JOINT EVENT

12th World Congress on **Biofuels and Bioenergy**

&

13th Global Summit and Expo on **Biomass and Bioenergy**

September 04-06, 2018 | Zurich, Switzerland

Scientific Tracks & Abstracts

Day 1

Day-1

SESSIONS

Biomass Conversion Methods | Biomass Applications | Biomass Energy Resources | Biomass Power & Thermal

Chair: Magda Constantí, University Rovira I Virgili, Spain
Co-Chair: Ferruccio Pittaluga, University of Genoa, DIME, Italy

SESSION INTRODUCTION

Title: Biomass Gasification Technologies for Biochar Production and Energy Generation
Ferruccio Pittaluga, University of Genoa, DIME, Italy

Title: Nanocatalysts for oxygen removal from biomass derived biofuel
Antonia Infantes-Molina, Universidad de Málaga, Spain

Title: Bioethanol Production from Perennial Grasses
Satyawati Sharma, CRDT, IIT New Delhi, India

Title: Antimicrobial activity of microalgal strains against pathogenic bacteria and fungal Strains
Sitwat Aman,The University of Lahore,Pakistan

Title: Biomass Gasification: Sustainable technology for waste to energy
Sandeep Kumar, Indian Institute of Technology (IIT) Bombay, India

Ferruccio Pittaluga, J Bioremediat Biodegrad 2018, Volume 9
DOI: 10.4172/2155-6199-C1-014

Biomass Gasification Technologies for Biochar Production and Energy Generation

Ferruccio Pittaluga
University of Genoa, & president, Tecnoforest Ltd. Italy

Starting from 2012, the innovative SME Tecnoforest Ltd. (formerly an academic spin-off of the University of Genoa) has addressed its activity towards the testing of existing, and the development of new, small-scale biomass gasification technologies aimed at assuring electric and thermal self sufficiency to rural enterprises of the agricultural and wood-based sectors (www.tecnoforest.wordpress.com). Tecnoforest researchers took great advantage from the parallel activities being carried out at DIME/SCL, the Combustion Laboratory of the DIME Department, University of Genoa (www.en2.unige.it/savona-combustion-lab/). On the other hand the intrinsic limitation of these power plants' typologies, common to both downdraft and updraft gasifiers, has become apparent as the main obstacle preventing, in absence of costly abatement provisions, their continuity of operation: namely, the unavoidable need of progressively heavier maintenance provisions, especially related to the removal of sticky carbon-rich deposits and soot on the internal surfaces of the various plant components. In order to tackle this issue, a novel approach has been recently pursued at Tecnoforest, based on the evidence that no tar is produced not only when woodchips are directly burned, but also when they undergo a delayed combustion (i.e. a gasification) provided the embers are not 'stifled' from an overwhelming amount of feedstock weighing upon them from above. This concept, which implies a 'floating' front of the embers (without any physical hearth), has been implemented in three similar types of 'gasifiers', all of sturdy, 'rural' technology, two fully operational and already on the market, a third still undergoing development. They are the following: 'SynChar', a thermal converter featuring a cyclic (batch) operative modality, producing biochar of pharmaceutical quality while a clean syngas flame issues from its top nozzle; 'SynBurner', a clean syngas generator, with continuous operation, suitable to fuel gas burners for air heaters, boilers and furnace applications; 'SynGen' a syngas generator suitable to feed dual-fuel diesel gensets, after proper mixing, for ignition purposes, with small quantities of vegetable oils, even exhausted.

Recent Publications

1. Ballesteros-Plata D, Infantes-Molina A, Rodríguez-Cuadrado M, Rodríguez-Aguado E, Braos-García P, Rodríguez-Castellón 1. D.Accornero, E.Manzino, F.Pittaluga (2011). Rapid-Growth Forestation Techniques and Wood Thermal Pre-Treatments for Enhanced Energy Generation. Proceed. CEBC, Central European Biomass Conference 2011, Graz, Austria, Jan. 2011
2. Accornero D, Caruggi M, A. Nilberto, Pittaluga F (2011). Nuovo impianto di produzione elettrica da 800 kW mediante gassificazione di biomasse. Atti del Convegno ATI, Associazione Termotecnica Italiana, Arcavacata di Rende (CS), 05/09/2011, p. 1-7, ISBN: 9788895267111

3. D.Accornero, E.Manzino, F.Pittaluga (2012). A novel separation technology for nano- particles at discharge of combustion and incineration equipment. EQA Environmental Quality, 8 (2012), p. 13-24, ISSN: 2281-4485
4. D.Accornero, A.Nilberto, F.Pittaluga (2013). Design features and performance data of a new 400 kW biomass gasification plant of downdraft type. J. Energy and Power Engineering, Vol.7, N.2, Febr. 2013, p. 229-236, ISSN: 1934-8975
5. E.Manzino, D.Olampi, F.Pittaluga (2015). Performance Analysis of a Woodchip Downdraft Gasifier: Numerical Prediction and Experimental Validation. J. Energy and Power Engineering. Vol.9, N.4, Apr. 2015, p. 336-347, ISSN: 1934-8975

Biography

Ferruccio Pittaluga, recently retired, has been full professor of Thermal Machines at the University of Genoa. Now continues his teaching activity as contract professor. His fields of interests have been Thermo-Fluid Dynamics, Combustion & Gasification, Atmospheric Emissions. In 1998 he established DIME/SCL, the Combustion Laboratory of the University of Genoa, of which has been in charge up to his retirement in 2015. The participation to numerous National and EC-funded R&D programmes, mostly dealing with environmental sustainability of combustion processes, has granted, in the years, rich support for research activities and technological developments. In 2011, with a few of his former doctoral students, he was co-founder (and since then, president) of Tecnoforest, an academic spin-off (now an innovative SME) addressed at rapid growth forestation, wood gasification and biomass-based renewable energy cogeneration. Tecnoforest has been for some years Italian representative of APL gasifiers (USA).

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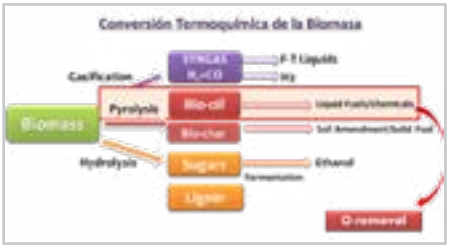
Nanocatalysts for oxygen removal from biomass derived biofuel

Infantes-Molina[1], **E Rodríguez-Aguado**[2] **D Ballesteros-Plata**[3] and **E Rodríguez-Castellón**[4]
Universidad de Málaga, Spain

The use of bio-energy as a renewable alternative to fossil fuels is nowadays attracting more and more attention. The bio-fuel from biomass seems to be a potential energy substitute for fossil fuels since it is a renewable resource that could contribute to sustainable development and global environmental preservation and it appears to have significant economic potential. Liquid fuels can be obtained from fast pyrolysis of lignocellulosic biomass, where fast pyrolysis is a promising route because the process takes place at moderate temperatures, in absence of air and with a short hot vapor residence time. However, these liquid fuels have poor quality due to their low volatility, high viscosity, low heating value, a high oxygen content and poor chemical stability. This high oxygen content is due to the presence of oxygen-containing compounds such as alcohols, aldehydes, ketones, furans and phenols. In this sense, catalytic hydrodeoxygenation (HDO) is one the most efficient process to remove oxygen from these liquid fuels. In this context, the catalyst design is of upmost importance to achieve a high degree of deoxygenation, and bifunctional catalysts are required to achieve high degrees of activity. Noble metal and non-noble metal based catalysts will be evaluated in HDO of model molecules in order to get further insight about the important role of the active phase. Transition metal phosphides have shown excellent catalytic performances due to their good hydrogen transfer properties that diminishes the amount of metal exposed, avoiding, as much as possible, the deactivation, and modifies the electronic density of the catalyst leading to solids that favors the HDO. In addition these phosphides show bifunctional catalytic properties (metallic sites for hydrogenation and acid sites for cracking, methyl transfer reaction, dehydration and isomerization).



Recent Publications

1. Ballesteros-Plata D, Infantes-Molina A, Rodríguez-Cuadrado M, Rodríguez-Aguado E, Braos-García P, Rodríguez-Castellón E (2017) Incorporation of molybdenum into Pd and Pt catalysts supported on commercial silica for hydrodeoxygenation reaction of dibenzofuran. Applied Catalysis A: General 547: 86-95.
2. García-Sancho C, Cecilia JA, Mérida-Robles, JM, Santamaría González J, Moreno-Tost R, Infantes-Molina A, Maireles-Torres P (2017) Effect of the treatment with H3PO4 on the catalytic activity of Nb2O5 supported on Zr-doped mesoporous silica catalyst. Case study: Glycerol dehydration. Applied Catalysis B: Environmental 221: 158-168.
3. Rodríguez-Aguado E, Infantes-Molina A, Ballesteros-Plata D, Cecilia JA, Barroso-Martín I, Rodríguez-Castellón E (2017) Ni and Fe mixed phosphides catalysts for O-removal of a bio-oil model molecule from lignocellulosic biomass. Journal of Molecular Catalysis 437: 130-139.
4. Infantes-Molina A, Moretti E, Segovia E, Lenarda A, Rodríguez-Castellón, E (2016) Pd-Nb binfunctional catalysts supported on silica and zirconium phosphate heterostructures for O-removal of dibenzofurane. Catalysis Today 277: 143-151.
5. Cecilia JA, Infantes-Molina A, Sanmartín-Donoso J, Rodríguez-Aguado E, Ballesteros-Plata D, Rodríguez-Castellón E (2016) Enhanced HDO

Biography

Antonia Infantes-Molina is a Senior researcher at the University of Malaga. Chemical Engineer (2002) and Ph in Science (2006-University of Malaga) has developed its research line in the synthesis and characterization of nanomaterials and nanocatalysts as well as their use for environmental applications. After her PhD, she has studied adsorbent materials in collaboration with Pesquisa em Separações por Adsorção, Universidade Federal do Ceará (Brasil); catalytic systems for clean fuels production in the Institute of Catalysis and Petroleochemistry (ICP-CSIC) in Madrid (Spain) and NOx catalytic removal from mobile sources and catalytic processes for CO_2 transformation in the Laboratory of Catalysis and Catalytic Processes group at Politecnico di Milano. Her current research includes catalytic hydrodeoxygenation as well as waste valorization: new catalytic formulations and new applications for ashes derived from biomass treatment.

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Satyawati Sharma et al., J Bioremediat Biodegrad 2018, Volume 9
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Bioethanol Production from Perennial Grasses

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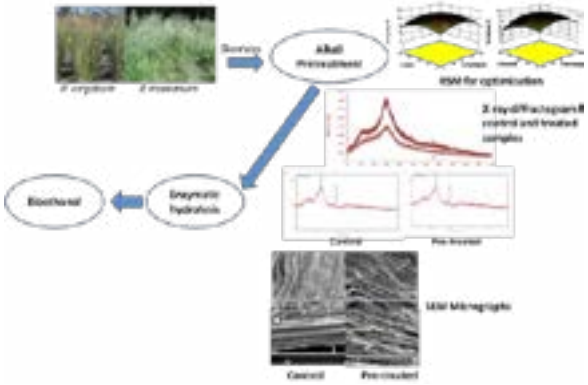
In the present demand for renewable and sustainable sources of energy to overcome the burden of world energy crisis, perrenial grasses present exciting options. *Panicum virgatum* (Switchgrass) the ligno-cellulosic perennial grass, being considered as a cheaper and efficient feedstock for bioethanol production in Europe and USA, could also be utilized in India for same purpose. The present work focuses on cultivation of *P. virgatum* (very first time in India) and *P. maximum*, for bioethanol production. The seeds of the Switch grass were obtained from Univ. of Bologna, Italy, while of guinea grass from IGFRI, Jhansi, UP, India. Both the grasses were cultivated in Micromodel (an experimental field site), IIT Delhi. The harvested grass biomass was analyzed for various parameters including reducing sugars for subsequent bioethanol production. Among different pretreatment methods (Acid pretreatment, Alkali pretreatment and Microwave pretreatment) tested , alkali method showed maximum reducing sugars (280 mg/g for *P. virgatum* and 262 mg/g for *P. maximum*) with 15 % reduction in crystallinity of cellulose in *P. virgatum* and 12% in *P. maximum*. It was further optimized with RSM and CCD was applied. Joint effects of four independent variables: NaOH (1-5%), temp. (60-100 °C), substrate loading (1-3%), and reaction time (30-150 min), were investigated to increase in reducing sugar content. The combined optimum conditions for maximum reducing sugar (68.3%) were: 2.5% substrate, 5% NaOH, a reaction time 120 min at 100 °C. The result analyzed (ANOVA) with a second order polynomial equation. showed 62 - 68 % significant increase in reducing sugars. The calculated theoretical ethanol production from switch grass was found to be 26.72%, while for *P. maximum* it was 25.24%. This study reveals that under optimized pretreatment conditions, sugar yield is significantly increased and promises the use of both *P. virgatum* and *P. maximum* grasses as feedstock for bioethanol production in India also. All the findings pertaining to all steps in cultivation, characterization, pretreatment and hydrolysis methods and bioethanol from these grasses will be presented at conference.



Recent Publications

1. Adak, A., Tiwari, R., Singh, S., Sharma, S., & Nain, L. (2016) Laccase Production by a Novel White-Rot Fungus, Pseudolagarobasidium acaciicola LA 1 Through Solid-State Fermentation of Parthenium Biomass and Its Application in Dyes Decolorization. *Waste and Biomass Valorization,* 7, 1427-1435.
2. Arora, K., Sharma, S., & Monti, A. (2016) Bio- remediation of Pb and Cd polluted soils by switchgrass: A case study in India. *International Journal of Phytoremediation,* 7(18), 704-709.
3. Arora, K.; Kumar, A., & Sharma, S. (2012) Energy from Waste: Present Scenario, Challenges and Future Prospects towards Sustainable Development. IGI Global, 271-296.

4. Tiwari, G., Shivangi, Sharma, S., & Prasad, R. (2015) Bioethanol production: Future prospects from non-traditional sources in India. *International Journal of Research in Biosciences,* 4, 1-15.
5. Kumar, A., & Sharma, S. (2011) Non-edible oil seeds as biodiesel feedstock for meeting energy demands in India, *Renewable and Sustainable Energy Reviews*, 15, 1791-1800.

