Conference Abstracts

The 5th International Conference on Energy and Environment Research (ICEER 2018)

Prague, Czech Republic

July 23-July 27, 2018

Masaryk Dormitory

Add: (Masarykova kolej-ČVUT): Thákurova 1, 160 41, Praha 6, Prague

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Welcome Message

23-27 July 2018, Prague, Czech Republic

ICEER2018 is the 5th International Conference on Energy and Environment Research and is being held with annual regularity, from 2014.

ICEER2018 is a joint organization of the School of Engineering (ISEP) of the Polytechnic of Porto (P.Porto) and of the SCIEI, and will take place this year at Prague, with collaboration of the CIETI and LEPABE research groups.

ICEER2018 aims to be a privileged space to discuss current matters related to Energy and the Environment. This event aims to explore emerging technologies and concepts in a collaborative way, bringing together engineers, researchers and professionals from different areas. The climate changes are there, and we must act fast to prevent further irreversible changes. Sustainable development goals have been set by several countries, leaving the way to reach them at anyone's free will as it is a sensitive matter concerning to each country that affects all. Since these topics are beyond the present generation, it is therefore also very important to prepare and educate young people.

ICEER is a multicultural event with a significant number of participant countries in the past editions. **ICEER2017@ISEP** registered 46 countries, from five continents, which justifies the increasing high internationalization of this conference series. In ICEER2017 we reached the magical number of 150 participants.

The numbers of **ICEER2018@Prague**:

- Scientific and Technical Committee: 70 members from 28 countries
- Invited reviewers: 12
- Registered Submissions: 199
- Total of authors involved: 453 from 51 countries, from 5 continents.
- Rate of acceptance: 41% for oral presentation;

  15% for [Poster + Oral Presentation];

  6.5% for Poster Presentation.

Following the trend in ICEER2016 and ICEER2017, the papers presented at **ICEER2018** will be published in *Energy Procedia* (*Elsevier*), a Scopus indexed International Journal.

The **ICEER2018** Organization is working closely with Editors of renowned International Journals to consider the publication of extended versions of selected papers.

In ICEER2017, more than 200 contributions of authors were submitted to thorough peer revision process of at least two reviewers, 100 full papers and 20 abstracts have been accepted for oral / poster+oral flash

/ poster presentation, respectively. 11 full extended papers have already been published in *Energies* and 3 in *ChemEngineering*. 4 published and one still under review process in *Waste and Biomass Valorization*.

A very warm welcome to all participants and our best wishes that you enjoy both the technical and the social activities of ***ICEER2018*** *in Prague.*

Carlos Felgueiras

(Conference Chair)

ICEER 2018 Committee

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CIETI/ISEP/P.Porto

Nídia S. Caetano **PT**
CIETI/ISEP/P.Porto

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NUPTECS - Research group of Sustainable Process Technologies/IFG, Goiânia, Brazil

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Instituto Superior Técnico, Universidade de Lisboa, Portugal

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Wrocław University of Economics /Department of Corporate Finance and Public Finance

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BRTeam/ABRII/IBS

Mohamed Benbouzid **FR**
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Local Information

Conference Venue

Masaryk Dormitory

Add: (Masarykova kolej-ČVUT): Thákurova 1, 160 41, Praha 6, Prague

Tel: +420 233 051 111 | **E-Mail:** mkkongres@suz.cvut.cz

Time

UTC/GMT+2

Weather

The Weather Situation of Prague in July

Average daily minimum temperature	Average daily highest temperature
13℃	25℃

Emergency

Emergency medical service: 155
Fire alarm: 150
Emergency call: 158

Transportation (Prague Airport)

1. By bus: U Hangáru (119) →Divoká Šárka →Nádraží Hostivař(26) →Hadovka (45Minutes)
2. By tax: Around 20 minutes

Instructions for Oral & Poster Presentations

Oral Presentations

- **Timing:** a maximum of 15 minutes total, including speaking time and discussion. Please make sure your presentation is well timed. Please keep in mind that the program is full and that the speaker after you would like their allocated time available to them.

  Please arrive at the designated conference room 15 minutes earlier, in case some authors are not able to make the presentation on time.

- You can use USB flash drive (memory stick) and make sure you scanned viruses in your own computer. Each speaker is required to meet her / his session chair in the corresponding session rooms 10 minutes before the session starts and copy the slide file (PPT or PDF) to the computer.
- It is suggested that you email a copy of your presentation to your personal inbox as a backup. If for some reason the files can't be accessed from your flash drive, you will be able to download them to the computer from your email.
- Please note that each session room will be equipped with a LCD projector, screen, point device, microphone, and a laptop with general presentation software such as Microsoft Power Point and Adobe Reader. Please make sure that your files are compatible and readable with our operation system by using commonly used fronts and symbols. If you plan to use your own computer, please try the connection and make sure it works before your presentation.
- Videos: If your Power Point files contain videos please make sure that they are well formatted and connected to the main files.

Poster Presentations

- Maximum poster size is 36 inches wide by 48 inches high (3ft.x4ft.)
- Posters are required to be condensed and attractive. The characters should be large enough so that they are visible from 1 meter apart.
- Please note that during your poster session, the author should stay by your poster paper to explain and discuss your paper with visiting delegates.

Dress Code

- Please wear formal clothes or national characteristics of clothing.

Conference Chair

Prof. Carlos Felgueiras, CIETI / ISEP / P.Porto

Biography: Prof. J. A. Manuel Carlos Felgueiras received the B.S. and Ph.D. degrees in electrical and computer engineering from the Faculty of Engineering, University of Porto, Porto, Portugal, in 1987 and 2008, respectively. He started is professional activity in 1987 as electronic designer for automation systems. Later he was invited to supervise a test laboratory aimed at verifying the accomplishment of European Standards in thermoelectric household appliances. He started the teaching activity in 1994 as Assistant Professor and later on as Adjunct Professor and researcher with the Department of Electrical Engineering, School of Engineering, Polytechnic Institute of Porto (IPP), Porto, Portugal.

Title: To Be Or Not To Be… Sustainable In Education

Sustainable Development is an unavoidable topic today that becomes a civilizational mater, i.e., which humanity depends on. Sustainable Development has followed different paths. Several actions have been implemented to increase the efficiency of modern systems. However, this growth in efficiency has led to a rise in the complexity of solutions that are increasingly multidisciplinary. The teaching of engineering, and particularly sustainable issues, is currently facing difficulties since the single-disciplinary basic training is insufficient for the current problems. In addition, the new generation of Digital Natives feel more comfortable at the Software level than in Hardware. One way to overcome these limitations is to place students at the center of the Teaching / Learning process by developing solutions to increase Sustainable Development. Another consists on the use of Remote Laboratories, which allow the realization of real experiences guided by Computers or even Smart Phones. In this presentation, it will be addressed how to reach Sustainable Development, by involving this new generation of graduates in multidisciplinary environments.

Program Chair

Prof. Nidia Caetano, CIETI / ISEP / P.Porto

Biography: Prof. Nidia Caetano graduated and received her Ph.D. degrees in Chemical Engineering from the Faculty of Engineering of the University of Porto (FEUP), Porto, Portugal, in 1987 and 1996, respectively.

She started the teaching activity in 1992, as Assistant Professor and is today Coordinator Professor with the Chemical Engineering Department, School of Engineering (ISEP), Polytechnic Institute of Porto (P.Porto), Porto, Portugal.

She was Subdirector of the Chemical Engineering Department of ISEP for 4 years, having been laboratory Director for ten years (2001-2011).

From March 2013 to June 2018 she was the Director of the Master Course in Sustainable Energies of ISEP, in the Mechanical Engineering Department of ISEP.

Prof. Caetano is member of the Portuguese Engineers Association (OE), and also of the Portuguese Association of Environmental and Sanitary Engineering (APESB) where she is involved in the solid waste section (GRAPESB).

She started her R&D career in the LSRE of FEUP in 1987, where she did her PhD research in MTBE kinetic study in a batch reactor and simulation / operation of a fixed bed reactor. Later on (in 1998), she co-founded the LEPAE of FEUP (nowadays LEPABE), where she is External Senior Researcher. She is also collaborator of CIETI, a R&D center at ISEP.

Her research interests include collaborative research activities; biofuels (waste to energy: biodiesel, bioethanol, biogas, combustion) either from waste biomass, oil or microalgae; efficient use of solar energy for microalgae production; microalgae biorefineries; solid waste valorization and wastewater treatment, always using a sustainability-based approach, having participated in several projects with the industry.

She has supervised over 40 Master and PhD students, is the co-author of 12 book chapters and over 70 papers in international journals and over 150 papers in conferences. She has also participated in several organizing and scientific committees of conferences, having presented more than 100 communications. She has been the reviewer of numerous scientific publications in international indexed journals and conferences and projects evaluator for national and international agencies.

publons.com/a/1310302/
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researcherid.com/rid/I-3934-2012
Scopus 55901684900

Title: Educating Engineering Professionals on Sustainability: Living Labs as a Tool for an Integrated Approach

Strategies to reduce emissions responsible for greenhouse effect, and contributing to economy decarbonisation, should focus on using renewable energy, increasing energy efficiency both at production, distribution and consumption (equipment efficiency), sustainable mobility, urban renewal and rehabilitation and behavioural changes. Considering that man spend a significant part of their lives inside buildings that represent a significant share of energy consumption, buildings turn out to be an attractive area to invest efforts, aiming to improve efficiency, as recommended in the European Commission reports. However, despite the goals outlined in the Energy Performance of Buildings Directive, there are difficulties in the projection of new buildings that can be classified as nearly Zero Energy Buildings (nZEB). These include legal and financial obstacles, as insufficient formation of professionals (such as architects, engineers and consultants), able to tackle the challenges. This lecture aims to point strategies that can contribute to the creation of a nearly zero energy laboratory in a university environment, that works as a tool for raising awareness about nZEB while improving the future engineering professionals' skills towards team work and knowledge sharing – a living lab.

Keynote & Invited Speakers

Prof. Alírio E. Rodrigues, University of Porto, Portugal

Biography: Prof. Alírio E. Rodrigues, Emeritus Professor at the U. Porto since 2013, was born in Funchal, Madeira (1943). He graduated in Chemical Engineering (U. Porto, 1968), and got his Docteur-Ingenieur (U. Nancy, 1973), and "Agregado" (IST, 1976). He was Visiting Professor at U.T. Compiegne, 1983; U. Virginia, 1988; U. Oviedo, 1991.

He received several awards: Medal of Scientific Merit of MCTES in 2016; AIChE The Separation Division, Honorary session, Atlanta, 2014; PSE Model-based Innovation Prize, (with C. Pereira and V. Silva), 2012; IChemE Award THE ABB GLOBAL CONSULTING AWARD FOR SUSTAINABLE TECHNOLOGY" (with V. Silva), 2008.

He supervised more than 60 PhD students, and 60 Post-doc researchers, published +600 articles in SCI, several patents and books: "Sorption Enhanced Reaction Processes", World Scientific Publishing (2017), "Simulated Moving Bed Technology. Principles, Design and Process Apllications", Elsevier, (2015), Perfume Engineering: design, performance and classification, Elsevier (2013) and Moving Finite Element Method: Fundamentals and Applications in Chemical Engineering, CRC Press (2016) in collaboration with former students.

His research areas of interest are:

Cyclic adsorption processes: SMB, PSA, Electric Swing Adsorption ESA, Parametric pumping, Expanded bed adsorption for various separations: CO2 capture, olefins/paraffins, syngas, H2 purificarion, chiral separations, proteins separations; Perfusion chromatography.

Process Intensification: Simulated Moving Bed Reactor (SMBR) and PermSMBR for the synthesis of acetals and green solvents; Sorption Enhanced Reaction Processes (SERP) for H2 production.

Biorefineries: Lignin valorization to get vanillin, syringaldehyde & polyurethane.

Perfume Engineering and **Microencapsulation**

Title: Valorization of Lignin: A Contribution to the Circular Economy in the Pulp Industry

In pulp mills and biorefineries, the lignocellulosic material is delignified, producing a liquid stream containing soluble lignin, which represents about one half of dissolved solids. In the integrated process for lignin valorization developed in our lab, the strategy is to combine reaction engineering and efficient separation processes for conversion of lignin from pulping liquors. The goal is to produce several value-added products: vanillin, syringaldehyde and oligomers that can be used as polyols for special polymers, getting the complete valorization of lignin.

Valorisation of lignin started with the process development of vanillin production in batch reactor, and

then in structured packed bubble column reactor for continuous processing. A membrane process enables simultaneously recovery of vanillate and a high molecular weight fraction of lignin. This macromolecule is the polyol for polyurethane production. After this stage, the recovery of the neutral form of the high value aldehydes is achieved by adsorption/desorption processes (Figure 1).

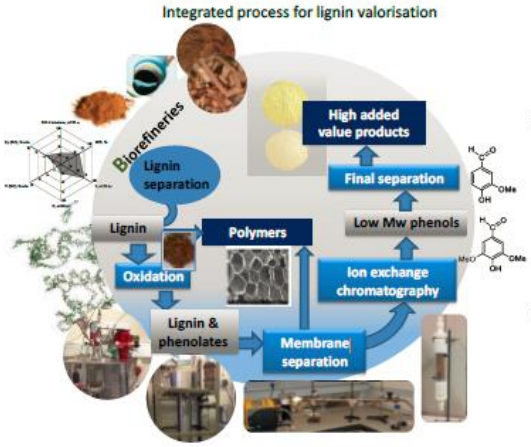

Figure 1. Integrated process for lignin valorization

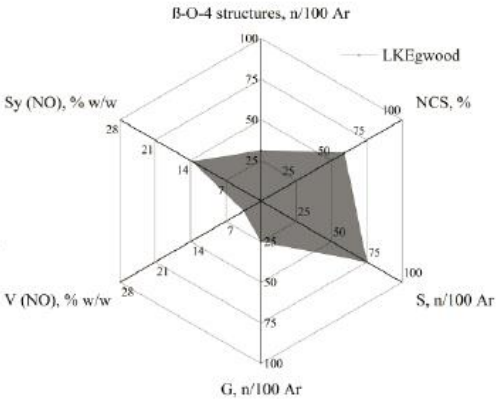

Figure 2. Radar plot for evaluation of kraft lignin

A tool for lignin classification was developed based on radar plots using descriptors identified as key structural characteristics for vanillin and syringaldehyde production by oxidation in alkaline medium. This tool greatly simplifies the evaluation of the impact of the delignification on lignin structure. Figure 2 shows an example of radar plot.

Prof. J. A. Tenreiro Machado, Polytechnic Institute of Porto, Portugal

Biography: Prof. J. A. Tenreiro Machado was born at 1957. He graduated with 'Licenciatura' (1980), PhD. (1989) and 'Habilitation' (1995), in Electrical and Computer Engineering at the University of Porto. During 1980-1998 he worked at the Dept. of Electrical and Computer Engineering of the University of Porto. Since 1998 he works at the Institute of Engineering, Polytechnic Institute of Porto. He is presently Principal Coordinator Professor at the Dept. of Electrical Engineering, Institute of Engineering, Polytechnic of Porto, Portugal.

He published 98 chapters of international books, 345 papers in international journals, 364 papers in international conferences.

Editor of 14 books Guest-Editor of 39 special issues in journals. Editor-in-Chief of Journal of Applied Nonlinear Dynamics, Associate Editor of Nonlinear Dynamics (Springer), Communications Nonlinear Science and Numerical Simulation (Elsevier), Fractional Calculus and Applied Analysis (de Gruyter), Journal of Vibration and Control (Sage), Entropy (MDPI), Int. J. of Nonlinear Sciences and Numerical Simulation (de Gruyter), Applied Mathematical Modelling (Elsevier), Computational and Applied Mathematics (Springer), Acta Polytechnica Hungarica, and others.

Google Scholar, March/2018: h-index = 55, Scopus, Elsevier, March/2018: h-index = 40, Web of Science, Clarivate Analytics, March/2018: h-index = 33.

His research interests are: Complex systems, Nonlinear Dynamics, Fractional Calculus, Modelling, Entropy, Control, Data series analysis, Biomathematics, Evolutionary Computing, Genomics, Robotics and Mechatronics, and Intelligent Transportation Systems.

Title: The Garden of Earthly Delights

Fractional Calculus (FC) started in 1695 when L'Hôpital wrote a letter to Leibniz asking for the meaning of Dny for n = 1/2. Starting with the ideas of Leibniz many important mathematicians developed the theoretical concepts. By the beginning of the twentieth century Olivier Heaviside applied FC in the electrical engineering, but, the visionary and important contributions were forgotten. Only during the eighties FC emerged associated with phenomena such as fractal and chaos and, consequently, in nonlinear dynamical. In the last years, FC become 'new' tool for the analysis of dynamical systems. FC is now recognized to be an important tool to model and control systems with long range memory effects. This lecture introduces the FC fundamental concepts and presents several applications in distinct areas of science and engineering.

