotechnology roadmap and commercialization framework. In addition, R&D activities and development of human capital and resources will be strengthened through recognition of a number of Nano Centers of Excellence and development of NanoMalaysia Center. NanoMalaysia Center will serve as a platform for penetrating and building global market for local nanotechnology products through cooperation and smart partnerships with local and international companies. There are currently 20 top-down research projects being conducted and 3 products being developed for commercialization.

Plenary 2

Professor Dr. Seeram Ramakrishna

Dr Seeram Ramakrishna, FREng, FNAE, FAAAS is a Professor of Materials Engineering and Director of HEM Labs at the National University of Singapore. He is an acknowledged global leader for his pioneering work on science and engineering of nanofibers (http://researchanalytics.thomsonreuters.com/m/pdfs/grr-materialscience.pdf). He authored five books and over four hundred peer reviewed international journal papers, which attracted ~ 13,000 citations with an H-index of 55 and G-index of 82. Various global databases including ISI Web of Knowledge places him among the top one percent of materials scientists worldwide. He is an elected international fellow of major professional societies in Singapore, ASEAN, India, UK and USA. He also authored the book The Changing Face of Innovation (http://www.worldscibooks.com/business/7558.html).

Functional Nanomaterials by Electrospinning – from Basic Research to Applications

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ABSTRACT

Scientific research led innovative solutions are vital in meeting the growing demand for energy, water, clean environment, food, health care and security. Over the last decade the electrospinning method has become a platform nanotechnology for a growing number of researchers around the world to produce a range of organic, inorganic and composite fibers for diverse applications. This lecture illustrates various advances in science and engineering of electrospun fibers, and their performance in treatment of waste water, converting solar energy into electricity and storing it, and regeneration of tissues for improved quality of life.

Plenary 3

Professor Dr. Lachezar Komitov

Lachezar Komitov is Professor of Physics in the University of Gothenburg (UG), Sweden. He is the Head of the Liquid Crystal Group at the Department of Physics of UG and recently has been appointed as CEO of Innovidis, Ltd, IP holding company belonging to GU Holding Ltd, Gothenburg.

Prof. Komitov is author and co-author of more than 180 scientific articles and has also more than 50 patents and patent applications. Prof. Komitov has a number of pioneering contributions in the field of Physics of Liquid Crystals and their device applications. He has been invited speaker at many international conferences in the field of liquid crystals.

Magnification of Nano-Scale Effects by the Long Range Molecular Order in Liquid Crystals

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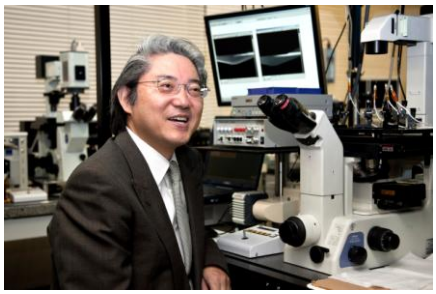
ABSTRACT

Liquid crystals are organic materials characterized by long range order of their molecules possessing strong shape anisotropy. Due to this fact, the effect of the interactions of the liquid crystal molecules with solid substrates is not limited to the solid surface-liquid crystal interface but penetrates in the liquid crystal bulk thus giving rise to macroscopic effects such as optical appearance of a liquid crystal slab, for instance. Hence, the nano-scale effects in liquid crystals related to solid surface-liquid crystal interactions can efficiently be magnified thus enabling their optical visualization. In my talk I will overview several examples of amplification of nano-scale effects in liquid crystals. Among these examples are alignments of liquid crystals induced by nano-structured solid surfaces, light-induced reorientation of the liquid crystals as well as alignment of liquid crystals by nano-paticles.

Plenary 4

Professor Dr. Yoshinobu Baba



Dr. Yoshinobu Baba received PhD degree in 1986 from Kyushu University. After postdoctoral research, Assistant Professor at Oita Univ., and Associate Prof. at Kobe Pharm. Univ., he was promoted to the full professor at The University of Tokushima in 1997. He has been Professor of Department of Applied Chemistry, Graduate School of Engineering, Nagoya University since 2004. He is also a Director of FIRST Research Center for Innovative Nanobiodevices, Nagoya University and Satellite Principal Investigator, Swedish Medical Nanoscience Center, Karolinska Institute, Sweden. He is an Associate Editor of *Anal. Chem.* of American Chemical Society and serving to over 20 scientific journals, including *Nanoscale* of Royal Society of Chemistry and *Biomicrofluidics* of American Institute of Physics, as an editorial/advisory board member. He is a co-initiator for the world largest Nanotech/Nanobio International Meeting and Exhibition in Japan and International Academy of Nanomedicine. He is a general chair of numerous international meetings (microTAS, MSB, NanoBioEXPO, ISMM). He has been admitted as a Fellow of the Royal Society of Chemistry and received over eighty awards for his contributions in nanobiotechnology: MERCK Award in 2004, award from the Applied Physics Society of Japan in 2006, The CSJ (Chemical Society of Japan) award for creative work in 2008, and Award for Industrial-Academy Collaboration in 2009. His major area of interest is nanobiosicence and nanobiotechnology for omics, systems biology, medical diagnosis, tissue engineering, and molecular imaging. He is the author or co-author of 716 publications, including research papers, proceedings, reviews, and books and is also an inventor of over 70 patents. He has delivered more than 680 plenary and invited lectures at conferences. His work has been cited on 266 occasions by newspapers and televisions.

Nanobiodevice-Based Single Biomolecule and Cell Sensing for Cancer Diagnosis and *in vivo* Imaging for Stem Cell Therapy

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ABSTRACT

Nanobiodevice is a piece of contrivance, equipment, machine, or component, which is created by the overlapping multidisciplinary activities associated with nanotechnology and biotechnology, intended for biological, medical, and clinical purposes. During the past decade, nanobiodevice has progressively begun to focus on the establishment of main four fields of biomedical applications of nanotechnology, including 1) diagnostic devices, 2) molecular imaging, 3) regenerative medicine, and 4) drug delivery systems. In this lecture, I will describe the development of nanobiodevices to analyze biomolecules and cells towards biomedical applications [1-20]. I developed numerous diagnostic nanodevices based on the single biomolecular separation and detection. These devices are also applicable to fast and low invasive blood marker detection of cancer with pM-fM detection sensitivity. Additionally, I developed new synthetic method of quantum dots (QDs) based on appropriate cluster confirmation by the *ab initio* molecular orbital calculation. QDs are applied to the development of nanobiodevice for single cancer cell diagnosis, single molecular epigenetic analysis, *in vivo* imaging for stem cell therapy and theranostic device for cancer diagnosis/therapy.

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Plenary 5

Professor Dr. Arunava Gupta

Prof. Gupta is the MINT Professor at the University of Alabama and is affiliated with the Chemistry, Chemical and Biological Engineering Departments. He joined the University in 2004 prior to which he was a Research Manager in the Magnetoelectronics Department at the IBM Thomas J. Watson Research Center, New York. He received his undergraduate degree from the Indian Institute of Technology and Ph.D. degree in chemical physics from Stanford University. He has worked in a wide range of materials-related topics, including laser processing, high temperature superconductors, semiconducting oxides and chalcogenides, dielectrics and magnetic materials, and their device applications. Prof. Gupta has published over 300 journal articles and holds 30 U.S. patents. He is a fellow of the American Physical Society (APS) and the American Association for the Advancement of Science (AAAS). In 2010 Prof. Gupta received the Humboldt Research Award in recognition of his exceptional and sustained contributions to research on magnetism and superconductivity of oxide-based materials.

Synthesis and Properties of Magnetic and Semiconducting Oxide and Chalcogenide Nanocrystals

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ABSTRACT

Monodisperse inorganic nanocrystals have been intensively investigated in recent years, both because of fundamental scientific interest and technological applications arising from the unique properties in reduced dimension. In particular, the spinel ferrites of composition MFe_2O_4 (M=Co, Ni, Mn, Fe, etc.) exhibit interesting magnetic, magnetoresistive, and magneto-optical properties that are potentially useful for a broad range of applications, including magnetoelectric devices, drug delivery, ferrofluidics, etc. Their magnetic properties can be systematically varied by changing the identity of the divalent M^{2+} cation or by partial substitution. The properties can additionally be tuned by controlling the shape, size and crystallinity of the nanocystals. Another class of spinel nanocrystals that remain largely unexplored are the chromium-based spinel chalcogenides, ACr_2X_4 (A = Cu, Cd, Hg, Fe, Co; X = S, Se, Te), which are ferro/ferrimagnetic insulators, semiconductors, or even metals that display unique properties in the bulk. We have synthesized monodisperse nanocrystals of a number of spinel ferrites and chalcogenides using facile solution-based methods and investigated their magnetic properties. The synthesis of the chalcogenides has been further expanded to semiconducting nanocrystals of varying compositions and band gaps, such as $CuIn_xGa_{1-x}S_2$ and $CuIn_xGa_{1-x}Se_2$, with different anisotropic shapes and crystal structures. Colloidal suspensions of the nanocrystals are attractive for use as inks for low-cost fabrication of thin film solar cells by spin or spray coating

Plenary 6

Professor Emeritus Dato'Dr. Muhammad Yahaya

Dr Muhammad Yahaya is an Emeritus Professor of Physics at Universiti Kebangsaan. Dr Muhammad Received his Ph.D at Monash University in 1979 and Drs from ITB, Indonesia in 1973. Dr Muhammad has 35 years of teaching and research experience with Universiti Kebangsaan Malaysia, Brown University, USA, Monash University, Australia. He was appointed Head of Physics Department (74-79), Deputy Dean, Center of Postgraduate studies (1994-1999), Director, Research Management Centre, (1999-02) Director, Centre of Academic Advancement, (02-07). Dr Muhammad maintains a diverse research interest including thin films, electronic property of metals, solar energy and computer in physics communication. Dr Muhammad holds membership to various organizations and institutions. He is actively involved in Physics and Science Terminology, Writing Malay language Text book in Physics. Dr Muhammad is currently a member of editorial board, UKM. He is currently the president, Malaysian Solid State Science and Technology, Fellow Malaysian Institute of Physics, member IEEE and member Malaysia Materials Science. Dr. Muhammad has received many awards for his academic and professional excellence. He received commonwealth Scholarship and Fellowship plan to pursue his Ph.D (1975) DAAD - German Fellowship (1984), Fullbright fellowship (1984-1985), JSPS Fellowship and Associate member of ICTP,Italy, Fellow, Academy Science Malaysia (2006-now), KMN (1995) Anugerah KMN (1995),Tokoh Ilmuan MABBIM (1997),Award, Recognition of Service UKM (1999),ANS- Negeri Sembilan (2004), Award 'Prominent Physics Figure –UPM (2005)- 100 years world year of physics, DSPN (Dato' Penang (2007).

Research Progress in Nanotechnology: University's Perspective

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ABSTRACT

The rapid advances in knowledge and information network that drive many sectors of the economy of a country, has created new value-chain, opportunities, wealth and economic growth. The developed countries have allocated about 3% of their GDP for research and development. Some companies in information technology such as Microsoft and Apple spent more than 5 % of their revenue for R&D. Recognizing that the growth of the future economy lies in high technology; Malaysia has embarked on the same path to transform the country's economy. Thought the allocation for R&D is small, less than 1% of GDP, Malaysia has focus on some priorities areas which support the country development plan such as biotechnology, information technology, renewable energy, advanced material and nanotechnology. Nanotechnology has been identified as a new source of economic growth and will take advantage of ICT wave and it is forecast that nanotechnology in the manufacturing sector will grow exponentially for the next 20 years. This paper provides an overview of nanotechnology and related field of research in Malaysia and particularly at Universities.

Keywords: knowledge economy, nanotechnology, nanomaterial, economic growth

KEYNOTE PAPERS

Keynote 1

Liquid Crystal-Nanoparticle Hybrids: Realization of Restricted Geometries and Enhanced Electrical Properties

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ABSTRACT

Nanoparticles have attracted great interest because of their unique physical and chemical properties based on the quantum-size effects, with potential to serve as novel materials for electronics, photonics, and magnetic devices. For optimal usage, it is desirable to control and tune the spatial arrangement and distribution of the nanoparticles. On the other hand, liquid crystals (LCs) as self-organized organic materials exhibiting long-range order, cooperative effects, and anisotropic nature in optical and electrical properties, while having fluid like order in one or more dimensions are naturally the media to achieve such an arrangement of the nanoparticles (NPs). Thus, the LC-NP hybrids, being the combination between the mature field of LC, with its structural diversity on a molecular/supramolecular level, notwithstanding the demonstrated impact on the display technology, and the fascinating nanoparticles with myriad behaviour, are very promising to study inorganic-organic particle interaction as well as interesting applications. On another front, LCs confined to nanodimensions has entered a new and exciting era of complex geometries that are more random in nature. The intricate mechanisms which govern the physical properties of LC confined to well defined geometries, as well as to more complex and random ones, have revealed various properties and effects not observed in the same substances when they are in the bulk. Of specific interest are geometries achieved by dispersing silica particles of a few nm in diameter, in which the extent of random disorder is controlled simply by varying the concentration of the particle inclusions.

In this presentation, I will be describing our recent results on the LC-NP hybrids of two different classes. The studies on the metallic type NPs which bring out the importance of the shape anisotropy of such particles in stabilizing certain properties. Specifically, the enhancement of the Frank elastic constant, anisotropic electrical conductivity and the dielectric constant, as well as the increase of the pretransition effects in the isotropic phase above the LC phase will be discussed. The second type of hybrids are the soft gels formed by aerosil-LC systems, where we find that the

presence of particles, while creating a global organo-gel environment introduce more disorder at the local level. These features affect the static as well as dynamic properties, including those stimulated by actinic light.

Keynote 2

Nanostructured Materials for Lithium Ion Batteries

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ABSTRACT

Lithium ion batteries (LIBs) use layer-type compounds, lithium cobalt oxide ($LiCoO_2$) as the cathode (positive electrode) and graphite (C) as the anode (negative electrode) material, and a non-aqueous Li- ion conducting electrolyte. The latter is in the form of a solution or immobilized in a gel-polymer. LIBs with an operating voltage of 3.6 V are extensively used in the present-day portable electronic devices like, cell phones. For high-power applications like, back-up power supplies and electric/hybrid electric vehicles, the LIBs need to satisfy several criteria, namely, cost-reduction, improvement in the energy density, safety-in-operation at high current charge/discharge rates and improvement in the low-temperature-operation. To satisfy the above criteria, researches are being carried out worldwide to find alternative high performance nanostructured materials for Lithium ion batteries.
In my talk, I will discuss recent studies on nanostructured electrode materials from Chowdari's group. It includes preparation of simple and complex oxides by molten salt method, carbothermal reduction method, hydrothermal, sol-gel and ammonolysis methods etc. Materials were well characterized by Rietveld refinement X-ray diffraction, Neutron diffraction, X-ray absorption spectroscopy, XPS, SEM, TEM, density and BET surface area methods. Electro analytical studies like cyclic voltammetry, galvanostatic cycling and electrochemical impedance spectroscopy techniques. In my talk I will discuss few high performance nanostructured materials for Lithium ion batteries.

Keyword: Nanostructures; Energy storage; Anodes; Cathodes; Lithium ion batteries

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INVITED PAPERS

Invited 1

Thermal Analysis for the Characterization of Nanocomposites

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ABSTRACT

Relative to neat polymeric material, the physical properties of nanocomposite may be altered as a result of blending filler into the polymeric matrix. And, thermal analysis techniques are part of the physical testing tools that can be used to determine the physical change that may takes place due to the blending effect. The aim of this review is to discuss the feasibility of thermal analysis techniques in the characterization of nanocomposites. Differential scanning calorimetry (DSC) can be used to study the effect of the filler content change upon the change in the crystallization kinetics of the nanocomposite, based on the change in its crystallization temperature. Meanwhile, based on the change in the thermal decomposition temperature, thermogravimetry (TGA) can be used to study the dependence of nanocomposite's thermal stability to the filler content change. Also, thermo mechanical analysis (TMA) is used to characterize the effect of filler content change upon the change in the coefficient of thermal expansion of the nanocomposite. And, dynamic thermal mechanical analysis (DMA) can be used to characterize the stiffness change of the nanocomposite as an effect of the change in the filler content.

Keywords: Nanocomposite, DSC, TGA, TMA, DMA

Invited 2

Intercalation Nanotechnologies as Applied to Advanced Energy Storage Devices

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ABSTRACT

The advent of nanotechnology has brought impetus to modern energy storage technologies. These technologies include Ion storage batteries, electrochemical supercapacitors and lithium containing breathing batteries. These storage devices find tremendous applications ranging from power hunger hand-held electronic gadgets, missile launching, microwave communications, and the modern transportation called hybrid and/or zero-emission cars (ZEVs). The talk highlights various advances made hither to in these devices with specific reference to nano-scale materials and how the nanotechnology aspects help advancing the functionalities of these devices. Authors focus on their recent achievements in the fields of supercapacitors and green breathing battery technologies. The talk will concentrate on both carbonaceous and non-carbonaceous materials focusing on electrostatic supercapacitors and intercalation hybridcapacitors. Some niche electrode materials for instance, nickel based inverse spinels and in-situ nano-carbon wired olivine phosphates will be discussed as potential materials for redox capacitors (pseudo and/or intercalation). The talk will also concentrate on new green battery technologies being developed by the group based on Nano-porous carbons and m-doped graphenes as host for oxygen carriers as cathode (in collaboration with IMRAM, Japan).

Invited 3

Use of Multiwall Carbon Nanotubes to Enhance the Physical and Mechanical Properties of Wood Composites

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ABSTRACT

Medium Density Fibreboard (MDF) had been widely used in the furniture construction. Wood composite industry faces the main problem of formaldehyde emission from finished products that leads to use the low F/U ratio urea - formaldehyde resin (UF) in wood composites, which have the negative effects on the properties of UF resin and performance of wood composites. The multiwall carbon nanotubes (MWCNTs) would increase the mechanical properties of MDF. The main purpose of this research is to enhance the mechanical properties of the wood composite boards. The different amount of MWCNTs will be used on the solid content bases of UF resin. The result shows that, the increasing amount of MWCNTs had improved the mechanical properties of MDF.

Keywords: Medium density fibreboard, multiwall carbon nanotubes, urea-formaldehyde resin

Invited 4

Preparation and Characterization of Aluminium-Doped Zinc Oxide Nanorods for Ultra-Violet Photoconductive Sensors

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ABSTRACT

Aluminium (Al)-doped zinc oxide (ZnO) nanostructures consisting of nanorod–nanoflake networks were prepared for metal–semiconductor–metal (MSM)-type ultraviolet (UV) photoconductive sensor applications. These nanostructures were grown on a glass substrate coated with a seed layer using a combination of ultrasonic-assisted sol–gel and immersion methods. The synthesised ZnO nanorods had diameters varying from 10 to 40 nm. Very thin nanoflake structures were grown vertically and horizontally on top of the nanorod array. The thin film had good ZnO crystallinity with a root mean square roughness of approximately 13.59 nm. The photocurrent properties for the Al-doped ZnO nanorod–nanoflake thin films were more than 1.5 times greater than those of the seed layer when the sensor was illuminated with 365 nm UV light at a density of 5 mA/cm^2. The responsivity of the device was found to be dependent on the bias voltage. We found that similar photocurrent curves were produced over eight cycles, which indicated that the UV sensing capability of the fabricated sensor was highly reproducible. Our results provide a new approach for utilising the novel structure of Al-doped ZnO thin films with a nanorod–nanoflake network for UV sensor applications. To the best of our knowledge, UV photoconductive sensors using Al-doped ZnO thin films with a nanorod–nanoflake network have not yet been reported.

Invited 5

Nanofluid Properties and Conditions for Heat Transfer Enhancements

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ABSTRACT

Heat transfer fluids such as water, mineral oils and ethylene glycol play an important role in many industrial sectors including power generation, chemical production, air-conditioning, transportation and microelectronics. The performance of these conventional heat transfer fluids is often limited by their low thermal conductivities. Solids have higher thermal conductivity compared to liquids of many orders of magnitude. The use of nano meter size particles for use as heat transfer fluid is initiated by a research group at the Argonne National Laboratory in 1995. Since then, the thermal conductivity and viscosity of various nanofluids are experimentally determined. The properties are required to evaluate the heat transfer capability of these fluids. The experimental values of thermal conductivity and viscosity values of Cu and metal oxides such as Al_2O_3, TiO_2, CuO, ZnO, ZrO_2, etc nanoparticles dispersed in water at various concentrations and temperatures are available in literature in a discreet manner. The data of thermal conductivity is set to regression with the consideration of nanoparticle thermal diffusivity in the analysis. The equations developed are valid for concentration less than 4.0%, temperature $20 \le T_b \le 70\ ^oC$ and particle size $20 \le d_p \le 170$ nm. One of the significant observations from the equations developed is that the increase in viscosity compared to thermal conductivity of nanofluid can be greater at low temperatures and high concentrations. The observation is confirmed through experiments undertaken at the test facility at FKM, UMP and also with the data of other investigators. The analysis aids in evaluating the conditions and suitability of nanofluid for a specific application. It confirms that nanofluids cannot enhance thermal energy transfer at all operating conditions! A theoretical model for the estimation of energy transfer rate is developed for turbulent flow of Newtonian fluids in a tube. The numerical results from the model are compared with a wide range of experimental data obtained by various investigators for the determination of heat transfer rate or coefficient. A good agreement between the values from theory using the equations developed for thermal

conductivity and viscosity is observed with the experimental data. This further validates the equations developed.

Invited 6

Electroceramics Research at the ANU

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ABSTRACT

Given the ever-increasing energy-related needs of the planet, it is essential that technologies are developed that enable energy to be used more efficiently. Indeed, the need for energy efficient technologies is one of the few things that the renewables industry and the fossil fuels industry can agree on. Progress in this area has been slow over the years but thanks to the advent of an understanding of materials on the nanolevel, this progress has started to significantly accelerate. Some of this progress has been through the development of new nanostructured /nanoengineered materials, and some has been through the production of existing materials in the nanoform. Also contributing to this progress has been innovative devise design ideas which have now enabled efficient energy technologies to be considered for an ever-widening suite of applications. Here at the Australian National University, the Electroceramics Research Group has been focusing on efficient energy technologies through the development of nanostructured electroceramics via the electrospinning process. This talk will present our current research using this technique and will examine a number of material systems and device design ideas geared towards thermoelectric technologies, energy storage materials and photocatalytic properties. These material systems include cobaltite-based systems, manganese-based systems as well as zirconia, vanadia, titania and zirconate/titanate complexes.

Invited 7

Bioimprint Reproduction of Cancer Cells for Analysis under Atomic Force Microscopy

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ABSTRACT

Biological cell replications for the purpose of imaging and analysis under Atomic Force Microscopy (AFM) have facilitate the opportunity to study and examine the molecular processes of living cells in a manner that was not possible before. But direct cellular analysis using the instrument in situ for morphological studies of cells is still a major challenge. Therefore a novel approach of applying nanoimprint technology in a new area of biological studies has emerged, whereby high resolution AFM imaging has revealed some very important biological events. For this work, a soft lithography Bioimprint replication technique, which involved simple fabrication steps, was used that incorporated a newly developed polymer that is biocompatible and has fast curing time. The structure and topography of the endometrial (Ishikawa) cancer cell was investigated. An impression of the cell profile was created by applying a layer of the polymer onto the cells attached to a substrate and rapidly cured under UV-light. Fast UV-radiation helps to lock cellular processes within minutes after exposure and replicas of the cancer cells exhibit ultra-cellular structures and features down to nanometer scale. High-resolution AFM imagery provides the opportunity to examine the structure and topography of the cells closely so that any abnormalities can be identified. Craters that resemble fusion pores may possibly be steps on a transitional series of sequential structures that represent either an endocytotic or exocytotic processes, which were evident on the replicas and together with exocytosis they play a very significant part in the tumorigenesis of these cancer cells.

Invited 8

Preparation, Characterization of Chitosan/Modified Chitosan Novel Blends and its Nanofiltration Membranes for Desalination Application

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ABSTRACT

Chitosan, a biomaterial obtained via alkaline N-deacetylation of chitin, has recently attracted much attention from scientists across the globe due to nontoxic nature. It shows many excellent biological properties such as biodegradability, antimicrobial activity and immunological activity. Although the polymer backbone consists of hydrophilic functional groups and is hydrophobic in nature, chitosan is normally insoluble in water and most of the common organic solvents (e.g. DMSO, DMF, NMP, organic alcohols, pyridine). Many attempts have been made to enhance chitosan's solubility in water. Most biological applications for chemical substances require the material to be processible and functional at neutral pH. Thus, obtaining a water soluble derivative of chitosan is an important step towards the further application of the polymer as a biofunctional material.

Till now chitosan-polysulfone blend has not been reported in the area of polymeric materials due to nonsoluble nature of chitosan in organic solvent and nonsoluble nature of polysulfone in aqueous based solvents. We have developed such types of novel blend and modification of chitosan for increasing its solubility in water. In last two decades, lot of research is under progress for the development of low fouling nanofiltration polymeric membranes for the desalination application. Chitosan and its derivatives find lot of application in membrane technology due to its above mentioned properties. This lecture describes about preparation of chitosan based novel nanoporous membranes for the desalination application.

ORAL PAPERS

O1

Surface Mechanism of New Hybrid Catalysts for the Synthesis of Controlled Production of High Density and High Quality Carbon Nanotubes

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ABSTRACT

In this work, series of new hybrid catalysts were formulated from various combinations of nickel, chromium, manganese and copper. Different combinations of selected metal oxide catalysts is known to exhibit different capacity of synergistic effect among them which will contribute to the growth of various quality of CNTs. Therefore, the surface reaction mechanism of the hybrid catalysts were investigated by the Temperature Programmed reduction and desorption (TPDR) technique in order to obtain the gas-solid optimum sorption conditions for controlled growth of CNTs. Based on the TPDR results, combination of Ni-Cr hybrid catalyst had provided sufficient reduced reaction environment for the CNTs growth. The micrographs obtained from the Field Emission Scanning Electron Microscope (FESEM) showed production of high density CNTs for the combination of Ni-Cr hybrid catalyst, while Raman spectra revealed for high quality CNTs which was designated by the occurrence of high intensity of the G-band as compared to the D-band.

Keywords: temperature programmed reduction, carbon nanotube, hybrid catalyst, Raman spectroscopy

O2

The Synthesis of Silver and Titania Core-shell Structure Nanocomposites as UV Photocatalyst

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ABSTRACT

The synthesis of nanocomposites silver, (Ag) and titania, (TiO_2) in the form of core-shell structure is carried out via two simple steps. Ag nanoparticles, ~ 100 nm were synthesized by hydrothermal method from the reduction of silver nitrate by glucose. The as-synthesized Ag nanoparticles were then coated by TiO_2 nanoparticles of size ~ 10 nm from the hydrolysis of tetrabutyl titanate (TBT) by vapour-thermal method. The decorating of TiO_2 on Ag surface is successful since we introduced mechanical force during the process. The uniform coating of TiO_2 nanoparticles on to Ag surfaces resulted a core (Ag) – shell (TiO_2) structure nanocomposites, Ag@TiO_2. This core-shell structure is essential to enhance the photocatalytic activity of TiO_2 under UV irradiation. TiO_2 is a well-known UV photocatalyst, whose photocatalytic activity depends on the interfacial charge-transfer reactions such as oxidation and reduction process of the photogenerated electron-hole pairs. However, the fast recombination rate of the electron-hole pairs as compared to interfacial charge-transfer reactions rate limits the photocatalytic activity of TiO_2 for practical applications. By coupling TiO_2 with Ag, the fast recombination rate of the electron-hole pairs could be retarded. The photocatalytic activity of the Ag@TiO_2 sample was evaluated by photocatalytic degradation of Rhodamine B (RhB) in aqueous solution at ambient temperature under UV-light irradiation. It was found that the Ag@TiO_2 nanocomposites significantly enhanced the photocatalytic activity of TiO_2. Results show that Ag@TiO_2 nanocomposites degraded RhB completely in much shorter time as compared to TiO_2. A similar result was also found when the concentration of RhB is doubled. The Ag@TiO_2 nanocomposites degraded RhB completely, however in the case of TiO_2, RhB was only partially degraded.

Keywords: silver, titania, hydrothermal, nanocomposites, core-shell structure, photocatalys

O3

Flocculation of Nano-Silica in Epoxidised Natural Rubber Compound

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ABSTRACT

There has been an increased use of silica-filled rubber treads for tires to give improved rolling resistance, traction and tread wear. Filler dispersion plays an important role in reinforcement of silica-filled rubber compounds. It is known that silica tends to flocculate during early stages of vulcanisation, when dense rubber network has yet to be formed. It is assumed, big agglomerates, composed of loosely packed aggregates exert particularly detrimental effect on properties of vulcanisates. Under external stresses they will break, initiating a formation of microcracks whose propagation in a matrix leads to a rubber rupture. In this study the influence of additives on silica dispersion in Epoxidised Natural Rubber (ENR) compound was investigated. A high loading of dispersible silica with 150 BET surface areas was introduced in the compound formulation. The viscosity of the compound was measured via viscometer. The filler flocculation and dispersion was monitored by following the change in torque and storage modulus at low strain using rheometer MDR 2000 and DisperGrader. The filler network on the other hand was characterised by Rubber Processing Analyzer (RPA). Bound rubber measurements were also done in order to estimate the interfacial interaction between silica and polymer. It was found that, viscosity of the compounds increased with ageing and predominantly occured with the absence of non-additive in the ENR silica compound. An initial torque rise or two-step rheometer curve was observed for compound containing non-additive as compared to compound containing additive. Indeed, the non-additive compound showed higher torque value and greater *Payne Effect*. The increase in *Payne Effect* illustrates strong filler-filler interaction at high loading of silica as a result of flocculation. The strong filler-filler interaction contributes to low bound rubber content. Thus, it could be deduced that the addition of additive could reduce silica flocculation and increases specific bound rubber content which strongly dependent on the strength of the association of silica-additive to the filler and to polymer.

