ECOCYCLE GROUP

ecocycle
Your Specialist Recycler

ecoe-waste
your electronics recycler

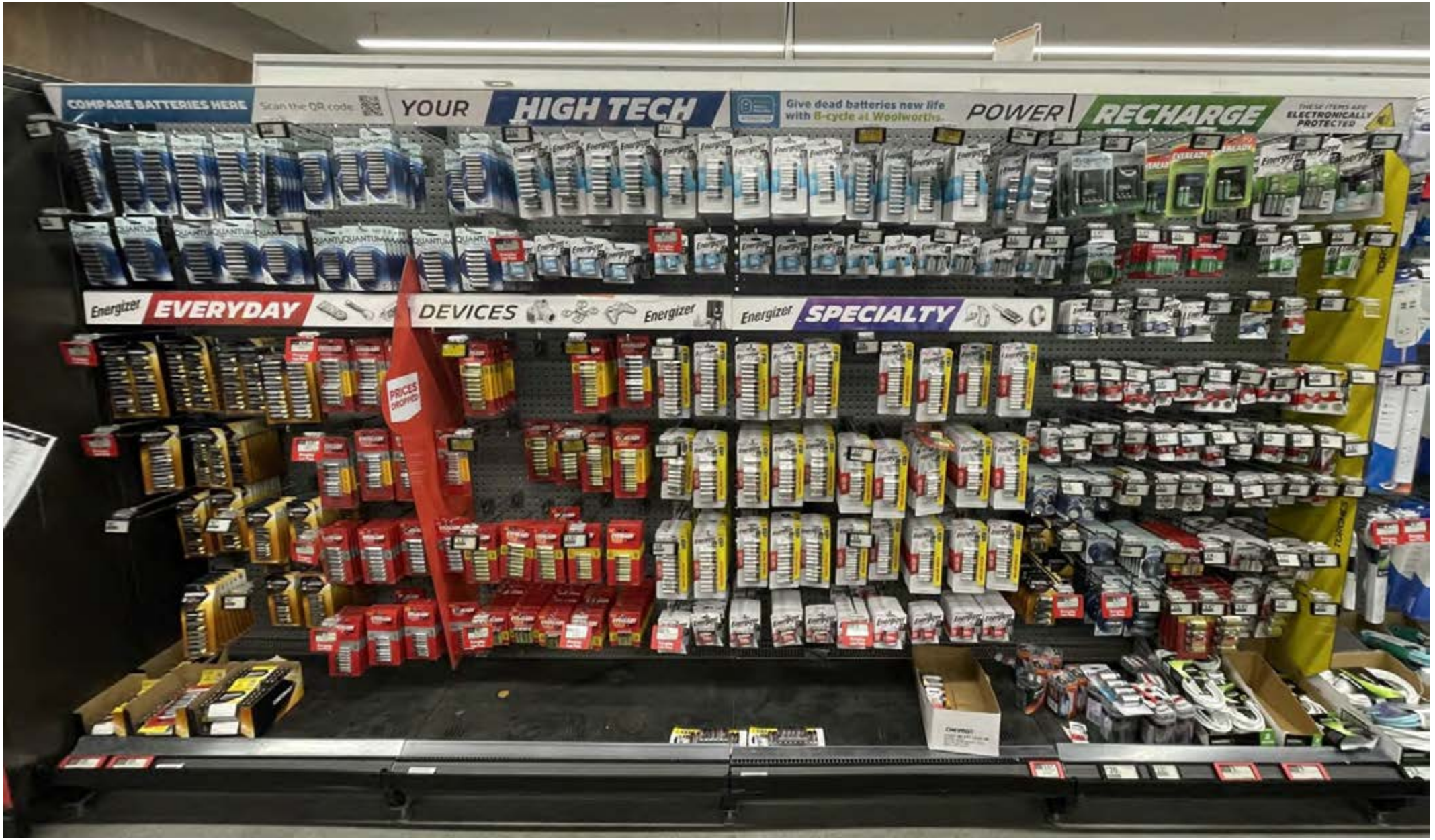
ecobatt
your battery recycler

ecobattsafety

Waste Lithium batteries and Lithium battery embedded devices:
"A Waste Management crisis that is yet to become worse before it is going to get better."

- Batteries store electrical energy in chemical form (Electrochemistry)
- Lithium Batteries are safe when used to manufactures specifications
- Since 2019 Lithium-ion battery development - one of the most active contemporary research areas.
- Lithium-ion and Lithium-Metal Batteries are a dominant energy storage technology due to their high energy, size flexibility, power capability and relative cost.
- End of Life Batteries are found in every waste stream – est. 10,000 – 12,000 adverse events pa.

