

## Solid Polymer Electrolytes Consisting of amphiphilic PVC-*g*-POEM Comb-Like Copolymer and LiCF<sub>3</sub>SO<sub>3</sub>

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An amphiphilic comb-like copolymer consisting of a poly(vinyl chloride) (PVC) backbone and poly((oxyethylene)<sub>9</sub> methacrylate) (POEM) side chains, PVC-*graft*-POEM was synthesized via atom transfer radical polymerization. This comb copolymer was complexed with LiCF<sub>3</sub>SO<sub>3</sub> to form a solid polymer electrolyte. FT-IR and FT-Raman spectroscopy indicate that lithium salts are dissolved in the ion conducting POEM domains of microphase-separated graft copolymer up to 10 wt % of salt concentration. Microphase-separated structure of the materials and the selective interaction of lithium ions with POEM domains were revealed by TEM, WAXS, and DSC. The maximum ionic conductivity of 4.4x10<sup>-5</sup> S/cm at room temperature was achieved at 10 wt % of salt concentration, above which salts are present as less mobile species such as ion pairs and higher order ionic aggregates, as characterized by FT-Raman spectroscopy.