ICMSET 2020

2020 9th International Conference on Material Science and Engineering Technology

ICCME 2020

2020 7th International Conference on Chemical and Material Engineering

October 9-12, 2020 | Kyoto, Japan

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Online Presentation Instruction

Equipment Needed

1. A computer with an internet connection (wired connection recommended)
2. USB plug-in headset with a microphone (recommended for optimal audio quality)
3. Webcam (optional): built-in or USB plug-in

Environment Requirement

1. Quiet Location
2. Stable Internet Connection
3. Proper lighting

Platform

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To effectively control the time and avoid some unexpected situations, we advise you record your presentation ahead of time, play the video while it's your turn for presentation. The Video presentation should be within 12 minutes, 3 minutes for Q&A, in total, one presentation is 15 minutes.

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Keynote Speakers

“Review of Various Types of Metamaterials with Unusual Properties”

Prof. Ramesh K. Agarwal, Washington University in St. Louis, USA

Abstract: Metamaterials are rationally designed artificial materials composed of tailored functional building blocks densely packed into an effective (crystalline) material. While metamaterials historically are primarily thought to be associated with negative refractive indices and invisibility cloaking in electromagnetism or optics, it turns out that the simple metamaterial concept also applies to many other areas of physics namely the thermodynamics, classical mechanics (including elastostatics, acoustics, fluid dynamics and elastodynamics) and in principle also to the quantum mechanics. This lecture will review the basic concepts and analogies behind the thermodynamic, acoustic, hydrodynamic, elastodynamic/elastostatic, and electromagnetic metamaterials and differences among them. It will provide an overview of the theory, the current state of the art and example applications of various types of metamaterials. The review will also discuss the homogeneous as well as inhomogeneous metamaterial architectures designed by coordinate-transformation-based approaches analogous to transformation optics.

Biography: Professor Ramesh K. Agarwal is the William Palm Professor of Engineering in the department of Mechanical Engineering and Materials Science at Washington University in St. Louis. From 1994 to 2001, he was the Sam Bloomfield Distinguished Professor and Executive Director of the National Institute for Aviation Research at Wichita State University in Kansas. From 1978 to 1994, he was the Program Director and McDonnell Douglas Fellow at McDonnell Douglas Research Laboratories in St. Louis. Dr. Agarwal received Ph.D in Aeronautical Sciences from Stanford University in 1975, M.S. in Aeronautical Engineering from the University of Minnesota in 1969 and B.S. in Mechanical Engineering from Indian Institute of Technology, Kharagpur, India in 1968. Over a period of forty years, Professor Agarwal has worked in various areas of Computational Science and Engineering - Computational Fluid Dynamics (CFD), Computational Materials Science and Manufacturing, Computational Electromagnetics (CEM), Neuro-Computing, Control Theory and Systems, and Multidisciplinary Design and Optimization. He is the author and coauthor of over 500 journal and refereed conference publications. He has given many plenary, keynote and invited lectures at various national and international conferences worldwide in over fifty countries. Professor Agarwal continues to serve on many academic, government, and industrial advisory committees. Dr. Agarwal is a Fellow eighteen societies including the Institute of Electrical and Electronics Engineers (IEEE), American Association for Advancement of Science (AAAS), American Institute of Aeronautics and Astronautics (AIAA), American Physical Society (APS), American Society of Mechanical Engineers (ASME), Royal Aeronautical Society, Chinese Society of Aeronautics and Astronautics (CSAA), Society of Manufacturing Engineers (SME) and American Society for Engineering Education (ASEE). He has received many prestigious honors and national/international awards from various professional societies and organizations for his research contributions.

“Evolution of Platinum(II) Based OLED Phosphors; Tuning Emission from Purple to Near Infrared”

Prof. Yun CHI, City University of Hong Kong, Hong Kong

Abstract: This presentation is aimed at the current research progression of an unique class of Pt(II) metal complexes bearing the azolate-containing bidentate chelate. The azolate fragment, either pyrazolate or triazolate, can link to a neutral aromatic fragment or another anionic azolate unit in forming bidentate chelates, such as monoanionic 3-pyridyl-1*H*-pyrazolate and derivatives, and dianionic 3,3’-bi-1*H*-pyrazolate, 3,3'-(1-methylethylidene)-bis-1*H*-pyrazolate and analogues. These azolate-containing chelates readily reacted with variety of Pt(II) source reagents to afford the corresponding bis-bidentate Pt(II) complexes. Majority of them were highly emissive in solution, doped polymer matrix, thin film, and even as crystal or powder, due to the high ligand field strength exerted by these chelates and high propensity in forming the singular square-planar architecture and intermolecular aggregates with substantially strengthened Pt···Pt interaction. Dependent to their molecular designs, their emission can cover a very broad spectral range from ultraviolet and purple, all the way to saturated red and near infrared. The blue shifted emission is typically caused by enlarging the HOMO/LUMO energy gap within the molecule while preventing the intermolecular stacking interaction at the same time. In sharp contrast, the red shifted emission is principally induced by occurrence of excessive intermolecular Pt···Pt stacking interaction.

More specifically, Pt(II) metal complexes with a general formula [Pt(C^C)(X^X)], to which the charge-neutral dicarbene C^C chelate and dianionic azolate X^X chelate are represented by 1,1′-methylene bis(3-methyl-imidazol-2-ylidene) and 5,5′-di(trifluoromethyl)-3,3′-bipyrazolate, are capable to exhibit bright solid-state emission ranging from purple to sky blue color. Time-dependent density functional theory (DFT/TD-DFT) calculations confirmed that their emission characteristics were dominated by the combined ^{3}LLCT/^{3}LMCT/^{3}IL transition character, where LLCT and LMCT and IL stand for ligand-to-ligand charge transfer, ligand-to-metal charge transfer, and intra-ligand $\pi\pi^*$ transition processes. At the other extreme of longer emission wavelength, a series of Pt(II) metal complexes flanked by dual pyridyl pyrimidinate chelates, which are also akin to the azolate chelates, were synthesized and tested as efficient OLED emitters. The reduced $\pi\pi^*$ energy gap of these pyrimidinate chelates, and strong intermolecular stacking interaction and high crystallinity in vacuum deposited thin films engendered strong intermolecular charge transfer (ICT) transition including metal-metal-to-ligand charge transfer (MMLCT) process. Thereby, these emitters exhibited efficient photoluminescence with emission peak maxima between 700 - 900 nm, i.e. into the genuine region of near infrared (NIR). Consequently, NIR OLEDs based on these Pt(II) complexes are fabricated, The corresponding OLEDs emit light with a 930 nm peak wavelength and a high external quantum efficiency up to 2.14% and a radiance of 41.6 W sr^{-1} ṁ$^{-2}$, both are at least one order of magnitude higher than those documented in literature.

Therefore, based on these recorded performances, the relevant Pt(II) metal based phosphors should possess bright prospective in both academic and industrial arena, particularly to the fabrication of commercial viable NIR-emitting organic light-emitting diodes.

Biography: Professor Yun CHI received his bachelor degree from National Tsing Hua University in 1978 and doctoral degree under Prof. John R. Shapley from University of Illinois at Urbana-Champaign in 1986. After spending one year as postdoctoral fellow, he joined the Department of Chemistry, National Tsing Hua University as associate professor in 1987 and promoted to professor in 1991. He was awarded the Academic Award and the National Chair Professorship of Taiwan in 2006 and in 2011, and Permanent National Chair Professorship in 2016.

