

Carbon Dioxide Adsorption Isotherms Onto Activated Carbons

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In the last few years, carbon dioxide has gained considerable attention as an alternative to HFC based refrigerants for cooling and air conditioning applications as it is abundantly available in nature. Moreover, it is a non toxic and non flammable fluid. The use of CO₂ for solid sorption system seems attractive and interesting. Many works have been done in order to determine the capture of CO₂ using different adsorbents. In this study, high pressure uptake of carbon dioxide on activated carbons (activated carbon fiber of type A-20 and charcoal) were measured at temperatures ranging from 263 to 343 K and pressures up to 6 MPa. A static volumetric apparatus is used, in which adsorption amount is calculated with the ideal gas law and from the measurement of pressure change of the adsorption cell. Adsorption isotherms of CO₂ in the assorted micro-porous materials were fitted with three different isotherm equations namely Toth, Langmuir-Freundlich and Dubinin-Astakhov. Adsorption isotherms of CO₂ on activated carbons are found to be type I of IUPAC classification. These present adsorption isotherms data are compared with previously published results. These data are crucial to determine the performance of an adsorption cooling cycle using activated carbon-CO₂ as adsorbent-refrigerant pair. From the confirmed adsorption isotherms equation, the isosteric heat of adsorption, specific heat capacity, enthalpy, and entropy of the single component CO₂-activated carbon system had also been computed which allow the better understanding of CO₂ based adsorption processes.