UNIVERSITAS INDONESIA

FAKULTAS TEKNIK

i-TREC

Towards Tropical Renewable Energy Innovation and Technology Integration

THE 2nd INTERNATIONAL TROPICAL RENEWABLE ENERGY CONFERENCE (i-TREC)

3-4 OCTOBER 2017
COURTYARD BY MARRIOTT
NUSA DUA, BALI
INDONESIA

PROGRAMME BOOK

in conjunction with : iTech Scopus IOP Conference Series Earth and Environmental Science

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PREFACE FROM THE GENERAL CHAIR

Eny Kusrini, Ph.D.

General Chair of The 2nd i-TREC

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On behalf of the 2nd International Tropical Renewable Energy Conference (i-TREC) 2017, I would like to welcome all of you to the majestic island of the Gods, Bali. This year the 2nd i-TREC 2017 conference is the second international conference we've had since the founding of the Tropical Renewable Energy Center (TREC) at the Faculty of Engineering Universitas Indonesia. Following last year's successful conference, this year, the 2nd i-TREC 2017 addresses the theme of "Towards Tropical Renewable Energy Innovation and Technology Integration".

The 2nd i-TREC 2017 aims to promote an opportunity and challenge tropical renewable energy integrated with environmentally safe and economically sustainable, to create a theoretical base of the development, utilization, implementation for further application of tropical renewable energy sources. This 2nd i-TREC 2017 brings together national and international academicians, researchers, executives, government, industrial and business officials, practitioners and leaders to present and discuss a vast range of technology and innovation based on green and smart technology on renewable energy. It is our hope and aim that this conference would be able to provide an international media for exchange of the knowledge, experience, and research as well as the review of progress and discussion on the state of the art and future trend of prospective collaboration and networking in broad field of technology, and innovation of renewable energy. Furthermore, this event would be beneficial for industrial sector, since it would be a forum for fruitful discussions between and among the audiences.

With three symposia, namely Renewable Energy System and Regulation; Biomass and Biotechnology; and Multifunctional and Advanced Materials for Renewable Energy Applications, we have received more than 234 abstracts and have selected 166 fullpapers for presentation from researchers all around the world. We have papers from Malaysia, Singapore, Japan, France, Brazil, Australia, Saudi Arabia and from our home country, Indonesia. We hope that this conference will grow to provide platforms and forums to disseminate our scientific achievements and exchange information for further research and education collaboration on renewable energy especially for the tropical region.

On behalf of the 2nd i-TREC 2017 committee, I would like to thank all of our keynote and invited speakers, participants, contributors, partners and professional associations for their generous contributions. I would also like to acknowledge a special thank you to our Advisory Board members and distinguished reviewers and also to our local co-organizer, the Department of Mechanical Engineering of Udayana University. Last but not least, to our Main Sponsor, the Office of Research and Innovation Product Management (KPPRI) Universitas Indonesia, our Platinum Sponsor, PT. Perusahaan Listrik Negara (PLN), our Bronze Sponsor PT. Wijaya Karya (WIKA) and support from PT. Luas Birus Utama. To our fellow participants from Indonesia or overseas, please welcome and enjoy your time with us and may this two days will be as fruitful as we hope it will be.

Eny Kusrini, Ph.D

The 2nd i-TREC 2017 General Chair

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Prof. Dr. Ir. Akhmad Herman Yuwono, M.Phil.Eng.	Assoc. Dean on Research and Community Service, Faculty Engineering, Universitas Indonesia

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Event	Tikka Anggraeni, M.Si.	Faculty Engineering, Universitas Indonesia
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KEYNOTE SPEAKER

YVES ANDRES
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Dr. Yves Andrès has been Professor for six years at IMT Atlantique (previously, Ecole des Mines de Nantes) Bretagne-Pays de La Loire, Nantes, France. He is Head of the Energy Systems and Environment Department and leader of the "Ecotechnology" group of the GEPEA, a joint research unit of CNRS (UMR CNRS 6144), in which the IMT Atlantique is a partner as well as ONIRIS and the University of Nantes. He holds a PhD from the University of Strasbourg (1994) in Molecular Biology and Microbiology: Environmental Microbiology. His research focuses on bioprocess applied to water and air treatment such as waste biomass to energy using anaerobic digestion or microbial fermentation, as well as the fate and persistence of microorganisms in these processes. He published 100 peer reviewed research papers and supervised 30 PhD students.

"Integrated approach for Waste to Energy or Resources Recovery"

Abstract.
With the increase in world population, estimated to be 9.5 billion people by 2050, the amount of solid waste generation is expected to growth much higher due to the rapid urbanization and industrialisation. As per the World Cities report 2016 (UN-Habitat, 2016), nowadays, cities are home to 54 per cent of the world's population, and by the middle of this century that figure will rise to 66 per cent. Most megacities are located in developing countries and this trend will continue as several large cities in Asia, Latin America and Africa are projected to become megacities by 2030. The fastest growing urban centres are the small and medium cities with less than one million inhabitants. The high generation rates of waste and its disposal to open dumpsites or non-sanitary landfills are resulting in adverse environmental, economic and social problems. The efficient treatment of waste is critical not only from a sanitation point of view but also due to associated economic and environmental benefits. In the same time energy demand is expected to increase considerably in the coming years as the result of population growth and economic development. The largest increases in energy demand will take place in developing countries where the proportion of global energy consumption is expected to increase from 46 to 58 percent between 2004 and 2030 (FAO, 2010). Therefore, the strategic deployment of renewable energy is required to reduce the GHG emission in comparison to conventional fuels. Energy and biofuels production from organic solid waste or from non-food feedstocks that reduce the land use is a good option to improve the solid waste management and to fulfill the energy demand increase. An integrative approach developed in biorefinery technologies such as pyrolysis, fermentation, gasification, anaerobic digestion (AD), hydrothermal liquefaction, incineration, and refuse derived fuel (RDF) have emerged as promising methods to produce fuels from non-food feedstocks such as

agricultural and forest biomass waste, municipal and industrial organic waste or plastic waste. Physicochemical technologies such as transesterification use chemical agents to convert waste oil and fat into liquid fuels. Therefore, if such technologies could be combined under an integrated waste biorefinery concept, mixed and multiple wastes could be treated to produce various products in the form of fuel, electricity and heat along with value-added chemicals. From the conclusions of various research projects Nizami et al. (2017) recommend some criteria to follow before developing any biorefinery technology in developing country: (i) Waste composition and its (bio)chemical characterization; (ii) Waste generation rates; (iii) Energy contents; (iv) Advantages and limitations of each biorefinery technology for a particular region; (v) Technical and economic benefits of each biorefinery technology for a particular region; (vi) LCA of biorefinery technology including its technical, economic and environmental assessment.

The aim of the paper is to present a general overview of waste to energy project and resources recovery and to discuss the future technological development in the context of tropical developing countries.

KEYNOTE SPEAKER

WIDODO WAHYU PURWANTO
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Widodo Wahyu Purwanto is a professor in Sustainable Energy at the Department of Chemical Engineering, Faculty of Engineering, Universitas Indonesia. He earned his doctoral degree in chemical engineering from the Institut National Polytechnique de Toulouse (INPT), France in 1992. Prof Widodo has served as Director of the Center for Energy Studies, Universitas Indonesia (PEUI) from 2004 to 2007, Head of the Department of Chemical Engineering Universitas Indonesia, from 2007 to 2013, and Chairman of the Association of Higher Education in Chemical Engineering Indonesia (APTEKINDO) 2009-2012. He is currently the editorial board of Journal of Natural Gas Science and Engineering - Elsevier, Head of research cluster on Sustainable Energy Systems and Policy Universitas Indonesia (http://sesp.ui.ac.id/), member of the National Research Council (DRN) - technical commission energy, and senior member of American Institute of Chemical Engineers (AIChE). Prof Widodo research focus include: (i) Sustainable energy system modeling and policy analysis and (ii) Nano-materials for sustainable energy technology. Prof. Widodo has published more than 100 scientific journals and two books, and has graduated 18 PhD, more than 60 Master and was guiding 5 PhD students.

"THE ROLE OF RENEWABLE ENERGY IN DESIGNING SUSTAINABLE ENERGY SYSTEM AND POLICY FOR AN ARCHIPELAGIC STATE"

Abstract

Indonesia, the world's largest archipelagic state, has sizeable fossil and substantial renewable energy resources, however, high disparity in population density, infrastructure, economic level, and distance between energy sources and consumers inflict a discrepancy in a complex energy system performance among regions and incurs challenges in developing sustainable energy system and policy. In this regard, The review discusses current energy status in Indonesia and identifies the barriers. An assessment of the role of renewable energy in designing sustainability of energy system, by multi-scale, multi-region, and multi-creteria approaches, are presented. Finally, the key recommendations of research challenges are proposed.

KEYNOTE SPEAKER

ANUTOSH CHAKRABORTY
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Dr. Anutosh Chakraborty is an Assistant Professor at the School of Mechanical & Aerospace Engineering since January 2010. He obtained his BSc (Mechanical Engineering) from Bangladesh University of Engineering & Technology (BUET) in 1997. He then obtained his MEng and PhD degrees from the department of Mechanical Engineering, National University of Singapore (NUS), in 2001 and 2005 respectively. Later he worked at the Institute for Materials, Chemistry and Engineering, Kyushu University, Japan as a lecturer for one year.

He was awarded the Japan Society for the Promotion of Science (JSPS) postdoctoral fellowship in 2007. He is the PI and Co-PI of several projects funded by A*STAR MND, MCERP, MOE, NTU internal and NRF Competitive Research Program. His research interest includes: Adsorption Thermodynamics, Adsorption/Absorption cooling, Adsorption Gas Storage and Metal Organic Frameworks, Thermoelectric cooling and power generation, Sorption Desalination.

"ADSORPTION CHARACTERISTICS OF VARIOUS TYPES OF SILICA GEL – WATER SYSTEMS FOR COOLING AND DESALINATION APPLICATIONS"

Abstract :
The knowledge of water uptakes on silica gel under static and dynamic conditions are necessary for understanding adsorption isotherms and kinetics, which enables us to design thermal compressor for adsorption assisted heat transmission applications such as adsorption cooling and desalination. In this article, we report an experimental study to calculate the amount of water uptakes for the temperatures ranging from 30 oC to 65 oC and pressures up to 8 kPa. We use gravimetric method to calculate water uptakes. Hence five types of silica gels (Types-RD, A, 3A, A5BW and A++) are investigated using a surface characteristic analyzer, which employs the static volumetric method with liquid Nitrogen at 77 K as the filing fluid. The surface area of each adsorbent is studied using Brunauer–Emmett–Teller (BET) method whilst the pore size distribution (PSD) analysis is conducted with the Non-Local Density Functional Theory (NLDFT).

KEYNOTE SPEAKER

FARID NASIR BIN ANI
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Professor Farid Nasir Bin Ani received his Bachelor degree from Glasgow University in UK and continued his study in Master of Science in Thermodynamics and Related Studies in Birmingham University where he graduated in 1985. He received his Ph.D in Fuel and Energy in 1992 from Leeds University in UK. December 2017 would mark his 35 years' time of service at the Universiti Teknologi Malaysia. His Global Frontier Researches includes: Microwave Processing of Biofuels and Biomass Wastes, Plasma Incineration and Gasification of Waste Materials, Laser Pyrolysis of Carbonaceous Waste, Ultra Supercapacitor from Carbon Sources, Microwave Processing of Activated Carbon and Related Products. He is UTM's University Top Publication Figure in 2005 and also Top Research Scientist of Malaysia – Academic Sciences Malaysia in 2015. Prof. Farid Nasir Bin Ani has published 9 books with 6 patents granted and 14 patents filings. Up to date, he has received more than 35 awards on Academic and Inventions and as Principle Researcher currently manage a research grants worth more of RM3.5 Million.

"MICROWAVE INDUCED THERMAL PROCESSING OF BIODIESEL AND BIORESOURCES"

Abstract. Energy crisis and continuously fluctuating cost of petroleum have move attention of researchers toward renewable energy and sustainable materials sources. Biomass or bioresources and crop oils are available in abundantly and cheap sources that are environment friendly in tropical countries. It has been identified as one of the main sources of the sustainable and renewable energy and materials in this region. One example of utilization of biomass is in the processing of palm oil industries. The presentation describes several possible routes to provide energy as well as potential value-added products from bioresources. The trend in thermo-conversion processing of the biomass is the application of microwave energy into renewable biofuels, materials and chemicals. The potential uses of agro-products and agro-solid wastes for biofuels, materials and chemicals are highlighted. The applications of these biofuels, materials and chemicals have been applied in some countries around the world. The implementation and utilization of this technology will be feasible when the technology is developed, fabricated and commission locally with locally produced biomass. With advanced research and development efforts, together with local expertises, indigenous technologies could be developed and produced, thus reducing the high cost of import technologies.

KEYNOTE SPEAKER

ANDIANTO HIDAYAT
Pertamina Research & Technology Center
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Andianto Hidayat graduated in 1991 from Gadjah Mada University, Indonesia, majoring in Chemistry. Between
1997- 1998 he continued to study Surface Engineering & Tribology at the University of Leeds, United Kingdom, where he achieved Master degree in Mechanical Engineering. He joined PT Pertamina (Persero) in 1994 as Marketing &
Trading R&D Assistant for 5 years where he produced numerous important studies on LPG Business, Fuel Supply Chain & Transit Terminals, and KPI Implementation.

From 2000 to 2010 he was assigned as Lubricant Engineer, during which, he setup the foundation for company's overseas market expansion program for Lubricant Business. Within three years, he has successfully opened Pertamina's lubricant market in Pakistan, Belgium, China, UAE, Myanmar, Australia, and Singapore. Between July 2016 and June 2017, he runs the Board of Commissioners office at PT Pertamina Geothermal Energy as Secretary to Board of Commissioners. As of July 2017 to the present, Mr. Hidayat is appointed as Vice President Research & Technology Planning & Commercial at the Pertamina Research & Technology Center.

KEYNOTE SPEAKER

KEYNOTE SPEAKER

DJOKO RAHARDJO ABUMANAN
State Electrical Company (Perusahaan Listrik Negara)

Djoko Rahardjo Abumanan was born in Surabaya, 10 September 1960. He graduated from Bandung Institute of Technology in 1985 with a Bachelor Degree in Engineering. He then finished his Master degree from Jakarta Institute of Management Studies in Jakarta majoring in Finance in 1999.

His career in the National Electricity Company/Perusahaan Listrik Negara varied in in position. From 2011 – 2014 he was the General Manager for PLN for Riau and & Riau Islands, Central Java and Jogjakarta. He was the Head of Division of New and Renewable Energy in 2014, General Manager for PLN West Java and Banten Area in 2015. From 2015 to July 2017 he was appointed as the Regional Business Director for Kalimantan Region for PLN. Currently he is the Regional Business Director for East Java, Bali and Nusa Tenggara for PLN.

INVITED SPEAKER

AKHMAD HERMAN YUWONO
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Prof. Dr. Ir. Akhmad Herman Yuwono, M.Phil.Eng graduated from Universitas Indonesia with a Bachelor of Engineering. He continued to pursue his Master Degree in the University of Cambridge in the United Kingdom and was awarded a Doctorate Degree from the National University of Singapore in Materials Science and Engineering.

With over 20 research experiences under his belt, Prof. Akhmad Herman Yuwono has published around 40 papers in International Journals. He was awarded the Scientific Award for Researcher for Universitas Indonesia in 2013. He currently served as both Professor in the Metallurgy & Materials Engineering and the Associate Dean for Dean for Research and Community Engagement Faculty of Engineering Universitas Indonesia.

INVITED SPEAKER

SARY AWAD
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Dr. Sary Awad Achieved his Ph.D in energy and process engineering in 2011 at Ecole des Mines de Nantes. He was a lecturer and research assistant at Ecole Polytechnique de l'Université de Nantes between 2010 and 2012. Since 2012 he is assistant professor at IMT Atlantique and is in charge of alternative fuels adaptation on combustion engines.

He is currently involved in research projects dealing with alternative fuels production from different types of residues and their adaptation to internal combustion engines. He also develops models of combustion analysis and predictive models correlating fuels characteristics to their behaviour while used on engines. He was also involved in studies aiming the industrialization and economic analysis of waste to biofuel processes.

"Experimental Study on The Effects of Feedstock Composition on The Properties of Biodiesel"

Abstract. Biodiesel as an alternative diesel fuel holds promise for the future of alternative fuels. Biodiesel that derived from renewable resources such as vegetable oils and animal fat was used in this experimental study. The main objective of this study is to produce biodiesel from different initial feedstock and to study the composition and the quality of produced biodiesel. Biodiesels samples were produced from seven different types of vegetable oil (sunflower, peanut, walnut, beef tallow, rapeseed, hydrogenated coconut and hydrogenated copra oil). Then, biodiesel quality was tested according to the EU 14214. The results have related methyl ester profile to several specifications such as viscosity, density, flash point, cold filter plugging point, higher heating value, iodine value and oxidative stability. The results show that high degree of unsaturation will increase the higher heating value and density. On the other hand, large number of double bonds will lower the oxidation stability and reduce viscosity.

THE 2nd INTERNATIONAL
TROPICAL RENEWABLE ENERGY CONFERENCE (i-TREC)

3-4 October 2017
Courtyard by Marriott Nusa Dua, Bali, Indonesia

General Conference Schedule

The 2nd i-TREC 2017

2-4 October 2017

Date	Time	Program	Keynote/PIC	Venue
2-Oct-17	17.00 - 19.00	Welcome Drink and Early Registration		Pool Terrace
3-Oct-17	07.00 - 08.00	Registration		Function Room outside of Ballroom
	08.00 - 09.00	**Opening Ceremony**		Palma 1 & 2
	09.00- 13.45	**Plenary Sessions**	**Moderated by: Mohammed Ali Berawi, Ph.D**	
	09.00 - 09.30	Plenary Session-1	**Prof. Yves Andres** IMT Atlantique, France	
	09.30 - 10.00	Plenary Session-2	**Prof. Widodo Wahyu Purwanto** Universitas Indonesia	
	10.00 - 10.30	Plenary Session-3	**Perusahaan Listrik Negara** (State Electricity Company)	
	10.30 - 10.45	Disscussion Session 1	Moderator & Plenary Speakers Session 1	
	10.45 - 11.00	Coffee Break	Organizing Committee	
	11.00 - 11.30	Plenary Session-4	**Prof. Anutosh Chakraborty** Nanyang Technological University	
	11.30 - 12.00	Plenary Session-5	**Prof. Farid Nasir Ani** Universiti Teknologi Malaysia	
	12.00 - 12.30	Plenary Session-6	**Drs. Andianto Hidayat M.Sc (Eng)** Pertamina Research & Technology Center	
	12.30 - 12.45	Disscussion Session 2 Closing of Plenary Lectures	Moderator & Plenary Speakers Session 1	
	12.45 - 13.45	Lunch Break		Restaurant
	13.45 - 18.00	**Parallel Session**	Session Chair	Krisan 1, Krisan 2, Krisan 3
	15.00 - 15.15	Coffee Break		
	19.00 - 21.00	**i-TREC Banquet Dinner**	All Participants	Palma 1 & 2
4-Oct-17	07.00 - 08.00	Registration		Function Room outside of Ballroom
	08.00 - 17.00	**Parallel Session**	Session Chair	Krisan 1, Krisan 2, Krisan 3
	10.00 - 10.15	Coffee Break		
	10.15 - 12.00	Parallel Session	Session Chair	
	12.00 - 13.00	Lunch Break		Restaurant
	13.00 - 17.00	Parallel Session	Session Chair	Krisan 1, Krisan 2, Krisan 3
	15.00 - 15.15	Coffee Break		
	17.00 - 18.00	**Closing Ceremony**		Krisan

TECHNICAL PROGRAM

DAY 1 PARALLEL SESSIONS

Tuesday, October 3rd 2017 | Krisan Room 1 | 13.45 -15.15

Symposia 1 Renewable Energy System and Regulation

Session Chair : Dr. Nasruddin

No	Paper#	ID	Author(s)	Title	Affiliation	Time
1	-	Invited Speaker	Dr.-Ing. Eko Adi Setiawan	Evolution of Electricity Grids	Univ Indonesia	13.45 – 14.00
2	10127	01.03.01	Subhan Petrana, Eko Adhi Setiawan, Muhammad Yunus H. Abbas	Improving Energy Consumption Model with Principal Component Analysis Method for Small Village Community	Universitas Indonesia	14.00 – 14.15
3	11464	01.03.02	Matthias Guenther	Challenges of a 100% renewable energy supply in the Java-Bali	Swiss German University	14.15 – 14.30
4	12445	01.03.03	Arief Murnandityo	Study and Development of Investment Feasibility Application of Renewable Energy-based Power Plant Under Willingness to Pay and Ability to Pay Approach for Revenue Potency	Univ Indonesia	14.30 – 14.45
5	10455	01.03.04	Muhammad Arif Budiyanto, Nasruddin Yusuf Nasruddin, Reyzando Nawara	Comparative Study of The Monthly Global Solar Radiation Estimation Data in Jakarta	Univ Indonesia	14.45 – 15.00
6	10452	01.03.05	Muhammad Arif Budiyanto, Nasruddin Yusuf Nasruddin, Muhammad Hanafi Lubis	Study on the Hourly Solar Radiation in Depok, West Java, Indonesia	Univ Indonesia	15.00 – 15.15
Coffee Break						15.15 – 15.30

DAY 1 PARALLEL SESSIONS

Tuesday, October 3rd 2017 | Krisan Room 2 | 13.45-15.15

Symposia 2 Biomass and Biotechnology

Session Chair : Dr. S.D. Sumbogo / Dr. Yuta Sudo

No	Paper #	ID	Author(s)	Title	Affiliation	Time
1	004	02.01.01	A.Q. Mairizal, S. Awad, G. Burnens, C.R.Priadi, K. Loubar, M. Tazerout, Y.Andred, S.S.Moersidik, D.M. Hartono	Experimental Study on The Effects of Feedstock Composition on The Properties of Biodiesel	Environnement, IMT Atlantique, 4 Rue Alfred Kastler, CS 20722, 44307, Nantes, France	13.45 – 14.00
2	12596	02.01.02	Nur Hamzah Said	Emission and performance Characteristics of Waste Cooking Oil Biodiesel Blends in a Single Cylinder DI Diesel Engine	Universiti Teknologi Malaysia	14.00 – 14.15
3	12691	02.01.03	Mochammad Ilham Attharik	The Effect of Antioxidant Additives on the Growth of Deposits on the Use of Biodiesel Fuel (B100) at Certain Temperatures	Univ Indonesia	14.15 – 14.30
4	12658	02.01.04	Risya Utaviani Putri	Synthesis of Green Diesel Through Hydrolysis and Hydrodeoxygenation of Waste Cooking Oil Using NiMo/Al2O3 Catalyst	Univ Indonesia	14.30 – 14.45
5	12669	02.01.05	Elsa Ramayeni	Synthesis of Partially Hydrogenated of Kemiri Sunan Biodiesel (H-FAME) using NiMo/Carbon Catalyst to Increase Oxidation Stability of Biosolar	Univ Indonesia	14.45 – 15.00
6	9532	02.02.06	Haroki Madani, Arie Wibowo, Hermawan Judawisastra, Elvi Restiawaty, Chrisella Lazarus, Yogi Wibisono Budhi	An eco-friendly preparation of cellulose nano crystals from oil palm empty fruit bunches	ITB	15.00 – 15.15
Coffee Break						15.15 – 15.30

DAY 1 PARALLEL SESSIONS

Tuesday, October 3rd 2017 | Krisan Room 3 | 13.45 -15.15

Symposia 3 Multifunctional and Advanced Materials for Renewable Energy Applications

Session Chair : Prof. Anne Zulfia

No	Paper#	ID	Author(s)	Title	Affiliation	Time
1	-	Invited Speaker	Prof. Akhmad Herman Yuwono, Ph.D.	Development of Nanostructured Semiconductor Oxides and Natural Dyes from Indonesian Resources for Dye Sensitized Solar Cell	Univ Indonesia	13.45 – 14.00
2	003	03.04.01	B Munir, B E Prastyo, E Y Muslih	Synthesis and characterization of Cu2ZnSnS4 thin film prepared by appropriate non-stoichiometry precursor	Univ Indonesia	14.00 – 14.15
3	13000	03.04.02	Nofrijon Sofyan, Frans Wensten Situmorang, Aga Ridhova, Akhmad Herman Yuwono, Arief Udhiarto	Visible Light Absorption and Photosensitizing Characteristics of Natural Yellow 3 Extracted from Curcuma Longa L. for Dye-Sensitized Solar Cell	Univ Indonesia	14.15 – 14.30
4	12693	03.04.03	Nyayu Aisyah	Exergetic and Economic Analysis of Solar Assisted Heat Pump Using Multi Objective Genetic Algorithm	Univ Indonesia	14.30 – 14.45
5	12992	03.04.04	Erlina Yustianti dan Azwar Manaf	Enhanced Dielectric Properties of Nanocrystalline Ba(1-x)SrxTiO3 (x=0 and 0.3) Ceramics	Univ Indonesia	14.45 – 15.00
6	010	03.04.05	Sutrasno	Utilization of Super Hydrophobic Membrane Contactor for NOx Absorption	Univ Indonesia	15.00 – 15.15
Coffee Break						15.15 – 15.30

DAY 1 PARALLEL SESSIONS

Tuesday, October 3rd 2017 | Krisan Room 1 | 15.30 -16.45

Symposia 1 Renewable Energy System and Regulation

Session Chair : Session Chair : Dita Trisnawan, M.Arch. STD

No	Paper#	ID	Author(s)	Title	Affiliation	Time
1	13131	01.02.01	FX Teddy Badai Samodra	Optimization of Architectural Electroacoustic Design for the Vertical Building Structure of Interior Mezzanine	ITS, Surabaya	15.30 – 15.45
2	13134	01.02.02	FX Teddy Badai Samodra, Ima Defiana, Wahyu Setyawan	Tropical X-Y Transformation Design for Building Courtyard Integrated Photovoltaic	ITS, Surabaya	15.45 – 16.00
3	11588	01.02.03	Inas Nabilah Fauziyyah, Arrad Ghani Safitra, Fifi Hesty Sholihah	Experimental study of slope angle and antireflective glazing	Polytechnic Institute of Surabaya	16.00 – 16.15
4	006	01.02.04	Danny Tirta Winata, Sabrina Nurul Hidayah and Ayomi Dita Rarasati	Sustainable Infrastructure Transportation to Improve Society Wellbeing in Karawang	Univ Indonesia	16.15 - 16.30
5	13156	01.02.05	Hartono Budi Santoso, Sri Paryanto Mursid, Sapto Projogo	Review: Home Energy Management System In A Smart Grid Scheme To Improve The Power Quality Of Power Systems	Politeknik Negeri Bandung	16.30 – 16.45

DAY 1 PARALLEL SESSIONS

Tuesday, October 3rd 2017 | Krisan Room 2 | 15.30-16.45

Symposia 2 Biomass and Biotechnology

Prof. Anne Zulfia / Dr. Erlina Yustanti

No	Paper #	ID	Author(s)	Title	Affiliation	Time
1	13147	02.02.01	N Sofyan, W.C. Pawito, A Z Syahrial, A Subhan	Performance of Lithium Ferro Phosphate (LiFePO4) Doped Vanadium Battery with Active Carbon Bamboo Coating and Carbon Black	Univ Indonesia	15.30 – 15.45
2	011	02.02.02	Nasruddin, Q H Alius, Djubaedah, A Taufan, R G Gurky, and A P Arsyad	Performance and prediction of vaccine carrier using adsorption process and 13x/cacl2 composite zeolite as adsorbent	Univ Indonesia	15.45 – 16.00
3	11543	02.02.03	Hermawan Judawisastra, Ramona Delphine Romian Sitohang, Dodi Ihsan Taufiq, Mardiyati	The Fabrication of Yam Bean (Pachyrizous Erosus) Starch Based Bioplastics	ITB	16.00 – 16.15
4	11544	02.02.04	Hermawan Judawisastra, Yusi Siti Syamsiar, Mardiyati	The Effect of Processing Methods on The Improvement of Tensile Properties of Random Ramie Fiber – Reinforced Tapioca Starch Biocomposites	ITB	16.15 - 16.30
5	013	02.02.05	Nasruddin, Djubaedah, R G Gurky, Q H Alius, and A P Arsyad	Design, Development and Performance Prediction of Solar Heater for Regeneration of Adsorbent Chamber	Univ Indonesia	16.30 – 16.45

DAY 1 PARALLEL SESSIONS

Tuesday, October 3rd 2017 | Krisan Room 3 | 15.30-16.45

Symposia 3 Multifunctional and Advanced Materials for Renewable Energy Applications

Session Chair : Dr. Erlina Yustanti / Prof. Anne Zulfia

No	Paper#	ID	Author(s)	Title	Affiliation	Time
1	9284	03.06.01	Yuliusman, Rahmatika Alfia Amiliana, Prita Tri Wulandari, Faracitra Akuwalifah Kusumadewi	Selection of Organic Acid Leaching Reagent for Recovery of Zinc and Manganese from Zinc-Carbon and Alkaline Spent Batteries	Univ Indonesia	15.30 – 15.45
2	9477	03.06.02	Yuliusman, Rahmatika Alfia Amiliana, Prita Tri Wulandari, Faracitra Akuwalifah Kusumadewi	Process Optimization and Kinetics for Leaching Zinc and Manganese from Zinc-Carbon and Alkaline Spent Batteries using Citric Acid	Univ Indonesia	15.45 – 16.00
3	11585	03.06.03	B Priyono , P W Winowatan, A Z Syahrial, Faizah, A Subhan	Optimizing the Performance of Li4Ti5O12/LTO by Addition of Silicon Microparticle in Half Cell Lithium-ion Battery Anode	Univ Indonesia	16.00 – 16.15
4	12676	03.06.04	Rifa Satria	Effect of Nano Si Addition on Synthesized LTO for Lithium Battery Anode	Univ Indonesia	16.15 - 16.30
5	12663	03.06.05	Supriyono	Influence of Anodizing Concentration and Electric Potential on Morphology and Corrosion Behavior of Anodized Magnesium in Seawater Activated Battery	Universitas Brawijaya	16.30 – 16.45

DAY 1 PARALLEL SESSIONS

Tuesday, October 3rd 2017 | Krisan Room 1 | 16.45-18.00

Symposia 1 Renewable Energy System and Regulation

Session Chair : Filbert Hilman Juwono, Ph.D.

No	Paper #	ID	Author(s)	Title	Affiliation	Time
1	11957	01.01.01	Rizky Esa Respati, Mukhsinun Hadi Kusuma, Nandy Putra	A New Cascade Solar Desalination System Integrated with Thermosyphon	Univ Indonesia	16.45 – 17.00
2	11612	01.01.02	Zulkarnain Jalil, Adi Rahwanto, Erfan Handoko, Akhyar Hasan	The Use of Silica from Beach Sand as Catalyst in Magnesium based Hydrides for Hydrogen Storage Materials	Syiah Kuala University, Aceh	17.00 – 17.15
3	12123	01.01.03	Warjito, Dendy Adanta, Budiarso, and Aji P Prakoso	Effect of Bucket Number on Breastshot Waterwheel Performance	Univ Indonesia	17.15 – 17.30
4	9527	01.01.04	Pujo Satrio, Reisa Adityo, Rahmat Agung, Yulianto Sulistyo Nugroho	Experimental Study of Thermal Radiation from Jet Flame	Univ Indonesia	17.30 – 17.45
5	11521	01.01.05	Zulkarnain Jalil, Adi Rahwanto, Akhyar Hasan, Erfan Handoko	MgH2-SiC Based Hydrogen Storage Material Prepared by Reactive Mechanical Alloying	Syiah Kuala University, Aceh	17.45 – 18.00

DAY 1 PARALLEL SESSIONS

Tuesday, October 3rd 2017 | Krisan Room 2 | 16.45-18.00

Symposia 2 Biomass and Biotechnology

Session Chair : Dr. Setiadi / Dr.-Ing. Eko Adhi Setiawan, S.T., M.T.

No	Paper#	ID	Author(s)	Title	Affiliation	Time
1	11204	02.08.01	Milanti Okta Ruliza, Tuty Emilia Agustina, Risfidian Mohadi	Impregnation of Activated Carbon-TiO2 Composite and Its Application in Photodegradation of Procion Red Synthetic Dye in Aqueous Medium	Univ. Sriwijaya	16.45 – 17.00
2	12698	02.08.02	Venitalitya Alethea Sari Augustia, R Abdul Djalal, Bachrun Sutrisno, Arif Hidayat	Kinetic Study of Free Fatty Acid in Palm Fatty Acid Distillate (PFAD) over Sugarcane Bagasse Catalyst	Univ Islam Indonesia	17.00 – 17.15
3	11712	02.08.03	Nuraini Raman Yusuf, Suzana Yusup, Nik Ruzaimah Kamil	Surface Functionalization and Characterization of Fatty Acids Coated Iron Oxide	Universiti Teknologi Petronas Malaysia	17.15 – 17.30
4	014	02.08.04	Djubaedah, Wulandari, Nasruddin	Preliminary Study of Natural Zeolite from Bayah for Solar Powered Cooling Application	Univ Indonesia	17.30 – 17.45
5	9529	02.08.05	Namira Widiaksana, Andara Asifa Yudiana, Yulianto Sulistyo Nugroho	Analysis of effectiveness of oil spill recovery using a disk-type oil skimmer at laboratory scale	Univ Indonesia	17.45 – 18.00

DAY 1 PARALLEL SESSIONS

Tuesday, October 3rd 2017 | Krisan Room 3 | 16.45-18.00

Symposia 3 Multifunctional and Advanced Materials for Renewable Energy Applications

Session Chair : Dr. Yuta Zudo / Prof. Anne Zulfia

No	Paper#	ID	Author(s)	Title	Affiliation	Time
1	12715	03.01.01	Slamet, Muhammad Triyogo Adiwibowo	Synthesis of ZnO Nanoparticles and Its Stability on Palm Oil-Based Primary Alkyl Sulphates Solution as Nanofluids for Detergent Application	Univ Indonesia	16.45 – 17.00
2	13181	03.01.02	K Mulia, D Adam, E Krisanti, I Zahrina	Green solvent extraction of palmitic acid from palm oil using betaine-based natural deep eutectic solvents	Univ Indonesia	17.00 – 17.15
3	13195	03.01.03	Mega Ayu Yusuf	Environmental Impact Analysis of Sago Starch : Life Cycle Assessment (LCA) Perspective	IPB, Bogor	17.15 – 17.30
4	12697	03.01.04	Silmina Adzhani, Ahmad Maksum, Sulaksana Permana and Johny Wahyuadi Soedarsono	The Influence of Palm Kernell Shell Mass Ratio as a Reducing Agent in The Lateritic Nickel Ore Carbothermic Reduction Process	Univ Indonesia	17.30 – 17.45
5	12709	03.01.05	Muhammad Azif, Ahmad Maksum, Delfiendra and Johny Wahyuadi Soedarsono	Effect of Pellet Size Addition on the Selective Reduction of Limonite Ore from Southeast Sulawesi	Univ Indonesia	17.45 – 18.00

DAY 2 : PARALLEL SESSIONS

Wednesday, October 4th 2017 | Krisan Room 1 | 08.00-09.15

Symposia 1 Renewable Energy System and Regulation

Session Chair : Dr. Matthias Guenther / Filbert Hilman Juwono, Ph.D.

