



NICKEL ALLOY FLUX CORED WIRE

SAFETY DATA SHEET

1. IDENTIFICATION

Product Type:	Nickel Alloy Flux Cored electrodes
Product Names:	Unibraze 82T-1, Unibraze 622T-1, Unibraze 625T-1, Unibraze C276T-1
Specifications:	AWS A5.34
Product Intended/Recommended Use:	Arc welding
Manufacturer/Supplier Name:	UNIBRAZE CORP. 1050 Penner Crest Houston TX USA 77055
Emergency Phone	(713)-869-6000 1-800-364-6900

2. HAZARD IDENTIFICATION

Hazard Classification: Not classified as hazardous according to the applicable Globally Harmonized System of Classification and Labelling of Chemicals (GHS) and OSHA Hazard Communication Standard (29 CFR 1910.1200) criteria.

Label Elements: Hazard Symbol – None Signal Word – None
Hazard Statement – Not Applicable Precautionary Statement – Not Applicable

Other Hazards: This product presents no hazards in its intrinsic form. However, hazards generated during welding can be harmful.

ELECTRICITY- Electric shock can kill.

HEAT- Molten metal and weld spatter can burn skin and start fires.

RADIATION- Arc rays can injure eyes and burn skin.

FUMES AND GASES- Fumes and gases generated during welding can be dangerous to your health. See Section 11.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Composition: Chemical composition is shown below for the solid wire electrodes. For the covered and cored electrodes, chemical composition data is given as a maximum weight percentage of the composite electrode, which includes flux ingredients. These flux ingredients typically consist of Mn, Si, Ti, and/or Zr oxides, as well as certain fluoride, carbonate and silicate compounds.

Cored Electrodes for Arc Welding

Product	Ni	Cr	Mo	Fe	Mn ¹	Si ¹	C	Nb	Ti ¹	Co	W	Zr ¹	Fluoride
82T-1	Bal	22.0		3.0	3.5	1.0	0.10	3.0	7.0			1.0	0.5
622T-1	Bal	22.5	14.5	6.0		1.0	0.02		7.0	2.5	4.5	1.0	0.5
625T-1	Bal	23.0	10.0	5.0		1.0	0.10	4.2	7.0			1.0	0.5
C276T-1	Bal	16.5	14.5	6.0			0.02		7.0	2.5	4.5	1.0	0.5

(1) Total for this element and its compounds, which are generally characterized as oxides.

4. FIRST AID MEASURES

Inhalation - If not breathing, begin CPR & seek immediate medical assistance. If breathing: move fresh air area and seek immediate medical assistance.

Skin contact – Flush skin burns due to arc radiation with cold water. If burning/irritation persists seek medical attention. If skin contact with fume or dust, wash affected areas with soap and water. Thoroughly clean shoes and wash clothing. Seek medical attention if irritation develops and persists.

Eye contact – Seek medical attention if radiation burns due to arc flash occurs and move to a dark room. To remove fume/dust, flush with lukewarm water. Seek medical attention if irritation develops. In case of foreign metallic or slag material lodged in the eye, seek medical attention to remove it. Do not rub or agitate the eyes.

Ingestion – Although unlikely due to product form, immediately seek medical attention if wire pieces or metal powders from inside the wire are ingested. Do not induce vomiting unless directed to do so by medical personnel.

Electric Shock - Disconnect power. Use non-conductive material to pull victim from contact with live wires. If no detectable pulse, seek medical attention immediately and begin CPR if you are trained to do so.

Most Serious Symptoms:

Short Term Exposure – Acute overexposure to welding fumes may result in discomfort such as irritation of the respiratory system, metal fume fever, nausea, and may aggravate pre-existing respiratory conditions.

