TUNGSTEN (-180, -182, -183, -184, -186) OXIDE

Chemwatch: **4042-23**
Version No: **4.1.1.1**
Safety Data Sheet according to OSHA HazCom Standard (2012) requirements

Issue Date: **01/01/2013**
Print Date: **8/18/2016**
Initial Date: **Not Available**
S.GHS.USA.EN

SECTION 1 IDENTIFICATION

Product Identifier

Product name	TUNGSTEN OXIDE
Chemical Name	Tungsten oxide
Synonyms	Tungsten oxide
Chemical formula	WO_3
Other means of identification	Not Available
CAS number	1314-35-8

Relevant identified uses of the substance

	Research and medical applications

Details of the manufacturer

Registered company name	Oak Ridge National Laboratory
Address	P.O. Box 2008, Oak Ridge, Tennessee 37831-6158
Telephone	(865) 574-6984
Fax	(865) 574-6986
Website	http://isotopes.gov/
Email	isotopes@ornl.gov

Emergency telephone number

Association / Organization	Oak Ridge National Laboratory
Emergency telephone numbers	865-574-6606
Other emergency telephone numbers	CHEMTREC: 1-800-424-9300

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

CHEMWATCH HAZARD RATINGS

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

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

	Not Applicable

Label elements

	Not Applicable

Hazard statement(s)

Not Applicable

Precautionary statement(s) Prevention

Continued...

Not Applicable

Precautionary statement(s) Response

Not Applicable

Precautionary statement(s) Storage

Not Applicable

Precautionary statement(s) Disposal

Not Applicable

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

CAS No	%[weight]	Name
1314-35-8	100	tungsten oxide

Mixtures

See section above for composition of Substances

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	If this product comes in contact with the eyes: ▪ Wash out immediately with fresh running water. ▪ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. ▪ Seek medical attention without delay; if pain persists or recurs seek medical attention. ▪ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin or hair contact occurs: ▪ Flush skin and hair with running water (and soap if available). ▪ Seek medical attention in event of irritation.
Inhalation	▪ If dust is inhaled, remove from contaminated area. ▪ Encourage patient to blow nose to ensure clear passage of breathing. ▪ If irritation or discomfort persists seek medical attention.
Ingestion	▪ If swallowed do **NOT** induce vomiting. ▪ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. ▪ Observe the patient carefully. ▪ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. ▪ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. ▪ Seek medical advice.

Indication of any immediate medical attention and special treatment needed

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

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

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

Special hazards arising from the substrate or mixture

	None known.

Advice for firefighters

Fire Fighting	▪ Alert Fire Brigade and tell them location and nature of hazard. ▪ Wear breathing apparatus plus protective gloves in the event of a fire. ▪ Prevent, by any means available, spillage from entering drains or water courses. ▪ Use firefighting procedures suitable for surrounding area.
Fire/Explosion Hazard	▪ Noncombustible. ▪ Not considered a significant fire risk, however containers may burn. Decomposition may produce toxic fumes of; metal oxides, tungsten. May emit poisonous fumes.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

	▪ Remove all ignition sources. ▪ Clean up all spills immediately.

Continued...

	▪ Avoid contact with skin and eyes. ▪ Control personal contact with the substance, by using protective equipment.
Major Spills	Moderate hazard. ▪ **CAUTION**: Advise personnel in area. ▪ Alert Emergency Services and tell them location and nature of hazard. ▪ Control personal contact by wearing protective clothing.

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

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	▪ Avoid all personal contact, including inhalation. ▪ Wear protective clothing when risk of exposure occurs. ▪ Use in a well-ventilated area. ▪ Prevent concentration in hollows and sumps.
Other information	▪ Store in original containers. ▪ Keep containers securely sealed. ▪ Store in a cool, dry, well-ventilated area. ▪ Store away from incompatible materials and foodstuff containers.

Conditions for safe storage, including any incompatibilities

Suitable container	▪ Polyethylene or polypropylene container. ▪ Check all containers are clearly labelled and free from leaks.
Storage incompatibility	▪ WARNING: Avoid or control reaction with peroxides. All *transition metal* peroxides should be considered as potentially explosive. For example transition metal complexes of alkyl hydroperoxides may decompose explosively. ▪ The pi-complexes formed between chromium(0), vanadium(0) and other transition metals (haloarene-metal complexes) and mono-or poly-fluorobenzene show extreme sensitivity to heat and are explosive.

