

2019 5th International Conference on Advances in Environment Research (ICAER 2019)

August 13-15, 2019

Nanyang Technological University, Singapore



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Conference Venue

Nanyang Technological University, Singapore

Address: NTU@one-north 11, Slim Barracks Rise (off North Buona Vista Road) Singapore 138664



A research-intensive public university, Nanyang Technological University, Singapore (NTU Singapore) has 33,000 undergraduate and postgraduate students in the colleges of Engineering, Business, Science, and Humanities, Arts and Social Sciences, and its Graduate College. NTU's Lee Kong Chian School of Medicine was established jointly with Imperial College London.

NTU's campus is frequently listed among the Top 15 most beautiful university campuses in the world and has 57 Green Mark-certified (equivalent to LEED-certified) buildings, of which 54 are certified Green Mark Platinum.

Besides its 200-ha (500-acre) lush green, residential campus in the western part of Singapore, NTU also has a second campus in the heart of Novena, Singapore's medical district.

Route and detailed address:

Nanyang Technological University

NTU@one-north Executive Centre

11, Slim Barracks Rise (off North Buona Vista Road), Singapore 138664, L9, SR906



Route to NTU@ one-north campus, Executive Centre



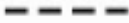
-  Vehicle Route from AYE
-  Vehicle Route from Commonwealth Avenue
-  Pedestrian Path from Buona Vista MRT Station(Exit D) via North Buona Vista Road

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Session Chair: Prof. Ngai Weng Chan

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Singapore Conference Introductions

✧ Publication

Welcome to 2019 HKCBEEES Singapore conference. This conference is sponsored by the Hong Kong Chemical, Biological & Environmental Engineering Society (HKCBEEES). It is one of the leading international conferences for presenting novel and fundamental advances in the fields of Advances in Environment Research. It also serves to foster communication among researchers and practitioners working in a wide variety of scientific areas with a common interest in improving Advances in Environment Research related techniques.

2019 5th International Conference on Advances in Environment Research (ICAER 2019)

Accepted papers will be published in the following Journals:

IOP Conference Series: Earth and Environmental Science (EES) (ISSN: 1755-1315), which is indexed by EI Compendex, Scopus, Thomson Reuters (WoS), Inspec, et al.

Conference website: <http://www.icaer.org/>

Conference email: icaer@cbees.net

Presentation Instructions

Instructions for Oral Presentations

Devices Provided by the Conference Organizer:

Laptop Computer (MS Windows Operating System with MS PowerPoint and Adobe Acrobat Reader)

Digital Projectors and Screen

Laser Sticks

Materials Provided by the Presenters:

PowerPoint or PDF Files (Files should be copied to the Conference laptop at the beginning of each Session.)

Duration of each Presentation (Tentatively):

Regular Oral Presentation: about **20** Minutes of Presentation and **5** Minutes of Question and Answer

Keynote Speech: about **50** Minutes of Presentation and **5** Minutes of Question and Answer

Instructions for Poster Presentation

Materials Provided by the Conference Organizer:

The place to put poster

Materials Provided by the Presenters:

Home-made Posters

Maximum poster size is A1

Load Capacity: Holds up to 0.5 kg

Best Presentation Award

One Best Presentation will be selected from each presentation session, and the Certificate for Best Presentation will be awarded at the end of each session on August 14, 2019.

Dress code

Please wear formal clothes or national representative of clothing.

Keynote Speaker Introductions

Keynote Speaker I



Prof. Kuo-Lun Tung
National Taiwan University, Taipei, Taiwan

Prof. Kuo-Lun Tung, is currently the Huang C.H. Chair Professor of Department of Chemical Engineering at National Taiwan University (NTU) in Taipei, Taiwan. He was the Deputy Vice President of the Office of the International Affairs in NTU. He received the B.S., M.S. and Ph.D. degrees in 1991, 1994 and 1998, respectively, from the NTU, all in chemical engineering. Before joining NTU since August 2012, he was the Director of the R&D Centre for Membrane Technology at Chung Yuan University from 2009 to 2012, with a specialty of research and development on membrane filtration applications for 20 years. Allan is also active in the international affairs in membrane filtration discipline. He was a council member of The Filtration Society in UK within 2008-2012 and also serving as the vice chair of the membrane technology specialist group in international water association (IWA). He also a newly elected fellow of IWA since 2018.