Keywords: flocculation, filler-filler interaction, dispersion

O4

Influence of Surfactants on the Dispersion of Carbon Nanotubes in Aqueous

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ABSTRACT

Carbon nanotubes are one of the carbon allotropes in a nanometer scale, which can be synthesized by the decomposition of hydrocarbons at higher temperature. Carbon nantubes are mainly important for various applications such as in electronic devices component, chemical reaction catalysis, reinforcement in composite and sensors. However, the carbon nanotubes collected after their synthesis processes are always in the form of tangled and aggregated floss. This is due to the existence of van der Waals forces between each of the adjacent CNTs tubular floss. In this study, the use of surfactant in the surface modification of the carbon nanotubes and the elimination of the van der Waals forces within the carbon nanotubes floss is investigated. Selection on three types of surfactant which are cethytrimethylammoinum bromide (CTAB), sodium dodecyl sulphate (SDS) and tween 80, based on their respected charges were employed in this study. Results obtained from the UV-Visible spectroscopy analysis showed that different type of surfactants have great influenced on the dispersion behaviour of the CNTs colloidal suspension. Changes in the physical and chemical properties of the carbon nanotubes were observed from the thermogravimetric (TGA), Fourier transform Infrared (FTIR) and X-ray diffraction (XRD) analysis. Results obtained signify the effect of surfactant criteria such as molecular structure, size, charges and critical micelle concentration (CMC) have contributed in the non-covalent bonding among the carbon nanotubes floss which affect the stabilization of the carbon nanotubes dispersion in the aqueous media.

Keywords: carbon nanotubes; surfactant; non-covalent interaction

O5

Nano Cao from Waste Shells as a Catalyst in Transesterification of Palm Olein

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ABSTRACT

The present work demonstrates the use of nano scale CaO (22 to 26 nm) from waste sources (crab and cockle shells) as a heterogeneous catalyst in the transesterification of palm olein to produce methyl esters (biodiesel). The catalysts were characterized by BET, SEM-EDX, TEM, XRD and XRF. Results showed that upon thermal activation at 900 °C for 2 h, the shells turned into calcium oxide, the active components that catalyzed the reaction. Parametric study demonstrated that the optimal conditions for reaction catalyzed by the shells were: methanol/oil molar ratio 13:1 and catalyst amount 5 wt. %, reaction time of 3 h at methanol refluxing temperature. Under the optimal conditions, thermally activated shells gave an acyl conversion of more than 98%.

Keywords: Methyl ester; Transesterification; Heterogeneous catalyst; Crab shell; Cockle shell

O6

Characterizations of Compression Moulding Sago Starch-Nanoclay Biocomposites

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ABSTRACT

In order to solve the environmental problem generated by plastic waste, eco-friendly products based on agricultural materials have been developed. One of the promosing materials that can be converted into thermoplastic materials is sago starch, with the addition of plasticizer. The bioplastic properties such as strength and stiffness can be further enhanced by the presence of nanosize clay particles. This paper reports the characterization on starch/clay nanocomposites prepared from abundantly available local sago starch (*Metroxylon* Rottb.) and Montmorrillonite (MMT) nanoclay. The thermoplastic starch-Montmorillonite (TPS-MMT) was produced by plasticizing with glycerol through melt blending before being compression moulded. The investigated biocomposite was prepared at starch/glycerol weight fraction of 70:30 with 0, 3, 6, 9 and 12 wt % of MMT content. The degree of crystallinity of the TPS-MMT was analyzed by X-ray Diffractometer (XRD) which showed that TPS crystalline structure was affected by MMT integration. Scanning Electron Microscope (SEM) presented micrographs of continuous phase of TPS-MMT biocomposites. The samples were also tested by Fourier transform infrared (FTIR) to understand the functional groups and chemical characteristic of the biocomposites. The results show that the MMT nanoclay is compatible reinforcement with sago starch to form biocomposites.

Keywords: sago, glycerol, thermoplastic starch, montmorillonite, extrusion

O7

Synthesis and Structure Control of Graphene by Sonication of Graphite Nanoparticles (GNP)

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ABSTRACT

Interest in graphene has been increased tremendously in world of science due to its excellent mechanical, thermal and also electrical properties. In this study, we have prepared graphene from sonication-exfoliated graphite nanoparticles (GNP) in N-methyl-pyrrolidone (NMP) as a solvent. The study was undertaken to evaluate the effect on graphene size and thickness by different power of sonication (310w – 180w) and also sonication time (10 minutes – 300 minutes). From the data, it can be seen clearly that the two variables gave different result on graphene flakes' structures. Transmission electron microscopy shows that the sizes of the graphene flakes were at the optimum size when using low-power sonication at 10 minutes (~2µm) whereas the minimum size was about 1µm after using 310w of sonication power for 300 minutes. This method can be used to produce graphene and facilitates to the broad range application of graphene.

Keywords: Graphene exfoliation, sonication, graphene size, TEM image of graphene

O8

Green Catalytic Hydrogenation of Natural Rubber Latex (NRL) by Nanocatalyst

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ABSTRACT

Nickel and Palladium nanoparticles stabilized by natural rubber latex were successfully synthesized via chemical reduction method using sodium borohydride ($NABH_4$) as reducing agent under microwave and ultrasonic irradiation process. The resulting natural rubber stabilized nanoparticles were characterized using TEM and FTIR spectroscopy techniques. The size range of nickel and palladium nanoparticles were 10-26 nm and 30-74 nm respectively. Catalytic hydrogenation of NRL in aqueous and chlorobenzene solvent were carried out and the degree of hydrogenation was determined by monitoring C=CH- proton using ^{1}H-NMR spectroscopic technique. Hydrogenation of NRL in chlorobenzene catalysed by NR-Pd causes 70% conversion compared to NR-Ni which is 62%. The use of aqueous medium resulted in 30% conversion over both catalysts. The results indicate the potential of green catalytic hydrogenation approach for converting NRL into more stable product.

O9

Effect of Nano-silica in Combination with Aluminium Hydroxides on Flame and Mechanical Properties of Epoxidized Natural Rubber (ENR)

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ABSTRACT

Incorporation of nanofillers to improve the flame retardant behaviour of elastomers has been of much interest over recent years. The synergistic effect is normally obtained by combining nanofillers with conventional flame retardant additives to lower the overall level of flame retardant in the polymer compound while maintaining a given level of flame resistance. This can reduce the negative impact on mechanical properties. Likewise, the main criteria for an effective flame retardant are also dependent on formation and stability of the char network. Epoxidized Natural Rubber (ENR) has good oil resistance and gas barrier properties. Despite its superior qualities, one of the drawbacks that limit its usage is its inherent high flammability. The present study investigates the effect of nano-silica in combination with inorganic fillers, namely aluminium hydroxides (ATH) on ENR. Two different types of commercial nano-silica with different surface area (designated as Si-A and Si-GR) were used. The flame-retardant ENR composite was characterized by Limiting oxygen index (LOI), UL-94V, and thermogravimetric analysis (TGA). Besides the flame retardant behaviour, cure characteristics and mechanical properties of the compounds were also evaluated. From the LOI and UL 94V tests, it was found that when 14 wt % nano-silica substituted ATH in the compound, the LOI was not enhanced although it passed the UL 94 V-0 standard. These results indicate that nano-silica selected in this work did not have a synergistic effect with ATH on the flame retardant behaviour of ENR compounds. It is probably due to the incompatibility of the nanofiller with high loadings of ATH which prevented sufficient nanodispersion.

Keywords Flame retardant, ENR-50, nano-silica, synergistic effect

O10

Characteristics of Carbon Nanotube from Palm Oil Precursor with Au, Pt and Pd as Metal Contact using Thermal Chemical Vapour Deposition Method

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ABSTRACT

In this study, we reported the I-V characteristics of carbon nanotube (CNT) from palm oil precursor with Aurum, Platinum and Palladium as metal contact. The CNT synthesized on silicon substrate around 30 mins using thermal chemical vapour deposition method at 750^{o}C. The thickness of CNT was around 5.016μm with the estimated diameter was around 18.6-25.4 nm. The electrical conductivity of CNT with metal contact was greater than the CNT without metal contact. However, it depended on electrical conductivity of metal contact itself. The electrical properties were measured using four point probe equipment. The CNT was analyzed using field emission scanning electron microscopy, micro-Raman spectroscopy and thermogravimetric analysis. The result indicated Au as metal contact has the lowest electrical resistivity and the highest electrical conductivity of 1.15×10^{-3} Ωm and 8.70×10^{2} S/m respectively.

O11

Bio-oil From Decanter Cake and Its Upgrading through Catalytic Hydrogenation over Pd Nanoparticles: Some Preliminary Results

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ABSTRACT

There has been an increase in research interest recently on the upgrading of bio-oil into liquid fuel. In this study, we explore the production of bio-oil from decanter cake, a waste from palm oil milling plant. The bio-oil were obtained by vacuum pyrolysis and characterized using FTIR, NMR and GC/MS. Temperature program pyrolysis of decanter cake starting at RT to 600ºC at 20ºC per minute produce 22 wt % of liquid. Proton-NMR analysis indicated the organic fraction of bio-oil consists of 87.75% aliphatic, 1.44% olefinic and 10.82% aromatic components, while FTIR confirmed the presence of carboxylic acids, alkanes, aldehydes and ketones in bio-oil. The higher heating value equal of the bio-oil is 37.4 MJ/kg comparable to that of hydrocarbon fuel. The organic fraction was hydrogenated over Pd nanoparticles stabilized in poly-vinylpyrollidine (PVP). The preliminary results of this study shall be presented and discussed.

O12

High Performance Bionanocomposites Based on Chiral Poly(Amide-Imide) and Reactive Organoclay with Tyrosine Amino Acid

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ABSTRACT

In the present study, novel organoclay was synthesized from Cloisite Na^+ and bioactive trifunctional L-tyrosine amino acid salt via ion-exchange reaction and then it was used for the preparation of poly(amide imide) (PAI)/ organoclay hybrid films. The soluble PAI with amine end groups enclosing phenylalanine amino acid was synthesized under green condition using molten tetra-butylammonium bromide during direct polymerization reaction of chiral diacid and 2-(3,5-diaminophenyl)benzimidazole. Then, (PAI)/organoclay hybrid films were prepared via solution intercalation method. X-ray diffraction and transmission electron microscopy revealed that the dispersion of silicate layers in the PAI created an exfoliated structure as a result of using the trifunctional groups of the swelling agent. The structure and thermal behaviour of the synthesized materials were characterized by a range of methods, such as X-ray diffraction, Fourier transform infrared spectroscopy, and electron microscopy and thermogravimetric analysis techniques.

Keywords: Bionanocomposites, Layered silicate, α-Amino acids, Poly(amide imide), Green chemistry

O13

Kinetics of Cadmium Adsorption by CNTs Grown on PACs

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ABSTRACT

Isotherms and kinetic models are useful tool for the investigation of adsorption process. Carbon nanotubes (CNTs) grown on powdered activated carbons (PACs) was used as novel adsorbent. The adsorbents were functionalized with $KMnO_4$ to improve the adsorption capacity. Two isotherms and three kinetic models were studied for the removal of cadmium from water. The isotherms were Langmuir and Freundlich and the kinetic models were pseudo-first-order, pseudo-second-order and intraparticle diffusion models. Langmuir constants were q_m = 69.759 mg/g, K_l = 0.223 and R^2 = 0.924. The adsorption process was found more likely to follow Freundlich model with R^2 value of 0.961, K_f of 9.215 and n of 3.015. Based on the kinetics study, the pseudo-second-order was the best fit with R^2 of 0.996 and model constants were q_e = 34.29 (mg/g) and K_2 = 0.0013 (g/mg.min). Coefficients for the pseudo first order were q_e= 21.145 (mg/g) and K_1= 0.09 (min^{-1}) with R^2 of 0.936. The intraparticle kinetic model exhibited R^2 value of 0.812 with K_d = 1.295 ($g/mg.min^{0.5}$). CNTs after oxidative functionalization with $KMnO_4$ were proven to be an efficient adsorbent for Cd^{2+} removal from water.

Keywords: Adsorption, Cadmium, CNTs, Kinetics, PACs.

O14

Electropolymerized Biosensor Based On Multi Walled Carbon Nanotube and Imprinted Polymer Film

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ABSTRACT

A sensitive electrochemical biosensor for Warfarin was prepared based on molecular imprinting strategy. In order to enhance the electrode sensitivity and electronic transmission, MWCNTs containing carboxylic functional group (f−MWCNTs) were introduced on glassy carbon electrode (GCE). Thin film of molecularly imprinted polymer (MIP) with specific binding sites for Warfarin was cast on the modified electrode using electrochemical deposition. In order to form a double layer with MIP layer as an insulating electrolyte, Au nanoparticles (AuNPs) was introduced at the MIP surface to form final modified electrode (AuNP/MIP/f−MWCNT/GCE). The properties of AuNP/MIP/f−MWCNT/GCE were studied in the presence of $K_3Fe(CN)_6$ as a probe. AuNP/MIP/f−MWCNT/GCE exhibits fast binding kinetics and higher selectivity to template due to their high ratio of surface imprinted sites, large surface-to-volume ratios and large affinity to template. The modified electrode was used to detect the concentration of Warfarin with a linear range and detection limit (S/N=3) of 0.015 - 0.310 μg mL^{-1} and 0.004 μg mL^{-1}, respectively. Finally, the modified electrode was successfully applied to determine Warfarin in human serum sample.

Keywords: Warfarin determination; Electrochemical biosensor; Molecularly imprinted polymer; Multiwall carbon nanotubes; Au-nanoparticles.

O15

Study on the Use of Nanosized Alpha Alumina from Scheduled Waste as Formulation in Thermal Insulation Paint

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ABSTRACT

Aluminium dross, a waste produced from the aluminium smelting process, is categorized as a schedule waste. In this study we produced nanosized alpha alumina from this schedule waste via the top-down method. As the aluminium dross comprised of the aluminium trihydroxide (Gibbsite) crystalline phase, it can be converted into the alpha alumina crystal form through dehydroxylation and phase transformation. Alpha alumina with particle size of about 200 nm was produced from this process and high velocity milling was performed to reduce it to 40-70nm. Used of this nanosized alpha alumina powder as thermal insulator in paint formulation for ceramic and metal structures were then studied. Comparative study was also done on the same samples with commercial micron-sized alpha alumina powder on the same samples. The result shows that on average, the used of nanosized alpha alumina could resulted to 15% lower surface temperature as compared to the micron-sized alumina.

O16

Green Synthesis of Silver Nanoparticles using Local Honey

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ABSTRACT

In this work, silver nanoparticles have been successfully prepared with a simple, cost-effective and reproducible aqueous room temperature "green" synthesis method. Honey was chosen as the eco-friendly reducing and stabilizing agent replacing most reported reducing agents such as hydrazine, sodium borohydride ($NaBH_4$) and dimethyl formamide (DMF) which are highly reactive chemicals but pose a biological risk to the society and environment. The size and shape of silver nanoparticles were modulated by varying the honey concentration and pH of the aqueous solution that contain silver nitrate as the silver precursor, sodium hydroxide as the pH regulator and ethylene glycol as the solvent. The silver nanoparticles obtained are characterized by field- emission scanning electron microscope (FESEM) and ultraviolet-visible spectra (UV-Vis). From SEM analysis, it was found that by increasing the concentration of honey, the size of silver nanoparticles produced decreased, from the range of 20.22 nm - 22.44 nm for 10 g of honey to 15.63 nm to 17.86 nm for 40 g of honey. Similarly, the particle size decreased as the pH of the aqueous solution increased. The results also revealed that silver nanoparticles produced were all quasi-spherical in shape which indicated that both parameters have no influenced on the shape of nanoparticles formed. A sharpen absorption peak at 430 nm was observed by UV-vis spectra which is the characteristic of spherical particles for the colloid obtained at 20 g honey concentration. While, for the colloid obtained at pH 8, a smooth and narrow absorption band at 424nm was observed which the characteristic of monodispersed spherical nanoparticles is.

Keywords: Silver nanoparticles, Green method, Honey, UV-Vis spectra

O17

Light Extraction from GaN Using Microcavity Structure

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ABSTRACT

Improving of light extraction efficiency of GaN using flat and dome epoxy was demonstrated. Theoretically the angle, wavelength, and thickness dependent photoluminescence emission of a luminescent film on a transparent substrate was studied using Fresnel type transmittance calculations for s- (TE) and p- (TM) polarized emission. Experimentally we have demonstrated a GaN/sapphire microcavity exhibiting 1.3-1.6 fold enhancement in light extraction efficiency by using flat and dome epoxy as external medium compared with air external medium. In addition, simulation results shows that by using (HfO_2 ($\theta_c = 52.7^0$), Epoxy ($\theta_c = 36.8^0$), MgF_2 ($\theta_c = 33.7^0$) and the free space ($\theta_c = 23.5^0$)) improve the light extraction by increase the critical angle and diffracts the internal light with a large solid angle into the escape light cone.

Keywords: GaN Microcavity; UV light enhancement; critical angle.

O18

Mechanical and Flammability Properties of PVC Reinforced with Nano-sized ATH Particles

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ABSTRACT

The effect of nano-sized alumina trihydrate (ATH) as reinforcement and flame retardant in polyvinyl chloride (PVC) were determined. Melt mixing technique using two roll mills was employed to prepare PVC/alumina trihydrate (ATH) nanocomposites with different ATH loadings. The nano-sized ATH particles were treated with silane coupling agent prior to mixing with PVC resin. All the nanocomposites were characterized by flexural, impact and flammability tests. It was found that the addition of nano-sized ATH enhanced the flexural strength of PVC and this property was further increased in treated nanocomposites. However, the impact strength was only improved slightly, excluding the nanocomposite that contains 30phr of treated ATH. The flame retardant property of PVC nanocomposites was also higher compared to pristine PVC.

Keywords: PVC, alumina trihydrate, flexural, impact, flame retardant

O19

Fabrication of ZnO Nanofiber by Electrospinning Method for Sensor Applications

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ABSTRACT

One-dimensional (1D) nanostructures of semiconductor have been of particular interest over the past few years because of their potential exploitation for the preparation of optical signal processors and switches. Until now, a large number of methods have already been demonstrated for generating 1D nanostructures, including chemical vapour deposition, vapour– liquid–solid, solution–solid, solvothermal routes, and so on. But they are not suitable for synthesizing organic–inorganic materials. Recently, electrospinning, a drawing process based on electrostatic force, has been proved to be a relatively simple and versatile method for generating 1D nanostructures from organic–inorganic materials. ZnO nanofibers were fabricated by electro spinning. The Electro spinning apparatus was operated at 20kV. ZnO nanofibers with a diameter of 50 -100 nm could be successfully obtained. Uniform and smooth nanofibers were observed at a calcination temperature of 500˚C for 4 h. The calcination process of the ZnO/PVP composite nanofibers brought forth a random network of polycrystalline quartzite ZnO nanofibers with a reduction in diameter. The sample was characterized by scanning electron microscopy (SEM), X-ray diffraction (XRD), PL spectroscopy and Raman technique. Scanning electron microscopy (SEM) shows that the obtained ZnO nanofibers were randomly aligned on the substrates. XRD and Raman patterns show that the ZnO nanofibers are the quartzite structure. Optical properties were measured by PL spectroscopy. Experimental results suggest that the calcination temperature was most essential in determining the nanofibers morphology and size. The present findings demonstrate that electro spinning is the easiest way to assemble one-dimensional nano structures for building integrated nano devices for various applications, such as transistors, sensors, diodes, and photo detectors.

O20

Enhanced Luminescence from Erbium-doped Tellurite Glass: Effect of Silver Nanoparticles

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ABSTRACT

Recently, the localized surface plasmon resonance (LSPR) around the metallic nanoparticles (NPs) is exploited in the glass formation to modify the surroundings of rare earth (RE) ions doped in glass matrix. The tellurite glass being a promising candidate for laser and optical amplifiers, enhancing the nonlinear optical properties and reducing the nonradiative decay rates is a challenging issue [1]. LSPR has an ability to encounter problem related to the decrease in emission intensity caused by nonradiative losses of different excited levels. By introducing the metallic NPs, the plasmonic modes inside the glass can be excited that modifies the radiative decay properties of the RE ions and thereby increase the optical performance. The NPs size dependent enhancement of the infrared-to-visible frequency up-conversion luminescence (UC), quantum efficiency, multiphonon relaxation rates and absorption coefficient in Er^{3+} doped tellurite glasses containing silver nanoparticles under 976 nm radiations are investigated. A phenomenological 4-level model is developed integrating the quantum size effect on optical band gap, the surface plasmon resonance and the local field of silver NPs and the rate equations are obtained [2]. The analytical expression for the luminescence intensity, quantum efficiency and absorption coefficient are derived from the rate equations by considering the NPs size distribution as Gaussian. The role of NPs in enhancing UC emission intensity and absorption coefficient are examined and understood. An enhancement in UC emission intensity of the green bands ($^2H_{11/2}\rightarrow{}^4I_{15/2}$ and $^4S_{3/2}\rightarrow{}^4I_{15/2}$) and red band ($^4F_{9/2}\rightarrow{}^4I_{15/2}$) emission of Er^{3+} ion at temperature 250 K and at optimized Er^{3+} concentration 1.0 mol% are observed up to few times in the presence of silver NPs in the glass. The enhancement for the green emission is found to be larger than the red emission. The observed of Er^{3+} luminescence is mainly attributed to the local field effects namely the surface plasmon resonance of silver NPs. The presence of NPs causes an intensified electromagnetic field around NPs, resulting enhanced optical transitions of Er^{3+} ions. It is possible to tune the quantum efficiency, absorption coefficient luminescence peak, full width at half maxima and the emission intensity by controlling a set of fitting parameters in our model. The results suggest that both quantum confinement and local field effects determine the enhanced optical performance and electronic

properties of these glasses. Our results on NPs size dependent emission intensity, efficiency, multiphonon relaxation rates and absorption coefficient are in agreement with other observations [1, 3]. The model is quite general and can be applied to study the optical and electronic correlation effects in rare earth doped glasses containing metallic NPs. The present systematic study may provide useful information for further development of UC lasers, solar cells, bio-labeling and sensors.

Keywords: Nanoparticles, up-conversion, luminescence, absorption coefficient, surface plasmon resonance

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O21

Nanotechnology Applied in Bone Reconstructive Surgery: The Role of Nano-scaffold and Biological Factors

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ABSTRACT

In a natural environment, the cells in our body interact with surrounding extracellular matrix (ECM). From a topographical point of view, when the ECM is examined, it becomes apparent that the matrix is structured as a mixture of pores, ridges, and fibers, which are all sized in a nanoscale range. From this perspective, it has been suggested that it could be worthwhile to develop man-made scaffold (as a synthetic ECM) of similar dimensions. For bone reconstructive surgery, those developed so far were not able to mimic the nanostructure of bone, partly because of the aggregated, microscale organization of the mineral component. In our previous study, we have been successful to develop a CHA-scaffold which displayed a nanostructured mineral phase without occurrence of microscale Calcium-Phosphate (CaP) particles. Aggregation and sedimentation of CaP mineral phase was reduced considerably using sodium citrate as dispersant. We found that specific adsorption of citrate anions onto CaP nanocrystals was shown to result in strong increase in the negative surface charge of the CaP particles and consequently increased repulsive interparticle forces that were able to overcome attractive van der Waals forces. To continue the work, it is known that tissue engineering approaches consist of three key elements, those are matrix (also termed as scaffold), combined with cells and/or biologically active molecules such as growth factors and cell adhesion molecules. Accordingly, bone tissue engineering can be divided into two classes: cell-based and growth factors (GFs)-based. Growth factor-based bone tissue engineering seems to provide an easier and more cost-effective way to induce bone regeneration in patients. It is because time and labour consuming in vitro cell expansion procedure and the risk of disease transmission or cell infection of cell-based bone tissue engineering. The aim of this study is to investigate the effect of biological factors applied in the CHA-nanoscaffold we developed to initial bone regeneration in femoral condyle of Wistar rats. The parameters observed in this study were collagen density, number of osteoblast and

new blood vessel after certain periods of implantation with CHA-nanoscaffold. It seemed that biological factors did stimulate thicker collagen deposition at the early phase and accelerate new bone formation than in the CHA-nanoscaffold without biological factors. However, it seemed that the effect was only on the early stage of regeneration showing that CHA-nanoscaffold itself has adequate potential to facilitate bone regeneration.

Keywords: Nanotechnology, Dispersant, CHA-nanoscaffold, Biological factors, Reconstructive surgery

O22

Physico-Chemical Characterization of Mesoporous Silica MCM-41 Grafted Calix[4]arene Derivatives

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ABSTRACT

Three new mesoporous silica MCM-41 modified with calix[4]arene derivatives (p-tert-butyl-calix[4]arene, calix[4]arene and calix[4]arene sulfonate) have been prepared via modification of activated mesoporous silica with toluene 2,4-di-iso-cyanate (TDI) as linker. The modified mesoporous silicas were characterized by fourier transform infrared spectroscopy (FTIR), thermal analysis (TGA) and elemental analysis. The FTIR spectra and TGA analysis verified that the calix[4]arene derivates are covalent attached to the silica. The preservation of the MCM-41 channel system was checked by X-ray diffraction (XRD) and nitrogen adsorption analysis (BET).

Keywords: MCM-41, calix[4]arene, p-tert-butyl-calix[4]arene, calix[4]arene sulfonate

O23

Ab Initio DFT Studies on Electrons Injection from CdSe Quantum Dots Semiconductor to Ligand

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ABSTRACT

In quantum dot solar cells, ligands were used to link inorganic quantum dot semiconductor with inorganic photoelectrode. Numbers of ligand consists of thiol (-SH) functional group were used by previous researchers and showed fluctuations of efficiency in lower value region. The selection of ligand is crucial as it affects the rate of electron injections from the lowest unoccupied molecular orbital (LUMO) of quantum dots into LUMO of ligand. Density functional theory (DFT) offers a better understanding of the electronic structure of each component. A DFT study consists of three types of ligand and CdSe as sensitizer was carried out. As a conclusion, the energy level of LUMO of each component affects the efficiency of electron injections from quantum dot to ligand.

Keywords: Quantum dot solar cell, Density functional theory, *ab initio*, Electronic properties of quantum dots

O24

Structural Characterization of PCL-Gelatin Nanofibrous Composite Scaffolds Electrospun with Different Solvent Systems

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ABSTRACT

As the effect of scaffold structure on cell behavior is approved by different studies, ability of preparation of scaffolds with different morphology for tailoring different requirements of various cells is an aim of researchers. One of the important factors affecting the nanofibers morphology is solvent system. Polycaprolactone- gelatin composite electrospun scaffolds, the successful complex in scaffolding for soft tissue engineering, can be fabricated using different solvent systems.
In the present study we investigate the effect of different solvent systems (formic acid: glacial acetic acid, TFE:formic acid and TFE;glacial acetic acid) on the nanofiber formation and morphology using SEM micrographs.
The results suggest that using a mixture of formic acid and glacial acetic acid has higher productivity compared to using a trifluorothanol -based solvent system. Also, it will be shown that using a mixture of formic acid and glacial acetic acid leads to fabricating fine nanofibers. Using a mixture of formic acid and glacial acetic acid for dissolving polymers leads to smaller fibers comparing to using TFE-based solvents. It might be due to higher electrical conductivity of formic acid and acetic acid.
Therefore, it can be concluded that nanofibers with different diameter size can be fabricated only by changing the solvent.

Keywords: Nanofibrous scaffold, Electrospinning, Polycaprolactone, Gelatin, Solvent system, Morphology, Electrical conductivity

O25

Synthesis of Carbon Nanotubes on a Silicon Substrate from Waste Cooking Palm Oil using Nickel, Iron and Cobalt Catalyst

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ABSTRACT

In this work, the synthesis of carbon nanotubes (CNT) from waste cooking palm oil precursor by thermal chemical vapour deposition method was systematically investigated. The precursor decomposition was performed on nickel, iron (III) and cobalt nitrate catalysts with precursor and synthesis temperature of 450 and 750°C respectively. The catalyst was spin-coated on silicon substrates at a speed of 3000 rev.min^{-1}. The CNT obtained were characterized using field emission scanning electron microscopy, Raman and Fourier transform infrared spectroscopy to examine its structural properties. As a conclusion, cobalt catalyst was considered the most suitable catalyst for higher quantity, reasonably good graphitized CNT with smaller diameter. These were followed by nickel and iron catalyst.

Keywords: Nanotubes, Thermal Chemical Vapour Deposition, Field emission scanning electron microscopy, Raman and Fourier transform infrared spectroscopy.

O26

Controlled Drug Release and Degradation of Linamarin-loaded PLGA Submicron Particles

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ABSTRACT

Linamarin, a water-soluble cyanogenic glucoside found abundantly in cassava plant (*Manihot esculenta Crantz*) showed some anticancer activity when tested on both Hela and Caov-3 cells. Clinical administration of linamarin might be limited by drug deactivation or loss, side-effects or toxicity. If linamarin administered orally, it may also have little chance to effectively get into the blood system and finally tumor sites. The cyanide group found in Linamarin, which is toxic and expected to be responsible of killing cancer cells, could affect the normal cells as well if not well formulated before its administration. Therefore, encapsulation of linamarin into biodegradable polymeric delivery systems would provide a key solution to above limitations by providing drug protection, controlled drug delivery and enhanced drug bioavailability. Linamarin-loaded poly (D,L-lactide-co-glycolide)(PLGA) nanoparticles were prepared by double emulsion solvent evaporation (w/o/w) techniques with the aid of poly (vinyl alcohol) (PVA) as a surfactant. Surface morphology, zeta potential, particle size, thermal properties, and the drug encapsulation efficiency (DEE) were investigated using scanning electron microscope (SEM), zeta meter, nanoparticle size analyzer, differential scanning calorimeter (DSC), and UV-Spectrophotometer, respectively. The polymer degradation was also investigated using SEM and high performance liquid chromatography (HPLC). The formulated nanoparticles were spherical, negatively charged (from -26.5 mV to -29.9 mV) indicating their relative stability in emulsions. The nanoparticles were likely amorphous and this will enhance their wettability and consequently the drug diffusion from the matrix as well as the

polymer degradation. Generally, the finally formulated nanoparticles showed unimodal particle size with an average size <200 nm. However, most water-soluble drugs prepared by w/o/w usually suffer from low DEE, interestingly, most of our samples showed good DEE values (>50%). Preparation techniques which yield High DEE will reduce drug loss during formulation. Formulations with High DEE also indicate that a little quantity of delivery device would be enough to deliver the required amount of drug. The *in vitro* drug release showed a fast (burst) release within the first 8 hours followed by a controlled release profile lasts for days where about 80% of the drug released in >200 hours. Burst release is mainly due to surface adsorbed or weakly attached drug molecules while the slow controlled release is mainly attributed to diffusion or leach of the well encapsulated drug molecules. The main advantage of this controlled drug release is that one dose can last for days or even weeks thus reduce the need for frequent doses which might be harmful or life threatening especially for anticancers as well as this linamarin. Most likely, a complete degradation of the PLGA polymer into body metabolites namely lactic and glycolic acids was also confirmed. This ensures a complete release of the encapsulated drug as well as excretion of these metabolites from the body hence safety of the drug deliver carrier. It would be concluded that linamarin-loaded PLGA nanoparticles proved to be a new promising anticancer candidate.

