

Polymer Electrolytes Consisting of PVC-g-POEM Comb-like Copolymer with LiCF_3SO_3

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An novel amphiphilic comb-like copolymer consisting of a poly(vinyl chloride) (PVC) backbone and poly((oxyethylene)9 methacrylate) (POEM) side chains, PVC-g-POEM was synthesized via atom transfer radical polymerization (ATRP). This comb copolymer was complexed with LiCF_3SO_3 to form a 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 transmission electron microscopy (TEM), wide angle X-ray scattering (WAXS) and differential scanning calorimetry (DSC). The maximum ionic conductivity of 4.4×10^{-5} 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.