Hierarchial Structures in PDMS-based Ammonium Ionenes
DAVID SALAS-DE LA CRUZ, University of Pennsylvania, SUDIPTO DAS, GARTH WILKES, Virginia Tech, KAREN WINEY, University of Pennsylvania — Ionenes are polymers with a charged entity in the backbone. Polydimethylsiloxane (PDMS) based ionenes were synthesized from 6-bromohexanoyl chloride and 1,4-diazabicyclo[2.2.2]octane (DABCO). X-ray scattering patterns were recorded at the small, intermediate and wide angle regions for both un-stretched and stretched films. Stretching induces orientation without changing the spacing in the morphology. The hard charged segments, that include DABCO, align in pseudo-cylindrical aggregates in the direction of the stretch and the PDMS soft segments remain amorphous. The orientation relative to the stretching direction suggests that the hard charged segments self assemble into anisotropic aggregates. This self-assembly arises from the hydrogen bonding of the urethane groups and ion sharing between Br- and N+. The characteristic spacing between the pseudo-cylindrical aggregates increases with the molecular weight of the PDMS segments and the size of the hard segments. Ionic conductivity measurements reveal that the through-plane conductivity increases by an order of magnitude upon stretching.