Pattaya, Thailand
March 13-15, 2020
Venue: Centre Point Hotel Pattaya
Add: 275 Moo 6, Sukhumvit Rd., Naklua, Banglamung, Chonburi 20150 Thailand

2020 4th International Conference on Materials Engineering and Nano Sciences

ICMENS 2020

With Workshop

2020 4th International Conference on Metallurgical Fundamentals and Science

ICMFS 2020

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Welcome Address

Materials Engineering based on Nano Sciences is a key ingredient of current advanced technologies supporting modern society, especially Information and Energy Technologies. The tremendous rapid growth of these fields makes them highly interdisciplinary and then inevitably demands their mutual interactions. Under these circumstances, the 2020 4th International Conference on Materials Engineering and Nano Sciences (ICMENS 2020) was organized as a series of successful international conferences held in Singapore (2017), Hong Kong (2018), and Hiroshima, Japan (2019).

The ICMENS 2020, with its workshop 2020 4th International Conference on Metallurgical Fundamentals and Science (ICMFS 2020), is aimed to address latest original results in materials engineering and nano sciences, including both theoretical advances and practical implementations, which are becoming more and more popular in industry and in our daily lives. The ICMENS 2020 & ICMFS 2020 will provide a premier interdisciplinary platform for scientists, researchers, industry leaders, engineers and educators throughout the world to present and discuss the most recent innovations, trends, concerns, as well as practical challenges encountered, and streamline solutions in the relevant fields.

The committee of ICMENS 2020 & ICMFS 2020 have assembled an excellent programme comprising of 5 distinguished speeches respectively from Prof. Akira Toriumi (IEEE Fellow, the University of Tokyo, Japan), Prof. Alan Lau (Swinburne University of Technology, Australia), Prof. Richard Haverkamp (Massey University, New Zealand), Prof. Akihiko FUJIWARA (Kwansei Gakuin University, Japan), Assoc. Prof. Petr Valášek (Czech University of Life Science Prague, Czech Republic), and 2 parallel technical sessions.

On behalf of the organizing committee, our thanks go to respected speakers, and authors of selected papers for their outstanding contributions. We would also like to thank members of the organizing committee, anonymous reviewers for their great efforts. Without their contribution, dedication and commitment, we would not have achieved so much. We sincerely hope that you will find the ICMENS 2020 & ICMFS 2020 beneficial and fruitful for your professional development. We also hope that you will enjoy our hospitality and will have an enjoyable and memorable time in Pattaya.

Conference Organizing Committee
Pattaya, Thailand

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Instructions

Registration Guide

Arrive at the conference venue --> Inform the conference staff of paper ID --> Sign your name on the participants list --> Collect conference kits.

Devices Provided by the Conference Organizers

Laptops (with MS-Office & Adobe Reader)
Projectors & Screen
Laser Sticks

Materials Provided by the Presenters

PowerPoint or PDF files

Duration of Each Presentation

Regular Oral Session: 15 minutes of presentation including 2-3 minutes of Q&A

Notice

*Certificates of listeners can be collected at the registration desk.
*Certificates of presentation can be collected from the session chair after presentations.
*A "Best Presentation" award will be selected from each session, which will be announced at the end of each session and will be awarded by the session chair in the meeting room.
*Please take care of your safety and all personal belongings, and wear your name tags during the whole conference. No responsibility or liability is accepted by conference organizer in respect of any loss or damage.
*The organizer will not provide accommodation, so we suggest you make an early reservation.
*Given the situation of COVID-19, please wear face masks during the conference. Conference staff will measure body temperature of every participant before entering the venue. If you feel any discomfort, please inform staff.

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COVID-19 Advice for the Public

Stay aware of the latest information on the COVID-19 outbreak, available on the WHO website and through your national and local public health authority. COVID-19 is still affecting mostly people in China with some outbreaks in other countries. Most people who become infected experience mild illness and recover, but it can be more severe for others. Take care of your health and protect others by doing the following:

- **Wash your hands frequently.** Regularly and thoroughly clean your hands with an alcohol-based hand rub or wash them with soap and water.

  Why? Washing your hands with soap and water or using alcohol-based hand rub kills viruses that may be on your hands.

- **Maintain social distancing.** Maintain at least 1 metre (3 feet) distance between yourself and anyone who is coughing or sneezing.

  Why? When someone coughs or sneezes they spray small liquid droplets from their nose or mouth which may contain virus. If you are too close, you can breathe in the droplets, including the COVID-19 virus if the person coughing has the disease.

- **Avoid touching eyes, nose and mouth.**

  Why? Hands touch many surfaces and can pick up viruses. Once contaminated, hands can transfer the virus to your eyes, nose or mouth. From there, the virus can enter your body and can make you sick.

- **Practice respiratory hygiene.** Make sure you, and the people around you, follow good respiratory hygiene. This means covering your mouth and nose with your bent elbow or tissue when you cough or sneeze. Then dispose of the used tissue immediately.

- **If you have fever, cough and difficulty breathing, seek medical care early.** Stay home if you feel unwell. If you have a fever, cough and difficulty breathing, seek medical attention and call in advance. Follow the directions of your local health authority.

  Why? National and local authorities will have the most up to date information on the situation in your area. Calling in advance will allow your health care provider to quickly direct you to the right health facility. This will also protect you and help prevent spread of viruses and other infections.

- **Stay informed and follow advice given by your healthcare provider.**

  Why? National and local authorities will have the most up to date information on whether COVID-19 is spreading in your area. They are best placed to advise on what people in your area should be doing to protect themselves.

- More information can be found on https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public

