



MATERIAL SAFETY DATA SHEET

For Welding Consumables

Conforms to Hazard Communication Standard 29CFR 1910.1200
 "ESSENTIALLY SIMILAR" to U.S. Department of Labor Form OSHA 20

SECTION I - PRODUCT IDENTIFICATION

Product Type: Stainless Steel Coated Electrodes for SMAW Welding Process

Product Name: TECH-ROD

Classification/Specification: AWS/ASME/ MILITARY

Manufacturer's Name: Techalloy, Inc.

Web Site: www.techalloy.com

Manufacturer's Address: 2310 Chesapeake Avenue
 Baltimore, Maryland 21222

Emergency Phone: 410-633-9300
 1-800-638-1458

SECTION II - HAZARDOUS INGREDIENTS¹

This section identifies the materials from which these products are manufactured. The fumes and gases produced during welding with the normal use of this product are covered in SECTION V. Refer to it for industrial hygiene information.

TRADENAME and NOMINAL COMPOSITION (Weight %)

| AWS/SFA 5.4 ² | E308/308L | E309/309L | E310 | E312 | E316/316L | E317L | E320/320LR | E330 | E347 | E385 | E2209 | E2594 | E410 | E410NiMo | E430 | E630 |
|--|-----------|-----------|-------|-------|-----------|-------|------------|-------|-------|-------|-------|-------|-------|----------|-------|-------|
| Iron | 30-50 | 30-50 | 30-50 | 30-50 | 30-50 | 30-50 | 30-50 | 30-50 | 30-50 | 30-50 | 30-50 | 30-50 | 30-50 | 30-50 | 30-50 | 30-50 |
| Chromium* | 20 | 23 | 21 | 30 | 18 | 19 | 20 | 16 | 19 | 20 | 22 | 25 | 11.5 | 11.5 | 16 | 16.5 |
| Manganese* | 1.75 | 1.75 | 1.75 | 2.0 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.75 | 1.50 | 1.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Molybdenum | | | | | 2.25 | 3.25 | 3.25 | | | 4.50 | 3.00 | 3.75 | | 0.50 | | |
| Columbium | | | | | | | | | 0.50 | | | | | | | 0.25 |
| Copper | | | | | | | 3.50 | | | 1.50 | | | | | | 3.75 |
| Nickel* | 10.0 | 13.0 | 21.0 | 8.5 | 12.0 | 13.0 | 33.0 | 35.0 | 10.0 | 25.0 | 9.0 | 9.0 | | 4.50 | | 3.50 |
| Cobalt | <0.10 | → | | | | | | | | | | | | | | |
| Calcium Carbonate | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 |
| Calcium Fluoride | 2-10 | 2-10 | 2-10 | 2-10 | 2-10 | 2-10 | 2-10 | 2-10 | 2-10 | 2-10 | 2-10 | 2-10 | 2-10 | 2-10 | 2-10 | 2-10 |
| Cryolite (Na ₃ AlF ₆) | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 |
| Potassium Titanate | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 |
| Titanium Dioxide | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 | 5-15 |
| Potassium Silicate | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 |
| Sodium Silicate | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 | 1-5 |
| Potassium Hydroxide | .50 | .50 | .50 | .50 | .50 | .50 | .50 | .50 | .50 | .50 | .50 | .50 | .50 | .50 | .50 | .50 |

¹ The term "Hazardous" in "Hazardous Ingredients" is to be interpreted as a term required and defined in the Hazards Communication Standard and does not imply the existence of any hazard.

² Electrode composition shown in the above table were obtained from processing with Type 16 coating.

* The ingredients marked with an asterisk are covered under the reporting requirements of Section 313 of the Emergency Planning and Community Right to Know Act of 1986 and of 40 CFR 372.

