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The role of tortuosity on ion conduction in block copolymer electrolyte thin films[1] YU KAMBE, University of Chicago, CHRISTOPHER G. ARGES, PAUL F. NEALEY, University of Chicago / Argonne National Laboratory — This talk discusses the role of grain tortuosity on ion conductivity in block copolymer electrolyte (BCE) thin films. In particular, we studied lamellae forming BCEs with both domains oriented perpendicular to the substrate surface and connected directly from one electrode to another – i.e., tortuosity of one. The BCE is composed of ion-conducting, poly(2-vinyl n-methylpyridinium) blocks and non-ionic polystyrene blocks. Prior to creating the BCE, the pristine block copolymer, poly(styrene-*b*-2-vinyl pyridine), was directly self-assembled (DSA) on topographical or chemical patterns via graphoepitaxy and chemoepitaxy. A chemical vapor infiltration reaction modified the P2VP block into positively charged, fixed quaternary ammonium groups paired with mobile counteranions. The graphoepitaxy process utilized topographical interdigitated gold nanoelectrodes (100s of nanometers spacing between electrodes) created via e-beam lithography. Alternatively, chemical patterns had gold electrodes incorporated into them with 10s to 100s of microns spacing using conventional optical lithography. The interdigitated gold electrodes enabled in-plane ion conductivity measurements of the DSA BCEs to study the role of grain tortuosity on ion conductivity.

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