SciWide
WEBINARS

Abstract Book

2nd Edition of Renewable and Sustainable Energy Virtual

February 04-05, 2022 | GMT 07:00 – 15:00

SciWide
WEBINARS

PLENARY FORUM

DAY 1

2nd EDITION OF

RENEWABLE AND SUSTAINABLE ENERGY VIRTUAL

FEBRUARY

04-05, 2022

GMT 07:00 – 15:00

V-Renewable2022

Bunsho Ohtani and Mai Takashima

Institute for Catalysis, Hokkaido University, Sapporo 001-0021, Japan.

True Design and Characterization of Catalyst and Photocatalyst Materials through Electron Trap-distribution Analyses

How can we design functional solid materials, such as catalysts and photocatalysts for renewable-energy production? What is the decisive structural parameters controlling their activities, performance or properties? What is obtained as structural properties by popular conventional analytical methods, such as X-ray diffraction (XRD) or nitrogen-adsorption measurement, is limited to bulk crystalline structure and specific surface area, i.e., no structural characterization on amorphous phases, if present, and surface structure has been made so far. This is because there have been no macroscopic analytical methods to give surface structural information including possibly-present amorphous phases. Recently, we have developed reversed double-beam photoacoustic spectroscopy (RDB-PAS) which enables measurement of energy-resolved distribution of electron traps (ERDT) for semiconducting materials such as metal oxides [1,2]. Those detected electron traps (ETs) seem to be predominantly located on the surface of almost all the metal oxide particles, with exception of nickel oxide and therefore they reflect macroscopic surface structure, including amorphous phases, in ERDT patterns. Using ERDT pattern with the data of conduction-band bottom position (CBB), i.e., ERDT/CBB patterns, it has been shown that metal oxide powders, and the other semiconducting materials such as carbon nitride, can be identified without using the other analytical data such as XRD patterns or specific surface area, and similarity/differentness of a pair of metal-oxide samples can be quantitatively evaluated as degree of coincidence of ERDT/CBB patterns. In this talk, an approach of material design based on the ERDT/CBB-pattern analyses is introduced [3].

[1] *Chem. Commun.* **2016**, *52*, 12096-12099. [2] *Electrochim. Acta* **2018**, *264*, 83-90.[3] *Catal. Today* **2019**, *321-322*, 2-8.

Biography

The research work on photocatalysis by Professor Bunsho Ohtani started in 1981 when he was a Ph. D. course student in Kyoto University. Since then he has been studying photocatalysis and related topics for 40 years and published more than 300 original papers (h-index: 72) and two single-author books. After gaining his Ph. D. degree from Kyoto University in 1985, he became an assistant professor in the university. In 1996, he was promoted to an associate professor in Graduate School of Science, Hokkaido University and was then awarded a full professor position in the Catalysis Research Center (presently Institute for Catalysis), Hokkaido University in 1998. He was awarded several times form the societies related to chemistry, photochemistry, electrochemistry and catalysis chemistry.

Takashi Nakanishi
International Center for Materials Nanoarchitectonics (WPI-MANA), National Institute for Materials Science (NIMS), Tsukuba, Japan. E-mail id: nakanishi.takashi@nims.go.jp

Solvent-free Liquid Phosphors and Electrets towards Stretchable Applications

Newly developing functional soft matter/materials, namely "functional molecular liquids (FMLs)", are recently focused much attention toward the most promising candidate to be fabricated into foldable/stretchable optoelectronic devices. In particular, solvent-free alkyl-π liquids exhibit excellent deformability, photo-/thermal- stability and predictable π-unit based optoelectronic functions. Herein, we present (i) fine-tuning of luminescence of solvent-free liquid dyes,[*Nature Commun.* **2013**] and (ii) unprecedented 'liquid electret' devices by using newly designed solvent-free liquid porphyrins which show mechanoelectrical and electroacoustic functions as well as their stretchable performance. Our strategy of shielding π-unit of tetraphenylporphyrins with insulating flexible and bulky-alkyl chains are suitable for stably holding electric charges by the π-unit of liquid-porphyrins.[*Nature Commun.* **2019**]

The solvent-free alkyl-π molecular liquid's strategy has been also extended to a conjugated polymer system. The creation of viscoelastic conjugated polymer (VE-CP) at room temperature, by using an intact π-conjugated backbone and bulky, yet flexible, alkyl side chains as internal plasticizers,[*Angew. Chem. Int. Ed.* **2019**; *Mater. Horiz.* **2020**] will be also presented in the paper.