Venue

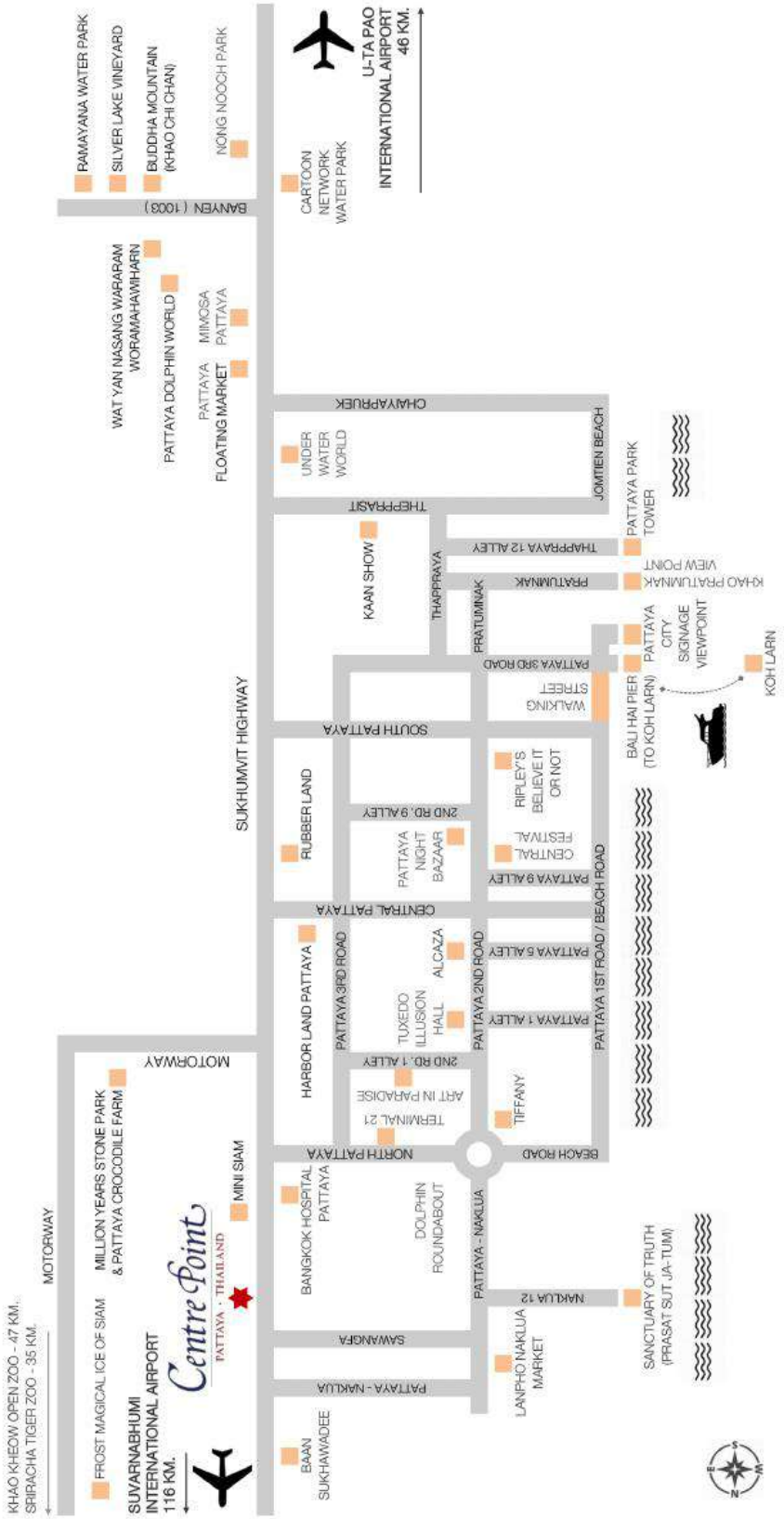
Centre Point Hotel Pattaya

Add: 275 Moo 6, Sukhumvit Rd., Naklua, Banglamung, Chonburi 20150 Thailand

Centre Point Hotel Pattaya will now bring their great service and state of the art hotel rooms in Pattaya. The location will be just a few minutes before the North Pattaya junction, situated on the main Sukhumvit Road, which will bring easy access to most attractions in and around the city, such as Pattaya city centre and beach, as well as being close to the Motorway (Bangkok-Chon Buri), Utapao airport and Suvarnabhumi airport.

As the local 4+ star property in Pattaya with a total 556 units in a 33-story building, each room is equipped with international hotel-standard fittings, a comfortable bed, enjoyable living area, pantry with microwave, and private balcony to enhance your memorable stay. With soft design colors to help you feel relaxed and at ease for your vacation or work, the whole layout was designed with guests in mind and the relaxing nature of the calm, deep blue sea.

Directions


RAMAYANA WATER PARK
SILVER LAKE VINEYARD
BUDDHA MOUNTAIN (KHAO CHI CHAN)
NONG NOOCH PARK
BANYEN (1003)
U-TA PAO INTERNATIONAL AIRPORT 46 KM.
CARTOON NETWORK WATER PARK
WAT YAN NASANG WARARAM WORAMAHAWIHARN
PATTAYA DOLPHIN WORLD
MIMOSA PATTAYA
PATTAYA FLOATING MARKET
CHAIYAPRUEK
UNDER WATER WORLD
JOMTIEN BEACH
THEPPRASIT
KAAN SHOW
THAPPRAYA
THAPPRAYA 12 ALLEY
PATTAYA PARK TOWER
PRATUMNAK
KHAO PRATUMNAK VIEW POINT
PRATUMNAK
PATTAYA 3RD ROAD
PATTAYA CITY SIGNAGE VIEWPOINT
BALI HAI PIER (TO KOH LARN)
KOH LARN
WALKING STREET
SOUTH PATTAYA
SUKHUMVIT HIGHWAY
RUBBER LAND
RIPLEY'S BELIEVE IT OR NOT
2ND RD. 9 ALLEY
PATTAYA NIGHT BAZAAR
CENTRAL FESTIVAL
PATTAYA 9 ALLEY
CENTRAL PATTAYA
HARBOR LAND PATTAYA
PATTAYA 3RD ROAD
ALCAZA
PATTAYA 5 ALLEY
TUXEDO ILLUSION HALL
PATTAYA 2ND ROAD
PATTAYA 1 ALLEY
2ND RD. 1 ALLEY
PATTAYA 1ST ROAD / BEACH ROAD
ART IN PARADISE
TERMINAL 21
TIFFANY
NORTH PATTAYA
BEACH ROAD
MOTORWAY
MILLION YEARS STONE PARK & PATTAYA CROCODILE FARM
FROST MAGICAL ICE OF SIAM
SUVARNABHUMI INTERNATIONAL AIRPORT 116 KM.
Centre Point
PATTAYA - THAILAND
MINI SIAM
BANGKOK HOSPITAL PATTAYA
DOLPHIN ROUNDABOUT
PATTAYA - NAKLUA
SAWANGFA
NAKLUA 12
SANCTUARY OF TRUTH (PRASAT SUT JA-TUM)
LANPHO NAKLUA MARKET
BAAN SUKHAWADEE
KHAO KHEOW OPEN ZOO - 47 KM.
SRIRACHA TIGER ZOO - 35 KM.
MOTORWAY
N
S
E
W

Conference Agenda

Friday, March 13, 2020

Venue: Meeting Room – 3F

1:00pm - 5:00pm	Conference Check In and Materials Collection

Saturday Morning, March 14, 2020

Venue: Meeting Room – 3F

9:00am – 9:05am	**Opening Remarks** - *Prof. Richard Haverkamp, Massey University, New Zealand*
9:05am – 9:45am	**Speech I** **Development of Materials and Device for Sustainable Energy in ICT and IoT Society** - *Prof. Akihiko FUJIWARA, Kwansei Gakuin University, Japan*
9:45am – 10:25am	**Speech II** **Modification of the Strength and Structure of Collagen Biomaterials** - *Prof. Richard Haverkamp, Massey University, New Zealand*
	<10:25am – 10:50am Group Photo & Coffee Break>
10:50am – 11:30am	**Speech III** **Usage of Cellulose Fibers in Composite Systems** *- Assoc. Prof. Petr Valášek, Czech University of Life Science Prague, Czech Republic*
11:30am – 12:10pm	**Speech IV <Online>** **Technical Advancements and Scientific Impacts of HfO_2 Gate Stacks for Advanced CMOS** - *Prof. Akira Toriumi, IEEE Fellow, the University of Tokyo, Japan*
	<12:10pm – 1:30pm Lunch at Blue-Spice Restaurant – 1F>

Saturday Afternoon, March 14, 2020

Venue: Meeting Room - 3F & Board Room - 5F

1:30pm – 2:10pm Meeting Room – 3F	**Speech V <Online>** **Recent Research Development in Fibre Reinforced Polymer Composites for Engineering Applications** *- Prof. Alan Lau, Swinburne University of Technology, Australia*
2:10pm – 3:00pm Meeting Room – 3F	**Session 1-A: Material Preparation & Characterization** **Presentations:** S020-A, S007, S019-A
2:10pm – 2:55pm Board Room – 5F	**Session 2-A: Material Structure Design & Performance Analysis** **Presentations:** S003-A, S022, S031
3:00pm – 4:00pm	**Coffee Break & Video Presentations** **Meeting Room – 3F:** S035-A, S009-A, S021-A, S008 **Board Room – 5F:** S034-A, S1003, S010, S1004
4:00pm – 5:15pm Meeting Room – 3F	**Session 1-B: Material Preparation & Characterization** **Presentations:** S029-A, S036, S045, S041, M0002
4:00pm – 5:15pm Board Room – 5F	**Session 2-B: Material Structure Design & Performance Analysis** **Presentations:** S042, S1005, S051, S057, S037
1:30pm – 5:30pm Meeting Room – 3F	**Poster Session**

<6:00pm – 8:00pm Dinner at Blue-Spice Restaurant – 1F >

Introduction of Speakers

Prof. Akira Toriumi

IEEE Fellow, the University of Tokyo, Japan

Speech Title: Technical Advancements and Scientific Impacts of HfO_2 Gate Stacks for Advanced CMOS

Abstract: HfO_2 is now used for advanced CMOS gate stacks. Many efforts on HfO_2 have been carried out these 20 years and a number of interesting findings have been reported not only in technology but also in materials science. In this talk, following topics are selectively discussed.

