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PHOTO-LMEn: Biochar-based materials for the sustainable photoproduction of liquid and gaseous molecules to energy

Biochar-based materials applications in catalytic and photocatalytic reactions related with the photoproduction of liquid and gaseous molecules will be presented. Sawdust of a soft wood was used to prepare biochars for H_2 photoproduction on Au-TiO₂/biochars under visible irradiation. A remarkable increase in the photoactivity of the composite up to a factor about 3 times higher than the commercial catalyst free of biochars was found and ascribed to the surface pH of biochars. Biomass-derived molecules such as furfural, chitosane, and saccharose were used to prepare hybrid C-TiO₂ materials by solvothermal synthesis. Hybrid TiO₂-C supports led to an important enhancement in the catalytic activity of Pd-based catalysts in the electrooxidation of formic acid with a maxima density power up to 3.3 times higher than the same catalyst on a commercial carbon. Pd-based catalysts supported on hybrid Biochar-TiO₂ supports can be designed to control the selectivity of phenol hydrogenation to cyclohexanone or cyclohexanol (up to 100% yield) by controlling the chemical nature of the biochar supports. Up to 10 times higher photoactivity that the standard semiconductor was found in the photodegradation of methylene blue under visible-irradiated Biochar-based/TiO₂ materials. An integrated approach will be presented to remark the potential of biochar-based sustainable catalysis and photocatalysis considering energy production and environmental considerations. It can be concluded that biochars-based materials show new perspectives for the sustainable catalysis and photocatalysis related with clean energy production, green and selective catalytic processes, and for the environmental remediation of polluted water by solar technology.

Biography

Juan Matos Lale completed his PhD in Physics and Chemistry of Surface at the Central School of Lyon (France) in 1999. He worked upon the influence of carbon materials in different heterogeneous photocatalytic reactions with potential applications in solar nanotechnology. He focuses his research in the synthesis, characterization and applications of nanomaterials in catalysis, photocatalysis, environmental, industrial and green chemistry and alternative energies processes. He has been Invited Professor at Clark University (USA) in 2004, Claude Bernard University (France) in 2005, Palermo University (Italy) in 2007, Szczecin University (Poland) in 2008, Max Plank Institute for Colloids and Interfaces (Germany) in 2010, Politechnique University of Valencia (Spain) in 2010-2011, Adam Mickiewizs University (Poland) in 2011, and National Carbon Institute at Oviedo, Spain (2012). He is now Full Professor and Researcher of the Biomaterials Department in the Technological Development Unit (UDT) of University of Concepcion. He currently has about 70 papers published in high impact journals, about 1500 citations and h-factor 18.

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