Study of LATP ceramics for subsequent fabrication of thin film electrolytes

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In recent years, solid lithium-ion batteries (SLIBs) have attracted increased interest due to their safety, high energy efficiency, and wide range of applications, from portable electronics to electric vehicles. One of the key components of such batteries is a solid electrolyte, which provides reliable and stable conductivity of lithium ions, as well as stability at the interface with the electrodes [1].

Among the many solid electrolytes studied, special attention is paid to materials with a NASICON-like structure, in particular lithium-aluminum-titanium-phosphate (LATP) compounds. These materials have a number of valuable characteristics, including high ionic conductivity, chemical inertness, and thermal stability, which makes them promising for use in modern SLIBs [2–3].

This study investigates the influence of different lithium concentrations in LATP on its structural and electrochemical properties, synthesized using the molten flux method.

To evaluate the ionic conductivity and study the effect of composition on the transport properties of LATP, studies were carried out using the electrochemical impedance spectroscopy (EIS) method. Measurements were performed in the frequency range from 1 MHz to 1 Hz with an amplitude of 0.01 V at temperatures of 25°C and 85°C for samples with different lithium content ($Li_{1.3}$, $Li_{1.4}$, $Li_{1.5}$).

X-ray diffraction (XRD) analysis confirmed the formation of the main phase LATP in all the studied samples. However, with increasing lithium content, the formation of secondary phases ($Li_4P_2O_7$, TiP_2O_7, $AlPO_4$), was observed, which can potentially reduce the ionic conductivity of the material. These structural changes are shown in **Figure 1.**

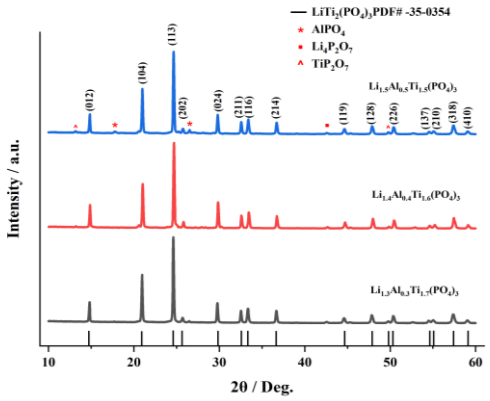

Figure 1. XRD patterns of LATP

Extensive characterization of the materials and corresponding electrochemical performance will be presented and discussed at the conference.

In a broader sense, precise selection of the composition of ceramic electrolytes is important to ensure stable ionic conductivity and can be further used to obtain thin-film electrolyte for microbatteries.

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