No	Paper#	ID	Author(s)	Title	Affiliation	Time
1	12609 / 13059	01.04.01	Muswar M, M Idrus Alhamid, Nasruddin, Dieter R, M Zaky S, Edi Marzuki, Nyayu Aisyah	Design of One Combination Package Between Heat Exchangers and Heater For Organic Rankine Cycle Power Plant	Univ Indonesia	08.00 – 08.15
2	12720	01.04.02	Danang Arengga	SPEKTRA Fast and Smart Software For Renewable Energy Management	Univ Indonesia	08.15 – 08.30
3	12605	01.04.03	Nasruddin, Syaiful Nasution	Exergy Analysis and Exergoeconomic Optimization of PLTP Binary Cycle System Using Multi-objective Genetic Algorithm	Univ Indonesia	08.30 – 08.45
4	10447	01.04.04	Anhar Riza Antariksawan, Surip Widodo, Mulya Juarsa, Dedy Haryanto, Mukhsinun Hadi Kusuma, Nandy Putra	Numerical Study on Natural Circulation Characteristics in FASSIP-02 Experimental Facility Using RELAP5 Code	BATAN	08.45 – 09.00
5	12733	01.04.05	Yuni Rahmawati, Danang Arengga, Arif Nur Afandi, Siti Sendari, Toru Matsumoto, Indriyani Rachman	Developing a Simulator of Renewable Energy as a Learning Media of Energy Conversion	Univ Negeri Malang	09.00 – 09.15
Coffee Break						09.15 – 09.30

DAY 2 : PARALLEL SESSIONS

Wednesday, October 4th 2017 | Krisan Room 2 | 08.00-09.15

Symposia 2 Biomass and Biotechnology

Session Chair : Dr. Erlina Yustanti

No	Paper#	ID	Author(s)	Title	Affiliation	Time
1	001	02.03.01	Maria de Fatima Salgado, Adekunle Moshood Abioye, Muhammad Mat Junoh, João Alberto Porto Santos, Farid Nasri Ani	Preparation of Activated Carbon from Babassu Endocarp under Microwave Radiation by Physical Activation	Maranhao State University, Brazil	08.00 – 08.15
2	11509	02.03.02	Agung Satrio Wibowo, Nasruddin	Utilization of Waste Heat from Separation Process of Ulubelu's Geothermal Power Plant by Implementing an Absorption Refrigeration System (ARS) to Improve Plant Performance	Univ Indonesia	08.15 – 08.30
3	11496	02.03.03	Kat Sheng, Allen Lau, Muhammad Roil Bilad, Noridah Binti Osman	Sequencing Batch Membrane Photobioreactor for Secondary Effluent Polishing using Native Microalgae	Univeristi Teknologi Petronas, Malaysia	08.30 – 08.45
4	11579	02.03.04	Urip Riyadi, G. S. Boedi Andari Kristanto, Cindy Rianti Priadi	Utilization of Steel Wool as Removal Media of Hydrogen Sulfide in Biogas	Univ Indonesia	08.45 – 09.00
5	9309	02.03.05	Yuswan Muharam, Fiqi Giffari	Techno-Economic Feasibility of Flare Gas Utilization using Adsorbed Natural Gas	Univ Indonesia	09.00 – 09.15
Coffee Break						09.15 – 09.30

DAY 2 : PARALLEL SESSIONS

Wednesday, October 4th 2017 | Krisan Room 3 | 08.00-09.15

Symposia 3 Multifunctional and Advanced Materials for Renewable Energy Applications

Session Chair : Dr. Setiadi / Dr. Mega Yusuf

No	Paper#	ID	Author(s)	Title	Affiliation	Time
1	12576	03.04.01	Yuni Dwi Lestari, Praswasti Pembangun Dyah Kencana Wulan	The Effect of Oxidative Heat Treatment towards the Preparation of Stainless Steel 304 and 316 as the Effective Catalytic Substrates Growth of Carbon Nanotube	Univ Indonesia	08.00 – 08.15
2	12721	03.04.02	Asep Ridwan Setiawan	The Influence of Titanium Alloying and Co3O4 Coating on the Oxidation Behavior of Fe-20Cr Ferritic Stainless Steels for SOFC Interconnects	ITB	08.15 – 08.30
3	13190	03.04.03	Ryan Adrian Rahardi, Retno Maharsi, Ferry Iskandar, Hary Devianto, Yogi Wibisono Budhi	Catalytic Oxidation of Benzene Using Nano-CuO/y-Al2O3 and Commercial Catalysts	ITB	08.30 – 08.45
4	12740	03.04.04	Slamet, Khalil Gibran, Muhammad Ibadurrahman	Effect of Electrolyte Type on The Morphology and Crystallinity of TiO2 Nanotubes From Ti-6Al-4V Anodization	Univ Indonesia	08.45 – 09.00
5	10611	03.04.05	Afiza Ahmad Fairuzi	Catalytic Degradation of Methylene Blue Using Silver Nanopartides Synthesized from Imperata Cylindrica Aqueous Extract	University Teknologi MARA, Malaysia	09.00 – 09.15
Coffee Break						09.15 – 09.30

DAY 2 : PARALLEL SESSIONS

Wednesday, October 4th 2017 | Palma Room | 08.00-09.15

Symposia 3 Multifunctional and Advanced Materials for Renewable Energy Applications

Session Chair : Prof. Ahmad H. Yuwono

No	Paper#	ID	Author(s)	Title	Affiliation	Time
1	12603	03.05.01	Prita Tri Wulandari, Yuliusman, Rahmatika Alfia Amiliana, Faracitra Akuwalifah Kusumadewi	Acquisition of Co metal from spent lithium-ion battery using emulsion liquid membrane technology and emulsion stability test	Univ Indonesia	08.00 – 08.15
2	12684	03.05.02	A Z Syahrial, F Aldy, B Pryiono, A Subhan	Enhanced Electrochemical Performance of Li4Ti5O12/Sn Composites Anode via Sol-Hydrothermal Method for Lithium Ion Batteries	Univ Indonesia	08.15 – 08.30
3	11607	03.05.03	Muhammad Amin, Nandy Putra	Thermal Properties of Paraffin based Nano-Phase Change Material as Thermal Energy Storage	Univ Indonesia	08.30 – 08.45
4	11956	03.05.04	Ainur Rosidi, Nandy Putra, Mukhsinun Hadi Kusuma	Effect of Graphene Nano-Fluid on Heat Pipe Themal Performance for Passive Heat Removal in Nuclear Spent Fuel Storage Pool	Univ Indonesia	08.45 – 09.00
5	12606	03.05.05	Bambang Ariantara, Nandy Putra, Sugeng Supriadi	Battery Thermal Management System using Loop Heat Pipe with Sintered Lotus-Type Porous Copper Capillary Wick	Univ Indonesia	09.00 – 09.15
Coffee Break						09.15 – 09.30

DAY 2 : PARALLEL SESSIONS

Wednesday, October 4th 2017 | Krisan Room 1 | 09.30-10.45

Symposia 1 Renewable Energy System and Regulation

Session Chair : Dr. S.D. Sumbogo / Dr. Sary Awad

No	Paper#	ID	Author(s)	Title	Affiliation	Time
1	12670	01.05.01	Bambang Heru Susanto, Dimas Farlyansyah Pratama, Elsa Ramayeni	Application of Modified Microwave Polyol Process Method on NiMo/C Nanoparticle Catalyst Synthesis for Hydrogenated Biodiesel Production	Univ Indonesia	09.30 – 09.45
2	9398	01.05.02	Arif Hidayat	Biodiesel Production from Rice Bran Oil over Modified Natural Zeolite Catalyst	Univ Indonesia	09.45-10.00
3	12984	01.05.03	Setiadi, Fairuz Nawfal Hamid	Synthesis of Biodiesel from Palm Oil with Dimethyl Carbonate and Methanol as Reagent Variation Using KOH and Lipase Enzyme Catalyst	Univ Indonesia	10.00 – 10.15
4	12980	01.05.04	Sella Lametta	Identification Characteristics and Effectiveness of Restructured Product of Snakehead Fish (Channa Striata) with Transglutaminase Enzyme Addition	Univ Indonesia	10.15 – 10.30
5	10543	01.05.05	Mulya Juarsa, Anhar Riza Antariksawan, Mukhsinun Hadi Kusuma, Dedy Haryanto, Nandy Setiadi Djaya Putra	Estimation of Natural Circulation Flow Based on Temperature in the FASSIP-02 Large-Scale Test Loop Facility	BATAN	10.30 – 10.45

DAY 2 : PARALLEL SESSIONS

Wednesday, October 4th 2017 | Krisan Room 2 | 09.30-10.45

Symposia 2 Biomass and Biotechnology

Session Chair : **Prof**. Farid Nasir Ani / Nofrijon Sofyan, Ph.D.

No	Paper#	ID	Author(s)	Title	Affiliation	Time
1	12494	02.07.01	Nasruddin A. Abdullah, Nandy Putra, Imansyah Ibnu Hakim, Raldi A. Koestoer, Amaranggana Novianti	Influence of Temperature on Conversion of Plastics Waste (Polystyrene) to Liquid Oil Using Pyrolysis Process	Univ Indonesia	09.30 – 09.45
2	11580	02.07.02	Dwita Fitriani Wijayanti	Effect of Addition of Fat Oil and Grease (FOG) to Performance of Dry Anaerobic Digestion Food Waste Reactor	Univ Indonesia	09.45-10.00
3	12754	02.07.03	Maharani Suci, Rita Arbianti, Heri Hermansyah	LIPASE PRODUCTION FROM Bacillus subtilis WITH SUBMERGED FERMENTATION USING WASTE COOKING OIL	Univ Indonesia	10.00 – 10.15
4	12686	02.07.04	Resi Levi Permadani	Utilization of Waste Cooking Oil As Raw Material For Synthesis of Methyl Ester Sulfonate (MES) Surfactant	Univ Indonesia	10.15 – 10.30
5	12737	02.07.05	Wanda Ediviani, Cindy Rianti Priadi, Setyo Sarwanto Moersidik	Nutrient Recovery from End-of-Waste of Energy Recovery Process (Liquid Digestate) using Ornamental Aquatic Macrophytes in a Constructed Wetland System	Univ Indonesia	10.30 – 10.45

DAY 2 : PARALLEL SESSIONS

Wednesday, October 4th 2017 | Krisan Room 3 | 09.30-10.45

Symposia 3 Multifunctional and Advanced Materials for Renewable Energy Applications

SC : Prof. Farid Nasir Ani / Elsa Krisanti, Ph.D.

No	Paper#	ID	Author(s)	Title	Affiliation	Time
1	12566	03.08.01	Stephanie Rawi, Muhammad Amin, Eny Kusrini, Nandy Putra	Characterization of Shape-stabilized Phase Change Material using Beeswax and Functionalized Multi-walled Carbon Nanotubes	Univ Indonesia	09.30 – 09.45
2	11660	03.08.02	Bambang Marhaendra Djaja, Muhammad Zainuddin Lubis, Herika Muhammad Taki	Signal Detection for Identification Energy and Behaviour of Male Dolphin Bottle Nose (Tursiops Aduncus) using NTD Model	Univ Indonesia	09.45-10.00
3	9524	03.08.03	Andara Asifa Yudiana, Namira Widiaksana, Yulianto Sulistyo Nugroho	Effect of Temperature and Type of Dispersant on Treating Oil Spills	Univ Indonesia	10.00 – 10.15
4	11566	03.08.04	Dhinny Dwi Putri, Afifa Husna, Hans Kristian Irawan, Manabu Miyamoto, Shigeyuki Uemiya, Yogi Wibisono Budhi	Dynamic Operation of Water Gas Shift Reaction over Fe2O3/Cr2O3/CuO Catalyst in Pd/Al2O3 Membrane Reactor	ITB	10.15 – 10.30
5	9530	03.08.05	Reisa Adityo, Rahmat Agung, Pujo Satrio, Yulianto Sulistyo Nugroho	Measurement of thermal radiative heat transfer using a multi-axis radiometer	Univ Indonesia	10.30 – 10.45

DAY 2 : PARALLEL SESSIONS

Wednesday, October 4th 2017 | Palma Room | 09.30-10.45

Symposia 3 Multifunctional and Advanced Materials for Renewable Energy Applications

Session Chair : Dr. Sary Awad / Dr. Erlina Yustanti

No	Paper#	ID	Author(s)	Title	Affiliation	Time
1	12677	03.01.01	Fitri Amalia, Rionelli Ghaudenson, Setijo Bismo, Eva Fathul Karamah	Disinfection of Escherichia Coli Bacteria using Combination of Ozonation and Hydrodynamic Cavitation Method with Venturi Injector	Univ Indonesia	09.30 – 09.45
2	12635	03.01.02	Setiadi, Famila Anindia Putri	Manufacture of Solid Soap Based on Crude Papain Enzyme and Antioxidant From Papaya (Carica Papaya)	Univ Indonesia	09.45-10.00
3	12177	03.01.03	Ardita Rizky Putri Arcanggi, Prasitiwi Arum, Ahmad Rafif, Rita Arbianti, Adinda Eka Kemala	Tapioca and Tofu Waste Utilization to Produce AA, DHA, and EPA	Univ Indonesia	10.00 – 10.15
4	12486	03.01.04	Astrid Miranti, Rita Arbianti, and Tania Surya Utami	Effect of pH, Temperature and Medium Agitation Rate in Production of AA, DHA, EPA from Aspergillus oryzae with Submerged Fermentation	Univ Indonesia	10.15 – 10.30
5	13157	03.01.05	Johny Wahyuadi Soedarsono, Muhammad Nafies Shihab and Ahmad Maksum	Study of Curcuma Xanthorrhiza Extract as Green Inhibitor for API 5L X42 Steel in 1M HCl Solution	Univ Indonesia	10.30 – 10.45

DAY 2 : PARALLEL SESSIONS

Wednesday, October 4th 2017 | Krisan Room 1 |10.45-12.15

Symposia 1 Renewable Energy System and Regulation

Session Chair : Prof.Dr. Ir. Adi Surjosatyo, M.Eng. / Dr.-Ing Eko Adhi Setiawan, S.T.M.T.

No	Paper#	ID	Author(s)	Title	Affiliation	Time
1	12714	01.06.01	Edy Susanto	The Use of Perforated Floor Plates to Reduce Speed and Uniformity of Flow in a Room Chamber Test Household Refrigerator	Univ Indonesia	10.45 – 11.00
2	12644	01.06.02	Syahrul Muhammaddiyah, Adi Winarta, Nandy Setiadi Djaya Putra	Experimental Study on Heat Pipe Heat Exchanger Multi Fin for Energy Efficiency Efforts in Operating Room Air System	Univ Indonesia	11.00 – 11.15
3	13106	01.06.03	Edy Susanto, M Idrus Alhamid, Nasruddin, Budihardjo	An Experimental Investigation into the Effect of Thermostat Setting on Energy Consumption of Household Refrigerators	Univ Indonesia	11. 15 – 11.30
4	13037	01.06.04	Adi Winarta	A Preliminary Investigation on Visualization of Oscillating Heat Pipe with Non Destructive Test	Univ Indonesia	11.30 – 11.45
5	9504	01.06.05	Iwan Setyawan, Nandy Putra, Imansyah Ibnu Hakim	Experimental Study of Hybrid Loop Heat Pipe using Pump's Assistance for High Heat Flux System	Univ Indonesia	11.45 – 12.00
6	13159	01.06.06	Erol Efraim Kaban, Ahmad Maksum, Sulaksana Permana, Johny Wahyuadi Soedarsono	Utilization of Secang Heartwood (Caesalpinia Sappan L) As A Green Corrosion Inhibitor on Carbon Steel (API 5L Gr. B) in 3.5% NaCl Environment	Univ Indonesia	12.00 – 12.15
Lunch Break & Praying Time						12.15 – 13.15

DAY 2 : PARALLEL SESSIONS

Wednesday, October 4th 2017 | Krisan Room 2 | 10.45-12.15

Symposia 2 Biomass and Biotechnology

Session Chair : Prof.Dr. Ir. Adi Surjosatyo, M.Eng / Dr. Setiadi

No	Paper#	ID	Author(s)	Title	Affiliation	Time
1	12655	02.03.01	Yanuar Yanuar, Winda Wulandari, Kurniawan Teguh Waskito, Sealtial Mau	Effect of Coconut Fiber Suspensions on Drag Reduction in Circular Pipe	Univ Indonesia	10.45 – 11.00
2	12548	02.03.02	Muhammad Anshar Anshar	Pyrolysis Characteristic of Rice Husk with Plastic Bags Fuel For Power Generation by Using A Thermogravimetric Analysis	Politeknik Negeri Ujung Pandang	11.00 – 11.15
3	9300	02.03.03	Cindy Dianita, Mahahera Bastinov Putri Al'Magistra, Asep Handaya Saputra	Estimating Greenhouse Gas Emission Level of A Natural Gas Transmission Pipeline From Point A To B In West Java Based On INGAA And IPCC Guidelines	Univ Indonesia	11.15 – 11.30
4	12624	02.03.04	Suhartono	The Properties of Vegetable Cooking Oil as a Fuel and Its Utilization in a Modified Pressurized Cooking Stove	Univ. Jenderal Ahmad yani	11.30 – 11.45
5	12560	02.03.05	Fatma Sari, Bambang Heru Susanto, Setijo Bismo	The Potential Utilization of Coconut Oil and Palm Oil as Raw Materials of Alkanolamide under Alkaline Conditions	Univ Indonesia	11.45 – 12.00
6	10148	02.03.06	Nofrijon Sofyan, Muhammad Muhammad, Akhmad Herman Yuwono, Arief Udhiarto	Characteristics of Nano Carbon Pyrolyzed from Table Sugar and Sucrose for Pt-less DSSC Counter Electrode	Univ Indonesia	12.00 – 12.15
Lunch Break & Praying Time						12.15 – 13.15

DAY 2 : PARALLEL SESSIONS

Wednesday, October 4th 2017 | Krisan Room 3 | 10.45-12.15

Symposia 3 Multifunctional and Advanced Materials for Renewable Energy Applications

Session Chair : Dr. Yuta Sudo / Dr. S.D. Sumbogo

No	Paper#	ID	Author(s)	Title	Affiliation	Time
1	11443	03.04.01	Ulina Ayu Pangesti	Adsorption Capacity Study of Ethanol-water Mixture for Zeolite, Activated Carbon, and Polyvinyl Alcohol	Univ Indonesia	10.45 – 11.00
2	12711	03.04.02	Rangga Ega Santoso	The Effectiveness of Hydrolysis and Fermentation Cerbera Manghas into Bioethanol Use a Variety of Levels of H_2SO_4 and Zymomonas Mobilis	Universitas Negeri Malang	11.00 – 11.15
3	9525	03.04.03	Luthfi Rizki Perdana, Nadhira Gilang Ratnasari, Pither Palamba, Nasruddin, Yulianto Sulistyo Nugroho	Hydrophilic and Hydrophobic Characters of Peat	Univ Indonesia	11.15 – 11.30
4	12636	03.04.04	Setiadi, Nurul Hidayah	The Effect of Papain Enzyme Dossage on the Modification of Egg-yolk Lecithin Emulsifier Product through Enzymatic Hydrolysis Reaction	Univ Indonesia	11.30 – 11.45
5	13158	03.04.05	Muhammad Fikri Azmi, Ahmad Maksum, and Johny Wahyuadi Soedarsono	Study of Bawang Dayak (Eleutherine Americanna Merr) Extract as Eco-friendly Corrosion Inhibitor for Pipeline API 5L X42 in 1M HCl	Univ Indonesia	11.45 – 12.00
6	9505	03.04.06	Haroki Madani, Arie Wibowo, Hermawan Judawisastra, Elvi Restiawaty, Chrisella Lazarus, Yogi Wibisono Budhi	One-step Synthesis of Cellulose Nanocrystals from Oil Palm Empty Fruit Bunches	ITB	12.00 – 12.15
Lunch Break & Praying Time						12.15 – 13.15

DAY 2 : PARALLEL SESSIONS

Wednesday, October 4th 2017 | Palma Room | 10.45-12.15

Symposia 3 Multifunctional and Advanced Materials for Renewable Energy Applications

Session Chair : Prof. Nandy Putra / Dr.-Ing. Eko Adhi Setiawan, S.T., M.T.

No	Paper #	ID	Author(s)	Title	Affiliation	Time
1	11510	03.08.01	Irma Amryana Suhartiwi, Zamiul, Ainussalbi Al Ikhsan, Ali Fitrah, Arman Faslih, Muhammad Zakaria Umar	Identification of Local Wisdom of Bajo Society in Making Roof of Nipah Leaf (Nypa Fructicans Wurmb)	Universitas Haluoleo, Kendari	10.45 – 11.00
2	13161	03.08.02	F M Abdul Aziz, S N Surip, N N Bonnia, K A Sekak	The Effect of Pineapple Leaf Fiber (PALF) Incorporation Into Polyethylene Terephthalate (PET) on The Properties Via Electrospinning Method	Universiti Teknologi Mara, Malaysia	11.00 – 11.15
3	7508	03.08.03	Muhammad Zakaria Umar, Arman Faslih, Mazhfia Umar, Hapsa Rianty, Muhammad Arsyad, Arief Saleh Sjamsu	Age Wearing The Roof of Nipah Leaf (Nypa Fructicans Wurmb) Soaked in Sea Water	Universitas Haluoleo, Kendari	11.15 – 11.30
4	10149	03.08.04	Nofrijon Sofyan, Audiya Dewi Rachmawati, Anne Zulfia	Use of Carbon Pyrolyzed from Coconut Shell in the LiFePO4 /V/C Composite for Lithium Ion Battery Cathode Cathode	Univ Indonesia	11.30 – 11.45
5	10147	03.08.05	Nofrijon Sofyan, Prita Sekaringtyas, Anne Zulfia	Characteristics of Carbon Pyrolyzed from Rice Husk in the LiFePO4/V/C Composite Used for Lithium Ion Battery Cathode	Univ Indonesia	11.45 – 12.00
6	10743	03.08.06	Setiadi, Ervandy Haryoprawironoto	Product distribution from catalytic conversion of bio-oil from biomass pyrolysis Using B2O3/γ-Al2O3 catalyst	Univ Indonesia	12.00 – 12.15
Lunch Break & Praying Time						12.15 – 13.15

DAY 2 : PARALLEL SESSIONS

Wednesday, October 4th 2017 | Krisan Room 1 | 13.15 – 14.45

Symposia 1 Renewable Energy System and Regulation

Session Chair : Dr.-Ing. Eko Adhi Setiawan, S.T., M.T. / Prof. Ahmad H. Yuwono

No	Paper#	ID	Author(s)	Title	Affiliation	Time
1	12597	01.07.01	Agus Siswanto	Grid Connected Stability Improvement of Penetration Wind Turbine Using Fuzzy Logic Controller PSS	Univ Hasanuddin	13.15 – 13.30
2	13191	01.07.02	Adi Surjosatyo, Budiman R. Saragih, Bagus Rizky Dewantoro, Filbert Nainggolan, Wahyu Dwianto, Teguh Darmawan	Selecting and Testing of Wind Turbine Blades of the Local-Wood Growing Fastly on Local Wind Characteristics	Univ Indonesia	13.30 – 13.45
3	009	01.07.03	Yuswan Muharam	Process Optimization of Microalgae Cultivation in a Bubble-Column Photobioreactor	Univ Indonesia	13.45 – 14.00
4	12734	01.07.04	Rizal Ibnu Syifa, Setyo Nugroho	Experimental Study on Horizontal Axis Wind Turbine with Splitted Winglets	Power Plant Engineering EEPIS	14.00 – 14.15
5	12739	01.07.05	Tri Bimantara Satriyo, Hendrik Elvian Gayuh Prasetya, Prima Dewi Permatasari	Modeling of Turbine Follow Control with IMC Tuning Method Based on HYSYS	ITS, Surabaya	14.15 – 14.30
6	015	01.07.06	Sentot Novianto, Raldi Koestoer, Agus S. Pamitran	Heat Transfer Coefficient of Near Boiling Single Phase Flow with Propane in Horizontal Circular Micro Channel	Univ Indonesia	14.30 – 14.45
Coffee Break & Praying Time						14.45 – 15.00

DAY 2 : PARALLEL SESSIONS

Wednesday, October 4th 2017 | Krisan Room 2 | 13.15-15.00

Symposia 2 Biomass and Biotechnology

Session Chair : Dr. Sary Awad / Prof. Adi Surjosatyo

No	Paper#	ID	Author(s)	Title	Affiliation	Time
1	12771	02.07.01	Hadi Wahyudi	Numerical Study of Biomass Gasification in 3D Full-Loop Circulating Fluidized Bed Using Eulerian Multi-Fluid Approach	Sultang Ageng Tirtayasa University	13.15 – 13.30
2	13154	02.07.02	Hafif Dafiqurrohman, Felly Rihlat Gibran Simatupang, Adi Surjosatyo, Andika Akbar Hermawan, Muhammad Barryl Anggriawan, Naufal Riyadhi Yusuf, Samsul Ma'arif	Secondary Air Intake Optimization on Fixed Bed Downdraft Reactor Type Rice Husk Biomass Gasification	Univ Indonesia	13.30 – 13.45
3	12646	02.07.03	Dijan Supramono, Muhammad Alfinuha Nabil, Setiadi Setiadi, Mohammad Nasikin	Effect of Feed Composition of Co-pyrolisis of Corncobs-Polypropylene Plastics on Mass Interaction Between Biomass Particles and Plastics	Univ Indonesia	13.45 – 14.00
4	12706	02.07.04	Nadia Tuada Afnan	Utilization of Sesame Seed Sprout Biomass as Lipase Source to Hydrolyze Palm Oil	Univ Indonesia	14.00 – 14.15
5	12621	02.07.05	Aji Agraning Bawono	Tariff Calculating Model for Natural Gas Transportation through Open Access Transmission Pipeline with Multi Tariff System to Produce Competitive Gas Prices to Substitute Clean Energy Source	Univ Indonesia	14.15 – 14.30
6	11619	02.07.06	Aloysius Damar Pranadi	An Economic Analysis from Two Projects of Solar Water Pumping System (SWPS) in Banyumeneng Village, Yogyakarta	Univ Indonesia	14.30 – 14.45
Coffee Break & Praying Time						14.45 – 15.00

DAY 2 : PARALLEL SESSIONS

Wednesday, October 4th 2017 | Krisan Room 3 | 13.15-14.45

Symposia 3 Multifunctional and Advanced Materials for Renewable Energy Applications

Session Chair : Elsa Krisanti, Ph.D. / Dr. Setiadi

No	Paper#	ID	Author(s)	Title	Affiliation	Time
1	9978	03.08.01	Astrini Pradyasti, Adinda Sofura Azhariyah, Setijo Bismo	Preparation of Zinc Oxide Catalyst with Activated Carbon Support for Ozone Decomposition	Univ Indonesia	13.15 – 13.30
2	12305	03.08.02	Devi Permata Sari, Tania Surya Utami, Rita Arbianti, and Heri Hermansyah	The Effect of Centrifugation Speed and Chitosan-Sodium Tripolyphosphate Ratio Toward The Nanoencapsulation of Sambiloto (Andrographis paniculata) for The Formulation of Hepatitis B Drug	Univ Indonesia	13.30 – 13.45
3	10078	03.08.03	Adinda Sofura Azhariyah, Astrini Pradyasti, Setijo Bismo	Preparation and Characterization of Copper Oxide Catalyst with Activated Carbon Support for Ozone Decomposition in Industrial Environment	Univ Indonesia	13.45 – 14.00
4	12694	03.08.04	Dwipuji Rahayu, Ahmad Maksum, and Johny Wahyuadi Soedarsono	Effects of Reduction Time on Carbothermic Reduction of Lateritic Nickel Ore Using Palm Kernel Shell as Green Reducing Agent	Univ Indonesia	14.00 – 14.15
5	12696	03.08.05	Risty Hidayanti, Ahmad Maksum, and Johny Wahyuadi Soedarsono	Study on The Effects of Temperature in the Carbothermic Reduction Laterite Ore Using Palm Kernel Shell as Reducing Agent	Univ Indonesia	14.15 – 14.30
6	12728	03.08.06	Siti Sendari, Yuni Rahmawati, Waras Kamdi, Hakkun Elmunsyah, Whyna Agustin, Nur Cholis Hadi, Fauzy Satrio Wibowo, Toru Matsumoto, Indriyani Rachman	Internet-Based Monitoring and Warning System of Methane Gas Generated in Garbage Center	Univ Negeri Malang	14.30 – 14.45
Coffee Break & Praying Time						14.45 – 15.00

DAY 2 : PARALLEL SESSIONS

Wednesday, October 4th 2017 | Palma Room | 13.15-14.45

Symposia 3 Multifunctional and Advanced Materials for Renewable Energy Applications

Session Chair : Dr. S.D. Sumbogo / Dr. Mega Yusuf

No	Paper #	ID	Author(s)	Title	Affiliation	Time
1	12699	03.10.01	Yudianto, Ahmad Maksum, Delfiendra and Johny Wahyuadi Soedarsono	Effects of Temperature on the Direct Reduction of Southeast Sulawesi's Limonite Ore	Univ Indonesia	13.15 – 13.30
2	12712	03.10.02	Rinanda Rahmat, Ahmad Maksum, Delfiendra, and Johny Wahyuadi Soedarsono	Effects of Na2SO4 Addition on the Selective Reduction of Limonite Ore from Southeast Sulawesi	Univ Indonesia	13.30 – 13.45
3	11571	03.10.03	Lidia Dwi Putri	Optimization of Insulated Sandwich Panel Core from Empty Fruit Bunch	Swiss German University	13.45 – 14.00
4	11688	03.10.04	Ahmad Fadzil Ahmad Shuhaili, Suzana Yusup, Noridah Osman	The Promotional Effect (Co, Ni and Fe) On HZSM-5 Catalyst for Biogasoline Production	Universiti Teknologi Petronas Malaysia	14.00 – 14.15
5	12170	03.10.05	Muhammad Arvianda Hymes Vinci Kumia, Tania Surya Utami, Rita Arbianti	Sodium Percarbonate Addition as Electrolyte and Buffer to Produce Electricity Economically using Industrial-Tempeh-Wastewater based Microbial Fuel Cell	Univ Indonesia	14.15 – 14.30
6	9225	03.10.06	Bambang Heru Susanto	The Effect of Pyrogallol Antioxidant Addition and The Storage Temperature Influence to Biodiesel Quality Changes During Storage Period	Univ Indonesia	14.30 – 14.45
Coffee Break & Praying Time						14.45 – 15.00

DAY 2 : PARALLEL SESSIONS

Wednesday, October 4th 2017 | Krisan Room 1 | 15.00 – 17.00

Symposia 1 Renewable Energy System and Regulation

Session Chair : Prof. Nandy Putra / Dr.-Ing. Eko Adhi Setiawan, S.T., M.T.

No	Paper #	ID	Author(s)	Title	Affiliation	Time
1	12660	01.08.01	Dianursanti Ismail	Biodiesel Synthesis Optimization from Wet and Dry Based Microalgae Chlorella vulgaris by Reaction Time Arrangement	Univ Indonesia	15.00 – 15.15
2	12661	01.08.02	Dianursanti Ismail	Synthesis of Biodesel from Microalgae through Transesterification Process Using NaOH/Zeolite as Heterogeneous Catalyst: Comparison between Nannochloropsis sp. and Chlorella vulgaris	Univ Indonesia	15.15 – 15.30
3	13169	01.08.03	N P Pinasthika, R Arbianti, T S Utami and H Hermansyah	Effect of Medium and Incubation Time on Production of AA, DHA and EPA from Aspergillus Oryzae by Solid State Fermentation	Univ Indonesia	15.30 – 15.45
4	12724	01.08.04	Sealtial Mau	Characteristics of Calcium Carbonate Nanofluids Flowing in a Circular	Univ Indonesia	15.45 – 16.00
5	016	01.08.05	S.D. Sumbogo Murti, Yuta Sudo, Sun Yan, Adiarso, Reiji Noda	Investigation of Biomass Gasification using Indonesian Clay as Catalyst	BPPT	16.00 – 16.15
6	012	01.08.06	Tulus Sukreni	Effect of Anode Depth and Conductivity of Electrolyte Solution on Energy Consumption in Plasma Electrolysis	Univ Indonesia	16.15 – 16.30
7	12731	01.08.07	Aji Agraning Bawono	The impact analysis of postage multi-tariff system on gas transportation through the pipeline to increase gas price efficiency as the attraction of more environmentally friendly power plant substitution	Univ Indonesia	16.30 – 16.45
8	10132	01.08.08	Wayan Nata Septiadi, Wayan Nata Septiadi, Gemilang Ayu Iswari, Muhammad Ainur Rofiq, Boby Gitawan, Jeplind Morico Gugundo, Christ Ave Duga Purba	Voltage Characterization Of Waste Heat Recovery using Thermoelectric Generator	Univ Udayana	16.45 – 17.00
All back to Palma Room for Plenary Closing						17.00 - 18.00

DAY 2 : PARALLEL SESSIONS

Wednesday, October 4th 2017 | Krisan Room 2 | 15.00 -17.00

Symposia 2 Biomass and Biotechnology

Session Chair : Dr. Maria de Fatima Salgado / Prof. Adi Surjosatyo

No	Paper#	ID	Author(s)	Title	Affiliation	Time
1	Invited Speaker		Dr. Sary Awad	Experimental Investigation on the Reduction of Catalyst Costs in the Polyethylene Pyrolysis Process	GEPEA, UMR-CNRS (DSEE) IMT Atlantique France	15.00 – 15.15
2	12753	02.09.01	Ambar Maresya, Rita Arbianti, Heri Hermansyah	Production of Dry Extracelluler Lipase From Pseudomonas aeruginosa With Submerged Fermentation Method In Palm Oil Mill Effluent	Univ Indonesia	15.15 – 15.30
3	12749	02.09.03	Danti Firda Nur, Heri Hermansyah, Tania Surya Utami, Muhamad Sahlan, Anondho Wijanarko	Production of Extracellular Immobilized Lipase from Solid State Fermentation of Aspergillus niger on Palm Kernel Cake, Soybean Meal, and Coir Pith	Univ Indonesia	15.30 – 15.45
4	12674	02.09.04	Setia Abikusna, Ratna Monasari	Performance Analysis (BHP and Torque) on SI Engine Fueled with Low-grade Bioethanol and Oxygenated Fuel Additive	Univ Indonesia	15.45 – 16.00
5	13179	02.09.05	Ratna Monasari, Nasruddin, Agung Satrio Wibowo, Bagus Rizky Dewantoro, M. Ilham Attharik	Thermodynamic Analysis and Multi Objective Optimization of Kalina and Absorption Cycle for Power and Cooling Driven by Lahendong Geothermal Source	Univ Indonesia	16.00 – 16.15
6	017	02.09.06	J Muliawan and Sotya Astutiningsih	Preparation and characterization of phosphate – sludge-kaolin mixture for ceramic bricks	Univ Indonesia	16.15 – 16.30
7	8772	02.09.07	Neng Tresna Umi Culsum	Preparation of Cellulose Nanocrystals from Empty Fruit Bunch of Palm Oil by Using Phosphotungstic Acid (HPW)	ITB	16.30 – 16.45
8	12675	02.09.08	Setia Abikusna, Ratna Monasari	Analysis of Emission Gas and Fuel Consumption on SI Engine Fueled with Low-grade Bioethanol and Oxygenated Cycloheptanol Additive	Univ Indonesia	16.45 – 17.00
All back to Palma Room for Plenary Closing						17.00 – 18.00

DAY 2 : PARALLEL SESSIONS

Wednesday, October 4th 2017 | Krisan Room 3 | 15.00-16.45

Symposia 3 Multifunctional and Advanced Materials for Renewable Energy Applications

Session Chair : Dr. Sunaryo

No	Paper #	ID	Author(s)	Title	Affiliation	Time
1	12297	03.05.01	Yanuar, Kurniawan Teguh Waskito, Bilmantasya Al Fattha Rahmat, Aufa Yusuf Perdana, Bagus Dwi Candra, Sigit Yoga Pratama	Microbubble Drag Reduction with Triangle Bow and Stern Configuration Using Porous Media on Self Propelled Barge Model	Univ Indonesia	15.00 – 15.15
2	12595	03.05.02	Yanuar, Wiwin, Sulistyawati	Pentamaran configuration design with modelling hull form for resistance minimization	Univ Indonesia	15.15 – 15.30
3	12678	03.05.03	Yanuar, Ibadurrahman, M. Mahfud, Arby G., and Rachmat A. W.	Experimental investigation of Interference Resistance of Pentamaran Model with Asymmetric Outrigger Configurations	Univ Indonesia	15.30 – 15.45
4	12681	03.05.04	Yanuar, Ibadurrahman, Syifa Alfiah A. P.	Resistance Characteristic of Submerged Vehicle-Bow Shape based on Hull Envelope Coefficient Using CFD Simulation	Univ Indonesia	15.45 – 16.00
5	9431	03.05.05	Sunaryo	Design and Calculation of Mechanical System for Solar-Powered Electric Boat	Univ Indonesia	16.00 – 16.15
6	10144	03.05.06	Asep Rachmat, Nasruddin	Exergoeconomic Optimization of a Combined Double Flash – Binary Cycle for Wayang Windu Geothermal Power plant in Indonesia	Univ Indonesia	16.30 - 16.45
All back to Palma Room for Plenary Closing						16.45 - 18.00

DAY 2 : PARALLEL SESSIONS

Wednesday, October 4th 2017 | Palma Room | 15.30-17.00

Symposia 3 Multifunctional and Advanced Materials for Renewable Energy Applications

Session Chair : Prof. Adi Surjosatyo / Dr.-Ing. Eko Adhi Setiawan, S.T., M.T.

