MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards .This Material Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard (29 CFR 1910.1200). Other government regulations must be reviewed for applicability to these products.

WARNING: PRODUCT COMPONENTS PRESENT HEALTH AND SAFETY HAZARDS. READ AND UNDERSTAND THIS MATERIAL SAFETY DATA SHEET (M.S.DS.). ALSO, FOLLOW YOUR EMPLOYER'S SAFETY PRACTICES. This product may contain Chromium and/or Nickel which are listed by OSHA, NTP, or IARC as being a carcinogen or potential carcinogen. Use of this product may expose you or others to fumes and gases at levels exceeding those established by the American Conference of Governmental Industrial Hygienists (ACGIH) or the Occupational Safety and Health Administration (OSHA) The information contained herein relates only to the specific product. If the product is combined with other materials, all component properties must be considered. **BE SURE TO CONSULT THE LATEST VERSION OF THE MSDS. MATERIAL SAFETY DATA SHEETS ARE AVAILABLE FROM HARRIS PRODUCTS GROUP** salesinfo@jwharris.com 513-754-2000 **www.harrisproductsgroup.com**

STATEMENT OF LIABILITY-DISCLAIMER

To the best of the Harris Products Group knowledge, the information and recommendations contained in this publication are reliable and accurate as of the date prepared. However, accuracy, suitability, or completeness are not guaranteed, and no warranty, guarantee, or representation, expressed or implied, is made by Harris Products Group. as to the absolute correctness or sufficiency of any representation contained in this and other publications; Harris Products Group. assumes no responsibility in connection therewith; nor can it be assumed that all acceptable safety measures are contained in this and other publications, or that other or additional measures may not be required under particular or exceptional conditions or circumstances . Data may be changed from time to time.

PART I *What is the material and what do I need to know in an emergency*

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED): **TUNGSTEN ELECTRODES FOR WELDING**
CHEMICAL NAME/CLASS: Tungsten; Element
SYNONYMS: Wolfram
PRODUCT USE: Welding; Metal-Working Operations
DOCUMENT NUMBER: 0001
SUPPLIER/MANUFACTURER'S NAME: **HARRIS PRODUCTS GROUP.**
4501 Quality Place Mason, Ohio 45040
EMERGENCY PHONE: CHEMTREC: 1-800-424-9300
BUSINESS PHONE: 513-754-2000 **FAX** 513-754-8778
DATE OF PREPARATION: July 12, 2007

2. COMPOSITION and INFORMATION ON INGREDIENTS

NOMINAL COMPOSITION WEIGHT % ELECTRODES						
TRADE NAME	W	CeO_2	La_2O_3	ThO_2	ZrO_2	Other Oxides or Elements Total
Pure Tungsten	99.5					0.5
1% Thoriated Tungsten	98.3			0.8-1.2		0.5
2% Thoriated Tungsten	97.3			1.7-2.2		0.5
1% Lanthanated Tungsten	98.3		0.8-1.2			0.5
1.5% Lanthanated Tungsten	97.8		1.3-1.7			0.5
2% Lanthanated Tungsten	97.3		1.8-2.2			0.5
Ceriated Tungsten	97.3	1.8-2.2				0.5
Zirconiated Tungsten	99.1				0.15-0.40	0.5