Biography

Takashi Nakanishi received his Ph.D. degree from Nagasaki University in 2000 and then did JSPS postdoctoral research at the University of Houston and the University of Oxford. He joined NIMS in 2004 and was promoted to group leader in 2016. His research interest focuses on precisely controlled self-assembly of functional soft materials and non-assembled optoelectronically-functional molecular liquids. He has published more than 125 papers in reputed journals and has been serving as an international advisory board member of *Molecular Systems Design & Engineering*.

Edgar Harzfeld
Stralsund University of Applied Sciences, Germany.

New solutions for storing and using surplus electricity in Methanol

The use of the air conditioning system presented here should help to operate air conditioning systems more efficiently than before. Furthermore, an additional electricity storage function provides a contribution to the long-term storage of surplus electricity from renewable energies. The surplus electricity stored in methanol can be converted back into electricity when needed, for example in the event of a grid disconnection, so that the consumer air condition systems can operate without interruption.

Biography

Edgar Harzfeld, Professor at Stralsund University. Studies and research in Leipzig and Zurich. Since 1996 at the Faculty of Electrical Engineering and Computer Science of Stralsund University responsible for electrical power supply and renewable energy systems. Since 2004 - 2021 numerous research projects on the subject of electrical energy storage technologies.

Manuel F. M. Costa[1], Mário Passos[2], Joaquim O. Carneiro[3]

[1]Centre of Physics, Department of Physics, University of Minho, Gualtar Campus, 4710-057 Braga, Portugal.
[2]CESPU - Polytechnic and University Higher Education Cooperative, 4760-409 Vila Nova de Famalicão, Portugal.
[3]Centre of Physics, Department of Physics, University of Minho, Azurém Campus, 4800-058 Guimarães, Portugal.

Solar Energy and Sustainability

Solar energy is one of the main sources of endogenous energy with a strong expression in sustainability issues, namely in the social, energy, economic and environmental components. The use of solar energy strongly contributes to improving the competitiveness of the countries' economy and to the modernization of society, while safeguarding the quality of life of future generations by reducing gas emissions, in particular carbon dioxide (CO_2), responsible for climate change. Among the several renewable sources of energy (for example, wind, hydro, waves, etc.), solar energy is the most abundant, inexhaustible and a freely available energy source that enables the management of long-term problems that may arise from energy crises. The main goal of this article is to provide an overview about the evolution of the photovoltaic industry on a global scale and, in particular, highlighting some characteristics of the Portuguese photovoltaic market, which arises from the political and economic environment. The sustainable development trends in the photovoltaic industry are also discussed, both from the perspective of the Portuguese market and worldwide. Additionally, issues related to the state of maturity of the different solar PV technologies in the global market are also emphasized, as well as the expected market share of those different technologies. The information herein presented will be of great value to educators and science teachers and all involved in raising the awareness and literacy on sustainable development.

Keywords: Solar energy, Solar cells, Photovoltaic market, Renewable energies, Climate change, Sustainability

Biography

Manuel F. M. Costa hold a PhD degree in Science (Physics) from the University of Minho (Portugal) where he works since 1985 at the Physics Department teaching and performing applied research in optical metrology, image processing, thin films nanostructures and applications, instrumentation, and science education and literacy. He is the president of the Ibero-American Optics Network, RIAO, for the term 2019-2022. He also acts as: president of the Hands-on Science Network, HSCI; deputy chair of the Scientific Advisory Board of the European Optical Society, EOS; Executive Committee member and Europe Regional Representative of the International Council of Associations for Science Education, ICASE; and, president of the Portuguese Society for Optics and Photonics, SPOF. He is Fellow of the European Optical Society.

DAY 1

KEYNOTE FORUM

2rd EDITION OF

RENEWABLE AND SUSTAINABLE ENERGY VIRTUAL

FEBRUARY

04-05, 2022

GMT 07:00 – 15:00

Kesaven Bhubalan

Faculty of Science and Marine Environment, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia. E-mail id: kesaven@umt.edu.my

Exploiting marine bacteria for the production of value-added biomaterials from renewable resources: an effort towards embracing circular economy

The marine environment is noted for its high bacteria diversity, thus, a hotspot for unveiling bacteria with biotechnology potentials. Polyhydroxyalkanoate (PHA) is a bacteria–derived biodegradable polymer with material properties similar to petrochemical based plastics. On the other hand, rhamnolipid (RL), is a major component of bacteria-derived biosurfactant. Both biomaterials are produced by some marine bacteria under limited nutrient condition and in the presence of excess carbon source. The PHA and RL are completely biodegradable and non-toxic. The similarities in metabolic pathways for the synthesis of both products served as an important factor for detailed research for simultaneous production in a bacterial system. The bioprocess development of these biomaterials involves statistical optimization in shaken-flasks cultures and scale-up production in fermenters. Agro-industrial by-products from sugar cane refining processes and oleochemical industries are used as the renewable carbon sources for production. The potential applications of PHA and RL encompass various fields including aquaculture, agriculture, medical and pharmaceutical sciences. The use of PHA as biodegradable micro-exfoliating agent in cosmetics and its fate in marine organism is being investigated as potential replacement of plastic-based beads and solution for microplastic contamination. The sustainability in PHA and RL production and applications emphasizes waste-to-wealth concept of eco-friendly materials and progress towards a circular economy.

