



A Basic Safe Handling Guide for Lithium Metal

Disclaimer

In preparing this guide, FMC Lithium has utilized the best information known and available at the time of printing. FMC Lithium recognizes that over time techniques, methods and equipment related to the safe handling of lithium metal will evolve, dating the information within this guide.

Additionally, the information presented in this Guide has been written to address most typical situations, environments and facilities, based upon FMC Lithium's experiences. However, FMC Lithium recognizes that each customer's situation is different and necessitates specific solutions to fit those requirements.

FMC Lithium seeks to provide up-to-date solutions to the questions or concerns that our customers may have. Please contact us to discuss your specific needs.



Responsible Care

FMC supports the principles of the American Chemistry Council (ACC) Responsible Care[®] program by working with our employees, suppliers, customers, contractors, and commercial partners to promote responsible management of products and processes.

Certificate of Registration

This certifies that the Environmental Management System of

FMC CORPORATION

1735 Market St.

Philadelphia, PA 19103 US

has been assessed by NSF-ISR and found to be in conformance to the following standard(s):

Responsible Care Management System[®]

Scope of Registration:

Corporate and business management, health, safety, environment, security, product stewardship, distribution and communications located at 1735 Market Street, Philadelphia, PA and 2801 Yorkmont Road, Charlotte, NC.

Outline

- Lithium Metal Safety
 - ❖ Physical Properties
 - ❖ Hazards
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 - ❖ Handling & Storage
 - Handling
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 - Waste Disposal
 - ❖ Emergency Guidelines
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 - Fire Fighting
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Properties of Lithium Metal

Li	3
[He]2s ¹	
6.941	
Lithium	

- Lithium is a somewhat soft, silver-white metal in elemental form
- Lithium is the lightest metal (d=0.534 g/cm³)
- Lithium has a high electrochemical potential (more negative standard electrode potential relative to SHE)
- Lithium metal is flammable and air and water sensitive

Properties of Lithium Metal

Lithium metal, like other alkali metals, is very reactive toward water and air. The degree of the metal's reactivity is proportional to its surface area. Large pieces of lithium metal will react relatively slowly with air and water while lithium metal as a finely divided powder can react very rapidly.



Lithium will react with nitrogen in the air to form lithium nitride. This reaction is catalyzed by the presence of moisture in the air. Lithium should be stored under argon.



For this reason, lithium metal is usually handled under argon, in oil and/or in a dry room. Even in a dry environment, however, finely divided dry lithium powder will react with the oxygen in the air unless it is protected with an inert coating. These coatings allow even finely divided lithium metal powder to be handled in a dry room environment for extended periods of time.



Lithium Metal Product Offering

- Grades:
 - Battery
 - Alloy
 - Technical
- Forms:
 - Bulk
 - Ingot
 - Rod/Wire
 - Foil
 - Engineered Precuts
 - Stabilized Lithium Metal Powder (SLMP®)



See Product Data Sheets or contact FMC Lithium directly for more details

Physical Properties

Appearance	Silvery-white soft metal solid	
Molecular Formula	Li	
Molecular Weight	6.941	
Atomic Number	3	
Melting Point	180.5 °C	
Boiling Point	1317 °C	
Autoignition Temperature	179 °C	
Solubility in Water	Reacts violently with water	
Density (g/cc)		
	20 °C	0.534
	200 °C	0.507

Hazards

- Lithium is highly reactive in contact with many substances, releasing large quantities of heat and/or hazardous products.
- Lithium can react violently with water, even the humidity in the air, and the moisture in other substances, releasing hydrogen gas, which may catch fire explosively. Corrosive fumes of lithium oxide and/or lithium hydroxide are also released.
- Lithium is incompatible with acids, oxidizers, oxygen and nitrogen.
- Reactivity of lithium increases with surface area.