Topic: 'Highly Zeolite-Loaded Polyvinyl Alcohol Composite Membranes for Alkaline Fuel-Cell Electrolytes'

Abstract—Having a secure and stable energy supply is a top priority for the global community. Fuel-cell technology is recognized as a promising electrical energy generation system for the twenty-first century. Polyvinyl alcohol/zeolitic imidazolate framework-8 (PVA/ZIF-8) composite membranes were successfully prepared in this work from direct ZIF-8 suspension solution (0–45.4 wt %) and PVA mixing to prevent filler aggregation for direct methanol alkaline fuel cells (DMAFCs). The ZIF-8 fillers were chosen for the appropriate cavity size as a screening aid to allow water and suppress methanol transport. Increased ionic conductivities and suppressed methanol permeabilities were achieved for the PVA/40.5% ZIF-8 composites, compared to other samples. A high power density of 173.2 mW cm⁻² was achieved using a KOH-doped PVA/40.5% ZIF-8 membrane in a DMAFC at 60 °C with 1–2 mg cm⁻² catalyst loads. As the filler content was raised beyond 45.4 wt %, adverse effects resulted and the DMAFC performance (144.9 mW cm⁻²) was not improved further. Therefore, the optimal ZIF-8 content was approximately 40.5 wt % in the polymeric matrix. The specific power output was higher (58 mW mg⁻¹) than most membranes reported in the literature (3–18 mW mg⁻¹).

Keynote Speaker II

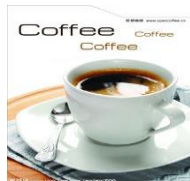


Assoc. Prof. Dr. Shanti Faridah binti Salleh
Universiti Malaysia Sarawak (UNIMAS), Sarawak, Malaysia.

Assoc. Prof. Dr. Shanti Faridah Salleh has served as a lecturer at Universiti Malaysia Sarawak for more than 16 years. She graduated from Loughborough University, United Kingdom from which she has an Engineering degree in Chemical Engineering and Master Degree in Advanced Process Engineering. She obtained her PhD in Chemical Engineering focusing on Biomass Conversion from Agricultural Waste from Universiti Putra Malaysia. She is currently a Chartered Energy Engineer of Institute of Energy under Engineering Council of UK Since 2000, she has had a long and successful career in Universiti Malaysia Sarawak working in different strategic areas, including; Faculty of Engineering, Academic Development and Management Division and Centre of Academic Quality Assurance and Curriculum Development.. On Professional Recognition, Assoc Prof Dr Shanti Faridah is Certified Auditor RSPO (Round Table Sustainable Palm Oil), Certified Environmental Lead Auditor ISO14001 and Registered EIA Consultant for NREB. She has involved in various module developments for TVET, Sime Darby and Palm Oil Refinery Association Malaysia. In terms of consultancy work, she has served few projects with Sarawak Energy Berhad, XFab Sarawak Bhd, Murata (Malaysia) Sdn Bhd.

Title: Rural Electrification for Sustainable Development: Key Issues and Challenges

Abstract—Energy generation and use are strongly linked to all elements of sustainable development such as economic, social and environmental. It is not just about the availability, but the accessibility and the sustainability of the energy is of paramount importance. World Energy Outlook data in 2018 estimated less than 1 billion people living in this world who lack access to electricity. Renewable energy is identified as one of the ways to solve this problem. It offers advantages such as clean source of energy, flexible power sources especially for homes. In rural areas, the development of rural electrification is lagging due to lack of mature commercial technology, difficult logistic planning and fragmented settlement as a result of scattered locality of villages and geographical variations. This paper addresses the issues and challenges in implementing rural electrification projects and the existing framework to access the sustainability of the project.



Coffee Break & Group Photo Taking	10:45~11:10
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Keynote Speech III



Prof. Ngai Weng Chan
Universiti Sains Malaysia, Malaysia

Ngai Weng Chan is Professor of Physical Geography at the Universiti Sains Malaysia in Penang, Malaysia. His main research areas are Environmental Hazards Management, Hydro-Climatology & Water Resources Management. He is currently Vice-President of the International Water Resources Association, Member of International Association of Hydrological Sciences and Member of International Water Association. He is currently President of Water Watch Penang (WWP), Treasurer of Malaysian Environmental NGOs (MENGOs) and member of Malaysian Water Partnership and Malaysian Water Association. He has completed more than 50 research/consultancy projects and published 26 Books, 59 Chapters in Books, and more than 100 professional papers.

Topic: ‘Holistic Urban Water Management Integrating Rainfall Harvesting, Water Conservation and Sustainable Drainage Systems in Universiti Sains Malaysia’