Prof. Ambra Giovannelli, Roma Tre University, Italy

Biography: Prof. Ambra Giovannelli is Researcher of Fluid Machinery, Professor "Aggregato" of Turbomachinery (MS degree) and Applied Thermodynamics and Fluid-dynamics (BS degree) in the Department of Engineering at ROMA TRE University, Rome, Italy. She received the MSc degree cum laude in Mechanical Engineering (2004) and a PhD in Mechanical and Industrial Engineering (2008).
Author of many papers and technical reports in the field of Fluid Machinery and Energy Conversion Systems, her research work is focused on turbomachinery modelling (Supercritical CO2 Turbomachines, Gas Turbines (GTs) fuelled with syngas, Solar GTs, Hybrid GTs), power production from renewable energy (high-temperature solar concentrators, reactors and TGs), storage systems (PCM storage systems and CAES) and energy-saving in refrigeration and cryogenic plants (e.g. regeneration in Vapour Compression Refrigeration Plants, regenerative cooling systems for automotive applications).
She, currently, serves as reviewer for indexed scientific journals (e.g. Elsevier, Springer, SAGE journals) and international conferences in the field of mechanical and industrial engineering (e.g. ASME, IEEE conferences).

Title: Development of Turbomachines for Renewable Energy Systems and Energy-Saving Applications

Turbomachines play a significant role in some key sectors as power production, aircraft and marine propulsion, HVAC, chemical processing. The success of dynamic machines is connected to the wide multiplicity of demands which they can cover, in terms of processed mass flow rates, total pressure increase/decrease, kind of fluids which can be elaborated as well as in terms of compactness, reliability and availability, to cite just some relevant aspects.
Design procedures for traditional turbomachinery are more than established and, at this point, the development is limited to a technological upgrade of existing machines. Nevertheless, the efficient exploitation of renewable energy sources and the application of energy-saving techniques in any industrial sector require the design of machines suitable for such purposes. Plants based on innovative concepts require machines which can work with new fluids (e.g. ORC systems) or in new operating conditions (e.g. high-flexibility or new pressure ratios). Such requirements pose new challenging aspects in the machinery preliminary design methodologies. For example, how can the long-established knowledge reported in non-dimensional charts be used effectively under the new boundary conditions? Which kind of secondary effects are relevant to transfer accurately information from literature to novel applications? Moreover, another challenging aspect is how innovative techniques (e.g. high-integrated design systems, 3D printing) can be integrated in the design process and how much they can affect the machine development and final performance.
Several case studies based on the Author's experience will be presented, from the preliminary design of new turbomachines for supercritical CO2 plants to the development and prototyping of unconventional systems for energy-saving in industrial vapor-compression cooling plants.

Prof. Michael Hartnett, NUIG, Ireland

Biography: Prof. Michael Hartnett is a Professor in Civil Engineering, NUI Galway, is a Visiting Professor at Hohai University, Nanjing, China and at the University of Edinburgh. He has co-authored 60 journal papers, and is on the editorial boards of 5 international journals. He is Deputy Director of the Science Foundation Ireland funded Research Centre, for Marine and Renewable Energy, MaREI. He leads the Hydraulic Modelling team at NUI Galway, much of his current research is focussed on marine renewable energy. He is a member of the Irish Committee of the International Hydrology Programme. His group set up the first Irish operational system for marine forecasting. His models have been used to provide national surge forecasts to the Irish Office of Public Works. His group has developed an innovative flood modelling system which is based on a nested approach for ultra-high resolution hydraulic modelling of flood events in urban areas. Mike has worked as Expert Advisor to the Irish Government on radionuclide transport in the Irish Sea. He was awarded the Excellence in Marine Research Award' at the Marine Industry Awards in 2016 and was awarded the Telford Premium Award from the Institution of Civil Engineers, London. He delivered a Keynote Address at the UKACM 25th Annual Conference in 2017.

Title: Developments in Marine Renewable Energy

Accurate information of surface currents is crucial to a variety of economic and environmental operations relating to marine renewable energy extraction. Although numerical models based on fluid mechanics are capable of providing forecasting information, its establishment process is a challenge for researchers due to difficulty in accurately defining initial and boundary conditions, grid structure and so on. In this paper, a soft computing approach Random Forests (RF) was adopted to predict surface currents covered by a radar system with high density in Galway Bay. The RF model was trained based on taking use of outputs from numerical model Environment Fluid Dynamics Code (EFDC) and observations from a Coastal Ocean Dynamic Application Radar (CODAR) system. Input variable structure was examined in details through experiments. Sensitivity experiments on input variable structure were performed to establish the best RF models for estimating surface currents. Results indicated that the RF algorithm is a promising means to generate satisfactory surface currents over a long prediction period.

Prof. Jürgen Mahlknecht, ITESM, Mexico

Biography: Prof. Jürgen Mahlknecht is research chair of Water Science and Technology at Tecnológico de Monterrey (since 2014), founding director of the Water Center for Latin America and the Caribbean (2008-2017) and serves as associated research professor at Tecnológico de Monterrey (since 2004). Previously he worked as researcher at University of Guanajuato (Mexico), University of Applied Life Sciences Vienna (Austria), National Autonomous University of Mexico and University of Guanajuato (Mexico). He is graduated in Water and Wastewater Management and Engineering and holds a PhD in Hydrogeology from University of Applied Life Sciences Vienna, Austria. He has more than 20 years of research on water resources management, hydrogeochemistry and isotope hydrology, groundwater contamination and remediation. He received several distinctions (Sistema Nacional de Investigadores), awards (Dr. Karl-Heinz Schleinzer, Austria) and prizes (Eternit-Tiefbau Preis, Austria).

His research areas of interest are:

Earth and Planetary Sciences (miscellaneous); Earth-Surface Processes; Environmental Chemistry Environmental Science (miscellaneous); Geology; Global and Planetary Change; Inorganic Chemistry; Pollution; Renewable Energy; Sustainability and the Environment; Soil Science; Water Science and Technology; Hydrogeology

Title: Water Energy Food Nexus: A Review on the Current Situation and Future Challenges in Latin America and the Caribbean

The Water-Energy-Food Nexus is a conceptual framework for analyzing and managing natural resources for life and sustainable development. It is well known that these three sectors are intrinsically related. Under this statement, this paper presents an actual overview of the current state of the water-energy-food nexus in Latin American and The Caribbean countries. The analysis presents the water, energy and food security index for each country. The proposed index comprises three key indicators per sector, considering availability, access, and stability of sector’s resources. The obtained results show that all three sectors need more attention for future development, especially in the Caribbean countries.

Prof. Rui Calejo Rodriguesm, Porto University – FEUP – CONSTRUCT – NI&DEA, Portugal

Biography: Prof. Rui Calejo Rodrigues was born in 1960, Vila Real, Portugal. He graduated with 'Licenciatura' (1983), MSc. (1989) and PhD. (2003), in Civil Engineering at the Faculty of Engineering of the University of Porto (FEUP). Since 1984 he has been teaching at the Department of Civil Engineering of FEUP. He is presently Assistant Professor at FEUP, Integrated Researcher at CONSTRUCT and Head of NI&DEA which stands for Nucleus of Research end Development in Acoustic Engineering.

Under his supervision, more than 150 theses were successfully presented to several institutions. He published 4 chapters of international books, 12 papers in international journals, 34 papers in international conferences.

He was the Editor of 4 books and author of other 6 books.

Scopus, Elsevier, March/2018: h-index = 10

His research interests are: Civil Engineering, Acoustics, Sustainability, Building Maintenance

Title: Quiet Areas and Urban Sustainability

Urban areas are usually the scope of sustainability strategies with no consideration of the noise factor. As a matter of fact, natural resources, energy, economy, air quality and so on are environmental factors usually associated to sustainability studies, but noise is usually forgotten. In addition, more than a comfort problem, urban noise is nowadays a health issue related with major diseases such as high arterial pressure, headaches and stress. The "quiet area" concept deals with the importance of keeping urban soundscapes as a "resource" for newer generations. The aim of this work is focused in the relationship between urban noise and sustainability in "quiet areas" where different aspects such as natural resources maintenance, air quality and natural noise implications on people's health are considered. Data from a case study at Oporto is presented as an illustration of the concept.

Dr. Biao Wang, North China University of Technology, China

Title: Wind Potential Evaluation with Urban Morphology --A Case Study in Beijing

Wind energy is beneficial for the sustainable development of cities. With increasing new wind turbine technologies and CFD techniques, urban wind becomes to attract public attention while large-scale wind capacity installation is stabilizing. This work is trying to estimate wind energy within the angle of urban morphology. Seven different urban tissues were compared and analysed with several relevant urban morphology parameters. Numerical simulations in CFD were undertaken to visualize the outcome of wind energy of each urban tissue. The results showed that the forms with lower floor area ratio usually have the higher wind potential density, and the forms with higher porosity usually have the higher wind potential density on unit of roof surface.

Afternoon, July 24th, 2018

Session 1A—Renewable Energy Systems I

Venue: Gallery | Time: 13:50-14:50

Note:
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E051

Time: 13:50-14:05

Autonomous Active Power Management in Isolated Microgrid based on Proportional and Droop Control

Mr. Hyeon-Jin Moon, Jae Won Chang, Seok-Young Lee and **Prof. Seung-Il Moon**
Seoul National University, Korea

In an isolated microgrid, coordinated active power control is required for power balance under any circumstances. We propose a proportional control method based on the master-slave concept to achieve power balance even from insufficient power supply. This autonomous control method uses the frequency generated by the grid-forming BESS as a global data signal. Other units are controlled indirectly. The frequency is controlled to be proportional to the AC voltage deviation of the grid-forming BESS for detecting sudden power shortages and for sharing active power. The effectiveness of the proposed method is verified by simulations in MATLAB/Simulink.

E003

Time: 14:05-14:20

Impact of Strong Climate Change on the Statistics of Wind Power Generation in Europe

Juliane Weber, **Mr. Fabian Gotzens**, Dirk Witthaut
IEK-STE, Forschungszentrum Juelich

Variable renewable energy sources highly rely on weather and climate variability. Therefore, their power output may become subject to climate change. We analyze how strong climate change may affect wind power resources in Europe, based on the outcome of high-resolution climate simulations. In particular, we evaluate the probability and persistence of low, medium and high wind regimes and the seasonal variability of wind speeds. For many parts in Europe we find a shift in the wind speed distribution: from higher to smaller wind velocities. Thus, the occurrence of wind velocities smaller than the cut-in velocity becomes more likely, which may result in

lower wind power output. We further observe an increasing seasonal wind variability over most of Central and North-Western Europe. This may enhance curtailment in the winter months and backup energy needs in summer.

E010

Time: 14:20-14:35

Outdoor Microclimatic Validation for Hybrid Simulation Workflow in Hot Arid Climates Against ENVI-Met And Field Measurement

Mr. Ibrahim Elwy, Yasser Ibrahim, Mohamad Fahmy, Mohamed Mahdy
Military Technical College

Outdoor microclimate simulations as part of sustainable urban development process have become of a great significance to reduce energy consumption, CO_2 emissions, urban heat island, and urban sprawl. Accordingly, the development of microclimate simulation tools is crucial to catch up with the cutting-edge technologies and generate optimized urban forms according to their environmental performance. In this paper, a hybrid parametric workflow of Ladybug Tools is applied to validate their generic outdoor thermal comfort, calculated in Physiological Equivalent Temperature (PET), against measured meteorological data using HOBO-U30 weather station, and ENVI-met simulations for a case study in Cairo, Egypt. The comparison of four meteorological parameters have shown minor error percentages with nearly 90% precise PET results. The study have demonstrated that Ladybug Tools have no less significance than other fully-integrated microclimate simulation engines, particularly for consuming less simulation time, and their appropriateness for the iterated design processes and simulations.

E067

Time: 14:35-14:50

Optimized Empirical Model of Solar Radiation in BÉJaia

Zahir Asradj, **Prof. Rezak Alkama**, Kahina Ouali, Aida Kabla
Bejaia University, Algeria

In this paper, the Genetic Algorithm is applied to optimize the parameters of a model with meteorological parameters, (sunshine hours, ambient temperature, air pressure and relative humidity), for estimating 8 minutes global solar irradiation data collected in Bejaia city (Algeria).We compare its performance with four models in the literature (Angstrom-Prescott, Bahel, Newland and Abdalla).

To compare solar radiation estimation equations, the most widely used statistical indicators are the root mean square error (RMSE), Mean Percentage Error (MPE) and the mean bias error (MBE).The proposed model give a relative error of 0,0734% (in absolute value), indicating a very good agreement between measured data and those calculated.

Session OF1—Bioproducts

Venue: Gallery | Time:14:50-15:05

OF006

Design of Portable Biodiesel Plant from Waste Cooking Oil

Alan Try Putra Samad, **Ms. Dwini Normayulisa Putri**, Meka Saima Perdani, Tania Surya Utami, Rita Arbianti, Heri Hermansyah
Universitas Indonesia

The design of portable biodiesel plant from waste cooking oil has been done simultaneously based on biodiesel standard of SNI 7182: 2012. Design of biodiesel production involves several processes including esterification, transesterification, decantation, vacuum evaporation, and ultra-filtration. Production of biodiesel has been simulated using several software packages. Based on the simulation conducted, the esterification process was able to convert 92.8% of FFA into FAME by using sulfuric acid as the catalyst with 10% w/w of FFA. Transesterification showed the biodiesel yield of 90% by using NaOH as the catalyst with 1% w/w of triglyceride. Evaporation on vacuum system was able to obtain biodiesel with methanol content less than 0.5% with lower energy consumption. Purification of biodiesel using ultra-filtration requires considerable energy but it was able to produce the purity rate of biodiesel up to 99.8% with relatively shorter time.

OF007

Techno-Economic Analysis of Portable Plant from Waste Cooking Oil

Alan Try Putra Samad, **Ms. Meka Saima Perdani**, Dwini Normayulisa Putri, Heri Hermansyah
Universitas Indonesia

Techno-economic analysis for portable biodiesel plant from waste cooking oil in Indonesia has been performed in this study. Analysis was performed by calculating the capital expenditures (CAPEX), operational expenditures (OPEX), and evaluation of economically aspects. Sensitivity of raw material cost, product price, and number of batch fluctuation have also been analyzed in this study. Overall process in this portable biodiesel plant has been simulated in the prior study and able to produce 128 L of biodiesel per batch production with 18 batch production per day. Based on calculation, the total of CAPEX and OPEX for this plant is IDR 5.354 billion and IDR 6.505 billion, respectively. Regarding to the economic evaluation, this plant will provide internal rate of return by 17.8%, net present value of IDR 7.196 billion, and payback period on the third year, with 20 years of plant lifetime with product price of USD 0.847/L. Hence, this plant is considered to be built and commercialized in order to enhance biodiesel production in Indonesia.

OF009

Antimicrobial Activity of Biosurfactant Derived from Bacillus Subtilis C19

Hanif Yuliani, **Ms. Meka Saima Perdani**, Imelda Savitri, Meilani Manurung, Muhamad Sahlan, Anondho Wijanarko
Universitas Indonesia

Bacillus subtilis produces lipopeptides biosurfactant that have a great potential for biotechnological and biopharmaceutical applications, and Surfactin is the most potent lipopeptide biosurfactant known. In this work, the lipopeptide biosurfactant produced by Indonesian marine bacteria, B. subtilis C19, was analyzed. After 300 h cultivation in defined medium, a crude biosurfactant concentration of 2 g/L was produced. Biosurfactant product characterization have revealed high stability product in the wide range variation of pH and salinity. The antimicrobial activity evaluation of biosurfactant against 6 human pathogenic microbes (Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa, Salmonella enterica typhi, Listeria monocytogenes, and Candida albicans), demonstrated that biosurfactant produced by B. subtilis C19 have a specific antimicrobial activity. It could inhibit growth of C. albicans without inhibit both gram positive and gram negative bacteria; therefore It could be promote as antifungal active agent.

OF029

Phaeodactylum Tricornutum Derived Biosilica Purification for Energy Applications

Ms. Monique Branco-Vieira, Sergio San Martin, Cristian Agurto, Marcos A. V. Freitas, Teresa M. Mata, António A. Martins and Nídia Caetano
LEPABE / FEUP

For biotechnological proposes, it is important to determine biochemical composition of microalgae biomass, in order for correct addressing of the high value compounds produced and enhance the economic feasibility of the cultures process. This study aimed to analyzed the biochemical composition of P. tricornutum cultivated at an outdoor pilot-scale bubbled columns photobioreactor under natural conditions in Chile, for biofuel and high-value compounds production in order to propose an P. tricronutum biorefinery approach. The P. tricornutum biomass concentration was about 0.96 kg.m-3.d-1 with volumetric productivity of 0.13 kg.m-3.d-1. The samples showed a proportion of 7.85 wt.% of carbohydrates, 38.40 wt.% of proteins, 0.63 wt.% of fucoxanthin, 0.50 wt.% of bio-silica and 9.08 wt.% of lipids. The P. tricornutum samples showed a proportion of saturated fatty acids (SFA), monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA) of 42.34%, 21.91% and 31.41%, respectively. These findings suggest that P. tricornutum could be an alternative raw material for biofuels production, associated with high-valued compounds commercialization, using under a biorefinery approach.