Biography

Dr. Satyawati Sharma is Professor at CRDT, IIT Delhi. She did her post graduation from Agra University and Ph.D. from IIT Delhi. She has more than 140 publications in reputed international and national journals. She has executed 15 sponsored projects and filed four formulations (termite and nematode control and rapid composting) for patenting. She has guided 21 Ph.D. students and 12 are pursuing their Ph.D. She has guided 4 PDFs and 3 PDFs are continuing. She is awarded 'Iraj Zandi award' in 2013 in Solid Waste Technology and Management by Widener University, USA and also honored by Royal Society of Chemistry, UK, for 'Energy Crops' book. Recipient of 'Golden Jubilee Award' for excellence in the field of Khadi and Village Industries" to IIT Delhi by KVIC for MGIRI project jointly. Research areas are Biopesticides and Biofertilizer, Waste management, Tissue culture, Wasteland Reclamation, Mushroom technology, Biogas slurry management.

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Notes:

Sitwat Aman et al., J Bioremediat Biodegrad 2018, Volume 9
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Antimicrobial activity of microalgal strains against pathogenic bacteria and fungal strains

Sitwat Aman, Asma Ahmed, Rafia Dastageer, Maheen Fatima Khan and **Mussarat Shareef**
The University of Lahore, Pakistan

Causative agents of many ailments of plants, animal and human are microbes particularly bacteria and fungus which are generally treated using antibiotics, but the frequent occurrence of antibiotic resistance requires the development of new antibiotic agents. Unexplored bioactive natural candidates should be a chance for the production of targeted drugs with antibacterial and antifungal activity. In this paper, polarity based extracts of four different strains of *Chlorella spp.* has been used against 6 bacterial strains namely *Pseudomonas aeruginosa (P. aeruginosa), Staphylococcus aureus (S. aureus), Escherichia coli (E.coli), Klebsiella pneumonia (K. pneumonia), Acinetobacter baumannii (A. baumannii) and Bacillus thuringiensis (B.thuringiensis)* and 6 fungal strains namely *Penicillium italicum (P. italicum), Cladophialophora bantiana (C. bantiana), Rhizopus, Aspergillus falvus (A. falvus), Aspergillus niger (A. niger) and Aspergillus terrus (A. terrus)* by using levofloxacin as standard antibiotic and pure solvent for comparison. Agar well diffusion assay has been used for antibacterial assay while Rapid Susceptibility Assay (RSA) has been done to measure the antifungal activity of all algal extracts. Later on Minimum Inhibitory Concentration (MIC) has been calculated for active extracts while Minimum Bactericidal and Fungicidal Concentrations (MBC and MFC) has been calculated for inactive extracts against fungal and bacterial pathogens. Results have been analyzed statistically and these results suggest that the *Chlorella spp.* have potential to develop antimicrobial drugs.

Biography

Sitwat Aman has worked on microalgae during her Post-doc in China, where she tried to find out the best strains for biodiesel production. Nowadays, she is working as an Assistant Professor.

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Sandeep Kumar, J Bioremediat Biodegrad 2018, Volume 9
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Biomass Gasification: Sustainable technology for waste to energy

Sandeep Kumar
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Statement of the Problem: Biomass is a potential source of renewable energy. Agro residue and organic industrial and civic waste provides a huge potential to harvest energy from waste. Biomass gasification is a quite mature technology finding its use in various sectors. Downdraft gasification system is widely used to generate produce gas coupled with IC engine to generate electricity. Oxy-steam gasification yields syngas of high energy density (8-10 MJ/Nm3). High H2 fraction in syngas and its combustion characteristics motivates towards developing a more efficient gasifier-engine system. Also, high silica ash content in few agro residue like paddy waste has motivated to evolve a system to extract useful silica from waste ash.

Methodology & Theoretical Orientation: Oxy-steam gasifier was designed using oxygen and superheated steam mixture as reactant. Woody biomass as well as agro residue was used for study. Steam to biomass ratio was varied from 0.75 to 2.7 and ER from 0.2 to 0.3. Syngas with varying H_2/CO ratio was obtained and results analysed. System efficiency was evaluated and CFD based numerical model developed from fundamentals. Silica extraction from paddy waste ash was performed using acid leaching method.

Findings: Oxy-steam gasification proved to be highly efficient system with over 80% efficiency achieved at lower steam to biomass ratio of 0.75. The high energy density in the range of 8-9 MJ/Nm^3 has been achieved which makes it better fuel compared to producer gas obtained from air gasification. Analysis showed upto 68% silica content ii paddy waste ash. High purity Silica was extracted from residual ash of paddy waste gasification. SEM results showed high quality silica which is in demand in maket. Over 62% Silica was extracted from ash in high purity form.

Recent Publications

1. Sandeep K, S. Dasappa, Modeling and analysis of single particle conversion of biomass in a packed bed gasification system. Applied Thermal Engineering. 2017:112:1382-1395
2. Mahapatra S, Sandeep K, Dasappa S. Gasification of wood particles in a co-current packed bed: Experiments and model analysis. Fuel Processing Technology. 2016:145: 76–89
3. Sandeep K, Dasappa S. First and second law thermodynamic analysis of air and oxy-steam biomass gasification. International Journal of Hydrogen Energy. 2014:39(34): 19474–19484
4. Sandeep K, Dasappa S. Oxy–steam gasification of biomass for hydrogen rich syngas production using downdraft reactor configuration. International Journal of Energy Research. 2014:38:174–188
5. Anmol Garg, Sandeep K. Oxy-enriched air gasification of wet biomass. Proceedings of the International Conference on Sustainable Energy and Environmental Challenges (SEEC-2017). 26 - 28 February, 2017, Mohali, India (P.No. - 157)

Biography

Sandeep Kumar is Faculty in Dept. of Energy Science & Engg., Indian Institute if Technology (IIT) Bombay, India. He has his expertise in thermo-chemical conversion of biomass and use of alternate fuel in IC engine. His works involves both experimental work as well as CFD based models. He has his basic degree in Mechanical Engineering. His research interest also includes solid combustion, solid waste management and renewable system analysis.

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Day-1

SESSIONS

Production of Biofuels | Advanced Biofuels & Biochemicals

Chair: Jinying Yan, KTH - Royal Institute of Technology, Sweden
Co-Chair: Anushree Malik, Centre for Rural Development and Technology, IIT Delhi, India

SESSION INTRODUCTION

Title: Sustainable Water-Energy-Environment Nexus for Thermal Bioenergy Conversion
Jinying Yan, KTH - Royal Institute of Technology, Sweden

Title: Algal-fungal interactions for dewatering and pretreatment of microalgal biomass targeting improved biofuel production
Anushree Malik, Centre for Rural Development and Technology, IIT Delhi, India

Title: Microalgae cultivation in continuous reactor using mixotrophic anaerobic effluent: Effect of dilution rate on biomass productivity and tertiary treatment
SERVIO CASSINI, Dept. Environmental Engineering UFES, Brazil

Title: Modeling of slow pyrolysis of various biomasses in a rotary kiln using TGA data
Ramiar Sadegh-Vaziri, KTH Royal Institute of Technology, Sweden

Title: BIORAISE: a GIS tool for the evaluation of agricultural and forestry available biomass resources and costs in Mediterranean Countries
Eva Sevillano Marco, CEDER-CIEMAT, Spain

Title: Numerical study of the natural -draft flow and heat transfer in a biomass plancha-type cookstove
Alberto Beltrán, Universidad Nacional Autónoma de México, México

Title: Ultra-thin membrane made by Atomic layer deposition for CO_2 separation
Ying-Bing Jiang,Univ. of New Mexico, USA

Title: Advanced liquid biofuels from residue biomass by thermo-catalytic reforming
Andreas Hornung,Fraunhofer Institute for Environmental, Safety, and Energy Technology (UMSICHT), Germany

Title: Fast entrained bio-oil production in an entrained flow pilot reaction
Peyrot Marine,CEA LITEN, Grenoble, France

Jinying Yan et al., J Bioremediat Biodegrad 2018, Volume 9
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Sustainable water-energy-environment nexus for thermal bioenergy conversion

Jinying Yan[1], **Zhi Zou**[1], **Hailong Li**[2], **Eva Thorin**[2] and **Daniel Billstrom**[3]
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[2]Mälardalen University, Sweden
[3]Mälarenergi AB, Sweden

A concept of sustainable water-energy-environment nexus has been developed for thermal bioenergy conversion processes as shown in Figures 1 and 2. Two case studies are performed in a biomass-fired combined heat and power (CHP) plant and a waste incineration unit, which intend to approve and implement the concept. The main results from the case study on stormwater issues in biomass-fired CHP plant show that the biomass fuel storage can play an important role in the sustainable development for the water-energy-environment nexus. It has been proved that the water adsorption capacity of wood chips can be used as a buffer to reduce water runoff, to extend the time for natural water evaporation, to receive the recycled runoff water without significant impacts on fuel quality. The runoff water absorbed by the biomass fuels could increase heat recovery and water reuse. The results also indicate that it is possible to achieve near zero water runoff and wastewater emissions in the tested plant area by an integration of stormwater management with the bioenergy conversion processes. Another case study is focused on a closed water loop in waste-to-energy (waste incineration) unit. The closed water loop can properly integrate the thermal energy conversion with an efficient flue gas cleaning, cost-effective water treatment and energy-effective water recovery. The investigation shows that it is possible to achieve a near zero wastewater discharge, which could also result in a significant amount of water recovery for internal usage. The two case studies demonstrate that sustainable water-energy-nexus could be set up in biomass energy conversion processes, which can provide good solutions, handle important issues associate with water resource, energy efficiency and emissions to air and waters in bio energy conversion processes.

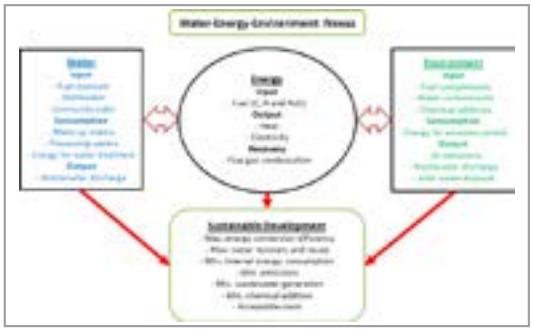

Figure1: Illustration of the concept development for a sustainable water-energy-environment nexus in thermal bioenergy conversion processes

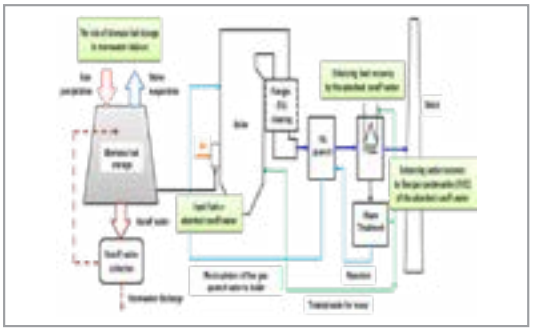

Figure2: Minimising storm water discharge could be achieved by a water

Recent Publications

1. Galanopoulos C, Yan J, Li H and Liu L (2018) Impacts of acidic gas components on combustion of contaminated biomass fuels. Biomass and Bioenergy 111:263-277.
2. Li H, Tan Y, Ditaranto M, Yan J and Yu Z (2017) Capturing CO2 from biogas plants. Energy Procedia 114:6030-6035.
3. Larsson M, Yan J, Nordenskjöld C, Forsberg K and Liu L (2016) Characterisation of stormwater in biomass-fired combined heat and power plant-impacts of biomass fuel storage. Applied Energy 170:116-129.
4. Zhang X, Yan J, Li H, Chekani S and Liu L (2015) Investigation of integration between biogas production and upgrading. Energy Conversion and Management 102:131-139.
5. Sun Q, Li H, Yan J, Liu L, Yu Z and Yu X (2015) Selection of appropriate biogas upgrading technology- a review of biogas cleaning, upgrading and utilisation. Renewable & Sustainable Energy Reviews 51:521-532.

Biography

Jinying Yan is the Adjunct Professor of Chemical Engineering and Technology at KTH Royal Institute of Technology, Stockholm, Sweden. Currently his research interests are the emission control technologies for bioenergy conversion processes and energy storage technologies for integration of renewable energy. He has also more than 10 years research experience working on the development of CO_2 capture technologies for thermal power generation with focus on gas cleaning, CO_2 capture, and CO_2 compression & purification. He joined Chemical Engineering and Applied Chemistry, University of Toronto as a Postdoctoral research fellow from 1999 to 2000. He received his PhD in Chemical Engineering from KTH Royal Institute Technology, Stockholm, Sweden in 1998.

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Anushree Malik et al., J Bioremediat Biodegrad 2018, Volume 9
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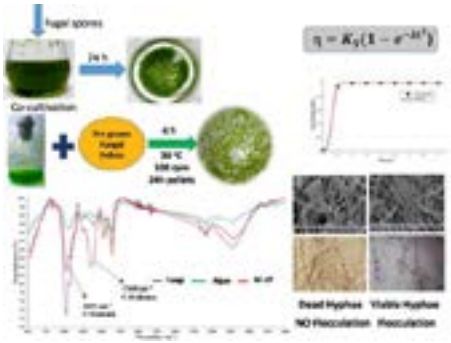
Algal-fungal interactions for dewatering and pretreatment of microalgal biomass targeting improved biofuel production.

Anushree Malik[1], ArghyaBhattacharya[1], Megha Mathur[1], Pushpendra Kumar[1] and Sanjeev Kumar Prajapati[2]
[1]Centre for Rural Development and Technology, IIT Delhi
[2]Deptt. of Chemical & Biochemical Engineering, IIT Patna.

