International Journal of ChemTech Research
CODEN (USA): IJCRGG ISSN: 0974-4290
Vol.8, No.12 pp 588-597, 2015

Sol-Gel mediated synthesis of tri-doped TiO_2Nanoparticles towards application of photo catalysis and its kinetic study

Savitha Elango, Kalainathan Sivaperuman*

Centre for Crystal Growth, School of Advanced Sciences,VIT University,Vellore 632014,Tamilnadu, India.

Abstract: Rare earth (RE) ion (RE = La, Ce, Y) doped TiO_2 catalysts were successfully synthesized by the sol-gel method. The particle size were reducing while increasing doping concentration (x= 0.2, 0.4, 0.6) in the 2nd order reaction and it was strongly reflected inX-ray diffraction (XRD), Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy(TEM). The resulted images indicated that the particles were binded. While increasing the concentration of dopents particle size also increases. The average particle size of TiO_2 with dopant said to 70±2 nm. In FTIR spectrum comparing all compositions peak between 400-4000 cm^{-1} were shifted and also Ti-O-RE stretching band, which attributed to formed pure and doped TiO_2 nanoparticles. The reflectance spectra reveal that the RE-doped TiO_2resulted in red shifts. Optical band gap (Eg) was reducedin high doping concentration (0.6) due to highadsorptionon the surface of RE-doped TiO_2 (3.02 eV) and pristine TiO_2 (3.2 eV). It causes that the separation of TiO_2 particles through UV radiation in recycling process were in environment treatment applications. Further tri doped TiO_2 nanoparticles were used as applicant in photocatalytic degrdation of industrially toxic dye methylene blue. Hence, these results indicate that the Tri- doping of the rare earth ions can extensively improve the photocatalytic activity of TiO_2 doped rare earth contrast with the pristine TiO_2.
Keywords: Rare earth elements, Sol-Gel, optical band gap, photocatalytic activity, kineticstudy.

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