Session 2A—Environment I

Venue: Meeting Room | Time:13:50-15:05

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E006

Time: 13:50-14:05

Evolution and Multivariable Analysis of Trace Elements In Groundwater of An Agricultural Area in A Semi-Arid Region of Mexico

Dr. Abrahan Mora, Jürgen Mahlknecht, Antonio Torres-Martínez
Instituto Tecnológico y de Estudios Superiores de Monterrey

The evolution of several trace elements was evaluated in shallow groundwater of an agricultural area located in a semi-arid region of northeastern Mexico. A Principal Component Analysis (PCA) was performed to assess the geochemical processes controlling the distribution and mobility of these elements. Five principal components (PC) were significant. PC1 indicates that Ti and Si come from soil/silicate weathering. Sulfate, Mo and U were grouped in PC2, indicating the same redox behavior. PC3 shows similar sources for Rb and Cs (halite weathering), whereas the PC4 grouped the immobile elements Cd and Pb. The correlation found between Zn and Cu in PC5 indicates a similar behavior of both elements during the weathering and transport. Although the measured trace elements were detected in groundwater, their concentrations were lower than the guidelines values for safe drinking water proposed by international organizations, suggesting that these elements do not pose any significant threat to consumers

E018

Time: 14:05-14:20

Repair Methods of River Channel Ecological Landscape

Dr. Shuai Sun and Biao Wang
North China University of Technology

Fluvial greenway connectivity has multiple dimensions, so it is the complex ecosystems of nature. The longitudinal connectivity of fluvial greenway is directly related to the natural flow of water, and is sensible and cognizable. The lateral Connectivity of fluvial greenway is closely linked to the Flood Pulse Concept and river cross-section design. The vertical connectivity of fluvial greenway refers to the vertical materials and energy circulation performance and the biocoenosis relevancy in the cross section of the river. They constitute the complicated continuum system of fluvial greenway.

E044

Time: 14:20-14:35

Monitoring of Polychlorinated Biphenyls (Pcbs) in Environmental Objects of the City Ust-Kamenogorsk in Kazakhstan

Ms. Roza Tursunova, Sana Kabdrakhmanova, Kydyrmolla Akatan, Yesbol Shaimardan, Ainur Kabdrakhmanova and Bagadat Selenova
Satbayev University, Kazakhstan

This work devoted to the assessment of the current level of the contamination with polychlorinated biphenyls (PCBs) in environmental objects of the city Ust-Kamenogorsk in Kazakhstan. Particularly, the territory of former Capacitor Plant in Ust-Kamenogorsk and surrounding area were explored and samples of soil, bottom sediments, water, vegetation and fish were sampled from these places. The chemical-analytical studies of PCB contamination were carried out using gas chromatography-mass spectrometry, electrochemical impedance spectroscopy.

E029

Time: 14:35-14:50

The Influence of CO2 Leaking on Environmental Monitoring in the Process of CO2 Geological Sealing

Prof. Xiaowei Zhai, **Mr. Hui Ge**, Xiaokun Chen, **Mr. Yu Xu**, **Prof. Guixian Fan**
Xi'an University of Science and Technology

Carbon dioxide capture and storage (CCS) is one of the most promising emission reduction measures. Based on the CCS project in Shen Hua Group Corporation, the eddy correlation monitoring system was used to monitor the CO_2 flux in the sealed area. Combing with local wind direction, the flux change in the sealed area was analyzed. A simulation study on the CO_2 leaking rule is carried out by ANSYS. CO_2 distribution law in the sealed area in different leaking rates was predicted. The results show that the flux anomaly was caused by the CO_2 leaking from surge tank in the sealed area. The interference on gas leaking from the surge tank should be considered in the monitoring process of the CCS project.

E048

Time: 14:50-15:05

Enhanced Hybrid Removal of DEHP from Contaminated Water Using Acinetobacter Sp. Immobilized on Scrap Tyres

U Hin Kelvin Chao, **Dr. Renata Alves de Toledo**, Hojae Shim
University of Macau

This study investigates the biological removal enhancement of Di(2-ethylhexyl) phthalate (DEHP) by Acinetobacter sp., indigenous isolate, using waste tyres. The DEHP adsoption capacity was poor (2 mg/g) and the contaminant was almost

completely removed after 3 days. When tyres were added with the isolate, the colony forming units (CFUs) increased with the incubation time, while the DEHP was almost completely removed within 2 days. The obtained results indicate both DEHP and Acinetobacter sp. sorbed/attached on tyre surface and the isolate utilized DEHP as carbon source to grow. Further studies are under way to better elucidate the exact DEHP removal mechanism.

Session 3A—LCA

Venue: Classroom II | Time:13:50-15:05

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E041

Time: 13:50-14:05

Life Cycle Inventory for Biomethane as A Diesel Substitute for the Brazilian Ethanol Industry - Case Study.

Prof. Joachim Werner Zang, Kairo Martins, Prof. Warde Antonieta da Fonseca-Zang
IFG – Instituto Federal de Goiás, Brazil

Due to concerns for sustainability in production processes reliable Life-cycle assessment (LCA) methodology is needed. Brazilian sugarcane industry processed 651 Mt of sugarcane in the 2016/2017 harvest producing 38.7 Mt of sugar and 27.3 Mm^3 of bioethanol, providing more than half domestic fuel consumption for light vehicles, reducing greenhouse gas emissions significantly. Nevertheless, bioethanol production demands diesel, which leaves to a ratio between fossil fuel input to renewable fuel output of up to 1/10. For this work the generation of biomethane from sugarcane residues as a diesel substitute based on data collected at a sugarcane mill located in Goiás State, Brazil, was simulated with the GaBi-software (Thinkstep, Germany). LCA to improve the sustainability of ethanol production leaves to two alternative scenarios: (i) the substitution of 50% of consumed diesel in dual-fuel diesel engines by biomethane for harvesting and crop transport, and (ii) substituting 100% of non-renewable fuels by biomethane.

E037

Time: 14:05-14:20

How Sustainable is A Low Carbon Power System? Holistic Hybrid Modelling for the Portuguese Case-Study

Dr. Patricia Fortes and Sara Proença
CENSE/NOVA University Lisbon

This paper proposes a new methodological framework to assess in a holistic approach the sustainability of energy scenarios. It combines endogenous modelling outcomes, from the hybrid modelling platform HYBTEP, with external indicators to evaluate the environmental, economic and social performance of distinct power sector scenarios.
Results for Portugal show that a shift to mature and cost-effective renewable power

technologies conducts to positive impacts at environmental, economic (GDP growth) and social spheres (employment growth), while costly emergent technologies are counterproductive. This tool and its outcomes can provide valuable insights for the design of technology-oriented policies that allow fostering sustainability targets.

E024

Time: 14:20-14:35

Water Footprint of Microalgae Cultivation in Photobioreactor

Dr. António Martins, Nídia Caetano, Teresa Mata
LEPAE / FEUP

This work aims to evaluate the water footprint of microalgae cultivation in a closed pilot-scale horizontal multi-tubular photo-bioreactor, taking into account the reactor construction and its operation/microalgae cultivation steps by a Portuguese company, on a gate-to-gate perspective. The results indicate that the water footprint of the photobioreactor is 35.05 m3/kg dry biomass, of which 61 % from the construction and 39 % from the reactor operation steps, in the last step mainly due to freshwater consumption for the growth medium preparation and microalgae cultivation

E036

Time: 14:35-14:50

The Interest of Spanish Wine Sector in Renewables for Reducing GHG

Assoc. Prof. Nieves García-Casarejos, **Assoc. Prof. Pilar Gargallo** and Javier Carroquino
University of Zaragoza, Spain

The objective of this paper is to discover through a survey, the Spanish wine sector’s attitude towards incorporating renewables. To that end, the multivariate statistical technique of factor analysis is applied to the information provided by a sample of 87 wineries stratified by Spanish regions. This resulted in a set of four indicators describing the determinant factors (Cost, Conviction, Motivation and Investment) influencing a winery’s decision to implement renewable energies. Furthermore, a cluster analysis resulted in three groups of completely different wineries. The first contains a 25.3% of the wineries, which are not concerned about environmental issues. The second comprises a 26.7% of the wineries, which are dissuaded from adopting renewables as they perceive a high investment is necessary. The third group involves a 48% of wineries, which are committed to renewables because they are absolutely convinced of their benefits.

E034

Time: 14:50-15:05

Carbon Footprint of Microalgae Production in Photobioreactor

Dr. Teresa Mata, António Martins, Nídia Caetano
LEPAE / FEUP

This work aims to evaluate the carbon footprint of microalgae production in a pilot

scale PBR by a Portuguese company, on a gate-to-gate analysis. The data was obtained from real production conditions complemented with data from the literature and life cycle inventory databases. The carbon embedded in the construction materials and nutrients necessary to grow the microalgae was considered. A global carbon footprint of 68.34 kg CO2-eq/kg dry biomass was calculated on an annual basis. For the PBR construction stage, a carbon footprint of 1.722 kg CO2-eq/kg dry biomass was calculated, contributing only to 2.5 % of the overall value. Since the average annual production of the pilot scale photobioreactor is 74 kg of dry biomass/year, the carbon footprint for this stage was 66.62 kg CO2-eq/kg dry biomass, corresponding to 97.5 % of the total global carbon footprint. In this study, the production of the nutrients needed to prepare the culture medium is the major contributor to the overall footprint, approximately 79 %. The CO2 fixation by microalgae reduces the overall value by 3 %.

Session 1B—Buildings

Venue: Gallery | Time: 15:35-17:05

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E001

Time: 15:35-15:50

Determinants of Sustainable Upgrade for Energy Efficiency – the Case of Existing Buildings in Australia

Mr. John Dadzie, Goran Runeson
University Of Technology Sydney, Australia

The impact of existing buildings on the environment is on the rise; thus to achieve environmental sustainability requires sustainable upgrade (SU) of existing built facilities. Over the years, SU has focused on technologies with little attention given to the nature and conditions of existing buildings. The purpose of this paper is to identify existing building characteristics that impact SU. A detailed literature review on the nature and characteristics of existing buildings, as well as energy and environmental performance was undertaken. A survey questionnaire with all the determinants of existing buildings was administered to sustainability and construction professionals in Australia. The results show that size of building, age of building, U-value of wall, U-value of ceiling, area of external wall, thickness of insulation materials, occupancy, size of window opening, life span of sustainable technologies, and the type of building impact sustainable upgrade of existing buildings for energy efficiency.

E002

Time: 15:50-16:05

Exploring Dynamic Slat System for Enhancing Daylighting Distribution at Deep Office Spaces in hot Arid Regions

Anwer Zayed, Mahmoud Elkhateib, Mohamed Mahdy, **Mr. Ibrahim Elwy**
Military Technical College

Reaching satisfactory daylighting levels is an obligatory assignment in arid regions, which are normally described by year-long clear skies. Sun-breakers are normally utilized to control sun powered infiltration, accordingly enhancing illuminance circulation and diminishing visual uneasiness. This paper goes for characterizing the principle attributes of the slats that could be utilized to control solar access into office rooms of administrative building under clear-sky conditions. The study tended to office room plans with WWR 100% confronting south in Cairo, Egypt. The attention

was on the effect of the slat position (whether indoor or outdoor) after research for the optimum inclination angle for each season of the year. The major objective was to guarantee sufficient Daylighting performance. Parametric recreation runs were performed utilizing Grasshopper, DIVA 4-for-Rhino. The results of this work distinguished the scope of slats as sun-breaker and their relation to enhance daylighting performance for the deep-office space.

E031

Time: 16:05-16:20

Short-Term Characterization of the Indoor Air Radon Concentration in a XII Century Monastery converted into a School Building

Prof. Sérgio I. Lopes, João Silva, Ana Antão and António Curado
Instituto Politécnico de Viana do Castelo

An ancient monastery built with thick granite walls, and recently rehabilitated to house a polytechnic school (ESA-Escola Superior Agrária) placed in Ponte de Lima, an inner village in Alto Minho region, North of Portugal, was monitored in order to assess radon gas concentrations in its main rooms.
The aim of this paper is to perform a short-term radon gas characterization to assess the radon risk in a school building and therefore propose adequate mitigation strategies. The experimental campaign took place during spring and summer of 2017 and was carried out in 2 complementary steps involving 17 different sites. Each room was monitored continuously for more than, at least, 7 complete days, and the ventilation periods were registered manually by the users.
This study revealed that the radon concentration levels are above the legal limit of 400 $Bq.m^{-3}$, in 77% of the samples. The value rises to 86% when Euratom Directive limit of 300 $Bq.m^{-3}$ is considered. Furthermore, the results obtained show that the indoor radon concentration is considerably influenced by the season in which the measurements are performed, and it also reveals that indoor radon concentration varies with the occupancy of the rooms, since it is evident that the human ventilation actions have a considerable impact on the reduction of its concentration.

E070

Time: 16:20-16:35

Monitoring of Indoor Ultrafine Particulate Matter at the Fire Rescue Brigade Workplaces

Dr. Eva Kellnerová, Josef Kellner, Josef Navrátil and František Paulus
University of Defence

The contribution deals with the issue of ultrafine particles in order of tens of nanometers in the air of Fire Rescue Brigade workplaces. Concerns about potential contact with air pollutants are arising even in situations, when these professionals are not deployed. The purpose of this work is to assess whether the presence of exposed persons in these workplaces is safe and does not in itself pose a risk of adverse health effects. Testing took place in two fire-fighting rooms. In the observed areas, mean particle counts were found at 1.02×10^{4} and 2.51×10^{4} $N\cdot cm^{-3}$ for the changing room and chemical workshop.

E063

Time: 16:35-16:50

Green Building Rating Systems in Swedish Market - A Comparative Analysis between LEED, BREEAM SE, Greenbuilding and Miljöbyggnad

Mr. Iuri Abreu Saraiva Freitas and Xingxing Zhang
Dalarna University, Sweden

In Sweden, there are four most commonly used green building rating systems, which are LEED, BREEAM SE, GreenBuilding and Miljöbyggnad. In this study, each of them is analyzed under the aspects of certification process, implementation cost, educational needs and the variety of categories. SWOT method is further applied to extract the strengths, weaknesses, opportunities and threats of each of the rating system in a direct and indirect manner, making it clearer to choose among various options when considering the individual needs of each project in practice.

E012

Time: 16:50-17:05

A Control Methodology for Building Energy Management Systems (BEMS) in Heat Networks with Distributed Generation

Mr. Sean Jones, John Beardmore, Mark Gillott, Rabah Boukhanouf and Gavin Walker
University of Nottingham

Reducing building energy consumption is undoubtedly important to achieve sustainable development and as a result, there is a need to investigate better energy systems with well-designed management infrastructure. At the University of Nottingham's Creative Energy Homes test site, a low-temperature district heat network with distributed generation links 7 residential properties. The aim of the system is to investigate the efficiency benefits of low temperature heating in the UK, while at the same time testing the prosumer concept in communities. For a homeowner to be a prosumer, they can buy and sell heat to a network. At a community level this system is the first of its kind, and as a result required bespoke Building Energy Management Systems (BEMS). This paper primarily focuses on the hardware, software, and system operation used as part of project SCENIC (Smart Controlled Energy Networks Integrated in Communities). The project utilises a simple and cheap hardware configuration involving relays, IO boards and RaspberryPi microcomputers. An open-source Building energy Management System (oBeMS) platform is used for monitoring and control functions. In the discussion the system is reviewed and the control strategy for distributed generation scheduling and optimisation is given.

Session OF3—RES

Venue: Gallery | Time:17:05-17:20

OF027

Optimization Potential Analysis of Micro-Hydro Power Plant (MHPP) from River with Low Head

Romy Marliansyah, **Ms. Dwini Normayulisa Putri**, Andy Khootama, Heri Hermansyah
Universitas Indonesia

Indonesia has a lot of civilization without electricity in remote areas. In order to fulfill the high demand of electricity, low cost and environmentally friendly power plants are required to reach remote areas. Micro-hydro power plants are proposed as a solution that could penetrate the limited accessibility for transport, technology, and cost. This paper covers a case study of optimization potential analysis of micro-hydro power plant (MHPP) in Subang. This study analyze the current technical specification of the MHPP in Subang in order to optimize the operation to reach the attached generator capacity with the condition of low head and low discharge of the river. Analysis of the existing MHPP proposes a redesign focused on the penstock pipe and turbine. According to the calculations, penstock pipe design has the minimum required diameter of 0.7 m in order to withstand the debit of 1.1 m^3/s. Besides, in order to optimize the cross flow turbine performance with the debit of 1.1 m^3/s, the existing turbine's radius should be redesigned to 0.71 m, with the existing turbine's blade length should be redesigned to 0.248 m. All of the redesigns proposed could increase the potential power generation up to 200% from the current condition.

