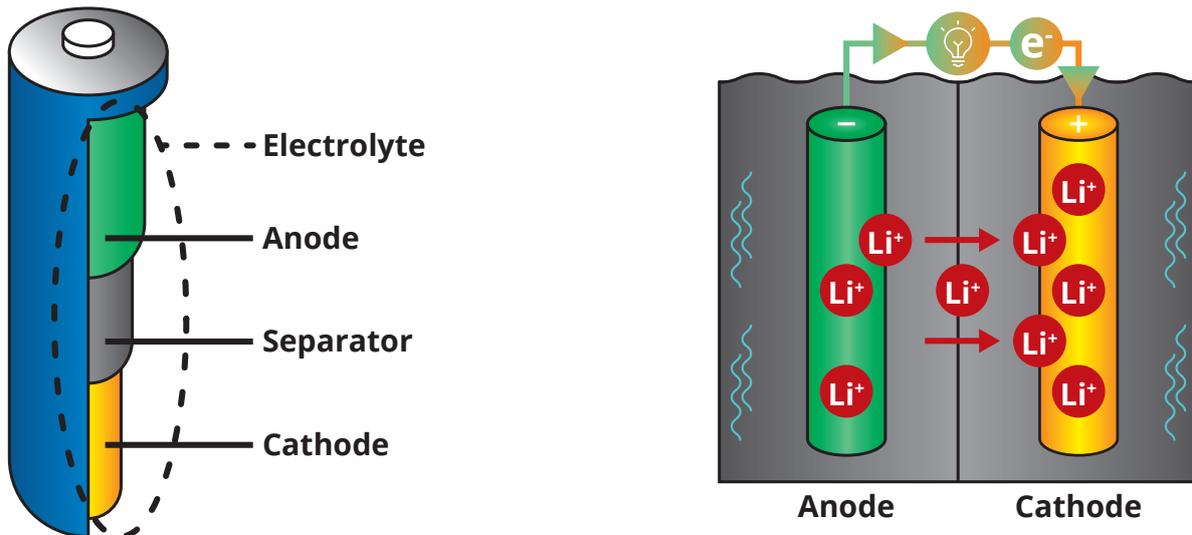


RELATED RISKS WITH LITHIUM-ION BATTERIES

A LITHIUM-ION BATTERY, WHAT IS IT ?

A Li-ion battery, or Li-ion accumulator, consists of two electrodes (cathode and anode) and an electrolyte ensuring the ionic exchange of the system. During discharge (use) of the battery, the ions pass from the anode to the cathode.

During charging the reverse occurs. These two electrodes are isolated by a separator that prevents a short circuit.



On the left, components of a Li-ion battery. On the right, principle of operation of a Li-ion battery when in use

WHAT ARE THE DANGERS RELATED TO THESE BATTERIES ?

Among the 50 potential accident scenarios identified by INERIS (National Institute of Industrial and Risk Environment) throughout the various stages of the batteries life cycle, 12 were considered critical.

They notably relate to the storage, charging and use steps. The most problematic consequence of those risks are battery fire (or metal fire).

This is a significant risk because the fire caused by lithium-ion batteries cannot be put out in a conventional way, the battery itself generating the oxygen molecules and heat necessary for combustion. It can then only be switched off with the help of special powders, all in a confined environment (at the risk of the powder losing its efficiency).

WHERE DOES THOSE BATTERY FIRES COME FROM ?

- **By thermal runaway due to overload or exposure to excessive temperatures**

A battery usually supplies the energy stored chemically during discharge in the form of electrical energy. However, it may be that not all the energy is supplied as electrical power, thus causes overheating that can reach up to 7 to 11 times the energy stored electrically. Given the structure of the battery, the reaction itself strengthens and causes critical overheating. The materials that make up the the battery also releases bound oxygen, which further fuels the fire.

- **By complete discharge**

Complete discharge due to the non-use of the battery for too long periods of time can damage the battery. If it is then exposed to temperatures that are too cold, it can cause decomposition of the electrolyte liquid and the formation of inflammable gases. The absence of liquid breaks the battery protection, leading to a short circuit or fire.

- **By mechanical damage**

Shocks or misuse can damage the internal structure of the battery and lead to deterioration of the battery separator, leading to a short circuit or a fire.

HOW TO STORE THEM SAFELY ?

Storage recommendations depends on the size and power of the battery :

- **Low-power lithium batteries** (less than 100 Wh per battery)

These are the small batteries contained in cellphones or computers for example. No special safety regulations apply here, in the way that all the manufacturer's instructions and safety locations are respected. For larger stored quantities (volume greater than 7 m³) the indications for lithium batteries of medium power apply.

- **Medium-power lithium batteries** (more than 100 Wh per battery and 12 kg gross weight per battery)

Batteries in this category are used in electric bicycles, electric scooters, electric vehicles or various similar small vehicles. Those must be stored in separate fire resistant enclosures (e. g. a fire room or a safety cabinet). They must not be stored with other products and this area must be the subject of constant monitoring. For larger stored quantities (area occupied at 60 m²) the indications for high-power lithium batteries apply.

- **High-power lithium batteries** (100 Wh per battery and 12 kg gross per battery)

Batteries in this category are mainly used in electric cars as well as in large stand-alone devices. Recommendations for the storage of medium-power batteries shall constitute the basis for reflection. However, securities must be implemented in a case by case after study. If the storage space is large, fire protection must be adapted. If the use of sprinklers is allowed, it must be as localized as possible and we will recommend separating the batteries and storing them in a confined environment that is able to prevent a fire.

Find all our security points and our products on our website
www.ecosafesa.com

Sources :

www.BatteryUniversity.com
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