Analytical Seminar

"Surface modifications of electroactive materials for lithium-ion batteries"

Many technologies, such as electric vehicles and portable electronics, have created a demand for lithium-ion batteries (LIBs) with high-capacities and long-term usability. However, materials that can provide conventional LIBs with a higher capacity, such as silicon or $LiNi_xMn_yCo_{1-x-y}O_2$ (NMC), exhibit a large amount of capacity fade due to unwanted side reactions from electrolyte degradation on the electrode surface. In this talk, I will discuss forming electrode coatings to prevent unwanted electrolyte degradation while maximizing lithium conductivity and minimizing surface resistivity. We have studied the formation of an electrochemically cross-linked surface layer directly attached to silicon to prevent unwanted electrolyte degradation when silicon is used as an anode host material. We have also gained an understanding of the facet-dependent surface reactivity of cathodes such as NMC and its analog, $LiCoO_2$ (LCO), with common cathode coatings such as Al_2O_3 via X-ray photoelectron spectroscopy studies on single crystal LCO. This work provides a greater understanding of the effects of coatings on LIB performance and how we can improve them to enable high-capacity lithium-ion batteries.

Laura Slaymaker

UW-Madison

Hamers group

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1315 Chemistry