

Lithium Batteries In Research at U of M

Collaboration and Lessons Learned

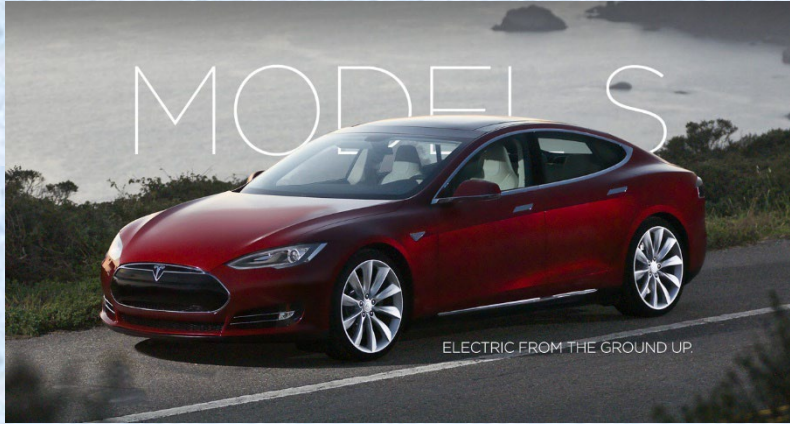
Will Dawson

University of Michigan

EHS Department

