**Scientific Achievement**

Scientists demonstrated spectroscopic chemical imaging at unprecedented nanoscale resolution.

**Significance and Impact**

Understanding chemical interplay at the nanoscale in materials such as batteries and microchips allows for faster development of new technologies; this work demonstrates the ability to resolve the chemical structure of such materials with high sensitivity and <50 nm spatial resolution.

**Research Details**

- Studies combined fluorescence-yield x-ray absorption near-edge structure (XANES) spectroscopy with a hard x-ray nanoprobe to achieve the nanoscale chemical imaging at the HXN beamline at NSLS-II.
- Scientists applied the method to study lithium-ion battery particles (Li_xFePO_4) and revealed the morphology change of the trace iron-phosphide phase in pristine and partially (de)lithiated samples.

---

This image shows how different iron species are distributed within one battery particle using high resolution x-ray imaging at the nanoscale.


Work was performed in part at Brookhaven National Laboratory.