OF030

Supercapacitor in Battery Charges of Photovoltaic Panel: Analysis of the Technical Feasibility

Victor Barbosa, Teresa Nogueira, Emerson Carati and **Prof. Carlos Felgueiras**
CIETI / ISEP / P.Porto

The power generation from photovoltaic sources is variable in nature and may contain unhoped fluctuations, which can be relieved by using energy storage systems. However, there is a technical contradiction in extracting the maximum power from a photovoltaic panel and the charge cycle of a battery. To overcome this problem, an improvement consisting in the collaborative association of batteries and supercapacitors has been studied. This paper presents an analysis of the technical feasibility of using supercapacitors to assist in the charging of lithium ion batteries in a photovoltaic system.
The structure of the energy conversion system was developed and was set up the converter's configuration, design and operation simulation. The power management of full system implementation was simulated and the results are presented. Accordingly, the proposed system development and it technical analysis was carried out, for the situations with and without the use of supercapacitor. It was concluded that the supercapacitor in the photovoltaic systems bring about better charging

conditions, resulting in shorter charging times and better system performances

OF019

Experimental and Simulation-based Evaluation of a Wind Energy Conversion System

Mr. Reda Rabeh, Mohamed Bakhouya, Mohammed Ferfra, Radouane Ouladsine and Ahmed Ezbakhe
Université Internationale de Rabat (UIR), Morocco

The Wind energy conversion systems (WECS) have been developed in the past few years as renewable energy sources for minimizing greenhouse emissions while reducing power consumption. Despite the importance of modeling and simulation, experimental studies of WECS are required to figure out the behavior of these systems according to the environmental and climatic circumstances (e.g., wind availability). This paper presents the implementation and experimentation of a wind energy conversion model using the permanent magnet synchronous generator (PMSG) according to different wind speeds. Experiments have been conducted with the main goal is to show the accuracy of the Wind turbine model.

Session 2B—Energy

Venue: Meeting Room | Time:15:35-17:05

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E045

Time: 15:35-15:50

Fossil Fuel Energy Consumption in European Countries

Prof. Florinda Martins, Carlos Felgueiras, Miroslava Smitková
REQUIMTE/ISEP

Traditionally fossil fuels have been use as the main resource to obtain energy but its use has several negative impacts, such as global warming and air pollution. Global warming has been mentioned has a key challenge to be addressed due to its expected grave consequences. Air pollution is another important problem and has been responsible for many health problems causing social and economic negative effects. However the use of fossil fuels has another strategic dimension when a sustainability perspective is considered, namely the preservation of natural resources, which is a goal of Circular Economy strategy. In this work fossil fuel energy consumption is analyzed in European countries as well as its relationship with other variables such as energy dependence and share of renewable energy in gross final energy consumption. It was possible to conclude that many European countries still dependent heavily on fossil fuels.

E065

Time: 15:50-16:05

World Energy Market in the Conditions of Low Oil Prices, the Role of Renewable Energy Sources

Eder L.V., Provornaya I.V., Filimonova I.V., **Mr. Kozhevin V.D.**, Komarova A.V.
Novosibirsk State University, Russia

With help of panel data, the paper establishes the relationship between the development of renewable energy and (1) the prices of fossil energy, (2) hydrocarbons production to consumption ratio, (3) corruption index and (4) country technological development factor. All observed factors have shown significant influence on renewable energy consumption. Was received 1% change of price for hydrocarbons causes 1.05% change of RES consumption. In the context of cheap fossil energy resources, fundamental technological restructuring of renewable energy will be required to improve its competitiveness.

E071

Time: 16:05-16:20

Optimal Allocation of Distributed Generation Units for Converting Conventional Radial Distribution System to Loop Using Particle Swarm Optimization

Dr. Amal Hassan Ahmed, Saady Abd El Hamid El Sayed
Helwan University, Egypt

Closed loop distribution system is one of the promising techniques to overcome the shortage of the radial distribution system. Converting the conventional radial distribution system to loop is an interesting research area. The voltage difference during connecting any two buses in radial distribution system, to convert a radial part to loop, is the main problem that should be solved. In this work, a new technique based on applying distributed generators (DGs) to overcome this problem is introduced. This paper proposes a particle swarm optimization (PSO) based algorithm for optimal allocation of DGs in a primary radial distribution system to minimize the difference in voltage between specified two buses so that they could be tied to loop a part of the system. The proposed algorithm makes use of a backward/ forward load flow method for the load-flow analysis of the radial distribution system. The proposed PSO-based algorithm is tested on the IEEE 33 –bus radial distribution system and results are obtained using MATLAB. Discussions are provided based on the obtained results.

E022

Time: 16:20-16:35

Analytical and Particle Swarm Optimization Algorithms for Optimal Allocation of Four Different Distributed Generation Types in Radial Distribution Networks

Tawfeek Sayed Tawfeek, **Dr. Amal Hassan Ahmed**, Saady Abd El Hamid El Sayed.
Helwan University, Egypt

In this paper, two algorithms, analytical and particle swarm optimization (PSO), are introduced and compared with each other for optimal allocation of distributed generation (DG) units in radial distribution networks (RDNs) to minimize the total loss in real power. Four different types of DG units are considered in this work. The two algorithms make use of a backward / forward load flow method for the load flow analysis of the RDN by which the node voltages and the total active power loss of the network are determined. The introduced algorithms are tested on the IEEE 41 bus radial distribution system and the results are obtained using MATLAB. Discussions are provided based on the results of case studies.

E032

Time: 16:35-16:50

Influences and Uncertainty of Battery-Swapping Electric Scooters on Energy system in Taiwan

Dr. Pei-Ying Hsieh, Tai-Yi Yu, Kuang-Chong Wu, and Len-Fu W. Chang
National Taiwan University

This paper proposes a new formula which is the demand of electricity from battery-swapping stations (BSS) at peak hour, combing the parameters including the

number of battery-swapping electric scooters (NBSES) and the number of scooters served by a BSS, and presents a novel decision-support analysis for assessing future impact on energy system with an increasing NBSES in Taiwan. The paper combines utilized VaR (Value at Risk) values and Monte Carlo method to assess key variables of NBSES and potential benefits. This study finds that the probability of the power system under 6.0 percent operating reserve is only 86.28%. When NBSES reaches 1.28 million, the probability is down to 69.0% and the percentage of operating reserve (R) is 2.9% (95%CI) without considering the storage ability of BSS. However, R could be higher than 6.0% (95%CI) if considering the storage ability of BSS.

E039

Time: 16:50-17:05

Determination of most suitable low-emission energy technologies development in Poland using integrated fuzzy AHP-TOPSIS method

Assoc.Prof. Magdalena Ligus, Piotr Peternek
Wroclaw University of Economics, Poland

In the current period of sustainable development policy implementation, energy planning has become complex due to the involvement of multiple criteria: social, economic and environmental. In this study, a hybrid MCDM model based on FAHP and FTOPSIS is proposed to evaluate and prioritize five low-emission energy technologies development in Poland. For this purpose, a number of criteria are defined from the viewpoint of accomplishment of sustainable development policy goals in Poland. The research results show that renewable energy technologies should be utilized instead of nuclear energy. The results are compared with those obtained by classical and combined FAHP-TOPSIS decision-making models.

Session OF4—Sustainability

Venue: Meeting Room | Time:17:05-17:20

OF031

LCA of constructing an industrial building: focus on embodied carbon and energy

Vinicius Rodrigues, António A. Martins, Maria Isabel Nunes, Ana Quintas, Teresa M. Mata, **Prof. Nídia S. Caetano**
CIETI / ISEP / P.Porto

This work evaluates the embodied carbon and energy of an industrial building construction with 6733 m² of built area, following a life cycle analysis methodology, on a gate-to-gate perspective. For the life-cycle inventory it was used primary data of electricity, water and diesel fuel, complemented with secondary data from the Bath Inventory of Carbon and Energy for estimating the construction materials' data, of the architecture and stability phases. Results showed an embodied carbon of 508.57 kgCO2-eq/m² and an embodied energy of 4907.62 MJ/m2 for the construction of the industrial building.

OF024

Comparison between Eco-Management and Audit Scheme and ISO 14001:2015

Prof. Florinda Martins, Luis Fonseca
REQUIMTE/ISEP

Traditional approaches to protect environment usually rely on a legal framework that enforces measures and behaviors on organizations. However, to achieve sustainability it is necessary to apply other tools that need a stronger commitment from the organizations in the three pillars of sustainable development. The implementation of an Environmental Management System, being a voluntary instrument, can play an important role in the environmental pillar because it has a structured approach to manage environmental aspects of organizations. The new revisions of the two most important standards maintain the previous pattern. EMAS (Eco-Management and Audit Scheme) incorporates the requirements of ISO 14001:2015, while maintaining important additional requirements such as the Environmental Statement and the employee involvement. The new revision of ISO 14001 by emphasizing organizational environmental performance can be a huge opportunity to increase sustainability given the fact that this international standard is more widely implemented than EMAS.

Afternoon, July 25th, 2018

Session 4A—Combustion

Venue: Gallery | Time:13:50-14:50

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E015

Time: 13:50-14:05

Molecular Dynamics Simulation of Characteristics of the Nanodroplet Evaporation

Weihong Zhang, **Assoc. Prof. Yan Li**, Yunshu Qi, Han Yuan and Ning Mei
Ocean University of China

The molecular dynamics method is used to simulate the evaporation process of nanodroplets on heated substrates by LAMMPS software. The simulation process includes three stages: the relaxation of argon droplets at 84K, heating the substrates to 200 K, keeping the substrates temperature at 200 K to observe the evaporation of the droplet. By measuring the change of the whole morphology of the droplets during the evaporation process, the changes of the edge thickness are obtained. By analyzing the atomic velocity and displacement, the trajectories of the particles at the edge of the evaporation process are revealed and distribution of the temperature of the droplets are expressed. It is concluded that when the substrates at 200K, the whole droplet evaporation process is conclude four stages: fixed evaporation stage, the stick slip motion stage, once again into the fixed evaporation stage and fixed contact angle and the contact radius are decreasing the evaporation process until the end. Finally, the experimental platform was set up to verify the validity of the simulation. Without considering the influence of plate roughness, the height variation of the droplet obtained from the experiment has a high consistency with the simulation results.

E019

Time: 14:05-14:20

Simulation of Explosion Characteristics of Syngas/air Mixtures

Dr. Manh-Vu Tran, Gianfranco Scribano, Cheng Tung Chong, Thinh X. Ho
Monash University Malaysia

Explosion characteristics of syngas/air mixtures was investigated numerically in a 3-D cylindrical geometric model, using ANSYS Fluent. The results showed that the maximum explosion pressure increased from lean to an equivalence ratio of 1.2,

then decreased significantly with richer mixtures, indicating that maximum explosion pressure occurred at the equivalence ratio of 1.2, while explosion time was shortest at an equivalence ratio of 1.6. Increasing H_2 content in the fuel blends raised maximum explosion pressure and significantly shortened the explosion time. Normalized peak pressure was sensitive to the initial pressure of the mixture, showing that they significantly changed with increased initial pressure.

E062

Time: 14:20-14:35

Crude Glycerol Gasification in A Fixed Bed Gasifier

Ms. Ana Almeida, Albina Ribeiro, Elisa Ramalho and **Prof. Rosa Pilão**
ISEP

The purpose of this work was the study of crude glycerol gasification, using steam as oxidant. The results were compared with those obtained for technical glycerol gasification. The producer gas composition and the gasification parameters were evaluated. Tests were performed in a fixed bed reactor and the producer gas samples were analysed by gas chromatography. The results using crude glycerol showed higher H2/CO ratio and cold gas efficiency values than the ones obtained using technical glycerol while no significant differences were observed for the remaining evaluated parameters. The results reveal that gasification is a possibility of crude glycerol valorisation.

E050

Time: 14:35-14:50

Techno-Economic Analysis of Lipase Enzyme Production from Aspergillus Niger Using Agro-Industrial Waste by Solid State Fermentation

Andy Khootama, **Ms. Dwini Normayulisa Putri**, **Prof. Heri Hermansyah**
Universitas Indonesia

Techno-economic analysis needs to be conducted in order to study the feasibility of enzyme industry development to fulfill the annually increasing demand of enzyme in Indonesia. This research aim to study the feasibility of a new plant to produce lipase enzyme from Aspergillus niger using agro-industrial waste as the substrates by solid state fermentation. Based on the simulation conducted, economic analysis of lipase production with the production capacity of 4290 kg/year, product price of IDR 1,061,811, and WACC of 15.10% yields IRR of 34.99%, NPV of IDR 5,520,728,137, and payback period of 2.98 years, with product price as the most sensitive parameter. Based on this result, this plant is profitable to be developed.

Session OF2—Environment & Buildings

Venue: Gallery | Time: 14:50-15:05

OF010

Low-altitude UAV 3D Modeling Technology in the Application of Ancient Buildings Protection Situation Assessment

Dr. Shuai Sun and Biao Wang
North China University of Technology

Based on low-altitude UAV remote sensing technology to quickly build 3D models of ancient architecture. Not only can truely record of the monomer building shape, color, texture, style, damage, structural features, and can truely record of the entire distribution patterns of village buildings, roads and other information surrounding terrain. On one hand, the status information of ancient relics can be recorded rapidly, massively, incoherently, on the other hand, work and assessment efficiency of heritage conservation staff and government departments can be greatly improved.

OF015

Study on ecological restoration technology of Yanxi River wetland in Beijing

Dr. Shuai Sun and Biao Wang
North China University of Technology

By using the design method of horizontal subsurface flow constructed wetland, the ecological environment of Yanxi River Basin as an important water resource protection area in Beijing was repaired. The main pollutants represented by COD, total nitrogen and total phosphorus in the river channel were able to meet the National safety standards. This kind of wetland type and design method has been successfully practiced in North China.

OF026

Energy Efficiency Enhancement of Mixed Refrigerant Process in LNG plant

Chaima Derbal, **Assoc. Prof. Abdallah Haouam**, Hocine Mzad
Badji Mokhtar Annaba ALGERIA, Algeria

The liquefaction natural gas (LNG) process is one of the most important thermodynamic processes in the cryogenic gas industry. The operating conditions change during the compression process, throttling and heat transfer, changing the thermodynamic properties of the natural gas (NG) and refrigerants in the major equipments, including cryogenic compressors, expanders, coolers and heat exchangers. To improve the energetic efficiency of LNG plant, a thermodynamic analysis by the exergetic method was used. Energy equilibrium equations and exergy equilibrium equations of each equipment in the Air Products and Chemicals Inc (APCI) process were established. This paper is limited to the exergy analysis of the mixed refrigerant (MR) components: the axial and centrifugal compressors and the main cryogenic heat exchanger. The results show that the inlet temperature and

inlet pressure of MR compressors has an impact on the evolution of the exergy efficiency. For a process MR, compression equipment is the main equipment contributing to total exergy losses.

OF011

An Investigation on Effect of Ultrasound Waves on Sludge Treatment

Dr. Nasser Mehrdadi, Farshad Golbabaei Kootenaei
Faculty of Environment - University of Tehran, Iran

Sludge treatment in wastewater treatment plants are one of the most difficult challenges. The purpose of this study is to determine the effect of ultrasonic waves on soluble chemical oxygen demand (SCOD), temperature and pH of the sludge during improving the sludge dewatering properties. In this research variables include ultrasound density and Time. With the increase of time, the SCOD also increased, which is due to increasing exposure of cells and microorganisms to sonification. This Enhancing Contacts with ultrasound waves leads to increasing cell wall collapse and the withdrawal of intracellular water, proteins and nutrients into the sludge. Also with the increase of ultrasound density, the rate of SCOD increase has raised. This means an increase of SCOD of the sludge and it is due to the higher import of energy and production of nano-bubbles and damage of cells and biological flocs. By increasing the ultrasound density and sonification time, the temperature was significantly increased.

Session 5A—Environment II

Venue: Meeting Room | Time:13:50-15:05

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E047

Time: 13:50-14:05

Estimation of Viscosity and Phase Inversion Point for Oil-Water Mixture

Ji Zhang, Han Yuan, Yan Li, **Mr. Jian Zhao**, Hongyu Si and Ning Mei
Ocean University of China

In this paper, a method and an experimental system for on-line prediction of oil-water emulsion viscosity and phase inversion point are proposed based on the engineering inverse problems. By measuring the oil-water mixture heat transfer temperature distribution, the viscosity parameters of optimal composition can be estimated using the inverse problem method, then the phase inversion point of oil-water emulsion can be determined by Gaussian formula using these estimation viscosity data. Based on this, some experiments are conducted, the experimental results show that maximum relative error of viscosity is 7.38%, while the phase inversion point can be controlled within 3%.

E030

Time: 14:05-14:20

Sustainable Development of the World Energy Taking into Account Dynamic of Energy Intensity: Current Trends and Long-Term Forecast

Prof. Eder L.V., Provornaya I.V., Filimonova I.V.
Novosibirsk State University

Based on the comparative analysis of the existing econometric characteristics, it has been shown that the exponential trend is the best trend describing the energy intensity of an economy in permanent and variable prices. The presence of the exponential trend in the energy intensity reduction indicates that the rates of enhancing the efficiency of energy consumption reduce uniformly in time. It is proposed in this work to consider beta convergence for countries not at equal intervals of time but from the moment of the start of reduction for each specific region. In this work, a close relationship is demonstrated for countries between the rate of energy intensity reduction and the initial value of the energy intensity considered. Based on the revealed regularities, forecast of the change in the energy intensity of the economy was made for a long-term perspective till 2040.

