

TUNGSTEN ELECTRODE

Wilhelmsen Ships Service AS

Part Number: 674710 (1.6 x 175 mm) 674736 (2.4 x 175 mm)

Version No: 4.4

Safety Data Sheet (Conforms to Annex II of REACH (1907/2006) - Regulation 2020/878)

Issue Date: 24/07/2024

Print Date: 06/08/2024

L.REACH.NOR.EN

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

1.1. Product Identifier

Product name	TUNGSTEN ELECTRODE
Chemical Name	Not Applicable
Synonyms	Not Available
Chemical formula	Not Applicable
Other means of identification	674710 (1.6 x 175 mm) 674736 (2.4 x 175 mm), 674710, 674736

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

Product Category Consumer	PC38 Welding and soldering products, flux products
Relevant identified uses	WELDING
Uses advised against	No specific uses advised against are identified.

1.3. Details of the manufacturer or supplier of the safety data sheet

Registered company name	Wilhelmsen Ships Service AS	Outback (M)SDS portal: http://jr.chemwatch.net/outb/account/autologin?login=wilhelmsen	Wilhelmsen Ships Service AS* Central Warehouse
Address	Strandveien 20 Lysaker 1366 Norway	-----Use our Outback portal to obtain our (M)SDSs in other languages and/or format.----- For questions relating to our SDSs please use Email: WSS.GLOBAL.SDSINFO@wilhelmsen.com ----- Norway	Willem Barentszstraat 50 Rotterdam Netherlands
Telephone	+47 67 58 40 00	Not Available	+31 10 4877 777
Fax	Not Available	Not Available	Not Available
Website	http://www.wilhelmsen.com/	http://www.wilhelmsen.com	http://www.wilhelmsen.com
Email	wss.norway.cs@wilhelmsen.com	wss.global.sdsinfo@wilhelmsen.com	wss.rotterdam@wilhelmsen.com

1.4. Emergency telephone number

Association / Organisation	Giftinformasjonssentralen - 24 timer	24hrs - Chemwatch	Dutch nat. poison centre
Emergency telephone numbers	+47 22591300	+31-10-4877700	+ 31 88 7558561
Other emergency telephone numbers	+31-10-4877700	+31-10-4877700	+ 31 10 4877700

Association / Organisation	CHEMWATCH EMERGENCY RESPONSE (24/7)
Emergency telephone numbers	+47 23 25 25 84
Other emergency telephone numbers	+61 3 9573 3188

Once connected and if the message is not in your preferred language then please dial 01

SECTION 2 Hazards identification

2.1. Classification of the substance or mixture

Classification according to regulation (EC) No 1272/2008 [CLP] and amendments [1]	H350 - Carcinogenicity Category 1A
Legend:	1. Classified by Chemwatch; 2. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI

2.2. Label elements

Hazard pictogram(s)	
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Signal word	Danger
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Hazard statement(s)

H350	May cause cancer.
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Supplementary statement(s)

Not Applicable

Precautionary statement(s) General

P101	If medical advice is needed, have product container or label at hand.
P102	Keep out of reach of children.
P103	Read carefully and follow all instructions.

Precautionary statement(s) Prevention

P201	Obtain special instructions before use.
P280	Wear protective gloves and protective clothing.

Precautionary statement(s) Response

P308+P313	IF exposed or concerned: Get medical advice/ attention.
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Precautionary statement(s) Storage

P405	Store locked up.
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Precautionary statement(s) Disposal

P501	Dispose of contents/container to authorised hazardous or special waste collection point in accordance with any local regulation.
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Material contains lanthanum oxide, welding fumes.

2.3. Other hazards

REACH - Art.57-59: The mixture does not contain Substances of Very High Concern (SVHC) at the SDS print date.

SECTION 3 Composition / information on ingredients

3.1.Substances

See 'Composition on ingredients' in Section 3.2

3.2.Mixtures

1. CAS No 2. EC No 3. Index No 4. REACH No	% [weight]	Name	Classification according to regulation (EC) No 1272/2008 [CLP] and amendments	SCL / M-Factor	Nanoform Particle Characteristics
1. 7440-33-7 2. 231-143-9 3. Not Available 4. Not Available	97.52	tungsten	Not Classified ^[1]	Not Available Acute M factor: Not Available Chronic M factor: Not Available	Not Available
1. 1312-81-8 2. 215-200-5 3. Not Available 4. Not Available	1.48	lanthanum oxide	Skin Corrosion/Irritation Category 2, Serious Eye Damage/Eye Irritation Category 2, Specific Target Organ Toxicity - Single Exposure (Respiratory Tract Irritation) Category 3; H315, H319, H335 ^[1]	Not Available Acute M factor: Not Available Chronic M factor: 10	Not Available
1. Not Available 2. Not Available 3. Not Available 4. Not Available	<0.99	welding fumes	Acute Toxicity (Inhalation) Category 4, Carcinogenicity Category 1A; H332, H350 ^[1]	Not Available Acute M factor: Not Available Chronic M factor: Not Available	Not Available
Legend: 1. Classified by Chemwatch; 2. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI; 3. Classification drawn from C&L; * EU IOELVs available; [e] Substance identified as having endocrine disrupting properties					

SECTION 4 First aid measures

4.1. Description of first aid measures

Eye Contact	<ul style="list-style-type: none">Particulate bodies from welding spatter may be removed carefully.DO NOT attempt to remove particles attached to or embedded in eye.Lay victim down, on stretcher if available and pad BOTH eyes, make sure dressing does not press on the injured eye by placing thick pads under dressing, above and below the eye.Seek urgent medical assistance, or transport to hospital.For "arc eye", i.e. welding flash or UV light burns to the eye:Place eye pads or light clean dressings over both eyes.Seek medical assistance. <p>For THERMAL burns:</p> <ul style="list-style-type: none">Do NOT remove contact lensLay victim down, on stretcher if available and pad BOTH eyes, make sure dressing does not press on the injured eye by placing thick pads under dressing, above and below the eye.Seek urgent medical assistance, or transport to hospital.
Skin Contact	<p>If skin contact occurs:</p> <ul style="list-style-type: none">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. <p>For thermal burns:</p> <ul style="list-style-type: none">Decontaminate area around burn.Consider the use of cold packs and topical antibiotics. <p>For first-degree burns (affecting top layer of skin)</p> <ul style="list-style-type: none">Hold burned skin under cool (not cold) running water or immerse in cool water until pain subsides.Use compresses if running water is not available.Cover with sterile non-adhesive bandage or clean cloth.Do NOT apply butter or ointments; this may cause infection.Give over-the counter pain relievers if pain increases or swelling, redness, fever occur. <p>For second-degree burns (affecting top two layers of skin)</p> <ul style="list-style-type: none">Cool the burn by immerse in cold running water for 10-15 minutes.Use compresses if running water is not available.Do NOT apply ice as this may lower body temperature and cause further damage.Do NOT break blisters or apply butter or ointments; this may cause infection.Protect burn by cover loosely with sterile, nonstick bandage and secure in place with gauze or tape. <p>To prevent shock: (unless the person has a head, neck, or leg injury, or it would cause discomfort):</p> <ul style="list-style-type: none">Lay the person flat.Elevate feet about 12 inches.Elevate burn area above heart level, if possible.Cover the person with coat or blanket.Seek medical assistance. <p>For third-degree burns</p>

	<p>Seek immediate medical or emergency assistance.</p> <p>In the mean time:</p> <ul style="list-style-type: none">▸ Protect burn area cover loosely with sterile, nonstick bandage or, for large areas, a sheet or other material that will not leave lint in wound.▸ Separate burned toes and fingers with dry, sterile dressings.▸ Do not soak burn in water or apply ointments or butter; this may cause infection.▸ To prevent shock see above.▸ For an airway burn, do not place pillow under the person's head when the person is lying down. This can close the airway.▸ Have a person with a facial burn sit up.▸ Check pulse and breathing to monitor for shock until emergency help arrives.▸ Generally not applicable.
Inhalation	<ul style="list-style-type: none">▸ 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.▸ Generally not applicable.
Ingestion	<ul style="list-style-type: none">▸ Generally not applicable.

