Appendix 11

Material Safety Data Sheets for Products of the DZP

- Zirconia (Zirconium Dioxide) (ZrO₂)
- Zirconium Hydroxide (ZOH)
- Zirconium Basic Sulphate (ZBS)
- Niobium Pentoxide (Nb₂O₅)
- Ferro Niobium (FeNb)
- Heavy Rare Earth Chloride Solution
- Light Rare Earth Chloride Solution

(Total No. of pages including blank pages = 40)

Note: A colour version of this Appendix is available on the Project CD



Report No. 545/04

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Appendix 11



| Ormanizi 2031 Prif Dair 2007 Bit Dair 2007 Standard Mark Dair Sector (ng b CHSC) and ADD requerements Standard Sector (ng b CHSC) and ADD requerements Standard Sector (ng b CHSC) Standard Sector (ng b CHSC) Independent of the substance / mixture and of the company / undertaking Profession (ng b CHSC) Product Internet Terme Independent of the substance / mixture and of the company / undertaking Product Internet Terme Independent of the substance / mixture and of the company / undertaking Product Internet Terme Independent of the substance / mixture and of the company / undertaking Standard Sector (Ng b CHSC) Independent of the substance / mixture and of the company / undertaking Standard Sector (Ng b CHSC) Independent of the substance / mixture and of the substance / mixture and of the substance / mixture and substance / substance / mixture and substance / mixtu | | ZIRCON | | | | | |
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| SECTION 1 Identification of the substance / mixture and of the company / undertaking Product name Product Identified Product Id | Version No: 5.1.1.1 | OHSC and ADG requirements | | Issue Date: 01/01/ | | | |
| Product Identifier Product Identifier Product Identifier ZirCONIUM DIOXEE Comma Identifier ZirCONIUM DIOXED Comma Identifier AL2000/PDE Comma Version 2000/PDE ZIRCONIUM/NV OVER LINE (SPORDOR JONE, TAK PD, 2000/PMR/NS 200 PMR, 2000/PMR 200 PMR 200 PMR 2000/PMR 200 PMR | · · | | f the company / undertaking | | | | |
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| Adrease: Anteria Anseria Caste Hil 2154 NSW Antaria Anseria Caste Hill 2154 NSW Antaria Antaria Anseria Caste Hill 2154 NSW Antaria Antar | Registered company name: | Merck | Sigma-Aldrich | | | | |
| Telephone: Indefaula Telephone: Indefaula Telephone: Indefaula Fax: Indefaula Indefaula Indefaula Fax: Indefaula Indefaula | Address | | | | | | |
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| Email: admin@merck.com.au ausmal@gial.com Emergency telephone number: Nct Available Nct Available Emergency telephone number: 413 9728 7000 Nct Available Emergency telephone number: 413 9728 7000 1000 448 456 SECTION 2 Hazards identification Classification of the substance or mixture HAZARDOUS SUBSTANCE. NON DAIN SERVUS GOODS. According to the Criteria of NOHSC, and the ADG Code. Section 2 hours and a substance or mixture Reading: A substance of the substance or mixture or m | | | | | | | |
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| Toxicity 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 | ChemWatch Hazard Ratings | | | | | | |
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| Legend: 1. Classified by Chemwatch; 2. Classification drawn from HSIS; 3. Classification drawn from EC Directive 1272/2008 - Annex VI GHS Classification ^[2] : Not Applicable Label elements GHS label elements Signal word: NOT APPLICABLE Hazard statement(s): Not Applicable LIMITED EVIDENCE Supplementary statement(s): Not Applicable | R17 Spontaneously flamma | able in air. | | | | | |
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| Supplementary statement(s): Not Applicable | Not Applicable | | | | | | |
| Not Applicable | | | | | | | |
| | Supplementary statement(s): | | | | | | |
| | | | | | | | |

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| Not Applicable | | | |
|---|--|-----------------------------|---|
| Not Applicable | statement(s): Response | | |
| Not Applicable | Material (1), response | | |
| - | statement(s): Storage | | |
| Not Applicable | | | |
| Not Applicable | statement(s): Disposal | | |
| Label elements | | | |
| | | | |
| | ements are found in section 2.1 | | |
| Indication(s) of | fdanger: F | | |
| Safety advice: S02 | Keep out of reach of children. | | |
| S43 | In case of fire use | | |
| S7/8 | Not Available | | |
| Other hazar | 'ds | | |
| Not Available | | | |
| SECTION | 3 Composition / information on ingre | dianta | |
| | | alents | |
| Substances CAS No | ; | %[weight] | Name |
| 1314-23-4 | | 99 | ZIRCONIUM DIOXIDE |
| Mixtures | | | |
| See 'Information of | on ingredients' in section 3.1 | | |
| SECTION 4 | First aid measures | | |
| Description | of first aid measures | | |
| Eye Contact: | | | |
| Wash o Ensure Seek m Removal | mes in contact with the eyes: ut immediately with fresh running water. complete imigation of the eye by keeping eyelids apart and edical attention without delay; if pain persists or recurs seek al of contact lenses after an eye injury should only be undert | medical attention. | the eyelids by occasionally lifting the upper and lower lids. |
| Skin Contact: If skin contact oc | 0166 | | |
| ImmediaFlush sl | ately remove all contaminated clothing, including footwear. kin and hair with running water (and soap if available). edical attention in event of initation. | | |
| Inhalation: | | | |
| Lay pati Prosthe Apply a | or combustion products are inhaled remove from contamin ent down. Keep warm and rested. sees such as false teeth, which may block airway, should be rificial respiration if not breathing, preferably with a demand ort to hospital, or doctor, without delay. | removed, where possible, | prior to initiating first aid procedures. ve mask device, or pocket mask as trained. Perform CPR if necessary. |
| Ingestion: | | | |
| If vomitiObserveNever g | wed do NOT induce vomiting. ng occurs, lean patient forward or place on left side (head-c e the patient carefully. jive liquid to a person showing signs of being sleepy or with | reduced awareness; i.e. b | ecoming unconscious. |
| | ater to rinse out mouth, then provide liquid slowly and as mu edical advice. | ch as casualty can comforta | ibiy dnnk. |
| Indication o | f any immediate medical attention and s | pecial treatment n | eeded |
| Treat symptomat | ically. | | |
| SECTION 4 | 5 Firefighting measures | | |
| Extinguishi | 5 5 | | |
| There is | ng meana s no restriction on the type of extinguisher which may be use tinguishing media suitable for surrounding area. | ed. | |
| | ards arising from the substrate or mixtu | re | |
| Fire Incompatik | , , , , , , , , , , , , , , , , , , , | | |
| None known. | | | |
| Advice for f | irefighters | | |
| Fire Fighting: | | | |
| Wear bit Prevent | e Brigade and tell them location and nature of hazard. reathing apparatus plus protective gloves in the event of a fi , by any means available, spillage from entering drains or v fighting procedures suitable for surrounding area. | | |
| Fire/Explosion | | | |

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Non combustible.

· Not considered a significant fire risk, however containers may burn

Decomposition may produce toxic fumes of metal oxides May emit poisonous fumes. May emit corrosive fumes.

SECTION 6 Accidental release measures

Minor Spills:

- Remove all ignition sources
- Clean up all spills immediately
- Avoid contact with skin and eyes.
 Control personal contact with the substance, by using protective equipment.

Major Spills:

- Moderate hazard. CAUTION: Advise personnel in area.

 - Alert Emergency Services and tell them location and nature of hazard.
 Control personal contact by wearing protective clothing.

Personal Protective Equipment advice is contained in Section 8 of the MSDS.

SECTION 7 Handling and storage

Precautions for safe handling

Safe handling

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.

Other information

- Store in original containers.
 Keep containers securely sealed.
 Store in a cool, dry, well-ventilated area.
 Store away from incompatible materials and foodstuff containers

Conditions for safe storage, including any incompatibilities

Suitable container:

- Polyethylene or polypropylene container.Check all containers are clearly labelled and free from leaks.

Storage incompatibility:

- WARNING: Avoid or control reaction with peroxides. All transition metal peroxides should be considered as potentially explosive. For example transition metal complexes of alkyl
- hydroperoxides may decompose explosively.
- The pi-complexes formed between chromium(0), vanadium(0) and other transition metals (haloarene-metal complexes) and mono-or poly-fluorobenzene show extreme sensitivity to heat and are explosive.



X : Must not be stored together

0: May be stored together with specific preventions

+: May be stored together

Package Material Incompatibilities:

| SECTION 8 Exposure controls / personal protection | | | | | | | |
|---|-------------------|-----------------------------|----------|--------------|---------------|--|--|
| Control parameters | | | | | | | |
| Occupational Exposure Limits (OEL) | | | | | | | |
| INGREDIENT DATA | | | | | | | |
| Source | Ingredient | Material name | TWA | STEL | Peak | Notes | |
| Australia Exposure Standards | zirconium dioxide | Zirconium compounds (as Zr) | 5 (mgm3) | 10 (mgm3) | Not Available | American Conference of Governmental Industrial Hygienists (ACGIH)4,5 is the documentation source | |
| Emergency Limits | | | | | | | |
| Ingredient | TEEL-0 | TEEL-1 | TEEL-2 | | TEEL-3 | | |
| zirconium dioxide | 6.75(ppm) | 13.5(ppm) | | 13.5(ppm) | | 33.8(ppm) | |
| Ingredient | Original | IIDLH | | Revised IDLH | | | |
| zirconium dioxide 500(mgm3) 25(mgm3) | | | | | | | |
| Exposure controls | | | | | | | |
| Appropriate engineering control | ols | | | | | | |

Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection. The basic types of engineering controls are:

Process controls which involve changing the way a job activity or process is done to reduce the risk. Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment.

Personal protection

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Appendix 11

| | | Skin protection: See Hand protection below Hand protection: The selection of the suitable gloves does not only several substances, the resistance of the glove n See Value Substances, the resistance of the glove n The exact break through time for substances has Suitability and durability of glove type is dependent Body protection: See Other protection below Other protection: • Overalls. | ard; soft contact lenses may absorb and concent y depend on the material, but also on further mark naterial can not be calculated in advance and has to be obtained from the manufacturer of the prote nt on usage. |
|--|---------------------|--|---|
| | | P.V.C. apron.Barrier cream. | |
| | | Thermal hazards: | |
| Recommended material(s): | R | espiratory protection: | |
| | | | |
| SECTION 9 Physical and chemi | ad proportion | | |
| - | | | |
| Information on basic physical and | chemical properties | | |
| Appearance | | | |
| Not Available | | | |
| Physical state | Divided solid | Relative density (Water = 1) | 5.85 |
| Odour | Not Available | Partition coefficient n-octanol / water | Not Available |
| Odour threshold | Not Available | Auto-ignition temperature (°C) | Not Available |
| pH (as supplied) | Not Available | Decomposition temperature | Not Available |
| Melting point / freezing point (°C) | 2680 | Viscosity (cSt) | Not Available |
| Initial boiling point and boiling range (°C) | 4300 | Molecular weight (g/mol) | 123.22 |
| Flash point (°C) | Not Available | Taste | Not Available |
| Evaporation rate | Not Available | Explosive properties | Not Available |
| Flammability | Not Available | Oxidising properties | Not Available |
| Upper Explosive Limit (%) | Not Available | Surface Tension (dyn/cm or mN/m) | Not Available |
| Lower Explosive Limit (%) | Not Available | Volatile Component (%vol) | Negligible |
| Vapour pressure (kPa) | Negligible | Gas group | Not Available |
| Solubility in water (g/L) | Immiscible | pH as a solution(1%) | Not Available |
| Vapour density (Air = 1) | Not Available | | |
| | | | |
| SECTION 10 Stability and reactive | /ity | | |
| Reactivity: | | | |
| See section 7.2 | | | |
| Chemical stability: | | | |
| Presence of incompatible materials. Product is considered stable. Hazardous polymerisation will not occur. | | | |
| Possibility of hazardous reactions: | | | |
| See section 7.2 | | | |
| Conditions to avoid: | | | |
| See section 7.2 | | | |
| Incompatible materials: | | | |
| See section 7.2 | | | |
| Hazardous decomposition products: | | | |
| See section 5.3 | | | |
| SECTION 44 Towing logical inform | | | |
| SECTION 11 Toxicological infor | | | |
| Information on toxicological effect | | | |
| | | | |

the lung is able to respond to a chemical insult by first removing or neutralising the irritant and then repairing the damage. The repair process, which initially evolved to protect mammalian lungs from foreign matter and antigens, may however, produce further lung damage resulting in the impairment of gas exchange, the primary function of the lungs. Respiratory tract irritation often results in an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system.

Ingestion:

Accidental ingestion of the material may be damaging to the health of the individual. The acute oral toxicities of inorganic zirconium salts is low due to their poor gastrointestinal absorption. Intraperitoneal or intravenous injection produces toxic effects approximately 20 times greater than by ingestion. Acutely poisoned animals show progressive depression until death.

Skin Contact:

Evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dematitis is often characterised by skin references (erytherma) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.

Eye:

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Evidence exists, or practical experience predicts, that the material may cause eye irritation in a substantial number of individuals and/or may produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Repeated or prolonged eye contact may cause inflammation characterised by temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other

transient eye damage/ulceration may occur.

Chronic:

Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.

Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems. Long term exposure to high dust concentrations may cause changes in lung function (i.e. pneumoconiosis) caused by particles less than 0.5 micron penetrating and remaining in the lung. A prime symptom is breathlessness

ΤΟΧΙΟΙΤΥ IRRITATION zirconium dioxide Not Available Not Available

* Value obtained from manufacturer's msds

unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances

ZIRCONIUM DIOXIDE

Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airllow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS.

| Acute Toxicity: | Not Available | Carcinogenicity: | Not Available |
|------------------------------------|---------------|---------------------------|---------------|
| Skin Irritation/Corrosion: | Not Available | Reproductivity: | Not Available |
| Serious Eye Damage/Irritation: | Not Available | STOT - Single Exposure: | Not Available |
| Respiratory or Skin sensitisation: | Not Available | STOT - Repeated Exposure: | Not Available |
| Mutagenicity: | Not Available | Aspiration Hazard: | Not Available |
| | | | |

SECTION 12 Ecological information

Toxici

Metal-containing inorganic substances generally have negligible vapour pressure and are not expected to partition to air. Once released to surface waters and most soils their fate depends on solubility and dissociation in water. Environmental processes (such as oxidation and the presence of acids or bases) may transform insoluble metals to more soluble ionic forms. Microbiological processes may also transform insoluble metals to more soluble forms.

| Persistence and degradability | | | | | | |
|----------------------------------|-------------------------|------------------|--|--|--|--|
| Ingredient | Persistence: Water/Soil | Persistence: Air | | | | |
| Not Available | Not Available | Not Available | | | | |
| Bioaccumulative potential | | | | | | |
| Ingredient | Bioaccumulation | | | | | |
| Not Available | Not Available | | | | | |
| Mobility in soil | | | | | | |
| Ingredient | Mobility | | | | | |
| Not Available | Not Available | | | | | |

SECTION 13 Disposal considerations

Product / Packaging disposal:

Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked. A Hierarchy of Controls seems to be common - the user should investigate:

Reduction

Reuse

 Recycling Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use.