Material selection

Before entering the 21st century, various materials such as ZrO_2, Al_2O_3, TiO_2 or Ta_2O_5 rather than HfO_2 had been investigated for gate dielectrics. Each material has own advantages and disadvantages, so we still cannot say HfO_2 is the best for CMOS gate stacks. But it is the fact that most of high-k research has been devoted to HfO_2 all over the world. So, this talk mainly focusses on HfO_2.

Device process evolution

In the early stage of high-k gate stack research, it was considered to be impossible to obtain high-quality high-k films by CVD/ALD. However, most of works have been devoted to ALD-grown HfO_2 after the Intel' s announcement. Another impact was the gate-last process (~500oC) in high-k gate stacks, although in SiO_2 CMOS fabrication process, the gate-first process (~1000oC) process has been used. This was really a big jump in Si device/process technology.

Interface dipole formation

Anomalous Vth was found in high-k CMOS. This was critically important rather than the mobility degradation. Several mechanisms had been proposed. Here, we focus on a high-k/SiO_2 interface dipole formation. The interface between two different insulators is electrically active! We found this phenomenon experimentally, and proposed an intuitive explanation from the viewpoint of an unbalanced number of oxygen atoms at the interface.

Scavenging of SiO_2 in $HfO_2/SiO_2/Si$

The phenomenon itself was already reported in the early stage of high-k research. But the mechanism had not been seriously considered. We have paid attention to the SiO_2 scavenging in $HfO_2/SiO_2/Si$ from the viewpoint of its mechanism rather than practical application. We have proposed that a kinetic linkage of Vo with Si motion should be the key in the scavenging process.

Higher-k and ferroelectric HfO_2

HfO_2 has several polymorphs such as monoclinic, cubic, tetragonal, and orthorhombic. It was proposed theoretically that the more symmetric types of structures provide the higher-k value.

We demonstrated how to stabilize the cubic or tetragonal structural phase of HfO_2. The dielectric constant was increased up to be over 30 with the dopant introduction. Furthermore, NamLab has recently distinguished ferroelectric from higher-k properties of doped HfO_2. The ferroelectric origin of HfO_2 is now a hot research topic.

Bio: Akira Toriumi received the B.S. degree in physics, the M.S. and Ph.D. degrees in applied physics from The University of Tokyo in Japan in 1978, 1980 and 1983, respectively. Then, he joined R&D Center of Toshiba Corporation in Japan, in which he had been engaged in device physics and technology in CMOS miniaturization. He was with Massachusetts Institute of Technology, USA (1988–1990) as a visiting scientist on leave from Toshiba. In May 2000, he moved to Department of Materials Engineering of The University of Tokyo. He had also served as a high-k gate stack group leader in MIRAI Project (a national project for advanced CMOS in Japan) from 2001 to 2007. He retired in March 2019, and he is now an emeritus professor in The University of Tokyo.

Through his professional carrier, his research interests have been on device physics and materials science with regard to semiconductor devices. Particularly, he has investigated gate dielectrics, functional oxides, electron transport and processing science in Si and Ge CMOS, and low-dimensional materials and devices. He has authored and co-authored more than 600 scientific journal papers and conference proceedings, and several book chapters. He received several awards such as IEEE International Reliability Physics Symposium (IRPS), Best Paper Award (1997), Solid-State Device and Materials (SSDM), Best Paper Award (2000 & 2003), IEEE EDS Paul Rappaport Award (2004), SSDM Award (2014), IEEE Cledo Brunetti Award (2016) and JSAP (The Japan Society of Applied Physics) Outstanding Achievement Award (2017). He served as several international conference chairs and committees such as Executive Committee in VLSI Symposium (2008-2017), Program Chair (2005) and Organizing Chair (2018) in International SSDM, General Chair in Si-Nanoelectronics Workshop (IEEE/JSAP) (1999), Executive Committee (2004-2006) and Vice President (2012-2013) in JSAP, Vice Chair (2010-2011) and Chapter Chair (2012-2013) in IEEE EDS (Electron Device Society) Japan.

Prof. Alan Lau

Swinburne University of Technology, Australia

Speech Title: Recent Research Development in Fibre Reinforced Polymer Composites for Engineering Applications

Abstract: Since the early of 50' s century, carbon fibre reinforced polymer composites have always attracted much attention by the engineering industry owing to their high specific strength-to-weight ratio, ease for producing products with a complex shape by one-stop moulding process, non-corrosive properties and their embedability for placing tiny sensors and actuators to make them multifunctionable and self-defect detectable. However, in the early stage, the price of fibre was a major concern, which restricted the development of this high-strength material only in military and space applications. Until recently, technologies for mass production of these composites have become mature, which greatly lower the prices, to an acceptable limit. Therefore, many industries have started adopting them for both high-end and low-end products. For examples, the use of carbon fibre composites to strengthen civil infrastructures to prolong their service life, or to replace old structures, to make them more light and seismic resistance have been found in United States and Japan. The development of new aircraft fuselage and wings by using hybrid composites can greatly reduce their deadweight, which thus also reduce the fuel use to minimize the production of greenhouse gas from the exhaust of engines. Domestic products including sport utilities, interior components of cars and exterior structures of boats are very common to be seen in everywhere. Although the popularity of using composites has increased in recent years, many inherent problems still exist that may affect the safety level of using them for real-life applications. In this lecture, the recent trend of applications of engineered fibre composites will be reviewed and their problems are also highlighted and discussed with audiences.

Bio: Professor Lau is Pro-Vice-Chancellor (Research Performance and Development) of Swinburne University of Technology, Australia since April 2016. Prior to this appointment, he was appointed as Alex Wong/Gigi Wong Professor in Product Design Engineering and Associate Dean (Industrial Relation) in the Faculty of Engineering of the Hong Kong Polytechnic University. Professor Lau has received numerous research and teaching awards since 2002. His published articles have received citations over 18,500 times with the h-index of 65. He was appointed as World Class University Professor by the Ministry of Education, Korea. He has been elected as Academician of the European Academy of Science and Arts and European Academy of Sciences, Fellow of many professional organizations. He was also International Vice President of the Institution of Mechanical Engineers (IMechE) for 5 year-term (The first non-UK member is elected as Vice President in IMechE' s history) and Independent Non-executive Director of King' s Flair International (Holdings) Limited.

Prof. Richard Haverkamp

Massey University, New Zealand

Speech Title: Modification of the Strength and Structure of Collagen Biomaterials

Abstract: Collagen based biomaterials derived from natural tissues are remarkably strong and tear resistant due to a complex nanostructure. These materials find a wide variety of uses in surgical and consumer applications. These applications often have strength requirements but also the need for flexibility of suppleness. Mechanical measurements (tear and tensile strength, bend force) combined with synchrotron based small angle X-ray scattering are used to investigate the strength-flexibility-structure relationships in manufactured collagen materials. The fibril orientation in-plane is a key determinant of tear strength and the nature of the fibril orientation affects the directional mechanical properties. These can be influenced by source material selection and by processing conditions. Intermolecular packing is the critical property for suppleness and may be influenced by water-controlling chemical treatments. This knowledge enables the development of nanostructured materials with tailored physical properties for a variety of applications.