SECTION III - PHYSICAL DATA

Physical State: Solid

SECTION IV - FIRE AND EXPLOSION HAZARD

Nonflammable, however welding arcs and sparks can ignite combustible and flammable products. Ref. Z49.1, NFPA 51B. Only packaging will burn.

| | |
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| <p style="text-align: center;">Flammability</p> <p style="text-align: center;">* Special Hazards</p> | <p style="text-align: center;"><u>NFPA Ratings</u></p> <p>4 - Extreme 3 - High 2 - Moderate 1 - Slight 0 - Insignificant</p> |
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SECTION V - HEALTH HAZARD DATA

The State of California requires the following information: *This product contains a chemical known to cause cancer.*

Electric arc welding may create one or more of the following health hazards:

- ❑ **Arc Rays** can injure eyes and burn skin. **Heat Rays (infrared radiation)** from hot metal can injure eyes.
- ❑ **Electric Shock can kill.**
- ❑ **Noise** can injure hearing.
- ❑ **Shielding Gases** such as *Argon, Helium, and Carbon Dioxide* are asphyxiants and adequate ventilation is required.
- ❑ **Carcinogenicity:** *Chromium, Nickel, Cobalt and their compounds* are on the IARC and NPT lists as posing a carcinogenetic risk to humans.
- ❑ **Fumes and Gases** can be dangerous to your health. *Common entry is by inhalation.*

Chromium (Cr) Exposure Limits: TLV 0.5 mg/m³, PEL 1.0 mg/m³ (as Cr metal); TLV 0.05 mg/m³ PEL 0.005 mg/m³ (as Cr VI inorganic compound as Cr VI, water soluble); PEL 0.1 mg/m³ Ceiling Limit (as CrO₃) CAS No.: 7440-47-3

Chromium metal is relatively non-toxic. The IARC lists Hexavalent Chromium as a carcinogen. Long term exposure to chromium and trivalent chromium dust can cause scaling, redness, itchiness and burning sensation on the skin.

Cobalt (Co) Exposure Limits: TLV 0.02 mg/m³ (for metal dust and Co fume) PEL 0.1 mg/m³ (for metal dust and Co fume) CAS No.: 7440-48-4

Excessive ingestion may lead to flu-like symptoms such as chills, fever, body aches, vomiting, sweating, etc. Eye contact may cause conjunctivitis.

Iron (Fe) Exposure Limits: TLV 5.0^R mg/m³ (as Fe₂O₃) PEL 10.0 mg/m³ (as Fe₂O₃ fume)
CAS No.: 7439-89-6

Inhalation of excessive oxides fumes or dust can cause irritation of the respiratory tract.

Manganese (Mn) Exposure Limits: TLV 0.2 mg/m³ (Mn and inorganic compounds, as Mn) PEL 5.0C mg/m³
(Mn and inorganic compounds, as Mn)
CAS No.: 7439-96-5

Excessive inhalation or ingestion of manganese can produce manganese poisoning.

Excessive inhalation of fumes may cause "Metal Fume Fever" with flu-like symptoms such as chills, fever, body aches, vomiting, sweating, etc.

Molybdenum (Mo) Exposure Limits: TLV 10 mg/m³ (Dust & Fume as Mo) PEL 15 mg/m³ (as insoluble compounds, total dust as Mo) CAS No.: 7439-98-7

Skin and eye contact may cause irritation. Molybdenum and its insoluble compounds are reported to have a low toxicity.

Nickel (Ni) Exposure Limits: TLV 1.50 mg/m³ (as metal, inhalable Fraction) PEL 1.00 mg/m³ (metal and insoluble compounds as Ni) CAS No.: 7440-02-0

The U.S. Toxicology Program has listed nickel and seven nickel compounds as carcinogens. The IARC lists nickel compounds as carcinogenic to humans and metallic nickel as possibly carcinogenic to humans. Nickel may produce allergic reactions.

Niobium (Nb) also known as Columbium (Cb) Exposure Limits: No limits set. PEL No limits set.
CAS No.: 7440-03-0

No specific data on NB (Cb) at present time. Acute exposure to metal dust and fumes could cause irritation of skin, eyes and respiratory.