Biography

Ts. Dr. Kesaven Bhubalan is an Associate Professor with the Marine Biology Program at the Faculty of Science and Marine Environment, Universiti Malaysia Terengganu (UMT). His research interest includes bioplastic, biosurfactant (rhamnopilid), bioprocess, gene expression and palm oil biodegradation. His work on bacteria-derived bioplastic known as polyhydroxyalkanoate (PHA) has gained much attention, especially for its renewable nature, biodegradability and biocompatibility. He has progressed in biotransformation of agro-industrial by-products to PHA using marine bacteria. He has produced more than 60 research outputs in reputable journals, books and proceedings.

Bin CHEN

State Key Laboratory of Multiphase Flow in Power Engineering, Xi'an Jiaotong University, Xi'an, Shaanxi, China.
Email id: chenbin@mail.xjtu.edu.cn

Hydrogen based sustainable energy system: to achieve carbon neutral

Fossil energy utilization, particularly carbon-based fuel burning, has caused great environmental pollution. Building a sustainable energy system is critical to achieve carbon neutral. As an ideal energy carrier, hydrogen has attracted the attention of government, industry and research institutions. Hydrogen production in large-scale and low-cost can solve the problems of sustainability and environmental emissions. It can be produced from water by using a variety of energy sources, such as solar, nuclear and fossils, and it can be converted into useful energy forms efficiently without detrimental environmental effects. Extensive investigations of hydrogen production were conducted in State Key Laboratory of Multiphase Flow in Power Engineering. Focuses are mainly put on high-efficient, low-cost, and large-scale operable system. A brief introduction of possible hydrogen production methods are presented including coal/bio-mass/organic wastes gasification in super-critical water and solar-driven photocatalytic water splitting. Coal gasification in supercritical water takes the advantages of the unique chemical and physical properties of supercritical water to convert organic matter in coal to H2 and CO2. As to the solar-driven water-splitting, the low efficiency is attributed to obstacles in energy flow and mass flow, as well as non-coupling and mismatching of energy flow and mass flow. Based on these technologies, hydrogen based sustainable energy system can be achieved in the foreseeable future.

Biography

Prof. Bin CHEN has completed his PhD from Xi'an Jiaotong University, China and postdoctoral studies from National Maritime Research Institute, Japan. He is the vice director of the State Key Laboratory of Multiphase Flow in Power Engineering. He has published more than 80 papers in reputed journals and has been serving as an editorial board member of repute.

Wai Yin Wong and Chun Yik Wong

[1]Fuel Cell Institute, Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor, Malaysia.
E-mail id: waiyin.wong@ukm.edu.my

Development of Alternative Proton Exchange Membrane Materials for Application in Low Temperature Fuel Cells

Hydrogen fuel cell is a promising future energy generation device beneficial for decarbonizing the energy sector. Proton exchange membrane fuel cell is among the most mature fuel cell technologies used for off-grid electricity generation, with their potential use for automotive and portable devices. At present, extensive efforts are ongoing to search for alternative catalyst and membrane materials aimed at solving the cost and technical challenges. This study investigated the feasible use of chitosan/sulfonated poly(vinyl alcohol) (PVA) as novel proton exchange membrane (PEM). The design criteria for PEM includes high proton conductivity, good water uptake, adequate mechanical, thermal and hydrolytic stability. Often, the hydrophilic nature in a polymer offers good water uptake which enables the grotthuss proton transport on the hydrated membrane. Nonetheless, excessive swelling could occur simultaneously which results in low mechanical and hydrolytic stability. Pristine PVA film exhibits high water uptake of 165.5 % with poor proton conductivity (0.189 mS/cm) and ion exchange capacity (0.1264 mequiv/g). Notably, blending with chitosan could improve the hydrolytic stability through limiting water swelling. This work presents a series of modification strategies, including chemical crosslinking via sulfonation, polymer blending, and addition of inorganic fillers, to improve the hydrolytic stability and proton conductivity of the CS/SPVA membrane. This work reported a successful reduction of water uptake from 215.9 % on non-optimized CS/SPVA membrane to 72.48 % with only slight trade-off in proton conductivity (7.34 to 6.75 mS/cm) achieved after the modification processes. In addition, the elastic modulus has increased from 67 MPa to 108 MPa.