Abstract—Water is a serious issue world-wide with a large number of cities experiencing water stress. Climate change is exacerbating flash floods and water stress in cities. Increasingly, many cities in have grown extremely huge in populations and physical dimensions. These megacities have a ravenous appetite for water but at the same time vulnerable to flooding. Water disasters are serious problems that cannot be solved by city governments alone. A holistic urban water management system that integrates rainfall harvesting, water conservation and sustainable drainage system is explored in this paper. This includes engagement of all stakeholders in addressing urban water problems. Stakeholders such as universities are like small towns with dense populations and are large water consumers. Universiti Sains Malaysia (USM), one of Penang State’s largest water consumers, needs to control and reduce its water usage. USM relied solely on piped water supply and

does not have an alternative water source. Water consumption is very high in USM as the staff, students and visitors do not pay for the water. There is also poor awareness and apathy on water usage. The School of Humanities (SOH) in USM took the lead in installing a rainfall harvesting system and run a water saving demonstration project. Likewise, flooding is also a serious issue in cities. The USM Egeineering Campus is built on a sustainable urban drainage system (SUDS). The SUDS is built on green environmentally-friendly structures. **Objective:** This study aims to examine the effectiveness of integrating urban water management with sustainable urban drainage systems as a viable way to reduce the negative effects of water stress and flooding. The main objective of the project is to control and reduce water usage and flooding. **Methods:** The methodology includes addressing the hardware (water fittings) and software (humans) parts. Addressing the hardware includes installing a rainfall harvesting system as alternative water source, changing conventional/outdated water fittings that use a lot of water are to water-friendly fittings, and plugging all the leaks in the water system. The rain water harvested is used for general washing, toilet flushing, gardening and car washing. Addressing the software includes creating water awareness and providing water education, changing human behaviour in water use practices and sensitizing staff, students and visitors on water use. The methodology on flood reduction includes a literature review of existing related flood studies, and primary experimental flood and water quality data obtained from the River Engineering and Urban Drainage Research Centre (REDAC) of Universiti Sains Malaysia. **Results:** Results of the project showed that water use can be reduced by half resulting in significant water savings. This also contributed to USM's aim of being a sustainability-led university. The project also enhanced water awareness and increased commitment of Staff, Students and Visitors on water conservation. Overall, the project showed that total water consumption in USM can be controlled to a level that can benchmark USM as being a "Water Responsible" and Sustainability-led university. Results from the flood study showed that SUDSs reduces the amount of concrete jungle, replaces dark absorbent surfaces with green and blue surfaces, increase the amount of vegetation, increases rates of evapotranspiration, reduces heat source potentials, cleans the air of pollutants, relocates industries and disperse populations while encouraging wind flow via smooth surfaces. More significantly, the results indicate that not only can sustainable drainage systems control flooding, but it can also improve stormwater quality and reduce urban heat islands. **Conclusion:** In conclusion, a holistic urban water management system integrating rainfall harvesting, water conservation and SUDS is effective in solving urban water issues such as water stress, water quality and floods as it combines both engineering measures and human measures in management leading to greater stakeholders engagement, better water conservation practices, more green spaces, better water quality discharge, and less flooding. All these lead to achievement in reaching Sustainable Development Goals (SDGs).

Brief Schedule for Conference

Tips: The schedule for each presentation is for reference only. In order not to miss your presentation, we strongly suggest that you attend the whole session.

Day 1	<p>August 13 (Tuesday) 10:00~17:00</p> <p>Venue: Nanyang Technological University, Singapore (in the Lobby) (Add: NTU@one-north, 11, Slim Barracks Rise (off North Buona Vista Road) Singapore 138664)</p> <p>Participants Onsite Registration & Conference Materials Collection & Conference Reports</p>
Day 2	<p>August 14 (Wednesday) 09:00~17:30</p> <p>Venue: Nanyang Technological University, Singapore (SR906) (Add: NTU@one-north, 11, Slim Barracks Rise (off North Buona Vista Road) Singapore 138664)</p> <p>Participants Onsite Registration & Conference Materials Collection & Conference Reports</p>
	<p>Opening Remarks 09:00~09:05 Prof. Ngai Weng Chan Universiti Sains Malaysia, Malaysia</p> <p>Keynote Speech I 09:05~09:55 Topic: “Highly Zeolite-Loaded Polyvinyl Alcohol Composite Membranes for Alkaline Fuel-Cell Electrolytes” (Prof. Kuo-Lun Tung, National Taiwan University, Taiwan)</p>
	<p>Keynote Speech II 09:55~10:45 Topic: “ Rural Electrification for Sustainable Development: Key Issues and Challenges” (Assoc. Prof. Dr. Shanti Faridah binti Salleh, Universiti Malaysia Sarawak (UNIMAS), Sarawak, Malaysia.)</p>
	<p>Coffee Break & Group Photo Taking 10:45~11:10</p>
	<p>Keynote Speech III 11:10~12:00 Topic: “Holistic Urban Water Management Integrating Rainfall Harvesting, Water Conservation and Sustainable Drainage Systems in Universiti Sains Malaysia” (Prof. Ngai Weng Chan, School of Humanities, Universiti Sains Malaysia, Malaysia)</p>
	<p>Lunch 12:00~13:30</p>

	<p>Session 1 13:30~15:50 Venue: SR906 5 presentations-Topic: “ Environmental Management and Engineering ” Session Chair: Prof. Ngai Weng Chan (B8004-A, B8009, B8014, B8017, B9005)</p>
	<p>Coffee Break 15:50~16:15</p>
	<p>Session 2 16:15~17:30 Venue: SR906 3 presentations-Topic: “ Waste Recycling and Renewable Energy” Session Chair: Assoc. Prof. Dr. Shanti Faridah binti Salleh (B0007, B0006, B1002-A)</p>
	<p>Poster Session : 9:00-17:30 Venue: SR906 6 presentations (B8018, B9007-A, B0009-A, B0012, B0014, B0016-A)</p>
	<p>Dinner 17:30</p>

Tips: Please arrive at the conference to upload or copy PPT into the laptop room 10 minutes before the session begins.

