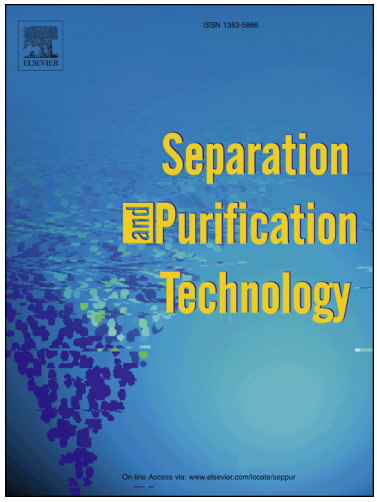

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PERMEABILITY AND SELECTIVITY OF ACID GASES IN SUPPORTED CONVENTIONAL AND NOVEL IMIDAZOLIUM-BASED IONIC LIQUID MEMBRANES

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Abstract

The novel imidazolium salts based on bis(2-ethylhexyl) sulfosuccinate anion have been developed as ionic liquids (ILs) which can potentially be used as absorbents of acid gases. The transport of CO_2, H_2S, CH_4 and N_2 in a series of supported ionic liquid membranes (SILMs) with immobilized conventional (bmim[PF_6], bmim[BF_4], bmim[Tf_2N]) and novel ILs was investigated. The supported ionic liquid membrane containing 1-butyl-3-methylimidazolium bis(2-ethylhexyl) sulfosuccinate (bmim[doc]) yielded a very high H_2S solubility and, hence, H_2S/N_2 selectivity equal to 65. However, the permeability of acid gases through such a membrane had relatively low values varying in a range of 100-200 Barrer, whereas permeability for SILMs impregnated by conventional ILs achieved 565 Barrer. The most effective separation of CO_2 was observed for SILMs impregnated by bmim[BF_4] predominantly owing to solubility component of permeability. In order to estimate the stability of SILMs, the polymeric support surface properties such as free surface energy, surface topology and roughness parameters were evaluated. Analysis of experimental data revealed that among the tested ILs, bmim[BF_4] immobilized in porous polymeric support was more resistant to losses and determined the higher stability of membranes.

Key words

Supported ionic liquid membrane; hydrogen sulfide; carbon dioxide; free surface energy; contact angle; wettability; ionic liquid; surface roughness,: capillary pressure; gas separation; stability