Abstract (600 word limits)

Solar fuels and chemicals are a promising strategic pathway since they are produced from simple and abundant molecules using a renewable energy source such as sunlight. However, the efficiency is still low and far for the practical application. Highly active photocatalysts are required to produce solar fuels. This work will show the advances in the production of solar fuels using efficient carbon-based photocatalysts as well as the valorization of biomass residues to be used in some model reactions to obtain solar chemicals. The efficiency for H2 production by direct water splitting using TiO2 is rather low, but it can be notably increased in presence of sacrificial agents. Aqueous pollutants can play the role of sacrificial agent and simultaneous H2 production and pollutant removal can take place. The CO2 reduction permits to obtain a wide variety of organic compounds such as formic acid, methanol and methane. Considering that noble metals have a high activity for C-O bond cleavage combined with flexible and highly tuneable chemistry of the carbon surface it can be postulated that noble metal/graphene-based catalysts should be suitable to achieve efficient hydrogenation of CO2 in the aqueous phase. Finally, the photo-assisted valorisation of furfuryl alcohol (FA) and 5-hydroximethyl furfural (5-HMF), two products from the biorefinery industry, and glycerol (Gly), the main by-product of the biodiesel industry, is an innovative approach to explore. These target molecules can be photo-converted into aldehydes or ketones or even more valuable compounds such as five- or six-member dioxane-based carbocycles by condensation reactions.

Recent Publications (minimum 5)

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Biography [100 words]

Juan Matos Lale completed his PhD in Physics and Surface Chemistry at the Central School of Lyon (France) in 1999. He worked on the influence of carbon materials with p applications in solar nanotechnology, catalysis, photocatalysis, environment, green chemistry and alternative energies. He was Associate Researcher of the Venezuelan Institute for Scientific Research (IVIC) from 1999 to 2009, and later Full Professor from 2010 to 2014. Since 2015, he is a Professor of the Postgraduate Studies in Energy of the University of Concepcion, and a Researcher in the Technological Development Unit (UDT) of the same University. Since 2016, he is President of the Latin American Carbon Federation and Director of the Chilean Association of Carbon Materials.

Currently has more than 70 articles published in journals and high-impact serial books, more than 2200 citations and a factor H equal to 23. He has also written two patents.