Schedule at a Glance

[Time Zone: UTC/GMT +9]

October 9, 2020 | Friday Test Sessions		
10:00-11:00	Keynote Speeches Test	
13:30-17:50	Session 1-5 Test	
October 10, 2020 | Saturday Formal Sessions		
10:00-10:05	Opening Remarks	**Prof. Ramesh K. Agarwal**, *Washington University in St. Louis, USA*
10:05-10:50	Keynote Speech	"Review of Various Types of Metamaterials with Unusual Properties" **Prof. Ramesh K. Agarwal**, *Washington University in St. Louis, USA*
10:50-11:10	Break	
11:10-11:55	Keynote Speech	"Evolution of Platinum(II) Based OLED Phosphors; Tuning Emission from Purple to Near Infrared" **Prof. Yun CHI**, *City University of Hong Kong, Hong Kong*
11:55-13:30	Break	
13:30-15:15	Session 1	Functional Materials and Devices
15:15-15:35	Break	
15:35-17:35	Session 2	Environmental and Chemical Engineering
October 11, 2020 | Sunday Formal Sessions		
10:00-11:45	Session 3	Mechanical Properties of Materials and Manufacturing
11:45-13:45	Break	
13:45-15:30	Session 4	Nanomaterials and Materials Chemistry
15:30-15:50	Break	
15:50-17:35	Session 5	Building Materials and Technology
October 12, 2020 | Monday Replay Sessions | 09:00-18:00		

Presentations Overview

Meeting ID: 646 8388 7273 https://zoom.com.cn/j/64683887273			
Test Keynote Speeches	**October 9th**	**Formal Keynote Speeches**	**October 10th**
Prof. Ramesh K. Agarwal	10:00-10:30	Prof. Ramesh K. Agarwal	10:00-10:50
Prof. Yun CHI	10:30-11:00	Prof. Yun CHI	11:10-11:55
Test Session 1	**October 9th**	**Formal Session 1**	**October 10th**
N2008	13:30-13:35	N2008	13:30-13:45
N2007	13:35-13:40	N2007	13:45-14:00
ET20-309	13:40-13:45	ET20-309	14:00-14:15
N1001	13:45-13:50	N1001	14:15-14:30
ET20-316	13:50-13:55	ET20-316	14:30-14:45
A202	13:55-14:00	A202	14:45-15:00
ET20-312	14:00-14:05	ET20-312	15:00-15:15
Test Session 2	**October 9th**	**Formal Session 2**	**October 10th**
N2003	14:25-14:30	N2003	15:35-15:50
ET20-206	14:30-14:35	ET20-206	15:50-16:05
A208E	14:35-14:40	A208E	16:05-16:20
N2004	14:40-14:45	N2004	16:20-16:35
N1010	14:45-14:50	N1010	16:35-16:50
N1009	14:50-14:55	N1009	16:50-17:05
N1011	14:55-15:00	N1011	17:05-17:20
N2013	15:00-15:05	N2013	17:20-17:35

Test Session 3	**October 9th**	**Formal Session 3**	**October 11th**
ET20-307	15:25-15:30	ET20-307	10:00-10:15
ET20-311	15:30-15:35	ET20-311	10:15-10:30
A208	15:35-15:40	A208	10:30-10:45
ET20-306	15:40-15:45	ET20-306	10:45-11:00
ET20-203	15:45-15:50	ET20-203	11:00-11:15
A209	15:50-15:55	A209	11:15-11:30
N2012	15:55-16:00	N2012	11:30-11:45
Test Session 4	**October 9th**	**Formal Session 4**	**October 11th**
N1002-A	16:20-16:25	N1002-A	13:45-14:00
N2009-A	16:25-16:30	N2009-A	14:00-14:15
N1006	16:30-16:35	N1006	14:15-14:30
ET20-204	16:35-16:40	ET20-204	14:30-14:45
ET20-317	16:40-16:45	ET20-317	14:45-15:00
ET20-313-A	16:45-16:50	ET20-313-A	15:00-15:15
N2011-A	16:50-16:55	N2011-A	15:15-15:30
Test Session 5	**October 9th**	**Formal Session 5**	**October 11th**
ET20-310	17:15-17:20	ET20-310	15:50-16:05
ET20-315	17:20-17:25	ET20-315	16:05-16:20
ET20-321E-A	17:25-17:30	ET20-321E-A	16:20-16:35
ET20-301	17:30-17:35	ET20-301	16:35-16:50
ET20-322E-A	17:35-17:40	ET20-322E-A	16:50-17:05
ET20-319	17:40-17:45	ET20-319	17:05-17:20
ET20-323E-A	17:45-17:50	ET20-323E-A	17:20-17:35
Replay Sessions			**October 12th** **9:00-18:00**

Session 1: Functional Materials and Devices

Test Presentation time: 13:30 – 14:05, October 9, 2020
Formal Presentation time: 13:30 – 15:15, October 10, 2020
[Time Zone: UTC/GMT +9]

Join Zoom Meeting
Meeting ID: 646 8388 7273

Formal Session 1 | October 10th
Session Chair: Prof. Yun CHI,
City University of Hong Kong, Hong Kong

Note:
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13:30-13:45

N2008

Presenter: Siti Nooraya Mohd Tawil
From: Universiti Pertahanan Nasional Malaysia, Malaysia
Title: Influence of Substrate Rotational Speed on the Structural and Optical Properties of Sputtered Gd-doped ZnO Thin Films
Authors: Nur Amaliyana Raship, Siti Nooraya Mohd Tawil, Nafarizal Nayan, Khadijah Ismail, Anis Suhaili Bakri and Zulkifli Azman

Abstract: Rare-earth element of gadolinium (Gd) were successfully doped into zinc oxide (ZnO) using dual sputter source of DC and RF sputtering. The substrate rotation speed was controlled from 1 rpm to 9 rpm to investigate their effects on the properties of the films in order to achieve a great feature of thin film. XRD profiles confirmed the c-axis orientation with structure of ZnO hexagonal wurtzite. No peaks related to secondary phases were observed. The intensity of dominant peak showed increment upon improvement of substrate rotation speed. The incorporation of Gd into ZnO structure was further confirmed by composition element form EDX with average atomic percentage of 3 at. % for all the films. Surface topology from AFM images showed the grain size has increased with the higher speed of substrate rotation. Gd-doped ZnO thin films indicated good transparency with an average transmittance above 90 % regardless of substrate rotation speed. The bandgap has a slight decrease from 3.06 eV to 3.03 eV with an increment speed of rotational substrate. These findings further imply that the substrate rotation speed has a significant influence on the structural and optical properties of the sputtered thin films.

13:45-14:00

N2007

Presenter: Der-Cherng Liaw
From: National Chiao Tung University, Taiwan
Title: Feedback Control Design for VCM
Authors: Der-Cherng Liaw, Li-Feng Tsai and Jun-Wei Chen

Abstract: We have presented the evidence of hole self-doping due to excess oxygen addition in polycrystal $LaMnO_3$ (LMO). The polycrystal LMO samples were prepared

by use of a solid-state reaction method. Powder mixtures with a molar ratio of 1:1 between La_2O_3 and Mn_2O_3 were pre-annealed at 1100 ℃ for 18 hours in the atmospheres of oxygen gas, helium gas and vacuum. By this heat treatment, non-crystalline LMO samples were produced. After that, the non-crystalline LMO samples were grinded and were pressed into pellets at the pressure of $3t/cm^3$. The pellets were annealed at 1100 ℃ and 1300 ℃ for 18 hours in the same atmospheres as the pre-annealing. Through these processes, polycrystal LMO samples were finally produced. To investigate crystallographic structure of the LMO samples, X-ray diffraction (XRD) measurements were performed by use of Cu-K radiation. From the experimental results of XRD measurements, we have found that all LMO samples have perovskite structure and are polycrystals. In addition, to investigate surface structure of the LMO samples, scanning electron microscope (SEM) measurements were carried out. Electrical resistivities (ERs) of the polycrystal LMO samples were measured as a function of temperature (4K-300K). The ERs of polycrystal LMO samples produced in an oxygen gas atmosphere show lower values as compared with other LMO ones in He gas and vacuum atmospheres. Especially, the temperature dependence of the ER for a polycrystal LMO sample produced at the annealing temperature of 1100 ℃ in an oxygen atmosphere shows a metallic behavior. Thus, we have considered that this LMO sample has the largest hole self-doping concentration in all LMO ones.

14:00-14:15

ET20-309

Presenter: Bouchaib Zazoum

From: Prince Mohammad Bin Fahd University, Saudi Arabia

Title: Deep Neural Network for Dielectric Properties Prediction of PVDF/$BaTiO_3$ Nanocomposites for Flexible Capacitors

Authors: Bouchaib Zazoum and Abdel Bachri

Abstract: In this work, PVDF/$BaTiO_3$ nanocomposites consisting of polyvinylidene fluoride (PVDF) as matrix and $BaTiO_3$ (BT) as fillers were prepared by ball milling and hot-pressing process. It is known that nanofillers content and frequency affect the effective dielectric permittivity of the nanocomposites materials. Therefore, a developed model based on deep neural network (DNN) was used to study the effect of the input parameters on the dielectric permittivity of the nanocomposites. The volume fraction (vol%) of BT and frequency of alternating current (AC) were selected as the input parameters and the effective dielectric permittivity as the output response. The results show that the developed DNN model was able to predict the effective dielectric permittivity of PVDF/BT nanocomposites with a correlation coefficient (R) of 0.997. Thus, our study confirmed the accuracy and efficiency of the developed DNN model for predicting the relative dielectric permittivity of PVDF/BT nanocomposites.