Note: (1) The registration can also be done at any time during the conference.

(2) The organizer doesn't provide accommodation, and we suggest you make an early reservation.

(3) One Best Presentation will be selected from each presentation session, and the Certificate for Best Presentation will be awarded at the end of each session on August 14.

Session 1

Afternoon, August 14 (Wednesday)

Time: 13:30~15:50

Venue: SR906

5 presentations-Topic: “Environmental Management and Engineering”

Session Chair: Prof. Ngai Weng Chan

B8004-A Presentation 1 (13:30~13:55)

Phosphate recovery using electro dialysis reactor with a magnesium anode from swine wastewater

Yuyan Cai and Zhiying Han

Zhejiang University, Hangzhou, China

Abstract—Excessive discharge of nitrogen and phosphorus in wastewater is a burning environmental issue of the present world. Wastewater from swine farm is characterized by a high concentration of ammonia nitrogen and low-level ratio of carbon to nitrogen (C/N), which results in a poor nitrogen removal performance through traditionally biological denitrification. Thus, it is necessary to find a new measure in field of treating swine wastewater, and choose a proper parameter before application. In recent researches, it was found that nitrogen and phosphate in wastewater could be recovered and recycled simultaneously by forming struvite, which is an effective slow releasing fertilizer to maintain the stable production of agricultural system. However, few researchers have connected this method with electro dialysis to treat wastewater. In this study, a novel electro dialysis plant with 20 pair of ion exchange membranes, a magnesium anode and a titanium cathode was designed for nutrient reclamation. The electro dialysis plant was able to concentrate nitrogen and phosphate in wastewater to the degree where struvite could precipitate spontaneously, when compared with the electrolysis cells. Therefore, electro dialysis technology is more efficient to treat low nutrient concentration wastewater and produce high purity struvite. As the results shown, when the pH and current density were set at optimal condition of 8.8 and 1.0 A respectively, the dilute efficiency of desalination chamber was close to 100% and the total phosphate removal efficiency of simulated swine wastewater reached 80% after 90 minutes.

Session 1

Afternoon, August 14 (Wednesday)

Time: 13:30~15:50

Venue: SR906

5 presentations-Topic: “Environmental Management and Engineering”

Session Chair: Prof. Ngai Weng Chan

B8009 Presentation 2 (13:55~14:20)

Analysis of Urban Points of Interest and Urban Traffic from Shenzhen Urban Space Optimization

Yang Wang and Liquan Xu

Huazhong University of Science and Technology, Wuhan, Hubei, China

Abstract—This paper is to discussing traffic accessibility and point of interest spatial network on the relationship between urban point of interest and the urban road network, First, we introduced the distribution of POI (points of interest, such as business, banking, catering, and attractions), and determining the road traffic and accessibility of cities through urban map data. Secondly, the spatial network formed by the POI is used to find the main factors, analyze the correlation between road traffic density and the road traffic density. Finally, the GIS platform is used for data organization for system analysis, mining urban data to obtain feature factors, and urban space optimization strategy. The studies results show urban POI affect road traffic through functional attributes, leading to changes in urban space.

Session 1

Afternoon, August 14 (Wednesday)

Time: 13:30~15:50

Venue: SR906

5 presentations-Topic: “Environmental Management and Engineering”

Session Chair: Prof. Ngai Weng Chan

B8014 Presentation 3 (14:20~14:45)

Synergism and Antagonism among Indigenous Hydrolytic Bacteria from Biomedical Wastes for the Generation of Bacterial Consortium Used as Bioremediation Agent

Stalis Norma Ethica, Rifki Muslim, RM Bagus Irawan Widyawardhana, Akbar Firmansyah, Sakti Imam Muchlissin, Sri Darmawati, Agus Sabdono

