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Title

Safety review of lithium ion battery for space environment through modeling and simulation

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Abstract

Lithium-ion batteries have seen increasing use in aerospace systems due to their improved performance. They have gone from being primarily used in low-power system like satellites to being able to handle high-power systems like electric pump cycles as well. However, high discharge rates can put a large load on the battery, leading to heat generation and rapid voltage drops. Additionally, the space environment poses unique challenges for batteries, requiring additional testing.

In this research, the battery was modeled and simulated using Ansys Fluent. The simulation was compared to actual tests, and it was found that the error was less than 4%. The simulations were conducted at discharge rates ranging from 6 to 10 C without convective cooling.

To further confirm the battery's characteristics, a vacuum chamber test apparatus was built to simulate a high vacuum and high discharge environment. The safety of the apparatus was confirmed, and part of the battery environmental test was conducted. The results of this research have added to the understanding of how lithium-ion batteries can be used in high-power aerospace systems, and have provided valuable information for future development and design of such systems."

References

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