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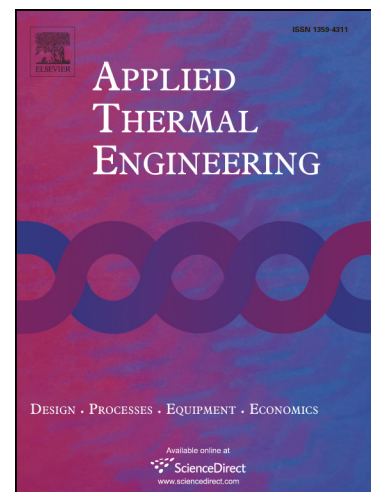
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Sequential application of microwave and conventional heating methods for preparation of activated carbon from biomass and its methylene blue adsorption

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Abstract

The preparation of activated carbon from sunflower seed husk as raw precursor with sequentially application of the both microwave and conventional heating methods assisted ZnCl_2 activation was investigated for the first time in the study. The influences of microwave power, microwave treatment time, conventional heating time, and conventional heating temperature and ZnCl_2 concentration on the properties of the activated carbon were investigated. Characterization of prepared activated carbons was done by measuring TG/DTG, BET surface area analysis, SEM and FT-IR analysis. The maximum surface area and total pore volume for the prepared activated carbon were $1511 \text{ m}^2/\text{g}$ and $0.35 \text{ cm}^3/\text{g}$ at a microwave power of 500 W, a microwave treatment time of 30 min, an activation time of 45, an activation temperature of 500°C and the ZnCl_2 concentration of 1:1. Some parameters affecting adsorption such as pH, isotherm, kinetic, thermodynamic, and desorption were investigated. In addition, Langmuir and Freundlich adsorption isotherms were employed to determine type of adsorption isotherm. The maximum MB adsorption capacity for the activated carbon obtained by Langmuir adsorption isotherm was 240 mg/g at 30°C . The kinetic analysis was carried out by pseudo-first-order and pseudo-second-order models. The results revealed that the adsorption kinetic is more similar to the pseudo -first-order. The parameters of thermodynamic like ΔH° , ΔG° and ΔS° were calculated.

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