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PEG-based Sulfonated Ionomers Microphase Separate with Increasing Temperature WENQIN WANG, Department of Materials Science and Engineering, University of Pennsylvania, GREGORY J. TUDRYN, RALPH H. COLBY, Department of Materials Science and Engineering, Pennsylvania State University, KAREN I. WINEY, Department of Materials Science and Engineering, University of Pennsylvania — A series of Li, Na, and Cs-neutralized sulfonated polyester ionomers with well-defined PEG spacer lengths have been investigated by in situ X-ray scattering over a wide temperature range. At room temperature, no "ionomer peak" at q=1-5 nm^{-1} was observed, due to the high dielectric constant of the polymer matrix. As the length of the PEG segment increases, the crystallization of PEG segments is evidenced by multiple crystalline reflection peaks. In addition, crystallization produces periodic low-angle peaks, indicating a layered structure. Scanning transmission electron microscopy will be employed to facilitate the understanding of the nanoscale structures. At high temperatures, the PEG-based ionomers exhibit a new X-ray scattering peak in the angular range of 2-3 nm^{-1}, reminiscent of conventional ionomers. The peak intensity increases with temperature while the angular position remains fixed. The appearance of an "ionomer peak" at high temperature is attributed to the microphase separation of ionic aggregates as the PEG dielectric constant decreases. A mechanism is proposed to explain the ionic association behavior as a function of temperature.

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