Improved thermal features and ionic conductivity of lithium-zinc-tellurite glass electrolytes

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Abstract	Synthesizing glass electrolytes with modified ionic conductivity by incorporating Li2O for enhanced secondary battery safety is ever-demanding. Electrolytes based on zinc-tellurite glasses with chemical composition (85-x) TeO2.xLi(2)O.15ZnO, where x = 0, 5, 10, 15 mol% are prepared using melt quenching method. The temperatures, frequency and Li2O concentrations dependent modifications of structural features, thermal stability, and ionic conductivity are determined. Amorphous nature of electrolytes is verified from X-ray diffraction patterns. Incorporation of Li2O in the electrolytes is found to decrease the glass transtition temperature from 318.41 to 280.63 degrees C leading to their thermal stability enhancement. Alternating current impedance measurement revealed that the ionic conductivity of the electrolytes is significantly influenced by the temperature and concentration of Li2O and not by the frequency of AC voltage. The glass electrolyte containing 5 mol% of Li2O exhibited good performance with the ion conductivity of 1.72x10(-2) S cm(-1) and activation energy of 3.85x10(-1) eV. These improvements in the conductivity and activation energy are attributed to the alteration in ions vibration and breakage of covalent bonds. This modification allowed the ions to move through un-perfect non-bridging oxygen under the influence of an external electric field (applied voltage) with enhanced mobility. The present glass electrolyte is very promising for secondary Li-ion battery fabrication.
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