Consumers choice and lack awareness



(Know your Li-ion Batteries)
Safety for Lithium-Ion Batteries – check FRNSW for formal advice.

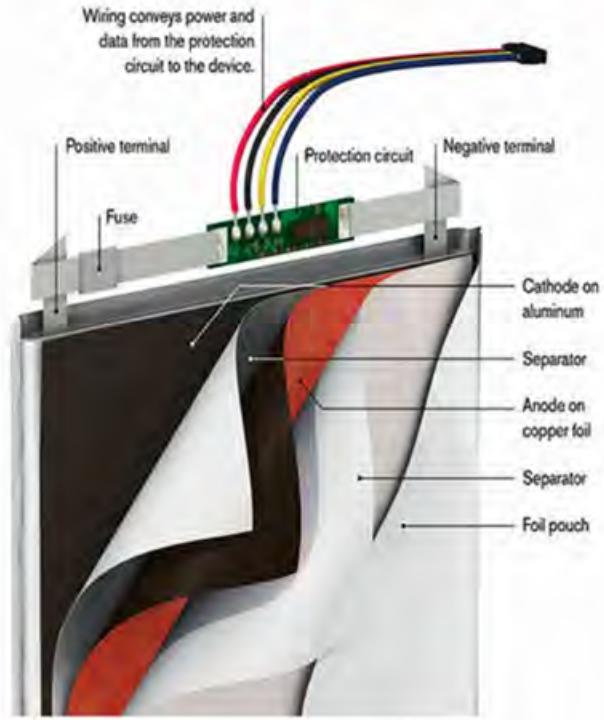
EV, BESS, e-bikes, e-scooters, Tool batteries, Household Batteries Button Cells

Chargers:	**Always use the originally supplied Battery Charger**
Lithium-ion Family of Chemistries	**Do Not overcharge** the battery (timer and temperature) **Do Not over-discharge** the Battery (safety cutoff Volt setting) **Do Not short circuit** a Lithium Battery
Heat:	**Do not leave** a Lithium battery in Sun or near a heat source
Physical Damage:	- swollen batteries – gas buildup - damage to casing - breach of case wall
Safety First - Emergency Response :	**Keep cool - bucket of sand – encapsulate; or submerge in water**
Hissing and Gassing:	Walk way – risk of uncontrolled energy release
Fire suppressants:	Sand, Vermiculite, **CellBlockEX** – recommended.
Fire extinguisher:	F500, AVD, LithEx, Other: AB, E, C – not for Lib class.
Fumes/Gasses/Electrolyte:	Toxic – Do not Inhale – seek medical help.

Who reads the fine print?

Lithium-ion Batteries

Lithium-ion and Lithium Metal Batteries are Safe when used within manufactures specifications

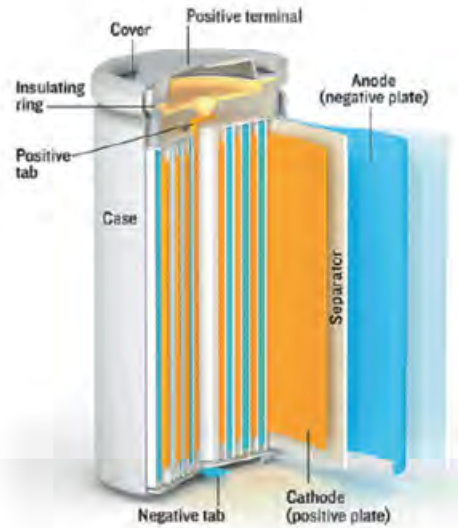


Lithium Battery families:

- **NCA:** Nickel Cobalt Aluminium ($LiNi_xCo_yAl_zO_2$) or Li-NCA
- **NMC:** Nickel Manganese Cobalt ($LiNi_xMn_yCo_zO_2$) or Li-NMC
- **LCO/NCO:** Lithium (Nickel) Cobalt Oxide ($LiCoO_2$) or Li-NCO
- **LiPo/LiPol:** Lithium Polymer Batteries are differently packaged - (high risk if damaged).

