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X-ray and neutron reflectometry to study the interfacial structure of ionic liquids

The electric double layer (EDL) structure of ionic liquids (ILs) is unique. Since bulky ions gather at the interface, not only the so-called Stern-type exclusion volume between ions and the electrode but also the inter-ionic one cannot be neglected. Due to the excluded volume effect, ionic multilayer structures are spontaneously formed. Furthermore, due to the repulsion between like ions and attraction between unlike ions, alternating ionic multilayers are formed at the charged interface, where cation-rich and anion-rich layers appear alternately. The reflectometry is a powerful technique to study such unique interfacial structures. Reflectometry is based on the simple principle of measuring the reflected intensity (normalized to reflectance) of a beam incident on the interface at various angles of incidence or wavelengths. Especially for x-ray [1-4] and neutron [5-6] beams with wavelengths comparable to the ion size, interference due to the interfacial structure appears in their reflectance. In the present paper, I will introduce the IL interfacial structure revealed through the author's x-ray and neutron reflectivity measurements and report recent results of neutron reflectivity measurements at the IL/water interface.

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