Titanium Doped $Li_7La_3Zr_2O_{12}$ Solid Electrolyte for Lithium batteries

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Solid electrolytes have been considered for lithium batteries due to their useful ionic conductivity, high energy density, non- toxicity and safety in operation. Several solid state electrolytes based on sulfides and oxides have been investigated [1]. Among them, Garnet phase materials have shown significant improvement in conductivity [2]. Garnet has cubic and tetragonal phases of which the cubic is high temperature with a high ionic conductivity value of 10^{-4} S/cm^2 [3]. Several doped compositions have also been reported in order to improve the cubic phase ionic conductivity [4]. Currently, we have synthesized a Ti doped $Li_7La_3Zr_2O_{12}$ by a simple Pechini process to investigate its ionic conductivity for possible application in lithium ion batteries.

Synthesis of $Li_7La_3Zr_2Ti_xO_{12}$ by Pechini method uses active species as nitrate salts, ethylene glycol and citric acid in a 38:36:26 ratio respectively in de-ionized water. The samples were dried in an oven overnight at 120°C and then heat-treated at different temperatures to achieve the desired phases. The optimized product was heat treated at 1000°C for six hours, pelletized and then sintered again at the same temperature to perform the ionic conductivity measurements.

Samples were characterized by XRD for phase analysis and electrochemical impedance performance has been investigated under varying temperatures and voltages (see Figure 1). Figure 2 shows the impedance plot of the Ti doped $Li_7La_3Zr_2O_{12}$ at room temperature

The details of the titanium doped garnet phase performance will be presented.

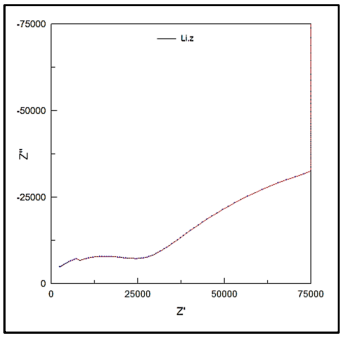

Figure 1 shows the impedance plot of the Ti doped $Li_7La_3Zr_2O_{12}$ at room temperature

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