

Synthesis, Characterization and Application of Undoped and Fe Doped TiO₂ (Ti_{1-x}Fe_xO₂; X=0.01, 0.02, 0.03) Nanoparticles

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Abstract : Undoped and Fe doped TiO₂, Ti_{1-x}Fe_xO₂ (x=0.00, 0.01, 0.03, 0.05, 0.07 and 0.09) have been synthesized by solution combustion method using Titanium (IV) oxide as a precursor, and also were characterized by XRD, DRS, FTIR, XPS, SEM, and EDX. The formation of anatase phase of undoped and Fe TiO₂ nanoparticles were confirmed by XRD, and the average crystallite size was determined by Debye-Scherrer's equation. The DRS analysis indicates the shifting of light absorbance in visible region from UV region with increasing the doping concentration in TiO₂. The vibrational band of the Ti-O lattice was confirmed by the FT-IR spectrum. The XPS results confirm the presence of elements of titanium, oxygen and iron in the synthesized samples and determine the binding energy of elements. SEM image of the above-synthesized nanoparticles showed the spherical shape of nanoparticles. The purities of the synthesized nanoparticles were confirmed by EDX analysis. The photocatalytic activities of the synthesized nanoparticles were tested by studying the degradation of dye (Direct Blue 199) in the photocatalytic reactor. The Ti_{0.97}Fe_{0.03}O₂ photocatalyst shows highest photodegradation activity among all the synthesized undoped and Fe doped TiO₂ photocatalyst.

Keywords : direct blue 199, nanoparticles, TiO₂, photodegradation

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