

Degradation of organic pollutants using metal-doped TiO₂ photocatalysts under visible light: a comparative study

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ABSTRACT

Various concentrations of dopants such as Mn, La, and Mo (0.25%–0.1%) were doped into TiO₂ particles. An improved sol-gel method was used to prepare these particles using titanium isopropoxide as a precursor and their photocatalytic activity was tested by studying the degradation of three different types of organic pollutants (acid blue 129, tinidazole, and metalaxyl). The prepared samples were characterized with standard analytical techniques such as X-ray diffraction (XRD), scanning electron microscopy (SEM), and UV–Vis spectroscopy. The XRD analysis suggests the anatase phase with a crystalline nature. The SEM image of undoped TiO₂ exhibits high roughness and irregular shaped particles. The doped TiO₂ particles showed smaller size than undoped TiO₂ with regular shaped and high surface area. The doped TiO₂ particles also show lower band gap energy than undoped. The photocatalytic results indicate that TiO₂ with a dopant concentration of 0.75% for all metal ions shows the highest photocatalytic activity. Moreover, the Mn-doped TiO₂ (0.75%) degraded metalaxyl more efficiently as compared with other studied pollutants.

Keywords: Degradation; Doped TiO₂; Pesticide; Drug; Dye; Visible light

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