

**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 H<sub>2</sub> production by direct water splitting using TiO<sub>2</sub> 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 H<sub>2</sub> production and pollutant removal can take place. The CO<sub>2</sub> 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 CO<sub>2</sub> in the aqueous phase. Finally, the photo-assisted valorisation of furfuryl alcohol (FA) and 5-hydroxymethyl 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)**

Ahmadi Tehrani A, Omranpoor MM, Vatanara A, Seyedabadi M, Ramezani V. Formation of nanosuspensions in bottom-up approach: theories and optimization. *Daru*. 2019 Jan 19.

Seyedabadi M, Rahimian R, Ghia JE. The role of alpha7 nicotinic acetylcholine receptors in inflammatory bowel disease: involvement of different cellular pathways. *Expert Opin Ther Targets*. 2018 Feb;22(2):161-176.

Fatemikia H, Seyedabadi M, Karimi Z, Tanha K, Assadi M, Tanha K. Comparison of 99mTc-DMSA renal scintigraphy with biochemical and histopathological findings in animal models of acute kidney injury. *Mol Cell Biochem*. 2017 Oct;434(1-2):163-169

Rahimian R, Zirak MR, Seyedabadi M, Keshavarz M, Rashidian A, Kazmi S, Jafarian AH, Karimi G, Mousavizadeh K. Protective effects of tropisetron on [cerulein-induced acute pancreatitis](#) in mice. *Biomed Pharmacother*. 2017 Sep;93:589-595

Seyedabadi M, Fakhfour G, Ramezani V, Mehr SE, [Rahimian](#) R. The role of serotonin in memory: interactions with neurotransmitters and downstream signaling. *Exp Brain Res*. 2014 Mar;232(3):723-38.

Seyedabadi M, Ostad SN, Albert PR, Dehpour AR, Rahimian R, Ghazi-Khansari M, Ghahremani MH. Ser/Thr residues at  $\alpha 3/\beta 5$  loop of G $\alpha$ s are important in morphine-induced adenylyl cyclase sensitization but not [mitogen-activated](#) protein kinase phosphorylation. FEBS J. 2012 Feb;279(4):650-60

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 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.