2. COMPOSITION and INFORMATION ON INGREDIENTS (Continued)

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL			OTHER
			TWA mg/m^3	STEL mg/m^3	TWA mg/m^3	STEL mg/m^3	IDLH mg/m^3	mg/m^3
Tungsten The exposure limits provided are for "Tungsten and Insoluble Compounds"	7440-33-7	97.3-99.5 See Table in Previous Page	5	10	5 (Vacated 1989 PEL)	10 (Vacated 1989 PEL)	NE	NIOSH RELs TWA = 5 STEL = 10
Lanthanum Oxide (La_2O_3)	1312-81-8	See Table in Previous Page	NE	NE	NE	NE	NE	NE
Cerium Oxide (CeO_2)	1306-38-3	See Table in Previous Page	NE	NE	NE	NE	NE	NE
Thorium Oxide (ThO_2)	1314-20-1	See Table in Previous Page	NE	NE	NE	NE	NE	Carcinogenicity: IARC-1
Zirconium Oxide (ZrO_2) The exposure limits provided are for "Zirconium Compounds, as Zr" (CAS # 7440-67-7)	1314-23-4	See Table in Previous Page	5, A4 (Not Classifiable as a Human Carcinogen)	10, A4 (Not Classifiable as a Human Carcinogen)	5	10 (Vacated 1989 PEL)	50 (as Zr)	NIOSH RELs TWA = 5 STEL = 10 DFG MAKs: TWA = 5 (MAK measured as the inhalable fraction of the aerosol) PEAK = 10 MAK 30 min., average value Carcinogenicity: TLV-A4
Other components each present in less than 1 percent concentration (0.1% concentration for potential carcinogens, reproductive toxins, respiratory tract sensitizers, and mutagens).			None of the other components contribute significant additional hazards at the concentrations present in these products. All pertinent hazard information has been provided in this document, per the requirements of the Federal Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalent Standards; Canadian Workplace Hazardous Materials Identification System Standards (CPR 4); and the applicable Council Directives of the European Community.					

NE = Not Established. See Section 16 for Definitions of Terms Used.

NOTE (1): The ACGIH has an established exposure limit for Welding Fumes, Not Otherwise Classified. The Threshold Limit Value is 5 mg/m^3. NIOSH classifies welding fumes as carcinogens.

NOTE (2): ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. These products has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: These products are hard, brittle, silvery-gray metal electrodes. The chief health hazard associated with these products would be the inhalation of fumes generated by welding or dusts and powdered, formed if grinding operations are performed on the product. Those electrodes that contain Thorium Oxide have a special hazard if dusts or powders are produced and inhaled during use or grinding of tips of the electrodes, as thorium compounds are suspected of being cancer-causing compounds. When exposed to extremely high temperatures, these products will produce irritating oxides of cerium, thorium, tungsten and zirconium. These electrodes present no significant fire hazard; however finely divided metal powder which may be generated during grinding of the tips of electrodes, is highly flammable (especially when exposed to oxidizing compounds at elevated temperatures). In some circumstances, powdered tungsten can be spontaneously flammable. Emergency responders must wear the proper personal protective equipment (and have appropriate fire-extinguishing protection) suitable for the situation to which the are responding.

3. HAZARD IDENTIFICATION (Continued)

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of over-exposure to these products is inhalation of fumes generated during welding operations or of dusts generated by grinding operations.

INHALATION: Inhalation is not a significant route of over-exposure to the electrodes. Inhalation of fumes generated from welding operations and to powders generated by grinding of the electrode tips, can cause irritation of the nose, throat, and respiratory system. Symptoms of such over-exposure can include sneezing, coughing, and a sore throat. Inhalation of Tungsten fumes has the potential for causing transient or permanent lung damage. Additionally, short-term over-exposure to welding fumes may result in discomfort, dizziness, nausea, and irritation of the eyes, nose, and throat. Chronic inhalation of large amounts of particulates generated by these products during metal processing operations can result in pneumoconiosis (a disease of the lungs).

CONTACT WITH SKIN or EYES: Contact with skin and eyes can be irritating, especially areas which have been over-exposed to Tungsten powders. Symptoms of skin contact include irritation and redness; prolonged or repeated skin over-exposures to Tungsten powders can lead to dermatitis. Symptoms of eye contact include pain, redness, irritation, and tearing.

SKIN ABSORPTION: Skin absorption is not a significant route of over-exposure for these products, or their components.

INGESTION: Not applicable.

INJECTION: Not applicable.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH	(BLUE)	1
FLAMMABILITY	(RED)	0
REACTIVITY	(YELLOW)	0
PROTECTIVE EQUIPMENT		B

EYES	RESPIRATORY	HANDS	BODY
	See Section 8		See Section 8

For routine industrial applications

See Section 16 for Definition of Ratings

OTHER HEALTH EFFECTS: Some of these products contain Thorium Oxide, which is a low-level radioactive material. Studies performed by the International Institute of Welding have shown that these electrodes do not present any radiation risks during normal use, storage, welding or disposal of residues of these products. However, during grinding of electrode tips there is generation of radioactive dusts, which present a hazard through inhalation.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms.

