

CellBlock®

Fire Containment Systems

Certificate of Test

Project:	CellSafe Lithium Battery Recall Kit	Date:	March 12, 2019
		Document No.:	CBRPT012
		Project Manager:	Dylan Vandemark
		Date of Testing:	March 12, 2019

Description: Lithium-Ion Thermal Runaway Containment Study Within Fiberboard Boxes

Details: TEST 12: 15" x 8" x 4" Folded Mailer with closure tape, B-flute with 2.0lbs of CellBlockEX within heat sensitive textile pillow lined with fire resistant textile.

Purpose: This test was conducted to demonstrate and document the capability of CellBlockEX® to contain a thermal event involving lithium ion cells and batteries (UN 3480) within a fiberboard box.

Test Sample Identification: TENERGY 18650 9.6 Wh, 11 count @ 100% SOC (105.6 total Wh), installed in 1x11 tight arrangement inside of box between CellBlock® extinguishing pillows. These cells are the same as used by the FAA William J. Hughes Technical Center and represent one of the most volatile cells commercially available. The tight cell arrangement was designed for full propagation.

Test Equipment: FireRod heater cartridge, 110 DC Power Supply, Type-K Thermocouples

Procedure: Single cell ignition by heating at a rate of 2°C/sec to vent and thermal runaway or 200°C. Record temperature every 1 second on the ignition cell, adjacent cell, aft cell, box top, box front, box bottom, and box left; record photographs and video.


The results and any data provided by CellBlock in any format ("Data") apply only to the sample(s) tested and shall not be considered indicative of the qualities of apparently identical or similar samples. This certificate does not indicate successful or unsuccessful completion of a test or qualification program. CellBlock disclaims all warranties, express or implied, and liability for the performance of the tested sample(s) and use of any Data.

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Results: An initiation cell was heated until it experienced rapid disassembly (thermal event). The initiation cell exposed adjacent cells to heat, fire and ejected contents. The cells were assembled in close proximity to each other and as a result there was propagation of adjacent cells but the CellBlockEX material was effective in preventing mass propagation of all of the test cells. CellBlockEX prevented propagation in cells 5 through 11. The heat generated from the initiated thermal event melted the heat sensitive textile material as intended, dispersing CellBlockEX loose-fill. While initially there was significant smoke that exited the seams of the box, once the CellBlockEX material was released it absorbed significant quantities of the smoke as can be viewed in the video recordings. Electrolyte leakage was observed in cells 5 and 6 but was absorbed by the CellBlockEX. There was no hazardous flame or hazardous fragments that exited the package. No outer package charring was observed. The test was performed with a quantity of CellBlockEX consistent with a ratio of 2.7 cubic inches per Watt hour (Wh) of cells. Performance would likely be improved with a greater quantity of CellBlockEX, e.g. 3-5 Cubic inches per Wh (in/Wh). The maximum internal temperature recorded was 675.3°C. The maximum external temperature recorded was 91.2°C on the box top. The result was positive in that the thermal runaway was suppressed and fully contained, the CellBlockEX absorbed the gas from the thermal event, leaking electrolyte was absorbed and contained and propagation was limited. Additional testing is planned to demonstrate more effective propagation prevention by separating the test cells.

Prepared by:


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Reviewed by:


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List of Attachments:

Attachment 1: Test Photos
Attachment 2: Thermocouple Data

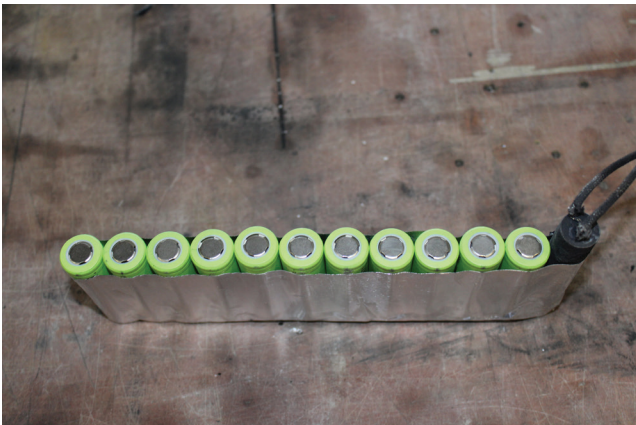
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Inside package view