Long Term Exposure – Chronic overexposure to welding fume may lead to iron deposits in the lungs (siderosis) and reduced pulmonary function. Manganese overexposure can lead to irreversible damage to the central nervous system resulting in impaired speech and movement. Chronic overexposure to nickel fumes and hexavalent chromium can cause cancer. Some of the products contain silica quartz, but not in an inhalable fraction. Silica quartz is a listed carcinogen.

Refer to Section 11 for more information.

5. FIRE FIGHTING MEASURES

General - Products are non-flammable as shipped. Welding arcs and spatter can ignite nearby combustible materials.

Suitable Extinguishing Media- Use methods and materials appropriate for the combustible material.

Specific Hazards Arising from the chemical - Welding arcs and spatter can ignite nearby combustible materials.

General Firefighting Procedures- Keep people away. Isolate fire and deny entry to the area by any non-essential personnel. Fight fire from protected location or safe distance.

Special Actions for Firefighters- Firefighters should be equipped with self-contained breathing apparatus to protect against potentially toxic and hazardous fumes. Toxic and irritating fumes and gases may be given off during burning or thermal decomposition.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures:

For Non-Emergency Personnel – Isolate the area and keep non-essential people away. Do not touch or walk through spilled material. Allow the molten metallic material to solidify and cool before disposal. If molten metal spills out of the weldment, turn off the power. Contain the flow using sand or submerged arc flux. If airborne dust and or fumes are present, wear appropriate personal protective equipment (PPE) to avoid overexposure.

For Emergency Personnel – Wear appropriate personal protective equipment (PPE), including clothes, gloves and breathing protection. Evacuate non-essential personnel.

Environmental Precautions: Keep material out of waterways and drains.

Methods and Materials for Containment and Cleaning Up: Isolate and clean up spills immediately. Avoid generating dust or airborne particles during clean up. Dispose of solidified mass per Federal, State and Local regulations.

7. HANDLING AND STORAGE

Precautions for Safe Handling: Wear safety glasses and gloves to avoid cuts and abrasion when handling welding consumables and their packaging. Do not eat drink or smoke in areas where these products are being used.

Conditions for Safe Storage, Including Any Incompatibilities: Store in a cool, dry area in the original packaging. Keep products away from heat, flame and moisture.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Appropriate Engineering Controls: Provide adequate ventilation and/or local exhaust at the weld station to keep fumes and gases away from the welder. Train welders and welding operators to keep their head out of the fumes. See ANSI Z49.1 “Safety in Welding, Cutting, and Allied Processes” for recommendations of safe work practices.

Personal Protective Equipment:

Eye/Face Protection – Wear safety glasses/goggles with appropriate side shields. Wear a helmet or face shield with an appropriate filter lens. Use protective screens to shield others in the work area.

Skin/Body Protection – Wear hand, head and body protection including welder’s gloves, protective face shield and long sleeved protective clothing.

Respiratory Protection – Use NIOSH approved fume respirator or air supplied respirator when where ventilation is inadequate, welding in confined spaces or where required to by OSHA regulations.

Fume sampling per AWS F1.1 “*Method for Sampling Airborne Particulates Generated by Welding and Allied Processes*” may be required. Other appropriate standards that may be considered include, but are not limited to, AWS F1.2 “*Laboratory Method for Measuring Fume Generation Rate and Total Fume Emission of Welding and Allied Processes*” and AWS F3.2

“*Ventilation Guide for Weld Fume*”. For actual weld fume and particulate analysis, refer to the appropriate analytical methods recommended by NIOSH or OSHA, and consult an industrial hygiene professional.

