

## 10 59-1 Thorium (10µg/mL in 2% HNO<sub>3</sub>)

### High-Purity Standards

Catalogue number: 10 59-1  
Version No: 3.3  
Safety Data Sheet according to OSHA HazCom Standard (2012) requirements

Chemwatch Hazard Alert Code: 3

Issue Date: 05/31/2017  
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S.GHS.USA.EN

## SECTION 1 IDENTIFICATION

### Product Identifier

<b>Product name</b>	10 59-1 Thorium (10µg/mL in 2% HNO <sub>3</sub> )
<b>Synonyms</b>	10µg/mL Thorium in 2% HNO <sub>3</sub>
<b>Proper shipping name</b>	Corrosive liquid, acidic, inorganic, n.o.s. (contains nitric acid)
<b>Other means of identification</b>	10 59-1

### Recommended use of the chemical and restrictions on use

<b>Relevant identified uses</b>	<i>This radioactive material may be supplied in a variety of package types and may exhibit a range of specific activities.</i>
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### Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party

<b>Registered company name</b>	High-Purity Standards
<b>Address</b>	PO Box 41727 SC 29423 United States
<b>Telephone</b>	843-767-7900
<b>Fax</b>	843-767-7906
<b>Website</b>	highpuritystandards.com
<b>Email</b>	Not Available

### Emergency phone number


<b>Association / Organisation</b>	INFOTRAC
<b>Emergency telephone numbers</b>	1-800-535-5053
<b>Other emergency telephone numbers</b>	1-352-323-3500

## SECTION 2 HAZARD(S) IDENTIFICATION

### Classification of the substance or mixture

<b>Classification</b>	Metal Corrosion Category 1, Skin Corrosion/Irritation Category 1A, Serious Eye Damage Category 1
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### Label elements

<b>Hazard pictogram(s)</b>	
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**SIGNAL WORD** DANGER

### Hazard statement(s)

<b>H290</b>	May be corrosive to metals.
<b>H314</b>	Causes severe skin burns and eye damage.

### Hazard(s) not otherwise specified

Not Applicable

### Precautionary statement(s) Prevention

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**P260** Do not breathe dust/fume/gas/mist/vapours/spray.

**Precautionary statement(s) Response**

**P301+P330+P331** IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

**Precautionary statement(s) Storage**

**P405** Store locked up.

**Precautionary statement(s) Disposal**

**P501** Dispose of contents/container in accordance with local regulations.

**SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS**

**Substances**

See section below for composition of Mixtures

**Mixtures**

CAS No	%[weight]	Name
1314-20-1	0.001 (as Th)	thorium oxide
7697-37-2	2	nitric acid
7732-18-5	balance	water

**SECTION 4 FIRST-AID MEASURES**

**Description of first aid measures**

<b>Eye Contact</b>	<ul style="list-style-type: none"> <li>▶ <b>GET MEDICAL ATTENTION IMMEDIATELY</b></li> <li>▶ Remove victim to a restricted area for decontamination.</li> <li>▶ Thoroughly wash eyes with large amounts of water, occasionally lifting the upper and lower eyelids (for approximately 15 minutes).</li> <li>▶ Following the water treatment, provide an isotonic solution.</li> <li>▶ <b>DO NOT use eye baths, rather provide a continuous and copious supply of fluid.</b></li> <li>▶ Monitor the victim for radioactivity. If activity is present, rewash the eyes and remonitor until little or no radioactivity is present.</li> <li>▶ Any water used to wash the victim's eyes must be stored in a metal container for later disposal. Any other articles that are used to decontaminate the victim must also be stored in metal containers for later decontamination or disposal.</li> <li>▶ Any personnel involved in rendering first aid to the victim must be monitored for radioactivity and decontaminated if necessary</li> </ul> <p>IAEA Safety Series No.: 47                      Manual on Early Medical Treatment of Possible Radiation Injury, 1978, p.35.</p>
<b>Skin Contact</b>	<p>The objectives of skin decontamination are to remove as much of the radionuclide as practicable in order to reduce the surface dose rate and to prevent activity from entering the body. Over-aggressive skin decontamination procedures must be avoided since these may injure the natural barriers of the skin and increase percutaneous absorption.</p> <p><b>IT IS IMPERATIVE THAT THE SKIN SHOULD BE DECONTAMINATED AS QUICKLY AS POSSIBLE</b></p> <p>It is <b>IMPORTANT</b> to review each potential exposure, prior to the first use of the radioactive substance, to establish whether an alternative decontamination regime exists should simple washing techniques prove to be inadequate. (see point 4 below)</p> <p>If radioactive contamination is suspected:</p> <ul style="list-style-type: none"> <li>▶ Gently brush away dry particles or blot excess liquids with absorbent materials; ensure responders are adequately protected.</li> <li>▶ Where possible, rinse victim in warm water (30 deg. C.); caution must be exercised to ensure that areas of tissue damage or body cavity openings are <b>NOT</b> rinsed.</li> <li>▶ Wash victim with mild liquid soap and large quantities of water. Pay particular attention to the head, finger nails and palms of the hands</li> <li>▶ On completion of the washing, monitor the victim for radioactivity. If water and soap have been inadequate in removing the radioactive material, decontaminating compounds consisting of surfactants and absorbent substances may be effective. Complexing reagents may also be of use.</li> <li>▶ The use of organic solvents is to be avoided as they may increase the solubility and absorption of the radioactive substance.</li> <li>▶ Skin contamination with radiation may be an indication that other parts of the body have been exposed.</li> <li>▶ Contaminated clothing must be stored in a metal container for later decontamination or disposal.</li> <li>▶ The water used to wash the victim must be stored in metal containers for later disposal.</li> <li>▶ Any personnel involved in rendering first aid to the victim must be monitored for radioactivity and decontaminated if necessary.</li> </ul> <p>IAEA Safety Series No.: 47                      Manual on Early Medical Treatment of Possible Radiation Injury, 1978, p.9.</p>
<b>Inhalation</b>	<p><b>IMPORTANT:</b> For patients with life-threatening injuries (from incidents involving small quantity release) and particle or liquid exposure, decontamination procedures must be initiated:</p> <p><b>GET MEDICAL ATTENTION IMMEDIATELY.</b></p> <ul style="list-style-type: none"> <li>▶ <b>NOTE:</b> Personal Protective Equipment (PPE), including positive pressure self-contained breathing apparatus may be required to assure the safety of the rescuer.</li> <li>▶ Remove from exposure area to a restricted area with fresh air as quickly as possible.</li> <li>▶ Remove, as soon as possible, patient's clothing, jewelry and shoes.</li> <li>▶ Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures</li> <li>▶ If breathing has stopped, perform artificial respiration by administering oxygen; mouth-to-mouth resuscitation should be avoided to prevent exposure to the person rendering first aid.</li> <li>▶ Any evidence of serious contamination indicates that treatment must be initiated. (Inhalation of radioactive particles may indicate that other parts of the body were also contaminated, such as the digestive tract, skin and eyes.)</li> <li>▶ If time permits, wipe the face with wet filter paper, force coughing and blowing of the nose. Thorough decontamination should be started prior to the victim being removed to the medical area</li> <li>▶ Package the patient using transportation bags, plastic or blankets; this ensures that contamination is limited during transportation.</li> <li>▶ Provide adequate ambulance ventilation (intake and exhaust fans of appropriate design and capacity).</li> <li>▶ Notify Emergency Department that a potentially contaminated patient is enroute; supply all available information regarding the nature and identity of the contaminant.</li> <li>▶ Any personnel involved in rendering first aid must be monitored for radioactivity and thoroughly decontaminated if necessary.</li> </ul>