- **LFP:** Lithium Iron Phosphate ($LiFePO_4$)
- **LTO:** Lithium Titanate Oxide
- **LMO:** Lithium Manganese Oxide ($LiMn_2O_4$)

- **LSB:** Lithium Sulphur Dioxide (Li-SO_2) *Primary Battery*
- **LTC:** Lithium Thionyl Chloride (Li-$SOCl_2$) *Primary Battery*
- **LMP SSB:** Lithium Metal Polymer Solid State Battery



Thermal runaway of Lithium-ion Battery Cell Cluster

(Laboratory abuse testing – natural progression (Fig1) and with CellBlockEX Lib suppressant on a Lib cell cluster (Fig2)

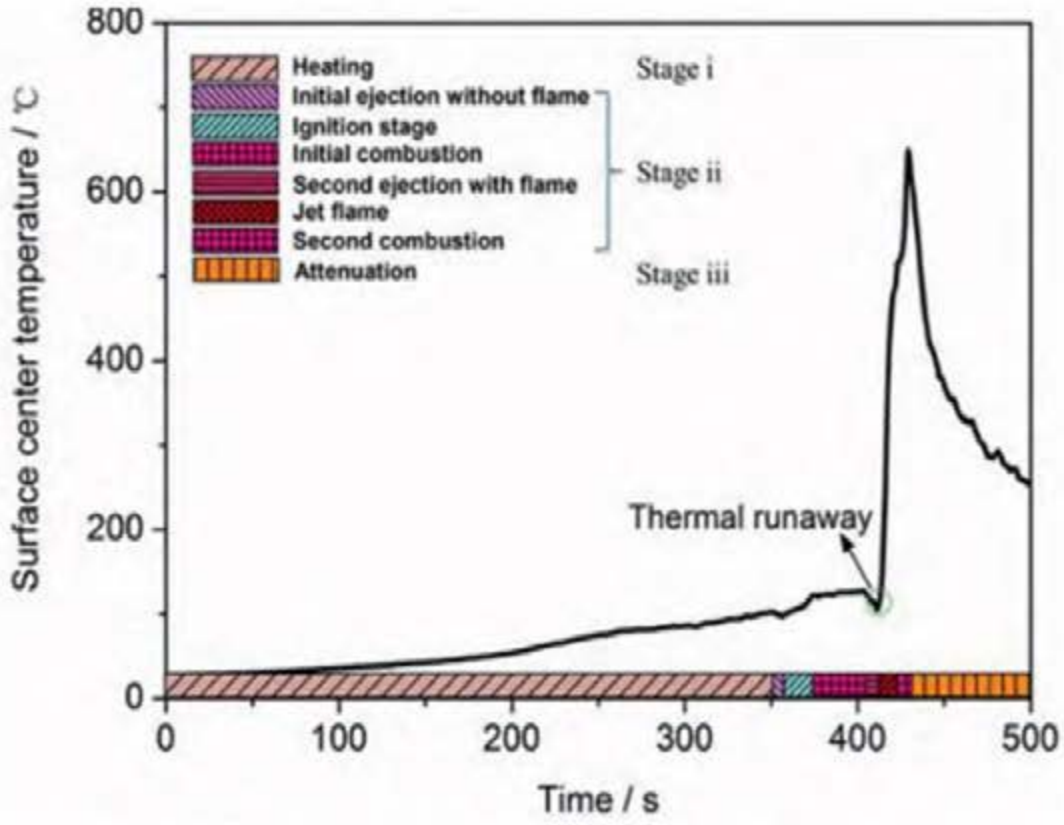


Fig1. Thermal runaway - single cell Lib event Time/Temp progression – without intervention *(note: release of toxic gases ~6L/Wh or 6000L/kWh)*

