Technical Project Series

Mechanical Characterization of Lead Batteries for Energy Storage Applications

Objective

The team will model how mechanical behavior, electrochemical changes, and microstructure evolution in **lead battery electrodes** evolve over cycling in energy storage systems (ESS).

The gathered electrochemical and microstructural models with be used with artificial intelligence to predict cell failure. The findings will support recommendations for electrode design modifications to **extend battery life** in energy storage applications.

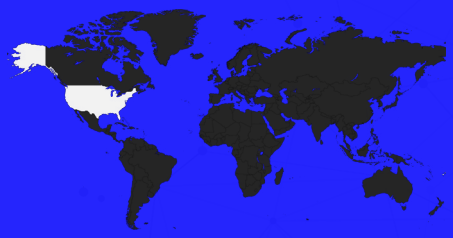
Project Info

Duration: 3 years

Partners: East Penn Manufacturing
Villanova University

Focus: Energy Storage Applications

Location: USA



Expected Impact

This project will provide insights into how **structural changes in lead battery electrodes** relate to electrical performance, laying the groundwork for failure prediction in ESS applications.

The techniques will offer insights into the dissolution and formation mechanisms of charge and discharge products at both positive and negative electrodes. The results will support the **design of lead batteries** with improved performance, reliability, durability, and extended cycle life.

Initial Results

1)	Collected baseline reference spectra for key lead species using Raman microscopy.
2)	Conducted in situ Raman microscopy on preliminary battery electrodes.
3)	Analyzed aged lead battery electrodes from prior use with a range of analytical techniques.
4)	Ongoing development of Raman microscopy to map electrolyte and species changes under representative ESS testing conditions.

Research Imagery

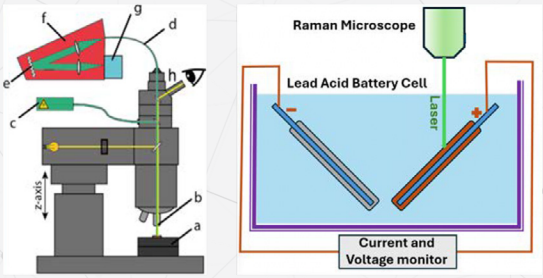


Figure 1: Raman microscopy will be used to characterize the microstructure of lead battery electrodes during operation. The combination of optical and Raman microscopy will be used to gather structural characteristics.