National Battery Research Institute

Queen Mary University of London

ICB-REV 2022

"Accelerating global energy transition agenda through revolutionary battery technology, renewable energy, and electric vehicles"

Program Book

www.n-bri.org

21 - 23 June 2022

WELCOME FROM CHAIRS

Dears All Participants,

Welcome to the International Conference on Battery for Renewable Energy and Electric Vehicles (ICB-REV) 2022. This conference becomes one of the most important scientific events to discuss the current issue of the battery technology for renewable energy and electric vehicles for attaining clean energy transition target. The ICB-REV 2022 will bring together the experts from all over the world, the researchers from university and institution, practitioners from industry, and other stakeholders that related to battery, renewable energy and electric vehicles.

The ICB-REV 2022 is organized by the National Battery Research Institute (NBRI) in collaboration with the Queen Mary University of London (QMUL). This event is sponsored by Material Research Society Indonesia (MRS-INA) and PT Tiki Jalur Nugraha Ekakurir and supported by International Union of Material Research Societies (IUMRS), National Research and Innovation Agency (BRIN), Indonesia Neutron Scattering Society (INSS), and also PT. Infiniti Energi Indonesia.

The main interest of ICB-REV 2022 is focused on advanced battery technology from raw materials to cell fabrication, energy storage for renewable energy, and electric vehicles battery and charging station. This conference will invite 30 distinguished experts including global industry players and international battery association. It is expected that ICB-REV 2022 can deliver the output and outcome that will be beneficial for all parties. Therefore, the world target on clean energy transition will be successfully achieved.

Due to the present situation of COVID-19, the format of presentation will be conducted online. We sincerely hope that you will enjoy the ICB-REV 2022 and have a pleasant experience.

Prof. Dr. rer. nat. Evvy Kartini
Chair and Founder of National Battery Research Institute (NBRI)

Prof. Alan J Drew
Vice Chair and Co-Founder of National Battery Research Institute (NBRI)

BACKGROUND

The latest report from the International Governmental Panel on Climate Change (IPCC) captures the full scale of the threat to human life in a heating world. The surge of carbon emissions in the last decade lead mother earth to the climate crisis. Various initiatives have taken to curb the climate catastrophe. From global treaty policy (Paris Agreement 2015 to Glasgow Climate Pact 2021) to technology intervention (renewable energy to battery electric vehicles innovation). Even, Indonesia G20 presidency makes the energy transition as one of priority agenda. Because energy transition follows the Paris Agreement, which targets net-zero emissions by 2060.

Based on the current situation, the National Battery Research Institute (NBRI) will conduct the International Conference on Battery for Renewable Energy and Electric Vehicles (ICB-REV) 2022 in collaboration with Queen Mary University of London (QMUL) United Kingdom, International Union of Material Research Societies (IUMRS) and Material Research Society Indonesia (MRS-INA). This conference will bring together scientists, academicians, industry partners, the government and all stakeholders that focus on battery technology for both Electric Vehicles and Renewable Energy. The ICB-REV 2022 will be the insightful space for all related stakeholders to disseminate their innovations, exchange their ideas & perspectives and also open international networking for bolstering the global energy transition agenda.

Since its establishment on December 07th 2020, the NBRI has performed various events covering the battery technology, renewable energy, and electric vehicles topics. NBRI has successfully conducted the ICB-REV 2021 and International Conference on Advanced Material and Technology (ICAMT) 2021 with 154 distinguished speakers across 16 countries. There were more than 150 selected articles published in AIP Proceedings, IONICS journal, and Progress on Natural Science and Material International (PNSMI) journal. In addition, NBRI has also organized International Battery School (IBS) 2021, Climate Challenge Workshop 2021, International School of Battery in Electric Vehicles (ISBEV) 2021, International Workshop on Material and Advanced Characterization (IMAC) 2021 and International Workshop on Solar Rooftop Residential and Utilities Scale (ISRUS) 2021.

The main concern of ICB-REV 2022 is focused on advanced battery technology from raw materials to cell fabrication, energy storage for renewable energy, and electric vehicles battery and charging station that support energy transition. This should be accomplished by the presence of invited world-class speakers, international participants, global industry players and international battery associations. The selected articles will be published in AIP international proceedings and other reputable journal Scopus indexed.

Following ICB-REV 2022, the consecutive events will be organized as complementary to broaden audiences such as

- International Battery School (IBS) on May 24th-25th, 2022
- NBRI Youth Ideas Competition (NBRI-YIC) on June 21th, 2022

- International Workshop on Solar Rooftop Residential and Utilities Scale (ISRUS) on July 13th-14th, 2022.

TIME AND VENUE

Time: June 21 -23, 2022
Venue: Conducting Online (Indonesia)

THEME

The theme for the International Conference on Battery for Renewable Energy and Electric Vehicles (ICB-REV) 2022 is ***accelerating global energy transition agenda through revolutionary battery technology, renewable energy and electric vehicles***.

SCOPES

1. Advanced battery technology from upstream (raw materials), midstream (cell fabrication), and downstream (applications and recycling).
2. Energy storage technology for renewable energies (solar, wind, biomass, geothermal, etc)
3. Electric vehicles ecosystem (battery, electric motor, charging station, etc)
4. Other related topics (policy, regulation, standardization, industry, etc)

COMMITTEES

Steering Committees

Prof. Dr. rer. nat. Evvy Kartini	*Founder of National Battery Research Institute and President of MRS-INA, Indonesia*
Prof. Alan J Drew	*Co-Founder of National battery Research Institute and Director of the Materials Research Institute of QMUL, United Kingdom*
Prof. Rodrigo Martins	*President of International Union of Material Research Societies (IUMRS), Portugal*
Prof. Ir. Muhammad Nizam, Ph.D.	*Former Coordinator of National Research Priority Mandatory on Energy Storage*

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Treasury	Adit Tri Wiguno, SE. & Noeraida, A.Md.
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Coordinator of IBS 2022	Mohammad Ridho Nugraha, ST.
Coordinator of NBRI YIC 2022	Adinandra Caesar Fachrudin, S.Si
Coordinator of ISRUS 2022	Dhiko Rosanda, ST.
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Creative and Social Media	Shafira Ramadhani
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	Sigit Aryo Kristianto
	Baihaqi Muhammad S.Si.

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TENTATIVE AGENDA OF ICB-REV 2022

Sessions	Time	(Day-1) Tuesday, June 21	Time	(Day-2) Wednesday, June 22	Time	(Day-3) Thursday, June 23
Morning Session (UTC+7)	08.00-08.10	Opening by Master of Ceremony	08.20-08.30	Opening by Master of Ceremony	08.20-08.30	Opening by Master of Ceremony
	08.10-08.20	**Prof. Dr. rer. nat. Evvy Kartini** (*Founder of NBRI and President of MRS-INA*)	08.30-09.10	**Toto Nugroho Pranatyasto** *(President Director of Indonesia Battery Corporation, Indonesia)*	08.30-09.10	**Prof. Roberto M. Torresi** *(Professor of University of São Paulo)*
	08.20-08.30	**Dr. Laksana Tri Handoko** (*Chairman of National Research and Innovation Agency (BRIN), Indonesia*)	09.10-09.50	**Dr. Agus Gumiwang Kartasasmita*** *(Minister of Industry Republic of Indonesia, Indonesia)*	09.10-09.50	**Danny Kennedy** *(Chief Energy Officer at New Energy Nexus, USA)*
	08.30-09.10	**Dr. M. V. Reddy** *(Senior Researcher of Institute of Research Hydro-Québec, Canada)*	09.50-10.30	**Prof. Satish Patil** *(Professor of Solid State and Structural Chemistry, Indian Institute of Science, India)*	09.50-10.30	**Prof. Dr. rer. nat. Evvy Kartini** (*Founder of National Battery Research Institute and President of MRS-INA*)
	09.10-10.00	**Prof. Neeraj Sharma** (*Director of Australian Battery Society, Australia*)	10.30-10.35	Room Transition	10.30-10.35	Room Transition
	10.00-10.30	Keynote Session **Prof. Arief Budiman** *(Director of Oregon Renewable Energy Center), United States of America*	10.35-11.05	Parallel Session **Muhammad Fakhrudin, ST** *(Assistant Manager of RDI, NBRI)* **Drs. Nanan Soekarna** *(Chairman of Indonesian Nickel Miners Association (APNI), Indonesia)*	10.35-11.05	Parallel Sessions **Prof. Giichiro Uchida** *(Professor at Faculty of Science and Technology, Meijo University, Japan)* **M. Firmansyah, S.E.** (*CEO of PT Infiniti Energi Indonesia*)
	10.30-12.00	YIC Final Presentation	11.05-12.00	Oral Session	11.05-12.00	Oral Session
	12.00-13.00	Break Session				
Afternoon Session (UTC+7)	13.00-13.15	Opening Remark **Prof. Colin Grant** *(Vice Principal of Queen Mary University of London (QMUL), United Kingdom)*	13.00-13.45	**Prof. Rodrigo Martins** (*President of International Union of Material Research Societies (IUMRS) and European Academy of Science (EurASc)*), *Portugal*	13.00-13.45	**Prof. Jacqui Murray** *(Deputy Director of Faraday Battery Challenge Innovate UK, United Kingdom)*
	13.15-14.00	**Rene Schroeder** (*Executive Director of European Automotive and Industrial Battery Manufacturers (EUROBAT), Belgium*)				
	14.00-14.45	**Prof. Alan J. Drew** *(Professor & Director of the Materials Research Institute, QMUL United Kingdom)*	13.45-14.30	**Prof. Ayi Bahtiar** *(Head of Advanced Materials Laboratory at University of Padjadjaran, Indonesia)*	13.45-14.30	**Dr. Kim Jong Yeon** *(CEO of TAOS Company, South Korea)*
	14.45-15.20	Keynote Session **Prof. Worawat Meevasana** *(Assistant Professor of Suranaree Institute of Technology,Thailand)*	14.30-15.00	Keynote Session **Dr. Haznan Abimanyu** *(Chairman of Research Organization for Energy and Manufacture, BRIN)*	14.30-15.00	Keynote Session **Dr. Eng. Budi Prawara** *(Chairman of Research Organization for Electronics and Informatics, BRIN)*
	15.20-17.15	Oral Session	15.00-16.30	Oral Session	15.00-16.00	Oral Session
					16.00-17.00	**Closing Remarks & Announcement**

National Battery Research Institute

Queen Mary University of London

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Day 1

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Program Book

Day-1 (Tuesday, 21 June 2022)

Session	Time	Code	Estimation	Speaker	Topic	Affiliation
Morning Session (UTC+7)	08.00-08.10	**Opening by Master of Ceremony**				
	08.10-08.20	OP	10’	Prof. Dr. rer. nat. Evvy Kartini		Founder of NBRI, President of MRS-INA and INSS, Indonesia
	08.20-08.30	OP	10’	Dr. Laksana Tri Handoko		Chairman of National Research and Innovation Agency (BRIN), Indonesia
	08.30-09.10	PL	40’	Dr. M.V. Reddy	Recent Advances in Materials for Energy Storage and Sustainability	Senior Researcher of Institute of Research Hydro-Québec, Canada
	09.10-10.00	PL	50’	Prof. Neeraj Sharma	A brief snapshot of Australia’s battery-based research and industry	Director of Australian Battery Society, Australia
	10.00-12.15	**Keynote Session**				
		Youth Ideas Competition Final Presentation				
		KN	30’	Prof. Arief S Budiman	Renewable Energy Prospect for Accelerating Energy Transition	Director of Oregon Renewable Energy Center), United States of America
		SC	10’	Fadhillah Raka Pratama, Alfi Gymnastiar Pratama, and Beta Maisaroh	Self-Sufficiency Of Seawater Battery Electricity Empowerment Using NiHCF + C Cathode with Wind Turbine As A Power Plant That Is Free Of Air Exposure In The 3T Area for Residential Scale	Diponegoro University, Indonesia
		SC	10’	Anggi Supriyono, Evira Bella Yustiani, Nurfauziah Sucipto	Green-charge Station : Electric Vehicle Charging Station using TiO2 for Perovskite Solar Cell and Al-ion Batteries from Bioleaching Red Mud	Bandung Institute of Technology, Indonesia
		SC	10’	Jofrian Adriel, M. Fahrizal Himawan, M. Syaifuddin Imansyah	Potential Optimization of Nickel Based Components For EV Batteries With Nanotechnology in Indonesia	University of Airlangga, Indonesia
		SC	10’	Muhammad Nuril Islam, Izzuddin Ar Rofi	Application of LiFePO4 Battery Using Cell to Pack Method on DSSC Made from Lichenes Extract in Accelerating Energy Transformation	Sepuluh Nopember Institute of Technology, Indonesia
		SC	10’	Atanasius Tora Rangga K., Muhammad Arifin Ilham	Utilization of Renewable Energy Environment with Smart Grids, Smart Meters and Wireless Power Transmission Based on Artificial Intelligence to Solve the Problem of Poverty in Remote Coastal Areas	Gadjah Mada University, Indonesia
		SC	10’	Rahmad Hendrawan	The Impact of Digitalization on ASEAN's Renewable Energy Transition: A Taxonomy of Innovative Business Models	Gadjah Mada University, Indonesia
		SC	10’	Baihaqi Muhammad, Nur Annisa Kusumawardani	Synthesis Polymer Blend PEO/PVA/NaClO4 with Nano-SiO2 from Sugarcane Bagasse Burning Ash PT. PG Candi Baru Sidoarjo as Battery Filler	Sepuluh Nopember Institute of Technology, Indonesia
		SC	10’	Salma Aridha Muflihah, Albani Zhillan Abdullah, Siti Zahrotul Jannah	Analysis of Potential and Capacity of Lithium-ion Batteries Using Density-Functional Theory for Electric Vehicle Applications	Bandung Institute of Technology, Indonesia
		SC	10’	Felix Cahyadi, Leonardo Valentino Kosasih	Optimization of EV Battery Switching Stations with Inventory System Using Agent-Based	Bandung Institute of Technology, Indonesia

