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Faculty of Engineering

SYNTHESIS AND CHARACTERIZATION OF DATE SYRUP/Fe_2O_3 MAGNETIC CARBON PARTICLES FOR WASTEWATER TREATMENT APPLICATIONS

A graduation project submitted to the Chemical Engineering Department in partial fulfillment of the requirements for the degree of Bachelor of Science in Chemical Engineering

BY

Mohammed Milad Adriwe

Jiprel Moftah Abozahow

Abd Almalik Sleem Alshawish

SUPERVISIONS

Assist. Prof. Almahdi A. Alhwaige

Mr. Khaled S. Aljfairy

Zliten, Libya

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ABSTRACT

Magnetic carbon nanoparticles (MCNPs) are a new class of nanostructured porous carbon materials that are received tremendous attention in various applications due to their excellent properties including high porosity, high thermal properties, working with various operating conditions, and low-cost. The present work reports a facile synthesis of eco-friendly MCNPs derived from date-syrup (DS) and iron rust as a source of Fe_2O_3. The densities and porosities of the prepared MCNPs were measurements. The obtained MCNPs were employed as magnetic adsorbents for removing methylene blue dye (MBD) from aqueous solution. The results indicated that the increasing in contact time and mixing speed enhance the adsorption efficiency. The adsorption capacity was also increased with an increase in the operating temperature and initial pH of solution. The results showed that the maximum MBD adsorption efficiency were about 89%. The effect of initial concentration of MBD on the adsorption capacity was studied and the adsorption experimental data was fitted with the available adsorption isotherm models, namely Langmuir, Freundlich, and Temkin equations. The adsorption equilibria were adequately described with the Freundlich isotherm model and the adsorption process was well described by the pseudo-second order kinetic model. The thermodynamic investigations showed that the MBD adsorption onto MCNPs was a heterogeneous, spontaneous, and endothermic process.

KEYWORDS: Date-syrup; Rust; Magnetic carbon nanoparticles; Wastewater treatment; Adsorption isotherm models.