SECTION 14 Transport information

Labels Required:

Marine Pollutant: NO

HAZCHEM:

Land transport (ADG): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

SECTION 15 Regulatory information

zirconium dioxide(1314-23-4) is found on the following regulatory lists

"Australia Inventory of Chemical Substances (AICS)", "Fisher Transport Information", "Sigma-Aldrich Transport Information", "OECD List of High Production Volume (HPV) Chemicals", "United Nations Consolidated List of Products Whose Consumption and/or Sale Have Been Banned, Withdrawn, Severely Restricted or Not Approved by Governments", "Australia Hazardous Substances", "Australia Exposure Standards'

SECTION 16 Other information

Other information

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Dubbo Zirconia Project Report No. 545/04

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chernwatch Classification committee using available literature references. A list of reference resources used to assist the committee may be found at:

www.chemwatch.net/references

The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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ZIRCONIUM HYDROXIDE





PERSONAL PROTECTIVE EQUIPMENT FOR INDUSTRIAL/COMMERCIAL ENVIRONMENTS



Issue Date: Mon 28-Jan-2008 Print Date: Wed 30-Sep-2009

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DZ ZIRCONIUM BASIC SULPHATE

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Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME DZ ZIRCONIUM BASIC SULPHATE

PRODUCT USE

» Used according to manufacturer's directions.

SUPPLIER

Company: Australian Nuclear Science And Technology Organisation Address: New Illawarra Road Lucas Heights NSW, 2234 AUS Telephone: +61 2 9717 3111 Fax: +61 2 9543 5097

Section 2 - HAZARDS IDENTIFICATION

STATEMENT OF HAZARDOUS NATURE

HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code.

POISONS SCHEDULE

None

RISK

» Harmful if swallowed.
 » Irritating to eyes respiratory system and skin.

SAFETY » Avoid contact with eyes. » Wear suitable protective clothing.

» To clean the floor and all objects contaminated by this material use water and detergent.
 » Keep away from food drink and animal feeding stuffs.
 » In case of contact with eyes rinse with plenty of water and contact Doctor or Poisons Information Centre.
 » If swallowed IMMEDIATELY contact Doctor or Poisons Information Centre (show this container or label).

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

| NAME | CAS RN | % |
|-------------------|------------|-------|
| zirconium sulfate | 14644-61-2 | 30-60 |
| water | 7732-18-5 | 30-60 |

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Section 4 - FIRST AID MEASURES

SWALLOWED

• IF SWALLOWED, REFER FOR MEDICAL ATTENTION, WHERE POSSIBLE, WITHOUT DELAY.

• For advice, contact a Poisons Information Centre or a doctor.

Urgent hospital treatment is likely to be needed.

• In the mean time, qualified first-aid personnel should treat the patient following observation and employing supportive measures as indicated by the patient's condition.

• If the services of a medical officer or medical doctor are readily available, the patient should be placed in his/her care and a copy of the MSDS should be provided. Further action will be the responsibility of the medical specialist.

• If medical attention is not available on the worksite or surroundings send the patient to a hospital together with a copy of the MSDS.

• Where medical attention is not immediately available or where the patient is more than 15 minutes from a hospital or unless instructed otherwise:

• INDUCE vomiting with fingers down the back of the throat, ONLY IF CONSCIOUS. Lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. NOTE: Wear a protective glove when inducing vomiting by mechanical means.

EYE

» Not applicable.

SKIN

- » If skin contact occurs:
- Immediately remove all contaminated clothing, including footwear.
- Flush skin and hair with running water (and soap if available).
- · Seek medical attention in event of irritation.

INHALED

- If dust is inhaled, remove from contaminated area.
- Encourage patient to blow nose to ensure clear passage of breathing.
- If irritation or discomfort persists seek medical attention.

NOTES TO PHYSICIAN

» Treat symptomatically.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

• There is no restriction on the type of extinguisher which may be used.

• Use extinguishing media suitable for surrounding area.

FIRE FIGHTING

- Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves for fire only.
- Prevent, by any means available, spillage from entering drains or water courses.
- Use fire fighting procedures suitable for surrounding area.
- DO NOT approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.
- Equipment should be thoroughly decontaminated after use.
- Slight hazard when exposed to heat, flame and oxidisers.

FIRE/EXPLOSION HAZARD

- Non combustible.
- Not considered a significant fire risk, however containers may burn.



AUSTRALIAN ZIRCONIA LTD Dubbo Zirconia Project Report No. 545/04

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CHEMWATCH 21-1228 Version No:2.0 CD 2009/1 Page 3 of 9 Section 5 - FIRE FIGHTING MEASURES

Decomposition may produce toxic fumes of: sulfur oxides (SOx).

FIRE INCOMPATIBILITY

» None known.

HAZCHEM: None

Section 6 - ACCIDENTAL RELEASE MEASURES

EMERGENCY PROCEDURES

MINOR SPILLS

- · Clean up all spills immediately.
- Secure load if safe to do so.
- Bundle/collect recoverable product.
- · Collect remaining material in containers with covers for disposal.

MAJOR SPILLS

- · Clean up all spills immediately.
- Wear protective clothing, safety glasses, dust mask, gloves.
- · Secure load if safe to do so. Bundle/collect recoverable product.
- · Use dry clean up procedures and avoid generating dust.
- · Vacuum up (consider explosion-proof machines designed to be grounded during storage and use).
- Water may be used to prevent dusting.
- · Collect remaining material in containers with covers for disposal.
- Flush spill area with water.

Personal Protective Equipment advice is contained in Section 8 of the MSDS.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- · Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- · Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
 DO NOT enter confined spaces until atmosphere has been checked.
- DO NOT allow material to contact humans, exposed food or food utensils.
- · Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- · Keep containers securely sealed when not in use.
- · Avoid physical damage to containers.
- · Always wash hands with soap and water after handling.
- Work clothes should be laundered separately. Launder contaminated clothing before re-use.
- Use good occupational work practice.
- · Observe manufacturer's storing and handling recommendations.
- · Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

SUITABLE CONTAINER

- · Polyethylene or polypropylene container.
- · Packing as recommended by manufacturer.
- · Check all containers are clearly labelled and free from leaks.



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CHEMWATCH 21-1228 Version No:2.0 CD 2009/1 Page 4 of 9 Section 7 - HANDLING AND STORAGE

STORAGE INCOMPATIBILITY

· WARNING: Avoid or control reaction with peroxides. All transition metal peroxides should be considered as potentially explosive. For example transition metal complexes of alkyl hydroperoxides may decompose explosively.

• The pi-complexes formed between chromium(0), vanadium(0) and other transition metals (haloarene-metal complexes) and mono-or poly-fluorobenzene show extreme sensitivity to heat and are explosive.

· Avoid reaction with borohydrides or cyanoborohydrides.

· Avoid strong bases.

STORAGE REQUIREMENTS

» Store away from incompatible materials.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source

Material

Australia Exposure Standards

TWA mg/m³ zirconium sulfate (Zirconium 5 compounds (as Zr))

STEL mg/m³

10

The following materials had no OELs on our records water: CAS:7732-18-5

EMERGENCY EXPOSURE LIMITS

zirconium sulfate Material

MATERIAL DATA

» Not available. Refer to individual constituents.

INGREDIENT DATA ZIRCONIUM SUI FATE:

» Sensory irritants are chemicals that produce temporary and undesirable side-effects on the eyes, nose or throat. Historically occupational exposure standards for these irritants have been based on observation of workers' responses to various airborne concentrations. Present day expectations require that nearly every individual should be protected against even minor sensory irritation and exposure standards are established using uncertainty factors or safety factors of 5 to 10 or more. On occasion animal no-observable-effectlevels (NOEL) are used to determine these limits where human results are unavailable. An additional approach, typically used by the TLV committee (USA) in determining respiratory standards for this group of chemicals, has been to assign ceiling values (TLV C) to rapidly acting irritants and to assign short-term exposure limits (TLV STELs) when the weight of evidence from irritation, bioaccumulation and other endpoints combine to warrant such a limit. In contrast the MAK Commission (Germany) uses a five-category system based on intensive odour, local irritation, and elimination half-life. However this system is being replaced to be consistent with the European Union (EU) Scientific Committee for Occupational Exposure Limits (SCOEL); this is more closely allied to that of the USA.

OSHA (USA) concluded that exposure to sensory irritants can:

- cause inflammation
- · cause increased susceptibility to other irritants and infectious agents
- · lead to permanent injury or dysfunction
- · permit greater absorption of hazardous substances and

• acclimate the worker to the irritant warning properties of these substances thus increasing the risk of overexposure.

OSHA concluded that the recommended TLV-TWA and STEL would protect workers from any significant risk of pulmonary effects. NIOSH conclude that a separate limit should be considered for zirconium tetrachloride (because of the irritancy of hydrogen chloride derived from hydrolysis). This was based on a 60-day inhalation study at 6 mg/m3 zirconium tetrachloride which found an increase in mortality of rats and guinea

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CHEMWATCH 21-1228 Version No:2.0 CD 2009/1 Page 5 of 9 Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

pigs due to respiratory infection and reductions of borderline statistical significance in circulating hemoglobin and erythrocyte counts in dogs.

WATER:

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» No exposure limits set by NOHSC or ACGIH.

PERSONAL PROTECTION

EYE

Safety glasses with side shields

· Chemical goggles.

Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59].

No special equipment required due to the physical form of the product.

HANDS/FEET

· Wear chemical protective gloves, eg. PVC.

- Wear safety footwear or safety gumboots, eg. Rubber.
- No special equipment required due to the physical form of the product.

OTHER

- · Overalls.
- P.V.C. apron.
- · Barrier cream.
- · Skin cleansing cream.
- Eye wash unit.

RESPIRATOR

» Selection of the Class and Type of respirator will depend upon the level of breathing zone contaminant and the chemical nature of the contaminant. Protection Factors (defined as the ratio of contaminant outside and inside the mask) may also be important.

| Breathing Zone Level ppm (volume) | Maximum Protection Factor | Half- face Respirator | Full- Face Respirator |
|--------------------------------------|------------------------------|-----------------------|-----------------------|
| 1000 | 10 | - AUS P | - |
| 1000 | 50 | - | - AUS P |
| 5000 | 50 | Airline * | - |
| 5000 | 100 | - | - 2 P |
| 10000 | 100 | - | - 3 P |
| | 100+ | | Airline** |

* - Continuous Flow ** - Continuo

** - Continuous-flow or positive pressure demand.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required. For further information consult site specific CHEMWATCH data (if available), or your Occupational Health and Safety Advisor.

ENGINEERING CONTROLS

» General exhaust is adequate under normal operating conditions. Local exhaust ventilation may be required in special circumstances. If risk of overexposure exists, wear approved respirator. Supplied-air type respirator may be required in special circumstances. Correct fit is essential to ensure adequate protection. Provide adequate ventilation in warehouses and enclosed storage areas.



DZ ZIRCONIUM BASIC SULPHATE

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CHEMWATCH 21-1228 Version No:2.0 CD 2009/1 Page 6 of 9 Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

Moist white cake; insoluble in water.

PHYSICAL PROPERTIES

Does not mix with water.

Molecular Weight: Not Applicable Melting Range (\mathfrak{C}): Not Available Solubility in water (g/L): Immiscible pH (1% solution): Not Available Volatile Component (%vol): Not Applicable Relative Vapour Density (air=1): Not Applicable Lower Explosive Limit (%): Not Applicable Autoignition Temp (\mathfrak{C}): Not Applicable State: Manufactured Boiling Range (°C): Not Applicable Specific Gravity (water= 1): Not Available pH (as supplied): Not Applicable Vapour Pressure (kPa): Not Applicable Evaporation Rate: Not Applicable Flash Point (°C): Not Applicable Upper Explosive Limit (%): Not Applicable Decomposition Temp (°C): Not Available Viscosity: Not Available

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY

» Product is considered stable and hazardous polymerisation will not occur. For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

» Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual. Sulfates are not well absorbed orally, but can cause diarrhoea.

Because inorganic zirconium is poorly absorbed from the digestive tract, acute oral toxicity is low. Injection is much more dangerous, causing progressive depression until death.

EYE

» This material may produce eye irritation in some persons and produce eye damage 24 hours or more after instillation. Moderate inflammation may be expected with redness; conjunctivitis may occur with prolonged exposure.

SKIN

» The material may cause moderate inflammation of the skin either following direct contact or after a delay of some time. Repeated exposure can cause contact dermatitis which is characterised by redness, swelling and blistering.

The external application of zirconium can cause nodules in the skinof the armpits. Open cuts, abraded or irritated skin should not be exposed to this material.

INHALED

» The material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage.



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DZ ZIRCONIUM BASIC SULPHATE

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CHEMWATCH 21-1228 Version No:2.0 CD 2009/1 Page 7 of 9 Section 11 - TOXICOLOGICAL INFORMATION

IRRITATION

Nil Reported

Zirconium workers exposed to fume for 1-5 years showed no abnormalities due to zirconium. Animal studies also reveal a low order of hazard from inhaled zirconium.

CHRONIC HEALTH EFFECTS

» Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure.

Zirconium can accumulate in the spleen. Oral administration has not beenshown to cause any ill effects.

TOXICITY AND IRRITATION

» Not available. Refer to individual constituents.

ZIRCONIUM SULFATE:

» unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY

Oral (rat) LD50: 3500 mg/kg Intraperitoneal (rat) LD50: 175 mg/kg Intraperitoneal (Rat) LD50: 63 mg/kg Subcutaneous (Rat) LD: 500 mg/kg Oral (Rat) LD50: 1235 mg/kg

Where the initial production is a set of the initial production initial production is a set of the initial production initial production is a set of the initial production initial production is a set of the initial production initial production is a set of the initial production initial production is a set of the initial production initial production is a set of the initial production initial production is a set of the initial production. The material may produce moderate everities in the initial production. The material may produce conjunctivities.

The material may produce respiratory tract irritation, and result in damage to the lung including reduced lung function.

The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.

WATER:

» No significant acute toxicological data identified in literature search.