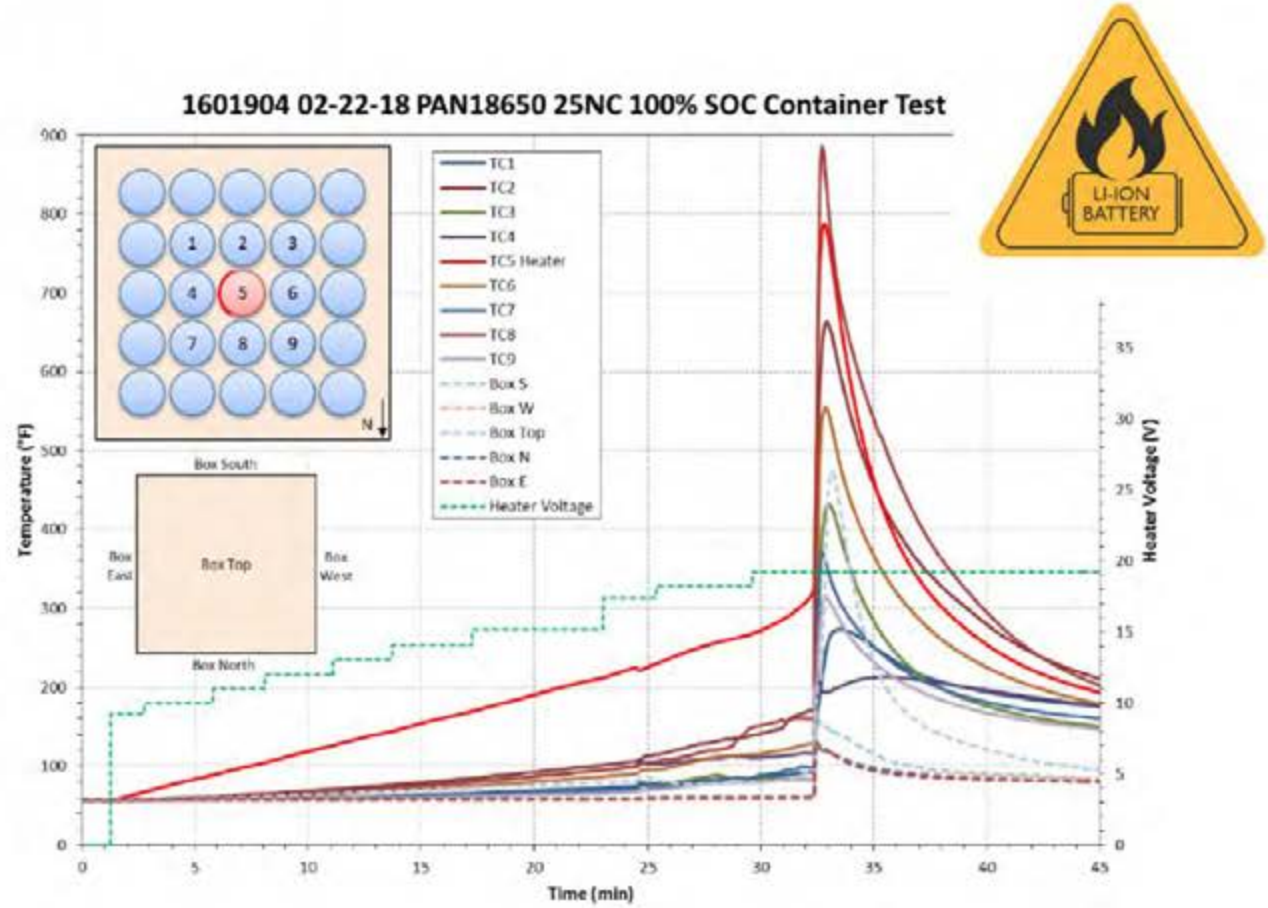
