SAFETY DATA SHEET **LITHIUM METAL**

1. Identification of the Substance/Mixture and of the Company/Undertaking:

1.1 Product Identifier: Lithium

1.1.1 Substances

Alternate names and trade name Lithium metal, Lectro® Max 100 Anode Material, Lectro® Max 300 Anode Material, Lectro® Max 400 Anode Material

1.1.2 Mixture name: Not applicable

1.2 Relevant Identified Uses of the Substance or Mixture and Uses Advised Against:

Formulation and chemical synthesis in industrial manufacturing operations;
Additive for preparations and articles for industrial and consumer use;
Component in lithium batteries.
Do not use for private purposes (household).

1.3 Details of the Supplier of the Safety Data Sheet

North America
FMC Corporation
2801 Yorkmont Road, Suite 300
Charlotte, NC 28208
Phone: +1.704.426.5300
Fax: +1.704.426.5370
1.888.lithium

Europe
FMC Chemicals
Commercial Road
Bromborough, Merseyside
CH62 3NL, England
Phone: +44.151. 334.8085
Fax: +44.151.482.7361

Asia Pacific
FMC Asia Innovation Center
No 3 Building No. 4560
Jinke Road
Shanghai, China 201203
T: +86.21.2067.5888

Email: lithium.info@fmc.com
Web: www.fmclithium.com

1.4 Emergency Telephone Number:

North America
CHEMTREC: +1.800.424.9300
+1.703.527.3887
Plant: +1.704.629.5361
Medical: +1.303.595.9048

Europe
24 hr Specialist advice number:
CHEMTREC: +44 870 8200418

Asia Pacific
Phone: +86.21.2067.5888

2. Hazards Identification

2.1 Classification of the Substance or mixture:

2.1.1 GHS Classification [EC Regulation No 1272/2008 and US OSHA regulations]

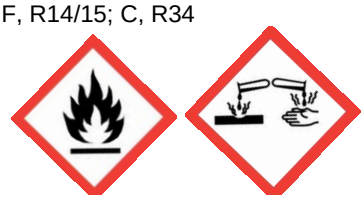
Water-reactive, Category 1
Corrosive to skin, Category 1B
Eye damage; Category 1

2.2.2 EC: Classification according to 67/548/EEC or 1999/45/EC [DSD/DPD]

F, R14/15; C, R34

2.2 Label Elements:

2.2.3 Hazard Pictograms(s):



2.2.4 Signal Word: Danger

Hazard Statement(s):

In contact with water releases flammable gases which may ignite spontaneously	H260
Causes severe skin burns and eye damage	H314

Precautionary Statement(s):

Keep away from any possible contact with water, because of violent reaction and possible flash fire.	P223
Handle under inert gas. Protect from moisture.	P231 + P232
Wear protective gloves/protective clothing/eye protection/face protection.	P280

In case of fire: Use graphite, copper powder, Lith-X (Ansul) for extinction.	P370 + P378
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.	P303 + P361 + P353
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.	P305 + P351 + P338
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.	P301 + P330 + P331
Immediately call a POISON CENTER or doctor/physician.	P310

Additional Precautionary Statement(s):

Do not breathe dust/fume/gas/mist/vapours/spray.	P260
Wash hands thoroughly after handling.	P264
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.	P304 + P340
Wash contaminated clothing before reuse.	P363
Store in a dry place. Store in a closed container.	P402 + P404
Store locked up.	P405
Dispose of contents/ container to an approved waste disposal plant.	P501

2.3 Other Hazards

Reacts violently with water	EUH014

3. Composition / Information on Ingredients

3.1 Substances

3.1.1 GHS Classification [EC: Regulation No 1272/2008; US: OSHA regulations]

Chemical Name	CAS #	EC No	EC Index No	REACH Reg No	Wt.%	Classification, Hazard Statement Codes	
lithium	7439-93-2	231-102-5	003-001-00-4	01-2119966143-38-0000	99-100	Water-react. 1 Skin Corr. 1B	H260 H314 EUH014

3.1.2 EC: Classification according to 67/548/EEC or 1999/45/EC [DSD/DPD]

Chemical Name	CAS #	EC No	Wt.%	Symbols	R-phrases
lithium	7439-93-2	231-102-5	99-100	F C	R15 R14 R34

3.2 Mixtures Not applicable.

(see Section 16 for R-phrase text)

4. First Aid Measures

4.1 Description of First Aid Measures

EYES: Immediately flush with water for at least 15 minutes, lifting the upper and lower eyelids intermittently. See a medical doctor or ophthalmologist immediately.

