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Influence of Ion Content, Cation Size and Polymerization Method on Ion Association States of Poly(ethylene oxide)-based Ionomers HANQING MASSER, JING-HAN HELEN WANG, RALPH COLBY, PAUL PAINTER, JAMES RUNT, Penn State University — The effects of ion content, cation size and polymerization method on ion association states are systemically studied using FTIR spectroscopy in a series of ionomers with short ethylene oxide and ionic sulfonated styrene side chains. Ion content is controlled by the ratio of these side chains. When comparing similar ionomers with different ion content, there are more free ions at higher ion content. Free radical and RAFT polymerizations yield ionomers with different molecular weights, polydispersity and ionic side chain distributions. FTIR spectroscopy demonstrates that the ionomers synthesized via free radical polymerization have more free ions compared to their RAFT analogs. The ionomers with larger cations, such as tetrammonium, have higher free ion contents. Information on ion association states is then related to ion conductivity and crystallinity characterized by dielectric relaxation spectroscopy and wide angle X-ray scattering, respectively.

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