Control Parameters:
Exposure Limits - USA

Common Name	CAS#	Form	Exposure Limit	Source	
Aluminum Metal	7429-90-5	Total Dust	15 mg/m ³	USA. OSHA PELs	
		Total Dust	10 mg/m ³	USA. California OSHA PELs	
		Respirable	5 mg/m ³	USA. OSHA PELs	
Aluminum Oxide	1344-28-1	Respirable	1 mg/m ³	USA. ACGIH TLVs	
		Total Dust	15 mg/m ³	USA. OSHA PELs	
		Respirable	5 mg/m ³	USA. OSHA PELs	
Barium Compounds	7440-39-3	Respirable	1 mg/m ³	USA. ACGIH TLVs	
		Soluble Compounds	0.5 mg/m ³	USA. OSHA PELs	
		Soluble Compounds	0.5 mg/m ³	USA. ACGIH TLVs	
Calcium Carbonate	1317-65-3	Total Dust	15 mg/m ³	USA. OSHA PELs	
		Total Dust	10 mg/m ³	USA. California OSHA PELs	
		Respirable	5 mg/m ³	USA. OSHA PELs	
Chromium	7440-47-3	Meta	1 mg/m ³	USA. OSHA PELs	
		Meta	0.5 mg/m ³	USA. ACGIH TLVs	
		Cr II compounds	0.5 mg/m ³	USA. OSHA PELs	
		18540-29-9	Cr III Compounds, Inorganic	0.5 mg/m ³	USA. OSHA PELs
			Cr III Compounds, Inorganic	0.5 mg/m ³	USA. ACGIH TLVs
			Cr VI Compounds	0.1 mg/m ³	USA. OSHA PELs Ceiling
			Cr VI Compounds, Soluble	0.005 mg/m ³ (as Cr VI)	USA. OSHA PELs
			Cr VI Compounds, Soluble	0.05 mg/m ³ (as Cr)	USA. ACGIH TLVs
			Cr VI Compounds, Insoluble	0.005 mg/m ³ (as Cr VI)	USA. OSHA PELs
Cobalt	7440-48-4	Cr VI Compounds, Insoluble	0.01 mg/m ³ (as Cr)	USA. ACGIH TLVs	
		As Metal, Dust & Fume	0.1 mg/m ³	USA. OSHA PELs	
		As Metal, Dust & Fume	0.02 mg/m ³	USA. California OSHA PELs	
Copper	7440-50-8	As Metal, Dust & Fume	0.02 mg/m ³	USA. ACGIH TLVs	
		Dus	1 mg/m ³	USA. OSHA PELs & ACGIH TLVs	
		Fum	0.1 mg/m ³	USA. OSHA PELs	
Fluorides	7789-75-5	Fum	0.2 mg/m ³	USA. ACGIH TLVs	
		As Fluorides	2.5 mg/m ³	USA. OSHA PELs & ACGIH TLVs	
		Iron & Iron Oxide	1309-37-1	Iron Oxide (As Fume)	10 mg/m ³
Iron & Iron Oxide		Iron Oxide (As Fume)	5 mg/m ³	USA. California OSHA PELs	
		Respirable	5 mg/m ³	USA. ACGIH TLVs	
		Graphite	7782-42-5	Total Dust	15 mg/m ³
Graphite		Total Dust	10 mg/m ³	USA. California OSHA PELs	
		Respirable	5 mg/m ³	USA. OSHA PELs	