Bio: Professor Richard Haverkamp holds a Personal Chair in Nanotechnology at Massey University in New Zealand and teaches in the School of Engineering and Advanced Technology. His research covers nanostructure and mechanical relationships in collagen materials, nanomaterials for electrochemical processes, and materials from mineral resources. He makes extensive use of a variety of synchrotron techniques, most often at the Australian Synchrotron. He graduated with a PhD from the University of Auckland, New Zealand, and he has held visiting research positions at NTNU, Trondheim, Norway and MIT, Cambridge, USA. He has published about 100 journal papers and received a number of awards including the President' s Medal from the Institute of Professional Engineers NZ, and the Gold Award from the Ministry of Innovation Business and Employment, NZ. He has received research funding from government and industry sources from NZ, US, Norway, Australia, France, Canada, Taiwan and Japan.

Prof. Akihiko FUJIWARA

Kwansei Gakuin University, Japan

Speech Title: Development of Materials and Device for Sustainable Energy in ICT and IoT Society

Abstract: Demands of information and communication technology (ICT) and internet of things (IoT) societies for high-performance materials and devices has increased more and more. Along with the spread of ICT/IoT, reduction of energy consumption and efficient use of renewable energy is also required for sustainable society. This requirement is not only limited to energy consumption during device operation, but also expanded to energy and materials consumption at the production process. The examples of research targets are high performance secondary battery cathodes and printable amorphous oxide semiconductors. The former is an organosulfur polymer which shows high capacity due to the formation/scission of the disulfide (S-S) bond as the charge/discharge processes, and has now been investigated for photo-charging battery. The latter is doped indium oxides fabricated by solution processes, and has now been investigated for printed thin-film transistors. The latest results will be introduced at the conference.

Bio: Prof. Akihiko FUJIWARA gained his Ph.D in 1995 from Tohoku University in Japan. He worked at Department of Physics in the University of Tokyo as a Research Associate (1995 – 2001), at School of Materials Science in Japan Advanced Institute of Science and Technology (JAIST) as an Associate Professor (2001 – 2010), and at Japan Synchrotron Radiation Research Institute (JASRI/SPring-8) as a Chief Scientist (2010 – 2015). From 2015, he has been a Full Professor at Department of Nanotechnology for Sustainable Energy in Kwansei Gakuin University. Beside the above primary research position, he was a Visiting Professor at Department of Physics in Tohoku University and at JAIST. His main research interests are experimental condensed mattered Physics focusing on semiconductor and battery materials for sustainable development.

Assoc. Prof. Petr Valášek

Czech University of Life Science Prague, Czech Republic

Speech Title: Usage of Cellulose Fibers in Composite Systems

Abstract: Cellulose fibers, for example from the field of palm oil processing, can be used in material engineering. It is a renewable resource and in the case of oil palm (EFB - empty fruit bunch) can be called as a secondary raw material. Cellulose fibers of EFB can be used in similar places as for example coconut fibers (coir) - in the automotive industry etc. Contribution describes processing methods, fiber surface treatment and mechanical characteristics of the resulting composites in comparison with other cellulose composites/fibres.

Bio: Dr. Petr Valášek is Associate Professor in the field Technology and mechanization of agriculture on Faculty of Engineering – Czech University of Life Sciences Prague (CULS), Czech Republic. Currently he works at the Department of Material Science and Manufacturing Technology and he is Vice-Rector for Quality of Academic Activities on CULS. He defended his dissertation thesis "Polymer particle composite systems" in the doctoral study program Special technology in the field of study quality and reliability of machines and equipment. He attended of more than hundred lectures at European universities in Italy, Estonia, Latvia, Poland, Spain, Portugal etc. He has passed several Keynote lectures at international non-European universities as well. As part of research projects, he actively participates in various international conferences, and cooperates with foreign universities (e.g. China, Malaysia, and Indonesia). Assoc. Prof. Ing. Petr Valášek, Ph.D. is the author or co-author of 94 entries in the database Scopus, h-index 15 and 44 entries in the database Web of Science. Professional interests: Composite systems, Biocomposites, Biomass usage in materials engineering, Composites with Natural Fibres, Manufacturing Technology.

Parallel Sessions

Tips

- ✓ Please arrive at the session 15 minutes earlier to copy your files for presentation to conference computer.
- ✓ It is recommended bringing two versions of your presentation files on USB in case of any error.
- ✓ There will be a session group photo part at the end of each session.
- ✓ One best paper will be chosen after each session and the certificate will be awarded by the chair.
- ✓ Please note no food or drink is allowed in the room.

Session 1: Material Preparation and Characterization **Chair: Assoc. Prof. Petr Valášek, Czech University of Life Science Prague, Czech Republic** **Venue: Meeting Room – 3F** **Time: 2:10pm-5:15pm**	
S020-A **2:10pm-2:30pm**	**Preparation and Potential Applications of Nano Calcium Hydroxide-modified Broken-milled Rice Foam** **Kiattipoom Rodpun, Kantaphon Ngunbunsri, Chinapat Khumpitak and Prachaya Intra** Mahidol Wittayanusorn School, Thailand Abstract: This project was initially inspired from the problems of a lot of undegradable foams from Krathong waste on the river and the sea throughout Thailand. Hence, this research aims to create the eco-friendly degradable foam from broken-milled rice to be used instead of undegradable materials. Moreover, the eco-friendly degradable broken-milled rice foam in this project was also modified by coating with Calcium hydroxide ($Ca(OH)_2$) nanoparticles. $Ca(OH)_2$ was used in the purpose of reducing ocean acidification by reacting with H_2CO_3 in seawater to become $CaCO_3$. The broken-milled rice foam was characterized its physical properties by FTIR and UTM whereas $Ca(OH)_2$) nanoparticles were studied the size and morphology through DLS and TEM. The pH of the seawater was continuously monitored by pH meter to confirm the reaction of $Ca(OH)_2$ and H_2CO_3 that can increase the pH of the seawater. It is worth noting that the benefits of the $Ca(OH)_2$ nanoparticles-coated broken-milled rice foam from this research project is like the idiom of "killing two birds with one stone" because it can reduce the acidic of the ocean by reducing H_2CO_3 and can benefit the shell formation of aquatic shell animals and the coral calcification of coral reefs in the ocean due to producing $CaCO_3$ as a by-product.

S007 **2:30pm-2:45pm**	**Stability Test of Nanostructured Lipid Carriers-Loaded Mefenamic Acid Prepared by Microemulsion Technique** **Jirapornchai Suksaeree**, Apinya Treelop, Pitsacha Veeravatanayothin, Pattwat Maneewattanapinyo and Chaowalit Monton College of Pharmacy, Rangsit University, Thailand Abstract: The objectives of this study were to prepare the nanostructured lipid carriers (NLCs)-loaded mefenamic acid and to study the particle size and zeta potential of the NLCs-loaded mefenamic acid after storage in refrigerator (approximately 2 – 4°C) for 7 days. The preparation method of NLCs-loaded mefenamic acid used the microemulsion technique. All compositions were vigorously mixed with vertex method to obtained the clear microemulsion solution. Tween®80 (surfactant) and 1 – butanol (co – surfactant) were mixed at the ratio of 3:2 to use as the surfactant mixture. Then, it was dispersed in cold water (approximately 2 – 4°C) at different ratio, and the droplet size was reduced by a homogenizer at 6,000 rpm for 5 minutes and sonicator for 30 minutes to form the NLCs-loaded mefenamic acid. The prepared NLCs-loaded mefenamic acid were kept in refrigerator (approximately 2 – 4°C) for 7 days. After that, the solutions were tested the particle size and zeta potential. The particle size and zeta potential of NLCs-loaded mefenamic acid after storage were in the range of 160-310 nm and -4.00 to -19.00 mV, respectively. It was found that the F4 formula was the best to prepare the NLCs-loaded mefenamic acid. F4 formula composed of the 1%w/w mefenamic acid, 10%w/w water, 80%w/w surfactant, and 10%w/w capric triglyceride, and the dilution ratio was 1:25.
S019-A **2:45pm-3:00pm**	**An Influence of Thermal Stimulation on Performance of Superplasticizer** **Mizuki TAKIGAWA**, Yu BOMURA, Rio KITA and Shigeyuki DATE Tokai University, Japan Abstract: The superplasticizer is an essential material for ensuring the performance of concrete such as fresh properties and hardened properties. In particular, type of PCE superplasticizers is being widely used because it has excellent dispersion and retention ability of fluidity. In the previous study, when heat the superplasticizers up (hereinafter, this is called the thermal stimulation) and use it for making the concrete, it is confirmed that it improved the fluidity of fresh concrete. However, there are many unconfirmed points about transformation of the polymer structure in the superplasticizer by thermal stimulation. In this study, it was confirmed the structural transformation of the polymer by the dynamic light scattering method. Furthermore, it was confirmed the change in the molecular weight of the superplasticizers by gel permeation chromatography. As a result, it is confirmed that the entangled or shrunken polymer can be disentangled or stretched by

	applying thermal stimulation. Furthermore, enlargement of apparent polymer size was also confirmed by DLS analysis. In addition, it was verified that this effect can be kept at least 1 week after heating. It was proofed that thermal stimulation does not affect molecular weight fluctuation of the polymer by GPC analysis.