Section 12 - ECOLOGICAL INFORMATION

» DO NOT discharge into sewer or waterways. Refer to data for ingredients, which follows:

ZIRCONIUM SULFATE: » Fish LC50 (96hr.) (mg/l):

14- 145

» Soluble salts of zirconium are moderately toxic to algae and fish. Zirconium is more toxic in soft water than in hard water. The toxicity of zirconium salts and zirconium complexes with organic acids are expected to be related to their water solubilities and their octanol/ water partition coefficient (Kow). Compounds with molecular weights exceeding 1000 are not expected to be absorbed by aquatic organisms even if they are water soluble. Only water-soluble zirconium compounds with a molecular weight of less than 1000 are expected to be to be:



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» Data from tap water studies with human volunteers indicate that sulfates produce a laxative effect at concentrations of 1000 - 1200 mg/litre, but no increase in diarrhoea, dehydration or weight loss. The presence of sulfate in drinking-water can also result in a noticeable taste; the lowest taste threshold concentration for sulfate is approximately 250 mg/litre as the sodium salt. Sulfate may also contribute to the corrosion of distribution systems. No health-based guideline value for sulfate in drinking water is proposed. However, there is an increasing likelihood of complaints arising from a noticeable taste as concentrations in water increase above 500 mg/litre.

Sulfates are removed from the air by both dry and wet deposition processes. Wet deposition processes including rain-out (a process that occurs within the clouds) and washout (removal by precipitation below the clouds) contribute to the removal of sulfate from the atmosphere.

In soil, the inorganic sulfates can adsorb to soil particles or leach into surface water and groundwater. Sulfates can be taken up by plants and be incorporated into the parenchyma of the plant. Sulfate in water can also be reduced by sulfate bacteria (Thiobacilli) which use them as a source of energy.

Section 13 - DISPOSAL CONSIDERATIONS

- · DO NOT allow wash water from cleaning or process equipment to enter drains.
- · It may be necessary to collect all wash water for treatment before disposal.

• In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.

- Where in doubt contact the responsible authority.
- Recycle wherever possible or consult manufacturer for recycling options.
- Consult State Land Waste Management Authority for disposal.
- · Bury residue in an authorised landfill.
- · Recycle containers if possible, or dispose of in an authorised landfill.

Section 14 - TRANSPORTATION INFORMATION

HAZCHEM: None (ADG7)

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS: ADG7, UN, IATA, IMDG

Section 15 - REGULATORY INFORMATION

POISONS SCHEDULE: None

REGULATIONS

DZ Zirconium Basic Sulphate (CAS: None): No regulations applicable

Regulations applicable Regulations for ingredients zirconium sulfate (CAS: 14644-61-2) is found on the following regulatory lists; Australia Exposure Standards Australia Inventory of Chemical Substances (AICS) zirconium sulfate (CAS: 34906-73-0) is found on the following regulatory lists; Australia Exposure Standards Australia Hazardous Substances Australia Inventory of Chemical Substances (AICS) zirconium sulfate (CAS: 7446-31-3) is found on the following regulatory lists; Australia Exposure Standards Australia Exposure Standards Australia Hazardous Substances Australia Hazardous Substances Australia Inventory of Chemical Substances (AICS)

Australia Inventory of Chemical Substances (AICS)

water (CAS: 7732-18-5) is found on the following regulatory lists;
 Australia Inventory of Chemical Substances (AICS)
 GESAMP/EHS Composite List of Hazard Profiles - Hazard evaluation of substances transported by ships
 IMO IBC Code Chapter 18: List of products to which the Code does not apply
 OECD Representative List of High Production Volume (HPV) Chemicals

No data available for zirconium sulfate as CAS: 15092-04-3.



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Section 16 - OTHER INFORMATION

INGREDIENTS WITH MULTIPLE CAS NUMBERS CAS

Ingredient Name zirconium sulfate

14644-61-2, 34806-73-0, 15092-04-3, 7446-31-3

EXPOSURE STANDARD FOR MIXTURES

» "Worst Case" computer-aided prediction of spray/ mist or fume/ dust components and concentration:

» Composite Exposure Standard for Mixture (TWA) :100 mg/m³.

» Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

A list of reference resources used to assist the committee may be found at: www.chemwatch.net/references.

» The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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Issue Date: 13-May-2009 Print Date: 14-May-2009

This is the end of the MSDS.



Appendix 11



NIOBIUM(V) OXIDE

| Version No: 4.1.1.1 Material Safety Data Sheet according to N | IOHSC and ADC maninements | Print Date: 05/08/201 Issue Date: 01/01/201 SL and ALIS EN RISK |
|---|---|---|
| Material Safety Data Sheet according to N | | S.Local.AUS.EN.RISK |
| | of the substance / mixture and of the company / und | ertaking |
| Product Identifier | | |
| Product name: | NIOBIUM(V) OXIDE | |
| Chemical Name: | niobium(V) oxide | |
| Synonyms: | 3-bromoberzo(b)/thiophene-2-carboxylic acid, Columbium Oxide, Columbium pentoxide-Niobia~Niobium(5+)oxide-Niobium pentaoxide, Ethanoic acid, M 99+, Niobia, Niobium Pentoxide Columbium Pentoxide, Niobium pentaoxide, oxide = 99.9%, OXYDE DE NIOBIUM(V), Ossido di niobio(V) | ethanecarboxylic acid, NIOBIUM OXIDE (V), NIOBIUM(V) OXIDE |
| Proper shipping name: | Not Applicable | |
| Chemical formula: | Nb2-O5 | |
| Other means of identification: | Not Available | |
| CAS number: | 1313-96-8 | |
| Relevant identified uses of t | he substance or mixture and uses advised against | |
| Relevant identified uses: | Intermediate; electronics. | |
| Details of the supplier of the | safety data sheet | |
| Registered company name: | Not Available | |
| Address: | Not Available | |
| Telephone: | Not Available | |
| Fax: | Not Available | |
| Website: | Not Available | |
| Email: | Not Available | |
| Emergency telephone numbe | | |
| Association / Organisation: | Not Available | |
| Emergency telephone numbers: | Not Available | |
| Other emergency telephone numbers: | Not Available | |
| | | |
| Classification of the substan | | |
| SECTION 2 Hazards idention Classification of the substan HAZARDOUS SUBSTANCE. NON-DAI ChemWatch Hazard Ratings MinMax | ce or mixture | |
| Classification of the substan HAZARDOUS SUBSTANCE. NON-DAI ChemWatch Hazard Ratings MiniMax | ce or mixture GEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code. | |
| Classification of the substan HAZARDOUS SUBSTANCE. NON-DAI ChemWatch Hazard Ratings MinMax Flammability 0 Toxicity 0 | Ce or mixture VGEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code. 0 = Minimum 1 = Low 2 = Miderate | |
| Classification of the substan HAZARDOUS SUBSTANCE. NON-DAI ChemWatch Hazard Ratings MiniMax | Ce or mixture VGEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code. 0 = Minimum 1 = Low | |
| Classification of the substan HAZARDOUS SUBSTANCE. NON-DAI themWatch Hazard Ratings MiniMax flammability 0 foxicity 0 Sody Contact 2 Reactivity 0 | Ce or mixture VGEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code. 0 = Minimum 1 = Low 2 = Moderate 3 = High | |
| Classification of the substan HAZARDOUS SUBSTANCE. NON-DAI hemWatch Hazard Ratings MinMax lammability 0 oxicity 0 oxicity 0 eactivity 0 thronic 2 | Ce or mixture VGEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code. 0 = Minimum 1 = Low 2 = Moderate 3 = High | |
| Classification of the substan HAZARDOUS SUBSTANCE. NON-DAI themWatch Hazard Ratings MinMax 'lammability 0 oxicity 0 oxicity 0 keactivity 0 thronic 2 Poisons Schedule: | Ce or mixture WGEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code. 0 = Minimum 1 = Low 2 = Moderate 3 = High 4 = Extreme | |
| Classification of the substan HAZARDOUS SUBSTANCE. NON-DAI ChemWatch Hazard Ratings MinMax Tammability 0 Toxicity 0 Sody Contact 2 Reactivity 0 Chronic 2 Poisons Schedule: Risk Phrases ^[1] | Ce or mixture VGEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code. 0 = Minimum 1 = Low 2 = Moderate 3 = High 4 = Extreme None | |
| Classification of the substan HAZARDOUS SUBSTANCE. NON-DAI ChemWatch Hazard Ratings MiniMax Tammability 0 Frammability 0 Sody Contact 2 Reactivity 0 Chronic 2 Poisons Schedule: Risk Phrases ^[1] R37 Irritating to resp | Ce or mixture VGEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code. 0 = Minimum 1 = Low 2 = Moderate 3 = High 4 = Extreme None | |
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| Classification of the substant HAZARDOUS SUBSTANCE. NON-DAI ChemWatch Hazard Ratings Filammability 0 Society 0 Reactivity 0 Chronic 2 Poisons Schedule: Risk Phrases ^[1] R37 Irritating to resp R33? Cumulative effor IMTED EVIDENCE | Ce or mixture WGEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code. 0 = Minimum 1 = Low Poderate 3 = High 4 = Extreme Diratory system. acts may result following exposure*. | I-Annex VI |
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| Classification of the substant AZARDOUS SUBSTANCE. NON-DAI ChemWatch Hazard Ratings Minikax Tammability 0 Society 0 | Ce or mixture WGEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code. | |
| Classification of the substant HAZARDOUS SUBSTANCE. NON-DAI ChemWatch Hazard Ratings MiniMax Flammability 0 Sody Contact 2 Reactivity 0 Chronic 2 Poisons Schedule: Risk Phrases ^[1] R37 Invitating to resp R33? Cumulative effet Limited Evidence Legend: 1. Classified by Chemwatch; 2. GHS Classification ^[1] : STOT - SE (Resp. Irr.) Category 3 LIMITED EVIDENCE Legend: 1. Classified by Chemwatch; 2. Label elements | Ce or mixture WGEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code. | |
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| Supplementary sta lot Applicable | ttement(5). | | | | | | |
|--|---|---|----------------------------|--|--|--|--|
| | ement(s): Prevention | | | | | | |
| P261 | Avoid breathing dust/fume/gas/mist/vapours/spra | ıy. | | | | | |
| 2271 Use only outdoors or in a well-ventilated area. | | | | | | | |
| Precautionary state | ement(s): Response | | | | | | |
| P304+P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. | | | | | | | |
| P312 | Call a POISON CENTER/doctor/physician/first a | aider/if you feel unwell. | | | | | |
| Precautionary state | ement(s): Storage | | | | | | |
| 2403+P233 Store in a well-ventilated place. Keep container tightly closed. | | | | | | | |
| P405 | Store locked up. | | | | | | |
| - | ement(s): Disposal | | | | | | |
| P501 | Dispose of contents/container to authorised che | mical landfill or if organic to high | n temperature incineration | | | | |
| Label elements | | | | | | | |
| | nts are found in section 2.1 | | | | | | |
| Indication(s) of da | nger: Xi | | | | | | |
| Safety advice: | | | | | | | |
| S40 | To clean the floor and all objects contaminated by If swallowed, IMMEDIATELY contact Doctor or F | | | | | | |
| S46 S56 | Dispose of this material and its container at haza | | ·····, | | | | |
| S64 | If swallowed, rinse mouth with water (only if the p | | | | | | |
| Other hazards | | | | | | | |
| Not Available | | | | | | | |
| CAS No | | | | | | | |
| 1313-96-8 | | %[weight] >95 | Name NIOBIUM(V) OXIDE | | | | |
| | | | | | | | |
| Mixtures | igredients' in section 3.1 | | | | | | |
| Mixtures See 'Information on ir | ngredients' in section 3.1 <mark>'irst aid measures</mark> | | | | | | |
| Mixtures See Information on ir SECTION 4 F | irst aid measures | | | | | | |
| Mixtures See 'Information on ir SECTION 4 F Description of | | | | | | | |
| Mixtures SECTION 4 F Description of Eye Contact: If this product comes • Wash out in • If irritation c • Removal of | irst aid measures | >95 | | | | | |
| Mixtures see Information on in SECTION 4 F Description of Eye Contact: If this product comes • Wash out in • If inritation c • Removal of Skin Contact: | inst aid measures first aid measures in contact with eyes: mmediately with water. ontinues, seek medical attention. contact lenses after an eye injury should only be und | >95 | | | | | |
| Mixtures See Information on in SECTION 4 F Description of Eye Contact: If this product comes • Wash out in • If irritation c • Removal of Skin Contact: If skin or hair contacc • Flush skin a | inst aid measures first aid measures in contact with eyes: mmediately with water. ontinues, seek medical attention. contact lenses after an eye injury should only be und | >95 | | | | | |
| SECTION 4 F Description of Eye Contact: If this product comes • Wash out in • If irritation c • Removal of Skin Contact: If skin or hair contact • Flush skin a | irst aid measures first aid measures in contact with eyes: mediately with water. ontinues, seek medical attention. contact lenses after an eye injury should only be und t occurs: and hair with running water (and soap if available). | >95 | | | | | |
| Mixtures See Information on in SECTION 4 F Description of Eye Contact: If this product comes • Wash out in • If irritation of • Removal of Stein Contact: If skin or hair contact • Flush skin en • Seek media Inhalation: • If fumes or • Lay patient • Prostheses • Apply artific | Inst aid measures first aid measures in contact with eyes: nmediately with water. ontinues, seek medical attention. contact lenses after an eye injury should only be und t occurs: and hair with running water (and soap if available), al attention in event of irritation. combustion products are inhaled remove from contar down. Keep warm and rested. | >95 Iertaken by skilled personnel. ninated area. | NIOBIUM(V) OXIDE | | | | |
| Mixtures See Information on in SECTION 4 F Description of Eye Contact: If this product comes • Wash out in • If initation c • Removal of Skin Contact: If skin or hair contact • Flush skin a • Seek medic Inhalation: • If fumes or • Lay pairent • Prostheses • Apply artific • Transport to Information: • Instructure • Internation: • Internation: • Internation: • Transport • Internation: • Internation: • Internation: • Transport • Internation: • In | irst aid measures first aid measures first aid measures in contact with eyes: mediately with water. ontinues, seek medical attention. 'contact lenses after an eye injury should only be und t occurs: and hair with running water (and soap if available). cal attention in event of irritation. combustion products are inhaled remove from contar down. Keep warm and rested. such as false teeth, which may block airway, should al respiration if not breathing, preferably with a deme | >95 Iertaken by skilled personnel. ninated area. I be removed, where possible, p and valve resuscitator, bag-valve | NIOBIUM(V) OXIDE | | | | |
| Mixtures iee Information on in SECTION 4 F Description of Eye Contact: If this product comes • Wash out in • If imitation c • Removal of Skin Contact: If skin or hair contac • Flush skin a • Seek medic Inhalation: • If fumes or • Lay patient • Prostheses • Apply attific • Transport to Ingestion: • Immediately • First aid is in Indication of a | Inst aid measures first aid measures in contact with eyes: mediately with water. ontinues, seek medical attention. contact lenses after an eye injury should only be und to cours: and hair with running water (and soap if available). at attention in event of inflation. combustion products are inhaled remove from contar down. Keep warm and rested. such as false teeth, which may block airway, should ial respiration if not breathing, preferably with a deme o hospital, or doctor, without delay. y give a glass of water. not generally required. If in doubt, contact a Poisons iny immediate medical attention and | >95 Iertaken by skilled personnel. | NIOBIUM(V) OXIDE | | | | |
| Mixtures ise Information on in SECTION 4 F Description of Eye Contact: If this product comes • Wash out in • If initiation c • Removal of Skin Contact: If skin or hair contact • Flush skin a • Seek medic Infalation: • If fumes or • Lay patient • Prostheses • Apply attiffic • Transport to Information: • First aid is in Information of a Treat symptomatical | Inst aid measures first aid measures in contact with eyes: mediately with water. ontinues, seek medical attention. contact lenses after an eye injury should only be und to cours: and hair with running water (and soap if available). at attention in event of inflation. combustion products are inhaled remove from contar down. Keep warm and rested. such as false teeth, which may block airway, should ial respiration if not breathing, preferably with a deme o hospital, or doctor, without delay. y give a glass of water. not generally required. If in doubt, contact a Poisons iny immediate medical attention and | >95 Iertaken by skilled personnel. | NIOBIUM(V) OXIDE | | | | |
| Mixtures see Information on in SECTION 4 F Description of Eye Contact: If this product comes • Wash out in • If imitation c • Removal of Skin Contact: If skin or hair contac • Flush skin a • Seek medic Inhalation: • If fumes or • Ling apatient • Prostheses • Apply attific • First aid is r Indication of a Treat symptomaticall SECTION 5 F | inst aid measures first aid measures first aid measures in contact with eyes: mmediately with water: contact lenses after an eye injury should only be und to cours: and hair with running water (and soap if available). at attention in event of initiation. combustion products are inhaled remove from contar down. Keep warm and rested. such as false teeth, which may block airway, should ial respiration if not breathing, preferably with a deme o hospital, or doctor, without delay. y give a glass of water. not generally required. If in doubt, contact a Poisons my immediate medical attention and y. | >95 Iertaken by skilled personnel. | NIOBIUM(V) OXIDE | | | | |
| Mixtures ise Information on in SECTION 4 F Description of Eye Contact: If this product comes • Wash out in • If inritation c • Removal of Skin Contact: If skin or hair contact • Flush skin a • Seek medic Inhalation: • If fumes or • Lay patient • Transport to Ingestion: • Immediatel • First aid is of Indication of a Treat symptomatical SECTION 5 F Extinguishing • There is no | inst aid measures first aid measures first aid measures in contact with eyes: mmediately with water: contact lenses after an eye injury should only be und to cours: and hair with running water (and soap if available). at attention in event of initiation. combustion products are inhaled remove from contar down. Keep warm and rested. such as false teeth, which may block airway, should ial respiration if not breathing, preferably with a deme o hospital, or doctor, without delay. y give a glass of water. not generally required. If in doubt, contact a Poisons my immediate medical attention and y. | >95 Iertaken by skilled personnel. I be removed, where possible, p and valve resuscitator, bag-valve Information Centre or a doctor. | NIOBIUM(V) OXIDE | | | | |
| Mixtures See Information on in SECTION 4 F Description of Eye Contact: If this product comes • Wash out in • If initation c • Removal of Skin Contact: If skin or hair contag • Flush skin a • Seek medic Inhalation: • If fumes or • Lay patient • Prostheses • Apply attific • Transport to Indication of a Treat symptomatical SECTION 5 F Extinguishing • There is no • Use extingu | inst aid measures first aid measures first aid measures first aid measures in contact with eyes: nmediately with water. contact lenses after an eye injury should only be und cocurs: and hair with running water (and soap if available). cal attention in event of irritation. combustion products are inhaled remove from contar down. Keep warm and rested. such as false teeth, which may block airway, should ai respiration if not breathing, preferably with a deme o hospital, or doctor, without delay. y give a glass of water. not generally required. If in doubt, contact a Poisons ny immediate medical attention and y. irrefighting measures media restriction on the type of extinguisher which may be i using media suitable for surrounding area. | >95 Iertaken by skilled personnel. ninated area. I be removed, where possible, p and valve resuscitator, bag-valve Information Centre or a doctor. | NIOBIUM(V) OXIDE | | | | |
| Mixtures See Information on in SECTION 4 F Description of Eye Contact: If this product comes • Wash out in • Firitation c • Removal of Skin Contact: If skin or hair contact • Flush skin a • Seek media Inhalation: • If fumes or • Lay patient • Prostheses • Apply artific • Transport to Ingestion: • Immediate • First aid is I Indication of a Treat symptomatical SECTION 5 F Extinguishing • There is no • Use extingu | Inst aid measures first aid measures first aid measures first aid measures in contact with eyes: mediately with water. contact lenses after an eye injury should only be und cocurs: and hair with running water (and soap if available). cal attention in event of initiation. combustion products are inhaled remove from contar down. Keep warm and rested. such as false teeth, which may block airway, should ai respiration if not breathing, preferably with a deme o hospital, or doctor, without delay. y give a glass of water. not generally required. If in doubt, contact a Poisons ny immediate medical attention and y. irrefighting measures media restriction on the type of extinguisher which may be to ishing media suitable for surrounding area. Is arising from the substrate or mixe | >95 Iertaken by skilled personnel. ninated area. I be removed, where possible, p and valve resuscitator, bag-valve Information Centre or a doctor. | NIOBIUM(V) OXIDE | | | | |
| Mixtures See Information on in SECTION 4 F Description of Eye Contact: If this product comes • Wash out in • If initation c • Removal of Skin Contact: If skin or hair contac • Flush skin a • Seek medir Inhalation: • If fumes or • Lay patient • Prostheses • Apply attific • Transport to Indication of a Treat symptomatical SECTION 5 F Extinguishing • There is no • Use extingu | inst aid measures first aid measures first aid measures in contact with eyes: mediately with water. contact lenses after an eye injury should only be und cours: and hair with running water (and soap if available). cal attention in event of irritation. combustion products are inhaled remove from contar down. Keep warm and rested. such as false teeth, which may block airway, should ial respiration if not breathing, preferably with a deme o hospital, or doctor, without delay. y give a glass of water. not generally required. If in doubt, contact a Poisons iny immediate medical attention and y. irrefighting measures media restriction on the type of extinguisher which may be faiting media suitable for surounding area. Is arising from the substrate or mix y: | >95 Iertaken by skilled personnel. ninated area. I be removed, where possible, p and valve resuscitator, bag-valve Information Centre or a doctor. | NIOBIUM(V) OXIDE | | | | |