ACUTE: The chief health hazard associated with these products would be inhalation of fumes generated during welding, or inhalation of powders generated during grinding of electrode tips. Symptoms of acute inhalation of fumes generated during welding include irritation of the nose, throat, and respiratory system.

CHRONIC: Chronic inhalation of large amounts of particulates generated by these products during metal processing operations can result in pneumoconiosis (a disease of the lungs). Prolonged or repeated skin over-exposures to Tungsten powders can lead to dermatitis. Inhalation of Tungsten fumes during welding operations has the potential for causing transient or permanent lung damage. A component of some of these electrodes contain Thorium Oxide, which is a known human carcinogen, and which is a low-level radioactive emitter. If dusts from these electrodes are generated and inhalation, there is risk of long-term effects. See Section 11, Toxicological Information, for further information.

TARGET ORGANS: ACUTE: Skin and eyes, respiratory system. CHRONIC: Respiratory system, skin.

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

Victims of chemical exposure must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take a copy of label and MSDS to health professional with victim.

SKIN EXPOSURE: If dusts or powders from these products contaminates the skin, immediately begin decontamination with running water if any adverse effect occurs. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek medical attention if any adverse reaction occurs..

EYE EXPOSURE: If the powder or particulates from these products enter the eyes, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes.

4. FIRST-AID MEASURES (continued)

INHALATION: If powders generated from grinding of the tips of these electrodes are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Remove or cover gross contamination to avoid exposure to rescuers.

INGESTION: If swallowed call physician immediately! Do not induce vomiting unless directed by medical personnel. Rinse mouth with water if person is conscious. Never give fluids or induce vomiting if person is unconscious, having convulsions, or not breathing.

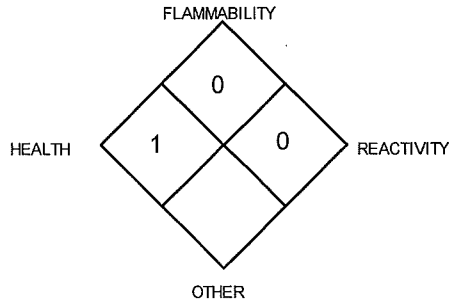
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Skin disorders may be aggravated by prolonged over-exposures to fumes generated during welding or to powders generated during grinding of tips of the electrodes. Chronic over-exposure to Tungsten powders via inhalation can aggravate lung disorders.

RECOMMENDATIONS TO PHYSICIANS: When personnel have chronic exposure to dusts from electrodes that contain Thorium Oxide, monitoring of personnel for early symptoms and changes such as abnormal leukocytes in the blood smear may be of value. In cases of chronic or acute exposure, the determination of thorium in the urine or the use of whole body radiation counts & breath radon are useful methods of monitoring the exposure dose and excretion rates.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not flammable.
AUTOIGNITION TEMPERATURE: Not flammable.
FLAMMABLE LIMITS (in air by volume, %):
Lower (LEL): Not applicable.
Upper (UEL): Not applicable.

NFPA RATING:



See Section 16 for Definition of Ratings

FIRE EXTINGUISHING MATERIALS:
For Electrode: Not flammable. Use the extinguishing media appropriate for the fire.

Water Spray: YES	Carbon Dioxide: YES
Foam: YES	Dry Chemical: YES
Halon: YES	Other: Any "ABC" Class.

For Powders of Tungsten: Powders of Tungsten are considered to be a Class D Fires. Use Soda-Ash, Lime, DRY Sand (Purple K, if available).

