Ionic Liquids with Asymmetric Anions Based on Fluorosulfonyl Derivatives

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Bis[(trifluoromethyl)sulfonyl] imide and trifluoromethanesulfonate are iconic anions in ionic liquids (ILs) chemistry. These highly delocalized charge anions are nowadays widely used in ILs,^{2, 3} since they provide to corresponding salts lower toxicity, higher chemical, electrochemical and thermal stability than the majority of "traditional" counterions, such as chloride or tetrafluoroborate. With the aim to improve the properties of ILs, namely to decrease their viscosity and melting points as well as to improve their ionic conductivity and miscibility with certain gases (CO₂), efforts were put on the modification of these anions. One of the adopted strategies focuses on the introduction of asymmetry in imide anions via the substitution of one trifluoromethylsulfonyl group by another moiety, resulting in the preparation of 2,2,2-trifluoro-N-(trifluoromethylsulfonyl) acetamide (TSAC)¹¹ anion and, very recently, the 2,2,2- (trifluoromethyl)sulfonyl-N-cyanoamide (TFSAM)^{12, 13} anion. In this work, we will present the results of our studies of two ILs based on 1-ethyl-3-methylimidazolium cation ([C₂mim]) combined with two assymetric anions, TFSAM and TSAC. As expected, the introduction of asymmetry in the anion plays a remarkable role in decreasing the viscosity of the resultant ILs, which is relevant for their use as supported IL membranes in CO₂ separation processes. On the other hand, since the introduction of asymmetry in the anion is achieved using hydrophilic moieties, the phase behavior of these ILs in water will also be presented. Finally, the behavior of these asymmetric IL will also be compared with that of binary mixtures of the parent ILs.

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