Physical Hazards

- GHS Classification: Water reactive, Category 1
- Water and air reactive solid
- Flammable solid
- Not sensitive to static discharge
- Does not polymerize
- Autoignition temperature 179 °C (essentially melting point)
- Molten lithium is pyrophoric

Health Hazards

- GHS Classification: Skin corrosive Category 1B
- Lithium is extremely reactive with body moisture and is corrosive to skin, nose, throat, stomach and eyes (may cause blindness)

Toxicological Information

- Not a Sensitizer
- Not a Carcinogen
- Not Mutagenic or Genotoxic

Environmental Hazards

- Lithium reacts violently with water
- The hydrolysis products consist of hydrogen gas and lithium hydroxide
- The hydroxide ion may affect the pH of the water

Handling

- Lithium should only be handled by trained personnel wearing proper personal protective equipment.
- Solid lithium can be handled in open atmosphere at room temperature, either coated in mineral oil or where relative humidity is maintained below 50%. To maintain best quality, humidity levels of less than 2% are recommended.
- Reactivity increases with temperature and surface area, so molten, dispersions, and powders require special handling. Mineral oil or Argon is recommended for dispersions and powder, while molten lithium can only be handled under Argon.



Personal Protective Equipment

Eyes and Face:

- Safety glasses or goggles for solid Lithium
- Full flame-resistance face shield required if Lithium is in molten state

Respiratory:

- None

Protective Clothing:

- Dry rubber gloves for solid Lithium
- Wear full flame-resistant clothing if Lithium is in the molten state

Work Hygienic Practices:

- Quick-drench eyewash and safety shower

Storage

- Store lithium in original unopened shipping container in a cool, dry location
- Once opened either store under Argon, in a dry room, or under mineral oil
- Do not use a water fire-suppression system in Lithium storage area
- Keep away from water, humid air, acids and oxidizing materials
- Keep away from heat, sparks and flame

Transportation

Proper Shipping Name	Lithium
Classification	Class 4.3, Dangerous When Wet
UN Number	UN1415
Packing Group	I



Post/Parcel	Not acceptable
Sea	Class 4.3 (IMDG)
Road, Rail	Class 4.3.11a (RID/ADR)
Air	15 kg max – cargo aircraft only

For shipments within Europe labeling for supply requirements are

F	Highly Flammable
C	Corrosive
R&S phrases	see MSDS

Responsible Care® initiative dictates that all shipments of lithium chemicals must be transported in an approved vehicle in a responsible manner (i.e., no flat bed trucks)

Waste Disposal

- Waste containing lithium metal should be disposed of only by a reputable licensed hazardous waste disposal facility experienced in handling reactive chemicals.
- Strict packaging guidelines exist for shipping lithium metal as a hazardous waste and are available from the disposal firms.
- FMC is not a licensed hazardous waste and treatment facility and cannot accept shipment or returns of material that meet the criteria of a hazardous waste.
- Contact FMC if you need further information or industry contacts on proper lithium disposal.



First Aid Measures

Eyes	Immediately flush with water for a minimum of 15 minutes. See medical doctor or ophthalmologist immediately.
Skin	Quickly wipe off as much as possible, then immediately flush with plenty of water. Remove contaminated clothing, wash with soap and water.
Ingestion	Quickly wipe material from mouth and rinse with water. Do not induce vomiting. See a medical doctor immediately.
Inhalation	Remove to fresh air. If breathing difficulty occurs and persists, see a medical doctor. If breathing has stopped give artificial respiration.

Firefighting

- Special fire fighting procedures are required when lithium metal is involved in a fire due to its high reactivity.
- Facilities with lithium metal on site should notify local authorities to plan appropriate emergency response.
- Permissible extinguishers (for lithium only) include graphite, copper powder, and Lith-X (Ansul).
- Water, sand, and carbon dioxide should NOT be used.
- Wear full protective clothing and self-contained breathing apparatus approved for fire fighting to protect against the hazards of heat, products of combustion and oxygen deficiency.
- Lithium metal can reignite after fire is initially extinguished. Never leave extinguished fire unattended.
- For additional fire fighting information, see National Fire Protection Association Standard NFPA 485.



Phone Numbers

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(toll free in US 1-888-Lithium)

Emergency

North America

Transportation: CHEMTREC 800 424-9300

Other Emergency: FMC 704 629-5361 (call collect 24 hrs/day)

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