Study of a solid-state electrolyte for lithium-ion battery

Aiym Mashekova[1*], Zhumabay Bakenov[1,2,3], Aliya Mukanova[1,2**]
[1]*Institute of Batteries, 53 Kabanbay Str., 010000 Nur-Sultan, Kazakshtan*
[2]*National Laboratory Astana, 53 Kabanbay Str., 010000 Nur-Sultan, Kazakhstan*
[3]*School of Engineering and digital Scineces, Nazarbayev University, 53 Kabanbay Str., 010000 Nur-Sultan, Kazakhstan*
*E-mail: aiym.mashekova@nu.edu.kz
**E-mail: aliya.mukanova@nu.edu.kz

Currently, lithium-ion batteries have been used in many products, such as consumer electronics, electric/hybrid electric vehicles, stationary energy storage systems etc. One of the significant parts of the battery is an electrolyte. However, traditional lithium-ion batteries have critical safety issues because of use of highly flammable organic liquid electrolytes. Liquid-state batteries have low thermal stability and low flame point so that it is easy to cause fire accidents and explosion if they are improperly used. The formation of dendrites in the lithium-ion battery could lead to a short circuit of the battery and further explosion. The possible solution in terms of safety is to use solid-state batteries that contains the solid electrolytes.

The aim of the study is to find the most optimal synthesis method for solid electrolytes. $Li_{1.3}Al_{0.3}Ti_{1.7}(PO_4)_3$ (LATP) revealed the highest ionic conductivity of 7×10^{-4} Scm^{-1} at 25 °C, which is comparable to other high Li-ion conducting materials. LATP solid electrolytes can be prepared by different techniques, one of these is a molten flux. The molten flux method showed high pure LATP material in comparison with another ones and it used as a method for further doping of LATP electrolyte. The characterization details as well as synthesis procedures will be presented at the conference.

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