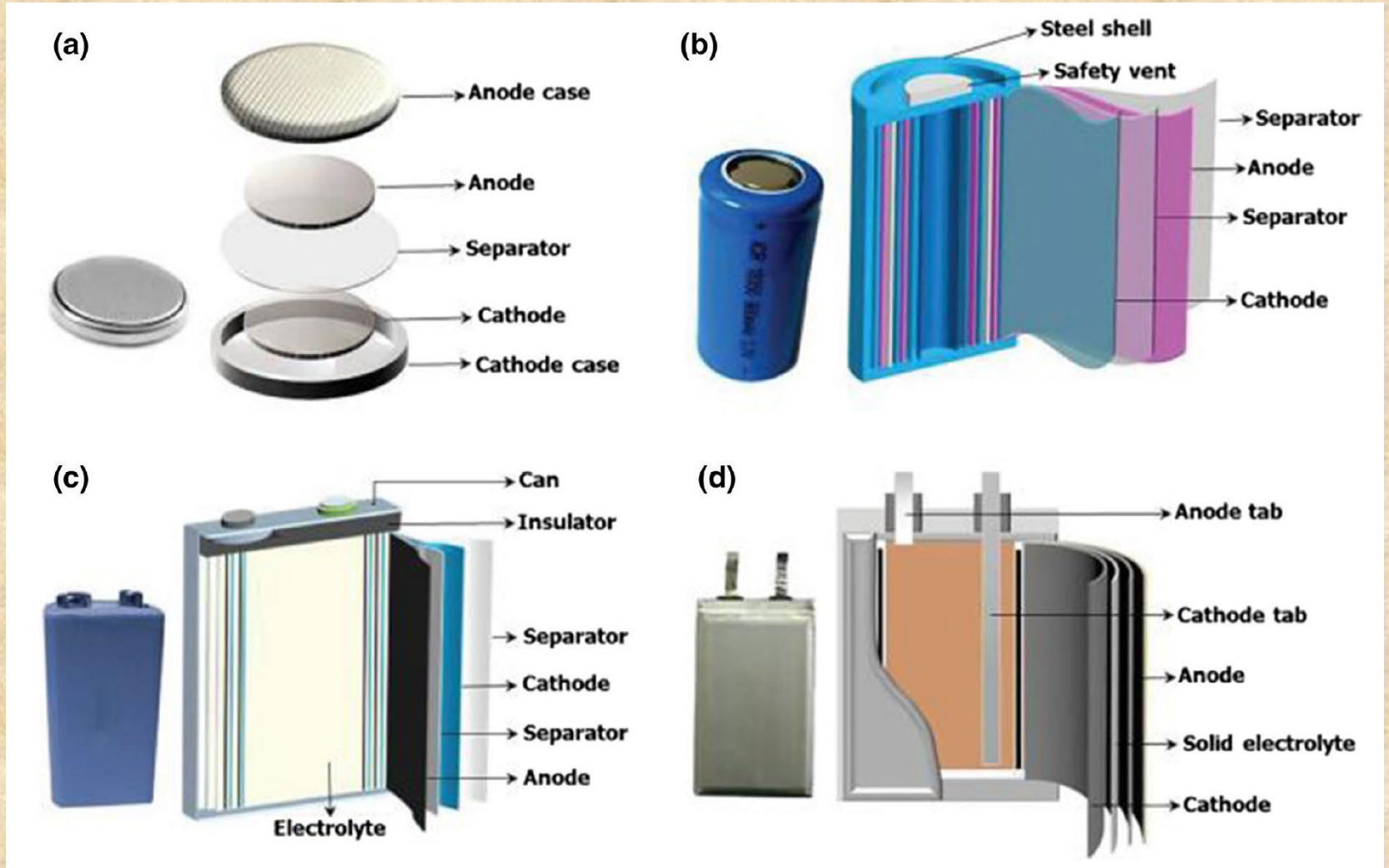
Research Health & Safety

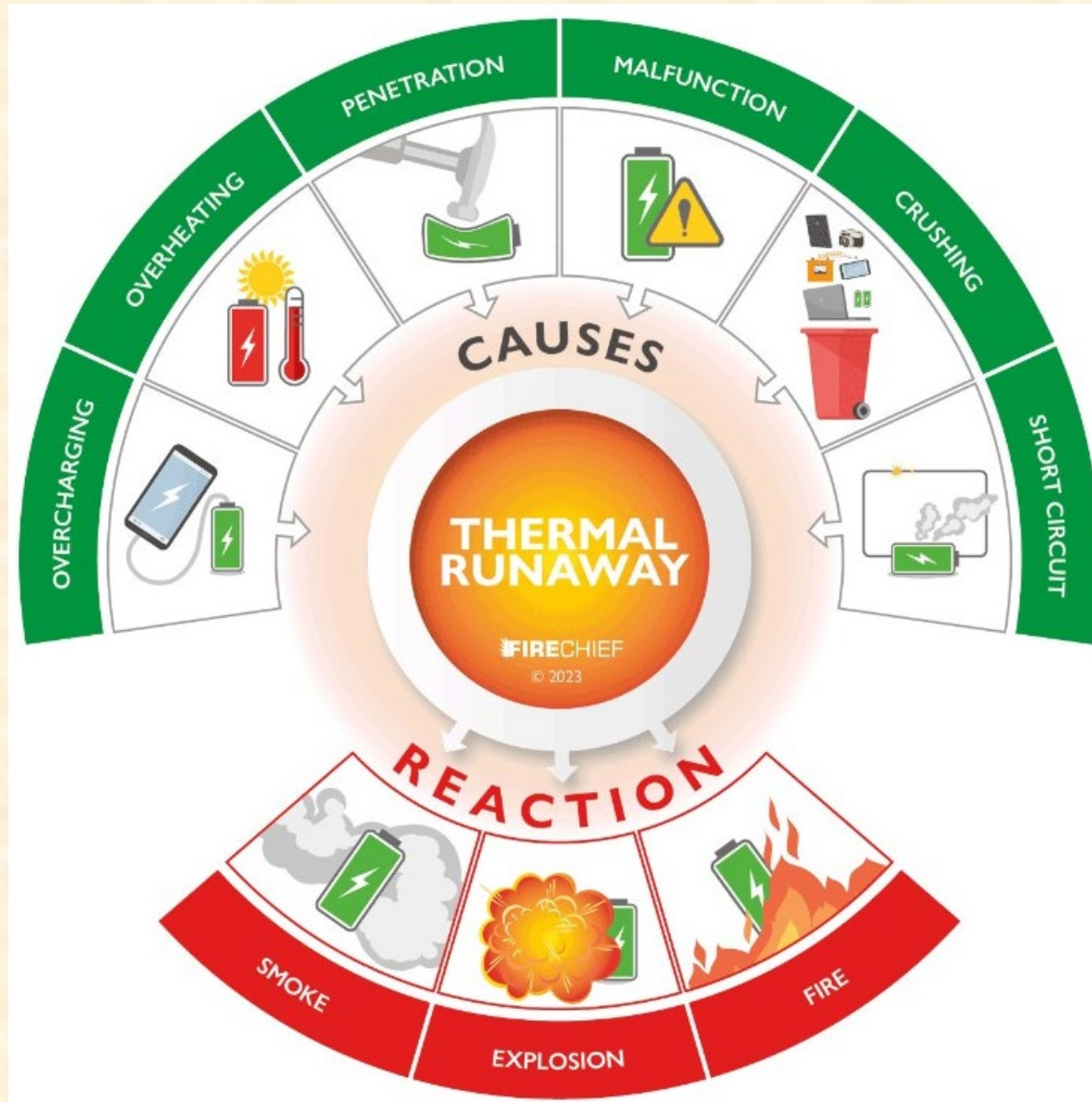
Working with College of Engineering



They're Everywhere!!!!