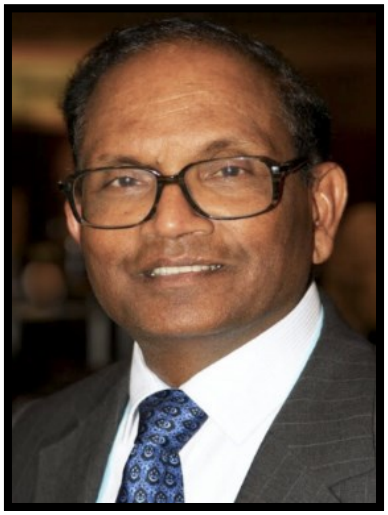
					Simulation	
	12.15-13.00	**Break Session**				
	13.00-13.15	OP	15’	Prof. Colin Grant		Vice Principal of Queen Mary University of London (QMUL), United Kingdom
	13.15-14.00	PL	45’	Rene Schroeder	Battery policy framework in Europe and the latest developments	Executive Director of European Automotive and Industrial Battery Manufacturers (EUROBAT), Belgium
	14.00-14.45	PL	45’	Prof. Alan J Drew	Dual ion battery for Accelerating Energy Transition	Co-founder of NBRI and Director of the Materials Research Institute, Queen Mary University of London (QMUL), United Kingdom
	14.45-17.15	**Keynote Session**				
		Battery				
		KN	35’	Prof. Worawat Meevasana	A journey to decentralize renewable energy in Thailand	Assistant Professor of Suranaree Institute of Technology, Thailand
		INV	25’	Putu Suwarta, Bagus Alifah Hasyim, Daffa Satriyo, Habib Saifuddin Fathoni, Achmad Subhan, Ika Dewi Wijayanti, Suwarno, Sutikno, Fahmi Mubarok and Yatim Lailun Nimah	Understanding The Role of Glass Fabric Separators on the Performance of Structural Composite Battery	Institute Technology of Sepuluh Nopember, Indonesia
		INV	25’	Abyan Panjaitan, Ramses Siregar, Bambang Priyono and Achmad Subhan	Effect of Addition Level of Activated Carbon from Plastic Waste Recycling on LTO/Carbon Anode Composites for Lithium-Ion Batteries	University of Indonesia, Indonesia
		OR	15’	Moh. Wahyu Syafi'ul Mubarok, Muhammad Fakhrudin, and Evvy Kartini	The Effect of Lithium Excess on NMC 811 Synthesis for Cathode Material	National Battery Research Institute, Indonesia
		OR	15’	Muhammad Dzulqornain, Bambang Priyono, Muhammad Rauf, Anne Zulfia Syahrial, Achmad Subhan and Alfian Noviyanto	The Effect Of Percentage Variations Of Ammonium Polycarbonate In The Synthesis Of Sodium Lithium Titanate Oxide (Na2Li2Ti5,9Zr0,1O14) On Its Performance Test Results As An Active Anode In Lithium-Ion Batteries	University of Indonesia, Indonesia
		OR	15’	Sahrul Hidayat, Sarifah Mudaim and Risdi Risdiana	Study of Chemical Structure and Electrical Properties of Nitrogen-Doped Activated Carbon from Candlenut Shell (Aleurites moluccana)	University of Padjajaran, Indonesia
		OR	15’	Indra Gunawan, Deswita and Bambang Sugeng	The Influence of Polylactide Addition to the Performance of LiFePO4/C Composite as Cathode Materials	National Research and Innovation Agency, Indonesia

OP= Opening Remarks, PL= Plenary Session, KN= Keynote Session, INV= Invited Speaker, OR= Oral Contributor, SC= Student Competition

OPENING REMARKS

Prof. Dr. rer. nat. Evvy Kartini

Evvy Kartini is an expert on the neutron scattering and respected internationally. Her international reputation in the field of neutron scattering and solid state ionics, has been well established. She began her research on Superionic glasses early 1990, at Hahn Meitner Institute, Berlin, Germany and supervised by scientists Prof. Dr. Ferenc Mezei. In 1994-1995, during her PhD work, she joint McMaster University, under supervision of Prof. Dr. Malcolm F. Collins. The existence of Boson peaks in $ZnCl_2$ and CKN, glasses were an interesting phenomena, therefore she conducted experiment inelastic neutron scattering at Nuclear Research Reactor, Chalk River Laboratory, Canada. In 1995-1996, she returned to Germany, and finished her PhD at the Technical University (TU), Berlin, Germany. She has been performing international collaborations with prominent International scientists from Bragg Institute, Australia Nuclear Science and Technology Organization (ANSTO), Australia; Japan Proton Accelerator Research Complex (J-Parc), Japan; High Energy Accelerator Research Complex (KEK), Japan; Ibaraki University, Japan; Tohoku University, Japan etc; McMaster University, Canada; and former Hahn Meitner Institute, Berlin, Germany. She has been represented as a leader (President) of the Indonesian Neutron Scattering Society (INSS) since 2013. Since 2012, Evvy Kartini has been appointed as one of referee members of the National Accreditation Journal of the Indonesian Institute of Science. She has been evaluating and reviewing various national journals and contributing on their quality improvements.



Prof. Dr. B. V. R. Chowdary

Prof. B.V.R. Chowdari obtained Ph.D degree from the Indian Institute of Technology (IIT) Kanpur, Doctor of Science (Honoris Causa) from the K.L. University, India and the Doctor of Literature (Honoris Causa) from the Mangalore University, India. His 50-year research career enabled him to work at IIT Kanpur, India; Nagoya University, Japan; University of Stuttgart, Germany; University of Pennsylvania, USA; University of Zurich, Switzerland; and Shanghai Institute of Ceramics, China, in different capacities at different times. As a part of his academic career, he worked at the Indian Institute of Technology (IIT), Madras; the National University of Singapore (NUS) and the Nanyang Technological University (NTU), Singapore, in different capacities at different times with the ultimate one being the Professorship at both NUS and NTU. Currently he is the Director, NTU – India Connect, a special initiative of NTU, Singapore, to connect NTU with the Indian Universities and Institutes of Higher Learning in India through variety of actions. He has served as the President of the "International Union of Materials Research Societies (IUMRS)" and the "Asian Society for Solid State Ionics", and Chairman of the 15th Asian Physics Olympiad (APhO 2014). Currently he is the President of the Materials Research Society of Singapore and Chairman of the International Conference on Materials for Advanced Technologies (ICMAT) series which is going to the 10th edition. He has also initiated series of conferences named "IUMRS – International Conference of Young Researchers on Advanced Materials (ICYRAM)" and "Trilateral Conference on Nanoscience – Energy, Water and Healthcare".

Dr. Laksana Tri Handoko

Dr. Laksana Tri Handoko is an Indonesian scientist and public official specializing in theoretical and particle physics. He formerly served as the deputy head of science and technology for the Indonesian Institute of Sciences from 2014 to 2018. And he became Chairman of the institute start from 2018. He appointed as the second (but first independent) holder of Head of National Research and Innovation Agency.

Prof. Colin Grant

Professor Colin Grant is a Vice Principal (International) of Queen Mary University of London (QMUL), United Kingdom. He studied modern languages, international organisations, literature and European Studies in Edinburgh, Nantes, Leipzig, Bath and Berlin and had two DAAD postdoctoral fellowships at the University of Siegen (Germany). Professor Colin was an exchange student at the universities of Leipzig and Nantes and a visiting PhD student at the Humboldt/Zentralinstitut fuer Literaturgeschichte in Berlin. He was Head of Department, Head of School, Dean and inaugural Pro-Vice-Chancellor for International Relations at the University of Surrey and inaugural PVC (International) at the University of Bath and inaugural Vice President (International) at the University of Southampton. Professor Colin was Visiting Professor at the Federal University of Rio de Janeiro and at Paris 4. He has taught across many different areas at all levels: European Studies, international organisations, German and French literature, social philosophy, translation studies, media and communication theory. Professor Colin's PhD students and postdoctoral fellows have worked on various aspects of political communication, mental health and environmental communication, the public sphere and uncertainty and dialogism, media and communication, Islamophobia and communication philosophy.

PLENARY LECTURES

Dr. M. V. Reddy

Dr. M.V. Reddy obtained his Ph. D (2003) in the area of Materials Science and Engineering (with highest distinction) from the University of Bordeaux, France. From July 2003 to May 2019, he worked at the Department of Materials Science and Engineering, Chemistry and Physics, National University of Singapore (NUS). Singapore. From June 2019 to Aug 2021, he worked at the Center of Excellence in Transportation Electrification and Energy Storage, Hydro-Québec, Canada. Currently working as a Senior Professional Researcher and group leader in Energy storage Technology at Nouveau Monde Graphite (New graphite world) (NMG), Quebec, Montreal, Canada. Over the past 21 years, he has conducted leading research on Materials for Energy Storage (cathodes, anodes, supercapacitors and electrolytes), Materials processing & characterization, and the development of in situ techniques for Energy storage renewable technologies. Dr. Reddy has published 220 papers in various international journals. He has obtained an h-index of 68 with over 17200 citations. These have recently placed him within the top 2% highly cited researchers in Energy (world Ranking the 1002nd out of 186500 researchers) and Highly cited Researcher in Materials Science in Canada (National ranking:39) Dr. Reddy is serving as an editorial advisory board member in Materials Research Bulletin and Journal of Energy Storage (Elsevier, Scopus journal) as well as several open access journals Awards: Outstanding Science Mentorship Award (2010- 2018), and Inspiring Research Mentor Award (2011 to 2019), 2021 Battery Materials electrochemistry award from the Electrochemical Society of India, Indian Institute of Science (IISc), Bangalore, India. He was also Invited life member in ICDD USA and given 150 talks at various conferences and workshops & FDP. Dr. Reddy also became Invited committee member in various international Research proposals, theses and conference organizations and visiting Professor at various Universities.

ABSTRACT

Recent advances in Materials for Energy Storage and Sustainability

M.V. Reddy
Nouveau Monde Graphite (new Graphite world), Montréal, Québec, Canada
*e-mail:reddymvvr@gmail.com

Abstract:

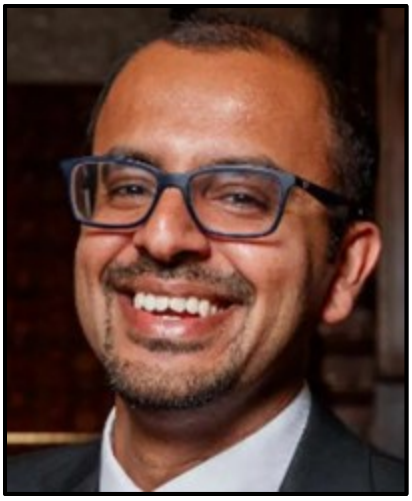
In recent years advanced materials had a considerable interest in worldwide researchers due its interesting functional properties and applications in areas of energy storage and conversion, water, health care, and sensors technology. In my talk, I will discuss various studies high power and Energy density materials for related to electric vehicle applications. Materials mining, fabrication, characterization techniques, fundamentals, interface studies and applications. I will focus on materials challenges for electric vehicles, smart grid for smart city applications. Battery fabrication and various fast charging, thermal management in

electric vehicles and in situ and ex-situ studies, reaction mechanisms, and present challenges in electric vehicles will be discussed. Finally, i will discuss briefly materials sustainability techniques

Keywords: *Advanced Materials; Materials Processing; Energy Storage; Electric Vehicles; Thermal runways*

Reference

1. More details of publications are listed in http://scholar.google.com.sg/citations?user=pWKr2M0AAAAJ&hl=en ; Orcid ID: 0000-0002-6979-5345



Prof. Neeraj Sharma

Professor Neeraj Sharma is a Director of Australian Battery Society (ABS), Australia. He also Associate Professor of University of New South Wales (UNSW), Australia. Neeraj completed his Ph.D. at the University of Sydney then moved to the Bragg Institute at Australian Nuclear Science and Technology Organisation (ANSTO) for a postdoc. He started at the School of Chemistry, UNSW on a Australian Institute of Nuclear Science and Engineering (AINSE) Research Fellowship followed by an Australian Research Council (ARC) Discovery Early Career Research Award (DECRA). He is currently an Associate Professor and ARC Future Fellow. Neeraj has been the Royal Australian Chemical Institute (RACI) Nyholm Youth Lecturer (2013/2014) and has won the NSW Premier's Prize for Science and Engineering (Early Career Researcher in Physical Sciences, 2019), Australian Synchrotron Research Award (2018), RACI Rennie Memorial Medal for Chemical Science (2018), UNSW Postgraduate Supervisor Award (2017) and a NSW Young Tall Poppy Award (2014). Neeraj has over 165 publications and has been invited to present his work at over 30 conferences. Neeraj's research interests are based on solid state chemistry, designing new materials and investigating their structure-property relationships. He loves to undertake in situ or operando experiments of materials inside full devices, especially batteries, in order to elucidate the structural subtleties that lead to superior performance parameters. Neeraj's projects are typically highly collaborative working with colleagues from all over the world with a range of skill sets.

Abstract

A brief snapshot of Australia's battery-based research and industry

Neeraj Sharma

This talk will provide a brief snapshot of Australia's role in the battery value chain. It will highlight key areas of strength and areas where there is opportunity for growth. The presentation will also show a little history of how the Australian Battery Society was developed and our aspirations.

