CYCLE DE CONFÉRENCES DE CHIMIE

Avec le concours de : Manufacture Française des Pneumatiques MICHELIN
SIGMA Clermont
Institut de Chimie de Clermont-Ferrand (ICCF UMR 6296)
U.F.R. de Chimie

Vendredi 7 décembre à 16 h

Amphi Rémi (site des Cézeaux)

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Approach to the Solubility of Ammonia in Ionic Liquids from Polarity and Diffusivity Analysis

Ionic liquids (ILs) have been proposed as potential absorbents to overcome several drawbacks of the traditional working fluid mixtures used in absorption refrigeration and heat pumps systems. However, their implementation in these applications is still scarce, due among other reasons to the low solubility of the refrigerant in them. Experimentally, the solubility is usually determined from vapor-liquid equilibrium data, which is difficult to obtain. For a screening stage, another type of analysis should be of interest to select ILs suitable for this application. Taking into account that the solubility of a compound in other depends on its force as solvent (polarity) and the diffusivity of the first in the second one, we propose that the polarity of the ionic liquid and the diffusivity coefficients can be used as a first criterion to select ILs suitable for different refrigerants. This approach is used to evaluate the solubility of four protic IL in ammonia.

To study the polarity, the Kamlet-Taft and normalized Reichardt's parameters for three protic IL have been determined: 1-(2-Hydroxyethyl)-3-methylimidazolium tetrafluoroborate [EtOHmim$^+$][BF4$^-$], 1-(2-Hydroxyethyl)-3-methylimidazolium bis(trifleoromethylsulfonyl)imide [EtOHmin$^+$][NTf2$^-$], and choline bis(trifluoromethylsulfonyl)imide [N111(2OH)$^+$][NTf2$^-$]. These ILs have been selected as potential absorbents of ammonia, due to their high thermal stability and high absorption capacity. For the diffusivity, we have studied the effect of the temperature on the self-diffusion coefficients of these ILs in the temperature range between 293.15 K and 333.15 K. The self-diffusion coefficients of the cations [EtOHmin$^+$] and [N111(2OH)$^+$]) and anions [BF4$^-$] and [Tf2N$^-$] were determined using pulsed-gradient spin-echo nuclear magnetic resonance (PGSE-NMR). The results have been compared with solubility data of ammonia in these Ionic Liquids.

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