No	Paper#	ID	Author(s)	Title	Affiliation	Time
1	9126	03.09.01	Yuswan Muharam, Fabian Mahendra Nur, Thomy D Vollmer, Alisya Purnama Ramadhania	Prediction of Ignition Delay Time of Liquefied Gas for Vehicle	Univ Indonesia	15.30 – 15.45
2	12738	03.09.02	Ghany Heryana	Power Consumption Analysis On The Large-Sized Electric Bus	Univ Indonesia	15.45 – 16.00
3	9430	03.09.03	Yuswan Muharam	Simulation of a metal organic framework-based adsorbed natural gas storage tank	Univ Indonesia	16.00 – 16.15
4	9326	03.09.04	Erwin, Tresna Priana Soemardi, Adi Surjosatyo, Yulianto Yulianto	Design Optimization of Hybrid Renewable Energy Power Plant for Minapolitan Cluster in Domas, Serang Banten, Indonesia	Univ Indonesia	16.15 – 16.30
5	019	03.09.05	Dita Trisnawan	Eco-Tect Design Simulation on Existing Building to Enhance Its Energy Effeciency	Univ Indonesia	16.30 – 16.45
6	020	03.09.06	Dita Trisnawan, Alhayatul Rifqih	Reading Sustainability Post Annexations of Rumah Gadang Architecture	Univ Indonesia	16.45 – 17.00
All back to Palma Room for Plenary Closing						17.00 - 18.00

SYMPOSIA 1 : RENEWABLE ENERGY SYSTEM AND REGULATION

ENERGY CONSUMPTION MODEL IMPROVEMENT WITH PRINCIPAL COMPONENT ANALYSIS METHOD FOR SMALL VILLAGE COMMUNITY

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Tropical Renewable Centre, Faculty of Engineering, Universitas Indonesia, Depok, Indonesia

Abstract

Daily electrical energy consumption is a key parameter to determine balancing electricity supply and demand particularly in remote area where is not yet being electrified. The absence of daily electrical energy consumption data is a constraint for developing microgrid systems based on renewable energy. The purpose of this study is to improve electrical energy consumption model with adding some variables such as family income and family expenses, the number of family members and the load factor as independent variable, and electrical energy consumption assumption as dependent variable. Principal Component Analysis (PCA) method is used to find the relationship between independent and dependent variables. The electric energy consumption model Y=(0.69)+(1.77e^(-7) x A_1)-(1.54e^(-7) x A_2)+(0.037x A_3)+(7.45 x A_4), with determination factor (R-Square) is 97%.

THE 2nd INTERNATIONAL
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CHALLENGES OF A 100% RENEWABLE ENERGY SUPPLY IN THE JAVA-BALI GRID

Matthias Günther1
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Abstract

Renewable energy resources are used more and more to cover the demand in the electricity grids in many countries. A question that is for now for most grids rather theoretical, although interesting for opening a long-term perspective, is how an energy supply from exclusively renewable energy resources could look like. This question has to be answered individually for each grid. The present paper has the objective to scrutinize the specific challenges that a 100% renewable energy scenario reveals for the Java-Bali grid. It presents some results of an energy demand and supply modelling for the year 2050 that was done in a series of research projects at SGU. The scenario reveals a very high dependency on solar energy, which generates an enormous primary power generation fluctuation on a daily and also on an annual timescale. In particular the seasonal fluctuations come along with a high storage demand, which is the biggest challenge concerning a 100% renewable energy supply, at least if pumped storages and batteries are considered as storage technologies. There are options to reduce considerably the storage demand: the installed PV capacity can be increased, bioenergy can be used for seasonal balancing, and a special long-term storage can be added. The large PV capacity is also a challenge given the high population density and the related high land value, which makes offshore PV a reasonable option for the Java-Bali grid.

STUDY AND MODEL DEVELOPMENT OF RENEWABLE ENERGY INVESTMENT FEASIBILITY UNDER WILLINGNESS AND ABILITY TO PAY APPROACH

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2 Lecturer, Electrical Engineering Department, Universitas Indonesia, Depok City, West Java 16424, Indonesia (period 2008-2017)

Abstract

Solar PV power plant investment in Indonesia is one amongst the alternative for electricity supply to maintain electrical reliability supply and to maximize local energy potential for remote areas. An objective approach in terms of ability and willingness to pay of the community at study location becomes the basis for revenue potential calculation of on this study. Assessment of investment feasibility including economic incentive calculation becomes more important if incentive is required in order to improve return of investment and at the time to provide good quality of energy supply at the lowest possible cost. Community characteristics data on study location is processed using statistical methods and micropower optimization simulation to generate PV system specification and all component needed to invest. To increase the return of investment the economic incentive scenarios are generated to provide alternatives to optimize the economic feasibility while maintaining the technical feasibility based on the ability and willingness to pay of the community, and not inflicting financial loss to the incentive giver. The results of investment feasibility calculation, with various scenarios built for investment alternatives, PV investment is economically feasible based on common investment analysis criteria such as expected NPV (net present value), IRR (internal rate of return), and PBP (payback period).

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Comparative Study of the Monthly Global Solar Radiation Estimation Data in Jakarta

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Abstract.
The objective of this paper is to get the most suitable model of monthly global solar radiation estimation in Jakarta which performs better than the others model. In this study, measured data of solar radiation were utilized to be compared with the empirical models from the literature and a new based-temperature model, to estimate the monthly intensities of global solar radiation in Jakarta, Indonesia (Latittude: 6.13º S, Longitude: 106.8º E). Global solar radiations were measured for two complete years, and the estimation of monthly solar radiation were calulated by four empirical models and also one linear regression model. The accuracy of the models was then analyzed in terms of some statistical indicators such as Mean Bias Error (MBE) and Root Mean Square Error (RMSE). The statistical analysis of result revealed that the empirical models have not the same accuracy, and it is concluded that there are the models that can be preferred for the estimation of monthly global solar radiation in Jakarta, Indonesia. The obtained results indicate that Allen is performing better than the others. It also can be said that Allen is the most suitable model for estimating a monthly global solar radiation in Jakarta, Indonesia.

HOURLY SOLAR RADIATION IN DEPOK, WEST JAVA, INDONESIA (106.7942 LONGITUDE, -6.4025 LATITUDE)

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Depok, Indonesia

ABSTRACT

The objective of this paper is to calculate daily solar radiation in Faculty of Engineering, Universitas Indonesia, Depok, West Java, Indonesia (106.7942 longitude, -6.4025 latitude) as studied site. The calculation of hourly solar radiation is needed to know the efficiency power that applicable to the solar power technology during peak solar time. The calculation is based on several empirical models and compared to the measured data from the meteorological station. The comparison of theoretical data and measured data in order to know the influence of solar radiation parameters like solar irradiance condition, angstrom turbidity coefficient, and climate condition used to calculate the solar radiation at studied site. The measured data from meteorological station is below of some theoretical data because of the solar radiation parameters. In this paper provide the estimation of hourly solar radiation with small error based on the calculation and the comparison with the measured data.

Keywords: Daily solar radiation, solar radiation models, meteorological parameters, and renewable energy

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OPTIMIZATION OF ARCHITECTURAL ELECTROACOUSTIC DESIGN FOR THE VERTICAL BUILDING OF INTERIOR MEZZANINE

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Abstract.

A vertical building structure, column, is usually designed separately with architectural aspect and other technical consideration like building utility. Interior mezzanine has unique characteristic on propagating sound because its balconies could be an element of room acoustic reflector and absorber. For optimum music and speech activities, hybrid design of active strategy using electroacoustic combined with the passive method is conducted. The research optimizes room acoustics criteria of variated building models as integrated building system with a loudspeaker. Ecotect Analysis and additional audio programming determine all process by simulating all potential variables. The result shows that 5 m will be the recommended minimum distance of column-loudspeaker placement for mezzanine floor. With the same loudspeaker specification power and frequency, the vertical structure as armature of electroacoustic orientation and interior material are the most critical variables in determining of reverberation time optimization.

Tropical X-Y Transformation Design for Building Courtyard Integrated Photovoltaic

FX Teddy Badai Samodra[1*], Ima Defiana[2], Wahyu Setyawan[3]
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Abstract.
The tropical region has a richness of solar radiation with its consequences on building thermal comfort. For that exception, the photovoltaic hold a role in generating eco-friendly energy also. Two-dimensional geographical location, recognized as X-Y for translating latitude (X) and altitude (Y) are analyzed for determining the optimum integrated thermal comfort of building and energy generating. This research utilizes open space, courtyard, which not only provides a slimming body of the tropical building to reduce deepness of cross ventilation work but also develops potential green energy by a simultaneous method in making opening area. All were done by *Ansys Fluent* and *Ecotect simulation* method in order to give a recommendation for each location. The result highlighted that higher width and length different ratio for East-West orientation courtyard, more energy can be generated. It has a capability in reducing more than 10% of energy consumption with maintaining indoor temperature by providing air. Comparing latitude (X), altitude location (Y) shows the higher effect on providing thermal comfort and energy efficiency because the different tropical location has less difference on solar distribution.

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EXPERIMENTAL STUDY OF SLOPE ANGLE AND LOW E GLAZING EFFECTS ON PHOTOVOLTAIC MODULE

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Abstract.

The intensity of solar radiation received by the PV Module can be maximized by installing a PV module with a slope angle. In addition, when the intensity of solar radiation increases, the surface temperature of PV also tends to increase which causes the decrease in PV power output. Temperature Surface can also be lowered by the additional glazing that is low emissivity. By knowing the appropriate angle of inclination and the glazing will be able to maximize light energy (photon) and minimize heat energy received by PV surface, so that obtained the value of maximum output power and heat release. The heat transfer can be determined by analyzing the thermal resistance occurring from the sun down to the PV surface. The test was performed using a commercial PV module with 180 Watt Peak power, where the test results were discussed and presented. The results showed that in the PV module facing North with slope angle 30o has the highest output power and large heat release compared to the other slope angle. In addition, the addition of glazing decreases the output power due to medium transmittance 70% and the temperature of PV module decrease due to low emissivity 0.26.

SUSTAINABLE INFRASTRUCTURE TRANSPORTATION TO IMPROVE SOCIETY WELLBEING IN KARAWANG

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Abstract.

Transportation infrastructure design must follow sustainability concept that requires stability in economic, social and environment, then sustains in the future. Therefore, this research aims to identify time travel, fare level, percentage spending on transport, waiting time, and availability of alternatives mode as sustainable transportation indicators that could be applied in rural and urban area at Karawang Regency, as developing district correspond to society welfare as a social theme variable in sustainability development indicators. This research also identifies existing commutes characteristics and benchmark of the sustainable transportation indicators to improve society wellbeing. This research applies quantitative methods by conducting survey to collect data from respondents. The instruments to obtain data in Karawang Regency are questionnaire form, and then collaborated with structured-interview. Spearman's rank correlation is employed as the quantitative method in order to conduct non-directional and directional hypothesis test. In conclusion, time travel, spending on transport, and fare level variables representing mobility, equity, and affordability have significant influence to experience wellbeing, and then they have negative correlation to social welfare as well. For that reason, time travel and fare level must be reduced to improve society wellbeing.

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REVIEW: HOME ENERGY MANAGEMENT SYSTEM IN A SMART GRID SCHEME TO IMPROVE RELIABILITY OF POWER SYSTEMS

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Abstract.

The concept of home energy management system (HEMS) originated from the development of smart home that builds interaction between users with existing equipment at home so that existing equipment can operate automatically, multi function, adaptable and efficient. In line with the development of technology, the emergence of environmental problems and regulation associated with these problems, smart home applications evolved into HEMS applications that not only to provide easy and convenience, but intended for monitoring and efficiency of energy use at home, to reduce peak power quantity and electricity bill.

Smart grid as an intelligent power grid from generation, transmission and distribution, combining computing technology, artificial intelligence and communications technology in power systems, enabling a smarter power system, producing better power quality and generating costs more efficient. In the smart grid scheme, through HEMS applications, consumers can participate in improving the quality of power systems.

This study will discuss the development of HEMS and in associated with smart grid technology, in particular the role of HEMS with DSM (Demand Side Managment) and PEV (Plug-in Electric Vehicles) in the smart grid scheme to improve the power quality of power systems. Several studies have shown that the contribution of HEMS to the smart grid system can improve the power losses and voltage profile, one of the studies showed that voltage fluctuations resulting from large disturbances can be reduced up to five times.

Keyword : HEMS, DSM, PEV, smart grid, power quality, power system

PREPARATION AND CHARACTERIZATION OF PHOSPHATE – SLUDGE-KAOLIN MIXTURE FOR CERAMIC BRICKS

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Abstract. Phosphate Sludge (PS) waste has been a problem in metal surface finishing industry. The waste cannot be dumped in landfill due to the metal content. This paper describes the attempt of utilization of PS by mixing in in kaolin in preparation of ceramic bricks. A series of experiments shown that mixture containing between 25 - 50 weight % PS sintered at 1200 oC attained the highest compressive strength of >25 MPa. X-ray diffraction showed that the presence of PS in kaolin hindered the formation of mullite, the phase that contribute to strength in Al2O3-SiO2 kaolin system. In the mixture of 1:1 kaolin PS fired at 1200oC cristobalite was detected, instead of the expected mullite, in the XRD pattern.

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A NEW CASCADE SOLAR DESALINATION SYSTEM INTEGRATED WITH THERMOSYPHON

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Abstract.

The current cascade solar desalination system can convert sea water into fresh water. But the ability of cascade solar desalination system has not been able to produce fresh water in large quantities. One solution that has been made to produce more fresh water is to make modification the existing desalination system by adding thermosyphon. The objective of this research is to design a cascade solar desalination system using thermosyphon and to know its ability in producing fresh water. The experimental study was conducted by adding aluminum absorber plate as a heat absorber in the upper tub, and 9 pieces of copper thermosyphon with a length of 60 cm in the bottom of the tub. The thermosyphon with an inclination angle of 15° is used as a solar energy absorber and additional heat for sea water. The experiment is done by varying the inlet flow rate and level of sea water in the upper desalination tub. The sea water flow rates are varied at 3600, 7200, and 10800 mL/h. The levels of sea water at upper tub are varied at 2, 3, and 4 cm. To compare the amount of fresh water is obtained from the utilization of thermosyphon, it is also conducted the using of cascade solar desalination system without using thermosyphon. The results show that the cascade solar desalination using thermosyphon is able to produce average fresh water of 38.6 mL/h with an average daily thermal efficiency of 18.78%. While the same cascade solar desalination without using thermosyphon is producing the average of fresh water of 9.9 mL/h with an average daily thermal efficiency of 8%. These results indicate that the using of thermosyphon in the cascade solar desalination system can increase the productivity of fresh water up to four times more than cascade solar desalination without thermosyphon.

Keywords: Cascade solar desalination; Thermosyphon; Heat pipe; Solar energy

THE USE OF SILICA FROM BEACH SAND AS CATALYST IN MAGNESIUM BASED HYDRIDES FOR HYDROGEN STORAGE MATERIALS

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Abstract.

One of the alternative energy which has a promising prospect to be developed and can be converted into electrical energy with the help of fuel cells is hydrogen. But there is still obstacle that hinder at the application of the fuel cell in hydrogen storage tube. Latest efforts in hydrogen storage research is inserting of hydrogen in certain metals are called solid state hydrogen storage. Magnesium (Mg) as one of the potential candidate material for absorbing hydrogen, because theoretically has the ability to absorb large quantities of hydrogen 7,6 wt%. However, the kinetic reaction of Mg is very slow. Its takes 60 minutes to adsorp hydrogen with the operating temperature (adsorb/desorb) high of 3500C. Therefore, in this study discusses the hydrogen storage materials based on MgH2-SiO2. The purpose of this study to improve desorption temperature of hydrogen storage system based on MgH2. The main material is MgH2 combined with inserting SiO2 catalyst was successfully extracted from quartz sand with coprecipitation method. As for the material preparation process is done with the technique of mechanical alloying. Milling MgH2+SiO2 samples using a ball milling for 5 hours, with the ratio of ball to powder 10:1 and a speed of 400 rpm. By variation of the catalyst insertion of 1 wt%, 3 wt%, and 5 wt% of SiO2. The results of XRD measurement known that the sample was reduced to scale nanocrystal. Phase arising from the result of XRD observation are MgH2 phase as the main phase, and SiO2 phase as a minor phase. DSC testing results show that the lowest desorption temperature obtained on the sample with the addition of inserts weight of the catalyst 5 wt% SiO2 has milling for 5 hours which is equal 307,110C.

Keywords: Hydrogen storage, magnesium, mechanical alloying, SiO2 catalyst, quartz sand, desorption.

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THE EFFECT OF BUCKET NUMBER ON BREASTSHOT WATERWHEEL PERFORMANCE

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Abstract.

More than 17% of people in remote areas of Indonesia still do not have electricity. With the abundance of water potential in Indonesia, hydro pico is considered as the right solution because it has cheap investment and operational cost. The breastshot waterwheel is a suitable turbine that can be applied because it does not affect the garbage in the water. Characteristic of the breastshot waterwheel especially effect of bucket number on performance have been study in this paper. CFD method is used to evaluate the flow field and explain the effect of the number of the buckets on the waterwheel performance qualitatively. The turbulent model used is k-ε. Simulations were performed with the number of buckets 11, 12, 13, 14 and 15. Analysis using ANOVA block design explains that there is a relationship between the number of buckets to the generated power ($F_0 > F_{0.01,2:8}$). From the analysis, the wheel with the number of bucket 13 produces more stable power than other buckets. This is because the shape of the radial blade is not so steeply upward that the weight energy of water and kinetic energy can be utilized maximally.

EXPERIMENTAL STUDY OF THERMAL RADIATION FROM JET FLAME

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Abstract

This paper presents studies on the influence of the nozzle tilt angle on the on the thermal radiation generated by diffusion jet flame. Analysis was limited to the nozzle tilt angle, distance and height of the heat flux measurement, and nozzle diameter. The studies were conducted for three different nozzle tilt angles of 0o, 45o and 90o, three different distances 10 cm, 15 cm and 20 cm, six different heights 10 cm, 20 cm, 30 cm, 40 cm, 50 cm and 60 cm, and two different nozzle diameters 17 mm and 11 mm. The thermal radiation intensity increased with the distance and height of measurements. The variation of horizontal and vertical jet flame was found to follow a linear equation. The studies also included investigation of flame shapes influence on the thermal radiation. The obtained results are presented in a graphical and tabular form. Based on the analysis of results the conclusion are established, important not only for the theoretical considerations but also in practice, especially in the context of immediate ignition on Liquefied Petroleum Gas as fuel for household leakage.

Keywords: Thermal radiation, heat flux, jet flame, tilted flame

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MGH2-SIC BASED HYDROGEN STORAGE MATERIAL PREPARED BY REACTIVE MECHANICAL ALLOYING

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Abstract.

Hydrogen storage in metal hydrides, compared to conventional methods, is regarded as one of the best solutions due to the higher volumetric storage capacity and safety. Magnesium and magnesium-based alloys are promising candidates for hydrogen storage.The hydrogen storage capacity of magnesium in the form of MgH2 amounts to 7.6 wt%. Unfortunately, Mg has a high thermodynamic stability and therefore, relatively slow desorption kinetics, which are the major drawbacks for the application as a hydrogen storage material. Various techniques are developed to improve the sorption characteristics by accelerating the aforesaid processes. In this work we success to synthesis and investigate the catalytic effect of SiC and Ni (in nanostructure scale) on MgH2 using reactive mechanical alloying method in 10 bar H2. At first step, using SiC catalyst the sorption properties can be improved. The most promising step by using double catalysts of SiC and Ni (MgH2-5wt%SiC-5wt%Ni) which absorp 5.7 wt% hydrogen and at the same time decrease the desorption temperature to 250°C. Compared to T onset of pure MgH2 -which desorp at 380o C. To the best of our knowledge, this is the best result so far for MgH2-SiC system.

Keyword: Magnesium, hydrogen storage, reactive mechanical alloying, catalyst, silicon carbide.

DESIGN OF A COMBINATION PACKAGE OF HEAT EXCHANGER AND HEATER FOR ORGANIC RANKINE CYCLE POWER PLANT

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Abstract.

This paper presents the capacity of a heat exchanger with a plate heat exchanger model as evaporator and condenser to liquefy and evaporate R-134a refrigerant as the working fluid in a power plant system by operating an Organic Rankine Cycle (ORC) system using a scroll type expander. The evaporating and liquefying refrigerant as the working fluid uses hot water at a temperature between 40 0C - 80 0C and an evaporator inlet temperature at between 24.1 0C – 28.5 0C. The model design of the hot water production system is a combination of heat exchanger and heater with a shell and tube construction, where the heater is immersed in the heat exchanger. Experimental results show that the average revolutions of the turbine expander scroll is about 348.2 rpm and thermal efficiency between the evaporator and condenser as the heat exchanger ranges from 2 % to 8.5 %.

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SPEKTRA FAST AND SMART SOFTWARE FOR RENEWABLE ENERGY MANAGEMENT

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Abstract.

Nowadays, many countries prefer to use renewable energy and increase the capacity of power generations. One method to increase the capacity power uses a hybrid system. The aim of this paper is to introduce a software for simulating a hybrid power generation included renewable energy, which combines solar and wind power generations. This software is named as SPEKTRA. In order to represent the actual system, there are some editable variables to show exchange of solar and wind power outputs. This simulation is used to increase the understanding of the power generation in the hybrid system for users and to estimate the spending cost of the power generation on hybrid system. The SPEKTRA is developed using Visual Basic. Functional and developed simulation is analysed using the black box method. the result show that the output graph is similar to the theoretical review.

EXERGY ANALYSIS AND EXERGOECONOMIC OPTIMIZATION OF BINARY CYCLE SYSTEM USING MULTI-OBJECTIVE GENETIC ALGORITHM

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Abstract.

The increasing demand on energy and environmental issues make the experts develop the right technology in order to face both issues. Binary cycle system is a highly effective generating technology to be applied in the utilization of small-scale (enthalpy low to medium) geothermal energy by using a working fluid that has a lower boiling point than water. Hence in this paper, a geothermal power plant binary cycle system model was performed using the waste brine with temperature of 180 oC at well pad 4 of Dieng geothermal power plant. Modeling has been done by using MATLAB and REFPROP software. In optimization procedure, total exergy destruction and total annual cost are chosen as the objective function. The optimization is done by using a multi objective genetic algorithm. Based on the simulation it is known that the exergy efficiency and economic value of the optimal binary cycle of geothermal power plant system has an optimum condition at the evaporation temperature of 163.3 oC, brine temperature outlet the preheater of 130 oC, water cooling temperature outlet the condenser of 35.4 oC, working fluid pressure outlet the pump at 3859 kPa with the composition of the working fluid mixture 86% R601 and 14% R744, turbine power of 119.8 kW, total exergy destruction of 742.4 kW with exergy efficiency of 48.8% and total annual cost about 36,723 US dollars.

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NUMERICAL STUDY ON NATURAL CIRCULATION CHARACTERISTICS IN FASSIP-02 EXPERIMENTAL FACILITY USING RELAP5 CODE

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Abstract.

As in many other energy generating system, in the nuclear power plant, the use of natural circulation principle for the safety system is increasingly considered. The natural circulation could play an important role in providing emergency cooling of the nuclear reactor. The reliability of the use of natural circulation in the nuclear power plant should be demonstrated in order to assure the level of its safety. FASSIP-02 is a large scale test facility to study the natural circulation in the safety system of a nuclear power plant. To study the characteristics of the natural circulation and to help validating the design of FASSIP-02, a numerical study using RELAP5 code is undertaken. Based on the existing design of FASSIP-02, the numerical simulation is done with two variables, i.e. the heat flux and the pipe diameter. The effect of heat transfer surface area for dissipating the heat is also studied. The results show the natural circulation established in the FASSIP-02. The characteristics of the natural circulation with the values of several important parameters such as temperature, mass flow rate and pressure in the loop are obtained. The RELAP 5 calculations have provided the results that could be used to support the design and future operation of FASSIP-02.

Keywords: natural circulation, single phase, RELAP5

DEVELOPING A SIMULATOR OF RENEWABLE ENERGY AS A LEARNING MEDIA OF ENERGY CONVERSION

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Abstract.

A renewable energy is a new topic in education in Indonesia, especially for vocational education. The problem is the teaching trainer as a learning media is still not available at Universitas Negeri Malang while developing a trainer is expensive. This paper introduces a renewable-energy simulator, which can show the process of converting energy using hybrid solar cell and wind power systems. In case of the solar cell system, the simulator shows the process of converting the sunlight beam to energy production. Furthermore, the simulator shows the watt peak (WP) of the daily solar beam. In the case of the wind-power system, the simulator shows the capacity of power generator considering the size of rotor, wind speed, and the type of generator. The unique point of this simulator is that the hybrid systems of solar cell and wind power systems are demonstrated. While solar cell can't be effective if the sunlight beam is not available, it can be supported by the wind-power system, which is available for 24 hours, but it is depending on the speed of wind. Thus, implementation of this simulator can help students easier to understand and optimise the development of power generation using renewable energy.

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APPLICATION OF MODIFIED MICROWAVE POLYOL PROCESS METHOD ON NIMO/C NANOPARTICLE CATALYST PREPARATION FOR HYDROGENATED BIODIESEL PRODUCTION

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Abstract.

The development of renewable feedstock-based diesel fuel is start to come up as the solution of national energy problem. However, the thermal and oxidative stability of biodiesel is not good enough. As a result, biodiesel can only be added to commercial diesel fuel as a mixture with concentration under 20%. To get better thermal and oxidation stability, partial hydrogenation process is applied to biodiesel caused the increase of monounsaturated FAME structure. Activated carbon supported NiMo nanocrystal catalyst was used in partial hydrogenation reaction to get high activity, conversion, and selectivity. In this research, NiMo/C catalyst was prepared by modified microwave polyol process method, which is provided a rapid heating and cooling process. This method can produce nano-sized NiMo/C catalyst with short time and low energy consumption. NiMo/C catalyst produced in this research has 285.85 m2/gram surface area and 77.79 nm crystal size, resulting 20.41% conversion and 8.87% selectivity of biodiesel product. Further research should be conducted to obtain optimum condition.

BIODIESEL PRODUCTION FROM RICE BRAN OIL OVER MODIFIED NATURAL ZEOLITE CATALYST

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Abstract.

In the present work, we attempt to develop novel, low cost and highly efficient catalysts derived from the natural zeolite for the transesterification of rice bran oil to produce biodiesel production. The physicochemical properties of the prepared catalysts were characterized by X-Ray Diffraction (XRD), Fourier Transform Infrared (FTIR) spectrometer, N2 adsorption-desorption (BET), and Atomic Absorption Spectroscopy (AAS). The performances of the catalysts were evaluated in terms of the reaction temperatures, the molar ratios of methanol to RBO, and the catalyst loading. The effects of the mass ratio of catalyst to oil (1-10%), the molar ratio of methanol to RBO (6:1-12:1), and the reaction temperature (40-60 □C) were studied for the FAME yield to optimize the reaction conditions. Under the optimal reaction conditions of catalyst loading amount of 5 wt. %, methanol to RBO molar ratio of 12:1, the prepared catalysts gave 87% FAME yield in 120 min at 60 °C.

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SYNTHESIS OF BIODIESEL FROM PALM OIL WITH DIMETHYL CARBONATE AND METHANOL AS REAGENT VARIATION USING KOH AND ENZYME CATALYST

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Abstract.

Biodiesel is a methyl ester transesterification process from the result of triglyceride with a methyl reagent source using a catalyst. One of novel reagent used is Dimethyl Carbonate (DMC) which can eliminate the formation of glycerol as the byproduct through the reaction resulting a compound of glycerol dicarbonate. The advantage of this compound has the same physical properties and to be a mixture in one phase liquid product with methyl ester. Lipase is a hydrolase enzyme that can catalyze the formation of fatty acid molecule from the triglyceride containing oil in the reaction of transesterification. The purpose of this research is to produce biodiesel product by observing the formation of one phase mixture of biodiesel product from the palm oilusing methanol and DMC as the reagent, KOH and lipase catalyst andthe variation of molar ratio of the oil. To obtain the best biodiesel quality examined by four characteristics: methyl ester (FAME) content, density, viscosity, and cloud point. The result of this research is that biodiesel can be produced by both reagent, and for biodiesel by DMC there was only one-phase biodiesel formed without impurities shown visually. For catalyst variation, the best biodiesel produced by methanol is biodiesel with KOH catalyst and has 98.2% ester content, 0.858 g/ml density, and 4.58 cSt viscosity. The best biodiesel produced by dimethyl carbonate is biodiesel with KOH catalyst and has 89.0% ester content, 0.883 g/ml density, and 4.91 cSt viscosity.

Characteristics and Effectiveness Identification of Restructured Product of Snakehead Fish (Channa striata) with Transglutaminase Enzyme Addition

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Abstract.

The existence of fishery waste problem shows that the innovation of fishery processing not yet maximized in Indonesia. Both waste and fresh cuts of fish can be utilized by restructuring with transglutaminase enzyme addition as a crosslinking agent. This microbial transglutaminase (MTG) enzyme can alter protein functionalities by forming stable covalent bonds between residues of the amino acid of protein. Accordingly, this study focused on Snakehead Fish (Channa striata) is used as the protein source and variations of treatment conditions include incubation duration (2 days and 7 days) and the composition of enzyme and processed fish meat (0.0%, 0.5%, 1.0%) and. The results of this study showed the strong performance of crosslinking by MTG on processed fish meat. This is confirmed by an increase in texture profile parameters (hardness, cohesiveness, and elasticity), the detection of myosin changes, also wave number increment of C-N and an increase of intensity of C=O bonds. The highest effectivity value in the sample was achieved by variation of incubation duration of 7 days and the addition of 1.0% MTG enzyme with a value of 129,78% in hardness parameter in sample.

Keywords: protein; restructurisation; microbial transglutaminase enzyme

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ESTIMATION OF NATURAL CIRCULATION FLOW BASED ON TEMPERATURE IN THE FASSIP-02 LARGE-SCALE TEST LOOP FACILITY

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Abstract.

In the future, the use of passive cooling system without electrical power input become highly considered to be implemented in the design of nuclear reactor safety system. Moreover, the lessons learned from the Fukushima-Daiichi accident encourage the incorporation of such passive cooling system. The passive safety cooling system is aimed to cope with both design bases as well as severe accidents. The natural circulation is one example parameter of the passive cooling system features being widely considered. However, some of the parameters involving in natural circulation are still being investigated, in particular the problem of flow instability. BATAN is designing a large-scale test loop facility, named FASSIP-02 loop, with a height of 11 meters between a heat source and a cooling source. The FASSIP-02 loop is designed to simulate the residual heat in the reference reactor. To ensure the validity of the design prior to the construction, it is necessary to make an analytical calculation using some correlations to estimate the natural circulation flow rate. The calculation method is performed by using the derived two principle correlations of the buoyancy force in the heating section and the gravitational force on the cooling section. The water temperatures in the heating section are varied at 50ºC, 60ºC, 70ºC, 80ºC and 90ºC with the water temperature in the cooling tank pool are varied at 10ºC, 20ºC, 30ºC, 40ºC and 50ºC. The calculation results can estimate the water temperature and volume are required. In addition, it could be used to determine the experimental matrix that is based on the FASSIP-02 loop design.

Keywords: natural circulation, passive cooling, temperature, large-scale, calculation

AN EXPERIMENTAL INVESTIGATION OF SETTING THERMOSTAT EFFECT ON ENERGY CONSUMPTION OF HOUSEHOLD REFRIGERATOR

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Abstract.

Setting the thermostat on the household refrigerator is a thing that is rarely noticed by the owner. This study presents the effect of thermostat regulation on the increase of household refrigerator energy consumption. The experiments were performed on room chamber as the conditioned room with temperature controlled 25 o C. A household refrigerator is used as a test unit with a cooling load included in the freezer. Cooling loads using M-package in accordance with IEC 15502: 2008. From the test results, household refrigerator energy consumption increases with increasing thermostat settings. Increased energy consumption ranges from 17.10% to 18.65%, depending on thermostat settings. If the user understands, it will save energy consumption and can maintain the quality of food stored.

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EXPERIMENTAL STUDY OF HEAT PIPE HEAT EXCHANGER MULTI FIN FOR ENERGY EFFICIENCY EFFORT IN OPERATING ROOM AIR SYSTEM

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Abstract.

