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COMPARATIVE INVESTIGATION OF Fe_3O_4, Fe_3O_4@HA AND Fe_3O_4@AC NANOPARTICLES ON DYES ADSORPTION

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Abstract

In this study, the removal of MB (Methylene Blue) and MO (Methyl Orange) dyestuffs from aqueous solutions via adsorption by using magnetic nanoparticles of Fe_3O_4, Fe_3O_4@HA and Fe_3O_4@AC synthesized under laboratory conditions was investigated. The synthesized magnetic nanoparticles were characterized by SEM, EDX, XRD, BET surface area, FTIR, average pore diameter and particle size distribution analysis. When Fe_3O_4, Fe_3O_4@HA and Fe_3O_4@AC were used as adsorbents, the optimum pH values for MB were determined as pH 11, pH 9 and pH 7, respectively, and pH 6, pH 4 and pH 4 for MO, respectively. At the determined optimum pH values, Fe_3O_4, Fe_3O_4@HA and Fe_3O_4@AC were determined to be 4.2 mg/g, 4.8 mg/g and 8 mg/g for MB at an initial dye concentration of 10 mg/L, while Fe_3O_4, Fe_3O_4@HA and Fe_3O_4@AC were determined to be 3 mg/g, 1.6 mg/g and 4.5 mg/g for MO, respectively. It was found to be compatible with the Freundlich isotherm and pseudo second-order model of all adsorption experiments. This study showed that Fe_3O_4@HA, synthesized by binding HA to Fe_3O_4, and Fe_3O_4@AC, synthesized, and carbonized by pyrolysis, magnetic nanoparticles can be used as a good alternative adsorbent for removing hazardous dyes from wastewater due to their good cleaning efficiency as well as easy synthesis and regeneration.

Key words: adsorption, color removal, desorption, magnetic nanoparticle

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