Appendix 11

Material Safety Data Sheets for Products of the DZP

- **Zirconia (Zirconium Dioxide) (ZrO_2)**
- **Zirconium Hydroxide (ZOH)**
- **Zirconium Basic Sulphate (ZBS)**
- **Niobium Pentoxide (Nb_2O_5)**
- **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

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ZIRCONIUM DIOXIDE

Merck

Chemwatch:	25364	Print Date:	05/08/2013
Version No:	5.1.1.1	Issue Date:	01/01/2013
Material Safety 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 Identifier

Product name:	ZIRCONIUM DIOXIDE
Chemical Name:	zirconium dioxide
Synonyms:	AI3-29087, Dioxido de circonio, ZIRCONIUM (IV) OXIDE, ZIRCONIUM(IV) OXIDE, MESOPOROUS, 10A PO, ZIRCONIUM(IV) OXIDE, MESOPOROUS, 10A PO&, ZIRCONIUM(IV) OXIDE, MESOPOROUS, 20A PO, ZIRCONIUM(IV) OXIDE, MESOPOROUS, 20A PO&, ZIRCONIUMDIOXID, ZWAVELZUUROPLOSSINGEN (DUTCH), Zirconia, Zirconia, zircon, zirconium oxide, Zirconium (IV) Oxide , Special Grade, Technipur, Zirconium (IV) Oxide, Zirconium (IV) Oxide, 98.5%, Zirconium (IV) Oxide, P.A, Zirconium (IV) Oxide, P.A., Zirconium Dioxide, Zirconium Oxide, Zirconium dioxide, Zirconium(IV) oxide discs about 6 g (ZrO2) Patinal, Zirconium(IV) oxide discs grey, about 6 g (ZrO2) Patinal., Zirconium(IV) oxide special grade Technipur.., Zirconium(IV) oxide tablets grey, about 1 g (ZrO2) Patinal, Zirconium(IV) oxide tablets grey, about 6 g (ZrO2) Patinal., Zirconium(IV) oxide, 98.5%, Zirkonium(IV) oxide Technipur, Zirkonium(IV) oxide, granules grey about 3-6 mm (ZrO2) Patin, Zironium Dioxide, ZrO2, zirconium dioxide, zirconium oxide
Proper shipping name:	Not Applicable
Chemical formula:	O2Zr
Other means of identification:	Not Available
CAS number:	1314-23-4

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses:

Details of the supplier of the safety data sheet

Registered company name:	Merck	Sigma-Aldrich
Address:	207 Colchester Road Kilsyth 3137 VIC Australia	12 Anella Avenue Castle Hill 2154 NSW Australia
Telephone:	+61 3 9728 7600	+61 2 9841 0555
Fax:	+61 3 9728 1351	+61 2 9841 0500
Website:	http://203.221.251.46/msds/msds.aspx	www.sigma-aldrich.com
Email:	admin@merck.com.au	ausmail@sial.com

Emergency telephone number

Association / Organisation:	Not Available	Not Available
Emergency telephone numbers:	+61 3 9728 7600	+44 8701906777
Other emergency telephone numbers:	+61 3 9728 7600	1800 448 456

SECTION 2 Hazards identification

Classification of the substance or mixture

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

ChemWatch Hazard Ratings

		Min/Max
Flammability	0	
Toxicity	2	
Body Contact	2	
Reactivity	0	
Chronic	2	

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

Poisons Schedule:	None

Risk Phrases[2]

R15	Contact with water liberates extremely flammable gases.
R17	Spontaneously flammable in air.

**LIMITED EVIDENCE*

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

Not Applicable

Signal word:	**NOT APPLICABLE**

Hazard statement(s):

Not Applicable

**LIMITED EVIDENCE*

Supplementary statement(s):

Not Applicable

Precautionary statement(s): Prevention

Not Applicable

Precautionary statement(s): Response

Not Applicable

Precautionary statement(s): Storage

Not Applicable

Precautionary statement(s): Disposal

Not Applicable

Label elements

Relevant risk statements are found in section 2.1

Indication(s) of danger:	F

Safety advice:

S02	Keep out of reach of children.
S43	In case of fire use...
S7/8	Not Available

Other hazards

Not Available

SECTION 3 Composition / information on ingredients

Substances

CAS No	%[weight]	Name
1314-23-4	99	ZIRCONIUM DIOXIDE

Mixtures

See 'Information on ingredients' in section 3.1

SECTION 4 First aid measures

Description of 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.
- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial 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, without delay.