Heat Pipe Heat Exchanger (HPHE) has been widely applied in various fields. One area of application is on the operating room of Heating Ventilating Air Conditioning (HVAC) system. The hospital operating room of HVAC system has several indicators such as temperature, relative humidity, cleanliness and air change per hour. These indicators are an absolute requirement to maintain indoor air quality and thermal comfort of the operating room. The operating room temperature range is 20-24 °C and relative humidity at 30-60%. The value of indoor air change is at least 20 times per hour. The objective of this study was to obtain the effectiveness and heat recovery values of installed Heat Pipe Heat Exchangers in HVAC system. HPHE is a passive device that provides energy saving function in the HVAC system. In this research the HPHE is designed to consist of 42 heat pipe tubes equipped with 120 wavy fins on the evaporator and condenser. HPHE is designed with 3 row configuration, and tested on an air system with variations of inlet airflow temperature: 28, 30, 35, 40, and 45 ºC and variations in air velocity of 1, 1.5, and 2 m/s. The test result on 3 row configuration resulted inlet temperature reduction around 2.97 – 10.3 °C, while having HPHE effectiveness value in the range of 47.9 – 54.4%. The highest effectiveness value of 54.4% was obtained at air velocity of inlet 1 m/s and temperature 45 ºC. The highest HPHE heat recovery value is 5,368 Watt at 2 m/s inlet air velocity and 51.7% HPHE effectiveness rating. This HPHE system can be considered for saving energy in HVAC system.

AN EXPERIMENTAL INVESTIGATION INTO THE EFFECT OF THERMOSTAT SETTINGS ON ENERGY CONSUMPTION OF HOUSEHOLD REFRIGERATORS

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Abstract.

Many household refrigerator owners do not control their thermostat settings. Controlling the thermostat could save energy consumption and also maintain the quality of stored food. This study presents the effect of regulated thermostat settings on household refrigerator energy consumption. The experiment is performed in a room chamber conditioned to temperature control at 25 o C. A household refrigerator is used as a test unit with a cooling load placed inside the freezer component. The cooling load used is M-package in accordance with IEC 15502: 2008. Test results reveal that household refrigerator energy consumption increases with higher thermostat settings. Increases in energy consumption ranges from 17.10% to 18.65%, depending on the thermostat settings.

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A PRELIMINARY INVESTIGATION ON VISUALIZATION OF OSCILLATING HEAT PIPE WITH NON DESTRUCTIVE TEST

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Abstract.

Oscillating Heat Pipe (OHP) is a passive heat exchanger operating on two phase flow principle. As one of the newest members of the heat pipe family, OHP has a complicated operating mechanism of working fluid flow. OHP is a potential device, which can be used for saving energy and cost. Although, OHP is a promising two-phase heat transfer device with excellent performance, simple structure and low cost but its operational characteristic is still not clear yet and debatable. As one of the non-destructive test, neutron radiography uses neutron beam techniques to penetrate heavy materials while beam are absorbed by lighter materials. This method is very suitable for use in visualization technique of the two-phase flow of heat transfer device with hydrogen-based fluids. In this paper, the visualization method is coupled with thermocouple temperature measurement. Aluminium OHP with 12 turns has been manufactured and tested. The dimension of aluminium OHP is made fit with the neutron beam size. DI Water with filing ratio 35 % has been chosen as the working fluid for the close loop OHP. Three level of heating power was applied to the evaporator section of OHP. The result showed that this preliminary study could reveal the temperature fluctuation of the thermocouple data. The condensation and evaporation also can be observed adequately with this method.

EXPERIMENTAL STUDY OF HYBRID LOOP HEAT PIPE USING PUMP'S ASSISTANCE FOR HIGH HEAT FLUX SYSTEM

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ABSTRACT

Loop heat pipe is a promising thermal control system, the same as a heat pipe, to realize the efficient release of heat from electric appliances. It is suitable for applications in electronics that have higher power density. Meanwhile, the heat pipe loop (LHP) can also be considered for adoption in the manufacture of solar hot water systems, due to its unique features such as effective thermal conductance and flexible design embodiments. However, the start-up problem of the LHP and transport distance and higher heat release capacity is still existed influencing the operating stability of the device. Base on the problem, this study focuses to carry out work on the developing a novel LHP system in order to provide a robust solution for significant enhance the ability energy transfer. This novel LHP is a conventional LHP that was modified by adding a diaphragm pump to accelerate the fluid transportation (called as hybrid loop heat pipe, HLHP). The pump is installed on the liquid line complete with a reservoir. It will work passively using the wick capillary pressure when there is no sign the occurrence of dry-out. In another hand, the pump was only activated when the evaporator temperature tends increased extremely because of the failure of start-up. The experimental result showed that installed diaphragm pump in LHP modified system was able to prevent the occurrence of dry-out and significantly reduced the evaporator temperature. The study will contribute to achieving the targets for energy saving and renewable energy utilization.

Keywords: Hybrid Loop Heat Pipe, Pump's Assistance, Start-up, Renewable Energy, Solar collector.

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UTILIZATION OF SECANG HEARTWOOD (CAESALPINIA SAPPAN L) AS A GREEN CORROSION INHIBITOR ON CARBON STEEL (API 5L GR. B) IN 3.5% NACL ENVIRONMENT

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Abstract.

This research is to investigate secang heartwood extract (caesalpinia sappan l) as a corrosion inhibitor on carbon steel metal (API 5L Gr B) in 3.5% NaCl environment. This research utilized polarization linier for the measurement method. Secang extract is adequate to reduce corrosion rate by 53.18% efficiency (based on polarization measurement). The most effective concentration of inhibitor secang is 2.0 ml/400 ml 3.5% NaCl. Furthermore, inhibitor efficiency of secang tends to decrease by increasing of temperature. From polarization study, secang was indicated as mixed type inhibitor, with predominant cathodic effectiveness. In addition, the inhibition mechanism of secang shown as physicsorption mechanism and obeys Langmuir Isotherm model.

GRID CONNECTED STABILITY IMPROVEMENT OF PENETRATION WIND TURBINE USING FUZZY LOGIC CONTROLLER PSS

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Abstract.

This paper, Fuzzy Logic Controller (FLC) Power System Stabilizer (PPS) scheme is proposed. This scheme improved Stability effect of wind turbine penetration grid. The performance of the proposed scheme is validated on the grid connected with high penetration of wind turbine using MATLAB and DIgSILENT simulation. The simulation results showed that the proposed controller can reduce oscillation the stability caused by high penetration wind turbine.

Key word: Connected Grid, Stability, Penetrated, FLC, PSS

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SELECTING AND TESTING OF WIND TURBINE BLADES OF THE LOCAL-WOOD GROWING FASTLY ON LOCAL WIND CHARACTERISTICS

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Abstract.

The total potential of wind energy in Indonesia reaches 144 GW. This wind energy potential is dominated by small wind speeds ranging from 4-6 m / s and about 113 GW. This is the reason why the development of small-scale wind powerplant is more feasible to be developed in Indonesia. The characteristics of local wind and geographical conditions of Indonesia which is an archipelagic country are fundamental in designing wind power and utilizing of local materials. This study aims to get local fast-growing wood of wind turbines blades in Indonesia, which has the best physical and mechanical properties of wood, and is tested computationally on certain airfoils and shows a uniform distribution of stress. The types of wood are tested in this study were Sengon (Albizia chinensis), Jabon (Antocephalus cadamba), and Balsa (Ochroma Rowlee grandiflorum). The test covers the basic properties of the wood, physical and mechanical properties. The test results showed that Jabon have density 0.34 was the best compared to Sengon (0.24) and balsa (0.18). The best dimensional stability (T/R Ratios) are Jabon (1.97), sengon (2.19) and balsa (2.84), respectively. With the highest density result and the lowest dimensional stability value, mechanical testing of Jabon wood shows the best mechanical properties. The simulation result using Q-Blade software was obtained airfoil NACA 4415 most suitable for local wind characteristics, and got the low value of stress and distribution color uniformly on each wood.

Key Word: airfoil NACA4415, blade design, physical and mechanical properties, and wind turbine.

PROCESS OPTIMIZATION OF MICROALGAE CULTIVATION IN A BUBBLE-COLUMN PHOTOBIOREACTOR

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Abstract.

A process optimization was performed in this study to obtain parameter and geometry values providing an optimum average concentration of microalgae in an internally illuminated bubble-column photobioreactor. A phenomenological model of the photobioreactor is used to simulate the process in the reactor. The model considers gas-phase mass balance and liquid-phase mass balance accompanied by the rates of CO2 and nutrient intakes in liquid phase. The process optimization yields the values of the diameters of the small and large cylinders, the culture height, the inlet air flowrate, the CO2 mole fraction in the air and the initial concentration of microalgae that promotes the microalgae growth up to 0.773 g/L from 0.2 g/L for less than four days.

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EXPERIMENTAL STUDY ON HORIZONTAL AXIS WIND TURBINE WITH SPLITTED WINGLETS

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Abstract

Human needs increasing over years, energy is needed to fulfill the daily life. In the other hands, source of energy such as coal is decrease and become less and less. There is a renewable energy that can made from wind source. Wind energy can be obtained by using some tools such as wind turbine. Wind turbine is a device that used to convert wind energy into electricity. Wind turbine has developed to many variation. One of variation that added to the wind turbine especially on their blades is splitted winglet. This additional variation is an adaptation from recent aircraft. The advantages of using this typical of winglets on aircraft is increasing the lift coefficient and decreasing drag coefficient. The function of splitted winglet on wind turbine blades is to minimize the backflow on the tip of blades. This research expectation is turbine will get better performance. Comparing the turbine with the blade without winglets, with winglets and with splitted winglets. Turbine with the blades without winglets gives best performance among all the turbine variations. The air flow hit the turbine at 6 m/s, the performance of turbine without winglets give Cp about 5,2E-1. With the same velocity of airflow, the turbine with winglets and splitted winglets give Cp about 4,7E-1 and 2,1E-1.

MODELING OF TURBINE FOLLOW CONTROL WITH IMC TUNING METHOD BASED ON HYSYS

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Abstract.

The power plant is one of the several industries whose product are used by consumers directly. To maintain electricity production, the power plant requires an appropriate control strategy based on real-plant. Turbine Follow Control (TFC) is one of the several control strategies for keeping electricity production. TFC is a control strategy that used to control throttle pressure based on Advanced Regulatory Control (ARC) concept. When there is a change of load on the generator, the error signal will be received by the indicator control. The error signal used to respond with the fuel arrangement in order to maintain the main steam production. Furthermore, the changes of main steam production indicated by the pressure indicator control. It will be responded by the turbine governor valve to carry out a follow-up response in maintaining the main steam towards the turbine. The actual response is given in the form of the percentage of a valve. In this paper has been modeled TFC strategy using Internal Model Control (IMC) tuning method and First Order Plus Dead Time (FOPDT) approach for getting good control response based on HYSYS. In addition, IMC tuning response in this paper also depends on the ± 5% from set point test. From modeling of TFC based on HYSYS, the simulation shows that TFC is precise control strategy to handle the changes of load on the generator with integral absolute error value are 102,087.7 for +5% from set point test and 122,947.1 for -5% from set point test.

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HEAT TRANSFER COEFFICIENT OF NEAR BOILING SINGLE PHASE FLOW WITH PROPANE IN HORIZONTAL CIRCULAR MICRO CHANNEL

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Abstract.

Experimental study of heat transfer coefficient of single phase has conducted successfully. The study used natural refrigerant of propane as working fluid with heating process. The aim of the present research is to study near boiling single phase heat transfer coefficient on the micro channel of 500 µm diameter and 0.5 meter length. Variable of research are heat flux of 1 to 15 kW/m2, mass flux of 297 to 1102 kg/m2.s, and test section inlet temperature of 21 to 26oC. The experimental results showed single phase laminar-turbulence flow with Reynolds number less than 10000. Heat transfer coefficient of near boiling single phase flow is significantly affected by Reynolds number and Prantl number. Using the present experimental data, new correlation of Nusselt number is developed as a function of Reynolds number and Prantl number.

BIODIESEL SYNTHESIS OPTIMIZATION FROM WET AND DRY BASED MICROALGAE CHLORELLA VULGARIS BY REACTION TIME ARRANGEMENT

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Abstract.

Microalgae have the potential to be used as the raw material for biodiesel synthesis. One of promising microalgae species to be used is Chlorella vulgaris. However, in the process of biodiesel synthesis from microalgae needs to be optimized. In this study, optimization of biodiesel synthesis from wet and dry based microalgae Chlorella vulgaris has been studied. Optimization done by arranges the time of transesterification reaction. Transesterification reaction has been done using KOH catalyst. The reaction time was varied at 20, 40, and 60 minutes. From the results, the highest yields of biodiesel are obtained on the 40 minutes reaction time with biodiesel yield is 75% for wet based microalgae and 62.8% for dry based microalgae. Biodiesel from dry based microalgae Chlorella vulgaris composed by several types of FAME, including saturated FAME such as methyl myristate (4.48%), methyl palmitate (28.3%), and methyl stearate (17.1%), and also composed by unsaturated FAME such as methyl palmitoleate (11.1%) and methyl oleate (39.1%).

Keywords: biodiesel, Chlorella vulgaris, dry based, reaction time, wet based, yield

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BIODIESEL SYNTHESIS FROM NANNOCHLOROPSIS OCULATA AND CHLORELLA VULGARIS THROUGH TRANSESTERIFICATION PROCESS USING NAOH/ZEOLITE HETEROGENEOUS CATALYST

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Abstract.

Microalgae are promising sources of biofuel due to its production capacity of lipid that can be utilized as raw material for biodiesel production, especially Nannochloropsis oculata and Chlorella vulgaris. The lipid produced can be converted into biodiesel through transesterification reaction using homogenous or heterogeneous catalysts. Heterogeneous catalysts are more advantageous than homogeneous catalysts due to its solid form that eases the separation of catalysts from the products. In this research, NaOH/zeolite heterogeneous catalyst is utilized with varying Na loadings in the zeolite to observe its effect towards the yield of biodiesel produced from N. oculata and C. vulgaris. The best result was obtained with Na loading concentration of 20.5%. The biodiesel yields obtained from the lipids are 83.5% from N. oculata and 98% from C. vulgaris. The biodiesels contain 47.15% of saturated fatty acid methyl esters from N. oculata and 56.41% from C. vulgaris.

Keywords: biodiesel, Chlorella vulgaris, NaOH/Zeolite catalyst, Nannochloropsis oculata, transesterification, yield

EFFECT OF MEDIUM AND INCUBATION TIME ON PRODUCTION OF AA, DHA AND EPA FROM ASPERGILLUS ORYZAE BY SOLID STATE FERMENTATION

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Abstract.

Two percent of the 48 million people with disabilities suffer from mental illness, where the biggest cause is the lack of Arachidonic Acid (AA), Docosahexaeonic Acid (DHA) and Eicosapentanoic Acid (EPA) that play a role in brain development. Single Cell Oil, which utilizes one-cell microorganism, can be a solution, such as Aspergillus oryzae, to produce AA, DHA & EPA. A. oryzae was cultivated on Potato Dextrose Agar (PDA), Czapek Dox Agar (CDA) and Malt Extract Agar (MEA), and then the incubation times are 2,4,5,6 and 7 days in optimal medium. Lipids were extracted using ethanol and n-hexane. The characterization of lipid was done by gas chromatography (GC) method. The most optimal medium is CDA with a lipid concetration of 0,18 g. The best incubation time on CDA medium was 5 days with 0,216 g lipid content containing 0,123 g unsaturated fatty acid, 0,0613 g PUFA and 0,0615 g MUFA. The unsaturated fatty acid composition produced on the 5th day was 29.2% oleate; 29.1% linoleate and ± 0.046% EPA.

Keywords: Aspergillus oryzae, MUFA, PUFA, Single Cell Oil, Solid State Fermentation

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CHARACTERISTICS OF CALCIUM CARBONATE NANOFLUIDS FLOWING IN PIPE

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Abtract.

Issue of energy is important because energy is one of economic foundation to support a nation. In Indonesia, new renewable energy sources was abundant, and can be used as a source of friendly energy. Innovations continue to be developed to find the right method about good quality and cheap, energy that is widely available in nature. Calcium carbonate nano particles of shellfish one of the are environmentally friendly materials available in abundance in nature. In this study, calcium carbonate nanoparticles are used in aqueous solution of water-ethylene glycol fluid with a ratio of 40:60. The purpose of this study was to determine characteristics and hidrodinamic behavior of non-Newtonian calcium carbonat nanoparticles dispersed in a small tube. Concentration of particle was used 100 ppm, 300 ppm and 500 ppm on the working fluid. The test is performed on a horizontally designed test with component of the piping system a circular pipe 4 mm of inner diameter. Pressure drop were determinate between two different point there are high pressure and low pressure tap by different data acquisition. Through this test, the change of friction factor value becomes the parameter of the indicator to DR. At the highest DR laminar is 79.94% for the 100 ppm concentration with Re' 1500 and DR at the highest turbulent flow is 47% for the 300 ppm concentration and with Re' 2500.

INVESTIGATION OF BIOMASS GASIFICATION USING INDONESIAN CLAY AS CATALYST

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Abstract

Gasification is one of the technologies to process biomass as a renewable alternative energy source. Steam biomass gasification using various clays derived from Indonesia was carried out with laboratory scale fluidized bed reactor to evaluate the activities of clay as catalysts. At the same time to elucidated the relationship between material bed characteristics and gasification process activity. Tar capturing ability was compared for activated clay, silica sand and clay minerals derived from Indonesia by using a laboratory scale fluidized bed reactor. Even raw clay minerals were found to reduce heavy tar and water-soluble species emissions and increased carbonaceous materials deposited on the bed materials compared to activated clay. Activity of some Indonesian clay revealed high performance on the biomass gasification due to the amount of acid center.

Keywords: Biomass Gasification, Indonesia clay catalysts, fluidized bed, acid center,

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EFFECT OF ANODE DEPTH AND CONDUCTIVITY OF ELECTROLYTE SOLUTION ON ENERGY CONSUMPTION IN PLASMA ELECTROLYSIS

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Abstract.

This research was conducted to investigate the effect of anode depth and conductivity of electrolyte solution on required energy for plasma generation in plasma electrolysis. The experimental parameters were composed of different depth of anodes (0, 15, 25, 45, and 65 mm) and various solution conductivity. The difference in electrolyte solution conductivities is presented by different concentration of Na2SO4 (0.01, 0.02, 0.03, and 0.05 M). A batch reactor (diameter 130 mm, height 190 mm) with tungsten electrodes (cathode diameter 6 mm and anode diameter 0.5 mm) was used by applying a continuous cooling system. Current was observed in various voltage (40 – 400 V) for 30 second in each voltage. Energy consumption for vapor formation and discharge plasma found higher at deeper position of anode. At higher conductivity of electrolyte solution, although energy consumption for vapor formation was observed lower, energy consumption for plasma discharged was found higher.

Keywords: breakdown voltage, conductivity, depth of anode, energy consumption, plasma electrolysis

THE IMPACT ANALYSIS OF POSTAGE MULTI-TARIFF SYSTEM ON GAS TRANSPORTATION THROUGH THE PIPELINE TO INCREASE GAS PRICE EFFICIENCY AS THE ATTRACTION OF MORE ENVIRONMENTALLY FRIENDLY POWER PLANT SUBSTITUTION

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Abstract.

The purpose of this study is to provide an analysis of the comparison and impact of changes in the model of Gas Transportation Tariff calculations through Pipes on the transportation of natural gas for fuel power plants in the region X. Which initially used a single tariff distance system that provides gas prices that are still not economically attractive, will be replaced with a more efficient multi-tariff postage stamp system. With the change of tariff calculation method, it will get the lower gas price and will inevitably increase the commercial appeal to be able to replace HSD (High-Speed Diesel) Generator which is expensive and cause more pollution. Initially, the substitution program is still less attractive because gas prices are still inefficient because the use of tariff calculation method is less precise. New tariffs are modeled by modifying cash flow and some variables with scenarios dividing tariffs into groups and re-modeling the volume of gas flowing in the pipeline through simulations using software and calculations. With the sensitivity test will also be done to provide the best scenarios to the efficiency of gas price formation. If gas prices are more efficient than fuel, it will further increase the attractiveness to accelerate fuel substitution of fuel with cleaner gas fuel and support Government programs. A comparison of the carbon decline will also be made to prove the substitution of diesel with gas to have a positive impact on the environment to provide an analysis of environmental issues. Finally, we propose that the application of a multi-tariff system will provide the best scenario for enhancing the efficiency of natural gas prices in the substitution of power generation from diesel into previously less attractive gas to be more efficient and more environmentally friendly.

Keywords: Efficiency, Environmentally friendly, Gas price, Gas tariff, Multi-tariff, Substitution

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VOLTAGE CHARACTERIZATION OF WASTE HEAT RECOVERY USING THERMOELECTRIC GENERATOR

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ABSTRACT

Nowadays the great challenge to energy engineers is how to develop new and renewable energy sources to reduce the use of fossil fuels. In this direction, the research focuses on the recycling of wasted heat energy on a motorcycle exhaust gas into electrical energy using the concept of feedback. Recycle energy using this concept on a motorcycle is done because the bike has the energy efficiency of ± 35 – 40 percent while the rest were dumped unceremoniously in the form of heat energy that is issued through the exhaust. This research aims to know the characteristics of the output voltage thermoelectric generator utilizing waste heat of the motorcycle. This research has been done on the measurement of the output voltage is generated by the thermoelectric module series SP1848-27145 as a Thermoelectric generator to produce electrical energy. This research was conducted to know the output voltage from 4 thermoelectric modules arranged in series or parallel. Furthermore, this thermoelectric generator will be the main energy source for SSUPER-BT devices. Stages of the research done by performing laboratory and road testing. In laboratory testing, simulation of thermoelectric generator made using aluminum rods contain Heater. two sides of the aluminum coupled to thermoelectric modules, heat pipe and CPU fan. in each experiment, the thermoelectric modules strung together in series or in parallel. The results showed on the stem contains aluminium heater heated up to 159 ° C equals the heat exhaust, thermoelectric modules are assembled in parallel capable of producing an average output voltage 3 volts with temperature difference in hot and cold side 61.46 ° C while the thermoelectric modules strung together in series to produce the average output voltage of 10 volts with a hot and cold side temperature of 94,06 ° C.

Keywords: Waste heat, thermoelectric, heat recovery, thermoelectric Generator, voltage

SYMPOSIA 2 : BIOMASS AND BIOTECHNOLOGY

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EMISSION AND PERFORMANCE CHARACTERISTICS OF WASTE COOKING OIL BIODIESEL BLENDS IN A SINGLE CYLINDER DI DIESEL

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Abstract.

The waste cooking oil (WCO) has been converted to WCO methyl ester (WCOME) by transesterification using microwave irradiation reaction. The fuel was blended with Petron Diesel Max (PDM) containing 7% methyl ester to perform the performance and emission testing of a one cylinder Yanmar Diesel engine L70. The results were compared with PDM fuel and two blends of PDM with Palm Oil methyl ester (POME) that to B10 and B20 respectively. The performance and emission test results of five test fuel PDM, BP10, BP20, BW10 and BW20 then compared with the simulation results by using the GT-Power software. The experimental results indicated that using POME and WCOME blends led to increment in brake specific fuel consumption (BSFC) up to 5.9% and reduction in the brake thermal efficiency (BTE) up to 29.3% compare to PDM. These biodiesel blends also increased NOx emissions and decreased CO2, CO and HC emissions for all engine loads at the constant speed of 2500 rpm. The experiment of the cylinder peak pressure increase significantly with the increase of engine load, for four test fuels. All the simulation graphs show the similar trend compared to experiment.

THE EFFECT OF ANTIOXIDANT ADDITIVES ON THE GROWTH OF DEPOSITS ON THE USE OF BIODIESEL FUEL (B100) AT CERTAIN TEMPERATURES

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Abstract. Indonesia and several tropical countries produce a lot of energy sources including palm oil, coconut, nyamplung, rubber seeds, kosambi and various other plants. The source can be converted into biodiesel or bioethanol. This is reinforced by Presidential Instruction, the government issued Indonesia's National Energy Policy under Presidential Regulation No. 5/2006. This regulation formalized the promotion of biofuels in Indonesia, for both ethanol and biodiesel, and established a 5% biofuel in national energy consumption mandate by 2025. However, consideration of the use of biodiesel fuel is the formation of deposits in the engine or combustion chamber. In this study, the formation of a deposit of biodiesel fuel was carried out by comparison of biodiesel B100-NA without additive with biodiesel variation plus antioxidant additives such as B100 + BHT, and B100 + PG performed by the method of fuel droplet to heat plate to know the characteristics and mechanism of deposit formation On each fuel variation. The research was conducted by the deposition process and evaporation of Diesel fuel which was repeatedly carried out on a hot plate. The plate is heated with temperature variations in the enclosed space so that the conditions are close to the real condition of the engine. This test uses hot room temperature test rig. Use of antioxidant additives to inhibit oxidation in biodiesel is expected to keep the acid number low and increase oxidative stability, which will help prevent excessive deposits in the combustion chamber. This study aims to find the optimal temperature for the growth of the deposit can be controlled.

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SYNTHESIS OF GREEN DIESEL THROUGH HYDROLYSIS AND HYDRODEOXYGENATION REACTION FROM WASTE COOKING OIL USING NIMO/AL2O3 CATALYST

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Abstract. Green diesel is a second generation of biofuel that has a potential to answer the energy needs either in Indonesia or in the world. The reaction used to produce green diesel are hydrolysis and hydrodeoxygenation by using NiMo/Al2O3 catalyst. Hydrolysis will change the triglycerides in the raw material, which is waste cooking oil into free fatty acid (FFA) and then converted into green diesel through hydrodeoxygenation. Hydrolysis of waste cooking oil carried out at temperature of 200oC and pressure of 16 bar for 3 hours with water and oil volume ratio of 1:1. FFA product of hydrolysis is as much as 73.89%. For hydrodeoxygenation, variation in operating condition used are 375oC with pressure of 12 bar and 400oC with pressure of 15 bar. The optimum operating condition, which is at 400oC can produce green diesel with conversion of 82.15%, selectivity of 69.58%, and yield of 62.49%.

SYNTHESIS OF KEMIRI SUNAN (REUTEALIS TRISPERMA (BLANCO) AIRY SHAW) H-FAME THROUGH PARTIALLY HYDROGENATION USING NI/C CATALYST TO INCREASE OXIDATION STABILITY

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Abstract. Synthesis of Kemiri Sunan (Reutealis Trisperma (Blanco) Airy Shaw) Hydrogenated FAME (H-FAME) using Nickel/Carbon catalyst is one of the methods to improve the oxidation stability of Kemiri Sunan biodiesel. The partial hydrogenation reaction breaks the unsaturated bond on FAME (Fatty Acid Methyl Ester), which is a key component of the determination of oxidative properties. Changes in FAME composition by partial hydrogenation reaction are predicted to change the oxidation stability so it does not cause deposits that can damage the diesel engine injection system, pump system, and storage tank. Partial hydrogenation reaction under conditions of 120 °C and 6 bar with 100:1, 100:5, 100:10 %wt catalyst in the stirred semi-batch autoclave reactor. H-FAME synthesis with 100:5 %wt Ni/C catalyst can decrease the iodine number which is the empirical measure of the number of unsaturated bonds from 166.77 to 155.64 (g-I2/100 g) with an increase of oxidation stability from 558 to 569 minutes.

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AN ECO-FRIENDLY PREPARATION OF CELLULOSE NANO CRYSTALS FROM OIL PALM EMPTY FRUIT BUNCHES

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ABSTRACT

Cellulose Nanocrystals (CNCs) have attract a lot of attention as one of the promising green nanomaterials because of their interesting properties such as low density, high mechanical properties, high surface area, high biocompatibility and low toxicity. However, sulphuric acids is generally used in conventional method to prepare CNCs which is highly corrosive and harmful to environment. Replacing sulphuric acid with ammonium peroxodisulphate (APS), which possess lower toxicity, are desirable from environment point of view. In this research, preparation of CNCs from Oil Palm Empty Fruit Bunches (OPEFB) as alternative raw materials and using APS is reported. Three kind of methods were carried out before applying APS solution: (i) without pre-treatment, (ii) with alkali pre-treatment and (iii) with alkali-chloride pre-treatment. Based on visual observation, Dynamic Light Scattering (DLS) and X-Ray Diffraction (XRD) results, sample with alkali-chloride pre-treatment showed highest possibility to obtain CNCs with particles size around 30 nm and crystallinity index (CrI) around 57%.

Keywords : Cellulose Nano Crystals, eco-friendly synthesis, Oil Palm Empty Fruit Bunches.

Performance of Lithium Ferro Phosphate (LiFePO4) Doped Vanadium Battery with Active Carbon Bamboo Coating and Carbon Black

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Abstract. A synthesis of hydrothermal methods has been made to prepare $LiFePO_4$ cathodes with variations of vanadium elements and coatings with carbons. In this study, the preparation of $LiFePO_4$ beguns with the precursor of LiOH, $NH_4H_2PO_4$, and $FeSO_4.7H_2O$ according to stoichiometry. After the synthesized, the addition of vanadium elements from H_4NO_3V powder as a variation of the cathode active material and two types of carbon sources, the activated carbon from bamboo and carbon black. The materials were mixed using a ball-mill and subsequently characterized the thermal analysis with STA to determine the sintering temperature. The result shows that LiFePO4 formation temperature is at 639°C. Then sintering process is done for 4 hours and afterwards characterization is done by using X-ray diffraction (XRD) and electron microscope (SEM). The result of characterization with XRD shows that $LiFePO_4$/V/C phase formed olivine structure, while the SEM result of $LiFePO_4$/V/C shows fairly even distribution and smaller particle size and some agglomerated microstructure. The batteries were prepared from the as-synthesized materials and was tested using electrochemical impedance spectroscopy (EIS) to show the conductivity. The results show that carbon coating on the active material increases the high conductivity, while the addition of vanadium conductivity decreases dramatically.

Keywords : LiFePO4, hydrothermal, bamboo carbon, carbon black, battery cathode

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PERFORMANCE AND PREDICTION OF VACCINE CARRIER USING ADSORPTION PROCESS AND 13X/CACL2 COMPOSITE ZEOLITE AS ADSORBENT

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Abstract. Vaccine is one of the biggest problem that happen in Indonesia. Almost 75% vaccine is frozen on shipment process from Province to healthcare in district. Vaccine usually is transferred using a vaccine box whose the temperature has to be maintained at 3-8°C. The newest technology of vaccine box uses adsorption cooling and solar energy to keep the cold chain. This technology is separated into 3 modules which are cooling module (contain zeolite and water), vaccine box, and solar heater. The cooling module using adsorption as the cooling process, where the adsorption makes a pressure drop and causes the decrease of the temperature. The decrease temperature will be used as source of the cooling in the vaccine box. After the zeolite in cooling module reach the saturation because of adsorption process, it has to be heated up using solar cooker as the media. The solar cooker collects the energy from the sun using the principle of greenhouse effect. From simulation using MATHLAB, the vaccine box could reach temperature 5°C and can be maintained for 12 hours. For the desorption process, it needs heat 150 KW and 23 minutes to complete the process.

THE FABRICATION OF YAM BEAN (PACHYRIZOUS EROSUS) STARCH BASED BIOPLASTICS

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ABSTRACT.

Bioplastics, easily degraded plastics made from renewable biopolymers such as starch and protein, are being studied as possible substitute for synthetic plastics. One of Indonesian natural resource, Jicama (Pachyrizous erosus), also known as yam bean, is believed to have a potential to be made as bioplastics. This study aims to develop starch-based biofilms made from yam bean. The films were fabricated using solution casting method, with varying water (67–93 wt%) and sodium hydroxide (0.3–0.7 g) contents. Examinations were carried out by means of visual inspection, tensile test, scanning electron microscopy and FTIR spectroscopy. A continuous bioplastic film was successfully made with 93 wt% water. Addition of water increased film formability. Sodium hydroxide also improved the film formability, but induced fragility. The highest tensile strength and stiffness of 11.5 MPa and 0.98 GPa, respectively, were achieved from the film prepared with 93 wt% water. These values are comparable to LDPE, but with a lower ductility.

Keywords: Bioplastic, Jicama, Pachyrizous Erosus, Starch, Water, Yam bean

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THE EFFECT OF PROCESSING METHODS ON THE IMPROVEMENT OF TENSILE PROPERTIES OF RANDOM RAMIE FIBER – REINFORCED TAPIOCA STARCH BIOCOMPOSITES

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Abstract. The use and the disposal of Glass Fiber-Reinforced Plastic (GFRP) composites are becoming an environmental issue. To overcome the problem, biocomposites made of ramie fibers and tapioca starch might become an alternative to GFRP composites, due to their renewable properties, environmental friendly and easily degraded by nature. However, mechanical properties of fiber-reinforced starch based biocomposites are quite low due to high void content and poor fiber-matrix interface. In this research, the effect of the processing methods on tensile properties of tapioca starch - reinforced random ramie fiber biocomposites were studied. Ramie fiber reinforced tapioca starch biocomposites were fabricated by means of solution casting and compression molding technique. Random ramie fiber-reinforced tapioca starch biocomposites were succesfully made with the highest tensile strength and modulus elasticity of biocomposites were 18 MPa and 959 MPa respectively. The use of 1% NaOH alkalization process on ramie fiber increased tensile strength and modulus elasticity of biocomposites 64% and 54% respectively. Application of 120 oC compression temperature, increased tensile strength and modulus elasticity of biocomposites 18% and 74% respectively. Homogenous dispersion of ultimate fiber increased the tensile strength up to 91%. However, the addition of glycerol decreased the tensile strength and modulus elasticity for 46% and 39% respectively.

Keywords: biocomposite, ramie fiber, tapioca starch, tensile modulus, tensile strength

DESIGN, DEVELOPMENT AND PERFORMANCE PREDICTION OF SOLAR HEATER FOR REGENERATION OF ADSORBEN CHAMBER

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Abstract. Adsorbtion cooling is the newest technology that can be used in the distribution of vaccines. The principle of adsorption cooling is applicable to make a new technology called portable vaccine cooler, using zeolite as the absorbent and heat energy to keep cold chain of vaccine which need to be stored in temperature of 2oC to 8oC. Those are many ways to heat the zeolite up. Instead of using fire that induce environmental pollution to heat the zeolite up, the authors choose to use solar energy as the source of the desorption process. This paper reports design, development, and performance prediction of 2 types of solar heater using ANSYS. As the results, simulation of solar heater type 1 is better to use because it can heat the adsorbent chamber up faster than the solar heater type 2. The solar heater type 1 can heat the absorbent chamber up at the temperature of 109℃in an hour running, as the absorbent only needs the temperature around 70℃-80℃for make the process of desorption running perfectly.

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IMPREGNATION OF ACTIVATED CARBON-TIO2 COMPOSITE AND ITS APPLICATION IN PHOTODEGRADATION OF PROCION RED SYNTHETIC DYE IN AQUEOUS MEDIUM

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Abstract. Synthetic dyes are often used for textile dyeing process. The dye wastewater containing hazardous materials, toxic, and also harmful to the environment. Among the existing technologies, photodegradation using semiconductor catalyst is a promising alternative method. However, the weak adsorption capacity of photocatalyst is an issue for photocatalysis process. To overcome this lack, photocatalyst material needs to combine with an adsorbent. The composite was synthesized by combining the function of activated carbon as adsorbents and TiO2 as a catalyst. The objective of the study was to synthesize a composite of activated carbon and TiO2 through impregnation method. The activated carbon-TiO2 composite produced was characterized to determine the surface morphology and the elements contained in the composite by using SEM/EDX. The composite activity to photodegrade various concentrations of Procion red, as a model of synthetic dye, was also investigated. To compare the activity of activated carbon-TiO2 composite in degrading Procion red, different conditions were applied by using UV lamps, sunlight irradiation, and without irradiation (darkroom). The activated carbon-TiO2 composite was able to photodegrade of Procion red by UV light irradiated at optimum wavelength 530 nm. The highest photodegradation percentage of 58.9% and 71.7 % were obtained when using the activated carbon-TiO2 composite ratio of 3:7 and 1:1, respectively.

