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ARTICLE

Photocatalytic efficiency of sol–gel synthesized Mn-doped TiO_2 nanoparticles for degradation of brilliant green dye and mixture of dyes

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First published: 01 September 2022
https://doi.org/10.1002/jccs.202200248

Abstract

The Mn-doped TiO_2 nanoparticle photocatalysts have been prepared by a simple sol–gel method. 1, 3, and 5 mol% Mn-doped TiO_2 nanoparticles have been prepared by using a stoichiometric amount of manganese acetate and titanium isopropoxide as precursors of Mn and Ti respectively. The physico-chemical characterization of the prepared samples has been studied by x-ray diffraction (XRD), Brunauer–Emmett–Teller surface area analysis, field emission scanning electron microscope, energy dispersive x-ray analysis, high-resolution transmission electron microscopy, x-ray photoelectron spectroscopy, Ultraviolet–visible spectroscopy, photoluminescence spectroscopy, Fourier transform infrared spectroscopy (FTIR) and thermogravimetric analysis (TGA). XRD study reveals the formation of pure anatase phase of TiO_2 and decrease in crystalline size of TiO_2 on increasing the Mn doping content. TGA reveals minimum weight loss in the high-temperature region of 500–1,000°C, showing the thermal stability of the catalyst. FTIR study shows highly bonding in metal atoms. These samples have been tested for photocatalytic degradation of brilliant green dye. 5 mol% Mn-doped TiO_2 is having nearly four times more photocatalytic activity than pure TiO_2. In addition, Mn-doped TiO_2 has shown excellent photodegradation of a mixture of three dyes namely, rhodamine B, brilliant green, and methylene blue.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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