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Photocatalytic degradation of Azo dyes using N-TiO_2 photocatalyst: Effect of nitrogen loading and calcination temperature

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Photocatalytic nanomaterials are of great technological importance in environmental remediation due to their ability to generate charge carrier when activated with certain energy. The release of textile dyes especially the azo dyes into the water bodies is of great concern due to their inimical effects on flora and fauna. These dyes are toxic, allergic and carcinogenic in nature even at very low quantities. Current research work is focused to develop and explore the efficacy of non-metal doped titania (TiO_2) nanomaterials for adsorption and eventually photocatalytic mineralization of selected azo dyes. A series of nitrogen doped TiO_2 with different mol% N was synthesized via sol-gel technique and characterized using thermal gravimetric analyzer, Fourier transform infrared spectroscopy, scanning electron microscopy and Raman spectroscopy. The synthesized N-TiO_2 were calcined at different calcination temperature 200°C, 300°C and 400°C. Photocatalytic degradation and optimization studies were conducted for the best nitrogen doped photocatalysts. 20N-TiO_2 photocatalysts showed best performance at all calcination temperatures as compared to other mol% N-TiO_2 photocatalysts. 90% dye removal was achieved using photocatalysts calcined at 300°C. It is recommended to further explore the nonmetal doped photocatalysts with combination of metal doped to reduce the photoreaction duration and charge recombination.

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