Conductivity studies on ceramic $Li_{1.3}Al_{0.3}Ti_{1.7}(PO_4)_3$-filled PEO-based solid composite polymer electrolytes

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For the use of $Li_{1.3}Al_{0.3}Ti_{1.7}(PO_4)_3$ as a lithium fast ionic conductor (FIC) to produce the best conductivity in $Li_{3-2x}(Al_{1-x}Ti_x)_2(PO_4)_3$ (x=0.55 to 1.0), $Li_{1.3}Al_{0.3}Ti_{1.7}(PO_4)_3$-filled, PEO-based, composite polymer electrolytes (CPE) films were prepared by a solution-cast technique and their characteristics were investigated by several experimental techniques including X-ray diffraction (XRD), infrared (IR) spectra, differential scanning calorimetry (DSC) and scanning electron microscopy (SEM). As measured by electrochemical impedance spectrum (EIS) measurement, the temperature-dependent ionic conductivity of PEO-$Li_{1.3}Al_{0.3}Ti_{1.7}(PO_4)_3$ film with EO/Li=16 was maximized at 2.631×10^{-6} S/cm at room temperature and at 1.185×10^{-4} S/cm at 343 K, while the ionic conductivity of the PEO-$LiClO_4$-$Li_{1.3}Al_{0.3}Ti_{1.7}(PO_4)_3$ film with EO/Li=8 was maximized 7.985×10^{-6} S/cm at room temperature and at 1.161×10^{-3} S/cm at 373K when $Li_{1.3}Al_{0.3}Ti_{1.7}(PO_4)_3$ content was 15 wt.%.