Goals and Motivation

Dynamic materials processes are at the heart of many energy and electronics technologies.

It is critical to understand materials dynamics for better devices.

Research Theme: Use real-time experiments to understand how materials behave in energy and electronic devices for improved performance.

1: Investigating Transformations in Battery Materials

Goal: Develop and use in situ techniques to probe reaction mechanisms in real time in lithium-, sodium-, and potassium-ion batteries from the nanoscale to the mesoscale.

2: Stabilizing Interfaces in Solid-State Batteries

Goal: Enable solid-state alkali metal batteries by controlling and understanding transformations/degradation at interfaces.

3: Low-Temperature Batteries

Enable low-temperature operation of lithium metal electrodes by tailoring electrolytes and controlling electrodeposition

4: Transformations in Layered Electronic and Catalytic Materials

Goal: Controlled synthesis and characterization of metal-TMDC interfaces for superior electronic and catalytic properties.

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