E054

Time: 14:20-14:35

Decomposition Analysis of CO2 Emission in ASEAN : An Extended IPAT Model

Assoc. Prof. Jaruwan Chontanawat
King Mongkut's University of Technology Thonburi, Thailand

Association of Southeast Asian Nations (ASEAN) is one of the most diverse regions. 3.6% of global greenhouse-gas emissions was released in 2013 and is expected to rise substantially due to increasing population and income. Understanding how greenhouse-gas emissions in the region have evolved is an important first step to develop appropriate policies and this paper analyses the historical increase in CO_2 emissions over the period 1971/2013, based on IPAT/Kaya approach combined with Variance analysis technique. Main findings indicate that: (1) population growth and increased income per capita have the largest contribution to emission growth; (2) fossil fuels increasingly become the dominant fuel and reversing this is a challenging task; (3) Energy efficiency gains have been achieved but it is the only factor that reduced emissions; and (4) the effect of changes in carbon intensity of fossil energy was negligible. These results should help Governments frame effective policies.

E064

Time: 14:35-14:50

Support Vector Regression Modeling of the Performance of An R1234yf Automotive Air Conditioning System

Prof. Murat Hosoz, Kaplan Kaplan, M. Celil Aral, Mukhamad Suhermanto, H. Metin Ertunc
Kocaeli University, Turkey

This study aims at modelling various performance parameters of an automotive air conditioning (AAC) system using support vector regression (SVR), a novel soft modelling technique. For this purpose, a bench-top AAC system was set up, charged with alternative refrigerant R1234yf, and tested in a wide range of operating conditions. Next, the cooling capacity and coefficient of performance of the AAC system were evaluated. Then, the proposed SVR was trained by using some of the input-output data pairs, and the performance of model predictions was tested using the remaining data. It was determined that the SVR model yielded very accurate predictions.

E060

Time: 14:50-15:05

Freshwater-seawater Transition in Coastal Todos Santos Aquifer, Baja California Sur

Prof. Jürgen Mahlknecht, William E. Sanford, Marissa Fichera, Abrahan Mora
Instituto Tecnológico y de Estudios Superiores de Monterrey, Mexico

Todos Santos is a coastal town located in Baja California Sur (Mexico), which has experienced an increase in tourist and agricultural activities during the last years. However, the Todos Santos aquifer is the sole source of freshwater supplied to populations. Therefore, the goal of this work is to investigate the processes that can cause groundwater salinity in this aquifer. The results of the chemical analysis

performed in groundwater indicate 3 water groups: i) less mineralized waters of the recharge zones showing a strong interaction with silicate rocks; ii) transition-zone waters from alluvial sediments also reflecting silicate rock-water interaction; iii) the most mineralized waters located along the coastline reflecting seawater intrusion. Overall, the ionic composition and the salinity gradient of groundwater are in agreement with the topographic flow paths. Nevertheless, in wells located in the coastline, groundwater interacts with seawater and undergoes evaporation simultaneously, exponentially increasing the salinity beyond seawater composition.

Session 6A—Renewable Energy Systems - PV

Venue: Classroom II | Time:13:50- 14:50

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E020

Time: 13:50-14:05

Effect of Partial Shading Patterns and Degrees of Shading on Total Cross-Tied (TCT) Photovoltaic Array Configuration

Chayut Tubniyom,Watcharin Jaideaw, Rongrit Chatthaworn, Amnart Suksri, **Assoc. Prof. Tanakorn Wongwuttanasatian**
Khon Kaen University, Thailand

Effect of partial shading on PV modules is simulated. Three standard configurations of PV array consisting of series-parallel (SP), bridge-linked (BL), and total cross-tied (TCT) are studied. Nine PV panels are arranged in 3x3 array. The suitable solar radiation level to start reconfiguring the PV array according to shading pattern is investigated. Partial shading of 1, 2 and 4 panels in 9 are simulated. From the simulation results, it is found that the reconfiguration of PV arrays may not increase the power output higher than 5% when there are shaded greater than 50% of the total area. Therefore, it is unnecessary to reconfigure the PV array. Conversely, if shaded area is less than 50% reconfiguring can improve the power output. Moreover, different shading patterns provide different power outputs even if the shaded areas are equal and the points to start reconfiguring the array are different for various shading patterns.

E027

Time: 14:05-14:20

Evaluation of the performance of a photovoltaic power plant installed in a building in the north of Portugal

Gustavo Pinto Monteiro, **Dr. Ana I. Palmero-Marrero**, Carlos Moreira and Armando C. Oliveira
INEGI - Institute of Science and Innovation in Mechanical and Industrial Engineering
In this work, the evaluation of the performance of a small-size photovoltaic plant, with 15 kWp of capacity, is made and some proposals for its optimization are presented. The plant consists of a grid-connected centralized system, where the output power is consumed in the same building. The PV plant production data of the last couple of years are analysed, filtering the periods of inoperation. To obtain an accurate prediction of the efficiency and power output, the characteristics of all plant components were introduced in SAM software. The results obtained through the simulations and the measured output power values were compared.

E055

Time: 14:20-14:35

Approach for Dimensioning Stand-alone Photovoltaic Systems

Ms. Sofia Boulmrharj, **Mr. Youssef Nait Malek**, Abd Ellatif El Mouatamid, **Assoc. Prof. Mohamed Bakhouya**, Radouane Ouladsine, Khalid Zine-Dine, Mohammed Khaidar and Mohamed Riduan Abid
UCD/UIR

The intermittent nature of renewable energy sources has attracted much interest for integrating storage devices towards the deployment of micro-grid systems. In fact, these devises could be added into the system by decoupling energy production from consumption mainly by storing the extra produced energy from RES during the day for eventual usage at night. However, for standalone systems, computing the optimum size of energy production and storage devices is required for continuous electricity supply. In this paper, a micro-grid (MG) system is modeled, sized, and experimented according to a given consumption profile using a deployed prototype at our EEBLab test site.

E056

Time: 14:35-14:50

Modeling, Simulation and Optimization of A Cds/Cdte Solar Cell Including A Zno Buffer Layer

Dr. AINAD TABET Zaid, BENMANSOUR Abdelhalim
URMER University of Tlemcen – Algeria

In this work, the influence of a ZnO buffer layer on the performance of a CdS/CdTe solar cell has been investigated using SILVACO/ATLAS device simulator. Results obtained showed that the introduced ZnO buffer layer improved significantly the conversion efficiency, in particular when the CdS thickness is relatively small (50 nm in this work). In fact, the conversion efficiency has increased from 17.19% for the reference cell to 20.01% after adding the ZnO layer. Furthermore, the thickness of the ZnO and the CdTe layer were varied separately in order to define the optimal characteristics. The maximum conversion efficiency of 20.41% with a fill factor of 83.58% was achieved after optimization.

Session 4B—Cities & Sustainability

Venue: Gallery | Time: 15:35-17:20

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E040

Time: 15:35-15:50

PM2.5 Emissions from Urban Crematoriums

Griselda Gonzalez-Cardoso, Naxieli Santiago-De La Rosa, **Ms. Janai Monserrat Hernández-Contreras**, Mirella Gutiérrez-Arzaluz and Violeta Mugica-Alvarez
Universidad Autónoma Metropolitana-Azcapotzalco

The cremation of human cadavers has increased in the last years due to the lack of land for burial, thus currently in Mexico City there are around 40 crematoriums that works every day, emitting as a consequence particulate matter and gaseous pollutants. This research presents the results of PM2.5 concentrations of a sampling program of one week in two crematoriums located in Mexico City. Sampling was carried out applying the US EPA 201A isokinetic Method, obtaining moisture, speed, temperature and flow of the polluted stream. Mass of the bodies, age, gender, cause of death, clothes type, cremation time and ovens temperatures were registered. Every crematorium has two combustion chambers with automatic control, and usually each crematory burn between 4 and 6 human cadavers. The first crematorium takes 120 minutes of cremation, PM2.5 emissions ranged between 11-59 mg/ m3 (sfc) dry, and most of them are below the maximum permissible limit (MPL) whereas the second crematorium with a burning time of 70 minutes presented PM2.5 emissions of 25-205 mg/m3 (sfc) dry exceeding most of the services the MPL. PM emissions do not depend on the service number or the temperature, but they depend on burning time since the longer the combustion time the better oxidation of organic compounds.

E046

Time: 15:50-16:05

A Methodological Approach to Identify Policy Priorities of Municipalities in Greece

Dr. Alecos Kelemenis, Panagiota Galiatsatou
Hellenic Open University, Greece

This study introduces a proposed framework encompassing all pivotal sectors a municipality deals with contributing to sustainable development at a local level. This framework is tailor-made to fit into the Greek environment in which municipalities operate. Furthermore, by making use of an appropriate weighting method, considering the challenges of the working environment in Greek municipalities, the

study proposes a specific methodology to better understand the policy priorities of municipalities. This information can be used to adjust and better align local policies with national strategies and with the needs and priorities of citizens.

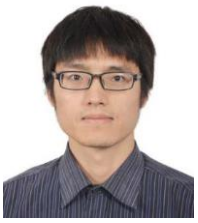
E014

Time: 16:05-16:20

Water, Food and Power Grid Optimization at macroscopic Level Involving Multi-Stakeholder Approach

Dr. Ramón González -Bravo, Jürgen Mahlknecht, José María Ponce-Ortega
Instituto Tecnológico y de Estudios Superiores de Monterrey, Mexico

The link between water, energy, and food has gotten more attention over the last years. The increased needs for water, energy and land resources, as well as the environmental degradation and, in some cases, scarce resources, have driven the search for strategies for sustainable development within the Water-Energy-Food (WEF) nexus concept. This paper presents an approach to assess water and power distribution grids for food production, based on WEF nexus approach, in order to support decision-making and guide the sustainable development, sensitive to the nexus policies. The proposed optimization model seeks to identify the optimal solution including economic, environmental and social aspects that satisfy the stakeholders. The model is applied to a case study in the Sonora desert, Mexico. The results show that the proposed methodology is a suitable tool to evaluate multiple scenarios for the decision-making process.



E069

Time: 16:20-16:35

Impact of Building form on the Wake Flow Wind Potential

Dr. Biao Wang, Shuai Sun and Minglei Duan
North China University of Technology

Wind energy development is beneficial for urban sustainable environment. Thanks to new technologies, small and micro-size wind turbines that can adapt to urban wind environment are increasing these years. Urban wind development becomes more realistic and is proved to be achievable if the site and the turbine are well considered. Built environment has great impact on the wind flow. We have many articles doing research on the wind flow around some genetic building forms [1, 2], however, parametrical study of the impact of building form on the rear wind potential is hardly addressed.

E073

Time: 16:35-16:50

Community-Based Spatial Arrangement for Sustainable Village Environmental Improvement – Case Study of Candirejo Village, Borobudur, Indonesia

Dr. Titin Fatimah
Universitas Tarumanagara, Jakarta, Indonesia

This study focuses on spatial pattern arrangement initiated by village community in relation with the effect on environmental improvement. It takes Candirejo Village in

Borobudur, Magelang Regency as a case study. Candirejo Village, located about 3 km south east of Borobudur Temple, has been renowned as ecotourism village in the recent decade. A previous research shows that ir has a long history to reach the current achievement. The initiative had started around 1980 through a yard cleaning program. Village residents with gotong-royong spirit cut unnecessary and overcrowded trees inside their settlement area and replaced them with more productive trees. They also arrange their house yard and settlement area by planting greeneries. Therefore this study aims to reveal how community=based spatial pattern arrangement has brought positive effect for village environmental improvement. This study use field survey and interview as the primary data collection, and literature study as the secondary one. Research investigation analysis show that in 1980s Candirejo Village was a poor village with dirty and gloomy condition and also bad sanitation of yard cleaning program had results a better environment in Candirejo Village. As a result, they also got some awards from several village competitions. These achievements brought up a new motivation of village residents to participate the program on keeping their surrounding environment. It has raised pride and sense of belong among village residents. These efforts had lead to sustainable village environmental improvement.

E033

Time: 16:50-17:05

Acoustic Environment Research of Railway Station in China

Dr. Wu Yue, Kang Jian, Zhao Shuishan
Harbin Institute of Technology, China

The characteristics of railway station in China is that the entrance hall, ticket office, integrated waiting hall and auxiliary space are all concentrated in a large span space, forming a unified whole space. However, the large space of multi-function fusion results in a series of acoustic problems such as long reverberation time, high environmental noise and poor language articulation. Therefore, it is necessary to study the acoustic environment of railway station in China. In this study, the sound field characteristics of the typical railway station are studied to reveal its law of sound propagation. Secondly, subjective evaluation and objective experiment are carried out to study the acoustic environment and comfort in the waiting hall. Finally, based on the comparative analysis of various influential factors such as sound source and sound field, this paper puts forward some suggestions for the acoustical design of high-speed railway station.

E013

Time: 17:05-17:20

Pharmaceutical compounds electrotreatment by Pt anodes and effect on synaptic function

Morgana Bosio, Bianca Souza, Enrico Saggioro, Marcia Dezotti, João Paulo Bassin, Emília Quinta-Ferreira and **Prof. Rosa Quinta-Ferreira**
University of Coimbra, Portugal

In all parts of the world, thousands of compounds are used and disposed of every day and many of them are not degraded in conventional treatment plants. For this reason it is necessary an alternative to eliminate these compounds, preventing them from polluting rivers, lakes and oceans. This can be done through advanced oxidative

processes, such as the electrooxidation technology, which was applied in this work to a mixture of pharmaceutical compounds and to the individual drugs including alprazolam (ALP), clonazepam (CLP), diazepam (DZP), lorazepam (LZP) and carbamazepine (CBZ) at 100 µg.L-1. The mixture was studied with different types of electrolytes and the neurotoxic effect of the treatment was evaluated. The best degradations of the mixture compounds were obtained with NaCl (0.5 g.L-1), leading to complete degradation of CLP, LZP and CBZ after 30 minutes.

Session 5B—Biofuels & Bioproducts

Venue: Meeting Room | Time: 15:35-17:20

Note:
* The certification of Oral Presentations will be awarded after each presentation.
* For the Best Presentation of each session, it is encouraged to award to student author prior at the end of each session.
*To show the respect to other authors, especially to encourage the student authors, we strongly suggest you attend the whole session, the scheduled time for presentations might be changed due to unexpected situations, please come as early as you could.
*Session Photo will be taken at the end of the session.

E016

Time: 15:35-15:50

Growth Kinetics of Bacillus subtilis for Pyrene Biodegradation

Hanif Yuliani, **Ms. Meka Saima Perdani**, Meilani Manurung, Muhamad Sahlan, Anondho Wijanarko, **Prof. Heri Hermansyah**
Universitas Indonesia

Biodegradation of pyrene compound was catalyzed by multi-component enzymes, and the initial dioxygenase gene was used as key Bacillus subtilis C19 enzyme for aromatic ring structure degradation. The bacterial cell growth rates were also analyzed; it was fitted using Monod, Mason-Mallis, Haldane, Andrews, and Aiba kinetics models. The un-competitive inhibition mechanism of high substrate concentration proposed by Andrews model could be best fitted to experimental bacterial growth kinetic data. Further, the maximum specific growth rate (μ_{max}) has been found to be 0.0048 h^{-1}, the half velocity constant (K_s) was 0.0079 gL^{-1}, and the inhibition growth rate coefficient (K_i) was 0.2619 gL^{-1}.

E011

Time: 16:50-16:05

Production of Immobilized Extracellular Lipase from Aspergillus Niger by Solid State Fermentation Method Using Palm Kernel Cake, Soybean Meal, and Coir Pith as the Substrate

Ratri Kirana Prabaningtyas, **Ms. Dwini Normayulisa Putri**, Tania Surya Utami, **Prof. Heri Hermansyah**
Universitas Indonesia

Microbial lipase has shown great potentials as a biocatalyst due to its ability to perform hydrolytic activities at low temperature and pressure conditions. Many researches prove that agro-industrial 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 agro-industrial 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 enzyme 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 40 ^{o}C and 50 hour cycle. Immobilized enzyme has 47.3% biodiesel yield and maintained 57% of its initial activity after four cycle of interesterification.

E004

Time: 16:05-16:20

Optimization of Major Environmental Parameters to Degrade Scrap Tyres by Bacillus SP.

Weng Chon Lao, Renata Alves de Toledo, **Assoc. Prof. Hojae Shim**
University of Macau

The possibility to degrade spent rubber and tyre waste using microorganisms to reduce environmental threats has been considered. The present study investigated the optimization of major environmental parameters (pH, temperature, dissolved oxygen concentration, inoculum size, and tyre surface area) that would enhance the Bacillus sp. growth, an indigenous bacterial isolated from scrap tyres. The optimal conditions were determined as pH 7, 30°C, 6.7 mg/L dissolved oxygen, 10% (v/v) inoculum size, and 120 mm^2 tyre surface area. Further detailed investigation is under way to pinpoint the exact organic compound(s) leached out from tyre, as growth substrate(s) for Bacillus sp.