KINETIC STUDY OF FREE FATTY ACID IN PALM FATTY ACID DISTILLATE (PFAD) OVER SUGARCANE BAGASSE CATALYST

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Abstract. Biodiesel production is made by using edible or vegetable oils; however, their high prices and use as food resource are great limiting factors to their application. During the refining of palm oil, a lower-value by-product known as palm fatty acid distillate (PFAD) is generated in the fatty acid stripping and deodorization stages. PFAD is potentially a valuable, low-cost feedstock for the production of biodiesel. In this work, the esterification reactions of free fatty acid (FFA) in PFAD over sugarcane bagasse catalysts were studied. The effects of catalyst concentration (1 to 10 wt%), reaction temperature (30 to 60oC), and molar ratio of oil/methanol (1:6 to 1:12) on the conversion of FFA was studied to optimize the conditions for maximum conversion of FFA in PFAD. A kinetic model was developed on the basis of the Eley–Rideal mechanism according to the experimental data. The surface reaction of FFA with adsorbed methanol was assumed to be rate-determining.

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SURFACE FUNCTIONALIZATION AND CHARACTERIZATION OF FATTY ACIDS COATED IRON OXIDE

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Abstract. Surface functionalization of iron oxide magnetic nanoparticles (Fe3O4) has been focused in this work because of their great importance in enhancing Fe3O4 fluids for various range of applications. The structural, elemental composition and thermal stability of surface modified fatty acids Jatropha curcas oil are evaluated using Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy (SEM) and Thermogravimetric Analysis (TGA) respectively. The FTIR spectrum showed that strong band of oleate ion (COO-) at 1561 cm-1 and 1424 cm-1 indicated that fatty acids have been chemisorbed onto Fe3O4 surface through bridging bidentate interaction. The SEM images cannot be clearly determined because they are small in size and in the form of clusters and EDX spectra confirmed that Fe, O and C are main elements in these fatty acids coated Fe3O4. The presence of fatty acids on Fe3O4 surface was also determined by TGA analysis. The result showed decomposition temperature for coated Fe3O4 is lower with additional mass losses curve compared to bare Fe3O4 which indicated removal of fatty acids that bounded to the Fe3O4 surface.

PRELIMINARY STUDY OF NATURAL ZEOLITE FROM BAYAH FOR SOLAR POWERED COOLING APPLICATION

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Abstract. This paper present the first attempt to investigate of natural zeolite for cooling adsorption application. Representative samples were collected from Bayah- West Jawa, Indonesia. As known that zeolites can be used as adsorbent. But unfortunately, natural zeolite has many limitation, among them contains a lot of impurities. To improve the character of natural zeolite must be done activation and modification first. Activation was conducted by reducing grain size (1-2mm), washing by aquadest and heating using microwave. While the chemically activation is done through acidification by adding HCl solution. Finally, the activated natural zeolite was calcined by gradually from room temperature to 150oC for 2 hours and then heating continued from 150oC to 300oC for 4 hours. The final zeolite activated product was characerized by X-Ray Diffraction (XRD), Brunauer–Emmett–Teller (BET) and Transmission Electron Microscopy (TEM). The result showed that the morphology of the natural zeolte was cubic shave as observed by TEM and the surface area of activated natural zeolite geater than raw material.

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ANALYSIS OF EFFECTIVENESS OF OIL SPILL RECOVERY USING DISC-TYPE OIL SKIMMER ON LABORATORY SCALE

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Abstract. In Indonesia, there have been 14 accidents of oil spill as the result of ship collisions. There have been several methods in handling oil spill accident, one of the most effective methods is using mechanical oil skimmer with disc plate. The effectiveness of the oil skimmer's performance on handling oil spills is influenced by various factors, such as the depth of the disk submerged or the disk surface area dipped into the oil spill, the area of the wiper sweep, the thickness of the oil on the disk surface, and the rotation speed of the disk. The oil samples used are diesel engine oil with 15W-40 SAE and the water sample used is sea water. The experiment was conducted with variation of 27 mm and 55 mm of disc submersion depth or equal to dipped surface area of 31.35 cm2 and 88,832 cm2. The duration of the test for 3 data is 5 minutes. Based on theoretical calculations, the increase of rotation speed of the disk, the result of spill transport will also be higher. This is proved by the experimental results. The lifting process of oil spill is more effective with low rotation speed, because the result of oil spill transported will be more dominated by oil than water. In this test, the higher the rotation speed of the disk, the higher the water produced.

PREPARATION OF ACTIVATED CARBON FROM BABASSU ENDOCARP UNDER MICROWAVE RADIATION BY PHYSICAL ACTIVATION

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Abstract

Babassu endocarpwere used to prepare activated carbons by physical activation via microwave radiation for the first time. The pyrolysis temperature was 600°C and the derived biochar were activated in CO2atmosphereat 700, 750 and 800°C for 30 min.The material was characterized using scanning electron microscopy (SEM). The porous properties of the activated carbons obtained including the Brunauer-Emmett-Teller (BET) surface area, pore volume, and average pore diameter were determined by nitrogen adsorption isotherms at 77.32 K. The experimental results showed that most pores occurred during the activation predominantly as micropores. Endocarp babassu can be used as precursor to produce activated carbon with a rather well-developed porosity by pyrolysis and physical activation by two-steps with CO2 activation via microwaves radiation. The activated carbon, with a low production cost, could be suitable for applications in gaseous pollutant adsorption, adsorb iodine, methylene blue, and residual chlorine.

Keywords: Babassu, Activated Carbon, Microwave Pyrolysis, Physical Activation, Biomass

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UTILIZATION OF WASTE HEAT FROM SEPARATION PROCESS OF ULUBELU'S GEOTHERMAL POWER PLANT BY IMPLEMENTING AN ABSORPTION REFRIGERATION SYSTEM (ARS) TO IMPROVE PLANT PERFORMANCE

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Abstract. Utilization of geothermal energy for water-dominated reservoir usually involves a separation process that turns geothermal fluid mixtures into pure steam and brine water. This process also occurred on Ulubelu's geothermal power plant (GPP). As waste energy from the power generation process, the remaining heat energy in brine water is still high enough to run an absorption refrigeration system (ARS). This study proposed an integrated power generation and absorption system that operate side by side for a further cooling process. ARS will be employed to produce a lower temperature of cooling water from the GPP's cooling tower and then pass it to GPP's condenser. The lower temperature of cooling water will affect steam condensation process and the vacuum pressure of condenser, moreover, increase power production and exergy efficiency of Ulubelu's GPP. The improvement of exergy efficiency & production capacity will be observed along with the rise of the investment cost as form as the annual cost of the ARS. A Multi-objective optimization using genetic algorithm will be conducted to minimize exergy efficiency and the annual cost of ARS. The optimization will be conducted using MATLAB along with EES for work fluid properties database. The temperature of generator, absorber, condenser, and evaporator of ARS are used as decision variables. Finally, the effect of integrated system and optimum value for each decision variables are presented in this study.

Keywords: absorption refrigeration system, geothermal power plant, brine water.

SEQUENCING BATCH MEMBRANE PHOTOBIOREACTOR FOR SECONDARY EFFLUENT POLISHING USING NATIVE MICROALGAE

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Abstract. Microalgae technology can play important roles in wastewater management, carbon dioxide fixation and biofuels feedstock resource if utilized properly. The core challenge is to substantially lower the biomass production costs. This study assesses performances of photobioreactor (PBR) and sequencing batch membrane photobioreactor (SB-MPBR) for polishing real secondary effluent by removing the nitrogen and phosphorus and at the same time produce lipid by cultivating a native strain of Euglena sp. Three batch-wise PBR were first run as reference, followed by converting them into three SB-MPBRs. The SB-MPBRs were operated at 2, 4 and 8 days hydraulic retention time (HRT). Results show that the SB-MPBR with 4 days retention was found to be the optimum condition in terms of nutrients removal (≥97% and ≥45% for total nitrogen and total phosphorous respectively), water treatment capacity and lipid yield (≥9%). The advantage of SB-MPBR must be seen as attractive alternative to conventional nitrogen and phosphorous removals technologies in term of practical feasibility and “green” technology.

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UTILIZATION OF STEEL WOOL AS REMOVAL MEDIA OF HYDROGEN SULFIDE IN BIOGAS

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Abstract. The raw biogas content is not only CH4 but also contains CO2, H2O, and H2S which are impurities. One of the most common impurities is hydrogen sulfide. Although the amount is relatively non-dominant, the presence of hydrogen sulfide can trigger corrosion, and harmful to health and environment. Therefore, it is necessary to reduce the hydrogen sulfide content in biogas. Iron oxide as adsorption media comes in various shapes/types and in this study used steel wool or iron sponge (coir washing wire) that exist in everyday life as a form of iron oxide. This study identifies the characteristics of the steel wool and knows the efficiency to reduce H2S concentrations. Biogas production comes from a pilot scale Dry Anaerobic Digester type CSTR (Continuous Stirred Tank Reactor). Biogas flows up to a polyvinyl chloride col umn of 2 inches diameter containing steel wool. Media characteristics were obtained from the SEM-EDS test, while the H2S gas concentration analysis was performed using SNI 19-7117.7-2005 (JIS K 0108-1995) method. The result shows that steel wool media contains active elements of Fe and Zn which are spread evenly on the media surface with a total amount of 97.5% mass. The concentration of H2S at intake ranged from 68 to 111 ppm with the output of 21.2-0 ppm, and the temperature in the system varied between 29-32.9 °C. Optimal H2S removal efficiency reaches 100% (97% average) obtained at 100 cm column height and flow rate of 0.1 L / min. Based on the results of the study, it was concluded that the higher the columns the longer the contact time so that the removal efficiency of H2S is relatively greater, while the slower flow rate relative yields H2S removal efficiency is large, and Steel Wool can be an option for use as a medium for reducing H2S content in biogas.

TECHNO-ECONOMIC FEASIBILITY OF FLARE GAS UTILIZATION USING ADSORBED NATURAL GAS

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Abstract. Adsorbed natural gas (ANG) is a natural gas storage technology, which is potential to transport natural gas in small and medium quantity. The objective of this study is to determine the techno-economic feasibility of ANG technology for flare gas to consumers around flare gas sources. The method is process simulation, economic calculation and optimization with variables being ANG selling price, flare gas price, and the percentage of capital financing by the government. The process simulation shows that the ANG product is in the range of 2.07 MMSCFD – 2.97 MMSCFD. The economic calculation results in the interest rate of return of less than 10%. With optimization, the IRR increases to more than 20%.

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INFLUENCE OF TEMPERATURE ON CONVERSION OF PLASTICS WASTE (POLYSTYRENE) TO LIQUID OIL USING PYROLYSIS PROCESS

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Abstract. Plastic waste has been a problem in waste treatment. The growth of plastic waste is increasing especially in Jakarta and needs more serious attention in waste processing. To convert polystyrene to be liquid much heat energy is needed. In this research, pyrolysis is used as the method to process polystyrene to be a liquid product. The objective of this research is to obtain the characteristics of the heating process, and the properties of the liquid product. This liquid can be used as a fuel. Fixed-bed reactor with SUS 316L as the base material was constructed to decompose the polystyrene using an electric heater, which was controlled using Digital PID controller. Power sensor was mounted in the electrical circuit to monitor the power that entered to the heater and recorded using data acquisition. The reaction temperature was varied from 350 °C – 550 °C. No sweep gas injected into the system. The vapor flows naturally based on their partial pressure. The temperature of cooling water was varied into two conditions, water ambient temperature, and cold water. To condense pyrolysis vapor to be liquid oil, the double-pipe condenser was constructed. The thermocouples were installed at many points of the system to monitor temperature change in the system. The maximum liquid yield was obtained at reaction temperature 500 °C with cooling water temperature at 16.59 °C. The operating temperature Below 500 °C will produce more wax, and above 500 °C will produce much gas. The liquid can be applied as fuel with heating value 43.83 mJ/kg, density 0.89 g/ml and 0.78 cSt of kinematic viscosity.

EFFECT OF ADDITION OF FAT OIL AND GREASE (FOG) TO PERFORMANCE OF DRY ANAEROBIC DIGESTION FOOD WASTE REACTOR

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Abstract. Organic waste mostly comes from food waste that has characteristics of high concentrations of nitrogen and fat, high humidity. Domestic waste in Indonesia has characteristics of organic content which is suitable with anaerobic conditions. Waste oil and fat can help in the process of AD which is used as co-substrate. This research is intended to analyze the performance of dry anaerobic digestion reactor of food waste and analyze the effect of oil and waste addition on dry anaerobic digestion reactor performance. The research was conducted using Continuous Stirred Tank Reactor (CSTR) with a volume of 400 L applied at an average temperature of 27.8 ± 1.07oC. The first scenario operation study was performed with food waste substrate input with Organic Loading rate (OLR) is 10 kg VS/m3 for 43 days and stirred using constantly strirring intensity variation of 30 rpm and 60 rpm. The second scenario operation was conducted for 59 days using food waste and cow dung substrate of Fat Oil and Grease waste (FOG) with Organic Loading Rate (OLR) which is similar to the first scenario and stirred using constant 30 rpm intensity. The results of study showed that there was a significant difference between the input of food waste substrate with the addition of Fat Oil and Grease ($p < 0.05$). Biogas production rate was higher at food waste substrate inputs with an average of 392.82 ± 67.52 L / day, while with high Fat Oil and Grease (FOG) inputs having an average of 231.40 ± 22.91 L / day. However, the average percetage reduction of volatile solids and COD removal is higher in substrate input than the addition of Fat Oil and Grease (FOG). The mean percentage of COD removal and reduction of volatile solids on substrate input from Fat Oil and Grease (FOG) addition were 63.3 ± 2.71% and 89.30 ± 1.55%, whereas in the input of the waste substrate 59.45 ± 4% and 77.65 ± 1.46%. This study concludes that the use of substrate on reactor is not only for handling of food waste management, but also Fat Oil and Grease (FOG).

Keyword: Anaerobic Digestion (AD), food waste, Fat Oil and Grease (FOG)

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LIPASE PRODUCTION FROM BACILLUS SUBTILIS WITH SUBMERGED FERMENTATION USING WASTE COOKING OIL

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Abstract. Bacterial lipase has been developed lately because of its advantage to produce with large scale. Culture of Bacillus subtilis were grown to produce lipase in Waste Cooking Oil (WCO) using submerged fermentation (SmF) method. The enzyme activity of the culture was improved by using different concentration of inoculum, substrate, nitrogen source, inducer, and Ca2+ ion at 30oC for 84h fermentation. Lipolytic activity of crude lipase was determined using titrimetric method with hydrolysis reaction. Maximum activity of lipase (4.96 U/mL) was found at 5% (v/v) inoculum, 4% (v/v) WCO, 0.5% (w/v) yeast extract, 0.25% (v/v) olive oil, and 10 mM Ca2+ that present in medium culture. Later, the crude lipase has been dried with spray dryer and resulting 17.33 gr of dry lipase powder per 500 mL crude lipase.

UTILIZATION OF WASTE COOKING OIL AS RAW MATERIAL FOR SYNTHESIS OF METHYL ESTER SULFONATES (MES) SURFACTANT

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Abstract. In this study, MES surfactant was synthesized from waste cooking oil (WCO) which can lower the synthesis cost and represent efficient utilization of waste. MES is an eco-friendly anionic surfactant, which can be used for our detergent application. The purpose of this study was to obtain optimum MES surfactant from purification of WCO. WCO is purified first to reduce high impurities and free fatty acid (FFA). Purification steps of WCO consist of filtration to separate food residues, neutralization with various concentrations of NaOH solution 13%;14%;15%;16% and bleaching with activated carbon 7,5% (wt. % of oil). After purification followed by trans-esterification process with variation of mole ratio oil and methanol 1:8; 1:9; 1:10 then synthesized MES surfactant with sodium bisulfite (NaHSO3) as sulfonating agent. Neutralization results showed high reduction percentage of FFA was 31,31% for 15% NaOH solution; bleaching results showed reduction percentage of FFA was 20,27% and WCO color was originally dark brown to be light yellow. The results of trans-esterification showed highest yields 94,15% for mole ratio 1:9 and sulfonation results will be described further in this paper.

Key word : FFA, MES, purification, surfactant, WCO

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NUTRIENT RECOVERY FROM END-OF-WASTE OF ENERGY RECOVERY PROCESS (LIQUID DIGESTATE) USING ORNAMENTAL AQUATIC MACROPHYTES IN A CONSTRUCTED WETLAND SYSTEM AS A POST-TREATMENT FOR IMPROVING ENVIRONMENT QUALITY

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Abstract. Anaerobic digestion (AD) which treat food waste is a waste-to-energy method that causes problem for producing the end-of-waste, digestate. Digestate contains high nutrients that could be recovered by a nutrient recovery method which involves ornamental aquatic macrophytes in a constructed wetland system. The study was about how to recover the nutrient from digestate and also improve the effluent quality (nutrient removal). Canna indica, Iris pseudocarus, and Typha latifolia were the ornamental aquatic macrophytes which are going to recover the nutrient (nitrogen—N, phosphorus—P) from liquid digestate, together improving the quality of AD effluent. The bed effluent which meet the wastewater quality standards for TSS and COD was T. latifolia (TSS = 71, COD = 56.735 mg/L). C. indica removed up to 72.19% N as the highest N removal efficiency, and recovered almost the most of N, even though it still needs longer observation to meet the standard. I. pseudocarus removed up to 98.18% P yet the average TP level was slightly above T. latifolia. The result shows that nutrient recovery using constructed wetland improves the effluent quality within short operation period, meanwhile C. indica and I. pseudocarus as ornamental aquatic macrophytes also added the aesthetic value to the environment.

PYROLYSIS CHARACTERISTIC OF RICE HUSK WITH PLASTIC BAG AS FUEL FOR POWER GENERATION BY USING A THERMOGRAVIMETRIC ANALYSIS

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Abstract. Determination of the characteristics of rice husk (RH) with plastic bag (PB) mixture as a source of energy is carried out in pyrolysis study. Test characteristics of RH with PB mixture is performed by using a thermogravimetric analysis at temperatures from 30 - 800^{o}C, heating rate of 10^{o}C/min, and nitrogen flow rate of 50 ml/min. The dehydration process occurs at temperatures from 40 - 100^{o}C, while for thermal degradation at temperatures from 200 - 340^{o}C, 400-500^{o}C, and 580 - 670^{o}C. Activation energy and calorific value of RH with PB mixture increase significantly with the addition of 10%, 30%, and 50% PB in RH. It is concluded that pyrolysis characteristic of RH with PB mixture is better as fuel for power generation if compared with its original state.

Keywords: Fuel, Plastic bag, Pyrolysis, Rice husk, Thermogravimetric,

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ESTIMATING GREENHOUSE GAS EMISSION LEVEL OF A NATURAL GAS TRANSMISSION PIPELINE FROM POINT A TO B IN WEST JAVA BASED ON INGAA AND IPCC GUIDELINES

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Abstract. When being transported by pipeline, natural gas is often emitted to the atmosphere, either for depressurization (venting emissions) or leak through the pipeline (fugitive emission). The emission level must be well estimated to provide relevant informations and recommendation to formulate strategies for reducing greenhouse gas (GHG) emission. Organizations such as INGAA (The Interstate Natural Gas Association of America) and IPCC (Intergovernmental Panel on Climate Change) provide GHG estimation guidelines which are adopted by many companies and countries. This study estimates the emission level of a natural gas pipeline in West Java using emission factors referring to INGAA and IPCC guidelines with flow rate variation. The result shows that the flow rate variation affects the total emission based on Tier 2 and Tier 3 INGAA as well as Tier 1 IPCC. It is also shown that fugitive emissions dominate the total emission of gas pipeline. However, the use of different methodologies and guidelines gives different emission level for the same pipeline. Different estimation results of emission level have been reviewed and national emission factors database for gas transmission is highly suggested to be developed.

Keywords: Gas transmission, Greenhouse Gas, Emission, INGAA, IPCC

THE PROPERTIES OF VEGETABLE COOKING OIL AS A FUEL AND ITS UTILIZATION IN A MODIFIED PRESSURIZED COOKING STOVE

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Abstract. Vegetable cooking oils (VCOs) and used vegetable cooking oils (UCOs) can be considered as alternative fuels which will provide the household with low price fuel and may solve the problem of getting rid of waste VCOs. Their utilization as cooking fuel can bring numerous benefits not only for urban but also for rural communities in Indonesia. The paper focuses on characterizing VCOs and UCOs as fuels for the household cooking application using a modified pressurized cooking stove. Physical properties such as auto-ignition point, auto-ignition time, flash point, density and viscosity of VCOs play the vital role in the combustion. Some properties of these oils were measured and characterized according to ASTM standards. The oil was used directly as a fuel using in a design modified pressurized cooking stove. Adjusting the temperature of vegetable cooking oils used as fuel, it is possible to improve their combustion performance, thus reducing ignition time and incomplete combustion. The main target of the research is to determine the quality and performances of these oils combustion. The auto-ignition point for the several oils was determined to be as follows: UCO: 460 oC, crude VCO: 406 oC, fresh VCO: 405 oC and the peanut cooking oil did not auto-ignite. Crude VCO gave the shorter auto-ignition time than other oils within 30 s. The efficiency of the pressurized stove using UCO, crude VCO and fresh VCO as fuel were observed 23.65%, 25.99%, and 31.57%, respectively. The highest flame temperature of 942ºC in these experiments was achieved by burning fresh VCO as fuel in this modified pressurized cooking stove. UCOs tended to produce luminous flames compared other oils.

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THE POTENTIAL UTILIZATION OF COCONUT OIL AND PALM OIL AS RAW MATERIAL OF ALKANOLAMIDE UNDER ALKALINE CONDITIONS

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Abstract. Indonesia has a high production of vegetable oils. Coconut oil and palm oil are vegetable oils that can be source of raw material in Industry The purpose of this research is potential utilization of coconut oil and palm oil as raw material of alkanolamide in alkaline condition. Alkanolamide is produced from the reaction between triglycerides and diethanolamine (DEA). The amidation reaction between triglyceride and diethanolamine was mixing in a glass batch reactor for 2 hours with mol ratio 1:1 using potassium hydroxide catalyst (KOH) 1% (w/w). The temperature reaction at 125 °C. Alkanolamides as dispersant and detergency widely used in various industries. One of its uses was as fuel gasoline additives that can clean the engine, especially in the combustion chamber so it is expected to increase the fuel economy value. From the synthesis point of view, the palm oil is constrained because it is easily oxidized and viscosity palm oil higher than coconut oil. So this research is focused on using coconut oil as raw material. From the analysis result using FTIR analysis, amides compound formed have a wavenumbers of 3358.28 cm-1,GC-MS analysis is the compound diethanolamide laurate with percent area of 32.10%.

CHARACTERISTICS OF NANO CARBON PYROLYZED FROM TABLE SUGAR AND SUCROSE FOR PT-LESS DSSC COUNTER ELECTRODE

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Abstract. Platinum is the best counter electrode used in the dye-sensitized solar cells (DSSC). However, the price of platinum is very expensive that impedes its broad use for the DSSC counter electrode. As an alternative, carbon has been use for this purpose. In this work, carbon nanoparticles have been successfully pyrolyzed from precursors of sucrose and table sugar through a chemical process, i.e. dehydration of the precursors with sulphate acid followed by a pyrolysis process. The as-synthesized carbon nanoparticle was characterized using X-ray diffraction (XRD) for the crystal structure information and a scanning electron microscope (SEM) equipped with energy dispersive X-ray spectroscopy (EDX) for morphological and compositional examination. Material activity and performance for counter electrode in DSSC was analysed using a semiconductor parameter analyser through current versus voltage characteristic curves (J-V). The results show that precursors from table sugar without any addition of metal catalyst and initial heat treatment at 300 °C for 60 minutes and sucrose with a catalyst could produce carbon nanoparticle. However, the characteristic of I-V curve from DSSC device assembled using carbon nanoparticle from table sugar as counter electrode only that showed good performance with a power conversion efficiency (PCE) of 3.239%, almost equivalent to that of platinum paste with a PCE of 4.024%. This result is promising in terms of using a cheap source of carbon for the Pt-less counter electrode.

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NUMERICAL STUDY OF BIOMASS GASIFICATION IN 3D FULL-LOOP CIRCULATING FLUIDIZED BED USING EULERIAN MULTI-FLUID APPROACH

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Abstract. A three dimensional Eulerian Multi-Fluid Model of biomass gasification in full-loop circulating fluidized bed has been developed. The governing equations of continuity, momentum, and energy are solved by well-known Navier-Stokes formulation. The kinetic theory of granular flow (KTGF), homogeneous and heterogeneous reactions, and standard k-ε turbulence model are considered and incorporated into the equations in order to describe the spatial velocity, temperature, and concentration for each phase and species. The particle-particle heat transfer mechanisms, which consists of particle-particle conduction through contact area and particle-fluid-particle conduction, are also considered. The results are compared to existing experimental data. It is demonstrated that the model considering all particle-particle heat transfer mechanisms has better predictions in term of syngas compositions compared to the model considering particle-particle conduction through contact area only and the model without particle-particle heat transfer mechanisms. From this basis, biomass gasification process inside 3d full-loop circulating fluidized bed is analysed. The results should be useful for development of better understanding of biomass gasification in such systems.

SECONDARY AIR INTAKE OPTIMIZATION IN FIXED BED DOWNDRAFT REACTOR FOR RICE HUSK BIOMASS GASIFICATION

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ABSTRACT

Rice husk is one of agricultural wastes in Indonesia with the largest annual potency of 13,662 MWe. Using biomass gasification, rice husk can be converted into producer gas which energy can be used for thermal and electrical power generation. Meanwhile, utilizing its energy means that the gas quality has to meet certain standard. In gasification terms, this standard can be interpreted as tar content and gas energy. Experiment using open top fixed bed downdraft gasifier (batch system) with double stage air supply was conducted by varying the secondary air injection position (Z) and Air Ratio (AR). In order to analyse the standard values, both can be represented by flaming pyrolysis duration and combustion energy of the gas. Flaming pyrolysis is a phenomenon occurred inside the reactor where produced tar is recracked and dissolved into smaller compounds. This can be achieved if pyrolysis zone temperature ranges between 500-800oC. The results are when AR 80%, at Z = 38 cm, flaming pyrolysis with the longest duration of 400 seconds was created which indicated that this condition had the lowest tar content, meanwhile, at Z = 50 cm, gas with the highest combustion energy (734.64 kJ) was obtained.

Keywords: Air Ratio; Biomass Gasification; Flaming Pyrolysis; Pyrolysis Zone Optimization; Secondary Air Gasification

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EFFECT OF FEED COMPOSITION OF CO-PYROLYSIS OF CORNCOBS–POLYPROPYLENE PLASTIC ON MASS INTERACTION BETWEEN BIOMASS PARTICLES AND PLASTICS

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ABSTRACT

Polypropylene plastic (PP), which has higher hydrogen content compared to that in biomass, is potential to be used as a cheap hydrogen source for pyrolysis of biomass, such as corncobs, to remove part of oxygen content in the biomass pyrolysis oil. By charging these two materials, synergistic effects will appear that improve quality and quantity of bio-oil produced. The aim of the present work is to investigate possible mass interaction between biomass and plastic materials leading to the synergistic effects using slow co-pyrolysis. The experiment was performed in a displacement reactor. Feed compostion was varied at 12.5%, 25%, 37.5%, 50%, 62.5%, 75%, and 87.5% weight of PP. This phenomenon was observed through expansion-contraction of the reactor prior to large mass decomposition of the reactor feed. In experiment involving biomass-dominated feeds, i.e. PP contents < 50% (regime 1), there was reactor bed contraction due to slight biomass decomposition followed by no-displacement of reactor piston. During the contraction, it is estimated, there was low velocity ejection of biomass volatile matter, while during no-displacement stage, there was a phase change of plastic granules to plastic melt. In experiment with plastic-dominated feeds, i.e. PP ≥ 50% (regime 2), the reactor bed underwent contraction due to phase change of plastic granules which reduced the bed volume, followed by bed expansion due to the swelling of biomass particles estimated in the presence of hydrogen bonding in the phenolic environment in biomass material. The last stage of co-pyrolysis in regime 2 was the bed contraction and it is predicted that there was high velocity gas ejection through the small pores which intensified interaction of biomass-plastic radicals in hydrogen-rich environment favourable for exerting synergistic effect.

Keywords: Displacement reactor, Co-pyrolysis, Corncobs, Polypropylene, Synergistic effect

UTILIZATION OF SESAME SEED SPROUT BIOMASS AS LIPASE SOURCE TO HYDROLYZE PALM OIL

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Abstract. Hydrolysis operation condition takes important role in creating emulsifier since it is a preliminary step. Lipase can boost the synthetic process of oleic methyl ester from fatty acid without addition of heat and pressure as chemical catalyst do. There are so much sources od lipase such as plants, microbes, and animal. But, lipase from plant seems interesting owing to its huge amount than microbes' lipase and less harm than animal's lipase. Many experts have proved that vegetable lipase is potential biocatalyst so that experiments continue to find economic method of producing great amount of lipase. This research investigated lipase content of sesame seed's sprout extract and juice. Based on the research, sesame seed supernatant produces 1.36 mmol FFA with 39% hydrolysis. Sesame sprout extract produces 1.37 mmol FFA with 39.14% hydrolysis. Those samples also contain lauric acid, miristic acid, palmitic acid, oleic acid and stearic acid which detected by GC instrument.

Keywords: Hydrolysis, Lipase Biocatalyst, Palm oil, Sesame Seed Sprout, Triglycerides

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TARIFF CALCULATING MODEL FOR NATURAL GAS TRANSPORTATION THROUGH OPEN ACCESS TRANSMISSION PIPELINE WITH MULTI TARIFF SYSTEM TO INCREASE GAS USAGE AS CLEAN ENERGY

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Abstract. The purpose of this study is to model the different tariffs on the transportation of natural gas through a pipeline for several shipper classes in an open access natural gas pipeline transmission line called a multi-tariff system. The determination of the natural gas tariff through the Open Access pipeline in Indonesia is mostly set using a distance system with the same value for all types of the shipper. The principle of justice is considered to be achieved from uniform tariffs for all the shipper, whereas in practice the separation of tariffs for each shipper group is currently essential. The proposed new tariff modeling is done by modifying the initial equations of the single-tariff model. Besides giving a new model proposal of tariff calculation for the multi-tariff system, in this research will also be modified free cash flow for new tariff calculation scheme and will be done the validity test on the formula. So that will get a multi-tariff calculation model which can become one of proposal material enter for Regulators to be able to set a fair tariff for the shipper without changing the economics of the transporter and can produce competitive gas prices to substitute clean energy sources for certain consumers such as electricity generation.

Keywords: Efficiency, tariff, multi-tariff, single tariff, cash flow, competitive gas prices

ECONOMIC ANALYSIS FROM TWO PROJECTS OF SOLAR WATER PUMPING SYSTEM (SWPS) IN BANYUMENENG VILLAGE, YOGYAKARTA

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Abstract. A village of Banyumeneng in Yogyakarta Special Province, is a one of examples where the villagers should walk along 2-km away from their homes to get the clean water access in the hilly karst area. Looking at that problem, Energi Bersih Indonesia (EnerBi) Foundation built two solar water pumping systems to cover around 150 households in this village supported by some grants. This paper provides an analysis on how much the levelized cost of energy (LCOE) of the systems and how the cost breakdown shares. In that calculation, two scenarios are applied in calculation of LCOE, worst and best scenario which consider in differentiate of lifetime period, discount rate, annual PV degradation rate and capacity factor. As the results, the best scenario shows that the LCOEs for both SWPS (8 kWp and 4 kWp) are at 0.443 USD/kWh and 0.513 USD/kWh, respectively. In worst scenario, the LCOEs of systems reached 0.696 USD/kWh and 0.807 USD/kWh. In conclusion, this paper found that the lower price of PV technology will not directly lessen the LCOE, while structural cost is another consideration for LCOE on social RE project.

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PRODUCTION OF DRY EXTRACT LIPASE FROM PSEUDOMONAS AERUGINOSA WITH SUBMERGED FERMENTATION METHOD IN PALM OIL MILL EFFLUENT

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Abstract. Palm oil mill effluent is is one of the agro-industrial waste with high avaiblity and contains high organic compounds that necessary for microbial growth. Cultures of Pseudomonas aeruginosa were grown to produce lipase in palm oil mill effluent using submerged fermentation method. To enhance the production of lipase, one factor at a time (OFAT) was used. Influencing factors as concentration of inoculum, Ca2+ ion, olive oil, peptone, and Tween 80 were investigated at 30□C and 96 h in shake flask fermentation. was determined The lipase activity unit of these five factor determined by by using titrimetri reaction of olive oil hydrolysis with crude lipase. The optimum values of lipase activity unit were gained when 3% (v/v) inoculum, 4 mM Ca2+ ion, 0.4% (v/v) olive oil, 0.9% (m/v) peptone, and 0.9% Tween 80 added into medium. Later, the crude lipase was dried using spray drier and resulting 15.643 gr of dry extracelluler lipase per 500 mL cell free supernatant

PRODUCTION OF EXTRACELLULAR IMMOBILIZED LIPASE FROM SOLID STATE FERMENTATION OF ASPERGILLUS NIGER ON PALM KERNEL CAKE, SOYBEAN MEAL, AND COIR PITH

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Abstract. Microbial lipase has shown great potentials as a biocatalysts due to its ability to perform hydrolitic activities at low temperature and pressure conditions. Many research proves that agroindustrial residues can be an excellent substrate for the production of lipase by solid state fermentation (SSF). This study aimed to produce extracellular lipase from solid state fermentation of filamentous fungi Aspergillus niger by SSF on agroindustrial residues such as palm kernel cake, soybean meal, and coir pith. Fermentation was carried out at room temperature, initial pH of 7, with no stirring or aeration. Produced enzymes were later characterized at several inducer concentration and incubation period. This research obtained lipase with highest activity of 163.33 U/g dss using soybean meal with 9 days of incubation and addition of 4% olive oil. Lipase activity was further investigated by spray drying and immobilization using anion-macroporous resin. Spray dried lipase showed enzyme loading of 53.7%. Immobilized enyme was analyzed by utilizing it as a biocatalyst for interesterification reaction in non-alcohol route of biodiesel synthesis in batch reactor with 1:12 of reactant palm oil and methyl acetate at 40oC and 50 hour cycle. Immobilized enzyme have 47.3% biodiesel yield and maintained 57% of its initial activity after four cycle of interesterification.

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PERFORMANCE ANALYSIS (WHP AND TORQUE) ON SI ENGINE FUELED WITH LOW-GRADE BIOETHANOL AND OXYGENATED FUEL ADDITIVE

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Abstract. Utilization of renewable energy in Indonesia is still relatively low compared to the non-renewable energy source of petroleum, coal, and natural gas. The limited amount of the non-renewable energy encourages the development of alternative fuels. Currently, low-grade bioethanol is one of the alternative fuel being developed. Bioethanol has a higher octane number compared to gasoline. Mixing of bioethanol requires a certain comparison, the mixing is intended to increase the octane number of a fuel mixture. The use of low-grade bioethanol (C2H5OH) as a substitute or mixture of fuels has an impact on engine performance. To get a more optimal effect on the fuel mixture, oxygenated cycloheptanol as an additive can be added to the fuel. This study examined the effect of fuel mixture with the addition of oxygenated cycloheptanol to single cylinder SI engine, 150 cc premix type at 100% throttle position. The tests was carried out on E5, E10, E15 and the addition of 0.5% oxygenated cycloheptanol at each fuel mixture with engine speed variation above 4000 rpm. Performance test will be performed with connecting the machine to a dynamometer. This study aims to obtain efficient performance on the engine with the addition of additives, there is an average increase of 9% in horsepower and 6% in torque.

