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Effects of Acid and Ionic Aggregation on the Polymer Dynamics in Precise Ionomers[1] LURI ROBERT MIDDLETON, University of Pennsylvania, JACOB TARVER, National Institute of Standards and Technology, JASON AZOULAY, DUSTIN MURTAGH, Sandia National Laboratory, KEN WAGENER, University of Florida, JOSEPH CORDARO, Sandia National Laboratory, MADHU TYAGI, CHRISTOPHER SOLES, National Institute of Standards and Technology, KAREN WINEY, University of Pennsylvania — Interest in acid- and ion-containing polymers arises from applications as single-ion conductors for selectively transporting a counter ion of the opposite charge for energy applications. The relatively low dielectric constant of the organic polymer and strong ionic interactions leads to ionic aggregation. Ion aggregation anchors the polymer chain, decreasing the mobility of the ion and the polymer. In precise poly(ethylene-acrylic acid) copolymers and ionomers (pxAA-%Li) we report on the effect of carbon spacer length (x=9, 15, 21) between the acid groups and the effect of the percent of acid groups neutralized with Li on backbone dynamics. The polymer backbone motion is investigated through quasi-elastic neutron scattering measurements. At nano-second timescales a single relaxation fits the data. Systematic changes in dynamics were observed with increasing neutralization percent where polymer dynamics are confined due to anchoring effects. Intriguingly, systematic changes in the spacer lengths did not result in similar behavior. At pico-second timescales multiple overlapping relaxations are observed but even at these short timescales systematic changes in atomic motion are observed with ion content.

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