Development of safer and high conductivity polymer-based electrolytes for Li ion batteries is a critical challenge. As an intermediate step, plasticized polymer electrolytes (PPEs) with modest plasticizer fractions are of importance.

Overall program goal: develop an understanding of the three-fold interactions occurring in model PPEs – plasticizer-polymer, polymer-salt, and plasticizer-t-salt – so that design parameters for mechanically durable, high-conductivity PPEs can be established.

Initial experiments have focused on contrasting polymer dynamics and ion conductivity of a poly(ethylene oxide-based) ionomer (repeat unit structure on the lower right), with plasticized forms containing 6 wt % of six miscible diluents.

Measured conductivity of the PPEs found to have statistically insignificant dependence on plasticizer dielectric constant and donor number, no dependence on viscosity, and an overwhelmingly strong dependence on $T_g$ of the mixtures.

Using these initial findings as a guide, we are now exploring conductivity and its relationship to polymer dynamics for the same plasticizers over a wider concentration range.