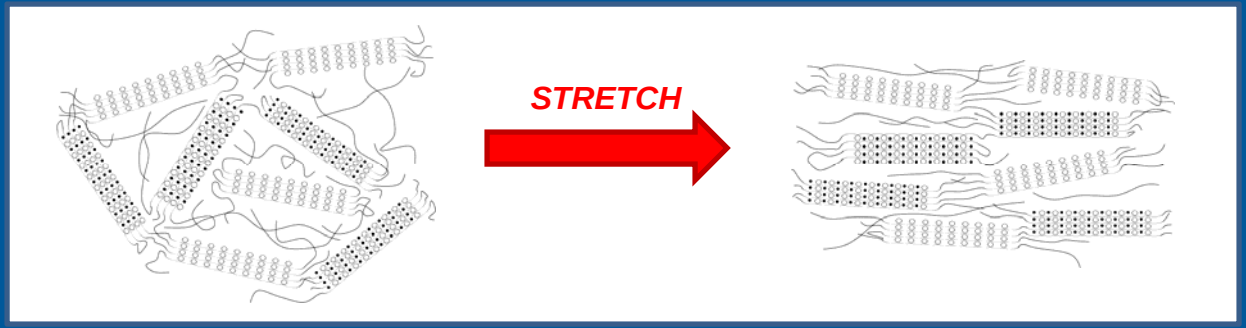
Polymer Chain Alignment and Conductivity for Polymer Electrolytes Relevant to Lithium Rechargeable Batteries

Christopher M. Burba, Department of Natural Sciences
Northeastern State University, Tahlequah, OK 74464

NORTHEASTERN STATE UNIVERSITY

The future success of developing lithium rechargeable batteries hinges on developing alternative electrolyte systems. Conventional wisdom for increasing ion conduction is to decrease crystallinity in the electrolyte. However, several striking examples of ordered polymer electrolytes with higher conductivities than analogous disordered systems questions the fundamental role of polymer chain order and ionic conductivity. This research systematically examined a family of poly(ethylene oxide)-based polymer electrolytes in which the constituent polymer chains are organized through of tensile stretching. Polarized FT-IR spectra provide missing *quantitative* information concerning the degree of polymer chain organization as well as temperature-dependent relaxation rates for the oriented materials.



Notable Achievements

- Determined that the relative rate of alignment is the same for the PEO and PEO-salt phases present in a polymer electrolyte
- Polymer chains become oriented through a process of stress-induced melting followed by recrystallization with the helical axes parallel to the stretch axis
- Spectroscopic data support the notion that conductivity enhancement is due to the alignment of polymer chains along the stretch direction