O27

Thermal and Photoluminescence Properties of Nd^{3+} doped Te_2O-MgO-Na_2O Nanoglass

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ABSTRACT

Neodymium doped all-solid-state laser sources have been recognized as the most efficient laser sources for numerous applications in the fields of high-resolution spectroscopy. The development of low threshold high gain host media for Nd^{3+} ion doping was encouraged by the applications in these areas. These tellurite glasses merge good mechanical stability, chemical durability and high linear. Therefore, the combination of rare-earth ions into tellurite glasses has been promising good candidates for the development of optical devices. The OH^- free tellurite glasses which are used as host material for Nd^{3+}-doped laser glasses have been a subject of increasing interest for optoelectronic applications. It is because of their high refractive index and low phonon energies. Addition, the astonishing advantages for the rare earth doping into nanoglass have been observed and systematic characterization of luminescence and thermal properties of tellurite nanoglass doped with Nd_2O_3 has been studied over the last few years. In this research, the glass was synthesized by system was conventional melt-quenching technique. The amorphous nature of this glass was confirmed by the x-ray diffraction technique. Differential thermal analysis (DTA) was employed to verify the glass transition (T_g), crystallization (T_x) and melting temperatures (T_m). The fluorescence spectra were measured by photoluminescence spectrometer. The increasing concentration of Nd^{3+} in tellurite nanoglass influenced the result.

Keywords: Tellurite glass, Thermal, Photoluminescence, Nanoglass

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O28

Light Atoms Mapping on the Surface of Carbon Nanomaterials by EELS and HAADF Techniques of Transmission Electron Microscopy

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ABSTRACT

Carbon nanotubes (CNT) now are widely used materials which combines advanced surface with chemical inertness, electrical conductivity and thermal stability, as well as admit surface chemical modification. All these facts opens up huge prospects for their practical use in the manufacturing of electronic devices, systems for energy storage, generation and conversion, in catalysis and construction as supports and additives, respectively. For most of applications additional chemical modification of their surface is necessary. It can be performed using different oxidizing agent such as mineral acids, hydrogen peroxide, KMnO4 or KCrO4 in acidic media or ozone. All these techniques lead to different amount of carboxyl groups on the surface of nanotubes. Moreover, nanotubes with different displacement of graphene layers, such as cylindrical and conical, demonstrate miscellaneous localization of carboxyl and other oxygen containing groups on the surface. For the characterization of such materials thermogravimetry with mass spectral control of the degradation products, elemental CHNO analysis, IR and Raman spectroscopy be utilized. First two techniques allow determining total amount of carboxyl groups, while last – only their types. But all of these methods do not allow evaluating of localization of them in the structure of CNT. Indispensable tool for this is high-resolution electron microscopy (HREM) with electron energy loss spectroscopy (EELS) and electron probe microanalysis (EDS). Direct identification of light oxygen atoms using these methods is hampered by low sensitivity and the destruction or displacement of the sample under high beam intensity. To do this, markers based on platinum or europium complexes were proposed. Much more effective was found to be the use of thulium nitrate, which hydrolyzes in a significantly shorter period and forms more stable complexes with oxygen-containing ligands. These heavy elements can be easily identified by EELS and EDS, especially with mapping processing. The most interesting images can be obtained in HAADF STEM mode what makes clear the heavy atoms positions on the surface. Non treated by oxidizing agents CNT after

modification by thulium salts demonstrate the absence of signals. The results obtained show that in the case of cylindrical CNT oxygen atoms locates mostly at the end of the tubes or defects, while cylindrical tubes are carboxylated uniformly on the surface.

Keywords carbon nanotubes, carboxylated CNT, transmission electron microscopy, electron energy loss spectroscopy, energy dispersive analysis

O29

Investigation on Enzyme-Glucose Reaction for Biosensing Application

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ABSTRACT

Glucose sensor is a state-of-art sensor that widely been investigated for the use of microcantilever in biosensing application. Furthermore, it can also be applied in clinical diagnosis and biochemical study [1]. The sensing was organized normally on the biologically elements such as enzyme, antibody, proteins, glucose etc because they are low cost, simple, easy to use and rapid [2]. Microcantilever deflection based in static mode where measures the stress changes induced by molecular interaction or in dynamic mode [4]. Surface stress can be representing by force to detect the deflection of microcantilever [5]. The weight of an object is defined as the force of gravity on the object and may be calculated as the mass times the acceleration of the gravity. In this study, w =mg will be used to determine the force for the microcantilever because there is no acceleration will be added. The standard condition for the gravity field is 9.8 N/kg. This work investigates the correlation of the glucose reaction and the induced forced by measuring their weight changes on the glass slides which represents the micro cantilever.

Preparation of the reagents that is used in this experiments includes glucose oxidase (type VII-S, purified from *Aspergillus niger*, bovine serum albumin (BSA), glutaraldehyde(GA) (50% aqueous solution), ß-*D*-Glucose, phosphate buffer(PB, 100mM, pH7), and sodium acetate buffer, pH 5.1. The dimensions of the glass slide are 18mm length and 18mm width. The glass slide was cleaned for 10 minutes in acetone and 10 minutes in absolute ethanol before immersed in piranha solution for 30 seconds and sputtered with Au layer with thickness 100 nm at 750s. GOx was immobilized by cross-linked with GA with the presence of BSA. Before the immobilized process, the 20mg glucose oxidase (GOx) was dissolve in 1ml 50mM sodium acetate buffer before added in sequence in 1 mL of PB solution with 5mg of BSA and 40µL of 50% GA. Then, 0.3mL enzyme solution was withdrawn onto the glass slide before the sample was stored and dried at 4^0C overnight. The samples were

weighed to differentiate the changes of each sample. 5mM of ß-D glucose was added in 1mL PB solution before injected to the samples and directly weigh once had been injected [3]. The reaction of 0.3mL enzyme and 5mM was observed in three different glass slides that weighed 176760.00µg, 180143.34 µg and 151873.34µg respectively. In conclusion, weight can affect the force reaction of the cantilever.

Keywords: Cantilever, Glucose sensors, Glucose oxidase, glucose, weight, force

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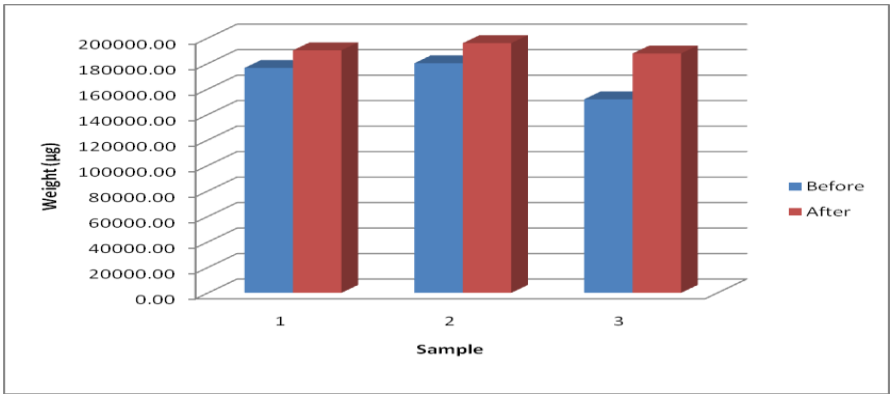

Figure 1: Observations of mass changes due to enzyme-glucose reaction

Sample	Before (N)	After (N)
1	2.606×10^{-15}	2.806×10^{-7}
2	2.656×10^{-15}	2.889×10^{-7}
3	2.239×10^{-15}	2.769×10^{-7}

Table 1: Comparison between force before and after added the enzyme - glucose

O30

Optical Properties of Tellurite Glass with Manipulated Growth of Metallic Nanoparticles

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ABSTRACT

The manipulated growth of metallic nanoparticles (NPs) in tellurite glass and thereby the improvement of optical properties are presented. Applying the concept of thermal nucleation to control the NPs formation in glass matrix for changing optical properties such as luminescence enhancement or quenching is the focus. The process of NPs formation in the glass involving thermal nucleation above the glass transition temperature ensures the number of growing particles remains constant and the distribution of particle sizes remains small. The optical properties of particles are strongly influenced by the size and shape of NPs. The kinetics of the subsequent growth process determines the size distribution of initial nuclei and their growth or decay. The average diameter of metallic NPs is reduced due to thermal fragmentation of the larger particles with the longer heat-treatment. The NPs can be the candidate to enhance fluorescence in tellurite glass as they exhibits a range of unique properties such as high refractive index, high dielectric constant, a wide band infrared transmittance and large third order non-linear optical susceptibility. The presence of metallic NPs enhanced the luminescence efficiency and the nonlinear optical properties. The luminescence is enhanced due to the energy transfer (ET) from the NPs to the rare earth (RE) ions. The multipole interactions increased and the ET from an excited RE ion to the metallic structure become efficient when the distance between the RE ion and the metallic NPs is very small. In this condition, metallic NPs play a main role to trigger the multipole interactions. Thermo-chemical reduction process takes place during the different annealing time. The methods of applying different heat-treatment times will cause different state of thermo-chemical reduction. Thus, the nucleation of NPs varies. The luminescence is sensitive to different processes such as excitation by the incident field, the local environment and the emission of radiation influenced by the competitive radiative and nonradiative decay processes. The thermally induced shrinkage of the host matrix and the diffusion length of the metallic NPs inside the glass influence the growth of NPs. The concentration of metallic NPs increases due to the longer heat-treatment time. This processes lead to the

increasing in absorbance. A wider selection of elements in tellurite glasses composition promises a greater control over variations in performance characteristics. The study and exploitation of optical absorption is very important to investigate the optical induced transition occurs inside such metallic NPs embedded glass.

Keywords: Alinco Alloys, Magnetic properties, Hysteresis loop

O31

Evolution of Magnetic Properties in New Hybrid Catalysts for the Synthesis of Carbon Nanotubes

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ABSTRACT

The relationship between catalytic activity and magnetic properties of the catalyst is investigated in this study. New hybrid catalyst formulations of nickel, manganese, copper, and chromium have been successfully discovered for synthesizing carbon nanotubes (CNTs) using the in-house built Catalytic Chemical Vapour Deposition (CCVD) micro reactor system. The magnetic properties of the hybrid catalysts were investigated using the Vibrating Sample Magnetometer (VSM). The effect of magnetism such as ferromagnetism and anti-ferromagnetism gives great influenced in the formation of different form of the as-synthesized CNTs. Field Emission Scanning Electron Microscope (FESEM) analysis have proven that change in the magnetisms have also contributed to great change in the morphology of the as-synthesized CNTs. TGA analysis of the as-synthesized CNTs has revealed different thermal stability for different form of CNTs.

Keywords: magnetism; hybrid catalyst; carbon nanotube; ferromagnetism; anti ferromagnetism

O32

Grafting Of Poly[1-(N,N-Bis Carboxymethyl)Amino-3-Allylglycerol Codimethylacrylamide] Copolymer onto Nano Graphite Support For Preconcentration And Determination of Ephedrine in Human Plasma And Biological Samples

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ABSTRACT

A method is carried out for surface grafting of polymer containing a functional monomer,poly[1-(N,N-bis-carboxymethyl)amino-3-allylglycerol-co dimethylacrylamide] (poly(AGE/IDA-co- DMAA) onto nano graphite as a support. Graphite is layered crystal with a c-axis lattice constant of 0.66 nm. Carbon atoms within a layer are covalently bonded, while layers are bound by much weaker van der Waals forces. It is understood that natural graphite flakes could be intercalated by various chemical species to form the graphite intercalation compounds (GICs). Expanded graphite (EG) is a product made by subjecting GICs to rapid thermal treatment. EG maintains the layered structures similar to natural flake graphite but produces tremendous different size of pores and nanosheets which stick to each other. Monomer 1-(N,N-bis-carboxymethyl)amino-3-allylglycerol(AGE/IDA) was synthesized by reaction of allyl glycidy ether with iminodiacetic acid. The resulting sorbenthasbeencharacterized using FT-IR, elemental analysis, thermogravimetric analysis (TGA) and scanning electron microscopy (SEM) and evaluated for the preconcentration and determination of ephedrine in human biological fluid and biologicalsamples. Ephedrine is a sympathomimetic amine commonly used as a stimulant, appetite suppressant, concentration aid, decongestant, and to treat hypotension associated with anaesthesia. Ephedrine is a substituted amphetamine and a structural methamphetamine analogue. It differs from methamphetamine only by the presence of a hydroxyl (OH). Amphetamines, however, are more potent and have additional biological effects.

Keywords: Nanographite, Ephedrin, Preconcentration

O33

Structural and Optical Investigation of Er:Ag Co-Doped Magnesium-Phosphate Nanoglass

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ABSTRACT

Fourier transform infra-red (FTIR) spectroscopy, Optical absorption and luminescence of Er^{3+}-doped magnesium-phosphate glasses with and without silver nanoparticles is described. The structure of the (59.5-x) P_2O_5-40MgO-0.5Er_2O_3-xAgCl with x= 0 and 1.5 mol%, was investigated by means of infrared spectroscopy. The structural changes induced by the AgCl presence into the magnesium-phosphate glass were evidenced and discussed in terms of the network depolymerization process and distortion of the PO_4 tetrahedra. The existence of silver nanoparticles inside the glass matrix, considered to be mainly responsible for the enhancement in the peak absorbance and the upconversion luminescence. The presence of these nanostructures is evidence from transmission electron microscope (TEM) image. Furthermore the variation in the optical properties with glass composition plays a vital role in the choice of efficient laser materials. From the experimental oscillator strength, the Judd-Ofelt intensity parameters (Ω_2, Ω_4, Ω_6) have been determined and are used to calculate different radiative parameters such as radiative transition probability (A), branching ratio (β_R), life-time (τ_R) and stimulated emission cross-section (σ_p^E) for different excited levels. Moreover it is found that in the presence of silver nanoparticles Ω_2 has a comparatively larger value which reflects low symmetry and high covalency around the Er^{3+} ions.

Keywords: Upconversion, Silver nanoparticles, Judd-Ofelt analysis

O34

Synthesis and Characterization of PANI- Ni Nanoparticles in PVA Films by Gamma Radiation Technique

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ABSTRACT

Nanoscience and nanotechnology are two new fields of applied science, focusing on the synthesis, characterization, design and application of materials and devices on the nanoscale level between 1 - 100 nm approximately. Moreover nanoscience involves study of how to control the formation of two- and three-dimensional assemblies of molecular scale building blocks into well-defined nanostructures or nanomaterials. From this view nanomaterials have attracted much attention due to their different characteristics, which are unavailable in conventional macroscopic materials. Nanoparticles as a type from nanomaterials at 0 D can exhibit unique chemical properties due to their limited size and optical characteristics related to their shape, their enormous surface-to-volume ratio, electron plasmon resonance, and quantum confinement effects, very different from the bulk of the atomic state. Many of the recent findings of the research activities in nanomaterials have led to discovery or improvement of advanced materials for microelectronics, biomedicine, photovoltaics, sensors, biosensors, photochemistry and optical devices. In the present work nickel nanoparticles – polyaniline (Ni- PANI) were synthesized radiolatically by a ^{60}Co γ-ray source. The sample films containing polyvinyl alcohol (PVA) as stabilizer was irradiated to a total dose of 50 kGy. UV-Visible analysis of the sample confirmed the formation of nickel nanoparticles and PANI respectively. The UV-Visible results were exhibiting tow peaks the first sharp peak at a wavelength of ≈400 nm indicating the zero-valent state of nickel and the second peak at a wavelength of ≈730 indicated that the conducting polymer of PANI is form. The films showed a transition in color from pale green to dark green after radiation. The structural and morphology of nickel nanoparticles in PANI/PVA films were studied using x-ray diffraction, atomic force microscopy, and transmission electron microscopy. The XRD patterns Ni nanoparticles are shown strong diffraction peaks at 2θ = 31.7, 45.5 and 56.6^0 are associated to Ni (200) and Ni (222) Ni (111) Bragg's diffractions of face-centered cubic (fcc) structure respectively.The average particle size distributions were found in the range of 22 – 54 nm for Ni nanoparticles. The particle sizes of metal nanoparticles were controlled by the concentration of metal ions and radiation doses.

Keywords: Nickel; Nanoparticles; Gamma Radiation

O35

Role of Unique Structures of Nanoparticle Manganese Dioxide on the Production of Fatty Acid Methyl Ester for Biofuel Formulation

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ABSTRACT

Fatty acid methyl ester (FAME) is produced via transesterification process in the present of oil, catalyst and alcohol. Various types of heterogeneous catalysts are commonly used to catalyse oil to FAME. This study is focusing on the use of different form of nano particle MnO_2 as catalyst for the production of FAME at very mild reaction conditions. Different method is employed in synthesizing MnO_2 and gave unique morphological structures depicted from the High Resolution Transmission Electron Microscope (HRTEM) analysis. The unique morphologies of nano particle MnO_2 were proven to have contributed to an efficient conversion of oil to FAME at high percentage of yield in the range of 70-90%. The pore structural analysis used to further analyse the MnO_2 showed the type IV isotherms with mixture of type 3 and 4 hysteresis for all samples. However, the present of different size of pore diameter within the nano MnO_2 catalysts have great influenced to their catalytic performance in the production of FAME.

Keywords: FAME, MnO_2, catalyst, transesterification

O36

The Optical Properties of the Congruent Lithium Niobate and Neodymium Doped Lithium Niobate Single Crystal

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ABSTRACT

Lithium Niobate, $LiNbO_3$ (LN) has an excellent nonlinear property. LN single crystal can be used in variety of technological application such as piezo-electricity, electro-optics, laser physics, halography and acoustics. Growth of congruent $LiNbO_3$ (CLN) single crystals is by using Czochralski method in an air atmosphere with ADC (Automatic Diameter Control). Furthermore, there are at least 70% of crystals are used in practical devices, due to that, the ADC technique can be used to grow a huge amount of LN materials. In addition, the critical diameter crystals and the critical rate of rotation crystals are calculated using the combination of Reynolds and Ghrashof number. The critical rotation rate is inversely proportional to the diameter of the single crystals. Therefore, the doped LN single crystals are also grown by using the Czochralski method of ADC. The doped LN crystals exhibits a strong resistance to photorefractive effect and shown a great plus strong optical properties of Nd:LN single crystals. The doped LN crystals are dividing into two dopant concentrations which are 0.5 mol % and 1.0 mol %. Therefore, the total samples of these experiments are three samples including the CLN. The optical properties of Nd:LN and CLN are investigate by using Photoluminescence Spectroscopy. A mechanism of RE elements incorporation in the crystal lattice into the crystal lattice of $LiNbO_3$ is proposed for a wide range of dopant concentrations. The results allow us to predict the mechanism of Neodymium concentration with LN crystal lattice and alter the nonlinear optical properties of LN. In conclusion, the study of the optical properties of CLN and Nd:LN single crystals are investigate and analyzed.

Keywords: LN, CLN, Nd:LN, Czochralski method, Optical Properties, Photoluminescence, Nonlinear Optical Properties.

O37

Structural Characterization of ZnSe and ZnSe:Te Nanoparticles Synthesized by Microwave Heating Process

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ABSTRACT

ZnSe nanoparticles were synthesized by microwave heating process using high purity Zn and Se powders in equal number of atoms ZnSe and ZnSe:Te nanoparticles were obtained within 10 minutes with high crystallinity .The crystalline structures were confirmed by X-Ray diffraction patterns to be cubic. The crystallite size were calculated using scherrer formula and found to be 39nm for ZnSe and 43nm for ZnSe:Te . The optical study was investigated by UV-vis spectroscopy. The optical energy band gap of pure ZnSe and ZnSe doped with tellurium were calculated found to be 3.1 eV and 2.8 eV respectively, which are higher than bulk ZnSe (E_g =2.7eV). They show the clear blue shifting by which may be due to the crystalline size and energy gap confinement. A wide range of nanocrystals with different morphologies providing great opportunities for the discovery of new properties and potential uses have been synthesized via different methods including the thermal method, magnetron sputtering, pulse laser deposition and microwave heating method. Among these methods, microwave heating method has great advantages in synthesizing nanocrystals which demanding no extrme pressure control, easy handling and requiring no special or expensive equipment, these make the mehod more suitable and economical for production. It is well known that, because of quantum size effect and the reduction of microstructure- sized crystalline meterials into the nanometer size can result in the dramatic modification of their magnetic, electronic and optical properties.

Keywords: ZnSe , ZnSe:Te, nanocrystal, Microwave heating, Structural properties.

O38

Electrospun Nanofibers for Bone Tissue Regeneration

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ABSTRACT

In the present study, nanofibrous membranes of hydroxyethyl cellulose (HEC)/ poly(vinyl alcohol) (PVA) were fabricated using electrospinning technique by blending HEC with poly(vinyl alcohol) (PVA) by using water as solvent. Nanofibrous membranes with different weight ratio of HEC to PVA were electrospun and characterised. The microstructure of the obtained nanofibers were analysed by scanning electron microscopy (SEM) and the mechanical properties of the blend nanofibrous mats were examined by tensile test. The weight ratio of HEC / PVA in blend greatly influenced the mechanical properties of the blend nanofibrous mats. The proliferations of bone cells on the nanofibrous membranes were further investigated. The biocompatibility of the HEC/PVA nanofibrous membranes is supported by the cellular assays which showed excellent cell attachment and proliferation. The cell morphology and cell-matrix interaction were examined using SEM. The seeded cells were attached and grown well on the nanofibrous membranes with a well maintained phenotypic shape. The results show that these biocompatible HEC/PVA membranes which have polysaccharide chains can mimic the extracellular matrix (ECM) in structure and morphology, and has potential application in bone tissue engineering.

Keywords: Bone tissue engineering, Hydroxyethyl cellulose, Electrospinning, Poly (vinyl alcohol), Biomaterials.

O39

Optical and Structural Properties of Sm^{3+}/Yb^{3+}Co-Doped Sodium Tellurite Glasses

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ABSTRACT

Rare earth doped tellurite glasses are fundamentally interesting with several technological applications on account of their low melting temperature, high refractive index good infrared transmission. Recently, they have been considered as promising material for optical fibers, solid state up-converted lasers and non-linear optical devices. Co-doping tellurite glasses with the rare earth oxides it is the possible to enhance the optical properties following energy transfer from one rare earth ion to the other rare earth ion. Therefore, the aim of the present paper is to study the effect of co-doping on the physical and optical properties of sodium-tellurite glass. Sm^{3+}/Yb^{3+} co-doped tellurite glasses of the $(79.5\text{-}x)TeO_2\text{-}20Na_2O\text{-}0.5Yb_2O_3\text{-}xSm_2Cl_3$ system ($0.5\ mol\% \leq x \leq 2.0\ mol\%$) have successfully been synthesized by conventional melt quenching technique. The amorphous nature of the glasses has been confirmed by employing X-Rays diffraction technique. The optical and structural properties of these glasses have been investigated by the UV-Vis-NIR, photoluminescence and FTIR spectroscopy. From UV-Vis-NIR spectroscopy nine absorption bands of Sm^{3+} ions namely $^6H_{5/2} \rightarrow {}^4L_{13/2}, {}^4I_{11/2}, {}^6F_{11/2}, {}^6F_{9/2}, {}^6F_{7/2}, {}^6F_{5/2}, {}^6F_{3/2}, {}^6H_{15/2}$ and $^6F_{1/2}$ and one band corresponding to $^2F_{7/2} \rightarrow {}^2F_{5/2}$for Yb^{3+} have been observed. The oscillator strength of these bands has been calculate and is found to increase with the increase of Sm_2Cl_3 concentration. Four emission bands such as $^4G_{5/2} \rightarrow {}^6H_{5/2}, {}^6H_{7/2}, {}^6H_{9/2}$ and $^6H_{11/2}$ have been revealed by photoluminescence spectroscopy under the 477 nm excitation. The FWHM increased with the increase of Sm_2Cl_3 concentration indicating increase in photoluminescence intensity. The FTIR spectroscopy is used for structural studies in the glass system. The IR transmission bands were found at 615 cm^{-1} and 748cm^{-1} which are attributed to the stretching vibration mode of TeO_4 tbp and TeO_3 tp respectively. The shift in the bands position has been observed as the Sm_2Cl_3 content is being increased, showing the change in the basic units of theses glasses structure. The role of co-doping in enhancing the optical properties and affecting the structural changes are compared and understood.

Keywords: Tellurite Glass, Sm_2Cl_3, Optical properties, Co-doped, Absorption

O40

Hydrothermal Synthesis and Magnetic Properties of Core / Shell $Co_xNi_{1-x}Fe_2O_4$ Nanoparticles

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ABSTRACT

Spinel ferrites have attracted considerable attention in recent years because of their applicability in high-density magnetic recording devices, microwave devices, magnetic fluids and sensors. The cubic inverse spinel ferrite structure comprises $(metal)^{2+}$ ions, occupying octahedric B-sites, and Fe^{3+} ions, which occupy both tetrahedral A-sites and octahedral B-sites. Cobalt ferrite ($CoFe_2O_4$) is a well-known hard magnetic material with relatively high coercivity, whilst nickel ferrite ($NiFe_2O_4$) is a soft magnetic material with low coercivity. $CoFe_2O_4$ and $NiFe_2O_4$ both exhibit ferrimagnetism, originating from the magnetic moment of anti-parallel spins between Fe^{3+} ions at tetrahedral sites and Co^{2+} or Ni^{2+} ions at octahedral sites. The approach of hydrothermal synthesis (HS) offers effective control over the size and shape of $NiFe_2O_4$ and $CoFe_2O_4$ nanoparticles (NPs) at relatively low reaction temperatures and short reaction times, providing for well-crystallised reaction products with high homogeneity and definite composition. Iron (III), cobalt (II) and nickel (II) chlorides act as simple precursors for the formation of these spinel ferrites. The inclusion of both Co^{2+} and Ni^{2+} to form stoichiometric $Co_xNi_{1-x}Fe_2O_4$ results in an inverse spinel ferrite with controllable magnetic properties, depending on the Co^{2+} and Ni^{2+} concentration. The production of hetero-structured core/shell spinel ferrite NPs also allows for functional property control, with different magnetic moment contributions arising from the core and shell ferrites. In this context, the multistep HS and magnetic properties of hetero-structured core/shell $CoFe_2O_4/NiFe_2O_4$ (and $NiFe_2O_4/CoFe_2O_4$)

NPs, investigated using the combined complementary characterization techniques of TEM, SAED, EDX, EELS, SQUID, XPS and XRD, is presented.

Keywords: Cobalt ferrite, Nickel ferrite, nanoparticles, hydrothermal synthesis, core shell structure, magnetic properties.

O41

Synthetic Rutile as Precursor for Nano-TiO_2 Particle Synthesis: A Comparative Study

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ABSTRACT

This work details the characterization and comparison between nano-TiO_2 particles produced using synthetic rutile derived from local mineral precursors, with commercial nano-TiO_2 particles. Both samples will be characterized for physical properties such as its crystallite size and crystallinity (XRD), surface area (N_2 adsorption-desorption) and Morphology (SEM). From both samples are compared, and it was discovered that the crystallite size of the synthesized nano-TiO_2 is smaller, although it is less crystalline than its commercial counterpart. Its surface area is also much larger, although it lacks uniformity and suffers from extensive agglomeration when compared to its commercial counterpart. It is concluded that synthetic rutile is a viable precursor for nano-TiO_2 synthesis, but its shortcomings in certain physical outcome limits its potential applications.

Keywords: Synthetic rutile, Nano-TiO_2, Comparative analysis, N_2 adsorption-desorption, Crystallite size

O42

Silver Nanoparticles Induced Surface Plasmon Enhanced Emission in Sm^{3+}-doped Tellurite Glass

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ABSTRACT

In recent years, research on topically important metal nanoparticles (NPs) embedded tellurite glass is fuelled by the possibility of fabricating up-converted solid state lasers and photonic devices. Great efforts are dedicated on their extraordinary third-order non-linear properties and optical performances. Undoubtedly, the tellurite glasses are good candidates for photonic applications due to their high refractive indices, low phonon cut-off energy, large Raman gain, high infrared transmittance and good thermal and mechanical stability. In addition, they gained wide attention because of their potential as hosts of rare-earth elements for the development of fibres and lasers covering all the main telecommunication bands. They show promise for optical switching devices and up-conversion laser. However, the low value of absorption cross-section and large multiphonon nonradiative relaxation are the severe limitations for achieving higher quantum efficiency and the enhancement is inevitable. To enhance the optical performance and the absorption, incorporation of metallic NPs in addition to rare earth doping/co-doping are the routes. It is believed that the enhancement relies on energy transfer from a species with a large absorption cross-section to the rare-earth ions. Some studies demonstrated the order of magnitude enhancement of the luminescence intensity in the presence of NPs without mentioning much insight of the microscopic mechanism. Careful sample preparation and characterization plays paramount role in establishing a standard for manufacturing functional glasses. Despite intensive studies the role of metal NPs in improving the optical properties are far from being understood. We made an attempt to examine the effects of NPs by synthesizing a series of glass samples with controlled doping by further characterizing them structurally and optically. The silver NPs is introduced to samarium-doped tellurite glasses having different composition using melt quenching method. Growth of silver NPs are controlled through post-annealing of the glass below the glass transition temperature. The luminescence is further enhanced at the resonance with surface plasmon frequency of the NPs. The differential thermal analysis is used to obtain the glass transition temperature. Transmission electron

microscopy image reveals the presence and distribution of NPs. UV-Vis absorption and fluorescence measurement are performed for the optical characterizations. Interestingly, an increase in the concentration of NPs results an increase in the intensity of the plasmon band. We further assert that the large local field due to metal NPs around the luminescent ion is responsible in enhancing the luminescence efficiency. The results are compared and mechanism behind the surface plasmon resonance enhanced up-conversion emission is discussed in detail.