4.2 Most important symptoms and effects, both acute and delayed

See Section 11

4.3. Indication of any immediate medical attention and special treatment needed

Copper, magnesium, aluminium, antimony, iron, manganese, nickel, zinc (and their compounds) in welding, brazing, galvanising or smelting operations all give rise to thermally produced particulates of smaller dimension than may be produced if the metals are divided mechanically. Where insufficient ventilation or respiratory protection is available these particulates may produce "metal fume fever" in workers from an acute or long term exposure.

- Onset occurs in 4-6 hours generally on the evening following exposure. Tolerance develops in workers but may be lost over the weekend. (Monday Morning Fever)
- Pulmonary function tests may indicate reduced lung volumes, small airway obstruction and decreased carbon monoxide diffusing capacity but these abnormalities resolve after several months.
- Although mildly elevated urinary levels of heavy metal may occur they do not correlate with clinical effects.
- The general approach to treatment is recognition of the disease, supportive care and prevention of exposure.
- Seriously symptomatic patients should receive chest x-rays, have arterial blood gases determined and be observed for the development of tracheobronchitis and pulmonary edema.

[Ellenhorn and Barceloux: Medical Toxicology]

Both dimercaptol and calcium disodium edetate are said to be effective in acute experimental tungsten poisonings.

SECTION 5 Firefighting measures

5.1. Extinguishing media

- **DO NOT** use halogenated fire extinguishing agents.
- Metal dust fires need to be smothered with sand, inert dry powders.
- DO NOT USE WATER, CO2 or FOAM.**
- Use DRY sand, graphite powder, dry sodium chloride based extinguishers, G-1 or Met L-X to smother fire.
 - Confining or smothering material is preferable to applying water as chemical reaction may produce flammable and explosive hydrogen gas.
 - Chemical reaction with CO2 may produce flammable and explosive methane.
 - If impossible to extinguish, withdraw, protect surroundings and allow fire to burn itself out.

5.2. Special hazards arising from the substrate or mixture

Fire Incompatibility	<ul style="list-style-type: none">▸ Reacts with acids producing flammable / explosive hydrogen (H2) gas
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5.3. Advice for firefighters

Fire Fighting	<ul style="list-style-type: none">▸ 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.▸ 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. <p>Slight hazard when exposed to heat, flame and oxidisers.</p>
Fire/Explosion Hazard	<ul style="list-style-type: none">▸ DO NOT disturb burning dust. Explosion may result if dust is stirred into a cloud, by providing oxygen to a large surface of hot metal.▸ DO NOT use water or foam as generation of explosive hydrogen may result.

With the exception of the metals that burn in contact with air or water (for example, sodium), masses of combustible metals do not represent unusual fire risks because they have the ability to conduct heat away from hot spots so efficiently that the heat of combustion cannot be maintained - this means that it will require a lot of heat to ignite a mass of combustible metal. Generally, metal fire risks exist when sawdust, machine shavings and other metal 'fines' are present.

Metal powders, while generally regarded as non-combustible:

- May burn when metal is finely divided and energy input is high.
- May react explosively with water.

Decomposition may produce toxic fumes of:

- metal oxides
- tungsten

May emit poisonous fumes.

May emit corrosive fumes.

Articles and manufactured articles may constitute a fire hazard where polymers form their outer layers or where combustible packaging remains in place.

Certain substances, found throughout their construction, may degrade or become volatile when heated to high temperatures. This may create a secondary hazard.

Welding arc and metal sparks can ignite combustibles.

SECTION 6 Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

See section 8

6.2. Environmental precautions

See section 12

6.3. Methods and material for containment and cleaning up

Minor Spills	<ul style="list-style-type: none">▸ 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	<ul style="list-style-type: none">· Do not use compressed air to remove metal dusts from floors, beams or equipment· Vacuum cleaners, of flame-proof design, should be used to minimise dust accumulation.· Use non-sparking handling equipment, tools and natural bristle brushes.· Provide grounding and bonding where necessary to prevent accumulation of static charges during metal dust handling and transfer operations· Cover and reseal partially empty containers.· Do not allow chips, fines or dusts to contact water, particularly in enclosed areas. <p>If molten:</p> <ul style="list-style-type: none">▸ Contain the flow using dry sand or salt flux as a dam.▸ All tooling (e.g., shovels or hand tools) and containers which come in contact with molten metal must be preheated or specially coated, rust free and approved for such use.▸ Allow the spill to cool before remelting scrap. <p>Minor hazard.</p> <ul style="list-style-type: none">▸ 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.▸ Prevent spillage from entering drains or water ways.▸ Contain spill with sand, earth or vermiculite.▸ Collect recoverable product into labelled containers for recycling.▸ 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.

6.4. Reference to other sections

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

SECTION 7 Handling and storage

7.1. Precautions for safe handling

Safe handling	<p>For molten metals:</p> <ul style="list-style-type: none">· Molten metal and water can be an explosive combination. The risk is greatest when there is sufficient molten metal to entrap or seal off water. Water and other forms of contamination on or contained in scrap or remelt ingot are known to have caused explosions in melting operations. While the products may have minimal surface roughness and internal voids, there remains the possibility of moisture contamination or entrapment. If confined, even a few drops can lead to violent explosions.
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	<ul style="list-style-type: none">· All tooling, containers, molds and ladles, which come in contact with molten metal must be preheated or specially coated, rust free and approved for such use.· Any surfaces that may contact molten metal (e.g. concrete) should be specially coated· Drops of molten metal in water (e.g. from plasma arc cutting), while not normally an explosion hazard, can generate enough flammable hydrogen gas to present an explosion hazard.<ul style="list-style-type: none">‣ 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.
Fire and explosion protection	See section 5
Other information	<ul style="list-style-type: none">‣ Store away from incompatible materials.