Use of pellet forming filamentous fungi (PFFF) for algal bioharvesting presents an interesting approach to enhance the sustainability of algal biofuels. The present work describes the critical factors governing algal-fungal interactions in two different modes i.e. during algal-fungal co-cultivation and while using pre-cultivated algal and fungal biomass. To begin with, identification of the limiting factors and subsequent optimization of the process during co-cultivation was attempted using eight fungal strains (Prajapati et al., 2014). It was found that the conventional algal growth media (BG11) needs to be supplemented with carbon and nutrient sources to support PFFF growth. Further, only Aspergilluslentulus could grow and pelletize, resulting in nearly 100 %harvesting of Chroococcus sp. within 24 h. However, the harvesting time increased with decrease in glucose levels. To further simplify and shorten the process time, a rapid method was developed which includes mixing of algae with pre-cultivated fungal pellets in a prefixed ratio and optimized conditions, resulting in nearly 100% harvesting within 4 h (Prajapati et al., 2016). An insight into the critical parameters revealed that metabolically active fungal pellet with undamaged hyphae is a prerequisite for flocculation. FTIR data showed the involvement of specific groups (C-N groups) in the interaction (Bhattacharya et al., 2017a). A mathematical model developed for the first time (Bhattacharya et. al., 2017b) shows dependence on the radius of the algae and fungi along with the velocity gradient of the media. The theoretical model showed good agreement with the experimental data. A simple incubation of harvested algal–fungal pellets under controlled conditions was associated with significant enzyme activity due to which>54% enhancement in digestibility and up to 50% increase in methane production during anaerobic digestion were noticed. The invented method (1593/DEL/2015) is a unique process of its kind and has potential application in algae based biofuel production.



Recent Publications

1. Prajapati, S. K., Kumar, P., Malik, A., &Choudhary, P. (2014). Exploring pellet forming filamentous fungi as tool for harvesting non-flocculating unicellular microalgae. BioEnergy Research, 7(4), 1430-1440.
2. Prajapati, S. K., Bhattacharya, A., Malik, A., & Vijay, V. K. (2015). Pretreatment of algal biomass using fungal crude enzymes. Algal research, 8, 8-14.
3. Prajapati, S. K., Bhattacharya, A., Kumar, P., Malik, A., & Vijay, V. K. (2016). A method for simultaneous bioflocculation and pretreatment of algal biomass targeting improved methane production. Green Chemistry, 18(19), 5230-5238.
4. Bhattacharya, A., Mathur, M., Kumar, P., Prajapati, S. K., & Malik, A. (2017). A rapid method for fungal assisted algal flocculation: critical parameters & mechanism insights. Algal Research, 21, 42-51.
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Biography

Dr. Anushree Malik is a Professor at the Center for Rural Development (CRDT), Indian Institute of Technology Delhi (IIT Delhi) and her research areas include Bioremediation, Wastewater Treatment, Algal Biofuels, and Biological Pest Control. She did her Ph.D. from IIT Delhi in the year 2000 and post doc from Utsunomiya University, Japan where she received prestigious Japan Society for the Promotion of Science (JSPS) fellowship awarded by Government of Japan. Later, she joined School of Environmental Sciences, Jawaharlal Nehru University (JNU) as Assistant Professor. She got associated with IIT Delhi as Assistant Professor in the year 2004 and contributed towards establishing Applied Microbiology Lab. Her lab has developed "Novel Mycotablets" for bioremediation which are designed to possess a unique and ideal combination of characteristics for easy storage & transportability to remote small scale industries. The mycotablet technology, patent for which has been filed, has won DST-Lockheed Martin India Innovation Growth Program (IIGP 2015) award recently. She has also filed patent for fungal assisted algal harvesting.During her research career she has published more than 110 international journal research papers and 17 book chapters. Besides, She is one of the Editors of Algal Biofuels: Recent Advances and Future Prospects, published by Springer. She has completed several research projects funded by various funding agencies like DST, DBT, ICMR, MOEF, MNRE and ICAR. Her work has also received "Top cited paper award 2009-2013" from Elsevier for a paper published in 2009 in Environment International. She has been active reviewer for over 55 reputed journals published from Elsevier, Springer, and Wiley. She is on the Editorial Board of several prestigious journals like "The Open Microbiology Journal", Bentham Open; "Bioremediation and Bioavailability", U.K.; "Journal of Bioremediation and Biodegradation", U.S.A. and "Frontiers in Food Microbiology", Switzerland. She has total 4883 citations with h-index of 33 and i-10 index of 72.

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Notes:

Servio Tulio Cassini et al., J Bioremediat Biodegrad 2018, Volume 9
DOI: 10.4172/2155-6199-C1-014

Microalgae cultivation in continuous reactor using mixotrophic anaerobic effluent: effect of dilution rate on biomass productivity and tertiary treatment

Servio Tulio Cassini, Marcos V N L Pereira, Aline Dassoler and **Ricardo F Goncalves**
UFES, Brazil

Microalgae are continuously attracting main attention from biomass researchers, especially due to their capacity of fast growth, CO_2 abatement and land-free cultivation as compared with conventional crops. Additionally, municipal wastewater has been long recognized as a suitable media for the cultivation of microalgae biomass. Culturing microalgae with wastewater effluents also promotes a process of tertiary treatment, characterized by removal of main nutrients (N, P) from wastewater and simultaneously achieving high biomass productivities. However, few studies report data concerning biomass productivity in continuous mode using unsterilized mixotrophic wastewater effluent and we found no reports of E. coli population decay rates in these continuous reactors. This study focuses on the selection of native microalgae strains that are applicable for biomass production and tertiary wastewater treatment in continuous mode. Five strains were isolated and cultivated in unsterilized anaerobic effluent in batch growth mode, to identify the efficient microalgae isolates for biomass conversion. The isolate L06 (Chlorella sp.) was selected and evaluated based on five dilution rates from 0.1 to 0.5 1/day on continuous growth reactor, resulting in five steady state conditions. Maximal volumetric biomass productivity of 294 mg/L day was obtained at 0.3 1/day without CO_2 addition or air bubbling. Carbohydrates were the major fraction of the dried biomass, followed by proteins and then lipids. The highest removal rates of total nitrogen and phosphorus from the liquid phase were 13.0 and 1.4 mg/L day, respectively, and were achieved at 0.4 1/day. The maximal decay rate for E. coli (3.7 1/day) was also achieved at this dilution rate, representing approximately a 99.9% population reduction of this bioindicator over a period of 2.5 days. Therefore, L06 – Chlorella sp. continuous cultivation using secondary-treated wastewater can be adjusted depending on its objective: for biomass production, a dilution rate of approximately 0.3 1/day is recommended; and for tertiary treatment a rate of 0.4 l/day is suggested.

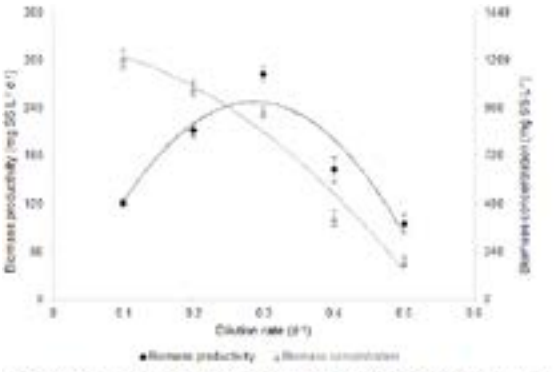

Fig 1. Variation in biomass productivity and concentration of L06 – *Chlorella* sp. cultures at steady-state as a function of the dilution rate applied to the system (n=6 and ±SD).

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Biography

Servio Tulio Cassini has completed his B S degree in Biological Science from UFMG, Brazil in 1975, MS in Agricultural Microbiology from USP, Brazil in 1980, PhD in Environmental Microbiology from North Carolina State University NCSU-USA in 1988. During 1976-1999, he was a Full Professor in Universidade Federal Vicosa, Full Professor in Environmental Microbiology at Universidade Federal do Espirito Santo UFES-Brazil 1999- till now. During 1996-1997, he was a Visiting Professor in University of Tennessee at Knoxville UTK-USA. He was an Environmental Engineering Graduate Program Coordinator during 2000-2006, UFES Brazil and Brazilian Sanitation Research Program PROSAB-FINEP sludge network coordinator during 2002-2004. His main projects on wastewater and bioenergy and microbiology applied to sanitation engineering.

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Notes:

Ramiar Sadegh-Vaziri et al., J Bioremediat Biodegrad 2018, Volume 9
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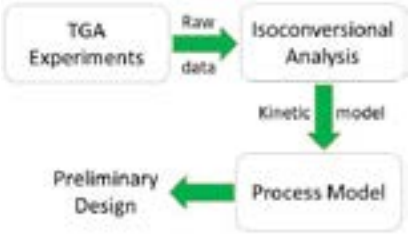
Modeling of slow pyrolysis of various biomasses in a rotary kiln using TGA data

Ramiar Sadegh-Vaziri[1] and **Matthaus U Babler**[2]
KTH Royal Institute of Technology, Sweden

Biomass thermochemical processes suffer from the problem of feedstock variation. In the other words, in order to run commercial biomass-based plants under economically feasible conditions, the process have to be capable of handling very different raw materials, ranging from forest residues to waste materials from various industries. Process modeling is crucial to predict the behavior of different feedstock materials in a given biomass plant. In this work, we consider the slow pyrolysis of biomass to produce biochar. In this process, the main quantity one aims at predicting by means of process modelling is the conversion of raw biomass to biochar as a function of the process conditions. To achieve this aim, the process model requires a kinetic rate expression for describing the evolution of the biomass when subject to thermochemical treatment. Here, we will show that the TGA data processed with an isoconversional method is enough to obtain an effective rate expression which allows for predicting the behavior of the biomass at an arbitrary temperature evolution. Such rate expressions can then be used in the process model to simulate conversion of raw biomass to biochar. An overview of this approach is shown in Fig. 1. To illustrate the feasibility of the approach we will consider different biomasses feedstocks undergoing slow pyrolysis in an indirectly heated rotary kiln reactor. The results of our modeling are then compared to experimental data obtained from a 500 kW pilot plant pyrolyzer and to a more detailed process model. A high level of agreement between the modeling results from this approach and the experimental data and the previously validate detailed process model is observed. This proves the capability of our cost-efficient approach to obtain preliminary design data.



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Biography

Ramiar Sadegh-Vaziri is a PhD candidate at the department of chemical engineering at KTH royal institute of technology in Sweden. He has developed skills in process modeling and numerical simulation. He has worked on different projects including raw syngas cleaning, particle-particle and particle-fluid interactions in two phase turbulent flows, biomass pyrolysis and gasification and modeling of supported liquid membranes. His understanding of transport phenomena and kinetics together with his knowledge of CFD modeling and numerical discretization of partial differential and integro-differential equations have helped him to be involved in various projects

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Eva Sevillano Marco et al., J Bioremediat Biodegrad 2018, Volume 9
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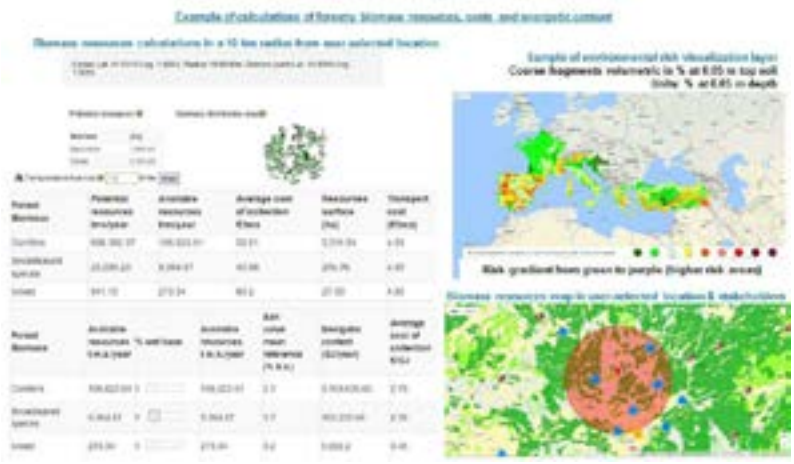
BIORAISE: A GIS tool for the evaluation of agricultural and forestry available biomass resources and costs in Mediterranean Countries

Eva Sevillano Marco, Paloma Pérez Ortiz, Luis S Esteban and **Juan Carrasco**
CEDER-CIEMAT Spain

The previous version of BIORAISE has been updated and extended to serve georeferenced quantitative data of biomass resources from agriculture, forestry and scrublands. BIORAISE is an open access GIS tool embedding sustainable biomass resources, environmental risks visualization and on-field exploitation costs covering Portugal, Spain, France, Italy, Croatia, Slovenia, Greece and Turkey. Additionally relevant stakeholders' information is also indicated. Georeferenced information is computed on the fly from user-selected locations (pick-up point and area of interest, either within a user-choice circular radio or an administrative boundary from municipality to European Nomenclature of Territorial Units for Statistics NUT3 limits): surfaces (hectares), potential biomass resources (tonnes of dry matter/year) and a more realistic availability derived from harvesting efficiency rates in the case of agricultural resources while considering slope percent rise, soil erosion risk and topsoil organic carbon content (30 cm depth) in the case of forestry resources, together with estimated harvesting and transport costs (€/tonnes of dry matter). Regarding quality parameters, the service provides energy content (GJ/year), and ashes content (% dry matter) on the basis of numbers obtained in a complete laboratory characterization study from biomass samples from the selected countries. The calorific values are updated depending on moisture content choices. The stakeholders databases consists of producers (raw biomass producers, wood, olive oil, nut hulling, and wine sector –distilleries- industries) and other actors (e.g., equipment and machines for industry, services and facilities, manufacture of biofuels and biomass valorisation, biofuel dealers, research centres, large consumers, and BIOMASUD PLUS biofuel producers). EUROSTAT, national forest inventories, and other statistical data have been integrated in the geospatial agriculture, shrub and forestry surfaces in CORINE LAND COVER 2012. Geoprocessing steps apply residues productivity rates, biofuels annual production data and achieve a compromise between local specifications, consistency of results, data harmonization and homogeneity for such a large area.



Biography

Eva Sevillano Marco is Extensive mix of social science and technical research approaches, promoting interaction among stakeholders. Collaboration in national and European projects: local action groups, regional governments, forest owners associations, SMEs, universities and research centres in several countries. Essentially, much of my work looks at how research could serve societies at large, and includes participation mechanisms. Research projects linked to nature conservation, rural development and forestry. Topics: local management, forest inventory, silviculture, growth & biomass modelling, suitability mapping, forest attributes estimation using RS and GIS tools, quality indicators spatialization and uncertainty assessment.

