Surface and Electrochemical Characterization of N-Fe-doped-TiO₂ Nanoparticle Prepared by Hydrothermal and Facile Electro-Deposition Method for Visible Light Driven Pollutant Removal

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Nitrogen-doped TiO₂ and Fe-N-TiO₂ nanoparticles having rectangular morphology were prepared by a hydrothermal method. A fixed amount N and Fe (III) chlorides was incorporated in a matrix of TiO₂ lattice. The XRD patterns of the as-prepared N- and Fe-doped TiO₂ samples show the presence of only the characteristic peaks of the anatase phase. The formation of the anatase phase in the N-doped TiO₂ photo catalyst was further confirmed by Raman spectroscopy. The particle size of the prepared samples was determined by transmission electron microscopy (TEM) analysis as well as by a particle size analyser. The TEM images revealed that the N-doped TiO₂ nanoparticles possessed a rectangular morphology and had a particle size in the range of 5–10 nm. The average particle size of the Fe-TiO₂ nanoparticles was found to be in the range of 2–10 nm. The photo electrochemical and photocatalytic properties of the as-prepared N- TiO₂ and N-Fe-TiO₂ nanoparticles towards the UV and Visible light condition and catalytic degradation of methylene blue (MB) dye were examined under visible light. These N- and Fe-doped TiO₂ nanoparticles are promising materials for the generation of hydrogen fuel through water splitting in the presence of solar light owing to the alteration in their band gaps after heteroatom modification.

Keywords: TiO₂ nanoparticle, methylene blue, electro catalysis, photo catalysis, visible light

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