SKIN: Quickly wipe off as much as possible, then immediately flush with plenty of water while removing contaminated clothing and/or shoes. Thoroughly wash with soap and water. Obtain immediate medical attention. Contact a medical doctor if necessary.

INGESTION: Quickly wipe material from the mouth and rinse mouth with water. Do not induce vomiting. Never give anything by mouth to an unconscious person. See a medical doctor immediately.

INHALATION: Remove to fresh air. If breathing difficulty or discomfort occurs and persists, see a medical doctor. If breathing has stopped, give artificial respiration and see a medical doctor immediately.

4.2 Most Important Symptoms and effects, both acute and delayed

Lithium metal reacts violently with water and is corrosive to the eyes, skin and respiratory tract. Treatment should first remove as much of the material as possible as quickly as possible, then flush with very large quantities of water.

4.3 Indication of any immediate medical attention and special treatment needed.

Notes to medical doctor:

This product is corrosive and reacts violently with water. Treatment should first remove as much of the material as possible as quickly as possible, then flush with very large quantities of water. Ingestion presents a singular problem as emesis may produce esophageal damage and/or aspiration damage; dilution with water or other water-containing materials

may produce a reaction that exacerbates the corrosive activity. Consideration may be given to gastric lavage with a large diameter tube for removal of material and then dilution with large amounts of water. Esophagoscopy may be of assistance in this procedure and to assess extent of damage. Treatment is otherwise symptomatic and supportive.

5. Fire-Fighting Measures

5.1 Extinguishing media

DO NOT USE WATER, SAND OR CARBON DIOXIDE. Use graphite, copper powder, Lith-X (Ansul). If not available, dry sodium chloride, dry (anhydrous) calcium oxide or dry lithium chloride can be used.

5.2 Special hazards arising from the substance or mixture

Hazardous combustion products	Lithium oxide, lithium hydroxide
General Hazard	Flammable solid. Water reactive.
Properties contributing to Flammability	Water reactivity of solid and flammable hydrogen gas given off on reaction with moisture.
Flashpoint	Not applicable
Flammable limits in air	Not applicable
Auto ignition temperature	At temperatures above the melting point (180.5ºC) lithium metal can catch fire spontaneously on contact with air.
Sensitivity to static discharge	Not applicable
Sensitivity to static impact	Not applicable

5.3 Advice for fire-fighters

Wear full protective clothing and self-contained breathing apparatus (SCBA) approved for fire fighting. This is necessary to protect against the hazards of heat, products of combustion and oxygen deficiency. Do not breathe smoke, gases or vapors generated.

Lithium fires can throw off molten lithium metal particles. Burning lithium releases corrosive lithium oxide dust and fumes. Lithium metal can reignite after fire is initially extinguished. Never leave extinguished fire unattended. After all material has apparently burned and cooled, carefully turn over remaining residue and be prepared to reextinguish should reaction occur. Carefully place residue in steel drum, using a long-handled shovel, and cover with extinguishing media.

For additional fire fighting information, see National Fire Protection Assn. Standard NFPA 485.

COMMENTS:
(See Section 10, Stability and Reactivity)

6. Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures

Before cleanup measures begin, review the entire SDS with particular attention to Section 2, Hazards Identification; and Section 8, Exposure Controls/Personal Protection.

6.2 Environmental precautions

Do not wash into drains. Dispose of at a qualified waste disposal facility.

6.3 Methods and material for containment and cleaning up

Remove all sources of ignition. To prevent ignition, cover with mineral oil (or kerosene), soaking thoroughly, and place in oiled steel drums which are approved for transport. Keep water and moisture away from spilled material. Dispose of waste according to local and Federal laws and regulations.

6.4 Reference to other sections

Before cleanup measures begin, review the entire SDS with particular attention to Section 2, Hazards Identification; and Section 8, Exposure Controls/Personal Protection.

6.5 Additional information

Not specified.

7. Handling and Storage

7.1 Precautions for safe handling

Wear safety glasses or goggles and dry rubber gloves. Where relative humidity is maintained below 50%, or lithium surface is coated with mineral oil, lithium pieces can be handled in open atmosphere at room temperature. To maintain best quality, humidity levels of less than 2% are recommended.

