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Adsorption of phenol onto activated carbon prepared from coffee extract residue chemically activated using $ZnCl_2$

L. Yahia cherif*, F Aissani-Benissad

Laboratoire de Génie de l'Environnement, Faculté de Technologie, Université A/ Mira de Bejaia, Algérie.

*Corresponding author: lamia.yc@gmail.com ; Tel.: +213550094930

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ABSTRACT/RESUME

Abstract: *In this work, coffee residue, a natural precursor of vegetal origin was used as a source material to prepare activated carbons by chemical activation with zinc chloride. The effects of differences found in the surface functional groups and textural characteristics of five activated carbons prepared with different impregnation ratios (activating agent/precursor) on their capacity to retain phenol from aqueous solutions are reported. Batch experiments were conducted to study the main parameters such as initial adsorbate concentration, contact time, pH solution, temperature and adsorbent concentration. It was found that retention of phenol is less in acidic carbons than in basic nature carbons. Activated carbon prepared with 25 % impregnation ratio showed best adsorption capacity and waschosen for further studies. Optimum conditions for phenol removal were found to be pH = 3, adsorbent concentration = 2 g/L and equilibrium time = 20 min. Under optimised conditions, the prepared activated carbon showed 85 % removal efficiency for a solution concentration of 30 mg/L. The experimental data were analysed by the Langmuir and Freundlich isotherm models. The results clearly showed that the adsorption data of phenol onto activated carbon fit perfectly to the Langmuir model with correlation coefficient higher than 0.99 at all temperatures. The surface chemistry of activated carbon affects the adsorption capacity significantly while the texture characteristics of surface area and pore volume play a minor role in phenol adsorption. Therefore, the surface chemistry must be taken into account in the decision-making process of choosing an adsorbent for phenol removal.*