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.

Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5 Firefighting measures

Extinguishing media

- There is no restriction on the type of extinguisher which may be used.
- Use extinguishing media suitable for surrounding area.

Special hazards arising from the substrate or mixture

Fire Incompatibility:

None known.

Advice for firefighters

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:

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

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

SECTION 6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

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	+	X	O	+

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 IDLH	Revised IDLH
zirconium dioxide	500(mgm3)	25(mgm3)

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.

Personal protection

Eye and face protection:

- Safety glasses with side shields.
- Chemical goggles.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentra 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 c several substances, the resistance of the glove material can not be calculated in advance and has th The exact break through time for substances has to be obtained from the manufacturer of the protecti Suitability and durability of glove type is dependent on usage.

Body protection:

See Other protection below

Other protection:

- Overalls.
- 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

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 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.

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 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:

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.

TOXICITY	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 airflow 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

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

Waste treatment methods

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

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

zirconium dioxide(1314-23-4) 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","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

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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ZIRCONIUM HYDROXIDE

CHEMWATCH 56750 **CD 2009/2 Page 1 of 1**

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

CAS RN:	14475-63-9,12688-15-2		HAZCHEM: None
UN NO:	None	DG Class: NONE	Packing Group: None
Poisons Schedule:	None	EPG: None	IERG: None

CHEMWATCH HAZARD RATINGS

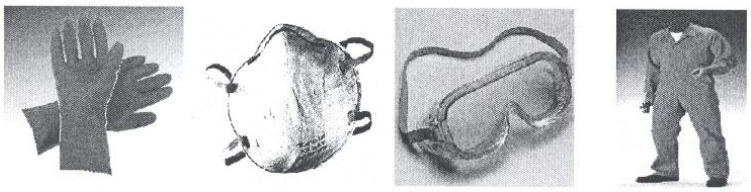
R Codes: R36/37/38
R22 R33
S Codes: S22 S24 S39 S401 S26 S46

R Statements:
- » Irritating to eyes respiratory system and skin.
- » *Ingestion may produce health damage*.*
- » *Cumulative effects may result following exposure*.*

** (limited evidence).*

S Statements:
- » Do not breathe dust.
- » Avoid contact with skin.
- » Wear eye/face protection.
- » To clean the floor and all objects contaminated by this material use water and detergent.
- » 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).

PERSONAL PROTECTIVE EQUIPMENT FOR INDUSTRIAL/COMMERCIAL ENVIRONMENTS



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DZ ZIRCONIUM BASIC SULPHATE

Chemwatch Material Safety Data Sheet
Issue Date: 13-May-2009
NC317ECP

CHEMWATCH 21-1228
Version No:2.0
CD 2009/1 Page 1 of 9

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

continued...

DZ ZIRCONIUM BASIC SULPHATE

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.

continued...

DZ ZIRCONIUM BASIC SULPHATE

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.

continued...

DZ ZIRCONIUM BASIC SULPHATE

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	TWA mg/m³	STEL mg/m³
Australia Exposure Standards	zirconium sulfate (Zirconium compounds (as Zr))	5	10

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

EMERGENCY EXPOSURE LIMITS

Material	zirconium sulfate

MATERIAL DATA
» Not available. Refer to individual constituents.

INGREDIENT DATA
ZIRCONIUM SULFATE:
» 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-effect-levels (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

continued...

DZ ZIRCONIUM BASIC SULPHATE

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

WATER:
» 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 ** - 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.

continued...

DZ ZIRCONIUM BASIC SULPHATE

Chemwatch Material Safety Data Sheet
Issue Date: 13-May-2009
NC317ECP

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 (℃): 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 (℃): Not Applicable
State: Manufactured

Boiling Range (℃): Not Applicable
Specific Gravity (water= 1): Not Available
pH (as supplied): Not Applicable
Vapour Pressure (kPa): Not Applicable
Evaporation Rate: Not Applicable
Flash Point (℃): Not Applicable
Upper Explosive Limit (%): Not Applicable
Decomposition Temp (℃): 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.

continued...

DZ ZIRCONIUM BASIC SULPHATE

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

» 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 airflow 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. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.
The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
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 toxic.

continued...