Universitas Muhammadiyah Semarang, Jawa Tengah, Indonesia

Abstract—The key steps to develop bioremediation agent from indigenous group of hydrolytic bacteria include isolation of the bacteria from polluted site followed by evaluation on pathogenicity levels and interactions among the isolated strains. This study aimed to evaluate synergism and antagonism between non-pathogenic and pathogenic groups of hydrolytic bacteria isolated from liquid biomedical wastes of hospitals in Semarang. Interactions among indigenous, non-pathogenic, hydrolytic bacterial isolates i.e. *Bacillus velezensis* R1.3, *B. amyloliquefaciens* R1.6, *B. amyloliquefaciens* R1.14, *B. velezensis* R1.16, *B. licheniformis* R2.5, and *B. amyloliquefaciens* R2.9 and with 20 other pathogenic ones were evaluated using overlay and cross streak methods. Observation was based on the formation of inhibition zone as evidence of antagonistic interaction and the absence of this zone as proof of synergistic interaction. As results, the 6 non-pathogenic isolates are all synergistic among each other, yet antagonist against most of the 20 pathogenic ones. As conclusion, the obtained 6 non-pathogenic isolates could be mixed as bacterial consortium and used as major component of bioremediation agent of liquid hospital waste

Session 1

Afternoon, August 14 (Wednesday)

Time: 13:30~15:50

Venue: SR906

5 presentations-Topic: “Environmental Management and Engineering”

Session Chair: Prof. Ngai Weng Chan

B8017 Presentation 4 (14:45~15:25)

Relationship between Time Lapse Microgravity Anomaly with Na and Cl Content for prediction of Sea Water Intrusion in Tourism Area Kota Lama Semarang Indonesia

Supriyadi, Khumaedi, Sugiyanto

Universitas Negeri Semarang, Indonesia

Abstract—This research is motivated by changes in infrastructure that occur in the old city, the changes in question are the frequent occurrence of flooding in this region. The flooding that occurred was estimated to be caused by subsidence. In addition, subsidence that has other effects, for example seawater intrusion in the Old City, which is located close to the north coast of Java, is also relatively close to about 3 km. The purpose of this study was to find a relationship between seawater intrusion and micro-gravity anomalies between times. The methods carried out are as follows: (1) choose Gravimeter with micro precision. For this study using the Autograv CG5 type, (2) determining the location of the measurement point, which is not expected to experience physical damage due to natural or human behavior for a certain interval, (3) measuring gravity for two different periods in September 2017 and March 2018 at the same point, (4) processing data with initial corrections, namely tidal correction to reduce tidal effects, float correction, and correction of the dynamics of groundwater levels associated with rainfall, and (5) conduct chemical tests of water samples taken from residents' wells at the Research site. The results showed that the negative time-weight gravity anomaly correlated with an average groundwater level decrease of 15,468 cm. This is in accordance with the fact that during this range rainfall trends tend to decline from September 2017 to March 2018. This decrease in ground water causes maximum subsidence and occurs in the south-southwest 2.3 cm. This zone experiences sea water intrusion which is characterized by the content of Na (60-100%) and Cl (100-160%).

Session 1

Afternoon, August 14 (Wednesday)

Time: 13:30~15:50

Venue: SR906

5 presentations-Topic: “Environmental Management and Engineering”

Session Chair: Prof. Ngai Weng Chan

B9005 Presentation 5 (15:25~15:50)

Behaviour of 3D printed PLA and PLA-PHA in marine environments

G R Montalvão, M Moshrefi-Torbati, A Hamilton¹, R Machado, A João, C Silva and S Sampaio

University of Southampton, Highfield, Southampton, SO17 1BJ, United Kingdom

Abstract—The accumulation of marine debris in the oceans has been escalating. There is an urgent need to develop new technologies that efficiently record and transmit ocean data without contributing to ocean pollution. In this study, the behaviour of Polylactic Acid (PLA) and Polylactic Acid-Polyhydroxyalkanoate (PLA-PHA) in marine environments was analysed in order to assess biodegradability in marine applications. 3D Printed samples were submerged completely in seawater and cyclically in a salt spray chamber. Their change in mechanical properties was evaluated by conducting uniaxial tension tests after submersion periods of up to 45 days and failure regions were observed in microscope. Contrarily to PLA’s behaviour, PLAPHA’s samples suffered embrittlement and registered losses in elongation at break of around 1018%. The alignment of salt crystals and other impurities in the failure regions suggests that embrittlement could be related with environmental stress cracking resulting from the penetration of those impurities into the polymer. Such inclusions originate residual stresses which lead to a faster and more brittle failure. Embrittlement could also be related to an increase in crystallinity caused by chain scission of amorphous regions by means of chemical degradation. Further evaluation of changes in molecular weight should be conducted to confirm the latter.