Rene Schroeder

Rene Schroeder is an Executive Director of European Automotive and Industrial Battery Manufacturers (EUROBAT), Belgium since 2017. EUROBAT is the association for the European manufacturers of automotive, industrial and energy storage batteries. EUROBAT has more than 50 members from across the continent comprising more than 90% of the automotive and industrial battery industry in Europe. He received his bachelor degree in University of Nebraska at Kearney (2001), then Master degree on History/Political Science from Universität Rostock (1997-2002) and Master degree on European Studies/Civilization from College of Europe in Natolin (2003-2004).

Abstract

Battery policy framework in Europe and the latest developments

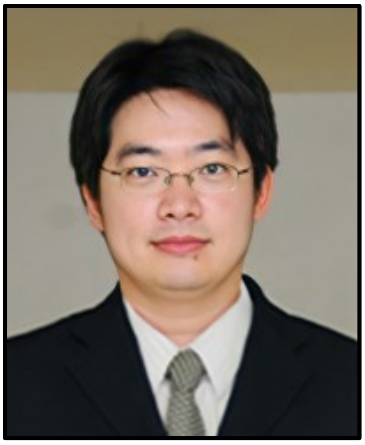
Rene Schroeder

In my presentation I will cover EU policy initiatives such as the Green Deal and the new Batteries Regulation. I will also touch upon the new chemicals' framework.

Prof. Alan J Drew

Prof. Alan Drew was appointed Leverhulme Fellow in the Centre of Condensed Matter & Materials Physics in 2008. He was rapidly promoted to Senior Lecturer (2011) and then Reader (2012), and in 2018 was promoted to Professor. Prof. Drew has been awarded a number of prestigious fellowships and awards over his career, starting with a Fellowship of the Royal Commission of the Exhibition of 1851 (2014), Leverhulme Fellow (2008), European Research Council (ERC) fellow (2012), Talent 1000 Scholar of the Chinese Ministry of Education (2014) and Changjiang Distinguished Professor at Sichuan University (2015). He is currently Head of the CCMMP Research Centre, and Director of the Materials Research Institute. His main research interests are using spin sensitive and structural probes situated at central facilities to characterize and understand the fundamental properties of materials, backed up with laboratory-based techniques (e.g. magnetic, structural and electrical characterization, thin film growth, Raman/IR spectroscopy, electro/photo luminescence). His main interests are understanding spin and charge carrier dynamics in organic and biological materials, the properties of materials with novel quantum mechanical states, structure function relationship in biomass derived conductors.

KEYNOTE LECTURES



Prof. Worawat Meevasana

Prof. Worawat Meevasana is an Assistant Professor of Suranaree Institute of Technology, Thailand. He is also Head of School of Physics, Suranaree University of Technology, Thailand from 2015 to present. Professor Meevasana holds a Bachelor of Science in Physics from University of California, Santa Barbara (UCSB), USA. He graduated in 2022 with the highest honor. Then, Prof. Meevasana continued his study in Master of Physics, Stanford University and graduated in 2007. He completed his Ph.D. in Physics, Stanford University back in 2009. In 2015, he was awarded the Outstanding Research Award from National Research Council of Thailand. Prof. Meevasana has various research expertise & interests, such as Synchrotron Radiation (SR) which can produce very bright light at various wavelengths, usually from infrared up to X-ray. Due to this brightness and the wavelength tunability, SR can have a wide range of applications, including many research fields (e.g. physics, material science, biology, chemistry, environmental study and engineering). Realizing much use of SR techniques, our group has much interest in exploiting SR techniques available at the Thai institute (Synchrotron Light Research Institute, SLRI) and the laboratories abroad (e.g. ALS and SSRL) to various research topics. Our current research interests are on 1) transition-metal oxides/ dichalcogenides, 2) carbon-based materials, 3) physical phenomena at low temperature. Professor Meevasana is one of the leading and most famous Physicists both in Thailand and at the international level and his research on batteries and EV vehicles is well-known.

Abstract

A journey to decentralize renewable energy in Thailand

Worawat Meevasana

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This talk will tell the story from the perspective of a physics researcher who would like to commercialize his research on energy storage. Initiated from the basic research on exploring the quantum states of matters using synchrotron radiation techniques, we found a quantum state so called “negative electronic compressibility” (NEC) providing a concept which could help boosting the performance of energy storage. With the concept, we have been trying to run a deep-tech startup and at the same time, we also use the existing technology with proper customization to make energy storage products in applications including off-grid solar system for households, uninterruptible power supply (UPS), mini EVs and electric source for smart farming. In this talk, I will share experience on basic research, motivation and obstacles regarding my journey to decentralize renewable energy in Thailand.

Prof. Arief S Budiman

Professor Arief S Budiman is a Director of Oregon Renewable Energy Center), United States of America. He finished his doctoral at Stanford University in 2008, taking material science and engineering as his field. He received several research awards and contributed to several high-impact journal publications, such as the prestigious Los Alamos National Laboratory (LANL) Director's Research Fellow Award in 2009 and received a Science Highlight from the famed Berkeley Lab for the technological breakthrough that has attraced wide industrial reception.

ORAL CONTRIBUTORS

Self-Sufficiency Of Seawater Battery Electricity Empowerment Using NiHCF + C Cathode With Wind Turbine As A Power Plant That Is Free Of Air Exposure In The 3T Area For Residential Scale

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Abstract. Electricity supply in some areas has not been depleted, with the possibility of a deficit in the country, if the power capacity does not follow the increase in electricity consumption. In addition, the remaining areas have potential resources if developed as renewable energy. RE here is far more environmentally friendly than a power plant with fossil fuels. In RE storage, energy storage forms a saltwater battery, since no heavy metal extraction is needed, so it's safer. Salt water battery also has a maximum power density, and much more effective voltage efficiency. Saltwater battery as safe and affordable energy storage, yet it has greater efficiency than previous generations. This will be used as storage on wind turbines in area 3T. NiHCF intercalation of sodium synthesized using a gellactic method. NiHCF is smoothed and blended with polyvinilidene fluoride, and black carbon, at 3.5 millilitres 1-minus 2-pirolidinon. The NiHCF cathode has an advantage of a voltage discharge with a 60-86% range and a human friendly. Compared with battery ro at the same fund these SWB batteries can have nearly twice as much efficiency as ro battery. It is also known in previous research that this katoda nihcf has a capacity of 75 Kwh/m^3. The saltwater battery will be composed in a three-part battery pack of C1, C2, and C3. The barrier between C1 and C2 is AEM, and between C2 and C3 is NASICON. Electricity distribution starts from electricity raised by wind turbines, then heads to the battery pack and passes to address electricity needs.

Keywords: *Seawater Battery, Wind Turbine, Electricity*

Green-charge Station : Electric Vehicle Charging Station using TiO2 for Perovskite Solar Cell and Al-ion Batteries from Bioleaching Red Mud

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Abstract. The world's energy needs, especially in the transportation sector, are still dominated by the use of fossil fuels. However, fossil fuel resources produce exhaust emissions that are harmful to the environment. It is necessary to develop future energy that is renewable and environmentally friendly. Sunlight is one source of energy that suits these needs. The total potential of solar energy in Indonesia reaches 3,294.36 gigawatt peak (GWp) which is spread evenly throughout the region (Ministry of Energy and Mineral Resources, 2021). This makes it very possible for Indonesia to develop electric vehicles that utilize solar energy. However, the weakness of solar energy is that it is intermittent (not available all the time) so energy storage devices such as batteries are needed. Indonesia has quite a lot of aluminum factories. Production of alumina from bauxite ore through the Bayer process will produce 55-60% red mud waste. Red mud waste contains heavy metals such as Al2O3 10-22%, Fe2O3 14-35%, SiO2 3-10%, TiO2 7-15% (Sharif, 2005) and are harmful to the environment. Based on these problems, we have an idea to create a Green-charge Station concept: an electric vehicle charging station using TiO2 for perovskite solar cells and Al-ion batteries from bioleaching red mud as energy storage media. Al-ion batteries were chosen for this concept because of the lower cost of battery fabrication and are considered safer than other types of batteries and the durability of aluminum foil is quite good. The methodology used in this paper is laboratory experiments and literacy studies to complete the required data. The concept of a Green-charge Station is expected to be the future of sustainable energy that is easy to use and beneficial for the environment and supports the achievement of new renewable energy mix targets.

Keywords: *Battery, Red Mud, Renewable Energy, Solar Cell*

Potential Optimization of Nickel Based Components For EV Batteries With Nanotechnology in Indonesia

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Abstract. Indonesia's mining resources such as carbon, lithium, cobalt, and nickel, are some of the key components to produce electric vehicle batteries(EVB).EVB production in Indonesia could exponentially increase the demand for electric vehicles.The use of nanotechnology for nickel application in anodes, cathodes, and separators can improve the battery's performance.For instance, the mesopore nickel fluoride nanocomposite can be used as cathodes because of its high energy density, high capacity characteristics, low cost production, and low toxicity.In contrast, nickel-cobalt selenide carbon doped nitrogen can be used as anodes because of its ability to activate the redox reaction with multiple electrons, has great cycle stability, and an outstanding rate performance.Whereas, hydroxide nickel composed of reduced graphene oxide nanosheets can be used as a separator because of its high energy density and resolves the shuttle effect of sulfur.In the nanoscale, core-shell structures have large specific surface, and a short charge transfer distance making it suitable for battery application. Here, the cathode-based core-shell structure of NiF_2/porous carbon is synthesized using ammonium fluoride with heat treatment for precise control of particle morphology. For the anode it is synthesized using a facile mixing method. While the separator uses a hydrothermal method due to its advantages such as high efficiency and uniform heating. Results show an increase in the properties of capacity, permittivity, conductivity, density, and reversibility in battery performance. This study accommodates the low cost approach and the improvements of nickel based components for practical use in EVB in Indonesia.

Keywords: *Nickel Based, Nanotechnology in Battery, EV Battery, Anode Material, Cathode Material, Separator Material*

Application of $LiFePO_4$ Battery Using Cell to Pack Method on DSSC Made from Lichenes Extract in Accelerating Energy Transformation

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Abstract. Dye Sensitized Solar Cell (DSSC) has developed as an alternative solution to conventional photovoltaics that still uses silicon as a photosensitizer. In this study, the photosensitizer used was formed by the dye-lichenes extract. The chlorophyll present in it will absorb the light of photons. According to the specification, it reaches the greatest absorbance power produced by lichens extract at a wavelength of 480 nm is worth 0.92. One cell of this DSSC with a size of 12.5 x 12.5 cm produces a power of 3.2 Wp. A battery is needed to store the energy produced by this DSSC in the off-grid power plant. $LiFePO_4$ batteries designed using the cell to pack method can be environmentally friendly as medium energy storage and have high efficiency and cycle life. The battery module is continuously composed of 4 cells, each cell of which has an energy density of 450 Wh/kg and is arranged in parallel until it has a capacity of 3 kWh. The compiled DSSC consists of 2 panels with a 250 Wp/panel capacity. The amount of power left and stored after use in a house with a load of 200 W is 347.07 W. This study shows that the storage of power generated by DSSC in $LiFePO_4$ batteries using the cell to pack method can accelerate energy transformation.

Keywords: *DSSC, lichenes extract,* $LiFePO_4$, *cell to pack*

Utilization Of Renewable Energy Environment with Smart Grids, Smart Meters And Wireless Power Transmission Based On Artificial Intelligence To Solve The Problem Of Poverty In Remote Coastal Areas.

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Abstract. The coast provides life for around 120 million people in Indonesia with an average growth of 2% per year, but there are still many people on the coast who live below the poverty line. The coastal poor have problems in their lives, namely the lack of access to electricity and the crisis of clean water. Automation and distribution of electricity in the territory of Indonesia is also less effective due to technological limitations. Therefore, Ocean Thermal Energy Conversion (OTEC), Solar panel, wind turbine and hydrogen energy storage in the ocean namely renewable energy environment combined with smart meters, smart grids and Wireless Power Transmission make sophisticated electricity distribution management a solution for energy as well as clean water in coastal areas so as to produce a qualified and sustainable energy area. All the technology can improve the economy and welfare of the region. A series of distribution components and the use of electrical energy are run based on artificial intelligence so that they do not require operational costs. All can be monitored using electronic devices such as mobile phones and laptops. This paper will discuss a series of concepts of renewable energy operations on the coast based on artificial intelligence that can solve the problem of poverty in remote areas in Indonesia.

Keywords: *OTEC, Renewable energy, smart meter, smart grid, coastal region.*

The Impact of Digitalization on ASEAN's Renewable Energy Transition: A Taxonomy of Innovative Business Models

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Abstract. Many researchers and practitioners focused on renewable energy development are looking to innovate business models to find new ways to create and leverage value from digital technology. The main concern is to address the challenges and inefficiencies in the energy transition. In business, such inefficiencies are referred to as bottlenecks. However, the enormous potential of digital technology and business model innovation to overcome obstacles in the energy transition has not been widely researched, especially in the case of ASEAN. This paper contributes to filling this gap. It appears that digital technology facilitates business model innovation that overcomes barriers to integrating renewable energy technologies into incumbent structures or barriers associated with the independence of renewable energy technologies from established structures. Furthermore, business model innovations to address these bottlenecks can be incremental or transformative. As a result, digitalization-based business model innovations appear in four types. Each type triggers new recommendations for research and practice of business model innovation and governance of renewable energy transitions.