PACKAGE MATERIAL INCOMPATIBILITIES

Not Available

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
US ACGIH Threshold Limit Values (TLV)	tungsten oxide	Tungsten, as W - Metal and insoluble compounds	5 mg/m3	10 mg/m3	Not Available	TLV® Basis: LRT irr
US ACGIH Threshold Limit Values (TLV)	tungsten(VI) oxide	Tungsten, as W - Metal and insoluble compounds	5 mg/m3	10 mg/m3	Not Available	TLV® Basis: LRT irr
US ACGIH Threshold Limit Values (TLV)	tungsten(IV) oxide	Tungsten, as W - Metal and insoluble compounds	5 mg/m3	10 mg/m3	Not Available	TLV® Basis: LRT irr

EMERGENCY LIMITS

Ingredient	Material name	TEEL-1	TEEL-2	TEEL-3
tungsten(VI) oxide	Tungsten trioxide; (Tungsten(VI) oxide)	13 mg/m3	13 mg/m3	210 mg/m3
tungsten(IV) oxide	Tungsten(IV) oxide	12 mg/m3	130 mg/m3	790 mg/m3

Ingredient	Original IDLH	Revised IDLH
tungsten oxide	Not Available	Not Available
tungsten(VI) oxide	Not Available	Not Available
tungsten(IV) oxide	Not Available	Not Available

Exposure controls

Appropriate engineering controls	Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection. The basic types of engineering controls are: Process controls which involve changing the way a job activity or process is done to reduce the risk. Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment.
Personal protection	
Eye and face protection	▪ Safety glasses with side shields ▪ Chemical goggles. ▪ Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of

Continued...

	▪ Chemicals in use and an account of injury experience.
Skin protection	See Hand protection below
Hands/feet protection	The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material cannot be calculated in advance and has therefore to be checked prior to the application. The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and. has to be observed when making a final choice. Suitability and durability of glove type is dependent on usage.
Body protection	See Other protection below
Other protection	▪ Overalls. ▪ P.V.C. apron. ▪ Barrier cream.
Thermal hazards	Not Available

Recommended material(s)

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:
"Forsberg Clothing Performance Index".
The effect(s) of the following substance(s) are taken into account in the computer generated selection:
TUNGSTEN OXIDE Not Available

Material	CPI

* CPI - Chemwatch Performance Index
A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion
NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -
* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

Respiratory protection

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	P1 Air-line*	- -	PAPR-P1 -
up to 50 x ES	Air-line**	P2	PAPR-P2
up to 100 x ES	-	P3	-
		Air-line*	-
100+ x ES	-	Air-line**	PAPR-P3

* - Negative pressure demand ** - Continuous flow
A(All classes) = Organic vapors, B AUS 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)

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

	Yellow powder

Physical state	Solid	**Relative density (Water = 1)**	Not Available
Odor	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odor threshold	Not Available	**Auto-ignition temperature (°C)**	Not Available
pH (as supplied)	Not Applicable	**Decomposition temperature**	Not available.
Melting point / freezing point (°C)	1473	**Viscosity (cSt)**	Not Applicable
Initial boiling point and boiling range (°C)	Not Available	**Molecular weight (g/mol)**	231.85
Flash point (°C)	Not Available	**Taste**	Not Available
Evaporation rate	Not Applicable	**Explosive properties**	Not Available
Flammability	Not Available	**Oxidizing properties**	Not Available
Upper Explosive Limit (%)	Not available.	**Surface Tension (dyn/cm or mN/m)**	Not Applicable
Lower Explosive Limit (%)	Not Available	**Volatile Component (%vol)**	Negligible
Vapor pressure (kPa)	Negligible	**Gas group**	Not Available
Solubility in water (g/L)	Immiscible	**pH as a solution**	Not Applicable
Vapor density (Air = 1)	>1	**VOC g/L**	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	▪ Unstable in the presence of incompatible materials. ▪ Product is considered stable. ▪ Hazardous polymerization will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7

Continued...