Fire Fighting:

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- Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves in the event of a fire.
 Prevent, by any means available, spillage from entering drains or water courses
- Use fire fighting procedures suitable for surrounding area.

Fire/Explosion Hazard:

Non combustible.
 Not considered a significant fire risk, however containers may burn.
Decomposition may produce toxic fumes of metal oxides May emit poisonous fumes. May emit corrosive fumes.

SECTION 6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

Minor Spills:

- Clean up all spills immediately.Avoid breathing dust and contact with skin and eyes.
- Wear protective clothing, gloves, safety glasses and dust respirator.
 Use dry clean up procedures and avoid generating dust.

Major Spills:

- Moderate hazard. CAUTION: Advise personnel in area.
 - Alert Emergency Services and tell them location and nature of hazard.
 Control personal contact by wearing protective clothing.
- Personal Protective Equipment advice is contained in Section 8 of the MSDS.

SECTION 7 Handling and storage

Precautions for safe handling

Safe handling

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs. Use in a well-ventilated area.
- · Prevent concentration in hollows and sumps

Other information

- Store in original containers.

- Keep containers securely sealed.
 Store in a cool, dry, well-ventilated area.
 Store away from incompatible materials and foodstuff containers

Suitable container:

- Glass container is suitable for laboratory quantities
- Polyethylene or polypropylene container.
 Check all containers are clearly labelled and free from leaks

Storage incompatibility:

- WARNING: Avoid or control reaction with peroxides. All transition metal peroxides should be considered as potentially explosive. For example transition metal complexes of alkyl
- hydroperoxides may decompose explosively. The pi-complexes formed between chromium(0), vanadium(0) and other transition metals (haloarene-metal complexes) and mono-or poly-fluorobenzene show extreme sensitivity to heat and • are explosive.



X: Must not be stored together

0: May be stored together with specific preventions +: May be stored together

atibilities: Package Material Incon

| SECTION 8 Exposure controls / personal protection | | | | | | | | |
|---|--------------------------------------|---|---|---|--|--|--|--|
| Control parameters | | | | | | | | |
| Occupational Exposure Limits (OEL) | | | | | | | | |
| INGREDIENT DATA | | | | | | | | |
| Not Available | | | | | | | | |
| Emergency Limits | | | | | | | | |
| Ingredient | TEEL-0 | TEEL-1 | TEEL-2 | TEEL-3 | | | | |
| niobium(V) oxide | 10(ppm) | 30(ppm) | 200(ppm) | 500(ppm) | | | | |
| Ingredient | | Original IDLH | Revised IDLH | | | | | |
| NIOBIUM | (V) OXIDE | Not Available | | Not Available | | | | |
| Exposure controls | | | | | | | | |
| Appropriate engineering control | ls | | | | | | | |
| Engineering controls are used to re | emove a hazard or place a barrier be | etween the worker and the hazard. Well-design | ed engineering controls can be highly e | ffective in protecting workers and will | | | | |

ighly

Englineeting controls are used to remove a macanity of prove a variable feature in the worker and the nazard. We reading not engline the strategically ended in the reader of the strategically and the reader of the strategically and the reader of the strategically "adds" and "removes" air in the work environment.

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Eye and face protection:

- Safety glasses with side shields.
- Chemical goggles.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task.
- Skin protection:

See Hand protection below

Hand protection:

The selection of the suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application. The exact break through time for substances has to be obtained from the manufacturer of the protective gloves andhas to be observed when making a final choice. Suitability and durability of glove type is dependent on usage.

Body protection:

See Other protection below

Other protection:

Overalls.P.V.C. apron.

P.V.C. apron.
 Barrier cream.

Thermal hazards:

Recommended material(s):

Respiratory protection:

SECTION 9 Physical and chemical properties

 Information on basic physical and chemical properties

 Appearance

 While orthorhombic crystals. Becomes yellow on heating. Insoluble in water. Soluble in HF and hot H2SO4.

 Physical state
 Divided solid
 Relative

| Physical state | Divided solid | Relative density (Water = 1) | 4.6 |
|--|---------------|---|---------------|
| Odour | Not Available | Partition coefficient n-octanol / water | Not Available |
| Odour threshold | Not Available | Auto-ignition temperature (°C) | Not Available |
| pH (as supplied) | Not Available | Decomposition temperature | Not Available |
| Melting point / freezing point (°C) | 1520 | Viscosity (cSt) | Not Available |
| Initial boiling point and boiling range (°C) | Not Available | Molecular weight (g/mol) | 265.82 |
| Flash point (°C) | Not Available | Taste | Not Available |
| Evaporation rate | Not Available | Explosive properties | Not Available |
| Flammability | Not Available | Oxidising properties | Not Available |
| Upper Explosive Limit (%) | Not Available | Surface Tension (dyn/cm or mN/m) | Not Available |
| Lower Explosive Limit (%) | Not Available | Volatile Component (%vol) | Negligible |
| Vapour pressure (kPa) | Negligible | Gas group | Not Available |
| Solubility in water (g/L) | Immiscible | pH as a solution(1%) | Not Available |
| Vapour density (Air = 1) | Not Available | | |

SECTION 10 Stability and reactivity

| Reactivity: |
|--|
| See section 7.2 |
| Chemical stability: |
| Presence of incompatible materials. Product is considered stable. Hazardous polymerisation will not occur. |
| Possibility of hazardous reactions: |
| See section 7.2 |
| Conditions to avoid: |
| See section 7.2 |
| Incompatible materials: |
| See section 7.2 |
| Hazardous decomposition products: |
| See section 5.3 |

SECTION 11 Toxicological information

Information on toxicological effects

Inhaled:

Evidence shows, or practical experience predicts, that the material produces irritation of the respiratory system, in a substantial number of individuals, following inhalation. In contrast to most organs, the lung is able to respond to a chemical insult by first removing or neutralising the irritant and then repairing the damage. The repair process, which initially evolved to protect mammalian lungs from foreign matter and antigens, may however, produce further lung damage resulting in the impairment of gas exchange, the primary function of the lungs. Respiratory tract irritation often results in an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system.

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The material has NOT been classified by EC Directives or other classification systems as "harmful by ingestion". This is because of the lack of corroborating animal or human evidence. The material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (e.g liver, kichey) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, il-health). Skin Contact:

The material is not thought to produce adverse health effects or skin irritation following contact (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting. Acute local effects on rabbit skin from niobium pentachloride are severe with oedema and irritation occurring within 24 hours and persisting for 72 hours. Eschar formation occurred within 7 days and become and irritation acute and irritation and the suitable gloves be used in an occupational setting. healing was not evident at 14 days.

Eve:

Although the material is not thought to be an imitant (as classified by EC Directives), direct contact with the eye may cause transient discomfort characterised by tearing or conjunctival redness (as with windburn). Slight abrasive damage may also result. The material may produce foreign body irritation in certain individuals. In contrast to severe irritation produced by niobium pentachloride when applied to skin only slight ocular irritation was produced in rabbits following application of niobium pentachloride.

Chronic:

Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems. Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems. Long term exposure to high dust concentrations may cause changes in lung function (i.e. pneumoconiosis) caused by particles less than 0.5 micron penetrating and remaining in the lung. A prime

symptom is breathlessne

| -,-+ | |
|------------------|---------------|
| τοχιςιτγ | IRRITATION |
| niobium(V) oxide | |
| Not Available | Not Available |

* Value obtained from manufacturer's msds unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances

NIOBIUM(V) OXIDE

Astima-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly initiating compound. Key criteria for the dagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abound constructions within minutes to hours of a documented exposure to the initiant. A reversible airlow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS.

| Acute Toxicity: | Not Available | Carcinogenicity: | Not Available |
|------------------------------------|---------------|---------------------------|---------------|
| Skin Irritation/Corrosion: | Not Available | Reproductivity: | Not Available |
| Serious Eye Damage/Irritation: | Not Available | STOT - Single Exposure: | Not Available |
| Respiratory or Skin sensitisation: | Not Available | STOT - Repeated Exposure: | Not Available |
| Mutagenicity: | Not Available | Aspiration Hazard: | Not Available |
| | | | |

CMR STATUS

SECTION 12 Ecological information

Toxicity

Metal-containing inorganic substances generally have negligible vapour pressure and are not expected to partition to air. Once released to surface waters and moist soils their fate depends on solubility and dissociation in water. Environmental processes (such as oxidation and the presence of acids or bases) may transform insoluble metals to more soluble ionic forms. Microbiological processes may also transform insoluble metals to more soluble forms.

