

SAR 101A Lithium Batteries – General and SP 188



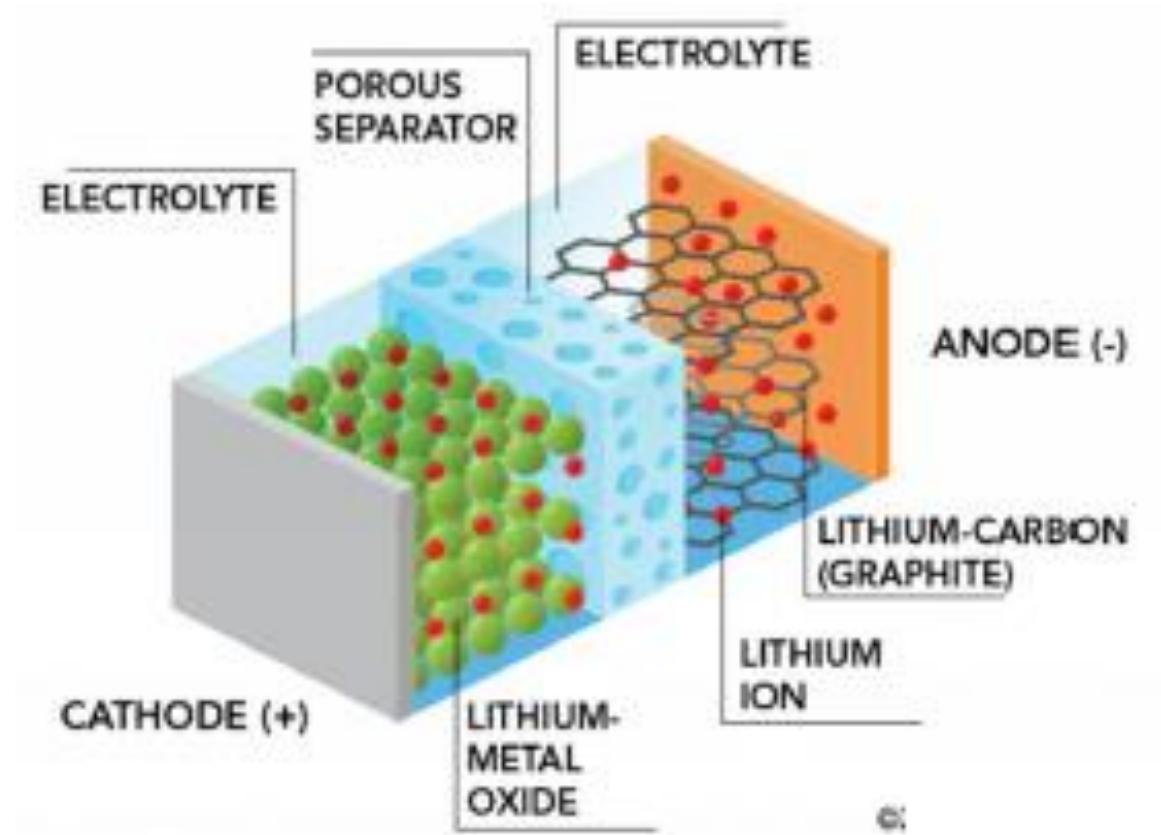
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What are Li-ion batteries?

- Cell comprises
 - Two electrodes
 - Electrolyte
 - Separator material
 - Current collector
- Majority anodes – graphite-based
- Cathode – Lithium based
- Electrolyte
- Discharge
- Charge



