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Electric Field Induced Ordering of a Battery Electrolyte SCOTT MULLIN, NITASH BALSARA, University of California, Berkeley — A disordered mixture of a symmetric poly(styrene-*block*-ethylene oxide) (SEO) copolymer and lithium bis(trifluoromethanesulfonimide) (a lithium salt) was placed between two lithium metal electrodes. Application of a 3V potential across the electrodes results in a current density of 15 mA/cm^2 and order formation as evidenced by the instantaneous development of a sharp small-angle X-ray scattering (SAXS) ring and Bragg spots due to the presence of a few large coherent grains. With time, radial streaks emanated from the ring, leading to a scattering pattern that resembles a sun dial. Our preliminary hypothesis is that these streaks are due to salt concentration gradients that occur when the current is passed. This gradient results in coherent grains within which the domain size changes continuously. To our knowledge, this kind of structure has not been observed previously in block copolymers. The disordered phase is recovered in the bulk when the applied potential is turned off, and the open circuit voltage of the cell and the SAXS invariant relax with similar time constants. This work represents the first step toward designing responsive battery electrolytes wherein structure and ion transport depends on the state-of-charge of the battery.

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