

GHS Material Safety Data Sheet

MSDS No. :ZRR04LAEG

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Section 1. Identification of the substance or mixture and of the supplier

1.1 Product Information

Product name: Tetrakis(ethylmethanimino)zirconium

| | | |
|-----------------|--------|--------|
| Product number: | Purity | Form |
| — | — | liquid |

Use of the Substance/Preparation:For industrial use

Function:Raw material(High-k precursor)

1.2 Company Information:

Manufacturer : Kojundo Chemical Laboratory Co., Ltd.

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Section 2. Hazards identification

GHS Classification

| Health Hazards | Environmental Hazards | Physical Hazards |
|--|-----------------------|---|
| Skin corrosion/ irritation: Category 2 Serious eye damage/ eye irritation: Category 2A Specific target organ toxicity, single exposure: Category3 | No data available | Flammable liquids: Category 2 Substances and mixtures which, in contact with water, emit flammable gases: Category 2 |

GHS Label: F,W



Pictogram or symbols

Warning word: DANGER

| Hazard information | Description of precaution |
|---|--|
| Highly flammable liquid and vapour. | Keep away from sources of ignition(e.g.; heat/sparks /open flames/hot surfaces).-No smoking. |
| In contact with water releases flammable gases. | Use explosion-proof equipment(e.g.;electrical/ventilating /lighting). |
| Causes skin irritation. | Take precautionary measures static discharge. |

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| <p>Causes serious eye irritation. May cause respiratory irritation.</p> | <p>Keep away from any possible contact with water,because of violent reaction and possible flash fire.</p> <p>Protect from moisture.Handle under inert gas.</p> <p>Wear protective gloves/protective clothing/eye protection /respiratory protection/face protection during handling.</p> <p>Avoid breathing dust/mist/gas/fume/vapours/spray.</p> <p>Do not eat, drink or smoke when using this product, and wash hands thoroughly after handling.</p> <p>Take off the contaminated clothing and wash before reuse.</p> <p>Keep container or bottle tightly closed when not in use.</p> <p>Use only outdoors or in well-ventilated area.</p> <p>IN CASE OF FIRE: Use Carbon dioxide, Dry chemical powder,Water fog or foam for extinction. (Do not use a direct water stream.)</p> <p>IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.</p> <p>IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Rinse mouth. Do NOT induce vomiting.</p> <p>IF ON SKIN; Remove immediately all contaminated clothing and rinse skin with water/shower. Then wash skin with plenty of soap and water. If skin irritation occurs, get medical advice/attention.</p> <p>IF IN EYES: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing.</p> <p>Call a POISON CENTER or doctor/physician if you feel unwell.</p> <p>Protect from sunlight. Store in a cool, dry and well ventilated place. Keep container tightly closed.</p> <p>Store locked up.</p> <p>Dispose of contents/ container in accordance with local/national regulations.</p> <p>Return the cylinder to your vendor.</p> |
|---|---|

Additional hazard information :

Other hazards which do not result in classification or are not covered by GHS.

Moisture will produce zirconium oxide powder and ethylmethylaniline vapor which is destructive to tissue of the mucous membranes and upper respiratory tract, eyes and skin. Inhalation or contact with vapors, substance, or decomposition products may cause severe injury. May produce corrosive solutions on contact with water.

Spills may create fire or explosion hazard.

With respect to additional hazard information, see Section 11.

Section 3. Composition / information on ingredients

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| Chemical or common name: | Tetrakis(ethylmethylamino)zirconium |
| Other name: | TEMAZ |
| Single Substance or Compound: | Single substance |
| Chemical formula: | Zr[N(C ₂ H ₅)CH ₃] ₄ |
| Composition: | 100% |
| CAS #: | 175923-04-3 |
| TSCA inventory : | not listed |
| EINECS: | not listed |
| RTECS #: | not listed |

(See Section 8 for Exposure Limits)

Section 4. First aid measures

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| Eye contact: | Promptly rinse eyes with plenty of water while lifting the eye lids. Continue to rinse for at least 15 minutes and get medical attention. |
| Skin contact: | Remove immediately all contaminated clothing. Wipe off the product immediately by tissue or soft cloth, etc. Promptly flush contaminated skin with soap or mild detergent and water. Contact physician if irritation continues. |
| Ingestion: | Rinse mouth and throat with water. Do not induce vomiting. Get medical attention immediately. |
| Inhalation: | Remove the exposed person immediately and provide fresh air. Get medical attention. |
| The most important symptoms and hazardous effects: | Ethylemethylamine, a decomposition product, is destructive to tissue of the mucous membranes, eyes and skin. |
| The protection of first aiders: | Respirator(or self contained breathing apparatus, if necessary), chemically resistant gloves, safety goggles, apron. |

Section 5. Fire fighting measures

| Chemical Name | Flash Point | Autoignition Temperature | Explosion Level (Lower-Upper) | Vapour Pressure | Vapour Density |
|----------------|-------------|--------------------------|-------------------------------|-----------------|----------------|
| Title compound | ND | ND | ND | 13.3/65 Pa/°C | ND |

ND:no data available

| | |
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| Extinguishing agents: | Carbon dioxide, Dry chemical powder, Water fog or foam. DO NOT use a direct water stream. |
| Fire fighting: | Flammable material.Burning material releases toxic fumes. Remove containers to safe place if possible. Use water spray to Cool down nearby structures and containers. |

Self-contained breathing apparatus and full protective clothing should be used, if the material is involved in fire.

Unusual fire and explosion hazards: No unusual fire and explosion hazards.