Sometimes batteries fail



What happened to make me so interested in battery safety?

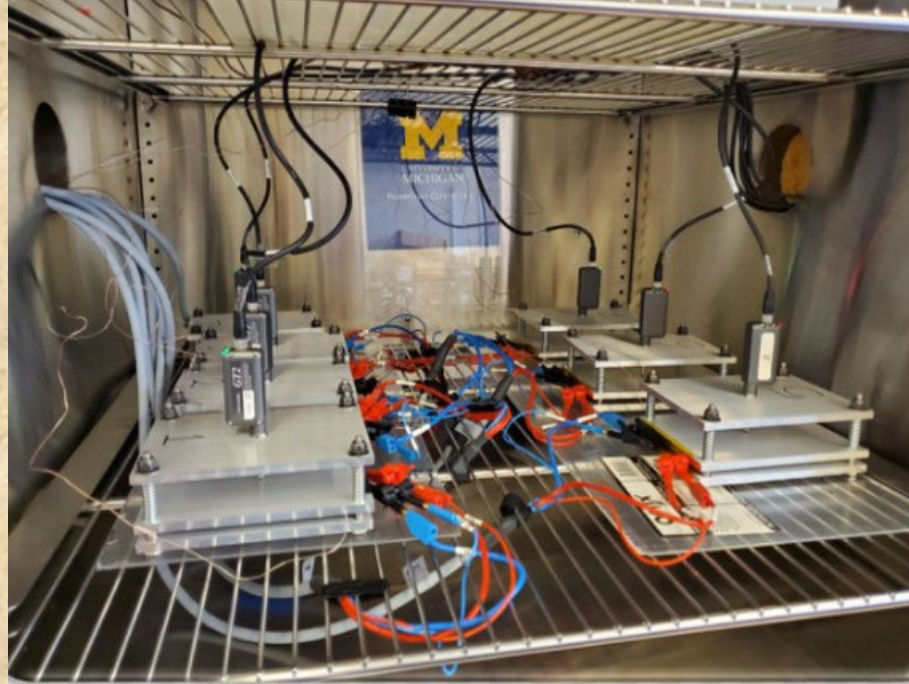
March 14, 2019 @ 0645

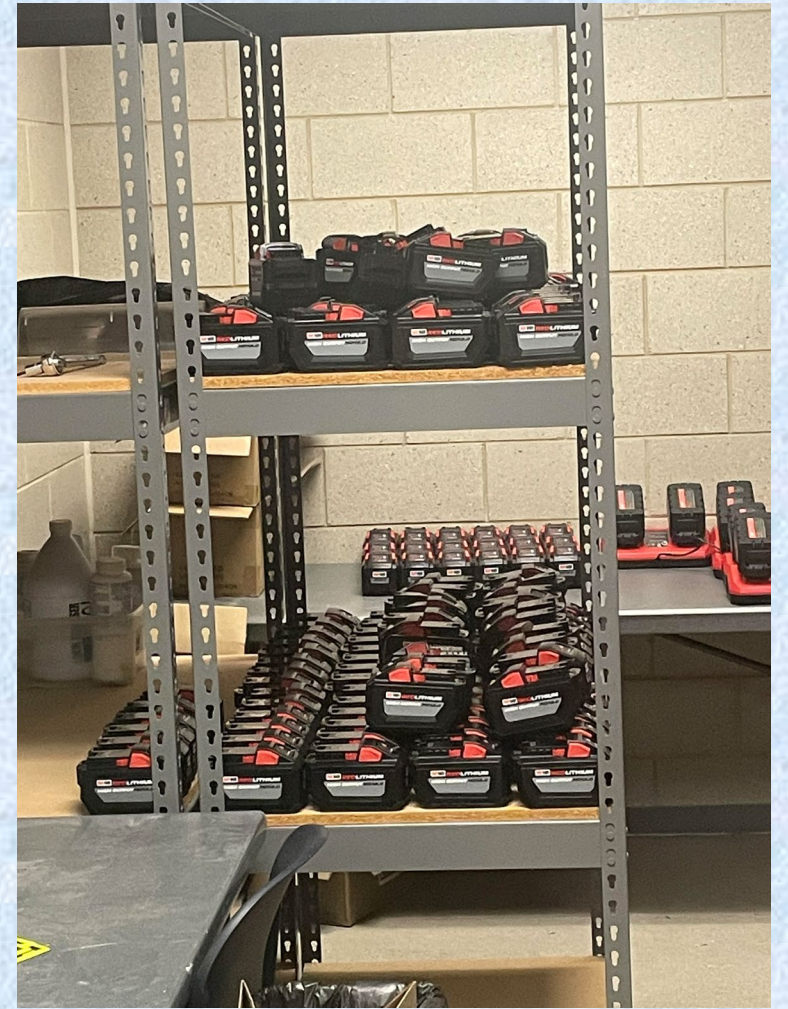




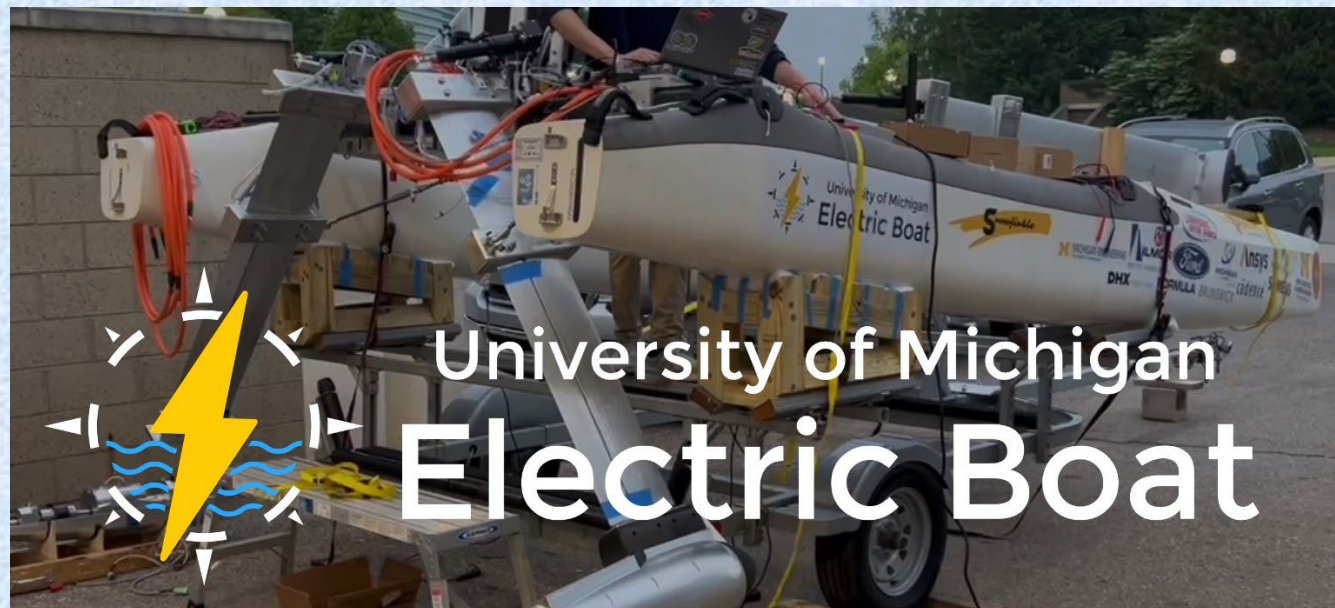
The small battery in this device caused the total loss







University Weapons Detection Battery Charging Room



University of Michigan Electric Boat

SPARK Electric Racing ATLAS

SPARK's most ambitious and advanced superbike to date. Boasting world class technology, with a completely custom lightweight trellis chassis, high voltage battery and integrated technology for a telemetric track advantage. Designed and manufactured to be an e-superbike killer.