UNUSUAL FIRE AND EXPLOSION HAZARDS: When Thorium Oxide-containing electrodes are involved in a fire, incipient fire-fighters must wear a respirator approved for radionuclides. When exposed to extremely high temperatures, these products will produce irritating oxides of cesium, thorium, tungsten and zirconium (depending on composition - see Section 2, Composition and Information on Ingredients). These electrodes present no significant fire hazard. Finely-divided tungsten powder, however, is highly flammable (especially when exposed to oxidizing compounds at elevated temperatures).

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: The finely divided powders of these products may ignite if exposed to static electrical discharge.

SPECIAL FIRE-FIGHTING PROCEDURES: Not applicable.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Not applicable.

PART III *How can I prevent hazardous situations from occurring*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: After the end of work shift, hands and other exposed skin should be thoroughly washed. Do not eat or drink during use of these products. Use ventilation and other engineering controls to minimize potential exposure to fumes during welding operations or to dusts if tips of electrodes are ground. Follow good house-keeping practices to ensure powders or dusts from grinding operations do not accumulate, which can be highly flammable and can pose special health hazards if from thorium-containing electrodes. Tungsten-Thorium Oxide alloys are generally safe to handle during use and almost all normal conditions and environments. **Special precautions must be taken during the grinding or machining of tips of electrodes that contain Thorium Oxide to avoid the generation and subsequent inhalation of dusts from these operations. Any dusts generated during these operations may be considered as "Source Material", as defined by the Nuclear Regulatory Commission, and therefore be subject to the requirements of 10 CFR,** Parts 20 and 40. Routine wet-mopping or vacuuming with an explosion-proof vacuum, fitted with a HEPA filter may be considered to reduce accumulation of dusts.

7. HANDLING and STORAGE (Continued)

STORAGE AND HANDLING PRACTICES: All employees who handle these materials should be trained to handle it safely. Avoid breathing dusts or powders generated during grinding of electrode tips. Open packages and containers of these products slowly, on a stable surface. Packages and containers of these products must be properly labeled.

When these products are used during welding operations, follow the requirements of the Federal Occupational Safety and Health Welding and Cutting Standard (29 CFR 1910 Subpart Q) and the safety standards of the American National Standards Institute for welding and cutting (ANSI Z49.1). Empty containers, which held these products, may still contain dusts from the products; therefore, such containers should be handled with care.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Not applicable.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure limits are below those provided in Section 2 (Composition and Information on Ingredients). Use a mechanical fan or vent area to outside. Prudent practice is to ensure eyewash/safety shower stations are available near areas where these products is used.

RESPIRATORY PROTECTION: Maintain airborne contaminant concentrations below exposure limits listed in Section 2 (Composition and Information on Ingredients). If respiratory protection is needed (i.e. a Weld Fume Respirator, or Air-Line Respirator for welding in confined spaces), U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the Canadian CSA Standard Z94.4-93 and applicable standards of Canadian Provinces. Respiratory Protection is recommended to be worn during welding operations. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998). The following are NIOSH Guidelines for respirator selection for Welding Fumes.

CONCENTRATION	RESPIRATORY PROTECTION EQUIPMENT
At Concentrations above the NIOSH REL, or where there is no REL, at any Detectable Concentration:	Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode, or any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Escape:	Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter, or any appropriate escape-type, self-contained breathing apparatus

In addition, in areas in which electrodes which contain Thorium-Oxide are involved in operations such as grinding of tips or other metal working operations are performed and dusts are generated, the use of an appropriate NIOSH approved respirator, equipped with radionuclide filters should be used.

EYE PROTECTION: Safety glasses. When used in conjunction with welding, wear safety glasses, goggles or face-shield with filter lens of appropriate shade number (per ANSI Z49.1-1988, "Safety in Welding and Cutting"), as necessary.

HAND PROTECTION: Wear gloves for routine industrial use When used in conjunction with welding, wear gloves that protect from sparks and flame (per ANSI Z49.1-1988, "Safety in Welding and Cutting"), as necessary.

BODY PROTECTION: Use body protection appropriate for task.