DZ ZIRCONIUM BASIC SULPHATE

» 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 for ingredients
zirconium sulfate (CAS: 14644-61-2) is found on the following regulatory lists;
Australia Exposure Standards
Australia Hazardous Substances
Australia Inventory of Chemical Substances (AICS)
zirconium sulfate (CAS: 34806-73-0) 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 Hazardous Substances
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.

continued...

DZ ZIRCONIUM BASIC SULPHATE

Section 16 - OTHER INFORMATION

INGREDIENTS WITH MULTIPLE CAS NUMBERS

Ingredient Name	CAS
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.

Powered by Chemwatch

NIOBIUM(V) OXIDE

Not Available Not Available

Chemwatch:	13614	Print Date:	05/08/2013
Version No:	4.1.1.1	Issue Date:	01/01/2013
Material Safety 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 Identifier

Product name:	NIOBIUM(V) OXIDE
Chemical Name:	niobium(V) oxide
Synonyms:	3-bromobenzo(b)thiophene-2-carboxylic acid, Columbium Oxide, Columbium Pentoxide, Diniobium pentoxide, Diniobium pentoxide~Niobia~Niobium(5+)oxide~Niobium pentaoxide, Ethanoic acid, Methanecarboxylic acid, NIOBIUM OXIDE (V), NIOBIUM(V) OXIDE 99+, Niobia, Niobium Pentoxide Columbium Pentoxide, Niobium pentaoxide, Niobium pentoxide, Niobium(5+) oxide, Niobium(V) oxide, Niobium(V) oxide = 99.9%, OXYDE DE NIOBIUM(V), Ossido di niobio(V)
Proper shipping name:	Not Applicable
Chemical formula:	Nb2-O5
Other means of identification:	Not Available
CAS number:	1313-96-8

Relevant identified uses of the 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 number

Association / Organisation:	Not Available		
Emergency telephone numbers:	Not Available		
Other emergency telephone numbers:	Not Available		

SECTION 2 Hazards identification

Classification of the substance or mixture

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

ChemWatch Hazard Ratings

	Min	Max
Flammability	0	
Toxicity	0	
Body Contact	2	
Reactivity	0	
Chronic	2	

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

Poisons Schedule:	None

Risk Phrases[1]

R37	Irritating to respiratory system.
R33?	*Cumulative effects may result following exposure*.*

**LIMITED EVIDENCE*

Legend:*1. Classified by Chemwatch; 2. Classification drawn from HSIS; 3. Classification drawn from EC Directive 1272/2008 - Annex VI*

GHS Classification[1]:

STOT - SE (Resp. Irr.) Category 3

**LIMITED EVIDENCE*

Legend:*1. Classified by Chemwatch; 2. Classification drawn from HSIS; 3. Classification drawn from EC Directive 1272/2008 - Annex VI*

Label elements

GHS label elements

Signal word:	**WARNING**

Hazard statement(s):

H335	May cause respiratory irritation

**LIMITED EVIDENCE*

Supplementary statement(s):	
Not Applicable	
Precautionary statement(s): Prevention	
P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P271	Use only outdoors or in a well-ventilated area.
Precautionary statement(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 aider/if you feel unwell.
Precautionary statement(s): Storage	
P403+P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
Precautionary statement(s): Disposal	
P501	Dispose of contents/container to authorised chemical landfill or if organic to high temperature incineration

Label elements

Relevant risk statements are found in section 2.1

Indication(s) of danger:	Xi

Safety advice:	
S40	To clean the floor and all objects contaminated by this material, use water and detergent.
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

Substances

CAS No	%[weight]	Name
1313-96-8	>95	NIOBIUM(V) OXIDE

Mixtures

See 'Information on ingredients' in section 3.1

SECTION 4 First aid measures

Description of first aid measures

Eye Contact:

If this product comes in contact with eyes:
- Wash out immediately with water.
- If irritation continues, seek medical attention.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact:

If skin or hair contact occurs:
- 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.
- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial 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, without delay.

Ingestion:

- Immediately give a glass of water.
- First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.

Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5 Firefighting measures

Extinguishing media

- There is no restriction on the type of extinguisher which may be used.
- Use extinguishing media suitable for surrounding area.

Special hazards arising from the substrate or mixture

Fire Incompatibility:

None known.

Advice for firefighters

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:

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

Decomposition may produce toxic fumes of:metal oxidesMay 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.