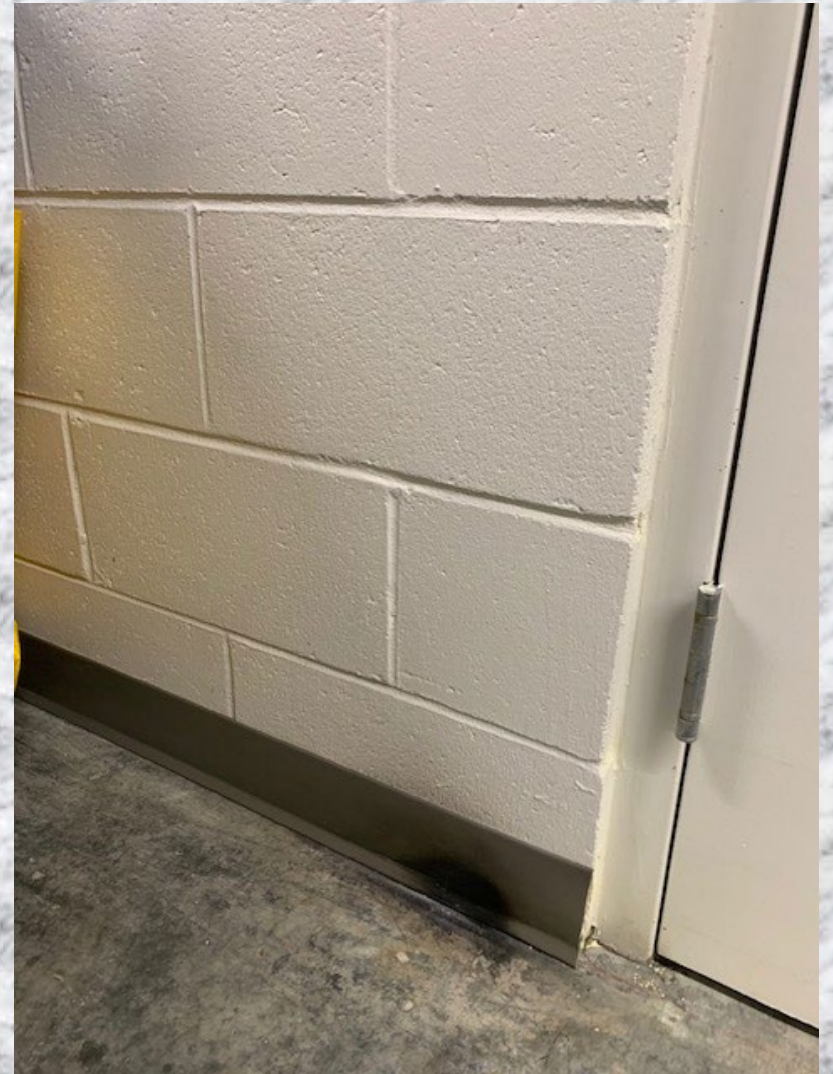
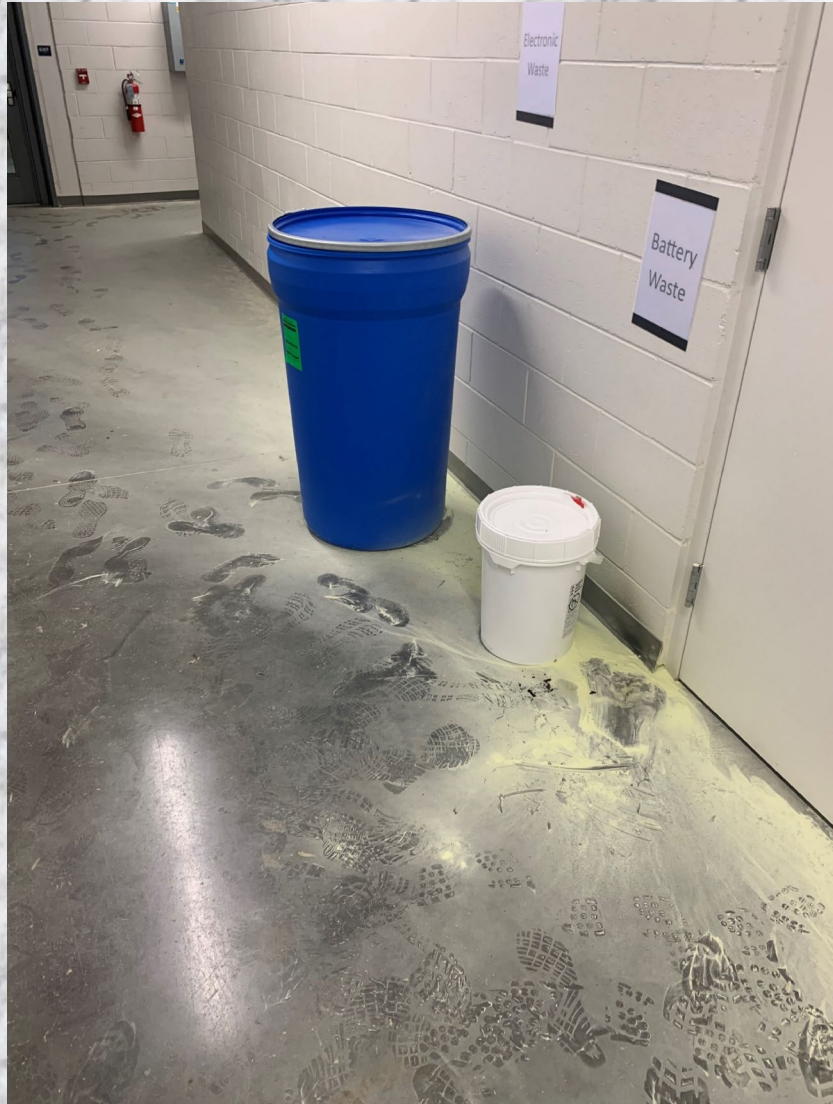
Speed	Performance	Battery & Weight
150+ mph	125+ HP	8.5 kWh
0-60 mph < 3s	120+ Nm Torque	280 lbs. Curb