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Alberto Beltrán et al., J Bioremediat Biodegrad 2018, Volume 9
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Numerical study of the natural -draft flow and heat transfer in a biomass plancha-type cookstove

Alberto Beltrán[1], **Miguel F Moctezuma Sánchez**[1], **José Núñez**[1], **Elizabeth M Fisher**[2] and **Omar Masera**[1]
[1]Universidad Nacional Autónoma de México, México.
[2]Sibley School of Mechanical and Aerospace Engineering, Cornell University, USA.

Statement of the Problem: Biomass cookstoves are important in the developing world and have room for improvement since a large percentage of people living in rural areas still satisfy their cooking and heating needs using local biomass fuels. Different types of biomass cookstove are used around the world and the vast majority involve natural-draft combustion of wood; big efforts to study their performance from an experimental point of view have been conducted. The purpose of this study is to model the fluid flow, heat transfer and gas-phase chemical reactions for a natural-draft biomass plancha-type cookstove that represents a new portable design of the Patsari stove for rural areas in Mexico and to be used for domestic activities. Methodology: A 3D CFD model is set up in ANSYS Fluent v19, using the module of species transport for modelling combustion, a turbulence viscous model and energy equation enabled; whereas, the solver configuration is pressure based type and the simple algorithm is used for steady state solutions. Findings: Power rates in the range of 2.5 and 7.5 kW and two injection areas of 50 and 100 cm^2 are analyzed. Contours for the flow, temperature and species mass fractions are obtained; additionally, Nusselt number at the comal surface, air fuel ratio and thermal efficiency are calculated as a function of power rate. Conclusion & Significance: A better combustion and thermal efficiency for the higher power rate cookstove are observed since the percentage of volatiles not burned decreases with the power rate. Authors would like to acknowledge SENER-CONACyT for the financial support through Project 246911.

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Biography

Alberto Beltrán has his expertise in numerical simulations of hydrodynamic, thermal and magnetohydrodynamics flows. His recent work on plancha-type cookstoves is focused on improving the actual designs based on CFD calculations and to compare them with experimental results. He is also interested in renewable energy and grid scale energy storage systems and their applications. He is the head of the Laboratory for design, modelling and simulations of biomass cookstoves at the CBS CEMIE-Bio project in Mexico.

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Ying-Bing Jiang, J Bioremediat Biodegrad 2018, Volume 9
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Ultra-thin membrane made by Atomic layer deposition for CO_2 separation

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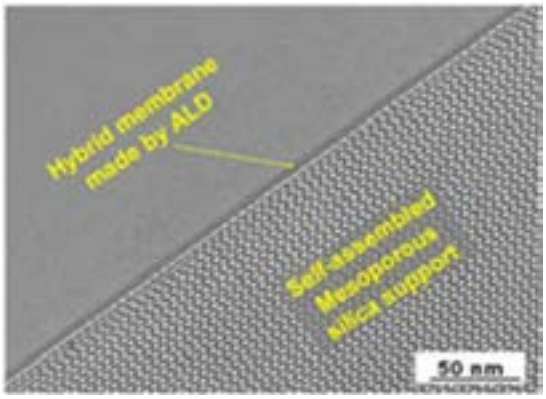
The global organic biogas market was worth more than $19.5 billion (€17.2bn) in 2015 and is forecast to exceed $32 billion by 2023, growing at more than 6% CAGR from 2016 to 2023. Biogas is primarily methane (CH4) and carbon dioxide (CO_2). Separation of CO_2 from CH4 is an importance step for biogas upgrading. Conventional approach uses pressure swing adsorption (PSA) to remove CO_2 from biogas, which is energy intensive. Membrane separation is in general more energy efficient, but the low CO_2 permeability of current CO_2 membrane results in a consequence that the CO_2 separation process typically requires compressing gas to a high pressure to achieve high separation flux, which also consumes a large amount of energy. Therefore a highly permeable and highly selective CO_2 membrane is critical for cost-effective biogas purification. Reduced membrane thickness and precise pore size/chemistry control are the keys for achieving combined high flux and selectivity. Membranes in natural biological systems can be down to 4 nm in thickness and the pores are precisely constructed by molecular assembly, leading to unbeatable performance when compared to synthetic industrial membranes that are difficult to be fabricated with similar molecular level precision and are typically 100-1000 times thicker. ALD is a layer-by-layer deposition method that builds up a thin layer with atomic precision in structure and compositions. Here we introduce the membrane fabrication by the combination of molecule self- assembly and a "plasma-defined" ALD process where the location of ALD modification is confined by plasma irradiation. Using this approach, hierarchically structured sub-20nm thick ultra-thin membranes with precisely defined pore size and pore surface chemistry have been successfully formed, leading to excellent CO_2 permeability and selectivity.

Recent Publications



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5. Moghaddam S, et al, Jiang YB et al (2010), An inorganic-organic proton membrane for fuel cells with a controlled nanoscale pore structure" Nature Nanotechnology, Vol. 5, 230-236

Biography

Ying-Bing Jiang has his expertise in thin film materials and selectively permeable membranes. He developed the method of using plasma-defined atomic layer deposition (ALD) to make sub-10nm ultra-thin membranes. He is a research Professor at the University of New Mexico as well as the founder of Angstrom Thin Film Technologies LLC, USA. In recent years his researches focus on tuning nanostructures by ALD and plasma-ALD, and their applications in ultra-thin membranes for gas separation and selective ion transport. In 2011, one of his ultra- thin desalination membranes received the prestigious "R&D 100 Award" from R&D Magazine. In 2015, his liquideous CO_2 separation membranes received another "R&D 100 Award" that was entitled "Green Technology Special Recognition Gold Award ". Dr. Jiang has also been served as the symposium organizer/session chair and delivered invited talks for a number of major international conferences such as MRS meeting, ACS conferences etc.

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JOINT EVENT
12th World Congress on Biofuels and Bioenergy
&
13th Global Summit and Expo on Biomass and Bioenergy
September 04-06, 2018 | Zurich, Switzerland

Andreas Hornung et al., J Bioremediat Biodegrad 2018, Volume 9
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Advanced liquid biofuels from residue biomass by thermo-catalytic reforming

Andreas Hornung[12] and **Nils Jäger**[1]
[1]Fraunhofer UMSICHT, Fraunhofer Institute for Environmental, Safety, and Energy Technology, Germany
[2]University of Birmingham, Edgbaston, Birmingham, United Kingdom

Statement of the Problem: To meet the ambitious political targets regarding the future energy supply, advanced biofuels are needed to reduce the dependency and correlated emissions of fossil fuels. It has become apparent that the transportation sector still offers great potentials to facilitate a sustainable transition. Biogenic fuels that meet fossil fuel standards could therefore utilize in standard fossil fuel engines without market entry barriers. These fuels are only sustainable if the production is not competing for food security or is economically competitive. Methodology & Theoretical Orientation: The research focuses on the development of a new thermo-chemical process to convert biogenic carbon-based residues into valuable storable products. The Thermo-Catalytic Reforming (TCR®) is an intermediate pyrolysis process combined with a unique integrated catalytic reforming step. Various biogenic and industrial residues like sewage or digestate were utilized in a TCR®-plant with a capacity of 30kg/h. The purpose of this work was the production of renewable high-quality transport fuels from residual and waste biomass. To reach the high standards of common fuels like gasoline and diesel, the crude TCR®-oils were hydrotreated. Findings: The crude TCR®-oil was hydrotreated at a temperature of 350 °C and a pressure of 140 bar to remove sulfur, nitrogen and oxygen compounds. After hydrogenation, the oil was fractionated into common fuel fractions. The renewable gasoline and diesel were analyzed and showed the required properties to meet fossil fuel standards (EN 228; EN 590). These fractions were successfully tested in modern EURO-6 car engines. Conclusion & Significance: The TCR® of residue biomass and the upgrading of the oils by hydrogenation enable sustainable production of advanced liquid biofuels. The fuels meet fossil fuel standards, and corresponding engine tests demonstrated the ability of the biofuels to substitute fossil fuel without drawbacks like higher fuel consumption or higher emissions.

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5. Neumann, J., et. al. (2016) Upgraded biofuel from residue biomass by Thermo-Catalytic Reforming and hydrodeoxygenation. Biomass Bioenerg., 89, 91-97.

Figure1: Crude TCR®-oil (left) and hydrotreated TCR®-oil (right)

Biography

Prof. Hornung is an expert in thermo-catalytic conversion of biomass and organic residues for sustainable fuels and chemical synthesis. He has over 25 years' experience in developing novel reactor systems for the conversion of biomass and has expertise in designing, building, and operating reactor units to achieve desired outcomes at all scales of operation. Prof. Hornung currently holds positions as Director of the Fraunhofer Institute, Sulzbach-Rosenberg, Germany. Furthermore, he keeps the Chair in Bioenergy at the University of Birmingham (UK) and is Professor in High-Temperature Process technologies at the Friedrich-Alexander Universität Erlangen-Nürnberg (Germany). He currently holds 21 patents and has published over 250 scientific papers.

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M Peyrot et al., J Bioremediat Biodegrad 2018, Volume 9
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Fast entrained bio-oil production in an entrained flow pilot reaction

M Peyrot, P Castelli, S Valin, G Ratel, H Miller, S Thiery, V Gouget, J Roussely, S Ravel, C Perret, M Perez, P Ponsdevincent and **C Tripoli**
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Bio-oil produced from biomass fast pyrolysis could constitute an alternative to fossil liquid fuels, especially to be combusted for local district heating. So far, only few studies have dealt with bio-oil production by biomass fast pyrolysis in an entrained flow reactor [1], yet it could constitute an alternative to the better-known fluidised bed pyrolysis process. In the context of the BOIL project with the CCIAG Company (Grenoble district heating), a new pilot based on an entrained flow reactor concept has been designed [2]. The pilot design has been carried out on the basis of woody biomass fast pyrolysis experiments and modeling performed in a drop tube reactor as a first step laboratory-scale study, and also CFD modeling [2-3]. The facility is composed of a biomass injection system with a hopper and a feeding screw, an electrically heated pyrolysis reactor, a cyclone to separate gas and char, 3 heat exchangers to cool the gas (at 30°C, 0°C and 0°C respectively) and condense bio-oil, and a post-combustion unit to burn the incondensable species. Gas temperature is maintained at 350°C from the reactor outlet to the entrance of the first heat exchanger in order to avoid bio-oil condensation. In the first experiments performed in the pilot, several conditions were tested: 3 different biomass feedstocks, varying biomass feeding rates from 2 to 9 kg/h and two reactor temperatures 500°C and 550°C. Recovered bio-oil mass yield is on average 40% and its LHV is about 15 MJ/kg. A certain percentage of bio-oil is found after the 3 condensers which means that they are not totally efficient yet. Detailed analyses of the bio-oil produced are in progress. The chemical and physical bio-oil characteristics will be compared to the European Standard recommendations [4].The next steps will be to test bio-oil combustion.

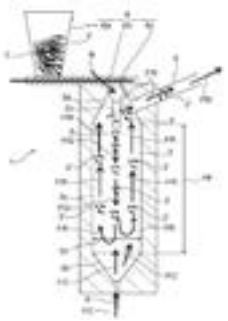

Figure1: Fast pyrolysis reactor with counter current flow of hot gas [2]

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Biography

Marine Peyrot works in the LTCB laboratory for 10 years in the LITEN CEA in Grenoble; she has her expertise in biomass and waste pyrolysis and gasification, and more particularly in reactor modeling.The Laboratory for Thermal Conversion of Bioresources (LTCB) works on the development of biomass and waste-to-energy processes (heat, electricity), as well as processes dedicated to the production of 2G/3G biofuels and green chemicals. It has wide expertise in gasification processes and technologies dedicated to dry resources (fixed bed, fluidized bed, entrained flow reactor) and wet resources (hydrothermal liquefaction, supercritical water gasification). It is equipped with numerous analytical devices to characterize the products (gas, bio-oil, bio-crude, char), study the reaction kinetics, and analyze the inorganic species and their interactions with materials.

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September 04-06, 2018 | Zurich, Switzerland

Scientific Tracks & Abstracts

Day 2

Day-2

SESSIONS

Bioenergy |Renewable Energy

Chair: **Layla Salih Al-Omran,** University of Basrah, Iraq
Co-Chair: **Harri Ali-Löytty,** Tampere University of Technology, Finland

SESSION INTRODUCTION

Title: **The most important factors influencing human exposure assessments of Brominated Flame Retardants (BFRs) via indoor dust ingestion**
Layla Salih Al-Omran, University of Basrah, Iraq

Title: **Efficient Use of Sugarcane Bioenergy for Sustainability of Indian Sugar Industry**
Narendra Mohan, National Sugar Institute, Kanpur,India

Title: **Operando Investigations of Electrochemical Interfaces for Solar Fuel Production by Ambient-Pressure Photoelectron Spectroscopy**
Harri Ali-Löytty, Tampere University of Technology, Finland

Title: **Moroccan energy transition: development of renewable energies and energy efficiency**
Touria Barradi, Ecole Centrale de Casablanca, Morocco

Title: **Producing energy through gases from biomass**
Aude Bertrandias, Air Liquide Centre de Recherche Paris-Saclay, France

Title: **Estimated production of electrical energy for the controlled landfill in Fez (Morocco) by the US EPA Land-GEM model**
Naimi Youssef, University of Hassan II Casablanca, Morocco

Layla S Al-Omran, J Bioremediat Biodegrad 2018, Volume 9
DOI: 10.4172/2155-6199-C1-014

The most important factors influencing human exposure assessments of brominated flame retardants (BFRs) via indoor dust ingestion

Layla S Al-Omran
University of Basrah, Iraq

Brominated flame retardants (BFRs) are industrial chemicals widely used in consumer products to enhance their ignition resistance. Since in most applications these chemicals are used additively, they can transfer from such products into the environment. The toxicity of some BFRs has led to concern about human exposure. Ingestion of indoor settled dust appears to represent a major pathway of exposure to BFRs. However, assessment of human exposure is rendered uncertain because of a lack of knowledge about spatial and temporal variation, dust particle size and sampling collection method. Thus, the study aims to investigate the most important factors influencing human exposure assessments of BFRs via indoor dust ingestion. Concentrations of polybrominated diphenyl ethers (PBDEs) and selected novel brominated flame retardants (NBFRs) were measured in 305 indoor dust samples from different homes in Birmingham, UK. Our results revealed that substantial within-room and within-home spatial variability in BFR concentrations was apparent between two floor areas and between elevated surface and floor dust, due to the varying distances of sampled surfaces from potential BFR sources. BFR concentrations in elevated surface dust exceeded significantly those in floor dust from the same rooms. Considerable within-room and within-home temporal variability in BFR concentrations was apparent over a nine month sampling period, that is likely attributable to changes in room contents. Exposure estimates based on analysis of a dust sample taken from one specific floor area at one specific point in time may not be entirely representative of human exposure in that room. While concentrations of higher brominated compounds did not differ significantly between different dust particle size fractions, those of lower brominated compounds were significantly higher in the finest particle size, underlining the importance of selecting the most appropriate dust particle size for the purpose of exposure assessment. BFR concentrations in researcher-collected dust were higher than those in household vacuum dust.