14:15-14:30

N1001

Presenter: Xiaohan Ming

From: Huazhong University of Science and Technology, China

Title: Effects of Functionalization and Stress on Graphene Electronic Properties: Focusing on Bandgap

Authors: Xiaohan Ming

Abstract: Graphene is considered as a promising base material for nanodevices due to

the excellent mechanical, thermal and electronic properties. However, when developing 2D semiconductor device such as a field-effect transistor, one obstacle we are facing is the zero bandgap of pure graphene, which makes it hard to apply to the semiconductor field. In this study, we verify the feasibility of opening the bandgap by functionalizing a graphene and adding stresses based on first principle calculations, where hydroxyl and epoxy groups are used. The effect on bandgap is also observed in the calculations after adding stress about a few GPa. The results show that bandgaps of 1~2 eV in functionalized graphene were opened and stresses of 1GPa induced slightly variations of bandgaps. The electron density differences indicate that the loaded functional groups take away the charge of graphene, making it a betatopic system. Our study may provide a potential method to modify the electronic properties of two-dimensional materials.

14:30-14:45

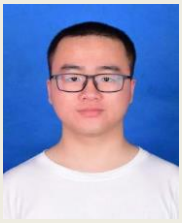
ET20-316

Presenter: Nurulain Adibah binti Romzi
From: Universiti Teknologi Petronas (UTP), Malaysia
Title: Synthesis of Ti_3C_2 MXene through In-situ HF and Direct HF Etching Procedures as Electrolyte Fillers in Dye-Sensititized Solar Cell

Authors: N.A Adibah, S.N. Azella and M.F.A Shukur

Abstract: MXene is the new family of two-dimensional (2D) transition metal carbides, carbonitrides and nitrides discovered in 2011. The unique properties of 2D MXene such as excellent mechanical properties, hydrophilic surfaces and metallic conductivity made it interesting for application in electrodes of rechargeable batteries, supercapacitors, photocatalysts, catalysts, transparent conducting films, and flexible high-strength composites. The MXene can be synthesized through a selective etching process by using either in-situ HF (hydrofluoric acid) or direct HF methods. This study reports on the effect of the in-situ HF and direct HF etching procedures on the morphology of the synthesis Ti_2C_3 MXene using titanium aluminum carbide (Ti_2AlC_3) as precursor. The morphology and elements presence were evaluated by using variable pressure field emission scanning electron microscope (FESEM) and energy dispersion X-ray (EDX) spectroscopy analyses, respectively. The analysis shows that the MXene synthesized through the direct HF method was successfully delaminated compared to the in-situ HF procedures.

14:45-15:00



A202

Presenter: Zhipeng Luo
From: University of Electronic Science and Technology of China, China
Title: Multi-objective Optimization of Electronic Components based on Metamodeling Technology

Authors: Zhipeng Luo

Abstract: Surrogate models are frequently used in the solution of difficult practical problems in the field of engineering and scientific research. In this literature, an electronic device is introduced into our research. Two shape parameters are considered as variables while mass and heat transfer are set as objectives to improve the working ability and working life of the electronic. To enhance the computing accuracy and effectiveness, Optimal Latin Hypercube design is applied for sampling points. And the

finite element model is built for later computation. Then, compared with Kriging about approximating precision, RBF model performs better in this problem. With the surrogate model, the optimal solution is calculated with NSGA-II.

15:00-15:15

ET20-312

Presenter: KHAIRUL ANUAR Mat Amin

From: Universiti Malaysia Terengganu, Malaysia

Title: Scaffolds Materials from Gellan Gum Incorporated Ball Clay as Dressing Materials

Authors: NUR MASYITAH Hamdan and KHAIRUL ANUAR Mat Amin

Abstract: The demand for wound management treatment especially advanced and active wound care products is huge. In this study, the scaffolds were prepared from gellan gum (GG) incorporated ball clay (BC) at different concentrations to investigate their swelling properties, water vapor transmission rates (WVTR), mechanical characteristic and thermal behavior. There are three different concentrations of BC were added into the GG scaffolds which were 5% w/w (GG/BC5), 10% w/w (GG/BC10) and 15% w/w (GG/BC15). Swelling ratio of GG scaffolds were increased upon addition of ball clay, while WVTR values of all scaffolds were decreased in the range of 1081–1164 g m^{-2} d^{-1}. The mechanical performance results show that the GG/BC10 has the highest compressive stress at break (26 ± 5 MPa) and compressive strain at break (110 ± 21%). For thermal behavior, it shows that the thermal stability of GG scaffolds had improved after the addition of ball clay attributed to the interaction between GG and ball clay. The results show that the GG/BC scaffolds could be a potential candidate to be used as an active wound care product.

Best Presentation Award

Session 2: Environmental and Chemical Engineering

Test Presentation time: 14:25 – 15:05, October 9, 2020
Formal Presentation time: 15:35 – 17:35, October 10, 2020
[Time Zone: UTC/GMT +9]

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Formal Session 2 | October 10th
Session Chair: Assoc.Prof.Takaaki Wajima,
Chiba University, Japan

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15:35-15:50

N2003

Presenter: Masayuki Miyazawa
From: Chiba University, Japan
Title: Recycling Technology for Waste Glass Fiber Reinforced Plastics (GFRP) Using Pyrolysis with NaOH
Authors: Masayuki Miyazawa, Takaaki Wajima

Abstract: Glass fiber reinforced plastics (GFRP) are composite materials with high strength and flame retardancy, and the disposal process is expensive to cause illegal dumping. Therefore, new recycling technology of waste GFRP are desired. In this study, recycling of waste GFRP using pyrolysis with sodium hydroxide (NaOH) under an inert atmosphere was attempted by gasification of resin and conversion of glass fiber into soluble sodium silicate. The pyrolysis behavior of GFRP, the characteristics of the obtained residue, the composition and the yield of generated gas, and the silica extraction into the solution were investigated. As a result, the gasification of the resin and the conversion of the glass fiber into soluble sodium silicate were promoted by pyrolysis with NaOH. It was confirmed that the gas yield, especially flammable gases (H2 and CH4), and the silica extraction increased and the residual ratio decreased as the increase of the heating temperature, NaOH addition and heating time.

15:50-16:05

ET20-206

Presenter: Jarernporn Thawornprasert
From: Prince of Songkla University, Thailand
Title: Reduction of Free Fatty Acid in Low Free Fatty Acid of Mixed Crude Palm Oil (LMCPO): Optimization of Esterification Parameters
Authors: Jarernporn Thawornprasert, Wiriya Duangsuwan and Krit Somnuk

Abstract: The objective of this research was to study the optimum condition of esterified oil production from low free fatty acid of mixed crude palm oil (LMCPO) by using a response surface methodology (RSM) with esterification reaction in a batch mode. LMCPO obtained from a vacuum refining process of mixed crude palm oil (MCPO) to extract the partial FFA in oil which was used as a raw materials in a food production. Therefore, remaining FFA of 6.170 wt.% in LMCPO should be reduced to

less than 1 wt.% by using esterification when required these oils to use as feedstock for producing biodiesel. After esterification process, FFA in esterified oil was studied to optimize the four independent variables of methanol (5-25 vol.%), sulfuric acid (0.5-4.5 vol.%), reaction time (5-65 min) and speed of stirrer (100-500 rpm). The results showed that the optimal condition of 25 vol.% methanol, 2 vol.% sulfuric acid, 500 rpm speed of stirrer, and 30 min reaction time at 60^{o}C reaction temperature can decreased the FFA level to less than 0.212 wt.%. However, it was found out that the high consumptions of methanol and sulfuric acid required for reducing FFA to lowest value. Thus, the selected condition of 17.4% methanol, 1.6% sulfuric acid, 300 rpm speed of stirrer, and 35 min reaction time was chosen to save the chemical contents because this condition achieved to reduce FFA to acceptable level of 1 wt.%. For the actual experiment, FFA can be decreased to 0.212 wt.%, and 1.028 wt.% respectively. The yields of 96.67 wt.% for crude esterified oil and 94.22 wt.% for pure esterified oil were achieved based on LMCPO under the selected condition.