Keywords: Tellurite glass, Samarium, Silver nanoparticles, Upconversion, Plasmon band, Local field effect

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O43

Characterization of Ce-Doped Polycrystal-Multi phase ZnO Particles Prepared by Micelle Method

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ABSTRACT

A wide range of metal oxide with different morphologies and potential uses has been synthesized via different methods. In this scientific research, Ce-doped polycrystal-multi phase ZnO particles were fabricated through the micelle method. Morover, as a member of II–VI semiconductor materials, zinc oxide (ZnO) nanostructures have attracted much research interest for their excellent catalytic, gas-sensing, piezoelectric, and photoelectrochemical properties. ZnO has a wide band gap (3.37 eV) and large exciton binding energy of 60 meV. Recently, various doped ZnO nanostructures with different elements have been achieved to improve the electrical, optical and magnetic properties. Cerium is a major element in the useful rare earth family. To date, there are limited reports about fabrication of Ce-doped ZnO nanostructures. In this article, Ce doped zinc oxide particles prepared by micelle- precipitation method. The XRD pattern emphasized that the nanoparticle powders are mixture of three types of nanocrystalline, containing: ZnO, Ce_7O_{12} and $CeZn_3$. They have crystalline structures, hexagonal, rhombohedral and orthorhombic respectively. Various optical properties of zinc oxide doped with Ce particles such as absorption coefficient, extinction coefficient, optical band gap energy, Urbach energy, threshold wavelength, refractive index, and optical conductivity, dielectric constants including imaginary and real parts have been analyzed by using UV-Vis data.

Keywords: ZnO, micelle-precipitation, optical properties, nanocrystal

O44

Current State of Nanocatalyst in the Production of Biodiesel: A Review

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ABSTRACT

Increasing demand on fossil fuels in the world will escalate the environmental problem; one of the solutions is to produce alternative fuel from an environmentally friendly source. Biodiesel has become an alternative fuel. It is non-toxic and very low sulfur content, renewable, biodegradable, low volatility, high cetane number and salutary atmospheric CO_2 balance fuel. In general, the reaction to produce biodiesel is transesterification reaction by using vegetable or waste oils and animal fats with short chain alcohol such as ethanol or methanol with a present of a catalyst. Several new types of carriers and technologies have been implemented in the recent past to improve the affectivity of the catalyst in transesterification. Presently, nanomaterial as a support or as a catalyst offers new and interesting possibilities for the promising in transesterification to produce biodiesel. The union of the precise physical, chemical, optical and electrical properties of nanoparticles with the specific recognition or catalytic properties has led to their appearance in myriad novel nanomaterial application. Enhancement in the reactivity of nanocatalyst is associated with their increased surface area, greater concentrations of highly reactive edge, unusual, and stabilized lattice planes. The greater activity of nanocatalyst which afford operational simplicity, low energy consumption, greater safety, and the possibility of fewer side reactions in the process transesterification. This review article highlights the advantages, which include the ability of nanomaterial as catalyst or as support, and factors that influence the activity of nanocatalyst.

Keywords: nanocatalyst, biodiesel, support material, transesterification

O45

Photoluminescence Spectroscopy of Nd^{3+} doped Tellurite Glass Containing Silver Nanoparticles

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ABSTRACT

Recently, rare earth doped tellurite glasses received much attention due to their interesting properties such as high rare earth ions solubility, higher refractive indices than silicates and fluoride glasses, large amplification bandwidth, high infrared transmittance and good thermal and mechanical stability. However, the small absorption cross-section of most of the lanthanide ions makes these glasses unsuitable for photonic applications. Enhancing the optical absorption and thereby increasing the luminescence efficiency is the key issue. Most concept of this enhancement relies on energy transfer from a species with a large absorption cross-section to the rare-earth ions. The original research in nanoglasses is fuelled by the use of the metal NPs with rare earth ions for the enhancement of optical behavior. The research in rare earth doped tellurite glasses embedded with metallic nanoparticles (NPs) became attractive due to the feasibility of fabricating up-converted solid state lasers. In this connection, the focused objective of our study is to synthesize and examine the enhanced frequency up-conversion properties of these glasses that could lead to the development of new solid-state short wavelength laser. These glasses are promising because of their extraordinary third order non-linear properties and enhanced optical absorption. The synthesis and characterization of optical and thermal-optical properties of tellurite nanoglasses with controlled doping of metallic NPs are prerequisite for the optimization and diverse applications. Understanding their fundamental origin, the role of NPs and the microscopic mechanism behind improved optical performance is the most challenging task. The quantum effect due to NPs is an important factor to improve nonlinear optical performances of NPs-embedded glasses, while controlling the size distribution and content of NPs in the glass accurately is the key to obtain good quality. So far, there is no standard for controlled doping of and choice of metal NPs that lead to functional glasses. We report the structural, optical and thermal characteristics of tellurite nanoglasses for enhanced light energy up-conversion. The Nd^{3+} and Ag co-doped nanoglass are synthesized by melt-quenching technique and the photoluminescence spectroscopy is exploited for electrical transition investigations. The influence of Nd^{3+} ions and silver NPs in modifying the optical transition emission are discussed.

Keywords: Tellurite glass, Metallic nanoparticles, Up-Conversion, Photoluminescence

O46

Synthesis of Disc-shaped Polymer Nanoparticles Using Seeded Dispersion Polymerization in the Presence of Various Saturated Hydrocarbons.

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ABSTRACT

Recently, non-spherical nano-particles and their preparation methods have attracted interest of scientific and industrial circles. Among these particles, nano-discs have attracted much attention. Having a controllable aspect ratio and shape, these particles can be used in delicate applications like drug delivery systems and particle characterization. Seeded dispersion polymerization is a powerful technique for production of these particles and recently scientists have used this method in the presence of various organic solvents. In this work, the effect of monomer type on the formation of disc-shaped polymer particles by seeded dispersion polymerization of methyl methacrylate (MMA), ethyl methacrylate (EMA), n-butyl methacrylate (BMA) and Lauryl methacrylate (LMA) was studied in the presence of polystyrene (PS) seed particles with an average diameter of 1-5 µm average. In addition, effect of various saturated hydrocarbons, initiators and polarity of media were investigated. The analysis of optical and SEM micrographs showed that increasing alkyl chain length of ester group of the corresponding methacrylate, produced particles with shapes similar to an ideal disc.

Keywords: Nonspherical Shape, Seeded Dispersion Polymerization, Particle

O47

Optimization of Reaction Conditions of the Synthesis, Structure Characterization and Catalytic Activity of Some Metal Tungstate Nanoparticle

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ABSTRACT

In this study, an orthogonal array design (OAD), OA9, was employed as a statistical experimental method for the controllable, simple and fast synthesis of two metal (manganese and nickel) tungestate nanoparticles. Ultrafine metal tungestate nanoparticles were synthesized by a precipitation method involving the addition of metal ion solution to the tungestate reagent. The effects of reaction conditions, i.e., metal ion and tungestate concentrations, flow rate of reagent addition and temperature, on the diameter of the synthesized metal tungestate nanoparticles were investigated. The effects of these factors on the width of the metal tungestate nanoparticles were quantitatively evaluated by the analysis of variance (ANOVA)[1-3]. Finally, optimum conditions for synthesis of metal tungstate nanoparticles via this simple, fast, and cost effective method were proposed. The structure and composition of prepared nano-material under optimum condition was characterized by means of EDAX, X-ray diffraction (XRD), scanning electron microscopy (SEM), FT-IR spectroscopy, and photoluminescence. Finally, catalytic activity of the produced nanoparticles for the [2+3] cycloaddition reaction of nitriles with sodium azide to produce 5-substituted 1H-tetrazoles in DMF solution was investigated.

Keywords: Nanoparticle, Nickel tungstate, Manganese tungstate, Catalyst, Precipitation synthesis, Statistical optimization.

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O48

The Influence Erbium Doped on TeO_2 -ZnO-Na_2O of Nanoglass

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ABSTRACT

A lot of research has been done on rare earth doped tellurite glass because of their attractive properties such as fabrication at low temperature, low phonon energy, high refractive index, high dielectric constant, large amplification bandwidth, extended infrared transmittance, good corrosion resistance and thermal and chemical stability. The combination of variety of rare-earth ions into tellurite glasses has been promising good candidates for the development of optical devices. Especially, erbium-doped tellurite glasses have suitable features for optical application because of their excellent optical properties. Over the last few years, several extraordinary advantages have been observed for the rare earth doping into nanoglass and has great implication on the optical properties of theses glasses. In order to create a clear understanding the fundamental characteristics on the nanoglass, temperature heat treatment is very important for these properties of tellurite nanoglass. In this connection, we think that focused a study of both thermal and optical properties of tellurite glasses with temperature heat treatment. On the other hand, content of Er^{3+} extensively give affect the luminescence of tellurite nanoglass. The tellurite nanoglass doped with Er^{3+} synthesized by melt-quenching technique. The photoluminescence spectroscopy is exploited for electrical transition investigations. The influences of Er^{3+} ions in modifying the optical transition emission have been obtained in the present work and discussed.

Keywords: Tellurite glass, Thermal, Photoluminescence, Nanoglass,

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O49

Optimization in Synthesis of Hybrid Spherical Silica Particles from Agricultural Waste via Sol-Gel Technique

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ABSTRACT

An optimized synthesis of hybrid silica particles via sol gel technique from rice husk is described. This study investigated a sol-gel technique as a function of alcohol amount, reaction pH and dilution of water in order to get the optimum conditions for preparing silica particles. Transmission electron micrographs revealed the formation of spherical shape and stable silica particles with range particle size of 30-400nm when using alcohol compare without using alcohol, the silica particles were irregular shape and hardly to measure the particle size. Surface characteristic of the sample depend mainly upon reaction pH and agglomeration of silica can be reduced by diluting the sodium silicate with distilled water. Electron microscopy, N_2 adsorption/ desorption measurements; XRD analysis, FTIR analysis and Image analysis were performed to elucidate the chemical and physical properties of silica particles.
The objective of this study was to developed an inexpensive and environment-friendly which lead to solving pollution problems and suitable for using as filler in dental materials.

Keywords: Rice husk, silica, sol-gel, material

O50

Comparative Study of Fabrication Porous Silicon using Alternative and Direct Current Methods

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ABSTRACT

In this work, we produced micro and nano structure porous silicon (PS) using alternating current (AC) and direct current (DC), two different methods were employed to prepared (PS) at different preparation condition. Scanning electron microscope (SEM) and reflections spectrum have been used to characterize the morphological and optical properties of PS. Our results shows the AC samples have uniform and high porosity compare to DC samples, these results were confirmed by reflectivity measurements which show the AC samples have low reflection for wide spectrum compare with the DC samples. These results give good improvement in the solar cell efficiency.

Keywords: porous silicon, electrochemical etching, reflectivity, solar cell.

O51

Synthesis and Dielectric Properties of Zinc-Aluminium Layered Double Hydroxide Nanocomposite

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ABSTRACT

Zinc–Aluminium Layered Double Hydroxide (Zn–Al–NO_3–LDH) precursors were prepared using the coprecipitation method in two categories, first one at different Zn^{2+}/Al^{3+} molar ratios (2, 3, 4, 5 and 6) with adjusting pH value at 7.5. The second category at different pH values (6, 7, 8, 9 and 10) with constant molar ratio of 4, as a part 1 of this work. The second part of work is the calcination of Zn–Al–NO_3–LDH sample prepared at Zn^{2+}/Al^{3+} molar ratio of 4 and pH value of 7 at two temperature ranges, the first range of 50–150 °C. The structural, morphological, thermal and dielectric responses were studied. For changing of Zn^{2+}/Al^{3+} molar ratios samples, the crystallinity of LDH were found to improve as molar ratio decreased due to the distortion of the hydroxide sheet networks of the LDH crystal by the larger difference in ionic radii of Zn^{2+} and Al^{3+}. On the other hand, the crystallinity of pH-value changing samples were improved as the pH-value increased due to the increasing the precipitation of Zn^{2+} ions into the LDH slurry. For the calcination temperature at and below 150 °C, LDH structure was well preserved. The dielectric response of the LDH is believed to be caused by two charge carriers: the protons of the LDH water molecules and the NO_3^- interlayer anions, which can be described by the anomalous low frequency dispersion with the second type of Universal Power Law. The dominance of ZnO dipoles and charge carriers (NO_3^- ions) in the dielectric relaxation increases with the increasing molar ratio.

O52

Synthesizing of Trehalose Based Alkyldiglucosides on Mesoporous Silica Sol-Gel Catalyst.

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ABSTRACT

Alkyldiglucosides prepared by Fischer direct glycosidation process, involving condensation of decanol with trehalose in the presence of mesoporous silica sol-gel as a catalyst. Alkyldiglucosides are mild and biodegradable non-ionic surfactant that offers excellent performance for consumer products. Due to that, alkyldiglucosides have a broad application and widely used in detergents, cosmetic, industrial cleaners, and even in agricultural applications. *p*-toluene sulfonic acid and sulfuric acid have been used as catalyst in tradition because of their good catalytic. However, main problem using liquid catalyst is the need of final neutralization step and the difficulties to separate it from the products. In this work, mesoporous silica sol-gel is used to avoid the main problem. The product was confirmed by using the by FT-IR, ^{1}H and ^{13}C NMR and ESI LC-MS (ToF). Confirmation with FTIR spectroscopy gives a prominent band at wavenumber 1121-1057 cm^{-1} (ether linkage, C-O-C). This showed the condensation of the hydroxyl group of trehalose with decanol.

The ^{1}H-NMR spectrum showed protons of the alkyl CH_3 groups (*t*, 3H, $CH_3(CH_2)_9$), at δ = 0.86 ppm, the CH_2 protons of alkyl chain (16H, CH_3-$(CH_2)_8$) dominated the spectrum at δ = 1.25- 1.29 ppm. The protons of the hydroxyl groups of trehalose are found at δ = 4.3 ppm. The alkyl CH_2 protons attached to trehalose (m, 2H, O-$CH_2(CH_2)_8$), are found at δ = 3.3 ppm and CH protons of the trehalose moieties are found as multiplet at δ = 3.39 ppm. The ^{13}C-NMR spectrum showed the terminal CH_3 are found at δ = 14 ppm, the methylene carbons are found between δ = 25 ppm and δ = 33 ppm. The peak at δ = 60 ppm is CH_2OH (of glucose ring) carbon atom. The remaining peak at δ = 67- 77 ppm are the carbon of CH-O which directly attached to the trehalose ring and the carbon atoms of the trehalose ring, with the exception of the anomeric carbon. Anomeric carbon attached to two oxygen atoms and deshielded at δ = 98 ppm and δ = 103 ppm, each for α- and β-anomer.

The mass spectrometric was studied by positive-mode ESI LC-MS (ToF). Alkyldiglucosides was identified by the m/z value of the adduct ions $[M + Na]^+$ and

$[M + H]^+$. The m/z 481.3571 and 477.4682 correspond to the m/z of $[M + H]^+$ ions while 685.4487 correspond to m/z of $[M + Na]^+$ ions which both exist due to the different affinities α- and β-anomers toward Na^+.

Alkyldiglucosides from trehalose and decanol have been synthesized successfully on mesoporous silica sol-gel.

Keywords: alkyldiglucosides, trehalose, mesoporous silica sol-gel.

O53

Characterization of Nano-Structure Synthesized Ion Exchange Resins (SIERs)

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ABSTRACT

Nine different nano-structure ion exchange resins were prepared during this study, which can be based on their DVB content (10, 25 and 40%) and dilution degree (50, 100 and 200%). Variations in DVB content and dilution degree produced a range of SIER morphologies, from gel-type to macroporous structures with different physicochemical properties and morphological characteristics. FTIR confirmed that the amine group had been successfully grafted onto the polymeric resin beads. It was found that SIERs produced with 50% dilution degree displayed gel-like structures, characterized by high apparent density. Clearly, an increase in the dilution degree of the monomers to diluents increased the formation of more porous structures with larger pores, except for SIER-6 at 200% DD, and 10% DVB. Similarly, an increase in DVB content increased polymer crosslinking, leading to phase separation occurring earlier at low polymerization conversions, leading to the formation of larger entangled polymer nuclei, fewer collapsed and more porous structures. In addition, an increase in DVB content increases the surface area and 'true pore' volume of resins synthesized at a 100% dilution degree. However, this was not true for copolymers produced at 200% dilution degree, where an increase in DVB content reduced surface area and 'true pore' volume. Overall, SIER-6 (200% DD, 10% DVB) exhibited the highest surface area and 'true pore' volume, at 398.8 m^2/g and 0.89 cm^3/g, respectively. The highest 'true pore' diameter was obtained with SIER-4 (200%, 40% DVB) at 22.3 nm. These SIERs will be used as as heterogeneous catalysts for transesterification of triglycerides.

Keywords: Synthesized Ion Exchange Resin, Inverse Steric Exclusion Chromatography, and Heterogeneous Catalyst.

O54

Bisphenol A MIP Fabrication Using the Application of Factorial Design Analysis

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ABSTRACT

Molecular imprinted polymer (MIP) has caught the attention of many researches in recent years as a great tool for molecule recognition and other applications. But the main issue in the synthesis of MIP nanoparticles is the identification and optimization of the main factors affecting the material structure and size. This paper describe an experimental design approach to synthesis bisphenol A molecular imprinted polymer nanoparticles (BPA-MIP NPs) aimed at analysis of the relationship of four selected parameters: the polymerisation temperature, agitation rate, cross-linker to solvent ratio, and percentage of initiator. The results presented demonstrate the importance of keeping the right balance between these various parameters of polymerisation conditions which are approximately 60^{o}C, 100rpm, 65% solvent ratio and 1% initiator, respectively. Generally, it can be concluded that MIPs should be synthesized using enough heating, adequate agitation, low concentration of initiator and with a bit higher amount of solvent. Such procedure is proven as time and cost effective, and also can be used as a general tool in the preparation of MIP NPs for many different target molecules.

Keywords: Bisphenol A, Molecular imprinted polymers, Nanoparticles, Full factorial design

O55

Magnetic and Structural Properties of Nanocrystalline ALNICO-5 Alloy

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ABSTRACT

The crystal structure of an Alnico-5 Alloy during different annealing temperature up to 1050 °C for 1 hour has been monitored by measuring the magnetic hysteresis loop. X-ray diffraction and vibrating sample magnetometer (VSM) were used to characterize the phase composition and magnetic properties. The results found that, the effect of the annealing degree is the major parameter on particle size, phase transition and magnetic properties. The results also showed that grin size decreased with the increasing temperature from 18.3 nm at room temperature to 12.2 nm at 950°C. The maximum coercive force (He) with residual magnetization (Br) also increased with increasing temperatures above RT. The oxidation of the alloy with new crystalline phase leads to change the magnetic and structure properties at 1050 °C were found. A good correlation has been established between the structure and magnetic properties.

Keywords Alinco Alloys, Magnetic properties, Hysteresis loop

O56

An Experimental Study on Dependency of Charge Particle's Kinetics in DSSC to the Photoelectrode Area

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ABSTRACT

The ceaseless demand of energy around the globe, the diminishing primary energy resources, immediate increase in fossil fuels prices in last few decades and the global warming issues drives the researcher's attention to seek it from environmentally favourable resources. Despite of its emergence as a successful contender to conventional PV, the scalability issue of DSSC is yet to be addressed. The devices that obtained higher efficiency were on lab scale with the photoelectrode area unsuited for commercial applications. Charge transport within the device is a fundamental factor that involves in the lowered efficiency when scalability is concerned. Without a complete understanding of the charge kinetics at nanoscale level, it is unimaginable to improve the cell efficiency. An empirical study has been carried out to understand the dynamics of charge particle with a range of device areas ($0.16cm^2$-$1.96cm^2$) using standard TiO_2 porous layer (d=thickness, 9-14µm) and characterized by using impedance spectroscopy. The different parameters like; chemical capacitance, charge transport resistance, charge transfer resistance and the electrolyte diffusion co-efficient have been canvassed using a well-known transmission line model. This study demonstrated a descent in overall cell efficiency with an increase in cell area.

Keywords: DSSC, Scalability of DSSC, Charge transport in DSSC, Efficiency of DSSC

O57

Anodic Aluminiun Oxide Templates Synthesized by Electrodeposition for High Aspect Ratio of Nanowires

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ABSTRACT

In this paper, we investigate the fabrication of high aspect ratio anodic aluminiun oxide (AAO) from aluminium foils using an electrodeposition technique for the fabrication of a variety of nanostructures. An annealing process was implemented in pre-treatment before electrodeposition to improve the mechanical properties of the foils. Oxalic acid and sulphuric acid were used as electrolytes which form templates with varying pore sizes depending on the parameter settings, essentially the anodizing potential and electrolyte concentration. The tunable pore diameter and array of nanopores were obtained for the range of voltage potentials between 20-50 V and concentrations of 0.2 M - 5.0 M. Sample characterizations were done using field emission scanning electron microscopy (FESEM) and transmission electron microscopy (TEM). The result shows the relationship between different anodizing voltages on the pore diameter of alumina nanostructures. In contrast, the concentration effect appears to be very significant as shown by high-aspect ratios on selected pores. The results offer the optimal of the pore arrangement of templates (30-70 nm) with expected high-aspect ratio of nanowires exceeding 200. Moreover, here an exhaustive study on the main challenges of making stabilized templates is also investigated.

Keywords: anodic aluminium oxide, electrodeposition, pore size, nanostructure

O58

Influence of Operating Temperature on Turbulent Heat Transfer Coefficients of TiO_2 Nanofluid in Base Liquid Water

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ABSTRACT

The thermo physical properties such as thermal conductivity, viscosity, density and specific heat of nanofluids are required in the estimation of convection heat transfer coefficients. The density and specific heat of nanofluids is estimated using the law of mixtures. The data of thermal conductivity and viscosity of Cu and oxides such as Al_2O_3, TiO_2, CuO, ZnO, ZrO_2 is available at different concentrations, temperatures and particle sizes. The investigators determined the properties in the experimental range of heat transfer coefficients required for their study.

The experimental heat transfer coefficients (htc) estimated under turbulent flow conditions confirm heat transfer coefficients to increase with nanofluid concentration. To compare heat transfer enhancements of different nanofluids under similar operating conditions, the properties are to be known. It is essential to develop equations for viscosity and thermal conductivity valid in a range of operating conditions. Hence, non-linear regression equations are developed for the estimation of thermal conductivity and viscosity of water based nanofluids as a function of material properties, concentration, and temperature and particle size.

Titanium dioxide (TiO_2) nanoparticles of average diameters 30-50nm are uniformly dispersed in water. Experiments are conducted to determine turbulent forced convection heat transfer coefficients in the volume concentrations range of 0.7 – 3.0% for flow in a tube at two fluid temperatures. It is observed that the heat transfer coefficients increases with Reynolds number of flow. The enhancements in htc with temperature conducted at 25 and 30^{o}C are different, as the values increase with concentration, reach a maximum and decrease thereafter.

The enhancement in htc when operating at nanofluid temperature of 25^{o}C, for 1.0 and 1.5% volume concentration is respectively 33% and 4.3% when compared to distilled water at Reynolds number of 17500. However, the htc is lower than water by 12.6% when estimated at 2.0% concentration. When the operating temperature is 30^{o}C, the enhancement in nanofluid htc for 1.0, 1.5 and 2.0% concentration respectively is

5.5%, 13.6% and 0.5% when compared to distilled water at Reynolds number of 20000. However, the htc is lower than water by 5.8% when estimated at 3.0% concentration.

The conditions under which the heat transfer coefficients decrease are analysed with the aid of thermal conductivity and viscosity equations developed. The decrease in heat transfer coefficients observed by certain investigators is explained.

O59

The Effect of Multilayer Gold Nanoparticles on the Electrochemical Response of Ammonium Ion Biosensor Based on Alanine Dehydrogenase Enzyme

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ABSTRACT

The use of multilayer of gold nanoparticles (AuNPs) attached on gold electrode surface via thiol chemistry to fabricate an ammonium (NH_4^+) ion biosensor based on alanine dehydrogenase (AlaDH) was investigated. The approach of the study was based on construction of biosensor by direct deposition of AuNPs and 1,8-octanedithiol (C8-DT) onto the gold electrode surface. For the immobilisation of enzyme, 2-mercaptoethanol (2BME) was first covalently attached to AlaDH via esther bonding and then followed by chemically attached the 2BME-modified AlaDH (2BME-AlaDH) moiety onto the AuNPs electrode via the exposed thiol group of 2BME. The resulting biosensor response was examined by means of amperometry for the quantification of NH_4^+ ion. In the absence of enzyme attachment, the use of three layers of AuNPs was found to improve the electrochemistry of the gold electrode when compared with no AuNPs was coated. However, when more than three layers of AuNPs were coated, the electrode response deteriorated due to excessive deposition of C8-DT. When AlaDH was incoporated into the AuNPs modified electrode, a linear response to NH_4+ ion over the concentration range of 0.1-0.5 mM with a detection limit of 0.01 mM was obtained. In the absence of AuNPs, the NH_4+ ion biosensor did not exhibit any good linear response range although the current response was observed to be higher. This work demonstrated that the incorporation of AuNPs could lead to the detection of higher NH4+ ion concentration without the need of dilution for high NH_4^+ ion concentration samples with a rapid response time of < 1 min.

O60

Preparation and Morphology Investigation of Novel Heat Stable Zirconia-reinforced Nanocomposites Containing Chlorinated Poly(amide-imide)

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ABSTRACT

In the present investigation, for the first time, a new nanostructure poly(amide-imide) (PAI) was synthesized from the polymerization reaction of 4,4′-methylenebis(3-chloro-2,6-diethyl trimellitimidobenzene) as a novel diacid with 4,4′-methylenebis(3-chloro-2,6-diethylaniline) using tetra-*n*-butylammonium bromide and triphenyl phosphite as a condensing agent and green media. The obtained polymer was used to prepare PAI/ZrO_2 nanocomposites using nano-ZrO_2 surface-coupled by 3-aminopropyltriethoxylsilane as a coupling agent through ultrasonic cavitations process. TGA curves confirmed that the heat stability of the prepared nanoparticle-reinforced composites was improved in the presence of ZrO_2 nanocrystals.

Keywords: Nanocomposite, Poly(amide-imide), Heat stable, Zirconia nanoparticles

O61

Luminescence Studies on Lithium- Calcium Borophosphate Glasses doped with Fe^{2+}, Ni^{2+} and Zn^{2+} ions

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ABSTRACT

Luminescence material is a solid which converts certain types of energy into electromagnetic radiation over and above thermal radiation. Due to the limited studies on luminescence properties of the transition metal ion doped glass, this present study aiming to understand further the effect of doping different transition metal ions to the luminescence properties. This paper report on the luminescence properties of $25Li_2CO_3$-$25Ca_2CO_3$-$30B_2O_3$-$20P_2O_5$ glasses doped with 1 mol % of different transition metal ions (Fe, Ni, and Zn) which had been prepared by melt quenching technique. The luminescence properties were analyzed based on emission spectra obtained from the photoluminescence spectroscopy. The luminescence spectra of $25Li_2CO_3$-$25Ca_2CO_3$-$30B_2O_3$-$20P_2O_5$: Fe^{2+} consists of three band regions in the range from 272 to 489 nm, 516 to 689 nm and 754 to 861 nm. It exhibits indigo emission band which is centered at 430 nm and this band has been assigned to the transition of $z^8D^\circ_{5/2} \rightarrow z^6D^\circ_{3/2}$. While for the luminescence spectra of $25Li_2CO_3$-$25Ca_2CO_3$-$30B_2O_3$-$20P_2O_5$: Ni^{2+}, it exhibits a strong orange emission band centered at 580 nm and this band has been assigned to the transition of $^2P^\circ_{1/2} \rightarrow {}^4F_{9/2}$. Lastly, for the luminescence spectra of $25Li_2CO_3$-$25Ca_2CO_3$-$30B_2O_3$-$20P_2O_5$: Zn^{2+}, it exhibits a strong indigo emission band at 433 nm ad this band has been assigned to the transition of $^2S_{1/2} \rightarrow {}^2D_{3/2}$.

Keywords: Borophosphate glass, Lithium, Calcium, Fe^{2+}, Ni^{2+} and Zn^{2+} ions, Luminescence

O62

Luminescence of Er^{3+} – doped Tellurite Glass containing Silver Nanoparticles

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ABSTRACT

The glasses containing metallic NPs and rare earth ions are attracting renewed interest because the NPs may change the material's luminescence characteristics. The luminescence enhancement is presented and the role of metallic nanoparticles is discussed. To improve the nonlinear optical performance of NPs-embedded glasses is the concept of quantum effect in controlling the size distribution and content of NPs in the glass accurately. The absorption cross-section of the most lanthanide ions in tellurite glass is small that requires further enhancement. For luminescence efficiency and improved up-conversion absorption cross-section both has to be increased. Most concepts for this enhancement rely on energy transfer from a species with a large absorption cross-section to the rare earth ions. However, the concentration of rare-earth ions should be low enough to avoid the quenching effect of up-conversion luminescence. The quantum effects associated with surface plasmon resonance (SPR) further enhances the emission when the luminescence frequency of the material is in near resonance with the surface plasmon frequency of the metal NPs. We study the effect of SPR resonance in silver NPs embedded rare earth doped glass. A series of Er^{3+}: Ag- tellurite glass nanocomposites are prepared by the conventional melt-quenching method and their optical characterizations are made using UV-Vis and PL spectroscopy. Structural studies are carried out using XRD. The small amount of silver NPs in glass is found to enhance the luminescence efficiency. Silver NPs exhibit unique and tunable optical properties on account their SPR. The Er^{3+} luminescence is mainly attributed to the local field where the SPR of silver NPs causes an intensified field around NPs. The effect of silver NPs concentration on the luminescence properties of Er^{3+} doped tellurite glasses is explored. Local field enhancement induced by the Ag SPR and energy transfer from fluorescent Ag – Er^{3+} ions are found to be responsible for this enhancement. The study the frequency up-conversion mechanism and exploitation of SPR and local field properties of metallic NPs embedded in glasses matrix may shows different levels of enhancement in fluorescence.

