Neutron Study on Li_3PO_4 Solid Electrolyte Prepared by Wet Chemical Reaction

E.Kartini[1], T.Y.S. Putra[1], Supardi[1], W.Honggowranto[1], T.Umbar[2], **M.Manawan**[3]

[1]*Science and Technology Center for Advanced Materials, National Nuclear Energy Agency (BATAN), Kawasan Puspiptek Serpong, Tangerang Selatan 15314, Indonesia.*
[2] *Technochemical Engineering, Polytechnic Institute of Nuclear Technology (STTN), Jl.Babarsari, Yogjakarta, Indonesia*
[3]*Postgraduate Program of Materials Science, Faculty of Mathematic and Natural Science, University Indonesia, Jl. Salemba Raya No.4, Jakarta 10430, Indonesia*

Abstract

Safety is the main problem on developing the lithium ion battery. The combustion is mainly due to the leakage or shortcut of the electrodes, caused by the liquid electrolyte and polymer separator [1]. For this reason, the research on solid electrolyte for replacing the existing liquid electrolyte is very important. Li_3PO_4 has been proved to be a good candidate for solid electrolyte, due to its easy in preparation, low cost, high melting temperature and good compatibility with the electrode materials. So far, Li_3PO_4 has been applied in thin film battery [2]. In the present work, Li_3PO_4 has been prepared by wet chemical reaction, a simple method with the advantage of recycling a waste product H_3PO_4. The crystal structure of Li_3PO_4 has been measured by using high resolution powder diffraction (HRPD) at the Neutron Scattering Laboratory, National Nuclear Energy Agency (BATAN), Indonesia. In addition, the x-ray diffraction was also carried out to the same sample, besides several measurements on its thermal and electrical properties [3]. The neutron results show the crystal structure of orthorhombic phase P m n 21 (31), that belongs to the β-Li_3PO_4 [4], with the lattice parameters are a = 6.116819, b = 5.249803, c = 4.872359. The conductivity of β-Li_3PO_4 was around 10^{-8} S/cm, and no phase transition β-to γ-Li_3PO_4 was detected on heating the materials up to 900^{o}C.

Keywords: Neutron diffraction, solid electrolyte, Li_3PO_4, lithium ion battery.

References

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