Titanium (Ti) Exposure Limits: No limits set. PEL No limits set.
CAS No.: 7440-32-6

Inhalation of titanium may cause mild irritation of the respiratory tract. Inhalation of titanium dioxide dust could produce lung fibrosis and chronic bronchitis.

Titanium Dioxide(TiO₂) Exposure Limits: TLV 10.0 mg/m³ PEL 15.0 mg/m³ Total Dust
CAS No.: 13463-67-7

Inert dust that is non-toxic. Prolonged exposure may cause particulate irritation to eyes and respiratory system.

Tungsten (W) Exposure Limits: TLV 5.0 mg/m³ (insoluble compounds as W) PEL 5.0 mg/m³ (insoluble compounds as W) CAS No.: 7440-33-7

Calcium Carbonate (CaCO₃) Exposure Limits: TLV 10.0 mg/m³ PEL 15.0 mg/m³ (total dust)
5.0 mg/m³ (Respirable fraction) CAS No.: 1317-65-3

Non-toxic substance. Ingestion may cause mild irritation of respiratory organs.

Calcium Fluoride (CaF₂) Exposure Limits: TLV 2.5 mg/m³ (Fluorides as F) PEL 2.5 mg/m³ (Fluorides as F)
CAS No.: 7789-75-5

Inhalation may cause irritation of respiratory system. Chronic exposure may cause chronic fluoride intoxication with symptoms of vomiting, loss of appetite, diarrhea or constipation.

Graphite (Carbon) Exposure Limits: TLV 3.5 mg/m³ (as Carbon Black) PEL 3.5 mg/m³ (as Carbon Black)

CAS No.: 7440-44-0

Prolonged inhalation may cause benign pneumoconiosis. No effect known for ingestion.

Potassium Silicate (K_2SiO_2) Exposure Limits: TLV - No Limit Set PEL - No Limit Set
CAS No.: 1312-76-1

Non-toxic. Irritant to skin, eyes and respiratory system.

Silica (SiO_2) Exposure Limits: TLV 0.1 mg/m³ (Respirable dust) PEL 6.0 mg/m³ (ppt. gel), 0.1 mg/m³ (crystalline, quartz), 0.05 mg/m³ (crystalline - cristobalite or tridymite)
CAS No.: 60676-86-0

No noted effect of ingestion. Acute exposure will irritate the respiratory system. Chronic exposure (20+ years) can produce silicosis with symptoms of cough, wheezing and repeated non-specific chest illness. Impairment of pulmonary function may be progressive. Crystalline Silica has been listed as a Class 1 carcinogen by the IARC.

Cryolite, Sodium Fluoroaluminate (Na_2AlF_6) Exposure Limits: TLV - No Limit Set PEL - No Limit Set
CAS No.: 15096-52-3

Prolonged exposure may lead to irritation of nose, throat and respiratory system. Ingestion may cause severe gastrointestinal irritation such as nausea, vomiting, diarrhea, and pain. Also, muscular weakness, tremors, convulsions, skeletal abnormalities, loss of consciousness and death. Prolonged skin contact may cause dermatitis.

Sodium Silicate ($Na_2Si_6O_9$) Exposure Limits: TLV - No Limit Set PEL - No Limit Set
CAS No.: 1344-09-8

Low toxicity. Prolonged exposure may cause irritation of mucous membranes. Skin exposure may cause slight irritation. No chronic effects noted.

Strontium Carbonate ($SrCO_3$) Exposure Limits: TLV - No Limit Set PEL - No Limit Set
CAS No.: 1633-05-2

Low toxicity. Prolonged exposure may cause irritation of nose membranes and cause coughing or sneezing.

SECTION VI - REACTIVITY DATA

Stability: Stable [x] Unstable [] Polymerization will not occur.

Incompatible Products: None currently known.

Hazardous Decomposition Products: Welding fumes and gases cannot be classified easily. The composition and quantity of welding fumes and gases are dependent upon the metal being welded, the process procedure, and the electrodes used. Other conditions that also influence the composition and quantity of fumes and gases to which a welder may be exposed include: Coatings off the metal being welded (such as paint, galvanizing, and plating), the number of welders and work area, the quality and amount of ventilation, the position of the welder's head with respect to the fume plume, as well as contaminants in the atmosphere (such as chlorinated hydrocarbon vapors from cleaning and degreasing activities).

