Interdependence of Wettability and Electrodeposition Rate in Na Batteries

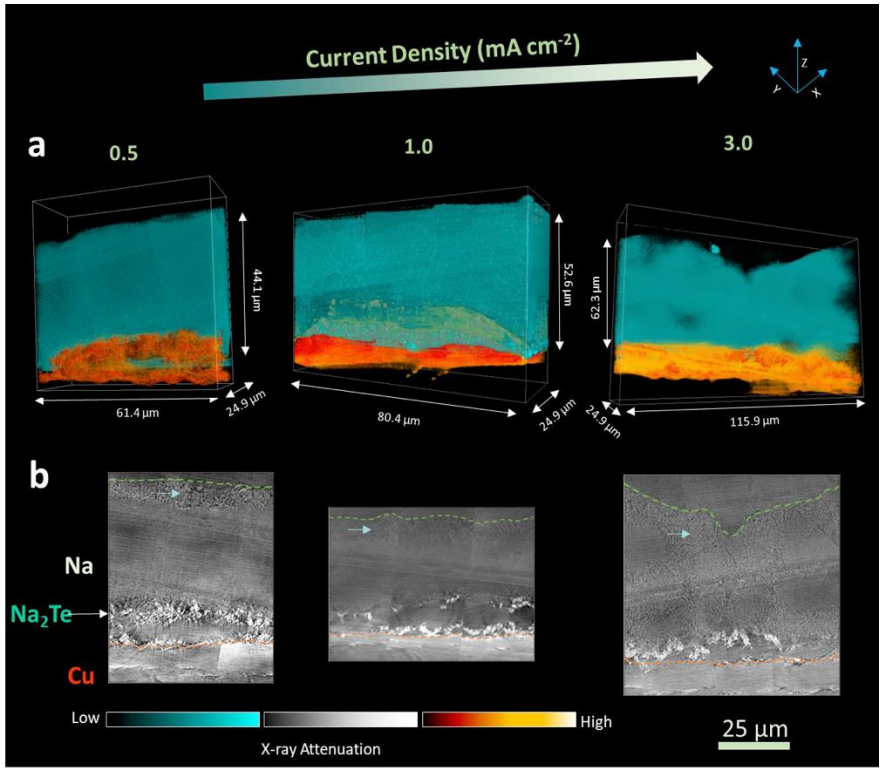

Figure. 3D synchrotron X-ray nano-tomography by transmission X-ray microscopy for visualizing the internal structure of the deposited Na on Te-Cu as a function of current density. (a) 3D tomographic volume rendering and (b) Corresponding pseudo cross-sectional 2D images along the XZ plane. Cyan arrows indicate surface Na structures.

Scientific Achievement

First of its kind multimodal investigation of the interdependence of the current collector support sodiophilicity, electrodeposition current density, and sodium metal and associated SEI structure.

Significance and Impact

This study examines how current collector support chemistry (sodiophilic intermetallic Na_2Te vs. sodiophobic baseline Cu) and electrodeposition rate affect microstructure of sodium metal and its solid electrolyte interphase (SEI).

Research Details

- Investigated the role of current collector wettability on cycle-one microstructure of electrodeposited sodium metal and its solid electrolyte interphase (SEI).
- Experiments demonstrate complex support and rate dependent interrelations to predict the effect on localized current density, and onset of electrochemical instability.

This work was performed in part at The Center for Integrated Nanotechnologies.

Lo, C.-A.; Wang, Y.; Kankanallu, V. R.; Singla, A.; Yen, D.; Zheng, X.; Naik, K. G.; Vishnugopi, B. S.; Campbell, C.; Raj, V.; Zhao, C.; Ma, L.; Bai, J.; Yang, F.; Li, R.; Ge, M.; Watt, J.; Mukherjee, P. P.; Mitlin, D.; Chen-Wiegart, Y. K. Interdependence of Support Wettability -electrodeposition Rate - Sodium Metal Anode and Sei Microstructure. *Angewandte Chemie International Edition* **2024**.