Biography

Dr. Wong Wai Yin is currently a research fellow in the Fuel Cell Institute at Universiti Kebangsaan Malaysia. She received her Ph.D. degree in Fuel Cell Engineering in 2014 at the Universiti Kebangsaan Malaysia. Her research focus is on design, characterization and application of electrocatalyst and proton exchange membrane for polymer electrolyte membrane fuel cell and water electrolyser technologies. She has published more than 60 papers with current H-index of 16 on Scopus. She is also the writer for several technical codes related to installation of hydrogen fuel cells at telecommunication sites, under the Malaysian Technical Standard Forum Bhd.

Bernard Saw Lip Huat

Department mechanical and material engineering, Lee Kong Chian Faculty of Engineering, Universiti Tunku Abdul Rahman, Kajang, Selangor, Malaysia. E-mail id: sawlh@utar.edu.my

Aluminium-air battery technologies for green energy development

Electric vehicles are gaining attention globally due to their capabilities of replacing internal combustion engines that use fossil fuels as an energy source. In the electric vehicle, lithium-ion battery is a popular choice in the market due to its high-power density. Besides, it is green, clean and produces less pollution. However, the development of lithium-ion batteries has reached its peak and the performance is limited based on current technology. In addition, lithium-ion batteries are prone to thermal runaway due to their narrow operating temperature range. Furthermore, disposal of lithium-ion batteries is one of the important issues that remain unsolved as there is no consensus on proper disposal or recycling method. Hence, there is a need to introduce alternative energy sources to reduce the environmental impact. Metal-air battery is a promising candidate as it has a high theoretical energy density which is ideally to improve the travel distance of the electric vehicle. Metal-air batteries required air and a metal anode to generate electricity. The design is simple and produces less end-product as compared to lithium-ion batteries. In general, most of the end-product of metal-air batteries is its corresponding metal oxide which can be recycled or processed into secondary products. In this talk, the architecture of the aluminium-air battery, factors affecting the aluminium-air battery performance, challenges of the aluminium-air battery will be discussed. Lastly, the research studies conducted in our laboratory will be illustrated and the important findings from these studies will be highlighted.

Biography

Dr. Bernard Saw Lip Huat is currently an associate professor and chairperson for the Centre for Sustainable Mobility Technologies in the Universiti Tunku Abdul Rahman (UTAR), Malaysia. He received his Ph.D. degree from National University of Singapore (NUS) in 2015. Besides, he is a Chartered Engineer registered with the Engineering Council (UK). His research interests include renewable energy, thermal management, energy storage system, computational fluid dynamic, electrochemical modelling and ventilation. He has co-authored more than 90 peer-reviewed papers in prestigious international journals and won 26 awards in the local and international competitions. He is serving as editorial member and guest editor of several international journals such as Sustainability, Frontiers in Energy Research, Journal of Renewable Materials, Energy Engineering, Fluid dynamic and material processing, etc.

Youn Jeong Jang

Department of Chemical Engineering, Hanyang University, Seoul, Korea, Republic of Korea.
E-mail id: yjang53@hanyang.ac.kr

Strategies to enhance N_2 reduction to NH_3 using non-noble metal catalysts in photoelectrochemical system

A sustainable solution to the global energy crisis and climate change is to replace fossil fuels with renewable carbon-free or carbon-neutral fuels prepared by an environmentally friendly process. Electrochemical or photoelectrochemical N_2 conversion to NH_3 is one of the most interesting processes, as NH_3 can be used as a carbon-free fuels as well as key commodities for various chemicals produced and utilized in industry.

The major current limitation of electrochemical or photoelectrochemical N_2 reduction in aqueous electrolyte is low Faradaic efficiency (FE) for NH_3 production, because the reaction is kinetically unfavored compared to competitive reaction, H_2 production from water. Thus, to date, noble catalysts such as Au and Pd, intrinsically inactive for H_2 production, have been developed significantly. In this talk, we will present multiple effective strategies to enhance N_2 reduction to NH_3 with suppressing the competitive reaction using non-noble metal catalysts in electrochemical and photoelectrochemical system. In addition, we will discuss how each strategies affects catalytic performance for NH_3 production in detail in terms of current density, faradaic efficiency, production rate and so on.

Biography

Dr. Youn Jeong Jang completed his PhD from Pohang University of Science and Technology (POSTECH), Korea, Republic of, and postdoctoral studies from University of Wisconsin-Madison, USA. She is a professor in chemical engineering at Hanyang University, Seoul in Korea, Republic of. Her research interest is to develop catalysts for electrochemical and photoelectrochemical applications.

M. Ismail

Energy Storage Research Group, Faculty of Ocean Engineering Technology and Informatics, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia.

