230f Separation of Fluorine Containing Greenhouse Gases with Porous Membranes

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Surface diffusion mechanism in the porous membranes was applied for the separation of fluorine-containing greenhouse gases from the gaseous mixtures with nitrogen. Transport of condensable components, i.e., fluorine-containing greenhouse gases, could be enhanced by the surface diffusion mechanism by the adsorbed molecules on the pore surface, while non-condensable gases such as nitrogen can be transported with only gas-phase diffusion mechanism. Consequently, the condensable components could be enriched by the permeation through porous membranes. The concept was examined experimentally for the separation of HFC-134a, HCFC-22, SF6 from the gaseous mixtures with nitrogen through porous glass membrane of which the pore diameter was 4 nm. For the single component permeation, the permeation flux of the fluorine-containing greenhouse gas was much higher than that of nitrogen, indicating the flux was enhanced by the surface diffusion mechanism. The flux of SF6 was lower than those for other gases, HFC-134a and HCFC-22, presumably due to lower boiling point. For the gaseous mixtures, the both fluxes of nitrogen and the greenhouse gases were reduced compared with those for single components. However, high selectivity of the greenhouse gases, especially under lower temperature conditions.