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Supported protic ionic liquid membrane based on 3-(trimethoxysilyl)propan-1-aminium acetate for the highly selective separation of CO_2

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Abstract

The ability to tailor ionic liquids can result in very high separation efficiency for CO_2/CH_4 and CO_2/N_2. In this study, a new protic ionic liquid was synthesized with high CO_2 absorption capacity employing (3-aminopropyl) trimethoxysilane and acetic acid, both of these have been reported to exhibit high affinity for CO_2. The synthesized ionic liquid was characterized by FTIR and the supported ionic liquid membrane was tested to determine the separation of CO_2 from CH_4. 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 CO_2 permeance of 23 GPU combined with CO_2/CH_4 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