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Tesis:	"THE DEVELOPMENT OF NEW MATERIALS FOR PHOTOCATALYTIC HYDROGEN GENERATION"

Resumen:

This work presents the development, characterization, and evaluation of 2D materials and Alkaline Metal Aluminates, namely Graphitic Carbon Nitrides (g-C3N4) and Barium or Magnesium Aluminates (MAl2O4: M=Ba or Mg) for the purpose of hydrogen generation. Graphitic carbon nitrides were synthesized by calcinating nitrogen-rich precursors at 550 ^{o}C whilst the alkaline metal aluminates were prepared by a combustion synthesis and were annealed in different gas atmospheres. The characterization of these photocatalysts was carried out through techniques such as Xray diffraction (XRD), Scanning Electron Microscopy (SEM), Diffuse Reflectance Spectroscopy (DRS), Energy Dispersive Spectroscopy (EDS), Raman Spectroscopy (RS), Brunauer-Emmett-Teller (BET) surface area analysis, Diffuse Reflectance Spectroscopy (DRS), Photoluminescence measurements (PL), and Electrochemical Impedance Spectroscopy (EIS). The g-C3N4 photocatalysts were evaluated comparatively in Hydrogen Evolution Reactions (HERs) using irradiation from either low-cost visible (405 nm or 440 nm) 15 W/m LED strips or from a UV (254 nm, 4.4 mW/cm2) pencil lamp. A high hydrogen production rate of 1622 mol.g-1.h-1, corresponding to an AQY of 3.2%, was achieved under UV irradiation using g-C3N4 p-n homojunction which was synthesized from Thiourea. The same irradiation source rendered a maximum H2 generation rate of 97 $\mu mol.h^{-1}.g^{-1}$ using the carbon annealed magnesium aluminates. The overall results of these studies reveal the potential of these photocatalysts and major photocatalysis enhancement strategies based on conductivity modulation and heat treatment.