JOINT EVENT

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

&

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

September 04-06, 2018 | Zurich, Switzerland

Keynote Forum

Day 1

Christophe Len, J Bioremediat Biodegrad 2018, Volume 9
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Christophe Len

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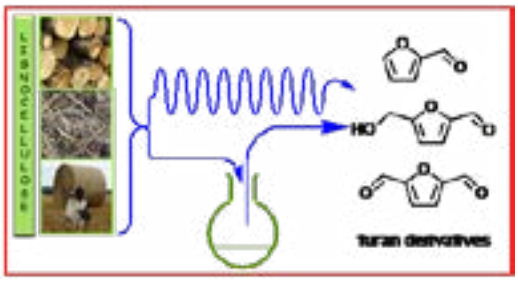
Recent advances in catalytic production of biobased furan derivatives

The design of environmentally friendly methodologies has been the driving force of scientists in recent years. In particular, the use of biomass-derived materials, green solvents and alternatives techniques has been investigated for the production of platform molecules and chemicals such as furfural, hydroxymethylfurfural... Several green chemistry approaches that target advanced synthesis and processes will be presented. All these approaches include the production of (i) furfural and derivatives from D-xylose, xylane and hemicellulose using alternative technologies; (ii) hydroxymethylfurfural and derivatives from D-glucose/D-fructose; (iii) 2,5-diformylfuran from D-fructose. All the process used alternative technologies (eg. microwave irradiation, high temperature/pressure…) in batch and continuous flow via homogeneous and heterogeneous catalysis.[1-8] Conception, synthesis and physico-chemical properties will be detailed.



Scheme 1. Furfural derivatives production in batch and continuous flow.

Recent Publications

1. Verma S, Nasir Baig RB, Nadagouda MN, Len C, Varma RS (2017) Sustainable pathway to furanics from biomass via heterogeneous organo-catalysis. Green Chemistry 19: 164-168.
2. Wang Y, Len T, Huang Y, Tabaoda AD, Boa AN, Ceballos C, Delbecq F, Mackenzie G, Len C (2017) Sulfonated Sporopollenin as an efficient and recyclable heterogeneous catalyst for dehydration of D-xylose and xylan into furfural. ACS Sustainable Chemistry & Engineering 5: 392-398.
3. Le Guenic S, Gergela D, Ceballos C, Delbecq F, Len C (2016) Furfural production from D-xylose and xylan by using stable Nafion NR50 and NaCl in a microwave-assisted biphasic reaction. Molecules 21: 1102-1112.
4. Delbecq F, Wang Y, Len C (2016) Conversion of xylose, xylan and rice husk into furfural via betaine and formic acid mixture as novel homogeneous catalyst in biphasic system by microwave-assisted dehydration. Journal of Molecular Catalysis A: Chemical 423: 520-525.
5. Le Guenic S, Delbecq F, Ceballos C, Len C (2015) Microwave-aided dehydration of D-xylose into furfural by diluted inorganic salts solution in a biphasic system. Journal of Molecular Catalysis A: Chemical 410: 1-7.

Biography

Prof. Dr. Christophe Len became assistant Professor at UPJV in 1997 and was promoted to full Professor in 2004 at the Université de Poitiers (France). In 2010, he moved as full Professor at the Université de Technologie de Compiègne (France). In 2017, he developed his research in Chimie ParisTech (France). He has published almost 150 original publications and review articles, 5 chapters and 8 patents. Among recent awards and recognition to his scientific career, he was promoted Honorary Professor of the University of Hull, England (2012-2018), Honorary Life Fellow of Indian Society of Chemists and Biologists (ISCB, 2014), Fellow of the Association of Carbohydrate Chemists and Technologist of India (ACCTI, 2015) and Fellow of the Royal Society of Chemistry (FRSC, 2015). In 2017, he has been honored with 2017 Glycerine Innovation Award sponsored by the American Cleaning Institute and the National Biodiesel Board. His current research explores organic chemistry and catalysis applied to biomass.

