Uncovering Reaction Mechanisms of Aqueous Zn/MnO_2 Batteries

18-ID FXI | 5-ID SRX | 8-ID ISS | 28-ID-2 XPD

Journal cover featuring this research

V.R. Kankanallu, X. Zheng, D. Leshchev, N. Zmich, C. Clark, C.-H. Lin, H. Zhong, S. Ghose, A.M. Kiss, D. Nykypanchuk, E. Stavitski, E.S. Takeuchi, A.C. Marschilok, K.J. Takeuchi, Ji. Bai, M. Ge, Y.-C.K. Chen-Wiegart, *Energy Environ. Sci.*, **16,** 2464-2482 (2023)

Work was performed at NSLS-II.

Scientific Achievement

Scientists elucidate the mechanisms that drive aqueous Zn/MnO_2 batteries, including correlations between changes in structure, reaction chemistry, and 3D morphologies.

Research Details

- Reaction mechanisms were detailed via a multimodal synchrotron approach with *operando* X-ray techniques at NSLS-II: powder diffraction, absorption spectroscopy, and fluorescence microscopy, coupled with elementally resolved X-ray nanotomography.
- Data reveal a crystalline-to-amorphous phase transition, with the associated structural and chemical changes tracked.
- Critically, the reaction pathways of Zn-Mn complex formation during battery cycling are shown to be independent of the polymorph of the initial electrode.

Significance and Impact

This work provides the fundamental understanding that is key to designing Zn/MnO_2 batteries with a more reversible capacity, thus furthering the development of these sustainable, cost-effective, and safe options for grid-scale energy storage media.

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