MAR17-2016-000944

Abstract for an Invited Paper
for the MAR17 Meeting of
the American Physical Society

Ohm's Law, Batteries, and the Clean Energy Landscape

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The need for creating safe electrolytes for lithium batteries is significant given the continued safety problems associated with current lithium-ion batteries. Nonflammable polymer electrolytes offer a possible solution but the rate of lithium ion transport is too low for practical applications. In this talk, I will discuss some of the fundamental factors that limit ion transport in polymers. Polymer electrolytes obey Ohm's Law, i.e. in the limit of small applied potentials, the current generated at steady state is proportional to the applied potential. Factors that determine the current generated will be determined using the continuum theory of Newman. Independent measurements of ion diffusion by pulsed-field gradient NMR will also be presented. The talk will end with a discussion of the possibility of commercializing all-solid batteries with polymer electrolytes.