Visible-Light Photodegradation of Dye on Co-Doped Titania Nanotubes Prepared by Hydrothermal Synthesis

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Abstract

Highly porous Co-doped TiO2 nanotubes synthesized from a hydrothermal treatment were used to photodecompose methylene blue (MB) in liquid phase under visible light irradiation. The anatase-type titania nanotubes were found to have high specific surface areas of about 289–379m2/g. These tubes were shown to be hollow scrolls with outer diameter of about 10–15nm and length of several micrometers. UV absorption confirmed that Co doping makes the light absorption of nanotubes shift to visible light region. With increasing the dopant concentration, the optical band gap of nanotubes became narrower, ranging from 2.4 eV to 1.8 eV, determined by Kubelka-Munk plot. The Co-doped nanotubes exhibit not only liquid-phase adsorption ability, but also visible-light-derived photodegradation of MB in aqueous solution. The synergetic effect involves two key factors in affecting the photocatalytic activity of Co-doped titania nanotubes under fluorescent lamp, that is, high porosity and optical band gap. The merit of the present work is to provide an efficient route for preparing Co-doped TiO2 nanotubes and to clarifying their adsorption and photocatalytic activity under fluorescent lamp.

Keyword：Photocatalysis, Titania nanotubes, Hydrothermal treatment, Cobalt