FLAMEBLOCK

MOLECULARLY ENGINEERED FIRE PROTECTION


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HOW DOES A LITHIUM-ION BATTERY WORK?

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A lithium-ion battery works by using lithium ions to move between two electrodes, typically made of graphite and lithium cobalt oxide.

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The movement of the lithium ions is facilitated by an electrolyte solution that separates the two electrodes and allows ions to move back and forth.

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WHY IS LITHIUM-ION BATTERIES SO DIFFICULT TO EXTINGUISH?

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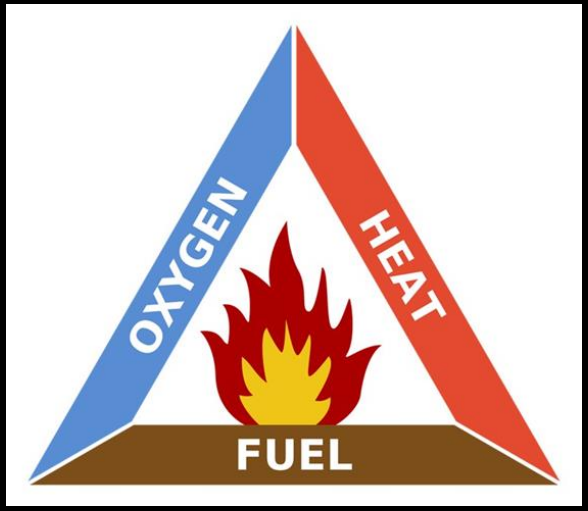

The Fire Triangle

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The Fire Triangle is a simple way of understanding the components of fire.

Each side of the triangle represents one of three components needed to have a fire – oxygen, fuel and heat.

Fire is a chemical reaction and without one of these components, fire cannot exist or be sustained

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Lithium-ion battery supplies it’s own:

Fuel

Heat

Oxygen

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Lithium-ion batteries contain a lot of energy in a small space.

Lithium is used as the cathode of the battery.

However, since lithium is unstable in the element form, the combination of lithium and oxygen, lithium oxide, is used for cathode.

What usually catches fire is the electrolyte liquid.

The electrolyte liquid swells up and releases toxic gasses.

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When it reaches a temperature of 150°C it changes the chemical makeup of the lithium and oxygen cathode.

This in turn releases the oxygen and that causes the thermal runaway from 150°C.

The electrolyte can also react with water, making traditional water-based fire fighting methods ineffective.

As long as the battery is charged, can the battery reignite

If the battery is exposed to outside oxygen, then it can reignite again.

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To fully extinguish a lithium-ion battery, the following has to happen:

1. Extinguish the fire.
2. Bring the temperature down to below 100° C
3. Keep the temperature below 100° C
4. Interrupt the combustion.
5. Get the battery to discharged.
6. Seal the battery off from outside oxygen.

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What is

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FlameBlock Lithium Black

FlameBlock Lithium Black is a complex mixture of minerals and dissolved organic and inorganic materials.

The inorganic materials include certain types of clays, and salts, that is dispersed in the aqueous phase, and can form a thick impervious layer on top of the substrate blocking access to air.

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FlameBlock Lithium Black takes into consideration the chemistry of the battery, as well as the response of the battery to high temperatures.

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FlameBlock Lithium Black include certain salts to bring the temperature of the fire to under 50°C and keep it there.

These salts in turn, also discharge the battery.

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FlameBlock Lithium Black introduce free radical scavengers to interfere with the combustion process.

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FlameBlock Lithium Black uses organic clays to cover and seal the battery.

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In conclusion:

1. FlameBlock Lithium Black extinguishes the fire.
2. FlameBlock Lithium Black brings the temperature to under 50°C
3. FlameBlock Lithium Black interrupts the free flow of oxygen.
4. FlameBlock Lithium Black discharges the battery.
5. FlameBlock Lithium Black seals the battery of from external oxygen.


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