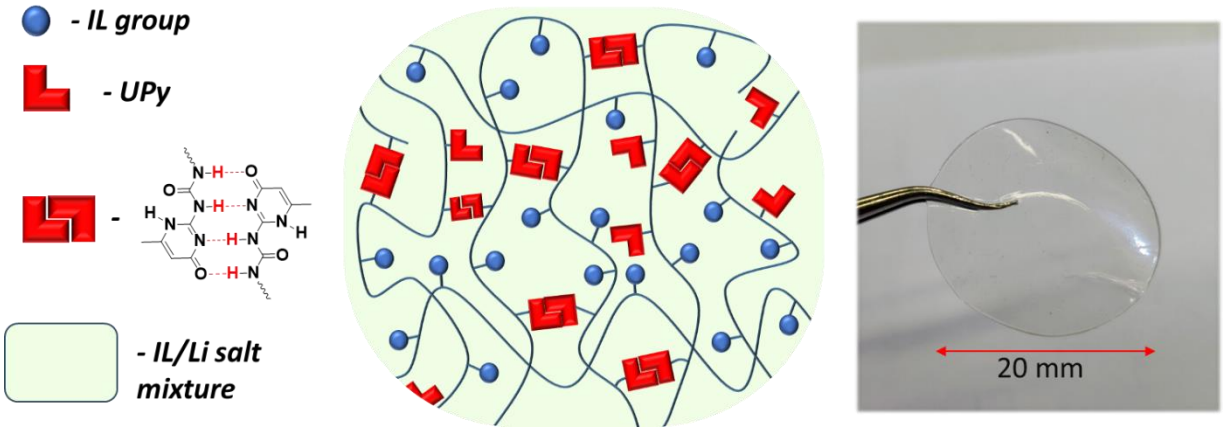
Self-healing poly(ionic liquid)-based iongels as potential electrolytes for lithium-ion batteries

Zviadi Katcharava[1], Rajesh Bhandary[1], Anja Marinow[1], Wolfgang H. Binder[1]

1. Martin Luther University Halle-Wittenberg, Faculty of Natural Science II, Institute of Chemistry, Chair of Macromolecular Chemistry, Halle (Saale), Germany



Lithium-Ion batteries (LiBs) are very widely used in energy storage devices. The demand for next-generation LiBs with higher energy densities, longer cyclic life and improved safety is expected to be growing. Some of the common drawbacks of current LiBs (dendrite formation, safety concerns, cracking of electrodes due to volume expansion during charging/discharging) can be overcome by replacing commercial liquid organic electrolytes by self-healing gel polymer-based electrolytes (GPE)[1-2]. One of the promising approaches is the incorporation of a self-healing functionality into poly(ionic liquid)s (PILs), which combines advantageous properties of polymeric materials and ionic liquids. Here we report solvent free GPE containing PILs based on pyrrolidinium repeating units and having embedded self-healing ability. Self-healing was achieved via introducing dynamic hydrogen bonds in the polymeric networks [3]. Combining PILs containing ureidopyrimidinone (UPy)[4] moieties, pyrrolidionium-based ionic liquid and lithium salt leads to a formation of self-standing films. Electrolyte films are displaying self-healing properties and good conductivities (10^{-4} S/cm at RT), which makes them a promising candidates as novel electrolytes in Li-ion batteries.

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