Persistence and degradability

| Feisistence and degradabili | Lý | |
|-----------------------------|-------------------------|------------------|
| Ingredient | Persistence: Water/Soil | Persistence: Air |
| Not Available | Not Available | Not Available |
| Bioaccumulative potential | | |
| Ingredient | Bioaccumulation | |
| Not Available | Not Available | |
| Mobility in soil | | |
| Ingredient | Mobility | |
| Not Available | Not Available | |

SECTION 13 Disposal considerations

Product / Packaging disposal:

Legislation addressing waste disposal requirements may differ by country, state and' or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.

- A Hierarchy of Controls seems to be common the user should investigate Reduction

 - Reuse
 Recycling
 - Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use

| SECTION 14 Transport information |
|--|
| Labels Required: |
| Marine Pollutant: NO |
| HAZCHEM: |
| Land transport (ADG): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS |
| Air transport (ICAO4ATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS |
| Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS |
| |
| SECTION 15 Regulatory information |

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niobium(V) oxide(1313-96-8) is found on the following regulatory lists

"Australia Inventory of Chemical Substances (AICS)", "FisherTransport Information", "Sigma-AldrichTransport Information", "OECD List of High Production Volume (HPV) Chemicals", "Australia National Pollutant Inventory"

SECTION 16 Other information

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chernwatch Classification committee using available literature references. A list of reference resources used to assist the committee may be found at:

www.chemwatch.net/references

The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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Appendix 11

Dubbo Zirconia Project Report No. 545/04

| | EIBACHER DUSTRIE AG accord | Safety Data Sheet ing to 1907/2006/EC, Article 31 and (EU) No 4 | Page 1/6 |
|---|--|--|------------------------------------|
| | Printing date: 28.08.2013 | Version number 6 | Revision: 28.08.2013 |
| * | SECTION 1: Identif 1.1 Product identifier Product name: Ferro nic CAS Number: 12023-22-2 EC number: 234-676-5 REACH-Registration m REACH-Pre-registration 1.2 Relevant identified u Application of the substr Master alloy Electrical batteries and ac 1.3 Details of the supplie Manufacturer/Supplier: Treibacher Industrie AG Auer von Welsbachstraße 9330 Althofen Austria Telefon: +43 (0) 4262 50-20 www.treibacher.com Further information obd 1.4 Emergency telephon +43 (0) 4262 505-0 (7:00 | umber: - n number(s): Niobium: 05-2114132066-60-0000 ises of the substance or mixture and uses advised a ance / the preparation: cumulators er of the safety data sheet 1 5-0 205 tainable from: msds@treibacher.com | |
| | The substance is not class Classification according Information concerning No hazards to be particula 2.2 Label elements | substance or mixture to Regulation (EC) No 1272/2008 iffied according to the CLP regulation. to Directive 67/548/EEC or Directive 1999/45/EC particular hazards for human and environment: arly mentioned. Regulation (EC) No 1272/2008 Void | Void |
| | SECTION 3: Comp 3.1 Chemical characteri CAS No. Description 12023-22-2 Ferro niobiur Identification number(s) EC number: 234-676-5 Components: | n | 60-70% (Contd. on page 2) GB |

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Dubbo Zirconia Project Report No. 545/04 Appendix 11

| J) No 453/2010 Revision: 28.08.201 (Contd. of page 30-409 |
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| |
| s persist, consult a doctor. ment needed er relevant information available. ce. |
| ce. ce with official regulations. |
| |



Appendix 11

Dubbo Zirconia Project Report No. 545/04

| IBACHER JSTRIE AG | Safety Data Sheet | Pa; |
|---|---|------------------|
| Printing date: 28.08.2013 | 07/2006/EC, Article 31 and (EU) N Version number 6 | Revision: 28.08 |
| Product name: Ferro niobium - FeNb | v erstolt humber o | Kevision. 28.08 |
| | | (Contribution) |
| See Section 13 for disposal informat | ion. | (Contd. of |
| SECTION 7: Handling and s | storage | |
| 7.1 Precautions for safe handling Ensure good ventilation/exhaustion a | at the workplace. | |
| Prevent formation of dust. | | |
| | xplosion protection: No special measures and the special measures of the sp | res required. |
| Conditions for safe storage, includ Storage: | ing any incompatibilities | |
| • Requirements to be met by storer (• Information about storage in one (| norms and receptacles: Keep container | tightly sealed. |
| Do not store together with acids. | | |
| Do not store together with alkalis (ca Further information about storage | | |
| • 7.3 Specific end use(s) see section 1 | - | |
| SECTION & Emogrand cont | nold/noncomplements | |
| SECTION 8: Exposure contr Additional information about desi | gn of technical facilities: No further d | ata: see item 7. |
| 8.1 Control parameters | - | , |
| · Ingredients with limit values that | require monitoring at the workplace | |
| | alid during the making were used as ba | 1515. |
| · 8.2 Exposure controls · Personal protective equipment: | | |
| General protective and hygienic m The usual precautionary measures at | easures: e to be adhered to when handling chen | nicals |
| Respiratory protection: Use suitab | le respiratory protective device when h | |
| Recommended filter device for she Filter P1 | ort term use: | |
| Filter FFP1 | | |
| • Protection of hands: Not required. • Eye protection: Not required. | | |
| Body protection: Protective work c | lothing | |
| SECTION 9: Physical and cl | nemical properties | |
| • 9.1 Information on basic physical : | and chemical properties | |
| General Information Appearance: | | |
| Form: | lumpy Powder | |
| Colour: | Grey | |
| · Odour : · Odour threshold: | Odourless Not applicable | |
| · Odour threshold: · pH-value: | Not determined | |
| Melting point/Melting range: | 1530 - 1610 °C | |
| · Boiling point/Boiling range: | Not applicable | |
| · Flash point: | Not applicable | |
| · Flammability (solid, gaseous): | Product is not flammable. | |
| · Self-igniting: · Danger of explosion: | Product is not selfigniting. | · • • |
| | Product does not present an explo | |



Appendix 11

| USTRIE AG | Safety Data Sheet | Page |
|---|---|---|
| U | o 1907/2006/EC, Article 31 and (EU) I | |
| Printing date: 28.08.2013 | Version number 6 | Revision: 28.08.20 |
| Product name: Ferro niobium - F | eNb | |
| | | (Contd. of pag |
| • Explosion limits: Lower: | Nist applicable | |
| Upper: | Not applicable Not applicable | |
| · Oxidizing properties | None | |
| · Vapour pressure: | Not applicable | |
| · Density: | 8.2 g/cm ³ | |
| Solubility in / Miscibility with | | |
| water: | Insoluble. | |
| · Partition coefficient (n-octano | ol/water): Not determined | |
| · Viscosity: | Not applicable | |
| Dynamic: Kinematic: | Not applicable Not applicable | |
| 9.2 Other information | No further relevant information a | wailable. |
| No decomposition if used and s 10.3 Possibility of hazardous r 10.4 Conditions to avoid No fu 10.5 Incompatible materials: Keep away from acids. Keep away from alkaline solution | ditions to be avoided: tored according to specifications. reactions No dangerous reactions known. In ther relevant information available. ons. n products: No dangerous decomposition p | products known. |
| No decomposition if used and s 10.3 Possibility of hazardous r 10.4 Conditions to avoid No fu 10.5 Incompatible materials: Keep away from acids. Keep away from alkaline solution | tored according to specifications. reactions No dangerous reactions known. Inther relevant information available. ons. n products: No dangerous decomposition p | products known. |
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| No decomposition if used and s 10.3 Possibility of hazardous n 10.4 Conditions to avoid No fu 10.5 Incompatible materials: Keep away from akaline soluti 10.6 Hazardous decomposition SECTION 11: Toxicolog 11.1 Information on toxicolog Acute toxicity: LD/LC50 values relevant for o 7439-89-6 Iron | tored according to specifications. reactions No dangerous reactions known. urther relevant information available. ons. n products: No dangerous decomposition p ical information ical effects classification: | oroducts known. |
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| No decomposition if used and s 10.3 Possibility of hazardous n 10.4 Conditions to avoid No fu 10.5 Incompatible materials: Keep away from acids. Keep away from alkaline solution 10.6 Hazardous decomposition SECTION 11: Toxicolog 11.1 Information on toxicolog Acute toxicity: LD/LC50 values relevant for of 7439-89-6 I ron Oral LD50 20000 mg/kg (Guin Lit.: Indian Journal 30000 mg/kg (Rat) | tored according to specifications. reactions No dangerous reactions known. urther relevant information available. ons. n products: No dangerous decomposition p ical information ical effects classification: nea pig) l of Pharmacy. Vol. 13, Pg. 240, 1951. | products known. |
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| No decomposition if used and s 10.3 Possibility of hazardous n 10.4 Conditions to avoid No fu 10.5 Incompatible materials: Keep away from acids. Keep away from alkaline solution 10.6 Hazardous decomposition SECTION 11: Toxicolog 11.1 Information on toxicolog Acute toxicity: LD/LC50 values relevant for of 7439-89-6 Iron Oral LD50 20000 mg/kg (Guin Lit.: Indian Journal 30000 mg/kg (Rat) Lit.: Indian Journal on the skin: No irritant effect. on the eye: No irritant effect. Sensitization: No sensitizing eff Other information (about exp Additional toxicological inform When used and handled accordit | tored according to specifications. reactions No dangerous reactions known. In the relevant information available. ons. n products: No dangerous decomposition p ical information ical effects classification: nea pig) 1 of Pharmacy. Vol. 13, Pg. 240, 1951. 1 of Pharmacy. Vol. 13, Pg. 240, 1951. () ffects known. rerimental toxicology): Caution - substance mation: ing to specifications, the product does not h | e not y et fully tested. |
| No decomposition if used and s 10.3 Possibility of hazardous n 10.4 Conditions to avoid No fi 10.5 Incompatible materials: Keep away from akaline soluti- 10.6 Hazardous decomposition SECTION 11: Toxicolog 11.1 Information on toxicolog Acute toxicity: LD/LC50 values relevant for o 7439-89-6 Iron Oral LD50 20000 mg/kg (Guin Lit.: Indian Journal 30000 mg/kg (Rat) Lit.: Indian Journal 0 on the skin: No irritating effect. Sensitization: No sensitizing eff Other information (about expr Additional toxicological inform When used and handled accordi experience and the information The substance is not subject to o | tored according to specifications. reactions No dangerous reactions known. In the relevant information available. ons. n products: No dangerous decomposition p ical information ical effects classification: nea pig) 1 of Pharmacy. Vol. 13, Pg. 240, 1951. 1 of Pharmacy. Vol. 13, Pg. 240, 1951. 1 of Pharmacy. Vol. 13, Pg. 240, 1951. ffects known. rerimental toxicology): Caution - substance mation: ing to specifications, the product does not h provided to us. classification according to the latest version | e not yet fully tested. ave any harmful effects to our 1 of the EU lists. |
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Appendix 11

Dubbo Zirconia Project Report No. 545/04

| | fety Data Sheet 6/EC, Article 31 and (EU) No | Pa; |
|--|--|--|
| 0 | Version number 6 | Revision: 28.08 |
| roduct name: Ferro niobium - FeNb | | 100151011. 20100 |
| | | ···· · · · · |
| • 12.3 Bioaccumulative potential Not deterr | nined | (Contd. of |
| 12.4 Mobility in soil No further relevant in | formation available. | |
| • Ecotoxical effects: • Other information: At present there are no | ecotoxicological assessments. | |
| Additional ecological information: | | (1 077 0) |
| • AOX-indication: The product does not con • General notes: Generally not hazardous for | | (AOX-free). |
| 12.5 Results of PBT and vPvB assessmen | | |
| • PBT: Not applicable. • vPvB: Not applicable. | | |
| • 12.6 Other adverse effects No further relev | vant information available. | |
| | | |
| SECTION 13: Disposal considerat | ions | |
| · 13.1 Waste treatment methods · Recommendation | | |
| Contact manufacturer for recycling informa | tion. | |
| Disposal must be made according to officia | | |
| • Waste disposal key: 35103 (ÖNORM S 21 • European waste catalogue 06 04 99 | .00) | |
| · Uncleaned packaging: | | |
| ·Recommendation: | | |
| Empty contaminated packagings thoroughly | The second s | and the second sec |
| Disposal must be made according to officia SECTION 14: Transport informat | l regulations. | ougn and proper cleaning. |
| Disposal must be made according to officia | l regulations. | ougn and proper cleaning. |
| Disposal must be made according to officia SECTION 14: Transport informat 14.1 UN-Number | l regulations. | Sugn and proper cleaning. |
| Disposal must be made according to officia SECTION 14: Transport informat ¹ 14.1 UN-Number ² ADR, IMDG, IATA ¹ 14.2 UN proper shipping name | l regulations. fion Void | ougn and proper cleaning. |
| Disposal must be made according to officia SECTION 14: Transport informat · 14.1 UN-Number · ADR, IMDG, IATA · 14.2 UN proper shipping name · ADR, IMDG, IATA · 14.3 Transport hazard class(es) · ADR, IMDG, IATA | l regulations. tion Void Void | |
| Disposal must be made according to officia SECTION 14: Transport informat 14.1 UN-Number ADR, IMDG, IATA 14.2 UN proper shipping name ADR, IMDG, IATA 14.3 Transport hazard class(es) ADR, IMDG, IATA Class | l regulations. fion Void | sugn and proper cleaning. |
| Disposal must be made according to officia SECTION 14: Transport informat · 14.1 UN-Number · ADR, IMDG, IATA · 14.2 UN proper shipping name · ADR, IMDG, IATA · 14.3 Transport hazard class(es) · ADR, IMDG, IATA · Class · 14.4 Packing group | l regulations. tion Void Void Void | |
| Disposal must be made according to officia SECTION 14: Transport informat 14.1 UN-Number ADR, IMDG, IATA 14.2 UN proper shipping name ADR, IMDG, IATA 14.3 Transport hazard class(es) ADR, IMDG, IATA Class | l regulations. tion Void Void | |
| Disposal must be made according to officia SECTION 14: Transport informat · 14.1 UN-Number · ADR, IMDG, IATA · 14.2 UN proper shipping name · ADR, IMDG, IATA · 14.3 Transport hazard class(es) · ADR, IMDG, IATA · Class · 14.4 Packing group · ADR, IMDG, IATA | l regulations. fion Void Void Void Void Void | |
| Disposal must be made according to officia SECTION 14: Transport informat · 14.1 UN-Number · ADR, IMDG, IATA · 14.2 UN proper shipping name · ADR, IMDG, IATA · 14.3 Transport hazard class(es) · ADR, IMDG, IATA · Class · 14.4 Packing group · ADR, IMDG, IATA · 14.5 Environmental hazards: · 14.6 Special precautions for user · 14.7 Transport in bulk according to Anne | I regulations. fion Void Void Void Void Void Void Not applicable. ex II of | |
| Disposal must be made according to officia SECTION 14: Transport informat 14.1 UN-Number ADR, IMDG, IATA 14.2 UN proper shipping name ADR, IMDG, IATA 14.3 Transport hazard class(es) ADR, IMDG, IATA 14.3 Transport hazard class(es) ADR, IMDG, IATA 14.4 Packing group ADR, IMDG, IATA 14.5 Environmental hazards: 14.6 Special precautions for user 14.7 Transport in bulk according to Annu- MARPOL73/78 and the IBC Code | l regulations. tion Void Void Void Void Void Void Void Not applicable. ex II of Not applicable. | |
| Disposal must be made according to officia SECTION 14: Transport informat · 14.1 UN-Number · ADR, IMDG, IATA · 14.2 UN proper shipping name · ADR, IMDG, IATA · 14.3 Transport hazard class(es) · ADR, IMDG, IATA · Class · 14.4 Packing group · ADR, IMDG, IATA · 14.5 Environmental hazards: · 14.6 Special precautions for user · 14.7 Transport in bulk according to Anne | I regulations. fion Void Void Void Void Void Void Not applicable. ex II of | |
| Disposal must be made according to officia SECTION 14: Transport informat · 14.1 UN-Number · ADR, IMDG, IATA · 14.2 UN proper shipping name · ADR, IMDG, IATA · 14.3 Transport hazard class(es) · ADR, IMDG, IATA · Class · 14.4 Packing group · ADR, IMDG, IATA · 14.5 Environmental hazards: · 14.6 Special precautions for user · 14.7 Transport in bulk according to Annu- MARPOL73/78 and the IBC Code · Transport/Additional information: | l regulations. fion Void Void Void Void Void Void Not applicable. ex II of Not applicable. Not dangerous according t | |
| Disposal must be made according to officia SECTION 14: Transport informat · 14.1 UN-Number · ADR, IMDG, IATA · 14.2 UN proper shipping name · ADR, IMDG, IATA · 14.3 Transport hazard class(es) · ADR, IMDG, IATA · Class · 14.4 Packing group · ADR, IMDG, IATA · 14.5 Environmental hazards: · 14.6 Special precautions for user · 14.7 Transport in bulk according to Annu- MARPOL73/78 and the IBC Code · Transport/Additional information: SECTION 15: Regulatory information | l regulations. tion Void Void Void Void Void Void Void Not applicable. ex II of Not applicable. Not dangerous according t | o the above specifications |
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| Disposal must be made according to officia SECTION 14: Transport informat · 14.1 UN-Number · ADR, IMDG, IATA · 14.2 UN proper shipping name · ADR, IMDG, IATA · 14.3 Transport hazard class(es) · ADR, IMDG, IATA · 14.3 Transport hazard class(es) · ADR, IMDG, IATA · 14.4 Packing group · ADR, IMDG, IATA · 14.5 Environmental hazards: · 14.6 Special precautions for user · 14.7 Transport in bulk according to Anne MARPOL73/78 and the IBC Code · Transport/Additional information: SECTION 15: Regulatory information · 15.1 Safety, health and environmental regisara · Section 302 (extremely hazardous substata · Section 313 (Specific toxic chemical listin | l regulations. tion Void Void Void Void Void Void Void Not applicable. ex II of Not applicable. II of Not dangerous according t attion gulations/legislation specific for t nces): Substance is not listed. gs): Substance is not listed. | o the above specifications |
| Disposal must be made according to officia SECTION 14: Transport informat · 14.1 UN-Number · ADR, IMDG, IATA · 14.2 UN proper shipping name · ADR, IMDG, IATA · 14.3 Transport hazard class(es) · ADR, IMDG, IATA · Class · 14.4 Packing group · ADR, IMDG, IATA · 14.5 Environmental hazards: · 14.6 Special precautions for user · 14.7 Transport in bulk according to Ann- MARPOL73/78 and the IBC Code · Transport/Additional information: SECTION 15: Regulatory information · 15.1 Safety, health and environmental regional substantion (Section 302 (extremely hazardous substantion)) | l regulations. tion Void Void Void Void Void Void Void Not applicable. ex II of Not applicable. II of Not dangerous according t attion gulations/legislation specific for t nces): Substance is not listed. gs): Substance is not listed. | o the above specifications |
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Appendix 11