Battery assembly view



Battery assembly top view



Battery assembly with thermocouples view in box



Top view of box



End view of box



Top view post test



Top/back view post test



Top/right view post test



Top/left view post test



Bottom/front view post test



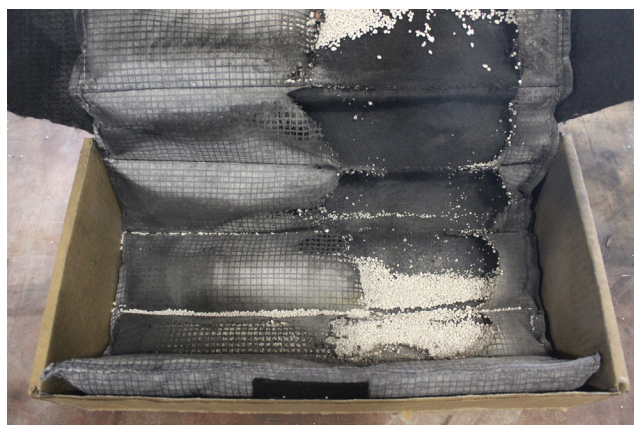
Open view post test



Open closeup view post test



Open closeup view post test



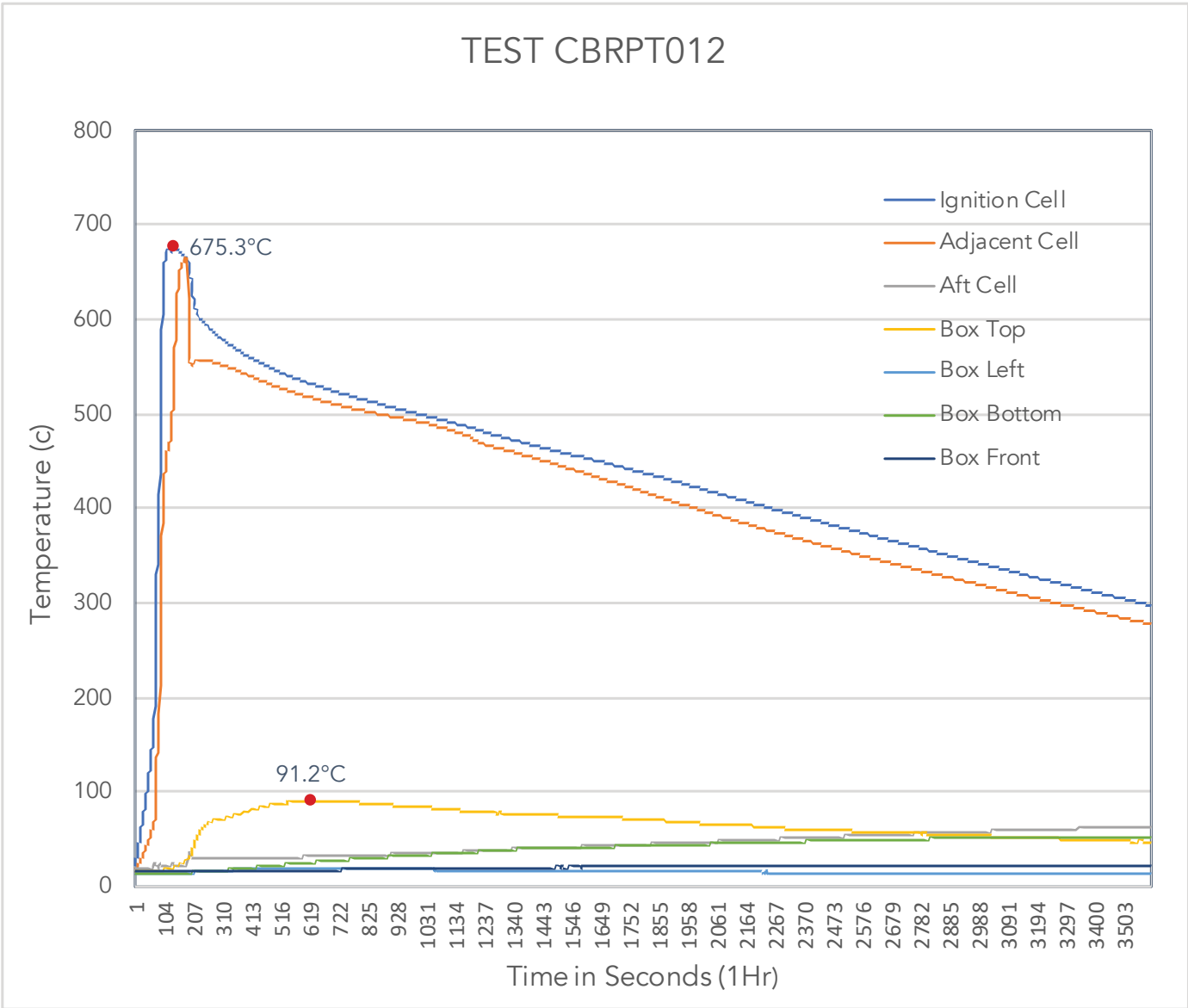
Open/emptied view post test



Inside lid view post test



Battery assembly view post test



Thermocouple data

Maximum internal temperature reached 675.3°C. Maximum exterior temperature reached 91.2°C on box top.