Chemical Deuteration of Ionic Liquids and their Application in Neutron Reflectivity

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Low melting imidazoliumsalts are one of the most popular and widely used ionic liquids (ILs). Due to their low vapor pressures and thermal stability, ILs have been widely studied and employed in many applications such as synthesis and catalysis solvents, extraction solvents, electrolyte, and biopolymer solvents. However, in many case, structural analysis of IL samples is difficult because the X-ray and neutron scattering contrast between the ILs and the organic solute is not enough to allow different elements to be clearly discerned. Partial or complete deuteration of organic compounds for contrast variation in the scattering length densities of materials is one of the most effective techniques in the application of neutron scattering analysis. Therefore, this technique isideally suited for the structural analysis of IL samples using neutron scattering techniques.

In this study, we synthesized several kinds of deuterated 1-alkyl-3-methylimidazolium ionic liquids (alkyl = ethyl, butyl, and octyl) for studying the electric double layer structure in ILs using neutron reflectivity technique. For this purpose, we have developed a simple and effective method for the deuteration of imidazolium salts ILs on gram scale, starting from their protonated versions. In this presentation, we will show the summary of deuteration experiments and the results of neutron reflectivity analysis of the electric double layer structure in ILs.