| 1- | TREIROCHER |
|----|----------------------------|
| | TREIBACHER INDUSTRIE AG |
| L | INDUSTRIE AG |

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Page 6/6

Safety Data Sheet according to 1907/2006/EC, Article 31 and (EU) No 453/2010

Printing date: 28.08.2013 Version number 6 Revision: 28.08.2013

| · | (| Contd. of pag |
|---|---|---------------|
| | Chemicals known to cause reproductive toxicity for males: Substance is not listed. | . 10 |
| • | Chemicals known to cause developmental toxicity: Substance is not listed. | |
| | Cancer ogenity categories | |
| | EPA (Environmental Protection Agency) Substance is not listed. | |
| | TLV (Threshold Limit Value established by ACGIH) Substance is not listed. | |
| | NIOSH-Ca (National Institute for Occupational Safety and Health) Substance is not listed. | |
| | OSHA-Ca (Occupational Safety and Health Administration) Substance is not listed. | |
| | European Inventory of Existing Commercial chemical Substances (EINECS) Substance is 1 | isted. |
| | Canadian substance listings: | |
| · | Canadian Domestic Substances List (DSL) Substance is not listed. | |
| | Canadian Ingredient Disclosure list (limit 0.1%) Substance is not listed. | |
| | Canadian Ingredient Disclosure list (limit 1%) Substance is not listed. | |
| | Philippines Inventory of Chemicals and Chemical Substances Substance is not listed. | |
| | Chinese Chemical Inventory of Existing Chemical Substances Substance is not listed. | |
| | Australian Inventory of Chemical Substances Substance is not listed. | |
| | Korean Existing Chemical Inventory | |
| | 2023-22-2 Ferroniobium | KE-2107 |
| | Standard for the Uniform Scheduling of Drugs and Poisons Substance is not listed. | |
| | | |
| | National regulations: | |
| | C.H.I.P.4 - The Chemicals (Hazard Information and Packaging Regulations) 2002 in the current | version (O |
| | Occupational Exposure Limits EH40.2002 (GB) | |
| | Other regulations, limitations and prohibitive regulations | |
| | Recovered iron (CAS: 7439-89-6, EINECS: 231-096-4) is exempted from registration according | |
| | | g to REACI |
| | Art. 2.7 (d). | g to REACI |
| | Art. 2.7 (d). I 5.2 Chemical safety assessment: A Chemical Safety Assessment has not been carried out. | g to REACI |
| | | ; to REACI |
| | | g to REACH |
| | 15.2 Chemical safety assessment: A Chemical Safety Assessment has not been carried out. SECTION 16: Other information | g to REACE |
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| | 15.2 Chemical safety assessment: A Chemical Safety Assessment has not been carried out. SECTION 16: Other information Department issuing MSDS: HSE Department | g to REACI |
| | 15.2 Chemical safety assessment: A Chemical Safety Assessment has not been carried out. SECTION 16: Other information Department issuing MSDS: HSE Department Chemical Management | g to REACI |
| | 15.2 Chemical safety assessment: A Chemical Safety Assessment has not been carried out. SECTION 16: Other information Department issuing MSDS: HSE Department Chemical Management Abbreviations and acronyms: | - |
| | 15.2 Chemical safety assessment: A Chemical Safety Assessment has not been carried out. SECTION 16: Other information Department issuing MSDS: HSE Department Chemical Management Abbreviations and acronyms: RID: Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Con- | - |
| | 15.2 Chemical safety assessment: A Chemical Safety Assessment has not been carried out. SECTION 16: Other information Department issuing MSDS: HSE Department Chemical Management Abbreviations and acronyms: RD: Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Con- international Transport of Dangerous Goods by Rail) (AO: International Civil Aviation Organization | cerning the |
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Heavy Rare Earth Chloride Solution

| ANSTO Minerals | Organisation (ANSTO |) Minerals) | | |
|-----------------------------------|-------------------------|---|---------------------|------------|
| Chemwatch: 48 | 341-20 | | Print Date: | 05/08/2013 |
| Version No: 2. | 1.1.1 | | Issue Date: | 01/01/2013 |
| Material Safety D | Data Sheet according to | NOHSC and ADG requirements | S.Local.AUS.EN.RISK | |
| SECTION 1 | Identification | of the substance / mixture and of the company / undertaking | | |
| | | | | |
| Product Ide | ntifier | | | _ |
| Product name: | | Heavy Rare Earth Chloride Solution | | |
| Chemical Name |): | Not Applicable | | |
| Synonyms: Proper shipping | a namo: | Not Available Not Applicable | | |
| Chemical form | | Not Applicable | | |
| Other means of | | Not Available | | |
| CAS number: | | Not Applicable | | |
| Relevant id | entified uses of | the substance or mixture and uses advised against | | |
| Relevant identi | | Used according to manufacturer's directions. | | _ |
| | | - | _ | _ |
| Details of th | le supplier of the | e safety data sheet | | - |
| Registered com | pany name: | ANSTO Minerals Organisation (ANSTO Minerals) | | |
| Address: | | Australia | | |
| Telephone: | | Not Available | | |
| Fax: | | Not Available | | |
| Website: | | Not Available | | |
| Email: | | Not Available | | |
| Emergency | telephone numb | per | | |
| Association / O | rganisation: | Not Available | | |
| | phone numbers: | +61 2 9717 3333 | | |
| Other emergen | cy telephone number | s: +61 2 9717 3333 | | |
| | | | | |
| SECTION 2 | Hazards ident | ification | | |
| Classificatio | on of the substa | nce or mixture | | |
| HAZARDOUS S | UBSTANCE. NON-DA | ANGEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code. | | |
| | | | | |
| ChemWatch Haz | zard Ratings MinMax | | | |
| Flammability | 0 📕 | 0 = Minimum | | |
| Toxicity | 0 | 1 = Low 2 = Moderate | | |
| Body Contact Reactivity | 2 | 3 = High 4 = Extreme | | |
| Chronic | 0 | 4 - LAUGHO | | |
| Poisons Sched | ule: | None | | |
| Risk Phrases ^[1] | | | | |
| R36/38? | 14 | ay produce discomfort of the eyes and skin*. | | |
| *LIMITED EVIDEN | | y produce disconnex of the system and shift. | | |
| | | | | |
| - | - | 2. Classification drawn from HSIS; 3. Classification drawn from EC Directive 1272/2008 - Annex VI | | |
| GHS Classificat Not Applicable | | | | |
| | | | | |
| Label eleme | | | | |
| GHS label eleme Not Applicable | ents | | | |
| Signal word: | | NOT APPLICABLE | | |
| Hazard stateme | ent(s): | | | |
| Not Applicable | | | | |
| *LIMITED EVIDEN | ICE | | | |
| Supplementary Not Applicable | statement(s): | | | |
| | statement(s): Prevent | ion | | |
| Not Applicable | | | | |
| Precautionary s | tatement(s): Respon | 50 | | |
| | statement(s): Storage | | | |
| | tatement(s): Disposa | · · · · · · · · · · · · · · · · · · · | | |