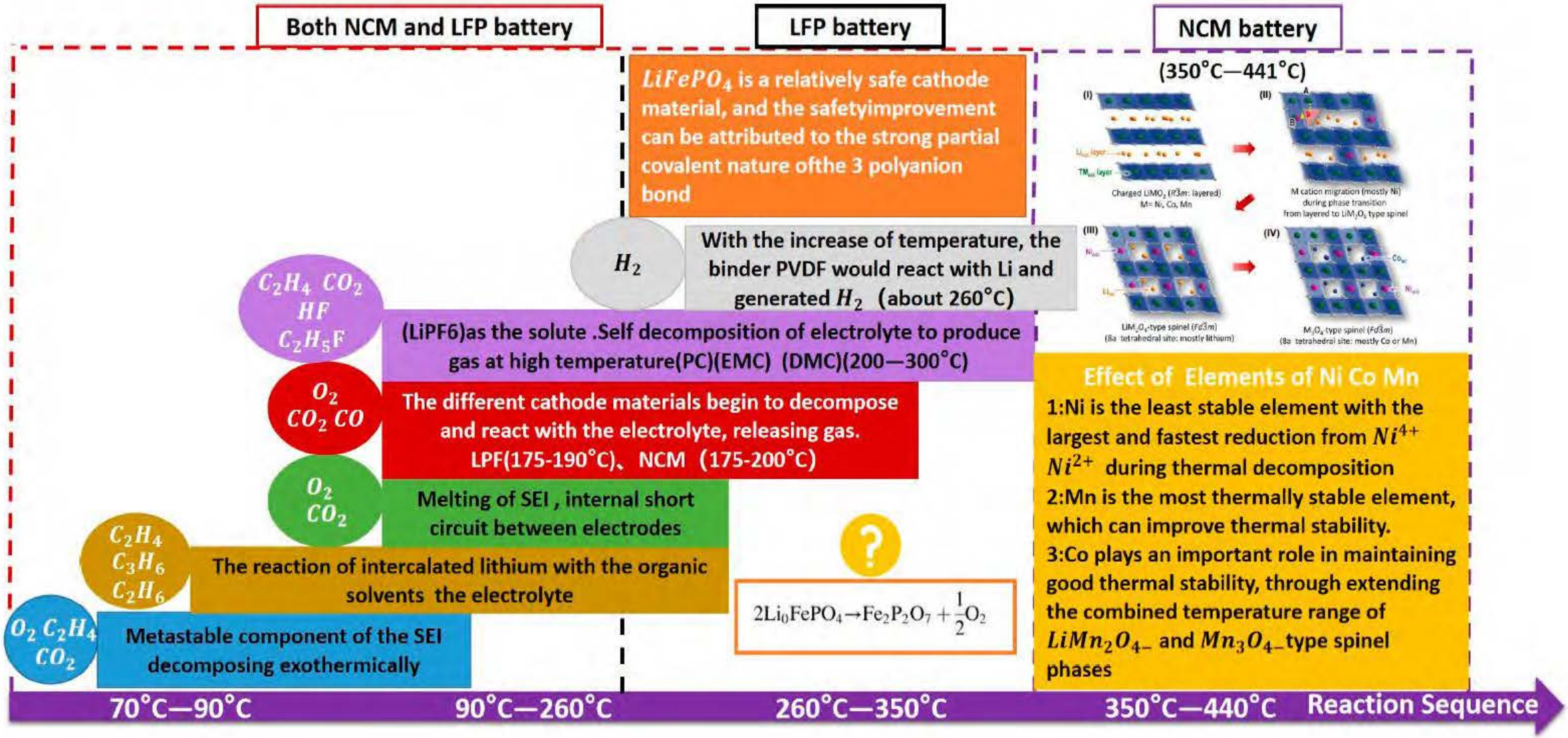