Keywords: SPR, Absorption Cross-Section, Up-conversion, Quantum Effect, Luminescence

O63

Angiotensin-Converting Enzyme Inhibitor and Controlled Release Properties of Perindopril Erbumine-Layered Double Hydroxide Nanocomposite

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ABSTRACT

The intercalation of perindopril erbumine (PE) into ZnAl-NO_3-layered double hydroxide (LDH) resulted in the formation of a host-guest type of material. By the virtue of the ion-exchange property of LDH, PE was released in a sustained manner. Therefore, this intercalated material can be used as a controlled release formulation. Perindopril was intercalated into the interlayers and formed a well-ordered layered organic–inorganic nanocomposite. The basal spacing of the products was expanded to 21.7 and 19.9 Å when the product was synthesised by the ion exchange and co-precipitation methods, respectively, in a bilayer and a monolayer arrangement, respectively. The release of perindopril from the nanocomposite synthesised by the co-precipitation method was slower than that of its counterpart synthesised by the ion-exchange method. The kinetic release was governed by pseudo-second order kinetics. An *in vitro* antihypertensive assay showed the intercalated PE has similar effectiveness on the antihypertensive property but better thermal stability than its free counterpart, therefore can be used as a controlled release formulation of antihypertensive drug.

Keywords: Perindopril erbumine, Layered double hydroxides, Ion exchange, Co-precipitation, Sustained release.

O64

Preparation of Saucer-Like Polymeric Nanoparticles via Seeded Dispersion Polymerization in the Presence of Saturated Hydrocarbon Droplets

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ABSTRACT

In recent years, polymer spherical particles especially polystyrene particles and their methods of preparation have attracted enormous interest in scientific communities all around the world. Seeded dispersion polymerization is a powerful technique for production of these particles and recently scientists have used this method in the presence of various organic solvents. In this work, saucer-like polymeric composite nanoparticles produced by seeded dispersion polymerization of styrene in the presence of poly ethylhexyl methacrylate (PEHMA) seed particles and Dodecane saturated hydrocarbon. The effect of various polymerization parameters such as stabilizer and initiator concentrations, methanol/water (w/w) ratio and polymerization temperature on the formation of these particles has been studied. Analysis of optical and SEM micrographs showed that the morphological development during the polymerization was retarded at "mushroom-like" and "inverse hamburger-like" morphology ogy, which are precursor of the saucer-like particles.

Keywords: Nonspherical Shape, Seeded Dispersion Polymerization, Nanoparticles

O65

Up-conversion Enhancement in Erbium Doped Tellurite Glass: Plasmonic Coupling

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ABSTRACT

Surface plasmon resonance (SPR) is a significant outcome of metallic nanoparticles (NP) to improve the optical and particularly non-linear properties of dielectric hosts. Interaction of light with metallic NPs leads to confine the large electric field around the NPs and to enhance the quantum efficiency of surrounding fluorophores in convertor glasses. Lightning rod effect and energy transfer are the major factors to reach such enhancements by increasing the radiative rate or intensifying the photon density around the fluorophores. Several advantages and applications of tellurite oxide present it to be a promising dry matrix to embed the trivalent lanthanides and to growth the metallic (Cu, Au and Ag) NPs. Glass samples with compositions (79-x)TeO_2 – 20ZnO – 1Er_2O_3 – xAgCl (where x=0.5 and 1 mol%) were prepared to study the annealing time and distribution effects of NPs on upconverted emissions of erbium ions. The conventional melt-quenching technique was carried out to synthesize the samples. Differential thermal analysis (DTA) of glasses was performed to obtain the glass transition, crystallization and melting temperature. Samples were annealed above the glass transition temperature to reduce the mechanical stress, to constitute the neutral NPs ($Ag^+ \rightarrow Ag^0$) and to aggregate and growth the silver NPs into the bulk. Glass density, average distance between Er^{3+}- Er^{3+} ions, Ag-Ag particles and Er^{3+}-Ag couples were calculated. UV-VIS-NIR absorption spectra of different samples were measured using a commercial spectrophotometer. Surface plasmon absorption band of Ag NPs were detected by preparing a single-doped zinc tellurite glass. Transmission electron microscopic imaging (TEM) were performed to capture the size and shape of NPs. Fluorescence spectra were measured to observe the plasmonic effect on emissions in visible range by exciting the samples under 786 nm laser. The major emission bands of Er^{3+} ions in visible range (one red and two green bands) are revealed in photoluminescence spectrum, originating from $^2H_{11/2}$, $^4S_{3/2}$ and $^4F_{9/2}$ excited states to $^4I_{15/2}$ ground state and a magnificent enhancement were achieved. This result is contributed and explained through the large localized electric field and energy transfer mechanism from surface of NPs to Er^{3+} ions. Tellurite glass doped

with Er^{3+} and Ag NPs shows promising properties to apply as color displays and many other nanophotonics devices.

Keywords: Silver nanoparticles, localized surface plasmon resonance, tellurite glass, metal-enhancement florescence

O66

Analysis of Nanoparticle Additive Three-layered Journal Bearing

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ABSTRACT

This work presents an analysis of nanoparticle additive three-layered journal bearing. A three-layered fluid film of different Newtonian dynamic viscosities at the surface (journal and bearing adjacent fluid film layers) and core is considered in the analysis. The modified classical Reynolds equation is derived taking into consideration of surface adjacent and core fluid film layer's film thickness and viscosity of nanoparticle additive fluid. All the three fluid film layers are assumed to be Newtonian. The Reynolds boundary conditions are used in the steady state analysis. Pressure distribution is obtained by integration of modified Reynolds equation using Reynolds boundary conditions.

Load capacity parameter and coefficient of friction are analyzed with surface (journal or bearing) adjacent fluid film layer thickness ratio using (i) dynamic viscosity ratio of surface to core layer; (ii) dynamic viscosity ratio of core to surface layer; and (iii) nanoparticle volume fraction. Nanoparticle additives increase lubricant viscosity and hence influence the fluid film bearing performance characteristics.

Based on the analysis presented in this work, higher non-dimensional load capacity (W) is obtained for a three-layered journal bearing operating with (i) higher dynamic viscosity of fluid film layers and (ii) nanoparticle additive fluid. The coefficient of friction (C_f) decreases with high viscosity surface adjoining layer fluid film. However, coefficient of friction (C_f) for a three-layered journal bearing is not influenced by the addition of nanoparticles.

Keywords: Journal bearing, nanoparticle additives, three-layered film, load capacity, coefficient of friction

O67

Structural and Morphological Studies of CdS Nanostructures

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ABSTRACT

Cadmium sulfide (CdS) thin films of nanostructure were prepared with different percentage of molarities (1.2 to 0.01 and 0.03 mol/L) and different spin coating speed (1000 and 3000 rpm) using sol-gel spin coating technique. Structural, morphological and analytical studies were investigated by X-ray diffraction XRD, scanning electron microscopy (SEM), fourier transform infrared (FTIR) and atomic force microscopy (AFM). It is found that the average grain size of CdS in the thin films is 60 to 400 nm. The physical conditions were kept identically while growing all the samples. The effect of grain size on the semiconductor properties is under consideration.

Keyword: CdS; Sol-gel spin coating; Grain size.

O68

The Mechanism of Core-Shell Formation of Cu-Al Bimetallic Nanoparticles under Gamma Irradiation

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ABSTRACT

Colloidal Cu-Al bimetallic nanoparticles were prepared by gamma irradiation method in an aqueous system in presence of polyvinyl alcohol and isopropanol as a colloidal stabilizer and scavenger of hydroxyl radicals, respectively. The gamma irradiation was carried out in a ^{60}Co gamma source chamber with different doses up to 120 kGy. The formation of Cu-Al nanoparticles has been observed initially by the change in colour of the colloidal samples from colourless to brown. The nanoparticles properties were characterized by transmission electron microscopy (TEM), energy dispersive X-ray spectrometry (EDX), and UV-Vis spectrophotometer. TEM and EDX results presented that Cu-Al nanoparticles are in core-shell structure. Precursor concentration and absorbed dose are the key parameters for controlling the size and size distribution during the reduction process. The average particle diameter increases with increase of precursor concentration and decreases with increase of dose. This is owing to the competition between nucleation process, aggregation process, and ions association in the formation of nanoparticles during irradiation.

Keywords: Cu-Al nanoparticles; Gamma irradiation method; particle size; core-shell structure.

O69

A Novel Bionanocomposite from Functionalized Multiwalled Carbon Nanotubes with an Amino Acid-Based Poly (amide-imide)

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ABSTRACT

It is well recognized that the properties of polymeric materials are highly affected by nano-sized fillers incorporated into the polymer matrix, which are highly dependent on the type and the dimension of fillers, their dispersion state, and the interaction with the polymer matrix [1]. Carbon nanotubes (CNT)s are high efficient in improving the composite properties because of their extremely high aspect ratio and low density. Recently, there has been an increasing attention in the studies of polymer/CNT nanocomposites (NC)s due to the unique combination of promising properties and construction of multifunctional structures of each component. These NCs exhibit potentially superior the thermal, electrical, and mechanical properties than the pristine polymers [2-4]. However, intrinsic van der Waals attraction among CNTs, in combination with their high surface area and high aspect ratio, often leads to significant agglomeration, thus preventing efficient transfer of their unique properties to the polymer matrix. To achieve homogeneous dispersion of CNTs in polymer matrix by facile mixing, chemically treated CNTs have been employed. Therefore, CNT has been functionalized to overcome its low dispersion and compatibility [5,6]. In this investigation, for the first time, the high compatibility of amino-acid based poly(amide-imide) (PAI) as a polymer matrix for acid-modified multi-walled carbon nanotubes (MWCNTs) is discussed. PAI was synthesized from the direct polycondensation reaction of N,N′-(pyromellitoyl)-bis-L-isoleucine with a dopamine-based diamine, 3,5-diamino-N-(3,4-dihydroxy-phenethyl)benzamide, in a medium consisting of a molten salt, tetrabutylammonium bromide (TBAB), and triphenyl phosphate (TPP) as the activator. To obtain homogeneous dispersion of MWCNT in PAI matrix, acid treatment of MWCNT is chosen in this study. The obtained bionanocomposites (BNC)s containing 5, 10, and 15 wt% MWCNT-COOH exhibited relatively good dispersion in macroscopic scale. Aromatic PAI/MWCNT composite films have been prepared by casting a solution of precursor polymer containing

MWCNTs into thin films and the film tensile properties were examined. Incorporation of MWCNTs improved the mechanical properties significantly. The PAI and BNCs were also characterized by Fourier transform infrared spectroscopy (FT-IR), powder X-ray diffraction (XRD), field emission scanning electron microscopy (FE-SEM), and thermal gravimetric analysis (TGA). The thermal stability of the BNCs containing the CNTs was improved due to the enhanced interfacial interaction and good dispersion between the PAI matrix and modified CNTs. FE-SEM images of fracture surfaces of neat PAI and BNCs are displayed in Fig. 1.

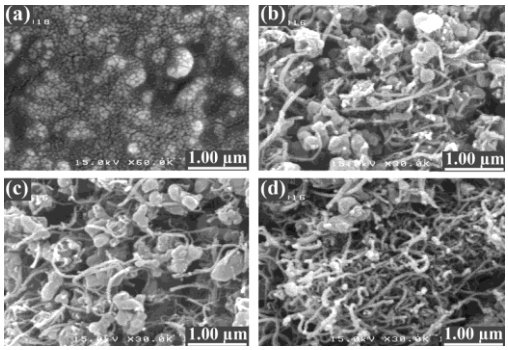

Fig. 1 FE-SEM micrographs of (a) pristine PAI and NCs containing (b) 5 wt%, (c) 10 wt%, and (d) 15 wt% modified MWCNTs.

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O70

Effect of Nanofiller on Puncture Resistance of High Strength Coated Woven Fabric

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ABSTRACT

Coated fabrics are widely used for technical textile applications and therefore are often subjected to various conditions such as snagging, puncture, bursting and tearing. Puncture resistance test are normally conducted on coated fabric to measure the load needed to penetrate the fabric. Of late, there have been some interests in coating high strength fabrics with natural rubber latex (NRL). However, the addition of fillers in the form of carbon nanotube (CNT) and its relation with puncture resistance are not fully understood. The purpose of fillers addition is to get the desired properties of the NRL as fillers have various functions towards latex's properties. Therefore, the main objective of this study is to investigate the effects of nanofiller on the puncture resistance of high strength coated woven fabric.

High strength Kevlar woven fabric was coated with NRL and CNT filled NRL. The coated fabrics were tested for puncture resistance test and results were compared with neat fabrics. Three different puncture probe shapes were used to test the fabrics which were in the form of conical shape, ogival shape and hemispherical shape. The results suggest that the NRL coated fabric gave higher puncture resistance in comparison with the neat fabric. The result also showed that the CNT filled influenced the properties of the coated fabric by increasing the resistance to puncture for all probe shapes. Among the puncture probe shapes, the hemispherical shape gave the highest puncture resistance result. It can be said that the CNT filler have some significant effect on the puncture resistance of the high strength coated fabric.

Keywords: carbon nanotube, Kevlar, puncture, coated, natural rubber latex

O71

Preparation and Characterization of Mesoporous Alumina Membrane Containing Iron Oxide Nanocrystallites Using Sol-Gel Method

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ABSTRACT

Iron containing alumina membranes have been prepared using the sol–gel method using a dip coating process. Pure and iron-doped γ-alumina membranes have been synthesized with (Fe/Al+Fe) weight fraction of 0.06. The effect of thermal treatment of the unsupported membranes on the iron dioxide phase was studied in the range of 400- 600 ^{o}C. The unsupported membranes were characterized by X-ray diffraction (XRD). Characterization showed that iron species present in nanocrystals and γ-Fe_2O_3 phase. Scanning electron microscopy (SEM) images of supported membranes revealed that the membranes were cracks-free. The gas permeance test for the supported membranes exhibit Knudsen diffusion behaviour verifying the good quality of the membrane.

Keywords: Alumina membrane, Iron dioxide, Sol–gel Method, Thermal treatment.

O72

Morphological and Optical Properties of Erbium Doped Phosphate Glass Containing Metallic Nanoparticles

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ABSTRACT

The nanoglass research is originally propelled by the quest for an up-converted luminescent material structure for photonic applications. However, the recent development of the enhanced up-conversion luminescence and absorption characteristics of rare earth doped phosphate based glasses in the presence of the metal nanoparticles (MNPs) received much attention as a means of achieving this target. These materials are promising for biomedical, photonic and laser applications because of their large nonlinear optical performance and efficiency. In biomedical applications the bio-glass materials containing MNPs is attractive due to their valuable capabilities towards the formation of degradable temporary scaffolds for the regeneration of hard and soft tissues in the eventual replacement of the natural tissue. The addition of the MNPs into bioactive glass composition is aimed to minimize the risk of the potential antimicrobial activity of leaching the MNPs ions. Meanwhile, in photonic and laser applications, the presence of the MNPs improve the photoluminescence properties and exhibit desired third nonlinear optical properties. The enhancement of the local field at the rare earth site due to the interaction with the surface plasmon resonance excitations of metallic nanoclusters and subsequent increase in the intensity is now widely attributed to energy transfer from small metal aggregates. The MNPs that exhibit a collective oscillation of conductive electrons described as *plasmon resonance* at certain defined frequencies in the visible and near-infrared region of the optical spectrum can be exploited device miniaturization and functionality. The unique characteristics of surface plasmon resonance in MNPs include both greatly enhanced optical extinction cross sections relative to their geometric cross sections and concentration of electromagnetic energy near the MNPs surface suitable for solar cells. Methods for positioning MNPs on surfaces in a controlled manner that would enhance their fundamental properties such as field enhancement, electromagnetic coupling and quantum effects still remain the most challenging issue. Synthesis and characterizations of such glasses for nanophotonic and plasmonic applications is of special interests to us. We investigate the structural

and optical behavior of MNPs embedded phosphate glass and the influence of MNPs in improving their properties. The glasses with different compositions with varying concentration of MNPs are prepared using melt-quenching technique. The local structure is analyzed with the help of Raman and infrared spectroscopy. The UV-VIS absorption measurements performed on the samples to reveal the existence of nanoparticles within the glass matrix. TEM analyses are made to confirm the presence of spherically shaped MNPs of various sizes inside the glass matrix. The UV-VIS data is further used to extract important structural and morphological parameters such as the radius of the nanospheres and the volume fraction of the spheres. The role played by the MNPs in enhancing the optical performance of these glasses is understood and results are compared with other findings.

Keywords: Metal nanoparticles, phosphate glass, absorption spectra, UV-VIS, TEM, surface plasmon resonance.

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O73

A Comparison Study on the Effect of Adiabatic Extrusion by Twin-Screw Extruder to the Thermal Stability Behavior and Morphology of Layered Silicates in Nylon 6-Nanocomposite

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ABSTRACT

In this paper, the influence of adiabatic extrusion on the thermal stability and morphology of fabricated Nylon6-nanocomposite is discussed. The effect of zero-heat- transfer extrusion system on the thermal degradation rate of organic polymer and inorganic layered silicates in particular is a main interest of the author in this research. A hybrid nanocomposite based from Nylon6 and Cloisite® 20A, a commercialized organic modified layered silicates type, was prepared by using an adiabatic melt extrusion. The thermal stability of compounded Nylon6-nanocomposite was determined through the application of thermo-gravimetric analysis, while its morphology was characterized from X-ray diffraction and transmission electron microscopy. An adiabatic extrusion affects the thermodynamics stability of melt-processed polymer-nanocomposite by allowing a uniform distribution of heat energy throughout of molten compound. However, it does only have a little effect on the morphology structure of Nylon6-nanocomposite.

Keywords: polymer-nanocomposite, Nylon6, layered silicate, adiabatic extrusion

O74

Visible Light Active Tantalum (V) Nitride Nanoparticles prepared from Mesoporous Carbon Nitride Template for Oxygen Evolution

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ABSTRACT

Reaction of water splitting to hydrogen and oxygen is an uphill reaction that requires a large Gibbs energy to occur at room temperature. However, it has been widely reported that the reaction is feasible to proceed at room temperature in the presence of light and photocatalyst. As overall water splitting is generally very difficult, photocatalytic activities are usually investigated in the presence of sacrificial agents as test reactions for overall water splitting. Due to the fact that our sunlight consists of more visible light portion than UV light, the use of visible light active photocatalysts would be a great advantage. For such reason, tantalum (V) nitride, Ta_3N_5, can be a potential photocatalyst as it absorbs light up to 600 nm. In this work, we reported the photocatalytic activity of visible light active Ta_3N_5 nanoparticles for oxygen evolution from water. The Ta_3N_5 nanoparticles were prepared by using a novel template approach, *i.e.*, mesoporous carbon nitride as the template, under ammonia flow at various temperatures. XRD patterns and DR UV-visible spectra of the prepared samples were almost similar to each other even though they were prepared at different nitridation temperatures or using various templates with different pore sizes. However, it was found that the particle size increased while the BET specific surface area decreased as the nitridation temperature increased. On the other hand, larger particle size but lower BET specific surface area was observed on the Ta_3N_5 nanoparticles when they were prepared using mesoporous carbon nitride with larger pore size. For the photocatalytic activity test, the sample was dispersed in water containing sacrificial agent. Various sacrificial agents were used to study the efficiency of the system to produce oxygen. The photocatalytic reactions were carried out at room temperature under visible light irradiation (λ > 400 nm). It was found that the sample prepared at higher nitridation temperature with larger particle size and lower specific surface area showed better photocatalytic activity. In good agreement with the result, the sample prepared using larger pore size template also showed better activity. In

order to increase the photocatalytic activity of the Ta_3N_5 nanoparticles, effect of cocatalysts addition was examined. General important factors for Ta_3N_5 nanoparticles to give high photocatalytic activity for oxygen evolution from water were discussed.

Keywords: Tantalum (V) nitride nanoparticles, mesoporous carbon nitride, photocatalyst, oxygen evolution, visible light

O75

Optical Absorption of Erbium Doped Zinc Tellurite Glass Embedded Gold Nanoparticles

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ABSTRACT

The rare earth doped /co-doped tellurite glasses have attracted much attention in recent years due to the feasibility of widespread photonic applications. However, the main bottleneck of implementing these glasses in technology is the low absorption cross-section of lanthanide ions and concentration quenching of up-conversion luminescence. In order to get enhanced optical characteristics in these glasses, the concentration of RE ions should be low enough to avoid quenching effect. To overcome these difficulties other alternatives such as using two or more lanthanide ions with metallic nanoparticles (NPs) are suggested. The enhancement of the up-conversion fluorescence and third order nonlinearities by incorporating NPs are demonstrated. Despite few experimental studies on optical and structural characterizations no conclusive remark are made regarding the role of metal NPs in improving the optical performance of these materials. Different mechanism such as energy transfer, multiphonon relaxation, cross relaxation, radiative transition, surface plasmon resonance (SPR), electric field of NPs and two photon absorption processes are suggested. These glasses are of special interests to us because of their large optical nonlinearity, excellent transmission in the visible and near infrared region, low cutoff phonon energy and large refractive index compare to other oxide glasses. It is believed that the phenomenon of SPR and the generation of localized surface plasmon are responsible for the enhancement of luminescence and optical absorption. Understanding the influence of gold and silver NPs in enhancing the emission intensity is the most challenging aspect. In contrast, the practical limitation of the small oscillator strength of the 4f-transitions of rare-earth ions, where losses can easily provoke de-excitation of different excited levels resulting in a decrease of the emission intensity can be overcome by embedding metallic NPs. Therefore, efforts are made to minimize such effects in modifying the surroundings of Er^{3+} ions by embedding metallic NPs that in turn produce localized SPR and enhance the luminescence of Er^{3+} ions. The presence of NPs contributes to enhance the luminescence due to energy transfer from NPs to the rare earth ions. This enhancements rely on the energy transfer process from a species with a large

absorption cross-section to the RE ions. In addition, quantum effects enhance the emission further when the optical frequency of excitation beam is in near resonance with the surface plasmon frequency of the NPs. Quantifying all these requires careful sample preparation and thorough characterizations. A series of Er^{3+}: Au- tellurite nanoglass has been prepared using melt-quenching technique. Detailed structural and optical characterization is carried out. An optical absorption behavior of the glass has been investigated using the UV-VIS spectroscopy. The role of gold NPs in the variation of optical energy band gap (E_{opt}) and DE will be explained and compared with the other investigations.

O76

Preparation of the Reinforced Nanocomposites Based on Epoxy, Silicone Rubber and Multi-wall Carbon Nanotube by Melt Blending

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ABSTRACT

The present work deals with the preparation of the nanocomposites based on Epoxy Resin, RTV Silicone Rubber (SR) and Multi-wall carbon nanotube (CNT) by melt blending. The effect of dispersion state and wt. % loading of CNT on material properties were explored in this study. EP nanocomposites with different compositions of MWNT (0.5, 2.5 and 5.0 wt %) and RTV silicon rubber (SR) were prepared by melt blending method. The structure–property relationship of the EP/SR/MWNT nanocomposites was established based on the results of different analysis techniques. FTIR spectra showed the strong interactions between MWNT–COOH and EP/SR matrix and silicon rubber. SEM microphotographs revealed the functionalized MWNTs effectively dispersed within the soft and hard segments of the EP/SR matrix through interfacial interactions between MWNT and EP/SR, whereas it showed aggregated or cluster structure of the CNT bundles at 5 wt% MWNT loading. TGA study showed that the incorporation of CNTs significantly im proved the thermal stability caused by the high thermal conductivity of the CNTs. DSC results indicated that the melting temperature, Tg and crystallinity slightly increased with inclusion of MWNT, which suggested that the functionalized MWNT substantially influenced both crystalline and amorphous structure of the EP/SR matrix. Mechanical tests showed that the addition of MWNT significantly improved the tensile properties. The homogeneous dispersion of MWNTs throughout the EP/SR matrix at lower MWNT loading and presence of strong interfacial adhesion between functionalized MWNTs and the EP/SR matrix are responsible for the significant improvement of overall material properties of the EP/SR/MWNT nanocomposites. The overall properties of the 5 wt% MWNT filled EP/SR nanocomposites are not

significantly enhanced and also not reduced comparing to that of the pristine counterpart, which indicated that the higher wt% of MWNT loading adversely affect the properties of the nanocomposites due to the poor dispersion of CNTs throughout the polymer matrix and weak adhesive bonding with the polymer matrix. In addition, the properties of the nanocomposites which have been evaluated through various characterization techniques (SEM, FTIR and TGA) can be indicated to the suitability of the nanocomposites for industry
al applications. Due to the reaction between Si—OH and C—OH in two-phase polymer blends of EP/SR, the cross linking distance is enlarged, which significantly increases the polarity of compound. Consequently the polarity causes the high peel adhesion between two layers such as metal and polymer.

Keywords: EP/SR/MWNT Nanocomposites, SEM, FTIR, TGA, Tensile properties.

O77

Stereomicroscopy: Reviewing the Third Dimension from Imaging pairs By SEM

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ABSTRACT

Perspective is often confused with 3D, which is not quite true, because the third dimension (Depth) is only "simulated". Therefore, 2.5D would be a more appropriate expression. Stereoscopic imaging (or "real 3D"), however, requires a minimum of two pictures, simulating our two eyes. This can either be accomplished by using traditional photography (stereo photography), computers (for example Virtual Reality) or Lasers (Holography).

The traditional Stereographs are always applied to reveal things in the eyesight of human beings, but nowadays, people start to be interesting in some details even invisible by normal microscope, in these cases, we need the electron microscopes.

Scanning electron microscopy (SEM) has been widely used for imaging objects with various dimensions ranging from millimeters to nanometers. Compared with other common microscopies, SEM offers a unique combination of imaging characteristics including high lateral resolution, broad magnification range, and large depth of field.

Although SEM micrographs appear to be three dimensional, they are in fact purely two dimensional. The grey level of the pixel is not a function of the local height difference of two objects particularly when both are in good focus. To overcome this limitation, many efforts have been made to recover the third dimension in SEM. Examples include shape-from-shading method[1], Monte Carlo electron transport modeling[2], and FIB/SEM dualbeam techniques [3]. On technique, photogrammetry, based on stereo=pair images has been extensively studied and applied to reconstruct three dimensional fearures. The theoretical description of photogrammetry applied to SEM was first described by Piazzesi [4]. Building on the early work on photogrammetric analysis [5, 6], this technique has become more interesting in recent years partially due to the fast development of powerful software which enables good qualitative and quantitative 3D reconstructions of specimen surfaces. Currently quantitative measurements of specimen at micro- and nano-scales by a truly three dimensional characterization technique are highly demanded in a in a variety of applications such as high aspect ratio MEMS structures [7], surface roughness determination [8], nanomaterials and nanodevices, life sciences [3], fracture analysis [9], and many others.

In this study, qualitative stereo imaging was demonstrated on Agilent 8500 compact field emission scanning electron microscope by using three different methods based on stereo-pair technique: “lateral shifting”, “individual MCP images”, and “sample tilting”. The qualitative imaging creates 3D looking micrographs revealing objects at different levels. In the following, a simplified geometric definition was discussed for quantitative measurement and examples were given by measuring three dimensions on stereo pairs. This quantitative measurement is of importance for investigations of objects with 3D topographic features, especially for uncovering the “hidden” third dimension. From the results, it is shown that the “lateral shifting” method does not generate obvious stereo effect while “sample tilting” is able to create sufficient parallax. The Agilent 8500 FE-SEM, which is equipped with quad-segmented MCP detector, offers a simple but effective “individual MCP channel imaging”, to create 3D images without any sample lateral shifts or sample tilting. Quantitative measurement was also carried out on stereo-pair images to determine the third dimension of a 3D structure, which have been demanded for a variety of applications.

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O78

Germanium Nanocrystals with Enhanced Optical Properties

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ABSTRACT

Various approaches are being investigated to achieve group-IV based, efficient, light weight, cost-effective, high efficiency photovoltaics. Silicon (Si) has been the most widely used material for commercial solar cells with efficiencies in the range of 19 - 21%. Germanium (Ge), though more expensive than silicon (Si), has been more desirable for satellite photovoltaic applications due to its significantly higher efficiencies ranging from 30 - 35%. With recent advances in nanotechnology, researchers at the National Renewable Energy Laboratory (NREL) anticipate that nanocrystal (NC) based solar cells, when combined with the suitable solar concentration optics, have the potential to reach over 60% efficiency. NCs synthesized from Ge have the added advantage of being able to provide stronger quantum confinement due to the larger Bohr radius, higher dielectric constant, and lighter carrier effective mass, in comparison with Si NCs, and seem more promising for solar cells with greater efficiencies. In addition, such band-engineered nanocrystals are perfectly suitable for monolithic integration with silicon photonics as it is known to be fully compatible with conventional CMOS processes. Also, the near-direct band structure of Ge offers great potential for efficient light emission in the telecommunication range of wavelengths.

Optically active Ge NCs have been synthesized using a variety of processes and techniques such as magnetron cosputtering, isotropic chemical etching of porous Ge, ion implantation, solid phase epitaxy, ultra high vacuum chemical vapour deposition, thermal decomposition, and epitaxial growth. Ge NCs grown over a Si substrate using molecular beam epitaxy have exhibited some improvement in their optical properties due to strain in the nanostructures. Researchers have also demonstrated tensile strain in freestanding Ge nanocrystals synthesized using ball milling techniques.

Here, we present a simple mechanical grinding process used to synthesize Ge NCs and demonstrate that the high tensile strains induced by the fabrication process result in greatly enhanced optical absorption and emission at room temperature through direct

band-to-band recombination. Transmission Electron Microcopy, Selected area electron diffraction, micro-Raman measurements and optical-absorption spectroscopy measurements have been use to probe their structural properties, clearly indicating dislocations, where high tensile-strained areas are concentrated in the NCs. Photoluminescence (PL) spectroscopy, excitation-power evolution and time-resolved PL measurements provide insight into the optical properties of the synthesized Ge NCs. The improvements in the properties of Ge achieved by such mechanically synthesized NCs and how they may be exploited for the fabrication of flexible photovoltaic devices are discussed in this report. Such band engineered Ge NCs are highly compatible with the existing CMOS technology and their simple and cost-effective fabrication and excellent optical properties form the basis for a polymer nanofiber based nanocomposite for application in flexible photovoltaics, currently being investigated by researchers at the Army Research Laboratory for applications as power sources for micro-robotic devices.

