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Ionic liquid and water molecules diluted in hydrophobic solvent matrix investigated by infrared absorption spectroscopy DOSEOK KIM, WOONGMO SUNG, JONGGWAN LEE, Department of Physics, Sogang University — Pure ionic liquids ([BMIM]: 1-butyl-3-methylimidazolium, X: Cl and I) and their aqueous solutions were loaded on top of non-polar solvent CCl_4, and the infrared spectra of CCl_4 phase were taken as a function of time for in-situ probing of the transfer of the ionic liquid and water molecules. We observed clear vibrational bands of methyl and methylene groups of the cations similar to that of bulk ionic liquids. On the other hand, normally strong infrared absorption from C(2)-H and C(4,5)-H vibrations was hardly observable. As these bands work as indicators of specific interaction between the imidazolium core and the halide anions, we concluded that ion pairs are fully dissociated and [BMIM] cations exist as monomers in CCl_4. For 1 M of [BMIM]Cl and [BMIM]I aqueous solutions, water molecules transferred into CCl_4 also exist mostly as monomers, with a possible existence of anion-bound water molecules inferred from the new band at 3421 cm^{-1} for [BMIM]Cl, and at 3452 cm^{-1} for [BMIM]I. Both transfer rate and saturation amount of ionic liquid molecules are larger for [BMIM]I. For this, we propose that this difference in transfer rate originates from excess ionic liquid molecules at the interface between hydrophlic (aqueous solution) and hydrophobic (CCl_4) medium.

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