MATERIAL SAFETY DATA SHEET

OSRAM SYLVANIA INC.
CHEMICAL AND METALLURGICAL DIV.
TOWANDA, PA. 18848
TELEPHONE: 717-268-5000

ISSUE DATE: 03-14-94
SUPERSEDES: 09-19-93  * CHANGE ** ADDITION *** CORRECTION

CHEMICAL NAME: THORIATED TUNGSTEN ELECTRODES (VARIOUS SIZES)

TRADE NAME AND SYNONYMS: THORIA TUNGSTEN ELECTRODES; TIG WELDING ELECTRODES; GTA WELDING ELECTRODES

CHEMICAL NAME: THORIATED TUNGSTEN ELECTRODES

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FORMULA: W WITH 1 OR 2% THO2

CAS NUMBER: TUNGSTEN: 7440-33-7 THORIUM OXIDE: 1314-20-1

PHYSICAL DATA

APPEARANCE AND ODOR: GRAY METAL/NO ODOR

BOILING POINT: 5660 C

SPECIFIC GRAVITY (H2O=1): 19

VAPOR PRESSURE (MM HG): NA

PERCENT VOLATILE BY VOLUME: 0

VAPOR DENSITY (AIR=1): NA

EVAPORATION RATE: NA

SOLUBILITY IN WATER: INSOLUBLE

HOW BEST MONITORED: AIR SAMPLE

HAZARDOUS INGREDIENTS

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>PERCENT BY WEIGHT</th>
<th>OSHA PEL</th>
<th>ACGIH TLV</th>
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<tr>
<td>TUNGSTEN</td>
<td>98 OR 99%</td>
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<td>5MG/M3</td>
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THORIUM DIOXIDE ** 1 OR 2% * *

*NOTE: LIMITS FOR THORIUM DIOXIDE HAVE NOT BEEN ESTABLISHED BY THE ACIGH. ALL APPLICABLE REQUIREMENTS FOR RADIOACTIVE MATERIALS, INCLUDING EXPOSURE LIMITS, CONTAINED IN 29 CFR 1910.96 (OSHA) AND 10 CFR PARTS 20 & 40 (NRC) SHOULD BE MET.


HEALTH HAZARD DATA

ROUTES OF EXPOSURE: INHALATION OF FUMES GENERATED DURING WELDING.

EFFECTS OF OVEREXPOSURE: SHORT-TERM OVEREXPOSURE TO WELDING FUMES MAY RESULT IN DISCOMFORT SUCH AS DIZZINESS, NAUSEA, AND/OR IRRITATION OF THE EYES, NOSE AND THROAT. OTHER EFFECTS DEPEND ON THE METAL BEING WELDED AND THE WELDING CONDITIONS. TIG WELDING ELECTRODES ARE NON-CONSUMABLE. HOWEVER, SOME LOSS OF ELECTRODE METAL MAY OCCUR DEPENDING ON WELDING CONDITIONS. WITH THE EXCEPTION OF TWO RUSSIAN STUDIES THAT FOUND EARLY SIGNS OF PULMONARY FIBROSIS IN SOME WORKERS EXPOSED TO TUNGSTEN AND TUNGSTEN TRIODIDE DUST, MOST STUDIES HAVE SHOWN TUNGSTEN TO BE TOXICOLOGICALLY INERT. THORIUM DIOXIDE IS A NATURALLY OCCURING RADIOACTIVE ELEMENT. IT IS AN ALPHA EMITTER AND, AS SUCH, ITS PRIMARY HAZARD LIES IN INHALATION OF DUST/FUMES. NORMAL HANDLING OF THESE ELECTRODES ARE NOT EXPECTED TO RESULT IN ANY SIGNIFICANT EXTERNAL RADIATION EXPOSURE. CONSIDERABLE EXPERIENCE IN REFINING AND USE OF THORIUM HAS NOT REVEALED ANY ADVERSE EFFECTS FROM INDUSTRIAL EXPOSURE.

EMERGENCY AND FIRST AID PROCEDURES:

INHALATION: IF IRRITATION, DISCOMFORT OR OTHER SIGNS OF PULMONARY INVOLVEMENT DEVELOP REMOVE FROM EXPOSURE AND SEEK MEDICAL ATTENTION.

EYE CONTACT: IF IRRITATION OCCURS DUE TO WELDING FUMES, FLUSH WITH COPIOUS AMOUNTS OF WATER. IF IRRITATION PERSISTS, SEEK MEDICAL
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ATTENTION.