Page 1 of 5

Dubbo Zirconia Project Report No. 545/04

| Label elements | | | |
|--|--|---|--|
| × | | | |
| Relevant risk staten | nents are found in section 2.1 langer: Xi | | |
| Safety advice: | | | |
| Salety advice. | Do not breathe gas/fumes/vapour/spray. | | |
| 525 S25 | Avoid contact with eyes. | | |
| S26 | In case of contact with eyes, rinse with plenty | of water and contact Doctor or P | oisons Information Centre. |
| 539 | Wear eye/face protection. | | |
| S40 | To clean the floor and all objects contaminate | ed by this material, use water. | |
| S46 | If swallowed, IMMEDIATELY contact Doctor | or Poisons Information Center. (| show this container or label). |
| S56 | Dispose of this material and its container at h | | ction point. |
| S64 | If swallowed, rinse mouth with water (only if t | he person is conscious). | |
| Other hazard | s | | |
| Not Available | | | |
| | | | |
| SECTION 3 | Composition / information on i | ngredients | |
| Substances | | | |
| | n ingredients' in Section 3.2 | | |
| Mixtures | | | |
| CAS No | | %[weight] | Name |
| 7732-18-5 | | >60 10-30 | WATER rare earth chlorides |
| | | 10-30 | Tare earth chlondes |
| SECTION 4 | First aid measures | | |
| | dical attention without delay; if pain persists or recu of contact lenses after an eye injury should only be | | |
| | | | |
| | ely remove all contaminated clothing, including foo n and hair with running water (and soap if available | | |
| Seek meet | ely remove all contaminated clothing, including foo | | |
| Seek mer Inhalation: If fumes of Lay patier Prosthese Apply arti Transport | ely remove all contaminated clothing, including foo a nat hair with running water (and soap if available dical attention in event of irritation. r combustion products are inhaled remove from co it down. Keep warm and rested. se such as false teeth, which may block airway, sh | ntaminated area. ould be removed, where possible | , prior to initiating first aid procedures. Ive mask device, or pocket mask as trained. Perform CPR if necessary. |
| Seek mer Inhalation: If fumes of Lay patier Prosthese Apply arti Transport Ingestion: | ely remove all contaminated clothing, including foo a and hair with running water (and soap if available dical attention in event of irritation. r combustion products are inhaled remove from co tt down. Keep warm and rested. es such as false teeth, which may block airway, sh ficial respiration if not breathing, preferably with a d to hospital, or doctor. | ntaminated area. ould be removed, where possible | |
| Seek met Inhalation: If fumes c Lay patier Prosthese Apply artir Transport Ingestion: If swallow If vomiting Observe t Never giv | ely remove all contaminated clothing, including foo a nad hair with running water (and soap if available dical attention in event of irritation. r combustion products are inhaled remove from co t down. Keep warm and rested. s such as false teeth, which may block airway, sh licial respiration if not breathing, preferably with a d to hospital, or doctor. ed do NOT induce vomiting. o occurs, lean patient forward or place on left side (he patient carefully. e liquid to a person showing signs of being sleeply r to rinse out mouth, then provide liquid slowly and |)). ntaminated area. ould be removed, where possible emand valve resuscitator, bag-va head-down position, if possible) t or with reduced awareness; i.e. | live mask device, or pocket mask as trained. Perform CPR if necessary. o maintain open airway and prevent aspiration. becoming unconscious. |
| Seek mer nhalation: If funes c Lay patier Prosthess: Apply arti Transpor ngestion: If svallow If vorniting Observe i Never giv Give wate Seek mer | ely remove all contaminated clothing, including foo a nad hair with running water (and soap if available dical attention in event of irritation. r combustion products are inhaled remove from co t down. Keep warm and rested. s such as false teeth, which may block airway, sh licial respiration if not breathing, preferably with a d to hospital, or doctor. ed do NOT induce vomiting. o occurs, lean patient forward or place on left side (he patient carefully. e liquid to a person showing signs of being sleeply r to rinse out mouth, then provide liquid slowly and |)). ntaminated area. ould be removed, where possible emand valve resuscitator, bag-va head-down position, if possible) t or with reduced awareness; i.e. as much as casualty can comfort | live mask device, or pocket mask as trained. Perform CPR if necessary. o maintain open airway and prevent aspiration. becoming unconscious. ably drink. |
| Seek men mhalation: If funes c Lay patier Prosthess: Apply arti Transpor ngestion: If svallow If voniting Observe i Never giv Give wate Seek mee ndication of | ely remove all contaminated clothing, including foc a na hair with running water (and soap if available fical attention in event of irritation. r combustion products are inhaled remove from co t down. Keep warm and rested. s such as false teeth, which may block airway, sh ficial respiration if not breathing, preferably with a d to hospital, or doctor. ed do NOT induce vomiting. occurs, lean patient forward or place on left side (he patient carefully. e liquid to a person showing signs of being sleepy r to rinse out mouth, then provide liquid slowly and fical advice. any immediate medical attention a |)). ntaminated area. ould be removed, where possible emand valve resuscitator, bag-va head-down position, if possible) t or with reduced awareness; i.e. as much as casualty can comfort | live mask device, or pocket mask as trained. Perform CPR if necessary. o maintain open airway and prevent aspiration. becoming unconscious. ably drink. |
| Seek men mhalation: If funes c Lay patier Prosthess: Apply arti Transpor ngestion: If svallow If voniting Observe i Never giv Give wate Seek mee ndication of | ely remove all contaminated clothing, including foc a na hair with running water (and soap if available fical attention in event of irritation. r combustion products are inhaled remove from co t down. Keep warm and rested. s such as false teeth, which may block airway, sh ficial respiration if not breathing, preferably with a d to hospital, or doctor. ed do NOT induce vomiting. occurs, lean patient forward or place on left side (he patient carefully. e liquid to a person showing signs of being sleepy r to rinse out mouth, then provide liquid slowly and fical advice. any immediate medical attention a |)). ntaminated area. ould be removed, where possible emand valve resuscitator, bag-va head-down position, if possible) t or with reduced awareness; i.e. as much as casualty can comfort | live mask device, or pocket mask as trained. Perform CPR if necessary. o maintain open airway and prevent aspiration. becoming unconscious. ably drink. |
| Seek mer If sums of the second s | ely remove all contaminated clothing, including foc a na hair with running water (and soap if available fical attention in event of irritation. r combustion products are inhaled remove from co t down. Keep warm and rested. s such as false teeth, which may block airway, sh ficial respiration if not breathing, preferably with a d to hospital, or doctor. ed do NOT induce vomiting. occurs, lean patient forward or place on left side (he patient carefully. e liquid to a person showing signs of being sleepy r to rinse out mouth, then provide liquid slowly and fical advice. any immediate medical attention a |)). ntaminated area. ould be removed, where possible emand valve resuscitator, bag-va head-down position, if possible) t or with reduced awareness; i.e. as much as casualty can comfort | live mask device, or pocket mask as trained. Perform CPR if necessary. o maintain open airway and prevent aspiration. becoming unconscious. ably drink. |
| Seek men inhalation: If fumes c Lay patier Prosthess: Apply arti Transport Ingestion: If swallow If vorniting Observe i Never giv Give wate Seek men indication of Treat symptomatic SECTION 5 | ely remove all contaminated clothing, including foc a na hair with running water (and scap if available fical attention in event of irritation. r combustion products are inhaled remove from co it down. Keep warm and rested. s such as false teeth, which may block airway, sh ficial respiration if not breathing, preferably with a d to hospital, or doctor. ed do NOT induce vomiting. g occurs, lean patient forward or place on left side (he patient careful). e liquid to a person showing signs of being sleepy r to rinse out mouth, then provide liquid slowly and fical advice. any immediate medical attention a ally. Firefighting measures |)). ntaminated area. ould be removed, where possible emand valve resuscitator, bag-va head-down position, if possible) t or with reduced awareness; i.e. as much as casualty can comfort | live mask device, or pocket mask as trained. Perform CPR if necessary. o maintain open airway and prevent aspiration. becoming unconscious. ably drink. |
| Seek men inhalation: If funes c Lay patier Prosthess: Apply arti Transport Ingestion: If swallow If vorniting Observe i Give wate Seek men indication of Treat symptomatic SECTION 5 Extinguishin | ely remove all contaminated clothing, including foc a na hair with running water (and scap if available fical attention in event of irritation. r combustion products are inhaled remove from co it down. Keep warm and rested. s such as false teeth, which may block airway, sh ficial respiration if not breathing, preferably with a d to hospital, or doctor. ed do NOT induce vomiting. g occurs, lean patient forward or place on left side (he patient careful). e liquid to a person showing signs of being sleepy r to rinse out mouth, then provide liquid slowly and fical advice. any immediate medical attention a ally. Firefighting measures |). ntaminated area. ould be removed, where possible emand valve resuscitator, bag-va head-down position, if possible) to or with reduced awareness; i.e. as much as casualty can comfort and special treatment r | live mask device, or pocket mask as trained. Perform CPR if necessary. o maintain open airway and prevent aspiration. becoming unconscious. ably drink. |
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Appendix 11

- Non combustible.
- Not considered to be a significant fire risk.
 Expansion or decomposition on heating may lead to violent rupture of containers.
- · Decomposes on heating and may produce toxic/ irritating fumes

SECTION 6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

Minor Spills:

- · Clean up all spills immediately.
- Avoid breathing vapours and contact with skin and eyes.
 Control personal contact with the substance, by using protective equipment.
 Contain and absorb spill with sand, earth, inert material or vermiculite.
- Major Spills:
- Minor hazard.
 - Clear area of personnel
 - Alert Fire Brigade and tell them location and nature of hazard.
 Control personal contact with the substance, by using protective equipment as required.
- Personal Protective Equipment advice is contained in Section 8 of the MSDS.

SECTION 7 Handling and storage

Precautions for safe handling

Safe handling

- Limit all unnecessary personal contact.
 Wear protective clothing when risk of exposure occurs.
 Use in a well-ventilated area.
 When handling DO NOT eat, drink or smoke.

Other information

- Store in original containers.
- Keep containers securely sealed.
 Store in a cool, dry, well-ventilated area.
- Store in a cool, dry, well-ventilated area.
 Store away from incompatible materials and foodstuff containers

Conditions for safe storage, including any incompatibilities

Suitable container:

Storage incompatibility:



X: Must not be stored together 0: May be stored together with specific preventions +: May be stored together

Package Material Incompatibilities:

SECTION 8 Exposure controls / personal protection

| Control | Control parameters | | | | | |
|---------------|------------------------------------|----------|---------------|------------|---------------|--|
| Occupatio | Occupational Exposure Limits (OEL) | | | | | |
| INGREDIE | NT DATA | | | | | |
| Not Available | Э | | | | | |
| Emergency | y Limits | | | | | |
| Ingredient | TE | EEL-0 | TEEL-1 | TEEL-2 | TEEL-3 | |
| | water | 500(ppm) | 500(ppn | n) 500(ppr | n) 500(ppm) | |
| Ingredient | | | Original IDLH | Revised | IDLH | |
| | Heavy Rare Earth Chloride | Solution | Not Availa | ble | Not Available | |

Exposure controls

Appropriate engineering controls

Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will

typically be independent of worker interactions to provide this high level of protection. The basic types of engineering controls are: Process controls which involve changing the way a job activity or process is done to reduce the risk. Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment.



Eye and face protection

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Appendix 11

| • | Safety | gl | asses | with | side | shields; | or | as | required, | |
|---|--------|----|-------|------|------|----------|----|----|-----------|--|
| | | | | | | | | | | |

- Chemical goggles.
- Contract lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience.

| ee Hand protection below | | | | | | |
|---|---|--|--|--|--|--|
| Hand protection: | | | | | | |
| Wear chemical protective gloves, e.g. PVC.Wear safety footwear. | Near chemical protective gloves, e.g. PVC.Wear safety footwear. | | | | | |
| Body protection: | | | | | | |
| See Other protection below | | | | | | |
| Other protection: | | | | | | |
| Overalls. Eyewash unit. | | | | | | |
| Thermal hazards: | | | | | | |
| | | | | | | |
| Recommended material(s): | Respiratory protection: | | | | | |
| | | | | | | |

SECTION 9 Physical and chemical properties

Information on basic physical and chemical properties

Appearance Purple and slightly green odourless liquid; mixes with water.

| Physical state | Liquid | Relative density (Water = 1) | Not Available |
|--|---------------|---|----------------|
| Odour | Not Available | Partition coefficient n-octanol / water | Not Available |
| Odour threshold | Not Available | Auto-ignition temperature (°C) | Not Available |
| pH (as supplied) | 28 | Decomposition temperature | Not Available |
| Melting point / freezing point (°C) | Not Available | Viscosity (cSt) | Not Available |
| Initial boiling point and boiling range (°C) | 100 | Molecular weight (g/mol) | Not Applicable |
| Flash point (°C) | Not Available | Taste | Not Available |
| Evaporation rate | As for water | Explosive properties | Not Available |
| Flammability | Not Available | Oxidising properties | Not Available |
| Upper Explosive Limit (%) | Not Available | Surface Tension (dyn/cm or mN/m) | Not Available |
| Lower Explosive Limit (%) | Not Available | Volatile Component (%vol) | Not Available |
| Vapour pressure (kPa) | 2.3 @ 20C | Gas group | Not Available |
| Solubility in water (g/L) | Miscible | pH as a solution(1%) | Not Available |
| Vapour density (Air = 1) | Not Available | | |

SECTION 10 Stability and reactivity Reactivity: See section 7.2 Chemical stability: Product is considered stable and hazardous polymerisation will not occur. Possibility of hazardous reactions: See section 7.2 Conditions to avoid: See section 7.2 Incompatible materials: See section 7.2 Hazardous decomposition products: See section 5.3

SECTION 11 Toxicological information

Information on toxicological effects

Inhaled:

Not normally a hazard due to non-volatile nature of product

Ingestion:

The material has NOT been classified by EC Directives or other classification systems as "harmful by ingestion". This is because of the lack of corroborating animal or human evidence. The material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (e.g liver, kichey) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, il-health).

Skin Contact:

Limited evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin initiation may also be present after prolonged or repeated exposure; this may result in a form of contact dematitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.

Eye:

Limited evidence exists, or practical experience suggests, that the material may cause eye irritation in a substantial number of individuals and/or is expected to produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Repeated or prolonged eye contact may cause inflammation characterised by temporary rechess (similar to windbum) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.

Chronic:

Long-term exposure to the product is not thought to produce chronic effects adverse to health (as classified by EC Directives using animal models); nevertheless exposure by all routes should be minimised as a matter of course.

ΤΟΧΙΟΙΤΥ

IRRITATION

Heavy Rare Earth Chloride Solution

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| Not Available | | Not Available | | | |
|--|---|--|--|--|--|
| water | | Net A state | | | |
| Not Available | | Not Available | | | |
| rare earth chlorides | | N | | | |
| Not Available | | Not Available | | | |
| Not available. Refer to individual constitue | nts. | | | | |
| WATER | | | | | |
| No significant acute toxicological data ide | ntified in literature search. | | | | |
| Acute Toxicity: | Not Available | Carcinogenicity: | NotAvailable | | |
| Skin Irritation/Corrosion: | Not Available Reproductivity: Not Available | | | | |
| Serious Eye Damage/Irritation: | Not Available | STOT - Single Exposure: | NotAvailable | | |
| Respiratory or Skin sensitisation: | Not Available | STOT - Repeated Exposure: | Not Available | | |
| Mutagenicity: | Not Available | Aspiration Hazard: | Not Available | | |
| CMR STATUS | | | | | |
| | | | | | |
| SECTION 12 Ecological infe | ormation | | | | |
| Toxicity | | | | | |
| DO NOT discharge into sewer or waterwa | ys. | | | | |
| Persistence and degradabilit | у | | | | |
| Ingredient | Persistence: Water/Soil | | Persistence: Air | | |
| Not Available | Not Available | | Not Available | | |
| Bioaccumulative potential | | | | | |
| Ingredient | Bioaccumulation | | | | |
| Not Available | Not Available | | | | |
| Mobility in soil | | | | | |
| Ingredient | Mobility | | | | |
| Not Available | Not Available | | | | |
| | | | | | |
| SECTION 13 Disposal cons | iderations | | | | |
| Waste treatment methods | | | | | |
| Product / Packaging disposal: | | | | | |
| Recycle wherever possible or coil Consult State Land Waste Manage Bury residue in an authorised lan Recycle containers if possible, or | dfill. | | | | |
| SECTION 14 Transport info | ormation | | | | |
| Labels Required: | | | | | |
| • | | | | | |
| Marine Pollutant: NO | | | | | |
| HAZCHEM: | | | | | |
| HAZCHEM: Land transport (ADG): NOT REGULAT | ED FOR TRANSPORT OF DANGEROUS GOODS | | | | |
| HAZCHEM: Land transport (ADG): NOT REGULAT Air transport (ICAO-IATA / DGR): NOT I | REGULATED FOR TRANSPORT OF DANGEROUS | | | | |
| HAZCHEM: Land transport (ADG): NOT REGULAT Air transport (ICAO-IATA / DGR): NOT I | | | | | |
| HAZCHEM: Land transport (ADG): NOT REGULAT Air transport (ICAO+ATA / DGR): NOT I Sea transport (IMDG-Code / GGVSee): | REGULATED FOR TRANSPORT OF DANGEROUS NOT REGULATED FOR TRANSPORT OF DANGE | | | | |
| HAZCHEM: Land transport (ADG): NOT REGULAT Air transport (ICAO-IATA / DGR): NOT I Sea transport (IMDG-Code / GGVSee): SECTION 15 Regulatory inf | REGULATED FOR TRANSPORT OF DANGEROUS NOT REGULATED FOR TRANSPORT OF DANGE Formation | ROUS GOODS | | | |
| HAZCHEM: Land transport (ADG): NOT REGULAT Air transport (ICAO-IATA / DGR): NOT Sea transport (IMDG-Code / GGVSee): SECTION 15 Regulatory inf Safety, health and environme | REGULATED FOR TRANSPORT OF DANGEROUS NOT REGULATED FOR TRANSPORT OF DANGE formation Intal regulations / legislation specific | ROUS GOODS | Ire | | |
| HAZCHEM: Land transport (ADG): NOT REGULAT Air transport (ICAO-IATA / DGR): NOT Sea transport (IMDG-Code / GGVSee): SECTION 15 Regulatory inf Safety, health and environme water(7732-18-5) is found on the follow | REGULATED FOR TRANSPORT OF DANGEROUS NOT REGULATED FOR TRANSPORT OF DANGE formation Intal regulations / legislation specific ing regulatory lists | ROUS GOODS for the substance or mixtu | IF9 bstitution – Norway", "IMO IBC Code Chapter 18: List of | | |

products to which the Code does not apply", "International Fragrance Association (IFRA) Survey: Transparency List,"OECD List of High Production Volume (HPV) Chemicals", "Australia High Volume Industrial Chemical List (HVICL)"