E005

Time: 16:20-16:35

Butanol Production by Clostridium beijerinckii from Pineapple Waste Juice

Dr. Vorapat Sanguanchaipaiwong and Noppol Leksawasdi
King Mongkut's Institute of Technology Ladkrabang (KMITL)

Renewable energy has received increasing attention, due to global energy crisis and limited supply of fossil fuels. Butanol is one of the alternative biofuels with the similar energy properties as gasoline, such as, energy density and heat of vaporization. It could be produced by Clostridia via acetone-butanol-ethanol fermentation from various renewable sources. To obtain economical raw materials, pineapple waste juice was utilized as a carbon source for Clostridium beijerinckii TISTR 1461. The juice was collected from 'Pattavia' pineapple waste and utilized to prepare culture medium. The maximum viable C. beijerinckii concentration (2.40 ± 0.12 x 10^8 CFU/mL) was obtained at 168 h of cultivation with pineapple waste juice under anaerobic condition at 37 °C. The butanol concentration of 3.14 ± 0.16 g/L was subsequently produced. A yield of 0.08 g $_{butanol}$·g^{-1} $_{reducing\ sugars}$ was achieved suggesting the necessity to improve fermentation process for higher level of butanol concentration.

E007

Time: 16:35-16:50

Co-Digestion of Food Waste and Domestic Wastewater–Copper Supplementation to Enhance Biogas Production

Mr. Pak Chuen Chan, Renata Alves de Toledo, Hojae Shim
University of Macau

This work aims to study the effect of copper supplementation (as $CuCl_2$), at different concentrations (10, 30, and 50 mg/L Cu^{2+}) to enhance the conversion of organics present in a mixture of food waste and domestic wastewater (0.183, v/v) to biogas. The UASB reactor was operated under mesophilic conditions (35±0.1°C) at hydraulic retention time of 10 days in the intermittent feed mode (48 h feed/48 h feedless). Regardless of the Cu^{2+} concentration supplemented, a higher cumulative biogas yield (260-329 mL CH_4/g $COD_{removed}$) was obtained compared to the control without supplementation (175 mL CH_4/g $COD_{removed}$). The microelement supplementation reduced the amount of short chain fatty acids accumulated in the reactor by 35%, stimulating the methane production.

E026

Time: 16:50-17:05

Bioethanol Production from Nannochloropsis Gaditana in Municipal Wastewater

Dr. Melih Onay
Van Yuzuncu Yil University, Turkey

This study aimed to produce bioethanol from Nannochloropsis gaditana in various municipal wastewaters. Microalgae were cultivated at 24 ± 2 with f/2 medium for control. Bioethanol yields of of Nannochloropsis gaditana in various municipal wastewaters (0, 30, 60 and 100 %) range from 70.3 ± 2.4 mg. g $biomass^{-1}$ to 94.3 ± 5.5 mg. g $biomass^{-1}$ and % 30 of wastewater had the highest bioethanol yield (94.3 ± 5.5 mg. g $biomass^{-1}$). These findings suggest that Nannochloropsis gaditana in different municipal wastewaters can be used for bioethanol production after wastewater disinfection process.

E053

Time: 17:05-17:20

Evaluation of Bioactivities of Delonix regia Extracts from Different Regions of Thailand

Dr. Suttijit Sriwatcharakul
King Mongkut's Institute of Technology Ladkrabang, Thailand

This research is to study bioactivity of Delonix regia flower and leaf extracts collected in Thailand. We analyzed for efficacy of free radical scavenging and found that flower and leaf extracts from Samut Prakarn showed the strongest percentage of reduction with IC_{50} 50.21 and 105.0 mg/ml, respectively. The result of evaluated phytochemicals revealed that Chon Buri's flower extract had the highest of total phenolic and tannin contents at 200 mg GAE/g extract and 32 mg TAE/g extract, respectively. Furthermore, Samut Prakarn's flower extract had the highest flavonoid compounds at 328.5 mg QE/g extract. To examine cytotoxicity on breast cancer cell

lines, we found that Samut Prakarn's flower extract had the most cytotoxicity CC_{50} value, 5000 µg/ml. In conclusion, we found that the flower of Delonix regia is the promising part for the further study because the antioxidant activity and cytotoxicity strongly enhances when flower extract concentration is increased.

Poster Session

OF012

Research on Changes of Soil Organic Carbon in Abandoned Homestead of Weibei Loess Upland after Land Remediation—A Case Study in Chengcheng County, Shaanxi Province, in China

Mr. Chendi Shi, Huanyuan Wang, Juan Li, Yuteng Li and Ao Zhang
The Shaanxi provincial Land Engineering Construction Group co., LTD.

Through the research and analysis of the changes in the content of soil organic carbon (SOC) before and after the remediation of the abandoned homestead in Chengcheng County and SOC changes after nearly ten years remediation and cultivation, the paper makes a thorough investigation of influence of the pre-remediation and post-remediation of abandoned homestead together with many years cultivation on the change of SOC content, before and after being remedied and after many years of cultivation. The result shows that: After the remediation, the content of SOC in the layer at the depth of 0~20cm, 20~40cm is reduced, and the SOC content in the layers of 40~60cm is increased. After five years of cultivation, the soil depth is 20~40cm is the maximum increase. The average content of SOC in abandoned homesteads after being remedied and cultivated for ten years is only about half of the average content of SOC in maturity farmland.

OF002

Towards Measuring the Water-Energy-Food Nexus: The Case of Latin America and the Caribbean Region

Prof. Jürgen Mahlknecht and Ramón González-Bravo
Instituto Tecnológico y de Estudios Superiores de Monterrey

The Water-Energy-Food Nexus is a conceptual framework for analyzing and managing natural resources for life and sustainable development. It is well known that these three sectors are intrinsically related. Under this statement, this paper presents an actual overview of the current state of the water-energy-food nexus in Latin American and The Caribbean countries. The analysis presents the water, energy and food security index for each country. The proposed index comprises three key indicators per sector, considering availability, access, and stability of sector's resources. The obtained results show that all three sectors need more attention for future development, especially in the Caribbean countries.

P005

Tropical Rainforest Destruction and Climate Change: the Interface and Its Implications for Sustainable Forest Conservation Policy

Dr. Choy Yee Keong
Keio University, Korea

The world's largest green lung is made up of the tropical rainforest in Congo Africa, South America and Southeast Asia. This vital green lung regulates global warming and climate change. Together, the three forests serve as important carbon sinks, storing billions of tons of carbon while at the same time absorbing roughly one to two billion tons of carbon from the atmosphere per year. However, today, this mega green lung is rapidly being dissected and extensively transplanted with oil palm and rubber plantations, and commercial soya farms. Large swathes of forests have also been cleared for industrial timber harvesting, mega-dam constructions, and cattle ranching. These unsustainable commercial practices serve to aggravate the carbon concentration in the atmosphere and threaten to destabilize global climate conditions.
In this paper, I examine empirically the extent of deforestation in the mega green lung regions mentioned above and hope to drive home the impact of deforestation on the critical ecological function of rainforests which touch the core of human existence. Some of the issues under consideration include bio-sequestration properties and abedo effects on surface-energy balance in maintaining and sustaining stable climate conditions. This line of analysis allows us to see the clear connection between an ecological healthy rainforest system and long term human survival. With reference to a specific case study in Malaysia, I further propose alternatives to the current unsustainable forest use practices based on forest zoning. In moving towards a sustainable forestry management, policy-makers need to have an integrative and scientific understanding of the critical life-support functions of the forest ecosystems, and ensure a balance between commercial use of forest resources and ecological conservation of forest ecosystems through zoning processes.

P001

Study Of Sonocatalytic Degradation Of Food Dye With Two Different Morphological Of Zno Catalysts

Insaf Ould Brahim, **Prof. Mohamed Belmedani**, Hocine Hadoun, Ahmed Belgacem, Ahmed Haddad
USTHB, Algiers, Algeria

In this study, the trade ZnO nanocrystalline and the ZnO nanoparticle prepared by sonochemical process (using ultrasound (US)) with the Zinc acetate dehydrate Zn(CH3COO)2 precuror and without surfactants were used for the degradation of food dyes.
The characterizations were carried by X-Ray Diffraction (DRX), FTIR, scanning electron microscopy (SEM) after synthesis ZnO and compared with the trade ZnO, and after sonocatalysis of food dye.
The results obtained indicate that the yield obtained by sonocatalysis food dye with nanocrystalline ZnO is better than the yield obtained using the synthesis nanoparticle for 50 mg/L of food dye. The morphology of ZnO plays an important role in the percentage of sonocatalysis degradation of food dye.

P014

VOC Emission Profiles from Gasoline and Diesel Vehicles in Mexico City

Assoc. Prof. Griselda González-Cardoso and Violeta Mugica-Alvarez
Universidad Autonoma Metropolitana-Azcapotzalco

In order to know the most reactive species that contributes to ozone formation the Secretary of Science and Technology of Mexico City (SECITI) supported this research to developing VOC emission profiles from gasoline and diesel vehicles. Sampling campaign for VOC emissions of light duty gasoline vehicles was performed in a tunnel, whereas diesel emission VOC samples were taken in a bus terminal and a truck cargo, using stainless steel canisters followed by gas chromatography to identify the VOCs. Emission profiles from light duty vehicles had significant differences with VOC emission profiles of diesel vehicles (<0.05). Most abundant VOC from gasoline vehicles were alkanes accounted with 50% of emissions, acetylene contributed with 10% and aromatics with almost 20%. In the case of diesel emissions aromatic contributions was up to 30%, olefin were more than 50% and alkane contributions of 20%. Acetylene accounted up to 6% in both cases of diesel vehicles.

P019

Energy and Economic Analysis of Flat-Plate Solar Collector Using CuO Nanofluid

Mr. Woobin Kang, Yunchan Shin, Honghyun Cho
Chosun University, Republic of Korea

The performance experiment of flat-plate solar collector using CuO nanofluid and water as a working fluid was carried out. The efficiency of flat-plate solar collector was investigated according to the concentration of CuO nanofluid and was compared to that using water. The maximum efficiency was 73.5% when 40 nm-0.5 vol% CuO nanofluid was used. When 40 nm-0.5 vol% CuO nanofluid was used in a flat-plate solar collector, the efficiency was improved by 10.6% compared to that using water. The economic analysis of flat-plate solar collector using CuO nanofluid was performed and compared to that using water. The economic analysis result, the highest electricity cost reduction was in Germany, which was 364 dollars, while the lowest cost reduction was in Korea, which was 137.9 dollars. Through this study, it was confirmed that electricity and energy consumption were reduced effectively when CuO nanofluid was applied into the flat-plate solar collector.

P020

Performance Analysis of Three Types of Solar Collectors with Various Working Fluids

Ms. Minjung Lee, Yunchan Shin, Honghyun Cho
Graduate school of Chosun University, Korea

Simulation study on the performance of three types of solar collectors based on the thermodynamic model using CuO and Al_2O_3-nanofluid were carried out. The maximum efficiency of the flat-plate, U-tube, and heat pipe solar collector was 73.4%, 70.7%, and 74.5%, respectively, when the CuO was used as the working fluid. When the Al_2O_3-nanofluid was used as the working fluid into the three types of solar collectors, the efficiency of flat-plate, U-tube, and heat pipe solar collector was

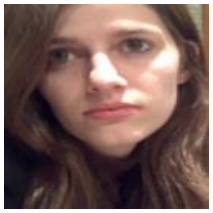
72.3%, 69.8% and 73.7%, respectively. Compared the performance of solar collector, the efficiency of three types of solar collectors using CuO-nanofluid was higher than those using Al_2O_3-nanofluid, However the difference of efficiency of solar collector between solar collectors was not significant. The efficiency of solar collector using CuO-nanofluid was increased by 1.52%, 1.36%, and 1.05%, respectively, for the flat-plate, evacuated U-tube, and heat pipe solar collector, compared that using Al_2O_3-nanofluid.

P003

Vegetable Tanning: Sulfited Black Liquor and Pine Extract Effect

Ms. Vania Filipa Silva, Ricardo Soares, Alfredo Crispim, Filipe Crispim
CIETI/ISEP

The tanning industry transforms animal hides and skins, a natural material, easily putrescible, into leather, a flexible material, not putrescible, used in footwear, leather goods, upholstery and clothing industries. The tanning process is commonly made with chromium salts that can have some health and environment problems. So, an effort has been made to find alternatives to chromium tanning with vegetable tanning being one of them.
In the present work, black liquor from sulfite paper pulp and different vegetable extracts were studied in the vegatble tanning process. Bovine limed skin splitted at 2.5/3.0 mm was used. Quebracho, Mimosa, natural and sweetened Chestnut, common extracts used in vegetable tanning, and also pine extract were tested. The effect of the different tanning agents used was evaluated by determination of the leather shrinkage temperature. The tanning process was the same for all the vegetable extracts tested using black liquor from sulfite paper pulp as a dispersing agent and eight different combinations of the vegetable extracts.
The extracts were commercially purchased, exception for the Pine extract which was obtained by direct contact extraction of crushed pine bark using water as solvent. The extraction was carried out in an open vessel at about 100ºC. and the obtained extract was then concentrated and used in the skin tanning process.
The obtained results allow to separate the tanned skins into two groups. The first group, corresponding to the samples of the first four trials, showed shrinkage temperatures between 68 and 69ºC. The extracts used in this group were Quebracho, sweetened Chestnut and combinations of these two extracts with natural Chestnut. The second group, corresponding to the samples of the second four trials, showed shrinkage temperatures between 75 and 77ºC. The extracts used in this second group were Mimosa and Mimosa combined with natural Chestnut and Pine. In the tests carried out, the substitution of natural Chestnut extract by Pine extract didn't changed the shrinkage temperature and the better results of the second group show a better performance of Mimosa, may be due to the better penetration of this extract.



P025

Leather Rettaning: Compact Processes and Environment

Ângela Queirós, Magdalena Tomaszewska, **Ms. Vânia Silva**, Alfredo Crispim, Filipe Crispim, Juliana Duarte
CIETI/ISEP

Environment is a global concern. There are more and more legal requirements set

as an effort to protect the environment. Thus, it becomes necessary to develop and adapt alternative and clean processes.
The tanning industry transforms animal hides and skins, a natural material, easily putrescible, into leather, a flexible material, not putrescible, used in footwear, leather goods, upholstery and clothing industries.
The process of transforming animal skin into leather uses a wide variety of chemicals, some of which have a significant environmental impact, which has increasingly led to a tendency to replace them with products with a lower environmental impact and which, at the same time, contribute to the sustainability of the planet.
The pulp and paper industry produce as a by-product the known black liquor which shows a large field of applications.
The main goal of this study was to prepare a compact product for leather retanning process using the black liquor and finding its environmental impact on leather treatment process in comparison with standard process.
There were made 10 leather retanning trials. One of them was a standard retanning process, to which compact retanning processes were compared. Compact processes varied through amount of added compact product, kind of compact product, time of dye action, temperature of retanning process and time of formic acid action. The compact retanning process was distinguished by the fact that the compact product was added instead the various products used in the standard retanning process and the quantity of water used was lower. Leather and wastewater from the different processes were evaluated.
The wastewater resulted from the compact process showed the lowest values of COD (chemical oxygen demand), TS (total solids) and SS (suspended solids), and similar values of mechanical resistance for the leather obtained in comparison with standard process.
From these results, it can be concluded that the compact product formulated has some advantages comparatively to a standard process concerning the environmental impact.

P026

Leather Softness with Enzymes: Better Solution for the Environment

Ms. Ângela Queirós, Alfredo Crispim, Filipe Crispim, Paul Salgueiro
CIETI/ISEP

The tanning industry transforms animal skin in leather, material with sufficient thermal stability to be used for various purposes: footwear, leather goods, furniture, clothing and car upholstery.
The skin treatment process for leather undergoes a phase of unhairing, mechanical fleshing and splitting to adjust the thickness. After this phase, the skin is delimed to eliminate the lime used in unhairing, pickled for reduction of pH and tanned in order to promote their thermal stabilization. Thereafter, the skin is sammed, shaved to adjust the thickness and subjected to a process of dyeing, drying and finishing involving some mechanical operations.
The novelty seeking is a constant of the fashion world to promote products more appealing. The light and soft leather demand is a constant that needs study and development to be achieved with different origins for skin and different thicknesses.
On the other hand, environment is a global concern and there are more and more legal requirements set as an effort to protect the environment. Thus, it becomes necessary to develop and adapt alternative and clean processes. The process of transforming animal skin into leather uses a wide variety of chemicals, some of

which have a significant environmental impact, which has increasingly led to a tendency to replace them with products with a lower environmental impact and which, at the same time, contribute to the sustainability of the planet.
The main goal of this study was the application of enzymes in the retanning, dyeing and fatliquoring phases of the leather treatment in order to promote an adequate softness, lightness and elasticity minimizing the use of fats and resins that have a negative environmental impact on the wastewater resulted. For that, enzymes were tested in different levels of concentration and time at its optimum conditions of temperature and pH application.
From the results obtained it was possible to achieve a leather product very soft, light and elastic using a protease with a good activity for the collagen and elastin, skin proteins. In this way, the environmental impact was reduced taking into account the biodegradability of the enzyme.

