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PHOTOCATALYTIC DEGRADATION OF INDIGO CARMINE IN AQUEOUS SOLUTION BY TITANIUM DIOXIDE

Arun, T,[a], Thirumal, J.[a], Akshay Dhivakar[b], Rajesh, K.B.[a], Sivamani, S[b].
[a]Anna University of Technology,Tirunelveli
[b]Kumaraguru College of Technology, Coimbatore
Corresponding Author: Arun, T. E-mail: stharun@gmail.com Ph: +91 9488484288;+971 569769001

Abstract

Photocatalysis is a process in which the initial absorption of photons by a semiconductor, leads to the formation of electrons and holes. Heterogeneous photocatalysis is a process of great potential for pollutant abatement and waste treatment. Nitrogen doped Titanium dioxide has been successfully prepared and subjected into XRD, FTIR and SEM analysis. The visible light absorbance increases with increase of the dopant concentration. The FTIR analysis results clearly demonstrated that the Nitrogen has been incorporated into the TiO_2 lattice. The nitridation occurred by replacing the oxygen atom in the TiO_2 with the nitrogen atom in the Urea molecule, resulting in the formation of the O–Ti–N species. The SEM images show that N-doped TiO_2 photocatalyst consist of irregular agglomerated nanoparticles of size ranging from 70 to 150 nm and the result shows that the morphology of the TiO_2 particles was not altered on nitrogen doping due to the comparable atomic size of nitrogen atom with oxygen. The XRD patterns of Nitrogen doped TiO_2 shows that the material was in pure anatase phase, and the average crystallite size was found to be 127 nm. Indigo carmine dye has been successfully decolorized in the presence of N doped TiO_2 photocatalyst. In case of dye solution of $1*10^4$ M concentration, degradation was found to be 95% in sun light respectively at the optimized reaction conditions like pH of 4.0, catalyst dose of 2 mg/L. Thus, sun light can be effectively used for decolorization of indigo carmine dye solution.

Keywords: *TiO_2, Indigo carmine; Photocatalysis; Degradation*