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APPLICATION OF SUPPORTED IONIC LIQUID MEMBRANES FOR BIOGAS SEPARATION

Z. Sedláková, M. Kárászová, J. Vejražka, P. Izák

Institute of Chemical Process Fundamentals, Czech Academy of Sciences, Rozvojová 135, 165 02 Prague 6, Czech Republic

Abstract: The ionic liquids have shown a wide applicability thanks to their unique properties such as negligible vapor pressure and low chemical reactivity as well as their tunability by changing a substituent on their cation etc. The ionic liquids are predestined for preparation of supported liquid membranes (SLIMs). It was found that selectivity of the SLIMs is mainly determined by the different solubility of separated gases in ionic liquids¹. The values of permeability presented in literature are often estimated from solubility and diffusivity of gases in ionic liquids. These values thus cannot be directly applied on SLIMs because of the influence of the support².

Hydrophilic polyvinylidene difluoride (PVDF) was used as a support for studied SLIMs³. The SLIMs were prepared from two ionic liquid with the same cation 1-ethyl-3-methylimidazolium [C₂mim]. Therefore, the influence of the anion was discussed, namely for bis(trifluoromethylsulfonyl)imide [Tf₂N] and dicyanamide [dca]. Both membranes were used continually at least one month as long as the measurements were completed.

The experiments were realized under optimal conditions and the solution diffusion transport occurred. The experimental tests were carried out for both a binary mixture representing a biogas and a raw biogas collected at sewage treatment plant in Prague. The minor impurities in biogas (less than 1 vol.%) did not significantly influenced the permeability of CO₂ and CH₄ through the membrane. The possibility of using supported ionic liquids for pre-dried biogas upgrading was verified. Nowadays, the development of the utilizable membranes module for SLIMs and its testing in lab-scale should follow.

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