

Revision: 000

Date: 28th May 2003

1. IDENTIFICATION OF THE SUBSTANCE AND COMPANY UNDERTAKING

General Chemical Name: Gadolinium foil

Intended or recommended uses of substance: Research,

Supplier (Distributor): New Metals & Chemicals Ltd.
Newmet House, Rue de St. Lawrence
Waltham Abbey, Essex, EN9 1PF
Telephone +44 (0)1992 711111

2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient Name	Concentration	Classification*	CAS number	EINECS No.
Gadolinium	100%	F: R11, 15	7440-54-2	231-162-2

*see 16. OTHER INFORMATION for full text of R-phrases.

3. HAZARD IDENTIFICATION

Flammable.
May react with water to produce flammable, explosive hydrogen gas.
Dusts in high concentration are ignitable and may irritate skin, eyes and respiratory system.

4. FIRST AID MEASURES

Inhalation If respiratory irritation or distress occurs, remove person from exposure to fresh air immediately and administer 100 percent humidified supplement oxygen with assisted ventilation as required. If breathing has ceased DO NOT use mouth-to-mouth respiration. Apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask. Seek immediate medical attention.

Skin Contact	Flush skin with large amounts of water. Remove contaminated clothing. If irritation persists, seek medical attention
Eye Contact	DO NOT allow patient to rub or keep eyes closed. Irrigate with copious quantities of water for at least 15 minutes. Flush under eyelids by lifting lid. DO NOT use a static eye bath. Seek immediate medical attention.
Ingestion	DO NOT induce vomiting. If patient is conscious and alert, wash out mouth with water. Give 2 cupfuls of milk with great care. Give nothing by mouth if patient is unconscious. Seek immediate medical attention.

5. FIRE FIGHTING MEASURES

Precautions against fire and explosion

Product will burn under fire conditions

May react with water or steam liberating flammable/explosive hydrogen.

Explosive reactions may occur when gadolinium is present as a concentrated airborne dust in the presence of an open flame, or when in contact with oxidising agents at high temperatures.

Suitable extinguishing media

Use dry sand or dry salt.

Extinguishing media which must not be used for safety reasons

DO NOT USE water, foam, carbon dioxide or dry powder directly on fire. See above.

Exposure hazards arising from substance, combustion products, resulting gases

Will react with water to produce flammable/explosive hydrogen and respirable gadolinium oxide particles.

Special protective equipment for fire fighters

Wear full protective clothing, including self-contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions:

Remove or extinguish all ignition sources. Evacuate all but essential authorised control personnel. Wear self-contained breathing apparatus and gloves to avoid inhalation, skin and eye contact. Provide sufficient ventilation.

Environmental Precautions

Prevent entry into drains, surface and ground water, soil and confined areas.

Methods for Cleaning up

Only trained, authorised personnel should be involved. Fully encapsulating protective clothing and self contained breathing apparatus should be worn for spills and leaks with no fire. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Keep combustibles (wood, paper, oil etc) away from spilled material. Cover spills with dry sand, dry diatomaceous earth or dry salt followed with a plastic sheet to minimise spreading or contact with water. Use clean non-sparking tools to collect material and place it into a closed plastic container, suitably marked, and dispose of through a licensed disposal contractor.

7. HANDLING AND STORAGE

Precautions for safe handling

To be handled by qualified and trained staff only. Avoid breathing dusts and direct contact with skin and eyes. Avoid all contact with water. Wash hands thoroughly after handling. See section 8 for personal protective equipment.

Precautions for safe storage

Keep container dry and tightly closed when not in use. Air and moisture sensitive. Store away from oxidisers and other materials listed under incompatibility (see section 10). Do not store in metal containers without a plastic lining. Material should be stored under inert gas in a sealed container.

Specific use

Research.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limit values

Ingredient name	OES LTEL (8 hr TWA)	OES STEL (15 min)	MEL(LT)	MEL(ST)
For this product no exposure limits are given. Comparison is given for:				
Respirable dust	5 mg/m ³			

Occupational exposure controls

Eye Protection	Wear appropriate protective eyeglasses, chemical safety goggles or full face shield to European Standard EN 166.
Hand protection	Wear appropriate gloves when handling this material. Suitable material is butyl rubber. However, due regard must be taken that heavy gloves will interfere with the wearer's sense to touch and may contribute to a dangerous situation. Thinner gloves of nitrile and PVC may be used as disposable gloves and must be discarded immediately after use. Gloves should comply with European Standard EN 465-3 class 3.
Skin Protection	Use one or more of the following personal protection items as necessary to prevent skin contact: Full chemical protective suit to EN 465 standard, PVC apron, helmet and boots.
Respiratory Protection	Avoid inhalation of dust. Select the following respirator based on airborne concentration of contaminants: Full face dust respirator. Half -mask air-supplied respirator to EN 147. Full-face high efficiency filter respirator to EN 147 or EN 12941/12942. Full-face or hood compressed air breathing apparatus to EN 139 or EN 270/271. Use appropriate local exhaust ventilation, to maintain airborne exposure below control limits.
Ingestion:	Do not eat, drink or smoke when using this product. Do not ingest. Exhibit the strictest hygiene control.

Environmental exposure controls

No specific environmental legislation applies, however in accordance with best practise only

use in a fume cupboard or with local exhaust ventilation, ventilated to a scrubbing system. In case of fire, spillage, or leakage, prevent material from entering water courses, sewers or soil. Material will hydrolyse or oxidise in air forming the oxide. This material is non-toxic and would not present an environmental hazard.

