

Abstract Submitted
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Superionic solid-state polymer electrolyte membrane for high temperature applications¹ THEIN KYU, Univerisity of Akron, RUIXUAN HE, JINWEI CAO, University of Akron — Completely amorphous, flexible, solid-state polymer electrolyte membranes (ss-PEM) consisted of polyethylene glycol diacrylate /succinonitrile plasticizer (SCN)/lithium trifluorosulfonyl imide were fabricated via UV polymerization. The room temperature ionic conductivity of our ss-PEM is extremely high (i.e., 10^{-3} S/cm), which is already in the superionic conductor range of inorganic and/or liquid electrolyte counterparts. Of particular interest is that our ss-PEM is thermally stable up to 140°C, which is superior to the liquid electrolyte counterpart that degrades above 80°C. The ss-PEM exhibits cyclic stability in both LiFePO₄/Li and Li₄Ti₅O₁₂ /Li half-cells up to 50 cycles tested. The trend of conductivity enhancement with temperature is reproducible in the repeated cycles, showing melting transitions of the SCN plastic crystals. In the compositions close to the solid (SCN plastic crystal)-liquid coexistence line, polymerization-induced crystallization occurs during photo-curing. The effect of solid-liquid segregation on ionic conductivity behavior is discussed.

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