9. PHYSICAL and CHEMICAL PROPERTIES

RELATIVE VAPOR DENSITY (air = 1): Not applicable.
SPECIFIC GRAVITY (water = 1): 19.3
SOLUBILITY IN WATER: Insoluble.
VAPOR PRESSURE, mm Hg @ 20°C: Approximately 0.
ODOR THRESHOLD: Not available.
EVAPORATION RATE (nBuAc = 1): Not applicable.
FREEZING/MELTING POINT: 3410°C (6170°F)
BOILING POINT: 5927°C (10701°F)
pH: Not applicable.
COEFFICIENT OF OIL/WATER DISTRIBUTION (PARTITION COEFFICIENT): Not applicable.
APPEARANCE AND COLOR: These products are a hard, brittle, silvery-gray metal electrodes.
HOW TO DETECT THIS SUBSTANCE (warning properties): The appearance is a distinctive characteristic of these product in event of accidental release.

10. STABILITY and REACTIVITY

STABILITY: Normally stable. Thorium Oxide, which is a component of some of these products, will undergo spontaneous radioactive decay.

DECOMPOSITION PRODUCTS: Exposure to elevated temperatures and oxidizers will lead to the production of tungsten oxide compounds.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Tungsten is not compatible with halogens and strong oxidizers (i.e. sulfuric acid, nitric acid).

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Avoid exposure to extreme temperatures and incompatible chemicals.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: Presented below are human toxicological data available for the components of these products present in concentration greater than 1%. Other data for animals are available for the components of these products, but are not presented in this Material Safety Data Sheet.

CESIUM OXIDE:
No human data currently available.

LANTHANUM OXIDE:
No human data currently available.

THORIUM OXIDE:
TDLo (Parenteral-Woman) 1 gm/kg: Tumorigenic: Carcinogenic by RTECS criteria; Liver: tumors
TDLo (Unreported-Human) 2880 mg/kg: Tumorigenic: neoplastic by RTECS criteria; Liver: tumors
TDLo (Intraarterial-Human) 490 mg/kg: Tumorigenic: Carcinogenic by RTECS criteria, tumors at site of application
TD (Parenteral-Human) 700 mg/kg: Tumorigenic: neoplastic by RTECS criteria; Liver: angiosarcoma; Blood: tumors

THORIUM OXIDE (continued):
TD (Parenteral-Human) 1260 mg/kg: Tumorigenic: neoplastic by RTECS criteria; Liver: angiosarcoma; Blood: tumors
TD (Parenteral-Woman) 2350 mg/kg: Tumorigenic: Carcinogenic by RTECS criteria; Kidney, Ureter, Bladder: Kidney tumors
TD (Intraarterial-Man) 1190 mg/kg: Tumorigenic: Carcinogenic by RTECS criteria; Liver: tumors; Blood: lymphoma, including Hodgkin's disease

THORIUM OXIDE (continued):
TD (Intraarterial-Woman) 2 gm/kg: Tumorigenic: Carcinogenic by RTECS criteria, tumors at site of application
TD (Intraarterial-Human) 1302 mg/kg: Tumorigenic: Carcinogenic by RTECS criteria; Liver: tumors, angiosarcoma

TUNGSTEN:
No human data currently available.

ZIRCONIUM OXIDE:
No human data currently available.

SUSPECTED CANCER AGENT: The components of these products are listed as follows:

THORIUM OXIDE, a component of some of these products, is listed by IARC as a Group 1 compound (Carcinogenic to Humans - Sufficient Evidence of Carcinogenicity).

The other components of these products are not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, CAL/OSHA and is therefore not considered to be, nor suspected to be, a cancer-causing agent by these agencies.

IRRITANCY OF PRODUCT: Dusts or powders of these products can be irritating to contaminated skin, eyes, and respiratory system.

SENSITIZATION TO THE PRODUCT: The components of these products are not known to be skin or respiratory sensitizers.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of these products and their components on the human reproductive system.

Mutagenicity: These products are not reported to produce mutagenic effects in humans.

Embryotoxicity: These products are not reported to produce embryotoxic effects in humans. Refer to the following paragraph for additional information.