O79

Enhancement of PLA Property Profile using Nanoscaled Organoclays

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ABSTRACT

In the last time, both increasing price of petrochemical products as well as responsibility for sustainable production facilitated industrial applications of bio-based polymers. The actual developments are focusing on full/partially bio-based technical polymers possessing similar property profile as their fossil equivalents. An interesting opportunity to optimize application properties (e.g. life-time, temperature stability) of bio-based polymers is the use of different additives and fillers. Nano-scaled fillers possess a high potential to optimize processing as well as utility properties due to high specific surface area and low interfacial tension as compared to conventional fillers. The primary particle shape of different nanofillers can be sphere, needle or plate. High aspect ratio (particle length/thickness) of filler facilitates high reinforcement of polymer. Therefore, layered and needle-formed fillers have been widely used for enhancement of polymer property profile. Montmorillonite belongs to the group of layered silicates and theoretically it is possilbe to reach aspect ratio of 1000 by proper dispersion of this mineral in polymer matrix. Montmorillonite is a three-layer-silicate where the primary layer consists of one octahedral sheet surrounded by two tetrahedral sheets. Na+ oder Ca2+ ions in the interlayer area have been usually replaced by long alkylammonium ions in order to increase interlayer space and, consequently, to facilitate dispersion in polymer melt during melt-compounding process. In this work, polylactic acid (PLA) nanocomposites with different organoclays (variation in surface treatment of layered silicate) and one special nanofiller (mixture of layered and needle-formed silicates) have been melt-compounded using semi-industrial co-rotating twin-screw extruder. Effect of silicate surface treatment and shape on the processing and mechanical properties as well on oxygen permeability in PLA matrix has been investigated.

Keywords: ICONT 2012, polymer nanocomposites, polylactic acid, clay, rheology, mechanical properties, permeability

O80

Structural Study on Lithium-Calcium Borophosphate Glasses doped with Transition Metal Ions using Infrared Spectroscopy.

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ABSTRACT

This paper reports on the structural properties of Lithium-Calcium borophosphate glasses. The glasses were prepared through melt quenching technique and studied in two compositional series which is $25Li_2O$-$25CaO$-(x)B_2O_3-(50-x)P_2O_5 where $0 \leq x \leq 50$ mole% and $25Li_2O$-$25CaO$-$30B_2O_3$-$20P_2O_5$-2(y) with y is the doped materials(Cr^{2+}, Mn^{2+} and Fe^{2+} ions). The aims of this work are to investigate the vibration mode about the local order around phosphorus tetrahedral structures and the boron coordination change from trigonal to tetrahedral structures. Their basic properties were determined and their structure was studied by Fourier Transform Infrared spectroscopy (FT-IR). FT-IR spectroscopy analysis of the sample revealed vibration mode related to the characteristic phosphate bonds especially P-O-P, O-P-O and P-O-B. Structural studies were devoted to the investigation of changes in boron coordination in the dependence on changes in B_2O_3 or P_2O_5 ratio in the borophosphate glasses. Besides that, the high frequency bands corresponding to stretching vibration become broader, less distinct and overlap each other with an increasing B_2O_3 content and decreasing P_2O_5 content. The decrease in the strength of the vibrations of the non-bridging PO_2 groups seems to indicate a progressive increase in the connectivity of the glass with increasing B_2O_3 content. It is likely that this connectivity is due to the formation of P-O-B links at $940cm^{-1}$, which replace the vibration mode P-O-P. The glasses doped with Cr^{2+}, Mn^{2+} and Fe^{2+} ions and the undoped glass are almost the same. The addition of doped glasses shows that the band is slightly shifted to the right side compare to the undoped glass. Besides that, it shows that the intensity of the bands described above increase and the position of the main bands shift to the lower frequencies. It is obviously shows that the increasing of B_2O_3 content and decreasing the P_2O_5 content causes the boron coordination changes from trigonal to tetrahedral and the basic units change from BO_3 to BO_4. The addition of doped Cr^{2+}, Mn^{2+} and Fe^{2+} ions to the glass slightly shift to the right side compared to the undoped glass.

Keywords: Borophosphate glass, Lithium, Calcium, Transition metal ions, Fourier Transform Infrared spectroscopy

O81

Asymmetric Redox Supercapacitors based on Nanostructured $Ni_xCo_yCu_zO_4$

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ABSTRACT

Copper substituted spinels having a general formula, $Ni_xCu_yCo_zO_4$ with select solid solution composition of $Ni_{0.8}Cu_{0.2}Co_2O_4$ (A site substitution) and $NiCo_{1.8}Cu_{0.2}O_4$ (B site substitution) were synthesized by a single step solution protocol. Aqueous solution of nickel acetate, copper acetate and cobalt acetate were mixed in appropriate molar ratio according to the required final composition. Acetyl acetone was used as a complexing agent, mixed with the mixture solution of acetates. The amount of acetyl acetone was twice the total molar concentration of all metals. The mixture solution thus prepared was heated at 110^{o}C to evaporate water/solvent and then the temperature was raised to 300^{o}C for complete combustion of the starting materials. The resultant oxide material was annealed at 350^{o}C for 2 h to get a refined crystalline structure as examined by XRD. HRTEM analyses reveal the perfect cubic spinel structure as revealed from a single grain SAED image. The pristine $NiCo_2O_4$ reportedly adopts a pure spinel structure in which all the Ni ions occupy the octahedral sites and the Co ions are distributed among the tetrahedral and octahedral sites of the structure.

To examine their pseudocapacitive properties, we fabricated composite electrode comprised of carbon additive (super-conductive black carbon L6 donated by Degussa) and PTFE as binder. Thin composite electrodes (~150 µm) were fabricated onto SS (316L) expanded mesh (samples supplied by Exmet, USA) in the customary combination and used a working electrode in conjunction with an aqueous electrolyte containing alkaline media against a Ag/AgCl reference electrode having platinum foil as counter electrode.

To reveal the role of Cu substitution in octahedral as well as tetrahedral positions in the spinel in the context of specific capacitance (F/g), electrochemical techniques (ac impedance, cyclic voltammetry (CV) and constant current charge/discharge) were employed to examine the capacitance behaviour of the substituted samples. Based on the measured capacitance, a site substitution (octahedral) has been found to be

beneficial (specific capacitance of 110 Fg^{-1}) compared to the B-site (tetrahedral) substitution (28 Fg^{-1}). The results will be discussed.

Keywords: Spinel Oxides, $NiCo_2O_4$, Solid solution, Pseudocapacitance, Asymmetric capacitors

O82

End-to-End Coupling of Cylindrical Block Copolymer Micelles with a Crystalline Polyferrocenylsilane Core

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ABSTRACT

The introduction of metal centers can introduce a wide range of additional functionality to polymeric and supramolecular materials. Block copolymers consist of two or more chemically distinct polymer segments, or blocks, connected by a covalent link. PFS block copolymers with a short crystalline PFS block form core-corona cylindrical micelles in selective solvent for the longer block. The terminii of these micelles are found to be active towards further addition of new PFS block copolymer, a process reminiscent of a living covalent polymerization and can therefore be regarded as living supramolecular polymerization. We demonstrate that living polymerizations driven by the epitaxial crystallization of a core-forming metalloblock represent a synthetic tool that can be used to generate complex and hierarchical micelle architectures from diblock copolymers. Using this novel concept, homoepitaxial growth using the addition PFS homopolymers and block copolymer to the short cylincrical micelles seeds can be studied. This talk presents living supramolecular for the formation of complex micelle architectures including block co-micelles, coupled micelles and network-like structure.

Keywords: Block copolymer, polyferrocenylsilane, cylindrical micelles, epitaxial growth

O83

Imaging of Colloidal Gold Nanoparticle Using Atomic Force Microscope

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ABSTRACT

Colloidal gold is a suspension of sub-micrometer-sized particle of gold in a fluid usually water. The liquid is usually either an intense red color (for particle less than 100 nm) or a dirty yellowish colour (for larger particle). In this articles, the gold nanoparticle synthesized by seeding growth method and imaging using XE-BIO Atomic Force Microscopy (AFM) have also been developed to determine the size of the nanoparticle even when they are agglomerated. Atomic Force Microscopy (AFM) has been widely used in bio-material sample for investigation of surface topography and molecular forces of biomolecules, both in air and liquid form. The spherical size of gold nanoparticle can be measured using AFM images through vertical height measurement by analysing a number of separate particles individually. It has been demonstrated that AFM gives the fastest way to determine the size, analysing hundreds of nanoparticles and produced images in all three dimensions compared to Transmission Electron Microscopy (TEM) and Zeta-Sizer.

Keywords: Nanotechnology; gold nanoparticle; imaging; atomic force microscopy

O84

Novel Mesoporous Silica Film Composites for Phosphorescent Nanosensors of Silver Ions

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ABSTRACT

Chemosensors with high sensitivity, selectivity, and reusability have been developed by functionalizing surface and or wall of mesoporous nanosilica materials with fluorescent chromophores [1]. Among of many pollutants, fluorescent chemosensors of silver ions have been widely studied due to its widespread using in electrical and electronic industry, as well as production of photographic films, coins, jewellery, silverware, and alloys. For enhancing the sensor capability, long-range molecular assembly of chromophore molecules having longer lifetimes than fluorescence must be immobilized in the nanoscopic channels of mesoporous silica. However, there is no report on this importance issue. By using a one-dimensional (1D) phosphorescent columnar assembly of trinuclear gold(I) pyrazolate complex [Au_3Pz_3] as a template in the sol-gel synthesis, we have successfully fabricated mesoporous silica film nanocomposite with a hexagonal geometry [Au_3Pz_3]/$silica_{hex}$ [2]. Recently, we found that [Au_3Pz_3]/$silica_{hex}$ showed permeation of Ag^+ ions into the silica nanochannels to give emission color change from red to green owing to formation of Au^+–Ag^+ heterometallic complex [3]. Herein, we report the systematic study on phosphorescent chemosensor of [Au_3Pz_3]/$silica_{hex}$ using the permeation of silver ions into the silicate nanochannels.

When thin firm of [Au_3Pz_3]/$silica_{hex}$ was dipped into a tetrahydrofuran (THF) solution of 100 μM silver triflate (AgOTf) at 20 ºC, the resulting Ag@[Au_3Pz_3]/$silica_{hex}$, showed a new luminescence center at 486 nm characteristic of a Au^I–Ag^I heterometallic interaction upon excitation at 276 nm [3], in addition to the less intensified original phosphorescence centered at 693 nm. The decrease in the intensity of 693 nm-emission band subsided in 30 min at 18% of the original intensity to give color change from red to green upon exposure to 254 nm UV light. Interestingly, 10 μM AgOTf can be also detected by decreasing the intensity to 41% at 693 nm in 90 min.

X-ray photoelectron spectroscopy (XPS) profiles of $[Au_3Pz_3]/silica_{hex}$ allow us to evaluate atomic ratio of Au to Ag from the intensities of Au 4f at 84.3 and 88.1 eV and Ag 3d at 368.1 and 374.1 eV peaks. After dipping into a THF solution of 100 μM AgOTf for 60 min, the ratio of Au to Ag was evaluated to be 3:7, at surface. Depth profiling experiments with sputtering for 5, 15, 30 and 75 s showed that the atomic ratios of Au to Ag changed to 2:3, 3:2, 2.3:1 and 3:1, respectively. These results strongly indicate that emission color change observed upon dipping $[Au_3Pz_3]/silica_{hex}$ into a THF solution of Ag^+ does not originate from the adsorption of Ag^+ on the silica surface, but is due to permeation of Ag^+ into the nanochannels of $[Au_3Pz_3]/silica_{hex}$ to form heterometallic composite $Ag@[Au_3Pz_3]/silica_{hex}$. By simply dipping the thin film of $[Au_3Pz_3]/silica_{hex}$, 1D columnar assembly of $[Au_3Pz_3]$ confined in the silicate nanochannels can be used as a novel phosphorescent nanosensor for detection of Ag^+ ions with sensitivity as low as 10 μM AgOTf.

Keywords: mesoporous silica, nanocomposite, nanosensor, permeation, silver ions

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O85

Preparation of Raspberry-Like Composite Polymeric Nanoparticles via Seeded Dispersion Polymerization

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ABSTRACT

In recent years, non-spherical and composite polymeric particles with special morphologies prepared by novel methods have attracted the attention of scientific community. Several techniques have been developed to prepare these structured particles, among which seeded dispersion polymerization has many advantages compared with the others. In this work the formation of nonspherical raspberry-like poly n-butyl methacrylate (PnBMA)/polystyrene (PS) composite nanoparticles by the seeded dispersion polymerization of styrene in the presence of PnBMA seed particles was discussed. The effect of various polymerization parameters such as stabilizer and initiator concentration, methanol/water (w/w) ratio and polymerization temperature on the formation of these particles has been studied. It was found thatwithincreasing in initiator and stabilizer concentrations, methanol/water ratio and polymerization temperature, the surface of particles become uneven and particles with raspberry-like morphology were produced.

Keywords: Nonspherical Shape, Seeded Dispersion Polymerization, Nano Particle

O86

Density Functional Theory Studies of Electronic Structures and Hyperfine Interactions for Muonium in Tetraphenylsilane

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ABSTRACT

Density functional theory (DFT) method was used to study the addition of muonium (Mu) in tetraphenylsilane ($SiPh_4$). Based on earlier Muon Spin Rotation/ Resonance (μSR) experimental results, three Mu trapping sites were considered in the investigations, namely *ortho*, *meta*, and *para* sites. In this study, six $SiPh_4$ molecules were chosen to simulate the host local environment. A muonium was then added to the trapping sites under studies and the local energies minima and hyperfine interactions of the Mu trapped at the three different positions in the system were calculated. Our results show that the total energies for all three cases are very close to each other. For the *meta* case, the predicted value of energy is about 0.05 eV higher than the other two sites. The isotropic term is the major contribution to the hyperfine parameters for the Mu, with values of 453.21 MHz, 477.78 MHz, and 396.11 MHz, respectively for the *ortho*, *meta*, and *para* sites. The anisotropic component was determined to be very small for all three cases.

Keywords: Density Functional Theory, tetraphenylsilane, muonium, hyperfine interactions.

O87

Structural and Thermal Properties of Silicon Nanorods Prepared on Porous Silicon

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ABSTRACT

Semiconductor nanorods have potential applications in photovoltaic, batteries and thermoelectric. In this study, the silicon nanorods have been grown on porous silicon (PSi) surface and the structural and thermal properties of these samples were studied. The porous silicon (PSi) was formed by electrochemical anodisation method. A thin layer of gold (Au) with a thickness of around 20 nm was deposited onto the surface of the porous silicon (PSi) sample prior to the thermal annealing at 360^{o}C, 600 ^{o}C, 800 ^{o}C, and 1000 ^{o}C. The structural and thermal properties of the samples have been studied using Field Emission Scanning Electron Microscope (FESEM) and Photoacoustic Spectroscopy (PAS). The structural results indicated that different size of silicon nanorods have been grown by annealing at 600 ^{o}C to 1000 ^{o}C. The SEM results show that for all the samples, the diameter of the nanorods decreased with increasing the temperature. In the samples annealed at 600 ^{o}C and 1000 ^{o}C, the length of nanorods reduced by raising the temperature, but for the sample annealed at 800 ^{o}C their length varied from 110 nm to 1500 nm. The thermal properties results showed that the thermal diffusivity (TD) of the porous silicon (PSi) was significantly smaller than silicon (Si) due to a limitation of the phonon mean free path by scattering at the boundaries of the large inner surface of porous silicon. The thermal diffusivity (TD) raised by gold deposition on the porous silicon sample due to the additional metal layer with a higher thermal diffusivity than PSi. By annealing the gold deposited porous silicon (Au/PSi) samples, the thermal diffusivity decreased at 360^{o}C. For the sample annealed at 600 ^{o}C the thermal diffusivity reached a maximum and then it decreased by increasing the annealing temperature.

Keywords: Porous silicon, Silicon, Nanorod, Photoacoustic spectroscopy, Thermal annealing, Gold, Thermal diffusivity

O88

The Mechanical Properties of Erbium Doped Tellurite Glass Rod

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ABSTRACT

A series of Erbium doped Tellurite glass rod of the (80-x) TeO_2- 20ZnO -xEr_2O_3 where $0<x \leq 2.5$ mol % was successfully been fabricated as a lasing medium by using the melt quenching technique. The glass mechanical properties have been investigated by means of their density, hardness and surface roughness that is depend on process variable such as spindle speed and feed rate. The density of the glass has been determined by using the Archimedes method and the glass exhibits linearly increase with the increasing of Er_2O_3 content. The range of the glass density is in between 5.541±0.092 g/cm^3 to 5.663±0.103 g/cm$^{3.}$ However, the glass hardness determined by using Vickers indenter is slightly decreased as the doping content increase from 327.8 to 232.2. The reason of this is because of the formation of non-bridging Oxygen (NBO), in the structural glass network. Meanwhile, to get the minimum surface roughness of the glass rod, the machining conditions have to be controlled. It is very important since it gives maximum total internal reflected wave. The surface roughness is measured using interferometry technique along the rods. The average surface roughness of the glass is in the range of 2.15 to 1.18 µm respectively with higher speed rates and spindle speed at 3000 rpm. The sample has been fabricated in the form of cylindrical rods with a diameter of 4mm and length 30mm.

Keywords: melt quenching technique, Archimedes method, Vickers indenter, NBO, structural glass network

O89

Functionalised Nanodiamonds: Raman and Photoluminescence Spectroscopy Study

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ABSTRACT

Due to their potential optical properties, nanodiamonds hold great interest in a variety of applications, such as biolabels. These properties are correlated with surface modification, the impurities and defects contained either on their surface or within the crystalline structure. Undecyl-nanodiamonds produced by attachment of 1-undecene onto nanodiamond surface could be a good candidate as luminescence markers in the future; therefore, understanding of their optical properties is essential. In this work, the optical properties of undecyl-nanodiamond have been determined by SERS and photoluminescence spectroscopy. The results demonstrated that signal at 1330 cm^{-1} is characteristic Raman signal for nanodiamond. In addition, photoluminescence spectra confirmed that nanodiamonds still conserved their luminescence emission in the 500-800 nm regions and the peaks become sharper as well as showed blue shift after surface modification and evaporation into UHV system. Moreover, the emission intensity rises significantly when photoluminescence of samples were measured at the lowest temperature.

Keywords: nanodiamond, optical properties, functionalisation, photoluminescence

O90

Fabrication and Characterization of p-Type Double Gate and Single Gate Junctionless Silicon Nanowire Transistor by Atomic Force Microscopy Nanolithography

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ABSTRACT

Departing from microelectronic to nano-electronics is one of the crucial areas in nanotechnology. Relevant obstacles rise up from this departing process could summarize in two main problems; fabricating the structure and understanding the transport phenomena. Among the several type of nanotransistors, the Junctionless transistors (JLs) lately were considered as the promising alternative for new generation of nanotransistor. In this letter, we investigate the fabrication of Double gate (DG) and Single gate (SG) Junction less silicon nanowire transistor (JLSNWT). The transistors are using silicon nanowire patterned on lightly doped (10^5 cm^{-3}) Silicon-on-insulator (SOI) wafer fabricated with an Atomic force microscope (AFM) nanolithography technique. The top Si layer has a thickness of 90 nm and a resistivity ρ of 13.5-22.5 Ω cm. The modified RCA method implemented for sample preparation. The Local anodic oxidation (LAO) followed by two wet etching steps, KOH etching for SI removal and HF etching for oxide removal, have implemented to reach the structures. A conductive Cr/Pt AFM tip was used to draw pre-designed oxide pattern on SOI. The writing speed and applied tip voltage were held in 0.6 μm/s and 9.6 volt respectively. Scan speed was held in 1.0μm/s. The etching processes were elaborately optimized by 30%wt. KOH + 10%vol. IPA in appropriate time, temperature and humidity. All the structures are junction-less transistor uniformly doped for source, drain and channel regions. The electrical characteristics measured by an HP4156c Semiconductor Parameter Analyzer (SPA, Agilent) at room temperature. The devices

geometry are as following, the length of the channel 200nm, the width is 100nm and the thickness is 90nm, when the distance between the source and the drain (fins) are 3.5µm for DG and 4 µm for SG.

Keywords: Local anodic oxidation (LAO); Silicon-on-insulator (SOI); Atomic force microscope (AFM), Double gate (DG) and Single gate (SG) Junction-less silicon nanowire transistor (JLSNWT).

O91

Design of Silicon Carbide (SiC) Capacitive Pressure Sensor Diaphragm

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ABSTRACT

This paper explores design of silicon carbide (SiC) capacitive pressure sensor diaphragm. Silicon based pressure sensor is currently a prominent device in MEMS and is normally fabricated via conventional MEMS technologies. Thus, several design and performance issues are inherent due to the selection of silicon structural and functional material. The two predominant types of silicon pressure sensors, capacitive and piezoresistive are nonetheless limited in performance due to material performance limitation. Pressure sensors utilize an elastic membrane known as diaphragm to detect pressure differentials. The membrane is designed to deflect consistent to the applied pressure on its surface. Here, we propose the use of SiC in lieu of silicon as the sensing element. The embossed SiC membrane deflects under higher range of extreme pressure differential.

SiC is a promising alternative material to silicon for high temperature sensing. To operate at high temperature, pressure sensors must satisfy several criteria involving the selection of substrate, in which the material should possess properties that will remain stable when exposed to extreme temperatures. SiC is suitable for harsh environment applications because SiC is a proven material for the development of high temperature solid-state electronics (up to 500ºC) and transducers, owing to its excellent electrical properties such as wide band gap (3 eV), extremely high breakdown electric field, high electron saturation drift velocity and low intrinsic carrier concentration, which in turn allows for stable electrical performance under harsh environment. This includes high temperature surroundings, highly corrosive environments, strong vibrations and high radiation ambients. SiC possesses higher values of stiffness and fracture strength as well as resistance to wear, and excellent retention against oxidation and corrosion as compared to silicon. Applications fields include aerospace, automotive, power and propulsion, oil and gas exploration, industrial process control, nuclear power plant, and biomedical monitoring.

The SiC membrane size, thickness, cavity size, gap between electrodes is varied to study their effects on membrane deflection, which directly signifies capacitance

performance and sensitivity. CoventorWare ver. 2008 was utilized to investigate the correlation between applied pressure and membrane deflection. Pressure is varied between 0 to 100 MPa at 20 MPa intervals and the corresponding maximum membrane deflections are observed. Based on the study, it was observed that maximum membrane deflection for SiC at 100 atm pressure is 4.0E+01 µm, which is lower than that of Si (4.7E+01 µm) at the same pressure level. Both sets of deflection values increases linearly with pressure. The lower value of deflection for SiC set of data indicates retardation against failure when operated at extremely high temperature and pressure. SiC membrane indicates promising performance in harsh environments.

Keywords: Capacitive pressure sensor, silicon carbide (SiC), high temperature sensing

O92

Pinch-off Effect in p-Type Double Gate and Single Gate Junctionless Silicon Nanowire Transistor Fabricated by Atomic Force Microscopy Nanolithography

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ABSTRACT

Fabrication and applications of transistors in nano-size region is now one of the most noticed fields of research among the scientists and engineers. The spark of aggressive scaling of transistors was started after the Moor's law on prediction of device dimensions. Recently, among the several types of transistors, junctionless transistors were considered as one of the promising alternative for new generation of nanotransistors. In this work, we investigate the pinch-off effect in double gate and Single gate junctionless silicon nanowire field effect transistor. The transistors are fabricated using silicon nanowire on lightly doped (10^{15}) p-type Silicon-on-insulator (SOI) wafer fabricated by using an Atomic force microscope nanolithography technique. The transistors are normally on state devices and working in depletion mode. The behaviour of the devices confirms the normal behaviour of the junctionless silicon nanowire transistor. The pinch-off effect appears at V_G= +2 V and V_G= +3 V for double gate and single structure respectively. On state current is in the order of 10^{-9} (A) for both structures due to low doping concentration. The single gate and double gate devices exhibit an on-off ratio of 10^5 and 10^7 respectively. The sub threshold swing of 167 mV/decade and 127mv/decade are measured for single gate and double gate structure respectively.

Keywords: Atomic force microscope (AFM) nanolithography, Junction-less silicon nanowire transistor (JLSNWT), Pinch off, Nanowires.

O93

Capacitance Performances of Planar and Double Stacked Supercapacitor Designs

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ABSTRACT

Supercapacitor has recently acquired great interest among researchers in many fields such as biomedical implants, power electronic devices and high power applications. Supercapacitor has a high potential to replace conventional battery usage due to its high power density, rapid charge and discharge and unlimited number of recharge cycles. Miniaturized electrochemical capacitor or micro supercapacitor has a high promising capability to power small electronic devices. Capacitance can be described the ability of capacitor to store charge and its one of the important parameters to determine the performances of supercapacitor. Our previous work in *IEEE* RSM 2011 has investigated the physical parameters for planar structure including length, width and gap between electrodes and their correlation to capacitance value.This paper introduces flip chip double stacked structure supercapacitor with interwoven electrodes. We compare the capacitance performance between planar and double stacked interdigital electrodes MEMS supercapacitor.

To achieve high capacitance value, conducting polymers such as polypyrrole (PPy), polyaniline (PANi) and polythiophene (PTh) are introduced as electrode material for the supercapacitor. Polypyrrole, functioning as the electroactive material for the supercapacitor, has good stability in aqueous solution and air, as well as high electrical conductivity. Planar interdigital electrodes polypyrrole (PPy) supercapacitor has the advantage of high charging capacity due to its interdigital structure.

Supercapacitor fabrication was initiated by coating 1.5 µm SiO_2 on 525 µm thick silicon substrate. SU-8 was used to pattern mold for supercapacitor fingers. A 500 µm thick nickel layer was electroplated within the SU-8 mold to create the interdigital structure. Upon removal of SU-8 mold, a 5 µm thick PPy was spin coated and patterned to encapsulate the nickel fingers to create the dielectric layer. Polyvinyl Alcohol (PVA) was then filled slightly in excess between the fingers to function as solid state electrolyte. Finally, an identical mirror imaged interdigital supercapacitor cell was attached face down on the first cell during PVA gel curing to complete the double stacked structure with interwoven electrodes. The planar and double stacked

supercapacitor designs were simulated using Coventorware 2008 for capacitance performance analysis and COMSOL ver 4.2 for electrical performance verification. In Coventorware, MemElectro module was used to analyse the capacitance performance. The planar supercapacitor consists of 20 single cells each sized 2mm x 4.4 mm.
From the simulation, the capacitance between two polypyrrole electrodes is 2.46 pF in operating voltage of 1V. The value slightly differs from the theoretical value of 3.45pF, which is probably due to meshing refinement effect. Capacitance value of a single cell double stacked supercapacitor is 5.0pF. For the double stacked design, interface between electrode and electrolyte is higher than planar design. When voltage is applied, reduction and oxidation reactions occur at a much higher surface area, thus increasing its capacitance. The higher the number of fingers, the larger the surface area available, thus increasing capacitance value. Comparison of capacitance between both designs is plotted. Double stacked supercapacitor has approximately the same size, only slightly thicker compared to the planar structure due to double stacking, but has much higher charging capacity.

Keywords: MEMS supercapacitor, planar capacitor, double stacked design

O94

Nanofiber Membrane to Improve Membrane Distillation Performance in Geothermal Water Desalination

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ABSTRACT

The objective of this study is to assess the potential of a polyurethane (PU) nanofibre membrane in geothermal water desalination using vacuum membrane distillation (VMD) process. The nanofibre membrane microscopically comprises of countless fibres in nano-size piles up to form a thin film and the film has a highly interconnected open pore structure. In a comparison, a conventional polyvinylidene fluoride (PVDF) porous membrane which is a film contains a lot of holes pierce extended from one side surface to another side surface of the film, was also tested. The geothermal water employed was collected from a reservoir located at Ranau, Sabah, Malaysia and the water temperature is approximately 60°C and a total dissolved solids (TDS) of 845.4 mg/L. The experimental results showed that the PU nanofibre membrane exhibited the highest flux of 6.03 kg/m^2 h at a feed flow rate of 20 L/h and a vacuum pressure of 70 kPa after 2 h operation. Two products were produced from the geothermal water desalination using the VMD process: a permeate stream of fresh water which can be used for municipal and industrial purposes, and a concentrated stream of minerals at 960.8 mg/L TDS which was suitable for therapeutic use and spa adaption.

O95

Preparation and Characterization of Erbium Doped TiO_2 Nanofibers using Electrospinning Technique for Thermophotovoltaic Applications

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ABSTRACT

In recent years, much attention has been paid to the preparation and characterization of one-dimensional (1D) nanomaterials because of their unique physical and chemical properties. Many unique and fascinating properties have been proposed and demonstrated for this class of materials, such as metal insulator transition, superior mechanic toughness, higher luminescent efficiency, enhancement of thermoelectric figure of merit and lowered threshold. Er-doped titania nanofibers have been fabricated by electrospinning technique.The Electro spinning apparatus was operated at 20kV. In order to create erbia-containing titania nanofibers, erbium (III) oxide particles were added to the pre-cursor solution before electrospinning. A systematic microstructural and spectroscopic characterization of Er-doped TiO_2 nanofibers is presented by means of scanning electron microscopy (SEM), Xray diffraction (XRD), Raman spectroscopy and Fourier Transform IR Spectroscopy (FT-IR). Optical properties were investigated by means of luminescence spectroscopy. All electrospun materials consisted of randomly oriented nanofibers. The average fiber size was 40–79 nm for Er-doped TiO_2 calcined at 500°C.The presence of RE elements shifted toward higher values the anatase to rutile phase transition temperature.The Raman spectroscopy analysis revealed the typical anatase phase vibrational modes at 500°C and the rutile phase ones at 1000 °C, accordingly to the XRD phase evaluations. Temperature-dependent near-infrared emission spectra demonstrate that the erbia-containing nanofibers emit selectively in the range 6000–7000 cm^{-1}. Because of their large surface to volume ratios and narrow-band optical emission, these nanofibers can be used as selective emitters for thermophotovoltaic applications.