Keywords : Low-grade Bioethanol; Oxygenated cycloheptanol; Performance; Spark ignition.

PREPARATION AND CHARACTERIZATION OF PHOSPHATE – SLUDGE-KAOLIN MIXTURE FOR CERAMIC BRICKS

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Abstract. Phosphate Sludge (PS) waste has been a problem in metal surface finishing industry. The waste cannot be dumped in landfill due to the metal content. This paper describes the attempt of utilization of PS by mixing in in kaolin in preparation of ceramic bricks. A series of experiments shown that mixture containing between 25 - 50 weight % PS sintered at 1200 oC attained the highest compressive strength of >25 MPa. X-ray diffraction showed that the presence of PS in kaolin hindered the formation of mullite, the phase that contribute to strength in Al2O3-SiO2 kaolin system. In the mixture of 1:1 kaolin PS fired at 1200oC cristobalite was detected, instead of the expected mullite, in the XRD pattern.

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PREPARATION OF CELLULOSE NANOCRYSTALS FROM EMPTY FRUIT BUNCH OF PALM OIL BY USING PHOSPHOTUNGSTIC ACID

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Abstract. Empty Fruit Bunch of Palm Oil (EFBPO), an abundant agro-waste in Indonesia, was used as raw material of Cellulose Nanocrystals (CNCs) preparation. Instead of conventional acid mineral, phosphotungstic acid ($H_3PW_{12}O_{40}$, HPW) was used to hydrolyze cellulose due to recycling ability and easy handling. Before hydrolysis process, dried EFBPO was treated by 3% NaOH solution at 90oC for 2 hours and bleached using 2% $NaClO_2$ solution at 80oC for 3 hours to remove hemicellulose and lignin. Hydrolysis reaction parameters such as temperature, acid concentration, and reaction time were optimized with fixed solid-liquid ratio of 1:40. The response surface method was used for experimental design to determine the optimum condition of each parameter by using software Minitab. In this study, pulp from dried EFBPO produced 44.8% yield of CNCs. The Dynamic Light Scattering (DLS) analysis showed that most of CNCs equivalent diameter was 140 nm. The crystallinity index was observed at 73.3% using X-ray Diffraction (XRD) analysis.

EFFECT OF COCONUT FIBER SUSPENSIONS ON DRAG REDUCTION IN CIRCULAR PIPE

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Abstract. Pipeline system as fluid transport is very commonly used. Thus, the drag reduction becomes very interesting to be studied because it is related to energy efficiency. One method of drag reduction is the active method by adding drag reduction additive agents such as surfactants, polymers, nanofluids, and fibers. The purpose of this study is to analyze the effect of coconut fiber on drag reduction by adding coconut fiber with varied concentration. The experimental was experimented by using circular pipe ID 38 mm with 1200 mm length. The test fluid was coconut fiber suspension with concentration 300, 500, and 1000 ppm. This study was conducted from low Reynolds Number until Reynolds Number about 25,000. In this research condition, the results showed that the drag reduction on circular pipe ID 38 was about 7.6% in the Reynolds Number about 25,000. The maximum drag reduction was for coconut fiber suspension with concentration 1000 ppm. The drag reduction increases with the increase of coconut fiber suspension concentration. Based on this research, it can be concluded that coconut fiber can be used as a drag reducing agent which save natural resources and environmentally friendly.

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Experimental Investigation on the Reduction of Catalyst Costs in the Polyethylene Pyrolysis Process

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Abstract. In our earlier works, the catalyst USY zeolite was tested for the pyrolysis of High density polyethylene (HDPE). It yielded 71% liquid oil that could be separated into diesel and gasoline-like fractions [3]. However, the high cost of this catalyst led to the present study where the effects of different low-cost catalysts on catalytic cracking of HDPE were investigated. GC-MS analysis were performed to check the carbon distribution of each sample and to make theoretical gasoline/diesel quantification in the pyrolysis liquids. Products where compared by studying carbon distribution, condensable range, branching degrees and reaction speeds. According to all those parameters, none of them outperformed USY zeolite. The Second Part has been conducted to observe the regeneration of USY Zeolite and monitor its performance for its economic value. The regeneration was done 10 times and the performance was monitored after every experiment with respect to % of heavier compound yields, carbon distribution range, char deposition range and gasoline and diesel yields. It was found that the regenerated catalyst loses its capability very slowly and even after 10 regenerations products characteristics were not sensibly altered.

THERMODYNAMIC ANALYSIS AND MULTI OBJECTIVE OPTIMIZATION OF KALINA AND ABSORPTION CYCLE FOR POWER AND COOLING DRIVEN BY LAHENDONG GEOTHERMAL SOURCE

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Abstract. Kalina cycle is a new concept in thermodynamics that convert heat energy into mechanical energy. The heat source in this system comes from the Lahendong geothermal source. The cycle is using a mixture of solution of two liquids with different boiling points for the working fluid. Water and ammonia are the most widely used combinations with a 30% - 70% ratio in this study. With the combined benefits of comparison ratios, the Kalina cycle is able to produce better exergy efficiency and exergoeconomoic compared to conventional Rankine cycle. Kalina cycle works on thermal efficiency around 40% - 60%. The objective of this study is to find optimization in exergy efficiency and exergoeconomoic based on Kalina cycle applied in Lahendong geothermal source used MATLAB-EES. The results showed that the optimal ammonia-water mixture occurred at 130.0626 ˚C, 2184.791 kPa, and 51.77% of basic solution can yield exergy value 2358.88517 W and use the cost 16994.9715 $/year.

Keywords: Kalina cycle, absorption refrigeration cycle, geothermal heat source.

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ANALYSIS OF EMISSION GAS AND FUEL CONSUMPTION ON SI ENGINE FUELED WITH LOW-GRADE BIOETHANOL AND OXYGENATED CYCLOHEPTANOL ADDITIVE

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Abstract. Increasing the number of vehicles will have an impact on the increase in fuel consumption, this is not in line with the depleting fuel reserves. To maintain the stability of energy availability, need to find alternative energy source of oil substitute. The use of alternative energy source is expected to reduce fossil energy consumption and exhaust emissions. One of the non-fossil energy alternatives introduced for vehicles is bioethanol, it can produce in a simple way and cheap. Low-grade bioethanol has characteristics that depend on exhaust emission generated. Low-grade bioethanol can be used as a substitute or mixture of fuel. The mixture of bioethanol and gasoline gives an effect to the increase of octane number and reduces the emission of CO2 produces. To get a more optimum effect on fuel consumption and emission, the oxygenated additive can be added to the fuel mixture. In this study, the effect of fuel consumption and emission was carried out by comparison of E5, E10, E15 without additive and with additive oxygenated cycloheptanol. The test will be performed by the method of calculating the amount of fuel consumption against the time to get specific fuel consumption. Emission test will be performed in single cylinder spark-ignition (SI) engine 150cc premix fuel with 100% opening throttle position conncected to the gas analyzer in variation speed engine to see the emission gas. This study aims to obtain reduce the emission gas (CO2 and CO) and fuel consumption with the addition of the oxygenated additive.

Keywords : Low-grade bioethanol; Oxygenated cycloheptanol; Emission; Fuel consumption

SYMPOSIA 3 : MULTIFUNCTIONAL AND ADVANCED MATERIALS FOR RENEWABLE ENERGY APPLICATIONS

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SYNTHESIS AND CHARACTERIZATION OF CU2ZNSNS4 THIN FILM PREPARED BY APPROPRIATE NON-STOICHIOMETRY PRECURSOR

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Abstract. Non-stoichiometry sulfur-containing precursors were studied to picture its connection to the formation of kesterite Cu2ZnSnS4 (CZTS) phase. The precursors were prepared from metal (Cu-Zn-Sn) chlorides with ethanol as solvent and 2-mercaptopropioninc acid as capping ligand. Mol ratio of S/Cu 4.4 was observed as the limit of non-stoichiometry. Confirmed by XRD characterization, the employment of sulphur in higher concentration resulted in the formation of secondary phases with a porous morphology. Further, a modification in holding time of annealing treatment was succesfully improved the crystallinity of the CZTS film. The SEM micrograph was showed the formation of well-growth CZTS grains with size ~ 1.5 µm. However, some porosity were still encountered at the surface film as indication of insufficient growth processes (heat treatment). The energy band characteristic of the film is 1.4 eV, determined by extrapolating the gradient line of $(\alpha h\upsilon)2$ vs $h\upsilon$ (photon energy). The route presented in this paper offers alternative solution to synthesize CZTS semiconductor from ethanol-based precursor.

VISIBLE LIGHT ABSORPTION AND PHOTOSENSITIZING CHARACTERISTICS OF NATURAL YELLOW 3 EXTRACTED FROM CURCUMA LONGA L. FOR DYE-SENSITIZED SOLAR CELL

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Abstract. Recently, there are many efforts to find energy alternatives that are renewable, inexpensive, and eco-friendly. The efforts become important because the reserves of fossil-based energy are increasingly shrinking. Indonesia, as a country with a tropical climate, is rich with renewable energy resources such as solar energy that shines throughout the year. With this great opportunity, Dye-Sensitized Solar Cells (DSSC) is being developed. DSSC is a device that can be used as an alternative source of renewable energy by utilizing solar energy source with simple photosynthetic-electrochemical principle in the molecular level. In this present work, curcumin was used as a sensitizer. Curcumin has a long intense wavelength absorption range from 420-580 nm in the visible region. Because of that, curcumin is a promising material for use in solar cells owing to its high thermal and chemical stability, as well as its eco-friendliness and cost effectiveness. Its resource, turmeric (Curcuma longa L.), is not only abundance but also easy to be attained. In this work, curcumin was extracted from Curcuma longa L. using a simple extraction technique by different organic solvents, i.e. acetone, methanol, and ethanol. Suitable solvent for extraction that can give high efficiency in DSSC were analysed. Characterization of the dye was performed using Fourier transform infrared (FTIR) and ultra violet-visible (UV-Vis), while the performance of DSSC was analysed through a simple current and potential different (I-V) curve analyser.

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EXERGETIC-ECONOMIC ANALYSIS AND OPTIMIZATION OF SOLAR ASSISTED HEAT PUMP USING MULTI-OBJECTIVE GENETIC ALGORITHM

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Abstract. This study proposes the use of two-stage heat pump systems (SAHPs) for high temperature applications, 105oC. This system integrates solar thermal collectors and heat pumps into a hybrid system to meet the 400 kW heating load. The aim of this research is providing a method to deliver heat with sustainable energy resource, than to improve the performance of the system which is indicated by low exergy destruction. The model creation, performance evaluation and the optimization of solar assisted heat pump system are discussed in this paper. This system used R1234ze (E) as working fluid. A genetic algorithm is employed to optimize operation condition of the system. To ensure that the optimal solution obtained from the proposed method is an optimum condition, three constraints are selected, including evaporation temperatures, condensing temperatures and compressor temperatures while exergy destruction and total cost as the objective functions. The result showed that the system has an optimum condition at evaporating temperature of 317 K, Flash Tank temperature of 353.6 K and condensing temperature of 380.4 K with exergy destruction of 70.21 kW and total cost of 63,441 US $.

ENHANCED DIELECTRIC PROPERTIES OF NANOCRYSTALLIN BA(1-X)SRXTIO3 (X=0 AND 0.3) CERAMICS IOP CONFERENCE SERIES: EARTH AND ENVIRONMENTAL SCIENCE

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Abstract. Ferroelectric has dielectric properties which widely needed in many applications like data storage which requires materials of high dielectric constant and high charge storage capacity, so it can be used as Ferroelectric Random Access Memory (FRAM). This study is aimed at how to increase the dielectric constant of conventional barium titanate (BTO) through partial substitution of strontium to barium in BTO and a particle size reduction. Doped BTO would have the improved properties, so it can respond very well to external field influences such as changes in electric field, temperature, pressure and electromagnetic waves. The researchers developed a nanoparticle of electronic components to support the goal of improving the performance device to be superior. Smaller particle size also resulted in an increase in the dielectric constant due to the formation of single domain. The crystalline powders were obtained, integration process through mechanical alloyed. SrCO3, BaCO3 and TiO2 precursors were mixed and milled in the planetary ball mill. A material with a high crystal defect was then performed compaction to produce the bulk sample, followed by a sintering at 1200 °C for 4 hours to form multicrystalite particles. The size of particles was found 300-400 nm. These fine particles were further refined under ultrasonic irradiation until 12 hours. Dielectric constant has increased from 137 (un-doped BTO) particle size of 353 nm to 190 (multicrystallite doped BTO) particle size of 348 nm and 841 (monocrystalite doped BTO) particle size of 35 nm.

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UTILIZATION OF SUPER HYDROPHOBIC MEMBRANE CONTACTOR FOR NOX ABSORPTION

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Abstract. NOx is produced from the reaction between nitrogen, oxygen and even hydrocarbons (during combustion), especially at high temperatures. Nitrogen oxide compounds are one of the harmful emissions that can result from fuel combustion. This research aims to find out the performance of super hydrophobic membrane contactors in the absorption process of N2O from its mixture with air using acid solution and hydrogen peroxide. N2O gas must be reduced from the exhaust gas especially to meet the regulations applicable to the environment due to the hazardous nature of the N2O gases. The experimental results showed that the amount of NOx absorbed and the absorption efficiency increased with increasing absorbent flow rate in the membrane contactor. Meanwhile, the concentration of NOX in the outlet gas decreased with increasing absorbent flow rate.

Keywords: Harmful emission, absorption process, absorption efficiency, NOx absorbed.

SELECTION OF ORGANIC ACID LEACHING REAGENT FOR RECOVERY OF ZINC AND MANGANESE FROM ZINC-CARBON AND ALKALINE SPENT BATTERIES

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Abstract

Zinc-carbon and alkaline batteries are often used in electronic equipment that requires small quantities of power. The waste from these batteries contains valuable metals, such as zinc and manganese, that are needed in many industries and can pollute the environment if not treated properly. This paper concerns the recovery of zinc and manganese metals from zinc-carbon and alkaline spent batteries with leaching method and using organic acid as the environmental friendly leaching reagent. Three different organic acids, namely citric acid, malic acid and aspartic acid, were used as leaching reagents and compared with sulfuric acid as non-organic acid reagents that often used for leaching. The presence of hydrogen peroxide as manganese reducers was investigated for both organic and non-organic leaching reagents. The result showed that citric acid can recover 64.37% Zinc and 51.32% Manganese, while malic acid and aspartic acid could recover less than these. Hydrogen peroxide gave the significant effect for leaching manganese with non-organic acid, but not with organic acid.

Keywords: Zn-C battery, alkaline battery, leaching, citric acid, malic acid, aspartic acid

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PROCESS OPTIMIZATION AND KINETICS FOR LEACHING ZINC AND MANGANESE FROM ZINC-CARBON AND ALKALINE SPENT BATTERIES USING CITRIC ACID

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Abstract

Zn-Carbon and Alkaline spent batteries contains heavy metals, such as zinc and manganese, which can cause environmental problem if not handled properly. Usually the recovery of these metals were done by leaching method using strong acid, but the use of strong acids as leaching reagents can be harmful to the environment. This paper concerns the recovery of Zn and Mn metals from Zn-C and alkaline spent batteries with leaching method using citric acid as the environmental friendly leaching reagent. The leaching condition using citric acid were optimized and the leaching kinetics of Zn and Mn in citric acid solution was investigated. The leaching of 89.62% Zn and 63.26% Mn was achieved with 1.5 M citric acid, 90oC temperature, and 90 minutes stirring time. Kinetics data for the dissolution of Zn showed best fit to chemical control shrinking core model, while the diffusion controlled model was suitable for the dissolution of Mn kinetics data. The activation energy of 6.12 and 1.73 kcal/mol was acquired for the leaching of zinc and manganese in the temperature range 60oC-90oC.

Keywords: Zn-C battery, alkaline battery, citric acid, leaching kinetics

OPTIMIZING THE PERFORMANCE OF Li4Ti5O12/LTO BY ADDITION OF SILICON MICROPARTICLE IN HALF CELL LITIUM-ION BATTERY ANODE

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ABSTRACT

The demand of lithium-ion battery (LIB) has been increased for high power application in transportation system. Thus, the current use of graphite as anode material needs to be replaced, due to formation of unwanted solid-electrolyte interphase (SEI) layer consuming intercalated Li+ that reduces the LIB performance and may cause ignition of the battery in high load usage. One of the candidates for anode material to replace graphite is lithium titanate (LTO), since the LTO does not form SEI and exhibits high-power with outstanding safety properties. This LTO compound was synthesized by mixing the TiO2 xerogel of anatase phase and lithium carbonate (Li2CO3) as a source of lithium-ion followed by sintering at temperatures of 750°C to obtain the LTO with spinel crystalline phase. However, the LTO has the low theoretical capacity, i.e: 175 mAh/g, with real specific capacity obtained is at 114 mAh/g. To increase the LTO specific capacity, the addition of 10, 20 and 30 wt.% silicon microparticle which has theoretical capacity of 4200 mAh/g was conducted during preparation of the slurry anode mixture to minimize the formation of SiO2. Anode sheet was made with Si/LTO and assembled into half-cell coin battery with lithium metal sheet as the counter electrode. Electro-impedance spectroscopy (EIS), Cyclic voltammetry (CV), and charge discharge (CD) testing were conducted to examine the battery performance. From EIS testing, the lowest im pedance was obtained for the sample of 20 wt.% Si, while the highest impedance value obtained in 30 wt.% Si. The CV testing shows that the highest capacity at 141.1 mAh/g is achieved at the composition of 10 wt.% Si. Finally, from the CD testing, this Si/LTO anode could withstand the charge-discharge until 12 C and shows good stability until 100 cycles. From EIS and CV testing known that the optimum composition having the best performance is ranging from 10 wt.% to 20 wt.% Si. It is predicted that at higher composition, the pulverization of Si particle is occurred declining the performance of Si/LTO anode.

Keywords: Li4Ti5O12 synthesis; lithium-ion battery; Li4Ti5O12/Si; silicon microparticle

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EFFECT OF NANO SI ADDITION ON SYNTHESIZED LTO FOR LITHIUM BATTERY ANODE

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Abstract. $Li_4Ti_5O_{12}$ or LTO is one of many compounds that could be used as anode component in lithium battery. The most interesting aspect of using LTO as an anode is its long cycle life which is affected by its zero strain property during insertion and extraction of lithium ions. Despite its advantages, LTO still has problem in its capacity value which is limited to 175 mAh/g. Researchers have tried many methods to increase the capacity of LTO, such as making a composite from LTO host. In this composite, nano sized Si is used as additional element because its high theoretical capacity could increase the overall capacity of the LTO composite. In this research, LTO was synthesized by hydrothermal-mechanochemical methods before we mix it with nano Si in slurry making process. The mass variation of nano Si was 1%, 5%, and 10% in wt. XRD and SEM were used for material characterization. For the battery performance testing we used EIS, CV, and CD. This research will explain the effect of Si on the LTO/Si composite performance. From the testing, it is known that the highest capacity was obtained from LTO/Si-10% sample with 216.15 mAh/g, and able to retain 42.76% of its capacity at higher C-rate (4C). The results show that LTO/Si-10% could be used as an alternative for anode component.

INFLUENCE OF ANODIZING CONCENTRATION AND ELECTRIC POTENTIAL ON SURFACE MORPHOLOGY AND CORROSION BEHAVIOR OF ANODIZED MAGNESIUM IN SEAWATER ACTIVATED BATTERY

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Abstract. Magnesium is one of the newly developed anode materials for seawater activated batteries. Anodizing is usually performed to expand the surface of anode materials which can improve the battery discharge performance. This work used Oxalic acid with concentration varied from 0.1 to 0.3 as an anodizing agent with electric potential varied from 1.5 to 6.0 Volt for an anodizing process. Electric potential used in the anodizing was varied from 1.5 to 6.0 Volt. Microstructure and corrosion behavior of anodized magnesium used in this work as battery anode and graphite as a cathode in 3.5% NaCl electrolyte solution were studied. Anodized magnesium in 0.3 M oxalic acid has the most uniform pores of microstructures than those anodized at other concentrations. Anodized magnesium at electric potential from 1.5 Volts tend to has higher value of potential (Ecorr = -1.754 to -1.772 Volt) and corrosion current (Icorr = 2.790 to 11.690μA/cm2), and lower polarization resistance (Rp = 425.170 to 1024.700 Ω) than non- anodized magnesium (Ecorr = -1.649 Volt; Icorr = 10.984 μA/cm2; Rp = 895.510 Ω). Anodized magnesium at the potential from 3.0 until 6.0 Volt indicates the presence of oxidation on the surface which leads to the less good characteristic pattern of dynamic potential.

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GREEN SOLVENT EXTRACTION OF PALMITIC ACID FROM PALM OIL USING BETAINE-BASED NATURAL DEEP EUTECTIC SOLVENTS

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Abstract. Natural deep eutectic solvents were proposed as solvent alternative to separate free fatty acid palm oil. The characteristics of solvents are related to hydrogen bonds occur between hydrogen bond acceptor such as betaine with hydrogen bond donor. Almost all betaine-based deep eutectic solventss formed had relatively similar polarity, i.e. 48.92 - 50.78 kcal/mol. High viscosity of solvents indicated the presence of extensive hydrogen bonds occurred between hydrogen bond donor and hydrogen bond acceptor, which inhibit movement of active compounds, such as palmitic acid. However viscosity was not the only factor affecting the extraction of palmitic acid, polarity as well as spacial effect had roles in extraction of palmitic acid. The viscosity values of all solvents vary from 9.7 to 236 cSt. Extraction with solvent made of betaine and 1,2-butanediol can absorb 60% (w) of palmitic acid from palm oil samples, and have a high selectivity of 3.62 (mole of solvent/mole of palm oil). Therefore, mixture of betaine- solvent with 1,2 butanediol was a potential green solvent for extracting palmitic acid from palm oil.

ENVIRONMENTAL IMPACT ANALYSIS OF SAGO STARCH : LIFE CYCLE ASSESSMENT (LCA) PERSPECTIVE

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Abstract. In general, all activities in various industries use energy and water resources and produce greenhouse gas (GHG). Currently, various regulations require the general industry and agroindustry in particular to measure and quantify the emissions generated from each stage of the process and the final product results. LCA is a method that can report and analyze the use of resources and emissions issued by various agricultural products. Therefore the objective of this research is to describe and evaluates environmental aspects (in particular) with an LCA methods and the applicable green technology or engineering on sago starch industry in Indonesia. The method used is an LCA methods by characterizing the waste produce. The success factor is characteristics of the waste products will be shown originally if the methods are detail. So that the green technology or engineering will be applicable through it. The environmental performance of sago agroindustry is actually can be seen through the Life Cycle Assessment compare with the using of fertilizers, cultivation or with the transportation.

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THE INFLUENCE OF PALM KERNELL SHELL MASS RATIO AS A REDUCING AGENT IN THE LATERITIC NICKEL ORE CARBOTHERMIC REDUCTION PROCESS

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Abstract. Indonesia has many valuable mineral resources, such as lateritic nickel ore. Today, the world demand of lateritic nickel continues to increase. This is an opportunity for Indonesia to develop its potentials in the nickel processing industry. To perform nickel reduction process, reducing agents such as natural gas and coal are needed. In this study, the use of a reductant from palm kernel shell waste as a coal alternative energy in order to reduce the use of fossil fuel which limited availability and cause environmental pollution, being a focus of this research. The purpose of this study is to determine the effect of palm kernel shell as a reductant in lateritic nickel reduction process, using mass ratio variable between mass of nickel ore and reductant. The mass ratio between nickel ore and reducing agent used in this study are 1:1, 1:2, 1:3, and 1:4, with the temperature of reduction in 800°C for 60 minutes. To observe the results of this experiment, the sample characterization was carried out using XRD and XRF. XRD data showed the presence of silica (SiO_2), iron oxide compounds such as maghemite (Fe_2O_3) and magnetite (Fe_3O_4), also compounds from reduction of lizardite such as forsterite (Mg_2SiO_4) and liebenbergite (Ni_2SiO_4). The results of XRF analysis showed improvement of Ni recovery in line with the addition of the mass of reducing agents.

EFFECT OF PELLET SIZE ADDITION ON THE SELECTIVE REDUCTION OF LIMONITE ORE FROM SOUTHEAST SULAWESI

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Abstract. With the increasing demands of nickel in the world and the decreasing of nickel sulfide deposits, the processing of nickel laterite is the new challenge with selective reduction by using coal as reducing agent and Na2SO4 additives. This research aims to determine the preparation parameters of the pelletizing method before the reduction process in order to increase nickel content in the reduction product. The samples were prepared by mixing limonite ore, coal, bentonite, and Na2SO4 additives, then continued by making the pellets with the variations of mass measurements of 5 grams, 10 grams and 15 grams. After the selective reduction, they were characterized by XRD to determine the formed phase, and AAS test to determine the content after selective reduction. The test result of XRD showed the forming of magnetite which were found in the pellets with mass size 5 grams. However fayalite phase was found in each size of pellet samples. The largest iron and nickel content was shown in the 5 gram pellets, 25% and 0.85%, respectively.

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THE EFFECT OF OXIDATIVE HEAT TREATMENT ON THE PREPARATION OF STAINLESS STEEL 304 AND 316 AS THE EFFECTIVE CATALYTIC SUBSTRATE FOR CARBON NANOTUBE GROWTH

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ABSTRACT

Stainless steel is the potential substrate in Carbon Nanotube (CNT) synthesis, Iron (Fe) and Nickel (Ni) content makes stainless steel doubly function as substrate and catalyst. In this study, stainless steel is prepared with chloride acid (37.8%) and oxidative heat treatment at 850 oC for 30 minutes. This study aims to identify the effect of oxidative heat treatment towards stainless steel in CNT formation. The identification is undergone using carbon sources of acetylene and camphor. The substrate of stainless steel 304 is varied into foil, plate, and wiremesh. The result with the use of acetylene for 20 minutes towards the three variations produces carbon loss over 90%. This is due to an increase in Cr percentage which inhibits the formation of nanoparticles of the catalyst. With the help of ferrocene foil substrate, plate, and wiremesh, CNT produced are 0.0573 gram, 0.0701 gram, and 0.1246 gram along with a decrease of carbon loss to 30%. The use of the substrate of stainless steel 316 with lower Cr content and additional time of synthesis to 60 minutes yields the mass of 0.6325 gram and carbon loss of 2.76%. The identification using camphor for 60 minutes results in an increase of CNT mass in stainless steel 304 (0.831 for foil, 1.856 for plate, 2.6305 for wiremesh). Scanning Electron Microscopy-Energy Dispersive X-Ray Spectroscopy (SEM-EDX) is used to identify the carbon form in stainless steel surface, while Gas Chromatography Flame Ionization Detector (GC-FID) is used to identify the acetylene decomposition. Based on this experiment stainless steel 304 and 316 type with oxidative heat treatment preparation method can be easily use as an effective substrate to produce carbon nanotube.

Keywords: Acetylene; Carbon Nanotube; Camphor; Oxidative heat treatment; Stainless steel.

THE INFLUENCE OF TITANIUM ALLOYING AND CO3O4 COATING ON THE OXIDATION BEHAVIOR OF FE-20CR FERRITIC STAINLESS STEELS FOR SOFC INTERCONNECTS

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Ferritic steel is a potential metal candidate for interconnect solid oxide fuel cell (SOFC) because its ability to form chromia layer at the surface during high temperature operation. However, chromia based oxide scales is reluctant to the evaporation of Cr from the oxide–gas interface. In this work, a combination of titanium alloying and application of Co3O4 spinel coating using dip coating method are carried out to improve the performance of ferritic steels as SOFC interconnect. The oxidation behavior of coated and uncoated Fe-20wt.%Cr alloys with different titanium contents: 0, 0.5, and 1 wt.% are studied as a function of time in air atmosphere. The samples were isothermally oxidized at 800°C for 24, 48, and 96 h in a box furnace. Preoxidation experiment were carried out on the alloys before the application of Co3O4 coating to improve its adherence. X-ray diffraction analysis (XRD) and Scanning Electron Microscope (SEM) were used for characterization of the prepared samples. The results shows that increasing the concentration of titanium in the alloys both for coated and uncoated samples caused the increased oxidation rates. The oxidation resistance of Co3O4 coated samples indicated from the weight change measurement was larger than that of the uncoated samples. Co3O4 coating is not effective for improving the oxidation resistance of samples.

Keywords : SOFC, Interconnect, Oxidation, Titanium, Co3O4

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CATALYTIC OXIDATION OF BENZENE USING NANO-CUO/ Γ-AL2O3 AND COMMERCIAL CATALYSTS

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Abstract. Volatile organic compounds (VOC) such as benzene are among the most dangerous air pollutants emitted by chemical industry stacks, as they may contribute to environment and health issues. Lean catalytic oxidation of benzene has been considered as most proper method to abate it from the flue gas. This work developed nano-based copper oxide catalysts for lean oxidation of benzene. The aim of this study was to evaluate the activity performance of the nano-based copper oxide catalyst and compare to commercial catalyst. On the basis of the commercial catalyst, this study was also aimed to determine the reaction rate and its kinetic parameter. The oxidation of benzene was conducted in a fixed bed reactor at 300oC, 1 atm, and GHSV of 15,000 h-1. The concentration of benzene in the feed and product were measured using online gas detector (Cosmos Gas Detector). The catalyst activity of nano-based copper oxide catalysts showed 20-30% conversion of benzene, while for commercial catalyst showed 86%. The reaction rate determination for first order reaction of benzene indicated that the activation energy was 48 kJ/mol with Arrhenius constant of 3x104 s-1.

EFFECT OF ELECTROLYTE TYPE ON THE MORPHOLOGY AND CRYSTALLINITY OF TIO2 NANOTUBES FROM TI-6AL-4V ANODIZATION

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Abstract. A good biocompatibility material such as Ti-6Al-4V is needed for a dental application. However, Ti-6Al-4V has no antibacterial properties. Therefore Ti-6Al-4V is modified using anodizing methods to improve its anti-bacterial properties. One of the most influential factors in the anodizing process is the type of electrolyte solution. The influence of electrolyte solution based on glycerol and ethylene glycol to morphology and crystallinity of TiO2 nanotubes will be studied. Smoothing and chemical polishing was performed against the Ti-4Al-6V plate. Then, the anodizing process for each plate in glycerol and ethylene glycol solution was done for 2 hours and 50 volts. Calcination was carried out for 3 hours at a temperature 500oC. FESEM-EDX and XRD were employed to analyze the surface morphology and crystallinity of TiO¬2 nanotubes. The viscosity of the electrolyte solution influenced the surface morphology, and calcination process influenced the crystallinity of TiO2 nanotubes.

Keyword: Anodization, Ti-4Al-6V, dental implant, electrolyte solution

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DEGRADATION OF METHYLENE BLUE USING SILVER NANOPARTICLES SYNTHESIZED FROM IMPERATA CYLINDRICA AQUEOUS EXTRACT

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Abstract. Green syntheses of nanoparticles are economic and environmental friendly. This present articles reports about the catalytic properties of silver nanoparticles (Ag NPs) produced from green synthesis method using aqueous Imperata cylindrica extract. The formation of Ag NPs synthesized from the extract was detected with the presence of brownish colour and confirmed with UV-visible spectroscopy. Analysis by using energy dispersive X-ray (EDX) spectroscopy confirmed the presence of elemental silver in the sample. The synthesized Ag NPs was known to have crystalline structure based on X-ray diffraction (XRD) analysis. The biomolecules involved in synthesizing nanoparticles was identified by using Fourier transform infrared (FTIR) spectroscopy. In presence of NaBH4, the biosynthesized Ag NPs is capable to decrease the absorbance of methylene blue (MB) in within 8 minutes. The degradation percentage is up to 92 %. The catalytic property of Ag NPs in degrading dye substance is useful in waste water treatment.

ACQUISITION OF CO METAL FROM SPENT LITHIUM-ION BATTERY WITH EMULSION LIQUID MEMBRANE TECHNOLOGY USING CYANEX 272 AS EXTRACTANT

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Abstract. Lithium-ion batteries are the most common type to be used as energy source in mobile phone. The amount of lithium-ion battery wastes is approximated by 200 – 500 ton/year. In one lithium-ion battery, there are 5 – 20% of cobalt metal, depend on the manufacturer. One of the way to recover a valuable metal from waste is leaching process then continued with extraction. Spent lithium-ion batteries will be characterized with EDX and AAS, the result will show the amount of cobalt metal with form of LiCoO2 in the cathode. Hydrochloric acid 4 M, temperature 80oC, and reaction time 1 hour condition give out the best leaching efficiency for both Co and Mn metals, 88.54% and 89.28% respectively. For extraction, the best extraction efficiency achieved when feed phase pH is 5 for Co and 6 for Mn. This study will discuss the leaching and extraction process and compare the efficiency for both processes.

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ENCHANCED ELECTROCHEMICAL PERFORMANCES OF LI4TI5O12/SN COMPOSITES ANODE VIA SOL-HYDROTHERMAL METHOD FOR LITHIUM ION BATTERIES

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Abstract. Li4Ti5O12 (lithium titanate) were synthesized by sol-gel and hydrothermal method with LiOH as lithium ion source. Li4Ti5O12/Sn composites anode were preparared by ball mill method with three of Sn variation. X-ray diffraction shows spinel, TiO2, and Sn phases with anatase and rutile residue. The lowest electrolyte resistance obtained at the highest Sn value. The specific capacity of battery can be increased from addition of Sn by up to 258.6 mAh/g. Alloying and dealloying reaction of LixSn accomodate the increased specific capacity from charge/discharge. However, The volume expansion from LixSn leads to loss of capacity when the C rate increases. The efficient capacity at low and high charge-discharge rate obtained at the highest value of added Sn.

THERMAL PROPERTIES OF PARAFFIN BASED NANO-PHASE CHANGE MATERIAL AS THERMAL ENERGY STORAGE

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Abstract. One way to save electrical energy is by directly reducing the energy consumption and using materials that able to absorb heat. The best material in absorbing heat is paraffin. Paraffin is a group of organic Phase Change Material (PCM) which has high latent heat. Adding nanoparticles to the paraffin is expected to increase the latent heat of nano-PCM. The research aims to find out the thermal properties of nano PCM based paraffin and engineered to improve its latent heat. In this research, PCM material used is paraffin with Fe3O4, CuO, TiO2, and ZnO nanoparticles are added. Nano – PCM is synthesized using sonification methods with variations of 5, 10, and 15 wt%. Latent heat of thermal properties and a melting point of paraffin nano-PCM are measured using Differential Scanning Calorimetry (DSC). The results show the latent heat of paraffin nano-PCM has increased by 20.67%, 78.89%, 7.5%, and 20.17% for the addition of Fe3O4 (5 wt%), CuO (10 wt%), TiO2 (15 wt%), and ZnO (5 wt%) respectively. The better nano PCM in storing latent heat is paraffin-CuO at a mass fraction of 10 wt%. Meanwhile, the addition of nanoparticles has no significant effect on the melting point. These results showed that paraffin based nano-PCM is an excellent thermal energy storage.