Coffee Break	15:50~16:15
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Session 2

Afternoon, August 14 (Wednesday)

Time: 16:15~17:30

Venue: SR906

3 presentations-Topic: “Renewable Energy and Electric Energy”

Session Chair: Assoc. Prof. Dr. Shanti Faridah binti Salleh

B0007 Presentation 1 (16:15~16:40)

A Distributed EV Charging Strategy in An Integrated Energy System

Tao Zhu, **Xiaoying Shi**, Ronghua Duan, Yizhen Wang and Yinliang Xu

Tsinghua-Berkeley Shenzhen Institute, Tsinghua University

Abstract—Electric vehicles (EV) is viewed as an environmental-friendly travel device but brings the driver with range anxiety. One of the solutions to tackle this issue is to recharge at the fast charging station (FCS). Since the traffic flow of the transportation network and the operation condition of the fast charging station varies from time to time, it is important to implement real-time charging guiding for the EV drivers. In this paper, we propose a distributed guiding method to search for the best FCS with minimum sum of time cost and electricity purchasing cost. The EVs are viewed as a distribution of spatial and temporal electrical loads, which would affect the locational marginal price (LMP) of the FCS. The varied LMPs would also react upon the EV driver’s choice. The proposed guiding method utilizes the wireless communication technologies. Simulation test demonstrates the effectiveness of the proposed EV guiding method in an integrated energy system.

Session 2

Afternoon, August 14 (Wednesday)

Time: 16:15~17:30

Venue: SR906

3 presentations-Topic: “Renewable Energy and Electric Energy”

Session Chair: Assoc. Prof. Dr. Shanti Faridah binti Salleh

B0006 Presentation 2 (16:40~17:05)

A Split PV-Thermal Hybrid Solar Collector

Anand Shankar

CMR National Public School, Bangalore, India

Abstract—The roof area available to low/middle income households in developing economies for installing solar energy systems is usually too limited to simultaneously accommodate both a PV system and a Thermal system, both of which will likely become universal needs. Here we describe a split PV-Thermal system that uses the same roof area to provide a sun-tracking PV panel arranged at a sufficient height above a fixed Thermal Panel of roughly the same dimensions, both of which can operate simultaneously during most of the day. The first interesting feature of the PV system is that it is split longitudinally into 2 independently rotatable subpanels, resulting in not only thermal-electric flexibility during the day, but more heat collection during winter and summer. The second interesting feature is that the rotary PV subpanel has a metal reflector backside, which can also track the sun in the morning or evening to reflect additional slanting solar radiation onto the fixed thermal panel below, resulting in thermal power reaching midday levels.

Session 2

Afternoon, August 14 (Wednesday)

Time: 16:15~17:30

Venue: SR906

3 presentations-Topic: “Renewable Energy and Electric Energy”

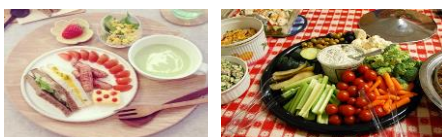
Session Chair: Assoc. Prof. Dr. Shanti Faridah binti Salleh

B1002-A Presentation 3 (17:05~17:30)

Selective hydrodeoxygenation of 5-hydroxymethylfurfural to 2, 5-dimethylfuran over bimetallic Cu-Ni catalyst

Changhui Zhu, Haosheng Xin, Haiyong Wang , Chenguang Wang, Qiyong Liu, Longlong Ma
Chinese Academy of Sciences, Guangzhou, China

Abstract—Alloyed Cu-Ni encapsulated in carbon was prepared by loading Ni and Cu onto the biochar (BC) through initial wetness impregnation method under mild conditions. This bimetallic catalysts were exploited to perform the selective hydrodeoxygenation (HDO) of 5-hydroxymethylfurfural (HMF). 2, 5-Dimethylfurfural (DMF), a promising liquid fuel/fuel additive, could be obtained from HMF with highest yield of 93.5% under the optimized conditions. During HMF HDO, two key intermediates, 5-methylfurfural (MFF) and 2, 5-dihydroxymethylfuran (DHMF), dominating two distinct conversion pathways were systematically investigated by Arrhenius kinetics analysis. In addition, turnover frequencies (TOFs) of the HDO reaction over Cu-Ni/BC corresponding with Cu amount were thoroughly discussed, finding that the electron transfer from Cu to Ni in the alloy structure was beneficial to the HDO reaction, and the conversion pathways can be regulated by reaction temperature variation. Importantly, the synergy of HDO of HMF by alloyed Cu-Ni metal and Lewis acidic sites from NiO_x were hence clarified by systematic catalyst characterizations. The Cu-Ni/BC catalyst is stable for at least five consecutive runs to obtain the stabilized 81.9% of DMF since the third run.



