

SECTION 1: PRODUCT & COMPANY IDENTIFICATION

1.1 Product Identifiers

Product Name / Description: Lithium Lanthanum Zirconium Oxide powder (Al-doped LLZO)
 CAS Number: A CAS number has not been assigned to this material

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

Identified Uses: Scientific research and development (solid electrolyte material for Li-ion batteries)

1.3 Details of the Supplier of the Safety Data Sheet

Company: NEI Corporation
 Address: 400 Apgar Drive, Unit E – Somerset, NJ 08873 – USA
 Phone: +1 (732) 868-3141 Fax: +1 (732) 868-3143
 Email: productinfo@neicorporation.com

1.4 Emergency Telephone Number

Manufacturer: +1 (732) 868-3142 (9am to 6pm EST / UTC -0500)
 U.S. Poison Control Center: +1-800-222-1222
 ChemTel (North America): +1 (800) 255-3924 (during transportation only)
 ChemTel (International): +1 (813) 248-0585 (during transportation only – collect calls accepted)

SECTION 2: HAZARDS IDENTIFICATION

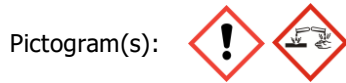
2.1 Classification of the Substance or Mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Skin corrosion / irritation (Category 1B) – H314
 Specific target organ toxicity, single exposure; respiratory tract irritation (Category 3) – H335

2.2 Label Elements

GHS Label Elements, including precautionary statements



Signal Word: Danger

Hazard Statement(s):

H314 Causes severe skin burns and eye damage
 H335 May cause respiratory irritation

Precautionary Statement(s):

P231 + P232 Handle under inert gas. Protect from moisture
 P233 Keep container tightly closed
 P262 Do not get in eyes, on skin, or on clothing
 P260 Do not breathe dust / fume / gas / mist / vapors / spray
 P280 Wear protective gloves, protective clothing, & eye protection
 P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water / shower.
 P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
 P301 + P330 + P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
 P405 Store locked up
 P501 Dispose of contents / container in accordance with local regulations

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

None

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

3.1 Substances

Component	Formula	Synonyms	CAS #	Concentration
Al-doped Lithium Lanthanum Zirconium Oxide	$\text{Li}_{6.24}\text{La}_3\text{Zr}_2\text{Al}_{0.24}\text{O}_{11.98}$	LLZO, Lithium Lanthanum Zirconate	n/a	100%
Hazard Classification: Skin corrosion /irritation (Cat. 1B, H314); STOT SE Resp. Tract Irritation (Cat. 3, H335)				

For the full text of the Classification statements mentioned in this Section, see Section 2

SECTION 4: FIRST AID MEASURES

4.1 Description of First Aid Measures

General Advice:

Move out of exposed area. Seek medical attention if irritation occurs. Show this SDS to the doctor in attendance.

After Inhalation:

If breathed in, move person into fresh air. If not breathing, give artificial respiration and seek medical attention.

After Skin Contact:

Immediately remove all contaminated clothing. Rinse skin with water or shower. Seek medical attention.

After Eye Contact:

Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing and seek medical attention if irritation occurs.

After Swallowing:

Never give anything by mouth to an unconscious person. Rinse mouth with water. Do NOT induce vomiting. Seek immediate medical attention.

4.2 Most Important Symptoms and Effects, Both Acute and Delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11.

4.3 Indication of any Immediate Medical Attention and Special Treatment Needed

No further relevant information available

SECTION 5: FIREFIGHTING MEASURES

5.1 Suitable Extinguishing Media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide

5.2 Hazardous Combustion Products

Lithium oxide, zirconium oxide, lanthanum oxide, aluminum oxide

5.3 Advice for Firefighters

Wear self-contained breathing apparatus for firefighting and full protective suit

5.4 Other Information

No further relevant information available

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal Precautions, Protective Equipment, and Emergency Procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist, or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

6.2 Environmental Precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and Materials for Containment and Cleaning Up

Use neutralizing agent. Pick up and arrange disposal without creating dust. Keep in closed containers for disposal.

6.4 Reference to Other Sections

For safe handling, see Section 7; for personal protection, see Section 8; for disposal, see Section 13.

"LLZO" – Lithium Lanthanum Zirconium Oxide ($\text{Li}_{6.24}\text{La}_3\text{Zr}_2\text{Al}_{0.24}\text{O}_{11.98}$) powder

SECTION 7: HANDLING AND STORAGE

7.1 Precautions for Safe Handling

Handle in a controlled environment, under inert gas. Appropriate personal protective equipment should be used at all times. Avoid contact with eyes and skin. Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed. Avoid breathing dust. For additional precautions, see section 2.2.

7.2 Conditions for Safe Storage (including any incompatibilities)

Keep container tightly sealed, in a cool, dry place under inert gas. This material is moisture and air sensitive. Protect from humidity and keep away from water. Keep away from oxidizing agents. Store in a locked cabinet or with access restricted to technical experts or their assistants. Also see Section 10.5.

7.3 Specific End Uses

A part from the uses mentioned in section 1.2 no other specific uses are stipulated.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control Parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure Controls

Appropriate Engineering Controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday. Keep away from food and beverages.

