High-pressure Adsorption of CO_2, CO, N_2 and H_2 on Microporous Sorbents

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High pressure adsorption of CO_2, CO, N_2, and H_2 on microporous solid substances, such as zeolites, activated carbons and metal-organic framework materials has been studied for simulating adsorption and kinetic behavior of a gas mixture consisting of 20% CO_2, 38% CO, 4% N_2 and 38% H_2. Among the sorbents used, zeolite 13X has the smallest micropore size (4.8Å) which is much larger, by 1Å, than a molecular diameter of N_2 whose value was the largest. Thus, no molecular sieve effect took place. Unlike the other adsorbents, zeolites showed a rapid CO_2 adsorption and a steep increase in its uptake below 2.5 bar. This dependence on equilibrated pressures allowed is associated not only with the difference in surface energetic heterogeneity among the sorbents but also with high quadrupole moment for CO_2. However, such a kinetic behavior in the adsorption of the gas mixture did not appear even on zeolites. This is mainly due to a low fraction of CO_2 in the mixture.