

Feasibility study of CO₂ absorption process using ionic liquid as solvent

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Abstract. Ionic liquids (ILs) have shown great interest to be used as liquid absorbents for CO₂ capture because of advantages such as non-volatility potentially that makes ILs “green” solvents. ILs would not contaminate the atmosphere, even in small amounts; they have high CO₂ solubility and low energy requirements for regeneration.

In this work, CO₂ separation process using the ionic liquid 1-hexyl-3-methylimidazolium tetracyanoborate ([hmim][TCB]) as physical solvent was investigated to substituting organic solvent dimethyl ether of polyethelene glycol (DEPG) called “Selexol” by simulation using Aspen plus V.8.0. The vapor-liquid equilibria of CO₂ and CH₄ in presence of [hmim][TCB] was modeled with the NRTL activity coefficient model, and the binary interaction parameters of CO₂ + [hmim][TCB] and CH₄ + [hmim][TCB] were fitted to the experimental data. Results show that [hmim][TCB] ionic liquid could be an excellent alternative to conventional solvents for CO₂ separation, especially for gas streams with low and moderate acid gas content. New design of the regeneration system has been proposed to improve solvent regeneration.

Keywords: CO₂ Capture, Ionic liquid, Physical absorption.