Coffee Break 3:00pm – 4:00pm

S035-A **3:00pm-3:15pm** **Video**	**Hydrothermal Synthesis of Carbon Quantum Dots from Plant Milks – When Kitchen Meets Chemistry** **Patrycja Małgorzata Wąsik**, Anna Kolanowska and Sławomir Boncel Silesian University of Technology, Gliwice, Poland Abstract: Carbon quantum dots (CQDs) are a new member of the carbon nanomaterial family in a form of quasi-spherical carbon nanoparticles. Their size does not exceed 10 nm. CQDs consist of a sp2-hybridised carbonic core with functional groups attached to its surface. Such a structure provides unique properties, like excellent water solubility and biocompatibility. Importantly, CQDs exhibit fluorescence- the wavelengths of maximum fluorescence depend on CQD' s size and composition; by altering these parameters it is possible to obtain fluorescence in the full spectrum range. Generally, the higher the CQD diameter, the maximum of emission corresponds to the higher wavelengths. The aim of our research was the hydrothermal synthesis of CQDs from six different types of plant milks to assess the influence of various substrates on CQDs' properties. Plant milks– an excellent source of carbohydrates, proteins and lipids– constitute a very promising substrate for supplying various functional groups on CQDs' surface. In this synthetic method, a carbon source in the form of an aqueous solution is subjected to heating at constant temperature for a few hours. During such a treatment, processes like carbonisation and surface functionalisation occur simultaneously. For the resulting CQDs, fluorescence and the potential of CQDs implementation as carbon nanotubes' (CNTs) dispersants were examined. The so-obtained CQDs exhibited blue fluorescence. It was also confirmed that CQDs' fluorescent properties depend not only on the substrate but also on its purification method. Additionally, it was found that CQDs stabilised CNTs water dispersions, implying a novel premise in the carbon-carbon hybrid materials processability.
S009-A	**In Situ Preparation of Highly Stable Transition Metals Doped**

3:15pm-3:30pm Video	**SiO_2@$CsPbBr_3$ Composites for White Light-Emitting Diodes** **Hongwei Ding** Southeast University, China Abstract: All-inorganic perovskite nanocrystals have drawn enormous attention recently for their excellent optoelectronic properties in many fields. However, their poor stability to polar solvents, ultraviolet light, high temperatures and fast anions exchange hinder practical applications. Moreover, PbX_2 (X= Cl, Br or I) are employed both as lead and halides precursors in common protocols, which imposes limitations on the precise adjustment of the amount of reaction species and the composition of the final NCs. Here we have demonstrated that transition metal halides (FeX_3, CoX_2, NiX_2, and ZnX_2; X=Cl, Br or I) can be efficiently used as halides sources, which not only allows the efficient control of the amount of halide precursors and emission wavelength, but also significantly improves the stability of NCs as the metal ions mainly doped on the surface of NCs. Then the $CsPbBr_3$@SiO_2 composites are syntheisized by a simple situ method with $NiBr_2$, which preserve the excellent optical properties, such as high photoluminescent quantum yield and narrow full width at half maxima. Besides, the stability of this kind of composite is improved markedly, the photoluminescent intensity of these composites can be reserved 92% dispersed in water for 3h and 96% under 25 W ultraviolet light for 2 h. In addition, the fast anions exchange could be limited effectively. As a result, by using green-emitting SiO_2@$CsPbBr_3$ composites and red-emitting $CsPbBr_1I2$ NCs as color converters, a warm white light-emitting diodes (WLED) device can be fabricated. This work would provide a general strategy for the preparation of perovskite nanocrystals and their composites, lay a good foundation for their applications.
S021-A **3:30pm-3:45pm** **Video**	**Diagnostic X-ray Attenuation of β-Bi_2O_3 Based Polymer Nanocomposites Containing Graphene and MWCNT Suitable for Radiopaque Fabric** **Sangeetha Jayakumar**, Saravanan T, Vadivel M and John Philip Indira Gandhi Centre for Atomic Research, India Abstract: In this study, we investigate the effect of graphene nanoplatelets and MWCNT on the X-ray attenuation property of silicone polymer (G1) nanocomposites containing β-Bi_2O_3 nanofillers suitable for lead-free fabric material for diagnostic X-ray attenuation. The effect of graphene and MWCNT of different concentrations on Bi_2O_3 based polymer nanocomposites is studied with respect to its X-ray attenuation property and thermal stability, in comparison with polymer nanocomposites containing only graphene and MWCNT, respectively. Thermal stability of the nanocomposites is studied using Thermogravimetric analysis (TGA) and Differential Scanning Calorimetry

	(DSC). Surface topography and surface roughness of the nanocomposite blocks are studied using Atomic Force Microscopy (AFM). X-ray attenuation of nanocomposites is studied using an industrial X-ray unit. Our study shows that the X-ray attenuation exhibited by nanocomposites of G1 polymer containing β-Bi_2O_3 and graphene is more than that of nanocomposites containing β-Bi_2O_3 and MWCNT, only β-Bi_2O_3, only graphene and only MWCNT. X-ray attenuation of nanocomposites containing only Bi_2O_3 and that of nanocomposites containing Bi_2O_3 and graphene (0.25 wt %) is found to be between 99-17 and 98-22 %, respectively, in the X-ray photon energy range of 30-66 keV. The percentage attenuation of nanocomposites containing Bi_2O_3 and MWCNT is found to be in the range of 98-14 % for X-rays of 30-66 keV energy. These multifiller nanocomposites are also found to be thermally more stable than the neat polymer matrix (containing no nanofiller). AFM topography images confirm the variation in surface roughness of the nanocomposites. Therefore, we have studied the effect of light atom nanoinclusions such as graphene and MWCNT on the X-ray attenuation property of β-Bi_2O_3 based nanocomposites and confirm an enhancement in its X-ray attenuation property due to the presence of graphene. Thus, multifiller nanocomposite containing β-Bi_2O_3 and graphene nanoplatelets is found to be a potential candidate for the development of radiopaque fabric materials.
S008 **3:45pm-4:00pm** **Video**	**Performance of Modified Nano-SiO_2 Composite Phosphating Coating on the Surface of Steel** **Xuxiang Tan** and Feng Nan Shandong Jiaotong University, China Abstract: In order to enhance the corrosion resistance and the quality of the phosphating film, nano-SiO_2 was used in the phosphating solution. The structure and properties of the phosphating film were evaluated by SEM, electrochemistry, cupric sulfate drop corrosion test and film thickness measurement. The results show that the thickness of the phosphating film increases with the increase of nano-SiO2 content. The nano-SiO2 modified with vinyl triethoxy silane possessed good dispersibility in the phosphating solution the phosphating solution with the addition of modified nano-SiO_2 could greatly improve the corrosion resistance of the phosphating film.