Fig2. Multi cell Lib thermal runaway event – first response CellBlockEX Lib fire suppressant – Time/Temp response (CellBlockEx offers toxic gas modulation when correctly applied, note Temp. in *F)

Exothermic thermal runaway (TR) characteristics ref. MDPI pub. Electronics 12071603



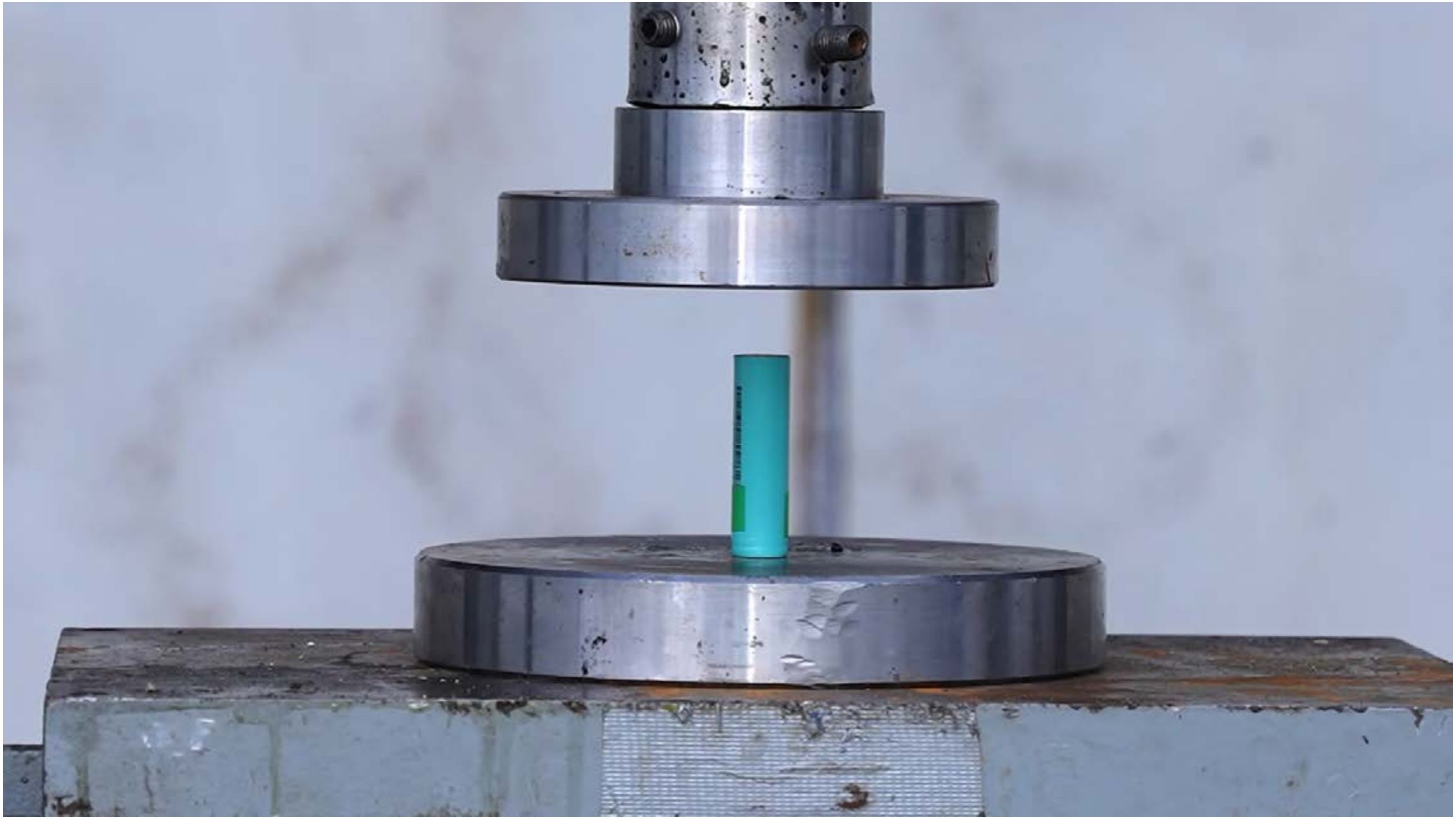
Lib sample, a common form - 18650

Here is a table outlining the actual 18650 battery size:

Specification	Dimension
Diameter	18 mm
Length	65 mm
Total Volume	Approximately 16.5 cm³

Voltage	Description
2.5V – 4.2V	Actual voltage range during operation
3.6V	Nominal voltage for lithium-ion 18650 batteries
3.7V	Nominal voltage for lithium-ion 18650 batteries
3.2V	Nominal voltage for lithium iron phosphate (LiFePO4) 18650 batteries
4.0V – 4.2V	Fully charged voltage for lithium-ion 18650 batteries
2.5V – 3.0V	Typical cut-off voltage for lithium-ion 18650 batteries (low charge state)
2.0V – 2.5V	Minimum safe operating voltage for lithium-ion 18650 batteries

Capacity: 1,200mAh to 3,600mAh, depending on the model and chemistry



Toxic gases generated by a Lithium Battery fire event:

- **HF (Hydrogen Fluoride)**: Highly corrosive, toxic compound used in industrial applications like glass etching and metal refining.
- **CO (Carbon Monoxide)**: Colorless, odorless gas, dangerous, binds to hemoglobin in the blood, preventing oxygen transport.
- **HCN (Hydrogen Cyanide)**: Highly toxic chemical, interferes with cellular respiration - historically infamous for its lethal effects.
- **HCl (Hydrogen Chloride)**: Strong acid, commonly used in laboratories and industrial processes. In gaseous form, it's highly irritating to the respiratory system.
- **SO_2 (Sulfur Dioxide)**: Toxic gas with a sharp odor, can contribute to acid rain.
- **CH_4 (Methane)**: Major greenhouse gas, flammable and contributes to climate change.
- **High levels of Hydrogen (H_2)**: Hydrogen gas, non-toxic but highly flammable, in large amounts, it can displace oxygen, creating an asphyxiation hazard.

KEEP CONNECTED WITH US

Further details are available, please contact:

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SOCIALS:

SAFE COLLECTION CONTAINERS

Ecocycle offer a large range of speciality built and designed battery safety containers for the safe storage and transport of Lithium batteries. Containers are designed to fit all our clients' requirements, also available are thermal resistant bags for smaller laptop/phone and e-bike batteries to secure electric vehicle container storage and DG transport option.

- Thermal Safe Storage containers – 600l and 800l capacities
  DG/UN approved; fully enclosed battery storage containers can be used by clients to keep on site to store bulk batteries ready for recycling. Designed to contain a lithium thermal runaway event and provides and added layer of comfort, safety and fire prevention.

- Logbatt EV Safety battery Box (XL-1)
  Designed specifically to safely store and freight all types of electric vehicle batteries. Thermal insulation in the event of accident with inbuilt filter flue system to control internal environment. Built to DG regulations and tested under real Lithium battery thermal conditions.

- Electric Vehicle Rescue Container
  For the safe transport of any damaged electric vehicle with a potential battery issue. Built in Fire Pro lithium extinguishing system and advanced fire detection systems.

