1,000 and 182 for CO_2/N_2 and CO_2/O_2, respectively, at a feed composition of 14.9% CO_2, 4.25% O_2 and 80.85% N_2. The adsorption/desorption mechanisms were favored at high temperature. However, the PEI polymer oxidized when the temperature was higher than 100°C. The best separation temperature was 75°C. The presence of moisture in the simulated flue gas mixture promoted the adsorption of CO_2. The adsorption capacity in the presence of 10% moisture was 63.7 ml (STP)/g adsorbent, and was 1.34 times higher than that for a dry gas mixture, showing a clear synergetic effect between the PEI and moisture on CO_2 adsorption. Cyclic adsorption/desorption experiments showed that the "molecular basket" adsorbent was stable under both dry and moist feed conditions.

Carbon dioxide can be selectively separated from boiler flue gases by using the novel "molecular basket" adsorbent. The adsorbent adsorbs little N_2 and O_2. The selectivity of CO_2/NO_x was 2.5 for natural gas-fired flue gas and the separation selectivities for CO_2/SO_2 and CO_2/NO_x were 10.7 and 2.86, respectively, for coal-fired flue gas. The desorption of CO_2 was complete. However, very little NO_x and SO_2 desorbed after adsorption indicating the need for pre-removal of NO_x and SO_2 from the flue gas mixture before capture of CO_2 by the PEI based "molecular basket" adsorbent.

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