New advances on Photonanocatalysts for Renewable Energy

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Carbon dioxide (CO_2) is the main responsible for greenhouse effect. The global concentration of CO_2 in the atmosphere is increasing mainly due to the emissions from fossil fuel combustion. The reduction of CO_2 by photocatalysis is one of the most promising methods since CO_2 can be reduced to useful compounds by irradiating it with UV light at room temperature and ambient pressure. Several semiconductors, titled *p*-type, exhibit suitable band energies for photocatalytic reduction of carbon dioxide. Among various catalysts, copper oxides have properties that leads methanol and ethanol formation when applied in CO_2 reduction process and it can be used as an efficient sensitizer to couple with other wide band gap semiconductors, such as TiO_2, to expand the photocatalytic application in the reduction experiments and to improve its absorbance in visible light. In this work will be presented different forms of preparation of nanocatalysts using TiO_2, copper oxides and ZnO, and their performances evaluated in the formation of chemical fuels by photoelectrocatalysis process. The electrodes were characterized by scanning electron microscopy with high resolution (SEM-FEG), X-ray diffraction (XRD), XPS, UV-Vis diffuse reflectance spectra (DRS) and photocurrents by linear voltammetry experiments in a solution containing 0,1 mol L^{-1} Na_2SO_4, with a potential range from -0.025 to -1.0 V vs. Ag/AgCl/Cl^- (3M). The formation of chemical fuels, such as methanol, ethanol, formic acid and acetone were identified by CG-MS and HPLC.

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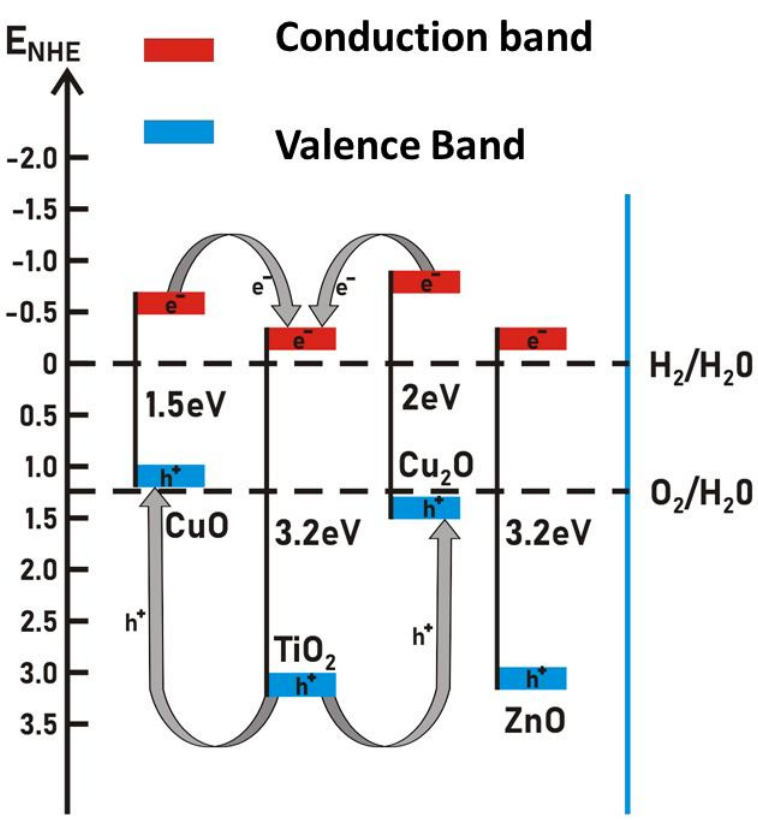
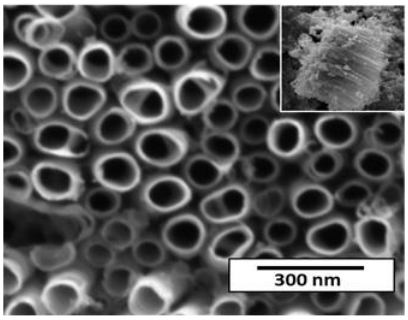
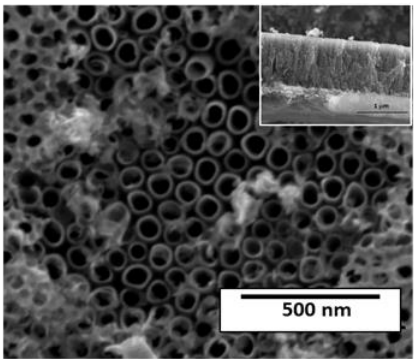


Dopped TiO_2 (CuO / Cu_2O)



Modified TiO_2 (ZnO / CuO / Cu_2O)



TiO_2-CuO Equiatomic System