Synthesis and Study of Magnesium Ferrite/Reduced Graphene Oxide (MgFe₂O₄/rGO) Nanocomposite Electrodes to Electrochemical Removal of Hexavalent Chromium Ion from Wastewater

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This study was conducted on the synthesis of magnesium ferrite/reduced graphene oxide (MgFe₂O₄/rGO) nanocomposite as anodes for removal of hexavalent chromium (Cr(VI)) ions from industrial wastewater through the electrocoagulation (EC) technique. MgFe₂O₄/rGO was synthesized using a hydrothermal method. Study of the morphology surface MgFe₂O₄/rGO using SEM showed that the MgFe₂O₄ particles were strongly attached on 3D crumpled and rippled rGO nanosheets which illustrated the higher porosity of the MgFe₂O₄/rGO structure. XRD analysis also indicated good anchoring of MgFe₂O₄ particles on rGO nanosheets. Results of EIS studies prove the interfacial processes and lower charge transfer resistance of MgFe₂O₄/rGO than that of MgFe₂O₄. The effect of pH value, Cr (VI) concentration and current density was studied for removal of Cr (VI) from industrial wastewater using the MgFe₂O₄/rGO as anode via EC technique. Results showed that complete treatment was obtained for treatment of 60 mg/L of Cr (VI) in NaCl concentration of 0.4 g/L and pH 2 under 25 minutes EC for 5mA/cm² current density and energy consumption of 0.0072 kWh/m³. Comparison between obtained results for Cr(VI) treatment using MgFe₂O₄/rGO nanocomposite and other reported works indicated to lower energy consumption in this study due lower charge transfer resistance in MgFe₂O₄/rGO.

Keywords: Ferrite; Reduced Graphene; Nanocomposite; Hexavalent Chromium; EC

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