

Degradation of methylene blue dye by CuO-BiVO₄ photocatalysts under visible light irradiation

ABSTRACT

Bismuth vanadate (BiVO₄) and a series of Cu-loaded BiVO₄ (CuO-BiVO₄) photocatalysts were prepared via precipitation and wet impregnation methods respectively. The samples were characterized by X-ray diffractometry (XRD), transmission electron microscopy (TEM) and the band gap energy was elucidated via UV-visible diffuse reflectance spectroscopy (DRS). Spherically-shaped particles of the photocatalysts were obtained which contained mixtures of monoclinic and tetragonal BiVO₄ phases. The particle sizes of the photocatalysts ranged from 20 to 100 nm and band gap energies varied from 2.47 to 2.53 eV. The photodegradation efficiency of the photocatalysts was evaluated by degrading methylene blue (MB) dye under visible-light irradiation. The optimum conditions for the photocatalytic degradation were determined based on wt% Cu loaded, mass loading, initial dye concentration and pH. 1 wt% CuO-BiVO₄ exhibited the highest photocatalytic activity where the complete removal of 10 mgL⁻¹ of MB was obtained at pH 10 when 0.8 g of the catalyst was used under 4 hours of 18W fluorescent light irradiation.

Keyword: Copper oxide-bismuth vanadate; Visible light photocatalyst; Semiconductor; Methylene blue