Electrochemical Performance of Composite Polymer Coated Cathodes for Enhanced Battery Safety

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The increasing energy density of batteries tightens the required abuse tolerance and the potential for catastrophic system failures. Currently, most safety devices and management systems are placed outside the cell. However, this approach cannot mitigate against internal failures, may increase the cell resistance, decreases the system energy/power and must be individually designed and applied. Physical Sciences Inc. (PSI) has developed a composite polymer coating that provides in-situ protection during a short-circuit event.

During this presentation, PSI will demonstrate the ability to apply a composite polymer coating to the cathode materials that becomes insulative during short-circuit, limiting the current pass, heat generation and potential for catastrophic failure. During normal operation, the coating permits normal electron flow and cell functionality. Figure 1 shows that the coating maintains the same cycling stability as uncoated material, therefore preserving the cell lifetime. Figure 2 shows the electrical resistance increase observed as the cell voltage is lowered. This increased resistance diminishes the current flow during a low voltage event, as a short-circuit.

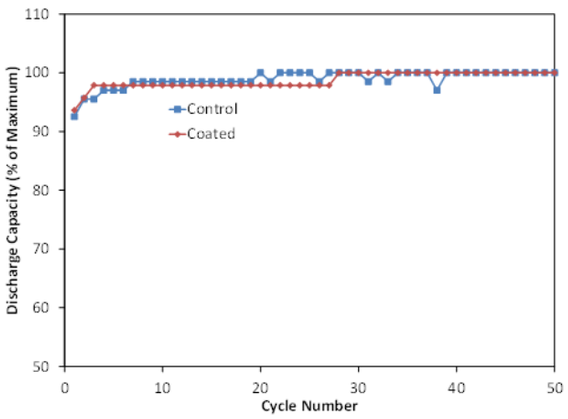

Figure 1. Full cell discharge capacity vs. cycle number for control and coated material

In addition to the electrochemical performance, successful coating and cell build scale-up efforts will be discussed. 18-650 cells were manufactured and have been investigated for cycle life and short-circuit current protection, these results will be reviewed.

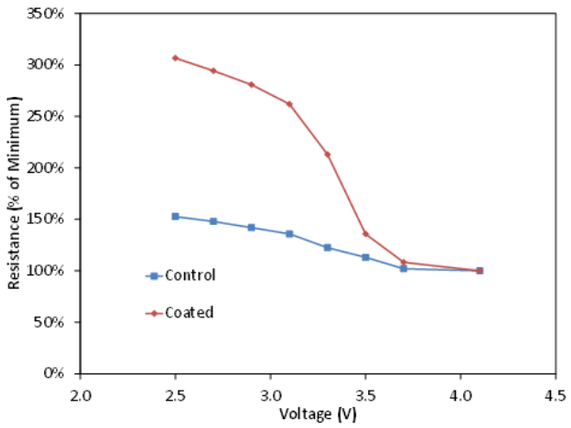

Figure 2. Full cell electrical resistance at different voltages using control and coated materials

Acknowledgement

Research to be presented during this talk has been supported by the Air Force under contract numbers FA8650-10-M-2054 and FA8650-11-C-2142.