

A BASIC SAFE HANDLING GUIDE FOR LITHIUM METAL

2018



DISCLAIMER

In preparing this guide, Livent has utilized the best information known and available at the time of printing. Livent 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 Livent's experiences. However, Livent recognizes that each customer's situation is different and necessitates specific solutions to fit those requirements.

Livent 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.

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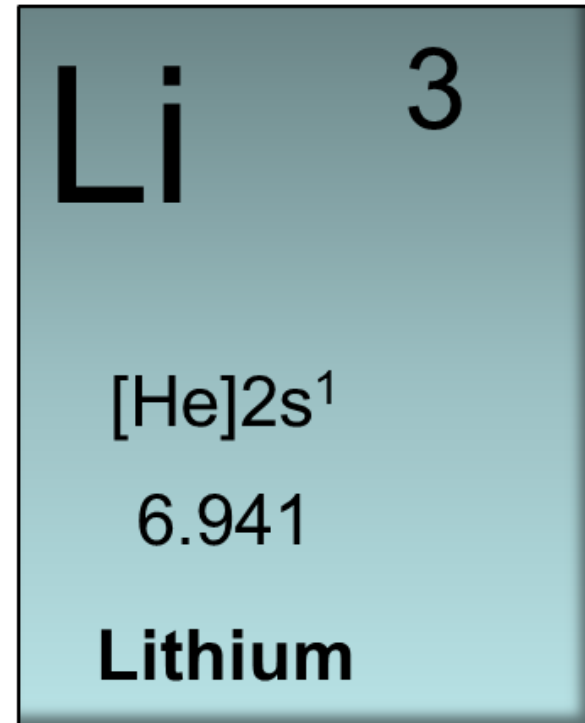


PHYSICAL PROPERTIES

PROPERTIES OF LITHIUM METAL

Lithium:

- A somewhat soft, silver-white metal in elemental form
- The lightest metal ($d=0.534 \text{ g/cm}^3$)
- Has a high electrochemical potential (more negative standard electrode potential relative to SHE)
- 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
- Engineered Precuts
- Stabilized Lithium Metal Powder (SLMP®)

See Product Data Sheets or contact Livent 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

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

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.

Livent 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 Livent if you need further information or industry contacts on proper lithium disposal.



EMERGENCY GUIDELINES

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.

FOR FURTHER INFORMATION

Livent

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For Emergency

CHEMTREC 800-424-9300

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