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### Ingestion

If poisoning occurs, contact a doctor or Poisons Information Centre.

- ▶ In case of ingestion of radioactive substances, the mouth should be rinsed out immediately after the accident, care being taken not to swallow the water used for this purpose.
  - ▶ Vomiting should be induced either mechanically, or with syrup of Ipecac. **DO NOT induce vomiting in an unconscious person.** \*
  - ▶ Further action depends on the nature of the radioactive substance.
  - ▶ Get medical attention immediately.
  - ▶ The victim must be monitored for radioactivity and decontaminated, if necessary, before being transported to a medical facility.
  - ▶ Any personnel involved in rendering first aid to the victim must be monitored for radioactivity and decontaminated if necessary. -
- \* The vomitus and lavage fluids should be saved for examination and monitoring. The gastric fluids and fluids used for lavage must be stored in metal containers for later disposal. IAEA Safety Series No.: 47 Manual on Early Medical Treatment of Possible Radiation Injury, 1978, p.59.

### Most important symptoms and effects, both acute and delayed

See Section 11

### Indication of any immediate medical attention and special treatment needed

For acute or short term repeated exposures to strong acids:

- ▶ Airway problems may arise from laryngeal edema and inhalation exposure. Treat with 100% oxygen initially.
- ▶ Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling
- ▶ Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.
- ▶ Strong acids produce a coagulation necrosis characterised by formation of a coagulum (eschar) as a result of the desiccating action of the acid on proteins in specific tissues.

INGESTION:

- ▶ Immediate dilution (milk or water) within 30 minutes post ingestion is recommended.
- ▶ **DO NOT attempt to neutralise the acid since exothermic reaction may extend the corrosive injury.**
- ▶ Be careful to avoid further vomit since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.
- ▶ Charcoal has no place in acid management.
- ▶ Some authors suggest the use of lavage within 1 hour of ingestion.

SKIN:

- ▶ Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.
- ▶ Deep second-degree burns may benefit from topical silver sulfadiazine.

EYE:

- ▶ Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjunctival cul-de-sacs. Irrigation should last at least 20-30 minutes. **DO NOT use neutralising agents or any other additives.** Several litres of saline are required.
- ▶ Cycloplegic drops, (1% cyclopentolate for short-term use or 5% homatropine for longer term use) antibiotic drops, vasoconstrictive agents or artificial tears may be indicated dependent on the severity of the injury.
- ▶ Steroid eye drops should only be administered with the approval of a consulting ophthalmologist).

[Ellenhorn and Barceloux: Medical Toxicology]

For radiation poisoning:

- ▶ Lavage may be useful. Care should be taken to avoid aspiration.
- ▶ The vomitus and lavage fluids should be saved for examination and monitoring. The gastric fluids and fluids used for lavage must be stored in metal containers for later disposal.
- ▶ There is no antidote for radiation sickness
- ▶ Treatment should be symptomatic and supportive, regardless of the dose received. IAEA Safety Series No.: 47; Manual on Early Medical Treatment of Possible Radiation Injury, 1978, p.35.