Conditions for safe storage, including any incompatibilities

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	+	X	O	+

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

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 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.

Personal protection

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.
- Barrier cream.

Thermal hazards:

Recommended material(s):	Respiratory protection:

SECTION 9 Physical and chemical properties

Information on basic physical and chemical properties

Appearance

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

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.

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, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, ill-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 healing was not evident at 14 days.

Eye:

Although the material is not thought to be an irritant (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 breathlessness.

TOXICITY	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

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 airflow 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

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

Waste treatment methods

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

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

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 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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TREIBACHER INDUSTRIE AG

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

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SECTION 1: Identification of the substance/mixture and of the company/undertaking

· **1.1 Product identifier**

· **Product name: Ferro niobium - FeNb**
· **CAS Number:**
12023-22-2
· **EC number:**
234-676-5
· **REACH-Registration number: -**
· **REACH-Pre-registration number(s):** Niobium: 05-2114132066-60-0000
· **1.2 Relevant identified uses of the substance or mixture and uses advised against**
· **Application of the substance / the preparation:**
Master alloy
Electrical batteries and accumulators

· **1.3 Details of the supplier of the safety data sheet**
· **Manufacturer/Supplier:**
Treibacher Industrie AG
Auer von Welsbachstraße 1
9330 Althofen
Austria
Telefon: +43 (0) 4262 505-0
Fax: +43 (0) 4262 505-2005
www.treibacher.com

· **Further information obtainable from:** msds@treibacher.com
· **1.4 Emergency telephone number:**
+43 (0) 4262 505-0 (7:00 - 16:00) - Central European Time (CET)
+43 (0) 1 406 4343-0 (Austrian Poison Information Centre)

SECTION 2: Hazards identification

· **2.1 Classification of the substance or mixture**
· **Classification according to Regulation (EC) No 1272/2008**
The substance is not classified according to the CLP regulation.

· **Classification according to Directive 67/548/EEC or Directive 1999/45/EC** Void
· **Information concerning particular hazards for human and environment:**
No hazards to be particularly mentioned.

· **2.2 Label elements**
· **Labelling according to Regulation (EC) No 1272/2008** Void
· **Hazard pictograms** Void
· **Signal word** Void
· **Hazard statements** Void
· **2.3 Other hazards**
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.

SECTION 3: Composition/information on ingredients

· **3.1 Chemical characterization: Substances**
· **CAS No. Description**
12023-22-2 Ferro niobium
· **Identification number(s)**
· **EC number:** 234-676-5

· **Components:**		
CAS: 7440-03-1 EINECS: 231-113-5	Niobium	60-70%

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Product name: Ferro niobium - FeNb

(Contd. of page 1)

CAS: 7439-89-6 EINECS: 231-096-4	Iron	30-40%

· **Impurities and stabilising additives:**	
CAS: 7440-21-3 EINECS: 231-130-8	Silicon
CAS: 7440-32-6 EINECS: 231-142-3	Titanium
CAS: 7429-90-5 EINECS: 231-072-3 Reg.nr.: 01-2119529243-45-0139	Aluminium metal (solid)
CAS: 7440-25-7 EINECS: 231-135-5	Tantalum

SECTION 4: First aid measures

· **4.1 Description of first aid measures**
· **After inhalation:** Supply fresh air; consult doctor in case of complaints.
· **After skin contact:** Rinse with warm water.
· **After eye contact:**
Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
· **After swallowing:**
If swallowed, rinse mouth with water (only if the person is conscious).
If symptoms persist consult doctor.
· **4.2 Most important symptoms and effects, both acute and delayed**
No further relevant information available.
· **Information for doctor:** Treat symptomatically.
· **4.3 Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

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SECTION 5: Firefighting measures

· **5.1 Extinguishing media**
· **Suitable extinguishing agents:**
All extinguishing substances suitable.
The product is not flammable.
Use fire extinguishing methods suitable to surrounding conditions.
· **5.2 Special hazards arising from the substance or mixture** No further relevant information available.
· **5.3 Advice for firefighters**
· **Protective equipment:** Wear self-contained respiratory protective device.
· **Additional information:**
Dispose of fire debris and contaminated fire fighting water in accordance with official regulations.