16:05-16:20

A208E

Presenter: Yadong Yu

From: School of Ecology and Environmental Science Yunnan University; The Ecological and Environmental Monitoring Station of DEEY in Kunming, China

Title: Simulaneous Determination of Heavey Metals in 6 Kind of Mineral Water by ICP-MS

Authors: Yu Yadong, Zhao Mingshan, Li Shigang and Zhu Yun

Abstract: A method for simultaneous determination of nine kinds of inorganic elements including Be, B, Ti, Co, V, Ni, Mo, Sb, Ba and Tl in mineral of six different mountains was established by inductively coupled plasma mass spectrometry (ICP-MS). The samples were analyzed directly after equilibration treatment. The results showed that the linearity ranged well among 0-200 ug/L with correlation coefficient above 0.9999.and the limit of detection was 0.03、0.90、0.40、0.07、0.03、0.07、0.06、0.07、0.30、0.10 ug/L。While the recoveries of spiked samples were between 88-110 % and the relative standard deviation (RSD) were 0 to 0.888 %. The method has simple operation, good reproducibility, no complicated pre-treatment steps, high sensitivity and reliable data, and can provide a reference for scientific selection of drinks to the residents.

16:20-16:35

N2004

Presenter: Takaaki Wajima

From: Chiba University, Japan

Title: Synthesis of X- and A-type Zeolites from Waste Stone Powder and Aluminium Dross using Alkali Fusion

Authors: Takaaki Wajima

Abstract: Zeolites A and X, well-known as practical materials, were successfully synthesized with high cation exchange capacity (CEC) using two industrial wastes, waste crushed stone powder and aluminum dross, by alkali fusion treatment. Waste stone powder and aluminum dross are industrial wastes, and effective utilization of these wastes has been highly expected. Since the main components of the two wastes are Si, Al and O, those wastes can be used as starting materials for synthesis of zeolites. In this study, these industrial wastes were converted into crystalline zeolite-X

and –A using alkali fusion. The stone powder, dross and the mixture of these wastes were transformed into a soluble phase via alkali fusion, and then agitated in distilled water at room temperature to give an intermediate gel-like solid, followed by synthesis at 80 ℃ to give the final product. The zeolites were successfully synthesized via the alkali fusion process, and selective synthesis of zeolites A and X was achieved by controlling the mixing ratio of aluminium dross to stone powder.

16:35-16:50

N1010

Presenter: Jem Valerie Perez

From: University of the Philippines Diliman, Philippines

Title: Fixed-Bed Adsorption Column Studies for the Removal of Methyl Orange from Water Using Polyethyleneimine-Graphene Oxide Polymer Nanocomposite Beads

Authors: Jem Valerie Perez, Jirah Emmanuel Nolasco, Camille Margaret Alvarillo, Joshua Chua and Ysabel Marie Gonzales

Abstract: Continuous fixed-bed column studies were performed using nanocomposite beads made up of chitosan, polyethyleneimine, and graphene oxide as adsorbents for the removal of methyl orange (MO) in water. The effects of different operating parameters such as initial MO concentration (5, 10, and 15 ppm), bed height (10, 17.5, and 25 cm), and flow rate (27, 43, and 58 mL/min) were investigated using an upward-flow fixed-bed column set-up. The breakthrough curves generated were fitted with Adams-Bohart, Thomas, Yoon-Nelson, and Yan et al. models. The results showed that Yan et al. model agreed best with the breakthrough curves having an R2 as high as 0.9917. Lastly, design parameters for a large-scale adsorption column were determined via scale-up approach using the parameters obtained from column runs.

16:50-17:05

N1009

Presenter: M Dwiki Destian Susilo

From: Universitas Gadjah Mada, Indonesia

Title: Development of Molecular Imprinting Polymer Nanofiber For Aflatoxin B1 Detection Based on Quartz Crystal Microbalance

Authors: M Dwiki Destian Susilo, Teguh Jayadi, Ahmad Kusumaatmaja and Ari Dwi Nugraheni

Abstract: Aflatoxin B1 (AFB1) is one of the mycotoxins with the most dangerous poisons and poses a threat to living things. Several detection methods for Aflatoxin B1 (AFB1) with high sensitivity (LC-MS technique, HPLC, ELISA, etc.) still require lengthy preparation time and are not real-time and portable. Aflatoxin B1 (AFB1) detection is one of the major challenges in the field of food safety because Aflatoxin B1 (AFB1) attacks the food and agricultural products sector. One of the potential sensors that can be used as a base for Aflatoxin B1 (AFB1) detection is the Quartz Crystal Microbalance (QCM) sensor. This study examines the performance of the Quartz Crystal Microbalance (QCM) sensor as one of the Aflatoxin B1 detection techniques through the physical deposition method. The Quartz Crystal Microbalance (QCM) sensor modified uses polyvinyl acetate (PVAc) material as a container to embed a molecular model that will be detected through a molecular imprinting polymer (MIP) process coated on QCM using the electrospinning method. The

response results show that the value of the sensor response using the MIP process is more significant than without the MIP process. The sensor characteristics demonstrated by the PVAc/AFB 50 sample have a limit of detection (LOD) value is 0.63 ppb, and a limit of quantitation (LOQ) is 1.91 ppb with a coefficient correlation is 0.97 for testing with a concentration range of 5.0 – 40.0 ppb. Therefore, the MIP process in QCM provides a favorable response for the detection of AFB1 in the future.

17:05-17:20

N1011

Presenter: Jem Valerie Perez

From: University of the Philippines Diliman, Philippines

Title: Fe/S Co-doped Titanium Dioxide Nanotubes: Optimization of the Photoelectrocatalytic Degradation Kinetics of Phenol Red

Authors: Edgar Clyde Lopez, Nicole Elyse Saputil, Lance Loza, Fiona Fritz Camiguing, Marlon Mopon and Jem Valerie Perez

Abstract: Textile dyes are very difficult to treat using conventional wastewater treatment processes because of their strong chemical bonds and resistance to biodegradation. Advanced oxidation processes are usually employed to completely degrade these recalcitrant pollutants into less harmful products. In particular, photoelectrocatalysis involves the use of a light source and applied potential to drive catalytic reactions on the surface of a photoelectrode. Here, we synthesized iron and sulfur co-doped titanium dioxide nanotubes via anodization of titanium sheets through an in-situ co-doping approach. The Fe/S-TiNTs were used as a photoelectrode for the photoelectrocatalytic degradation of a model pollutant – phenol red. Response surface methodology using a Box-Behnken design of experiments was used to investigate the effects of initial dye concentration, applied potential, and dopant loading on the kinetics of phenol red degradation, and a reduced cubic model was shown to adequately correlate these parameters. Maximum dye degradation was achieved at the optimized conditions: initial phenol red concentration = 5.0326 mg L-1, applied voltage = 29.9686 V, and dopant loading = 1.2244 wt.%. The experimental pseudo-first-order kinetic rate constant of k1 = 1.3042 x 10-2 ± 1.2243 x 10-4 min-1 agrees well with the model predicted value of k1 = 1.2004 x 10-2 ± 1.8285 x 10-4 min-1 at 99% confidence level. Complete degradation of phenol red may be achieved after 11.77 hours of treatment. The robustness of our model enables it to be used for process modeling and a basis for designing scaled-up photoelectrocatalytic reactors.

17:20-17:35

N2013

Presenter: Hiromi Kobori

From: Konan University, Japan

Title: Evidence of Hole Self-Doping due to Excess Oxygen Addition in Polycrystal LaMnO3

Authors: Hiromi Kobori, Megumi Sogabe, Akinori Hoshino, Atsushi Yamasaki, Toshifumi Taniguchi and Tetsuo Shimizu

Abstract: We have presented the evidence of hole self-doping due to excess oxygen addition in polycrystal LaMnO3 (LMO). The polycrystal LMO samples were prepared by use of a solid-state reaction method. Powder mixtures with a molar ratio of 1:1 between La2O3 and Mn2O3 were pre-annealed at 1100℃ for 18 hours in the

atmospheres of oxygen gas, helium gas and vacuum. By this heat treatment, non-crystalline LMO samples were produced. After that, the non-crystalline LMO samples were grinded and were pressed into pellets at the pressure of 3t/cm3. The pellets were annealed at 1100℃ and 1300℃ for 18 hours in the same atmospheres as the pre-annealing. Through these processes, polycrystal LMO samples were finally produced. To investigate crystallographic structure of the LMO samples, X-ray diffraction (XRD) measurements were performed by use of Cu-K radiation. From the experimental results of XRD measurements, we have found that all LMO samples have perovskite structure and are polycrystals. In addition, to investigate surface structure of the LMO samples, scanning electron microscope (SEM) measurements were carried out. Electrical resistivities (ERs) of the polycrystal LMO samples were measured as a function of temperature (4K-300K). The ERs of polycrystal LMO samples produced in an oxygen gas atmosphere show lower values as compared with other LMO ones in He gas and vacuum atmospheres. Especially, the temperature dependence of the ER for a polycrystal LMO sample produced at the annealing temperature of 1100℃ in an oxygen atmosphere shows a metallic behavior. Thus, we have considered that this LMO sample has the largest hole self-doping concentration in all LMO ones.