[GET A CLOSER LOOK](#)

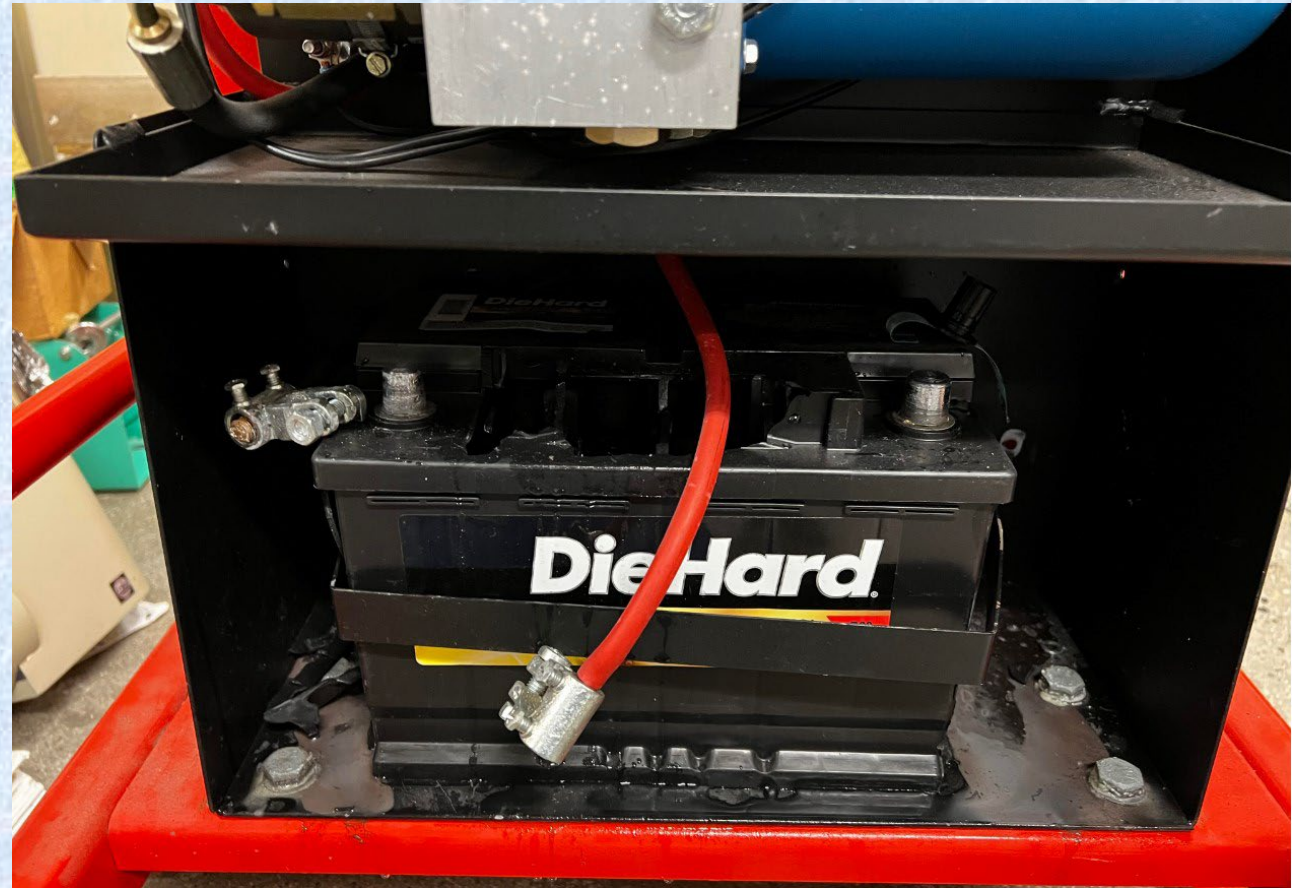


Past Incidents On Campus

- Battery deconstructed and lithium thrown in trash that reacted with solvent on wipe. Student threw lab coat over trash bin.
- Battery on charger that began to off gas and compromise the cells within the battery.
- After tearing down a battery for analysis, some pyrophoric material was thrown into a large waste barrel containing organic solvent and paper towels.
- Battery left on charger that led to over charging causing battery to overheat and swell.
- Vehicle battery on charger placed in engine compartment. Vehicle hood was lowered onto charger cables causing arching with the charger, battery, and hood.







FXB battery on charger
full runaway!

Lab battery on charger
full runaway!



Collaboration For Change

Collaboration For Change



Research Health and Safety
Fire Safety Services
HazMat



College of Engineering Facilities



Life Safety Systems
Aka Fire Extinguisher shop

Lithium Batteries in Research

Guidance

Date: 03/25/24

Applies To:

This Guideline applies to research users of lithium-ion (Li-ion) and lithium polymer (LiPo) cells and battery packs by anyone on the University of Michigan (U-M) Ann Arbor, Flint, and Dearborn campuses, and other University owned properties (e.g. Biological Station, Pellston, MI; Stinchfield Woods, Pinckney, MI; Camp Davis, Jackson, WY).

The U-M supports the safe use of Li-ion and LiPo batteries in the course of research and educational activities and other endeavors in the pursuit of the University's mission. This document provides guidance for the safe use and handling of these types of batteries under normal and emergency conditions on U-M properties and off U-M properties for U-M sanctioned events.