Magnesite	546-93-0	Total Dust	15 mg/m ³	USA. OSHA PELs
		Total Dust	10 mg/m ³	USA. California OSHA PELs
		Total Dust	10 mg/m ³	USA. ACGIH TLVs
		Respirable	5 mg/m ³	USA. OSHA PELs
		Respirable	2 mg/m ³	USA. ACGIH TLVs
Magnesium Oxide	1309-48-4	Fume	15 mg/m ³	USA. OSHA PELs
		Fume	10 mg/m ³	USA. California OSHA PELs
		Fume (Inhalable)	10 mg/m ³	USA. ACGIH TLVs
Manganese & Mn Compounds	7439-96-5	Fume	5 mg/m ³	USA. OSHA PELs Ceiling
		Fume	0.2 mg/m ³	USA. California OSHA PELs
		Fume (Respirable)	0.02 mg/m ³	USA. ACGIH TLVs
		Fume (Inhalable)	0.1 mg/m ³	USA. ACGIH TLVs
		Inorganic	5 mg/m ³	USA. OSHA PELs Ceiling
		Inorganic	0.2 mg/m ³	USA. California OSHA PELs
		Inorganic (Respirable)	0.02 mg/m ³	USA. ACGIH TLVs
		Inorganic (Inhalable)	0.1 mg/m ³	USA. ACGIH TLVs
Molybdenum	7439-98-7	Soluble Compounds	5 mg/m ³	USA. OSHA PELs
		Soluble Compounds (Respirable)	0.5 mg/m ³	USA. ACGIH TLVs
		Insoluble compounds (Total Dust)	15 mg/m ³	USA. OSHA PELs
		Insoluble compounds (Total Dust)	10 mg/m ³	USA. California OSHA PELs
		Insoluble compounds (Respirable)	3 mg/m ³	USA. ACGIH TLVs & California OSHA PELs
		Insoluble compounds (Inhalable)	10 mg/m ³	USA. ACGIH TLVs
Nickel	7440-02-0	Metal	1 mg/m ³	USA. OSHA PELs
		Metal (Inhalable)	1.5 mg/m ³	USA. ACGIH TLVs
		Metal	0.015 mg/m ³	USA. NIOSH RELs
		Soluble Compounds	1 mg/m ³	USA. OSHA PELs
		Soluble Compounds (Inorganic)	0.1 mg/m ³	USA. ACGIH TLVs
		Insoluble Compounds	1 mg/m ³	USA. OSHA PELs
		Insoluble Compounds (Inorganic)	0.2 mg/m ³	USA. ACGIH TLVs
Potassium Silicate	1312-76-1	Total	10 mg/m ³	USA. ACGIH TLVs
Sodium Silicate	1344-09-8	Total	10 mg/m ³	USA. ACGIH TLVs
Silicon	7440-21-3	Total Dust	15 mg/m ³	USA. OSHA PELs
		Total Dust	10 mg/m ³	USA. California OSHA PELs
		Respirable	5 mg/m ³	USA. OSHA PELs
Silica (Quartz)	14808-60-7	Respirable	0.1 mg/m ³	USA. OSHA PELs
		Respirable	0.025 mg/m ³	USA. ACGIH TLVs
		Total Dust	0.3 mg/m ³	USA. OSHA PELs
Titanium Dioxide	13463-67-7	Total Dust	15 mg/m ³	USA. OSHA PELs

		Total Dust	10 mg/m ³	USA. ACGIH TLVs
Tungsten	7440-33-7	Insoluble	5.0 mg/m ³	USA. ACGIH TLVs
		Insoluble	10.0 mg/m ³	USA. ACGIH TLVs Ceiling
		Soluble	1.0 mg/m ³	USA. ACGIH TLVs
		Soluble	3.0 mg/m ³	USA. ACGIH TLVs Ceiling
Vanadium	7440-62-2	Oxide Dust	0.5 mg/m ³	USA. OSHA PELs Ceiling
		Oxide Dust (Inhalable)	0.05 mg/m ³	USA. ACGIH TLVs & California OSHA PELs
		Oxide Fume	0.1 mg/m ³	USA. OSHA PELs Ceiling
		Oxide Fume (Inhalable)	0.05 mg/m ³	USA. ACGIH TLVs & California OSHA PELs
Zirconium & Zr Compounds	7440-67-7	Metal	5 mg/m ³	USA. ACGIH TLVs
		Metal	10 mg/m ³	USA. ACGIH TLVs Ceiling
		Compound	5 mg/m ³	USA. OSHA PELs
		Compound	5 mg/m ³	USA. ACGIH TLVs
		Compound	10 mg/m ³	USA. ACGIH TLVs Ceiling

