ABSTRACT

Malachite green (MG) is a synthetic dye that is toxic, persistent, and difficult to degrade naturally, thus potentially polluting the aquatic environment. This study aims to synthesize and characterize $CuCr_2O_{44}$/reduced graphene oxide (rGO) composites and activate their photocatalytic activity against MG degradation under visible light irradiation. The $CuCr_2O_4$/rGO composites were synthesized through a hydrothermal method with variations in the mass ratio of $CuCr_2O_4$:GO of 10:0, 7:3, 5:5, 3:7, and 0:10 (wt%). The synthesized materials were characterized using Fourier Transform Independent Spectroscopy (FTIR), X-Ray Diffraction (XRD), Scanning Electron Microscopy-Energy Dispersive X-ray (SEM-EDX) Mapping, and UV-Visible Diffuse Reflectance Spectroscopy (UV-Vis DRS). The characterization results showed the successful formation of the $CuCr_2O_4$/rGO composite, which was characterized by the appearance of the characteristics of both components in the FTIR spectrum, the diffraction pattern of the tetragonal spinel phase of $CuCr_2O_4$ and rGO in the XRD pattern, and the even distribution of elements on the material surface. The band gap energy value of the composite was in the range of 1.78–1.98 eV. The photocatalytic activity test showed that the $CuCr_2O_4$/rGO composite had a higher performance than pure $CuCr_2O_4$. The optimum composition was obtained at CCO7/rGO3 with an MG degradation efficiency of 90.82% after 60 minutes of visible light irradiation. The increase in photocatalytic activity in the $CuCr_2O_4$/rGO composite indicated a synergistic effect between $CuCr_2O_4$ and rGO in the degradation process of malachite green under visible light. The results of this study indicate that the $CuCr_2O_4$/rGO composite has the potential to be an effective visible light-based photocatalyst for the treatment of organic dye waste.

***Keywords**: $CuCr_2O_4$, rGO, composite, photocatalysis, malachite green, visible light.*