Dinner

17:30

Poster Session

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6 presentations

B8018 Presentation 1

Influence of meteorological factors on ecosystem services value: a case study of Beijing-Tianjin-Hebei region, China

Zhenya Zhu, Zhengyuan Zhao, Xiaoyuan Wang, Hongqing Li, Mengfei Yang and Lihua Chen

Beijing Forestry University, Beijing, China

Abstract—Meteorological factors are one of the natural factors, which affect ecosystem services value (ESV). Influence of meteorological factors was studied in Beijing-Tianjin-Hebei region using ordinary least square (OLS) with geographical weighted regression (GWR). The main aim of this study was to reveal the differences in the influence mechanism at the global and local levels. The main meteorological factors influencing ESV were temperature and precipitation, followed by humidity. Days with annual daily precipitation ≥ 0.1 mm, annual minimum precipitation and annual average relative humidity were three important meteorological factors. Annual temperature range, annual minimum precipitation, days with annual daily precipitation ≥ 0.1 mm, in particular, the last one had an obvious positive effects. The positive and negative effects of annual average relative humidity were coexisting, and the negative effect was the main. It was obvious that the spatial distribution characteristics of the local influence mechanism. The local model of GWR can better solve the spatial non-stationarity of the dependent and independent variables, thus it was better than the global model of OLS. The results also provide detailed field information on the different effects of meteorological factors at different locations

Poster Session

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6 presentations

B9007-A Presentation 2

Exploring Step-By-Step Assembly of Nanoparticle: Cytochrome Biohybrid Photoanodes

Ee Taek Hwang

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Abstract—Coupling light-harvesting semiconducting nanoparticles (NPs) with redox enzymes has been shown to create artificial photosynthetic systems that hold promise for the synthesis of solar fuels. High quantum yields require efficient electron transfer from the nanoparticle to the redox protein, a property that can be difficult to control. Here, we have compared binding and electron transfer between dye-sensitized TiO₂ nanocrystals or CdS quantum dots and two decaheme cytochromes on photoanodes. The effect of NP surface chemistry was assessed by preparing NPs capped with amine or carboxylic acid functionalities. For the TiO₂ nanocrystals, binding to the cytochromes was optimal when capped with a carboxylic acid ligand, whereas for the CdS QDs, better adhesion was observed for amine capped ligand shells. When using TiO₂ nanocrystals, dyesensitized with a phosphonated bipyridine Ru(II) dye, photocurrents are observed that are dependent on the redox state of the decaheme, confirming that electrons are transferred from the TiO₂ nanocrystals to the surface via the decaheme conduit. In contrast, when CdS NPs are used, photocurrents are not dependent on the redox state of the decaheme, consistent with a model in which electron transfer from CdS to the photoanode bypasses the decaheme protein. These results illustrate that although the organic shell of NPs nanoparticles crucially affects coupling with proteinaceous material, the coupling can be difficult to predict or engineer photosystems.

Poster Session

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6 presentations

B0009-A Presentation 3

Preparation of 2,5-Dimethylfuran from Biomass for Biofuel

Jia GUO, Cong ZHOU, Hua-dong WU, Lin-feng ZHANG

Wuhan Institute of Technology, Wuhan, Hubei, China

Abstract—The soaring prices of oil and natural gas have sparked a race to make transportation fuels from biomasses or plant matters instead of petroleum. Actually, both biodiesel and gasoline containing ethanol are starting to make an impact on the current market.

A derivative of furan, 2,5-dimethylfuran (DMF) is a heterocyclic compound of the formula C_6H_8O . Recent research has increased its attractiveness as a potential biofuel. It has an energy density 40% higher than ethanol, making it comparable to gasoline (or petrol)^[1]. Because it is also chemically stable, does not absorb moisture from the atmosphere, and does not blend with water, pipeline transport is viable. Its fuel characteristics, including a higher octane and cetane rating, also allow it to be combusted in a virtually unmodified engine. Evaporating dimethylfuran during the production process also requires around one third less energy than the evaporation of ethanol, although it has a boiling point some 14°C higher, at 92°C, compared to 78°C for ethanol.

The ability to efficiently and rapidly produce dimethylfuran from fructose, found in fruit and some root vegetables, like *Jerusalem artichoke*, or from glucose, which can be derived from starch and cellulose - all widely available in nature - is likely to add to the attraction of dimethylfuran once safety issues have been examined.

In this abstract, a route to synthesize dimethylfuran from fructose or glucose using a combined biochemical and thermochemical approach was developed. The process involves pretreatment of cellulose or starch with enzymes to yield glucose. Several microbes were found to degrade cellulose, including *Phanerochaete chrysosporium*, *Trichoderma reesei*, *Acetobacter xylinum* and *Fibrobacter succinogenes*. Alternatively, thermochemical and/or acid treatment of cellulose can give 5-hydroxymethylfurfural (5-HMF) directly. Glucose isomerase can convert the glucose into fructose, which is reductively dehydrated with hydrochloric acid and water, or chromium chloride in an ionic liquid into 5-HMF^[2]. The yield from fructose is higher than from glucose when using acid hydrolysis, but recent research has demonstrated that chromium chloride in an ionic liquid adequately reduces both sugars. The high-yield isomerization of glucose to fructose could maintain a higher overall yield. 5-HMF is subsequently reduced to 2,5-dimethylfuran by a copper-ruthenium catalyst.

