Porosity Development in Activated Carbon from Palm Kernel and Coconut Shell by Chemical Activation Method

M. M. Rahman[1], Mohammad Adil[2] and A. M. Yusof[2]
[1]*Department of Pharm. Chem., Faculty of Pharmacy*
International Islamic University Malaysia
25200 Kuantan, Pahang, Malaysia
[2]*Department of Chemistry, Faculty of Science*
Universiti Teknologi Malaysia
81310 UTM Skudai, Johor, Malaysia
Telephone: 609-5716400 (ext.:3097), Fax: 609-5716775
Email: mdrahman@iium.edu.my

Abstract

Several series of activated carbons have been prepared by chemical activation with phosphoric acid from palm kernel and coconut shells to study the effect of preparation variables, such as precursor, precursor size, pretreatment, impregnation condition and ratio, and finally the carbonization temperature on specific surface area and pore distribution of the resulting active carbon. Both precursors showed similar N_2 adsorption isotherms, an upward deviation at high relative pressure, revealing the presence of mesorpores when carbonized at 500^0 C with H_3PO_4. The bigger hysteresis loop indicates higher mesoporosity in coconut shell derived carbon whereas palm kernel shell derived carbon showed a higher macroporosity nature. Prolong sinking of the precursor in H_3PO_4 impregnation solution followed by carbonization at moderate temperature (450-500^0 C) produces carbon of high surface area with a higher macroporosity. The lowering of precursor size favours micropore development and semi-drying of the impregnation chemical prior to carbonization diminishes the macroporosity to a great extent. Thus an appropriate choice of preparation variables enables us to produce high surface area of micro- and mesoporous activated carbon.

Key words: Activated carbon; chemical activation; phosphoric acid; palm kernel; coconut shell.