Best Presentation Award

Session 3: Mechanical Properties of Materials and Manufacturing

Test Presentation time: 15:25 – 16:00, October 9, 2020
Formal Presentation time: 10:00 – 11:45, October 11, 2020
[Time Zone: UTC/GMT +9]

Join Zoom Meeting
Meeting ID: 646 8388 7273

Formal Session 3 | October 11th
Session Chair: Assoc. Prof. Khairul Anuar Mat Amin, Universiti Malaysia Terengganu, Malaysia

Note:
* The schedule of each presentation is for reference only. Authors are required to attend the whole session, in case there may be some changes on conference day. Please join in the room 5-10 minutes earlier

10:00-10:15

ET20-307

Presenter: Watsada Siripongtana
From: King Mongkut's University of Technology North Bangkok, Thailand
Title: Influence of Nickel on the Microstructure and Mechanical Properties of Nodular Cast Iron

Authors: Watsada Siripongtana and Rungsinee Canyook
Abstract: This research investigates the nickel content added by 1.1wt%, 2.2wt%, 3.7wt% and 4.5wt% on the microstructure and mechanical properties in the nodular cast iron. The results demonstrate that the microstructure of nickel addition consists of nodule graphite, ferrite and pearlite phase while nickel was added to 4.5 wt% the microstructure becomes ferrite transform to fully pearlite phase. In addition the ductile iron has the highest nodularity (0.79%), followed by 1.1%Ni (0.75%), 2.2%Ni (0.71%), 3.7%Ni (0.69%) and 4.5%Ni (0.58%). The hardness and tensile strength increase when increasing the nickel content. Elongation is enhanced with nickel increasing and reaches a maximum of 12% at 1.1 wt% Ni, then decreases with the further increase of nickel.

10:15-10:30

ET20-311

Presenter: Aappo Mustakangas
From: University of Oulu, Kerttu Saalsti Institute, Finland
Title: Enhancement of the Compressive Strength of 3D-Printed Polylactic Acid (PLA) by Controlling Internal Pattern

Authors: Aappo Mustakangas, Atef Hamada, Antti J ärvenp ää
Abstract: Cost-efficient 3D-printing can create a lot of new opportunities in engineering as it enables rapid prototyping of models and functional parts. In the present study, Polylactic acid (PLA) cubic specimens with different types of infill patterns (IPs), rectilinear, grid and cuboid, were additively manufactured by Fused Filament Fabrication 3D-printing. The PLA cubes are fabricated with one perimeter

and different IPs density (10, 20, and 30%). Subsequently, the compressive strengths of the PLA materials were measured in two loading directions, i.e., the layers building direction is parallel (PD) to the loading axis and perpendicular (ND) to the loading direction. An optical microscope was used to examine the deformed IPs in both loading directions. The compressive flow stress curves of the PLA cubes infilled with rectilinear and grid patterns exhibited strong fluctuations with lower compressive strengths in the loading direction along ND. The PLA with 30% grid IP revealed a superior strength of 12 kN in the loading direction along PD. On the contrary, the same material exhibited a worst compressive strength 3 kN along ND.

10:30-10:45

A208

Presenter: Xiaoyan Wang
From: Northwestern Polytechnical University
Title: Effect of Cooling Rate on Performance Repair of Creep Damage
Authors: Xiao-Yan Wang, Hao Cheng and Zhi-Xun Wen
Abstract: After solid solution treatment at 1335℃ for 4 hours and cooling to room temperature at different rate, the nickel-based single crystal superalloy were made into three kinds of nickel-based single crystal superalloy materials containing different size γ′ phases, respectively. The tensile test of I-shaped specimens was carried out at 980℃, and their effect of γ′ phase microstructure on the tensile properties was studied. The results show that the yielding strength of the material air-cooled to room temperature was lower than that with cooling rate at 0.15℃/s, but both of them were lower than the yielding strength of original material. Little difference was found on the elastic modulus of I-shaped specimens made of three kinds of materials. When the cubic degree of the γ′ phase is higher and the size is larger, the tensile properties of the material is better, which can be attributed to the larger size and narrower channel of the matrix phase that lead to higher dislocation resistance.

10:45-11:00

ET20-306

Presenter: Ordóñez Salazar Santiago
From: Universidad Técnica Particular de Loja, Ecuador
Title: Preparation of a Rice Husk Composite and Effects of Cold Pressing on the Flexural Strength Properties
Authors: Ordóñez Salazar Santiago, Aguirre Maldonado Eduardo, Balcázar Arciniega André
Abstract: The study of composites made from residual organic materials and polymeric resins, has a great projection due to the use of new raw materials and the good physical, mechanical and aesthetic characteristics these materials present in the construction industry. The manufacturing processes of these composites include the necessary pressure application to generate an efficiently compact material, where matrix and reinforcement bonding are efficient. This study defines how the compaction force influences the flexural strength of composites made from polyester resin as polymer matrix, and rice husk as reinforcement material. This is achieved by testing different series of specimens, made by applying different compaction forces in a cold process, to analyse the relationship between compaction and flexural strength. Specimens are made varying only the compaction force, from 2, 5, 8, 11, 14, and 17

tons. The results show that, when the compaction force increases, the flexural strength in the composites also increases, however, there is a pressure range where the flexural strength values are very close, conditioning the use of pressure in relation to the decrease in the specimen section.

11:00-11:15

ET20-203

Presenter: Wenduan Yan
From: Minnan University of Science and Technology, China
Title: Effects of Oxide Inclusions on Texture of 1235 Al-Alloy After Deformation
Authors: Wenduan Yan, Gaosheng Fu, Wanqing Lai, Hongling Chen, Yan Li, Long Xiao, and Xiumin Zhou

Abstract: Texture characteristics of compressed 1235 Al-alloy treated by different purification methods are studied by electron backscattered diffraction. The effects of oxide inclusions on texture components of material are studied as well. The main textures in hot-compressed 1235 Al-alloy are Cube texture, R texture, Gross texture, Brass texture, and Rotated cube texture. The lower the content of oxide inclusions in the material, the smaller the total relative ratio of textures. The total relative ratio of textures goes to the smallest by 1.8 % in high-efficient purified 1235 Al-alloy by oxide inclusion content of 0.051 %. The purification results have obvious effects on types and percentage of texture in the deformed alloy. With the decreasing content of oxide inclusion, the ratio of deformation texture decreases and recrystallization texture increases. Brass texture is gradually replaced by Goss texture in the deformation textures. R texture is the main texture in recrystallization textures. Therefore, reducing the content of oxide inclusions is effective for improving the hot deformation properties of 1235 Al-alloy.

11:15-11:30

A209

Presenter: Berenice Cecibel Zúñiga Torres
From: Technical University of Loja, Ecuador
Title: Influence of Carbon Nanotures on Traditional Material
Authors: Berenice Cecibel Zúñiga Torres ,Francisco Hernández Olivares , Francisco Fernández Martínez ,Alonso Rodrigo Zúñiga Suárez and Brad Emilio Noboa Ruiz

Abstract: Brick as a material is of vital importance in the construction industry, however, the burning processes for its preparation contribute to environmental pollution and the generation of greenhouse gases; for this reason, the present research has as aims to propose quality traditional materials for sustainable buildings through the design of soil-cement mixtures in making brick using raw materials from the amazon region of Ecuador: Centza mine (MC) and Quiringue mine (MQ) and improve the mechanical properties of the brick by incorporating carbon nanotubes, which have been dispersed in two aqueous media, sodium naphthalene sulfonate (NSS) and calcium chloride (CC) in percentages of 0.5%, 1% and 1.5%. The characterization of the raw material (analysis: physicochemical and mineralogical) was of great help. The optimum percentage of cement and water was determined through simple compression tests and soil compaction respectively. The different combinations were tested at

indirect traction strength at ages 7, 14 and 28 days, determining an optimal mixture for each group of combinations, in this way the simple compressive strength of bricks has been estimated using the Griffith criterion and validation of results by finite element method applying the CivilFEM software, obtaining a resistance of 4 MPa in mixtures of SC-Ar1, 6.3 MPa in combinations of MWCNTs NSS-9 and 5.3 MPa in mixtures of CC-4 MWCNTs, increasing resistance by 57.5% and 32.5% with respect to soil -cement bricks and qualifying them as suitable for use in construction according to standars.