SECTION 6: Accidental release measures

· **6.1 Personal precautions, protective equipment and emergency procedures**
Ensure adequate ventilation
Avoid formation of dust.
· **6.2 Environmental precautions:** No special measures required.
· **6.3 Methods and material for containment and cleaning up:**
Pick up mechanically.
Dispose of the material collected according to regulations.
· **6.4 Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.

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Safety Data Sheet

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Product name: Ferro niobium - FeNb

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See Section 13 for disposal information.

SECTION 7: Handling and storage

· **7.1 Precautions for safe handling**
Ensure good ventilation/exhaustion at the workplace.
Prevent formation of dust.
· **7.2 Information about fire - and explosion protection:** No special measures required.

· **Conditions for safe storage, including any incompatibilities**
· **Storage:**
· **Requirements to be met by storerooms and receptacles:** Keep container tightly sealed.
· **Information about storage in one common storage facility:**
Do not store together with acids.
Do not store together with alkalis (caustic solutions).
· **Further information about storage conditions:** Store in dry conditions.
· **7.3 Specific end use(s)** see section 1.2

SECTION 8: Exposure controls/personal protection

· **Additional information about design of technical facilities:** No further data; see item 7.

· **8.1 Control parameters**
· **Ingredients with limit values that require monitoring at the workplace:** Not required.
· **Additional information:** The lists valid during the making were used as basis.

· **8.2 Exposure controls**
· **Personal protective equipment:**
· **General protective and hygienic measures:**
The usual precautionary measures are to be adhered to when handling chemicals.
· **Respiratory protection:** Use suitable respiratory protective device when high concentrations are present.
· **Recommended filter device for short term use:**
Filter P1
Filter FFP1
· **Protection of hands:** Not required.
· **Eye protection:** Not required.
· **Body protection:** Protective work clothing

SECTION 9: Physical and chemical properties

· **9.1 Information on basic physical and chemical properties**	
· **General Information**	
· **Appearance:**	
Form:	lumpy Powder
Colour:	Grey
· **Odour:**	Odourless
· **Odour threshold:**	Not applicable
· **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:**	Product is not selfigniting.
· **Danger of explosion:**	Product does not present an explosion hazard.

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· **Explosion limits:**	
Lower:	Not applicable
Upper:	Not applicable
· **Oxidizing properties**	None
· **Vapour pressure:**	Not applicable
· **Density:**	8.2 g/cm³
· **Solubility in / Miscibility with water:**	Insoluble.
· **Partition coefficient (n-octanol/water):**	Not determined
· **Viscosity:**	
Dynamic:	Not applicable
Kinematic:	Not applicable
· **9.2 Other information**	No further relevant information available.

SECTION 10: Stability and reactivity

· **10.1 Reactivity**
· **10.2 Chemical stability**
· **Thermal decomposition / conditions to be avoided:**
No decomposition if used and stored according to specifications.
· **10.3 Possibility of hazardous reactions** No dangerous reactions known.
· **10.4 Conditions to avoid** No further relevant information available.
· **10.5 Incompatible materials:**
Keep away from acids.
Keep away from alkaline solutions.
· **10.6 Hazardous decomposition products:** No dangerous decomposition products known.

SECTION 11: Toxicological information

· **11.1 Information on toxicological effects**
· **Acute toxicity:**

· **LD/LC50 values relevant for classification:**		
7439-89-6 Iron		
Oral	LD50	20000 mg/kg (Guinea pig) Lit.: Indian Journal of Pharmacy. Vol. 13, Pg. 240, 1951. 30000 mg/kg (Rat) Lit.: Indian Journal of Pharmacy. Vol. 13, Pg. 240, 1951.

· **on the skin:** No irritant effect.
· **on the eye:** No irritating effect.
· **Sensitization:** No sensitizing effects known.
· **Other information (about experimental toxicology):** Caution - substance not yet fully tested.
· **Additional toxicological information:**
When used and handled according to specifications, the product does not have any harmful effects to our experience and the information provided to us.
The substance is not subject to classification according to the latest version of the EU lists.
· **CMR effects (carcinogenity, mutagenicity and toxicity for reproduction)** Not determined

SECTION 12: Ecological information

· **12.1 Toxicity**
· **Aquatic toxicity:** Not determined
· **12.2 Persistence and degradability** Not determined

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· **12.3 Bioaccumulative potential** Not determined
· **12.4 Mobility in soil** No further relevant information available.
· **Ecotoxical effects:**
· **Other information:** At present there are no ecotoxicological assessments.
· **Additional ecological information:**
· **AOX-indication:** The product does not contain organically bounded halogens (AOX-free).
· **General notes:** Generally not hazardous for water
· **12.5 Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.
· **12.6 Other adverse effects** No further relevant information available.

