Comparative adsorption isotherm for Beryllium oxide/Iron (III) Oxide toward CO2 adsorption and desorption studies

ABSTRACT

Surface modification of Fe2O3 by adding BeO was synthesized and calcined at different temperatures of 200-600 °C. The adsorbents were characterized by using XRD, N2 adsorption-desorption isotherm prior to performing CO2 adsorption and desorption studies. The CO2 adsorption data were analyzed using adsorption isotherm models such as Langmuir, Freundlich, Temkin, and Dubinin-Radushkevich. BeO/Fe2O3-300 that calcined at 300 °C showed the most efficient adsorbent with physisorption and chemisorption were measured at 5.85 and 45.88 mg/g respectively. The CO2 adsorption notably best fitted with Freundlich isotherm with R2 = 0.9897 and calculated adsorption capacity closest to experimental data. This implies the CO2 adsorption process was governed by multilayer adsorption on the heterogeneous surface of the adsorbent. The mean free energy of adsorption (E=3.536 kJ/mol) from Dubinin-Radushkevich and heat of adsorption (bT=3.219 kJ/mol) from the Temkin model support that the adsorption process is physical phenomena.

Keyword: Adsorption isotherm; Beryllium oxide; CO2 capture; Iron (III) oxide