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Magda Constanti, J Bioremediat Biodegrad 2018, Volume 9
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Magda Constanti

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Biomass valorization by means of catalytical and biological processes

Woody biomass is an abundant raw material, vastly available in nature. Each of the three main components of woody biomass, namely lignin, hemicelluloses and celluloses are themselves valuable resources, if being selectively transformed in valuable compounds. In this study, nut shell biomass was hydrolyzed with water assisted by microwave and the products were biologically treated without any separation process. Thus, the hydrolyzed product, xylose (from hemicellulose) was fermented by the appropriate microorganism for the production of lactic acid, the monomer of polylactic acid, a biodegradable plastic. Pure cellulose was also hydrolyzed to glucose and then fermented to lactic acid, as well. We obtained a high conversion to optically pure lactic acid through a non-petrochemical pathway. On the other hand, cellulose was hydrolyzed using basic catalysts, such as hydrotalcites, also assisted by microwave. Although the conversion was lower compared to acidic hydrolysis, alkali hydrolysis gave directly smaller molecules (C_2-C_3) with higher functional group densities. In conclusion, we propose a multidisciplinary study for the combination of catalytical and biological processes for the valorization of residual biomass, which makes the process more sustainable in the current society.

Recent Publications

1. Güell E J, Maru B T, Chimentao R J, Gispert-Girado F, Constantí M and Medina F (2015) Combined heterogeneous catalysis and dark fermentation systems for the conversion of cellulose into biohydrogen. Biochemical Engineering Journal 101:209-219.
2. Gavilà L, Constantí M and Medina F (2015) D-lactic acid production from cellulose: dilute acid treatment of cellulose assisted by microwave followed by microbial fermentation. Cellulose 22:3089-3098.
3. Gavilà L, Güell E J, Maru B T, Medina F and Constantí M (2017) Combining catalytical and biological processes to transform cellulose into high value-added products. Physical Sciences Reviews DOI: 10.1515/psr-2017-0026.
4. Gavilà L, Constantí M, Medina F, Pezoa-Conte R, Anufwom I, Mikkola J P An integrated biomass to lactic acid process. Submitted to Advanced Sustainable Systems.
5. Guarin C, Gavilà L, Constantí M, Medina F Impact of cellulose treatment with hydrotalcites in hidrothermal catalytic conversion. Submitted to Chemical Engineering Science.

Biography

Magda Constanti is an Associate Professor at the Department of Chemical Engineering at the University Rovira i Virgili, in Catalonia, Spain, and belongs to the Interfibio research group. She has expertise on the use of microorganisms and enzymes to different technological applications, which gives her a broad research vision. She has supervised several Doctoral and Master's theses related to biodegradation of toxic chemicals, biomass transformation to value added chemicals or bioenergy using microorganisms and enzymes, among others. She publishes in journals of biotechnology and chemical engineering areas. Currently, she co-directs with Dr. Francisco Medina (Director of the Catheter Research Group) a research project based on the bioproduction of value-added compounds from the residual lignocellulosic biomass.

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Vinay Sharma, J Bioremediat Biodegrad 2018, Volume 9
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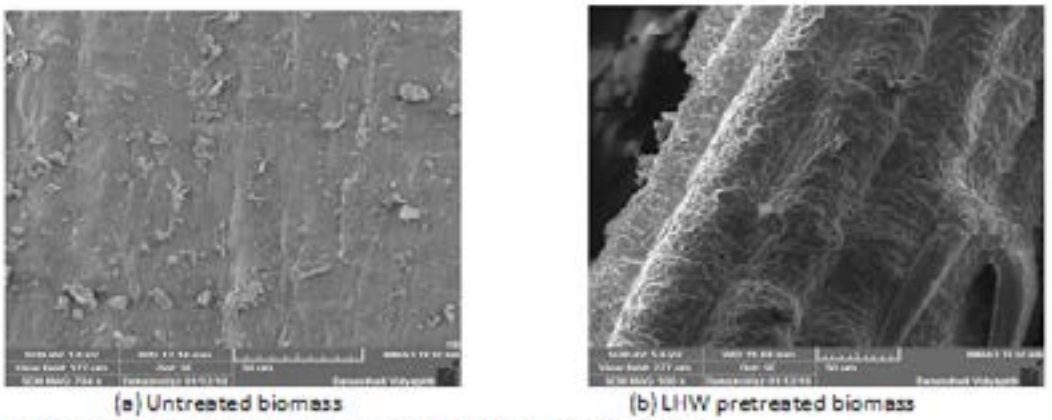
Vinay Sharma