11:30-11:45

N2012

Presenter: Ramiro Correa-Jaramillo
From: Universidad Técnica Particular de Loja, Ecuador
Title: Innovative Materials for Sustainable Construction
Authors: Berenice Zúñiga-Torres, Ramiro Correa-Jaramillo, Francisco Hernández-Olivares, Francisco Fernández-Martínez, Alonso Zúñiga-Suárez, Israel Briceño-Tacuri, Lenin Loaiza-Jiménez.

Abstract: The construction industry has focused on trying to minimize and control the environmental impacts caused within the process of production and manufacture of fired bricks, for this reason the present research proposes five different alternative mixtures for the elaboration of ecological bricks, four of these based on soil -cement and one obtained through a geopolymerization process, using raw materials from the amazon region and the southern highlands of Ecuador, such as soil from the Centza mine (MC), sand from the Quiringue mine (MQ), organic correctors of husk rice (RH), peanut shell (PS), natural gypsum (G) from the Malacatos sector and fired brick residues from the same sector. The raw materials were characterized (analysis: physicochemical and mineralogical); the soil-cement-based combinations used different percentages of substitution of organic correctors and gypsum, the optimum percentage of water and cement was determined through the compaction test and resistance to simple compression respectively, the samples were cured and tested at ages of 7, 14 and 28 days. In the geopolymerization process, an alkaline solution NaOH was used in different concentrations of molarity and solution contents, the specimens were cured at temperatures of 90 ℃, 120 ℃, 150 ℃, 180 ℃ and 200 ℃.
The different combinations were subjected to indirect traction with the purpose to determine the optimal mixture and subsequent estimation of the compressive strength of bricks applying the Griffith criterion, the results were validated by the finite element method, obtaining strengths of 4 MPa in the combination soil-cement sand (SC_Ar1), in soil-cement rice husk (SC_RH2) and soil-cement peanut shell (SC_PS2) mixtures its resistance is 3 MPa, while in the soil-cement gypsum (SC_G4) mixture the resistance is 6.90 MPa and finally the resistance in geopolymeric mixture (GBW) is 13.75 MPa; In this way, the optimal combinations comply and increase the resistance to simple compression of bricks by 35% the SC_Ar1 mixture, 130% in the SC_G mixture with respect to the spanish standard and 129% the GBW mixture with respect to the ecuadorian standard.

Best Presentation Award

Session 4: Nanomaterials and Materials Chemistry

Test Presentation time: 16:20 – 16:55, October 9, 2020
Formal Presentation time: 13:45 – 15:30, October 11, 2020
[Time Zone: UTC/GMT +9]

Join Zoom Meeting
Meeting ID: 646 8388 7273

Formal Session 4 | October 11th
Session Chair: Asst. Prof. Bouchaib Zazoum,
Prince Mohammad Bin Fahd University, Saudi Arabia

Note:
* The schedule of each presentation is for reference only. Authors are required to attend the whole session, in case there may be some changes on conference day. Please join in the room 5-10 minutes earlier

13:45-14:00

N1002-A

Presenter: Aura Alejandra Burbano Patiño

From: INQUISUR-CONICET-UNS, Argentina

Title: Magnetic Hydrochar (MHC) nanocomposite obtained from sunflower husk (SFH)

Authors: Aura Alejandra Burbano Patiño, Veronica Lassalle and Fernanda Horst

Abstract: The oil industry in Argentina produces just over 1.25 million Mg year^{-1} of sunflower oil, leaving 600000 Mg year^{-1} of shell residue. This shell residue can be transformed into hydrochar by hydrothermal carbonization where the biomass is treated at different conditions of temperature, pressure and residence time that will conduct to a material with particular chemical and physical properties. This method has attracted attention because it operates at relatively low temperatures ≈100-300 ℃ (compared to pyrolysis) and autogenous pressure. Furthermore, the hydrochar can be modified by adding iron oxides (Fe_3O_4, Fe_2O_4) on its surface. The incorporation of this inorganic oxides would be useful due to the magnetic properties acquire by the material, so this could be removed from the aqueous media easily, by an external magnetic field. The magnetic properties of magnetic hydrochars materials represent an advantage because it could be possible to overcome some of the conventional difficulties when working with hydrochars that include centrifugation, filtration, and bottleneck problem.

This study aimed to obtain an industrial waste-based magnetic hydrochar (MHC) by hydrothermal carbonization (HTC) method using 150 ℃, 3 hours and H_3PO_4 as the activating agent. Sunflower Husk (SFH) is a highly important residue in Argentina, especially in Buenos Aires province and it was used as the feedstock to obtain the hydrochar. Transmission Electron Microscopy (TEM), Scanning Electron Microscopy (SEM), X-ray Diffraction (XRD), Fourier-Transform Infrared Spectroscopy (FT-IR), Brunauer-Emmett-Teller (BET), elemental analysis, Dynamic Light Scattering (DLS) and zeta potential were implemented to characterized the synthesized materials. Characterization results showed a successful obtainment of the MHC. BET surface

area and pore volume of the hydrochar are found to be 150 m^2/g and 0.19 cm^3/g respectively. The carbon content of the hydrochar reached a value of 69%. Furthermore, TEM analysis provided information on the morphology and size particle showing a stabilization of magnetite nanoparticles by hydrochar matrix as it can be seen in Figure 1 and exhibiting a size which is around 20 nm. Besides, the diffractograms show a crystalline phase owing to magnetite and an amorphous phase due to the hydrochar. For MHC material, the mechanism of interaction between hydrochar and the iron oxide moieties was studied where it was suggested an electrostatic interaction. Furthermore, a stability test in water was carried out in terms of iron leaching, resulting in a negligible value. This test was important because the materials might be used in water remediation on the adsorption of organic pollutants from water especially those called emergent pollutants such as pharmaceutic, dyes among others.

14:00-14:15

N2009-A

Presenter: Ruipeng Chen

From: Southeast University, China

Title: Vertical flow assay based on nanoporous alumina and core-shell SERS nanotags for multiplex inflammatory biomarkers detection

Authors: Ruipeng Chen, Xiangwei Zhao

Abstract: Cardiovascular disease diagnosis and inflammation monitoring require simultaneous and sensitive detection of multiple inflammation biomarkers considering that single biomarker analysis present inadequate information to predicte the underlying biological evolution. Currently, surface-enhanced Raman scattering (SERS) is a promising technique and has been employed in chemical and biological sensing field, owning to its attracted merits, such as photostability, high sensitivity, as well as narrow emission peak which makes it a nice encoding element in multiplex bioassays.

In addition, nanoporous anocic aluminum oxide (AAO) with packed regular nanofluidic array has been widely used for biosensing or fabrication of SERS active nanostructioes. However, the cost of those fabrication is expensive, as well as the operation procedure is time consuming, complex and laborious. Nevertheless, vertical flow assay (VFA) is the most widely used point of care testing (POCT) technique owing to its simple operation, rapid detection and robustness in various applications. Thus, by combining porous AAO with vertical nanofluidic channels which allows actual nanofiltration, with the high sensitivity and multiplex coding capacity of SERS nanotags, we developed a high-throughput multiplex vertical flow array assay (VFAA) for quantitative and simultaneous detection of inflammatory biomarkers (Figure 1). Because of the high surface area to volume raito (SVR) of the porous AAO, as well as the absorption peak of the periodic structure of porous AAO matches with the excitation wavelength, resulting in the enhancement of electromagnetic field of SERS nanotags, thus in turn greatly improve the signal to noise ratio of SERS signal, which is favorable for ultral-sensitive detection. Therefore, the proposed biosensor shows great promise for carrying out high throughput sensitive biomarkers detection and clinical diagnosis in resource-limited areas.

