

IAF SPACE POWER SYMPOSIUM (C3)
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THE APPLICATION AND PERFORMANCE OF LITHIUM-ION BATTERY IN DEEP SPACE
EXPLORATION

Abstract

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Deep space exploration has the feature of complex space environment and mission diversity, which put forward the requirements of wide temperature adaptability, high specific energy and high reliability for rechargeable energy storage unit. Since being applied in deep space exploration, the Lithium-ion battery gradually replace the share of Ni-Cd and Ni-MH batteries owing to its high specific energy and other excellent performance. Shanghai institute of space power sources (SISP) has taken part in all lithium-ion battery applications in China's deep space exploration such as lunar exploration program and Mars mission. In order to meet the needs of these mission, SISP has developed such batteries named high specific energy ICP series product which owns ICP40/ICP50/ICP60 cells. These batteries have a specific energy of 195Wh/kg (3.3V-4.1V) which is the highest level of space battery as reported and can work at a temperature range from -20 degree to +55 degree. Moreover, numerous tests have been designed and done to make sure the characteristics of life adaptability and reliability. By analyzing the requirements of deep space exploration, combined with the features of batteries, adaptive design and test can be done to guarantee the mission's success. In the completed Chang'e-3/4/5 lunar exploration mission and ongoing Tianwen-1 Mars exploration mission, lithium-ion batteries produced by SISP have performed stably and reliably in orbit.

Abstract