Banasthali University, India

Development of efficient bioprocesses for improved bioethanol production from a mixture of food wastes

Lignocellulosic bioethanol production now-a-days is gaining increasing interest due to global warming, hike in oil price etc. But there are several technological and other challenges associated with bioethanol production. Technological challenges are development of efficient pretreatment step which can significantly degrade lignin without altering carbohydrates, efficient hydrolysis step and development of fermentation step which can utilize both pentose and hexose sugars. The present study has focused on bioprocess development for bioethanol production from a mixture of food wastes (spinach, cabbage, peels of onion and orange). First liquid hot water (LHW) pretreatment of food waste was optimized by varying different parameters (temperature, incubation time and substrate concentration). Maximum reducing sugar yield (525.60 mg/gram dry substrate) was found at substrate concentration 10% (w/v), temperature 160 °C and incubation time 30 min. After optimization, LHW pretreated biomass was characterized using Fourier transformed infrared spectroscopy (FTIR), X-ray diffraction (XRD), Scanning electron microscopy (SEM) and biochemical composition analysis. Further, pretreated biomass was hydrolysed using whole cells of *Fusarium incarnatum* KU377454 (locally isolated strain) without addition of any enzymes. It showed maximum reducing sugar yield of 580.95 mg/gram dry substrate) within 3 days of incubation at 30 °C. The produced sugar hydrolysate was further fermented using co-cultures of hexose fermenting strain (*Sacchromyces cerevisiae*) and pentose fermenting strain (*F. oxysporum*). Maximum ethanol production (3.25%, v/v) was observed after 48 h of incubation at 35 °C. The present study, reports development of efficient thermal pretreatment without addition of any chemicals. Further carbohydrates, part of pretreated biomass were converted into reducing sugars by whole fungal strain without the use of any costly chemicals. Lastly, fermentation process was optimized using co-culture strategy which yielded maximum ethanol from both pentose and hexose sugars. This study can be useful for commercial bioethanol production from food waste.



(a) Untreated biomass (b) LHW pretreated biomass

Figure 1: SEM image of (a) untreated and (b) LHW pretreated biomass

Recent Publications

1. Sharma S, Sharma V, Kuila A (2018) Simultaneous saccharification and fermentation of corn husk by co-culture strategy. Journal of Petroleum & Environmental Biotechnology (Revised manuscript under review).
2. Sharma S, Sharma V, Kuila A (2018) Thermochemical pretreatment of corn husk and enzymatic hydrolysis using mixture of different cellulases. Biomass Conversion and Biorefinery, 8:179-188.
3. Madhawan A, Aroora A, Das J, Sharma S, Kuila A, Sharma V (2017) Different types of thermochemical pretreatment and optimization of enzymatic hydrolysis of groundnut shell. Waste and Biomass Valorization (Accepted), doi: 10.1007/s12649-017-0083-y.
4. Sharma S, Kuila A, Sharma V (2017) Enzymatic hydrolysis of thermochemically pretreated biomass using a mixture of cellulolytic enzymes produced from different fungal sources. Clean Technologies and Environmental Policy, 19:1577-1584.
5. Madhawan A, Aroora A, Das J, Kuila A, Sharma V (2017) Microreactor technology for biodiesel production: a review. Biomass Conversion and Biorefinery (Accepted), doi: 10.1007/s13399-017-0296-0.