Keywords: *ASEAN; Digitalization; Business model innovation; Renewable energy transition*

Synthesis of Polymer Blend PEO/PVA/$NaClO_4$ With Nano-SiO_2 From PT. PG Candi Baru Sidoarjo Bagasse Ash As Battery Filler

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Abstract. PEO solid polymer electrolyte (SPE) is increasingly applied in sodium ion batteries. However, the application of PEO is very limited because of its poor thermodynamic stability, high crystallinity and low ionic conductivity, which is between 10^{-8}-10^{-7} S cm^{-1} at room temperature. Polymer blending technique is another effective strategy to achieve better ionic conductivity, mechanical strength and thermodynamic stability of SPE. The mixing between PEO and PVA using solution cast method is considered to have promising potential. The ionic conductivity was increased by the addition of $NaClO_4$ salt as a source of sodium ions as well as plasticizer. Nano-SiO_2 filler was added to reduce polymer crystallinity. The nano-SiO_2 was synthesized from baggase ash from PT. PG Candi Baru Sidoarjo using the sol-gel method. The polymer blend was evaluated by FTIR to identify the functional groups, XRD to analyze polymer crystallinity and Electrochemical Impedance Spectroscopy analysis to observe SPE ionic conductivity. The highest ionic conductivity obtained was 1.835 x 10^{-4} S cm^{-1} at 90◦C.

Keywords: *Battery, Renewable Energy, PEO, PVA, SiO_2*

Analysis of Potential and Capacity of Lithium-ion Batteries Using Density-Functional Theory for Electric Vehicle Applications

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Abstract. Lithium-ion batteries (LIBs) are widely used for energy storage in electronic devices, electric vehicles, and stationary applications. Key advantages of LIBs include high energy density, long cycle life, and high capacity. Several types of LIBs are available, among the most important of which are lithium iron phosphate (LFP), lithium cobalt oxide (LCO), nickel cobalt aluminium (NCA), and lithium nickel oxide (LNO). This research compares the capacity and potential performance of different LIB types, investigates the effects of nickel and cobalt concentration variation, and determines the most appropriate application for each variety of LIB. We use Visualization for Electronic and Structural Analysis (VESTA) software for structural visualization. For the calculation, we adopt a first-principle Density-Functional Theory (DFT) approach. Our implementation uses Quantum Espresso (QE) software, an open-source DFT-based modeling algorithm that can describe the properties and electronic structures of materials. Modeling with QE uses plane waves (PW) and pseudopotentials (PP) to represent interactions between electrons and ions. This model shows that variations in concentration of nickel and cobalt in NCA LIBs result in different performance characteristics. Of the LIB varieties modeled, LCOs show the highest potential (about 3.44-3.70 V), and LFPs the highest capacity (about 600 mAh/g). Since Indonesia has many of the natural resources (e.g., Ni, Al, Fe) that are commonly used as LIBs cathode materials, we hope that this research will support Indonesia's efforts to become a leading nation in battery research and an attractive location for investment by major battery companies.

Keywords: *LIBs, LFP, LCO, NCA, LNO*

Optimization of EV Battery Switching Stations Using Agent-Based Simulation with M/G/k Queuing

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Abstract. Electric vehicles (EVs) have developed rapidly over the past decade, driven largely by progress in battery technology. As batteries become cheaper and more efficient, gasoline-fueled conventional vehicles (CVs) are being replaced by EVs. Both classes of vehicle need supporting infrastructure. For EVs, this includes battery switching stations (BSS) where users can switch depleted batteries for charged ones. However, batteries and combustible fuel have different characteristics, dictating different design considerations for their supporting infrastructures. In this research, we consider two fundamental attributes of a switching station. First, batteries require time to charge (in contrast to CV refueling). Second, there is a limit to the power each station can provide. We propose a switching station model with an M/G/k queue characteristic to accommodate these key behaviors. Each switching station in the model has an inventory of full batteries and a series of ports to charge depleted batteries. This system allows the station to stock up batteries at night to accommodate increased demand during the day. To study the interaction between drivers and stations, we developed an agent-based simulation program using the Mesa library in Python. Switching station specifications are optimized according to the number of drivers and the distribution of stations in an area. The model shows that adding inventory can minimize a station's maximum power requirement. The methodology developed can be applied to urban layouts to estimate real-world switching station requirements.

Keywords: *Agent-Based Simulation, Battery Swapping Station, Electric Vehicles, Mesa Python Library.*

Understanding The Role of Glass Fabric Separators on the Performance of Structural Composite Battery

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Abstract. A structural composite battery having the ability to store energy and provides structural support in an electric vehicle is needed nowadays. It also needs to have a low density assisting the electric vehicle in travelling extended distances. The novel structural composite battery is made of carbon fiber woven as a structural negative electrode (anode), aluminum foil coated with Nickel Manganese Cobalt as the positive electrode (cathode), and glass fiber woven as a separator layer between the negative and positive electrodes. The separator layer between the anode and cathode is such an important and integral part of the battery as it inhibits short circuit. The anode, cathode and separator are surrounded by solid polymer electrolyte which act as a medium to transport Lithium ion between the anode and cathode while also provides structural integrity into the composite battery. The composite battery was manufactured inside a glovebox at a controlled water content of 0.60 ppm, 0.16 ppm O_2 content, and vacuum pressure of 0.19 mbar, in order to avoid contamination upon the composite material. This study aims to investigate the effect of using glass fiber woven as a separator on the performance of structural composite battery. Preliminary charge-discharge testing of the structural composite battery by using charging current of 0.2 mA has been conducted. When charged, the battery could store energy up to 4.3 voltage and when discharged, the delivered energy drops to 1 voltage. Based on those findings, it is deduced that the discharge capacity is 2.8 mAh and the discharge capacity is 0.01 mAh. The structural composite battery has a good performance when charged but quickly losses its capability to deliver current when discharge. This indicates the potential to further optimized the performance of this novel structural composite battery. On going work is conducted to further investigate the cause of the low discharge capacity by examining its microstructure and chemical composition.

Keywords: *Structural composites battery, multifunctional energy storage, glass fiber separator, electrochemical performance*

Effect of Addition Level of Activated Carbon from Plastic Waste Recycling on LTO/Carbon Anode Composites for Lithium-Ion Batteries

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Abstract. The consistent increase in plastic production is believed to increase the amount of plastic waste made. It is estimated that plastic waste that is considered to be mismanaged in Indonesia as of 2020 will reach 4.8 million tons/year, with the criteria that 48% of waste is burned, 13% is disposed of on land or unofficial landfills, and 9% into seawater. Therefore, proper waste management is needed, namely by recycling plastic waste. One of the sophisticated waste recycling is the utilization of plastic waste for renewable energy such as batteries. This study aimed to study the effect of the addition of activated carbon from plastic waste recycling on battery performance. This research was carried out by carbonizing PET plastic waste at a temperature of 400°C in an inert nitrogen atmosphere and activating the carbon yield using NaOH. Battery performance testing is carried out by testing Electrochemical Impedance Spectroscopy (EIS Cyclic Voltammetry (CV), and Charge Discharge (CD). The EIS test shows that the addition of activated carbon can increase the anode conductivity of LTO/C composites. The CV test shows that the addition of carbon is 1 wt% and has the highest specific capacity of 151.27 (mAh/g). The results of the battery performance test show that the optimal addition of carbon is 1 wt%.

The Effect of Percentage Variations of Ammonium Polycarbonate in the Synthesis of Sodium Lithium Titanate Oxide (Na2Li2Ti5,9Zr0,1O14) on its Performance Test Results as an Active Anode in Lithium-Ion Batteries

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Abstract. Sodium Lithium Titanate-Doped Zirconium, Na2Li2Ti5,9Zr0,1O14 (NaLTOZr) is a promising candidate as a lithium-ion battery anode material. In this study, a liquid containing ammonium polycarbonate, ((NH4)2CO3) was added as a dispersant in the grinding process of anode wet material to prevent agglomeration of particles. Three variations of content change ((NH4)2CO3)n in percent by weight relative to the weight of the anode, namely 0, 10, and 20 wt%. The anode material is then characterized using X-Ray Diffraction (XRD) and Field Emission Scanning Electron Microscopy (FESEM). These tests are carried out to test the effect of ((NH4)2CO3) on the structure, morphology, and surface area of the anode sample produced. The anode material is also subject to the Cyclic Voltammetry (CV) and Charge-Discharge (CD) tests, to test the suitability of the sample as an anode in lithium-ion batteries after the addition of ((NH4)2CO3)n.

Keywords: *Dispersant, Ammonium polycarbonate, Lithium-ion batteries*

Study of Chemical Structure and Electrical Properties of Nitrogen-Doped Activated Carbon from Candlenut Shell (Aleurites moluccana)

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Abstract. Li-Sulfur batteries have a high theoretical energy density of 1300 Ah/kg which is about 3 times of commercial lithium ion batteries today But it has several problem in application, especially low electrical conductivity ($5x10^{-30}$ S/cm) and the swelled volume during the charge/discharge process due to the formation of polysulfide. The solution of this problem is binded the Sulfur particles in porous carbon host. Binder Carbon/Sulfur will increase electrical conductivity while preventing swell the volume of Sulfur during the charge/discharge. In this paper, the nitrogen doped of activated carbon from candlenut shell was investigated for host material of carbon. The chemical structure and electrical conductivity of activated carbon doped nitrogen was studied. The synthesis of activated carbon was carried out by the pyrolysis process at 700°C and then activated by impregnation process for 24 hours using KOH as activator. The pyrolysis process is followed by nitrogen doped using NH3 as a source of nitrogen. The weight ratio of carbon and NH_3 is 1:3 using 10% and 25% of NH_3 concentrations. The sample was then heated in a furnace at 850°C for 3 hours. The results of BET characterization can be determined the surface area of activated carbon from candlenut shell around 681 m^2/g. The process of doping nitrogen of activated carbon has been carried out successfully proved by the presence of C≡N and C-N functional groups through FTIR analysis. Based on the results of SEM-EDX analysis, the nitrogen content in activated carbon is around 0.52% and 0.34% for NH_3 concentration of 25% and 10% respectively. The electrical conductivity of nitrogen doped activated carbon is around 2,31 x 10^2 S/cm and 2,03 x 10^2 for NH_3 concentration of 25% and 10% respectively.

Keywords: *Candlenut Shell, Activated Carbon, Nitrogen Doping, Li-Sulfur batteries*

The Influence of Polylactide Addutuon to The Performance of LiFePO4/C Composite as Cathode Materials

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Abstract. The polylactide and carbon addition to LiFePO4 have been studied to investigate the behavior of $LiFePO_4$/C composite. The cathode material of $LiFePO_4$ was prepared by coprecipitaion of $LiOH.H_2O$, $(NH_4)_2HPO_4$ and $FeSO_4.7H_2O$ solution. The resulting $LiFePO_4$ was mixed with biodegradable polymer PLA in the concentration of 6, 8, 10, 12 % weigth of polymer. Heat treatment was done by heating the precursor at 700 ° C for 4 hour. The physical chemistry properties of cathode materials analized by using Simultaneous Thermal Analysis (STA), X-Ray Diffractometer (XRD), Scaning Electron Microscope (SEM), and Particle Size Analizer (PSA) methods. High Precision LCR-meter was used to perform conductivity measurement, in which the $LiFePO_4$/C powder samples were prepared by using 200 kg/cm^2 hydrolic press. TG analysis inform gradually weigth decrease at $LiFePO_4$ temperature formation of 470 °C and pyrolisis of remaining PLA occur at 600 °C. From all samples XRD data indicate pure phase of $LiFePO_4$. SEM image shows the uniform distribution particle of sample with 6 % PLA content with conductivity of 1.99 X 10^{-2} Scm^{-1}.

Keywords: *copresipitation method, $LiFePO_4$, PLA, composite, physical chemistry characterization.*

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Day-2 (Wednesday, 22 June 2022)

Session	Time	Code	Estimation	Speaker	Topic	Affiliation
Morning Session (UTC+7)	08.20-08.30	**Opening by Master of Ceremony**				
	08.30-09.10	PL	40’	Toto Nugroho Pranatyasto	Indonesia as global player for battery technology	President Director of Indonesia Battery Corporation, Indonesia
	09.10-09.50	PL	40’	Dr. Agus Gumiwang Kartasasmita	The value chain of Indonesia electric vehicles ecosystem	Minister of Industry Republic of Indonesia, Indonesia
	09.50-10.30	PL	40’	Prof. Satish Patil	Chemistry for Redox Flow Battery	Indian Institute of Science, India
	10.30-10.35	**Room Transition**				
	10.35-12.00	**Battery**				
		KN	30’	Muhammad Fakhrudin, ST	Hydroxide co-precipitation of layered oxide cathode: A mini review	Assistant Manager of RDI, National Battery Research Institute
		INV	20’	A.A.N. Perwira Redi, Muhammad Asrol, Ryo Geoffrey Widjaja and Iwan Agustono	A Review On The Application Of Machine Learning To Predict The Battery State That Enables A Smart, Low-Cost, Self-Sufficient Drying And Storage System For Agricultural Purposes	BINUS University
		OR	15’	Adinandra Caesar Fachrudin, Baihaqi Muhammad, Evvy Kartini and Muhammad Fakhrudin	Rice Husk-Derived Graphene as a Conductive Additive for LiNi0.8Co0.1Mn0.1O2 Cathodes in Lithium-Ion Batteries	National Battery Research Institute
		OR	15’	Muhammad Abdul Razak, Anne Zulfia and Yustinus Purwamargapratala	Synthesis Optimization of Cathode Precursor Ni0.5 Mn0.4 Co0.1 (OH) with Coprecipitation Method	University of Indonesia, Indonesia
		OR	15’	Revina Dea Nanda, Sigit Aryo Kristianto, Evvy Kartini, Muhammad Fakhrudin	Study of Synthesis NMC 721 using Oxalate Co-Precipitation	National Battery Research Institute, Indonesia
		OR	15’	Markus Diantoro, Nasikhuddin, Ishmah Luthfiyah, Santi Maensiri, Worawat Meevesana, Agus Purwantu, and Agus Subagyo	Optimizing Performance of Supercapbatteries Modification Cathode Based AC Mesoporous and Anode MXene Ti3C2Tx with High Energy-and Rate Capability	State University of Malang, Indonesia
		Electric Vehicles				
		KN	30’	Commissioner General of Police (Ret) Nanan Soekarna	Nickel Indonesia for global battery manufactures	Chairman of Indonesian Nickel Miners Association (APNI), Indonesia
		INV	20’	Ganesha Tri Chandrasa, Barman Tambunan and Soedibyo	Design And Testing Lightweight Electric Trike Vehicle Hybrid With Lithium Battery, Flywheel, and PEM Fuel cell	Institute Technology of Sepuluh Nopember, Indonesia
		OR	15’	Ardhy Yuliawan Norma Sakti, Djarwadi Djarwadi, Miranti Budi Kusumawati, Ira Nurhayati Djarot and Pradipta Sangga Wiyasa	Upstream Bottleneck Detection on Electric Vehicle Industry: A Case Study of Indonesian Electric Scooter	Sustainable Energy and Resources Engineering, Thammasat University, Thailand
		OR	15’	Henri Firdaus, Bravel Sigalingging and Wahyu Ahadi Rouzi	Mobile Electric Rice Huller (MERU) for Electrifying Agriculture in Indonesia	PT. PLN, Indonesia
		OR	15’	Dewi Rianti Mandasari, Lia	Reducing of Cogging Torque in Segmented	National Research and Innovation Agency,