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EFFECT OF GRAPHENE NANO-FLUID ON HEAT PIPE THERMAL PERFORMANCE FOR PASSIVE HEAT REMOVAL IN NUCLEAR SPENT FUEL STORAGE POOL

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Abstract. After Fukushima Dai-ichi nuclear power reactor accident, spent fuel in spent fuel storage pool (SFSP) became an important thing to pay attention to, due to its decay heat release. If station blackout occurred, the active system for SFSP cooling system will experience malfunction to remove the product of decay heat. To keep spent fuel safe, heat pipe as passive cooling system device can be used to remove spent fuel decay heat even if the active cooling system failed. Heat pipe with 6 m on length will be proposed as a passive cooling system in SFSP. For that, it is necessary to analyze the effect of Graphene nano-fluid as heat pipe working fluid. The objective of this research is to know the effect on Graphene nano-fluid to enhance the heat pipe thermal performance and to know the heat transfer phenomena inside the heat pipe based on Graphene nano-fluid. Graphene nano-fluid with 1% weight concentration was used as working fluid with filling ratio of 80%. The experimental investigation is conducted with varying the evaporator heat load of 1000, 1500, 2000, and 2500 W. Water as coolant flows in the condenser with a constant volumetric flow rate of 8 L/min. The experiment results show that there was an overshoot, zigzag and stable phenomena inside the heat pipe. The thermal resistance of heat pipe is obtained at 0.015 oC/W. The use of Graphene nano-fluid as working fluid can enhance the heat pipe thermal performance significantly and can be used as an alternative working fluid in heat pipe for the passive cooling system in SFSP of nuclear power plant.

Keywords: Graphene nano-fluid; Heat pipe; Station blackout; Passive cooling system.

BATTERY THERMAL MANAGEMENT SYSTEM USING LOOP HEAT PIPE WITH LTP COPPER CAPILLARY WICK

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Abstract. Loop heat pipes (LHPs) with Lotus-Type Porous Copper (LTP Copper) capillary wick are expected to be applied to battery thermal management systems for safe operation at high performance with a long service life. Sintered LTP Copper is a high permeability porous metal with an excellent capillary pumping characteristic. The objective of this work is to determine the performance of the battery thermal management system using LHP with sintered LTP Copper capillary wick experimentally. The experiment used two battery simulators made of aluminum. The heat generation of the battery was simulated using cartridge heaters. The LHP was made of 10 m OD copper tube, and the sintered LTP Copper capillary wick was placed in the liquid line. Water was used as working fluid with filling ratio of 50%. The evaporator section of the LHP was inserted between the battery simulators surfaces. A thermostatic bath was used to regulate the condenser cooling fluid temperature. K-type 0.3 mm thermocouples were used for temperature measurement, and a digital power meter was used to measure the electric power. Experiments were conducted with various heating power with the condenser cooling fluid temperature was kept at 28°C. At a heat generation of 20 W, the LHP was capable of maintaining the battery surface temperature below 50°C. At a heat generation of 40 W, the utilization of LHP with LTP Copper can reduce the average battery simulator surface temperature from 93°C to 65°C.

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CHARACTERIZATION OF SHAPE-STABILIZED PHASE CHANGE MATERIAL USING BEESWAX AND FUNCTIONALIZED MULTI-WALLED CARBON NANOTUBES

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Abstract. One of the promising solutions for energy management is thermal energy storage. Beeswax is type of wax that is produced from beehive which also can be performed as thermal storage with high latent heat. Unfortunately, beeswax has low thermal conductivity. On the other hand, carbon nanotubes (CNT) is known as an advanced nanoparticle which has high thermal conductivity. In this research, modification of composite Beeswax/A-CNT was conducted in order to determine shifting on its structure and thermal performance. Multi-walled carbon nanotubes (MWNT) was functionalized with strong acidic mixture by ratio 3:1 of H2SO4 and HNO3 becoming acid-treated CNT (A-CNT). Impregnation method is being used to shape the composite with mass ratio of 5%. Several tests were conducted, functional group formation was determined by Fourier Transform Infrared (FTIR), Differential Scanning Calorimetry (DSC) test and thermal conductivity test was also operated to know the composite's thermal performance. Test results show that modification of stable composite Beeswax/A-CNT was successfully formed. The result shows that with addition of 5 wt.% A-CNT, the latent heat of Beeswax decreases 25% and significantly escalate the Beeswax's thermal conductivity by up to 84%.

SIGNAL DETECTION FOR IDENTIFICATION ENERGY AND BEHAVIOUR OF MALE DOLPHIN BOTTLE NOSE (TURSIOPS ADUNCUS) USING NTD MODEL

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Abstract. Whistle sound is a voice that is intended to echolocation, whistle sound is a major role in internal and inter-group communication. The objective research is to know the power spectral patterns and fluctuations in sound based on the frequency of the sounds produced by dolphins and observing the position of dolphins. Noisy Time Domain (NTD) and behaviour using the underwater camera, and also comparing between time and sound spectrum. Data recording was taken at the Safari Park of Cisarua Bogor in Indonesia, by taking data in show pool. The results showed that salinity before feeding time in the show pool with replication 1,2, and 3 has salinity value that is equal to 30 ‰. Data at the show pool before feeding with replications 1,2, and 3 has a salinity of 29 ‰. Sound whistle 3 before feeding time of 28.03 dB with the frequency interval of 14 642 Hz-16000 Hz. F-test at the show pool before meals has heterogeneous value. Treat before meals at the show pool has a value of $P < 0.001$ and $P < 0.001$. Value Noisy Time Domain have differences with each other and have a lot of different sound patterns. In general, there are real differences are evidenced by F test on a range of time at each whistle on show pool in the time before meals. In general, there is a noticeable difference in the range of time at each whistle on show pool in the time before meals. The behaviour of dolphins have a habit that has the movement toward the surface of the pool and movement and position will be influenced frequency and intensity value.

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EFFECT OF TEMPERATURE AND TYPE OF DISPERSANT ON TREATING OIL SPILLS

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ABSTRACT

Oil spill handling can be done by pouring a dispersant to speed up emulsification of oil in a water so it may disperse into a small droplets of water column. Dispersant effectiveness can be influenced by environmental temperatures and types of dispersant, so in this study, a MESLU-crude oil were mixed with two different dispersant at various temperature. The heating source was oven and refrigerant source was the ice cubes that placed on a cooler bag. The research is done by varying environmental temperature at 16^{o}C, 26^{o}C and 36^{o}. Sample is taking on the top, middle and base layer of water. Samples tested with the spectrophotometer UV-VIS by wavelength at 340 nm, 370 nm and 400 nm. This research found that dispersant can work effectively in temperatures range at 26^{o}C - 36^{o}C. The highest value of light absorbance is on the top layer of dispersant that soluble in a water at temperature about 26^{o}C with absorbance area 82.15 abs and the smallest light absorbance occurs on 16^{o}C temperatures with absorbance area 25.72 abs. The largest area light absorbance is found at temperatures 26^{o}C of dispersant that soluble in water with area 133.49 abs. This proves that the higher temperature up to a certain point makes dispersant performance more effective because the decreasing viscosity of the oil and dispersant. In addition, dispersant types can affect the stability of emulsion, the smaller concentration of emulsifier makes emulsification more stable.

Keywords: Oil Spills, Dispersant, Temperature Variations, Light Absorbance, Emulsification

DYNAMIC OPERATION OF WATER GAS SHIFT REACTION OVER FE2O3/CR2O3/CUO CATALYST IN PD/AL2O3 MEMBRANE REACTOR

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Abstract. Hydrogen has been considered as promising energy carrier that can be produced from renewable resources, such as biomass through gasification. This process results in producer gas containing CO, CO2, H2, N2, and CH4. The conventional enhancement of hydrogen is typically conducted using several unit operations such as water gas shift reactor (WGSR) and separation unit such as Pressure Swing Adsorption (PSA). Process intensification offers a new method to integrate both WGSR and separation unit into single membrane reactor. This research aimed to investigate the influence of dynamic operation on membrane reactor performance. The steady state fixed bed reactor and membrane reactor were used as base case to judge the performance of dynamic membrane reactor. The water gas shift reaction over Fe2O3/Cr2O3/CuO was carried out at 350oC and 1 atm by varying the feed composition and gas residence time. The feed composition ratio of H2O/CO consisted of 2 and 3 on mole basis, while the gas residence times were 1.2 s and 2.3 s. The membrane reactor consists of shell and tube sides made of Pd/Al2O3 material with technical specification of 10 mm inner diameter, 20 µm Pd thickness supported by alumina, and 10 cm reactor length. The compositions of the feed gas and products were measured using gas analysers such CO gas detector (Bacharach PCA® 3) and H2 gas detector (Cosmos XP-3140). The dynamic operation was performed following the square wave perturbation of the feed gas at switching time of 15 s. The experiment results showed that increasing the feed composition ratio and gas residence time increased the conversion of CO and hydrogen production in the fixed bed reactor and membrane reactor. Higher production of hydrogen also improved the recovery of hydrogen in membrane reactor. The use of membrane reactor increased significantly the conversion of CO when compared to fixed bed reactor. Moreover, the dynamic membrane reactor would give much better performance in term of CO conversion and hydrogen recovery. The stability of the Pd/Al2O3 membrane reactor was proven for at least 10 h operation.

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MEASUREMENT OF THERMAL RADIATIVE HEAT TRANSFER USING A MULTI-AXIS RADIOMETER

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ABSTRACT

Distance, view factor, and placement of an object will affect the amount of radiation to be received from the heat source. Therefore, to examine the effect of distance, the viewing factor and the placement of objects against radiation, a multi-axis heat flux measurement apparatus was designed. Testing of the instrument will be limited to heating temperature, the distance of the sensor to the heater, the sensor offset to the heater, the viewing angle of the sensor to the heater, and the orientation of the workbench. The results of testing distance and offset are validated by the theoretical calculations and numerical simulations of Fire Dynamics Simulation. The results of the test showed agreement with the theoretical calculations and simulations of Fire Dynamics Simulation. The results of this study also indicate that the distance and point of view affect the received radiation flux

Keywords: Thermal radiation, heat flux, multi-axis radiomter

DISINFECTION OF ESCHERICHIA COLI BACTERIA USING COMBINATION OF OZONATION AND HYDRODYNAMIC CAVITATION METHOD WITH VENTURI INJECTOR: EARTH AND ENVIRONMENTAL SCIENCE

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Abstract. This research aimed to evaluate the performance of a series of combined ozonation disinfection unit and hydrodynamic cavitation in the disinfection of Escherichia coli bacteria. Ozone dose and the circulation flow rate of wastewater contaminated with the Escherichia coli was used as variables of research to determine the best conditions of the combination methods. Variations of waste flow rate were 4; 5.5; and 7 LPM, while ozone dosage was varied by using household commercial ozonator ranging from 1 (84.38 mg/h) , 2 (157.44 mg/h) and 3 (231.36 mg/h) unit of ozonator. The best result of decreasing the Escherichia coli bacteria concentration was obtained by combining method of disinfection by hydrodynamic cavitation at 7 LPM and ozonation from 3 units ozonator with 231.36 mg/h of ozone dosage for 60 minutes of desinfection are 17 CFU/mL final concentration from 8.4 x 105, 0 CFU/mL for initial concentration 9.7 x 104 CFU/mL, and 0 CFU/mL for initial concentration 8.3 x 103 CFU/mL.

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MANUFACTURE OF SOLID SOAP BASED ON CRUDE PAPAIN ENZYME AND ANTIOXIDANT FROM PAPAYA FRUIT

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Abstract. The uncontrolled formation of free radical formation released to the air especially in the high urban area lead to resulting negative effect on the air quality. This condition is consequently made the human skin continuously contacts to those radicals and may cause a skin diseases. Therefore, one way to overcome this problems is to manufacture a soap formulation which provide a new function of its ingredient as radical scavenger or to keep the skin in health. Papain is a plant proteolytic enzyme for the cysteine protease enzyme which found naturally in papaya (Carica papaya) manufactured from the latex of raw papaya fruits. Proteolytic enzyme has a function which is able to break down organic molecules made of amino acids, known as polypeptides. In this research crude papain enzyme is developed into active ingredient of solid soap formulation with the antioxidant originated from fresh papaya to enhance the useful soap for human skin health. This study aims to produce a solid soap formula that is safe for the skin, meets the standard of SNI 1996 and tested the benefits in the addition of crude papain enzymes. The result showed that Formula IV is a formula soap that meets standard SNI 1996 and have highest antioxidant activity among other formulas indicated by the value of IC50 is 13,657 ppm. Compared soap with positive control (without enzymes) than negative control (with enzyme) has value of percentage dirt removal higher than positive control, it is 19% with measurement absorbance of wash water substrate and 32% measured by mass substrate after washed.

Keywords: Solid Soap, Crude Papain Enzyme, Standar Nasional Indonesia (SNI), Antioxidant, Removal Dirt Test

TAPIOCA AND TOFU WASTE UTILIZATION TO PRODUCE AA, DHA, AND EPA

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Abstract. Unsaturated fatty acids are one of important things. Meanwhile, the body has limited synthesize unsaturated fatty acids such as AA, DHA, EPA. Therefore, these fatty acids are essential for the body. This study initiated the procurement efforts of unsaturated fatty acids of microorganisms able to convert unsaturated fatty acids with low cost and produce unsaturated fatty acids with a high percentage. This studyuse the medium of waste tapioca and waste tofu. In addition, this study will analyze the varying composition of carbon and carbon concentration curves to the maximum lipid production from Aspergillus oryzae and determine the optimum rate of agitation against lipid production from Aspergillus oryzae. The results shows that the optimum composition of AA, DHA, EPA are 0.18% (w / w), 0.33% (w / w), and 2.96% (w / w) in concentration carbon of 9% (w / w) and agitation rate of 120 RPM.

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EFFECT OF PH, TEMPERATURE AND MEDIUM AGITATION RATE IN PRODUCTION OF AA, DHA, EPA FROM ASPERGILLUS ORYZAE WITH SUBMERGED FERMENTATION

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Abstract. There are several substances that needs to be fulfill to keep the brain cell growth such as AA, DHA and EPA. Fungi is one of the alternative source of omega 3, omega 6, omega 9 especially AA, DHA and EPA. This research variates operating condition that is suitable for the growth of Aspergillus oryzae in AA, DHA, and EPA fatty acid production with Submerged Fermentation using synthetic medium. Aspergillus oryzae cultivated in medium using glucose as carbon source and Ammonium sulfate and yeast extract as nitrogen source. The extraction method using ethanol and n-hexane as solvent. The result shows that optimum agitation rate for unsaturated fatty acid production of Aspergillus oryzae is 120 RPM, lipid yield 28,28% and unsaturated fatty acid content 50,36 % and EPA content 2,42 %. Optimum medium pH for PUFA production of Aspergillus oryzae is 6, lipid yield 22,35 % and unsaturated fatty acid content 45,5 %. optimum incubation temperature for unsaturated fatty acid production of Aspergillus oryzae is 25 oC, lipid yield 13,19 % and unsaturated fatty acid content 62,15 %. Unsaturated fatty acids produced from Aspergillus oryzae are oleic, linoleic, linolenic and EPA.

Keywords: Aspergillus oryzae, AA, DHA, EPA, Submerged Fermentation, Single Cell Oil

STUDY OF CURCUMA XANTHORRHIZA EXTRACT AS GREEN INHIBITOR FOR API 5L X42 STEEL IN 1M HCL SOLUTION

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Abstract. The inhibitory effects of Curcuma xanthorrhiza extract on the corrosion of API 5L X42 steel in 1M HCl solution was investigated by using weight loss, potentiodynamic polarization, and electrochemical impedance spectroscopy methods. In this study the concentration of C. xanthorrhiza extract used was 0 ppm, 100 ppm, 250 ppm, 500 ppm, and 1000 ppm. The results show that C. xanthorrhiza inhibit the steel corrosion and acted as mixed type inhibitors. The corrosion rate decreased with the increasing of inhibitors concentrations. At the same time, inhibition efficiency increased with the increase of inhibitors concentrations. The adsorption of the extract on the steel surface was found to obey Langmuir's adsorption isotherm. The free energy value (ΔGads) indicated that the adsorption of the inhibitor molecules was typical of physisorption. It can be concluded that C. xanthorrhiza extract could be used as an alternative and environmental friendly inhibitor for API 5L X42 steel in acidic environment.

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ADSORPTION CAPACITY STUDY OF ETHANOL-WATER MIXTURE FOR ZEOLITE, ACTIVATED CARBON, AND POLYVINYL ALCOHOL

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Abstract. Global energy issue is no longer a new topic. The expansion of energy production proven to show significant influence is the fossil fuel modification by blending it with liquid renewable fuel, such as bioethanol. Bioethanol must achieve fuel-grade standard to qualify as gasoline, one of the specification is to have moisture content of 1.0% v/v or less, as regulated by ASTM D4806. This parameter is a challenging one to achieve, because water-ethanol mixture will encounter the azeotrope phenomenon when the mixture undergoes a common distillation process and reach 95.6% v/v of ethanol. One of the dehydration method that use less energy is adsorption. One of the efficiency consideration of bioethanol dehydration with adsorption is its adsorption capacity. Adsorption capacity is influenced by the material of adsorbent, operational temperature and time. The material being tested in this research is poly vinyl alcohol (PVA), zeolite, and activated carbon. This research will analyze the dependency and influence of mixture's initial concentration and operational temperature condition towards the final concentration of ethanol and adsorption capacity utilizing a Langmuir model. The result of this study showed that the activated carbon has the highest parameter capacity, which is twice as much than zeolite and three times larger than PVA. Whereas the result of selectivity study between the three prove that zeolite has better selectivity.

Keywords: Bioethanol; Adsorption capacity; Activated Carbon; Zeolite, PVA.

EFFECT H_2SO_4 AND ZYMOMONAS MOBILIS CONCENTRATION TO BIOETHANOL PRODUCTION BY BINTARO FRUIT (CERBERA MANGHAS) SUBSTRATE

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Abstract. Bintaro fruit (Cerbera manghas) contains 36.945 of cellulose and 38% of lignin which is potential as a source of raw material for making bioethanol. The purpose of this research is to know the effectiveness of formula in producing bioethanol by the process of bintaro. The methods used in this research are pretreatment, delignification, hydrolysis, fermentation, and distillation. Pretreatment was performed by subcooling the substrate at 800C followed by milling it up to 60 mesh. Delignification was performed by soaking the substrate in 1000C of 1N NaOH and 1 barr for 30 minutes. Hydrolysis was carried out with sulfuric acid catalyst (H2SO4) variations of 5.5%, 6.0%, and 6.5% at 1200C for 60 minutes. Fermentation with Zymomonas in variation of 1%, 3%, and 5% at room temperature for 3 days. The fermented filtrate was distilled at 730C to obtain ethanol and tested the levels of ethanol with chromatography gas. The results showed that the highest levels of ethanol is 9.977% resulted from 6.5% of sulfuric acid hydrolysis and 5% of Zymomonas mobilis fermentation.. The high levels of ethanol is supported by qualitative test result of the presence of reducing sugars with fehling yielding of 7002 ppm red brick tested quantitatively by nelson somogyi method. In conclusion, the level of bioethanol produced is directly proportional to the increased concentration of sulfuric acid and Zymomonas mobilis. The conclusion is levels of bioethanol produced is directly proportional to the increase in the concentration of sulfuric acid and Zymomonas mobilis is used.

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HYDROPHILIC AND HYDROPHOBIC CHARACTERISTICS OF PEAT

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ABSTRACT

Indonesia is a country with the largest peat land in Southeast Asia. These vast peat land is spread throughout the country. In the last 2 decades, Indonesia encounter land fires and now becomes an annual land fire event. Later, observed that the land fire occurred because dry season in Indonesia causing the peat becomes dried enough to have hydrophobic characteristics and easily burned. This fire phenomena on peat land is determined by some factor such as, physical properties, organic content, oxygen concentration, etc. Peat has hydrophilic and hydrophobic properties as physical properties when treated differently. Initially raw peat has hydrophilic properties. However, in certain low level of moisture content, peat becomes hydrophobic. To examine this phenomena, mechanical understanding based experiment can be done. For hydrophilic properties can be experimented by using Shimadzu MOC63u Moisture Balance Analyzer. The peat sample which are used are Indonesian natural peat. The wet peat would be dried by using moisture balance equipment with various temperature (60, 80, 100, 120 0C). As for hydrophobic properties, it can be done by loading some dried peat into a tube 1.5 cm in diameter and 25 cm long) (Dekker, 2009) where both end are covered by. Then, the tube will be dipped into water in a certain depth. From the experiment, the parameter such as adsorption time and adsorption capacity which will show the hydrophobic characteristics of peat will be discovered.

Keyword: Hydrophilic, Hydrophobic, Moisture content, Peat

THE EFFECT OF PAPAIN ENZYME DOSAGE ON THE MODIFICATION OF EGG-YOLK LECITHIN EMULSIFIER PRODUCT THROUGH ENZYMATIC HYDROLYSIS REACTION

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Abstract. Lecithin emulsifier product is a good stabilizer agent used for food, pharmaceutical and cosmetic industries. In the food industry, most of the emulsifier used is a type of oil-in-water emulsion. Lecithin extracted from egg yolk was modified by enzymatic hydrolysis reaction using papain enzyme. This modification will change the molecular structure of the compound which makes lecithin more stable in the type of oil-in-water emulsion (O/W). This study was aimed to determine the optimum amount of papain enzyme used in hydrolysis reaction of lecithin. The results showed that the breaking of a single fatty acid chain from the structure of lecithin which can be demonstrated by FTIR instrumentation. Fatty acids that have been detected from the lecithin structure are shown at wavenumber 1699.45 cm-1 (C=O), 1231.44 cm-1 (C-O), 1422.45 cm-1 (C-O-H), 1092.85 cm-1 (C-C), 665.89 cm-1 (CH2), dan 3400.57 (-OH in carboxylate). Determination of modified lecithin yield was performed by several tests such as stability test, acid value, surface tension and potential zeta. From the results of tests that have been done, obtained the emulsion stability for the O/W type was achieved in hydrolyzed-lecithin using 4% papain enzyme with stable up to 31 hours. The lowest acid number was achieved in hydrolyzed-lecithin using 2% papain enzyme with value of 10.40. The lowest surface tension was achieved in hydrolyzed-lecithin using 2% papain enzyme with surface tension value 48.68 dyne / cm. The potential zeta of hydrolyzed-lecithin using 2% papain enzyme has a value of 94.8 mV. These results show that enzymatic hydrolysis of lecithin using papain enzymes is capable of enhancing the characteristic properties of lecithin emulsifiers.

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STUDY OF BAWANG DAYAK (ELEUTHERINE AMERICANNA MERR) EXTRACT AS ECO-FRIENDLY CORROSION INHIBITOR FOR PIPELINE API 5L X42 IN 1M HCL

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Abstract. This study aimed to investigate the ability of Eleutherine americanna Merr. extract as an environment friendly inhibitor for API 5L X42 in 1M HCl. Corrosion inhibition ability of this extract was tested using tafel polarization, weight loss and electrochemical impedance spectroscopy methods. FTIR test was used to investigate flavonoid and antioxidant compound that plays an important role to inhibit corrosion. In this study the concentration of Eleutherine americanna Merr extract used was 0 ppm, 100 ppm, 250 ppm, 500 ppm, and 1000 ppm. It can be concluded that Eleutherine americanna Merr extract can be used as an alternative and environmental friendly inhibitor for API 5L X42 in 1M HCl.

ONE-STEP SYNTHESIS OF CELLULOSE NANOCRYSTALS FROM OIL PALM EMPTY FRUIT BUNCHES

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ABSTRACT

Cellulose nano crystals (CNCs) is one of the most promising new materials due to their advantageous properties such as low density, high mechanical properties, high surface area, biocompatible and low toxicity. However, existing methods to prepare CNCs require multiple pretreatment steps for removal their non-cellulosic constituent, and using highly corrosive acids. Herein, green synthesis of CNCs from Oil Palm Empty Fruit Bunches (OPEFB) is being studied through one-step method using Ammonium persulphate (APS) which offer eco-friendly and simple process. Optimum condition for CNCs preparation from OPEFB was investigated by varying APS concentration (1-3 M), processing temperature (60-80oC), and time (5-15 hours). Based on visual observation and Dynamic Light Scattering (DLS) result, CNCs might be found in sample prepared at 70 oC for 15 hours using APS concentration 2 M and 3 M with particles size around 90 nm and 80 nm respectively.

Keywords: Cellulose nano crystals, one-step procedure, Oil Palm Empty Fruit Bunches.

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USAGE PERIOD OF NIPAH LEAVES NYPA FRUCTICANS WURMB WITH SALT WATER TREATMENT AS ROOFING MATERIAL

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Abstract. At this time began to revive the use of local materials with aesthetic and economic considerations, especially for tourism buildings, restaurants, resort hotels, and others. Therefore, researchers are encouraged to examine the knowledge of the utilization of local resources, especially nipah leaves. In Petoaha Sub District, Abeli District, Kendari City is located Kampung KB (Keluarga Berencana). Kampung KB is a former village of Bajo ethnic landed (formerly living on water). Mothers in Kampung KB are busy making roof material from nipah leaves. The leaves are taken from the palm trees that grow around Kampung KB. The phenomenon in the field that leaves soaked in sea water for 1-3 days before the roof is made. According to them that the leaves are soaked in sea water has a long lifetime compared to leaves that are not soaked in sea water. Based on their experience that the leaves are soaked in sea water has age wear for 6-7 years. Leaves that are not soaked in sea water have a life span for 2-3 years. This research is aimed to test the nipah leaf that is soaked in sea water and nipah leaves that are not soaked in sea water against the age of wear. The plate count method to test the total microbial between fresh nipah leaves and nipah leaves that were soaked in sea water was used in this study. This study concluded that nipah leaves are soaked in sea water has a longer lifetime when made a roof than nipah leaves are not soaked in sea water.

Keywords: Nipah leaves soaked in sea water, microbial count, life time

THE EFFECT OF PINEAPPLE LEAF FIBER (PALF) INCORPORATION INTO POLYETHYLENE TEREPHTHALATE (PET) ON THE PROPERTIES VIA ELECTROSPINNING METHOD

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Abstract. Pineapple Leaf Fibers (PALF) which is rich in cellulose, relatively inexpensive and abundantly available has the potential for polymer reinforcement. In this study, Polyethylene Terephthalatate (PET) were added with PALF and electro-spinned and compared with PET neat electrospun. The properties of the resulting mats were examined by Scanning Electron Microscope (SEM), Fourier Transform Infrared (FTIR) and contact angle (CA). Briefly, SEM results indicated that the present of fibers led to a tendency of lower average fiber diameter compared to the PET neat. PALF/PET shows uniform fiber network as the PET shows slightly random fibers networks. Two distinct fiber networks with intersecting fibers were observed in PALF/PET. One networks probably corresponds to PET and the others to PALF. FTIR analysis shows the intensity peak represent carbonyl at ~3400cm-1 and ester at ~1100 cm-1 decreased. It is suggested interaction occurred between lone pair of oxygen in the group with hydrogen group in PALF. New peak were observed at 3400 cm-1 that indicated hydrogen bonding as well as its hydrophilic tendancy. The contact angle of PET signify high average value 1560 that comes with hydrophobic properties compared to PALF/PET with average value 160 with more hydrophilic properties.

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AGE WEARING THE ROOF OF NIPAH LEAF NYPA FRUTICANS WURMB. WHICH SOAKED IN SEA WATER

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ABSTRACT
At this time began to revive the use of local materials with aesthetic and economic considerations, especially for tourism buildings, restaurants, resort hotels, and others. This encourages researchers to examine the knowledge of the utilization of local resources, especially nipah leaf. The method used in this study is the plate count method to test the total microbial between fresh nipah leaves with nipah leaves soaked in sea water. The result of this research is nipah leaf that soaked sea water has longer life time when made roof than nipah leaf that is not soaked.

Keywords: Number of microbes, roof of palm leaf.

USE OF CARBON PYROLYZED FROM COCONUT SHELL IN THE LIFEPO4/V/C COMPOSITE FOR LITHIUM ION BATTERY CATHODE

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Abstract. Most of the time, coconut shells from the coconut farms have not been used but for charcoal purpose. In this work, the charcoal from the coconut shells was converted into an activated carbon and used it for the development of lithium ion battery. The development was begun by firstly synthesizing LiFePO4 (LFP) through a hydrothermal route using stoichiometric amounts of precursors LiOH, NH4H2PO4, and FeSO4.7H2O. The as-synthesized LFP was then mixed with variation of vanadium concentrations and a fix concentration of the carbon pyrolyzed from the coconut shells. The as-synthesized LFP, vanadium, and the carbon were mixed in a ball-mill before characterizing it using a thermal analyser from which sintering temperature of 850°C for 4 hours was obtained. X-ray diffraction (XRD) was used to characterize the crystal structure information of the composite products, whereas a scanning electron microscope (SEM) equipped with energy dispersive X-ray spectroscopy (EDX) was used to characterize surface morphology and composition of the composite. The characteristic of the composite was further examined an electrochemical impedance spectroscopy (EIS) for its conductivity. The XRD results showed that the LiFePO4/V/C has been formed successfully with an olivine structure. The SEM results depicted an agglomerate morphology but most of LiFePO4/V particles have been coated by the carbon. The EIS results showed that the materials with addition of activated carbon from the coconut shell has greater conductivity than that of pure LFP. The results are promising in which the coconut shell has a great potential as a cheap carbon resource for the development of lithium ion battery cathode.

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CHARACTERISTICS OF NANO CARBON PYROLYZED FROM TABLE SUGAR AND SUCROSE FOR PT-LESS DSSC COUNTER ELECTRODE

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Abstract. Platinum is the best counter electrode used in the dye-sensitized solar cells (DSSC). However, the price of platinum is very expensive that impedes its broad use for the DSSC counter electrode. As an alternative, carbon has been use for this purpose. In this work, carbon nanoparticles have been successfully pyrolyzed from precursors of sucrose and table sugar through a chemical process, i.e. dehydration of the precursors with sulphate acid followed by a pyrolysis process. The as-synthesized carbon nanoparticle was characterized using X-ray diffraction (XRD) for the crystal structure information and a scanning electron microscope (SEM) equipped with energy dispersive X-ray spectroscopy (EDX) for morphological and compositional examination. Material activity and performance for counter electrode in DSSC was analysed using a semiconductor parameter analyser through current versus voltage characteristic curves (J-V). The results show that precursors from table sugar without any addition of metal catalyst and initial heat treatment at 300 °C for 60 minutes and sucrose with a catalyst could produce carbon nanoparticle. However, the characteristic of I-V curve from DSSC device assembled using carbon nanoparticle from table sugar as counter electrode only that showed good performance with a power conversion efficiency (PCE) of 3.239%, almost equivalent to that of platinum paste with a PCE of 4.024%. This result is promising in terms of using a cheap source of carbon for the Pt-less counter electrode.

Preparation of Zinc Oxide Catalyst with Activated Carbon Support for Ozone Decomposition

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Abstract. Investigation of catalyst for ozone decomposition was carried out by using zinc oxide (ZnO) catalyst and granular activated carbon (GAC) support. Ozone needs to be decomposed because it is harmful to human and can lead to death. Before GAC was used as a support, GAC was pre-treated using chloride acid (HCl) and sodium hydroxide (NaOH) to remove impurities. ZnO was impregnated onto the surface of GAC by using zinc carbonate ($ZnCO_3$) solution as precursor and then calcined at 300 °C to decompose carbon dioxide (CO_2). Size of GAC and loading percentage of ZnO were varied to get the highest catalytic activity. Size of GAC was varied between 18 – 100 mesh and loading percentage was between 0 – 2%-w. The morphology, composition, and crystal phase were characterized by BET, SEM-EDX, and XRD method. From XRD method, crystal phase of catalyst was changed from $ZnCO_3$ structure to ZnO when calcined with exact temperature. Ozone decomposition was performed at room temperature and atmospheric pressure using fixed bed reactor. ZnO/GAC with smallest size (60 – 100 mesh) and highest loading percentage (2%-w) showed the highest activity which the conversion reached 100% for 30 minutes. ZnO/GAC with smallest size and highest loading percentage had the largest surface area and the most active sites to decompose ozone.

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THE EFFECT OF CENTRIFUGATION SPEED AND CHITOSAN-SODIUM TRIPOLYPHOSPHATE RATIO TOWARD THE NANOENCAPSULATION OF SAMBILOTO (ANDROGRAPHIS PANICULATA) FOR THE FORMULATION OF HEPATITIS B DRUG

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Abstract. Hepatits B is a viral infection which attack the liver. One of the compound that can overcome and inhibits Hepatitis B is Andrographolide. The compound was derived from Sambiloto plants (Andrographis paniculate). Andrographolide compound works by inhibiting α-glucosidase which assists the secretion of Hepatitis B virus. The goal of this research is to make nanoencapsulation of sambiloto leaf extracts that was encapsulated in chitosan and STPP. The nanoencapsulation will increase the bioavailability of the body for the administered Andrographolide. The size of the resulting particle at a variation of centrifugal speed of 8.000 RPM with the concentration ratio of chitosan : STPP equals to 0.2% : 0.1% (g/mL), was 68.3nm. The loading capacity of the nanoparticles is 67.20% and the encapsulation efficiency of the nanoparticles is 99.48%. The release profile has a cumulative release of 34.55% with slow release in gastric pH conditions and followed by a burst release in intestine pH conditions.

Keywords: Andrographolide, Chitosan, Nanoparticles, Sambiloto extract, STPP

PREPARATION AND CHARACTERIZATION OF COPPER OXIDE CATALYST WITH ACTIVATED CARBON SUPPORT FOR OZONE DECOMPOSITION IN INDUSTRIAL ENVIRONMENT

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In this research, ozone decomposition has been synthesized based on copper oxide (CuOx) with granular activated carbon (GAC) as a support catalyst, being used as ozone decomposer in effluent gas emissions of industries that use ozone. GAC was prepared by using HCl and NaOH. CuOx was impregnated to the surface of granular activated carbon by using copper carbonate (CuCO3) as precursor and then calcined to release carbon dioxide with temperature of 300 °C for 1 hour. Size of activated carbon and loading percentage of copper oxide to the support were varied to get the optimum value. The quality of a catalyst such as pore diameter and surface area are characterized by BET, the cross-sectional surface of the catalyst and the catalyst elements composition are analyzed by X-ray spectroscopy (SEM-EDX) and X-Ray Fluorescence (XRF), while CuOx composition and crystal phase are analyzed by XRD. Ozone decomposition was performed at 20 - 40 °C and atmospheric pressure using fixed bed reactor. Results of the catalytic conversion was tested using iodometric method. Activated carbon with smallest diameter (60 - 100 mesh) and highest loading percentage (2 %-wt) showed the highest activity which the ozone conversion to oxygen reached 100%. Amount of CuOx on the support also determine the efficiency of catalyst due to appropriate amount of CuOx probably maintain the morphology and crystal phase of the catalyst.