	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhaled	The material is not thought to produce either adverse health effects or irritation of the respiratory tract following inhalation (as classified by EC Directives using animal models). Nevertheless, adverse systemic effects have been produced following exposure of animals by at least one other route and good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting. Tungsten is relatively inert and produces few respiratory effects.
Ingestion	Accidental ingestion of the material may be damaging to the health of the individual. If given orally, tungsten can accumulate in the spleen, kidney and liver. Symptoms of poisoning include diarrhea, stoppage of breathing and circulatory collapse leading to death.
Skin Contact	The material is not thought to produce adverse health effects or skin irritation following contact (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting. Open cuts, abraded or irritated skin should not be exposed to this material 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.
Eye	Although the material is not thought to be an irritant (as classified by EC Directives), direct contact with the eye may cause transient discomfort characterized by tearing or conjunctival redness (as with windburn). Slight abrasive damage may also result.
Chronic	Long-term exposure to the product is not thought to produce chronic effects adverse to the health (as classified by EC Directives using animal models); nevertheless exposure by all routes should be minimized as a matter of course. Long term exposure to high dust concentrations may cause changes in lung function i.e. pneumoconiosis; caused by particles less than 0.5 micron penetrating and remaining in the lung.

tungsten oxide	dermal (rat) LD50: >2000 mg/kg[1]	Not Available
	Oral (rat) LD50: >2000 mg/kg[1]	
tungsten(VI) oxide	dermal (rat) LD50: >2000 mg/kg[1]	Not Available
	Oral (rat) LD50: 1059 mg/kgd[2]	
tungsten(IV) oxide	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*	

TUNGSTEN(VI) OXIDE	Somnolence, excitement, muscle weakness recorded.
TUNGSTEN(IV) OXIDE	Tungsten can cause a reduction in body temperature, and enlargement of the adrenal glands and kidneys if injected. Death may occur if it is given directly into the abdominal cavity. No significant acute toxicological data identified in literature search.
TUNGSTEN OXIDE, TUNGSTEN(VI) OXIDE	Tungsten can cause a reduction in body temperature, and enlargement of the adrenal glands and kidneys if injected. Death may occur if it is given directly into the abdominal cavity.

Acute Toxicity	⊘	**Carcinogenicity**	⊘
Skin Irritation/Corrosion	⊘	**Reproductivity**	⊘
Serious Eye Damage/Irritation	⊘	**STOT - Single Exposure**	⊘
Respiratory or Skin sensitization	⊘	**STOT - Repeated Exposure**	⊘
Mutagenicity	⊘	**Aspiration Hazard**	⊘

Legend: ✔ *– Data required to make classification available*
✖ *– Data available but does not fill the criteria for classification*
⊘ *– Data Not Available to make classification*

CMR STATUS

Not Applicable

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

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 form in air. Some exceptions are tungsten carbonyl, which is expected to exist in both vapor and particulate phases in the atmosphere, and tungsten hexafluoride, which exists as a gas at room temperature. Vapor- and particulate-phase tungsten compounds may be removed from the air by wet and dry deposition. Soil containing tungsten can be re-suspended into the atmosphere by wind.

Continued...

Persistence and degradability

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

Bioaccumulative potential

Ingredient	Bioaccumulation
	No Data available for all ingredients

Mobility in soil

Ingredient	Mobility
	No Data available for all ingredients

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

	Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked. A Hierarchy of Controls seems to be common - the user should investigate: ▪ Reduction ▪ Reuse ▪ Recycling ▪ Disposal (if all else fails) This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use.

SECTION 14 TRANSPORT INFORMATION

Labels Required

	NO

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

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

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

SECTION 15 REGULATORY INFORMATION

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

tungsten(VI) oxide(1314-35-8) is found on the following regulatory lists	"US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants","US - Hawaii Air Contaminant Limits","US - California Permissible Exposure Limits for Chemical Contaminants","US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants","US - Oregon Permissible Exposure Limits (Z-1)","US - Michigan Exposure Limits for Air Contaminants","US - Alaska Limits for Air Contaminants","US - Washington Permissible exposure limits of air contaminants","US - Minnesota Permissible Exposure Limits (PELs)","US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants","US ACGIH Threshold Limit Values (TLV)","US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory"

SECTION 16 OTHER INFORMATION

Other information

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

The 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.