An upgraded g-C_3N_4 semiconductor by a Nitrogen doped carbon material: A photocatalytic degradation application

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This project aims to synthesize a cheap, non-metallic, and active photocatalyst. A facile wet impregnation technique was used to incorporate several nitrogen doped carbon (N-Carbon) loadings (0.2, 0.5, and 1 wt%) onto the semiconductor graphitic carbon nitride (g-C_3N_4). For the activation of the composite photocatalyst, temperature treatment was applied. X-ray diffraction (XRD), transmission electron microscopy (TEM), Fourier transform infrared spectroscopy (FTIR), thermal gravimetric analysis (TGA), and ultraviolet-visible spectroscopy were used to evaluate the catalysts and their precursors (UV-Vis). The sample with 0.5 wt% N-Carbon/ g-C_3N_4 treated for two hours at 500°C demonstrated the best performance by having the highest methylene blue (MB) degradation efficiency (90% in three hours). The ideal catalyst concentration in the media was found to be 1g/L following 3 hours of degrading testing under a solar simulator lamp. The presence of the nitrogen doped carbon in the core structure of the bulk g-C_3N_4 was thought to have improved the electrochemical characteristics of the material, which was the explanation for the high activity of the treated 0.5 wt% N-Carbon/ g-C_3N_4 catalyst. The intensification of conductivity and decrease in resistance of the g-C_3N_4 material following carbon doping and heat treatment served as evidence of this improvement in the material's electrochemical characteristics. The results of the kinetic investigation supported these conclusions. The significant potential of this technology for water purification and other related industries is demonstrated by the material's high activity, low cost, and non-toxicity.