Keywords: ozone; ozone decomposition; catalytic ozone decomposition; copper oxode; geranular activated carbon

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EFFECTS OF REDUCTION TIME ON CARBOTHERMIC REDUCTION OF LATERITIC NICKEL ORE USING PALM KERNEL SHELL AS GREEN REDUCING AGENT

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Abstract. Lateritic nickel ore is one of the biggest mineral resources in Indonesia. There is a large potential to acquire high concentration of nickel by processing and refining the ore, but because there is high energy use for mineral separation or gangue minerals processing, the cost will be high. Therefore, to resolve those problems, a pre-reduction stage called carbothermic reduction process is carried out. Carbothermic reduction process is usually used for saprolite which needs a reductor for the reduction reaction of lateritic nickel ore to produce pure nickel. Common reductors used are coal and cokes. In this study, a development on carbothermic reduction of saprolite, type of lateritic nickel ore using biomass reductor palm kernel shell, was conducted. The lateritic nickel ore used was obtained from East Halmahera and the palm kernel shells were obtained from the waste of palm oil plantation at Palangkaraya, Central Kalimantan. The purpose of this study is to find out the effect of reduction time variation on carbothermic reduction result of lateritic nickel ore with constant temperature and mass ratio value. Reduction time variation used in this study was 1, 2, 3, and 4 hours. All samples were tested at 800°C with the mass ratio of 1:4 (lateritic nickel ore : palm kernel shell) which were put into a crucible and then the carbothermic reduction process was done in a melting furnace. Peak formed on the XRD pattern showed that the process was able to reduce hematite or magnetite to wustite within one hour. XRF and recovery calculation results showed that the reduction time of one hour is the optimum time because nickel oxide (NiO) content was the highest i.e. 2.68% compared to other time variation.

STUDY ON THE EFFECTS OF TEMPERATURE IN THE CARBOTHERMIC REDUCTION LATERITE ORE USING PALM KERNEL SHELL AS REDUCING AGENT

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Abstract. Indonesia has a rich deposit of nickel. However, laterite in Indonesia has not been treated to its full potential. This happens because the refining process of lateritic nickel ore has a high cost, triggered by the amount of energy required and the complexity of the separation process. It needs pre-reduction due to the condition that the ore is more easily to be reduced and increased the metal content so that it can maximize the nickel refining process and minimize the energy usage. One method of pre-reduction is to do a carbothermic reduction. This research will study the effect of temperature variation on the results of the carbothermic reduction of laterite ores using palm kernel shells as the reducing agent. The reduction process is done by heating the # 270 mesh lateritic ore and palm kernel shells with a mass ratio of 1: 4 for 60 minutes in the melting furnace at the temperature variations of 700, 800, 900 and 1000°C. The result of the reduction was then tested using XRF and XRD. Based on the calculation of % recovery, the optimum temperature for reducing the laterite ore with palm kernel shells for 60 minutes is 800°C, which produces the content of NiO as much as 2.680%.

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INTERNET-BASED MONITORING AND WARNING SYSTEM OF METHANE GAS GENERATED IN GARBAGE CENTER

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Abstract. This paper introduces a system which can monitor the environment of the garbage center in a city. Comparing with developed countries, they have technologies to process garbage, while those technologies are still difficult to be implemented in developing countries. In Indonesia, garbage are mostly placed in a wide-open area called landfill, where methane gas could be produced by a decomposition process. The gas has a characteristic that it can be burned easily. However, it is potentially to be used as an alternative energy for gas stoves. Considering this characteristic, the gas should be managed appropriately for both of distributing and monitoring gas leakage. Since the production of methane gas is plentiful enough, the gas can be distributed among the households surrounding the garbage center. Monitoring of methane gas has to be done continuously and real time during producing and distributing, without generating pollutions to the environment. Here, the monitoring system has been developed using a micro controller equipped with a methane gas sensor, i.e., TGS 2611. The data of monitoring will be distributed using an Internet-based system, where a Wi-Fi module is attached to the micro controller to send and communicate with the web-based server. Furthermore, information of monitoring the gas can be accessed by using android application. The advantage of the proposed system is that the user can monitor, record, and get the information of gas level. The system can also be used as an early-warning system when the gas exceeds the limit and when a danger situation occurs. The proposed system was tested using the black box method to evaluate the functionality. Finally, the system is used to optimize the Waste Management program through the utilization of methane gas. Hence, the utilization of methane gas monitoring system is tested to the user, whether they can use it easily.

EFFECTS OF TEMPERATURE ON THE DIRECT REDUCTION OF SOUTHEAST SULAWESI'S LIMONITE ORE

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Abstract. Mining industry is one of the most important industries for the improvement in people's value in daily lives. Indonesia has abundant mineral resources. Nevertheless, these minerals are still in the depths of the earth and need to be explored so that the minerals are on the surface of the earth. In addition, it is necessary to also extraction process to be more efficient in the next process. Therefore, the method of mineral extraction needs to be further developed to obtain optimal results with the best use of energy but at the most competitive cost. In this study, the objective is to know the effect of reduction temperature on the increase of nickel contents in nickel laterite process using a pyrometallurgy extraction which will be performed in the varying temperature of 700°C, 800°C, 900°C, and 1000°C. The mixture contains coal reducer which will reduce iron metal and supposedly increase the nickel contents in nickel laterite ore. Moreover, Na2SO4 will be added as a constant variable where the sulfur in Na2SO4 is known to help extracting the nickel laterite. The tests include XRD, AAS, and proximate and ultimate test from coal. The result of this study shows that 700°C is the optimum temperature in doing the nickel laterite reduction. Apart from some factors that affect the final result, it is only at the temperature of 700°C that the nickel contents facing an increase from 1.16% to 1.18% after being reduced in a muffle furnace for an hour.

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EFFECTS OF NA2SO4 ADDITION ON THE SELECTIVE REDUCTION OF LIMONITE ORE FROM SOUTHEAST SULAWESI

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Abstract. In terms of its process, although only about 40% of the world's nickel reserves are classified as lateritic ore, nickel sulfide still dominates nickel laterite for its practicality. Because of the high demands on nickel, development and research on nickel mineral processing are needed to ensure that the demands are fulfilled from year to year. On this research, a study will be conducted on the effect of adding Na2SO4 to increase the level of nickel content in limonite by selective reduction process. The reduction process is done by heating limonite ore and coal as reducer from room temperature to 1000oC with temperature rising to 10oC/minute in mini furnace on varying addition of 0%, 5%, 10%, and 15% Na2SO4. After that, the reduction result is tested on XRD and AAS. It has been found that the nickel content has decreased, which is likely due to the excessive reduction time resulting in the magnetite being re-oxidized to hematite. Therefore, based on recovery calculations, the optimal addition of Na2SO4 is 5% by weight where the obtaining nickel content is 1.09%.

THE PROMOTING EFFECT (CO, NI AND FE) ON THE CATALYTIC PERFORMANCE OF HZSM-5 CATALYST FOR BIOGASOLINE PRODUCTION

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Abstract. The newly-modified bimetallic catalysts for biogasoline production should meet a few demands, namely sufficient on high activity in the removal of oxygen from a wide range of organic compounds with different reactivity, highly resistance to water at elevated temperatures in acidic medium and high stability to coking or to the regeneration via the cracking process. The objective of this research work is to synthesize and characterize the catalyst using nickel (Ni), Iron (Fe) and Cobalt (Co) as active phase promoters supported on HZSM-5 (Zeolite Socony Mobil–5) zeolites catalysts. Mechanical mixing, co-precipitation, and incipient wetness impregnation were applied in aqueous Ni, Fe and Co solution as promoting techniques to enhance bimetallic catalyst performance. The catalysts were characterized via Bruanauer-Emmett-Teller (BET) surface area, Scanning electron microscopy (SEM) and Fourier-Transform Infrared Spectroscopy (FTIR). According to the catalysts characterization, it indicates the higher surface area and smaller crystallites size owned by all 15 wt % of NiCO/HZSM-5, CoFe/HZSM-5 and NiFe/HZSM-5 respectively. Aluminium species acts as structural promoter in the catalyst which finely disperses all the promoters particles, thus reduce the crystallites size. The high metal loading of these promoters allowed improve contact of the oxygenated compounds with the active metals and minimizing the contact area between the inactively-acidic support and the reactive oxygenates. All three bimetallic HZSM-5 catalysts have been successfully synthesized and characterized, and all selected promoters used on HZSM-5 catalysts showed that the promotion techniques as well as promoting agent had a significant impact on the product properties. The most promising catalyst among concerned was 15 wt% of NiFe/HZSM-5.

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SODIUM PERCARBONATE ADDITION AS ELECTROLYTE AND BUFFER TO PRODUCE ELECTRICITY ECONOMICALLY USING INDUSTRIAL-TEMPEH-WASTEWATER BASED MICROBIAL FUEL CELL

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Abstract. Microbial Fuel Cell (MFC) is an energy conversion system used by bacteria to generate electricity from organic wastes. Currently MFC electricity is still small, so it complemented by electrolytes. Previous research shows the addition of potassium persulfate can increase electric voltage 10-fold, but this is less economical so it necessary to find alternative electrolyte. Sodium percarbonate is a cheap electrolyte which have buffering ability. Therefore, performance study of single-chamber-MFC using sodium percarbonate electrolyte and or without buffer was conducted by measuring electricity production and tempe wastewater treatment quality (BOD and COD). This result was compared with the results of MFC with potassium persulfate with and without buffer in the same procedure. In MFC containing sodium percarbonate, charge reversal was occurred, with average power 0.04 mW/m2, only 1.25% average power of MFC containing potassium persulfate. These results increased by buffer addition. Other results show that MFC containing sodium percarbonate will degrade more than 40% COD, greater than MFC with potassium persulfate, but still not efficient because Coloumb Efficiency are only in the range of 10-6 %. Nevertheless, this system can produce 63% BOD5 reduction when buffer was not added.

THE EFFECT OF PYROGALLOL ANTIOXIDANT ADDITION AND STORAGE TEMPERATURE TO THE CHANGE OF BIODIESEL QUALITY DURING STORAGE PERIOD

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Abstract. Biodiesel is an alkyl ester compound of fatty acids prepared from a source of naturally renewable triglycerides and used as diesel engine fuel, commonly made through the process of esterification or transesterification. In its application and storage, biodiesel is potentially damaged by oxidation reaction due to internal factors (high unsaturated fatty acid content) and external factors (air, heat or light) resulting in changes of the characteristics and quality of biodiesel. In order to maintain the characteristics and quality of biodiesel to conform to established standards, it is necessary to add antioxidants that can inhibit oxidation reaction in biodiesel. In this study, pyrogallol antioxidant is added to the biodiesel of palm oil with various concentrations and storage temperatures. The observed biodiesel parameters during the storage period are those that can represent oxidation such as changes in kinematic viscosity, density, acid value, and iodine value. The results showed that the addition of pyogallol antioxidant can inhibit the oxidation reaction in biodiesel. The use of antioxidant with a concentration of 0.1% at storage temperatures of 30°C and 60°C is known to retain the characteristics and quality of biodiesel during storage from damage caused by oxidation reaction.

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MICRO-BUBBLE DRAG REDUCTION WITH TRIANGLE BOW AND STERN CONFIGURATION USING POROUS MEDIA ON SELF PROPELLED BARGE MODEL

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Abstract. Drag reduction on ship to decrease fuel consumption and achieve higher speeds has became the topic since the last decades. One of the most atractive idea is micro-bubble, in order to reduce frictional resistance. The purpose of this research is to identify micro-bubble drag reduction effect on Self Propelled Barge Model at 1:28 scale. The influences of air injection ratio and speed will also be investigated. Five injection ratio were used in this experiments; 0,2; 0,3; 0,4; 0,5; and 0,6. Experiments were done in the towing tank, member of ITTC. Micro-bubble was injected on bow and midship using two configurations; triangle stern and triangle bow. The results show that triangle stern is the best configuration with 5% - 40% drag reduction at 0,2; 0,3; and 0,4 injection ratio.

PENTAMARAN CONFIGURATION DESIGN WITH MODELING HULL FORM FOR RESISTANCE MINIMIZATION

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Abstract. Multi-hull ship has characteristics with complex geometry configurations. In the early stages, multi-hull ship design with proper configurations necessary to produce minimum resistance and power consumption. The interacting factors on multi-hull ship were viscosity resistance due to wet surface area to pressure changes and velocity, also the wave resistance due to the relationship between cross-section along the hull and spread of waves. The increasing number of hull as in pentamaran will increase frictional resistance, but total resistance can be reducing by decreasing wave making resistance with a slender hull form. It can be said the determining components of multi-hull resistance were optimal hull form which implementation of the minimum resistance. With CFD tool this research was to examine the minimum resistance with modified modelling of chine hull form on variation i.e. deadrise angles, waterline section of entrance angle and longitudinal section of stem angle. The results of the study had been displayed in table and charts of chine pentamaran which having the smallest total resistance expressed in coefficient of friction and wave resistance.

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EXPERIMENTAL INVESTIGATION OF INTERFERENCE RESISTANCE OF PENTAMARAN MODEL WITH ASYMMETRIC OUTRIGGER CONFIGURATIONS

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Abstract

Experimental test of pentamaran model in calm water condition has been conducted to investigate the interference resistance. Wigley hull-form of the model is asessed with a pair of asymmetric outriggers and symmetries configured in each side of the main hull. Total drag of the model is acquired for a variety of asymmetric position and hull separation at certain Froude number range between 0.2 to 0.7. The outcome shows a slightly alteration of total resistance associated to the transposition of hull separation where wave interference may the responsible reason. Furthermore, there is non of any configurations that appeared to possess the best performance of characteristic across the entire speed regime.

Keywords: ship resistance, interference, asymmetric outrigger, pentamaran

RESISTANCE CHARACTERISTIC OF SUBMERGED VEHICLE-BOW SHAPE BASED ON HULL ENVELOPE COEFFICIENT USING CFD SIMULATION

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Abstract
The bow of the ship is the first part that will hit the running water when the ship moves forward. In the submerged vehicle, the bow shape is very influential both on the laying of acoustic equipment, and for the magnitude of resistance to be generated. This study focuses on reviewing the influence of the bow shape on submerged vehicle without appandages to the characteristics of its resistance. The bow will be varied based on the Hull Envelope equation that governs the bow shape design on the submarine. The computational simulation with CFD is chosen as a method to predict the result. The results show that nf = about 2 is the optimum bow shape with the lowest total resistance value that has a large enough extent.

Keywords– Submerged vehicle, Resistance, CFD, Hydrodynamics, Bow

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DESIGN AND CALCULATION OF MECHANICAL SYSTEM FOR SOLAR-POWERED ELECTRIC BOAT

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Abstract. Indonesian government has a flagship program that is to promote the nation through the maritime sector and make Indonesia as Global Maritime Fulcrum. To achieve that, sea transportation is very important for the development of Indonesia. But sea transportation is also the highest contributor to the air pollution and global warming. In order to reduce the source of global warming Indonesian Government has a strategic plan to gradually replace the use of fossil energy with renewable energy. One of the renewable energy that can be used effectively in Indonesia is solar energy, because Indonesia located along the equator and has a high intensity of sunlight that means it has excellent solar energy availability. In attempt to contribute to the Government's energy strategic plan, the research is aimed to design a solar-powered electric boat with single pilot. The project is a further development of the solar boat created by the Universitas Indonesia team that participated in the International Solar-boat Challenge competition in the Netherlands. The paper is focused on the design and calculation of its mechanical system. The system is divided into propulsion system, steering system, and bilge pump system. The research is conducted based on literature study, discussion with experts, and surveys to the solar-powered electric boat had been designed previously for the race. Collected data are then used as input for the calculation and simulation of the vessel being designed. It is expected that the study could optimize the mechanical system of the solar-powered electric boat, and can be developed for recreational use in Indonesian waters.

Keywords: Solar-Electric Boat; Electric Propulsion; Solar Energy, Design.

EXERGOECONOMIC ANALYSIS AND OPTIMIZATION OF A COMBINED DOUBLE FLASH – BINARY CYCLE FOR ULUBELU GEOTHERMAL POWER PLANT IN INDONESIA

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Abstract. In this paper, the combination of double-flash and binary cycles for Ulubelu geothermal power plant is proposed and optimized by using Matlab software. This proposed system uses real data and properties of brine exploited from the Ulubelu geothermal well in Indonesia and four working fluid candidates, namely n-Pentane, R141b, R123 and R245fa are used in binary cycles. Optimization using multi-objective genetic algorithm with an exergoenomic approach is applied to find out the proposed system performance from both thermodynamic and economic point of view. In the optimization procedure, the exergy efficiency and total specific cost of output power become objective functions while the first flash pressure, second flash pressure and Organic Rankine Cycle (ORC) turbine inlet temperature are selected as constraints. The system performance proposed in this paper is compared with the performance of the existing system. The results show that n-pentane is the best working fluid where multi objective optimization indicates that the system can generate 63.54 MW of power with thermal and exergy efficiencies of 17.59% and 65.26% and specific cost of 1.7049 USD / GJ at the selected optimal design point. Compared to the existing system, there is a significant improvement in performance both from thermodynamic performance and economic performance.

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PREDICTION OF IGNITION DELAY TIME OF LIQUEFIED GAS FOR VEHICLE (LGV)

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Abstract. Ignition delay time of liquefied petroleum for vehicle (LGV) fuel was predicted in this research. The method was using a detailed kinetic model of oxidation and combustion of propane/n-butane mixture. The validation of the model used experimental data in shock tubes in the temperature range from 1300 K to 1500 K and the pressure range from 2.5 bar to 10 bar for pure propane and pure n-butane. Calculated results of ignition delay time using the model have good agreement with experimental results indicating that the model may be used for LGV fuel. Simulation results of the model of LGV fuel show that the ignition delay time is faster when the n-butane fraction in the fuel is higher. The switchover of the ignition delay time order among different compositions of the fuels takes place at the initial temperature of 1200 K for the equivalence ratios of 1 and the initial pressure of 10 bar.

POWER CONSUMPTION ANALYSIS ON LARGE-SIZED ELECTRIC BUS

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Abstract. The increase of greenhouse gasses effect is one of the causes of climate change. The use of vehicles with fossil fuels is one of the contributors to pollution and global warming. Another reason why dependence on it should be reduced is the lack of Indonesia's petroleum reserves compared to other OPEC countries. Researchers are trying to anticipate this by developing electric vehicles capable of operating without pollution. Implementation of electric vehicles has begun with the electric train, tram, electric bus, and others. Vehicles with rails get electricity supplies from the grid along the tracks, but the type of freely moving vehicle without a rail requires another way to get electricity supplies. Electric vehicles with power storage (battery) have an advantage in the roaming area if supported by proper recharging techniques. In electric vehicles, the battery is recharged by the direct charging process or swapped with other one (swapping). If the vehicle has high mobility, such as public transport (bus) then the shortest charging time may be very important.

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SIMULATION OF A METAL ORGANIC FRAMEWORK-BASED ADSORBED NATURAL GAS STORAGE TANK

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Abstract. Adsorbed natural gas storage tank was simulated in this research with the objective being to predict filling time, filling capacity and storage efficiency. High-capacity HKUST-1 type metal organic framework was used as adsorbent. Time-dependent phenomenological model of adsorbed natural gas storage tank considers mass, momentum and energy transfers. The cylindrical tank has 1.09 m length and 0.15 m radius with an inlet hole for gas inflow. The simulation results show that the temperature increase in the tank due to adsorption heat is very significant. This affects the adsorbent ability so that the storage efficiency is very low. For the inlet gas flowrate of 50 L/min, the storage efficiency is 42%, and it increases to only 47% for 10 L/min. Corresponding filling capacities for the two flowrates are not much different, i.e. 98 V(STP)/V and 110 V(STP)/V STP. However, the difference of the filling times is very significant, which are 17 min for 50 L/min and 113 min for 10 L/min.

DESIGN OPTIMIZATION OF HYBRID RENEWABLE ENERGY POWER PLANT FOR MINAPOLITAN CLUSTER IN DOMAS, SERANG, BANTEN, INDONESIA

Erwin Erwin, Tresna Priana Soemardi, Adi Surjosatyo, Yulianto Yulianto, Wiyono Slamet

ABSTRACT

Domas is a coastline that has a wind speed is high enough that it has the potential to develop a wind power plant with a large enough capacity that can be utilized economical; in addition Domas village is also a centre of rice and rice husks producer. Community economic activity in Domas area as a farmers and milkfish breeders and this area is set to be minapolitan area of Serang district. The problem in this area is many of the ponds is placed far from electricity, so it requires another alternative as a source of electrical energy. Aquaculture requires aeration and lighting to increase fish and shrimp production, a pond requiring lights for lighting and aerators to keep the oxygen content dissolved in water. Lighting and home appliance are required starting at 6 pm to 6 am, and the aerators based on the shrimp and fish life cycle are required to be switched on from 5 pm to 6 am. Wind potential data is obtained from Homer database, meteonorm and NOAA database which is then processed in Homer software for optimization. Potential data of husk biomass is obtained from ministry of energy and mineral resources of the republic of Indonesia (EMR) database for Serang regency Indonesia in 2016. For 1 hectare of land with 1.5 tons of fish total electricity needed 2.4 kWh per day for lighting and 13 kWh per day for aerator, with peak of 0.385 kW and 1.9 kW. By using the Aeolos 500 wind turbine and biomass generator as a support, a simulation is performed to get the system that produces the lowest LCOE (Levelized Cost of Electricity) and highest renewable energy factor for wind turbine. The recommended system is 2 kW Biomass Generator, 10 kW Inverter, 10 kW Rectifier, 24 Battery Trojan L18P 360 Ah capacity with 8 units of Aeolos 500 array. With LCOE $0.445 / kWh, and 82.2 % renewable energy factor for wind turbine. This research aims is to design a renewable energy power plant based on the renewable energy potential in Domas village.

Keywords: Array VAWT; gasification; hybrid; optimization.

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ECO-TECT DESIGN SIMULATION ON EXISTING BUILDING TO ENHANCE ITS ENERGY EFFICIENCY

Dita Trisnawan

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Eco-tect Software has been used to calculate building's energy consumption by simulating its context within the environment. Mostly use by architects and building engineers to enhance their design advancements, the software is embedded to the main Autodesk CAD architecture, fully compatible with Autodesk REVIT. Research Studies on many existing buildings have been performed to evaluate its building's performance. It is related to its environment, especially on dealing with solar heat, its nature for daylighting, natural airflow for ventilation, and its energy consumption for man-made systems such as Air Conditioning and Lighting.

This research is conducted to reach basic optimum efficiency of an existing building at UI Campus in Depok. After using eco-tect software we presumed that some strategic upgrading design propositions should be done to minimize the daily energy consumptions on air conditioning and lighting. Sensitive to the annual solar path and air/wind direction, we could propose an alternative to maximize the use of natural resources to reduce the building's energy consumption.

Keyword: Eco-tect, Design Simulation, Energy Efficiency, Green Building, Green Architecture

READING SUSTAINABILITY POST ANNEXATIONS OF RUMAH GADANG ARCHITECTURE

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Many of Rumah Gadang of Minangkabau in West Sumatra has strived through many years of extreme tropical climate. Through times this type of vernacular house has remarkably endure and stay, hence the increasing numbers of maintenance cost. One family generation to its next, as many other normal family houses may have experienced, the annexation phase (adding spaces) of living is inevitable. As Rumah Gadang design has been considered as one model of eco-tropical architecture fine example, its annexation could make the green compactness of its majectic design changed. This research analyzes major typical modifications and changes that could happen to Rumah Gadang's original design. Field research was conducted direct to its site's origin in West Sumatra. Its actual and recent plans (after annex) are documented to study the basics and its upgrading modification tendencies. This information then could become the base for further research on exploring the local wisdom, its traditional building values, material development and changes, and also its future endurance.

Keyword: Rumah Gadang, Vernacular, Eco Tropical Architecture, Minangkabau, Architecture Annex

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OPTIMIZATION OF INSULATED SANDWICH PANEL CORE FROM EMPTY FRUIT BUNCH

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Abstract. Indonesia as the largest producer of palm oil, produced 35 million tons in 2016. The increasing demand consequently generates huge amount of Empty Fruit Bunch (EFB) as the main solid waste. So far, EFB has been utilized for fertilizer. However, EFB consist of high fibre content which exhibit low thermal conductivity that provide a suitable condition for the core replacement of insulated sandwich panel. Therefore, the research objectives were to identify the suitable EFB fibre size, adhesive concentration, thermal conductivity of EFB sandwich panel and internal condensation inside the panel. This research experiment consists of shredding, milling, refining and drying of EFB, as well as forming and covering process of core panel. PVC based adhesive was chosen as the adhesive used in this experiment. The thermal conductivity and the internal condensation of sandwich panel were conducted in a steady state heat transfer in a glass container. Based on the experiment, shredded EFB fibre indicates better performance than milled EFB fibre. Higher concentration of PVC based adhesive is preferred to formed a compact core panel and exhibit low thermal conductivity. The result shows that the thermal conductivity value of all samples are in the same range with the reference and no internal condensation inside the sandwich panel.

PRODUCT DISTRIBUTION FROM CATALYTIC CONVERSION OF BIO-OIL FROM BIOMASS PYROLYSIS USING B2O3/Γ-AL2O3 CATALYST

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ABSTRACT

The product distribution from catalytic conversion of bio-oil from biomass pyrolysis using different composition of B2O3/γ-Al2O3 catalyst and reaction temperature are investigated in this study. Bio-oil from different types of biomass pyrolysis will yield different bio-oil yields due to its different characteristics including volatile matter, ash, and fixed carbon content. Bio-oil from corncob pyrolysis yields 44.16% wt of bio-oil yield, greater than that of rice straw 22.46% wt. Different cellulose, hemicellulose, and lignin compositions on rice straw and corncob will give different composition of components found in bio-oil. Bio-oil from pyrolysis of rice straw contains the three largest groups of compounds namely phenol (19.01% wt), furan (12.92% wt), and ketone (12.54% wt). While the three largest groups of compounds in bio-oils of corncob pyrolysis are phenol (24.02% wt), ketones (15.08% wt), and furan (11.67% wt). Bio-oil from pyrolysis of rice straw and corn cobs are upgraded by catalytic conversion with the variation of B2O3/γ-Al2O3 catalyst composition and the reaction temperature to investigate its characteristic of the product compounds distribution. The catalyst composition of B2O3 used in the mixed catalyst was 0% wt, 5% wt, 10% wt, 15% wt, 20% wt, and 30% wt with the reaction temperature used was 450°C and 500°C. The aromatic yield of 33.01% wt was produced in the conversion of the corncob pyrolysis bio-oil with the catalyst composition used comprising 30% wt B2O3 and 70% wt γ-Al2O3 at reaction temperature of 450oC.

Keywords: aromatic; biomass; B2O3/γ-Al2O3 catalyst; catalytic conversion; pyrolysis

POSTER SESSION

(POSTER)

POSTER SESSION

Poster Session
Wednesday, October 4th 2017 15.30-16.45
Palma Room (Ballroom)

No	Paper #	ID	Author(s)	Title	Affiliation	
1	005		E Kusrini, A Rahman, Aji A Bumi, Chairani S. Utami	The Effect of Physical and Chemical Methods on Surface Area of Low-Grade Bauxite	Univ Indonesia	
2	12304		Luthfiana Azizah, Tania Surya Utami, Rita Arbianti, Heri Hermansyah	Evaluation on The Implementation of Coconut Shell Charcoal as Biolectrode in Microbial Desalination Cell System	Univ Indonesia	
3	018		M. Ali Berawi, A. Sihombing, P. Miraj, R. Windrayani	Increasing Energy Effeciency by Considering Buildings Life Cycle	Univ Indonesia	
4	007		Eny Kusrini, Nasruddin, Chairani S. Utami, Anwar Usman	Isotherm Adsorption of Carbon Dioxide using Graphite/CeO2 Composite via Volumetric Method	Univ Indonesia	
5	008		M Ali Berawi	Formulating Smart Integrated Workspace Concept to Improve Energy Efficiency	Univ Indonesia	
6	021		Eny Kusrini	Clinoptilolite Zeolite Modified Chitosan and Reusability for Biogas Purification	Univ Indonesia	

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THE EFFECT OF PHYSICAL AND CHEMICAL METHODS ON SURFACE AREA OF LOW-GRADE BAUXITE

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Abstract.

In this research, the effect of physically and chemically modifications of low-grade bauxite (LB) with particle size of 200 mesh were studied. Here, we demonstrate chemically technique to synthesis low-grade bauxite/CeO2 composites using Ce(NO3)3.6H2O with weight variations of 0.5, 1 and 2 g. The effect of Ce(NO3)3.6H2O concentrations on BET surface area of prepared low-grade bauxite/CeO2(0.5) (ALB0.5), low-grade bauxite/CeO2(1) (ALB1), and low-grade bauxite/CeO2(2) (ALB2) composites were observed. The characteristics of the LB and the prepared composites have been evaluated using XRD, XRF and BET analysis. The results showed the BET surface area of LB is 59.85 m²/g. After acid activation with 1M HNO3, activated low-grade bauxite (ALB) has BET surface area of 101.6 m²/g. By chemically modifications with Ce(NO3)3.6H2O in concentration ranging from 0.5; 1 and 2 g, the BET surface area were reduced in the respectively order of 94.5, 87.9, and 85.5 m²/g for ALB0.5, ALB1, and ALB2. With the increase of the Ce(NO3)3.6H2O concentration, the BET surface area become more smaller compare to those found in the ALB. The acid activation treatment has significant effect compare to the chemical modification using Ce(NO3)3.6H2O.

EVALUATION ON THE IMPLEMENTATION OF COCONUT SHELL CHARCOAL AS BIOLECTRODE IN MICROBIAL DESALINATION CELL SYSTEM

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Abstract.

Microbial Desalination Cell (MDC) is one of the technologies to produce fresh water. MDC system is able to perform desalination of sea water without any external energy with directly utilizing the electrical power generated by bacteria during organic matter oxidation. This research was conducted to evaluate MDC performance utilizing microorganisms from leachate with coconut shell charcoal (biochar) as the electrode. The use of charcoal as electrode will support the formation of biofilms on the surface of the electrode, so that desalination quickly underway. The coconut shell charcoal electrode was chosen because of the cheap price, so it can reduce the cost of MDC system construction. To improve the performance of the MDC, the effect of sodium percarbonate was evaluated by varying concentration of 0.05 M ; 0.1 M ; 0.15 M ; 0.2 M as catholyte in the cathode chamber. MDC with SP 0.05 M catholyte has been found for having the best desalination performance of 15.45 % salt removal.

Keywords : desalination, coconut shell charcoal, leachate, sodium percarbonate, Microbial Desalination Cell

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INCREASING ENERGY EFFICIENCY BY CONSIDERING BUILDING'S LIFE CYCLE

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Abstract.

Greenhouse gas and carbon emission have a considerable impact on the people behavior on constructing new buildings. One of the attempt to combat environmental issues is by implementing renewable energy such as photovoltaics (PV) into the buildings. However, a high cost from sustainability concept makes building owners or investors hesitate to use the device. The research aims to evaluate the solar energy implementation by taking university library building as the case study. Due to space and cost aspects, the analysis only considers lighting system. The life cycle cost is used to generate the best alternatives to the building. The results show three potential options; alternative one use public electricity from state-owned enterprises in the energy sector with a fluorescent lamp, alternative two use PV with a fluorescent lamp and alternative three use PV with LED lamp. Alternative three recommends as the most potential implementation on the building as it generates lower initial cost, moderate cost of operation and maintenance as well as fair salvage value.

ISOTHERM ADSORPTION OF CARBON DIOXIDE USING GRAPHITE/CEO2 COMPOSITE VIA VOLUMETRIC METHOD

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Abstract.

The exploration of raw natural gas found that it contains carbon dioxide in large quantities. It is also found that adsorption system is one of the most effective alternative methods that can be used to reduce the carbon dioxide (CO2) content in fuel gas. The aim of this research is to find the isothermal adsorption data by volumetric method at pressures up to 20 bars and isothermal temperature at 303, 308, 318 K. Adsorbent used in this research is composite of graphite/CeO2. Graphite waste was pre-treated by thermal and mechanical processes, and used as precusor to produce composite of graphite waste/CeO2. The results showed that the maximum adsorption capacity is 0.16 kg/kg at 303 K and 20 bars.

Keywords: CO2 adsorption; Isotherm adsorption; Graphite/CeO2 composite; Volumetric method

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FORMULATING SMART INTEGRATED WORKSPACE CONCEPT TO IMPROVE ENERGY EFFICIENCY

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Abstract.

The building is one of construction sector that consumes high energy and contributes to the greenhouse gas (GHG) emission. Many researchers and academics attempt to reduce the negative impact of the building by introducing alternative technology through the internet of things (IoT) and building management system (BMS). The research aims to examine components related to the workspace of building and evaluate the cost and energy usage. The study combining quantitative and qualitative approaches through energy simulation, life-cycle cost approach, and in-depth interview. The results show three components from lighting, cooling, and office equipment that can be quantified. Every component consists of equipment to tailor the concept of a smart integrated workspace. The energy per square meter from proposed concept generates 48.36 kWh per square meter or lower than the current design. Overall it requires 203,586,240 rupiahs or 18% more efficient to the current layout.

CLINOPTILOLITE ZEOLITE MODIFIED CHITOSAN AND RE-USABILITY FOR BIOGAS PURIFICATION

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Abstract

The development of modified clinoptilolite zeolites with chitosan as CO2 sorbent materials for purification of biogas in fixed-bed two columns adsorption reactor by simultaneous absorption-adsorption method and the corresponding regeneration conditions for the sorbent material was studied. The biogas was produced from palm oil mill effluent (POME). The natural clinoptilolite zeolites were modified by treatments with acid (HCl, 2M) and base (NaOH, 2M), calcined at 450□C and followed by coating with chitosan (0.5 w/v%), to increase the material's adsorption capacity for CO2. The effects of thermal (100 to 250□C temperature variation) and alkaline process (0.1 to 1.5 M NaOH concentrations) of the fixed-bed reactors were investigated for the reusability of the modified clinoptilolite zeolite as CO2 sorbent material. Using the modified clinoptilolite zeolites as sorbent material, the study observed the highest CO2 uptake efficiency from the generated biogas at 200□C with 1.5 M NaOH for 1 h. The uptake CO2 adsorption was □85% with the fresh modified clinoptilolite zeolite, □50% with only the alkaline treatment and □75% when combining both the thermal and alkaline treatments. Upon re-use of the modified clinoptilolite zeolites for CO2 uptake, the thermal and alkaline treatments recovered up to □75% of CO2 following the first regeneration cycle after the first use and □29% following two regeneration cycles after the second use.

Keywords: Biogas purification; Clinoptilolite zeolites; Simultaneous absorption-adsorption; Thermal-alkaline regeneration

Towards Tropical Renewable Energy
Innovation and Technology Integration

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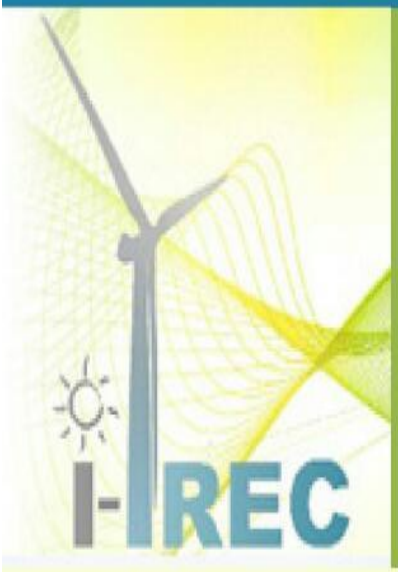

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