

# ThreatID: Lithium-ion Battery Decommissioning

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Lithium-ion batteries are prevalent in our society and used in everything from electric vehicles to personal devices. Disposal of used batteries represents a challenge, as even old or partially charged devices present deflagration hazards if exposed to heat, puncture, or other forms of perturbation. A method for decommissioning Li-ion batteries is to immerse them in a brine solution, which ostensibly de-energizes the electrical cells such that the batteries can be transported and discarded safely. However, this process is not trivial for remediation personnel as it results in the liberation of numerous gases that are highly toxic and flammable. As such, having a means to detect and identify these gases and to determine when they are no longer present is crucial to the decommissioning process.

In a recent case study, an agency was contracted to decommission numerous types of batteries including Li-ion cells and other electrical components that had been damaged in a large-scale fire event. The agency planned to deploy the brine solution method but was also interested in testing its efficacy and learning what gaseous components may be generated. Batteries were soaked in 55-gallon drums and smaller containers, and gaseous samples were extracted from headspaces using Tedlar bags. Initial air monitoring of the headspaces yielded some interesting and unexpected results, which prompted the need for additional gas identification.

The agency’s approach was to use ThreatID™, a portable analyzer for identifying powders, liquids, gas, vapors, and complex mixtures based on Fourier transform infrared (FTIR) technology.

The ThreatID can identify over 27,600 hazardous chemicals, including over 5,600 gases at low parts-per-million (ppm) levels, in less than 1 minute. A certified instructor was on-site for the endeavor to conduct the measurements and report results back to technical experts. From the headspace sampling, the ThreatID primarily identified methane and ammonia.

Reachback personnel confirmed the results and even identified some very minute components through detailed spectral data review. These additional materials included acetylene, formaldehyde, ethene, and even some unidentifiable substances. The ThreatID gas-phase results were confirmed on-site using colorimetric tubes which detected methane, ammonia, and formaldehyde

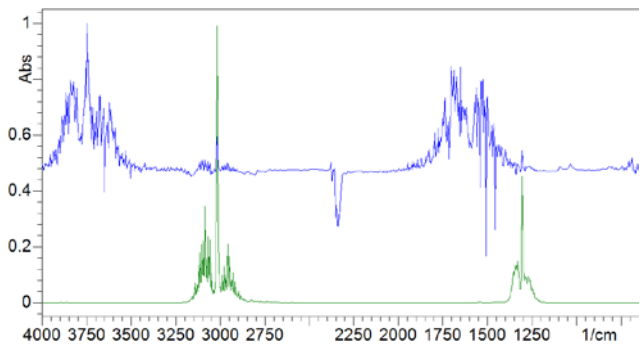
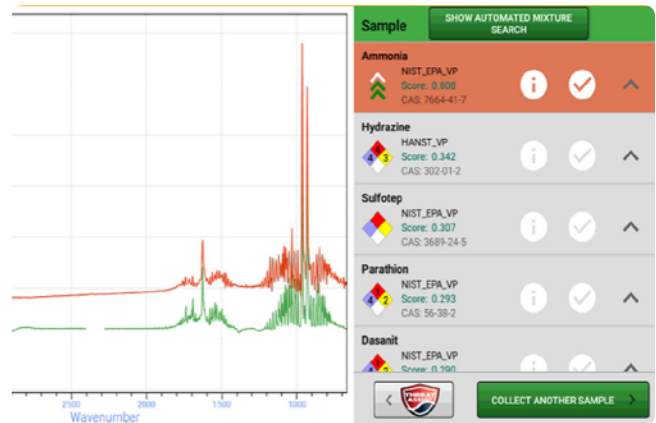


*The remnants of an exploded li-ion battery. Source: PETER PEREIRA/The Standard-Times*

Interestingly, the presence of ammonia and volatile organic compounds (VOCs) was not expected based on initial supposition and readings from basic air monitors. Headspace analyses showed that even after

the batteries were deemed “safe,” toxic and flammable materials continued to off-gas. The study proved that after a fire or other disastrous event when batteries are inactive, they may still pose significant hazards and must be properly monitored. By rapidly identifying the liberating gases and using secondary technologies to confirm them, the correct hazard associations can be made and greatly accelerate the time scale of future decommissioning projects.

This event was a success by demonstrating that the brine solution method must be further optimized to fully decommission Li-ion and other battery types to render them safe for transport and disposal. Without FTIR gas identification, the clean-up effort would have been plagued with uncertainties and require significantly more time to properly remediate the lurking potential hazards.



The sample CNB018a best matches with a small amount of methane. There are a couple of small peaks around 1000cm<sup>-1</sup> that are too low to identify.

No other materials were identified.

*Reachback Spectral Interpretation for sample CNB018a, matching Methane.*