Table of Contents

DEFINITIONS 1

EHS Lithium Battery Guidance Documents and Poster

Electric Transportation Vehicles in University Buildings

Guideline

Issue Date: 4/17/2023

Revision Date: Newly Issued

Applies To: All University personnel as well as all contractors, vendors, and visitors who operate, own an Electric Transportation Vehicle on University Property.

How to prepare batteries for recycling

Spent lithium batteries and batteries 9 volts or higher, should have the terminals covered with non-conductive tape (electrical tape, packing tape, or duct tape).



9 Volt Batteries
tape over the positive and negative posts



12 Volt Batteries
tape over the positive and negative posts



Universal Waste Label

The Universal Waste label must be affixed on all waste containers used to collect spent batteries and include:

- Accumulation Start Date (the first day a battery is placed in the pail)
- Universal Battery(ies)
- Contact Information

Spent batteries must be collected in a **1 or 5-gallon white plastic pail**. For lead acid batteries and batteries too large to fit in a container, call Hazardous Materials Management.

When the container is between 2/3 and 3/4 full, or it has been 10 months since the accumulation start date, call Hazardous Materials Management or complete the online waste form to schedule pick up.



1 or 5 gallon white plastic pail



To order supplies, call (734) 763-4568 or complete the online Waste and Supply Request form