7.2. Conditions for safe storage, including any incompatibilities

Suitable container	<p>Generally packaging as originally supplied with the article or manufactured item is sufficient to protect against physical hazards. If repackaging is required ensure the article is intact and does not show signs of wear. As far as is practicably possible, reuse the original packaging or something providing a similar level of protection to both the article and the handler.</p> <ul style="list-style-type: none">‣ CARE: Packing of high density product in light weight metal or plastic packages may result in container collapse with product release‣ Heavy gauge metal packages / Heavy gauge metal drums
Storage incompatibility	<p>The material is described as an electronegative metal.</p> <p>The activity or electromotive series of metals is a listing of the metals in decreasing order of their reactivity with hydrogen-ion sources such as water and acids. In the reaction with a hydrogen-ion source, the metal is oxidised to a metal ion, and the hydrogen ion is reduced to H2. The ordering of the activity series can be related to the standard reduction potential of a metal cation. The more positive the standard reduction potential of the cation, the more difficult it is to oxidise the metal to a hydrated metal cation and the later that metal falls in the series</p> <p>Three notable groups comprise the series</p> <ul style="list-style-type: none">‣ very electropositive metals‣ electropositive metals‣ electronegative metals <p>Electronegative metals have electronegativities that fall between 1.9 and 2.5.. Cations of these metals generally have positive standard reduction potentials.</p> <p>They:</p> <ul style="list-style-type: none">‣ are not oxidised by H+ (acids)‣ are good oxidising agents‣ oxidise H2 producing H+ and depositing the metals from an aqueous solution‣ produce cations that will oxidise more active metals to the cation - the less active metal is deposited as the metal <p>Electronegative metals are not corroded by oxygen.</p> <ul style="list-style-type: none">‣ WARNING: Avoid or control reaction with peroxides. All <i>transition metal</i> 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 <p>Welding electrodes should not be allowed to come into contact with strong acids or other substances which are corrosive to metals.</p> <ul style="list-style-type: none">‣ Many metals may incandesce, react violently, ignite or react explosively upon addition of concentrated nitric acid.‣ Avoid reaction with oxidising agents
Hazard categories in accordance with Regulation (EC) No 2012/18/EU (Seveso III)	Not Available
Qualifying quantity (tonnes) of dangerous substances as referred to in Article 3(10) for the application of	Not Available



X — Must not be stored together
O — May be stored together with specific preventions
+ — May be stored together

Note: Depending on other risk factors, compatibility assessment based on the table above may not be relevant to storage situations, particularly where large volumes of dangerous goods are stored and handled. Reference should be made to the Safety Data Sheets for each substance or article and risks assessed accordingly.

7.3. Specific end use(s)

See section 1.2

SECTION 8 Exposure controls / personal protection

8.1. Control parameters

Ingredient	DNELs Exposure Pattern Worker	PNECs Compartment
tungsten	Dermal 1.7 mg/kg bw/day (Systemic, Chronic) Inhalation 5.8 mg/m³ (Systemic, Chronic) Dermal 0.48 mg/kg bw/day (Systemic, Chronic) * Inhalation 0.0017 mg/m³ (Systemic, Chronic) * Oral 0.48 mg/kg bw/day (Systemic, Chronic) *	0.338 mg/L (Water (Fresh)) 0.31 mg/L (Water - Intermittent release) 0.034 mg/L (Water (Marine)) 960 mg/kg sediment dw (Sediment (Fresh Water)) 96 mg/kg sediment dw (Sediment (Marine)) 2.17 mg/kg soil dw (Soil) 5.86 mg/L (STP) 0.011 g/kg food (Oral)
lanthanum oxide	Dermal 8.75 mg/kg bw/day (Systemic, Chronic) Inhalation 61.5 mg/m³ (Systemic, Chronic) Dermal 5.25 mg/kg bw/day (Systemic, Chronic) * Inhalation 0.01826 mg/m³ (Systemic, Chronic) * Oral 5.25 mg/kg bw/day (Systemic, Chronic) *	10 mg/L (Water (Fresh)) 1 mg/L (Water - Intermittent release) 1 mg/L (Water (Marine)) 15.5 mg/kg sediment dw (Sediment (Fresh Water)) 15.5 mg/kg sediment dw (Sediment (Marine)) 18.9 mg/kg soil dw (Soil) 100 mg/L (STP) 156 mg/kg food (Oral)

* Values for General Population

Occupational Exposure Limits (OEL)

INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
Norway regulations on action values and limit values for physical and chemical factors in the work environment and infection risk groups for biological factors (Norwegian)	tungsten	Wolfram og uløselige wolframforb. (beregnet som W)	5 mg/m3	Not Available	Not Available	Not Available

Emergency Limits

Ingredient	TEEL-1	TEEL-2	TEEL-3
tungsten	10 mg/m3	330 mg/m3	2,000 mg/m3
lanthanum oxide	4 mg/m3	44 mg/m3	270 mg/m3

Ingredient	Original IDLH	Revised IDLH
tungsten	Not Available	Not Available
lanthanum oxide	Not Available	Not Available
welding fumes	Not Available	Not Available

Occupational Exposure Banding

Ingredient	Occupational Exposure Band Rating	Occupational Exposure Band Limit
lanthanum oxide	E	≤ 0.01 mg/m³
welding fumes	E	≤ 0.01 mg/m³

Notes: Occupational exposure banding is a process of assigning chemicals into specific categories or bands based on a chemical's potency and the adverse health outcomes associated with exposure. The output of this process is an occupational exposure band (OEB), which corresponds to a range of exposure concentrations that are expected to protect worker health.

MATERIAL DATA

for welding fume:

In addition to complying with any individual exposure standards for specific contaminants, where current manual welding processes are used, the fume concentration inside the welder's helmet **should not** exceed 5 mg/m3, when collected in accordance with the appropriate standard (AS 3640, for example).

ES* TWA: 5 mg/m3

TLV* TWA: 5 mg/m3, B2 (a substance of variable composition)

OES* TWA: 5 mg/m3

Most welding, even with primitive ventilation, does not produce exposures inside the welding helmet above 5 mg/m3. That which does should be controlled (ACGIH). Inspirable dust concentrations in a worker s breathing zone shall be collected and measured in accordance with AS 3640, for example. Metal content

can be analytically determined by OSHA Method ID25 (ICP-AES) after total digestion of filters and dissolution of captured metals. Sampling of the Respirable Dust fraction requires cyclone separator devices (elutriators) and procedures to comply with AS 2985 (for example).

During use the gases nitric oxide, nitrogen peroxide and ozone may be produced by the consumption of the electrode or the action of the welding arc on the atmosphere.

NOTE: Detector tubes for carbon monoxide, measuring in excess of 2 ppm, are commercially available for detection of carbon monoxide. 200 ppm carbon monoxide in air will produce headache, mental dullness and dizziness in a few hours; 600 ppm will produce identical symptoms in less than half an hour and may produce unconsciousness in 1.5 hours; 4000 ppm is fatal in less than an hour. The TLV-TWA and STEL is recommended to keep blood carboxyhaemoglobin (CoHb) levels below 3.5% in workers so as to prevent adverse neurobehavioural changes and to maintain cardiovascular exercise. Earlier recommendations did not take into account heavy labour, high temperature, high elevations (over 5000 feet above sea level), adverse effects on pregnant workers (i.e. the foetus) and the effects on those with chronic heart and respiratory disease. Workers who smoke frequently have CoHb saturations above 3.5%.

Coburn et al have calculated the time needed to reach 3.5% CoHb at various carbon monoxide exposures.

Carbon Monoxide Concentration (ppm)	Work Load (time in minutes)	
	Sedentary	
50	191	Light 102 Moderate 87
75	171	62 53
100	86	46 39
150	58	31 27
200	46	24 21
300	34	18 15
500	24	13 11
1000	18	10 8

Work Load is defined in terms of alveolar ventilation as:

Work Load	Ventilation (l/min)
Sedentary	6
Light	15
Moderate	20

Coburn, R.F.: Foster, R.E.: Kane, P.B.: Considerations of the Physiological Variables that Determine the Carboxyhaemoglobin Concentration in Man.

for ozone:

NOTE: Detector tubes for ozone, measuring in excess of 0.05 ppm, are commercially available. Exposure at 0.2 ppm appears to produce mild acute but not cumulative effects. It is thought that exposures of the order of 0.1 ppm will be tolerated by most workers including asthmatics. Chronic exposure at 0.1 ppm or more can induce significant adverse effects in the lower respiratory tract of both normal and atopic individuals.