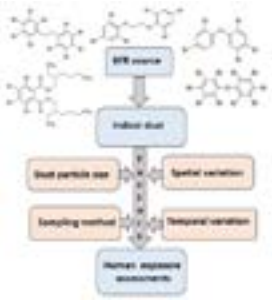

Figure1: Factors influencing human exposure assessments of BFRs via indoor dust ingestion

Recent Publications

1. Björklund, J A, U Sellstrom, C A de Wit, M Aune, S Lignell and P O Darnerud (2012) Comparisons of polybrominated diphenyl ether and hexabromocyclododecane concentrations in dust collected with two sampling methods and matched breast milk samples. Indoor Air 22(4):279-288.
2. Cao Z G, G Yu, Y S Chen, Q M Cao, H Fiedler, S B Deng, J Huang and B Wang (2012) Particle size: a missing factor in risk assessment of human exposure to toxic chemicals in settled indoor dust. Environment International 49:24-30.
3. Fang M and H M Stapleton (2014) Evaluating the bioaccessibility of flame retardants in house dust using an in vitro tenax bead-assisted sorptive physiologically based method. Environmental Science & Technology 48(22):13323-13330.

4. Mercier F, P Glorennec, O Thomas and B Le Bot (2011) Organic contamination of settled house dust, a review for exposure assessment purposes. Environmental Science & Technology 45(16):6716-6727.
5. Muenhor D and S Harrad (2012) Within-room and within-building temporal and spatial variations in concentrations of polybrominated diphenyl ethers (PBDEs) in indoor dust. Environment International 47:23-27.

Biography

Layla Salih Al-Omran is interested in analysis of organic and inorganic pollutants in both biotic and abiotic samples. She has an extensive experience in human exposure assessments of persistent organic pollutants (POPs) in indoor dust. She has built this experience during her PhD study at University of Birmingham, UK. The study involves investigating of the most important factors that affects human exposure assessments of legacy and novel brominated flame retardants via indoor dust ingestion, such as spatial and temporal variations, dust particle size, sampling methods, dust loading and organic carbon content. It has been suggested that without taking into account all of these factors, the exposure assessment will not be an entirely representative metric of exposure. This work is a part of her PhD thesis at University of Birmingham UK during 2012-2016. She has published four research papers regarding to these factors.

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Notes:

Narendra Mohan et al., J Bioremediat Biodegrad 2018, Volume 9
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Efficient use of sugarcane bioenergy for sustainability of Indian sugar industry

Narendra Mohan and **D Swain**
National Sugar Institute, Kanpur, India

Although India is regaining its number 2 position as far as sugar production is concerned and during the current crushing season has already produced a little above 30 MMT of sugar from sugarcane, sustainability of the sugar factories has always remained a matter of concern. In last three years, the variation in sugar production has been from about 20.2 MMT to 30 MMT (almost 50%). Such up and down of the sugar production is cyclic in nature distorting the demand-supply equilibrium and at times the downfall in the sugar prices adversely affect the profitability of the sugar factories to such an extent that it becomes impossible for them to make sugarcane price payment. To circumvent the situation to some extent through value addition and to address environmental issues as well, bagasse based cogeneration has gained favor in India. For current production of about 30 MMT of sugar, about 280 MMT of sugar cane is expected to be crushed by the sugar factories. Only about 60% (the stalk) of sugarcane plant is supplied to the factory and balance 40% (the SPR; sugarcane plant residue) remains in the field itself. This 40% on dry mass has considerable amount of bio-energy which is not being used properly and in fact, wasted by way of burning in the fields which also pollutes the atmosphere as indicated by high suspended particulate matter (SPM) values. While efforts are being made for returning 50% of the biomass (SPR), through trash mulching to improve soil fertility and conserve moisture, the remaining 50% of this biomass can be utilized efficiently for production of bioelectricity in the existing cogeneration units along with the bagasse for adding value to the system and providing clean and green form of renewable energy in place of fossil fuel based power generation.

Recent Publications

1. Waste to Resource Published in Proceeding of '75th Annual Convention of Sugar Technologists' Association of India, 2016.
2. Green Energy for the Indian Sugar Industry: a Sustainable Energy Future" published in the proceedings of 'IAPSIT 2018' held at Udan Thoni, Thailand.
3. Biomass Energy; a Step Towards Economic and Environmental Sustainability in India" published in proceedings of 'International Congress on Sugar and Sugarcane Derivatives- Diversification 2017', held at La Habana, Cuba.
4. Role of bagasse drying in controlling Uttar Pradesh Power Crisis" Published in 'Akshaya Urja', August 2015, a publication from Govt. of India, Ministry of New and Renewable Energy.
5. Diversification for Sustainability of the Sugar Industry" presented during the '23rd Asia International Conference' held in November, 2017 at Jakarta, Indonesia.

Biography

Narendra Mohan, after completing his Post-graduation in Sugar Technology carried out his studies further for award of Fellowship of National Sugar Institute. He has a long and distinguished career of working in sugar industry and at the institute. As Director of National Sugar Institute, Kanpur he has carried out exemplary work in bringing a radical change in the academic, research and consultancy activities of the institute and making its presence felt globally. Besides being an excellent, popular and inspiring teacher, he has been a research worker par excellence who has published more than 75 papers in various international and national journals. His passion for innovative work to covert waste to resource resulted in development of many cost effective and environment friendly technologies. He has been conferred with many prestigious awards including Excellence in Science by Hon'ble President of India.

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Harri Ali-Löytty, J Bioremediat Biodegrad 2018, Volume 9
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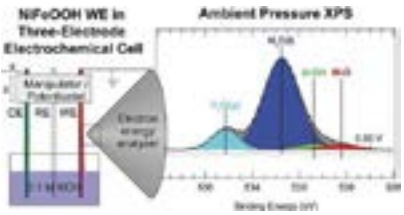
Operando Investigations of Electrochemical Interfaces for Solar Fuel Production by Ambient-Pressure Photoelectron Spectroscopy

Harri Ali-Löytty
Tampere University of Technology, Finland

Solar fuels could resolve the increasing demand for energy in future if only materials solutions capable for high solar-to-fuel (STF) efficiency at cheap price are found. Solar fuels can be produced in photoelectrochemical cells (PECs) that consist of electrodes made of photoactive materials that are coated with electrocatalyst materials. Currently, the STF efficiency of PECs is largely limited by the lack of efficient electrocatalyst materials. Limiting reaction steps include the Oxygen Evolution Reaction (OER) and the CO_2 Reduction Reaction (CO_2RR), which are crucial for solar hydrogen and hydrocarbon fuel production using only sunlight, water and carbon dioxide as raw materials. Operando analysis of reaction intermediates at the solid-liquid interface provides fundamental understanding of catalytic reaction mechanisms and structure-activity/selectivity relationships, which can guide the design of superior electrocatalysts. At present, X-ray Photoelectron Spectroscopy (XPS) probing of the solid-liquid interface is limited to electrochemical operation at rather low current densities. Recently, "tender" X-ray Ambient Pressure XPS and a dip-and-pull electrochemical cell depicted in the Fig. 1 were utilized to study Ni–Fe electrocatalyst at different potentials [1]. The approach allowed operando measurements just above the onset of OER. A two-dimension model was used to describe the spatial distribution of electrochemical potential, current density and pH as a function of the position above the electrolyte meniscus and to provide guidance towards enabling the acquisition of operando XPS at high current density. The current density of 10 mA/cm^2 is the desired operation condition in photoelectrochemical devices. New electrochemical cell designs and early results allowing higher current densities will be presented.



Recent Publications

1. Ali-Löytty, H. et al. Ambient-Pressure XPS Study of a Ni–Fe Electrocatalyst for the Oxygen Evolution Reaction. J. Phys. Chem. C 120, 2247–2253 (2016).
2. Hannula, M., Ali-Löytty H. et al. Improved stability of ALD grown amorphous TiO2 photoelectrode coatings by thermally induced oxygen defects. Chemistry of Materials, in Press.
3. Ali-Löytty, H. et al. The role of (FeCrSi)2(MoNb)-type Laves phase on the formation of Mn-rich protective oxide scale on ferritic stainless steel. Corrosion Science, in Press.
4. Hannula, M. et al. Fabrication of topographically microstructured titanium silicide interface for advanced photonic applications. Scripta Materialia 119, 76–81 (2016).
5. Ali-Löytty, H. et al. Grain orientation dependent Nb–Ti microalloying mediated surface segregation on ferritic stainless steel. Corrosion Science 112, 204–213 (2016).

Biography

Dr. Ali-Löytty has completed his PhD in physics in 2013 from Tampere University of Technology, Finland. After graduation, he visited SLAC National Accelerator Laboratory at Stanford University, California as postdoctoral scholar. Dr. Ali-Löytty is specialized in surface science research utilizing synchrotron light mediated methods, and he is a board member of the Finnish Synchrotron Radiation Users' Organization. Currently, Dr. Ali-Löytty holds a research post as Postdoctoral Researcher at the Academy of Finland focusing on research on photonic materials for solar fuel production.

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Touria Barradi, J Bioremediat Biodegrad 2018, Volume 9
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Moroccan energy transition: Development of renewable energies and energy efficiency

Touria Barradi
Ecole Centrale de Casablanca, Morocco

Sustainable pace of growth in electricity demand, high energy dependency and predominance of fossil fuels, led Morocco to undertake an ambitious, innovative and voluntarist National Energy Strategy on going with an emphasis on renewable energies (RE) [1]. The valorization of its high solar and potential [2] and the development of its interconnections predispose it to become an electricity hub in North and West Africa, and a potential partner of the EU. Initiated in the 1980s by a policy of dam construction, the energy transition has been reinforced during the last decade with the solar and wind contributions. Multiple challenges are addressed: the electrification rate is 100% in urban areas and is gradually approaching this value in rural areas [3], energy dependency decreased from 98% in 2009 to less than 93% this year, aiming to reach 82% in 2030 and the first solar Kwh was injected into the transmission grid in 2016, from the NOORo complex, considered the largest multi-technology solar site in the world [4]. The implementation of 10 GW leads the RE integration rate in the energy mix to reach 52% by 2030, making a historic turning point where the share of renewable electricity will exceed the share of fossil electricity [5]. A specific legislative, regulatory and institutional framework has also been implemented. The flexibility of the electric system and the reduction of RE intermittencies is achieved through the Energy Transfer Station by Pumping (ETSP), the CCGT and international interconnexions. Biomass and biogas benefit from the important agricultural residue and the abundance of organic components in the waste. In line with its commitment towards the climate, public health and the reduction of atmospheric emissions, Morocco intends to develop specific programs dedicated to process solid and liquid effluents [6¬]. The energy efficiency is also an important pillar of the Moroccan energy strategy, contributing to save 5% of the energy consumed by 2020 and 20% by 2030. The primary targeted sectors are transport, building, industry, agriculture and public lighting [7]. The intervention will give an overview of these main programs and projects with a social-economic impact.

Recent Publications

1. Moroccan National Energy Strategy, Ministry of Energy Water Mines and Environment (2009)
2. Atlas of renewable energies in Morocco, ADEREE (2012)
3. Rural Electrification Program (PERG), one.org.ma
4. Moroccan Agency of Sustainable Energy (2016)
5. Ministry of Energy Mines and Sustainable Development, "Moroccan Energy Strategy" (2018)

Biography

Touria BARRADI graduated from the Hassania School of Public Works (EHTP) option electricity, she was the first female engineer graduated from the school, and major of its promotion. In 1980, Touria Barradi-El Alami won the state engineering diploma from the Ecole Supérieure d'Electrique in Paris (Supelec), option energetic systems, nuclear energy. Once again, she is major of her promotion and first Moroccan winner of the school. In 1990, she obtained a doctorate of State of the Polytechnic Institute of Lorraine (INPL) of Nancy, in electrical engineering (honorable mention). Touria Barradi-El Alami taught for 15 years at the EHTP, where she was professor-researcher. She has also been involved in training, at the doctoral cycle at the Pierre and Marie Curie University, and carries out consulting engineering assignments for some companies. Prof. Touria BARRADI is using its academic and professional capital to strengthen the University - Company partnership.

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Aude Bertrandias et al., J Bioremediat Biodegrad 2018, Volume 9
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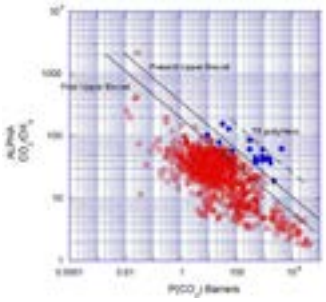
Producing energy through gases from biomass

Aude Bertrandias and **Solène Fournel**
Air Liquide Centre de Recherche Paris-Saclay, France

Biomass is renewable biological matter (e.g. wood, crops, algae, food waste…), which can be processed to generate targeted biomolecules, biomaterials or bioenergy. Bioenergy can be stored as bioethanol or biodiesel, which are commonly known liquid fuels obtained from biomass. But, bioenergy can also be stored under the form of gases, in particular biomethane and biohydrogen, which can be used for mobility. In this presentation, we focus on biomethane.Biogas is a mixture of gases, composed mainly of methane (~55%) and CO_2 (~45%). It is formed by the anaerobic microbiological conversion of organic matter. Biogas can be upgraded into biomethane, which may then be used for mobility (heavy goods vehicles, maritime transportation). In 2014, the European Commission recommended to develop European-wide CNG and LNG filling station infrastructures by launching the "Clean Fuel Strategy". Improvement of the biomethane production process is thus key to deploy clean transportation through biobased CNG and LNG. [1] To improve biomethane production, developments are needed to increase biogas production, reduce operating costs and optimize biogas upgrading. Several technologies can be considered for each. In this presentation, we focus on increasing biogas production through lignocellulosic degradation by biological pre-treatments. Indeed, agricultural waste is difficult to digest due its generally high content in lignocellulose. [2],[3] Agricultural waste is critical since it will represent 90% of the available feedstock for anaerobic digestion in France in 2030, according to an ADEME report. [4] We will also present the latest achievements in membrane permeation technology employed in Air Liquide upgrading units. Formulation of the polymers used in membranes can be improved to have a higher selectivity and at the same time, a higher permeance of CO_2. [5],[6] The right combination of selectivity and permeance can decrease operating or capital costs.