9. PHYSICAL AND CHEMICAL PROPERTIES

General information

Appearance	Silvery-white foil
Odour	Odourless

Important health, safety and environmental information

pH	N/A
Boiling point/boiling range	3273°C
Melting point/melting range	1312°C
Flash point	N/A
Flammability (solid, gas)	Flammable
Autoignition temperature	N/A
Explosive properties	N/A
Oxidising properties	Not oxidising
Vapour Pressure	N/A
Relative density	7.9g/cm ³ at 25 ⁰ C
Solubility	Water - insoluble/reacts
Partition coefficient:	N/A
Viscosity	N/A
Vapour density	N/A
Evaporation rate	N/A

10. STABILITY AND REACTIVITY

Stability	Stable, but may decompose if exposed to moist air or water.
Conditions to avoid	Avoid creating dusts. Air and moisture sensitive.
Materials to avoid	Avoid air, water, strong acids, strong oxidising materials, acid chlorides, halogens, chlorates, bromates and iodates.
Hazardous Decomposition Products	Will react with water to produce flammable/explosive hydrogen.

11. TOXICOLOGICAL INFORMATION

Effects from eye contact	May cause eye irritation.
Effects from skin contact	May cause skin irritation. Low toxicity potential due to poor skin absorption.
Effects from inhalation	May be harmful if inhaled (depending on particle size – particles smaller than 10 microns are considered to be respirable).
Effects from ingestion	Low toxicity potential due to poor absorption by the oral route.

(a) Acute toxicity (oral, inhalation, dermal)	not tested/no data
(b) Corrosive/irritation (eye, skin, respiratory tract)	not tested/no data
(c) Sensitisation (skin, respiratory)	not tested/no data
(d) Repeated-dose toxicity	not tested/no data
(e) Mutagenicity	not tested/no data
(f) Carcinogenicity	not tested/no data
(g) Reproductive toxicity	not tested/no data

This product is not considered to be a human carcinogen.

12. ECOLOGICAL INFORMATION

(1) Ecotoxicity

(a) Aquatic toxicity

- | | | |
|-------|--|--------------------|
| (i) | acute and chronic for fish | not tested/no data |
| (ii) | acute and chronic for daphnia | not tested/no data |
| (iii) | acute and chronic for algaefish | not tested/no data |
| (iv) | acute and chronic for other aquatic plants | not tested/no data |

(b) Soil toxicity

- | | | |
|-------|-----------------|--------------------|
| (i) | macro organisms | not tested/no data |
| (ii) | micro organisms | not tested/no data |
| (iii) | birds | not tested/no data |
| (iv) | bees | not tested/no data |
| (v) | plants | not tested/no data |
| (vi) | fauna | not tested/no data |

(2) Mobility

The product's mobility is limited because it will react with water or air-moisture at room temperature.

(3) Persistence and degradability

Gadolinium oxide may persist in soil or water but it is not considered to be eco-toxic.

(4) Bioaccumulation potential

Gadolinium cannot enter the food chain because it will hydrolyse and form non-toxic gadolinium oxide.

(5) Other adverse effects

No other effects are known.

13. DISPOSAL CONSIDERATIONS

All waste material to be contained in a plastic sealed bin, duly marked, and disposed of as special waste through a licensed waste contractor in accordance with "The Special Waste Regulations 1996". See sections 6 and 7.

14. TRANSPORT INFORMATION

As foil:

(a)	UN number	3178
(b)	class	4.1
(c)	proper shipping name:	Flammable solid, inorganic, n.o.s. (gadolinium foil)
(d)	packing group	II
(e)	marine pollutant (if applicable)	N/A
(f)	other applicable information	N/A

15. REGULATORY INFORMATION

EC Supply: Chip-3 regulations 2002

F Highly Flammable

Risk Phrases:

- 11: Highly Flammable.
- 15: Contact with water liberates highly flammable gases.

Safety Phrases:

- 7/8: Keep container tightly closed and dry.
- 43: In case of fire, use dry sand or salt. Never use water.

This material is subject to the COSHH regulations 2002. See COSHH Essentials for further information.

16. OTHER INFORMATION

R Phrases Full Text:

- 11: Highly Flammable.
- 15: Contact with water liberates highly flammable gases.

Abbreviations used:

CAS	Chemical Abstracts Service Registry Numbers
EINECS	European Inventory of Existing Commercial Chemical Substances
MSDS	Material Safety Data Sheet
HSE	Health and Safety Executive
TWA	Time Weighted Average
OES	Occupational Exposure Standards

References:

Chemicals (Hazard Information and Packaging for Supply) regulations 2002

Approved classification and labelling guide. Chemicals (Hazard Information and Packaging for Supply) Regulations 2002 Guidance on Regulations L131

Control of Substances Hazardous to Health Regulations 2002

Health and Safety at Work Act 1974

COSHH Essentials: Easy Steps to Control Chemicals. Control of Substances Hazardous to Health Regulations.

European Inventory of Existing Commercial Substances (EINECS) available on the European Chemicals Bureau website ["http://www.ecb.jrc.it/existing-chemicals"](http://www.ecb.jrc.it/existing-chemicals)

First Aid at Work. The Health and Safety (First Aid) Regulations 1981. Approved Code of Practice and Guidance L74.

Personal Protective Equipment (EC Directive) Regulations 1992

Respiratory Protective Equipment – A practical guide (ISBN 0-7176-1537-5)