Human exposure for 2 hours at an average concentration of 1.5 ppm ozone resulted in a 20% reduction in timed vital capacity of the lung and other effects. Concentrations of ozone in excess of a few tenths ppm cause occasional discomfort to exposed individuals manifest as headache, dryness of the throat and mucous membranes of the eyes and nose following exposures of short duration.

Exposure to ozone during moderate to heavy work loads results in significantly decreased forced vital capacity (FVC) and forced expiratory volume in one second (FEV1) at 0.12 ppm; this effect is greater at higher concentrations.

For nitric oxide:

Odour Threshold: 0.3 to 1 ppm.

NOTE: Detector tubes for nitrogen oxide, measuring in excess of 10 ppm, are commercially available. Experimental animal data indicates that nitric oxide is one-fifth as toxic as nitrogen dioxide. The recommended TLV-TWA takes account of this relationship. Exposure at or below the recommended TLV-TWA is thought to reduce the potential for immediate injury, adverse physiological effects, pulmonary disease (including the risk of increased airway resistance) from prolonged daily exposure

Odour Safety Factor (OSF)

OSF=7.7 (nitric oxide)

Exposed individuals are **NOT** reasonably expected to be warned, by smell, that the Exposure Standard is being exceeded.

Odour Safety Factor (OSF) is determined to fall into either Class C, D or E.

The Odour Safety Factor (OSF) is defined as:

OSF= Exposure Standard (TWA) ppm/ Odour Threshold Value (OTV) ppm

Classification into classes follows:

Class	OSF	Description
A	550	Over 90% of exposed individuals are aware by smell that the Exposure Standard (TLV-TWA for example) is being reached, even when distracted by working activities
B	26-550	As "A" for 50-90% of persons being distracted
	1-26	As "A" for less than 50% of persons being distracted
D	0.18-1	10-50% of persons aware of being tested perceive by smell that the Exposure Standard is being reached
E	<0.18	As "D" for less than 10% of persons aware of being tested

as lanthanum


CEL TWA: 1 mg/m3 (compare TLV-TWA yttrium)

(CEL = Chemwatch Exposure Limit)

Exposure to the vapours of some rare earth salts reportedly produces sensitivity to heat, itching and an increased perception of odour and taste. Other effects may include bronchiolitis, subacute bronchitis, acute transient chemical pneumonitis, focal hypertrophic emphysema, regional bronchiolar stricturing and cellular eosinophilia. In rare fatal cases of exposure to the rare-earth fluoride and/or oxide mixtures, delayed chemical hyperaemia has occurred. Lung granulomas have also been seen in experimental animals.

TUNGSTEN ELECTRODE

8.2. Exposure controls

<p>8.2.1. Appropriate engineering controls</p>	<p>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.</p> <p>The basic types of engineering controls are:</p> <p>Process controls which involve changing the way a job activity or process is done to reduce the risk.</p> <p>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. Ventilation can remove or dilute an air contaminant if designed properly. The design of a ventilation system must match the particular process and chemical or contaminant in use. Employers may need to use multiple types of controls to prevent employee overexposure.</p> <p>Articles or manufactured items, in their original condition, generally don't require engineering controls during handling or in normal use.</p> <p>Exceptions may arise following extensive use and subsequent wear, during recycling or disposal operations where substances, found in the article, may be released to the environment.</p> <p>For manual arc welding operations the nature of ventilation is determined by the location of the work.</p> <ul style="list-style-type: none"> For outdoor work, natural ventilation is generally sufficient. For indoor work, conducted in open spaces, use mechanical (general exhaust or plenum) ventilation. (Open work spaces exceed 300 cubic metres per welder) For work conducted in limited or confined spaces, mechanical ventilation, using local exhaust systems, is required. (In confined spaces always check that oxygen has not been depleted by excessive rusting of steel or snowflake corrosion of aluminium) <p>Mechanical or local exhaust ventilation may not be required where the process working time does not exceed 24 mins. (in an 8 hr. shift) provided the work is intermittent (a maximum of 5 mins. every hour). Local exhaust systems must be designed to provide a minimum capture velocity at the fume source, away from the worker, of 0.5 metre/sec.</p>
<p>8.2.2. Individual protection measures, such as personal protective equipment</p>	
<p>Eye and face protection</p>	<ul style="list-style-type: none"> Goggles or other suitable eye protection shall be used during all gas welding or oxygen cutting operations. Spectacles without side shields, with suitable filter lenses are permitted for use during gas welding operations on light work, for torch brazing or for inspection. For most open welding/brazing operations, goggles, even with appropriate filters, will not afford sufficient facial protection for operators. Where possible use welding helmets or handshields corresponding to EN 175, ANSI Z49:12005, AS 1336 and AS 1338 which provide the maximum possible facial protection from flying particles and fragments. [WRIA-WTIA Technical Note 7] An approved face shield or welding helmet can also have filters for optical radiation protection, and offer additional protection against debris and sparks. UV blocking protective spectacles with side shields or welding goggles are considered primary protection, with the face shield or welding helmet considered secondary protection. The optical filter in welding goggles, face mask or helmet must be a type which is suitable for the sort of work being done. A filter suitable for gas welding, for instance, should not be used for arc welding. <p>For submerged arc welding use a lens shade which gives just sufficient arc brightness to allow weld pool control.</p>
<p>Skin protection</p>	<p>See Hand protection below</p>
<p>Hands/feet protection</p>	<ul style="list-style-type: none"> Wear chemical protective gloves, e.g. PVC. Wear safety footwear or safety gumboots, e.g. Rubber Welding gloves conforming to Standards such as EN 12477:2001, ANSI Z49.1, AS/NZS 2161:2008 produced from leather, rubber, treated cotton, or aluminised These gloves protect against mechanical risk caused by abrasion, blade cut, tear and puncture Other gloves which protect against thermal risks (heat and fire) might also be considered - these comply with different standards to those mentioned above. One pair of gloves may not be suitable for all processes. For example, gloves that are suitable for low current Gas Tungsten Arc Welding (GTAW) (thin and flexible) would not be proper for high-current Air Carbon Arc Cutting (CAC-A) (insulated, tough, and durable) Protective gloves eg. Leather gloves or gloves with Leather facing <p>No special equipment required due to the physical form of the product.</p>
<p>Body protection</p>	<p>See Other protection below</p>
<p>Other protection</p>	<ul style="list-style-type: none"> Employees working with confirmed human carcinogens should be provided with, and be required to wear, clean, full body protective clothing (smocks, coveralls, or long-sleeved shirt and pants), shoe covers and gloves prior to entering the regulated area. [AS/NZS ISO 6529:2006 or national equivalent] Employees engaged in handling operations involving carcinogens should be provided with, and required to wear and use half-face filter-type respirators with filters for dusts, mists and fumes, or air purifying canisters or cartridges. A respirator affording higher levels of protection may be substituted. [AS/NZS 1715 or national equivalent] Emergency deluge showers and eyewash fountains, supplied with potable water, should be located near, within sight of, and on the same level with locations where direct exposure is likely. Prior to each exit from an area containing confirmed human carcinogens, employees should be required to remove and leave protective clothing and equipment at the point of exit and at the last exit of the day, to place used clothing and equipment in impervious containers at the point of exit for purposes of decontamination or disposal. The contents of such impervious containers must be identified with suitable labels. For maintenance and decontamination activities, authorized employees entering the area should be provided with and required to wear clean, impervious garments, including gloves, boots and continuous-air supplied hood.