### BASIC TREATMENT

- ▶ Establish a patent airway with suction where necessary.
- ▶ Watch for signs of respiratory insufficiency and assist ventilation as necessary.
- ▶ Administer oxygen by non-rebreather mask at 10 to 15 l/min.
- ▶ Monitor and treat, where necessary, for shock.
- ▶ Anticipate seizures.
- ▶ Routine emergency care may be necessary for associated injuries.
- ▶ **Do not use emetics.** Where ingestion is suspected rinse mouth and give up to 200 ml water (5 ml/kg recommended) for dilution where patient is able to swallow, has a strong gag reflex and does not drool.
- ▶ If necessary, perform BLS care.

### ADVANCED TREATMENT

- ▶ Consider orotracheal or nasotracheal intubation for airway control in unconscious patient or where respiratory arrest has occurred.
- ▶ Monitor and treat, where necessary, for arrhythmias.
- ▶ Support vital signs with IV lactated Ringer's solution.
- ▶ Hypotension with signs of hypovolaemia requires the cautious administration of fluids. Fluid overload might create complications.
- ▶ Treat seizures with diazepam.
- ▶ Advanced life-support care may be needed.
- ▶ Proparacaine hydrochloride should be used to assist eye irrigation.
- ▶ Chelating agents may be useful if given before or immediately after exposure.

### SPECIAL CONSIDERATIONS

- ▶ Symptoms associated with radioactives exposure are generally delayed. Treatment should address other medical problems or trauma.
- ▶ An accurate history of exposure is essential to determine proper treatment; Exposure to 100 rads is expected to produce GI symptoms such as nausea, vomiting, abdominal cramps, diarrhoea; onset of symptoms may be delayed for several hours. Exposure to 600 rads is expected to result in severe GI symptoms such as necrotic gastroenteritis which may result in dehydration and may be fatal within days. Exposure to several thousand rads is expected to produce neurological/ cardiovascular symptoms including confusion, lethargy, ataxia, seizures, coma, and cardiovascular collapse, within minutes or hours. Severe exposures may also produce bone marrow depression, leukopenia and infection.

BRONSTEIN, A.C. and CURRANCE, P.L. EMERGENCY CARE FOR HAZARDOUS MATERIALS EXPOSURE: 2nd Ed. 1994

## 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.

### Special hazards arising from the substrate or mixture

Fire Incompatibility | None known.

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Special protective equipment and precautions for fire-fighters

Fire Fighting	
Fire/Explosion Hazard	<ul style="list-style-type: none"> <li>▶ Non combustible.</li> <li>▶ Not considered to be a significant fire risk.</li> <li>▶ Acids may react with metals to produce hydrogen, a highly flammable and explosive gas.</li> <li>▶ Heating may cause expansion or decomposition leading to violent rupture of containers.</li> <li>▶ May emit corrosive, poisonous fumes. May emit acrid smoke.</li> </ul>

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

See section 8

Environmental precautions

See section 12

Methods and material for containment and cleaning up

Minor Spills	<p>Prior to working with radioactive material, devise a written procedure for handling a cleanup of small and large spills. For spillages involving less than 20 times the "Annual Limit on Intake (ALI)" value for inhalation</p> <ul style="list-style-type: none"> <li>▶ Wear rubber or plastic gloves</li> <li>▶ Clean up liquid spillages with absorbent material</li> <li>▶ Monitor the affected area when no visible spill material remains, to check the progress of the decontamination, preferably less than one "Derived Working Limit (DWL)"</li> <li>▶ Treat all materials used in the decontamination process as radioactive waste</li> <li>▶ Monitor all persons involved in the spillage or decontamination operation</li> <li>▶ Remove contaminated clothing, place in plastic bags and seal</li> </ul>
Major Spills	<ul style="list-style-type: none"> <li>▶ <b>DO NOT touch damaged containers or spilled materials.</b> Damage to outer container may not affect primary inner container.</li> <li>▶ Isolate hazard area and deny entry.</li> <li>▶ Evacuate the area if there is a significant radiological hazard to persons</li> <li>▶ It may be necessary to dike far ahead of the spill area</li> <li>▶ Enter spill area only to save life; limit entry to shortest possible time.</li> <li>▶ Detain uninjured persons and equipment exposed to radioactive material until arrival or instruction of qualified radiation authority.</li> <li>▶ Delay cleanup until arrival or instruction of qualified radiation authority.</li> </ul>