S029-A **4:00pm-4:15pm**	**Fabrication and Characterization of Photo/Thermal Tunable Liquid Crystalline Elastomers** **Chun-Yen Liu**, Kai-Ti Chang and Jui-Hsiang Liu National Cheng Kung University, Taiwan Abstract: The liquid crystalline actuators have both rubber elasticity and liquid crystal orientational order. They are unique materials that can be

	thermally induced by molecular polydomain and monodomain transition or anisotropic and isotropic states variations. They can also be triggered by optical or electrical stimulation. In this research, the mixture of monomeric RM105, poly (ethylene glycol) diacrylate and photo-initiator Irg-184 with cross-linker RM257 was polymerized under 254nm UV irradiation. A series of thermal tunable liquid crystalline actuators were fabricated via pretreatment of tilted and planar aligning. The real image of the fabricated thermal actuations based on order transition are shown in Figure 1. The reversible shape change can be controlled by regulating temperature. This phenomenon is ascribed to the change of molecular orientation via the transition of liquid crystal phases. Figure 2 shows the relationship between bending angle of the synthesized films and stimulated temperatures. To improve the triggered convenience and precision, the polydopamine (PDA) was coated on the surface of the synthesized LC actuators. Since PDA shows excellent photo-thermal transition property on near infrared (NIR) irradiation, under NIR irradiation, each of the PDA coated fingers of the hand shape LC actuator reveals curling action. The results suggest that the synthesized polydopamine coated LC polymer actuators can effectively transfer thermal energy to mechanical power. These LC actuators are expected to show a number of potential for applications in the field of shape memory materials and artificial muscles.
S036 **4:15pm-4:30pm**	**Effects of Surface in the IR and Raman Spectrum of Porous Silicon Carbide** R Bermeo, L. Arellano, **A Trejo**, F Salazar, M. Calvino, A Miranda, and M Cruz-Irisson Instituto Politécnico Nacional, ESIME Culhuacan, México Abstract: Porous Silicon carbide has been identified as an attractive material for its use as electrode in supercapacitors, however the theoretical investigations about its properties, specially its vibrational properties, are still scarce. In this work the effect of the Si-C surface ratio on the vibrational properties, IR and Raman spectrum of porous silicon carbide was studied using the first principles density functional perturbation theory. The porous structures were modelled by removing atoms in the [001] direction from an otherwise perfect SiC crystal using the supercell scheme. The morphology of the pores was chosen so there would be more Si or C in the pore surface. The results show that the vibrational properties, and thus the IR and Raman spectrum of the porous SiC change depending if the pore surface is either Si or C rich, having the Si-rich pores more low frequency modes due to its higher mass. Also, the effects of phonon confinement are lessened by the effect of surface passivation, thus indicating that the surface plays an important role in the IR and Raman characterization of these structures.
S045	**Mechanical and Thermal Behaviour of Epoxy/hexagonal Boron**

4:30pm-4:45pm	**Nitride/Short Sisal Fiber Hybrid Composites** **Alok Agrawal**, Saurabh Chandrakar and Abhishek Sharma Sagar Institute of Research and Technology-Excellence, India Abstract: Hybrid composite i.e. surface modified hexagonal boron nitride (hBN) and short sisal fiber reinforced in epoxy matrix is fabricated using hand lay-up method. The effect of surface modified hBN filler and sisal fiber content on mechanical and thermal properties of epoxy-based hybrid composites were investigated in this paper. The main aim of the investigation is to develop a material which can found its application in microelectronic components. As per the requirement of microelectronic industry, the material should possess high thermal conductivity. Hence, thermal conductivity of epoxy increases with increase in hexagonal boron nitride content. Inspite of insulative nature of sisal fiber, the study shows that its inclusion in combination with hBN enhances the thermal conductivity if the content of both the fillers were properly selected. Other thermal property like coefficient of thermal expansion and glass transition temperature appreciably improves when combination of fillers were added in epoxy matrix. Mechanical properties under study i.e. tensile strength and compressive strength also enhances when combination of sisal fiber and hBN were incorporated as compared to when single filler hBN were used. Hence, usage of hybrid filler as reinforcement in epoxy improve overall mechanical and thermal property of the developed material.
S041 **4:45pm-5:00pm**	**Case Studies of High Strength Lightweight Concrete using Expanded Siliceous Aggregate** **Aleksandr Sergeevich Inozemtcev** National Research Moscow State University of Civil Engineering, Russia Abstract: Structural lightweight concrete has various applications including the construction of multi-story buildings, bridges, offshore oil platforms and other reinforced concrete structural elements. Structural lightweight concrete also was used in offshore construction. The development of compositions of high-strength lightweight concrete with an average density of 1100-1500 kg/m3 may be in demand for the manufacture of most of the typical concrete products with an ordinary strength 20-35 MPa. This study has shown that granular expanded siliceous aggregates can be used as an alternative to hollow microspheres to obtain high mechanical characteristics of lightweight concrete. Based on the principles of producing high-strength lightweight concrete using the example of "Thermogran" granules the possibility of achieving strength of lightweight concrete of more than 45 MPa with an average density of less than 1600 kg/m3 is shown. In the same time, specific consumption of cement on 1 MPa of concrete strength is 8.1...8.8 kg/MPa.

M0002 **5:00pm-5:15pm**	**Wear Resistance of Bio-Polymer Composite Base on Cotton Post-Harvest Line Residues** M Tichý, **P Valášek**, M Müller Czech University of Life Sciences Prague, Czech Republic Abstract: New trend in material engineering are composites with biological-based fillers. On of aim in biological-bases composite is how to use waste from agriculture production i.e. unused secondary products known as residues. The aim of this research is experimental investigation of wear resistance of bio-polymer composite reinforce by cotton post-harvest line residues. These residues come from cotton production as a waste which contain cotton stems and plant roots. Most of these residues are burned as energy source, but residues can find other utilization. Composites based on polymer can solve friction and wear problems in industry for their advantages as self-lubrication, light weight, easy of properties modification, etc. This research is part of wide study dealing with material utilization of post-harvest line residues. Mass loss of wear resistance at composite PCFC 500 with short fibres decrease against the matrix up to 21% on 19.28 mg.

Session 2: Material Structure Design and Performance Analysis Chair: Prof. Stanislav Makhanov, Thammasat University, Thailand Venue: Board Room – 5F Time: 2:10pm-5:15pm	
S003-A **2:10pm-2:25pm**	**Creation of Carbon Dot- G Quadruplex Nano-Network for Improved Dnazyme Activity and Easy Catalyst Regeneration** **Prolay Das** and Sonam Kumari Indian Institute of Technology Patna Bihta, India Abstract: Guanine-rich G-quadruplexes and hemin is well known for to their peroxidase mimicking DNAzyme activity. However, the catalytic activity is not competent with the enzymatic counterpart due to several reasons including less control over the microenvironment. Herein, we demonstrate that DNAzyme consisting of a Carbon Dot (CD)-DNA–hemin complex can be an alternative to natural HRP for the oxidation of ABTS. The phosphate terminal of G-rich single-stranded DNA was covalently conjugated to the CD derived from Anthrarufin through phosphoramidite chemistry. CD-G-quadruplex network array was formed through K+ mediated intermolecular G-quadruplex formation and the fabrication of nanonetwork was confirmed using a host of characterization techniques like gel electrophoresis, HPLC, TEM, and AFM. CD-G-quadruplex nanonetwork significantly improves the DNAzye activity, stability, catalytic cycle and display simple catalyst regeneration through centrifugation. The current study suggests that the peroxidase activity of DNAzymes can be enhanced through the presence of CD in close vicinity that offer a favorable microenvironment. Besides, the photophysics of CD helps in monitoring of the DNAzyme reaction progress and recovery.
S022 **2:25pm-2:40pm**	**Decomposition of the Vector Field of Preferred Directions for Optimization of Five-Axis Machining** **Stanislav Makhanov** Thammasat University, Thailand Abstract: A new algorithm to increase the production rate of a five-axis milling machine through improving the coordinates of the to-be-milled points transformed from the workpiece to the machine coordinates is presented and analysed. The method optimizes the cutting path by following a vector field (VF) of optimal directions maximizing the material removal rate (MRR). The algorithm includes grid generation, space filling curves (SFC) and a VF decomposition using rotation invariant complex moments. The case of a radial tool path requires a special treatment called Compact Radial Zigzag (CRZ). To reduce the redundancy, the CRZ is composed of layers with a varying step between the tracks. The combination of the proposed techniques generates tool paths which