SECTION 16 Other information

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chernwatch Classification committee using available literature references. A list of reference resources used to assist the committee may be found at:

www.chemwatch.net/references

The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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AUSTRALIAN ZIRCONIA LTD Dubbo Zirconia Project

Report No. 545/04



Light Rare Earth Chloride Solution

| Version No: 2.1.1.1 Material Safety Data Sheet according to NOI | HSC and ADG requirements | | Is | rrint Date: sue Date: .Local.AUS.EN.RISK | 01/01/2013 |
|---|---|---------------------------|----|--|------------|
| SECTION 1 Identification of | the substance / mixture and of | the company / undertaking | | | |
| Product Identifier | | | | | |
| Product name: | Light Rare Earth Chloride Solution | | | | |
| Chemical Name: | Not Applicable | | | | |
| Synonyms: | Not Available | | | | |
| Proper shipping name: | Not Applicable | | | | |
| Chemical formula: | Not Applicable | | | | |
| Other means of identification: | Not Available | | | | |
| CAS number: | Not Applicable | | | | |
| Relevant identified uses of the | substance or mixture and uses a | dvised against | | | |
| Relevant identified uses: | Used according to manufacturer's directions. | | | | |
| Details of the supplier of the sa | afety data sheet | | | | |
| Registered company name: | ANSTO Minerals Organisation (ANSTO Minerals) | | | | |
| Address: | Australia | | | | |
| Telephone: | Not Available | | | | |
| Fax: | Not Available | | | | |
| Website: | Not Available | | | | |
| Email: | Not Available | | | | |
| Emergency telephone number | | | | | |
| Association / Organisation: | Not Available | | | | |
| Emergency telephone numbers: | +61 2 9717 3333 | | | | |
| | | | | | |
| SECTION 2 Hazards identific Classification of the substance HAZARDOUS SUBSTANCE. NON-DANG hemWatch Hazard Ratings | | NOHSC, and the ADG Code. | _ | | |
| ChemWatch Hazard Ratings MinMax Flammability 0 Foxicity 0 Sody Contact 2 Reactivity 0 | ation e or mixture | NOHSC, and the ADG Code. | | | |
| SECTION 2 Hazards identific Classification of the substance HAZARDOUS SUBSTANCE. NON-DANG ChemWatch Hazard Ratus Flammability 0 Foxicity 0 Soldy Contact 2 Reactivity 0 Chronic 0 | ation e or mixture EROUS GOODS. According to the Criteria of I 0 = Minimum 1 = Low 2 = Moderate 3 = High 4 = Extreme | NOHSC, and the ADG Code. | | | |
| SECTION 2 Hazards identific Classification of the substance HAZARDOUS SUBSTANCE. NON-DANG ChemWatch Hazard Ratings Flammability 0 Flammability 0 Flammabilit | ation e or mixture EROUS GOODS. According to the Criteria of I 0 = Minimum 1 = Low 2 = Moderate 3 = High | NOHSC, and the ADG Code. | | | |
| SECTION 2 Hazards identific Classification of the substance HAZARDOUS SUBSTANCE. NON-DANG ChemWatch Hazard Ratings Filemmability 0 Froxicity 0 Sody Contat 2 Reactivity 0 Chronic 0 Poisons Schedule: N Risk Phrases ^[1] | ation e or mixture EROUS GOODS. According to the Criteria of I 0 = Minimum 1 = Low 2 = Moderate 3 = High 4 = Extreme kone | NOHSC, and the ADG Code. | | | |
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| SECTION 2 Hazards identific Classification of the substance HAZARDOUS SUBSTANCE. NON-DANG ChemWatch Hazard Ratings ChemWatch Hazard Ratings ChemWa | ation e or mixture EROUS GOODS. According to the Criteria of I 0 = Minimum 1 = Low 2 = Moderate 3 = High 4 = Extreme None Soluce discomfort of the eyes and skin*. | | | | |
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| SECTION 2 Hazards identific Classification of the substance HAZARDOUS SUBSTANCE. NON-DANG ChemWatch Hazard Ramas Flammability 0 Flammability 0 Society 0 Reactivity 0 Chronic 0 Poisons Schedule: N Risk Phrases ^[1] R36/38? May pro- LIMITED EVIDENCE Legend:1. Classified by Chemwatch; 2. Cla GHS Classification: | ation e or mixture EROUS GOODS. According to the Criteria of I 0 = Minimum 1 = Low 2 = Moderate 3 = High 4 = Extreme None Soluce discomfort of the eyes and skin*. | | | | |
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| SECTION 2 Hazards identific Classification of the substance HAZARDOUS SUBSTANCE. NON-DANG ChemWatch Hazard Ratings MirMax Tammability 0 Gody Conta 2 Reactivity 0 Chronic 0 Poisons Schedule: N Risk Phrases ^[1] R36/38? May pro- Limited EviDence Legend: 1. Classification: Interpretable lements Interpretable Label elements Interpretable Signal word: N Hazard statement(s): Interpretable Supplementary statement(s): Prevention | ation or mixture EROUS GOODS. According to the Criteria of I O = Minimum 1 = Low 2 Monate 2 = Extreme kone cduce discomfort of the eyes and skin*. assification drawn from HSIS; 3. Classification draw | | | | |

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Not Applicable Label elements Relevant risk statements are found in section 2.1 Indication(s) of danger: Xi Safety advice: S23 Do not breathe gas/fumes/vapour/spray. S25 Avoid contact with eyes S26 In case of contact with eyes, rinse with plenty of water and contact Doctor or Poisons Information Centre. S39 Wear eye/face protection S40 To clean the floor and all objects contaminated by this material, use water. S46 If swallowed, IMMEDIATELY contact Doctor or Poisons Information Center. (show this container or label) S56 Dispose of this material and its container at hazardous or special waste collection point. S64 If swallowed, rinse mouth with water (only if the person is conscious). Other hazards Not Available **SECTION 3 Composition / information on ingredients** See 'Composition on ingredients' in Section 3.2 CAS No %[weight] 7732-18-5 >60 10-30 rare earth chlorides **SECTION 4 First aid measures** Eye Contact: If this product comes in contact with the eyes Wash out immediately with fresh running water Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
Seek medical attention without delay; if pain persists or recurs seek medical attention.
Removal of contact lenses after an eye injury should only be undertaken by skilled personnel. Skin Contact: If skin contact occurs: Immediately remove all contaminated clothing, including footwear.
 Flush skin and hair with running water (and soap if available).
 Seek medical attention in event of irritation. Inhalation: • If fumes or combustion products are inhaled remove from contaminated area. Lay patient down. Keep warm and rested.
 Prostneses such as failse teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
 Apply articial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
 Transport to hospital, or doctor. Ingestion: If swallowed do NOT induce vomiting.
If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink Seek medical advice. Treat symptomatically. **SECTION 5 Firefighting measures** • There is no restriction on the type of extinguisher which may be used. Fire Incompatibility:

None known

Fire Fighting:

- Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves in the event of a fire.
 Prevent, by any means available, spillage from entering drains or water courses.
- Use fire fighting procedures suitable for surrounding area.

Fire/Explosion Hazard:

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- Non combustible.
- Not considered to be a significant fire risk.
 Expansion or decomposition on heating may lead to violent rupture of containers.
- · Decomposes on heating and may produce toxic/ irritating fumes

SECTION 6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

Minor Spills:

- · Clean up all spills immediately.
- Avoid breathing vapours and contact with skin and eyes.
 Control personal contact with the substance, by using protective equipment.
 Contain and absorb spill with sand, earth, inert material or vermiculite.
- Major Spills:
- Minor hazard.
 - Clear area of personnel.
 - Alert Fire Brigade and tell them location and nature of hazard.
 Control personal contact with the substance, by using protective equipment as required.
- Personal Protective Equipment advice is contained in Section 8 of the MSDS.

SECTION 7 Handling and storage

Safe handling

- Limit all unnecessary personal contact.
 Wear protective clothing when risk of exposure occurs.
 Use in a well-ventilated area.
 When handling DO NOT eat, drink or smoke.

Other information

- Store in original containers.
 Keep containers securely sealed.
 Store in a cool, dry, well-ventilated area.
 Store away from incompatible materials and foodstuff containers.

Conditions for safe storage, including any incompatibilities

Suitable container:

Storage incompatibility:



X: Must not be stored together

0: May be stored together with specific preventions +: May be stored together

Package Material Incompatibilities:

SECTION 8 Exposure controls / personal protection

| Occupational Exposure Limits (OEL) | | | | | | |
|------------------------------------|--------------------------------------|------------|---------------|----------|---------------|--|
| INGREDIEN | INGREDIENT DATA | | | | | |
| Not Available | | | | | | |
| Emergency | Limits | | | | | |
| Ingredient | · | TEEL-0 | TEEL-1 | TEEL-2 | TEEL-3 | |
| | water | 500(ppm) | 500(ppm) | 500(ppm) | 500(ppm) | |
| Ingredient | ngredient Original IDLH Revised IDLH | | | | | |
| | Light Rare Earth Chloride | e Solution | Not Available | | Not Available | |

Appropriate engineering controls

Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection. The basic types of engineering controls are: Process controls which involve changing the way a job activity or process is done to reduce the risk. Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment.



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· Safety glasses with side shields; or as required,

 Chemical goggles.
 Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate initiants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience.

| Bin protection. | |
|---|-----------------------|
| See Hand protection below | |
| Hand protection: | |
| Wear chemical protective gloves, e.g. PVC.Wear safety footwear. | |
| Body protection: | |
| See Other protection below | |
| Other protection: | |
| Overalls.Eyewash unit. | |
| Thermal hazards: | |
| | |
| Recommended material(s): Res | spiratory protection: |

Respiratory protection:

SECTION 9 Physical and chemical properties

Appearance and slightly purplish odourless liquid: mixes with wate

| Green and signing purphish odduness induid, mixes with water. | | | | | |
|---|---------------|---|----------------|--|--|
| Physical state | Liquid | Relative density (Water = 1) | Not Available | | |
| Odour | Not Available | Partition coefficient n-octanol / water | Not Available | | |
| Odour threshold | Not Available | Auto-ignition temperature (°C) | Not Available | | |
| pH (as supplied) | 4.0 | Decomposition temperature | Not Available | | |
| Melting point / freezing point (°C) | Not Available | Viscosity (cSt) | Not Available | | |
| Initial boiling point and boiling range (°C) | 100 | Molecular weight (g/mol) | Not Applicable | | |
| Flash point (°C) | Not Available | Taste | Not Available | | |
| Evaporation rate | As for water | Explosive properties | Not Available | | |
| Flammability | Not Available | Oxidising properties | Not Available | | |
| Upper Explosive Limit (%) | Not Available | Surface Tension (dyn/cm or mN/m) | Not Available | | |
| Lower Explosive Limit (%) | Not Available | Volatile Component (%vol) | Not Available | | |
| Vapour pressure (kPa) | 2.3 @ 20C | Gas group | Not Available | | |
| Solubility in water (g/L) | Miscible | pH as a solution(1%) | Not Available | | |
| Vapour density (Air = 1) | Not Available | | | | |

SECTION 10 Stability and reactivity Reactivity: See section 7.2 Chemical stability: Product is considered stable and hazardous polymerisation will not occur Possibility of hazardous reactions: See section 7.2 Conditions to avoid: See section 7.2 Incompatible materials: See section 7.2 Hazardous decomposition products: See section 5.3

SECTION 11 Toxicological information

Information on toxicological effects

Inhaled:

Not normally a hazard due to non-volatile nature of product

Ingestion:

The material has NOT been classified by EC Directives or other classification systems as "harmful by ingestion". This is because of the lack of corroborating animal or human evidence. The material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (e.g liver, kichey) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, il-health).

Skin Contact:

Limited evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin initiation may also be present after prolonged or repeated exposure; this may result in a form of contact dematitis (nonallergic). The dematitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.

Eye:

Umited evidence exists, or practical experience suggests, that the material may cause eye irritation in a substantial number of individuals and/or is expected to produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Repeated or prolonged eye contact may cause inflammation characterised by temporary rechess (similar to windbum) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.

Chronic:

Long-term exposure to the product is not thought to produce chronic effects adverse to health (as classified by EC Directives using animal models); nevertheless exposure by all routes should be minimised as a matter of course.

TOXICITY

Light Rare Earth Chloride Solution

IRRITATION



Dubbo Zirconia Project

| Not Available | | Not Available | |
|---|---------------------------------|---------------------------|------------------|
| water | | | |
| Not Available | | Not Available | |
| rare earth chlorides | | | |
| Not Available | | Not Available | |
| Not available. Refer to individual constit | uents. | | |
| WATER | | | |
| No significant acute toxicological data i | dentified in literature search. | | |
| Acute Toxicity: | Not Available | Carcinogenicity: | Not Available |
| Skin Irritation/Corrosion: | Not Available | Reproductivity: | Not Available |
| Serious Eye Damage/Irritation: | Not Available | STOT - Single Exposure: | Not Available |
| Respiratory or Skin sensitisation: | Not Available | STOT - Repeated Exposure: | Not Available |
| Mutagenicity: | Not Available | Aspiration Hazard: | Not Available |
| CMR STATUS | | | |
| | | | |
| SECTION 12 Ecological in | Tormation | | |
| Toxicity | | | |
| DO NOT discharge into sewer or water | ways. | | |
| Persistence and degradabi | lity | | |
| Ingredient | Persistence: Water/Soil | | Persistence: Air |
| Not Available | Not Available | | Not Available |
| Bioaccumulative potential | | | |
| Ingredient | Bioaccumulation | | |
| Not Available | Not Available | | |
| Mobility in soil | | | |
| Ingredient | Mobility | | |
| Not Available | Not Available | | |
| SECTION 13 Disposal co | nsiderations | | |
| Waste treatment methods | | | |
| Product / Packaging disposal: | | | |
| Recycle wherever possible or Consult State Land Waste Mar Bury residue in an authorised | | | |
| SECTION 14 Transport in | formation | | |
| Labels Required: | | | |
| Marine Pollutant: NO | | | |
| HAZCHEM: | | | |

Land transport (ADG): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

SECTION 15 Regulatory information

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

water(7732-18-5) is found on the following regulatory lists

"Australia Inventory of Chemical Substances (AICS)", "Sigma-Aldrich Transport Information", "OSPAR National List of Candidates for Substitution – Norway", "IMO IBC Code Chapter 18: List of products to which the Code does not apply", "International Fragrance Association (IFRA) Survey: Transparency List", "OECD List of High Production Volume (HPV) Chemicals", "Australia High Volume Industrial Chemical List (HVICL)"

SECTION 16 Other information

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chernwatch Classification committee using available literature references. A list of reference resources used to assist the committee may be found at:

www.chemwatch.net/references

The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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