

Abstract Submitted  
for the MAR17 Meeting of  
The American Physical Society

**Observation of ion pairing of imidazolium-based ionic liquids in non-polar solvent** DOSEOK KIM, SEONCHEOL CHA, MINHO LEE, Department of Physics, Sogang University — Ion pairing is an important issue in the practical applications of ionic liquids such as electrolytes in the battery. Ion pairs in solutions of ionic liquids have been classified as (1) fully solvated ions, (2) solvent separated ion pairs, and (3) contact ion pairs. The relative abundance between these three states is determined by the interaction strength between ions (cation-anion), ion-solvent, and solvent-solvent. The solvation and pairing of ions have been usually investigated by conductivity measurement as the conductance is considered to come from the free ionic species. However, the techniques to monitor the microscopic structures of ion pairing directly including the contact ion pairs are much desired. Here, the ion pair formation of imidazolium-based ionic liquids having different anions ( $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ ,  $\text{TFSI}^-$ ,  $\text{BF}_4^-$ ) dissolved in a low-dielectric constant solvent (chloroform) was studied by IR spectroscopy by utilizing a specific vibrational mode of the cation ( $\nu\text{C}(2)\text{-H}$ ) that changes sensitively with the state of the ion pairing. Ionic liquids having halide anions were fully solvated at lower concentrations of ionic liquids due to the thermodynamic preference. Interestingly, the ionic liquids having strong interaction between cation and anion (e.g.  $[\text{BMIM}]\text{Cl}$ ) remained solvated at much higher concentrations as compared to more weakly interacting ionic liquids (e.g.  $[\text{BMIM}]\text{I}$ ).

Doseok Kim  
Department of Physics, Sogang University

Date submitted: 12 Nov 2016

Electronic form version 1.4