Poster Session

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6 presentations

B0012 Presentation 4

Application of turbine generator in pipeline for transporting natural gas

Liang Zhang and Jiyu Zheng

Southwest Petroleum University, Chengdu, Sichuan, China

Abstract—In recent years, the vigorous green technology is developing in the world, and the fuel cell is the top topic to be researched. One of the major factors limiting fuel cell commercialization is the development of bipolar plates since bipolar plates account for approximately 70% of the PEMFC weight, and 60% of the stack manufacturing and materials cost. The key factor of PEMFC is to investigate a feasibility of a conductive composite bipolar plate, in order to get the highly conductive, light weight, and low cost bipolar plates. This study proposes a method for the optimization of the etching process parameters for hot runner-layer composite carbon bipolar plates with single performance characteristics, using Taguchi. The results show the optimal performance characteristics for PEMFC hot runner-layer composite carbon bipolar plates with Taguchi method prediction design of A2B2C2 (Exp.6, Temperature of hot pressing 127 °C, Pressure of hot pressing of 3.1N.M , and Time of hot pressing of 40min). It is clear that all the hot running-layer composite carbon bipolar plates peaks at 24.7°, and 43° belong to (002) and (101) carbon planes, respectively. Success to develop a new type of surface modification (hot runner-layer) and modify surface of PMMA bipolar plates in this study.

Poster Session

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B0014 Presentation 5

Exploring China's Energy Situation through One Belt And One Road

Ali Gholizadeh , Qiang Huang, **Yilin Gong**

Huainan Normal University, Huainan, China

Abstract—Energy refers to various resources that can be directly obtained or be obtained through processing or conversion, including coal, crude oil, natural gas, coal-bed methane, water energy, nuclear energy, wind energy, solar energy, geothermal energy, biomass energy and other primary energy, electricity, thermal energy, refined oil and other secondary energy, as well as other new and renewable energy. Energy is an important material basis of national economy, and the future national destiny depends on the control of Energy. The development and efficient use of energy and per capita consumption are important indicators of production technology and living standards. This paper analyzes the relationship between China's energy status and One Belt And One Road security from the aspects of China's energy status, China's energy consumption in the next 30 years, China's various energy basic conditions and important energy policies related to countries along the silk road. It is found that "One Belt And One Road" strategy provides support and conditions for China's energy development.

Poster Session

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6 presentations

B0016-A Presentation 6

Low Band-gap Energy Photocatalytic Membrane Based on SrTiO₃-Cr and PVDF Substrate: BSA Protein Degradation and Separation Applications

Yi-Chen Lin, David K. Wang, Jing-Yuan Liu, Aligholi Niaei, **Hui-Hsin Tseng**

Chung Shan Medical University Hospital, Taichung, Taiwan

Abstract—A series of ultrafiltration (UF) membranes based on mixed matrix of chromium-doped strontium titanate (SrTiO₃-Cr) photocatalyst and polyvinylidene difluoride (PVDF) were systematically prepared by non-solvent induced phase inversion technique. Porous PVDF membrane and mixed matrix membranes (MMMs) incorporated with 3 to 10 wt.% SrTiO₃-Cr were produced in the UF range using polyethylene glycol as a porogen additive. The crystal morphology and electronic property of as-synthesized Cr-doped SrTiO₃ nanoparticles were characterized by XRD and UV-Vis DRS. We found that the SrTiO₃-Cr nanoparticles are cubic perovskite structure of approximately 30-40 nm in size with a low band gap energy of 2.05 eV. The morphology, surface roughness, hydrophilicity and textural properties of SrTiO₃-Cr/PVDF MMMs were comprehensively characterized using field emission-scanning electron microscope with energy-dispersive X-ray spectroscopy, atomic force microscope, sessile drop technique, and capillary flow porometer. The SrTiO₃-Cr was observed to be homogeneously dispersed in all the MMMs and provided additional anti-fouling properties from Bovine Serum Albumin (BSA) protein. The membrane UF property and tri-cycling performance were evaluated under three distinct protocols in (1) Dark, (2) constant UVA exposure, and (3) UVA during post-treatment clean only. By increasing the SrTiO₃-Cr concentration, the MMMs displayed an improved homogeneity and macropore distribution with enhanced water permeability given by 51 to 110 LMH bar⁻¹ pure water flux and 37 to 45 LMH bar⁻¹ BSA water flux in the Dark. A consistently high BSA rejection of 95% and an improved anti-fouling property under constant UVA irradiation were achieved due to a combination of photo-induced hydrophilic and photocatalytic effect. Also, a significant improvement in UF performance in terms of membrane flux recovery was observed in the 3rd protocol signifying that the effect of protein fouling on membrane filtration was further reduced due to a lower degree of BSA fragment deposition in the membrane pores. The findings in this study dramatically lower the operational constraints (transmembrane pressure, membrane cleaning, use of UVA) in the protein filtration process and offer an innovative membrane material for the research of photo-induced, anti-fouling membranes for protein separation applications



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