

Synthesis and Characterization of Neoteric Boronium Ionic Liquids

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Abstract

Ionic liquids (ILs) are highly tailorable materials with unique physical and chemical properties that set them apart from conventional organic solvents. As the library of readily accessible ILs continues to grow, so too does their relevance in applications ranging from material processing to electrochemical energy storage as solvents capable of accessing new chemistries disallowed by traditional chemicals. While a great deal of interest has been directed towards imidazolium and quaternary ammonium based ionic liquids, there are other understudied classes of cations which have potentially favorable properties for energy related applications. One such class is that with boronium cations. These cations have a unique structure with a formally negative boron flanked by positive nitrogens. This inherently zwitterionic structure presents interesting possibilities for electrochemical applications. To date only a handful of boronium cation-based ionic liquids have been thoroughly characterized despite exhibiting impressive electrochemical stabilities (> 5.0 V). In the present study we synthesized a series of ILs with novel boronium cations coupled with the bis(trifluoro-methanesulfonyl)imide anion. We then characterized the electrochemical and physical properties of these boronium ionic liquids by techniques such as cyclic voltammetry, broadband dielectric spectroscopy, oscillatory shear rheology, and thermogravimetric analysis. We will discuss how systematic variations in boronium cation structure impacted electrochemical and physical properties.

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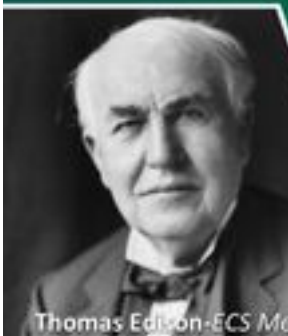
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