Section 6. Accidental release measures

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| Personal Precaution: | Wear self contained breathing apparatus, rubber boots and heavy rubber gloves. |
| Environmental hazard precaution: | Shut off leak if without risk. Prevent flow out to river, etc. so as not to badly affect. |
| Methods for containment and cleaning up: | Remove all sources of ignition. Avoid unnecessary contacts with spills. Indoor leakage: Ventilate as much as possible until the cleaning is completed. Outdoor leakage: Work from the windward and evacuate the leeward crowd. Absorb or cover with vermiculite or other suitable absorbent, and dispose of DOT-approved waste containers as much as possible. Carefully wash spill site with plenty of water after material pick up. Contaminated materials used to clean up spills or leaks should be disposed of in accordance with local, state and federal regulations. |

Section 7. Handling and storage

Precautions to be taken in handling:

Safe handling: Handle the material in a dry inert gas atmosphere, utilizing glove bag or glove box. Keep away from moisture when handling.
Under inevitable exposure cases, handle the material using ventilation. Prevent any chemical from coming into contact with the skin or eyes and from contaminating personal clothing.
Keep away from heat, sparks and naked flame.
Electrically ground all equipment when handling this material and use only non-sparking tools.

Precautions to be taken in storage:

General precautions: Store the material in a sealed chemically resistant container or in the original steel container.
Store in closed vessels in a dry place, away from source of heat, oxidizers and alkalis.
Keep vessels upright and protect from damage.

Section 8. Exposure controls / personal protection

Exposure guideline:

| Chemical Name | ACGIH(2008)/TLV | | OSHA(2006)PEL-TWA | |
|-----------------------------|-------------------------|---------------------|-------------------|----------------------|
| | TWA(mg/m ³) | STEL(ppm) | (ppm) | (mg/m ³) |
| Zirconium compounds (as Zr) | 5 | 10mg/m ³ | — | 5 |

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| Facility measures: | Use appropriate engineering controls to reduce air contamination to approved/permisible national exposure standards. |
| Protective ware: | Wear appropriate NIOSH/MSHA-approved respirator, safety goggles, impervious gloves, protective wear, protective boots. |
| Skin protection: | For handling in closed ventilation system, wear protective gloves and apron. In emergency cases, use full protective clothing, including boots. |
| Eye protection: | Wearing safety goggles is crucial for handling chemicals, in order to prevent accidental exposure. For leak or spills, use chemical safety goggles and face shields. Do not wear contact lenses. |
| Respiratory protection: | None required if handled in closed ventilation system recommended above. For spill, leak or other emergency where mist or vapor are concentrated, use a self-contained breathing apparatus or air supplied respirator, NIOSH-approved. For lower concentrations, use a cartridge respirators with an ammonia/amine cartridge, also NIOSH-approved. |
| Additional recommendations: | Provide eyewash stations and quick-drench shower facilities. |

Section 9. Physical and chemical properties

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| Color and Form: | Pale-yellow liquid |
| Chemical formula: | Zr[N(C ₂ H ₅)CH ₃] ₄ |
| Formula weigh: | 323.64 |
| Melting point: | < -70°C |
| Boiling point: | ca.65°C/13.3Pa |
| Specific gravity: | ca.1.05g/cm ³ |
| Miscible in: | Organic solvents |
| Solubility in water: | reacts with water |
| Flammable: | flammable substance |
| Oxidation: | None |

Section10. Stability and reactivity

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| Stability: | • Sensitive to moisture of the air. |
| Reactivity | |
| Incompatibility: | Oxidizing agents, water |
| Conditions to avoid: | • heat, sparks and flames. • moisture |
| Hazard decomposition products | Ethylmethylanine, carbon monoxide, carbon dioxide, nitrogen oxides, metallic oxide of zirconium and organic and toxic fumes. |
| Hazardous polymerization: | None |

Section11. Toxicological information

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| Acute toxicity: | GHS ; No information available on title compound nor decomposition products. |
| Skin corrosive / irritation: | GHS : Category 2 ;Causes skin irritation Ethylmethylanine, a decomposition product, is destructive to tissue of the mucous membranes, eyes and skin. |
| Serious eye damage / irritation: | GHS : Category 2A ;Causes serious eye irritation The liquid may irritate the skin, eyes and respiratory system. Moisture will produce zirconium oxide powder and ethylmethylanine vapor which is destructive to tissue of the mucous membranes and upper respiratory tract, eyes and skin. |
| Respiratory/ skin sensitization: | GHS ; No data available |
| Germ cell mutagenicity: | GHS ; No data available |
| Carcinogenicity: | GHS ; No data available Neither this product nor its components have been classified as carcinogen by IARC(2011),NTP(2011) or ACGIH(2008). |
| Reproductive toxicity: | GHS ; No data available |
| Specific target organ toxicity — single exposure: | GHS ; Category 3;May cause respiratory irritation |
| Specific target organ toxicity — repeated exposure: | GHS ; No data available |
| Aspiration hazard: | GHS ; No data available |

Section12. Ecological information

Ecotoxicity:

Hazards to the aquatic environment GHS ; No data available

— acute toxicity:

— chronic toxicity: GHS ; No data available

Fish toxicity: No data available

Degradability: No data available

Bioaccumulative potential: No data available

Section13. Disposal considerations

Disposal method: Arrange disposal as special waste, by licensed disposal company, in consultation with local Waste Disposal Authority, in accordance with national and regional regulations.

Section14. Transport information

UN number: 3148

IATA shipping name: Water-reactive liquid, n.o.s.

IATA classification: Hazardous Class 4.3



IATA packing group: II

HS code: 2921.29

Marine pollution: No

Section 15. Regulatory information

TSCA inventory : not listed.

Please refer to any other local / national measures that may be relevant.

Section 16. Other information

The information described above is believed to be correct. However, Kojundo Chemical Lab. makes no representation, warranty nor guarantee of any kind with respect to the information on this data sheet or any use of the product based upon this information.