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Synthesis of high ion conductivity solid electrolyte NASICON: Glass complex

Keun Young Yoon, Yi Eun Jung and Hae Jin Hwang
Inha University, Republic of Korea

Many lithium ion batteries use metal oxide cathode materials and combustible organic liquid electrolyte. The liquid electrolytes have a high ion conductivity of 10^{-2} s/cm^2. However, fire and explosion caused by short circuit due to leakage of liquid electrolyte and breaking of membrane, etc. may occur and therefore, there is always a question about safety. Used solid electrolyte instead of liquid electrolyte prevents to fire and explosion effectually and possible to make a battery had high capacity. To commercialize solid electrolytes, they are demanded high ion conductivity similar liquid electrolyte and minimized reaction with cathode materials. Among the solid electrolytes, the NASICON type electrolytes have a stable phase in water and atmosphere and less reactivity with the anode and cathode materials. We studied to improve ion conductivity of $LiZr_2(PO_4)_3$(LZP) which have a Li-ion conductivity mechanism. LZP compound stabilizes in a triclinic structure at room temperature. On heating over 60 degrees, LZP compound stabilizes in a rhombohedral structure. The Li ion conductivities of a triclinic and rhombohedral phase are 5×10^{-8} s/cm at room temperature and 1×10^{-5} s/cm close to room temperature. For stabilization, a rhombohedral structure at room temperature, some studies substitute Y ion for Zr ion in LZP. The sintering temperature is high and the sintering time is long nevertheless they have low density. For improve theoretical density, we mixed Li-ion conductivity glass and Y ion doped LZP. Used SEM and XRD and HSM, we evaluated characteristics of NASICON-glass complex and ion conductivity was measured with impedance analyzer.

Biography

Keun Young Yoon is currently pursuing his MS degree in department of materials science and engineering from the Inha University, Republic of Korea. His main topics are studying on all solid batteries performance evaluation and basic properties.

ukn2088@gmail.com

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