ELSEVIER

Journal of Power Sources 80 (1999) 272

JOURNAL OF POWER SOURCES

Lithium-ion cells for aerospace applications

R.L. Gitzendanner [a], C. Marsh [a,*], R.A. Marsh [b], F. Puglia [b], S. Vukson [b], R. Surampudi [c]

[a] *Yardney Technical Products Inc., 82 Mechanic Street, Pawcatuck, CT 06379, USA*
[b] *Air Force Research Laboratory, Propulsion Directorate, Battery Branch, 1950 Fifth Street, Dayton, OH 45433-7251, USA*
[c] *Jet Propulsion Laboratory, NASA, USA*

Abstract

The lithium-ion chemistry offers significant improvements in energy density, specific energy and cycle life compared to other current energy storage technologies. Most commercially successful lithium-ion cells use the lithiated cobalt oxide ($LiCoO_2$) cathode materials, carbon-based anode materials, liquid organic carbonate based electrolyte and are available in both wound cylindrical and flat-mandrel prismatic cell designs in several sizes to 3.6 Ah. While the commercially available cells demonstrate the viability, performance and economic potential of the lithium-ion technology for consumer applications, they are not suitable for aerospace applications. Aerospace batteries require very high reliability, outstanding low temperature operation, exceptionally long cycle life, high specific energy and larger cell sizes. In addition, due to the high cost and inaccessibility of many of the aerospace applications, these battery systems must have designed-in reliability that far exceeds industrial standards. Recent improvements to the lithium-ion cell design offer a unique weight, volume and reliability solution to aerospace requirements. Under sponsorship of the USAF and NASA, Yardney Technical Products is developing advanced lithium-ion cells that deliver a specific energy of 130 Wh kg^{-1}, energy density of 270 Wh dm^{-3} and thousands of cycles. Using a space-efficient and adaptable parallel-plate prismatic design, these cells demonstrate high sustained current and pulse capability and, with design improvements, will result in batteries that meet or exceed the demanding requirements of aerospace applications. This paper will present the design considerations and the results of performance and life testing. © 1999 Elsevier Science S.A. All rights reserved.

* Corresponding author

0378-7753/99/$ - see front matter © 1999 Elsevier Science S.A. All rights reserved.
PII: S0378-7753(99)00169-X