Biography

Dr. Vinay Sharma, currently Professor and Head (Chair), Department of Bioscience and Biotechnology at Banasthali Vidyapith has over 35 years experience of teaching and research in Plant Sciences/ Biotechnlology at I.I.T. Roorkee earlier and presently at Banasthali. He has delivered over 100 invited/ keynote lectures and has chaired sessions at many national and international fora in India and abroad. He had extensive international research experience as Postdoc/ Visiting Professor at many institutions including Max Planck Institute, Koeln, Technical University, Darmstadt, Germany, University of Central Florida, USA and others. He has published over 300 research papers, has authored 6 books and has mentered 55 doctoral students. He has been honoured with several prestigious fellowships and awards in India and abroad including Fellow of National Academy of Sciences. He has keen interest in Plant Biology (Plant Stress/ Plant Informatics)/ Biotechnology and his current major research focus is on Biofuels (lignocellulosic bioethanol/ biodiesel).

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Day 2

Abhishek Asthana, J Bioremediat Biodegrad 2018, Volume 9
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Abhishek Asthana

Hallam Energy, Sheffield Hallam University, United Kingdom

World markets for conventional and advanced biofuels over the next five years

Production of transport biofuels grew by just 2% in 2017. To achieve the 2030 SDS target, use of biofuels needs to triple, driven by cost reductions of advanced biofuels, widespread sustainability governance and more adoption in aviation and marine transport. This presentation provides an overview of the market prospects for conventional biofuels over the next five years. It would analyse the current status of deployment and costs for novel advanced biofuels. It would also draw comparisons with electric cars, the extent of their renewable electricity utilisation and decarbonisation potential. It would include the contribution of renewables to road transport demand over the next 5 years and focus on the main biofuels available to decarbonise road freight, now and in the long term. Finally, it will present a case study from India, focusing on ethanol-based chemicals.

Recent Publications

1. Asthana, A; Menard, Y; Sessiecq, P; Patisson, F; Modeling On-Grate MSW Incineration with Experimental Validation in a Batch Incinerator, Ind. Eng. Chem. Res., 49 (16), pp 7597–7604, 2010.
2. Asthana, A; Falcoz, Q; Sessiecq, P; Patisson, F; Modeling Kinetics of Cd, Pb, and Zn Vaporization during Municipal Solid Waste Bed Incineration, Ind. Eng. Chem. Res., 49, 7605–7609, 2010.
3. Ménard, Y; Asthana, A; Patisson, F; Sessiecq, P; Ablitzer, D; Thermodynamic study of heavy metals behavior during municipal waste incineration, Process Safety and Environmental Protection, 84 (B4) 290 -296, 2006.
4. Asthana, A; Ménard, Y; Patisson, F; Sessiecq, P; Ablitzer, D; A 2-D mathematical model of on-grate municipal solid waste combustion, [Proceedings] Sohn International Symposium on Advanced Processing of Metals and Materials, San Diego, U.S.A., 2006.
5. Ménard, Y; Asthana, A; Patisson, F; Sessiecq, P; Ablitzer, D; Thermodynamic study of heavy metals behavior during municipal waste incineration, [Proceedings] 1st International Conference on Engineering for Waste Treatment, Albi, France, 2005.

Biography

Dr Abhishek Asthana (CEng, MIET, FHEA, PhD) is Reader in Energy Engineering and the Director of Hallam Energy, the energy research group at Sheffield Hallam University (SHU). In 2009, he co-founded Hallam Energy and has since led and delivered more than 50 projects of industrial energy research, consultancy and knowledge transfer. He has won £3.5 million funding for SHU, co-authored 37 scientific papers and 1 book, invented 4 patents and developed 5 commercial software packages. He is the course director for BEng Energy Engineering and MEng and BEng Chemical Engineering programmes at the university. In 2015, he established a Doctoral Training Alliance (DTA) in Energy to train PhD students conducting energy research. The DTA has now grown to 90 PhD students and 180 Supervisors across 19 British Universities in the University Alliance, UK, and Abhishek is currently its Deputy Director. He also recently led the alliance to success in winning €6.5 Million funding from the European Commission's Marie Skłodowska-Curie Actions COFUND to further expand the DTA programme.