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

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	<ul style="list-style-type: none"> <li>▶ All work with unsealed radioactive substances shall be segregated from other work and, where possible, carried out in a laboratory or workplace reserved solely for this purpose. Where widely different levels of activity and radiotoxicity are to be in use, separate rooms are preferred.</li> <li>▶ Eating, drinking, smoking and the application of cosmetics should not take place in a radioactive substances designated area.</li> <li>▶ Before work with unsealed radioactive substances proceeds, written procedures describing good working practices, should be available.</li> <li>▶ Practice runs might be made with non-radioactive substances, so that when radioactive substances are used, operations are performed speedily and confidently with minimum exposure and risk of accident.</li> <li>▶ Working procedures and a contingency plan, taking into account every radiation spill that is reasonably foreseen, should be available for periodic review.</li> <li>▶ A high standard of cleanliness should be maintained in radioactive substances work-places.</li> <li>▶ Appropriate means of monitoring for contamination should be available.</li> <li>▶ Radiation and contamination surveys should be carried out regularly.</li> <li>▶ No mouth operations should be carried out in areas where radioactive materials are used. Pipettes should be syringe or bulb-operated, or be of the automatic plunger type with disposable single-use trips.</li> <li>▶ All reagents, tools and, where possible, apparatus used in the "active" area shall be clearly labelled and should remain where practical in the "actives" area.</li> <li>▶ Any items removed from the active area shall be monitored, decontaminated if necessary and labelled. The label might include details of the individual certifying the item is free from contamination.</li> <li>▶ All work surfaces in the actives (including sinks) should be marked be a radiation symbol.</li> <li>▶ Never store [human] food and beverage in refrigerators/freezers used for storing radioisotopes.</li> <li>▶ Prevent skin contact with skin-absorbable solvents containing radioactive material.</li> <li>▶ Fume hoods and biological safety cabinets for use with non-airborne radioactive material must be approved (through the protocol) and must be labelled "Caution Radioactive Material".</li> <li>▶ All volatile, gaseous, or aerosolized radioactive material must be used only in a properly operating charcoal and/or HEPA filtered fume hood or Biological Safety Cabinet bearing a Caution Airborne Radioactivity hood label, unless otherwise specified in writing by the Radiation Safety Officer.</li> <li>▶ Radioactive preparations should be marked with the radiation symbol, details of the chemical compound, radionuclide, activity, and as appropriate date and name of responsible user</li> <li>▶ Work with unsealed liquid sources should be carried out in a double container or large tray (stainless steel or plastic) lined with absorbent material to restrict the spread of spilled materials.</li> <li>▶ Operations producing vapour, spray, dust or radioactive gas shall be carried out in a fume cupboard, glove box or other enclosed areas.</li> <li>▶ Appropriate waste receptacles should be provided. Foot-operated waste-bins are preferable.</li> <li>▶ When leaving designated radiation areas, workers should wash hands thoroughly. Hands, clothing and shoes should be monitored to ensure that the contamination derived working level (DWL) (see "Engineering Controls") is not exceeded. These procedures should be followed before meals, visits to the toilet and prior to leaving the designated radiation area at the end of each day's work.</li> <li>▶ Cleaning of designated radiation areas should be carried out by suitably trained people. Wet cleaning is generally recommended to reduce the possibility of airborne contamination. Separate cleaning equipment should be reserved for use in these areas, Vacuum cleaners should only be used if equipped with high-efficiency exhaust (HEPA) filtration.</li> <li>▶ Electrical heating should be used for laboratory operation. Evaporation by infra-red lamp reduces splashing, spraying and droplet contamination.</li> <li>▶ Written procedures for maintenance work should be available.</li> </ul>
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<b>Other information</b>	<ul style="list-style-type: none"> <li>▶ Special security requirements apply in Federal/State regulation to the storage, packaging and handling of radioactive materials.</li> <li>▶ Regulation may include restriction on package size and quantities stored.</li> <li>▶ Store in an approved storage area and ensure that packages are appropriately labelled as required by relevant legislation.</li> <li>▶ Keep locked up at all times.</li> </ul>
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**Conditions for safe storage, including any incompatibilities**

<b>Suitable container</b>	<p>For packaging of radioisotopes.                  Packaging should be designed and finished so that external surfaces are free of protruding features and can be easily decontaminated.                  The outer layer of packaging should be designed so as to prevent the collection and retention of water.                  Many international standards, relating to correct package type and design, are in force and should be observed when repacking the contents of the original containers.</p>
<b>Storage incompatibility</b>	<ul style="list-style-type: none"> <li>▶ Avoid strong bases.</li> </ul>

**SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION**

**Control parameters**

**OCCUPATIONAL EXPOSURE LIMITS (OEL)**

**INGREDIENT DATA**

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
US OSHA Permissible Exposure Levels (PELs) - Table Z1	nitric acid	Nitric acid	5 mg/m3 / 2 ppm	10 mg/m3 / 4 ppm	Not Available	TLV® Basis: URT & eye irr; dental erosion
US NIOSH Recommended Exposure Limits (RELs)	nitric acid	Aqua fortis, Engravers acid, Hydrogen nitrate, Red fuming nitric acid (RFNA), White fuming nitric acid (WFNA)	5 mg/m3 / 2 ppm	4 ppm	Not Available	Not Available
US ACGIH Threshold Limit Values (TLV)	nitric acid	Nitric acid	2 ppm	Not Available	Not Available	Not Available

**EMERGENCY LIMITS**

Ingredient	Material name	TEEL-1	TEEL-2	TEEL-3
thorium oxide	Thorium oxide; (Thorium dioxide)	30 mg/m3	330 mg/m3	2,000 mg/m3
nitric acid	Nitric acid	Not Available	Not Available	Not Available

Ingredient	Original IDLH	Revised IDLH
thorium oxide	Not Available	Not Available
nitric acid	100 ppm	25 ppm
water	Not Available	Not Available

