

ABSTRACT:

Nanostructured Materials as Catalysts and Photocatalysts for Biomass Valorisation, Hydrogen Production and Environmental Purposes

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The growing demand for energy and the widespread environmental damage require sustainable technologies that integrate renewable resources. In this context some examples can be illustrated. The development of processes for the valorization of biomass-derived molecules to obtain platform molecules such as 5-hydroxymethylfurfural (5-HMF) is of great interest. It can be obtained from microalgae or olive mill wastes via heterogeneous catalysis in the presence of acidic materials such as Nb₂O₅ or NbOPO₄ [1]. Photocatalytic processes can also be useful in the context of the energy demand [2]. Photoreforming of aqueous solutions of organics, aimed at obtaining H₂ from water and simultaneously oxidizing organic molecules to higher added-value substances, is a good example of an applied technology for this purpose [3]. Spent Li-ion batteries (s-LIB) can be used to develop innovative sustainable photocatalysts for photoreforming. Indeed, the mechanical grinding of the mixture of material constituting anode and cathode of s-LIBs gives a powder that can be used in a composite with g-C₃N₄, Nb₂O₅ or TiO₂. The obtained catalysts, decorated with graphene or with biochar, obtained from the thermal treatment of orange peel, give excellent results in terms of H₂ productivity [4]. The photocatalysis technology as an advanced oxidation technology can be also applied for wastewater treatments and it is of particular interest when coupled with microalgae treatment. The photocatalytic degradation of glyphosate give rise to the formation of phosphate, ammonium and small organic acids, useful for the grow of microalgae applied in biomass valorisation or water treatment.

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