Battery Cells, Battery Modules and Battery Packs



Cylindrical cell



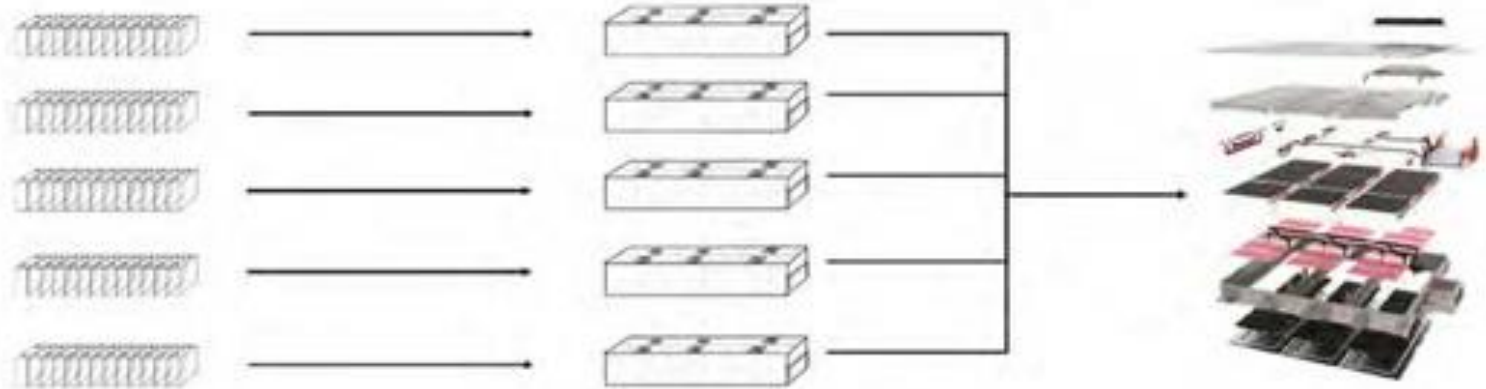
Pouch cell



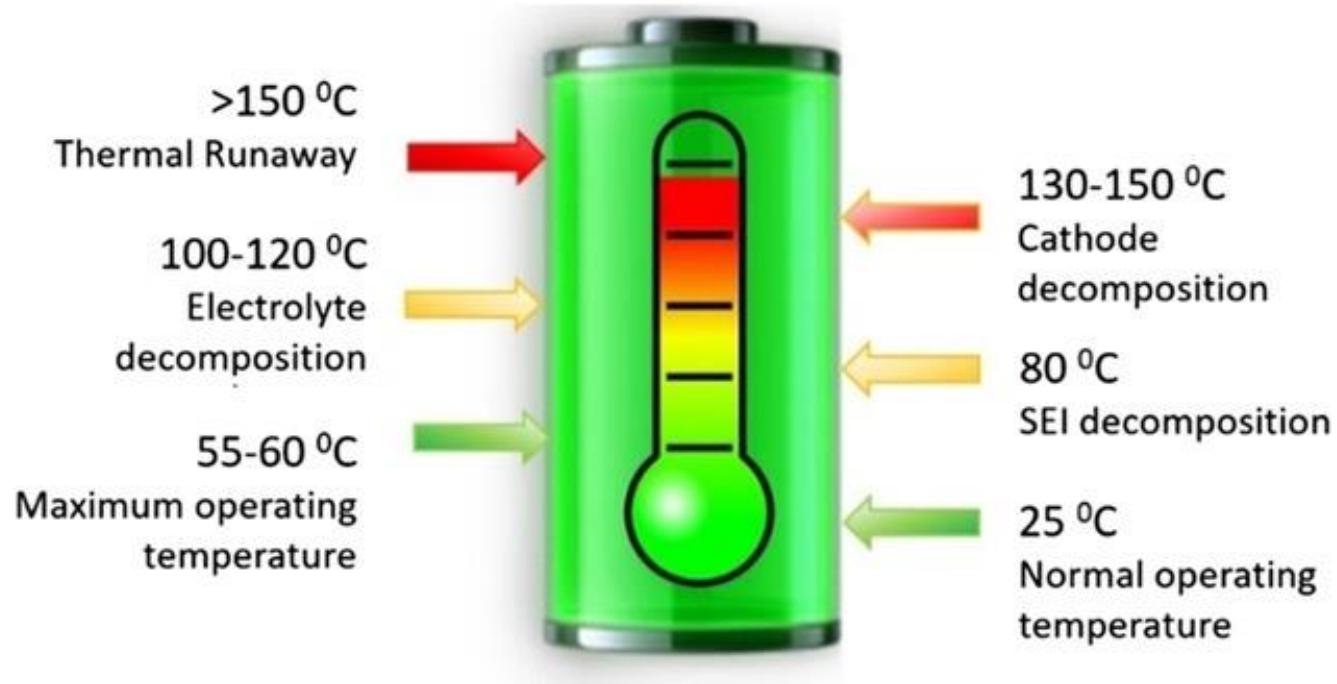
Prismatic cell

Cell
Types

Cell,
Module,
Pack

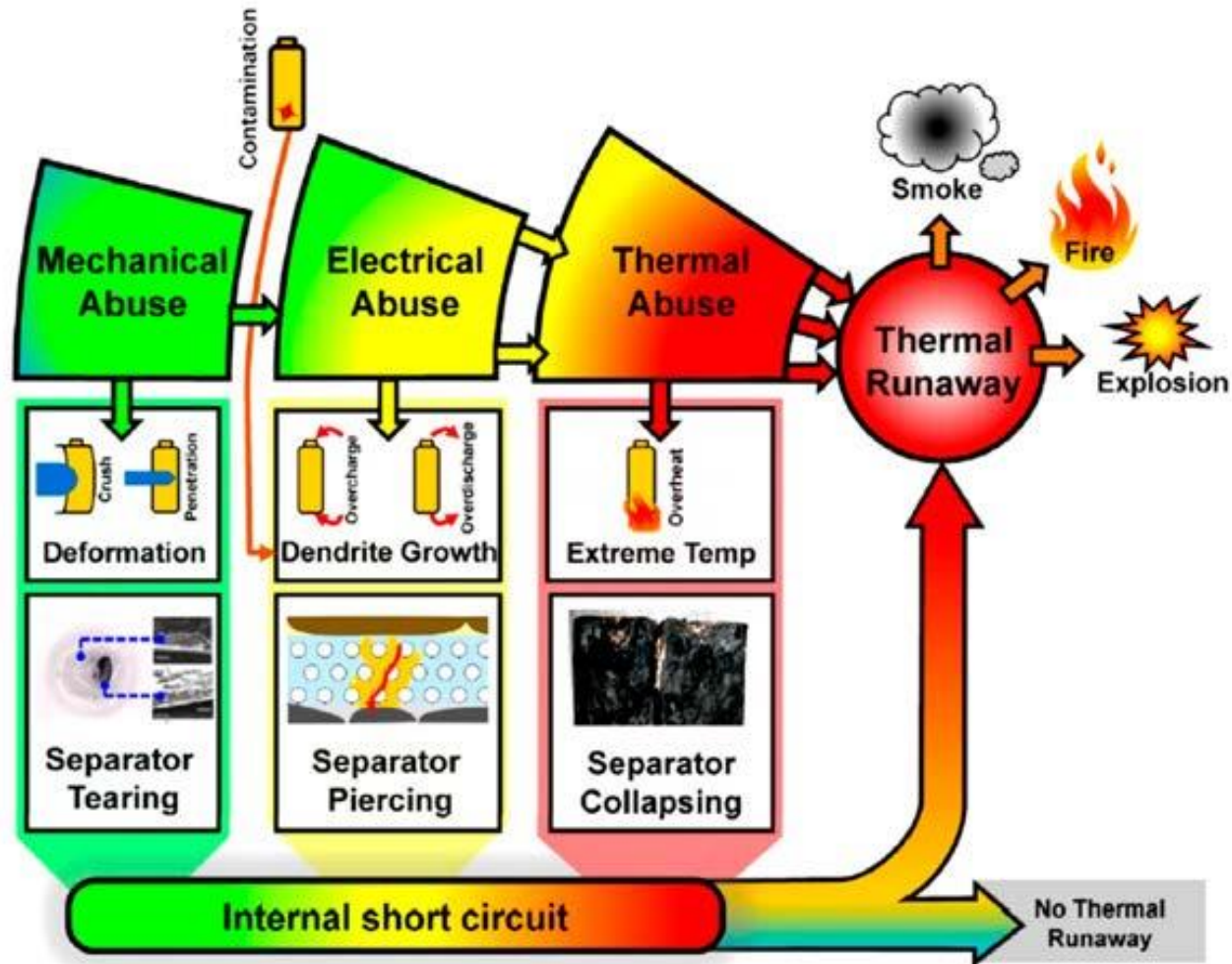


What is thermal runaway?



- Normal operation – heat produced
- Heat dissipates – no issues under normal circumstances
- Thermal runaway
 - Heat generated – by chemical reactions
 - Builds up/can't be dissipated
 - Causes further exothermic reactions
 - Releases more heat and gases
 - This reaction because self-sustaining/runaway
 - Continues until reaction material consumed

What causes thermal runaway?



What does thermal runaway look like?



Battery cargo on board container ships

UN Number	PSN
UN 3480	LITHIUM-ION BATTERIES (including lithium ion polymer batteries)
UN 3481	LITHIUM-ION BATTERIES CONTAINED IN EQUIPMENT or LITHIUM-ION BATTERIES PACKED WITH EQUIPMENT (including lithium ion polymer batteries)