**Exposure controls**

<b>Appropriate engineering controls</b>	<p>For potential exposure to radioactive substances, local exhaust or process enclosure ventilation should be provided as a minimum.                  External radiation exposure may be controlled with adequate shielding. The absorbing material and its thickness will depend on the type of radiation, its energy, the flux and dimensions of the source.</p> <ul style="list-style-type: none"> <li>▶ For <b>ALPHA PARTICLES</b> fraction of a millimetre of any ordinary material will generally be sufficient to attenuate the energy of the particle.</li> <li>▶ For the more energetic <b>BETA PARTICLES</b>, extra shielding will be required. This may comprise materials such as acrylics, aluminium and thick rubber. For example, 6 mm (approx. 1/4 inch) of acrylic will absorb all beta particles up to 1 MeV. With high energy beta radiation from large sources, Bremsstrahlung (X-ray production) contribution may be significant and it may be necessary to provide additional shielding of high atomic weight material, such as lead, to attenuate the Bremsstrahlung radiation.</li> <li>▶ For highly energetic <b>GAMMA PARTICLES</b> the most suitable shielding materials are lead and iron. Thickness will depend on whether the source is producing narrow or broad beam radiation. Primary and secondary barriers may be required to block all radiation.</li> </ul>
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<b>Personal protection</b>	
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<b>Eye and face protection</b>	<ul style="list-style-type: none"> <li>▶ Most safety glasses will provide protection against alpha particles, some protection against beta particles (depending on thickness) but will not shield gamma radiation.</li> </ul>
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<b>Skin protection</b>	See Hand protection below
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<b>Hands/feet protection</b>	<ul style="list-style-type: none"> <li>▶ When handling corrosive liquids, wear trousers or overalls outside of boots, to avoid spills entering boots.</li> </ul> <p>Disposable gloves. Most gloves will provide protection against alpha particles, some protection against beta particles (depending on thickness) but will not shield gamma radiation. Used gloves may present a radiation hazard and should be disposed of as radioactive waste.                  Suitable gloves should be worn for all work with unsealed radioactive substances, and special care is to be exercised when putting on or removing gloves, to avoid contaminating the hands and the inside surfaces of the gloves.</p>
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<b>Body protection</b>	See Other protection below
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<b>Other protection</b>	<p>Disposable overgarments, including head and foot coverings should be worn by any employee engaged in handling radioactive substances <i>in the workplace</i>. These garments are recommended even if the employee is working with a "glove-box" containment system.                  Protective clothing reserved specifically for radioactive work, shall be worn at all times <i>in a laboratory</i>, even for very low levels of specific activity. The following should be considered.</p> <ul style="list-style-type: none"> <li>▶ For work in low level laboratories, a normal laboratory coat or overall is sufficient.</li> <li>▶ For work in medium level laboratories, the laboratory coat should have elasticised sleeve cuffs and a crossover front with high neck fastened with hook and loop fastening fabric. Pockets are not recommended.                      NOTE: Velcro strips are suitable.</li> <li>▶ In high level laboratories, in addition to coats and overalls, overshoes or similar specially designed footwear should be worn to prevent the transfer of radioactive contamination from laboratory floors.</li> </ul> <p>All protective clothing worn in radioisotope and radiological laboratories should be removed prior to leaving and left in a specifically designated area in or</p>
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	immediately outside the laboratory. This area should be considered as a source of radioactive hazard. Contaminated clothing shall not be laundered with uncontaminated items. Certain clothing fibres may be useful in dosimetry studies so clothing should be kept in event of accident, large scale release or a large scale clean-up.
<b>Thermal hazards</b>	Not Available

**Respiratory protection**

Type A Filter of sufficient capacity (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

**SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES**

**Information on basic physical and chemical properties**

<b>Appearance</b>	colorless		
<b>Physical state</b>	Liquid	<b>Relative density (Water = 1)</b>	Not Available
<b>Odour</b>	Not Available	<b>Partition coefficient n-octanol / water</b>	Not Available
<b>Odour threshold</b>	Not Available	<b>Auto-ignition temperature (°C)</b>	Not Available
<b>pH (as supplied)</b>	<2	<b>Decomposition temperature</b>	Not Available
<b>Melting point / freezing point (°C)</b>	Not Available	<b>Viscosity (cSt)</b>	Not Available
<b>Initial boiling point and boiling range (°C)</b>	Not Available	<b>Molecular weight (g/mol)</b>	Not Available
<b>Flash point (°C)</b>	Not Available	<b>Taste</b>	Not Available
<b>Evaporation rate</b>	Not Available	<b>Explosive properties</b>	Not Available
<b>Flammability</b>	Not Available	<b>Oxidising properties</b>	Not Available
<b>Upper Explosive Limit (%)</b>	Not Available	<b>Surface Tension (dyn/cm or mN/m)</b>	Not Available
<b>Lower Explosive Limit (%)</b>	Not Available	<b>Volatile Component (%vol)</b>	Not Available
<b>Vapour pressure (kPa)</b>	Not Available	<b>Gas group</b>	Not Available
<b>Solubility in water (g/L)</b>	Miscible	<b>pH as a solution (1%)</b>	Not Available
<b>Vapour density (Air = 1)</b>	Not Available	<b>VOC g/L</b>	Not Available

