EFFECT OF SURFACE FUNCTIONAL GROUPS ON WATER VAPOR ADSORPTION OF EUCALYPTUS WOOD-BASED ACTIVATED CARBON

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Abstract

The aim of this study is to modify activated carbon surfaces by oxidizing them with HNO_3 to enhance the adsorption capacity of water vapor. The activated carbons were prepared from eucalyptus wood by CO_2 activation at 600°C and 900°C, giving activated carbons with different porous properties. The results from Boehm titration showed that the amount of acidic oxygen functional groups increased after oxidation with HNO_3 for both activated carbons, with activated carbon prepared at 900°C giving the higher amount of acidic oxygen functional groups. The activated carbon originally prepared at 900°C gave higher amounts of water adsorbed than the carbon prepared at 600°C because of its larger pore volume and surface area. The adsorption capacity of water vapor was found to increase after oxidation for both activated carbon samples. Water isotherms were also analyzed using the cluster model of Dubinin-Serpinski (DS) and Do and Do. The results indicated that water isotherms obtained from the original and oxidized activated carbons prepared at 600°C were well described by the Do and Do model over the relative pressure close to unity. However, the water isotherms of the original and oxidized activated carbons prepared at 900°C could only be described by the Do and Do model when the cluster size in the model was increased for adsorption in the high relative pressure range.

Keywords: Activated carbon, eucalyptus wood, surface functional groups, adsorption, water vapor

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