P027

Hydrogen Production Under Visible Light Irradiation on CaTiO3:Cu Prepared by Spray Pyrolysis with Polymeric Additive

Dr. Sung Nam Lim, Sine Ae Song, **Dr. Ki Young Kim**
Korea Institute of Industrial Technology

Hydrogen generation from water splitting with photocatalyst is an attractive field owing to growing concerns about environmental issues for fossil fuels. Since photocatalytic water splitting with TiO_2 was first reported, many groups have made efforts to develop photocatalyst with high photocatalytic activity. Among them, calcium titanate with perovskite structure is well-known as photocatalyst with high photocatalytic activity, good chemical stability and low cost. However, it only works under UV light owing to its large band-gap energy. Many studies have reported that transition metal doping into UV-light-photocatalyst is a promising method to have activity under visible light.
In this study, $CaCu_xTi_{1-x}O_3$ ($0 \leq x \leq 0.02$) was prepared by spray pyrolysis to investigate effect of copper doping. And the hydrogen generation of prepared photocatalyst was examined under visible light. In addition, the effect of particle size and surface area on photocatalytic activity was also investigated by adding polymeric additive.

P030

Non-metallic Components in Severe Accident Condition of Nuclear Power Plants

Dr. Kyungha Ryu, Taehyun Lee, Inyoung Song, and Youngjoong Kim
Korea Institute of Machinery and Materials

The materials of non-metallic components widely used in class 1E equipment are relatively vulnerable to severe environments such as high temperature and radiation environment during the severe accident (SA) of nuclear power plants (NPPs). Therefore, to ensure the integrity and performance of the safety-related equipment, degradation effect of SA on polymer must be investigated. To evaluate the equipment survivability (ES) of the polymer used in sealing materials, Viton, effect of thermal degradation under SA environment in NPPs was investigated.
To evaluate the degradation effect of radiation and heat during normal operating condition and SA environment, hardness measurement and tensile test were carried out. And FT-IR analysis was conducted to investigate the molecular structure and

bonds. The mechanical properties were not changed significantly in pre-aging, normal operating condition. But radiation of SA environment significantly affects the mechanical properties of fluoroelastomer and molecular structure, such as C=O formation.

P031

Development of a Core-Shell Heterojunction Ta-NRs/BaTaO2N Photoanode for Efficient Solar Hydrogen Production

Dr. Yuriy Pihosh, Masao Katayama, Taro Yamada, Yutaka Sasaki and Kazunari Domen
The University of Tokyo, Japan

An efficient conversion of solar energy to hydrogen via photo-electrochemical water splitting on semiconductor materials is a strategic goal of sustainable energy research. Barium-tantalum oxynitride ($BaTaO_2N$) is one of the promising photocatalytic materials for water splitting with the theoretical photocurrent density value of ~17 mA cm^{-2}. However, this material has poor electron transport properties due to a high recombination rate of photo-generated carriers. As a result, the carrier diffusion length is much shorter than the thickness required for sufficient light absorption. In order to overcome this problem, a core-shell heterojunction nanostructure of Ta_3N_5-NRs (core) / $BaTaO_2N$ (shell) has been proposed and realized. The fabricated photoanodes show the highest photocurrent of 5.5 mA cm^{-2}. The NRs morphology did not significantly change after making the $BaTaO_2N$ shell, and thus we expected a significant increase in the photocurrent value, if the thickness of the $BaTaO_2N$ shell on Ta_3N_5 NRs reaches 30-40 nm.

P033

A Eucalyptus Green Water Scarcity Footprint

Dr. Paula Sofia Gil Neto Quinteiro
University of Aveiro, Portugal

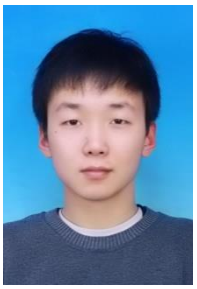
Currently in Portugal, an annual production of 90 thousand tons of biomass ash from energy production is estimated, typically disposed in landfills (around 90%), making urgent the search for alternative usages for biomass ash. A possibility for the ash valorization includes its incorporation in construction materials, therefore, this study evaluated the environmental impacts of different ash management: cement mortar, concrete blocks and bitumen asphalt. An attributional life cycle assessment was used to perform this evaluation. The results show that concrete production scenario with ash presented the best performance in all impact categories under study. The avoided burden in climate change impact category was 1070 kg CO_2-eq, but the difference for the cement mortar scenario is lower than 2%, indicating that this can also be an appropriate alternative. However, the avoided burdens in the asphalt production with ash were not enough to compensate the impact caused by ash processing.

P046

Two Dimensional Titanium Carbides Nanomaterials (MXene) for Adsorption of Cr(VI) from Aqueous Solution

Dr. Chenhui Yang, Yi Tang and Wenxiu Que
Xi'an Jiaotong University, China

Herein we report on a novel two-dimensional layered Ti_3C_2 nanomaterial (MXenes) with adsorption of Cr(VI) from aqueous solution, formed by etching Al from Ti_3AlC_2 in HF. Ti_3C_2 nanosheets were well characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), and transmission electron microscope (TEM), and the physical property of as-obtained samples was studied by UV-vis diffuse reflectance spectra (DRS). After HF treatment, not only Ti_3AlC_2 has a phase transition from one crystal to another, but surprisingly, its microstructure is also undergoing an obvious change. Ti_3C_2 with product of change possesses a novel accordion-like multilayer structure, and its specific surface area is an order of magnitude higher than untreated Ti_3AlC_2. Then, Ti_3C_2 with a high specific surface area has a large enough area for pollutant removal and functionalization. Therefore, the results suggest that MXenes are promising as an effective nanoadsorbent in heavy metal removal from the wastewater.



P048

The Passivation and Structural Effects on Restraining Hysteresis Behavior of Inverted Perovskite Solar Cells

Dr. Jie Liu, Xingtian Yin, Yuxiao Guo, Wenxiu Que
Xi'an Jiaotong University, China

Along with the improvement of power conversion efficiency, organic-inorganic hybrid perovskites based solar cells have been facing hysteresis phenomenon, which is closely related to the stability and efficiency evaluation. As for PCBM based inverted perovskite solar cells, PCBM is always considered as a passivator helping restrain hysteresis. However, we find that the devices with a structure of FTO/NiO_x/$MAPbI_3$/PCBM/Ag show nearly no hysteresis, while the devices with a structure of FTO/PCBM/$MAPbI_3$/spiro-OMeTAD/Ag perform obvious hysteresis. By comparing the hysteresis behaviors of both structures, we analyze the passivation and structural effects of PCBM. Based on the results of electrochemical impedance spectroscopy, PCBM coating onto perovskite layer enhances the electron transport and decrease the junction capacitive effect for PCBM can infiltrate into the perovskite grain boundaries of layer increasing the contact area. This work connects the interfacial effects and hysteresis behavior, and provides a method to remove hysteresis phenomenon of perovskite solar cells.

P050

Post-Annealing Engineering on the Thermal-Decomposed NiOx Hole Transport Layer for Perovskite Solar Cell Application

Mr. Yuxiao Guo, Xingtian Yin, Jie Liu, Haixia Xie and Wenxiu Que
Xi'an Jiaotong University, China

NiO_x film by decomposing the solution-derived $Ni(OH)_2$ film has been used as

superior hole transport layer in the perovskite solar cells, which possesses better electron blocking and hole extraction properties for its suitable work function and high conduction band edge position. However, the post-annealing process is vital for the complex decomposition. Herein, different conditions (temperature and atmosphere) has been tried in the $Ni(OH)_2$ decomposition for transparent and high-crystalline NiO_x. Reasonably, the post-annealing treatment could greatly affect the $Ni(OH)_2$ decomposition and the quality (discrepant crystallinity, morphology and transmission) of the agminated NiO_x nanoparticles, which definitely leads to a wide range of the final device performance. As a result, a postannealing process of 400 °C/2 h in air significantly promotes the photovoltaic properties of the NiO_x layer and the further device performance with a power conversion efficiency (PCE) of 13.89%.

P052

Embedding Ultrafine Nickel Oxide Nanoparticles in Three-Dimensional Reduced Graphene Oxide for Supercapacitor Application

Dr. Yangyang Luo, Wenxiu Que, Jie Liu and Xingtian Yin
Xi'an Jiaotong University, China

Ultrafine nickel oxide (NiO_x) nanoparticles (3-5 nm) having a good crystallinity and dispersibility were synthesized by a simple solvothermal method. With the integration of graphene oxide (GO), the NiO_x/rGO hybrids were successfully prepared. The NiO_x/rGO exhibits a three-dimensional (3D) porous skeleton structure, and the abundant ultrafine NiO_x nanoparticles uniformly deposit on the surfaces of rGO sheets. The structural advantage of NiO_x/rGO endows it with a high specific surface area and excellent conductivity, which can accelerate the permeation and shorten the diffusion path of electrolyte ions. The NiO_x/rGO electrode demonstrates a remarkable electrochemical performance than that of pure nickel oxide nanoparticles, which is ascribed to the 3D porous hybrid structure and the improved electrical conductivity. Our work provides a promising and feasible strategy for the high-performance supercapacitors.

P058

The Study of the Benefit of Biodiversity Conservation of Green Buildings by the Sustainable Green Energy Ecological Shelter

Hsiao-Ling Lu and **Prof. Yuan-Hsiou Chang**
MingDao University, Taiwan

In order to implement the four indicators of biodiversity, green energy and water resources in the concept of green building, this research will continue this year's Ministry of Science and Technology plan "green building water reuse facilities combined with green energy aquaponics system (MOST 105-2221-E-451-003) ", and with the recent government and civil society to promote the organic and natural agricultural research and development the "Sustainable Green Ecological Shelters (patent No. M532152)" By the land, water and sky comprehensive ecological conservation, and can attract beneficial insects to achieve the purpose of plant disease and pest control. In this study, the sustainable green energy ecological shelter is 50cm in length 50cm in width and 100cm in height. The size of underwater net is 50cm in length, 50cm in width and 30cm in height. There are 10 kinds of vegetables and flowers in each floating island, 20 species of native fish and shrimps

in each module. Evaluated for their ecological benefits; water purification benefits; flower growth benefits; agricultural growth; aquatic habitats; Insect diversity; and benthic diversity in water and so on. This equipment will be awarded the Gold Medal of IIIC International Innovation Competition in 2016, and TAIPEI LA EXPO Horticultural Landscape and Green Roof Design Exhibition will be exhibited in 2015, which will be popularized in the future. The future ecological shelter station can attract biological habitat, replace the purchase of bird cage to enjoy the ecological behavior. There is no photoelectric, green energy, environmental protection, artificial ecological habitat conservation, organic agriculture and fisheries and landscape design integration related research, this study is innovative and forward-looking, hoping for the construction and landscape design to provide useful information on equipment applications.

P061

Development of the Film-Type Supercapacitor with Flexibility and Transparency

Taeuk Kim and **Assoc. Prof. Sangeun Chun**
Kyungpook National University, Korea

There is an increasing interest in wearable electronic devices capable of changing shapes. Furthermore, the demand for the transparent electronics is increasing for various applications including displays. Therefore, this study endeavored to develop a flexible transparent supercapacitor as a power source for flexible transparent electronic devices. The primary components of the supercapacitor were prepared with the following materials. Activated carbon fiber was used as an active material, and an ITO film was used as a current collector for transparency. The gel electrolyte made from PVA and Na_2SO_4 was employed for easy assembly of the cell. Two electrodes made of the activated carbon electrophoretic deposited on ITO substrate were assembled with the gel electrolyte. Since the gel electrolyte prevents the contact of two electrodes, the additional separator was not employed. The assembled cell was packaged using a transparent flexible PDMS. The electrical conductivity of the fabricated cell was measured by impedance spectroscopy. The electrochemical performances of the assembled cell were evaluated by cyclic voltammetry and galvanostatic charging/discharging.

P064

Epitaxial Growth of Bandgap Tunable ZnSnN2 films on (0001) Al2O3 Substrates

Duc Duy Le, Trong Si Ngo, and **Prof. Soon-Ku Hong**
Chungnam National University

Growth of $ZnSnN_2$ films on (0001) Al_2O_3 substrates is performed by plasma-assisted molecular-beam epitaxy by changing the growth temperatures from 350 to 650 °C. Single crystal $ZnSnN_2$ films have been grown by using ZnO buffer while the film grown without the ZnO buffer has shown amorphous-like disordered characteristics addressed by no observation of any diffraction from reflection high-energy electron diffraction. All the grown crystalline $ZnSnN_2$ films with ZnO buffer show a pseudo-wurtzite structure without the formation of an orthorhombic structure. Epitaxial relationships between Al_2O_3 substrate, ZnO buffer, and ZnSnN2 film are determined to be [11-20] $ZnSnN_2$ // [11-20] ZnO // [10-10] Al_2O_3 and [0001] $ZnSnN_2$ // [0001] ZnO // [0001] Al_2O_3. The bandgaps of $ZnSnN_2$ films could be tuned from 1.85 to 2.15 eV, simply by increasing the growth temperatures from 350 to 650 °C. The carrier concentrations and carrier mobilities were investigated and compared.

P071

Ray Tracing Analysis of A Linear Fresnel Solar Concentrator

Dr. Danilo Carvajal
Universidad de La Serena, Chile

Linear Fresnel collectors are commonly designed with single axis tracking systems in order to maximize collection of direct solar radiation across the day. Expensive tracking systems in terms of capital and maintenance costs are used, which is directly related to the end use of solar energy for solar concentrators: usually steam generation for power plants. These plants require 24 hours by day steam supply, therefore in order to ensure power output, sun tracking systems, thermal energy storage and/or fossil fuel based auxiliary systems are usually used. This paper focused in low to medium temperature applications in which 24 hours by day operation is not required, such as solar thermal desalination and industrial process heating, among others. Through a one year-based three-dimensional transient ray tracing analysis of a linear Fresnel collector without tracking systems (receiver and absorber) was carry out. The results showed that this configuration can yield high energy outputs at least for 3 hours by day which can represent a 30 % energy output of a typical sun tracking based system.

EP003

Analysis of Influence Factors of Disaster Prevention Capacity in Urban Green Space Based on Analytic Hierarchy Process

Dr. Yi Liu, Shanshan Zhang, Tian Wang
Harbin institute of technology, China

Urban green space is the basic element for maintaining the stability of urban ecological environment and building urban environmental management systems. The research aims to explore the connection between urban green space and emergency medical management. By means of the relevance of the green space and the urban disaster prevention systems, the emergency medical capability characteristics of green space based on the environment and audience psychology are obtained. Taking Zhaolin Park in Harbin City as an example, the influential factors of the emergency medical capability characteristics of green space were extracted, and then using the method of quantitative analysis carried out quantitative research for influential factors of emergency medical management in the green space. The research results also play a promotional role in the disaster prevention management of urban green space

EP002

Research on the design of the "independent-combinatorial" mobile disaste emergency unit in the cold area

Dr. Tian Wang, Shanshan Zhang and Yi Liu
Harbin Institute of Technology, China

Through the study the existing problems of emergency medical space in severe cold region, and the existing mobile emergency medical space is based on two types of operation modes "independent " and "combined", a mobile emergency medical

space system with "independent and combined" operating mode is constructed.
This study adopts the method of modular design, the overall functionality of a mobile emergency medical space, modules functions and components function separately, make the type of component used in a variety of modules, different modules constitute multiple system.
In the domain of the sustainable design for mobile disaster response space, the goal is to make effective use of medical resources, improve rescue efficiency and improve treatment environment.

EP009

Comparison and Analysis of Thermal Efficiency and Exergy Efficiency in Energy Systems by Case Study

Prof. Youyuan Shao, Hanmin Xiao, Baiman Chen, Simin Huang, Frank G.F. Qin
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This paper analyzes thermal efficiency, exergy efficiency, and their inherent relationship in energy systems. Two typical thermal equipment, steam boiler and steam turbine, are used for case study. It shows that the exergy efficiency may not be ideally high in a process even though it may have a high thermal efficiency. It is insufficient to evaluate a system’s energy saving by using thermal efficiency only. Therefore a comprehensive analysis of thermal- and exergy- efficiency should be adopted, and energies, with different grade, should be utilized in cascade to achieve an optimized energy saving for a thermal system or equipment.

EP011

IoT and A Sustainable City

Prof. Limin Liu
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IoT, Internet of Things, is a foundation for connecting things, sensors, actuators, and other smart technologies, thus enabling person-to-object and object-to-object communications. It is a hot point of research and development after internet. Its applications are concerned to smart transportation, intelligent shopping, smart product management, smart meters, home automation, waste management, sustainable urban environment, continuous care and so on. With the IoT, the resources, energy and environment for cities will be managed availably and profitably. In this paper, IoT and the bicycle sharing system, an example, are discussed. With the bicycle sharing system, the transportation of a city will be the more green and convenient. Therefore, IoT may become an important role in a sustainable and smart city.