**SECTION 10 STABILITY AND REACTIVITY**

<b>Reactivity</b>	See section 7
<b>Chemical stability</b>	<ul style="list-style-type: none"> <li>▶ Unstable in the presence of incompatible materials.</li> <li>▶ Product is considered stable.</li> <li>▶ Hazardous polymerisation will not occur.</li> </ul>
<b>Possibility of hazardous reactions</b>	See section 7
<b>Conditions to avoid</b>	See section 7
<b>Incompatible materials</b>	See section 7
<b>Hazardous decomposition products</b>	See section 5

**SECTION 11 TOXICOLOGICAL INFORMATION**

**Information on toxicological effects**

<b>Inhaled</b>	<p>The material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage. Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may be damaging to the health of the individual.</p> <p>alpha-Radiation kills cells immediately adjacent to the source of contact. Damage may be irreversible.</p> <p>Corrosive acids can cause irritation of the respiratory tract, with coughing, choking and mucous membrane damage. There may be dizziness, headache, nausea and weakness.</p> <p>A whole body dose of 2-10 Gray may cause loss of appetite, tiredness, nausea and vomiting, most severe after 6-12 hours. After this subsides a gross disturbance in blood cell distribution occurs with loss of white blood cells and platelets over weeks.</p>
<b>Ingestion</b>	<p>The material can produce chemical burns within the oral cavity and gastrointestinal tract following ingestion.</p> <p>Accidental ingestion of the material may be damaging to the health of the individual.</p> <p>Ingestion of acidic corrosives may produce burns around and in the mouth, the throat and oesophagus. Immediate pain and difficulties in swallowing and speaking may also be evident.</p>
<b>Skin Contact</b>	<p>The material can produce chemical burns following direct contact with the skin.</p> <p>Skin contact is not thought to have harmful health effects (as classified under EC Directives); the material may still produce health damage following entry through wounds, lesions or abrasions.</p> <p>Skin contact with acidic corrosives may result in pain and burns; these may be deep with distinct edges and may heal slowly with the formation of scar tissue.</p> <p>Open cuts, abraded or irritated skin should not be exposed to this material.</p> <p>Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.</p>

10 59-1 Thorium (10µg/mL in 2% HNO3)

<b>Eye</b>	<p>The material can produce chemical burns to the eye following direct contact. Vapours or mists may be extremely irritating. alpha-Radiation produces severe inflammation of eyelid tissue and eye surface. There may be a delay of years before symptoms develop. Direct eye contact with acid corrosives may produce pain, tears, sensitivity to light and burns. Mild burns of the epithelia generally recover rapidly and completely. The eye is particularly sensitive to radioactivity. A single dose of 1 Gy can cause inflammation of the conjunctiva and cornea.</p>
<b>Chronic</b>	<p>Long-term exposure to respiratory irritants may result in airways disease, involving difficulty breathing and related whole-body problems. There has been concern that this material can cause cancer or mutations, but there is not enough data to make an assessment. Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure. Repeated or prolonged exposure to acids may result in the erosion of teeth, swelling and/or ulceration of mouth lining. Irritation of airways to lung, with cough, and inflammation of lung tissue often occurs. A single large or prolonged low exposure to radiation can cause delayed effects, including blood cancers, genetic disorders, shortened lifespan and cataracts. Leukaemia is the most common cancer caused; cancers of the thyroid, bone, lung (due to radioactive particle deposits) and skin are also seen.</p>

<b>10 59-1 Thorium (10µg/mL in 2% HNO3)</b>	<b>TOXICITY</b>	<b>IRRITATION</b>
	Not Available	Not Available
<b>thorium oxide</b>	<b>TOXICITY</b>	<b>IRRITATION</b>
	Not Available	Not Available
<b>nitric acid</b>	<b>TOXICITY</b>	<b>IRRITATION</b>
	Inhalation (rat) LC50: 625 ppm/1h <sup>[2]</sup>	Not Available
<b>water</b>	<b>TOXICITY</b>	<b>IRRITATION</b>
	Not Available	Not Available

**Legend:** 1. Value obtained from Europe ECHA Registered Substances - Acute toxicity 2.\* Value obtained from manufacturer's SDS. Unless otherwise specified data extracted from RTECS - Register of Toxic Effect of chemical Substances

<b>THORIUM OXIDE</b>	<p>Thorium and its compounds are mainly alpha particle emitters although beta and gamma radiation is also encountered                  The radiological danger is considerably more serious than the chemical danger in view of the long time that all thorium compounds remain in the organs where they are deposited (mainly in bones, lungs, lymphatic glands etc.) leading to long-term alpha-irradiation of the tissues.                  Tenth Annual Report on Carcinogens: Substance known to be Carcinogenic                  [National Toxicology Program: U.S. Dep. (liver tumours) Substance has been investigated as a tumorigen; Tumorigenic-carcinogenic in humans by RTECS criteria. Tumours, angiosarcoma, lymphoma recorded.</p>
<b>NITRIC ACID</b>	<p>Asthma-like symptoms may continue for months or even years after exposure to the material ends.                  For acid mists, aerosols, vapours                  Test results suggest that eukaryotic cells are susceptible to genetic damage when the pH falls to about 6.5.                  The material may produce severe irritation to the eye causing pronounced inflammation.                  The material may produce respiratory tract irritation, and result in damage to the lung including reduced lung function.                  The material may cause severe 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.                  Oral (?) LD50: 50-500 mg/kg * [Various Manufacturers]</p>
<b>WATER</b>	No significant acute toxicological data identified in literature search.