Continued...

- Prior to removing protective garments the employee should undergo decontamination and be required to shower upon removal of the garments and hood.
- Before starting; consider that protection should be provided for all personnel within 10 metres of any open arc welding operation. Welding sites must be adequately shielded with screens of non flammable materials. Screens should permit ventilation at floor and ceiling levels.
- Overalls.
 - P.V.C apron.
 - Barrier cream.
 - Skin cleansing cream.
 - Eye wash unit.

Respiratory protection

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	@1@ P2	-	-
	Air-line*	-	-
up to 50 x ES	Air-line**	@1@ P2	@1@ PAPR-P2
	-	Air-line*	-
up to 100 x ES	-	Air-line**	@1@ PAPR-P3

* - Negative pressure demand ** - Continuous flow

A(All classes) = Organic vapours, BAUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

Welding of powder coated metal requires good general area ventilation, and ventilated mask as local heat causes minor coating decomposition releasing highly discomforting fume which may be harmful if exposure is regular.

Welding or flame cutting of metals with chromate pigmented primers or coatings may result in inhalation of highly toxic chromate fumes. Exposures may be significant in enclosed or poorly ventilated areas

Respiratory protection not normally required due to the physical form of the product.

Where significant concentrations of the material are likely to enter the breathing zone, a Class P3 respirator may be required.

Class P3 particulate filters are used for protection against highly toxic or highly irritant particulates.

Filtration rate: Filters at least 99.95% of airborne particles

Suitable for:

- Relatively small particles generated by mechanical processes eg. grinding, cutting, sanding, drilling, sawing.
- Sub-micron thermally generated particles e.g. welding fumes, fertilizer and bushfire smoke.
- Biologically active airborne particles under specified infection control applications e.g. viruses, bacteria, COVID-19, SARS
- Highly toxic particles e.g. Organophosphate Insecticides, Radionuclides, Asbestos

Note: P3 Rating can only be achieved when used with a Full Face Respirator or Powered Air-Purifying Respirator (PAPR). If used with any other respirator, it will only provide filtration protection up to a P2 rating.

8.2.3. Environmental exposure controls

See section 12

SECTION 9 Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance	Metallic odourless welding electrode; does not mix with water.		
Physical state	Article	Relative density (Water = 1)	18.6
Odour	Not Available	Partition coefficient n-octanol / water	Not Available
Odour threshold	Not Available	Auto-ignition temperature (°C)	Not Available
pH (as supplied)	Not Applicable	Decomposition temperature (°C)	Not Available
Melting point / freezing point (°C)	760-3950	Viscosity (cSt)	Not Available
Initial boiling point and boiling range (°C)	6100	Molecular weight (g/mol)	Not Available
Flash point (°C)	Not Available	Taste	Not Available
Evaporation rate	Not Available BuAC = 1	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)	Not Applicable	Gas group	Not Available
Solubility in water	Immiscible	pH as a solution (1%)	Not Available
Vapour density (Air = 1)	Not Applicable	VOC g/L	Not Available
Nanoform Solubility	Not Available	Nanoform Particle Characteristics	Not Available
Particle Size	Not Available		

9.2. Other information

Not Available

SECTION 10 Stability and reactivity

10.1.Reactivity	See section 7.2
10.2. Chemical stability	Product is considered stable and hazardous polymerisation will not occur.
10.3. Possibility of hazardous reactions	See section 7.2
10.4. Conditions to avoid	See section 7.2
10.5. Incompatible materials	See section 7.2
10.6. Hazardous decomposition products	See section 5.3

