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Fast Polymer Dynamics and Ion Aggregates in a Model Single Ion Conductor CHRISTOPHER SOLES, MADHUSAN TYAGI, NIST, HUAGEN PENG, None, JENNY KIM, NIST, JIM RUNT, Pennsylvania State University — In this presentation we explore the fast dynamics of a polymeric single ion conductor using both the Disc Chopper Spectrometer (DCS; ps time scales) and the High Flux Backscattering Spectrometer (HFBS; ns time scales) at the NIST Center for Neutron Research. The model system studied here is a block copolymer consisting of runs 13 ethylene oxide repeat units separated by an isophthalate group functionalized with a sodium sulfonate salt. In these systems the sulfonate groups are bound as an in-chain anion, leaving the sodium cation as the only mobile ion in the system. We find that the quasielastic neutron scattering spectra across the two spectrometers can be consistently fit with a total of 3 different relaxation processes. The slowest, least mobile of the 3 processes looks purely diffusive and shows a normal thermal activation. The fastest, most mobile process shows strong signs of confinement; the FWHM of the relaxation is almost independent of Q , suggesting a caged type motion, and also shows signs of normal thermal activation. However, the intermediate process falls between the extremes of confinement and free diffusion. The motion is characteristic of jump diffusion with a characteristic residence time and jump length. Furthermore, there is clear evidence of this motion slowing down upon heating, the opposite of normal thermal excitation. This slowing down with upon heating is correlated with the appearance of ionic aggregates in the temperature dependent X-ray scattering measured by the Winey Group.

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