<b>Acute Toxicity</b>	☒	<b>Carcinogenicity</b>	☒
<b>Skin Irritation/Corrosion</b>	✔	<b>Reproductivity</b>	☒
<b>Serious Eye Damage/Irritation</b>	✔	<b>STOT - Single Exposure</b>	☒
<b>Respiratory or Skin sensitisation</b>	☒	<b>STOT - Repeated Exposure</b>	☒
<b>Mutagenicity</b>	☒	<b>Aspiration Hazard</b>	☒

**Legend:** ✘ - Data available but does not fill the criteria for classification  
 ✔ - Data available to make classification  
 ☒ - Data Not Available to make classification

**SECTION 12 ECOLOGICAL INFORMATION**

**Toxicity**

<b>10 59-1 Thorium (10µg/mL in 2% HNO3)</b>	<b>ENDPOINT</b>	<b>TEST DURATION (HR)</b>	<b>SPECIES</b>	<b>VALUE</b>	<b>SOURCE</b>
	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
<b>thorium oxide</b>	<b>ENDPOINT</b>	<b>TEST DURATION (HR)</b>	<b>SPECIES</b>	<b>VALUE</b>	<b>SOURCE</b>
	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable



10 59-1 Thorium (10µg/mL in 2% HNO3)

nitric acid	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
	NOEC	16	Crustacea	107mg/L	4

water	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

**Legend:** Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 3. EPIWIN Suite V3.12 (QSAR) - Aquatic Toxicity Data (Estimated) 4. US EPA, Ecotox database - Aquatic Toxicity Data 5. ECETOC Aquatic Hazard Assessment Data 6. NITE (Japan) - Bioconcentration Data 7. METI (Japan) - Bioconcentration Data 8. Vendor Data

**Ecotoxicity:**

The tolerance of water organisms towards pH margin and variation is diverse. Recommended pH values for test species listed in OECD guidelines are between 6.0 and almost 9. Acute testing with fish showed 96h-LC50 at about pH 3.5

**DO NOT discharge into sewer or waterways.**

**Persistence and degradability**

Ingredient	Persistence: Water/Soil	Persistence: Air
water	LOW	LOW

**Bioaccumulative potential**

Ingredient	Bioaccumulation
water	LOW (LogKOW = -1.38)

**Mobility in soil**

Ingredient	Mobility
water	LOW (KOC = 14.3)


**SECTION 13 DISPOSAL CONSIDERATIONS**

**Waste treatment methods**

<b>Product / Packaging disposal</b>	<ul style="list-style-type: none"> <li>▶ Containers may still present a chemical hazard/ danger when empty.</li> <li>▶ Return to supplier for reuse/ recycling if possible.</li> </ul> Otherwise: <ul style="list-style-type: none"> <li>▶ If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill.</li> <li>▶ Where possible retain label warnings and SDS and observe all notices pertaining to the product.</li> <li>▶ <b>WARNING Radioactive materials must not be disposed of as Industrial Waste or domestic garbage. Consult supplier/ appropriate Radiation Control Authority for disposal procedures</b></li> </ul>
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**SECTION 14 TRANSPORT INFORMATION**

**Labels Required**

	
<b>Marine Pollutant</b>	NO

**Land transport (DOT)**

<b>UN number</b>	3264				
<b>UN proper shipping name</b>	Corrosive liquid, acidic, inorganic, n.o.s. (contains nitric acid)				
<b>Transport hazard class(es)</b>	<table border="1"> <tr> <td>Class</td> <td>8</td> </tr> <tr> <td>Subrisk</td> <td>Not Applicable</td> </tr> </table>	Class	8	Subrisk	Not Applicable
Class	8				
Subrisk	Not Applicable				
<b>Packing group</b>	II				
<b>Environmental hazard</b>	Not Applicable				
<b>Special precautions for user</b>	<table border="1"> <tr> <td>Hazard Label</td> <td>8</td> </tr> <tr> <td>Special provisions</td> <td>386, B2, IB2, T11, TP2, TP27</td> </tr> </table>	Hazard Label	8	Special provisions	386, B2, IB2, T11, TP2, TP27
Hazard Label	8				
Special provisions	386, B2, IB2, T11, TP2, TP27				

**Air transport (ICAO-IATA / DGR)**

<b>UN number</b>	3264
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10 59-1 Thorium (10µg/mL in 2% HNO3)

<b>UN proper shipping name</b>	CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (contains nitric acid)	
<b>Transport hazard class(es)</b>	ICAO/IATA Class	8
	ICAO / IATA Subrisk	Not Applicable
	ERG Code	8L
<b>Packing group</b>	II	
<b>Environmental hazard</b>	Not Applicable	
<b>Special precautions for user</b>	Special provisions	A3A803
	Cargo Only Packing Instructions	855
	Cargo Only Maximum Qty / Pack	30 L
	Passenger and Cargo Packing Instructions	851
	Passenger and Cargo Maximum Qty / Pack	1 L
	Passenger and Cargo Limited Quantity Packing Instructions	Y840
	Passenger and Cargo Limited Maximum Qty / Pack	0.5 L

