Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Retarding Dendrite Formation in Rechargeable Lithium Metal Batteries with Block Copolymer Electrolytes GREG STONE, SCOTT MULLIN, NITASH BALSARA, University of California, Berkeley — The block copolymer electrolyte polystyrene-block-poly(ethylene oxide) (PS-PEO) is designed to extend the lifetime and cyclability of rechargeable lithium metal batteries. The PEO phase conducts lithium ions, while the PS phase provides mechanical strength to prevent short circuit due to dendrite growth – a primary failure mechanism in this battery chemistry. The duration an electrolyte can be cycled before short circuit is reported for both PEO and PS-PEO electrolytes. For all current densities tested, the PS-PEO electrolyte resisted short circuiting at least two orders of magnitude longer than the PEO electrolyte. SEM imaging showed lithium metal protrusions into the PS-PEO electrolyte were an order of magnitude larger than the domain size of the block copolymer structure. These results along with theoretical results from literature indicate that slowed dendrite growth is due to enhanced bulk modulus in the PS-PEO electrolytes.

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Date submitted: 20 Nov 2009 Electronic form version 1.4