

Properties of chemically prepared corncob-based activated carbons and their adsorption characteristics for aqueous lead and phenol

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Received 12 April 2016; Accepted 9 September 2016

ABSTRACT

To study the effects of activator on the surface and adsorptive properties of activated carbons (ACs), corncob-based ACs were prepared using H_3PO_4 , KOH and K_2CO_3 as activators. Their surface physico-chemical characteristics were analyzed using SEM, FTIR, XPS, XRD and BET methods. Compared to other ACs, H_3PO_4 activated AC (AC-PA) had more oxygen-related groups, more hydrophilic surface and larger surface area ($680.7\text{ m}^2/\text{g}$). Its pore size distribution was more heterogeneous. Resulted from the oxygen-containing and P-related groups, AC-PA gave favorable adsorption for Pb, with a maximum capacity of 298.5 mg/g . The adsorption of Pb onto other ACs was inferior and mainly through surface precipitation. Due to the combined effects of several interactions, the adsorption performance of ACs for phenol related to the concentration range. Surface properties including surface area, oxygen-containing groups and pore size distribution affected the interactions. AC-PA gave poor adsorption at low concentration but reached higher maximum uptake. Post-heat treatment of AC-PA strongly improved phenol adsorption especially at low concentration range. Accordingly, H_3PO_4 is more suitable to prepare ACs aiming at heavy metal removal. Other activators might be applicable when phenolic compounds are targeted. In addition, H_3PO_4 activation enjoyed the advantage of higher carbon yield.

Keywords: Activated carbon; Corncob; Surface characteristics; Lead; Phenol

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