

MATERIAL SAFETY DATA SHEET

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SECTION 1: MATERIAL IDENTIFICATION

NAME: Tungsten Welding Electrodes

SYNONYMS: Pure Tungsten (Wolfram) Welding Electrodes
Zirconiated (Zirconium Oxide) Tungsten Welding Electrodes
1% and 2% Thoriated (Thorium Oxide, Thorium Dioxide) Tungsten Welding Electrodes

CAS REGISTRATION NUMBERS: Tungsten - 7440-33-7
Zirconium Oxide - 1314-23-4
Thorium Oxide - 1314-20-1

CHEMICAL FAMILY: Refractory Metals

FORMULAS: Tungsten - W
Zirconium Oxide - ZrO_2
Thorium Oxide - ThO_2

SECTION 2: HAZARDOUS INGREDIENTS

The terms 'hazardous' and 'hazardous materials' as used within this MSDS should be interpreted as defined by, and in accordance with, the OSHA Hazard Communication Standard (29 CFR Part 1910, 1200) including cited Appendices, Lists, References, etc., all of which are hereby incorporated by reference and stated below as appropriate.

PRODUCTS	Nominal Composition		
	W	ZrO_2	ThO_2
Pure Tungsten Welding Electrode	>99.9 %	---	---
Zirconiated Tungsten Welding Electrode	>99.6 %	0.25 %	---
1% Thoriated Tungsten Welding Electrode	>98.7 %	---	1.2 %
2% Thoriated Tungsten Welding Electrode	>97.7 %	---	2.2 %

INGREDIENT	OSHA PEL	ACGIH TWA	ACGIH STEL	Alabama Radiation Control
Tungsten (W)	---	5 mg/m ³	10 mg/m ³	---
Zirconium Oxide (ZrO_2) As Zirconium	5 mg/m ³	5 mg/m ³	10 mg/m ³	---
Thorium Oxide (ThO_2) [*]	---	---	---	1×10^{-12} ($\mu Ci/ml$)

The above are for dusts, fumes, and mists in air.

^{*}Thorium is a naturally occurring radioactive element, emitting primarily alpha radiation. Its decay products emit both alpha and gamma radiation. For further information on exposure limits and licensing requirements, consult Title 10 CFR Parts 20 and 40.

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SECTION 3: PHYSICAL DATA

Melting Point: Approximately 3400° C
Boiling Point: Approximately 5900° C
Vapor Pressure: N/A at 25° C
Vapor Density (air = 1): N/A
Percent, Volatile by Volume: N/A
Radioactive Isotope: Th-232

Solubility in Water: Insoluble
Specific Gravity (H₂O = 1): Approximately 19
Molecular Weights: Tungsten - 183.85
Zirconium Oxide - 123.22
Thorium Oxide - 264
Appearance and Odor: Tin-White metal. No odor.

SECTION 4: FIRE AND EXPLOSION DATA

These welding electrodes do not readily burn. For ordinary conditions they can be considered non-flammable. However, welding arcs and sparks can ignite flammable liquids, vapors, and combustible solids.

Tungsten dust (from grinding, for example) may present a moderate fire hazard if allowed to accumulate.

Flash Point: N/A

Flammable Limits in Air: N/A

Extinguishing Media: For the surrounding fire. For tungsten dust fires use Class D extinguishing media, dry powders.

Special Fire Fighting Procedures: For a tungsten dust fire confined to a small area, use a respirator approved for toxic dusts and fumes. For a large fire, fire fighters should use self-contained breathing apparatus.

Unusual Fire and Explosion Hazards: When tungsten is heated in air, tungsten trioxide (TWA 5 mg/m³ (as W)) begins to sublime above 750°C.

SECTION 5: HEALTH HAZARD DATA

Primary Route(s) of Entry: Inhalation, skin contact, percutaneous absorption (of thorium) or eye contact with the dust or fume or mist (from coolants during cutting operations, etc.).

Effects of Overexposure: No specific data, testing or information has been found for the chemical compound(s) that comprise this product. Accordingly, general source comments are made below for the elements included in its composition.

Inhalation of tungsten dusts, fume, or mists may or may not cause transient or permanent lung damage. The skin may be irritated by dust, fume, or mists containing tungsten.

Thorium and its isotopes are toxic radiologically, but the chemical toxicity of thorium is low. Poorly absorbed by gastro-intestinal tract (0.01%), formation of particulate or colloidal forms of thorium following absorption, and being slowly excreted from the body through phagocytosis by the reticuloendothelial system, may account for its low toxicity.

Electric Shock can kill. See **Safety In Welding and Cutting**, OSHA requirements in 29 CFR 1910 and ANSI Z49.1.

No inhalation hazard is possible from solid, formed parts. If powder or dust may be generated, as from machining or polishing operations, exposure in excess of the NRC limits may increase risk of lung cancer.

The light from the arc can cause eye damage, inflammation of the mucous membrane covering the eye and eyelids (flash burn), and skin damage.

The light from the arc or the arc itself, can decompose chlorinated hydrocarbon solvents into dangerous concentrations of toxic gases such as phosgene (TLV 0.1 ppm) even if the chlorinated hydrocarbon solvent concentration is below its TLV.

The light from the arc or the arc itself, can produce ozone, (TLV 0.1 ppm), oxides the nitrogen (TWA 3 ppm with 5 ppm ceiling) and carbon monoxide (TLV 50 ppm), all of which are hazardous.

The fumes and gases from the welding and high temperature cutting will depend upon the composition of the metal being welded, the process, procedures, the electrode used, coating (such a lead based paint), filler metal being used, the flux being used, and other factors. The fumes may include oxides, chromites, fluorides, and other hazardous materials. The hazards in the welding environment must be considered case by case. See the Material Safety Sheets and your safety director for all materials involved in a particular operation.

Medical Conditions Aggravated by Exposure: Chronic respiratory diseases and asthma may be aggravated by exposure to dust, fume, or mists. Other conditions that may be aggravated are not known and will depend upon conditions during electrode use.

Carcinogenic Assessment (NTP, IARC, OSHA, Other): Although not listed as a carcinogen, it is reported by some authorities that thorium taken internally (by respiratory action, ingestion, by adsorption under the skin) is carcinogenic because of its radioactive Thorium and zirconium are not listed as either a known or suspect carcinogen by NTP, IARC, or OSHA.