EP013

Biochemical characterization of Phaeodactylum tricornutum for microalgae-based biorefinery

Ms. Monique Branco-Vieira, Sergio San Martin, Cristian Agurto, Marcos A. V. Freitas, Teresa M. Mata, António A. Martins and Nídia Caetano
LEPABE / FEUP

For biotechnological purposes, it is important to determine biochemical composition of microalgae biomass, for correctly addressing the valorization of the high-value compounds produced and enhancing the economic feasibility of the cultivation process. This study aims to analyze the biochemical composition of P. tricornutum cultivated at an outdoor pilot-scale bubble column photobioreactor under natural conditions in Chile, for biofuel and high-value compounds production in order to propose a P. tricronutum based biorefinery. The P. tricornutum biomass concentration is about 0.96 kg·m-3·d-1 with volumetric productivity of 0.13 kg·m-3·d-1. The samples showed a proportion of 7.85 wt% of carbohydrates, 38.40 wt% of proteins and 9.08 wt% of lipids. These findings suggest that P. tricornutum can be an alternative feedstock for biofuels production and high-value compounds commercialization, under a biorefinery approach.

E038

Construction of Conical Solar Concentrator with Performance Evaluation

Prof. Gwi Hyun Lee
Kangwon National University, South Korea

Conical solar concentrator (CSC), which has the corn angle of 45 degree was constructed for providing an attractive approach for high collecting efficiency. Conical solar concentrator was mounted on the dual tracking system, which is consisted of the linear actuator and slew drive with driving cycle of 6 seconds. Performance evaluations were carried out with different volumetric flow rate of 2, 4 and 6 L/min to find the influence of flow rate affecting on thermal efficiency. The results showed that solar collecting efficiency of the CSC system was 81.40% at a volumetric flow rate of 4 L/min, which was higher than that of other 2 and 6 L/min.

OF003

Study on the mechanism of SO2 removal by activated carbon

Dr. Bing Li and Chunyuan Ma
Shandong Branch of Huadian Electric Power Research Institute

SO_2 removal mechanism by activated carbon was investigated in a fixed bed reactor. The effects of SO_2, O_2 and H_2O concentration and adsorption temperature on SO_2 adsorption were studied. The results show that SO_2 initial adsorption rate increases with SO_2 concentration increasing, but decreases with adsorption temperature increasing. The reaction order for SO_2 is 0.896 when SO_2 is adsorbed at 65 °C. SO_2 initial adsorption rate constant and the reaction order for SO_2 decrease gradually with adsorption temperature increasing, and the activation energy in SO_2 initial adsorption stage is -16.344 kJ /mol, indicating that SO_2 adsorption on

activated carbon is unfavorable at higher temperature and SO_2 adsorption is the rate controlling step.

P008

The Biocidal effect of Thymol and Carvacrol on Marine Organisms: Possible Application in Ballast Water Management System

Mr. Beomseok Son, Sungmin Lee, Hyunwoo Kim, wonku Lee, and BuHyun Youn
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Ballast water is essential for maintaining balance and integrity of a ship. Exchanging ballast water resulted in mixing of seawater in recipient ports, which may cause ecosystem disturbance or marine pollution. Ballast water management (BWM) system is essential for the purification and disinfection of uptaken ballast water. As current BWM systems widely use biocides, but the chemical biocides may result in unintended toxicity after discharging. It can cause secondary environmental problems to marine organisms and humans. In this study, we suggested thymol and carvacrol as natural biocides for BWM systems and investigated their effectiveness using Artemia salina and Escherichia coli as models for the study. In our tests thymol and carvacrol showed biocidal effects and a combination treatment showed synergistic biocidal effects. Moreover, carvacrol naturally degrades after disinfection, which suggests that promising application of natural products to BWM to increase the efficacy and reduce unwanted toxicity.

P002

Sustainable Engineered Contaminated Soil Landfill Facility

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Kuwait Oil Company, Soil Remediation Group, Kuwait, Ahmadi

Kuwait Oil Company has initiated Soil Remediation from its oil fields to the damaged land, which occurred during the Gulf War 1991-1992. As part of UNCC Claim, approximately 26 million cubic meter of crude oil contaminated soils require remediation. As stipulated in the claim, the first soil remediation consists of two engineered landfills of 2.3 million cubic meters were constructed in (North/ South East) Kuwait to restore the landscape of the oil fields. The NK landfill system is comprised of a single composite liner High Density Polyethylene and geo-synthetic clay liner and, gatch materials to meet design permeability standards. The crude oil soils contained TPH ranging from 1% to 20% with an average of 4.0 %.
Landfilling is an option to contain hazardous, solid waste and/or municipal waste for undetermined period in a controlled environment for a long period. These wastes would naturally decay under field conditions. The unique KERP landfill was constructed for only crude oil contaminated soils. Typically, petroleum hydrocarbons contaminated soil is accepted as either daily covers for municipal landfills, recycling materials or mixed with more hazardous materials as blending materials for permanent containment.
The degradation process in containment system is biodegradation, which depends on the organic content, moisture content under first aerobic conditions and later after depletion of oxygen; it will proceed under anaerobic conditions. Gases such as Carbon dioxide, water, Methane and/or little hydrogen sulfide may be produced of minimal amounts and will be captured within the passive gas network and passed

through bio filters chambers to minimize gases emissions.
This paper attempts to evaluate and predict the various gases that could be emitted from the crude oil material landfill using existing models and discusses the application of bio filters principles during post closure to meet potential zero gases emissions. The operation and maintenance of the bio filters under amenable conditions in harsh environment is to minimize gases emissions (if any) and to sustain air quality during life cycle of the landfill. A comprehensive monitoring program is instituted as per international standards to monitor the production and treatment of gases.

P012

Ball Mill Pretreatment Technique for Improving Bioavailability of Biomass

Dr. Jin Hyung Lee
Korea Institute of Ceramic Engineering and Technology

Many countries have proposed the increase of renewable energy in the overall energy mix. Thereby, wind and solar energy play an important role. However, wind and solar energy are fluctuating and intermittent and have to be balanced for electric grid stability purposes. Therefore, stable production capacity should be reserved for renewable energy and biomass could be used for the resource of stable renewable energy production. In this presentation, ball mill pretreatment will be introduced to improve the bioavailability of organic solid waste or lignocellulosic biomass. Typically, lignocellulosic biomass has recalcitrance structure. Therefore, pretreatment step is needed to accelerate hydrolysis rate. Ball mill pretreatment is environmentally friendly method, which does not cause toxic byproduct. This study will introduce the use of ball mill to improve biogas production from food waste and fermentable sugar from corn stover.

P021

Performance Analysis of three types of Solar Collectors with various working fluids

Mr. Yunchan Shin, Woobin Kang, Honghyun Cho
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As the environmental pollution becomes worse, the interesting in renewable energy have accelerated. The solar energy is eco-friendly and has also the boundless energy. One of the common way to use solar energy is to use the solar collector. The currently used solar collector is a flat-plate solar collector. In this study, the performance of solar collector using Al_2O_3 nanofluid was analyzed according to the concentration of Al_2O_3 nanofluid. Energy and exergy efficiency of a flat-plate solar collector were analyzed using Al_2O_3 nanofluid and it compared with those using water. As a result, when the concentration of Al_2O_3 nanofluid was 1.0vol%, the maximum efficiency of flat-plate solar collector was 77.5% and it was 21.9% improve one compared to that of water. In addition, exergy efficiency was increased as the concentration of Al_2O_3 nanofluid and solar radiation was increased. Maximum exergy was 2.95% when the concentration of Al_2O_3 nanofluid was 1.0vol%.

P028

Renewable Energy R&D Investment Strategy based on Energy Conversion Policy in Korea

Dr. Kibong Kim
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Korea has promoted stabilization of energy supply-demand and security as energy policy issues for economic growth. However, due to the nuclear safety issues, the government announced 'Energy Conversion Roadmap' including expansion of renewable energy. According to the 'Renewable Energy 3020 Plan' announced later, the ratio of renewable energy generation will increase from 7.0% to 20.0% by 2030. To achieve the goal of 'Energy Conversion Roadmap', improvement of renewable energy technology competitiveness and stabilization of electric power system are needed. Government R&D investment in renewable energy and electric power needs to be continuously increased. For solar and wind power generation, in the short-term, R&D for cost reduction and localization should be promoted, and investment in the next generation technology is needed in the long term. To stabilize the electric power system, the government should focus on energy storage system, electric power transmission technology and electric power grid R&D.

P039

Removal of a Pharmaceutical Drug from Aqueous Solution by Using Activated Carbon Prepared from Date Stems.

Assia Djebri, Mohamed Belmedani, Mohamed Trari, **Prof. Zahra Sadaoui**
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This paper deals with the removal of pharmaceutical drug (Mebeverine hydrochloride) from aqueous solution by adsorption on activated carbon prepared from dates stems by chemical activation using $ZnCl_2$. The adsorption performance of Mebeverine hydrochloride (MB) was deeply investigated and carried out in batch system. The effect of various parameters such as contact time, solution pH and initial MB concentration were studied. The obtained results showed that the process was fast, equilibrium occurred within 30 min of contact. Furthermore, maximum Mebeverine hydrochloride removal of 90% was observed for MB concentration of 33.86 mg/L, pH= 5.68, T= 25°C and m=0.5g. The application of several isotherm models has shown that Dubinin-Radushkevich (DR) model described well the experimental data with a high correlation coefficient (R^2 =0.99). The maximum adsorption capacity of 4064 mg/g was found. The high value of adsorption capacity suggests the multilayer adsorption.

P047

Highly Dispersed S-NiFe2O4 Nanosheets on Mxene Modified Nickel Foam for Efficient Electrocatalytic Oxygen Evolution

Dr. Yi Tang, Chenhui Yang, Wenxiu Que
Xi'an Jiaotong University, China

Oxygen evolution reaction (OER) is the bottle-neck step in many important renewable energy applications. High-efficiency electrocatalysts, espically efficient

non-precious metal catalysts are very essential to overcome substantial overpotential and sluggish kinetics of this process. In this work, we report the synthesis of S-$NiFe_2O_4$ nanosheet on Ti_3C_2 wrapped nickel foam (S-$NiFe_2O_4$@ Ti_3C_2@NF) by a facile electrodeposition menthod. As a result, compared with the counterparts (S-Fe_3O_4@Ti_3C_2@NF, S-NiO@Ti_3C_2@NF, Ti_3C_2@NF), the S-$NiFe_2O_4$@Ti_3C_2@NF hybrid electrode could exhibit superior OER activity, which requires only 1.50 V vs. RHE to afford a current density of 20 mA cm^{-2}, a Tafel slope of 46.8 mV dec^{-1} and excellent stability in 1 M KOH. The excellent OER performance is attributed to the favorable 3D hierarchical structure, abundant active sites, low charge transfer resistance provided by the synergistic effect between the Ti_3C_2 maxtric and S-$NiFe_2O_4$ nanosheets.

P049

Low Temperature Derived TiO2-SnO2 Bilayered Electron Transport Layer for High Efficiency Planar Perovskite Solar Cells

Dr. Haixia Xie, Xingtian Yin, Jie Liu, Xiaoyu Guo, Peng Chen, Wenxiu Que, Gangfeng Wang
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Flexible perovskite solar cells are attracting an increasing attention. Traditional inorganic metal oxide electron-transport layers based devices though have the high efficiencies, generally require a high-temperature annealing process, which do not lend themselves to flexible subtract. Here we report a low-temperature derived TiO_2-SnO_2 bilayered electron transport film for an enhanced efficiency perovskite solar cells. The bilayered TiO_2-SnO_2 film exhibits efficient electron extraction and hole blocking ability even at a low processing temperature of 150 ^oC. The as-obtained cells exhibit a champion power conversion efficiency of 18.78% (V_{oc} = 1.10 V, J_{sc} = 22.21 mA·cm^{-2} and FF = 0.769) under one sun illumination, which is much higher than the devices based on individual SnO_2 or TiO_2 electron transport layers. The higher electron extraction driving force at the SnO_2/perovskite interface and the stronger hole blocking ability at the TiO_2/FTO interface are suggested to be the main reasons for the improved performance.

P053

Flexible and Freestanding MXene/Graphene Hybrid Films as Electrodes of Supercapacitors with Outstanding Rate Performance

Mr. Tian Yapeng, Xingtian Yin, Ling Bing Kong, Wenxiu Que
Xi'an Jiao Tong University, China

Supercapacitors have drawn great attention due to high-power density. $Ti_3C_2T_x$ (MXene), a 2D high conductivity material, is of great potential for Supercapacitors for its outstanding chemical and physical characters. A strategy to prepare flexible and conductive MXene/Phosphorene hybrid films by mixing the $Ti_3C_2T_x$ nanosheets and P nanosheets layer by layer is proposed. As a result, the phenomenon of self-restacking of the $Ti_3C_2T_x$ nanosheets is effectively prevented, leading to an obvious increased interlayer spacing, which can accelerate the diffusion of electrolyte ions, thus enable more electroactive sites to become accessible. The freestanding $Ti_3C_2T_x$/Phosphorene electrode displays a capacitance of 162 F g^{-1} at 10 mV s^{-1} and an excellent rate capability with 63.5% capacitance retention even at 5000 mV s^{-1} with 6M KOH as electrolyte. The above electrochemical performances

make the high flexible and freestanding MXene/Phosphorene hybrid films based supercapacitors a candidate for the portable electronic devices.

P056

Production of Cellulase and Xylanase Using Food Waste by Solid-State Fermentation

Dr. Qiuyan Yuan and Mengmeng Tian Tian
University of Manitoba, Canada

With rapidly increasing urban populations and economic growth combined with a swiftly expanding catering industry, alternative food waste disposal technologies have become a major concern in recent years. Fifteen fungal strains were compared with regards to their ability of producing cellulase and xylanase from food waste by solid-state fermentation. The fungi were isolated from 6 different types of composts (including various combinations of plant debris, worm castings, and wood chips) and these were identified based on rDNA internal transcribed spacer sequence data. The Congo red test was performed for the preliminary screening of fungi for cellulase and xylanase production. After initial screening, the fungi that showed cellulase and xylanase production were further investigated on the enzymatic activities in food waste through solid-state fermentation. The preliminary data showed that all the fungi, except for strain F1-20-35A, had cellulase and xylanase production activities. During the solid-state fermentation, the strain F2-20-44A showed the highest amount of extracellular cellulase and xylanase activities, 17.37 ± 3.76 U/g ds and 189.24 ± 2.96 U/g ds, respectively. Preliminary identification placed this strain within the Genus Penicillium. The results demonstrated that strain F2-20-44A was the most efficient cellulase and xylanase producer and food waste can be used as a potential substrate for the enzyme production. This study proposes a new and economical method to produce high value enzymes with food waste by solid-state fermentation, which could potentially alleviate environmental issues caused by food waste.

P062

Sustainability Evaluation of Clay Based Adsorbents through Life-Cycle Assessment

Prof. Florinda Martins, Wojciech Stawiński, Agnieszka Węgrzyn, **Mr. Miguel Ferreira**, Olga Freitas, **Prof. Sónia Figueiredo**
ERSUC

The use of natural materials as adsorbents has been seen as a low cost and sustainable alternative for wastewater treatment. Clays are abundant, widespread, relatively inexpensive compared to other raw materials and have unique physico-chemical properties. The development of clay based materials will contribute for finding new applications in diverse fields with the commitment to sustainable development principles.

Clay mineral based adsorbents have been synthesized from raw vermiculite through acid treatment with nitric and citric acid, acid/base treatment with nitric acid and sodium hydroxide, base treatment with sodium hydroxide. All the materials have been tested for removal of the textile dyestuff Astrazon red from model wastewater and have demonstrated good performances as adsorbents.
In this work the sustainability of the developed modified clay minerals was appraised

by considering the environmental impacts associated with each clay material adsorbent. Life-Cycle Assessment methodology was applied to compare the environmental performance of each material, from the extraction of raw-materials to its synthesis. The adsorbent produced by basic treatment presented the lowest environmental impact.

P073

Evaluation of Chronic Toxicity Effects of Fluoxetine towards the Microalga Raphidocelis Subcapitata

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The increased consumption of pharmaceuticals contributes to the contamination of water resources, seeing that pharmaceutical compounds are only partially removed during conventional wastewater treatment. Several studies have been detected fluoxetine, a selective serotonin reuptake inhibitor mainly used to treat depression, in treated effluents from wastewater treatment plants at concentrations that may affect aquatic organisms. Fluoxetine is relatively recalcitrant to hydrolysis, photolysis, and microbial degradation, it tends to be adsorbed by river sediments, where it appears to be persistent.
This study evaluates the effect of fluoxetine in the growth of the green microalgae Raphidocelis subcapitata according to OECD Test guideline 201. Tested fluoxetine concentrations were between 1 and 70 mg/L. R. subcapitata growth was evaluated by determining the content of chlorophyll by fluorescence and compared to a control culture. After 72 h of inoculation, it was revealed an increasing growth inhibition of algae with increasing fluoxetine concentration reaching up to 94% of growth inhibition. However, after 6 days at low concentrations of fluoxetine it was reported a slight enhance of microalgae growth. This evidence may suggest that R. subcapitata has a protective mechanism against external stress induced by fluoxetine at low concentrations.

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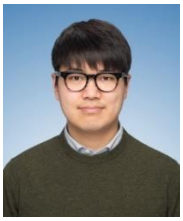

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