Lithium Ion Transfer in Zwitterion-Type Ionic Liquids

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Recently, research into the development of new ILs, particularly in the design of a zwitterionic liquids (ZILs) composed of covalently tethered cations and anions, is further driven to overcome the disadvantages of conventional ILs. For example, Forsyth et al. reported that the use of these compounds significantly enhanced ion diffusivity and conductivity in polyelectrolyte gels due to zwitterion effect, so called a role of ZIL as dissociation enhancer. In ion-transporting systems, favorable interactions between ZILs and target materials are required to obtain maximum performance as a consequence of balancing the number of carrier ions and their mobility. However, there are very few fundamental interpretations about these interactions. In the present work, we report a first attempt to investigate the changes in the conformation, structure, internal dynamics, and energetics as a result of interactions between ZILs and transporting molecules or ions. Theoretical and experimental results discussed herein are extremely important in terms of understanding transporting phenomenon through an electrolyte in an academic point of view as well as enhancing the transport properties of target ions from an applicative point of view.