Carbon Dioxide Separations through FAU Zeolite Membranes with Diverse membrane thickness and Si/Al ratio

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Faujasite zeolite membranes with diverse membrane thicknesses (1-20μm) and Si/Al ratio (1.3-1.8) were prepared by hydrothermally treating a porous α-alumina tube in Al_2O_3-SiO_2-Na_2O aqueous solutions and the CO_2/N_2 separation property(separation factor and flux) was evaluated in a He sweeping mode for an equimolar binary gas. The CO_2 flux is slightly dependent on the membrane thickness, Si/Al ratio and permeation temperature, while the CO_2 flux is highly affected by them. The CO_2/N_2 separation factor showed a maximum in ones with a membrane thickness of around 5μm and abruptly decreased with increasing permeation temperature. The prepared faujasite zeolite membranes showed an excellent CO_2/N_2 separation behavior: at a permeation temperature of 30℃, they showed the CO_2/N_2 separation factor of 30 to 90 and the CO_2 flux of 2 x 10^{-2} to 5 x 10^{-2} mol/m^2sec. In the present study, it was emphasized that a retardation of N_2 flux through the micropores is necessary to improve the CO_2/N_2 separation factor at room temperature or elevated temperatures.