Is Li-ion Technology Branching Out?

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The secondary Li-ion battery technology has reached its maturity and is in the cross-roads in its application. Since the first commercial introduction of Li-ion cells by Sony [1] in 1990, the market acceptability of Li-ion cells has been phenomenal. A careful analysis of the requirements for batteries in various applications reveals that Li-ion technology needs to be branched out to satisfy the sometimes mutually exclusive requirements of these applications.

The Li-ion technology was started with the introduction of cylindrical cells with 18 mm diameter and 65 mm length, more commonly known as 18650 cell, with 900 mAh capacity. From a modest start, the cell production volume is projected to reach 1.4 billion cells by the end of 2004. Mobile phone application still accounts for about 55% of consumption of Li-ion cells while Notebook computer market consumes about 29% of the cells. Other applications such as Digital Camera, PDA, Camcorder, Game, etc., consume the rest of the Li-ion production.

It is interesting to note that the mobile phone and computing markets almost exclusively use Li-ion cells today. The reliability, performance, and acceptable costs are the main reasons of the popularity of Li-ion cells in these applications. This fact has attracted the attention of developers of other products such as Power Tools, EVs, and other industrial applications like long term power back up, satellite applications etc.

The mobile phone, computer, game, audio and video applications fall in the category of Communications Applications while the Power Tool and EV products fall in the High Rate application. The main function of the batteries in a communications application is to provide power to a radio frequency trans-receiver where the battery is expected to power a motor in a high rate application, such as a power tool. The performance requirements for the energy source for these two types of applications are entirely different in many respects.

Recently, a new type application for Li-ion batteries is emerging. Long term back-up, satellite, stationary battery, and other low rate discharge applications fall in this category. The main performance requirement is the very long operating life of the battery in the range of 8-10 years.

An analysis of the requirements of the three type of application points to the fact that the current “fit-for-all” concept may not satisfy the market need. Therefore, there is a need to develop specific Li-ion technologies for different type of applications. It can also be said that there are indications of such specific developments exists [2, 3] in the industry. It is quite possible that we are witnessing the “branching out” of the technology as shown in Figure 1. The main characteristics of the requirements of these three types of applications are summarized in Table 1. A detailed discussion on the performance requirements of these three type applications as well as some data from Li-ion cells specifically prepared for these applications will be presented in the conference.

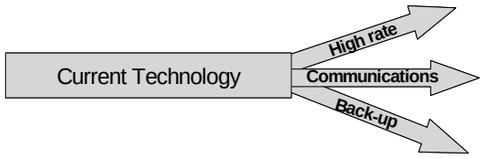

Figure 1: Schematic diagram indicating the branching out of Li-ion technology.

Table 1: Summary characteristics of the 3 different types of applications

Order of Importance	Communications	High Rate	Back-up
1	Energy Density	Power Density	Operating Life
2	Operating Life	Operating Life	Energy Density
3	Power Density	Energy Density	Power Density

References:
[1] T. Nagaura, 3rd International Rechargeable battery Seminar, Deerfield Beach, Florida, USA, March 1990.

[2] R. Gitzendanner, F. Puglia, S. Iaconnetti, S. Santee, Abstract No. 213, Extended Abstract, Fall Meeting, Electrochemical Society, October 2002.

[3]F.J. Kruger, A.J. Manning, T. Traulsen, M. Schweizer-Berberich, The 21st International Battery Seminar & Exhibit, Ft. Lauderdale, FL, USA, March 2004.