7.2 Conditions for safe storage, including any incompatibilities

Store in original unopened shipping container. Once opened, store in argon atmosphere or mineral oil. Keep away from water, humid air, acids and oxidizing materials. Keep away from heat, sparks and flame.

7.3 Specific end use(s)

Defined in Exposure scenarios. Industrial and professional use only

8. Exposure Controls / Personal Protection

8.1 Control parameters

Lithium metal

DNEL

Long-term exposure, systemic, inhalation	4.2 mg/m^3
Long-term exposure, systemic, dermal	12 mg/kg/day

PNEC

PNEC aqua (freshwater)	0.165 mg/l
PNEC aqua (freshwater, intermittent)	1.65 mg/l
PNEC STP	23 mg/l

EXPOSURE LIMITS

Chemical Name	EU TWA	EU STEL	EH40 (UK WEL) TWA	EH40 (UK WEL) STEL	USA (ACGIH) TWA	USA (ACGIH) STEL/Ceiling	USA (OSHA) PEL	USA (OSHA) STEL/Ceiling
lithium	none*		none*		none*		none*	

* No occupational exposure limit value

8.2 Exposure controls

Engineering controls:

Use local exhaust ventilation to keep airborne concentrations below exposure limits.

Personal protective equipment

Eyes and Face: Safety glasses or goggles for general use. Full flame-resistant face shield required if metal is in a molten state.

Respiratory: None

Protective Clothing: **Eyes:** Safety glasses or goggles for general use. Full flame-resistant face shield required if metal is in a molten state.
Gloves: Dry rubber gloves for general use. Wear full flame-resistant clothing if the metal is handled or used in a molten state.
Other: Quick-drench eyewash and safety shower.

Work Hygienic Practices: Quick-drench eyewash and safety shower.

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Appearance:	Silvery-white soft metal solid
Odor:	Odorless
Odor threshold:	Not applicable
pH:	Reaction with water creates a highly alkaline solution pH>12
Melting point:	Li metal: 180.5°C (Li metal with 1% Na has a melting point 2-3 °C lower than pure Li)
Boiling point:	1317°C
Flash point:	Not applicable
Evaporation rate(butyl acetate = 1):	Not applicable
Flammability:	Reacts with water to produce hydrogen, a flammable gas.
Flammable limits:	Not applicable
Vapor pressure:	Not applicable
Vapor density (air = 1):	Not applicable
Specific gravity:	0.5 g/cc
Solubility in water:	Reacts violently with water
Partition coefficient n-octanol/ water:	Not applicable
Autoignition temperature:	At temperatures above the melting point (180.5ºC) lithium metal can catch fire spontaneously on contact with air.
Decomposition temperature:	Not available

Viscosity:	Not available
Explosive properties:	Not explosive
Oxidizing properties:	Not an oxidizer

9.2 Other information

Self-reactive properties	Does not meet classification criteria.
Pyrophoric properties	Under normal working conditions, does not meet classification criteria.
Self-heating properties	Does not meet classification criteria.
Water reactive properties	Water-reactive, Category 1
Corrosive to metals	Does not meet classification criteria.
Molecular weight:	6.94

10. Stability and Reactivity

10.1	**Reactivity**	Reacts violently with water, producing flammable hydrogen gas.
10.2	**Chemical stability**	Stable when kept dry and under inert gas.
10.3	**Possibility of hazardous reaction**	Reacts violently with water, producing flammable hydrogen gas. Hazardous polymerization will not occur.
10.4	**Conditions to avoid**	Temperatures above the melting point (180.5ºC/357ºF), and contact with water, moisture or humid air.
10.5	**Incompatible materials**	Acids, oxidizers, oxygen, nitrogen, or carbon dioxide
10.6	**Hazardous decomposition products**	Lithium is an element and does not decompose. However, it is highly reactive in contact with many other substances, releasing large quantities of heat and/or hazardous products. It can react violently with water, the humidity in 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.

11. Toxicological Information

11.1 Information on toxicological effects

(a) acute toxicity	Based on the available data, the classification criteria are not met.
(b) skin corrosion/irritation	Classified as corrosive to skin on the basis of lithium.
(c) serious eye damage/irritation	Classified as corrosive to eyes on the basis of lithium.
(d) respiratory/skin sensitisation	Classed as not sensitizing to skin on the basis of lithium .
(e) germ cell mutagenicity	Classified as not mutagenic based on lithium.
(f) carcinogenicity	Classified as not carcinogenic based on lithium.
(g) reproductive toxicity	Classified as not a reproductive toxin based on lithium.
(h) STOT-single exposure	Classified as not causing organ damage based on lithium.
(i) STOT-repeated exposure	Classified as not causing organ damage on repeat exposure based on lithium.
(j) aspiration hazard	Lithium, a solid, does not present an aspiration hazard.