Recent Publications

1. EU directive 2014/94/EU on the deployment of alternative fuels infrastructure
2. Schroyen et al. (2015), "Effect of enzymatic pretreatment of various lignocellulosic substrates on production of phenolic compounds and biomethane potential", Bioresource Techno. Vol. 192, pp. 696-702
3. Cater et al. (2014), Methods for Improving Anaerobic Lignocellulosic Substrates Degradation for Enhanced Biogas Production, Springer Science Reviews, Vol. 2 (1–2), pp. 51–61
4. ADEME (2013), "Estimation des gisements potentiels de substrats utilisables en méthanisation", 117 p.
5. Lin and Yavari (2015), "Upper bound of polymeric membranes for mixed-gas CO2/CH4 separations", Journal of Membrane Sci. Vol. 475, pp. 101-109

Biography

Aude Bertrandias is an R&D engineer at the Research Center Paris-Saclay of Air Liquide. She is part of the Life Science Department, which develops innovative solutions for biotechnology, food and beverage applications and pharmaceuticals. Her main topics of research concern the improvement of biogas production, from both a quantitative and qualitative point of view. She also works on other subjects, linked to bioprocessing. Her background as an engineer in life science and PhD in process engineering enable her to approach bioprocessing projects with a dual perspective.

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NAIMI Youssef et al., J Bioremediat Biodegrad 2018, Volume 9
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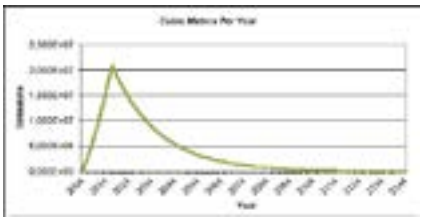
Estimated production of electrical energy for the controlled landfill in Fez (Morocco) by the US EPA Land-GEM model

NAIMI Youssef, Saghir Mohammed and **M. EL Chbihi**
University of Hassan II Casablanca, Morocco

Throughout this article, we will present, in the case of the controlled discharge of Fes which first at the national level is it, even on the level of Africa, It makes it possible to control all the effluents, while preserving the environment of the city. The discharge it is the state of the places of production of electrical energy and thermal energy by the cogeneration. The current production of household wastes in urban environment in Morocco is at 5.3 million tons a year, and in rural environment 1.47 million tons a year. With population growth, rapid urbanization and changes in consumption patterns, household waste production in Morocco is increasing. The rate of setting in controlled discharge is of 35%, this rate will have to reach 64% after the opening of several controlled discharges, which are in the course of construction [2]. Household waste in Morocco contains 65%-75% organic matter, so landfills in Morocco are one of the sources of biomass. According to the calculations of the energy potential of biomass, we can deduce that the amount of electricity that could produce by incineration of household waste from the Rabat region is about more hundred gigawatt-hours [3].

In this study, we used several techniques of calculation and modeling:

- IBM - Software SPSS,
- Technique of calculation for waste tonnage on the level the controlled discharge of Fes,
- Software Landfill Gas Emissions Model (LandGEM) version 3.02 of the USEPA,
- Equation potential of production of electrical energy starting from the methane recovery of the discharge,
- Equation of the thermal power released by the thermal engines of generator.



We will show that the quantity of the electrical energy estimated by the methanation of household wastes of the discharge of Fes is 65.5 GWh/year, and then these quantities are currently available to the level of the discharge of Fes. This alternative allows a reduction of tonnage of accumulated waste.

Recent Publications

1. Funds of Communal Equipment in Morocco and the World Bank, "Diagnosis of the System of Environmental Evaluation in Morocco", August 17th 2011, p.11-77
2. Delegated minister In charge of the Morocco Environment, "Current situation of waste management domestic and compared to Morocco", Organization of the 24th meeting of the National committee of the PNDM on October 2th, 2013
3. Y. Naimi, M. Saghir, A. Cherqaoui, B. Chatre, Energetic recovery of biomass in the region of Rabat, Morocco, International Journal of Hydrogen Energy, Volume 42, Issue 2, 12 January 2017, Pages 1396-1402.Lin and Yavari (2015), "Upper bound of polymeric membranes for mixed-gas CO2/CH4 separations", Journal of Membrane Sci. Vol. 475, pp. 101-109

Biography

Naimi Youssef has his expertise in the felds of renewable energies, and particularly in biomass, fuel cells, and environment. He is Full Professor at Sciences Faculty of Ben M'sik, the University of Hassan II of Casablanca. He is a Vice-President of association, The Moroccan Society for Advancement of Renewable Energy (SMADER), Coordinator of the course "Chemistry of the Environment" License Materials Science Chemistry (SMC), responsible for the Specialized Master "Renewable Energy and Material".

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Day-2

SESSIONS

Pyrolyis| Bioeconomy

Chair: **John Robinson,** University of Nottingham, UK

SESSION INTRODUCTION

Title: **Fuel characteristics of binder free briquettes made at room temperature fromblends of Ceiba pentandra and oil palm mesocarp fibre**
Stephen J Mitchual, University of Education, Ghana

Title: **I'm greenTM PE: paving the way for sustainable plastics.**
Martin Clemesha, BRASKEM, Netherlands

Title: **Scalable concepts for microwave pyrolysis**
John Robinson, University of Nottingham, UK

Title: **Waste-derived carbon: structure, properties and applications**
Swati Sharma, Karlsruhe Institute of Technology, Germany

Title: **How to meet the needs of bees? – Diversification of industrial crops cultivation for a more environmentally benign bioeconomy**
Moritz Von Cossel, Universität Hohenheim, Germany

Title: **Scalable concepts for microwave pyrolysis**
John Robinson, University of Nottingham, UK

Stephen J Mitchual et al., J Bioremediat Biodegrad 2018, Volume 9
DOI: 10.4172/2155-6199-C1-014

Fuel characteristics of binder free briquettes made at room temperature from blends of *Ceiba pentandra* and oil palm mesocarp fibre

Stephen J Mitchual[1], **Patrick Katamani**[1] and **Kojo Afrifa Agyapong**[2]
[1]University of Education, Kumasi Campus, Ghana
[2]Kwame Nkrumah University of Science and Technology, Kumasi, Ghana

This study assessed the fuel characteristics of briquettes made from sawdust of C. pentandra and oil palm mesocarp fibre at room temperature, using low compacting pressure without a binder. Properties of briquettes studied included: stability in diameter and length; relaxed density; compressive strength; impact resistance index; gross calorific value; volatile matter; ash content and elemental composition. These properties were determined using standard laboratory methods. The results showed that for all compacting pressure levels the stability in diameter and length of the briquettes produced decreased with increasing proportion of oil palm mesocarp fibre in the mixing ratio while increase in compacting pressure resulted in increased relaxed density. All the briquettes produced from blends of C. pentandra and oil palm mesocarp fibre had compressive strength lower than those produced from pure C. pentandra. However, compacting pressures of 40 MPa and 50 MPa produced briquettes with adequate compressive strength irrespective of mixing ratios. Additionally, all the briquettes produced from blends of C. pentandra and oil palm mesocarp fibre had adequate impact resistance index ranging from 120%-350% (IRI>100%). At 5% level of significance, the compacting pressure and mixing proportion had significant effect on the stability in length and diameter, relaxed density, compressive strength and impact resistance index of briquettes produced. The gross calorific values of C. pentandra and oil palm mesocarp fibre were found to be 20.33 MJ/kg and 19.50 MJ/kg respectively. The low ash, nitrogen, hydrogen and sulphur contents of the biomass materials used for the study makes them eco-friendly. Therefore, binder free briquettes with adequate physical, mechanical and thermal properties could be produced from a blend of C. pentandra sawdust and oil palm mesocarp fibre at room temperature using low compacting pressure.

Recent Publications

1. Okai R, Banful E A and Mitchual S J (2016) Dynamics of lumber production from buttressed-stumps of logging residues using a fuel powered horizontal mobile bandsaw machine. Journal of Environmental Science and Engineering doi:10.17265/2162-5298/2016.02.004
2. Mitchual S J, Donkoh M and Bih F (2015) Assessment of safety practices and injuries associated with wood processing in a timber company in Ghana. Open Journal of Safety Science and Technology DOI: 10.4236/ojsst.2015.51002.
3. Mitchual S J, Donkoh M and Bih F (2015) Awareness and willingness to utilize health and safety measures among workers of a timber processing firm in Ghana. Journal of Scientific Research and Reports 6(3):178-188.
4. Mitchual S J (2015) Enhancing the physical properties of briquettes from sawdust of Piptadenia africana through combination with Ceiba pentandra. British Journal of Applied Science and Technology DOI: 10.9734/BJAST/2015/12315.
5. Mitchual S J, Frimpong-Mensah K and Darkwa N A (2014) Evaluation of fuel properties of six tropical hardwood species for briquettes. Journal of Sustainable Bioenergy Systems 4(1):1-9.

Biography

Stephen J Mitchual an energetic and enthusiastic Wood Technologist who holds MSc and PhD in Wood Science and Technology. I have over the years past conducted extensive research in the area of sawmilling and biomass energy, and have published extensively in international journals. I have also successfully taught causes in Wood Technology and other related discipline at both Undergraduate and Postgraduate levels during my 13 years working experience with the University of Education, Winneba. Currently, I am the Dean of the Faculty of Technical Education. The opportunity to learn new skills and work with new technologies is particularly attractive to me. Finally, I am a dynamic individual with excellent team working and communication skills. I am also able to relate to a wide range of people.

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Martin Clemesha, J Bioremediat Biodegrad 2018, Volume 9
DOI: 10.4172/2155-6199-C1-014

I'm green™ PE: Paving the way for sustainable plastics.

Martin Clemesha
Braskem Netherlands BV, Netherlands

This lecture intends to introduce Braskem's sugar cane based polyethylene. Polyethylene derived from sugarcane based ethanol, produced in the center south region of Brazil, has a negative carbon footprint, meaning that from cradle to factory gate, the biobased PE captures more carbon from the atmosphere than its production chain releases. The development of a traditional polymer that is recyclable and from renewable resources represents a step forward towards a bio-circular economy. Other important aspects such as sustainable sourcing, land use issues and some examples of applications will be shown. Finally, a glance to Braskem's R&D programs in the renewable chemicals field will be shared.

Biography

Mr. Martin Clemesha graduated as a materials science engineer at the Polytechnic School of São Paulo University in 2001 and has a post-graduation degree in Packaging Engineering. Along his 15 years carrier, he has provided technical support to Customers in several segments in Brazil, South America and Europe. As market development engineer, he worked on projects involving the replacement of traditional materials in the paint packaging and medical packaging industries. Today in a more commercial role, his aim is to serve current customers and open new opportunities for Braskem's I'm GreenTM polyethylene in Europe.

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Notes:

Swati Sharma, J Bioremediat Biodegrad 2018, Volume 9
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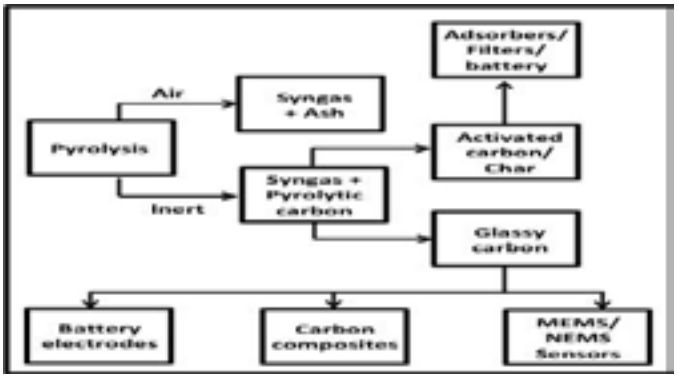
Waste-derived carbon: structure, properties and applications

Swati Sharma
Karlsruhe Institute of Technology, Germany

Pyrolysis or controlled heating of biodegradable and non-biodegradable polymers is an emerging technique for their safe decomposition and possible recycle. The mixture of volatile products resulting from pyrolysis is typically collected as the 'syngas', which is further separated by distillation into gaseous products to be used as fuels and precursors for the synthesis of various high molecular weight organic compounds. However, one major challenge associated with waste polymer pyrolysis is the handling of the residual solid byproducts, often designated as 'ash'. In our group we develop novel pathways to pyrolyze polymers such that the solid residues are useable forms of elemental carbon rather than ashes. Depending on the surface properties and the extent of crystallinity these carbon materials are further classified as glassy or activated. While activated carbon, often obtained from cellulosic materials such as papers waste, is employed in various industry-scale adsorber and filtration applications; glassy carbon is extensively used in miniaturized devices such as micro/ nano electromechanical systems (MEMS/ NEMS), battery and supercapacitor anodes, sensors and cell culture scaffolds owing to the fact that it can be derived from lithographically patterned polymers. This talk will be focused on various aspects of pyrolytic carbons including (i) the structure-property relationship in pyrolytic carbons at bulk and nano-scale, (ii) influence of pyrolysis conditions on the microstructure of resulting carbon, (iii) characterization and classification of carbon obtained from polymers of different chemical classes, and (iv) unconventional applications of pyrolytic carbons. Pyrolysis efficiency, state-of-the-art characterization techniques such as in situ electron microscopy will also be touched upon.



