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Polymerized Ionic Liquids: Promising Class of Polymer Electrolytes

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Use of polymer electrolytes instead of traditional liquid electrolytes offers an elegant solution to many problems in current battery technology. However, a major obstacle in use of polymer electrolytes is their low ionic conductivity and low transference number (percentage of charge transported by the desired ion). Polymerized ionic liquids (PolyILs), a relatively new class of polymer electrolytes, are essentially single ion conductors and provide simple solution for the increase of the transference number. However, their ionic conductivity at ambient conditions remains low. Our earlier studies demonstrated that only *strong decoupling of ionic conductivity from segmental dynamics* can lead to a 'superionic' behavior of a polymer and might provide sufficiently high conductivity [1,2]. Based on this concept, we overview recent developments in the field of polymerized ionic liquids, with the emphasis on the polymer specific decoupling of ionic conductivity from segmental dynamics. The latter is well illustrated by the comparison of ionic liquids with their polymerized analogs [3,4]. Ways to further improvement of ionic conductivity in PolyILs, and their possible limitations are discussed at the end.

1. Y. Wang, et al., **Phys. Rev. Letters 108**, 088303 (2012).

2. Y. Wang, et al., **Polymer 55**, 4067 (2014).

3. J. R. Sangoro, et al., **Soft Matter 10**, 3536 (2014).

4. F. Fan, et al., **Macromolecules 48**, 4461 (2015).