SECTION 13: Disposal considerations

· **13.1 Waste treatment methods**
· **Recommendation**
Contact manufacturer for recycling information.
Disposal must be made according to official regulations.
· **Waste disposal key:** 35103 (ÖNORM S 2100)
· **European waste catalogue** 06 04 99

· **Uncleaned packaging:**
· **Recommendation:**
Empty contaminated packagings thoroughly. They may be recycled after thorough and proper cleaning.
Disposal must be made according to official regulations.

SECTION 14: Transport information

· **14.1 UN-Number** · **ADR, IMDG, IATA**	Void
· **14.2 UN proper shipping name** · **ADR, IMDG, IATA**	Void
· **14.3 Transport hazard class(es)** · **ADR, IMDG, IATA** · **Class**	Void
· **14.4 Packing group** · **ADR, IMDG, IATA**	Void
· **14.5 Environmental hazards:**	Void
· **14.6 Special precautions for user**	Not applicable.
· **14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Not applicable.
· **Transport/Additional information:**	Not dangerous according to the above specifications.

*

SECTION 15: Regulatory information

· **15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**
· **Sara**
· **Section 302 (extremely hazardous substances):** Substance is not listed.
· **Section 313 (Specific toxic chemical listings):** Substance is not listed.
· **TSCA (Toxic Substances Control Act):** Substance is listed.
· **Proposition 65**
· **Chemicals known to cause cancer:** Substance is not listed.
· **Chemicals known to cause reproductive toxicity to femals:** Substance is not listed.

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· **Chemicals known to cause reproductive toxicity for males:** Substance is not listed.
· **Chemicals known to cause developmental toxicity:** Substance is not listed.
· **Cancerogenity 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 listed.
· **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**		
12023-22-2	Ferroniobium	KE-21072

· **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 (GB)
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 to REACH Art. 2.7 (d).
· **15.2 Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

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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 Concerning the International Transport of Dangerous Goods by Rail)
ICAO: International Civil Aviation Organization
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
IATA: International Air Transport Association
GHS: Globally Harmonized System of Classification and Labelling of Chemicals
ACGIH: American Conference of Governmental Industrial Hygienists
EINECS: European Inventory of Existing Commercial Chemical Substances
ELINCS: European List of Notified Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
· *** Data compared to the previous version altered.**

GB

Powered by Chemwatch

Heavy Rare Earth Chloride Solution

ANSTO Minerals Organisation (ANSTO Minerals)

Chemwatch:	4841-20	Print Date:	05/08/2013
Version No:	2.1.1.1	Issue Date:	01/01/2013
Material Safety 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 Identifier

Product name:	Heavy 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 advised against

Relevant identified uses:	Used according to manufacturer's directions.

Details of the supplier of the safety 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		
Other emergency telephone numbers:	+61 2 9717 3333		

SECTION 2 Hazards identification

Classification of the substance or mixture

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

ChemWatch Hazard Ratings

	Min	Max
Flammability	0	
Toxicity	0	
Body Contact	2	
Reactivity	0	
Chronic	0	

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

Poisons Schedule:	None

Risk Phrases[1]

R36/38?	*May produce discomfort of the eyes and skin*.*

**LIMITED EVIDENCE*

Legend:*1. Classified by Chemwatch; 2. Classification drawn from HSIS; 3. Classification drawn from EC Directive 1272/2008 - Annex VI*

GHS Classification:
Not Applicable

Label elements

GHS label elements
Not Applicable

Signal word:	**NOT APPLICABLE**

Hazard statement(s):
Not Applicable
**LIMITED EVIDENCE*

Supplementary statement(s):
Not Applicable

Precautionary statement(s): Prevention
Not Applicable

Precautionary statement(s): Response
Not Applicable

Precautionary statement(s): Storage
Not Applicable

Precautionary statement(s): Disposal

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

Substances

See 'Composition on ingredients' in Section 3.2

Mixtures

CAS No	%[weight]	Name
7732-18-5	>60	WATER
	10-30	rare earth chlorides

SECTION 4 First aid measures

Description of 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.
- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial 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.

Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5 Firefighting measures

Extinguishing media

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

Special hazards arising from the substrate or mixture

Fire Incompatibility:

None known

Advice for firefighters

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:

- 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 away from incompatible materials and foodstuff containers.

Conditions for safe storage, including any incompatibilities

Suitable container:

Storage incompatibility:

+	X	+	X	O	+

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

Not Available

Emergency Limits

Ingredient	TEEL-0	TEEL-1	TEEL-2	TEEL-3
water	500(ppm)	500(ppm)	500(ppm)	500(ppm)

Ingredient	Original IDLH	Revised IDLH
Heavy Rare Earth Chloride Solution	Not Available	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.

Personal protection

Eye and face protection:

- Safety glasses with side shields; or as required,
- 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.

Skin 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):	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)	2.8	**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, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, ill-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 irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (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 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 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	IRRITATION
Heavy Rare Earth Chloride Solution	

Not Available	Not Available
water	
Not Available	Not Available
rare earth chlorides	
Not Available	Not Available

Not available. Refer to individual constituents.

WATER

No significant acute toxicological data identified 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 information

Toxicity

DO NOT discharge into sewer or waterways.

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

Waste treatment methods

Product / Packaging disposal:

- 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 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

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

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

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SECTION 16 Other information

Other information

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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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Powered by Chemwatch

Light Rare Earth Chloride Solution

ANSTO Minerals Organisation (ANSTO Minerals)

Chemwatch:	4841-19	Print Date:	05/08/2013
Version No:	2.1.1.1	Issue Date:	01/01/2013
Material Safety 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 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 advised against

Relevant identified uses:	Used according to manufacturer's directions.

Details of the supplier of the safety 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		
Other emergency telephone numbers:	+61 2 9717 3333		

SECTION 2 Hazards identification

Classification of the substance or mixture

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

ChemWatch Hazard Ratings

		Min/Max
Flammability	0	
Toxicity	0	
Body Contact	2	
Reactivity	0	
Chronic	0	

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

Poisons Schedule:	None

Risk Phrases[1]

R36/38?	*May produce discomfort of the eyes and skin*.*

**LIMITED EVIDENCE*

Legend:*1. Classified by Chemwatch; 2. Classification drawn from HSIS; 3. Classification drawn from EC Directive 1272/2008 - Annex VI*

GHS Classification:

Not Applicable

Label elements

GHS label elements

Not Applicable

Signal word:	**NOT APPLICABLE**

Hazard statement(s):

Not Applicable

**LIMITED EVIDENCE*

Supplementary statement(s):

Not Applicable

Precautionary statement(s): Prevention

Not Applicable

Precautionary statement(s): Response

Not Applicable

Precautionary statement(s): Storage

Not Applicable

Precautionary statement(s): Disposal

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

Substances

See 'Composition on ingredients' in Section 3.2

Mixtures

CAS No	%[weight]	Name
7732-18-5	>60	WATER
	10-30	rare earth chlorides

SECTION 4 First aid measures

Description of 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.
- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial 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.

Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5 Firefighting measures

Extinguishing media

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

Special hazards arising from the substrate or mixture

Fire Incompatibility:

None known

Advice for firefighters

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:

- 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 away from incompatible materials and foodstuff containers.

Conditions for safe storage, including any incompatibilities

Suitable container:

Storage incompatibility:

+	X	+	X	O	+

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

Not Available

Emergency Limits

Ingredient	TEEL-0	TEEL-1	TEEL-2	TEEL-3
water	500(ppm)	500(ppm)	500(ppm)	500(ppm)

Ingredient	Original IDLH	Revised IDLH
Light Rare Earth Chloride Solution	Not Available	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.

Personal protection

Eye and face protection:

- Safety glasses with side shields; or as required,
- 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.

Skin 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):	Respiratory protection:

SECTION 9 Physical and chemical properties

Information on basic physical and chemical properties

Appearance

Green and slightly purplish 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)	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, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, ill-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 irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (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 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 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	IRRITATION
Light Rare Earth Chloride Solution	

Not Available	Not Available
water	
Not Available	Not Available
rare earth chlorides	
Not Available	Not Available

Not available. Refer to individual constituents.

WATER

No significant acute toxicological data identified 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 information

Toxicity

DO NOT discharge into sewer or waterways.

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

Waste treatment methods

Product / Packaging disposal:

- 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 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

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