

Potential Hazards of Halotron BrX(2BTP) in Lithium Ion Fires

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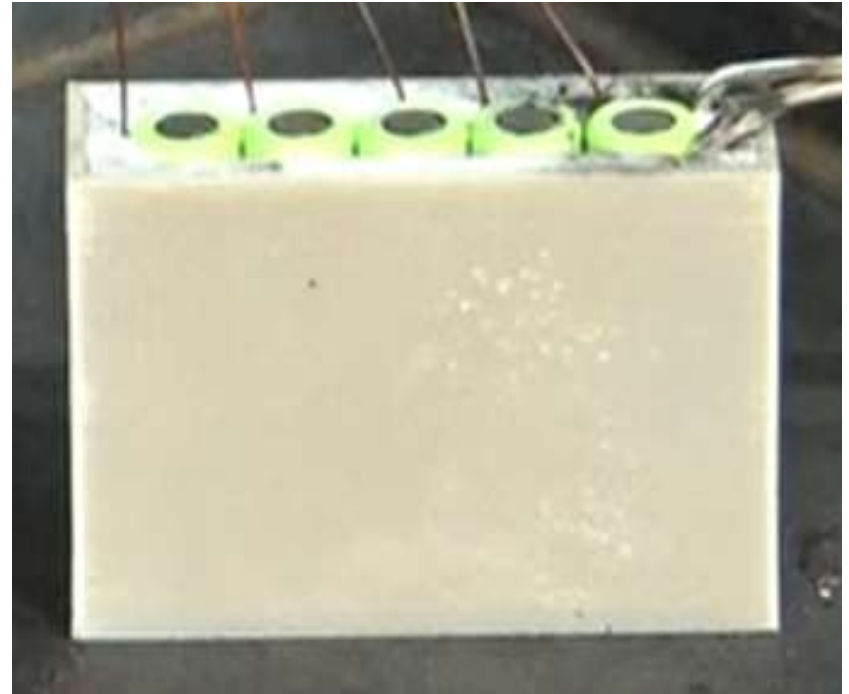
**Federal Aviation
Administration**

Background

- Lithium Ion fires produce high temperature environments which could lead to the break down of the extinguishing agent used.
- 2-bromo-3,3,3-trifluoropropene, which is the chemical makeup of (2-BTP) breaks down to extinguish the fire and some of the byproducts are Hydrofluoric (HF) and Hydrobromic (HBr) acid gases.
- The acid gases HF and HBr can cause severe respiratory complications and skin irritation.
- A lithium ion fire will be simulated in a controlled environment and the extinguishing agent 2-BTP will be introduced to the fire.
- A profile of the Concentration of gases vs Time will be measured with analytical techniques.
- This will provide an estimate of the level of toxicity that occupants of the flight deck could be exposed to due to decomposition products.

Recap Of Previous Test

- Effectiveness of Halon 1211 and Halotron BrX(2BTP) against lithium ion cell fires
- Five 18650 cells each fitted with a type-k thermocouple
- The five cells were tightly packed into the 3D printed case lined with ceramic micro board with the exception of the cover
- The right most cell fitted with the cartridge heater



Recap of Previous Test

The below pictures shows the cells during thermal runaway before, during, and after Halon 1211 was discharged.



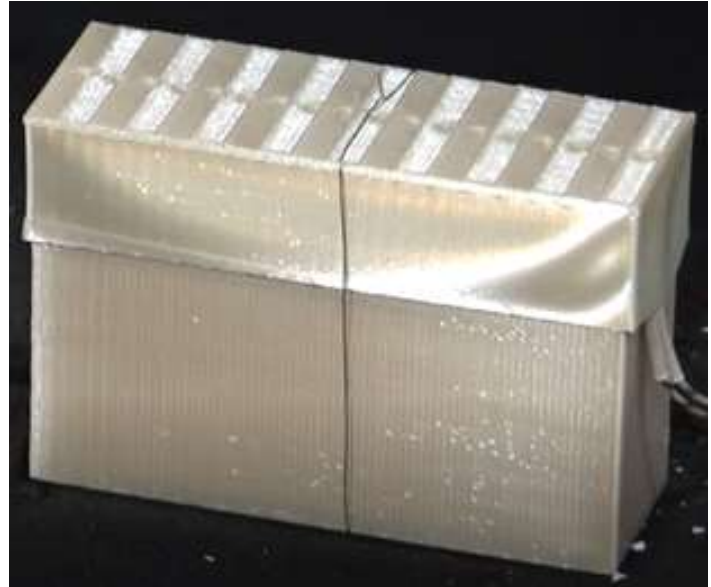
Recap of Previous Test

The below picture shows the cells during thermal runaway before, during, and after 2-BTP (Halotron BrX) was discharged.



Recap of Previous Test

3D printed batter case using polyetherimide (PIE)
thermoplastic material



Phase 2 Of Testing

- **Test will be conducted in 9'x9' room**
- **Cells will be set into thermal runaway propagation as in previous test.**
- **Halotron BrX(2BTP) will be introduced to the event after thermal runaway has propagated to the third cell.**
- **Acid gases produced from the event will be collected from two set heights**
- **Possible iterations of the test will have the fire source at ground level, bench level and or overhead compartment level**