MRSEC SEMINAR SERIES

"Imaging the Mesoscale Behavior and Performance of Materials for Renewable Energy."

My research group at UMD utilizes scanning probe and electron microscopy based methods to understand fundamental nanoscale physical and chemical phenomena in materials for energy applications. In the first part of the talk, I will focus on our research in photovoltaics, including the functional imaging of device performance. Our measurements reveal carrier recombination and collection within inhomogeneous materials with nanoscale spatial resolution, not possible by macroscopic electrical measurements. In particular, we implemented a variant of Kelvin probe force microscopy to quantify the open-circuit voltage (V_{oc}) of solar cells with spatial resolution <100 nm. To probe the dynamics of perovskite solar cells we realized a 4D imaging method to map mesoscale changes in V_{oc} thru ultrafast scanning probe microscopy (16 seconds/scan) that maintains high spatial resolution. On the realm of energy storage devices, we image *in situ* the electrochemistry of Li-ion all-solid-state batteries by combining real-time SEM in ultra-high vacuum with electrochemical cycling to quantify the dynamic degradation of anodes.

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Monday March 7, 2016
Ryan 4003
11:00 a.m. – 12:00 p.m.