Exposure Limits – Canada

Common Name	CAS#	Form	Exposure Limit	Source
Calcium Carbonate	1317-65-3	Total Dust	10 mg/m ³	Canada. Alberta OEL TWA
		Total Dust	20 mg/m ³	Canada. British Columbia OEL TWA STEL
		Total Dust	10 mg/m ³	Canada. British Columbia OEL TWA
		Respirable	3 mg/m ³	Canada. British Columbia OEL TWA
		Total Dust	10 mg/m ³	Canada. Saskatchewan OEL for 8hr ACL
		Total Dust	20 mg/m ³	Canada. Saskatchewan OEL for 15min ACL
		Total Dust	10 mg/m ³	Canada. Quebec OEL TWA
Manganese & Mn Compounds	7439-96-5	As Mn	0.2 mg/m ³	Canada. Alberta OEL TWA
		As Mn	0.2 mg/m ³	Canada. British Columbia OEL TWA
		As Mn (Inhalable)	0.1 mg/m ³	Canada. Manitoba OEL TWA
		As Mn (Respirable)	0.02 mg/m ³	Canada. Manitoba OEL TWA
		As Mn	0.2 mg/m ³	Canada. New Brunswick OEL TWA
		As Mn	0.1 mg/m ³	Canada. Newfoundland & Labrador OEL TWA
		As Mn	0.1 mg/m ³	Canada. Nova Scotia OEL TWA
		As Mn	1 mg/m ³	Canada. Nunavut OEL TWA
		As Mn	3 mg/m ³	Canada. Nunavut OEL STEL
		As Mn	5 mg/m ³	Canada. Nunavut OEL Ceiling
		As Mn	1 mg/m ³	Canada. Northwest Territories OEL TWA
		As Mn	3 mg/m ³	Canada. Northwest Territories OEL STEL
		As Mn	5 mg/m ³	Canada. Northwest Territories OEL Ceiling

		As Mn	0.2 mg/m ³	Canada. Ontario OEL TWA
		As Mn	0.2 mg/m ³	Canada. Prince Edward Island OEL TWA
		As Mn	0.2 mg/m ³	Canada. Quebec OEL TWA
		As Mn	0.2 mg/m ³	Canada. Saskatchewan OEL TWA
		As Mn	0.6 mg/m ³	Canada. Saskatchewan OEL STEL
		As Mn	5 mg/m ³	Canada. Yukon OEL Ceiling
Silicon	7440-21-3	Total Dust	10 mg/m ³	Canada. British Columbia OEL TWA
		Total Dust	3 mg/m ³	Canada. New Brunswick OEL TWA
		Total Dust	10 mg/m ³	Canada. Nunavut OEL TWA
		Total Dust	10 mg/m ³	Canada. Northwest Territories OEL TWA
		Total Dust	10 mg/m ³	Canada. Ontario OEL TWA
		Total Dust	10 mg/m ³	Canada. Quebec OEL TWA
		Total Dust	10 mg/m ³	Canada. Saskatchewan OEL TWA
		Total Dust	20 mg/m ³	Canada. Saskatchewan OEL STEL
		Total Dust	10 mg/m ³	Canada. Yukon OEL TWA
		Total Dust	20 mg/m ³	Canada. Yukon OEL STEL
Silica (Quartz)	14808-60-7	Respirable Fraction	0.025 mg/m ³	Canada. Alberta OEL TWA
		Respirable Fraction	0.025 mg/m ³	Canada. British Columbia OEL TWA
		Respirable Fraction	0.025 mg/m ³	Canada. Manitoba OEL TWA
		Respirable Fraction	0.1 mg/m ³	Canada. Ontario OEL TWA
		Respirable Fraction	0.05 mg/m ³	Canada. Quebec OEL TWA
		Respirable Fraction	0.1 mg/m ³	Canada. Saskatchewan OEL TWA
Titanium Dioxide	13463-67-7	Total Dust	10 mg/m ³	Canada. Alberta OEL TWA
		Dust (Respirable)	3 mg/m ³	Canada. British Columbia OEL TWA
		Total Dust	10 mg/m ³	Canada. British Columbia OEL TWA
		Total Dust	10 mg/m ³	Canada. Manitoba OEL TWA
		Total Dust	10 mg/m ³	Canada. Ontario OEL TWA
		Total Dust	10 mg/m ³	Canada. Quebec OEL TWA
		Total Dust	10 mg/m ³	Canada. Saskatchewan OEL TWA
		Total Dust	20 mg/m ³	Canada. Saskatchewan OEL STEL