SKIN CONTACT: ADVERSE REACTIONS FROM CONTACT WITH THESE ELECTRODES ARE UNLIKELY. PROMPT MEDICAL ATTENTION SHOULD BE OBTAINED FOR BURNS OR IRRITATION RESULTING FROM THE WELDING PROCESS.

CARCINOGENIC ASSESSMENT (NTP ANNUAL REPORT, IARC MONOGRAPHS, OTHER): THORIUM DIOXIDE HAS BEEN IDENTIFIED AS A CARCINOGEN BY THE NTP AND IARC. EVIDENCE FOR ITS ABILITY TO CAUSE CANCER HAS COME SOLELY FROM ITS INTERNAL MEDICAL USE.

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: NA TEST METHOD USED:

FLAMMABLE LIMITS: NA LEL: UEL:

EXTINGUISHING MEDIA: NON FLAMMABLE

SPECIAL FIRE FIGHTING PROCEDURES: NONE

UNUSUAL FIRE AND EXPLOSION HAZARDS: WELDING ARC AND SPARKS CAN IIGNITE COMBUSTIBLES. REFER TO ANSI Z49.1, "SAFETY IN WELDING AND CUTTING" PUBLISHED BY THE AMERICAN WELDING SOCIETY FOR FIRE PREVENTION AND PROTECTION INFORMATION DURING WELDING.

REACTIVITY DATA

STABILITY: STABLE

CONDITIONS TO AVOID: NA

INCOMPATIBILITY (MATERIALS TO AVOID): NONE

HAZARDOUS DECOMPOSITION PRODUCTS: WELDING FUMES (OXIDES OF METAL BEING WELDED) AND GASES (SUCH AS CARBON MONOXIDE, OZONE AND OXIDES OF NITROGEN) DEPENDING ON THE PROCESS, PROCEDURE AND METAL WELDED. SOME LOSS
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OF METAL FROM THE ELECTRODE DOES OCCUR.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: NA

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SPILL OR LEAK PROCEDURES

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STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:

NOT APPLICABLE

WASTE DISPOSAL METHOD:

DISPOSE OF IN ACCORDANCE WITH APPROPRIATE GOVERNMENT REGULATIONS.

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SPECIAL PROTECTION INFORMATION

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RESPIRATORY PROTECTION: USE A NIOSH APPROVED RESPIRABLE FUME RESPIRATOR WHEN WELDING IN CONFINED SPACES AND WHENEVER FUME CONCENTRATIONS EXCEED APPLICABLE LIMITS FOR THORIUM, TUNGSTEN OR OTHER WELDING FUMES. ALL APPLICABLE REQUIREMENTS SET FORTH IN 29 CFR 1910.134 SHOULD BE MET.

VENTILATION: USE ENOUGH GENERAL VENTILATION AND/OR LOCAL EXHAUST AT THE ARC TO KEEP THE FUMES AND GASES BELOW APPLICABLE LIMITS IN THE WORKER'S BREATHING ZONE AND THE GENERAL AREA. IF SUCH EQUIPMENT IS NOT AVAILABLE, USE RESPIRATORS AS SPECIFIED ABOVE.

PROTECTIVE GLOVES: WELDERS GLOVES ARE RECOMMENDED.

EYE PROTECTION: WEAR HELMET OR USE FACE SHIELD WITH APPROPRIATE FILTER LENS. PROVIDE PROTECTIVE SCREENS AND FLASH GOGGLES, IF NECESSARY, TO SHIELD OTHERS.
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OTHER PROTECTIVE EQUIPMENT: WEAR HEAD, HAND AND BODY PROTECTION TO PREVENT INJURY FROM ARC RADIATION, SPARKS AND ELECTRICAL SHOCK. SEE ANSI Z49.1. AT A MINIMUM THIS INCLUDES WELDER’S GLOVES AND A PROTECTIVE FACE SHIELD, AND MAY INCLUDE ARM PROTECTORS, APRONS, HATS, SHOULDER PROTECTION, AS WELL AS DARK SUBSTANTIAL CLOTHING. WELDER SHOULD BE TRAINED NOT TO TOUCH LIVE ELECTRICAL PARTS AND TO INSULATE HIMSELF FROM WORK AND GROUND.

SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: NONE

OTHER PRECAUTIONS: NONE

IN CASE OF QUESTIONS, PLEASE CALL:
OSRAM SYLVANIA INC.
INDUSTRIAL HYGIENIST, 717-268-5000

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