Effect of Eutectic Concentration on Conductivity in PEO:LiX Based Solid Polymer Electrolytes

PENGFEI ZHAN, LALITHA GANAPATIBHOTLA¹, JANNA MARANAS, The Pennsylvania State University — Polyethylene oxide (PEO) and lithium salt based solid polymer electrolytes (SPEs) have been widely proposed as a substitution for the liquid electrolyte in Li-ion batteries. As salt concentration varies, these systems demonstrate rich phase behavior. Conductivity as a function of salt concentration has been measured for decades and various concentration dependences have been observed. A PEO:LiX mixture can have one or two conductivity maxima, while some mixtures with salt of high ionic strength will have higher conductivity as the salt concentration decrease. The factors that affect the conductivity are specific for each sample. The universal factor that affects conductivity is still not clear. In this work, we measured the conductivity of a series of PEO:LiX mixtures and statistical analysis shows conductivity is affected by the concentration difference from the eutectic concentration (Δc). The correlation with Δc is stronger than the correlation with glass transition temperature. We believe that at the eutectic concentration, during the solidification process, unique structures can form which aid conduction.

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