

Photocatalytic reduction of aqueous Cr(VI) with CdS under visible light irradiation: effect of particle size

ABSTRACT

Stringent environmental standards have made the removal of Cr(VI) from water an important problem for environmental scientist and engineering. Heterogeneous photocatalysis using suspended photocatalyst is an interesting technique to consider for this application. In this work, the influence of particle size of suspended CdS on the photocatalytic reduction of aqueous Cr(VI) ion was investigated. The efficiency of Cr(VI) reduction was monitored through UV-visible analysis. The experimental results showed that the nanoparticle size has a dramatic effect on the adsorption and reduction of Cr(VI). As surface area increased from 44.2 ± 0.6 to 98.7 ± 0.5 m²/g due to particle size reduction, the rate of Cr(VI) reduction nearly doubled in the first 20 min of visible light irradiation. The results evidenced the inverse relationship between the apparent reduction rate constant and the CdS particle size. Conversely, the half-life ($t_{1/2}$) period of the photocatalytic reduction has a direct relationship with CdS particle sizes.

Keyword: CdS; Chromium(VI); Photocatalyst; Half-life; Particle size