Personal Protective Equipment

Eye / Face Protection:

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin Protection:

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection:

Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory Protection:

Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of Environmental Exposure

Do not let product enter drains.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on Basic Physical and Chemical Properties

Form:	Solid (powder)
Color:	White
Odor:	Odorless
pH:	Not determined
Melting point/range:	Not determined
Specific Gravity:	Not determined
Density (20 °C):	Not determined
Viscosity (20 °C):	Not determined
Boiling Point:	Not determined
Flashpoint:	Not determined

"LLZO" – Lithium Lanthanum Zirconium Oxide (Li_{6,24}La₃Zr₂Al_{0,24}O_{11,98}) powder

Ignition Temperature: Not determined
Auto-ignition Temperature: Not determined
Lower Explosion Limit: Not determined
Upper Explosion Limit: Not determined
Vapor Pressure: Not determined
Vapor Density: Not determined
Water Solubility: Not determined
Evaporation Rate: Not determined

9.2 Other Information

No further relevant information available

SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity

No information known

10.2 Chemical Stability

Stable under recommended storage conditions (see Section 7.2)

10.3 Possibility of Hazardous Reactions

Reacts with strong oxidizing agents

10.4 Conditions to Avoid

No further relevant information available

10.5 Incompatible Materials

Air, water / moisture, oxidizing agents

10.6 Hazardous Decomposition Products

Lithium oxide, zirconium oxide, lanthanum oxide, aluminum oxide (in the Event of Fire, see Section 5)

SECTION 11: TOXICOLOGICAL INFORMATION

11.1 Information on Toxicological Effects

Acute Toxicity

Oral LD50: No Data Available
Inhalation LC50: No Data Available
Dermal LD50: No Data Available

Skin corrosion/irritation

Causes severe skin burns

Serious eye damage/eye irritation

Causes serious eye damage

Respiratory or skin sensitization

No Data Available

Germ cell mutagenicity

No Data Available

Carcinogenicity

IARC: No classification data on carcinogenic properties of the material is available.
ACGIH: No classification data on carcinogenic properties of the material is available.
NTP: No classification data on carcinogenic properties of the material is available.
OSHA: No classification data on carcinogenic properties of the material is available.

Reproductive Toxicity

No Data Available

Teratogenicity

No Data Available

Specific Target Organ Toxicity - Single Exposure (Globally Harmonized System)

May cause respiratory irritation

Specific Target Organ Toxicity - Repeated Exposure (Globally Harmonized System)

Effects not known

Aspiration Hazard

No Data Available

Additional Information

To the best of our knowledge, the chemical, physical, and toxicological properties of this product have not been thoroughly investigated.

SECTION 12: ECOLOGICAL INFORMATION

12.1 Toxicity

Aquatic toxicity – low; no further information available

12.2 Persistence and Degradability

No Data Available

12.3 Bioaccumulative Potential

No Data Available

12.4 Mobility in Soil

No Data Available

12.5 Results of PBT and vPvB Assessment

PBT/vPvB assessment not available as chemical safety assessment not conducted / required.

12.6 Other Adverse Effects

The toxicological properties of this material have not been fully investigated.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1 Waste Treatment Methods – Product

Offer surplus and non-recyclable solutions to a licensed disposal company.

13.2 Waste Treatment Methods – Contaminated Packaging

Dispose of properly as you would with unused product.

SECTION 14: TRANSPORT INFORMATION

14.1 Department of Transportation (DOT - US)

UN number: 3262

Class: 8

Packing Group: III

Proper Shipping Name: Corrosive solid, basic, inorganic, n.o.s. (Lithium Lanthanum Zirconate)

14.2 International Maritime Dangerous Goods (IMDG)

UN number: 3262

Class: 8

Packing Group: III

Proper Shipping Name: Corrosive solid, basic, inorganic, n.o.s. (Lithium Lanthanum Zirconate)

14.3 International Air Transport Association (IATA)

UN number: 3262

Class: 8

Packing Group: III

Proper Shipping Name: Corrosive solid, basic, inorganic, n.o.s. (Lithium Lanthanum Zirconate)

14.4 Additional Transport Information

HS Code (first 6 digits) / HTS-US (9 digits) #: 2825.90.9000

Excepted Quantities (EQ): 30g (net) / 1kg (gross) Limited Quantities (LQ): 5 kg

"LLZO" – Lithium Lanthanum Zirconium Oxide (Li_{6.24}La₃Zr₂Al_{0.24}O_{11.98}) powder

SECTION 15: REGULATORY INFORMATION

15.1 Safety, Health and Environmental Regulations/Legislation Specific for the Substance or Mixture

No Data Available

15.2 Chemical Safety Assessment

A chemical safety assessment was not carried out for this product.

SECTION 16: OTHER INFORMATION

REACH Number

A registration number is not available for this substance as the substance or its uses are exempted from registration, the annual tonnage does not require a registration or the registration is envisaged for a later registration deadline.

HMIS Classification

Health Hazard: 3
Flammability Hazard: 0
Physical Hazard: 1

NFPA Rating

Health Hazard: 3
Flammability Hazard: 0
Reactivity Hazard: 1

Further Information

NEI has attempted to provide current and accurate information to the best of its knowledge. NEI makes no representations regarding the accuracy or completeness of the information and assumes no liability for any loss, damage, injury of any kind which may result from or arise out of the use of or reliance on the information by any person. Employers should use this information only as a supplement to other information gathered by them and should make independent judgment of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty and any use of the product not in conformance with this Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

– END OF SDS –