				Amelia, Arga Iman Malakani, Agus Krisnowo and Cuk Supriyadi Ali Nandar	Permanent Magnet BLDC Motor IPM V-Shape by Skewing Stator	Indonesia
		OR	15’	Moh. Wahyu Syafi’ul Mubarok and Evvy Kartini	Bolstering Domestic Electric Vehicles Ecosystem through Human Resources Development	National Battery Research Institute, Indonesia
	12.00-13.00	**Break Session**				
Afternoon Session (UTC+7)	13.00-13.45	PL	45’	Prof. Rodrigo Martins	Green Energy: A Future Global Challenge	President of International Union of Material Research Societies (IUMRS) and Director of European Academy of Science (EurASc), Portugal
	13.45-14.30	PL	45’	Prof. Ayi Bahtiar	Research and Developments of Solar Cells in Indonesia: Problems and Challenges as a Source of Charging Batteries for Electric Vehicles	Head of Advanced Materials Laboratory at University of Padjadjaran, Indonesia
	14.30-16.30	**Keynote Session**				
		Renewable Energy				
		KN	35’	Dr. Haznan Abimanyu	Renewable Energy & Electric Vehicle Research Ecosystem in Complying Net-Zero Carbon Emission 2050	Chairman of Research Organization for Energy and Manufacture, BRIN
		INV	25’	Wilman Septina and Nicolas Gaillard	Solar Hydrogen Production from Low Temperature Ink-Based CuInS2/In2S3 Heterojunction Photoelectrochemical Cell	National Research and Innovation Agency, Indonesia
		OR	15’	Mellin Hasna Nurfadhila	Green bonds of Supranational Financial Institutions as Potential Ophelimity Funding for Hydrogen Energy Development in Indonesia	University of Indonesia, Indonesia
		OR	15’	Satria Anugerah Suhendra, Dwi Resa Lamandau, Siti Fatimah, Aulia Rahma and Muthia Elma	Reverse Electrodialysis (RED) Membrane for Harvesting Salinity Gradient Energy with and without Spacer under Natural Wetland Saline Water	Lambung Mangkurat University, Indonesia
		OR	15’	Jelita Permatasari and Feri Yusivar	Modelling and Simulation of Hybrid Light Railway Vehicle Drive System	University of Indonesia, Indonesia

PL= Plenary Session
KN= Keynote Session
INV= Invited Speaker
OR= Oral Contributor

PLENARY LECTURES

Toto Nugroho Pranatyasto

Toto Nugroho Pranatyasto is a President Director of Indonesia Battery Corporation (IBC) Indonesia. He is former manager for New & Renewable Energy Business Development at Pertamina. He received bachelor science of chemical engineering from University of Indonesia (1986 - 1991). Then, he continued to The University of Texas Austin for Master on Chemical Engineering. Mr. Toto also enrolled in Leadership Executive Program, Business Administration and Management by INSEAD (2013- 2014).

Prof. Satish Patil

Prof. Satish Patil is a Professor of Solid State and Structural Chemistry Unit Indian Institute of Science, India. He obtained his Ph.D of polymer chemistry from Bergische University of Wuppertal, Germany. Professor Patil has a research interest in synthesis of organic semiconductors for singlet fission, thermally allowed delayed emission, organic solar cell, and organic electrochemical transistors. He already published more than 100 papers in peer reviewed journals.

Chemistry for Redox Flow Battery

Satish Patil
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spatil@iisc.ac.in

Redox flow batteries (RFBs) offer an opportunity to make renewable energy storage more affordable and could accelerate prospects for utility-scale development of solar/wind energy storage. There are, of course, challenges to surmount such as those related to phase changes at both the positive and negative electrodes. I will briefly summarize various redox flow batteries and stresses on the limitations of the other battery technologies in realizing the large-scale energy storage systems. I will discuss some of our recent endeavours to design stable anolyte for non-aqueous redox flow battery. I will also present the studies conducted in our group, primarily directed to propel soluble lead redox flow batteries from laboratory scale to a functional system by addressing key issues of scaling-up materials, fabrication and engineering.

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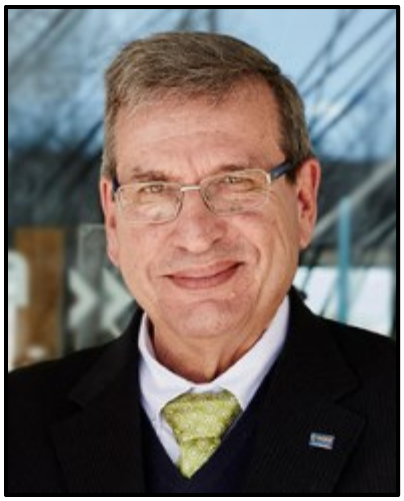
4. Ravikumar, M. K.; Rathod, S.; Jaiswal, N.; Patil, S.; Shukla, A. The Renaissance in Redox Flow Batteries. *J. Sol. St. Electrochem.* **2016**, *21*, 2467-2488.

Dr. Agus Gumiwang Kartasasmita

Dr. Agus Gumiwang Kartasasmita is an Indonesian politician. He is the current Minister of Industry in the Republic of Indonesia, appointed on 24 August 2019. He attended Canisius High School in 1984 and left in 1985 to Knox High School in New York. In 1991, he went to Pacific Western University where he studied Commercial Science and graduated in 1994 with a BSc in Commercial science. In 2007, he enrolled into University of Pasundan where he graduated with Master of Public Administration in 2009, and obtained a PhD in Administration in 2014. On October 23 2019, president elect Jokowi announced that Agus Gumiwang would make a return to his Indonesia Onward Cabinet as Minister of Industry replacing Gumiwang's fellow Golkar Party politician, Airlangga Hartarto.



Prof. Rodrigo Martins

Prof. Rodrigo Martins is full professor in Materials Science Department of Faculty of Science and Technology of New University of Lisbon, a fellow of the Portuguese Engineering Academy since 2009 and a member of the European Academy of Science since 2016. He was decorated with the gold medal of merit and distinction by the Almada Municipality for his R&D achievements. Prof. Rodrigo has been involved in the pioneer European research on Amorphous silicon semiconductors and pioneer with is group worldwide activity related to passive and active oxides, the so called transparent electronics and it is one of the inventors of the so-called paper electronics, where paper is exploit not only as asubstrate but also as a functional component in active devices. He published over 700 papers and during the last 10 years got more than 14 international and national prizes and distinctions for his work (e.g. Lisbon Energy Live Expo, Innovation Prize, 2012 Solar Tiles, European Patent Office Innovation nomination 2016, etc.

Prof. Ayi Bahtiar

Prof. Ayi Bahtiar is a Head of Advanced Materials Laboratory at University of Padjadjaran, Indonesia. He has served as a lecturer and researcher for University of Padjajaran in the past 25 years. His research interests are polymer solar, cells hybrid organic-metal oxide, perovskite solar cells, graphene to photonics with 604 citations and h-index score on 11.

Research and Developments of Solar Cells in Indonesia: Problems and Challenges as a Source of Charging Batteries for Electric Vehicles

Ayi Bahtiar[1,2]

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Abstract

Solar cells or in the form of solar panels are devices to directly convert sunlight into electricity. The electricity generated by solar panels can be used as a directly or indirectly source for electricity. The indirect use of electricity from solar panels can be applied to charge batteries which can then be utilized for lighting or for electric vehicles. Currently, silicon-based solar panel dominates the market with conversion efficiency of 13-16% for polycrystals and 15-20% for monocrystals. On the other hand, perovskite material recently is very promising as a solar cell material because it has superior optoelectronic properties and low processing costs in the form of thin films. In the last decade the efficiency of perovskite solar cells has grown very rapidly from 3.9% in 2009 to reach 26% in 2022. Since last three years, due to this superior properties of perovskite materials, many research have been focussed on the development of silicon/perovskite tandem solar cells and currently has achieved an efficiency of 29.8%. In Indonesia, many researchers are focussing on the study and development of third generation solar cells such as organic/polymer solar cells, Dye Sensitized Solar Cells (DSSC) and perovskite solar cells. In this talk, I will present the latest development of solar cells in the world, as well as the research and development of solar cells in Indonesia along with the problems faced and challenges for implementation as a support for charging batteries for electric vehicles.

KEYNOTE LECTURES

Muhammad Fakhrudin, ST.

Muhammad Fakhrudin, S.T. is a Junior Researcher, Research Center for Advanced Material, Research Organization for Nanotechnology and Materials, National Research and Innovation Agency (BRIN). He is also a senior researcher of National Battery Research Institute. He graduated from Chemical Engineering, Institute Technology of Bandung in 2012. Previously, He became a Junior Researcher, Center for Advanced Material Science and Technology, National Nuclear Energy Agency (PSTBM-BATAN) during 2019 to 2021. His research focus is on Ni-rich layered oxide and high voltage spinel Li-ion Battery Cathode and Raw material processing for cathode materials.

Commissioner General of Police (Ret) Drs. Nanan Soekarna

Commissioner General of Police (Ret) Nanan Soekarna is a Chairman of Indonesian Nickel Mining Association (APNI), Indonesia. He is a retired Indonesian National Police officer with the last rank as Commissioner General of Police. Graduated from the Police Academy in 1978, the College of Police Science (PTIK) in 1986, SESPIMPOL in 1995, SESKOGAB in 1999 and LEMHANNAS in 2005. He started his career as Dan Unit Patko Sabhara Polda Metro Jaya in 1979 and was later assigned to several police units in several parts of Indonesia. Previously served as Wakapolda Metro Jaya (2003-2004), Kapolda West Kalimantan (2004-2006), Kapolri Social Political Expert Staff (2006-2008), Kapolda North Sumatra (2008-2009), Inspector General Supervision of Police (2009-2011) and Deputy Chief of Police of the Republic of Indonesia (2011-2013). Also, part of UN peacekeeping forces, including UNTAG in Namibia, South Africa, in 1990 and UNTAC in Cambodia in 1992; as well as attending various police training and seminars abroad.

Dr. Haznan Abimanyu

Dr. Haznan Abimanyu is a Chairman of the Research Organization for Energy and Manufacture, National Research and Innovation Agency (BRIN), Indonesia. Dr. Haznan started his research career in 1997 at the Research Center for Chemistry at the Indonesian Institute of Science (LIPI). He pursued his PhD in University of Science and Technology, South Korea. His research scope related to energy, catalyst, atsiri, and oleochemistry.

Renewable Energy & Electric Vehicle Research Ecosystem in Complying Net-Zero Carbon Emission 2050

Haznan Abimanyu

In Paris Climate Agreement, Indonesia has been committed to reduce greenhouse gas (GHG) emissions by 26% (with its own efforts) and by 41% (if it receives international assistance) in 2030. By 2050, the largest share of final energy demand is oil fuels at 40.1%, followed by electricity (21,3%), gas (17.7%), coal(11.0%), and the remaining are LPG, biofuels and biomass respectively below 4%. The national power generation capacity in 2018 reached 64 GW, with the largest share of coal-fired power plants reaching 45%, while the share of new and renewable energy (NRE) power plants was around 15%. NRE power generation capacity is expected to continue to increase until its share becomes around 24% by 2050. The NRE growth substituted the decline of oil and gas shares. NRE continues to be driven along by increasing concerns over fossil energy prices and their environmental impacts. The potential for NRE in Indonesia is quite large and very diverse. NRE supply is dominated by biofuels, biomass, hydro, and geothermal. Other NREs (solar, wind, waste, and biogas) have a small share. However, the potential of NRE is still not optimally developed due to various implementation constraints, such as the high investment costs and geographical location. Meanwhile, globally, transportation is the second largest contributor for CO2 emission after power generation. Road transportation is the dominant contributor to CO2 emissions both globally and domestically for urban areas, accounting for 78% of emissions in Jakarta. The numbers of vehicles in Indonesia are 117,7 million units and 28,4 million units for motorcycles and cars, respectively. In 2019, by The President Regulation No.20 Indonesia has the accelerating battery electric vehicle (BEV) program for road transportation. With these backgrounds, it is necessary to have research ecosystem in renewable energy and electric vehicle to support the Net-Zero emission program.

