Comparison of CO_2 sorption performance on PEI silica and KOH treated activated carbon: Sorption equilibria and kinetics

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The adsorption equilibria and kinetics of CO2 on PEI silica and KOH treated activated carbon (KOH-AC) were measured through a volumetric method at 303K, 323 K and 343 K. Since the flue gas from post combustion contains N2, the adsorption equilibria of N2 on both adsorbents were also evaluated at 303K. The isotherms were correlated with Langmuir, dual site Langmuir (DSL), and Sips models. For CO2, DSL best fitted the isotherm of PEI silica, while Sips best fitted that of KOH-AC. The isosteric heat of adsorption for CO2 on PEI silica decreased with the increasing of CO2 loading, but that for KOH-AC was almost constant. In ideal adsorbed solution theory (IAST) calculation, PEI silica showed higher CO2/N2 selectivity over KOH-AC, indicating better working capacity in the flue gas condition. The uptake curves of CO2 were well correlated with a non-isothermal kinetic model, but an isothermal kinetic model showed a large deviation from the experimental data because the adsorption kinetics was controlled by heat generation and transfer. Although the uptake curves are different, the values of effective diffusional time constant (D/R2) for KOH-AC and PEI silica show in the same order.