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Structure of highly rigid ionic polymers from single molecules to membranes LILIN HE, DVORA PERAHIA, Chemistry Department, Clemson University. Clemson, SC 29634-0973 , CHRISTOPHER J. CORNELIUS, Sandia National Laboratories, Albuquerque, NM 87185 — The structure of ionic polymers in solutions and in their solid state is governed by the segregation to hydrophilic and hydrophobic regions. Very rigid backbones with persistence lengths much larger than the size of the monomer limit the segregation affecting the resulting structure and dynamics of the polymers. Using a newly synthesized *para* phenylene based sulfonated polymer with a potential to serve as a polymeric electrolytic membrane for fuel cell applications, we followed the structure of highly rigid ionic polymers from a single molecule to a water swollen membranes using small angle neutron scattering and AFM/TEM techniques. AFM and TEM images show that the dry membranes have domains with a diameter from 30 nm to 70nm. Small angle neutron scattering probes the smaller structure in the membranes from dry to swollen states. Fitting to Teubner-Strey model of SANS data indicates the bi-continuous phases were formed with water and ethanol despite the rigidity of the backbone.

Lilin He
Clemson University

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