X-ray Scattering Studies of Ionic Liquid Structure and Dynamics at Charged Graphene Interface

AHMET UYSAL, SANG SOO LEE, HUA ZHOU, PAUL FENTER, Argonne National Laboratory, PENGFEI ZHANG, SHENG DAI, Oak Ridge National Laboratory — Room temperature ionic liquids (RTILs) are promising electrolytes for energy storage systems, especially for supercapacitors. However, our knowledge of these highly dense ionic plasmas at electrified interfaces is still at its infancy due to the lack of in situ experimental data about their potential-dependent electric double layer (EDL) structures and dynamics. In particular, the behavior of mixed electrolytes (RTIL/RTIL and Solvent/RTIL), which are significantly important for practical applications, have been little studied with structural probes. We use in situ, real-time X-ray reflectivity to elucidate the role of different anion-cation combinations and solvents on the interfacial ionic liquid structure and dynamics at epitaxial graphene electrode during cyclic voltammetry and potential steps. Our results give direct information about the EDL structure and response, which helps us to connect the macroscopic system properties to the nanoscale structure.

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