SMART-SENSOR BATTERY KIOSKS

- Industry best safety, proved reliability, efficiency, flexibility, national reach.
- Completely self-managed, battery collection kiosks with heat detection, fill rate monitoring and GPS and 24/7 unexpected event notification capability.
- Smart Sensor fill data is monitored by our Logistics team for pick-ups, automatically dispatched, removing the need for recycling vendor's staff/personnel to call for change-overs.
- Purpose built for the safe and convenient collection of Household batteries and offering fully managed services.
- Battery collection cabinets were implemented over 14 years throughout Europe with outstanding success.
- Ecobatt provide custom branding options for Smart Collection Units to be fully sign-written.
- UN/ADG approved containers, DG approved collection vehicles and DG qualified Drivers are provided.
- Smart Sensor units currently in operation nationally are exclusively provided by Ecobatt
- Major equipment and national service provider to the B-Cycle Product Stewardship Scheme.

ECOBATT – 7800 SMART-SENSOR BATTERY COLLECTION KIOSKS (ANZ)

Syd. 1170, Bne/GCC 1150, Melb. 1240, Adl. 580, Perth 580, NT 64, NZ 39

Ecocycle Group

SMART SENSOR TECHNOLOGY

- **Networked smart sensors monitor battery volumes** in all Battery kiosks
- **Real time heat detection** and monitoring with automatic notification by SMS and email for designated personnel and client security bunkers.
- **Cloud hosted services, available 24/7** and no need for maintenance
- Platform accessible and proven real time data visualisation tools.
- **Highly developed reporting system** to help manage the collection process.
- **The GPS enabled** at collection points and assigned depots.
- **Dynamic route planning** – most efficient routes daily for collection **based on live collection levels, critical time requirements** or defined schedule collections.
- **Instant routing reports, tracking fleet vehicles** dynamically and safely.

CellBlockEX® for Fire Prevention and Suppression

There is only one CellBlockEX® - the True Blue dry fire-suppressant capable of halting thermal propagation in devices, batteries or cells. CellBlockEX® is a multi-functional environmentally friendly proprietary mineral fire suppressant comprised of spheres with an open cellular pore structure. It is the core of CellBlock's products.

How it works

Oxygen Displacement - Covering the battery fire load with a sufficient layer of CellBlockEX® displaces available oxygen from the fire, starving if from external fuel.

Phase Change and Isolation - CellBlockEX® melts at ~815°C, well within the range of a lithium battery fire. The phase change from solid to semi-liquid acts as a heat sink, dissipating energy, while forming an impervious hard shell around the fire load. The formed crystalline capsule around the battery prevents ignition and surrounds areas of energy density, including adjacent cells or batteries in proximity.

Flammable Gas Disruption - Due to the nature of the CellBlockEX®'s multicellular structure, the flammable gas is forced into physically separated micro-pores, breaking it into smaller concentrations beneath the ignition threshold, thus disrupting flammability of the gas.

Sorbency of Fire Gases - CellBlockEX®'s micro-porous structure and dry surface bind to large flammable molecules and vapors reducing their total volume, limiting their contribution to environmental ignition or toxicity.

Your Ultimate Tool Kit for Fighting Battery Fires

ecobatt safety

Wall-Mounted EHS Kit

Allows for the fastest possible deployment of fire suppression tools and safety equipment. Easy access to the EHS kit and its contents makes it ideal for laboratory environments, hospitals, schools, offices and manufacturing settings.

PED-Pad Fire Suppression Pillow

- A quick and concise method of mitigating a lithium-ion battery fire, while decreasing risk to the fire-fighter and reducing interaction time.
- Place over flame to release the inner CellBlockEX®, CellBlock's industry trusted and proven mitigating agent used for fighting lithium-ion battery and device fires.

Fire Shield Blanket

- Provides and impervious barrier between the fire fighter and the burning device and increases the suppressive effect of the PED-Pad pillow.
- Constructed from strong fire resistant fabrics that have undergone rigorous testing.

CellBlock® High Heat Gloves

- These durable, high-dexterity gloves are designed to protect the user when approaching overheating devices.
- Manufactured using composite textiles made to withstand extreme temperatures.