Lithium has been extensively tested for REACH registration

Acute Effects From Overexposure:
This product is extremely reactive with body moisture and is corrosive to skin, nose, throat, stomach and eyes (may cause blindness).
Chronic Effects From Overexposure:
No data available for product.

Carcinogenicity Listings

EH40: Not listed.
IARC: Not listed.
NTP: Not listed.
OSHA: Not considered a carcinogen under OSHA.
ACGIH: Not listed.

12. Ecological Information

12.1 Toxicity: No classification.

Lithium
Fish, short-term, freshwater: LC50 = 18 mg/L
Fish, long-term, freshwater: NOEC = 2.87 mg/L
Daphnia magna, short-term, freshwater: EC50 = 10 mg/L with pH-adjustment
Daphnia magna, long-term, freshwater: NOEC = 1.7 mg/L
Algae (Pseudokirchneriella subcapitata), long-term, freshwater: ErC50 = 25.6 mg/L

12.2 Persistence and degradability

Not applicable for metal.
Lithium metal reacts slowly with air in the environment to form lithium hydroxide, lithium carbonate and nitrides.

12.3 Bioaccumulative potential

Not accumulative

12.4 Mobility in soil

No data available for the product.

12.5 Results of PBT and vPvB assessment

Not applicable for metal.

12.6 Other adverse effects

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

13. Disposal Considerations

13.1 Waste treatment methods

Waste containing lithium metal is considered a reactive waste. Disposal facilities specializing in the handling of reactive waste are recommended. Dispose of waste according to local and Federal laws and regulations.

14. Transport Information

14.1	**UN Number**	UN1415
14.2	**UN proper shipping name (IMDG, ICAO, ADR, DOT)**	Lithium
14.3	**Transport hazard class(es) (IMDG, ICAO, ADR, DOT)**	4.3, Dangerous when wet
14.4	**Packing group (IMDG, ICAO, ADR, DOT)**	I
14.5	**Environmental hazards**	Based on available data, the classification criteria are not met.
14.6	**Special precautions for user**	None
14.7	**Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Based on available data, the classification criteria are not met.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance [or mixture]

EUROPEAN UNION:

German Wassergefährdungsklasse (water hazard class)

lithium	2

UNITED STATES:

Section 311 Hazard Category (40 CFR 370):	Reactive, fire hazard, immediate (acute) health hazard.
Section 313 Reportable Ingredients (40 CFR 372):	This product does not contain a toxic chemical subject to the reporting requirements of Section 313 of Emergency Planning and Community Right-To-Know Act of 1986.
Section 302 Extremely Hazardous Substances (40 CFR 355):	Not listed
CERCLA Hazardous Substance (40 CFR 302.4):	Not listed
TSCA Sec 12b Export Notification:	This product is not subject to TSCA 12 (b) Export Notification Requirements.
NFPA Rating:	**Health:** 3 **Flammability:** 3 **Reactivity:** 2 **Special:** ~~W~~

INTERNATIONAL INVENTORY STATUS:

Inventory/Country	Product Status
EINECS (EU)	Listed
TSCA (US)	Listed
ECL (Korea)	Listed
DSL (Canada)	Listed

15.2 Chemical Safety Assessment

A Chemical Safety Assessment has been completed for this material.

16. Other Information

European Union:

R Phrases:
R14/15 Reacts violently with water, liberating extremely flammable gases
R34 Causes burns

List of Abbreviations used in this SDS:

PBT Persistent, Bioaccumulative and Toxic
vPvB very Persistent, very Bioaccumulative
PEC Predicted environmental concentration
PNEC Predicted no effect concentration
DNEL Derived no effect level

Specific uses identified for Exposure Scenarios

ES1 Industrial use organolithium production and pharma synthesis
ES2 Industrial use, battery foils
ES3 Industrial use Li/Al alloys
ES4 Professional laboratory use

REVISION SUMMARY:
Revision # 2. Sections 2, 3, 11, 12 and 16 revised. DNELs added. Aquatic toxicity data added. Exposure Scenarios added. Regular review completed.

This SDS has been prepared to meet U. S. OSHA Hazard Communication Standard requirements.
type 5a
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