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Abstract

This experimental study explores the reverse-selective potential of room temperature ionic liquid (RTIL) based membranes by lowering the solubility of the non-condensing gases, N_2 and CH_4. Particular attention is given to the reverse-selective behavior in the propane/methane, propane/nitrogen, and *n*-butane/methane separations. For this purpose, a series of experiments were conducted in a batch gas permeance system. The permeances of the above-mentioned gases were obtained using polyvinylidene fluoride **(**PVDF) as the porous liquid stabilizing support and [emim][Tf_2N], [emim][BF_4], [emim][TfO], [emim][DCA], [emim][SCN], and [bmim][NO_3] as the stabilized RTILs. The permeance of CH_4 and N_2 were investigated in terms of hydrogen bond accepting ability of the RTIL, as an indication of the gas/RTIL solution nonideality. The results show that an increase in the solution nonideality leads to a decrease in the CH_4 and N_2 permeances. This decrease in permeances resulted in RTIL-membrane selectivities for the propane separations that are greater than polymer membrane literature values. The reverse-selective behavior decreases with an increase in the viscosity of the RTILs, which may be due to a shift in the dominate transmission mechanism from solubility to diffusion.