ORAL CONTRIBUTORS

A Review On The Application Of Machine Learning To Predict The Battery State including the State of Charge, State of Health, and Remaining Useful Life

A.A.N. Perwira Redi [1,a)], Muhammad Asrol [1,b)] , Ryo Geoffrey Widjaja [1,c)] , Iwan Agustono [1,d)]

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Abstract. This paper provide a review that discuss a more feasible battery for the energy storage system, and the advancement of battery technology toward high capacity, low cost, and extended battery lifespan. Accurate battery status forecasts help regulate charging and discharging and extend battery life. Several publications give a summary of battery state prediction methods for energy storage.This study addresses the use of machine learning to forecast battery charge, health, and remaining useful life. Recent study showed that 64.7% of researchers employed Neural Networks to make prediction, with few studies combining methods to overcome battery dynamic conditions in real world applications with reduced computing effort and cost to allow IoT integration. The possibility of using energy storage techniques to create a smart, low-cost, self-sufficient solar drier for agriculture is also discussed.

Keywords: *Battery State Prediction, Literature Review, Machine Learning, Smart Solar Drver*

Rice Husk-Derived Graphene as a Conductive Additive for $LiNi_{0.8}Co_{0.1}Mn_{0.1}O_2$ Cathodes in Lithium-Ion Batteries

Adinandra Caesar Fachrudin[1], Baihaqi Muhammad[1, a)], Evvy Kartini[1, 2, b)] and Muhammad Fakhrudin[1, 2]

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Abstract. Ni-rich cathode, capable of providing high specific capacity and energy density, is viewed as the future generation of batteries. However, it suffers from poor cyclic stability, especially in wide and high voltage windows. Therefore, in this study, rice husk-derived graphene (GRHA) using green synthesis approaches is added to the $LiNi_{0.8}Co_{0.1}Mn_{0.1}O_2$ (NCM) cathode as a conductive additive in a small amount (1 - 5 wt%). Results showed that GRHA addition successfully improved the electrochemical performance by hindering capacity fading. Good conductivity of GRHA also contributes to promoted rate capability in high cycles compared to the pure NCM cathode. It is attributed to the synergistic effect of NCM and GRHA materials facilitating a point-to-point contact between NCM particles and wrapping NCM materials to protect against direct contact with the electrolyte. The results of this study bring a promising opportunity to utilize graphene from agricultural waste as a high-value material in Li-ion battery applications.

Keywords: *NCM, Cathode, Conductive Additive, Graphene, Rice Husk*

SYNTHESIS OPTIMIZATION OF CATHODE PRECURSOR $Ni_{0,5}$ $Mn_{0,4}$ $Co_{0.1}$ (OH) WITH COPRECIPITATION METHOD

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Abstract.

The use of conventional fuels such from fossils sourced is non-renewable energy, which makes this energy source less environmentally friendly. Indonesian government is targeting to change energy sources towards environmental friendliness, one of which sources is electrical energy. Electrical energy requires components to store power, one of which is a battery. The battery that is nowaday used widely is the Lithium-Ion type with variations in the type of electrode. Electrodes have an important role for battery performance, especially at the cathode. Predecessor cathode types such as LiCoO2, LiMnO, and LiNiCo have various disadvantages due to their dangerous nature, insufficient capacity and poor stability. NMC cathode (NiMnCo), in this case NMC541 is presented with the aim to overcome these deficiencies. The process of making NMC541 cathode can be done by various synthesis methods, one of which is Co-precipitation. The synthesis parameter has a direct influence on the performance of the cathode precursor produced, especially on its microstructure. For that we try to optimizing the synthesis parameters, such as pH, Stirring Speed, and Aging time, it is expected to produce a precursor that has the desired characterization to become a superior cathode.

Keywords: ***NMC 541, Co-precipitation, pH, Steering speed, and Aging time.***

Study of Synthesis NMC 721 using Oxalate Co-precipitation

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Abstract. Nowadays, Lithium ion batteries (LIB) are becoming the main focus research in scope of energy source & storage, as it provides high energy density, extended life cycle, and light-weight, and also applicable widely among known electronic device. LIB consumption are forecasted to be increased which driven by raw materials' demand in EV industry. Li-NMC has been regarded as preferred cathode material for LIB, compared to other materials such as LCO and LMO. High Ni content as Co substitute in LCO makes the material's cost become lower, while gives better capacity than Mn rich content in LMO batteries. Previous works by researchers focused on transition metal ratio which gives better battery performance, which results in many known NMC types such as NMC 622, NMC 333, and NMC 811. Ni-rich content displays severe cycling performance, and needs to be addressed to improve material's cost and long term performance for EV's application. This research focused on NMC 721 synthesis in variation of different stirring time, and results are then evaluated by XRD and XRF to study their crystal structure and morphology. NMC are synthesized via oxalate co-precipitation method in 60°C of solution. The solution were then taken after 30, 60 and 300 minutes to get the precipitate, which then mixed with variation of 3% and 5% excess of lithium carbonate and goes to sintering process to 900°C for 12 hours. The XRD results in similarity of peak pattern with other types of NMC precursor, while XRF shows the ratio of transition metals at 7.5:1.5:1 which shows more Ni content and less Mn content than expected.

Keywords: *Battery, Electric Vehicle, NMC, Cathode*

Design And Testing Lightweight Electric Trike Vehicle Hybrid With Lithium Battery, Flywheel , and PEM Fuelcell

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Abstract. Nowadays, growing global awareness and need for clean transportation means for people mobility. Lightweight electric vehicles such as electric bicycles, e-scooters, e-trikes becoming popular for urban transport. This paper propose a novel design of an electric trike lightweight vehicle which is combined with multi source energy; a stainless steel solid disc flywheel as kinetic energy storage, lithium battery, and PEM fuelcell. The design prototype has been built, tested on a dynamometer, and analyzed. The result shown that the designated flywheel can improve the performance of the vehicle. Lesser horse power required to reach further distance, clean and renewable energy storage can be used for this transportation means.

Keywords: *Battery, Flywheel, Electric Trike Vehicle, Fuelcell*

Upstream Bottleneck Detection on Electric Vehicle Industry: A Case Study of Indonesian Electric Scooter

Ardhy Yuliawan Norma Sakti [1] , Djarwadi [2 a)] , Miranti Budi Kusumawati [3], Ira Nurhayati Djarot [3], Pradipta Sangga Wiyasa [4]

[1]*Sustainable Energy and Resources Engineering, Thammasat University, Thailand*
[2]*Directorate of Research and Regional Innovation Policy, National Research and Innovation Agency, Indonesia*
[3]*Research Center for Sustainable Production System and Life Cycle Assessment, National Research and Innovation Agency, Indonesia*
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Abstract. The development of the electric vehicle industry has reached a massive level. The significant increase in demand for electric vehicles can be a challenge for the local industry. Hence, The electric vehicle industry encounters various upstream supply problem and contribute to inefficient production. In this study, we focus on the electric scooter industry and set a case study in Indonesia. This study aims to detect upstream supply problems and focused on the area that has a major impact. An integrated approach of DMAIC Methods and tools (Gemba Walks, Interview, Path Diagram, SIPOC Diagram and Fishbone Diagram) were combined to identify this problem. The approach offers a deeper understanding of the upstream bottleneck supply problem. Finally, we found a bottleneck area which causes a major delay in production.

Mobile Electric Rice Huller for Electrifying Agriculture in Indonesia

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[1]*Vice President Market Intelligence & Economy Analysist PT PLN (Persero) Indonesia*

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Abstract. With the population of Indonesia based on 2021 population census of 255 million people, per capita income in 2021 of USD 3440, poverty rate of 11.03% and Indonesia's development index of 0.689, it poses challenges related to the provision of food, housing, clothing, electricity, and internet needs. as the 5 basic needs of the Indonesian people and the importance of Indonesia starting to carry out sustainable development targets (Sustainability Development Goals). In terms of food in 2021, around 31,36 million tons of rice is produced in Indonesia. Indonesia is leading rice producers in the world and rice is a staple food for most Indonesians and it is estimated that rice consumption per human in Indonesia in 2022 will increase to around 123.5 kilograms per capita. In the process of processing rice into rice, there is a grain milling stage to separate rice husks from rice which, if previously done manually, then uses a large rice mill machine that is centered in a certain location, then transforms using a modified diesel truck vehicle which is installed with the rice milling machine so that it can around looking for rice harvest locations in the surrounding area. This vehicle is prohibited from operating and dangerous if operated on the road and has a lot of fossil fuel for mobilization and the grinding process. PT PLN (Persero) is fully committed to supporting the government of the Republic of Indonesia in the implementation of the Sustainability Development Goals, the 2015 Paris Agreement policy, the 2021 Glasgow Climate Pact to technological intervention (renewable energy to battery electric vehicle innovation) in this case has created innovations that transform rice milling vehicles that previously diesel-fueled with a diesel engine propulsion into a battery-electric rice mill that mounts on a 2-4 wheel trailer that can be pulled by a car or tricycle which is more efficient. we call it Mobile Electric Rice huller (MERU). Meru's innovation is expected to be mass-produced because it participates in converting fossil energy into electrical energy and of course it will be cheaper in production and maintenance costs as well as being able to save foreign exchange because it has reduced imported fuel and agricultural activities will be more environmentally friendly.

Keywords: *battery, rice huller, agriculture, energy conversion*

Reducing of Cogging Torque in Segmented Permanent Magnet BLDC Motor IPM V-Shape by Skewing Stator

Dewi Rianti Mandasari[1, a)], Lia Amelia[1, b)], Arga Iman Malakani[1, c)], Agus Krisnowo[1, d)], Cuk Supriyadi Ali Nandar[1, e)]

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Abstract. The Cogging Torque on Brushless DC (BLDC) Motor, in this case on the Internal Permanent Magnet V-Shape motor, causes torque ripple and speed fluctuations. This can interfere with motor operating performance because the motor will not rotate smoothly due to noise and vibration, especially at low rpm. Therefore, the cogging torque must be reduced or eliminated so that the operating performance of the BLDC motor IPM V-Shape that has been designed and built can be better. Several studies have shown various ways to reduce or eliminate cogging torque. This paper will analyze and apply one of the methods to eliminate cogging torque, which is the Skew Method on the stator of the BLDC motor IPM V-Shape through FEA (Finite Element Analysis) simulation using ANSYS Maxwell. The motor's torque, speed, and efficiency will be analyzed to know the effectiveness of the Skew Method on the stator of BLDC Motor IPM V-Shape. The result shows that the Skew Method in the BLDC Motor IPM V-Shape can reduce more than 90% of cogging torque and produce a motor design that has good performance.

Keywords: *Cogging Torque, BLDC IPM V-Shape, Skew Method*

Solar Hydrogen Production from Low Temperature Ink-Based $CuInS_2/In_2S_3$ Heterojunction Photoelectrochemical Cell

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Abstract. Solar energy is the most abundant renewable-energy resources on our planet. Modern technologies are able to harness this tremendous energy for direct usage, mainly via conversion to electricity by photovoltaic (PV) process. However, the intermittent generation of electricity from PV requires complementary technologies for energy storage and utilization for practical large-scale applications. While pairing PV with battery seems a standard solution, storing directly the solar energy in the form of H_2 could provide an eco-friendly fuel for a wide range of applications, including fuel cell electric vehicle as a prime example.

Photoelectrochemical (PEC) water splitting is one of the promising methods to produce H_2 as a near zero-emissions energy carrier. In PEC water splitting, solar energy can facilitate the generation of H_2 at an electrode coated with photoabsorber semiconducting materials. In this report, we investigated PEC hydrogen production from $CuInS_2$ thin film semiconductor coated with In_2S_3 layer. Both materials are fabricated by low-cost spin-coating method utilizing molecular ink precursors without any further high-temperature sulfurization step. This process greatly reduces the fabrication cost of the photoelectrode. $CuInS_2$ and In_2S_3 layers formed p-n heterojunctions, as those found in solar cell, which improved the charge separation, resulting in improvement of photocurrent from 0.2 mA/cm^2 (without In_2S_3 layer) to 1.7 mA/cm^2 (with In_2S_3 overlayer) at 0 V vs RHE and an onset potential of 0.7 V vs. RHE. The photoelectrode had a maximum half-cell solar to hydrogen efficiency of 0.33% at 0.3 V vs. RHE. Details structural and electrochemical characterizations of the photoelectrode will be presented.

Keywords: *Hydrogen, Photoelectrochemical, Solar Cell, Molecular Ink, Thin Film*

Green bonds of Supranational Financial Institutions as Potential Ophelimity Funding for Hydrogen Energy Development in Indonesia

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Abstract. Sustainable development measures and low economic development in Indonesia require funding. New directions in green (sustainable) finance have emerged in the World. One of the green financial instruments is green bonds, which supranational financial institutions first issued. This paper aims to identify the features of green bonds and green projects implemented by the World Bank (WB) and the European Bank to develop hydrogen energy infrastructure in Indonesia. Data were obtained from databases and reports from WB, EBRD, ESDM and the Climate Bonds Initiative. Data analysis was carried out using statistical methods, particularly descriptive and comparative statistics. The positive trend in green bond issuance in the volume and timing of WB and EBRD is revealed, despite the shift in emphasis caused by COVID-19. Renewable energy, energy efficiency and clean transport remain the World Bank's main directions, and the EBRD's green projects account for more than 60% of total project funding. With the green bonds from WB and EBRD, it is hoped that it can be a solution for financing hydrogen infrastructure in Indonesia as a clean and environmentally friendly renewable energy. Supranational financial institutions were the first to come to the forefront of sustainable development funding and are now spearheading the creation of new financial instruments aimed at financing green and social projects, leading to the emergence of sustainable bonds. This potential is a solution to the development of hydrogen infrastructure in Indonesia.