Exposure Limits – Mexico

Common Name	CAS#	Form	Exposure Limit	Source
Calcium Carbonate	1317-65-3	Total Dust	20 mg/m ³	Mexico. OEL CTT
		Total Dust	10 mg/m ³	Mexico. OEL CPT
Manganese & Mn Compounds	7439-96-5	As Mn	0.2 mg/m ³	Mexico. OEL CPT
		As Mn Fume	1.0 mg/m ³	Mexico. OEL CPT
		As Mn Fume	3.0 mg/m ³	Mexico. OEL CTT
Silicon	7440-21-3	Total Dust	10 mg/m ³	Mexico. OEL CPT
		Total Dust	20 mg/m ³	Mexico. OEL CTT
Silica	69012-46-2	Fume	10 mg/m ³	Mexico. OEL CPT
		Fume (Respirable)	3 mg/m ³	Mexico. OEL CPT
Silica (Quartz)	14808-60-7	Respirable Fraction	0.1 mg/m ³	Mexico. OEL CPT

Titanium Dioxide	13463-67-7	Total Dust	20 mg/m ³	Mexico. OEL CTT
		Total Dust	10 mg/m ³	Mexico. OEL CPT

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Solid or tubular wire
Color:	Various
Odor:	None
Odor threshold:	Not Applicable
pH:	Not Applicable
Melting point	>2000F (1100C)
Initial Boiling Point & Range:	Data Not Available
Flash point	Data Not Available
Evaporation rate	Data Not Available
Flammability	Data Not Available
Upper flammability/explosive limit:	Data Not Available
Lower flammability/explosive limit:	Data Not Available
Vapor pressure	Not Applicable
Vapor density:	Not Applicable
Relative density	0.2-0.3 lbs/in ³
Solubility in water	Data Not Available
Solubility (other)	Data Not Available
Partition coefficient	Data Not Available
Auto-ignition temperature	Data Not Available
Decomposition temperature:	Data Not Available
Viscosity :	Data Not Available

10. STABILITY AND REACTIVITY

Reactivity – This product is not reactive under normal conditions as shipped.

Chemical stability – This product is chemically stable under normal conditions as shipped.

Possibility of hazardous reactions – Polymerization reactions will not occur. **Conditions**

to avoid – Protect product from moisture and contamination. **Incompatible materials** – Data not available

Hazardous decomposition products – Welding electrodes and wires emit fumes/gases when used under normal conditions. These fumes/gases produced during welding cannot be easily classified, and will differ in quantity and form from those ingredients listed in Section 3 of this SDS. The composition and quantity of these fumes/gases are directly dependent upon the metal being welded, any material coatings (such as primer or galvanizing), the welding process, the welding consumables and the welding procedures. Other conditions which also influence the composition and quantity of the fumes/gases produced include the number of welders in the work area, the volume of the work area, the quality and amount of ventilation or exhaust, and the proximity of the welder's head to the fume plume.

Decomposition products of welding consumables under normal operation include oxides of elements present in the welding consumable and base material. Manganese compounds may be present in the fume from manganese bearing electrodes. Hexavalent chromium may be present in the fume from electrodes containing chromium. Nickel compounds may be present in the fume from nickel bearing electrodes. Fluoride containing consumables may generate gaseous and particulate fluoride. Gases such as carbon monoxide, carbon dioxide, ozone and nitrogen oxides may also be produced in the arc area.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure:

Oral – Unknown health effects, but this exposure is unlikely to occur.