Modification of metal hydrides and complex hydrides properties in a reactive hydride composite (RHC) for solid-state hydrogen storage material

Hydrogen storage using the metal hydrides and complex hydrides is the most convenient method because it is safe, enables high hydrogen capacity and requires optimum operating condition. Metal hydrides and complex hydrides offer high gravimetric capacity that allows storage of large amounts of hydrogen. However, the high operating temperature and low reversibility hindered the practical implementation of the metal hydrides and complex hydrides. An approach of combining two or more hydrides, which is called reactive hydride composite (RHC), was introduced to improve the performance of the metal hydrides and complex hydrides. The RHC system approach has significantly enhanced the hydrogen storage performance of the metal hydrides and complex hydrides by modifying the thermodynamics of the composite system through the metathesis reaction that occurred between the hydrides, hence enhancing the kinetic and reversibility performance of the composite system. Thermodynamic destabilization is achieved when mixing two or more metal hydride/complex hydride that form a new compound during dehydrogenation process. In this talk, the overview of the RHC system was presented in detail. The challenges and perspectives of the RHC system are also discussed.

Biography

Mohammad Ismail was awarded a PhD in Advanced Materials from University of Wollongong, Australia. Currently he is an Associate Professor in Universiti Malaysia Terengganu, Malaysia. Mohammad's research interest in the field of energy materials, particularly in the modification of solid–state hydrogen storage materials such as metal hydride and complex hydride for hydrogen–energy applications. He has published more than 80 articles in indexed journals and received an H-index of 34 and 2281 citations from SCOPUS. In November 2020, Mohammad is listed among the Top 2% Scientist in the World in the Field of Energy studied by Stanford University.

Zuhair Jamain[1], Muhammad Aizat Mustamin[1] and Melati Khairuddean[2]

[1]Faculty of Science and Natural Resources, Universiti Malaysia Sabah (UMS), 88400 Kota Kinabalu, Sabah, Malaysia.

[2]School of Chemical Sciences, Universiti Sains Malaysia (USM), 11800 Penang, Malaysia.

Schiff base compounds as a material for solar energy applications

A series of symmetrical Schiff base compounds, namely N,N'-Bis-(4-alkloxybenzyli-dene)-benzene-1,4-diamine, **S1-S4**, were synthesized and investigated for their liquid crystal and electrical properties. These homologues with two Schiff base linking units are attached with different terminal alkoxy chains nonyl, decane, dodecane, and tetradecane. The structure elucidation and characterization were done using FT-IR, NMR spectroscopy, and CHN elemental analysis. Generally, all the compounds showed the presence of azomethine signal at 1620 cm^{-1} and 8.24 ppm in FTIR and ^1H NMR spectra, respectively. Meanwhile, observation under a polarized optical microscope (POM) showed that compounds **S1-S4** were mesogenic with Smectic A and nematic phases. The presence of two endotherms in the DSC thermogram confirms the transition of the liquid crystal phase, and a wider thermal mesomorphic range was observed as the chain length increased. In addition, compounds **S1-S4** showed band energy gaps of 1.05 and 2.80 eV. This behaviour indicated that the compound exhibits the Ohmic property and effective for electric resistances. As a result, compounds **S1-S4** can be used in the application of solar energy

Biography

Dr. Zuhair Jamain has completed his PhD from Universiti Sains Malaysia, Penang, Malaysia and currently work as senior lecturer in Universiti Malaysia Sabah, Malaysia. He has published more than 15 papers in reputed journals and has been serving as a reviewer for several journals. Dr. Zuhair's research interests focus on synthesis and modification of the organic compounds for various applications such as liquid crystal, fire retardant and dielectric materials. Moreover, he has involved in various research projects as a principal investigator and as a collaborator.

Soshu Kirihara

Joining and Welding Research Institute, Osaka University, Ibaraki City, Osaka, Japan.

