



Enhancement of photocatalytic activity and regeneration of Fe-doped TiO₂ (Ti_{1-x}Fe_xO₂) nanocrystalline particles synthesized using inexpensive TiO₂ precursor

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Abstract

Fe-doped TiO₂, Ti_{1-x}Fe_xO₂ ($x=0.00, 0.01, 0.03, 0.05, 0.07, \text{ and } 0.09$) photocatalysts with enhanced activity were synthesized via a citric-acid-assisted autocombustion method and characterized by X-ray diffraction (XRD) analysis, diffuse reflectance spectroscopy (DRS), Fourier-transform infrared (FTIR) spectroscopy, transmission electron microscopy (TEM), energy-dispersive X-ray spectroscopy (EDS), and X-ray photoelectron spectroscopy (XPS). The photocatalytic activity of the synthesized Fe-doped TiO₂ materials was evaluated using photodegradation of synthetic dye solution (Direct Blue 199) in photochemical and open pan reactors. Among the synthesized Fe-doped photocatalysts, Ti_{0.95}Fe_{0.05}O₂ showed the highest photodegradation activity. This Fe-doped TiO₂ photocatalyst was regenerated five times and its photocatalytic activity investigated.

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