



Preparation and characterization of solar light-induced rutile Cu-doped TiO₂ photocatalyst by solid-state molten salt method

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ABSTRACT

This study is the first report on the synthesis of Cu-doped TiO₂ nanoparticles with solid-state molten salt method for solar light-induced photo catalytic applications. Cu-doped TiO₂ nanoparticles were prepared using a precursor of a solid mixture of TiO₂ powder and CuSO₄. The effect of copper loading on the micro-structure and photo catalytic properties of TiO₂ particles was discussed. The obtained nanoparticles were characterized by structural X-ray diffraction (XRD), morphological scanning electron microscopy (SEM), optical (UV-Vis diffuse reflectance) and energy dispersive X-ray (EDX) analytical techniques. XRD analysis revealed the anatase crystalline phase for pure nanoparticles and rutile crystalline phase for Cu-doped TiO₂. According to SEM results, doping of TiO₂ nanoparticles with Cu ions changed their spherical shape into new larger structures. The existence of copper ions was confirmed by EDX. Doping process converted the absorption threshold of TiO₂ into visible spectrum range. The photo catalytic activity was also checked. With an appropriate content of Cu (0.1–3%), the Cu-doped TiO₂ nanoparticles exhibit improved photo catalytic performance in photo degradation of methyl orange, and the best performance was achieved by catalyst doped with 0.1% copper.

Keywords: Rutile; Cu-doped TiO₂; Solar light-induced; Photo catalyst

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