SECTION 11 Toxicological information

11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008

Inhaled	<p>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.</p> <p>Fumes evolved during welding operations may be irritating to the upper-respiratory tract and may be harmful if inhaled.</p> <p>Inhalation of freshly formed metal oxide particles sized below 1.5 microns and generally between 0.02 to 0.05 microns may result in "metal fume fever". Symptoms may be delayed for up to 12 hours and begin with the sudden onset of thirst, and a sweet, metallic or foul taste in the mouth. Other symptoms include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalised feeling of malaise. Mild to severe headache, nausea, occasional vomiting, fever or chills, exaggerated mental activity, profuse sweating, diarrhoea, excessive urination and prostration may also occur. Tolerance to the fumes develops rapidly, but is quickly lost. All symptoms usually subside within 24-36 hours following removal from exposure.</p> <p>Not normally a hazard due to non-volatile nature of product</p> <p>The toxicology of rare earth metal oxides has been determined by pathological and biochemical examination of rodents exposed to the oxides by oral, intraperitoneal or endotracheal routes. Weakly expressed general toxic action of the oxides is seen in acute and prolonged exposure. The dusts cause pronounced changes in the lungs. (The oxides of the rare earth metals are significantly less toxic than their salts.)</p> <p>Symptoms of exposure to rare earth oxides are coughing, congestion, granuloma in lungs and haemoglobinaemia.</p> <p>Rare earths may cause impairment of blood clotting.</p> <p>Exposure to rare earth oxide vapours has been reported to result in sensitivity to heat, itching, and an increased awareness of odour and taste, bronchiolitis, sub-acute bronchiolitis (inflammation of the bronchial tubes), acute transient chemical pneumonitis (inflammation of the lungs caused by chemical irritation), focal hypertrophy (excessive development of an organ), emphysema, regional bronchiolar stricturing, cellular eosinophilia (abnormal increase in the number of leucocytes with cytoplasmic inclusions, in the blood that is characteristic of allergic reactions), and, in some cases, fatal delayed chemical hyperemia (excess of blood in a body part).</p> <p>Intratracheal administration to animals of some rare earth oxides, has been reported to cause changes ranging from mild to marked fibrosis (a condition marked by the increase of interstitial fibrous tissue), emphysema (a condition of the lungs marked by abnormal dilation of the its air spaces and distension of its walls), small white nodules, granulomas (a mass or nodule of chronically inflamed tissue with granulations that are generally associated with an infective process), giant cells, and accumulation of dust in the lungs.</p> <p>Acute carbon monoxide exposure can mimic acute gastroenteritis or food poisoning with accompanying nausea and vomiting. Rapidly fatal cases of poisoning are characterised by congestion and hemorrhages in all organs. The extent of the tissue and organ damage is related to the duration of the post-hypoxic unconsciousness. Exposure to carbon monoxide can result in immediate effects and, depending on the severity of the exposure, delayed effects. These delayed effects may occur days to weeks after the initial exposure. Signs of brain or nerve injury may appear at any time within three weeks following an acute exposure. Characteristically, those patients manifesting delayed neuropathology are middle aged or older.</p> <p>Intratracheal instillation of tungsten metal and tungsten carbide in guinea pigs (50 mg/week for 3 weeks) proved the dusts to be inert. Moderate interstitial cellular proliferation was found after tungsten metal exposures. Based on examination of workers with long industrial experience, no pneumoconioses developed amongst those exposed solely to tungsten or its insoluble compounds (workplace concentrations were about 5 mg/m3). Occupational effects of soluble tungsten compounds are unknown.</p>
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	<p>Welding or flame cutting of metals with chromate pigmented primers or coatings may result in inhalation of highly toxic chromate fumes. Exposures may be significant in enclosed or poorly ventilated areas</p> <p>Principal route of exposure is inhalation of welding fumes from electrodes and workpiece. Reaction products arising from electrode core and flux appear as welding fume depending on welding conditions, relative volatilities of metal oxides and any coatings on the workpiece. Studies of lung cancer among welders indicate that they may experience a 30-40% increased risk compared to the general population. Since smoking and exposure to other cancer-causing agents, such as asbestos fibre, may influence these results, it is not clear whether welding, in fact, represents a significant lung cancer risk. Whilst mild steel welding represents little risk, the stainless steel welder, exposed to chromium and nickel fume, may be at risk and it is this factor which may account for the overall increase in lung cancer incidence among welders. Cold isolated electrodes are relatively harmless. Welding fume with high levels of ferrous materials may lead to particle deposition in the lungs (siderosis) after long exposure. This clears up when exposure stops. Chronic exposure to iron dusts may lead to eye disorders.</p>
Ingestion	<p>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). Gastrointestinal tract discomfort may produce nausea and vomiting. In an occupational setting however, ingestion of insignificant quantities is not thought to be cause for concern.</p> <p>Oral administration of sodium tungstate produces tungsten deposits in bone and spleen with smaller amounts in the kidney and liver. Oral doses are excreted in both urine and faeces. Diarrhoea may be symptomatic of the toxic syndrome whilst large doses may produce respiratory arrest of central origin or secondary to circulatory collapse. Oral (and intravenous) doses of sodium tungstate and tungsten produced anorexia, colic, incoordination, trembling and dyspnoea in guinea pigs; these animals showed weight loss before a delayed death. Tungsten toxicity depends on the age of the animal and whether the animal is fed or fasted. Young rats survive doses of sodium tungstate which prove lethal to old rats and mortality is reduced after animals were fed prior to exposure. Tungsten powder fed to weanling rats of both sexes (2-5% of the diet) for 70 days produced a reduction in weight gain in females only.</p>
Skin Contact	<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>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.</p> <p>Ultraviolet radiation (UV) is generated by the electric arc in the welding process. Skin exposure to UV can result in severe burns, in many cases without prior warning.</p> <p>Exposure to infrared radiation (IR), produced by the electric arc and other flame cutting equipment may heat the skin surface and the tissues immediately below the surface. Except for this effect, which can progress to thermal burns in some situations, infrared radiation is not dangerous to welders. Most welders protect themselves from IR (and UV) with a welder's helmet (or glasses) and protective clothing.</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, puncture wounds 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>
Eye	<p>Ultraviolet (UV) radiation can also damage the lens of the eye. Many arc welders are aware of the condition known as "arc-eye," a sensation of sand in the eyes. This condition is caused by excessive eye exposure to UV. Exposure to ultraviolet rays may also increase the skin effects of some industrial chemicals (coal tar and cresol compounds, for example).</p> <p>Exposure of the human eye to intense visible light can produce adaptation, pupillary reflex, and shading of the eyes. Such actions are protective mechanisms to prevent excessive light from being focused on the retina. In the arc welding process, eye exposure to intense visible light is prevented for the most part by the welder's helmet.</p> <p>Limited evidence or practical experience suggests, that the material may cause eye irritation in a substantial number of individuals. 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.</p>
Chronic	<p>Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.</p> <p>On the basis of epidemiological data, the material is regarded as carcinogenic to humans. There is sufficient data to establish a causal association between human exposure to the material and the development of cancer.</p> <p>Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.</p> <p>Long-term (chronic) exposure to low levels of carbon monoxide may produce heart disease and damage to the nervous system. Exposure of pregnant animals to carbon monoxide may cause low birthweight, increased foetal mortality and nervous system damage to the offspring.</p> <p>Carbon monoxide is a common cause of fatal poisoning in industry and homes. Non fatal poisoning may result in permanent nervous system damage. Carbon monoxide reduces the oxygen carrying capacity of the blood. Effects on the body are considered to be reversible as long as brain cell damage or heart failure has not occurred. Avoid prolonged exposure, even to small concentrations.</p> <p>Principal route of exposure is inhalation of welding fumes from electrodes and workpiece. Reaction products arising from electrode core and flux appear as welding fume depending on welding conditions, relative volatilities of metal oxides and any coatings on the workpiece. Studies of lung cancer among welders indicate that they may experience a 30-40% increased risk compared to the general population. Since smoking and exposure to other cancer-causing agents, such as asbestos fibre, may influence these results, it is not clear whether welding, in fact, represents a significant lung cancer risk. Whilst mild steel welding</p>

	<p>represents little risk, the stainless steel welder, exposed to chromium and nickel fume, may be at risk and it is this factor which may account for the overall increase in lung cancer incidence among welders. Cold isolated electrodes are relatively harmless. Metal oxides generated by industrial processes such as welding, give rise to a number of potential health problems. Particles smaller than 5 micron (respirables) articles may cause lung deterioration. Particles of less than 1.5 micron can be trapped in the lungs and, dependent on the nature of the particle, may give rise to further serious health consequences.</p> <p>Exposure to fume containing high concentrations of water-soluble chromium (VI) during the welding of stainless steels in confined spaces has been reported to result in chronic chrome intoxication, dermatitis and asthma. Certain insoluble chromium (VI) compounds have been named as carcinogens (by the ACGIH) in other work environments. Chromium may also appear in welding fumes as Cr2O3 or double oxides with iron. These chromium (III) compounds are generally biologically inert. Welding fume with high levels of ferrous materials may lead to particle deposition in the lungs (siderosis) after long exposure. This clears up when exposure stops. Chronic exposure to iron dusts may lead to eye disorders.</p> <p>Silica and silicates in welding fumes are non-crystalline and believed to be non-harmful.</p> <p>Other welding process exposures can arise from radiant energy UV flash burns, thermal burns or electric shock</p> <p>The welding arc emits ultraviolet radiation at wavelengths that have the potential to produce skin tumours in animals and in over-exposed individuals, however, no confirmatory studies of this effect in welders have been reported.</p> <p>Metallic dusts generated by the industrial process give rise to a number of potential health problems. The larger particles, above 5 micron, are nose and throat irritants. Smaller particles however, may cause lung deterioration. Particles of less than 1.5 micron can be trapped in the lungs and, dependent on the nature of the particle, may give rise to further serious health consequences.</p> <p>Metals are widely distributed in the environment and are not biodegradable. Biologically, many metals are essential to living systems and are involved in a variety of cellular, physiological, and structural functions. They often are cofactors of enzymes, and play a role in transcriptional control, muscle contraction, nerve transmission, blood clotting, and oxygen transport and delivery.</p>
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TUNGSTEN ELECTRODE	TOXICITY	IRRITATION
	Not Available	Not Available
tungsten	TOXICITY	IRRITATION
	dermal (rat) LD50: >2000 mg/kg ^[1]	Eye: adverse effect observed (irritating) ^[1]
	Oral (Rat) LD50: >2000 mg/kg ^[1]	Eye: no adverse effect observed (not irritating) ^[1]
		Eyes (rabbit) 500mg/24h-mild
		Skin (rabbit) 500mg/24h-mild
		Skin: no adverse effect observed (not irritating) ^[1]
lanthanum oxide	TOXICITY	IRRITATION
	Dermal (rabbit) LD50: >1087 mg/kg ^[1]	Eye: no adverse effect observed (not irritating) ^[1]
	Oral (Rat) LD50: >=10000 mg/kg ^[1]	Skin: no adverse effect observed (not irritating) ^[1]
welding fumes	TOXICITY	IRRITATION
	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
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TUNGSTEN ELECTRODE	WARNING: This substance has been classified by the IARC as Group 2B: Possibly Carcinogenic to Humans.
TUNGSTEN	Substance has been investigated as a reproductive effector in female rodents- Oral TDLo 1.16 mg/kg The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterised by skin redness (erythema) and swelling epidermis. Histologically there may be intercellular oedema of the spongy layer (spongiosis) and intracellular oedema of the epidermis.
LANTHANUM OXIDE	Symptoms of acute lanthanide toxicity in rats are immediate defecation, writhing, ataxia (the inability to coordinate voluntary muscular movement), sedation, laboured respiration and reduced activity. Death is due mainly to respiratory and cardiac failure. The rare earths exhibit low toxicity following ingestion but may be toxic by the intraperitoneal route and mildly toxic when administered by the subcutaneous route. The production of skin and lung granulomas, following exposure, may also occur. No significant acute toxicological data identified in literature search.
WELDING FUMES	WARNING: This substance has been classified by the IARC as Group 1: CARCINOGENIC TO HUMANS . Not available. Refer to individual constituents.
TUNGSTEN ELECTRODE & LANTHANUM OXIDE	Asthma-like symptoms may continue for months or even years after exposure to the material ends. This may be due to a non-allergic condition known as reactive airways dysfunction syndrome (RADS) which can occur after exposure to high levels of highly irritating compound. Main criteria for diagnosing RADS include the absence of previous airways disease in a non-atopic individual, with sudden onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. Other criteria for diagnosis of RADS include a reversible airflow pattern on lung function tests, moderate to severe bronchial hyperreactivity on methacholine challenge testing, and the lack of minimal lymphocytic inflammation, without eosinophilia. 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. On the other hand, industrial bronchitis is a disorder that occurs as a result of exposure due to high concentrations of irritating substance (often particles) and is completely reversible after exposure ceases. The disorder is characterized by difficulty breathing, cough and mucus production.

