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Transport properties of glassy polymer membrane after exposure to H2S

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Membrane processes continue to attract significant interest, as reflected in the growing number of studies focused on the development of innovative membrane materials. Novel membranes are frequently designed for specific separation processes, in which they demonstrate enhanced transport properties and improved resistance to fouling. In this study, a methodology was proposed to evaluate the transport properties of novel membrane materials with respect to their resistance to hydrogen sulfide, a common contaminant in biogas. To this end, the permeance, solubility, and diffusivity of CH4, CO2, N2, and O2 were experimentally determined both before and after exposure of a glassy polyimide membrane to hydrogen sulfide. Exposure to H2S resulted in a reduction of both permeation and diffusivity coefficients for all investigated gases. It was also observed that hydrogen sulfide exposure did not significantly affect the overall gas solubility. Notably, only for CO2 an increase in gas mobility within the fractional free volume was detected, whereas the mobility of the remaining gases was effectively diminished. To describe the solubility and diffusivity behavior of the gases in the glassy polyimide membrane, the Dual Mode Sorption and partial immobilization models were applied. The parameters of the DMS model were determined based on gravimetric sorption experiments.

Metryczka

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