Recent Publications

1. Erwin Fuhrer, Anne Bäcker, Stephanie Kraft, Friederike J. Gruhl, Matthias Kirsch, Neil MacKinnon, Jan G. Korvink, Swati Sharma. 3D Carbon Scaffolds for Neural Stem Cell Culture and Magnetic Resonance Imaging. Advanced Healthcare Materials, 2017, 1700915.
2. Anna Zakhurdaeva, Philipp-Immanuel Dietrich, Hendrik Hölscher, Christian Koos, Jan G. Korvink, Swati Sharma. Custom-Designed Glassy Carbon Tips for Atomic Force Microscopy. Micromachines, 8(9), 2017, 285.
3. Swati Sharma, Arpad Rostas, Neil MacKinnon, Stefan Weber, Jan Korvink. Micro and nano patternable magnetic carbon. Journal of Applied Physics, 120, 2016, 235107.
4. Gerald Göring, Philipp-Immanuel Dietrich, Matthias Blaicher, Swati Sharma, Jan G. Korvink, Thomas Schimmel, Christian Koos, Hendrik Hölscher. Tailored probes for atomic force microscopy fabricated by two-photon polymerization. Applied

Physics Letters, 109, 2016, 063101.

5. Swati Sharma, Neil MacKinnon, Vlad Badilita, Sebastian Kiss, Lorenzo Bordonali, Jan Korvink. Carbon MEMS for Magnetic Resonance. In 'Carbon: The Next Silicon?', Momentum Press, LLC, New York USA, 2016.

Biography

Dr. Swati Sharma currently leads the Advanced Carbon Materials and Devices research group at the Institute of Microstructure Technology, Karlsruhe Institute of Technology, Germany. Her research is focused on pyrolysis optimization for polymers from different chemical classes for obtaining carbons with pre -defined properties. These carbon materials are then used for various applications ranging from miniaturized devices to the bulk manufacture of composites. She is involved in various international collaborative projects aimed at large-scale waste treatment, and has organized meetings and workshops to facilitate a common platform to scientists working on different aspects of waste disposal and treatment. Her interests include finding novel applications of pyrolytic carbon and efficient scale-up of this technology to make it commercially more profitable.

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Notes:

Moritz von Cossel, J Bioremediat Biodegrad 2018, Volume 9
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How to meet the needs of bees? - Diversification of industrial crops cultivation for a more environmentally benign bioeconomy

Moritz von Cossel
University of Hohenheim, Germany

Statement of the Problem: Today, agriculture is facing fundamental ecosystemic crisis such as pollinator losses and land degradation mainly driven by both climate change and declining landscape heterogeneity. Consequently, industrial crops cultivation (ICC) key element of a growing bioeconomy - should both avoid competition with food crops cultivation (FCC) and take environmental aspects into account. In Germany however, ICC for biogas production is still characterized by only a few biogas substrates such as maize or whole crop cereal silage prevalently using non marginal areas strongly competing with FCC. This study reassesses agricultural diversification of ICC to support agrobiodiversity especially considering low-input practices on marginal lands.

Methodology & Theoretical Orientation: Several field trials with amaranth (Amaranthus hypochondriacus L.) and perennial wild plant mixtures (WPM) were conducted at three sites in southwest Germany from years 2014 to 2017. Lab scale biogas yield assessments were conducted with milled dry matter samples.

Findings: The diversification of biogas crop rotation systems with amaranth was found promising for increasing ecosystemic functioning of ICC for biogas production. Amaranth provides high amounts of nectar, an essential ecosystemic service towards biodiversity conservation. Additionally, amaranth showed comparable suitability for legume intercropping to maize. However, both better agronomic knowledge and genotypes are required to improve its performance. WPM cultivation showed highest potential for biodiversity conservation due to its high species diversity and long-term soil cover. High biomass yields (> 20 t ha 1) were observed under marginal growth conditions. The long term performance of WPM could be improved using maize as nurse crop in the establishment year. However, low yield stability and variable biogas substrate quality render crucial challenges for practical implementations of WPM.

Conclusion & Significance: This study reports promising temporal and spatial agricultural diversification measures for more environmentally benign industrial crop cultivation and derives basic recommendations for further investigations.

Recent Publications

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4. Von Cossel, M., Steberl, K., Möhring, J., Kiesel, A., Lewandowski, I. (2017) Etablierungsverfahren mehrjähriger Biogas-Wildpflanzenmischungen im Vergleich: Ohne Mais geht's nicht? Mitteilungen der Gesellschaft für Pflanzenbauwissenschaften (Witzenhausen: Liddy Halm), 58–59. Available at: https://www.gpw.uni-kiel.de/de/jahrestagung/tagungsbaende/tagungsband-2017 [Accessed June 11, 2018].

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Biography

Moritz von Cossel is a Research Associate and Doctoral candidate at the Department of Biobased Products and Energy Crops at Hohenheim University. Before studying, he trained to become a vegetable grower at Germany's largest vegetable farm, Behr AG where he gained first knowledge on basic agricultural practices and both chances and challenges of diverse cropping systems. After receiving his Master's degree in Crop Science from Kiel University, he moved to southern Germany and started his research on both temporal and spatial diversification measures in biogas cropping systems at Hohenheim University. Over the past four years, he has participated in the GOBI project (General Optimization of Biogas Processes) and revealed valuable insights to the cultivation of amaranth and perennial wild plant mixtures for biogas production. Currently, he is working on low-input agricultural practices for industrial crops cultivation on marginal lands across Europe (EU-28 and Ukraine) as part of the MAGIC project.

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Notes:

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Scalable concepts for microwave pyrolysis

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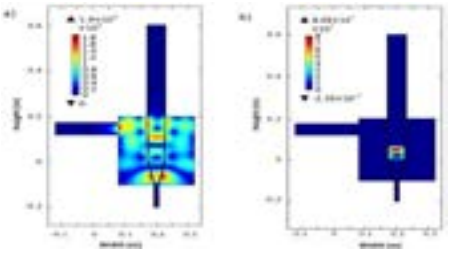
Microwave pyrolysis of biomass has long been recognized to provide potential opportunities for producing a range of bio-based products. Unlike conventional heating, microwave heating occurs through the interaction of biomass with electromagnetic energy, with the biomass heated volumetrically by energy conversion instead of conventional heat transfer mechanisms. With microwave heating pyrolysis can be achieved within a cold surrounding environment, a feat that is not possible with conventional heating processes. This unique phenomenon presents a number of opportunities for processing of biomass feed stocks, which include enhanced product quality and a significantly simplified process flow sheet, both of which improve the economic viability of industrial biomass processing. Examples of the benefits of microwave heating include the elimination of size-reduction and particulate removal steps and simplification of inert-gas preparation and recycling systems. These are discussed within the paper, along with the enhanced product quality that can be produced as a result. Previous studies in this field have typically made use of fixed bed reactors, in which heating heterogeneity issues and undesired thermal run away of the biomass are inherent. This paper presents five alternative and scalable microwave processing concepts which have already proven to successfully operate at scale, within an industrial environment. The potential application of these concepts for biomass processing and their ability to deliver a step-change in product quality and flow sheet simplification is discussed within the paper.



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4. E T Kostas et al., (2017) The application of microwave heating in bioenergy: A review on the microwave pre-treatment and upgrading technologies for biomass. Renewable and Sustainable Energy Reviews 77:12-27.
5. D Beneroso et al., (2017) Microwave pyrolysis of biomass for bio-oil production: Scalable processing concepts. Chemical Engineering Journal 316(1):481-498.

Biography

John Robinson is an Associate Professor in Chemical & Environmental Engineering at the University of Nottingham. His expertise is in the development and scale-up of microwave heating processes and has taken several processes from a laboratory scale curiosity to a commercial operation. His current research interests are based on understanding the opportunities and advantages for microwave heating within the bioenergy and biorefinery field and developing scalable processes for the pyrolysis of lignocellulosic biomass.

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Richard Ahorsu et al., J Bioremediat Biodegrad 2018, Volume 9
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L-lactic acid production from cellulose and hemicellulose extract of walnut shell through microwave-assisted autohydrolysis followed by microbial fermentation

Richard Ahorsu, Giacomo, Francesc Medina and **Magda Constanti**
Rovira I Virgili University, Spain

Conversion of lignocellulosic biomass to renewable and valuable chemicals has attracted global attention because it is a better alternative pathway to reverse the negative environmental impact and ultimately build up a sustainable society. Lactic acid has become a valuable chemical due to its versatile application in the food, medical, and cosmetics industries and as raw material for the manufacture of biodegradable plastics. Lignocellulosic biomass is a promising feedstock for lactic acid production considering its abundance and low cost compared to refined sugars. In this study, autohydrolysis of the amorphous region of cellulose and hemicellulose in the walnut shell through microwave-assisted reaction at selected temperature ranges (150°c, 170°c, and 190°c) with the residence time (20 min, 40 min, 60 min) were investigated. The corresponding severity factor of the hydrolysis was calculated. At a reaction condition of 190°C, 20 min, a maximum theoretical yield of 98% of xylose and 21.6% of glucose was obtained. Subsequently, the obtained hydrolysate from the maximum yield was converted to optically pure L-lactic acid. This was achieved by using inhibitor resilient bacteria Bacillus coagulans DSM 2314. This bacterium converted the higher amount of xylose from the hemicellulose to an optically pure L-lactic acid with a considerable utilization of the glucose present in the hydrolysate into optically pure L-lactic acid.

Recent Publications

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Biography

Richard Ahorsu is currently a PhD student at the Department of Chemical Engineering, Rovira I Virgili University. His research is focused on transformation of biomass into value added chemicals. At the present, he adopted simple and cost efficient autohydrolysis technique to convert walnut shell into xylose and glucose followed by batch fermentation to obtain L-lactic acid. He obtained his Master's degree in Nanoscience, Materials and Processes in URV. During his Master's degree he intensively investigated hydrogen evolution through water splitting mechanism by employing electrospun photocatalyst.

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John Ryan, J Bioremediat Biodegrad 2018, Volume 9
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Tuning biomass pyrolysis for polymer precursors

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All humans must reduce their dependency on fossil fuels. Just as polymers are a big part of modern life, so too crude oil is a big part of these polymers. Current estimates are that in order to produce a one litre water bottle, 250 mL of crude oil is consumed in heating, transport and raw material use.[1] Pyrolysis of biomass is a route to chemicals useful in applications similar to those derived from fossil fuels. Microwave pyrolysis allows more accurate and precise temperature control throughout the reaction. This improved temperature control allows more selective pyrolysis, yielding distinct aqueous and organic phases with partitioning of the pyrolysis products. These products have potential as feedstock for goods we use daily, and have undergone a primary separation during the microwave pyrolysis process itself. Characterisation and subsequent derivatisation of the aqueous and organic phases from microwave pyrolysis are outlined and compared to that of conventional pyrolysis methods.

Biography

Originally from Lincolnshire, UK. John is currently a second year PhD student as part of the Centre for Doctoral Training in sustainable chemistry based in the University of Nottingham's Carbon Neutral Laboratory.

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Notes:

JOINT EVENT

12th World Congress on **Biofuels and Bioenergy**

&

13th Global Summit and Expo on **Biomass and Bioenergy**

September 04-06, 2018 | Zurich, Switzerland

Scientific Tracks & Abstracts

Day 3

Day-3

SESSIONS

Bioalchol and Bioethanol | Biorefineries | Biodiesel

Chair: **Julio Sacramento-Rivero,** Universidad Autonoma de Yucatan, Mexico

SESSION INTRODUCTION

Title: **Mechanochemistry for a smart and sustainable biodiesel production under heterogeneous catalysis**
Irene Malpartida Garcia, University of Malaga, Spain

Title: **Ex-ante and ex-post sustainability evaluation of a biorefinery: lessons learned from jatropha biodiesel in Yucatan, Mexico**
Julio Sacramento-Rivero, Universidad Autonoma de Yucatan, Mexico

Title: **Fundamental Investigations of Electrocatalyzed Transformations of Organic Compounds**
Sneha A. Akhade, Pacific Northwest National Laboratory,Washington, USA

Title: **The strategic use of sugarcane for second generation ethanol production: Cold alkaline extraction pre-treatment**
Danila Morais de Carvalho, Royal Institute of Technology, Sweden

Title: **Production of ethanol and longer chain alcohols by fermentation**
Johann Orlygsson, University of Akureyri, Iceland

Title: **U.S Biodiesel markets and trends, with a special focus on sustainability.**
Ryan Lamberg, University of California,USA

Julio C Sacramento Rivero et al., J Bioremediat Biodegrad 2018, Volume 9
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Ex-ante and ex-post sustainability evaluation of a biorefinery: Lessons learned from jatropha biodiesel in Yucatan, Mexico

Julio C Sacramento Rivero[1], **Amarella Estmond-Spencer**[1], **Javier Becerril García**[1] and **Sam Sweitz**[2]
[1]Universidad Autonoma de Yucatan, Mexico
[2]Michigan Technological University, USA

The concept of sustainability is implicit in the definition of a biorefinery. Life cycle thinking as well as environmental, social, and economic assessments are intrinsic to a sustainability evaluation. There is an abundance of methods and indicators to perform sustainability evaluations; the more approaches are used, the better will be the understanding of the interlinkages between the issues in this multidimensional problem. In this work, we present two approaches to the sustainability evaluation of jatropha plantations for biofuels in Yucatan, Mexico. The *ex-ante* evaluation was performed during the early implementation of the project, from a biorefinery-process design perspective. The ex-post evaluation was performed after the fourth and final year of the project, heavily based on interviews and surveys with relevant stakeholders, and a life-cycle assessment. The *ex-ante* evaluation predicted potentially positive results from the biorefinery system, with all indicators in the social and economic categories within sustainable limits; the environmental performance of the system was sustainable only if the jatropha biomass was refined into a range of valuable co-products in addition to biodiesel. The ex-post evaluation was performed after four years of the project. At that time it was clear that the project had failed due to unrealistic, over-optimistic predictions of seed yields from the plantations that were established with very little knowledge of the crop. This inevitably resulted in the plantations being significantly downsized and the projects going back to the R&D stage. Interestingly, one of the companies obtained a sustainability certification from the Roundtable for Sustainable Biomaterials a few months before shutting down. The economic benefits to jatropha workers were significant and positive for both household income and local economies. If the issues with seed productivity and plant management had been well thought out from the beginning, the jatropha projects, they would have been of great value to the local communities.