	produce complex shaped Stereolithography (STL) surfaces faster than the conventional methods.
S031 **2:40pm-2:55pm**	**Accurate Scallop Evaluation Method Considering Kinematics of Five-Axis Milling Machine for Ball-End Mill** **Luu Hai Tuan** and Stanislav S Makhanov Thammasat University, Thailand Abstract: A new algorithm to evaluate the scallops left between consecutive tool tracks after five-axis machining of a complex-shaped part surface has been proposed. The algorithm has been developed for the ball-nose cutter. The novelty of the algorithm includes a variable plane to evaluate the effective tool profile and the part surface profile, the orientation of the tool as well as non-linear kinematics of the five-axis machine. The proposed algorithm has been specifically designed for and tested on the industrial Stereo lithography (STL) format representing complex shaped synthetic five-axis parts and a model of a crown of the molar tooth. The procedure has been tested against several modifications of the conventional curvature-based method and the sphere intersection method. The ground truth is generated using the solid modeling engine of Vericut 8.2. The algorithm provides a tangible accuracy increase in terms of the average and the maximum error with regard to the reference methods.

Coffee Break 3:00pm – 4:00pm

S034-A **3:00pm-3:15pm** **Video**	**Electroconductive Textile Coatings from Pastes Based on Individualized Multi-Wall Carbon Nanotubes – Synergy of Surfactant and Nanotube Aspect Ratio** **Anna W. Kuziel**, Anna Kolanowska, Artur P. Herman, Rafał G. Jędrysiak, Tomasz Giżewski and Sławomir Boncel Silesian University of Technology, Gliwice, Poland Abstract: E-textiles are the main components of textronics – the new discipline which conforms the cooperation of three mature fields: textiles, electronics and informatics. E-textiles require flexible and electrically conductive components with applications in safety, medicine, civil and military engineering, fashion, wellness, and logistics while the list is not complete. One of the key elements of e-textiles is the electrically conducting coating which should be characterized by – apart from high electrical conductivity –convenient and repeatable technology of production, light weight, flexibility, high mechanical performance, and

	resistance to atmospheric conditions. Owing to the unique combination of the all above-mentioned properties, individual carbon nanotubes (CNTs), and particularly their less expensive members of sp2-allotropes family, i.e. multi-wall CNTs (MWCNTs), emerge as promising candidates for application in e-textiles. We report on preparation, application and fixation of electrically conductive and flexible coatings of surface resistivity 110 Ω/sq. The most promising coatings were obtained from pastes exploiting synthesized in-house – via chemical catalytic vapour deposition (c-CVD) multi-wall carbon nanotubes (MWCNTs). MWCNTs were finely dispersed in water using a surfactant pre-selected according to 'individualizing' power measured by centrifugation-stability in UV–vis spectroscopy. The influence of MWCNT aspect ratio on: the resulting dispersion stabilities, and physicochemical compatibilities of nanotubes with aqueous solutions of surfactants was clearly demonstrated by comparative studies of individualized in-house versus commercial MWCNTs. The individualized MWCNTs were used as the further conductive components of acrylic resin-based pastes towards flexible and conductive textile coatings. The results fall within the understanding of production of conductive coatings for e-textiles – the field with numerous every-day life applications from medicine, e.g. in electrocardiography, to fashion to military.
S1003 **3:15pm-3:30pm** **Video**	**A Preliminary Study of a Graphene Fractal Sierpinski Antenna** **Alberto Boretti**, Lorenzo Rosa, Jonathan Blackledge and Stefania Castelletto Prince Mohammad Bin Fahd University, Al Khobar, Saudi Arabia Abstract: Here we perform a preliminary study of a graphene fractal antenna to work in the THz frequencies with the opportunity to modulate the emission. There are advantages of the fractal design, namely multiband/wideband ability, and smaller, lighter, simpler configuration for higher gain, that can benefit from the coupling with graphene, the thinnest and strongest material exhibiting superb electrical conductivity and tunability. This paper proposes the conceptual background for the study, as well as the result of Maxwell equation simulations.
S010 **3:30pm-3:45pm** **Video**	**Study on Influence of Blast Furnace Slag on Chloride Ion Penetration Property** **Prang Subpa-asa**, Ken Kubota, Satoshi Fujiwara and Shigeyuki Date Tokai University, Japan Abstract: Sustainability is getting more attention; the concrete and cement industry attempts to make decrease environmental impact. To implement this problem is using industry by-product as blast furnace slag (BFS) from steel product manufacturing to cement replacing materials has become common materials. To follow the description of

	chloride ion penetration which affects to reinforced concrete structure. Thus, the influence of BFS on blocking resistance and chloride ion penetration by using BFS with different Blaine value is studied by using "Standard on Test Methods for Chloride Ion Diffusion Coefficients in Concrete" by electrophoresis (Draft) (JSCE-G571-2003)" and the total chloride ion amount was measured in accordance with JIS R 5202. The result is inevitable BFS replacing cement influenced to penetration properties.
S1004 **3:45pm-4:00pm** **Video**	**Visible and Infrared Photoluminescence in Hexagonal Silicon Carbide by Direct Femtosecond Laser Writing** **Stefania Castelletto**, Brett C Johnson and Alberto Boretti RMIT University, Bundoora, Victoria, Australia Abstract: Optically active color centers in silicon carbide have attracted considerable attention in the past few years as candidates for quantum technologies such as single-photon sources, nanomagnetic resonance imaging, and spintronic devices. Control over defect position and their placement at the desired location within a chip, necessary to integrate them within optical and electronic devices, is still a challenge. Recently, laser writing emerged as a new tool to generate vacancies in crystals as a starting point for the formation of color centers. In this work, a laser writing method has been used to produce color centers in 4H and 6H bulk silicon carbide by using a femtosecond laser. An array of color centers was fabricated by different pulse laser energies in sites of square grids at varying depths (from the surface to 10 μm below the surface). We optically characterized the fabricated color centers using confocal imaging, photoluminescence, and Raman spectroscopy. We show that the technique can produce specifically vacancy color centers with a relevant emission in the visible (peak around 700 nm) and near-infrared (peak at 900 nm) with the latter identified as the silicon-vacancy. This method can be adapted to engineer color centers in silicon carbide at different depths in the material, for the above-mentioned applications, in addition to the fabrication of light-emitting diodes.

