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Composite Electrolytes of Pyrrolidone-Derivatives- PEO Enable to Enhance Performance of All Solid State Lithium-Ion Batteries

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ABSTRACT: All-solid-state batteries with LiFePO₄ cathodes and polyethylene oxide (PEO) based electrolytes are optimized with organic polymer synthesized from allyl amine and tartaric acid which show better properties including ionic conductivity, electrochemical window, charge-discharge capacity and rate performance. The ratio of PEO ($\overline{MW} = 4,000,000$) and lithium salt (Lithium bis(trifluoromethanesulphonyl)imide, LiTFSI) is 75:20 (w/w) and polymers of different molecular weight are tested at a wide temperature range from 27 °C (ambient temperature) to 120 °C. Electrolytes with larger amount (weighting more than half of PEO) of low-molecular-weight polymer show conductivity of above 10^{-4} S cm⁻¹, which is similar to typical gel-polymer-electrolyte. Electrolytes made of high-molecular-weight dopant, PEO and LiTFSI through ball

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