

Improvements of Li-ion Cell Safety and Gas Evolution through Formation of Good Solid Electrolyte Interface

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Safety and gas evolution with an elevated temperature storage that leads to cell swelling are among the key issues of a Li-ion battery. The gas evolution is known to lead to cell swelling, especially, of pouch-type cells (1). Both of these issues are related to chemical reactions between charged active material and the electrolyte. Therefore, the characteristics of solid electrolyte interface (SEI) that forms between the active material and the electrolyte (2) should be critically important for both safety and gas evolution. In an effort to address these issues we have studied Li-ion cells containing a flame retardant solvent in an organic carbonate-base electrolytes of various compositions. Electrochemical voltage spectroscopy (dQ/dV vs. V), ac impedance spectroscopy, SEM, XRD, and differential scanning calorimetric (DSC) experiments were carried out on the electrodes in order to understand the nature of the SEI layer, especially on the anode surface. These results appear to be correlated with those of cell overcharge tests and a swelling test after a 90°C-storage period for 4 hours.

References

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Bok Hwan Jung and Hong S. Lim, Mechanism of gas build-up in a Li-ion cell at elevated temperature. J Power Sources, accepted for publication, 2004

2. E. Peled, Rechargeable Lithium and Lithium-ion Batteries", ed. by Sid Megahed, Brian M. Barnett, and Like Xie, proceedings vol. 94-28, The Electrochemical Soc., Inc., 10 S. Main St., Pennington, NJ 08534-2896. p.1

Figures

1st) dQ/dV Curves at the first charge process, 2nd) Swelled thickness after storage at 90°C for 4Hr. 3rd) 1.0C Charge/discharge cycle property