Keywords: *Environmental Sustainability, Green Finance, Indonesian Hydrogen Energy, The World Bank, The EBRD.*

Reverse Electrodialysis (RED) Membrane for Harvesting Salinity Gradient Energy with and without Spacer under Natural Wetland Saline Water

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ABSTRACT

Salinity gradient energy (SGE) allows two solutions with different salt concentration in order to mix into solution and directly flow and produce into electrical energy called reverse electrodialysis (RED) membrane. Theoretically, the high-power outputs are forecasted, however, in the real practices, it is still relatively low RED power efficiency. The spacer shadow effect is occurred due to the application of spacers which has impact on the net energy output. In this work, the spacer shadow effects on both membrane and solution compartment resistances are investigated by employing spacer (material nylon) and without spacer. In addition, this experiment also proposes the power density performance of RED membrane under natural wetland saline water as low saline solution and variation of high saline solution i.e., artificial brackish water (0.3 wt% NaCl) and artificial seawater (3.5 wt% NaCl). The results indicate that the spacer shadow effect on RED membrane has a correlation with the energy output generated. The application of spacer led to an increase in stack resistance and decrease in power density compared not to use spacer. This result increases the impact of RED renewable power source and brings it closer to practical implementation, especially for the potential natural wetland saline water as low saline solution.

Keywords: Wetland saline water, power density, reverse electrodialysis (RED), nylon spacer

Modelling and Simulation of Hybrid Light Railway Vehicle Drive System

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Abstract. Vehicle technology is progressing at a rapid pace, particularly in the area of diesel trains. It will be easier to create technology in the next diesel train vehicle by modelling and simulating a light railway vehicle. In this paper, modelling and simulation of a hybrid light railway vehicle that include, battery, diesel engine, generator and induction machine drive are presented. Simulation results of vehicle configurations and vehicle speed with a battery, diesel engine and induction machine drive combination are discussed. The focus of the model is a detailed assessment of different subsystem components, as can be seen from the experimental results.

Keywords: *Light Railway Vehicle, Hybrid Vehicle, Vehicle Modelling*

National Battery Research Institute

Queen Mary University of London

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Day-3 (Thursday, 23 June 2022)

Session	Time	Code	Estimation	Speaker	Topic	Affiliation
Morning Session (UTC+7)	08.20-08.30	Opening by Master of Ceremony				
	08.30-09.10	PL	40’	Prof. Roberto M. Torresi	Ionic liquid as electrolytes for high-performance positive and negative electrode materials for LIBs	Professor of University of São Paulo, Brazil
	09.10-09.50	PL	40’	Danny Kennedy	Innovating the battery supply chain and the future demand for advanced batteries	Chief Energy Officer at New Energy Nexus, USA
	09.50-10.30	PL	40’	Prof. Dr. rer. nat. Evvy Kartini	Development of battery technology from upstream to downstream based on local mineral resources	Founder of National Battery Research Institute, President of MRS-INA and INSS
	10.30-10.35	Room Transition				
	10.35-12.00	Battery				
		KN	30’	Prof. Giichiro Uchida	High-capacity Li ion battery with nanostructured Ge and GeSn anode fabricated in the low temperature plasma process	Professor at Faculty of Science and Technology, Meijo University, Japan)
		INV	20’	Adinandra Caesar Fachrudin, Evvy Kartini, Muhammad Fakhrudin and Alan J. Drew	Effect of NaOH Treatment on Rice Husk-Derived Graphene on the Presence of Crystalline Silica	National Battery Research Institute, Indonesia
		OR	15’	Ida Hamidah, Andrivo Rusydi, Brian Yuliarto, Markus Diantoro, Ishmah Luthfiyah, and Nuviya Illa Muthi Aturroifah	Effect of Chemical Activator Concentration on Microstructure and Electrochemical Performance of Cassava Tubers Activated Carbon-Based Supercapacitor Electrodes	State University of Malang, Indonesia
		OR	15’	Muhammad Ridho Nugraha and Evvy Kartini	Understanding the commercial lithium ion battery 18650: Analysis of each component inside	National Battery Research Institute
		Renewable Energy				
		KN	30’	Muhammad Firmansyah, SE.	Optimizing Solar Rooftop and Residential for Accelerating Energy Transition	PT. Infiniti Energi Indonesia
		INV	20’	Hartono, Lantip Pramono, Niko Arfana Usti and Yusraini Muharni	Coreless Generator Permanent Magnet Axial Flux 500 Watt for Wind Turbine	Sultan Ageng Tirtayasa University, Indonesia
		OR	15’	Dafit Bagus Maha Bekti and A.A.N. Perwira Redi	Factor Analysis on Customer Intention to Use Rooftop Solar Panel in Indonesia	BINUS University, Indonesia
		OR	15’	Moh. Wahyu Syafi’ul Mubarok and Evvy Kartini	Analysis of Renewable Energy as Export Commodity (Study Case: Indonesia-Singapore)	National Battery Research Institute, Indonesia
	12.00-13.00	Break Session				
Afternoon Session (GMT+7)	13.00-13.45	PL	45’	Prof. Jacqui Murray	Engineering Change – the Faraday Battery Challenge and the UK journey towards net zero	Deputy Director of Faraday Battery Challenge Innovate UK, United Kingdom
	13.45-14.30	PL	45’	Dr. Kim Jong Yeon	Electric Vehicle Policy Trends by Country and How to use the Battery after Use	CEO of TAOS Company, South Korea
	14.30-16.00	Keynote Session				
		Electric Vehicles				
		KN	35’	Dr. Eng. Budi Prawara	Autonomous System of Electric Vehicle	Chairman of Research Organization for

						Electronics and Informatics, BRIN
		INV	25’	Marsalyna, Fandy Septian Nugroho, Achmad Ridho Mubarak, Cuk Supriyadi Ali Nandar, Katri Yulianto, Lambert Hotma and Nur Cholis Majid	Design and Analysis of 2 kW Induction Motor for Electric Motorcycle Application	National Research and Innovation Agency (BRIN)
		OR	15’	Zulfia Hanum Alfi Syahr and Sri Gilang Muhammad Sultan Rahma Putra	Zulfia Hanum Alfi Syahr and Sri Gilang Muhammad Sultan Rahma Putra	National Research and Innovation Agency (BRIN)
		OR	15’	Indra Gunawan, Ahmad Arif Santosa and A.A.N. Perwira Redi	Factor Analysis on Customer Intention to Use Electric Vehicle in Indonesia	BINUS University, Indonesia
		OR	15’	Naufal Fachruly Winanta and Evvy Kartini	Design and Construction of Protection and Monitoring Battery Management System (BMS) on Electric Motorcycle Based on ESP32	STTN BATAN, Indonesia
	16.00-16.30	**Youth Ideas Competition Announcement**				
	16.30-17.00	**Closing Remarks**				

PL= Plenary Session
KN= Keynote Session
INV= Invited Speaker
OR= Oral Contributor

PLENARY LECTURES

Prof. Roberto M. Torresi

Professor Roberto M. Torresi is a Professor at the Fundamental Chemistry Department Institute of Chemistry - University of São Paulo, Brazil. Professor Roberto is also an associate editor of the Journal of the Brazilian Chemical Society. He obtained his Bachelor in Chemical Physics (1980) and PhD in Chemical Sciences (1986) from the National University of Córdoba, Córdoba, Argentina. He did his postdoctoral work at Pierre et Marie Curie University, Paris, France between 1988 and 1990 working with Claude Gabrielli and Michel Keddam. Between 1990 and 1993 he was a visiting professor at the Physics Institute of UNICAMP, Campinas, and from 1994 onwards he became a professor at the São Carlos Institute of Chemistry (USP), São Carlos, where he remained until 2002. He has broad experience in Chemistry, with emphasis on Electrochemistry, working mainly on the following subjects: ionic liquids at room temperature, quartz crystal microbalance, modified electrodes with inorganic, organic or hybrid materials, lithium-ion batteries and electro-intercalation.

Ionic liquid as electrolytes for high-performance positive and negative electrode materials for LIBs

Roberto M. Torresi

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Nanostructured silicon (Si) is a promising anode for the next-generation of high-energy lithium-ion batteries. An important issue for the implementation of silicon is the control of the chemical reactivity at the electrode/electrolyte interface during lithiation and delithiation. Given their relevant physicochemical properties, such as high stability, good transport properties and nonvolatility, modulated by changing the cation or anion, ionic liquids (ILs) hold the possibility to alleviate mechanical failure due to the large volume changes of Si upon cycling. Here, we will anlize the performance of triethyl-n-pentylphosphonium bis(fluorosulfonyl)imide (P2225FSI) and bis(fluorosulfonyl)imide N-methyl-N-butylpyrrolidinium (BMPYRFSI) ILs as outstanding electrolytes for Si/PAN composite electrode. After 1000 charge/discharge cycle, these composite-IL systems exhibit a specific charge capacity of about 1000 mAh g − 1 attained at 1.0 A g −1 with a coulombic efficiency approaching 100%. Such performance makes these electrolytes promising materials for use in lithium-ion battery. On the other side, positive electrode materials as the spinel-type Li1-xMn2O4 material are a promising electrode material for lithium-ion batteries. This material presents 3D diffusion channels through the structure, allowing for the rapid diffusion of lithium ions during charge/discharge processes. Given its relevant properties, such as a

theoretical specific capacity of 149 mA h g-1 and high working potential, we propose LixMn1.8Ti0.2O4@N-doped graphene oxide ($x \leq 1$) as a superior positive electrode material for lithium-ion battery applications. In organic media, the spinel showed excellent Li storage performance due to the incorporation of a conductive carbonaceous matrix (using 1,10 phenanthroline as a graphene precursor). We obtained a specific capacity of 139 mA h g–1, which represented 81% charge retention after 70 cycles. Furthermore, taking advantage of the high working potential of this material, we studied the Li storage capacity using ionic liquids as electrolyte solvents. High rate cycling at high temperatures is essential for their practical applications in extreme environments. In this work, we performed rate capability experiments at different temperatures, obtaining the best response at 40 °C with a specific capacity of 117 mA h g–1 at an applied current density of 1 C. Finally, we will discuss the benefits and problems that ionic liquids present as electrolytes in LIBs.

Danny Kennedy

Danny Kennedy is the Chief Energy Officer for New Energy Nexus, an international organization that supports clean energy entrepreneurs with funds, accelerators and networks. Launched in California, New Energy Nexus now operates programs in China, India, Southeast Asia, and East Africa. Leading up to his role at New Energy Nexus, Danny worked at the California Clean Energy Fund, connecting entrepreneurs everywhere to capital to build an abundant clean energy economy that benefits all. In 2016, CalCEF launched New Energy Nexus. Kennedy is also the President of CalCharge, a public-private partnership with DoE National Labs and universities in California, unions and companies, working to advance energy storage. Kennedy co-founded Sungevity in 2007, the company that created remote solar design, and Powerhouse, a smart energy incubator and accelerator. He was the first backer of Mosaic in 2011, the $2B solar loan provider, and remains on the Board of Powerhive, a solar mini-utility in Kenya and Sunergise, a solar-as-a-service business out of Fiji and EnergyLabAustralia. He is also a Director of the organizations VoteSolar, Power for All and Confluence Philanthropy and adviser to SolarPhilippines. Kennedy authored the book Rooftop Revolution: How Solar Power Can Save Our Economy–and Our Planet–from Dirty Energy in 2012. Prior to being an entrepreneur, he worked at Greenpeace and other NGOs on climate and energy issues for 20+ years.

Prof. Dr. rer. nat. Evvy Kartini

Evvy Kartini is an expert on the neutron scattering and respected internationally. Her international reputation in the field of neutron scattering and solid state ionics, has been well established. She began her research on Superionic glasses early 1990, at Hahn Meitner Institute, Berlin, Germany and supervised by scientists Prof. Dr. Ferenc Mezei. In 1994-1995, during her PhD work, she joint McMaster University, under supervision of Prof. Dr. Malcolm F. Collins. The existence of Boson peaks in $ZnCl_2$ and CKN, glasses were an interesting phenomena, therefore she conducted experiment inelastic neutron scattering at Nuclear Research Reactor, Chalk River Laboratory, Canada. In 1995-1996, she returned to Germany, and finished her PhD at the Technical University (TU), Berlin, Germany. She has been performing international collaborations with prominent International scientists from Bragg Institute, Australia Nuclear Science and Technology Organization (ANSTO), Australia; Japan Proton Accelerator Research Complex (J-Parc), Japan; High Energy Accelerator Research Complex (KEK), Japan; Ibaraki University, Japan; Tohoku University, Japan etc; McMaster University, Canada; and former Hahn Meitner Institute, Berlin, Germany. She has been represented as a leader (President) of the Indonesian Neutron Scattering Society (INSS) since 2013. Since 2012, Evvy Kartini has been appointed as one of referee members of the National Accreditation Journal of the Indonesian Institute of Science. She has been evaluating and reviewing various national journals and contributing on their quality improvements.

Prof. Jacqui Murray

Prof. Jacqui Murray is a Deputy Director of Faraday Battery Challenge Innovate UK, United Kingdom. As Deputy Director of the £318m million Faraday Battery Challenge Jacqui helps lead government investment to develop batteries that are cost-effective, long range, fast charging, durable, safe and recyclable. Her background in the steel industry, environmental regulation and advanced materials innovation provides industrial relevance in her role as a Visiting Professor (Royal Academy of Engineering) at the University of Leicester, where she enhances the engineering program. A keen STEM ambassador, Jacqui takes an active leadership approach on diversity and inclusion throughout her work. Named as one of Autocar's Top 100 Women in Automotive based on Seniority and Influence in 2020.

