Research Title: **Thin-Film, Multilayered, Solid-State Lithium Batteries**

Topic: Interfacial and Bulk Kinetics in Multilayer, Solid Polymer Lithium Batteries

This work aims to explore straightforward, scalable fabrication methods for *multilayer* thin-film rechargeable batteries comprised of solvent-free, mechanically stable polymer electrolytes and dense metal oxide cathodes. The methods devised in this work are intended to assist the U.S. Office of Naval Research to move from a research phase to a development phase for solid polymer electrolyte batteries used for a multitude of military applications. More broadly, these efforts will also enable further technologies to be developed in the civilian and commercial sectors.

The research plan, broadly stated, aims to

1. understand the operation of the working battery
2. understand its failure modes
3. enhance battery performance.

The first goal, understanding the operation, will be accomplished through designing electrode and current collector systems that optimize the working multilayer, solid-state polymer battery. An understanding of the thin-film processing conditions for these multi-layers will be developed. The second goal, understanding the working battery's failure modes and mitigating these, will involve studying the kinetic properties and interface science of solid-polymer lithium batteries, linking the material properties subsequently discovered with specific failure modes. The third goal, enhancing performance, will involve relating changes in microstructure and composition of a thin-film cathode system to cell performance.