Sea transport (IMDG-Code / GGVSee)

<b>UN number</b>	3264	
<b>UN proper shipping name</b>	Corrosive liquid, acidic, inorganic, n.o.s. * (contains nitric acid)	
<b>Transport hazard class(es)</b>	IMDG Class	8
	IMDG Subrisk	Not Applicable
<b>Packing group</b>	II	
<b>Environmental hazard</b>	Not Applicable	
<b>Special precautions for user</b>	EMS Number	F-A, S-B
	Special provisions	274
	Limited Quantities	1 L

Transport in bulk according to Annex II of MARPOL and the IBC code

Source	Product name	Pollution Category	Ship Type
IMO MARPOL (Annex II) - List of Noxious Liquid Substances Carried in Bulk	Nitric acid (70% and over) Nitric acid (less than 70%)	Y; Y	2 2

SECTION 15 REGULATORY INFORMATION

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

**THORIUM OXIDE(1314-20-1) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - California Proposition 65 - Carcinogens	US EPCRA Section 313 Chemical List
US - Massachusetts - Right To Know Listed Chemicals	US National Toxicology Program (NTP) 14th Report Part A Known to be Human Carcinogens
US - New Jersey Right to Know - Special Health Hazard Substance List (SHHSL): Carcinogens	US Priority List for the Development of Proposition 65 Safe Harbor Levels - No Significant Risk Levels (NSRLs) for Carcinogens and Maximum Allowable Dose Levels (MADLs) for Chemicals Causing Reproductive Toxicity
US - Pennsylvania - Hazardous Substance List	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**NITRIC ACID(7697-37-2) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

International Air Transport Association (IATA) Dangerous Goods Regulations - Prohibited List Passenger and Cargo Aircraft	US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants
US - Alaska Limits for Air Contaminants	US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants
US - California OEHHA/ARB - Acute Reference Exposure Levels and Target Organs (RELs)	US - Washington Permissible exposure limits of air contaminants
US - California Permissible Exposure Limits for Chemical Contaminants	US - Washington Toxic air pollutants and their ASIL, SQER and de minimis emission values
US - Hawaii Air Contaminant Limits	US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants
US - Idaho - Limits for Air Contaminants	US ACGIH Threshold Limit Values (TLV)
US - Massachusetts - Right To Know Listed Chemicals	US CWA (Clean Water Act) - List of Hazardous Substances
US - Michigan Exposure Limits for Air Contaminants	US EPCRA Section 313 Chemical List
US - Minnesota Permissible Exposure Limits (PELs)	US NIOSH Recommended Exposure Limits (RELs)
US - Oregon Permissible Exposure Limits (Z-1)	US OSHA Permissible Exposure Levels (PELs) - Table Z1
US - Pennsylvania - Hazardous Substance List	US SARA Section 302 Extremely Hazardous Substances
US - Rhode Island Hazardous Substance List	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	

**WATER(7732-18-5) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Pennsylvania - Hazardous Substance List	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
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10 59-1 Thorium (10µg/mL in 2% HNO3)

**Federal Regulations**

**Superfund Amendments and Reauthorization Act of 1986 (SARA)**

**SECTION 311/312 HAZARD CATEGORIES**

Immediate (acute) health hazard	Yes
Delayed (chronic) health hazard	No
Fire hazard	No
Pressure hazard	No
Reactivity hazard	No

**US. EPA CERCLA HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES (40 CFR 302.4)**

Name	Reportable Quantity in Pounds (lb)	Reportable Quantity in kg
Nitric acid	1000	454

**State Regulations**

**US. CALIFORNIA PROPOSITION 65**

WARNING: This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm

**US - CALIFORNIA PREPOSITION 65 - CARCINOGENS & REPRODUCTIVE TOXICITY (CRT): LISTED SUBSTANCE**

Thorium dioxide Listed

National Inventory	Status
Australia - AICS	Y
Canada - DSL	Y
Canada - NDSL	N (thorium oxide; water; nitric acid)
China - IECSC	N (thorium oxide)
Europe - EINEC / ELINCS / NLP	Y
Japan - ENCS	N (thorium oxide; water; nitric acid)
Korea - KECI	Y
New Zealand - NZIoC	N (thorium oxide)
Philippines - PICCS	N (thorium oxide)
USA - TSCA	Y
<b>Legend:</b>	Y = All ingredients are on the inventory N = Not determined or one or more ingredients are not on the inventory and are not exempt from listing(see specific ingredients in brackets)

**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.

The 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.

**Definitions and abbreviations**

- PC—TWA: Permissible Concentration-Time Weighted Average
- PC—STEL: Permissible Concentration-Short Term Exposure Limit
- IARC: International Agency for Research on Cancer
- ACGIH: American Conference of Governmental Industrial Hygienists
- STEL: Short Term Exposure Limit
- TEEL: Temporary Emergency Exposure Limit.
- IDLH: Immediately Dangerous to Life or Health Concentrations
- OSF: Odour Safety Factor
- NOAEL :No Observed Adverse Effect Level
- LOAEL: Lowest Observed Adverse Effect Level
- TLV: Threshold Limit Value
- LOD: Limit Of Detection
- OTV: Odour Threshold Value
- BCF: BioConcentration Factors
- BEI: Biological Exposure Index

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