Engineering Change – the Faraday Battery Challenge and the UK journey towards net zero

Jacqui Murray

R Faraday Battery Challenge Innovate UK, United Kingdom

Abstract: Over the past 5 years, the UK has been transforming its transport system to meet the global challenge of net zero. This dramatic change driven by climate change created the risk that automotive manufacturers based in the UK, Jaguar Land Rover, Nissan, Toyota, Ford and Stellantis could move their European bases off-shore and closer to the manufacture of batteries and cells. The thriving UK automotive sector is based on the UK's knowledge of propulsion and engine manufacture so the solution was to manufacture cells here in the UK. Creating change especially when this urgent and transformational is difficult. The talk will give an insight into how the UK has moved forward as a country, the contribution of the Faraday Battery Challenge over the past 5 years and how eight simple steps (based on Kotter's theory of change) have underpinned the change.

Dr. Kim Jong Yeon

Dr. Jong Yeon Kim is a CEO of TAOS Company, South Korea. TAOS Co., Ltd – Korea provides services that prioritize customer value in the fields of IoT, Cloud, Big Data and Mobile in preparation for the fourth industrial revolution era. In addition, Taos offers connected car services based on cloud platform technology. Dr. Kim earned his bachelor's degree in Plant Genetic Engineering, Catholic University of Daegu in 2005. He continued his Master Degree in Cohesion Materials Physics, Daegu Catholic University and graduated in 2008. Then, Dr. Kim completed his Ph.D. in Materials Science and Chemical Engineering, Daegu Catholic University in 2018. Dr. Kim has various expertise in many fields in particular Electric Vehicles, such as Signal Detection and Analysis Device of Ultrasonic Sensor for Vehicle, Vehicle engine sound generation system, Monitorable secondary battery pack system for electric vehicles, Electric car care system using battery status information, Automobile collision warning system linked with user portable terminal, Electric car battery monitoring system firmware version_2.0, Electric Vehicle Battery Monitoring System (Hybrid_Web), Sensor interlocking firmware using gyro sensor and servo motor, to Monitoring device and method for managing the getting on and off of a vehicle.

KEYNOTE LECTURES

Prof. Giichiro Uchida

Prof. Giichiro Uchida is a Professor at the Faculty of Science and Technology, Meijo University Japan since April 2019. He obtained his Bachelor of Science from School of Engineering, Tohoku University, Japan in March 1994. He continued his learning journey through a Master Degree in the Graduate School of Engineering, Tohoku University, Japan in March 1998. Then, Professor Uchida obtained his Ph.D. at the same faculty and university in March 2001. Professor Uchida has received various prestigious awards since December 2007. Recently, He has been awarded the Best Presentation Award from the 13th International Symposium on Advanced Plasma Science and its Applications for Nitrides in March 2021. Prof. Uchida has published 102 papers, with 57 invited presentations and 12 patents in total.

High-capacity Li ion battery with nanostructured Ge and GeSn anode fabricated in the low temperature plasma process

Giichiro Uchida

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Abstract. The automobile industry is currently shifting towards hybrid and electric vehicles powered by electrochemical energy storage systems, or batteries. Recently, because of the limited capacity of carbon (graphite) anodes in Li-ion batteries, the development of alternative anode materials that are reactive with Li has been actively promoted. Among these, Si, Ge, and Sn are the most interesting materials because they have high theoretical capacities of 4,200, 1,600, and 993 mAh/g, respectively, which are much higher than the value of 372 mAh/g for conventional carbon active material. In this study, we show an method to fabricate Ge and GeSn nanostructures films for Li-ion-battery anodes with low-temperature plasma. The advantage of our process is that it allows direct fabrication of nanoparticle films on a current collector without pretreatment and temperature control by employing a simple single-step procedure. The gas-phase plasma process enables us to form a binder-free nanostructure anode film with only active material, such as Ge, which also allows precise control of nanoparticle aggregation in the film. Ge nanoparticle film was fabricated in a single-step process using low-temperature plasma sputtering under a He-gas high pressure condition of 0.1 Torr [1, 2]. In the such high-pressure range of 0.1 Torr, monodisperse nano-grains of about 56 nm in size were orderly arranged without aggregation. The film porosity, which is important for the stable operation of a Li ion battery, showed a high value of over 30% for the ordered arrangement of amorphous Ge nano-grains. The gravimetric capacity of a Li-ion battery cell with a Ge and GeSn nanostructure anode was analyzed. The GeSn battery cell showed stable behavior with a Coulombic efficiency of 99% after the first 14

cycles, where the highest gravimetric capacity of 1,221 mAh/g was observed. We also observed little fading of capacity over 50 cycles, and a high capacity of 1,128 mAh/g was maintained after 60 cycles, where the capacity retention was as high as 92%. The results show that the higher conductivity of a GeSn anode offers a significant advantage for high capacity retention of Li-ion batteries. In conclusion, precise control of the aggregation of nano-grains, which was realized in our He high-pressure plasma sputtering process, is important for stable cycling of high-capacity metal anodes.

[1] G. Uchida, et al., Sci. Rep. 12, 1701 (2022).

[2] J. Hayashi, et al., Jpn. J. Appl. Phys. 61, SA1002 (2021).

Keywords: *Li ion battery, Ge material, plasma process*

Muhammad Firmansyah, SE.

Muhammad Firmansyah completed his undergraduate education from Padjajaran University Bandung in 2015 majoring International Business Management. Then, He deepened his knowledge in entrepreneurship. Firman began his career at PT. HM. Sampoerna Tbk in 2015. Initially he got a position as a graduate trainee, then as a Consumer Engagement Supervisor. In 2016, he gained a position as Area Supervisor for Multitasking. In 2018, he held the position of Area Analyst and later became Area Manager. In the same year he founded his consulting company named PT. Infiniti Energi Indonesia and became President Director. In addition, he also became a commissioner of CV. Tridaya Cavali.

Dr. Eng. Budi Prawara

Dr. Eng. Budi Prawara is the Chairman of Research Organization for Electronics and Informatics, National Research and Innovation Agency (BRIN), Indonesia. He obtained his PhD and Master degree from University of Ryukyus, Japan on material engineering.

Autonomous System of Electric Vehicle

Yanuandri Putrasari

Research Center for Smart Mechatronics

Research Organization for Electronics and Informatics

Abstract

The Battery-Based Electric Motorized Vehicle Program is intended to support the national emission reduction program while at the same time providing new opportunities for the economy and down streaming of natural resources as well as strengthening artificial intelligence (AI) and robotic technology in supporting the productivity of national industries in the future. Thus, the development of core technology and supporting technology for electric vehicles will be one of the keys to success that will support the success of this program, as well as become a technology that can be utilized by other industries to improve the national economy. The main keys to the Autonomous System of Electric Vehicle that will be discussed are Object detection using LIDAR, RADAR and Camera, Information and Telecommunication Systems, Big Data, and Data Security for AEV, C-V2X, Vehicle Sensor and Computer Vision, and last but not least is Human-Vehicle Interaction and Voice Recognition.

ORAL CONTRIBUTORS

Effect of NaOH Treatment on Rice Husk-Derived Graphene on the Presence of Crystalline Silica

Adinandra Caesar Fachrudin[1, a)], Evvy Kartini[1, 2, b)], Muhammad Fakhrudin[1, 2] and Alan J. Drew[1, 3]

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Abstract. Graphene is produced using green synthesis approaches from rice husk, called rice husk-derived graphene (GRHA). Due to the high silicon content compared to carbon in raw rice husks, this research will add sodium hydroxide (NaOH) treatment to reduce silica in the obtained GRHA, commonly known as desilication. Rice husk ash (RHA) was mixed with NaOH solution by stirring at 80 °C for 3 hours, followed by filtering, washing, and drying. Variation in NaOH concentration is 0.5, 1.0, and 1.5 M to study the optimal one added between the carbonization and activation at high temperature with potassium hydroxide (KOH). EDS spectrums confirmed that the NaOH treatment could reduce silica, and the most optimal concentration was found at GRHA-1.0, as it has the highest carbon content of up to 80%. SEM images also showed a crumpled structure and a few folded shapes of layered graphene with a thickness of several nanometers. XRD patterns showed that the three samples contain silica with high crystallinity. It is due to thermal treatment, which is also responsible for converting silica from amorphous to crystalline. The methodology is a promising way to increase the added value of rice husks with a cost-effective process while reducing the wasted as an environmental burden.

Keywords: *Rice Husk, Graphene, Silica, NaOH, Desilication*

Coreless Generator Permanent Magnet Axial Flux 500 Watt for Wind Turbine

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Abstract. Geographical Indonesia is located on the equator which has relatively small wind potential. However, this does not rule out the possibility to build a wind turbine in Indonesia. Axial flux permanent magnet generator is one of the right choices to build a wind turbine. Axial flux permanent magnet generators have a smaller construction than conventional generators, namely radial. Some aspects must be considered from the generator used to build a wind turbine, namely mass, cogging effect, and output power. This aspect causes the generator to be designed to be optimal without using an iron core (coreless) and NdFeB magnets. The design of a permanent magnet coreless axial flux generator with a diameter of only 155 mm and a mass of 2,377 Kg is capable of producing an output power of 510.56 Watts at 250 rpm and 1687.27 Watts at 500 rpm. The use of NdFeB magnets causes a high output power compared to PM12 magnets. With the permanent magnet coreless generator, it is hoped that it will be able to generate the use of wind turbines in Indonesia.

Keywords: *Renewable Energy, Axial Flux Generator, Coreless Generator, Cogging Effect,*

Factor Analysis on Customer Intentions to use Rooftop Solar Photovoltaic in Indonesia

Dafit Bagus Maha Bekti [1,a)], and Anak Agung Ngurah Perwira Redi [1,b)]

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Abstract. Many equatorial nations, including Indonesia, have solar energy potential. Despite its promise, adoption is minimal. Several studies have explored the potential, viability, and supporting policy of this technology, but none from the consumers' national standpoint. This study examines the elements impacting consumers' inclination to utilize solar PV in Indonesia to build a circular supply chain for renewable energy. It was built on combining UTAUT2 and TPB (TPB). 208 people completed the online survey. SEM was used to determine the hypothesis' causality. Price Value (PV) has a favorable association and a considerable effect on Attitude Toward Use (ATU), which leads to Behavioral Intention (BI). This is the first research to examine rooftop solar panel usage based on UTAUT2 and TPB. Successful photovoltaic use will reduce waste and reinforce the circular supply chain, supporting sustainable growth.

Keywords: *solar photovoltaic; UTAUT2; circular supply chain; sustainability development*

Design and Analysis of 2 kW Induction Motor for Electric Motorcycle Application

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Abstract.

The increase of demand in electrical vehicles initiates this research intending to reach high-performance electric motors applicable for motorcycles. The induction motor is used in this research because it has low cost, simple construction, easy maintenance, and speed control. In order to be directly applied widely, the dimensions of the motor are adjusted to the general size of the electric motorcycle chassis which makes the motor size very compact and will reduce efficiency. Motor performance must also be reliable on all terrains, namely flat tracks, uphill and also reliable in transporting one or two passengers. An approach of the numerical method and performance simulation are carried out simultaneously. In this paper, the design of the motor component is obtained by analytical calculations using MATLAB and performance analysis using ANSYS MAXWELL. The motor's speed, torque, and efficiency will be analyzed to comply with the design requirements. Several changes such as the use of winding composition, slot type, and dimensional changes will be realized and the results will be analyzed in each track condition. The result shows the efficiency of the motor is 83.96% on a flat track and with one passenger. This is a good value of efficiency for a power rating of a 2 kW induction motor.

Keywords: *Electric Vehicle, Induction Motor, Electric Motorcycle, Motor Design, Performance Analysis*

Informal Sector Management Policy in Electric Vehicle Battery Recycling Cycle

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Abstract. The Indonesian government has issued several regulations to accelerate the realization of electric vehicles with battery technology. The effort to realize electric vehicles as a substitute for fossil fuel vehicles is a tangible manifestation of the Indonesian government's commitment to reducing carbon emissions. Of course, in accelerating the development of electric vehicles, some infrastructure must be prepared to start from the availability of the main material nickel for the manufacture of batteries, as well as the management of industrial areas by ensuring the survival of the surrounding community and the preservation of nature. Not only that but policies related to waste management from vehicle batteries must also be prepared. Battery waste is classified as electronic waste which contains many hazardous chemicals. Therefore, the focus of this study is how to determine the policy recommendations for the management of electric vehicle battery waste by utilizing the informal sector. The method used is quantitative with a desk review approach through a literacy study of several regulations and references. Then the results of the study were analyzed descriptively to obtain the concept of the required policy formulation. The results show that the informal sector can indirectly play a role in the battery recycling cycle. The role of the informal sector can be optimized through an educational process to prepare a battery-based electric vehicle ecosystem.

Keywords: *battery, electric vehicle, electronic waste, informal sector, recycling*

Factor Analysis on Customer Intentions to use Electric Vehicle in Indonesia

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Abstract. Electric cars can help Indonesia handle problems like pollution, health, and high fossil fuel usage, which can't be met domestically. This study uses structural equation modeling to explore Theory of Planned Behavior (TPB), Unified Theory of Acceptance and Use of Technology - 2 (UTAUT2), and risk perception to present an overview of the variables driving interest in electric cars in Indonesia. 526 people were surveyed in various Indonesian cities. The model accurately predicted the research variables. TPB's constructs are attitude toward use, subjective norm, and perceived behavior control. Perceived behavior control positively affects interest in electric vehicles, while attitude toward use is influenced by performance expectancy, effort expectancy, hedonic motivation, price value, functional risk, financial risk, and social risk. Facilitating situations affect perceived behavior control. Attitude toward usage is the most significant element on interest in electric cars; consequently, aspects such as performance expectation, effort expectancy, hedonic motivation, price value, functional risk, financial risk, and social risk need to be considered.

Keywords: *Electric Vehicle; Theory of Planned Behavior; Unified Theory of Acceptance and Use of Technology-2; Perceived Risk*

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