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## **Silicon-Induced Structural Changes in Commercial Li-ion Battery Anodes**

*Thursday 5 December 2024 15:25 (25 minutes)*

This study investigates the structural dynamics of silicon-containing graphite anodes in commercial lithium-ion batteries (LIBs) using systematic X-ray and neutron powder diffraction techniques. Silicon, increasingly used in state-of-the-art LIB anodes, due to its potential to enhance battery performance, shows significant volume expansion, and the amorphization of silicon during lithiation [1, 2]. Such issues complicate the direct detection of lithium redistribution within the anode using diffraction techniques. However, an indirect structural response of silicon lithiation was observed, by the delayed Li intercalation into the graphite structure. Additionally, the study focuses on the impact of aging of high-silicon-content anodes, showing the degradation of the cell electrodes and the role of silicon in this process. The findings contribute to a better understanding of the complex interplay between silicon content, structural stability, and lithium distribution in advanced LIBs.

[1] Moon, J., et al., Nature Communications, 12(1), 2021 (DOI: 10.1038/s41467-021-22662-7).

[2] Limthongkul, P., et al., Acta Materialia, 51(4), 2003 (DOI: 10.1016/S1359-6454(02)00514-1).

**Primary author:** HÖLDERLE, Tobias

**Co-authors:** SENYSHYN, Anatoliy; MÜLLER-BUSCHBAUM, Peter (TU München, Physik-Department, LS Funktionelle Materialien); Dr KOCHETOV, Vladislav (FRMII TUM)

**Presenter:** HÖLDERLE, Tobias

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