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Synthesis and characterization of nano Co_3O_4- B co-doped *g-CN* heterojunction for photocatalytic degradation of textile dye wastewater under sunlight

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Photocatalysis is the best method for organic dye removal process due to non-toxicity of the final products. Hetero-junction photocatalysis has become a hot topic in removal of organic pollutants from the wastewater under sunlight. In this study the photocatalytic activity of the boron doped graphitic carbon nitride (BCN) and tricobalt tetroxide (Co_3O_4) was used to produce visible light active Co_3O_4/BCN heterojunction photocatalyst. Graphitic carbon (g-C_3N_4) and B co- doped BCN with 0.5-10 (w/w) % was synthesized according to literature. 5% BCN has the lowest band gap energy of 2.64 eV. Different weight percentages Co_3O_4 (10-75 (w/w) %) was used to synthesize hetero-junctions catalyst. The 50 (w/w) % Co_3O_4-BCN showed the best band gap energy for the photocatalysis (2.34 eV, 530.0 nm). The photocatalysts were characterized by using FT– IR spectroscopy (809, 1237, 1317, 1407, 1555, 1631, 3000-3500 cm^{-1} for g-C_3N_4 and 656 cm^{-1} for Co_3O_4). Reactive black 5 dye (RB5) 50 ppm solution was used for the catalysis. The best photocatalyst dosage 0.3 g of g-C_3N_4 was found from 0.1- 0.4 g and 0.4 g of 50% (w/w) Co_3O_4-BCN from 0.1- 0.4 g was the best dosage at pH=4. Under sunlight, g-C_3N_4 was found the best photocatalyst. RB5 dye degradation reached 100% in 100 minutes under sunlight irradiation. Degradation efficiency was enhanced with the pH = 4 up to 100 % efficiency within 80 minutes.

Keywords: Hetero-junction photocatalyst, Organic pollutants, Band gap

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