

# Polymeric ionic liquids for lithium-based rechargeable batteries

[Gebrekidan Gebresilassie Eshetu](#),<sup>ab</sup> [David Mecerreyes](#),<sup>c</sup> [Maria Forsyth](#),<sup>d</sup> [Heng Zhang](#)<sup>\*e</sup> and [Michel Armand](#)<sup>e</sup>

<sup>a</sup> Institute for Power Electronics and Electrical Drives (ISEA), RWTH Aachen University, Jägerstraße 17/19, 52066 Aachen, Germany

<sup>b</sup> Department of Chemistry, College of Natural and Computational Sciences, Mekelle University, P.O.Box-231, Mekelle, Ethiopia

<sup>c</sup> POLYMAT, University of the Basque Country UPV/EHU, Joxe Mari Korta Center, Avda. Tolosa 72, 20018 Donostia-San Sebastian, Spain

<sup>d</sup> Institute for Frontier Materials, Deakin University, Geelong, VIC 3217, Australia

<sup>e</sup> CIC Energigune, Parque Tecnológico de Álava, Albert Einstein 48, 01510 Miñano, Álava, Spain. E-mail: [hzhang@cicenergigune.com](mailto:hzhang@cicenergigune.com)

Cite this: DOI: 10.1039/c8me00103k

Published on 02 January 2019.

## Abstract

The quest for reliable and high-performance batteries has incentivized the development of new battery chemistries/materials that can potentially improve the current lithium-ion battery technologies in terms of gravimetric/volumetric energy density and safety. Polymeric ionic liquids containing both ionic liquid-like moieties and polymer frameworks are emerging as alternative electrolyte/binder candidates for Li-based rechargeable batteries, owing to their various intrinsic features, such as superior mechanical and chemical stability, structural controllability over the IL species and macromolecular backbone and leak-proof nature and thereby improved safety. In this perspective, recent progress and advances on the use of PIL-based electrolytes and binders for Li-based rechargeable batteries are overviewed and discussed, with particular focus on the structural–property relationships. Future directions and improvements of the properties of PIL-based materials are given from the standpoint of chemistry of Li-based batteries.