TUNGSTEN ELECTRODE & TUNGSTEN	Tungsten toxicology has been investigated principally by administration of sodium tungstate. Subcutaneous administration produces severe rectal temperature drops in rats. Parenteral doses are almost completely eliminated in the urine within 12 hours. Parenteral, but not oral, routes show an enlargement of adrenals and kidneys. Tungsten powder but not tungsten carbide is toxic by intraperitoneal administration - fatalities occur within 24 hours with survivors showing minor gross changes in liver and spleen.
TUNGSTEN ELECTRODE & WELDING FUMES	<p>Most welding is performed using electric arc processes - manual metal arc, metal inert gas (MIG) and tungsten inert gas welding (TIG) – and most welding is on mild steel.</p> <p>In 2017, an IARC working group has determined that "sufficient evidence exists that welding fume is a human lung carcinogen (Group 1).</p> <p>A complicating factor in classifying welding fumes is its complexity. Generally, welding fume is a mixture of metal fumes (i.e., iron, manganese, chromium, nickel, silicon, titanium) and gases (i.e., carbon monoxide, ozone, argon, carbon dioxide). Welding fume can contain varying concentrations of individual components that are classified as human carcinogens, including hexavalent chrome and nickel. However the presence of such metals and the intensity of exposure to each differ significantly according to a number of variables, including the type of welding technique used and the composition of the base metal and consumable.</p> <p>Nonetheless, IARC did not differentiate between these variables in its decision.</p> <p>There has been considerable evidence over several decades regarding cancer risks in relation to welding activities. Several case-control studies reported excess risks of ocular melanoma in welders. This association may be due to the presence in some welding environments of fumes of thorium-232, which is used in tungsten welding rods</p> <p>Different welding environments may present different and complex profiles of exposures.</p>
TUNGSTEN & LANTHANUM OXIDE	The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

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

Legend: ✗ – Data either not available or does not fill the criteria for classification
✔ – Data available to make classification

11.2 Information on other hazards

11.2.1. Endocrine disrupting properties

No evidence of endocrine disrupting properties were found in the current literature.

11.2.2. Other information

See Section 11.1

SECTION 12 Ecological information

12.1. Toxicity

TUNGSTEN ELECTRODE	Endpoint	Test Duration (hr)	Species	Value	Source
	Not Available	Not Available	Not Available	Not Available	Not Available
tungsten	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	72h	Algae or other aquatic plants	7.35mg/l	2
	EC50	48h	Crustacea	>163mg/l	2
	LC50	96h	Fish	>181mg/l	2
	NOEC(ECx)	72h	Algae or other aquatic plants	0.812mg/l	2
lanthanum oxide	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	72h	Algae or other aquatic plants	13mg/l	2
	NOEC(ECx)	196h	Algae or other aquatic plants	>=0.002mg/L	2
welding fumes	Endpoint	Test Duration (hr)	Species	Value	Source
	Not Available	Not Available	Not Available	Not Available	Not Available
Legend:	Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 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				

For Metal:
Atmospheric Fate - Metal-containing inorganic substances generally have negligible vapour pressure and are not expected to partition to air.

Environmental Fate: Environmental processes, such as oxidation, the presence of acids or bases and microbiological processes, may transform insoluble metals to more soluble ionic forms. Environmental processes may enhance bioavailability and may also be important in changing solubilities.

Aquatic/Terrestrial Fate: When released to dry soil, most metals will exhibit limited mobility and remain in the upper layer; some will leach locally into ground water and/ or surface water ecosystems when soaked by rain or melt ice. A metal ion is considered infinitely persistent because it cannot degrade further. Once released to surface waters and moist soils their fate depends on solubility and dissociation in water. A significant proportion of dissolved/ sorbed metals will end up in sediments through the settling of suspended particles. The remaining metal ions can then be taken up by aquatic organisms.

For tungsten and its compounds;

Tungsten and most tungsten compounds have low vapor pressures at 25 C and are expected to exist in the particulate phase in air. Some exceptions are tungsten carbonyl and tungsten hexafluoride. According to a model of gas/particle partitioning of semivolatile organic compounds in the atmosphere, tungsten carbonyl, which has a vapor pressure of 0.1 mm Hg at 20 C, is expected to exist in both vapour and particulate phases in the atmosphere. Tungsten hexafluoride is a gas at room temperature. Vapour- and particulate-phase tungsten compounds may be removed from the air by wet and dry deposition. Tungsten-containing soil can be re-suspended into the atmosphere by wind.

In water, tungsten metal and metal alloys will exist as insoluble solids, while tungsten compounds will exist as ions or insoluble solids .

DO NOT discharge into sewer or waterways.

12.2. Persistence and degradability

Ingredient		Persistence: Water/Soil	Persistence: Air
		No Data available for all ingredients	No Data available for all ingredients

12.3. Bioaccumulative potential

Ingredient		Bioaccumulation
		No Data available for all ingredients

12.4. Mobility in soil

Ingredient		Mobility
		No Data available for all ingredients

12.5. Results of PBT and vPvB assessment

	P	B	T
Relevant available data	Not Available	Not Available	Not Available
PBT	✗	✗	✗
vPvB	✗	✗	✗
PBT Criteria fulfilled?			No
vPvB			No

12.6. Endocrine disrupting properties

No evidence of endocrine disrupting properties were found in the current literature.

12.7. Other adverse effects

No evidence of ozone depleting properties were found in the current literature.