14:15-14:30

N1006

Presenter: Yi Xiang

From: Tohoku University, Japan

Title: A Data Mining Approach to Investigate the Carbon Nanotubes Mechanical Properties via High-throughput Molecular Simulation

Authors: Yi Xiang and Go Yamamoto

Abstract: The relationship of geometrical properties and mechanical properties of carbon nanotubes (CNTs) was investigated by using high-throughput molecular simulation. Geometrical properties such as diameter, number of walls, chirality, and crosslink density were considered. As a key factor in determining the mechanical properties of composites reinforced with CNTs, nominal tensile strength is the focus in this study, which can be calculated by fracture force divided by the full cross-sectional area including the hollow core and the wall thickness. The fracture mode, nominal tensile strength, and nominal Young's modulus under the condition of CNTs outermost tube loading axial tensile test were evaluated. Three types of fracture modes led by different crosslink densities of CNTs were obtained. By data-mining through large amounts of datasets, we showed that CNTs with small diameter, large number of walls, and crosslinks between walls can have high nominal tensile strength. We demonstrated that zigzag-type CNTs with crosslink density of approximately 1.5% - 2.5%, armchair-type CNTs with crosslink density of approximately 3% - 4% can help improve the load transfer from the outer tube to the inner tube the most.

14:30-14:45

ET20-204

Presenter: Klin Tuangsitthisombat

From: NIST International School, Sukhumvit soi 15, Thailand

Title: Silver Nanoparticle Impregnation onto Different Types of Fabric

Authors: Klin Tuangsitthisombat and Nopphon Weeranoppanant

Abstract: Silver nanoparticles have long been used as antibacterial agents as they can release silver ions, which are likely to bind to and deactivate proteins in the bacteria's cell membrane. Therefore, AgNPs have been incorporated into different materials for preventing the growth of microorganisms. During the COVID-19 pandemic, the masks or cloths with this antibacterial property such as impregnated AgNPs, are needed. A recent report showed that the bacteria may act as a co-infection agent and worsen those with viral respiratory infections. In some cases, AgNPs can also serve as antiviral agent. Therefore, in this work, we aimed to develop an understanding of AgNPs impregnation into different types of common fabrics: 100% polyester, 100% cotton, and their blended fabrics (50%-50% cotton-polyester and 60%-40% cotton-polyester). The chemical synthesis, with sodium citrate as a reducing agent, was used as a method for AgNPs production. The impregnation of AgNP onto fabric was performed using the pad dry-cure method, commonly used in the textile industry. During this process, perapret CFF has been used as a binder. The fabric was padded for 5 mins, then cured for 2 mins at 150 oC . The AgNPs are characterized with UV-Vis spectrometry, with the maximum absorbance around 402 nm. The four impregnated fabrics were characterized with their whiteness, water permeability, and

FE-SEM-EDS. In all fabrics, the 100% cotton and the blended fabrics showed the highest portion of AgNPs on the surface while the 100% polyester showed a very minimal amount of AgNPs. The 100% cotton and 100% polyester were then characterized for their antibacterial activity with *Klebsiella pneumoniae* and *Staphylococcus aureus*.

14:45-15:00

ET20-317

Presenter: K. Vignarooban
From: University of Jaffna, Sri Lanka
Title: Gel Polymer Electrolytes for Sodium Batteries Raman and Electrochemical Impedance Spectroscopic Studies
Authors: G. Menisha, J.H.T. B. Jayamaha, K. Vignarooban, G. Sashikesh, K. Velauthamurthy, H.W.M.A.C. Wijayasinghe and M.A.K.L. Dissanayake

Abstract: Sodium-ion batteries (SIBs) as low-cost alternatives to expensive lithium-ion batteries become a hot R&D topic in the recent days due to the natural abundancy of sodium in the Earth's crust and also in the oceans. As far as solid electrolytes for SIBs are concerned, larger size of Na^+ ions compared to that of Li^+ ions hinders the ionic mobility resulting to insufficient ionic conductivity for practical applications. Development of quasi-solid state gel-polymer electrolytes (GPEs) would be a feasible solution to overcome this challenge. In this work, we developed Poly (methyl methacrylate) (PMMA) based GPEs with six different compositions dissolved in EC:PC (ethylene carbonate and propylene carbonate, 1:1 wt%) mixture. Among six different GPE samples investigated by Electrochemical Impedance Spectroscopic (EIS) and Raman Spectroscopic techniques, the best ambient temperature ionic conductivity of 4.2 mS cm^{-1} was obtained for 9PMMA:9$NaPF_6$:41EC:41PC (wt%). Variation of ionic conductivity with inverse temperature showed Arrhenius behavior with almost constant activation energies. The best conducting GPE showed an activation energy of 0.14 eV. In the Raman spectra, very sharp crystalline peaks (400-850 cm^{-1} wave number range) of $NaPF_6$ disappear in the gel state of the electrolytes confirming the non-crystalline nature of the GPEs. Boson modes remain almost constant in intensity for all the six different compositions. The best conducting GPE seems to be highly suitable for practical applications in SIBs as it has sufficient ambient temperature ionic conductivity.

15:00-15:15

ET20-313-A

Presenter: Syun Gohda
From: NIPPON SHOKUBAI CO., LTD., Japan
Title: Highly Soluble Oxygen-Containing Carbon Materials Prepared from Phloroglucinol
Authors: Syun Gohda, Hironobu Ono, Yasuhiro Yamada

Abstract: High solubility and dispersibility of nanocarbon materials are important to compose with the other materials such as resin. Graphene oxides (GO) is one of the oxygen-containing nanocarbon materials with high dispersibility, and it has been developed for various applications. However, it is too dangerous to manufacture GO at a large scale because it needs severe process using strong acids and oxidants. Therefore, the methods for manufacturing highly soluble carbon materials safely, stably, and cleanly are essential. In this work, highly soluble oxygen-containing nanocarbon materials were synthesized in high yield by simply pyrolysis of phloroglucinol. Phloroglucinol has symmetric three hydroxyl groups and high

carbonization reactivity at low temperature. Moreover, the by-product of this reaction is water and carbon oxides only. Therefore, it is safety and clean process. By analyzing the carbon materials prepared from phloroglucinol at various temperatures, the structures caused high solubility were discussed. Utilizing the solubility, the new applications were also developed such as a coating material to the surface of the base material. For example, silica nanoparticle can be coated with the soluble carbon material, and by further carbonizing after coating, the resulting nanoparticle has lower frictional resistance and higher electric conductivity than uncoated one.

15:15-15:30

N2011-A

Presenter: Peng Shen

From: Southeast University, China

Title: Liposomal Spherical Nucleic Acid Scaffolded Site-Selective Hybridization of Nanoparticles for Biosensing

Authors: Peng Shen and Qingjiang Sun

Abstract: In the past decade, hybridization of liposomes with rapidly developed nanoparticles to construct liposome-nanoparticle hybrids has been widely used for bosensing and bioimaging. As an excellent biological platform, spherical nucleic acid (SNA) plays an important role in biosensing and imaging. Herein, the advanced liposomal spherical nucleic acid (L–SNA) platform is exploited for the first time to establish a spherical, three–dimensional biosensing system by hybridizing with a set of nanoparticles.

By hydrophilic and hydrophobic interactions as well as programmable base-pairing, red-emission, green-emission quantum dots and gold nanoparticles are encapsulated into the internal aqueous core, the intermediate lipid bilayer and the outer SNA shell, respectively, producing an L–SNA–nanoparticles hybrid. As a result of the site-selective hybridization, the hybrid comprises a liposomal “fluorescent core–fluorescence resonance energy transfer” system surrounded by a SNA shell. The SNA shell functions as three-dimensional substrate for the duplex-specific nuclease target recycling reaction.

As schemed in fig.1, by the DSN target recycling reaction, the SNA shell can be completely hydrolyzed, and all AuNP-labeled “sunspot” sequences are released from the hybrid. As a consequence, the 3D FRET is fully eliminated and the green corona is recovered which produces ratiometric fluorescence. More importantly, the ratiometric fluorescence facilitates the hybrid for visual biodetection with remarkably high resolution. This is exemplified by traffic light-type transition in fluorescence-color achieved for sensing circulating microRNAs in clinical serum samples. Clearly, the controllable hybridization with functional nanoparticles opens a new avenue for the exciting biomedical applications of liposomal spherical nucleic acids.

