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Zns(En)0.5 Nanostructured Materials Timelife

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Extended Abstract

Photocatalytic hydrogen production is an alternative process that has taken place to contribute to the displacement of fossil fuels and provide a clean and efficient energy source. This photocatalytic reduction reaction occurs on a semiconductor surface, where the powder or film semiconductor typically works in an aqueous solution, but for this happened, the energy band edges of semiconductor material and the redox potentials of the aqueous chemical species must be matched [1]. In this line, a variety of semiconductors materials like metal oxide, metal sulfide and hybrid complex has been well performed, exhibiting a great capacity to produce huge quantity of photogenerated charge carriers and having a low recombination rate [2][3]. In recent years the relatively new kind of $ZnS(en)_{0.5}$ hybrid material has been slowly gaining attention, due to the conformed laminar structure, mono or multiple atomic ZnS layers, allowing that multilayers will be stacked [4]. Such stacking superstructure configuration facilitates that it can be exfoliated in situ during the photocatalytic H_2 production, increasing its activity at least 2 times.

Prismatic hexagonal plates and small irregular disordered sheets of $ZnS(en)_{0.5}$ hybrid powders were synthesized in a mixed solution of water, butanol and ethylenediamine by grand scale solvothermal and precipitation method. The influence of the fixed or varied volume of mixed solution as function of molar ratio H_2O/Zn and the treatment time on the stacking degree of the huge plates or small sheets were investigated by diverse techniques; X-ray Diffraction, Scanning Electron Microscopy, Infrared and Diffuse Reflectance spectroscopy. Then, the $ZnS(en)_{0.5}$ hybrid was evaluated for the hydrogen production in a water-ethanol solution under UV-illumination at accelerated degradation conditions at less 6-8th cycles of reaction. An enhancement in the H_2 production rate was achieved using small irregular disordered sheets, whit an amount of 38,333 $\mu molg^{-1}h^{-1}$ until to 5th cycle but the efficiency was then declined. The increasing of photoactivity and the deactivation during the H_2 production were correlated with the photoelectrochemical characterization at similar accelerated degradation conditions.

References

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