

Effect of oxidation with HNO_3 on the photocatalytic properties of $\text{g-C}_3\text{N}_4$

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The search for new efficient photocatalysts, aligned with the concept of sustainability, has aroused the interest of many scholars due to two major problems faced by humanity, the energy deficit and environmental pollution[1]. In this context, there is graphitic carbon nitride ($\text{g-C}_3\text{N}_4$), a semiconductor material without toxicity, of low cost, practicality of preparation and structure of bands properly positioned for photooxidation and reduction of H_2O molecules[2]. However, despite these advantages, $\text{g-C}_3\text{N}_4$ has some limitations, such as its low surface area and high rate of recombination[3]. In this work, we investigated the effect of oxidation of $\text{g-C}_3\text{N}_4$ with HNO_3 in a photocatalysis reaction. The $\text{g-C}_3\text{N}_4$ was synthesized by the polycondensation of melamine and the material obtained was subjected to acid treatment with HNO_3 in concentrations of 1, 3 and 5M. All samples were characterized by different techniques, including DRX, FTIR, SEM. Photocatalytic activity was assessed by photodiscolouring the indigo carmine dye (20 mg/L) in the presence of 15 mg of $\text{g-C}_3\text{N}_4$ and 25 μL of H_2O_2 under visible light irradiation (White light bulb, 12 W). The $\text{g-C}_3\text{N}_4$ -3M sample showed the best rate of light discoloration, 66%, while the sample, without acid treatment, of 28%, thus, based on the characterizations performed, we believe that functional groups oxygenated with intermediate NOx, C-OH and/or N-OH, may be responsible for the H_2O_2 reduction reaction forming $\cdot\text{OH}$ resulting in improved photocatalytic efficiency. The results presented showed that the photocatalytic properties of $\text{g-C}_3\text{N}_4$ have been improved, however, a rigorous study is needed regarding the reaction conditions to obtain a material with a high concentration of these intermediate NOx functional groups.

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References

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