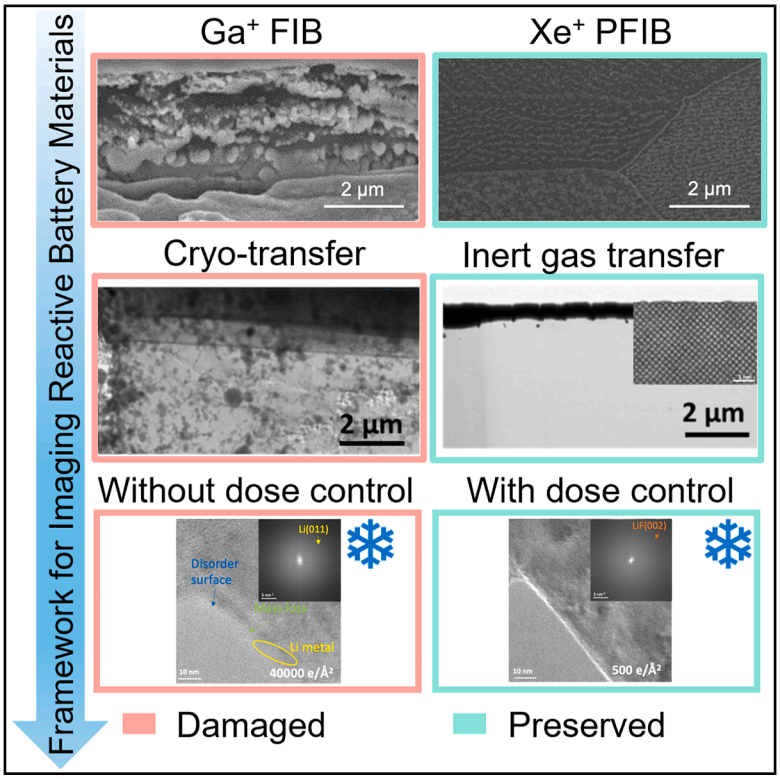
Joule

Guidelines for correlative imaging and analysis of reactive alkali metal battery materials

Graphical abstract



Highlights

- Framework for artifact-free imaging of reactive alkali metals and SEIs
- Room-temperature atomic-resolution imaging of lithium metal achieved
- Cryogenic, low-dose conditions required for beam-sensitive SEI phases
- Inert-gas sample transfer with PFIB enables damage-free preparation of alkali metal samples

Authors

Shuang Bai, Zhao Liu, Diyi Cheng, ..., Alexander Bright, Minghao Zhang, Ying Shirley Meng

Correspondence

miz016@uchicago.edu (M.Z.), shirleymeng@uchicago.edu (Y.S.M.)

In brief

Reactive alkali metals are central to next-generation batteries, yet their extreme sensitivity has long complicated reliable imaging. This study establishes a unified workflow—from storage to ion-beam milling to electron microscopy—that preserves the native structure and chemistry of lithium and sodium metals and their SEIs. By clarifying when cryogenic conditions are required and identifying dose limits for beam-sensitive phases, the work provides a foundation for reproducible, artifact-free characterization across the battery community.

Bai et al., 2026, Joule *10*, 102311
April 15, 2026
https://doi.org/10.1016/j.joule.2025.102311

CellPress