Abstract Submitted
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Effect of Molecular Weight on Mechanical and Electrochemical Performance of All Solid-State Polymer Electrolyte Membranes[1] RUIXUAN HE, University of Akron, DANIEL WARD, Miami University, MAURICIO ECHEVERRI, Kent Displays Inc., THEIN KYU, University of Akron — Guided by ternary phase diagrams of polyethylene glycol diacrylate (PEGDA), succinonitrile plasticizer, and LiTFSI salt, completely amorphous solid-state transparent polymer electrolyte membranes (ss-PEM) were fabricated by UV irradiation in the isotropic melt state. Effects of PEGDA molecular weight (700 vs 6000 g/mol) on ss-PEM performance were investigated. These amorphous PEMs have superionic room temperature ionic conductivity of $\sim 10^{-3}$ S/cm, whereby PEGDA6000-PEM outperforms its PEGDA700 counterpart, which may be ascribed to lower crosslinking density and greater segmental mobility. The longer chain between crosslinked points of PEGDA6000-PEM is responsible for greater extensibility of ∼80% versus ∼7% of PEGDA700-PEM. Besides, both PEMs exhibited thermal stability up to 120 °C and electrochemical stability versus Li^+/Li up to 4.7V. $LiFePO_4$/PEM/Li and $Li_4Ti_5O_{12}$ /PEM/Li half-cells exhibited stable cyclic behavior up to 50 cycles tested with a capacity of ∼140mAh/g, suggesting that $LiFePO_4$/PEM/$Li_4Ti_5O_{12}$ may be a promising full-cell for all solid-state lithium battery.

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