Inhalation – Inhalation of welding fumes may lead to acute and/or chronic health hazards (see table below).

Skin – Arc rays can burn the skin. Weld fume deposited on the skin may cause irritation (see table below).

Eye – Arc rays can injure the eyes. Weld fume contact with the eyes may cause irritation (see table below).

Information on toxicological effects:

The acute and chronic effects of compounds which may be exposed to the welder are listed in the table below. Also listed are the available measured values of toxicity for that substance and whether it is classified as carcinogenic.

Substance	Short-Term Exposure Effects	Long Term Exposure Effects	Toxicity Measure	Carcinogenicity
Aluminium Oxide	May cause eye & respiratory irritation.	May cause effects on central nervous system.	LC50 (Rat, Oral Exposure) >5,000 mg/kg	Not classifiable
Barium Compounds	May cause irritation to the nose, throat, and respiratory tract.	May cause baratosis (deposits of barium in lungs). Baratosis is benign & does not progress to fibrosis.	LD50 (Rat, Oral Exposure) = 418 mg/kg	Not classifiable
Chromium as Cr+3	May cause eye, skin & respiratory irritation.	May cause chronic bronchitis, sinusitis, rhinitis and ashtma.	LC50 (Rat, 14 day Oral Exposure) >5,000 mg/kg	Not classifiable
Chromium as Cr+6	May cause eye, skin & respiratory irritation.	May cause lung, nasal and sinus cancer, ulceration and perforation of the nasal septum and skin rash.	LC50 (Rat, Oral Exposure) = 29 mg/kg	IARC-1 NTP-known OSHA
Cobalt Compounds	May cause respiratory irritation and cardiovascular inflammation.	May cause chronic irritation, diminished pulmonary function, asthma and fibrosis.	LC50 (Rat, 30 min Inhalation Exposure) = 165mg/m ³	Not classifiable
Copper Oxide	May cause metal fume fever with upper respiratory irritation, chills, and aching muscles.	Prolonged contact may cause skin sensitization.	LD50 (Rat, Oral Exposure) = 470mg/kg	Not classifiable
Fluorides	May cause eye, skin & respiratory irritation.	May cause serious bone erosion and mottling of teeth (fluorosis).	LD50 (Rat, Oral Exposure) = 31 mg/kg	Not classifiable
Iron Oxide	May cause respiratory irritation.	May cause siderosis (deposits of iron in lungs). Siderosis is benign and does not progress to fibrosis.	LD50 (Rat, Oral Exposure) > 10,000 mg/kg	Not classifiable
Lithium Compounds	May cause eye & skin irritation.	May adversely affect the central nervous system & kidneys, and may be a reproductive toxin.	LC50 (Rat, 4 hour Inhalation Exposure) > 2.17 mg/L	Not classifiable
Magnesium Oxide	May cause eye & respiratory irritation.	May cause decreased lung function.	LD50 (Rat, Oral Exposure) = 3870 mg/kg	Not classifiable
Manganese Oxide	May cause respiratory irritation, metal fume fever with chills, fever, upset stomach, body ache, vomiting.	May cause brain and central nervous system effects resulting in arm and leg tremors, slurred speech and poor coordination.	LD50 (Rat, 4 hour Inhalation Exposure) = 19 mg mg/kg	Not classifiable
Molybdenum	May cause eye & respiratory irritation.	Not found.	Not found	Not classifiable