UN 3090	LITHIUM METAL BATTERIES (including lithium alloy batteries)
UN 3091	LITHIUM METAL BATTERIES CONTAINED IN EQUIPMENT or LITHIUM METAL BATTERIES PACKED WITH EQUIPMENT (including lithium alloy batteries)

Special Provision 188

- **SP 188** is one such easement for small cells and batteries packaged and marked in a particular way
- It originates in the UN Model Regulations so it is common to all surface modes of transport
- Self contained provision – consignments of cells and batteries which conform full to its requirements are not subject to other provision of ADR or the IMDG code

Special Provision 188

SPECIAL PROVISION 188 – ADDITIONAL CONDITIONS

Cells and batteries must meet the provisions of 2.9.4.1 and 2.9.4.5., and be proven to be to meet the requirements of the UN Manual of tests and Criteria, and manufactured under a quality management system which is recorded and reviewed.

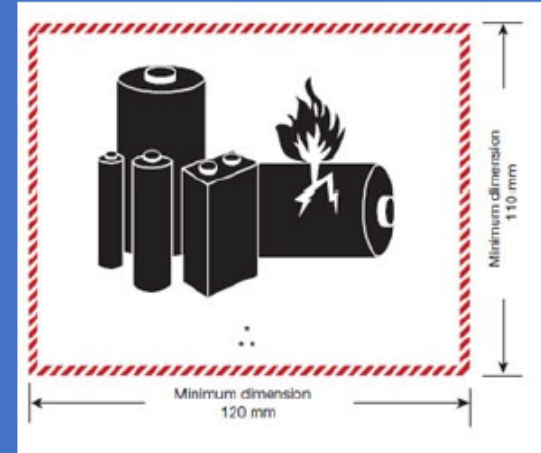
Must be packed in inner packaging that completely enclose the cell or battery (not applicable when contained in equipment), the inner packaging shall be packed in strong outer packaging and still comply with IMDG Code provisions.

Must be protected to prevent short circuits.

Cells and batteries when installed in equipment shall be protected from damage and short circuit, and the equipment shall be equipped with an effective means of preventing accidental activation.

Special Provision 188

Each package shall be marked with below lithium battery mark



Each package shall be capable of withstanding a 1.2 m drop test in any orientation without damage to cells or batteries contained therein, without shifting of the contents to allow battery to battery (or cell to cell) contact and without release of contents (not applicable when installed in equipment).

Gross mass must not be more than 30 kg.