E-mail id: kirihara@jwri.osaka-u.ac.jp

Stereolithographic Additive Manufacturing for Sustainable Developments

In stereolithographic additive manufacturing (STL-AM), 2-D cross sections were created through photo polymerization by UV laser drawing on spread resin paste including nanoparticles, and 3-D models were sterically printed by layer lamination. The lithography system has been developed to obtain bulky ceramic components with functional geometries. An automatic collimeter was newly equipped with the laser scanner to adjust beam diameter. Fine or coarse beams could realize high resolution or wide area drawings, respectively. As the row material of the 3-D printing, nanometer sized metal and ceramic particles were dispersed into acrylic liquid resins at about 60 % in volume fraction. These materials were mixed and deformed to obtained thixotropic slurry. The resin paste was spread on a glass substrate at 50 μm in layer thickness by a mechanically moved knife edge. An ultraviolet laser beam of 355 nm in wavelength was adjusted at 50 μm in variable diameter and scanned on the spread resin surface. Irradiation power was changed automatically for enough solidification depth for layer bonding. The composite precursors including nanoparticles were dewaxed and sintered in the air atmosphere. In recent investigations, ultraviolet laser lithographic additive manufacturing (UVL-AM) was newly developed as a direct forming process of fine metal or ceramic components. As an additive manufacturing technique, 2-D cross sections were created through dewaxing and sintering by UV laser drawing, and 3-D components were sterically printed by layer laminations with interlayer joining. Though the computer aided smart manufacturing, design and evaluation (Smart MADE), practical materials components were fabricated to modulate energy and material transfers in potential fields between human societies and natural environments as active contributions to Sustainable Development to Goals (SDGs).

Biography

Soshu Kirihara is a doctor of engineering and a professor of Joining and Welding Research Institute (JWRI), Osaka University, Japan. In his main investigation “Materials Tectonics” for environmental improvements of “Geotechnology”, multi-dimensional structures were successfully fabricated to modulate energy and materials flows effectively. Ceramic and metal components were fabricated directly by smart additive manufacturing, design and evaluation (Smart MADE) using high power ultraviolet laser lithography. Original stereolithography systems were developed, and new start-up company “SK-Fine” was established through academic-industrial collaboration.

Andrea Colantoni[1], Leonardo Bianchini[1], Riccardo Alemanno[1], Valerio Di Stefano[1]

Department of Agricultural and Forest Science, University of Tuscia, Viterbo, Italy.

Innovative technologies for the production of renewable energy: Agro-photovoltaics

European and international policies, such as the Green New Deal and the 2030 Agenda, have pushed member countries to increase the production of renewable and clean energy in their territories. Agrivoltaic systems are a strategic and innovative approach to combine solar photovoltaic (PV) with agricultural production and for the recovery of marginal areas. The Italian National Recovery and Resilience Plan (PNRR) has allocated over 5 billion euros to this technology, encouraging public and private entities to make this type of technological investment. Agro-photovoltaics will guarantee a series of advantages starting from the optimization of the harvest and livestock production, up to the production of clean energy, with a consequent increase in profitability and employment. The research carried out will aim to provide agricultural entrepreneurs with more information about the crops to choose, the economic advantages deriving from agro-photovoltaics, the safety and health of operators and the main mechanization solutions of the trackers. It is indeed necessary understanding the factors that act on the choice of crop and/or farming system according to the plant design of the photovoltaic system, as today the investment of an agro-photovoltaics system is very expensive if three main variables are not considered: i) type of panel to be inserted (height from the ground, characteristics, tracker, etc.); ii) type of crop to be used including sustainable mechanization and suitable for design and maintenance and phytosanitary treatments; iii) authorizations and environmental regulations to be respected in order to proceed correctly with the installation of the panels.

Biography

Prof. Andrea Colantoni is an associate professor at the Department of Agriculture of the University of Tuscia in Viterbo. He is a member of the Board of Professors of the PhD course in Engineering for energy and environment. He earned a research doctorate in Agricultural Mechanics XIX cycle with a thesis "Study and development of innovative technologies applicable to small and medium-sized enterprises, for the use of renewable energy resources".

SciWide
WEBINARS

SPEAKER FORUM

DAY 1

2nd EDITION OF

RENEWABLE AND SUSTAINABLE ENERGY VIRTUAL

FEBRUARY

04-05, 2022

GMT 07:00 – 15:00

V-Renewable2022

Tien Anh Tran

[1]Department of Marine Engineering, Vietnam Maritime University, Hai Phong City, Vietnam.

Potential Development of the Alternative Renewable Energies for the Diesel Engines in Maritime Transportation: A Critical Review

The importance of photonic technologies is steadily growing in our daily lives. In this field a new frontier of research is the development of non-classical light sources, like, for example, sources that produce streams of photons with controllable quantum correlations. With this respect a central building blocks are single-photon emitters (SPEs). Unlike classical light sources, SPEs are fundamental quantum devices for many scalable and leading technologies, such as quantum information, precision metrology and imaging. The ability to tailor and control quantum emitters, to realize efficient and scalable architectures, depends on site-selective defect engineering. In this work we predicted the electronic properties of an InSe monolayer and its applicability as SPE when impurity defects are introduced in the structure. In this work, we analyze the energetic and electronic properties of InSe monolayer with point defects, to assess its applicability as SPEs. The presence of deep defect states within the InSe bandgap is verified when considering substitutional defects with atoms belonging to group IV and V. In particular, the substitution of an Se atom with Ge appears particularly promising when studied within the GW approximation and by solving the Bethe-Salpeter equation. Direct transitions between the valence band maximum and the defect state are responsible for the absorption and spontaneous emission processes, so that the latter results in a strongly peaked spectrum in the near infrared. These properties, together with a high localization of the involved electronic states appear encouraging in the quest for novel SPE materials.

