One-step Solvothermal Synthesis of rGO/TiO_2 Nanocomposite for Efficient Solar Photocatalytic Degradation of Methylene Blue Dye

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Background: The discharge of effluents from the textile and dyeing industries has been a worldwide concern. Although reduced graphene oxide/titanium dioxide (rGO/TiO2) nanocomposite is a potential candidate for wastewater treatment, the influence of graphene oxide (GO) content on its physico-chemical characteristics and its subsequent photocatalytic capabilities in degrading the organic contaminants has not been well established.

Objective: The primary objective of this study was to assess the use of rGO/TiO2 nanocomposites with various GO contents for the removal of toxic methylene blue (MB) dye from aqueous solution.

Method: In the present study, rGO/TiO2 nanocomposites were fabricated using various GO contents through a one-step solvothermal method. The effect of GO content on the nanocomposite formation was investigated by using field emission scanning electron microscopy (FESEM), transmission electron microscopy (TEM), X-ray diffraction (XRD) and Raman spectroscopy. The resulting nanocomposites were evaluated against MB degradation under artificial solar light illumination.

Results: Based on the photocatalytic results, the highest removal percentage of MB was achieved by 0.15rGO/TiO2, which was about 1.7 times higher than that of 0.01rGO/TiO2.

Conclusion: The enhanced removal efficiency of MB by the nanocomposite with the highest GO content (0.15 g) was attributed to the increased active adsorption sites, which greatly promoted the π- π interaction

between the aromatic rings of MB dye and the graphitic skeleton of rGO, as well as the electrostatic interaction between the cationic center of MB molecules and the residual oxygen functionalities of rGO.

Keywords: GO content; artificial solar light illumination; methylene blue; one-step solvothermal; photocatalytic degradation; rGO/TiO2 nanocomposite

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