SECTION 13 Disposal considerations

13.1. Waste treatment methods

Product / Packaging disposal	▶ Recycle wherever possible or consult manufacturer for recycling options.
	▶ Consult State Land Waste Management Authority for disposal.
	▶ 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.
Waste treatment options	Not Available
Sewage disposal options	Not Available

SECTION 14 Transport information

Labels Required

Marine Pollutant	NO

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

14.1. UN number or ID number	Not Applicable	
14.2. UN proper shipping name	Not Applicable	
14.3. Transport hazard class(es)	Class	Not Applicable
	Subsidiary Hazard	Not Applicable
14.4. Packing group	Not Applicable	
14.5. Environmental hazard	Not Applicable	
14.6. Special precautions for user	Hazard identification (Kemler)	Not Applicable
	Classification code	Not Applicable
	Hazard Label	Not Applicable
	Special provisions	Not Applicable
	Limited quantity	Not Applicable
	Tunnel Restriction Code	Not Applicable

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

14.1. UN number	Not Applicable	
14.2. UN proper shipping name	Not Applicable	
14.3. Transport hazard class(es)	ICAO/IATA Class	Not Applicable
	ICAO / IATA Subsidiary Hazard	Not Applicable
	ERG Code	Not Applicable
14.4. Packing group	Not Applicable	
14.5. Environmental hazard	Not Applicable	
14.6. Special precautions for user	Special provisions	Not Applicable
	Cargo Only Packing Instructions	Not Applicable
	Cargo Only Maximum Qty / Pack	Not Applicable
	Passenger and Cargo Packing Instructions	Not Applicable
	Passenger and Cargo Maximum Qty / Pack	Not Applicable
	Passenger and Cargo Limited Quantity Packing Instructions	Not Applicable
	Passenger and Cargo Limited Maximum Qty / Pack	Not Applicable

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

14.1. UN number	Not Applicable	
14.2. UN proper shipping name	Not Applicable	
14.3. Transport hazard class(es)	IMDG Class	Not Applicable
	IMDG Subsidiary Hazard	Not Applicable
14.4. Packing group	Not Applicable	
14.5. Environmental hazard	Not Applicable	
14.6. Special precautions for user	EMS Number	Not Applicable
	Special provisions	Not Applicable
	Limited Quantities	Not Applicable

Inland waterways transport (ADN): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

14.1. UN number	Not Applicable	
14.2. UN proper shipping name	Not Applicable	

14.3. Transport hazard class(es)	Not Applicable	Not Applicable
14.4. Packing group	Not Applicable	
14.5. Environmental hazard	Not Applicable	
14.6. Special precautions for user	Classification code	Not Applicable
	Special provisions	Not Applicable
	Limited quantity	Not Applicable
	Equipment required	Not Applicable
	Fire cones number	Not Applicable

14.7. Maritime transport in bulk according to IMO instruments

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

Not Applicable

14.7.2. Transport in bulk in accordance with MARPOL Annex V and the IMSBC Code

Product name	Group
tungsten	Not Available
lanthanum oxide	Not Available
welding fumes	Not Available

14.7.3. Transport in bulk in accordance with the IGC Code

Product name	Ship Type
tungsten	Not Available
lanthanum oxide	Not Available
welding fumes	Not Available

SECTION 15 Regulatory information

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

tungsten is found on the following regulatory lists

- Europe EC Inventory
- European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)
- International WHO List of Proposed Occupational Exposure Limit (OEL) Values for Manufactured Nanomaterials (MNMS)
- Norway regulations on action values and limit values for physical and chemical factors in the work environment and infection risk groups for biological factors (Norwegian)

lanthanum oxide is found on the following regulatory lists

- Europe EC Inventory
- European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)
- International WHO List of Proposed Occupational Exposure Limit (OEL) Values for Manufactured Nanomaterials (MNMS)

welding fumes is found on the following regulatory lists

Not Applicable

Additional Regulatory Information

Not Applicable

This safety data sheet is in compliance with the following EU legislation and its adaptations - as far as applicable - : Directives 98/24/EC, - 92/85/EEC, - 94/33/EC, - 2008/98/EC, - 2010/75/EU; Commission Regulation (EU) 2020/878; Regulation (EC) No 1272/2008 as updated through ATPs.

Information according to 2012/18/EU (Seveso III):

Seveso Category	Not Available
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15.2. Chemical safety assessment

No Chemical Safety Assessment has been carried out for this substance/mixture by the supplier.

National Inventory Status

National Inventory	Status
Australia - AIIC / Australia Non-Industrial Use	Yes
Canada - DSL	Yes
Canada - NDSL	No (tungsten; lanthanum oxide)
China - IECSC	Yes
Europe - EINEC / ELINCS / NLP	Yes
Japan - ENCS	No (tungsten)
Korea - KECI	Yes
New Zealand - NZIoC	Yes
Philippines - PICCS	Yes
USA - TSCA	Yes
Taiwan - TCSI	Yes
Mexico - INSQ	Yes
Vietnam - NCI	Yes
Russia - FBEPH	Yes
Legend:	Yes = All CAS declared ingredients are on the inventory No = One or more of the CAS listed ingredients are not on the inventory. These ingredients may be exempt or will require registration.

SECTION 16 Other information

Revision Date	24/07/2024
Initial Date	19/09/2016

CONTACT POINT

- For quotations contact your local Customer Services - <http://wssdirectory.wilhelmsen.com/#/customerservices> - Responsible for safety data sheet Wilhelmsen Ships Service AS - Prepared by: Compliance Manager, - Email: wss.global.sdsinfo@wilhelmsen.com - Telephone: Tel.: +47 67584000

Full text Risk and Hazard codes

H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.

SDS Version Summary

Version	Date of Update	Sections Updated
3.4	21/06/2024	Exposure controls / personal protection - Exposure Standard, Composition / information on ingredients - Ingredients

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.

For detailed advice on Personal Protective Equipment, refer to the following EU CEN Standards:

- EN 166 Personal eye-protection
- EN 340 Protective clothing
- EN 374 Protective gloves against chemicals and micro-organisms
- EN 13832 Footwear protecting against chemicals
- EN 133 Respiratory protective devices

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
 - ES: Exposure Standard
 - 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
 - DNEL: Derived No-Effect Level
 - PNEC: Predicted no-effect concentration
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- AIIC: Australian Inventory of Industrial Chemicals
 - DSL: Domestic Substances List
 - NDSL: Non-Domestic Substances List
 - IECSC: Inventory of Existing Chemical Substance in China
 - EINECS: European INventory of Existing Commercial chemical Substances
 - ELINCS: European List of Notified Chemical Substances
 - NLP: No-Longer Polymers
 - ENCS: Existing and New Chemical Substances Inventory
 - KECI: Korea Existing Chemicals Inventory
 - NZIoC: New Zealand Inventory of Chemicals
 - PICCS: Philippine Inventory of Chemicals and Chemical Substances
 - TSCA: Toxic Substances Control Act
 - TCSI: Taiwan Chemical Substance Inventory
 - INSQ: Inventario Nacional de Sustancias Químicas
 - NCI: National Chemical Inventory
 - FBEPH: Russian Register of Potentially Hazardous Chemical and Biological Substances

Classification and procedure used to derive the classification for mixtures according to Regulation (EC) 1272/2008 [CLP]

Classification according to regulation (EC) No 1272/2008 [CLP] and amendments	Classification Procedure
Carcinogenicity Category 1A, H350	Calculation method

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