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Supported protic ionic liquid membrane based on 3-(trimethoxysilyl)propan-1-aminium acetate for the highly selective separation of CO₂

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Abstract

The ability to tailor ionic liquids can result in very high separation efficiency for CO₂/CH₄ and CO₂/N₂. In this study, a new protic ionic liquid was synthesized with high CO₂ absorption capacity employing (3-aminopropyl) trimethoxysilane and acetic acid, both of these have been reported to exhibit high affinity for CO₂. The synthesized ionic liquid was characterized by FTIR and the supported ionic liquid membrane was tested to determine the separation of CO₂ from CH₄. Experiments were conducted at different temperatures and feed conditions, and pure and mixed gas permeability/selectivity data were reported. This combination of silyl ether functionalized cation and acetate ion dramatically improved the membrane separation performance as the SILM displayed CO₂ permeance of 23 GPU combined with CO₂/CH₄ selectivity of 41. The synthesized SILM was stable upto 10 bar as no leaching of ionic liquid was observed and the permeance increased from 23 to 31 GPU as the temperature was raised from 25 °C to 65 °C, while the selectivity slightly

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