When the electrode is consumed, the fume and gas decomposition products generated are different in percent and form from the original ingredients listed in SECTION II. Fume and gas decomposition products, and not the ingredients in the electrode, are important. The concentration of a given fume or gas component may increase or decrease by times the original concentration of the electrode. Also, new compounds not found in the electrode may form. Decomposition products of normal operation include those originating from the volatilization, reaction or oxidation of materials listed in SECTION II, plus those from the base metal and coating, etc., as noted above.

Reasonably Expected Decomposition Products: Decomposition products derived from the normal use of these products include a complex of the oxides of the materials listed in Section II, as well as carbon dioxide and carbon monoxide. Ozone and Nitrogen oxides may be formed by the radiation from the arc.

The fume limit for Chromium, Nickel and/or Manganese may be reached before the general limit for welding fumes of 5.0 mg/m³ is reached. Monitor fumes for Chromium, Nickel and Manganese.

Notes:

- (1) The only way to determine the true identity of decomposition products is by sampling and analysis. The composition and quantities of the fumes and gases to which a worker may be overexposed can be determined from a sample obtained from inside the welder's helmet, if worn, or in the worker's breathing zone.
- (2) See ANSI/AWS F1.5, "*Methods for Sampling and Analyzing Gases from Welding and Allied Processes*" and ANSI/AWS F1.1, "*Method for Sampling Air borne Particles Generated by Welding or Allied Processes*" available from the American Welding Society.

SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE OF PRODUCT

Read and understand the manufacturer's instructions and the precautionary label on the product. See ANSI Z-49.1, "*Safety in Welding and Cutting*", published by the American Welding Society, P.O. Box 351040, Miami, FL 33135 and OSHA Publication 2206 (29 CFR 1910), U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954 for more details on the following information:

- **Ventilation**: Use enough ventilation, local exhaust at the arc, or both to keep exposure within legal limits. In the worker's breathing zone and the general area, the fumes and gases must be kept the TLVs and the *equivalent exposure* must compute to less than one. Train welders to keep their heads out of the fumes.
- **Respiratory Protection**: Use respirable fume respirator or air supplier respirator when welding in a confined space or where local exhaust or ventilation does not keep the exposure below TLV. Where respiratory protection is necessary, NIOSH approved respiratory protection should be used. A NIOSH approved Type TC-21-C mask is recommended.
- **Eye Protection**: Wear helmet or use face shield with filtered lens. Provides protected screens and flash goggles, if necessary, to protect others. Wear safety glasses or goggles when handling this material to prevent eye contact. Do not wear contact lenses in any environment where dust and fumes are present. Readily available eye wash stations are recommended in areas where operations may produce dust and fumes.
- **Protective Clothing**: Wear head, hand, and body protection that help prevent injury from radiation, sparks and electrical shock. See ANSI Z49.1. At a minimum, welder's gloves and protective face shield and additionally, arm protectors, aprons, hats, shoulder protection as well as dark protective clothing. Train welders not to touch live electrical parts and how to be insulated from work to ground.
- **Hygienic Work Practices**: Avoid contact to eyes, skin and mucous membranes. Avoid inhalation of vapors. Wash thoroughly after handling and use. Do not smoke, eat, chew gum or tobacco, or apply cosmetics within the work area. Otherwise follow the standards of good industrial hygiene practices.
- **Waste Disposal Method**: Prevent waste from contaminating surrounding environment. Discard any product, residue, disposable container or liner in an environmentally acceptable manner, in full compliance with Local, State and Federal Regulations.
- **Procedure for Cleanup of Spills or Leaks**: Alloy wastes that are to be collected to recover metal value should be placed in a suitable container. All disposal of wastes should be performed in accordance with local, state and/or federal regulations.