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The effect of microporous polymeric support modification on surface and gas transport properties of supported ionic liquid membranes

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Abstract

© 2015 by the authors; licensee MDPI, Basel, Switzerland. Microporous polymers based on anionic macroinitiator and toluene 2,4-diisocyanate were used as a support for 1-butyl-3-methylimidazolium hexafluorophosphate ([bmim][PF6]) and 1-ethyl-3-methylimidazolium bis(trifluoromethylsulfonyl)imide ([emim][Tf2N]) immobilization. The polymeric support was modified by using silica particles associated in oligomeric media, and the influence of the modifier used on the polymeric structure was studied. The supported ionic liquid membranes (SILMs) were tested for He, N₂, NH₃, H₂S, and CO₂ gas separation and ideal selectivities were calculated. The high values of ideal selectivity for ammonia-based systems with permanent gases were observed on polymer matrixes immobilized with [bmim][PF6] and [emim][Tf2N]. The modification of SILMs by nanosize silica particles leads to an increase of NH₃ separation relatively to CO₂ or H₂S.

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Keywords

Gas separation, Ionic liquid, Microporous polymers, Modification, SILMs, Supported liquid membrane