



Er-YAG/Er-YAP/TiO₂ Composite As A Novel Photocatalyst Using Solar Lights For Treating Aqueous Dye Solutions

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Accepted on 27th December 2013

ABSTRACT

A new photocatalyst for the treatment of aqueous dye solutions under visible and solar lights was designed and prepared. It is based on TiO₂ coating a combination of both upconversion luminescence agents: Er:Y₃Al₅O₁₂ (Er-YAG) and Er:YAlO₃ (Er-YAP), well known by their ability to transform visible light into UV light. TiO₂ and Er-YAG/Er-YAP/TiO₂ composites were characterized by X-ray diffraction (XRD) and Transmission electron microscopy (TEM). The degradation reaction of methylene blue (MB) aqueous solution was used to measure the photocatalytic activity of the prepared photocatalysts. The obtained results showed that (1.5 % Er_{0.01}-YAG + 0.5 % Er_{0.01}-YAP)/TiO₂ composite is strongly more photoactive than pure TiO₂ and was able to degrade 98 % of MB solution in one hour under sunlight irradiation at pH = 6.5. This efficiency was supported by TOC measurements and was proven to depend on the ionic nature of the dye and the pH of the solution. Consequently, it is a promising photocatalyst for treating aqueous dye solutions by sunlight.

Keywords: Composite materials, Oxides, Upconversion, Photocatalysis, Wastewater.
