

**MATERIAL SAFETY DATA SHEET**

**SECTION I - IDENTIFICATION**

Manufacturer : HYUNDAI WELDING CO., LTD. IL-SONG BLDG. 15TH FLOOR. 157-37 SAMSUNG-DONG, KANGNAM-GU, SEOUL, KOREA	Tel : +82-2-6230-6051~66 Fax : +82-2-522-2030
Product Type : Stainless Steel Electrodes for Shielded Metal Arc Welding	
Trade Name : S-316L-17	
Classification : AWS A5.4 E316L-17	

**SECTION II - HAZARDOUS INGREDIENTS / IDENTITY INFORMATION**

**IMPORTANT**

This section covers the materials from which this product is manufactured. The fumes and gases produced during welding which the normal use of this product are covered by Section V. The term "hazardous" in "Hazardous Materials" should be interpreted as a term required and defined in OSHA Hazard Communication Standard (29 CFR Part 1910.1200) and does not necessary imply the existence of any hazard.

INGREDIENTS	CAS No.	Approx. Wt(%)	PEL (mg/m <sup>3</sup> )	TLV (mg/m <sup>3</sup> )
Silicon Dioxide (SiO <sub>2</sub> )	14808-60-7	4 ~ 7	0.1R*	0.1R*
Aluminum Oxide (Al <sub>2</sub> O <sub>3</sub> )	1344-28-1	1 ~ 3	5R*	10 (as Al)
Titanium Dioxide (TiO <sub>2</sub> )	13463-67-7	8 ~ 15	5R*	10
Manganese (Mn)	7439-96-5	1 ~ 3	5 <sup>+</sup> (Dust) 1, 3STEL <sup>++</sup> (Fume)	5 <sup>+</sup> (Dust) 1, 3STEL <sup>++</sup> (Fume)
Nickel (Ni)	7440-02-0	6 ~ 10	1	1
Chromium (Cr)	7440-47-3	15 ~ 20	1	0.5
Calcium Carbonate (CaCO <sub>3</sub> )	471-34-1	2 ~ 5	5R*	10
Calcium Fluoride (CaF <sub>2</sub> )	7789-75-5	≤ 2	2.5	2.5
Molybdenum (Mo)	7439-98-7	1 ~ 3	5R*	5
Iron (Fe)	7439-89-6	40 ~ 55	10**	10**

\* : Respirable Fraction.

\*\* : Not listed. Nuisance value maximum is 10mg/m<sup>3</sup>. PEL/TLV value for iron oxide is 10mg/m<sup>3</sup>.

+ : Ceiling Limit. ++ : Short Term Exposure Limit.

**SECTION III - PHYSICAL / CHEMICAL CHARACTERISTICS**

Not applicable

**SECTION IV - FIRE AND EXPLOSION HAZARD DATA**

Nonflammable. Welding arc and sparks can ignite combustibles and flammables. Refer to American National Standard Z49.1 for fire prevention during the use of welding allied procedures.

**SECTION V - REACTIVITY DATA**

Hazardous Decomposition Products: Welding fumes and gases cannot be classified simply. The composition and quantity of both are dependent upon the metal being welded, the process, procedures and electrodes used. Other conditions which also influence the composition and quantity of the fumes and gases to which workers may be exposed include: coating on the metal being welded (such as paint, plating, galvanizing), the number of welders and the volume of the work area, the quality and amount of ventilation, the position of the welder's head with respect to the fume plume as well as the presence of 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 ingredients listed in Section 2. Decomposition products of normal operation include those originating from the volatilization, reaction, or oxidation of the materials shown in Section 2, plus those from the base metal and coating, etc., as noted above.

Note that fumes and gas decomposition products during welding are important, rather than the ingredients of the flux. These products are present as complex compounds. They would include oxides of iron, aluminum oxide, titanium dioxide, silicon dioxide, manganese, nickel, chromium, molybdenum, calcium fluoride and calcium carbonate. Ozone and nitrogen oxides may be formed by the radiation from the arc.

One recommended way to determine the composition and quantity of fumes and gases to which workers are exposed is to take an air sample from inside the welder's helmet if worn or in the worker's breathing zone. See ANSI/AWS F1.1, F1.2, F1.4, and F1.5, available from the American Welding Society, 550 N.W. LeJeune Road, Miami, FL33126.

## SECTION VI – HEALTH HAZARD DATA

**Threshold Limit Value :** The ACGIH recommended limit for Welding Fume NOC (Not Otherwise Classified) is 5 mg/m<sup>3</sup>. ACGIH-1987-88 preface states that the TLV-TWA should be used as guides in the control of health hazards and should not be used as fine lines between safe and dangerous concentrations. See Section 5 for specific fume constituents, which may modify this TLV.

**Effect of Overexposure -** Electric arc welding may create one or more the following health hazards :

**Fumes and Gases** can be dangerous to your health. **Primary Route of Entry** is the respiratory system, eyes and/or skin. **Aggravation** of respiratory or allergic conditions may affect some exposed individuals.

Short-term (acute) Overexposure may result in discomfort such as metal fume fever, dizziness, nausea or dryness of irritation of nose, throat or eyes. May aggravate pre-existing respiratory problems (e.g., asthma, emphysema).

Long-term (chronic) Overexposure to welding fumes can lead to siderosis (iron products in lungs) and believed by some investigators to affect pulmonary function.

**Arc rays** can injure eyes and burn skin.

**Electric shock** can kill.

**Emergency and First Aid Procedures :** Remove from exposure and call for medical aid. Employ first aid technique recommended by the American Red Cross.

**CARCINOGENICITY :** Nickel, Chromium and its compounds must be considered as carcinogens under OSHA (29 CFR 1910.1200). Welding fume must be considered as possible carcinogens under OSHA (29 CFR 1910.1200).

## SECTION VII

### PRECAUTIONS FOR SAFE HANDLING & USE/APPLICABLE CONTROL MEASURES

Read and understand the manufacturer's instructions and the precautionary label on the product. See American National Standard Z49.1, Safety in Welding and Cutting published by the American Welding Society, 550 N.W. LeJeune Road, Miami, FL. 33126 and OSHA Publication 2206 (29 CFR 1910), U.S. Government Printing Office, Washington, DC 20402 for more detail on any of the following :

**Ventilation :** Use enough ventilation, local exhaust at the arc or both, to keep the fumes and gases below PEL/TLV in the worker's breathing zone and the general area. Train the welder to keep his head out of the fumes.

**Respiratory Protection :** Use respirable fume respirator or air supplied respirator when welding in confined space or where local exhaust or ventilation does not keep exposure below TLV/PEL.

**Eye Protection :** Wear helmet or use face shield with filter lens. Lens filter should be as dark as possible without obstructing view of the weld zone. Provide protective screens and flash goggles, if necessary, to shield others.

**Protective Clothing :** Wear hand, head and body protection which help to prevent injury from radiation, sparks and electrical shock. See ANSI Z49.1. At a minimum this includes welder's gloves and protective face shield and my included arm protectors, aprons, hats, shoulder protection as well as dark nonsynthetic clothing. Train the welder not to touch live electrical parts and to insulate his/her person from work and ground.

**Procedure for Cleanup or Spills or Leaks :** Not applicable.

**Waste Disposal Method :** Prevent waste form contaminating the surrounding environment. Discard any product, residue, disposable container or liner in an environmentally acceptable manner, in full compliance with Federal, State, and Local regulations.