O96

Performance Evaluation of Solar Evacuated Tube Collector using water based Alumina (Al_2O_3) Nanofluid

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ABSTRACT

Experiments are undertaken to determine the efficiency of Evacuated Tube Collector (ETC) using water based alumina (Al_2O_3) nanofluid at Pekan campus (3˚30' N, 103˚ 25' E) Faculty of Mechanical Engineering, University Malaysia Pahang for conversion of solar thermal energy. Malaysia lies in the equatorial zone with an average daily solar insolation of more than 900W/m^2 and can reach a maximum of 1200 W/m^2 for most of the year. Traditionally, water is pumped through the collector at an optimum flow rate, for extraction of solar thermal energy. If the outlet temperature of water is high, further circulation of water through the collector is futile. This is due to low thermal conductivity of water of 0.6 W/m K compared to metals which is many orders higher. Hence, it is necessary to reduce the working temperature of water either by pumping at higher flow rates or modify the fluid properties by dispersion with metal particles. Pumping water at higher flow rates is not advantageous as the overall efficiency of the system is lowered. Nanofluids are liquids in which nanosize particles of metal or their oxides are dispersed in a base liquid such as water. It results in higher values of thermal conductivity compared to the base fluid. The thermal conductivity increases with concentration and temperature of the nanofluid. The increase in thermal conductivity with temperature is advantageous for applications in collectors, as the solar insolation varies throughout the day, with a minimum in the morning reaching a maximum at about 14:00 hrs and reducing thereafter. The ETCs have the space between the collector surface and the enclosure evacuated, minimizing the convective and radiation losses. The outlet temperature of water leaving the collector is higher than from a non-evacuated type. The nanofluid used to extract solar thermal energy at all available solar insolations in the present experiment. Consequently, the transfer of heat from the collector to the fluid takes place at comparatively low temperatures leading to high efficiency of the system. The efficiency of solar ETC estimated with ASHRAE standards is enhanced by 30 % maximum with 13nm size Al_2O_3 nanoparticles dispersed in water, compared to the

system working with water. The efficiency increased with increase in concentration from 2% and 4% volume by 8% when the flow rate is fixed at 2.5 LPM at similar operating conditions with water. The temperature of nanofluid is 54˚C and 61˚C with 2.0 and 4.0% concentration compared to water at the maximum solar insolation of 1260 W/m^2.

Keywords Solar Energy, Nanofluids, Evacuated Tube Collector

O97

Double Diffusive Free Convection Flow of Nanofluid Past a Power Law Stretching Sheet

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ABSTRACT

This study investigates theoretically the combined effects of double diffusive on the free convective boundary layer flow of nanofluid. It is assumed that the sheet is stretched with a power law velocity under the effects of buoyancy parameter, the solutal buoyancy parameter. The model used for the nanofluid incorporates the effects of Brownian motion and thermophoresis parameters. By using appropriate similarity transformations, the formulated non-linear partial differential equations are transformed into dimensionless forms and solved numerically using an implicit finite difference scheme known as the Keller-box method. The obtained numerical results are presented in tabular and graphical forms to show the effects of the embedded material parameters. The effects of physical parameters on local Nusselt number, local Sherwood number and skin-friction are also studied. It is found that thermophoresis parameter, the solutal buoyancy parameter and the power law velocity parameter have strong influence on the system.

Keywords: Double diffusion, Nanofluid, Power law velocity, Stretching sheet.

O98

Fabrication and Characterization of Porous Alumina Membranes

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ABSTRACT

Porous alumina membranes are often used as templates for synthesizing nanowire arrays due to their well-defined pore structures, high pore density and uniform pore sizes. In this study, porous alumina with pore diameters of 20 – 90 nm was prepared by anodisation technique. Two different electrolytes, sulfuric acid and oxalic acid, were evaluated as the anodizing solutions. The anodization process was carried out with voltage ranged from 18V to 60V, using pure aluminium foil as anode and platinum as cathode. Pore diameters, depths as well as spacings between adjacent pores were carefully controlled by the anodizing conditions used. The morphologies and pore structures of the templates produced were studied using plan-view and cross-sectional scanning electron microscopy (SEM).

Keywords: porous alumina, anodisation, templates.

POSTER PAPERS

P1

Aspirin Adsorption on Functionalized Multiwalled Carbon Nanotubes and Its Release Characteristics in Simulated Body Fluid

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ABSTRACT

Carbon nanotubes (CNTs) have been proposed and actively explored as innovative carriers for drug delivery applications. The functionalization of carbon nanotubes can improve substantially their dispersability and biocompatibility profile, thus offering the potential exploitation of carbon nanotubes in drug administration. In this study, the multiwalled carbon nanotubes (MWCNTs) were functionalized using concentrated nitric acid (68%) and sulfuric acid (98%) in the ratio 3:1 volume per volume by sonication techniques and were characterized using various characterization instruments. The generation of carboxylic groups was proven by FTIR spectroscopy. In addition, the adsorption of aspirin (ASA) drug onto functionalized MWCNTs was done by sonication technique at different concentration of ASA drug solutions and at different sonication time. The presence of ASA adsorbed onto functionalized MWCNTs was determined by FTIR spectroscopy. The results from UV-Vis Spectrophotometer gave the percentage of ASA adsorbed onto functionalized MWCNTs with the amount of 77.64% (77.64 mg/ 100 mg) at 30 000 ppm for 5 hours sonication. From the release study of ASA in Simulated Body Fluid (SBF) at 37oC (human body temperature) and 39oC (fever temperature), the results show a fast release of ASA from ASA-f-MWCNTs composite for the first 5 hours compared to the commercialized Aspirin tablets and followed by a controlled release at the following hours. It reveals that MWCNTs have the ability to improve the pharmacokinetics of ASA in the biomedical applications, thus it can be used as to improve the drug delivery system.

Keywords: multiwalled carbon nanotubes, drug loading, drug released, aspirin

P2

Synthesis of Nano Drug Delivery System using Functionalized Carbon Nanotubes

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ABSTRACT

The pharmacological profile of drugs, the properties of the targeted site of cell as well as the drug delivery mechanisms are three main areas that can have a significant effect in determining and controlling the administration routes of a drug delivery system. Many of the conventional drugs administered through tablets, liquids or injections exhibited the stated challenges in which they can greatly compromise the therapeutic efficacy to a certain extent and eventually lead to the withdrawal from the final stage of clinical development. To overcome the challenges faced by many conventional methods of drug delivery as mentioned above, multi-disciplinary scientists are extensively looking into the possibility of developing novel drug delivery systems by targeting drugs and/or delivery vehicles to the specific site of the cell with controlled-release capability. Furthermore, the novel therapeutic system can also function as drug reservoirs with sustained release features to prevent the drugs from biodegradation in the body and eventually leading to lower dosage required as well as improved patients compliance. Over the past few decades, functionalized carbon nanotubes (*f*-CNTs) have been extensively explored as multipurpose innovative carriers for drug delivery and diagnostic applications in nanobiomedical sciences. Their attractive properties such as good biocompatibility, excellent chemical and thermal stability can ensure the steadiness and solubility of drugs in aqueous environment. Furthermore, their ultrahigh surface area of CNTs can simultaneously enable the loading of different functional groups or bioactive compounds to be chemically (covalent or non-covalent) bonded to their side walls, tips or encapsulated inside the tubes for targeting, therapy and imaging. Apart from that, sufficiently *f*-CNTs can also promptly reduce the cytotoxic side effects of CNTs and at the same time, further increase their biocompatibility level. Most importantly, f-CNTs are known for their ability to cross

cell membranes which make them a potential drug candidate for synthesis of nano drug delivery system in nanomedicine. In this study, both single-walled and multi-walled carbon nanotubes functionalized with carboxyl groups (COOH) were used as nanovector for levodopa (an effective drug treatment for Parkinson's disease) to investigate the interaction and loading of levodopa (LD) onto the *f*-CNTs. According to the CHN-S elemental analysis, there was a significant increase in percentage drug loading of the *f*-SWNT-LD nanohybrids (in a percentage loading ranging from 12 – 20%), and the increase was presumably attributed to a more effective conjugation of LD-loaded SWNTs-COOH with the aid of *N*-(3-Dimethylaminopropyl)-*N*'-ethylcarbodiimide hydrochloride (EDC). This may be due to a better defined diameter and well dispersed of mostly individual SWNTs-COOH, whereas MWNTs-COOH are more likely to have structural defects, resulting in a less stable nanostructure. The above result was also supported by the characterization of Fourier transform infrared (FT-IR) spectroscopy in which the single-walled nanohybrids exhibit better adsorption peaks and characteristics as compared to the multi-walled nanohybrids. Based on these findings, it indicates that SWNTs-COOH appears to be the most suitable nanovector in comparison with MWNTs-COOH for direct drug conjugation to the surface of *f*-CNTs.

Keywords: functionalized carbon nanotubes, nanovector, levodopa, nanohybrid, direct drug conjugation

P3

Characterization of Schottky Barrier Carbon Nanotube from Bio-hydrocarbon Precursors

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ABSTRACT

The characterization of Schottky barrier carbon nanotube (CNT) from bio-hydrocarbon precursors; coconut, palm, corn, olive and sesame oil precursor were investigated in this paper. The synthesis CNT was carried out in a double-stage furnace chemical vapour deposition method. Ferrocene at 5.33 wt% was directly mixed with bio-hydrocarbon precursors for 60 mins synthesis time. The CNT synthesized on silicon substrates (1.0 cm x1.0 cm) and then characterized by field emission scanning electron microscopy, micro-Raman spectroscopy and thermogravimetric analysis. The characterization of Schottky barrier was measured using four point probe. The estimated thickness of CNT was around 7.23-4.71 μm with the diameter was around 35.6-37.5 nm. The result showed that coconut oil has the best gradient of Schottky barrier among bio-hydrocarbon precursors.

P4

Physicochemical Properties of SWNT Dispersed using Poloxamer 407 Surfactant for Nanotoxicity Study

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ABSTRACT

Physicochemical property of nanostructured material is a crucial element in delving into a better toxicology understanding. This understanding can lead to enhancement in design of nanostructures for therapeutic and diagnostic application as well as other fields. In our research, a biocompatible surfactant based on triblock copolymer, Poloxamer 407, was used for dispersing Single-walled Carbon Nanotubes (SWNTs) in aqueous solution. Physicochemical properties of SWNT dispersion were analysed in terms of size, surface charge, shape, chemical composition, zeta potential, concentration and purity. The stability of SWNT dispersion in context of steric, electrostatic and van der Waals forces between particles were discussed using Derjaguin-Landau-Verwey-Overbeek (DLVO) theory. In this study, the dispersion stability and hydrodynamic size were also discussed. The SWNT dispersion prepared by using probe sonication method exhibited good stability with average CNT diameter and length of 4±2 nm and 100-600 nm, respectively. The cytotoxicity study of SWNT was carried out by using mouse peritoneal macrophage cell line, RAW264.7 cells. The SEM and TEM results showed that SWNT exhibit cytotoxic effect by inducing damage to cell membrane via increased of phagosome in cytosol.

P5

Recycling of Waste Cooking Palm Oil for the Production of Carbon Nanotubes: Effect of Synthesis Temperature

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ABSTRACT

Recycled waste cooking palm oil was utilized as starting material for the production of carbon nanotubes (CNT). The synthesis was done using thermal chemical vapour deposition (TCVD) method at various synthesis temperature of 600-900°C over trimetallic catalyst (Fe-Ni-Co). The CNT morphology were characterized by field scanning electron microscopy, Raman and Fourier transform infrared spectroscopy. The experimental result revealed that CNT of various packing density, diameter and quality were highly dependent on synthesis temperature. CNT with different morphology were then assessed for its potential as electron emitter. Field emission measurement confirmed that different CNT morphology affect the electron emission performance of the CNT. Possible physical reasons attributed to the different emission properties were discussed.

Keywords: Nanotubes, Thermal Chemical Vapour Deposition, Field emission scanning electron microscopy, Raman and Fourier transform infrared spectroscopy, Field Electron Emission.

P6

Natural Reduction to Obtain Graphene from Graphene Oxide

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ABSTRACT

The used of the conventional chemical reagents (eg.hydrazine monohydrate, sodium borohydrate) in graphene oxide reduction are highly toxic and harmful to both living organism and environments. Trace amount of the poisonous agents could have harmful effect especially to the biorelated applications. Usage of those chemicals should be avoided and green method for reduction which gives at least the same effect as hydrazine is highly desirable. There were few studies focus on the green reduction of graphene oxide; however, most of the green reductant used was from food source. Merit of this study is β-carotene would be used to reduce the synthesized graphene oxide. β-carotene was found could be obtained from palm oil waste which gives great advantages as a green chemical reductant since no studies using β-carotene was reported before. Reduction was done in inorganic solvent at 95^{o}C for 6 hours. The resulting graphene was characterized using numerous equipments. The progress of reaction (reduction of graphene from graphene oxide) was monitored as a function of time by measuring the position of the UV-vis absorption peak of the dispersion. Raman spectroscopy and FTIR was used for graphene identification and to identify functional group in samples. Potentiostat was used to study basic electrochemical behaviours of the reduced graphene while SEM and TEM were employed for surface characterizations. In this study antioxidant used is found to yield the same quality graphene which produced previously by hydrazine and vitamin C. Reduction using safe and environmentally green reductant offers great potential for producing graphene for industrial scale.

Keywords: graphene, graphene oxide, green reduction, β-carotene

P7

Properties and Photocatalytic Behaviour of Nanocrystalline Bismuth Titanate in Cubic *Fm3m* Phase

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ABSTRACT

A series of nanocrystalline bismuth titanate (Bi:Ti = 10:1. 12:1, 14:1, 16:1, 18:1) were successfully synthesized via modified hot injection method. The synthesizing procedure was carried out by replacing a common non coordination solvent to an aqueous solvent which reduced the reaction temperature to 130°C. Bismuth nitrate and titanium butoxide were used as precursors of bismuth and titanium, respectively. XRD analysis showed formation of solid solution in these nanocrystalline bismuth titanate materials which were crystallined in cubic crystal system with *Fm3m* space group. As evidenced by FESEM images, these materials have an average particle size of 17 to 34 nm. DR UV Visible spectroscopy results revealed that all synthesized materials fell in the UV region with band gap energies of 3.65 eV in average. Their photocatalytic performance was tested through phenol degradation under ultraviolet light for 12 hours. It has been demonstrated that all synthesized materials were excellent photocatalysts. Among these materials, the nanocrystalline bismuth titanate with Bi to Ti mole ratio of 10:1 has shown the highest phenol degradation of 88 % compared to the others.

Keywords: Nanocrystalline bismuth titanate, Cubic *Fm3m*, Solid solution, Photodegradation

P8

Enhanced Photocatalytic Removal of Methylene Blue using Visible Light-driven Cr- and V- Doped TiO_2

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ABSTRACT

A new attempt was carried out to improve photocatalytic performance of TiO_2 by introducing 1−5 mol% chromium and vanadium via sol-gel method using acetylacetone as chelating agent. Structural analysis revealed existence of either Cr or V promoted phase transition of anatase to rutile in these metal-doped TiO_2 samples. It was observed that percentage of rutile phase increased with increasing of Cr or V content in the samples. Addition of Cr or V into/onto TiO_2 also suppressed the crystallite size growth from 20 to 15 nm. On the other hand, optical absorption results elucidated that absorption band edge of the samples extended to longer wavelength after introduction of Cr or V, making the resulted materials potential photocatalysts under visible light. As confirmed by EDS, Cr and V existed and dispersed homogeneously on the samples. Comparing with TiO_2, all Cr- and V- doped TiO_2 samples exhibited remarkable enhanced photocatalytic activity in methylene blue removal under visible light illumination due to the extended absorption edge as well as the formation of rutile phase. There was an optimum amount of Cr or V dopants in TiO_2 for the photocatalytic removal of methylene blue. Photocatalytic activity of the optimum V-doped TiO_2 samples was found to be higher than that of the optimum Cr-doped TiO_2 samples. The comparison between Cr- and V-doped TiO_2 will be discussed in detail.

P9

Novel Metal Free Mesoporous Carbon Nitride for Photocatalytic Removal of Toxic Salicylic Acid

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ABSTRACT

Salicylic acid is one of organic pollutants that can be found in waste water. The photocatalytic removal of salicylic acid has been considered as one green technology to reduce its effect on the environment. As the sunlight has more portion of visible light than the UV light, the development toward the visible light-driven photocatalyst is a very important approach. One of the concerned visible light-driven photocatalysts is carbon nitride that is a metal free material. Owning the high surface area, porous materials usually provides better catalytic performance than non-porous samples. In this work, we reported the photocatalytic activity of mesoporous carbon nitride and the bulk one for removal of salicylic acid under visible light irradiation. Both mesoporous carbon nitride (MCN) and bulk carbon nitride (BCN) were prepared similarly through thermal polymerization of urea precursor, except that the mesoporous structure was generated onto the MCN via hard template approach using silica nanospheres. X-ray diffraction patterns showed characteristic peaks of graphitic carbon nitride, suggesting successful preparation of both the MCN and BCN. Mesoporous structure of the MCN was confirmed by sorption analysis, showing a hysteresis loop for type IV isotherm with pore size diameter of 7 nm as determined by BJH equation. It was found that the MCN has higher specific surface area compared to the BCN. From TEM images, it was observed that the MCN with higher specific surface area has well-developed nanospherical structure, while BCN with lower specific surface area has nanoworm-structure. The ability for both samples to absorb visible light region was confirmed from their DR UV-Visible spectra, suggesting their potential application as visible light-driven photocatalyst. The photocatalytic removal of salicyclic acid was carried out under visible light irradiation (λ> 400 nm). After 6 hours of irradiation, the salicylic acid was almost completely removed on the MCN (99%), while less activity was observed on the BCN. This study again showed that high specific surface area plays an important role for the photocatalytic removal of salicyclic acid organic pollutant. The salicylic acid adsorption and photocatalytic activity behaviours on these materials were also discussed in detail.

Keywords: Carbon nitride, mesoporous, photocatalyst, salicyclic acid, visible light

P10

Synthesis of Novel Biocompatible Chitosan/ZnS:Mn^{2+} Quantum Dots by Microwaves Radiation

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ABSTRACT

Semiconductor quantum dots (QDs) are more promising materials with their unique optical properties. As QDs is broadly applied in biomedical domains, how to reduce the cycotoxicity is a great challenge. In this research a novel biocompatible chitosan-coated ZnS quantum dots [CS-ZnS QDs] and chitosan-coated ZnS: Mn^{2+} quantum dots [CSZnS: Mn2+ QDs] have been successfully synthesized through a convenient microwave radiation method. The water soluble manganese-doped core/shell ZnS/ZnS quantum dots (ZnS:Mn/ZnS) with size of around 5 nm were obtained. According to ultraviolet light's excitation, the quantum dots emit strong visible blue or orange light luminescence peaking at 590 nm due to the $^4T_1 \rightarrow {}^6A_1$ transition of Mn (II), which is visible to the uncovered eye. The nanoparticles characterized by X-ray diffraction (XRD), thermogravimetric analysis (TGA), scanning electron microscopy (SEM) and transmission electron microscopy (TEM). According to low cytotoxicity and good biocompatibility of these QDs, the chitosan-capped Mn doped ZnS QDs offered suitable for biomedical applications such as bio-labeling, particularly in fluorescence-based imaging.

Keywords: Quantum dots, Chitosan, ZnS, Biocompatible, Microwave

P11

Study of the Effect of Lauroyl Peroxide (LPO) Initiator and Various Stabilizers on the Size of PS Seed Nanoparticles

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ABSTRACT

Recently there has been much attention to the synthesis of polymeric nanoparticles. These nanoparticles can be used to improve impact strength and optical and electrical properties of other polymers, as well as in drug delivery systems. There are many ways to make nanoparticles, among which emulsion, suspension, and dispersion polymerization methods are very common. In all these methods spherical particles are usually formed. Dispersion polymerization is the method used in this study to control the particle size. In the first stage monodisperse seed particles were produced and in the second stage the monomer was changed to produce particles with different shapes under controlled polymerization conditions. Styrene and other vinyl monomers were polymerized in a polar solution and the effects of various parameters to adjust optimum particle size were studied. Control of polymerization conditions such as temperature, solvent type, and the polarity of the reaction medium were effective on the particle size. Core/shell and void-containing particles are some examples of polymer particles prepared by this method. In this article, monodisperse seed particles of polystyrene (PS) synthesized using dilauroyl peroxide (LP) and different colloidal stabilizers e.g. hydroxymethyl cellulose (Methocel F50), and various polyvinylalcohols like Alcotex B72 (with 72.5% Hydrolysis) and Gohsenol KH17 (with 80% hydrolysis) were synthesized via dispersion polymerization.

Keywords: Initiators; Particle size; Seed dispersion polymerization.

P12

Calcium Phosphate Ceramics Prepared from Natural Waste Materials

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ABSTRACT

Calcium phosphate bio-ceramics have widely been developed in biomedical applications due to excellent biocompatibility, bioactivity and osteoconduction characteristics. These materials may be employed in forms such as porous blocks, dense body, granular forms and hybrid composites to fill bone defects or voids. The main component of calcium phosphate ceramics is calcium. One of the means to produce calcium phosphate is through extraction from natural sources such as eggshells, animal bones, cockles and coral as biogenic materials that are naturally available. Finer particles of the resulting powder promises better bioactivity and mechanical properties of bio-ceramic materials. This present research aims to synthesize calcium phosphate powders from raw materials, egg shell and bovine bone, to study the chemical and morphological properties and evaluate the phase stability and mechanical characteristics of the resulting granulated bio-ceramic material. The final products are porous bio-ceramics used as ceramic scaffolds for spongy bone application and dense ceramics used for load bearing applications.

Keywords: Calcium Phosphate, Porous, Dense, Natural Waste, Bone Engineering Technology

P13

A Variety of Nano-Sized Silica using Langmuir-Blodgett Films Induced Differentiation of Osteoblast–Like Cells

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ABSTRACT

The aim of the study was to analyse that the role of nano-structure topography was affected by bone differentiation. We fabricated a silica nano-particle monolayer on glass substrates for the cell growth by the Langmuir-Blodgett technique. A thin film of 60, 300, 700 nm sized mono-dispersed silica particles was constructed on the air–water interface and transferred onto a glass substrate. Despite being a tumor cell line, it exhibits many osteoblastic traits, including high levels of 1, 25-(OH) $_2D_3$-responsive alkaline phosphatase activity. Studies also have shown its ability to synthesize osteocalcin and collagen type I, which are characteristic of bone-forming cells. MG 63 was cultured on Nano-structured substrates and bare glass substrates for 7 days. Surface properties were investigated by atomic force microscopy (AFM). The characterizations of MG 63 on nano-structured substrate were conducted on using phase-contrast microscope and fluorescent microscope. The vitro biological response was characterized by cell morphology, adhesion, alkaline phosphatase activity and the DNA expression level related to mineralization in order to show a relationship between osteoblast response and surface features. The MG 63 cultured on nano-structured substrate showed a thin film of 60 nm sized mono-dispersed silica particles was the slowest in MG 63 adhesion ratio at substrate and occurred at the highest level of stress fibers. It also presented at high level of alkaline phosphatase activity and osteocalcin relatively compared with others nano structure. The result of real-time PCR that can quantity the amount of expression level obtained a similar figure. Between the extracellular matrix and nano-structure of 60 nm silica particles compared with other substrates were effective in terms of bone differentiation. In particular, Collagen tyep I composed of the extracellular matrix forms fibrils with an interfibrillar spacing of 68 nm and 35 nm depths. The hydroxyapatite crystals are embedded in these fibrils and an average size of 50 X 25 X 4 nm3. As a result, cells with nano-structures of 60 nm silica particles were influenced bone differentiation. We proposed that the nano-structure that has

specific size of particle for using Langmuir-Blodgett technique can be induced bone differentiation on MG 63 cells.

Key words: Nano-Structure, Silica nanoparticle, Langmuir-Blodgett technique, MG 63 Cell Culture, alkaline phosphatase activity.

P14

Fabrication of Porous Hydroxyapatite Forms for a Bone Regeneration System

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ABSTRACT

The use of synthetic Nano calcium phosphate in the form of hydroxyapatite (nHAp) for the treatment of bone defects is of potential interest. Such product materials are tailor-made to promote strong bonding to the affected bone. The present technique allows the fabrication of porous granules/rods and other forms successfully with desirable macro-, micro- as well as nano-porous characteristics simulating natural bone architecture, and is expected to provide advantages for biomedical purposes. The process is based on evolution of carbon dioxide by the reaction of synthetic yeast and starch creating an airy texture in nHAp matrix. The addition of guar gum acts as binder and makes it possible to control the rapid escape of CO_2 which helps in the fabrication of different shapes providing desired porous nHAp products. For this study different samples were prepared by varying the compositions of starch, yeast and guar gum while keeping the amount of nHAp constant. The amount of gum significantly effects on texture and the size of pores (50 nm – 100 µm). Sintering of the products was also carried out at different temperatures. The product samples were characterized by SEM, XRD and FTIR to evaluate the textures, changes in nHAp phase and molecular composition.

P15

Application of Hydroxyapatite Granules in Posterolateral Intertransverse Lumbar Spinal Fusion

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ABSTRACT

In many clinical disciplines used of bone graft is unavoidable such as to replace bone loss due to trauma, to fill in bone defect after tumour excision, for reconstructive surgery or spinal fusion. Calcium phosphate based hydroxyapatite is widely used bone graft substitute due to its similarity with the mineral components of bone matrix. This study was conducted to evaluate bone formation effect of this biomaterial in posterolateral intertransverse lumbar fusion, a novel site for its application. Twelve adult New Zealand white rabbits underwent bilateral intertransverse lumbar spinal fusion at L5-L6 vertebrae. One site of the animals was implanted with hydroxyapatite granules (HA group) while the contralateral sides received autograft and served as the control (AUTO group). Bone formation was assessed at 6 and 16 weeks by undecalcified histology and scanning electron microscopy. New bone was formed on the surface of hydroxyapatite granules and continually formed even at 16 weeks. Close contact between new bone and hydroxyapatite granules was demonstrated by scanning electron microscopy.

P16

Application of Silver Nanoparticles for Extraction of Cobalt from the Food Samples

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ABSTRACT

The determination of heavy metals at trace levels is one of the important objectives of chemists because of their roles in our life. Some trace metals such as cobalt are essential to human since daily requirement is only a few milligrams. However, if the metals ingested in high level, it can be harmful for health. Nano-materials possess a series of unique chemical and physical properties. One of their important properties is that most of the atoms that have highly chemical activity and adsorption capacity to many element ions are on the surface of the nano-materials Recently nanoparticles have been utilized as sorbent due to their improved intrinsic properties such as chemical activity and fine grain size in compared with the classical substances such as normal scale titanium dioxide and alumina. The aim of this study is to develop a simple, fast and sensitive method for determination of cobalt in the food samples using silver nanoparticles.

Keywords: Cobalt, silver nanoparticle, solid phase extraction, food samples

P17

Mild Phenol Removal over Magnetic Separable Iron Oxides Nanoparticles

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ABSTRACT

Nanotechnology is a multidisciplinary field that covers wide technological applications including materials and catalysis sciences. Various techniques have been rapidly developed to synthesize and characterize materials at nano-scale. Recently, there have been increased interests in synthesizing iron (III) oxides (Fe_2O_3) nanoparticles due to its superior capabilities for various catalytic reactions and magnetic properties for easy separation. In catalysis reactions, it was reported that particle size, surface area, and crystallinity of the material are important factors to obtain high catalytic activity.

In the present work, a new approach to prepare Fe_2O_3 nanoparticles was proposed by using a mesoporous carbon nitride (mp-C_3N_4) as a template. The properties and the photocatalytic activity of the prepared nanoparticles were compared to the bulk Fe_2O_3 prepared without template. Based on the XRD patterns and UV-Vis reflectance spectra, it was confirmed that Fe_2O_3 nanoparticles was successfully prepared at calcination temperature of 973 K. At this temperature, the template also was also removed. The crystallinity of the nanoparticles was found to be similar to the bulk one.

From TEM and SEM images, the prepared Fe_2O_3 has much smaller particle size that is in nanometer size than bulk Fe_2O_3, which has micrometer size. It was obtained that the Fe_2O_3 nanoparticles prepared using mp-C_3N_4 showed better photocatalytic activity compared to the bulk Fe_2O_3. Under UV light irradiation, total removal of phenol (100%) can be achieved after 15 h on the prepared Fe_2O_3 nanoparticles. In contrast, only *ca.* 30% was observed on the bulk Fe_2O_3. It was suggested that the smaller the particle size, the shorter the diffusion length of electron to migrate to the surface, resulted in the lower the electron-hole recombination that would lead to the higher photocatalytic activity. In addition to the high activity, the Fe_2O_3 nanoparticles also showed good magnetic response, implying the potential separation method using magnetic field.

This study strongly showed the importance of mp-C_3N_4 as a template to synthesize Fe_2O_3 nanoparticles photocatalyst.

Keywords: bulk Fe_2O_3, Fe_2O_3 nanoparticles, mesoporous carbon nitride, photocatalyst, phenol

P18

Preparation, Characterization and Synthesis of Fe_3O_4 Magnetic Nanoparticles using for Drug Delivery

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ABSTRACT

Magnetite, (Fe_3O_4) is an important type of magnetic material having cubic inverse spinal structure which has been attracting increasing attention because of its wide use in magnetic recording, ferrofluid , catalyst and biomedical applications, such as magnetic resonance (MRI) , bio-separation , drug targeting and hyperthermia [1].

Drug delivery system based on the use of nano- and microparticles and it has some advantages such as the ability of targeting specific location in the body. Magnetic nanoparticles of iron oxide were studied in a lot of fields such as control magnetically transportation of anti-cancer drugs as well as hyperthermia generation [2-4]. The objectives of this work are to synthesise and characterize a nanocarrier of drug using (magnetic nanoparticles coated with chitosan) for oral gastrointestinal delivery and specific cell targeting and also to synthesize and characterize nanoparticles (Nanocarriers coated with gallic acid).

