THE EFFECT OF ALUMINA AS FILLER IN WASTE COOKING OIL-BASED POLYURETHANE SOLID POLYMER ELECTROLYTE

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ABSTRACT

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In the present study, polyurethane (PU) had been prepared by using a different content of Aluminium Oxide (Al_2O_3) filler, in order to examine the filler addition effect on the (SPE). The SPE has low ionic conductivity, so to enhance the conductivity, the filler was added. The solid polymer electrolyte is synthesized by solution casting technique. The SPE uses polyurethane (PU) as a host then doped with lithium perchlorate ($LiClO_4$), ethylene carbonate (EC) as plasticizer, and aluminium oxide (Al_2O_3) as filler. All solution use acetone as solvent. To determine the ionic conductivity of SPE, the Electrochemical Impedance Spectroscopy (EIS) was used. The highest conductivity is observed for the composition PU–$LiClO_4$–EC–30% Al_2O_3 with a value of 2.379×10^{-7} S/cm at room temperature. This is show that adding of filler can improved the ionic conductivity because the formation of adhance sites and conduction pathways are improve the for ionic transport by Lewis acid/base type interactions between the filler surface groups and the ionic species. Then to determine the functional group of the compound that contain in the SPE, its was characterized by using FTIR instrument. Thermal analysis (TGA) proved the occurence of chemical interaction of segmented PU solid polymer electrolyte. The conductivity is improve by mix of plasticizer (EC) to decrease the crystallinity and increasing the amorphous phase content of the SPE. The filler such as Al_2O_3 is used to improve the conductivity by encouraging the structure in the SPE. These properties exhibited promising potential for ehhancement of SPE that giving focus on polyurethane (PU).

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