Glenn T. Seaborg Center Seminar

Rebecca A. Sanders
Department of Chemistry and Biochemistry
University of Oklahoma

Characterization of Crystalline and Amorphous Phases in Poly(N-methyl-ethyleneimine) Polymer Electrolytes and in N,N,N',N',N''-Pentamethyldiethylenetriamine

Wednesday, October 22, 2003
4 pm
Building 70A-3377

Abstract

Polymer electrolytes are useful as ionic conductors in rechargeable lithium batteries. Poly(ethylene oxide):salt systems are the most widely investigated polymer electrolytes. However, the conductivity values for these systems are not sufficiently high to be useful for lithium batteries. Therefore, other polymers as polymer electrolytes are being explored such as linear poly(ethylenimine), LPEI, and linear poly(N-methylethylenimine), LPMEI.

LPEI $(CH_2CH_2NH)_n$ is analogous to PEO $(CH_2CH_2O)_n$, except LPEI has a heteroatom that is synthetically versatile because different side groups (i.e., methyl, ethyl, and butyl groups) can be attached. LPEI is a highly crystalline material, which exhibits low ionic conductivity values as a polymer electrolyte.

LPMEI $(CH_2CH_2NCH_3)_n$, a derivative of LPEI, is amorphous at room temperature unlike LPEI, which melts at 58° C. Because there is a limited amount of information reported about LPMEI as polymer electrolytes, LPMEI complexed with lithium triflate (LiTf) and NaTf has been characterized utilizing IR, differential scanning calorimetry (DSC), powder X-ray diffraction, and complex impedance. To gain further insight into LPMEI systems, N,N,N',N',N''-pentamethyldiethylene-triamine (PMDETA; $[CH_3N(CH_2CH_2N(CH_3)_2)]$) complexed with LiTf and NaTf was investigated as a model compound. When studying this model system, a crystalline compound was discovered and characterized utilizing X-ray diffraction, DSC, IR, and Raman spectroscopy. The local structure in crystalline PMDETA:NaTf can be correlated to these samples in solution, which provides greater insight into the local environment of the LPMEI:salt systems.

Host: Wayne Lukens x4305, wwlukens@lbl.gov | Admin. Assistant: Lynne Dory x5587