Teratogenicity: These products are not reported to cause teratogenic effects in humans. Clinical studies on test animals exposed to relatively high doses of Tungsten (a component of these products) during pregnancy indicate teratogenic effects.

Reproductive Toxicity: These products are not reported to cause reproductive effects in humans. Clinical studies on test animals exposed to relatively high doses of Tungsten (a component of these products) during pregnancy indicate adverse reproductive effects.

A mutagen is a chemical, which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical, which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical, which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance, which interferes in any way with the reproductive process.

BIOLOGICAL EXPOSURE INDICES: Currently there are no Biological Exposure Indices (BEIs) determined for the components of these products.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: Tungsten will slowly react with water, oxygen, and other compounds to form a wide variety of tungsten compounds.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Due to the product size and the product's form, no unusual environmental effects are expected from these products; however, large releases of Tungsten may be harmful to contaminated plants and animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: Due to the product size and the product's form, these products are not anticipated to cause adverse effects on aquatic life; however, large releases of Tungsten into a body of water may be harmful to aquatic plants and animals.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. These products, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority.

EPA WASTE NUMBER: Not applicable to wastes consisting only of these products.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS NOT HAZARDOUS (Per 49 CFR 172.101) BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Not applicable.
HAZARD CLASS NUMBER and DESCRIPTION: Not applicable.
UN IDENTIFICATION NUMBER: Not applicable.
PACKING GROUP: Not applicable.
DOT LABEL(S) REQUIRED: Not applicable.
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER, 2000: Not applicable.
MARINE POLLUTANT: No component of these products is designated as a marine pollutant by the Department of Transportation (49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: These materials are not considered as dangerous goods, per regulations of Transport Canada.

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: Tungsten is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Thorium Oxide	No	No	Yes

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for components of these products. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lbs (4,540 kg) therefore applies, per 40 CFR 370.20.

U.S. TSCA INVENTORY STATUS: Components of these products are listed on the TSCA Inventory.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

U.S. OTHER FEDERAL REGULATIONS: If these products are used during welding operations, follow the requirements of the Federal Occupational Safety and Health Welding and Cutting Standard (29 CFR 1910 Subpart Q). For those electrodes that contain thorium oxide, regulations of the Nuclear Regulatory Commission [Title 10, Parts 20 (Standards for Protection Against Radiation) and 40 (Domestic Licensing of Source Material)] should be consulted to determine if requirements of these regulations may apply to the use of these electrodes.

15. REGULATORY INFORMATION (Continued)

ADDITIONAL U.S. REGULATIONS (continued):

U.S. STATE REGULATORY INFORMATION: The components of these product are covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: Tungsten.
California - Permissible Exposure Limits for Chemical Contaminants: Tungsten.
Florida - Substance List: Thorium Dioxide, Tungsten.
Illinois - Toxic Substance List: Thorium Dioxide, Tungsten.
Kansas - Section 302/313 List: Thorium Dioxide.
Massachusetts - Substance List: Thorium Dioxide, Tungsten.
Minnesota - List of Hazardous Substances: Thorium Dioxide, Tungsten.
Missouri - Employer Information/Toxic Substance List: Tungsten.
New Jersey - Right to Know Hazardous Substance List: Thorium Dioxide, Tungsten.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.
Pennsylvania - Hazardous Substance List: Thorium Dioxide, Tungsten.
Rhode Island - Hazardous Substance List: Tungsten.
Texas - Hazardous Substance List: No.
West Virginia - Hazardous Substance List: No.
Wisconsin - Toxic and Hazardous Substances: No.

