5th International Conference on
Green Chemistry and Technology
&
6th International Conference on
Environmental Chemistry and Engineering
July 24-26, 2017 Rome, Italy

Marcelo E Domine, Trends in Green chem, 3:2
DOI: 10.21767/2471-9889-C1-001

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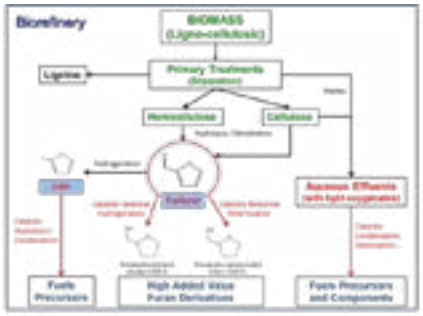
Novel heterogeneous catalysts and processes for biomass derivatives transformations into fuels and chemicals

A wide range of renewable raw materials and products can be easily obtained from ligno-cellulosic biomass and their derivatives in both polymeric (i.e. cellulose, starch, lignin) and monomeric (i.e. sugars, polyols, phenols) forms. These bio-based platform compounds could be converted into a large variety of chemical products and fuels to replace non-renewable fossil raw materials. The attainment of these bio-products is environmentally more favorable than that of their petroleum derived analogues, but also more expensive due to the lack of simple and efficient synthesis processes. In this sense, it is necessary to develop new highly selective catalytic processes allowing obtaining these bio-products in a competitive way (with lower energy consumption and higher profits) compared to conventional petro-products. Aligned with the new bio-economy and zero-waste concepts, the new bio-refineries should produce these bio-products for fuels and chemicals applications by reducing wastes, this includes both decreasing of side-products formation and residual effluents valorization in an integrated approach. In this presentation, the application of novel solid catalysts (with well controlled acid/base and redox properties) recently developed at ITQ for the efficient transformation of biomass derivatives into high added value products will be assessed. Particularly, catalytic processes for the production of chemicals starting from furfural will be discussed, such as i) the selective hydrogenation of furfural to tetrahydrofurfuryl alcohol, and ii) the reductive etherification of furfural to tetrahydrofurfuryl alkyl-ethers. In addition, solid catalysts will be evaluated in the production of precursors and components for fuels, such as iii) the hydrolysis/condensation of 2-methyl-furan, and iv) the valorization of oxygenated compounds present in biomass-derived aqueous fractions via ketonization/condensation, among others.



Scheme 1: Lignocellulosic biomass transformation in integrated biorefinery approach for fuels and furan derivatives co-production (Catalytic processes to be discused in this presentation in red)

Biography

Marcelo E Domine completed his PhD at the Polytechnic University of Valencia (Spain) in 2003 under the guidance of Prof. A Corma, and Postdoctoral Studies at the IRCE-LYON - CNRS (France, 2005-07). In 2008, he re-joined the Instituto de Tecnología Química (UPV-CSIC) of Valencia, Spain as Scientific Researcher of CSIC. His current research involves the synthesis and characterization of solid catalysts and their application in sustainable chemical processes, mainly focusing on new biomass-derivatives transformations and wastes valorization into fuels and valuable chemicals. He is co-author of more than 55 publications (also including several patent applications). He has presented at over 18 invited conferences around the world. He has acted as Guest Managing Editor of *Catalysis Today*, and also as Reviewer in many renowned scientific journals in catalysis and fuels areas. He is actually the representative of CSIC (Spain) at the EERA Program – JP-Bioenergy (European Commission).

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