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Pendant Dynamics of Ethylene-Oxide Containing Polymers with Diverse Backbones[1] JOSHUA BARTELS, JING-HAN HELEN WANG, QUAN CHEN, JAMES RUNT, RALPH COLBY, Penn State University — In the last twenty years, a wide variety of ion conducting polymers have used ether oxygens to facilitate ion conduction, and it is therefore important to understand the dynamics of ether oxygens (EOs) when attached to different polymer backbones. Four different EO-containing polymer architectures are studied by dielectric spectroscopy to understand the backbone effect on the EO dipoles. Polysiloxanes, polyphosphazenes, polymethylmethacrylates, and a polyester ether are compared, with different EO pendant lengths for the siloxane and methylmethacrylate backbones. The flexible polysiloxanes and polyphosphazene backbones impart superior segmental mobility with a glass transition temperature 15 K lower than that of the organic backbone polymers. Short EO pendants are found to impart a lower static dielectric constant at comparable EO content as compared to longer EO pendants of either inorganic or organic backbones. The long-pendant polymethylmethacrylate polymers show two relaxations corresponding to fast EOs near the pendant tail end and slow EOs close to the slower backbone, whereas the long-pendant polysiloxane shows a single relaxation due to the siloxane backbone relaxing faster than the EO pendant.

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