CALIFORNIA PROPOSITION 65: Thorium Oxide is a component of some of these products. Thorium Oxide is on the California Proposition 65 lists. **WARNING: This product may contain chemicals, and when used for welding may produce fumes or gases containing chemicals, known to the State of California to cause cancer, and/or birth defects (or other reproductive harm.)**

ANSI LABELING (Z129.1) [Precautionary Statements]:

CAUTION! MAY CAUSE SKIN AND EYE IRRITATION. INHALATION OF FUMES OR DUSTS FROM PROUDCT MAY BE IRRITATING TO RESPIRATORY SYSTEM. Avoid inhalation of fumes or dusts from product during use. Avoid contact with skin and eyes. Wash thoroughly after handling. Wear gloves and goggles. FIRST-AID: In case of skin or eye contact, flush skin with water for 15 minutes. Seek medical attention if adverse reaction occurs. IN CASE OF FIRE: Use water fog, dry chemical, CO_2, or "alcohol" foam. IN CASE OF SPILL: Pick-up spilled material. Place in a suitable container. Consult Material Safety Data Sheet before use.

LABELING FOR WELDING PRODUCTS:

WARNING! PROTECT yourself and others. Read and understand this information.

FUMES and GASES can be hazardous to your health.

ARC RAYS can injure eyes and burn skin.

ELECTRIC SHOCK can KILL.

- Before use, read and understand the manufacturer's instructions, Material Safety Data Sheets (MSDSs), and your employer's safety practices.
- Keep your head out of fumes.
- Use enough ventilation, exhaust at the arc, or both, to keep fumes and gases away from your breathing zone and the general area.
- Wear correct eye, ear, and body protection.
- Do not touch live electrical parts.
- See American National Standard ANSI/ASC Z49.1 "*Safety in Welding, Cutting, and Allied Processes*", published by the American Welding Society, 550 N.W., Lejeune Road, Miami, FL 33126; and OSHA Safety and Health Standards, 29 CFR 1910, available from the U.S. Government Printing Office, Washington, D.C.

DO NOT REMOVE THIS INFORMATION.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The components of these products are on the DSL Inventory.

OTHER CANADIAN REGULATIONS: Not applicable.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The components of these products are not on the CEPA Priorities Substances Lists.

CANADIAN WHMIS SYMBOLS: Not applicable.

16. OTHER INFORMATION

DATE OF PRINTING: July 13, 2007

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these, which are commonly used, include the following:

CAS #: This is the Chemical Abstract Service Number, which uniquely identifies each constituent.

EXPOSURE LIMITS IN AIR:

ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **TLV** - Threshold Limit Value - an airborne concentration of a substance, which represents conditions under which it is generally believed that nearly all workers, may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average **(TWA)**, the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level **(C)**. Skin absorption effects must also be considered.

OSHA - U.S. Occupational Safety and Health Administration.

PEL - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL, which was vacated by Court Order. **IDLH** - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). NIOSH issues exposure guidelines called Recommended Exposure Levels (**RELs**). When no exposure guidelines are established, an entry of **NE** is made for reference.

HAZARD RATINGS:

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]. Reactivity Hazard: **0** (normally stable); 1 (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).

NATIONAL FIRE PROTECTION ASSOCIATION: Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure causes death or major residual injury). Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:

Human and Animal Toxicology: Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD_{50}** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC_{50}** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m^3** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **Cancer Information:** The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. **Other Information: BEI** - ACGIH Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. **Ecological Information:** EC is the effect concentration in water. **BCF** = Bioconcentration Factor, which is used to determine if a substance will concentrate in lifeforms which consume contaminated plant or animal matter. Coefficient of Oil/Water Distribution is represented by **log K_{ow}** or **log K_{oc}** and is used to assess a substance's behavior in the environment.

REGULATORY INFORMATION:

This section explains the impact of various laws and regulations on the material. **U.S.: EPA** is the U.S. Environmental Protection Agency. **DOT** is the U.S. Department of Transportation. **SARA** is the Superfund Amendments and Reauthorization Act. **TSCA** is the U.S. Toxic Substance Control Act. **CERCLA (or Superfund)** refers to the Comprehensive Environmental Response, Compensation, and Liability Act. Labeling is per the American National Standards Institute (**ANSI Z129.1**). **CANADA: CEPA** is the Canadian Environmental Protection Act. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **TC** is Transport Canada. **DSL/NDSL** are the Canadian Domestic/Non-Domestic Substances Lists. **The CPR is the Canadian Product Regulations.** This section also includes information on the precautionary warnings, which appear, on the materials package label.