

Nano-SaNE: A Comprehensive Safety Evaluation of Nanomaterials in Lithium-Ion Batteries

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The integration of advanced nanomaterials, such as nanocarbons and nanosilicon, into lithium-ion batteries (LIBs) enhances electrochemical performance but introduces potential safety and environmental hazards. These risks arise not only from engineered nanostructures but also from particles generated during operation or degradation, particularly in thermal runaway events. However, a systematic assessment of these risks across the battery lifecycle is currently lacking.

This study, part of the Nano-SaNE project, addresses this gap through a comprehensive safety assessment. We characterized a range of novel nanomaterials (NMs) using analytical techniques (FT-IR, Raman, SEM) and assembled them into CR2032 coin cells to evaluate their electrochemical properties (figure 1). The thermal behavior was investigated in a lab-scale tubular reactor for cell-level thermal abuse tests, monitoring temperature, pressure, gas composition, and particulate emissions in real-time. The solid and particulate emissions from these tests are collected for further analysis.

This multi-faceted approach provides crucial insights into the hazard profile of next-generation LIBs, from material properties to failure events, supporting the development of safer energy storage technologies.