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Lithium dendrite growth through solid polymer electrolyte membranes KATHERINE HARRY, NICOLE SCHAUSER, NITASH BALSARA, UC Berkeley — Replacing the graphite-based anode in current batteries with a lithium foil will result in a qualitative increase in the energy density of lithium batteries. The primary reason for not adopting lithium-foil anodes is the formation of dendrites during cell charging. In this study, stop-motion X-ray microtomography experiments were used to directly monitor the growth of lithium dendrites during electrochemical cycling of symmetric lithium-lithium cells with a block copolymer electrolyte. In an attempt to understand the relationship between viscoelastic properties of the electrolyte on dendrite formation, a series of complementary experiments including cell cycling, tomography, ac impedance, and rheology, were conducted above and below the glass transition temperature of the non-conducting poly(styrene) block; the conducting phase is a mixture of rubbery poly(ethylene oxide) and a lithium salt. The tomography experiments enable quantification of the evolution of strain in the block copolymer electrolyte. Our work provides fundamental insight into the dynamics of electrochemical deposition of metallic films in contact with high modulus polymer electrolytes. Rational approaches for slowing down and, perhaps, eliminating dendrite growth are proposed.

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