Best Presentation Award

Session 5: Building Materials and Technology

Test Presentation time: 17:15 – 17:50, October 9, 2020
Formal Presentation time: 15:50 – 17:35, October 11, 2020
[Time Zone: UTC/GMT +9]

Join Zoom Meeting
Meeting ID: 646 8388 7273

Formal Session 5 | October 11th
Session Chair: Assoc. Prof. Marvin Herrera,
University of the Philippines Los Banos, Philippines

Note:
* The schedule of each presentation is for reference only. Authors are required to attend the whole session, in case there may be some changes on conference day. Please join in the room 5-10 minutes earlier

15:50-16:05

ET20-310

Presenter: Mizuki Takigawa
From: Tokai University, Japan
Title: Effects of Silica Fume Addition on Properties of Fresh Mortar
Authors: Mizuki Takigawa, Hiromitsu Koyama, Yoshiki Uno, Shigeyuki Date

Abstract: In recent years, concrete structures have tended to be taller and larger than before. With that trend, concrete as a material has diversified, and various kinds have been developed to meet differing quality requirements. In particular, the need for high-strength concrete is increasing. In general, high-strength concrete has a low water-binder ratio, so its workability is inferior to general concrete. Including admixtures such as silica fume is one way to remedy this problem. Previous studies have discussed the quality and hardening characteristics achievable using silica fume. Nevertheless, expected increasing demand for high-strength concrete dictates the need to understand not only its properties when fresh, but also to have an accurate picture of its vibration compaction properties on construction sites. In this study, the effect of adding silica fume on the workability of mortar was investigated by evaluating its fresh properties, plastic viscosity, and vibration propagation characteristics. Changes to mortar's fresh properties due to pressure were also investigated to clarify its behavior in pumping environments. The study confirmed that the addition of silica fume decreases plastic viscosity and increases vibration propagation characteristics, and that increased plastic viscosity due to pressurization can be reduced.

16:05-16:20

ET20-315

Presenter: Akbota Aitbayeva
From: Nazarbayev University, Kazakhstan
Title: Assessment of Recycled Toilet Bowl Wastes as Pozzolanic Materials: Material Characterization and Performance of Mortar Mixtures
Authors: Akbota Aitbayeva, Chang-Seon Shon, Dichuan Zhang and Jong Ryeol Kim

Abstract: The growing demand for finding alternative applications for ceramic

products wastes develops their usage as construction materials. The main objective of this paper is to evaluate the feasibility of recycled toilet bowl (RTB) wastes as pozzolanic materials in mortar mixture. The properties of RTB material were examined in terms of chemical composition, particle size distribution (PSD), X-ray diffraction (XRD) analysis, compressive strength, pozzolanic reactivity, sulfate resistance, and alkali-silica reaction according to ASTM C 618 and C 311 test specifications. The results demonstrated that the use of RTB materials as pozzolanic materials positively affects compressive strength development and durability by fully corresponding to all criteria of the ASTM C 618 guideline. Furthermore, chemical composition, PSD, and XRD test results had equivalent values to ASTM class F fly ash analysis.

16:20-16:35

ET20-321E-A

Presenter: Fuminori SHOKYU

From: Tokai University, Japan

Title: To Study on Quality Improvement of Precast Concrete by the Steam-Curing Method

Authors: Fuminori SHOKYU, Mizuki TAKIGAWA, Shigeyuki DATE

Abstract: In the Japanese construction industry, there is a demand for streamlining and labor saving in construction work, and precast concrete is drawing attention. It is generally known that placing precast concrete outdoors after steam curing reduces its strength. Therefore, we focused on sprinkling curing as a method to facilitate water supply to parts after steam curing. According to the results of the survey so far, the compressive strength of sprinkling curing was higher than that of outdoor installation. This study investigated the effect of the materials used and curing conditions on the secondary curing effect. As a result, B-type blast-furnace slag cement tended to be more effective than ordinary cement in improving the compressive strength by changing the material. Also, when changing the pre-steaming time, The effect of pre-steaming time on the watering effect could not be clearly confirmed. Therefore, it needs to be further examined and verified in the future.

16:35-16:50

ET20-301

Presenter: Van Phuc Le

From: University of Transport and Communications, Vietnam

Title: Determining Optimum Carbon Nanotubes Content for Asphalt Mixture in Road Pavements

Authors: Van Bach Le, Van Phuc Le

Abstract: Although small amount of binder in asphalt concrete mixture may commonly range from 3.5 to 5.5% of total mixture as per many international specifications, it has a significant impact on the total cost of pavement construction. Therefore, this paper investigated the effects of five carbon nanotubes contents of 0.05%, 0.1%, 0.15%, 0.2%, 0.25% by asphalt weight as an additive material for binder on performance characteristics of asphalt mixtures. Performance properties of CNTs modified asphalt mixtures were investigated through the Marshall stability (MS) test, indirect tensile (IDT) test, static modulus (SM) test, wheel tracking (WT) test. The results indicated that asphalt mixtures with CNT modified binder can improve both the

rutting performance, IDT strength and marshall stability of tested asphalt mixtures significantly at higher percentages of carbon nanotubes. However, the issue that should be considered is the construction cost of asphalt pavement. Based on the asphalt pavement structural analysis and construction cost, it can be concluded that an optimum CNT content of 0.1% by asphalt weight may be used as additive for asphalt binder in asphalt mixtures.

16:50-17:05

ET20-322E-A

Presenter: Yasuaki UNO

From: Tokai University, Japan

Title: To Verify the Function of an Absorbent Accelerated Test by using Epoxy Resin as a Crack Injectant based on Exposure and Accelerated Tests

Authors: Yasuaki UNO, Toshihiro SENGA, Tadashi YAMAUCHI, Shigeyuki DATE

Abstract: One of the deterioration of reinforced concrete is salt damage. “Salt damage deterioration” means that chloride ions penetrate into the inside of reinforced concrete to generate rust on the reinforcing bar, and the rust expands, causing cracking and peeling of the concrete. As a countermeasure against deterioration of reinforced concrete structures subjected to salt damage, repair materials with added salt adsorbents have been developed. In this research, the epoxy resin was used as an organic material, and the corrosion inhibitory effect of “Hybrid Epoxy Resin Repair Agent” was grasped and evaluated. As a result, it was confirmed that the reinforcing steel bar corrosion suppression effect assuming salt damage repair.

17:05-17:20

ET20-319

Presenter: Inzhu Mukangali

From: Nazarbayev University, Kazakhstan

Title: Effects of Waste Soda-Lime Glass Sand and Glass Fiber on Physical and Mechanical Properties of None-Autoclaved Aerated Concrete

Authors: Inzhu Mukangali, Chang-Seon Shon, Kirill Kryzhanovskiy, Dichuan Zhang, and Jong Ryeol Kim

Abstract: This paper investigates the combined effect of waste soda-lime glass sand and glass fiber on the physical and mechanical properties of none-autoclaved aerated concrete (NAAC). The use of both soda-lime glass sand and glass fiber can provide silica-rich materials in the aerated concrete and can enable the elimination of an autoclaved curing by enhancing the physical and mechanical properties in aerated concrete. In this study, a total of six mixture proportions were designed to evaluate these properties in NAAC. The mixture parameters included the partial substitutions of normal sand with soda-lime glass sand (0%, 15%, and 30%) and glass fiber (1%, 2%, and 3%). A series of tests were conducted to determine density, absorption, porosity, and both compressive and flexural strengths of the NAAC. Test results present that the increase of glass sand content leads to the increasing of both compressive and flexural strengths. Moreover, the combination of the use of glass sand with glass fiber also increases the strength up to 2 times (the mixture of 30% glass sand and 3% glass fiber). Furthermore, test results indicate the relatively good relationship between the density, porosity, and of NAAC with good accuracy.

17:20-17:35

ET20-323E-A

Presenter: Takaki FUJITA

From: Tokai University, Japan

Title: Study on the Salt Preventive Property by using Blast-Furnace Slag

Authors: Takaki FUJITA, Prang SUBPA-ASA, Sigeyuki DATE

Abstract: The reinforcing structure is important for the main structure, which is an obligation to protect against structural damage and extend its lifespan effectively. Blast furnace slag is the inevitable by-product of steel product manufacturing as sustainable materials and renewable materials course of low cost. Therefore, to extend the structure's life and reduce the costs of materials, it is essential such materials could be used to improve the properties of the construction materials industry. The purpose of this study aimed to examine the blast furnace slag with difference Blaine value affects the salt preventive property. The influence of blast furnace slag on blocking resistance and the effective diffusion coefficient of chloride ions was measured by accordance with the Japan Society of Civil Engineers standard as "Standard on Test Methods for Chloride Ion Diffusion Coefficients in Concrete" by electrophoresis (Draft) (JSCE-G571-2003). The Rapid chloride permeability testing confirmed salt preventive property, and immobilization performance was measured using blast furnace slag with different Blaine value. The result is shown as the permeability rate was decreasing with w/b=35%, on the other hand, increasing with w/b=50%. Furthermore, to confirmed that the immobilization performance could be greatly improved by increasing Blaine's value and penetration rate.

Best Presentation Award