Shock absorption design of lithium-ion battery cabinet

How do vibrational and shock profiles affect lithium-ion batteries?
Lithium-ion batteries are increasingly used in mobile applications where mechanical vibrations and shocks are a constant companion. This work shows how these mechanical loads affect lithium-ion cells. Therefore pouch and cylindrical cells are stressedwith vibrational and shock profiles according to the UN 38.3 standard.

What are the different design approaches for Li-ion batteries?
In particular, this paper analyzes seven types of design approaches, starting from the basic. The proposed classification is original and reflects the improvements achieved in the design of Li-ion batteries. The first methods described in the paper are Heuristic and Simulation-driven.

How do vibrations and shocks affect lithium-ion cells?
We investigated how vibrations and shocks affect lithium-ion cells. Cells were stressed with UN 38.3 profiles as well as real-world vibrational loads. Cells with a tight packaging and fixed internal components showed no damages. Post mortem analyses and uCT revealed a loose mandrel for the tested 18650 cells.

How does mechanical stress affect a lithium ion battery?
In particular,mechanical vibrations and infrequent shock loads affect all parts of a battery including its smallest energy storing part,the accumulator cell,or short cell. Mechanical stress on cell level may cause market durability failuresin the long-term and,especially for lithium-ion cells,these failures might pose a safety risk.

Why is the design complexity of Li-ion batteries increasing?
The design complexity increased due to the high degree of modularityof the battery system and the need for scalability. In this context,Narayanaswamy et al. highlighted how manual design approaches for Li-ion batteries are time-consuming and are error-prone.

How to test lithium ion batteries in space?
For lithium-ion batteries in space applications,the NASA requires testing with random vibrationsat frequencies between 20 and 2000 Hz with a peak acceleration of 13.65 g. In addition,the cells should be tested with shock loads at pyro-shock levels of 100-10000 Hz with up to 2000 g .

This paper reviews the main design approaches used for Li-ion batteries in the last twenty years, describing the improvements in battery design and the relationships between ...

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A novel thin-walled honeycomb structure for Li-ion battery packaging (Shuai et al., 2020) has been proposed, featuring a reinforcing grid for enhanced strength, reduced ...

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The shock test is to represent the sudden decceleration of an object such as when it is dropped and hits the floor or it is involved in a crash. ... by posted by Battery Design. January 31, 2025; Fast Charging of a Lithium-Ion Battery. by ...

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