Feasibility study of CO2/N2 separation intensification on supported ionic liquid membranes by commonly used impregnation methods

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This work presents the experimental research on feasible intensification of CO2/N2 separation by utilization of the developed supported ionic liquid membranes (SILMs). SILMs were developed through specific impregnation of commercially available ceramic microfiltration/ultrafiltration membranes made by INOPOR and polydimethylsiloxane (PDMS) membranes made by Pervatech BV with chosen imidazolium based ionic liquids (ILs). The effects of operating parameters, impregnation method, and SILM thickness were analyzed. The impregnation was performed by coating and soaking methods at normal pressure and under vacuum. The proper impregnation of the ceramic support, especially in case of commercial PDMS membranes, allows to achieve two distinct, stable, highly selective separation layers. The comparison of separation efficiency of the investigated SILMs shows that SILM based on PDMS membrane prepared by coating with 1-ethyl-3-methylimidazolium acetate ([Emim][Ac]) has very good stability, high CO2/N2 ideal separation factor of 152 and permeability of 2400 barrer. It was found that optimum operating conditions were feed temperature of 20°C and pressure below 200 kPa. The obtained results represent an interesting low cost alternative in the gas separation, especially when the choice of selectivity is the first priority. The comparison with literature data and upper bond Robeson correlation (2008) suggests, that applying an additional active

separating IL layer and an appropriate impregnating method to the commercial ceramic membranes may result in significant improvement of separation efficiency.

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