Substance	Short-Term Exposure Effects	Long Term Exposure Effects	Toxicity Measure	Carcinogenicity
Nickel Oxide	May cause respiratory irritant, inhalation of fumes may cause pneumonitis.	Prolonged exposure may lead to asthma. Nickel refinery workers showed a higher incidence of lung and nasal cancers.	LD50 (Rat, Inhalation Exposure) > 5,000 mg/kg	IARC-1 NTP-known
Niobium	May cause respiratory irritation.	Not found.	Not found	Not classifiable
Silica	May cause eye & respiratory irritation.	Crystalline silica is a known carcinogen. Overexposure may also result in silicosis.	Not found	IARC-1 NTP-known
Titanium Dioxide	May cause respiratory irritation.	May be carcinogenic.	LD50 (Rat, Oral Exposure) > 10 g/kg	IARC-2B
Tungsten compound	May cause respiratory irritation.	Not found.	Not found	Not found
Vanadium Oxide	May cause eye, skin & respiratory irritation.	Exposure to high concentrations of fume may lead to chronic nasal hyperplasia.	LD50 (Rat, Oral Exposure) =10 mg/kg	Not classifiable
Zirconium Oxide	May cause eye & respiratory irritation.	May cause decreased lung function.	Not found	Not classifiable
Carbon Dioxide	At low levels, may cause headache, dizziness, loss of coordination, nausea. At high levels can cause coma and possibly death.	Long term exposure may affect the body's metabolism.	LC50 (Human, Inhalation Exposure) =100,000 ppm/min	Not classifiable
Carbon Monoxide	May cause effects on the blood, resulting in carboxyhaemoglobinemia and cardiac disorders. High levels may result in death.	May have effects on the cardiovascular system and central nervous system. May cause toxicity to human reproduction or development.	LC50 (Rat, 4 hour Inhalation Exposure) =1807 ppm	Not classifiable
Ozone	May cause eye and respiratory tract irritation. Inhalation may cause lung oedema. May cause effects on the central nervous system, resulting in headache and impaired performance.	May cause decreased lung function.	LC50 (Rat, 3 hour Inhalation Exposure) =4.5 mg/m ³	Not classifiable
Nitric Oxide	May cause respiratory irritation. Inhalation may cause lung oedema. Exposure far above the OEL may result in death.	May cause decreased lung function.	LC50 (Rat, Inhalation Exposure) =160 mg/m ³	Not classifiable
Nitrogen Dioxide	Corrosive to the skin and respiratory tract. Inhalation may cause lung oedema. Exposure far above the OEL may result in death.	May cause effects on the immune system and lungs, resulting in decrease in resistance to infection.	LC50 (Rat, 4 hour Inhalation Exposure) =88 ppm	Not classifiable

16. OTHER INFORMATION

NFPA 704: **HEALTH: 2** **FLAMMABILITY: 0** **REACTIVITY: 0**
HMIS: **HEALTH: 2** **FLAMMABILITY: 0** **PHYSICAL HAZARD: 0**

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For additional information please refer to the following sources:

USA: American National Standard (ANSI) Z49.1 "Safety in Welding and Cutting", ANSI/American Welding Society (AWS) F1.5 "Methods for Sampling and Analyzing Gases from Welding and Allied Processes", ANSI/AWS F1.1 "Method for Sampling Airborne Particles Generated by Welding and Allied Processes", AWSF3.2M/F3.2 Ventilation Guide for Weld Fume", American Welding Society, 550 North Le Jeune Road, Miami, Florida, 33135. Safety and Health Fact Sheets available from AWS at www.aws.org OSHA Publication 2206 (29 C.F.R. 1910), U.S. Government Printing Office, Superintendent of Documents, P. O. Box 371954, Pittsburgh, PA. 15250-7954. Threshold Limit Values and Biological Exposure Indices, American Conference of Governmental Hygienists (ACGIH), 6500 Glenway Ave., Cincinnati, OH 45211, USA. NFPA 51B "Standard for Fire Prevention During Welding, Cutting and Other Hot Work" published by the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169.

UK: WMA Publication 236 and 237, "Hazards from Welding Fume", The arc welder at work, some general aspects of health and safety.

Canada: CSA Standard CAN-CSA-W117.2-01 "Safety in Welding, Cutting and Allied Processes".

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