Figure 1. Summary the sustainability evaluation. Indicators are normalized for attaining values between zero and one when in sustainable conditions.

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1. Navarro-Pineda FS, Ponce D, Sacramento-Rivero JC, Barahona Pérez LF (2017). An economic model for estimating the viability of biodiesel production from *Jatropha curcas* L. J Chem Technol Biotechnol 92(5):971-980.
2. Sacramento Rivero JC, Eastmond-Spencer A, Becerril García J, Navarro-Pineda F (2016). A three dimensional sustainability evaluation of jatropha plantations in Yucatan, Mexico. Sustainability 8:1316.
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5. Sacramento-Rivero JC (2012). A methodology for evaluating the sustainability of biorefineries: framework and indicators. Biofuels, Bioprod Bioref 6(1):32-44.

Biography

Dr Julio Sacramento has a PhD on Chemical Engineering from the University of Manchester Institute of Science and Technology. His research interest is on how to apply sustainability thinking to process design in multidimensional systems. He has developed a couple of methods to assess the sustainability of biorefinery systems and is applying these to biorefinery concepts around the world. He is heavily involved in the promotion of biofules in Mexico, serving in many academic and professional networks, such as the Mexican centre for innovation in biofuels (CEMIEBio).

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Notes:

Sneha A. Akhade, J Bioremediat Biodegrad 2018, Volume 9
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Fundamental Investigations of Electrocatalyzed Transformations of Organic Compounds

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Sustainable energy generation calls for a paradigm shift away from centralized, high-temperature catalysis to decentralized, low-temperature conversions that can be powered using replenishable, renewable energy sources. Electrocatalytic conversion of biomass derived feedstocks offers a promising avenue to effectively allow carbon recycling of distributed, energypoor resources using underutilized energy resources. To retain economic viability of this target technology, rational design of electrocatalysts with high activity and selectivity towards producing value-added chemicals and fuels is necessary. Despite extensive research done in electrocatalysis, there exists a lack of mechanistic exploration and molecular-scale understanding of electrocatalytic conversion of organic compounds specifically pertaining to biomass feedstocks. Moreover, these reactions occur at the solvated electrode-electrolyte interface where complex interactions between the electrode and solvent molecules have a critical influence on the reaction chemistry. In this talk, we address the confluent influence of the solvent distribution and the charged metal electrode on the reaction intermediates and their capacity to undergo reduction/hydrogenation. Results obtained using density functional theory (DFT) calculations and molecular dynamics (MD) simulations will be presented to demonstrate our efforts in securing molecular-scale representations of the structural/electronic properties of the electrochemical interface and the reaction energetics of target organic compounds. The inferences drawn will be used to postulate design criteria for electrocatalytic conversion of organic compounds from an experimental and theoretical perspective.

Recent Publications

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2. Akhade, S. A., Bernstein, N. J., Esopi, M. R., Regula, M. J., & Janik, M. J. (2017). A simple method to approximate electrode potential-dependent activation energies using density functional theory. Catalysis Today, 288, 63-73.
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Biography

Dr. Sneha Akhade completed her Ph.D. in Chemical Engineering from Penn State University in 2016 and obtained a M.S. from Carnegie Mellon University. She is currently a postdoctoral research associate at the Pacific Northwest National Laboratory and works across theory and experiment to investigate electrocatalysis at a fundamental and applied scale. Her research interests broadly include catalysis, fuel cells and batteries, high-throughput computational screening and rational design of materials for alternative energy storage and conversion technologies.

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Danila Morais de Carvalho et al., J Bioremediat Biodegrad 2018, Volume 9
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The strategic use of sugarcane for second-generation ethanol production: Cold alkaline extraction pretreatment

Danila Morais de Carvalho, Olena Sevastyanova, José Humberto de Queiroz and **Jorge Luiz Colodette**
Royal Institute of Technology, Sweden

The global demand for more sustainable alternatives for supplying fuels, energy, chemicals, materials etc. has attracted great attention of researchers and industries currently. The increasing use of lignocellulosic biomass as feedstock is a good example about how industry has investigated potential substitutes for the traditional fossil sources. The ethanol is an alcohol usually obtained from renewable sources by fermentation process and widely used for chemical and fuel purposes. In tropical areas, the main feedstock for ethanol production is the sugarcane, from which only the sugarcane juice is used within the production process. However, the strategic use of its lignocellulosic residues, *i.e.* bagasse and straw, in technologies for second-generation ethanol production presents great logistic advantages, with potential for enhancing the sugarcane industry profitability by integrating first and second-generation platforms. The second-generation ethanol production, however, faces nowadays some challenges to be commercially implemented, being one of them the biomass pretreatment. The cold alkaline extraction (CAE) is an efficient method to remove substantial amounts of hemicelluloses and lignin from biomasses. Performed in low temperature (20-40°C), CAE requires just relatively simple instrumental (unpressured reactor). In the present study we investigated the CAE pretreatment for bagasse and straw preparation and the ethanol production through semi-simultaneous saccharification and fermentation (SSSF) (Fig. 1). To the best of our knowledge, although used in other industrial segments, the use of CAE for treating biomass for ethanol production had not been explored before, especially in combination with SSSF. A removal of 52-61% xylan and 37-45% lignin from biomasses was observed during CAE process. Biomasses depleted in hemicelluloses and lignin were more susceptible to SSSF process, increasing the volumetric productivity of ethanol in 11.6 times and 15 times compared with untreated bagasse and straw, respectively. The volumetric productivity of ethanol was 0.29 g/L/h and 0.57 g/L/h for bagasse and straw, respectively.

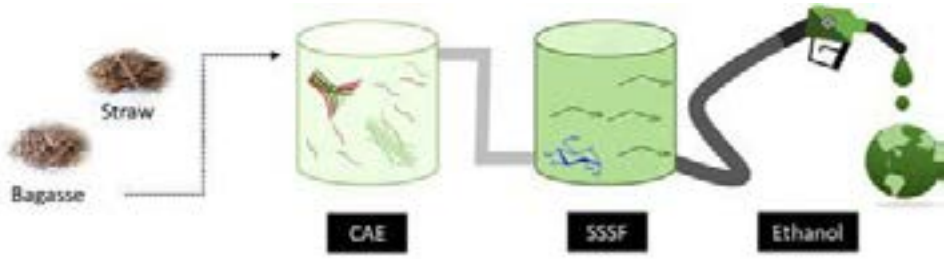

Figure 1: Working plan for second generation ethanol production from sugarcane bagasse and straw using cold alkaline extraction pretreatment.

Recent Publications

1. Carvalho DMde, Queiroz JHde, Colodette JL (2017) Hydrothermal and acid pretreatments improve ethanol production from lignocellulosic biomasses. BioResources 12(2):3088-3107.
2. Carvalho DMde, Colodette JL (2017) Comparative study of acid hydrolysis of lignin and polysaccharides in biomasses. BioResources 12(4):6907-6923.
3. Carvalho DMde, Queiroz JHde, Colodette JL (2016) Assessment of alkaline pretreatment for the production of biethanol from eucalyptus, sugarcane bagasse and sugarcane straw. Industrial Crops and Products 94:932-941.
4. Carvalho DMde, Sevastyanova O, Queiroz JHde, Colodette JL (2016) Cold alkaline extraction as a pretreatment for bioethanol production from eucalyptus, sugarcane bagasse and sugarcane straw. Energy Conversion and Management 124:315-324.

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Biography

Danila Carvalho has her expertise multiple use of lignocellulosic biomasses. During recent years the main goal of her research was to turn lignocellulosic wastes into renewable alternatives of feedstock for industry. Her recent project on bioethanol production from sugarcane residues confirmed the great potential of use of such biomasses in industry, including in the sugarcane industry itself. The strategic integration of first and second ethanol platforms, in addition to promote a greener and profitable use of lignocellulosic biomasses, results in an undeniable enhancing in ethanol production.

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Notes:

Johann Orlygsson, J Bioremediat Biodegrad 2018, Volume 9
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Production of ethanol and longer chain alcohols by fermentation

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The use of fermentative microorganisms for efficient C_2-C_5 alcohol production from renewable feedstocks has been a subject of intense investigation over recent decades. While the physiology of microorganisms involved in alcohol production from first generation feedstocks is well established, the utilization of microorganisms for the production of second generation bioalcohols from complex biomass, such as lignocellulose, remains challenging. At present, there are no "all in one" bioprocessing organisms that have been used on an industrial scale capable of both complex biomass conversions to fermentable substrates and fermentation to alcohols. Extensive investigations on bioalcohol-producing organisms and related processes have targeted challenges ranging from the conversion of feedstock biomass to fermentable substrates, process design, and organism improvements. Recent advances in the production of liquid fuel carriers such as ethanol, propanol, and butanol as well as branched-chain alcohols will be the subject of this presentation. The main emphasis is on thermophilic bacteria capable of producing ethanol with high titers as well as branched-chain alcohols (isopropanol, 2-methylbutanol and 3-methylbutanol) from branched-chain amino acids.

Recent Publications

1. Carvalho DMde, Queiroz JHde, Colodette JL (2017) Hydrothermal and acid pretreatments improve ethanol production from lignocellulosic biomasses. BioResources 12(2):3088-3107.
2. Carvalho DMde, Colodette JL (2017) Comparative study of acid hydrolysis of lignin and polysaccharides in biomasses. BioResources 12(4):6907-6923.
3. Carvalho DMde, Queiroz JHde, Colodette JL (2016) Assessment of alkaline pretreatment for the production of biethanol from eucalyptus, sugarcane bagasse and sugarcane straw. Industrial Crops and Products 94:932-941.
4. Carvalho DMde, Sevastyanova O, Queiroz JHde, Colodette JL (2016) Cold alkaline extraction as a pretreatment for bioethanol production from eucalyptus, sugarcane bagasse and sugarcane straw. Energy Conversion and Management 124:315-324.

Biography

Johann Orlygsson has expertise in physiology of thermophilic anaerobic bacteria with main emphasis on bioethanol and biohydrogen production. Additionally, recent investigations have been towards producing high value – low volume compounds like 1,2-propandiol using extremophiles like *Caldicellulosiruptor* and branched-chain alcohols with Thermoanaerobacter and Caldanaerobacter species.

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Notes:

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U.S Biodiesel markets and trends, with a special focus on sustainability.

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Representing the National Biodiesel Board (NBB) and the U.S. Biodiesel Industry, Ryan Lamberg proposes to provide an update on U.S Biodiesel markets and trends, with a special focus on sustainability. The NBB is the national trade association that represents the biodiesel and renewable hydrocarbon diesel industries as the coordinating body for research and development in the U.S. It was founded in 1992 and has developed into a comprehensive association that coordinates and interacts with industry, government and academia. NBB's membership is comprised of biodiesel producers, feedstock and feedstock-processor organizations, fuel marketers and distributors, and technology providers. Biodiesel is a renewable, clean-burning diesel replacement that is reducing U.S. dependence on imported petroleum, creating green jobs and improving our environment. It is made from an increasingly diverse mix of resources including agricultural oils, recycled cooking oil and animal fats and meets the strict specifications of ASTM D6751. Transportation is now our nation's largest source of Greenhouse Gases (GHGs). As other sectors find pathways to reduction, transportation and especially the heavy-duty sector will remain largely reliant on petroleum for years to come. Not all fuels are alike. Not all vehicles are alike. And not all duty cycles are alike. For each duty cycle, there is a vehicle that can be more efficient and consume more renewable fuel in cleaner technologies. Yet, this is especially difficult for the heavy-duty sector. The U.S. is consuming over 180 BILLION gallons of gasoline (~135 BILLION) and diesel (~60 BILLION) every year. Even with scheduled efficiencies on the horizon, our population and energy demands increase. If we are lucky, many passenger cars may eventually transition to electric vehicles on a clean grid AND simultaneously reduce carbon by embracing Biodiesel in all diesel applications. Biodiesel and other advanced biofuels are scientifically proven, commercially available and help dramatically reduce GHGs in the hardest to reach sectors where other alternative fuels and vehicles are not readily available. 400+ U.S. mayors and 20+ U.S. states have 80% percent reduction climate goals by 2050 will not be accomplished by electric vehicles alone. All renewable fuels can play a role, especially when considering Life Cycle Analysis (LCA) to help us differentiate between carbon intensities of fuels. The Low Carbon Fuel Standard in California is one example that uses LCA and is spreading along the west coast making quantifiable reductions with low carbon fuels. For example, the diesel pool in California is approximately 14% biomass based diesel fuel TODAY. Biodiesel is America's first Advanced alternative and renewable biofuel. Over the last decade, US biodiesel production has grown to more than 2 billion gallons per year. Government agencies and national laboratories have determined that biodiesel has significant lifecycle greenhouse gas emissions reductions. Over time, these studies have more accurately quantified additional impacts such as Indirect Land Use Change (ILUC). The science is clear; reductions are anywhere from 50 to 122 percent below petroleum diesel. Myths such as the food versus fuel false dilemma muddy the waters. Biofuels were developed to utilize the excess carbohydrates and fats coproduced with protein. Awareness of these co-product relationships, can also inform us about smart choices for optimizing the nitrogen cycle, water use efficiency, and prevention of soil loss and degradation as we meet the growing global demand for protein. A new study on biodiesel's lifecycle energy and greenhouse gas (GHG) emission effects updates and reaffirms the long-understood benefits of using the renewable fuel. The study is the latest in the significant body of transparent, peer-reviewed, studies that conclusively quantify biodiesel's widespread benefits. The report, recently published by a collaboration between Argonne National Laboratory, Purdue University, and the U.S. Department of Agriculture (USDA), represents the most up-to-date and comprehensive lifecycle analysis of biodiesel ever produced. Results confirm that biodiesel compared to petroleum diesel reduces GHG emissions by 72 percent and fossil fuel use by 80 percent.

Biography

As the Executive Director of the California Biodiesel Initiative, Ryan Lamberg works in tandem with the National Biodiesel Board, the California Biodiesel Alliance and regional NGOs to support increased production and consumption of biodiesel. Lamberg is a co-founder of Community Fuels, one of California's largest biodiesel production facilities. He also helped initiate the California Biodiesel Alliance in 2006. Lamberg has a technical background in renewable fuels, business development and energy efficiency including the Energy Upgrade California program

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