myumi.ch/NK5EV



More information on Lithium Battery Guidance

myumi.ch/DwZ54

Batteries in Non-Research Locations

Guidance

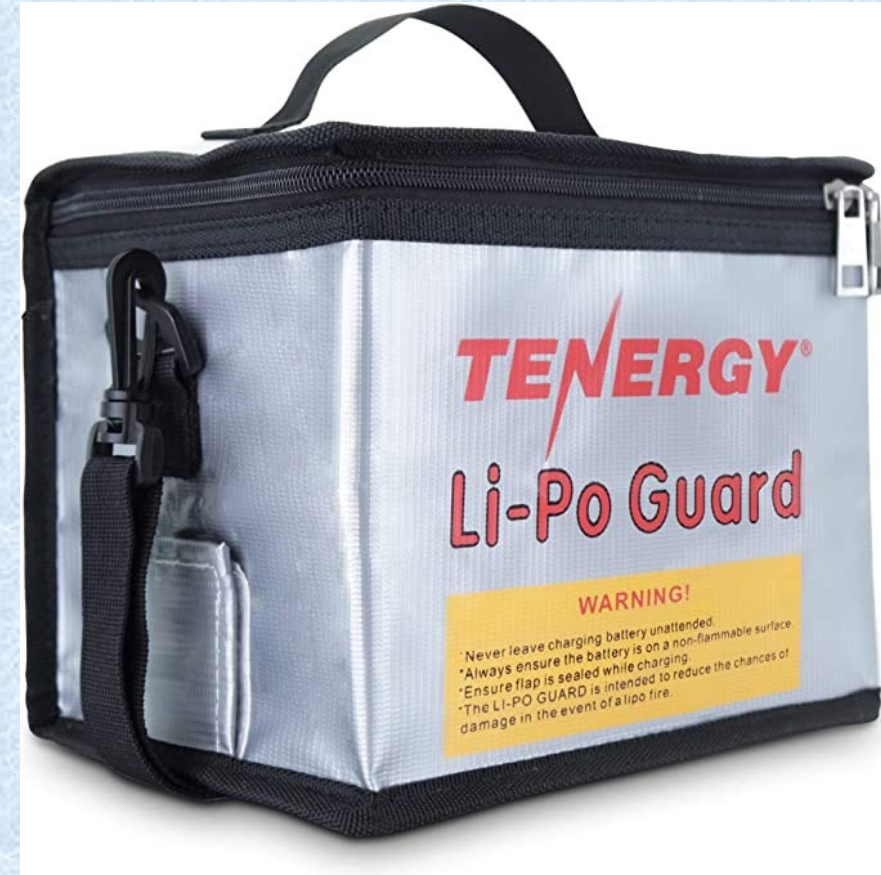
Issue Date: 3/29/2024

Applies To:

This Guideline applies non research users of lithium-ion (Li-ion) and lithium polymer (LiPo) cells, charging stations, battery packs, and battery powered equipment on Ann Arbor campus, Dearborn campus, Flint campus, other University owned properties (e.g. Biological Station, Pellston, MI; Stinchfield Woods, Pinckney, MI; Camp Davis, Jackson, WY).

RESPONSIBILITY

Custodial/Grounds/Plant Operations/Athletics



What is AVD?

AVD is an aqueous dispersion of chemically exfoliated vermiculite. It is applied to lithium battery fires as a mist, extinguishing them and preventing the propagation of the fire.

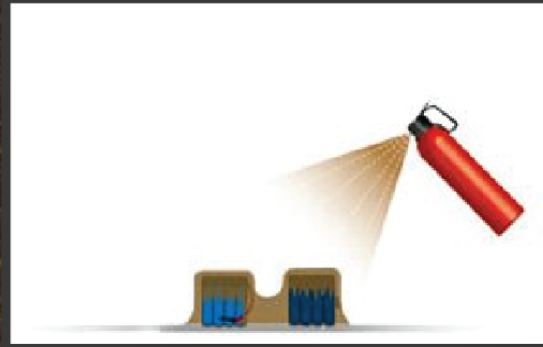
Vermiculite is a naturally occurring mineral of hydrated laminar aluminum-iron-magnesium silicates. It is both chemically and physically inert. Consisting of thin, flat flakes containing microscopic layers of water.

The chemical exfoliation of vermiculite produces microscopic, individual platelets that are freely suspended in water. This yields a stable aqueous dispersion of vermiculite to be used as a lithium battery fire extinguishing agent.





Lithium batteries exposed to heat, physical/impact damage, or overcharging, goes into thermal runaway leading to the release of hot flammable gases



The hot flammable gases ignite and burn vigorously at high temperatures and rapidly spread the fire to the surrounding cells and flammable material



AVD is applied as a fine mist, which instantly cools the batteries and extinguishes the flames bringing the fire under control



AVD encapsulates the fuel source and insulates the cells, preventing further propagation of thermal runaway and reduce the risk of reignition or explosion

Where will battery research go from here?



Pilot Program Proof Of Concept for AVD's



Thank you for attending!