Synthesis and electrochemical characterization of new li2o-p2o5 compounds for solid electrolytes

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The solid electrolyte is of great interest owing to its potential to be applied in a wide variety of electrochemical devices. One of the most stable solid electrolytes is lithium phosphate (Li3PO4). However, this compound has low enough conductivity to be applied to a device such as an electrolyte. A previous study has reported that the mixture of xLi2O-P2O5, where x=2, has a greater conductivity than Li3PO4, while, when x=1, this yields an amorphous structure. In this study, new compositions of the xLi2O-P2O5 compounds, where 1?x?2, were prepared through solid-state reactions. The prepared compounds were characterized using X-ray Diffraction Spectrometry (XRD), Scanning Electron Microscopy (SEM), and Electrochemical Impedance Spectroscopy (EIS) measurements in order to investigate their structure, morphology, and electrochemical properties. The XRD characterization showed that both of the samples were composed mainly of Li4P2O7 crystals. Agglomeration of particles was observed in the samples. The conductivity of the compounds was of the order of 10?6 S/cm, which was higher by three orders of magnitude than that of Li3PO4. The evaluated power exponent of conductivity indicated that the long-range drift of ions may be one of the sources of ion conduction in both of the observed samples. The nature of the dielectric loss indicated that the conduction in the samples was more predominantly DC conduction.