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Articles

Examination of the Potential of Ionic Liquids for Gas Separations

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Abstract:

Ionic liquids have received increasing interest in recent years for “green” synthesis and separations because they have essentially no vapor pressure. We have begun an investigation of the potential of ionic liquids for gas separations, including the removal of carbon dioxide from stack gas generated in coal-fired power plants. In this paper, we report results from measurements of the permeance of nitrogen and carbon dioxide in supported ionic liquid membranes. Preliminary results for a porous alumina membrane saturated with l-butyl-3-methyl imidazolium bis[trinuoromethylsulfonyl] amide yielded a CO_2 : N_2 selectivity of 127. Using previously reported measurements of CO_2 solubility in ionic liquids (1) and the measured membrane transport characteristics, a preliminary economic analysis of a separation process based on supported ionic liquid membranes has been performed. A comparison of cost estimates for this membrane-based separation to cost estimates reported for carbon dioxide removal using a conventional

amine scrubbing operation shows that, with continued technology development, an ionic liquid membrane process may potentially be economically competitive with amine scrubbing. A preliminary cost estimate for an ionic liquid scrubber indicates that an ionic liquid absorption process shows less favorable economics than a supported ionic liquid membrane or an amine scrubber. However, results indicate that a more comprehensive technical and economic assessment is warranted.

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