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Probing the Electromechanical Response Mechanism of Ionic Block Copolymers JASON DUGGER, Center for Nanophase Materials Sciences, Oak Ridge National Laboratory, MINGTAO CHEN, TIMOTHY LONG, Department of Chemistry, Virginia Tech, YAO FU, RAJEEV KUMAR, BRADLEY LOKITZ, Center for Nanophase Materials Sciences, Oak Ridge National Laboratory, JAMES BROWNING, Chemical and Engineering Materials Division, Oak Ridge National Laboratory, OAK RIDGE NATIONAL LABORATORY COLLABORATION, DEPARTMENT OF CHEMISTRY, VIRGINIA TECH COLLABORATION — One of the rapidly developing frontiers in research is focused on the design of materials that have targeted functionalities and tunable responses to external stimuli. A chief obstacle to achieving this capability is the lack of a fundamental understanding of how chemical structure and morphology give rise to macromolecular properties. Our research explores how polymer structure, counterion species, and film morphology affects the electromechanical response of ionic block copolymers when exposed to external electric fields using neutron reflectometry. Currently, the literature lacks a thorough understanding of how these factors drive the electrostatic and mechanical stresses that result in material deformation. The sensitivity of neutron reflectometry to scattering length density as well as subnanometer changes in thickness make it an ideal tool for investigating polymer and counterion mobility under applied fields. To this end, we have designed a vacuum chamber capable of applying electric fields to thin films during reflectometry measurements to probe electromechanical response.

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