S042 **4:00pm-4:15pm**	**Effects of Transition Zone on Magnetic Properties of Low Temperature Oxidation of Magnetite Particle: Comparison of Experiment and Micromagnetic Modeling** **Kunpeng Ge** and Wyn Williams East China University of Technology, China Abstract. A relationship of hysteresis parameters and oxidation of ultrafine magnetic particles on both experimental measurements and micromagnetic simulations is obtained through a step-by-step oxidation of magnetite. Numerical simulations of hysteresis loop and microstructure of a core-shell geometry with transition zone using a

	multi-layer structure show two categories of behaviour for magnetic grains during oxidation. First, the SD (Single Domain, <70 nm) and lager SV (Single Vortex, >130 nm) particles remain unchanged ratio of saturation remanence to saturation magnetization (Mrs/Ms), and slightly decreased coercivity (Bc) during oxidation. Second, the fine SV particles (80 nm to 120 nm), the hysteresis parameters respectively increase and dramatic decrease at the early and late stage of oxidation, and the micromagnetic behaviors vary significantly. Finally, the hysteresis parameters of larger SV particles remain nearly unchanged during oxidation. The predicted magnetic properties for the core-shell model exhibit better agreement with experimental data than that of previously used core-shell geometry (a stoichiometric core surrounded by an oxidized shell). It indicates that the magnetic properties of partially oxidized magnetic grains are controlled by the multi-layer coupling effects and can record paleomagnetic signals.
S1005 **4:15pm-4:30pm**	**Utilisation of Eggshell Powder (ESP) as Partial Replacement of Cement Incorporating Superplasticizer** **Gunalaan Vasudevan** and Seah Chan Wei Tunku Abdul Rahman University College, Malaysia Abstract: This research showed the results of experiments evaluating the use of eggshell powder from egg production industry as partial replacement for ordinary Portland cement. Research on the reuse of waste materials in the concrete industry has been quite intensive in the past decade. The objective of this research is to identify the performance of dried eggshell powder as a partial cement replacement in the production of concrete. Eggshell powder of various amounts, namely 5%, 10%, 15% and 20% by volume, was added as a replacement for ordinary Portland cement. The results showed that eggshell concrete greatly improved the compressive and flexural strength of concrete. The rate of water absorption of eggshell concrete was reduced as eggshell powder filled up the existing voids, making it more impermeable. However, the compressive strength of the eggshell concrete decreases gradually when the amount of eggshell powder increased. It can be concluded that the optimum percentage of dried eggshell powder as a partial cement replacement is 15%. In this direction, an experimental investigation of ultrasonic pulse velocity, rebound hammer concrete test, compressive strength, flexural strength and FTIR spectra and TGA analysis was undertaken to use eggshell powder and admixtures as partial replacement for cement in concrete.
S051 **4:30pm-4:45pm**	**Reflection Spectra of a Thin-Film Gesbte Diffraction Grating on a Silicon Nitride Waveguide** **R T Minnullin**, A A Sapegin, M E Makarov, D S Korolev and M Yu Barabanenkov Moscow Institute of Physics and Technology, Russia 23 JSC Molecular

	Electronics Research Institute, Russia Abstract: Recent advances in nanophotonics are due to the implication of new approaches to the photonic devices and components design, not only related to structural features, such as subwavelength periodic arrangements, but also new materials, e.g., phase-change materials like GeSbTe (GST) alloys. We consider recently proposed optical non-volatile GST memory cell with a GST diffraction grating instead of a continuous film placed on a silicon nitride waveguide. The grating allows diminishing the energy budget of an incident electromagnetic beam in case of an optically induced phase transition of GST due to excitation of the resonant guided mode in the grating. The excitation of this mode results in anomalous reflectance spectra of the waveguide-grating structure. Here, we present the reflection spectra of GST diffraction gratings on a silicon nitride waveguide calculated with the use of the matrix Riccati equation technique in the theory of multiple electromagnetic wave scattering in inhomogeneous media. We show how the reflection changes with variation of different parameters – grating period and height, incident wave polarization, and phase of the GST film.
S057 **4:45pm-5:00pm**	**Utilization of Waste Lubricating Oil as A Diesel Engine Fuel** **Abhishek Sharma**, Gaurav Gupta and Alok Agrawal Manipal University Jaipur, India Abstract: This research work is focused on the regeneration of used lubricating oils which are simply thrown out to the environment. It is evident from the past research outcome that there is an acute shortage of petroleum oils and regeneration of fuels from used lubricating oils can be potential substitute of fossil fuels. But due to some drawback such as higher viscosity and density it cannot be used as a single fuel. In this regard the distillation of used lubricating oil has been carried out with. Further, this distilled used lubricating oil (DULO) was blended in different proportions with Jatropha biodiesel (JB) which has excess oxygen by about 10%. The aim of the current study is to investigate the performance and emission characteristics of a DI diesel engine run on these blends and comparison with base fuel diesel. The behavior of the engine was evaluated in terms of brake thermal efficiency, brake specific fuel consumption, exhaust gas temperature, carbon monoxide emission, hydrocarbon, nitric oxide emission and smoke opacity. The test result revealed that, the behaviour of the engine run on the JBDULO20 (i.e. 80% JB and 20% DULO) blend was better than other blends considered in the study.
S037 **5:00pm-5:15pm**	**Morphological and Mechanical Properties of Natural Rubber Compound/Poly (butylene succinate) Blend** **N Prasoetsopha**, P Thainoi, R Jinnavat, W Charerntanom, A Hasook and W Singsang

	Rajamangala University of Technology Isan, Thailand Abstract: Biodegradable poly (butylene succinate) (PBS)/natural rubber compound (NRC) blends were melt mixed using a two-roll mill. A weight ratio of PBS/NRC was 100/0, 90/10, 80/20, 70/30, 60/40 and 50/50. Morphological and mechanical properties were investigated. The results showed that the elongation at break increased with an increase of NRC content until the ratio of 80/20. While the tensile strength continuously decreased with an increasing amount of NRC. Moreover, the impact strength of the PBS/NRC blend increased until the ratio of 80/20 and tended to decrease in the further ratios. Morphology of PBS/NRC blend showed that NRC had good dispersion in PBS matrix up to 80/20. When the amount of NRC was increased, it became a larger particle due to an agglomeration, resulting in the mechanical properties.

Poster Session Venue: Meeting Room – 3F Time: 1:30pm-5:30pm	
S018	**Electronic Properties of [111] Hydrogen Passivated Ge Nanowires with Surface Substitutional Lithium** Lucia Guadalupe Arellano Sartorius, Fernando Salazar Posadas, Alejandro Trejo Baños, Álvaro Miranda Duran, Luis Antonio Pérez López and Miguel Cruz Irisson Instituto Politécnico Nacional, ESIME Culhuacán, México Abstract: In this work, a density functional theory study of the lithium (Li) effects on the properties of hydrogenated germanium nanowires (H-GeNWs) is developed. In particular, the electronic band structures, densities of states, formation energies, and Li binding energies of H-GeNWs grown along the [111] crystallographic direction with a diamond structure for different concentrations of surface substitutional Li atoms were studied. Ge nanowires with hexagonal cross sections and three different diameters were considered. The results indicate that all studied H-GeNWs maintain a semiconducting behaviour and the size of the energy band gap is a function of the diameter and the concentration of substitutional surface Li atoms. The formation energy analysis reveals than the energy stability of the nanowires increases when the nanowire diameter and the concentration of Li atoms augment. The results of this work give insight of how the electronic properties of H-GeNWs change during the charging process and open the possibility to incorporate them as electrodes in Li-ion batteries.
S055	**Mechanical Behavior Analysis of Stainless Steels Subjected to Uniaxial Stress Tests** Josip Brnic, Sanjin Krscanski and Marino Brcic University of Rijeka, Faculty of Engineering, Croatia Abstract: The fundamental problem considered in this paper is the choice of materials, in this case stainless steels, for a particular industrial purpose. The choice of the appropriate material should be made based on the material behavior database established by experimental investigations. The mechanical behavior and mechanical properties of several stainless steels, such as ferritic, martensitic and austenitic stainless steels are investigated and analyzed in this research. Mechanical properties at room and high temperatures, creep behavior at different high temperatures and different stress levels as well as Charpy fracture impact energy were considered for several of the steels mentioned. Fracture toughness, based on the Charpy impact energy is calculated using known analytical procedure. In this sense, material properties are determined based on displayed engineering stress-strain diagrams while material creep behavior is displayed in the form of creep curves. Some of numerical values regarding the ultimate tensile strength, measured at room

	temperature, are given using the following order and in the following form: [⟦ σ_(m,Mat.Nr)] ⟧ _(20°C). In this sense, the stress levels of the u are: [⟦925_1.4122;782_1.4034;726_1.4305;686_1.4841;585_1.4762;607_1.4541]⟧ _(20°C)

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