

Accepted Manuscript

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PII: S0014-3057(18)31135-2
DOI: <https://doi.org/10.1016/j.eurpolymj.2018.08.015>
Reference: EPJ 8528

To appear in: *European Polymer Journal*

Received Date: 19 June 2018
Revised Date: 24 July 2018
Accepted Date: 6 August 2018

Please cite this article as: Chen, M., Tyler White, B., Kasprzak, C.R., Long, T.E., Advances in Phosphonium-based Ionic Liquids and Poly(Ionic Liquid)s as Conductive Materials, *European Polymer Journal* (2018), doi: <https://doi.org/10.1016/j.eurpolymj.2018.08.015>

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Advances in Phosphonium-based Ionic Liquids and Poly(Ionic Liquid)s as Conductive Materials

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Abstract

Ionic liquids (ILs) and poly(ionic liquid)s (PILs) are attracting significant research interest as safe and efficient electrolytes. Most research efforts focus on nitrogen based ILs and PILs (ammonium, imidazolium, pyridinium, *etc.*), while phosphorus based ILs and PILs have received relatively less attention despite exhibiting comparable ion conductivity over their nitrogen-based counterparts. In this review, we provide an overview of the structural elements in phosphorus based ILs and PILs that influence ion conductivity, such as ion size, ion polarizability, counterion selection, and backbone flexibility. We also highlight dominant physical parameters dictating ion conductivity including viscosity and glass transition temperature. A fundamental understanding of this structure-ion conductivity relationship will benefit the future rational design of phosphorus based ILs and PILs as electrolytes.

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