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Gerrit Brem, J Bioremediat Biodegrad 2018, Volume 9
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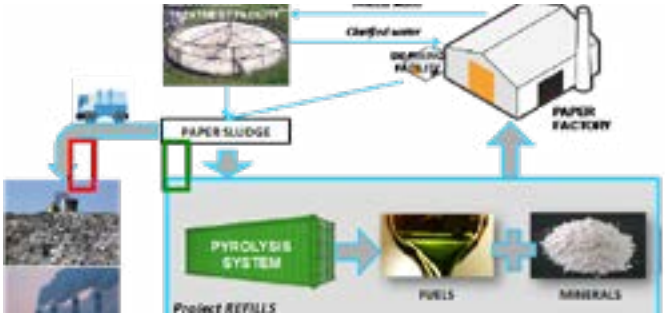
Energy and Materials from Biomass Pyrolysis

Flash pyrolysis is a thermochemical process to convert carbonaceous materials into oil, gas and char. Examples of carbonaceous materials are biomass and waste streams. Unfortunately, the quality of the present pyrolysis oil from biomass is not good enough for the existing infrastructure. There are in general two catalytic routes to improve the oil quality: deoxygenation or hydrogenation. Deoxygenation will remove the oxygenated compounds from the oil but unfortunately with the removal of oxygen also carbon is removed and thus the oil yield will be reduced. Via hydrogenation additional hydrogen has to be added to improve the oil properties. However, because of the ample presence of oxygen in pyrolysis oil a lot of water is formed and moreover expensive and mostly fossil hydrogen is required. A new idea presented here is aiming at a high-quality oil by simultaneously in-situ catalytic deoxygenation and hydrogenation. A next step is the application of flash pyrolysis for the production of both energy (biofuels) and materials. One example is paper sludge consisting of paper fibres and minerals. After drying and flash pyrolysis, the fibres in the paper sludge are transformed into oil and flammable gas and the minerals can be used as a raw material for the paper industry. Moreover, the paper industry can avoid dumping of this waste stream. This process of transforming biomass into fuels and minerals is very promising for all kind of residues such as sewage sludge, manure, packaging material or waste streams. More examples will be given during the presentation.



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1. Imran, A., Bramer, E.A., Seshan, K. & Brem, G. 2016, "Catalytic flash pyrolysis of oil-impregnated-wood and jatropha cake using sodium based catalysts", Journal of Analytical and Applied Pyrolysis, vol. 117, pp. 236-246.
2. Yukananto, R., Louwes, A.C., Bramer, E.A. & Brem, G. 2016, "Direct and standard injection of sewage sludge in a supercritical gasification system: Optimization of the energy efficiency using pinch analysis", European Biomass Conference and Exhibition Proceedings, pp. 538.
3. Naqvi, S.R., Prabhakara, H.M., Bramer, E.A., Dierkes, W., Akkerman, R. & Brem, G. 2018, "A critical review on recycling of end-of-life carbon fibre/glass fibre reinforced composites waste using pyrolysis towards a circular economy", Resources, Conservation and Recycling, vol. 136, pp. 118-129

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5. Sallevelt, J.L.H.P., Gudde, J.E.P., Pozarlik, A.K. & Brem, G. 2014, "The impact of spray quality on the combustion of a viscous biofuel in a micro gas turbine", Applied Energy, vol. 132, pp. 575-585

Biography

Gerrit Brem is a professor in Energy Technology and chairman of the Thermal and Fluid department at the University of Twente (NL). He is an expert in the field of thermal conversion processes. For 30 years he was a senior scientist at TNO and in 2009 appointed as a Senior Research Fellow. He has carried out a large number of research and development projects for national and international clients and developed new advanced conversion technologies and demonstrated in practice. He has written over 120 scientific publications and has several patents on his name.

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