

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

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Abstract	<p>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.xLi₂O.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 transition 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.</p>
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