Biography

Dr Risplendi earned her master’s degree in Physics Engineering (2010) and her doctoral degree in Electronic Devices from Politecnico of Torino (2014); She carried out postdoctoral research at Massachusetts Institute of Technology (2014-2015) and at Politecnico of Torino (2016-2017). She is currently employed as a researcher at Department of Applied Science and Technology of the Politecnico of Torino. Her research activities have been mainly devoted to the theoretical investigation of nanostructured materials, surfaces, and interfaces. Her research interests span from the simulation of chemical reactivity in photo- and electrocatalysis to the study of excited states in nanostructures for optoelectronic devices.

SciWide
WEBINARS

PLENARY FORUM

DAY 2

2nd EDITION OF

RENEWABLE AND SUSTAINABLE ENERGY VIRTUAL

FEBRUARY

04-05, 2022

GMT 07:00 – 15:00

V-Renewable2022

Eugene Wong
Department of Supply Chain and Information Management, School of Decision Sciences,
The Hang Seng University of Hong Kong.

Development of renewable energy for decarbonising and modelling sustainable transport

The need for sustainable low-carbon transport and logistics has become one of the top priorities in most countries since emission targets were set at the Conference of Parties to the United Nation Framework Convention on Climate Change (COP21). Many have also set policy goals to ban new petrol and diesel cars by 2030 or 2040. Carbon mitigation in the transport and logistics sector was emphasised in the recent World Economic Forums, as this sector is the second-largest carbon emitter in the world. This presentation shares a current project aims to develop a vehicle product carbon footprint model for selected types of vehicles used in transport and logistics, design a solid-state storage hydrogen-powered fuel cell prototype and analyse the economic and environmental effects on Hong Kong and cities in the Greater Bay Area (GBA). The novel vehicle product carbon footprint method, the development of solid-state hydrogen fuel cell as a renewable energy source for vehicles and the economic and environmental impact of advanced vehicles on Hong Kong and cities of the GBA will provide valuable academic insights and findings.

Biography

Ir Dr Eugene Y. C. Wong is an Associate Professor in the Department of Supply Chain and Information Management, Associate Programme Director of MSc in Global Supply Chain Management, Director of Policy Research Institute of Global Supply Chain, and Director in Virtual Reality Centre in the Hang Seng University of Hong Kong. Dr Wong has over thirteen years of managerial and consulting experience in logistics transportation, manufacturing and engineering industry before joining the academia. He received research and education funding projects on sustainability and decarbonisation, maritime operations, shipping law, and virtual reality in the recent years. He serves as council members of professional associations on logistics, transportation and engineering as well as editorial board of international journals. He has research publications covering areas in maritime and air transport logistics, supply chain decarbonisation, virtual reality, quality management and artificial intelligence.

Brian Cantor

Department of Materials, University of Oxford; and Brunel Centre for Advanced Solidification Technology, Brunel University.

Multicomponent High-Entropy Cantor alloys for Recycling and Reuse

All human advances have depended on making new materials, and all materials are alloys, i.e. mixtures of several different starting materials or components. So the history of the human race has been the continued invention of new materials by discovering new alloys. Recently a new way of doing this, manufacturing multicomponent high-entropy alloys, has shown that the total number of possible materials is enormous, even more than the number of atoms in the galaxy, so we have lots of wonderful new materials yet to find. And multicomponent phase space contains a surprisingly large number of extended solid solutions. The first group of these which was discovered are called Cantor alloys, an enormous composition range with a single-phase fcc structure, based loosely on the original equiatomic five-component Cantor alloy CrMnFeCoNi. This talk will discuss the previous history of alloying, the discovery of multicomponent alloys, the structure of multicomponent phase space, the fundamental thermodynamics of multicomponent solid solutions such as the Cantor alloys, the complexity of local atomic and nanoscale configurations in such materials, the effect of this on properties such as atomic diffusion, dislocation slip, and the resulting outstanding mechanical properties and potential applications, in particular as resilient materials for recycling and reuse in the circular economy.

Biography

Brian Cantor is an Emeritus Professor in the Department of Materials at the University of Oxford and a Research Professor in the Brunel Centre for Advanced Solidification Technology at Brunel University. He was previously Vice-Chancellor of the University of York and of Bradford University, Head of Mathematical and Physical Sciences at the University of Oxford, a research scientist and engineer at General Electric Research Labs in the USA, and worked briefly at Banaras Hindu University, Washington State, Northeastern, IISc Bangalore and the Kobe Institute. He founded and built up the World Technology Universities Network, the UK National Science Learning Centre, the Hull-York Medical School, and Oxford's Begbroke Science Park. He was a long-standing consultant for Alcan, NASA and Rolls-Royce, and editor of Progress in Materials Science. He invented the new field of multicomponent high-entropy alloys and discovered the so-called Cantor alloys.

