

ADSORPTION CHARACTERISTICS OF ETHANOL ON SURFACE TREATED ACTIVATED CARBONS AND PHENOL RESINS FOR ADSORPTIVE COOLING/REFRIGERATION

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Abstract

This article aims to consolidate the outcomes of a systematic investigation on the use of adsorption phenomenon for cooling and refrigeration applications. Adsorption isotherms and kinetics of promising adsorbent/refrigerant pairs have been investigated. Adsorbents used in the present study are (i) parent Maxsorb III, (ii) KOH-H₂ treated Maxsorb III, and (iii) two types of phenol resin based adsorbents named as KOH4-PR and KOH6-PR. Adsorption isotherms and kinetics of the assorted pairs have been measured using magnetic suspension adsorption measurement unit. Experiments have been conducted across assorted adsorption temperatures that are useful for the operation of adsorption chillers. The Dubinin-Astakhov and the Dubinin-Radushkevich equations are used to fit adsorption isotherms whilst adsorption kinetics are presented by the Fickian diffusion model. Experimental adsorption isotherm measurements show that the adsorption capacity of KOH4-PR/ethanol is as high as 1.43 kg kg⁻¹ whilst one kg of KOH6-PR is able to adsorb nearly about 2 kg of ethanol. To the best of our knowledge, the studied phenol resin based adsorbents possess the highest ethanol uptake.