B-13 Synthesis of ZSM-5 Zeolite Composite Membranes for CO_2/N_2 Separation

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ZSM-5 zeolite composite membranes have been manufactured by the hydrothermal treatment of porous alpha-alumina tubes in the reaction mixture of silica sol, sodium hydroxide, and templates like TPAOH and TPABr at 185°C for 40 h in the autoclave. The membranes synthesized by the hydrothermal treatment were surface-modified by dip-coating of the polymeric silica sol to improve the CO_2 separation efficiency via filling up the intercrystalline voids. To evaluate the separation efficiency of the ZSM-5 composite membranes, the CO_2/N_2 separation factor and permeance were measured as a function of the stage cut, the operation temperature, the feed pressure, and the composition of feed gas. The permeance and the separation factor of the ZSM-5 composite membranes for a CO_2/N_2 (50% CO_2) gas mixture were higher than $10^{-9}-10^{-8}$ mol/$m^2 \cdot s \cdot Pa$ and 30 at room temperature as well as $10^{-7}-10^{-8}$ mol/$m^2 \cdot s \cdot Pa$ and 10 even at 100°C, respectively.

B-14 Removal of Sodium Chloride in Aqueous Solution by Using Carbon Aerogel Electrodes

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Carbon aerogels are new materials that have high surface area (~700 m^2/g), low density (~0.45 g/cm^3), high specific capacitance (~220 F/g), and low electrical resistivity (~0.03 Ω·cm). A capacitive deionization (CDI) process using highly porous and electrically conductive carbon aerogel electrodes is a very simple, safe, cost-effective, energy-efficient and environmentally attractive process compared to the Reverse Osmosis (RO) or thermal distillation process. In this work, conductivity variations of CDI unit cell according to various applied voltages and NaCl concentrations were measured, and then the ion removal efficiency of the CDI multi-stacking system was evaluated with 50 mg/*l* NaCl solution (8.56×10^{-4} M) under 1.5 V applied.