Available in two options

- ✔ EHS Kit 180 Wh
- ✔ EHS HW Kit 1000 Wh

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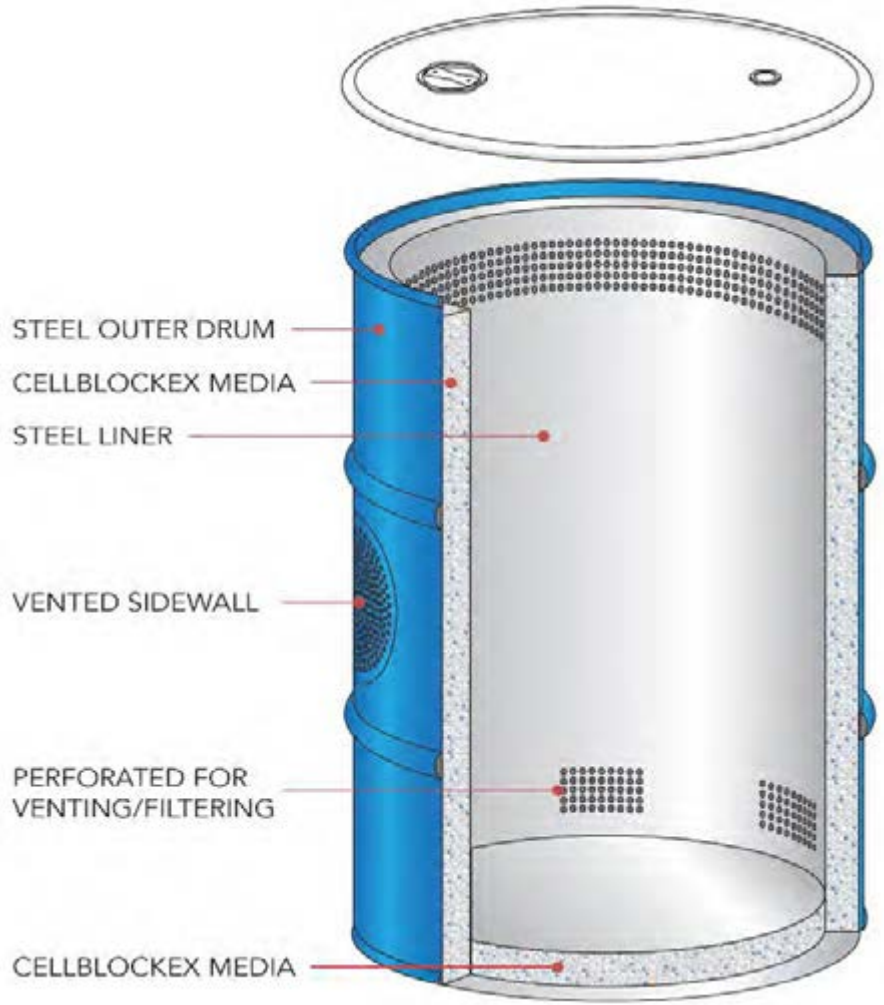

CellBlock® Max Drums

Leverage CellBlockEX® technology and patented packaging designs which impart powerful thermal runaway containment to achieve unmatched regulatory relief. Drums available in three sizes - 8, 16 and 55 Gallons.

- DOT Special Permit 21442 and Equivalency Certificate SU 13896 authorised; DOT Special Permit 20549
- P911 and P908 tested and compliant
- Safest and most cost effective solution for damaged batteries over 300 Wh

High Performance Packaging

- Ship lithium-ion batteries rated up to 1800 Wh including damaged/defective/recalled (DDR)
- Ship multiple DDR batteries per package

Patent nos. US 11,569,709, US 11,542,091

Simple Implementation

- Seamless integration and logistics with strategic battery recycling and recovery partners
- An off-the-shelf solution for the storage of high-energy batteries.

Safe E-Mobility Charging Solutions

Without the appropriate separation and safety measures in place, charging multiple high watt hour batteries poses a dormant but potentially devastating threat. CellBlock FCS's new Safe Charge racks were designed to accommodate e-bike batteries and to safely suppress fires in the event of a thermal runaway.

- Engineered to comply with fire codes and exceed fire marshal expectations of safety in the United States.
- First charging and storage system approved for exemptions from FDNY FC 309.3, including spacing requirements.
- Fire resistant barriers between each battery charging bay.
- CellBlockEX's brilliantly simple deployment system halts propagation, preventing the spread of fire to adjacent batteries.
- Powder-coated steel and aluminum construction.
- Rechargeable extinguishing system.
- Equipped with heavy-duty locking wheels.

MCR3036

Width	Width	Depth	Height	Weight	Batteries
5-Tier	103cm	81cm	195cm	340 kg	20

Height is inclusive of wheels. All sizes include FireShield cover.

Best-in-Class Textiles for Extreme Protection

The Safe Charge FireShield offers additional protection while providing easy access during business hours. Constructed from CellBlock's proprietary textiles, these covers have been tested at over 1000°C for 30 minutes.

- EBack panel features a single zipper for access to power strips and charger cords.
- Front panel zips on either side and rolls up when access is required.
- When fully zipped, the cover will contain flames and projectiles during a thermal runaway situation.
- Engineered to mitigate explosion potential.
- The FireShield is included with every Safe Charge Rack.

240V Powerstrips provides an outlet for each charging bay and velcro fasteners keep cords organised and compliant.

Wiring is provided for installation by a licensed electrician.

CellBlock
Fire Containment Systems

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KEEP CONNECTED WITH US

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