Photocatalytic degradation of methyl orange and cyanide by using TiO₂/CuO composite

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ABSTRACT

In this study, the effect of adding 5–12.5 wt% CuO to TiO₂ on photocatalytic properties of the nano-composite TiO₂/CuO was investigated. The products were characterized by X-ray diffractometer, SEM, Brunauer–Emmett–Teller (BET), and DRS. BET-specific surface area of the TiO₂/CuO composites was lower than that of the pure TiO₂. Incorporation of CuO into TiO₂ shifted absorption spectra to the visible region. As the CuO content increased from 0 to 12.5%, a clear decrease in optical band gap from 2.95 to 2.30 eV was observed. The photocatalytic performance was determined by methyl orange degradation and cyanide photo-oxidation under ultraviolet irradiation. However, the excessive incorporation of CuO did not improve any ability of TiO₂ to degrade MeO and cyanide. The highest rate of photocatalytic degradation was found in TiO₂–7.5% CuO. The rate constants of the dye degradation reaction using TiO₂ and TiO₂–7.5% CuO catalysts were 0.0107 and 0.0151 min⁻¹, respectively. Corresponding results for cyanide disinfection were 0.0049 and 0.0110 min⁻¹.

Keywords: TiO₂/CuO; Photodegradation; Nano-composite; Cyanide; Methyl orange

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