SciWide
WEBINARS

KEYNOTE FORUM

DAY 2

2nd EDITION OF

RENEWABLE AND SUSTAINABLE ENERGY VIRTUAL

FEBRUARY

04-05, 2022

GMT 07:00 – 15:00

V-Renewable2022

Jasmine Siu Lee LAM
Maritime Energy and Sustainable Development Centre of Excellence, School of Civil and Environmental Engineering, Nanyang Technological University, Singapore 639798, Singapore.

Alternative fuel pathways in maritime decarbonization

Maritime decarbonization is a significant and strategic topic of interest in view of the ambitious Greenhouse Gas (GHG) emission reduction targets set by the International Maritime Organization (IMO). According to the IMO Strategy on the reduction of GHG emissions from ships, the shipping in-industry in 2050 aims to cut GHG emissions at least by 50%, comparing with their level in 2008. In addition to technical and operation measures such as lowering ship's cruising speed and ship trim optimization, adopting cleaner and greener alternative energy sources is a promising solution. The presentation provides an analysis of various alternative energy sources, including liquified natural gas, biofuel, methanol, and hydrogen. Their key characteristics and technology readiness level will be explained. Among the alternative energy sources, biofuel shows good potential as a drop-in fuel using existing shipboard technologies and bunkering infrastructure and a new fuel replacing conventional fossil-based fuels. Hence, different options of biofuels would serve well as short-term, medium-term and long-term measures for maritime decarbonization. Examples from Singapore will be illustrated.

Biography

Professor Dr Jasmine Lam is Centre Director, Maritime Energy and Sustainable Development Centre of Excellence at Nanyang Technological University, Singapore. Leading a research team and working closely with the industry and government agencies, Prof Lam has completed over 50 R&D projects. A key focus is on maritime decarbonisation and sustainability. She is an active scholar having more than 280 publications, including over 130 in leading international journals. She also serves as the editor/board member of 10 international journals, holds several prestigious international appointments, and is the recipient of many awards, including 8 times Best Paper Awards.

Mozaffar Abdollahifar

Institute for Particle Technology, Technische Universität Braunschweig, Volkmaroder Str. 5, 38104 Braunschweig, Germany.

Battery LabFactory Braunschweig (BLB), Technische Universität Braunschweig, Langer Kamp 19, 38103 Braunschweig, Germany.

Enabling Long-Cycling Life of Si-on-Graphite Composite Anodes of LIBs

The energy density of lithium-ion batteries (LIBs) can be meaningfully increased by utilizing Silicon-on-graphite composites (Si@Gr) as anode materials, because of several advantages including higher specific capacity and low cost. However, long cycling stability is a key challenge for commercialization of these composites. To solve this issue, we have fabricated Si@Gr composites by fluidized bed granulation (FBG) for the first time. The FBG process is shown to produce composite powders comprising a uniform layer of nano-sized Si particles lodged onto the surface of micron-sized graphite particles to possess a core-shell microstructure. Adopting a suitable binder during the FBG process enables a firm adhesion of the Si nanoparticles on graphite surface during subsequent carbon-coating, where the composite particles are coated with pitch and then carbonized to form a highly electronically conductive and mechanical stabilizing layer of amorphous carbon. Additionally, we have developed a multifunctional polymeric artificial solid-electrolyte-interphase (A-SEI) protective layer on Si@Gr anode particles to prolong the cycling stability in LIBs. The coating promoting a good ionic conduction together with a sufficient mechanical strength of the A-SEI. The anode composites exhibit a high capacity reaching over 600 mAh g^{-1}, and even without electrolyte optimization the polymer coated Si@Gr illustrates the superior long cycle life performance of up to 1000 cycles (over 67% capacity retention). The excellent long-term cycling stability of the anodes was attributed to the polymer coating acting as A-SEI. The simple polymer coating process is highly interesting in guiding the preparation of long-cycle-life electrode materials of high-energy LIB cells.

Biography

Mozaffar Abdollahifar has completed his PhD from National Taiwan University, and two years' postdoctoral studies from the same university. Now, he is working at Technische Universität Braunschweig as a research scientist in the field of battery processing and production, he has more than 13 years' experience with materials for various applications such as catalysts, supercapacitors and batteries. He has published more than 40 papers in reputed journals and also more than 50 presentations in international conferences.