



## LITHIUM BATTERIES

The main features of lithium-ion batteries are high energy and power density, which make this energy storage technology suitable for portable electronics, power tools, etc ...

Electrochemical supercapacitors can accumulate relatively higher energy densities than conventional capacitors and are used for example for hybrid and electric vehicles.

**In conditions of non-ordinary operation of the battery, the cells can undergo an uncontrolled process called "thermal runaway". Thermal runaway implies a rapid increase in the temperature of the battery cells, accompanied by the release of flammable gases, which could be easily triggered by the high temperature reached by the battery, causing a fire. The thermal runaway can also be responsible for mechanical effects such as the projection of fragments and the release of toxic gases and vapors.**

Of the various products, emissions of fluorine compounds are the most worrying. Hydrofluoric acid (HF) is one of these, but there are also others such as phosphorus oxyfluoride (POF<sub>3</sub>).

These compounds are formed by the fluorine contained within the components of the lithium ion cell, such as the binder (PVDF) or the lithium salt most used in the electrolyte (LiPF<sub>6</sub>).

**Hydrofluoric acid is extremely toxic** both by inhalation of the gaseous form and by contact with the aqueous solution; the affinity of the fluoride ion with calcium and magnesium ions damages bone tissue and nerve pathways. Ingestion is often fatal.

The total amount of HF varies considerably for different cell types. The simple explanation for this variation may be the different relative quantities of electrolyte and filler materials in the cells, but information on such quantities for commercial batteries is difficult to find.

**The transport of lithium batteries, cells and accumulators, and of the equipment that contains them, is configured as the transport of dangerous goods** and, therefore, is subject to a UN classification and specific modes of transport, which also depend on the quantity of the items and the state of storage.

The term "lithium batteries" indicates elements and batteries of two specific types: metal lithium and ion lithium.

Lithium elements (cells), modules and batteries: alone, contained in equipment, packed with equipment, installed in freight transport units, are transported in Class 9 and assigned to the following categories:

- UN 3090 LITHIUM METALLIC BATTERIES (including lithium alloy batteries)
- UN 3091 LITHIUM METALLIC BATTERIES CONTAINED IN EQUIPMENT (including lithium alloy batteries)
- UN 3091 LITHIUM METALLIC BATTERIES PACKED WITH EQUIPMENT (including lithium alloy batteries)
- UN 3480 LITHIUM ION BATTERIES (including polymer lithium ion batteries)
- UN 3481 LITHIUM ION BATTERIES CONTAINED IN EQUIPMENT (including polymer lithium ion batteries)
- UN 3481 LITHIUM ION BATTERIES PACKED WITH EQUIPMENT (including polymer lithium ion batteries)
- UN 3536 LITHIUM BATTERIES INSTALLED IN GOODS TRANSPORT UNIT lithium ion batteries or lithium metal batteries

Elements and batteries must be protected to prevent short circuits.

This includes protection against contact with conductive materials within the same packaging which could cause a short circuit. Lithium batteries and accumulators, at the end of their life, and the electronic waste that contain them, are classified - by the UN - as dangerous goods. Their transport by road must take place according to the ADR regulation.

Airbank has just introduced in its catalogue a set of products for the correct management of lithium batteries.