Photocatalytic hydrogen production from glycerol-water over metal loaded and non-metal doped titanium oxide

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Modifications of the TiO2 P25 photocatalyst with metals: Platinum (Pt), Copper (Cu) and non-metal: Nitrogen (N) doping to produce Hydrogen (H2) from a glycerol-water mixture have been investigated. The metals (Pt and Cu) were loaded into Titanium Dioxide (TiO2) surface by employing an impregnation and Photo-Assisted Deposition (PAD) method, respectively. As prepared the metal doped TiO2 photocatalyst was then dispersed into an ammonia solution to obtain N-doped photocatalysts. The modified photocatalysts were characterized by X-Ray Diffraction (XRD), Scanning Electron Microscopy (SEM), and Ultraviolet-Visible Diffuse Reflectance Spectroscopy (UV-Vis DRS). XRD patterns indicated that the modified TiO2 photocatalysts have a nano-size crystallite range of 16-23 nm, while the DRS analysis showed that the doping of both metal and non-metal into TiO2 photocatalysts could effectively shift photon absorption to the visible light region. The optimum Cu loading of Cu-N-TiO2 was found to be 5%, resulting in a 10 times higher H2 production improvement level when compared to unloaded TiO2, even though this is still considered to be inferior compared to that of a 1% Pt loading, which results in a 34 times higher level than an unmodified TiO2photocatalyst. The effect of glycerol concentrations on hydrogen production has also been studied. This method offers a promising technology to find renewable and clean energy by using cheap materials and a simple technology.