Magnetic iron oxide nanoparticles have been prepared by using a sonochemical method under atmospheric at molar ratio of $Fe^{2+}:Fe^{3+} = 1:2$. Iron oxide nanoparticles were subsequently coated with chitosan -gallic acid. X-ray diffraction pattern demonstrated that magnetic nanoparticles were pure Fe_3O_4 with a cubic inverse spinal structure and the pattern was conserved .Vibrating sample magnetometer (VSM) study showed it is a superparamagnetic at room temprature. Transmission electron microscopy study showed that Fe_3O_4 nanoparticles were spherical shape with a mean diameter of 17 nm and after coating with gallic acid a mean diameter was 22 nm. The gallic acid coated with nanoparticles showed good controlled-release of the drug at 37°C with correlation coefficient of 0.993.

The average size of magnetite (Fe_3O_4) which was prepared by the method of ultrasonic irradiation is about 17 nm.

The Fe_3O_4-chitosan NPs have superparamagnetic property. Controlled-release of gallic acid showed that after around 1 day all the drug released at 37°C. The

measurements of FTIR indicated that the iron oxide nanoparticles are successfully coated by chitosan and gallic acid.

Keywords: Magnetic nanoparticles, Chitosan, Superparamagnetic, Drug Delivery

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Preparation of Raspberry-Like Polystyrene/Methyl Methacrylate Particles via Seeded Dispersion Polymerization

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ABSTRACT

Particles with various morphologies have a critical role in the development advanced materials because they usually exhibit noticeably enhanced or even properties (e.g., mechanical, chemical, electrical, rheological, magnetic, and optical onec). Several methods, such as dispersion polymerization have been developed, for generating nanocomposite particles with various interesting morphologies, such as raspberry-like structure. In this article for facile preparation of nonspherical raspberry-like poly styrene (PS) particles by seeded dispersion polymerization of methyl methacrylate (MMA), and the other acrylates monomers, such as butyl methacrylate (BMA), ethyl methacrylate (EMA) and even alyle, on micron-sized PS seed particles was described in the presence of a coupling comonomer. Various polymerization parameters influencing the particle morphology, and to stability, were studied. It was found that a relatively low temperature around 65^0C , an appropriate ratio of seed/MMA (1/2) , and a relatively low initiator (0.1gr) concentration hs needed for a successful polymerization. These particles showed very good morphological stability at room temperature, but they changed to the spherical ones when heat treated at 60^0C in methanol MMA solution.

Keywords: Seeded Dispersion Polymerization; Nanocomposite; Raspberry-like; Comonomer; Morphology.

P20

Synthesis and Characterization of ZnO Nanoparticles Using Surfactants and Hydrothermal Method

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ABSTRACT

Recently, ZnO nanoparticles had attracted a considerable attention owing to their unique properties that can be tailored to various applications, such as photo catalysts, conductivity, gas sensitivity and chemical sensors.
In this work, we synthesized and characterized ZnO nanoparticles utilizing a simple, non-polluted and energy-saving hydrothermal method which absolutely obeys the green chemistry chemical processes, in which the control of the experimental conditions is easy and straightforward.
The main goals of this work were to enhance the ZnO nanoparticles properties such as shape and surface morphology which was followed by investigating the effect of using two surfactants simultaneously, namely cetyltrimethylammonium bromide (CTAB) and sodium dodecyl sulfate (SDS). In addition the effect of altering the reaction temperature was also studied. Some of the main achievements observed from this study are:

- The XRD patterns illustrate that ZnO nanoparticles show high crystallinity and purity. All the diffraction peaks can be indexed as hexagonal (wurtzite-structure) ZnO phase, (JCPDS card no. 36-1451).
- Scanning electron microscopy (SEM) images proved that the morphology of ZnO is held a new nanostructure due to the addition of a mixture of CTAB/SDS as surfactants.
- The Obtained products show different structures; flower-like nanorods, branched rod-like, star-like, pencil-like, sphere-like aggregated nanosheets structure. They were achieved by using different concentrations of CTAB to SDS ratios.

- According to the SEM images, ZnO nanoflakes were obtained at low concentration of CTAB while at high concentrations ZnO nanorods were observed, when SDS concentration remained constant.
- Transmission electron microscopy (TEM) images indicated that ZnO particles which were synthesized are nano- and micro-sized particles.
- Results from BET show that surface area of as-synthesized product has increased when surfactants were used in the synthesis.
- Increasing in the reaction temperature show different morphologies for ZnO nanostructures for example ZnO-CTAB+1% SDS treated at 120˚C for 18 hours indicated 1D nanorods structures while same sample treating at 150˚C for 18 hours showed 3D branched rod-like structures. In addition, nanorods at low temperature (120˚C) were less in diameter and very sharp at tips while these values increased at temperature 150˚C.

To conclude, this work showed that ZnO nanoparticles can be synthesized by hydrothermal method using mixture of CTAB/SDS surfactants. The addition of surfactants affected on the shape, morphology and surface area of ZnO nanoparticles. Moreover, reaction temperature plays a very important role in the synthesized process.

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Synthesis and Characterization of Amino-Functionalized Gold-Silica Core-Shell Nanoparticles

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ABSTRACT

Gold nanoparticles (AuNPs) encapsulated in inorganic oxides shells can be used to tailor their functional properties. For example, silica (SiO_2) coating provides a scaffold for conjugating biomolecules on the oxide for applications such as biosensing and therapeutic delivery. Silica shells can be functionalized with amino groups ($-NH_2$) via aminosilanization. The active groups will enable subsequent covalent conjugation with biomolecules such as nucleic acids (DNA or RNA), antibodies, etc. With growing interest in using multifunctional core-shell nanoparticles, the quantification of superficial active groups has become significant. Hence, accurate assays are necessary in order to improve the efficiency of bioconjugation.

In this work, we will report on synthesizing and characterizing gold (core)-silica (shell) nanoparticles modified with amino groups via 3-aminopropyltrimethoxysilane (APTMS). The main focus is on the detection and quantification of active amino groups on the silica surface using fluorescamine, a fluorescent assay frequently used for determining the primary amino groups in proteins and peptides. The fluorescence calibration curves of amine standards including aminodextran and APTMS were used to determine the number of active amino groups per particle. Other supporting characterization of the amine-functionalized silica-coated particles including UV spectroscopy, transmission electron microscopy (TEM), and Fourier transform IR (FTIR) will also be presented.

P22

A Novel and Facile Synthesis of ZnO Nanoparticles using $H_3[PW_{12}O_{40}]$

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ABSTRACT

For the first time, a novel and facile wet chemical method has been presented to synthesize zinc oxide nanoparticles under ambient atmosphere at room temperature in alcohol. Keggin type heteropolyoxometalate ($H_3[PW_{12}O_{40}]$) was used as stabilizer. XRD and TEM of nanoparticles were used for morphological and structural characterizations. Size of nanoparticles was determined using TEM and Scherrer's formula. Results of these two methods are in good agreements and revealed single hexagonal zincite type crystal with average particle size in the range of 3-15 nm.

For the synthesis of ZnO nanoparticles (NPs), Zinc acetate dihydrate solution (0.2 M) was prepared in 20 mL dimethyl sulfoxide (DMSO) and stirred until it was completely dissolved and formed a clear solution. Then, solution of KOH (1.2 M) in 10 mL ethanol is added to the solution of Zinc acetate drop wise under slow stirring condition until it becomes uniformly white. Then, 0.4 g of $H_3[PW_{12}O_{40}]$ (HPW) was added and stirring was continued for additional specified time. The white precipitate was separated by centrifugation and then washed several times with DI water and ethanol, respectively to remove all impurities and then dried at 60°C for 8 hr.

In conclusion, a novel and facile wet chemical method has been presented to synthesize zinc oxide nanoparticles by using HPW. It has been found that HPW has important rule in the synthesis of ZnO NPs. XRD and TEM were used for morphological and structural characterizations of nanoparticles. Size of NPs was also determined using TEM and XRD. The results show that the average size of nanoparticles is about 3-4 nm.

Keywords: ZnO, Nanoparticles, Heteropolyoxometalates, Wet chemical method.

P23

The Effects of Substrate Doping Concentration to the Nano nLDD-MOSFET Electrical Parameter Characterization

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ABSTRACT

The main purpose of the transistor is designed to maximize the efficiency of devices and also to improve the device performance. Transistor consists of various types; one of them is MOSFET (Metal Oxide Semiconductor Field Effect Transistor) which is a transistor under the influence of the voltage that requires a small input current. MOSFET consists of two types; there are n-MOSFET and p-MOSFET. In this thesis we study the nLDD-MOSFET. Circuit analysis using a simulation program is intended to get the result of a circuit analysis without build it. This can save a lot of time and cost because this simulation program will provide the expected results which coherent the theory. Therefore, this circuit simulation program always carried out before running analysis with standard laboratory equipment. In this study, NanoHUb simulation software is used to study the effect on the electrical characterization of submicron n-MOSFETs. NanoHUB is an online simulation program that will provide simulation data and plotted graph. The graph is plotted by using Microcal Origin software. Analysis of the circuit will provide the changes to the graph of a I_D-V_{DS} and I_D-V_{GS} graph with different substrate doping concentration of submicron n-MOSFET. The threshold voltage, V_{TH} can be determined by Microcal Origin 3.5 based on least squares linear function.

Keywords: MOSFET, n-MOSFET, nLDD-MOSFET, simulation, NanoHUb, submicron n-MOSFETs, Microcal Origin 3.5, graph I_D-$V_{DS,}$ graph I_D-V_{GS}, threshold voltage, VLSI circuit, Current Characterization, Drain Voltage, Gate Voltage, Channel OFF, Linear Region, Saturator Region, Dopant Concentration, Gate-Drain Voltage.

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Nanopaper Innovation at Paper and Packaging Industry

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ABSTRACT

Nowadays due to globalization of economy and competition environment, innovation and technology plays key role at creation of wealth and economic growth of countries. In fact prompt growth of practical and technologic knowledge may results in social benefits for countries when changes into effective innovation. Considering to importance of innovation in developing of the countries, this study had introduced nanopapers as a radical technological innovation at paper and packaging industry and different stages of producing paper be included: stock preparation, using authorized additives, fillers and pigments, using retention, calendar, and stages of producing conductive paper, porous nanopaper and Layer by layer self-assembly. Research results show that in coming years the jungle related products will lose considerable portion of their market share, unless radical innovations happen. Although incremental innovations can make this industry still competitive in mid-term, but to have economic growth and competitive advantage in long term, radical innovations are necessary. Radical innovations can lead to new products and materials which their applications in packaging industry can produce value added. However application of nanotechnology in this industry can be costly, it can be done in cooperation with other industries making the maximum usage of nanotechnology possible. Therefore this technology can be used in all the production process, resulting in the mass production of simple and flexible papers with low cost which has special applied properties including facility at shape, form, easy transportation, light weight, recovery and recycle marketing abilities, sealing, which can make more value-added at packaging industry . Improving the resistance of the packaging materials, considerable weight reduction without reducing the performance of packaging materials and etc., enhance the quality and the value added of packaging. Improving the cellulose at nano scale can have considerable electron optical and magnetic effects leading to improvement in packaging and value added.

Comparing to the specifications of thermoplastic products and ordinary papers, nanopapers show much better performance in terms of effective mechanical indexes such as the modulus of elasticity, tensile strength, and strain-stress. In densities lower

than 640 kgm $^{-3}$, due to the network structure of nanofibers and the balanced and randomized distribution of NFC in flat space, this specification will even improve more. For this nanopaper, strain are 1,4Gpa, 84Mpa and 17%, 13.3 Gpa, 214Mpa and 10% respectively. In layer by layer self-assembly method (LbL) the tensile strength of nanopaper with TiO_3 particles and SiO_2 and halloysite clay nanotube are 30,4 ±7.6 Nm/g and 13,6 ±0.8Nm/g and 14±0.3,3Nm/g respectively that fall within acceptable range of similar samples with virgin fiber. The usage of improved brightness and porosity index in nanopapers can create more competitive advantage at packaging industry.

P25

Silicon Etching using RIE for Micro Pillars Fabrication

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ABSTRACT

Biosensors which utilize the micro pillars array structure are widely used for trapping or filtering proteins and pathogens. This work focused on the characteristics and simulations view of silicon etching using RIE. The resulting data is required for optimize the masking design of micro pillars fabrication in terms of gap size and pillar height. Simulations were carried out using *Intellisuite 8.0* which SF_6 gas used as the etchant. The parameters of the simulation are etch step, etch cycle, ion assist etch rate and isotropic etch rate value. Two methods of measurement; etch depth and undercut were analyzed and compared with theoretical for the each particular setting. The simulation views of the etched pattern were carried out with 2D and 3D visualizations. Results show the RIE etching of silicon produced an aggressive undercut or isotropic with the increased of ion assist etch value. The etch characteristics show the linear plotting of etch depth and undercut as the function of etch steps and etch cycles. The etch depth could be control by choosing the appropriate etch step and etch cycle values. The deviation of the simulation values are below 10% which indicates the validation of the simulations data. The undercut or isotropic structures being etched were up to 1 um and the depth up to 7 um with the manipulation of the ion assists and isotropic value, and the etch step constraint was set to 20 steps. Therefore, we could calculate the etching rate by simple statistical approach for each experiment done. Masking design for micro pillars need to consider these undercutting effects for optimization of gap and height values. The simulations value was also compared to the real experiments using RIE SNTek system. The simulations of silicon etching using RIE are relevant for preliminary work before the real fabrication process taking place.

Keywords: RIE, Etching, Micro pillars

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Studies of Surface Modification of Silane-coated TiO_2 for Photocatalytic Activity of 4-Chloromethylphenyltrichlorosilane (CMPS) on Silicon Nanostructures

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ABSTRACT

Self-assembled monolayers (SAMs) represent one particular class of organic thin film that are increasingly used as templates for the construction and the subsequent study of nanoscale features. The surface properties of a SAM are governed by the tail groups of the molecules; it can be altered to produce new surface chemistries which offer a range of applications, from microelectronic to biotechnology fields. In the study of biomolecules, the surface modification is created to allow the molecular interaction at the surface and provide a specific interaction. A conventional photochemistry is widely used to study SAMs surface modification. In photopatterning process, it involves the surface to be shone under deep UV in a presence of mask. TiO_2 in photochemical studies is well known for its unique characteristics as photocatalysts. Thus, in this work, 4-Chloromethylphenyltrichlorosilane (CMPS) on SiO_2 and TiO_2 were studied to monitor and compare photochemical reactions. CMPS were initially prepared on substrates (SiO_2 and TiO_2) using self-assembly approach and subsequently exposed to deep UV of 254 nm. UV reaction for unpatterned surfaces were studied using contact angle, fourier transform infrared (FTIR) and x-ray photoelectron spectroscopy (XPS) in order to monitor the photoproduct formed and reaction rates. It is proposed that heterolytic fission of chloromethyl tail group converts to aldehyde and carboxylic groups for further UV exposure. Highly efficient and rapid photo-oxidation was observed for CMPS on TiO_2, a complete conversion was found to occur within minutes compared to CMPS on SiO_2. The resulting carboxylic group terminated surface was then derivatised using 2-amino, 1,1,1-trifluoroethane (TFEA). Contact angle and XPS measurements postderivatization indicated that the surface functionalization was extensive. Microns-scale patterns will then be performed using mask based exposure, derivatized and characterized with atomic force microscopy (AFM).

Keywords: 4-Chloromethylphenyltrichlorosilane (CMPS), self-assembled monolayers (SAMs), silanisation reaction, photocatalytic irradiations, TiO_2 sol-gel

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2D Array Nanosphere Lithography for Sensitivity Enhancement of Surface Plasmon Resonance Sensor

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ABSTRACT

The Surface Plasmon Resonance (SPR) can be used to analyze the real-time response to the changes in surface properties on a metallic film. SPR has been widely employed for biosensor applications because of the capability for label-free detection of biomolecular interactions. Nanosphere lithography (NSL) is an inexpensive, simple to implement, inherently parallel, high throughput, materials general nanofabrication technique capable of producing an unexpectedly large variety of nanoparticle structures and well-ordered 2D nanoparticle arrays.

In this study, we used Au triangular-shaped nanostructure for SPR sensitivity enhancement. The Au based thin film was evaporated by sputter on the flat 18×18 mm^2 cover glass substrates. Periodic particle array surfaces have been prepared using identical single-layer Nanosphere lithography (NSL) masks made by Langmuir-Blodgett (LB) method of silica nanospheres with a variety of diameter(D = 150, 300, 500, and 700 nm). The Au nanostructured SPR chip was fabricated by e-beam evaporation on the Au based thin film substrates. The Au nanostructured SPR chips showed a remarkable shift of resonance angle for analytes such as water and ethanol aqueous solution compared with that of conventional Au chip. The peaks of near resonance angle were widened especially when 150 nm sized silica particle template based chip was used. In comparison to conventional flat Au chips, sensitivity enhancement was up to 120% on the 150 nm sized silica particle template based chip. The tendency for the sensitivity enhancement change in bulky refractive index remains the same as previous Au nanostructured SPR researches.

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Photo Alignment Effects on Nanolayers: Characteristic Properties and Applications

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ABSTRACT

The alignment of liquid crystal (LC) molecules on a substrate is an important research/development subject, because it is a critical element for fabricating LC displays and devices. Right from the beginning many researchers are used and using polyimide (PI) rubbing technique to align liquid crystals. Mechanical rubbing may result in static charge and dust on the surface, so noncontact alignment approaches including photoalignment, electron-beam alignment, among others, is being actively studied. Among all these photoalignment is most promising over the conventional rubbing technique.

The effect of LC photoalignment is a direct consequence of the appearance of the photo-induced optical anisotropy and dichroic absorption in thin amorphous films (of nano thickness, 20 nm to 100 nm range), formed by molecular units with anisotropic absorption properties. Present investigation on new azo dyes on different nano layer thickness produced high anchoring energy, superior contrast, better viewing angle and more over high stability (both UV and thermal). The new azo dyes studied here allow us to realize plenty of LC applications like photo-patterned super thin polarizers and phase retarders, optically rewritable LC display, photoaligned nematic displays on plastic substrates, photoaligning of ferroelectric LC etc.

Keywords: nanolayers, photoalignment, liquid crystals.

P29

First Principle Investigations of the Rotational Barrier and Hyperfine Interactions of Muonium in Tetraphenylgermane

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ABSTRACT

In this work, we have used the Density Functional Theory technique to study the rotational barrier for the muoniated–tetraphenylgermane, $(GePh_4)_6$–Mu system. Three Mu trapping sites were considered in the investigations, namely *ortho*, *meta*, and *para* sites. The positions of muonium (Mu) at the three different sites were determined by performing geometry optimization procedures to calculate the total energy of the system. The optimized geometries were then used to evaluate the hyperfine interactions for the Mu. The phenyl ring with the Mu attached to it was then rotated about the Ge–C bond at the intervals of 10° for a complete 360° rotation. For all three cases, the computed energy profiles showed three peaks. For the *ortho* case, the location of the peaks in the energy profile were determined to be at the rotatiaon angles of 80°, 240°, and 280°. In the case of the *meta* case, the peaks appear at 100°, 250°, and 280° while for the *para* site they are calculated to be at 110°, 240°, and 270°. The barrier height for the rotation of Mu–attached phenyl ring was calculated to be less than 1.1 eV. The largest contribution to the total hyperfine coupling constants for the Mu was from the isotropic part. The corresponding calculated value varies between 431.05 MHz and 476.93MHz.

Keywords: Density Functional Theory, tetraphenylgermane, muonium, rotational barrier

P30

The Growth and the Structural Properties of the Pure Lithium Niobate and Neodymium Doped Lithium Niobate Single Crystal

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ABSTRACT

Lithium Niobate, $LiNbO_3$ (LN) is an excellent nonlinear property. LN single crystals are used in variety application such as electro-optics, laser physics, acoustics and halography. The pure $LiNbO_3$ (PLN) single crystals are grown using Czochralski method in an air atmosphere with ADC (Automatic Diameter Control). This technique can be used to grow a huge amount of these crystals. The growth of LN crystals are divide into six phases: Preparation of materials, seeding process, core growth process, main growth process, separation of the crystals from melt process and cooling process. Furthermore, the critical diameter crystals and the critical rate of rotation crystals are determined by using the combination of Reynolds and Ghrashof number when the critical rotation rate is inversely proportional to the diameter of the single crystals. The doped LN crystals exhibits a strong resistance to photorefractive effect and shown a great plus strong optical properties of Nd:LN single crystals. The doped LN crystals are dividing into two dopant concentrations which are 0.5 mol % and 1.0 mol %. The structural properties of PLN and Nd:LN are investigated by using UV-VIS and Raman Spectroscopy. When the mechanism of RE elements incorporation in the crystal lattice of $LiNbO_3$ is analysed via experimentally can be understood.

Keywords: PLN, Nd:LN, Czochralski method, Structural Properties, UV-VIS, Raman Spectroscopy

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A Novel Acrylamide-Anatase Hybrid Nanocomposite

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ABSTRACT

A novel hybrid-nanocomposite of polyacrylamide-TiO_2 (PAM/TiO_2) with nano-anatase particles was synthesized in two steps. Firstly, the surface of nano-titanate particles was modified by (TMSM) as coupling agent by sol-gel method. Secondly, the surface modified nano-titanate particles were grafted onto the acrylamide monomer (AM) as an organic phase by free radical polymerization.
The spectral (Fourier transform Infrared spectroscopy) and thermal (TGA) methods, verified the participation of coupling agent, polymer and titanium dioxide into the hybrid. The results also showed that the degradation temperatures and residual content were obviously higher in nano-composite than those of pure polyacrylamide (PAM). Scanning electron microscopy (SEM), transmission electron microscopy (TEM) and atomic force microscopy (AFM) studies proved that the nano-titanate particles have been uniformly encapsulated inside the nano-composite sample containing 5wt% TiO_2. However, the agglomeration of nano-particles in the nano-composite with 20wt% of TiO_2 was detected by atomic force microscopy (AFM) and dynamic mechanical thermal analysis (DMTA) studies. Thermo-mechanical properties of acrylamide homopolymer (PAM) and their nano-composites were investigated by DMTA. The shifts in storage modulus and tanδ peaks were attributed to morphological changes in the nano-composites with increasing the amount of inorganic nano-particles and their distribution in polymer matrix. Flocculation behavior of PAM and PAM/TiO_2 in two different level of titanates (i.e. 5 and 20wt% TiO_2) for 0.25wt% nano-clay suspension was evaluated using batch method. The adsorption results showed that PAM/TiO_2 have ability for interaction with clay particles by means of adsorption through electrostatic interaction, Vander Waals forces and hydrogen bonding. However, it was found that the flocculation efficiency of the pure polymer (PAM) and the hybrid-nanocomposite (5wt% TiO_2) is much better than that of its high concentration (20wt% TiO_2) in the hybrid. This flocculation behavior can be attributed to uniform distribution of nano-particles and agglomeration

possibility in the case of low and high concentration level of titanate in hybrid nano-composite, respectively.

Keywords: Nanocomposite, Organic–inorganic hybrid, titanium dioxide, polyacrylamide (PAM), flocculent.

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Preparation and Thermal Conductivity of Alumina Nanoparticles Dispersed In a Mixture of Ethylene Glycol and Water

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ABSTRACT

Enhancement of energy saving and efficiency is a major concern of present science and technology. Therefore, many investigations conducted to improve the characteristics of cooling fluids by adding nano-sized particles to the base fluid, which called nanofluid. In the present study, thermal conductivity of alumina nanoparticles dispersed in the mixture of ethylene glycol and water (60:40 mass ratio) was investigated with the influence of volume concentration and temperature. The two-step method has been applied for nanofluids preparation. Meanwhile, ultrasonication and SDBS dispersant applied for higher stability and better dispersion of alumina nanoparticles. Zeta potential study showed the influence of ultrasonication on stability of nanofluids, which one and a half hour sonication obtained as an optimized time. Thermal conductivity results showed polynomial enhancement with increasing particle loading at low volume concentrations, while linear enhancement observed at higher concentrations. In addition, thermal conductivity enhancement observed with rising temperature, which was negligible in comparison to that of volume concentration.

Keywords: Nanofluid, Thermal conductivity, Alumina nanoparticles, Nanofluid preparation

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Structural and Thermal Properties of Gold Nanoparticles Prepared on n-Type Silicon

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ABSTRACT

In this work, the effect of thermal annealing on gold deposited silicon (Au/Si) was studied. A thin layer of gold (Au) with a thickness of around 20 nm was deposited onto the surface of a silicon (Si) wafer prior to the thermal annealing at 360 ^{o}C, 600 ^{o}C, 800 ^{o}C, and 1000 ^{o}C. The structural and thermal properties of the samples have been studied using Field Emission Scanning Electron Microscope (FESEM) and Photoacoustic Spectroscopy (PAS). The structural results indicated that Au nanoparticles formed on the samples by annealing. The size and shape of the nanoparticles are depended to the annealing temperature. For the sample annealed at 360 ^{o}C, the gold layer is shrunk and made the irregular form of particles. In this case the average size of particles is around 120 nm. Raising the temperature reduced the size to nanoparticle scale and made a uniform and regular form of nanoparticles. The best size for nanoparticles was achieved by annealing at 600 ^{o}C. At this temperature, the size of nanoparticles decreased to 70 nm, and then by increasing the temperature the nanoparticles began to agglomerate and made the bigger size of particles. The size of nano particles increased from 70 nm to 220 nm by raising the temperature. Also, the effect of thermal annealing on the thermal diffusivity of the samples was studied. Photoacoustic spectroscopy (PAS) was carried out for measuring the thermal diffusivity of the samples.

Keywords: Silicon, Nanoparticle, Photoacoustic spectroscopy, Thermal annealing, Gold, Thermal diffusivity

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Synthesis of Nano-Hamburger Polymer Particles and the Effect of Solvent Concentration on It

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ABSTRACT

Polymer nano-particles are used in many applications like biomedicine and drug delivery systems. The morphology of the composite polymer particles is one of the key factors their use. In the past two decades, many studies have been done to control the morphology during the polymerization processes. Morphology of particles is influenced by many parameters like monomer and solvent concentrations, and polymerization temperature.

Synthesis of these polymer particles can also be an attractive subject. Polymer nano-particles prepared by emulsion, suspension and dispersion polymerizations are usually spherical because of the thermodynamical tendency of system to minimize the interfacial free energy between particles and medium. Dispersion polymerization is a suitable method for preparation of these nano-particles, because it can be done in two steps. In this method at the first stage the seed particles are prepared in optimum conditions of polymerization and in the second stage of the polymerization monodisperse composite particles can be synthesized by adding the second monomer under controlled polymerization conditions. Shape of these particles is controlled by heterogeneous structures formed, and later phases separation of polymers in particles during the seeded dispersion polymerization in non-equilibrium conditions. Core/shell and void-containing particles are some examples of polymer particles prepared by this method. In this article, monodisperse seed polystyrene (PS) nano-particles in the first stage are prepared and in the second stage nano-hamburger polymer particles are synthesized. In addition, by changing the decane solvent concentration used, the change in the morphology of the particles is discussed.

Keywords: Spherical Nano-Particles; Seeded Dispersion Polymerization; Morphology; Particle size.

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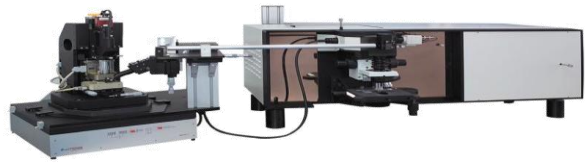

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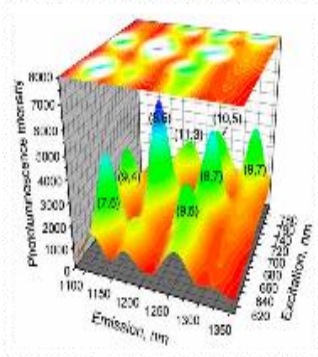

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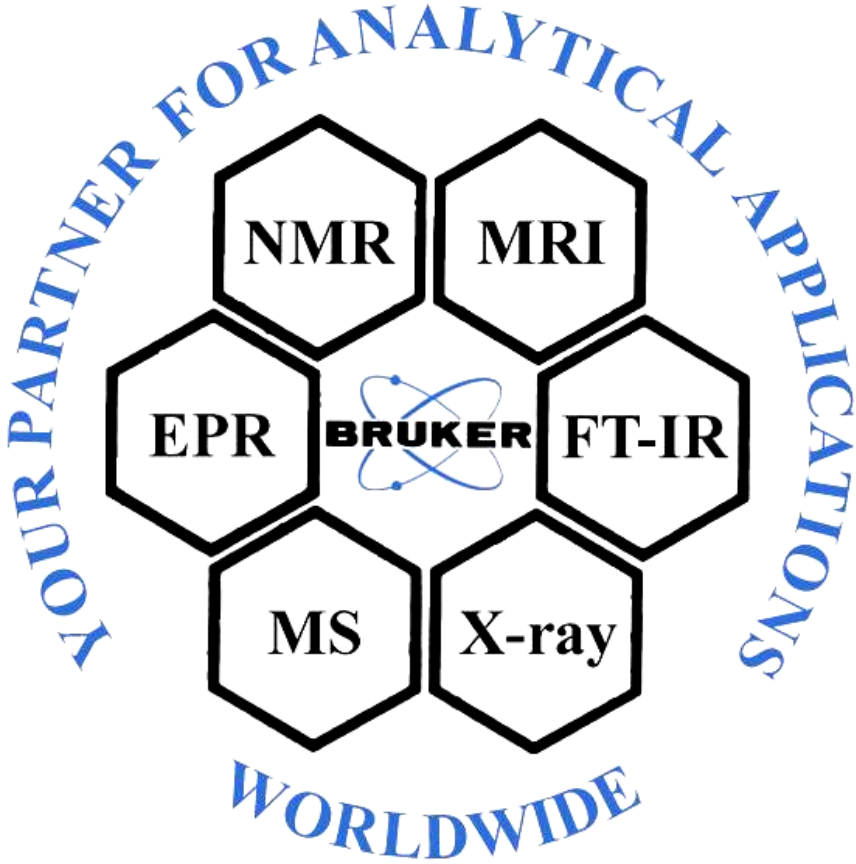

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