



MATERIAL SAFETY DATA SHEET

Prepared to OSHA, ACC, ANSI, NOHSC, WHMIS & 2001/58 EC Standards MSDS Revision: 1.1 MSDS Revision Date: 07/01/2010

1. PRODUCT IDENTIFICATION

1.1	Product Name: SHS8000 THERMAL SPRAY WIRE
1.2	Chemical Name: METAL WIRE
1.3	Synonyms: NA
1.4	Trade Names: SHS8000
1.5	Product Use: FOR PROFESSIONAL USE ONLY
1.6	Distributor's Name: THE NANOSTEEL COMPANY, INC.
1.7	Distributor's Address: 272 W. EXCHANGE STREET, SUITE 300, PROVIDENCE, RI 02903 USA
1.8	Emergency Phone: CHEMTREC: +1 (800) 424-9300 / +1 (703) 527-3887
1.9	Business Phone / Fax: TEL: +1 (401) 270-3549 / FAX: +1 (401) 270-9306

2. HAZARD IDENTIFICATION

2.1	<p>Hazard Identification:</p> <p>This product is classified as a HAZARDOUS SUBSTANCE but NOT DANGEROUS GOODS according to the classification criteria of NOHSC:1088(1999) and ADG Code (Australia).</p> <p>Electric shock from welding equipment or electrodes may be fatal. Hot metal spatter and heat from electric arcs, welding flames or the thermal spray process may cause burns to the hands and body or may cause fire if it comes into contact with combustible materials. UV, IR and light radiation from an electric arc or the thermal spray process may cause damage to unprotected eyes. Wear suitable protective equipment. Fumes and gases generated during the thermal spray process can be harmful to your health and noise generated during the thermal spray can damage hearing.</p> <p>Twin roll wire arc thermal spray utilizes a large voltage difference between two wires that causes an electrical arc between them. The arc is powerful enough to melt a small length of each wire that is then mixed together. The molten liquid metal is subsequently ejected through a nozzle by a gas stream that causes it to aspirate into fine droplets that then solidify upon impact forming a coating. See American National Standard Z-49.1, "Safety in Welding, Cutting and Allied Processes" published by the American Welding Society for additional safety precautions and hazard warnings.</p>						
2.2	Routes of Entry:	Inhalation:	YES	Absorption:	NO	Ingestion:	YES
2.3	<p>Effects of Exposure:</p> <p>INGESTION: Gastrointestinal irritation, nausea, and/or vomiting.</p> <p>EYES: Mild to moderate irritant.</p> <p>SKIN: Redness, irritation, rash at site of exposure.</p> <p>INHALATION: Inhalation of chromium and chromates, in fumes, can cause a metallic taste, tightness in the chest, nausea, fever, fatigue and allergic reaction. Fumes may cause irritation to nasal membranes, bronchial tubes and lungs.</p>						
2.4	<p>Symptoms of Overexposure:</p> <p>INGESTION: Intestinal discomfort, nausea, vomiting, and diarrhea.</p> <p>EYES: Mild irritation, redness, and watering.</p> <p>SKIN: Contact dermatitis, characterized by localized red or puffy dry skin and itching.</p> <p>INHALATION: Acute overexposure may include signs and symptoms such as watery eyes, nose and throat irritation, headache, dizziness, metal fume fever, difficulty in breathing, frequent coughing, or chest pain.</p>						
2.5	<p>Acute Health Effects:</p> <p>INGESTION: Gastrointestinal irritation and central nervous system depression.</p> <p>EYES: Mild to moderate irritant.</p> <p>SKIN: Prolonged or repeated contact may cause contact dermatitis (localized redness or rash).</p> <p>INHALATION: Acute overexposure may include signs and symptoms such as watery eyes, nose and throat irritation, headache, dizziness, metal fume fever, difficulty in breathing, frequent coughing, or chest pain.</p>						
2.6	<p>Chronic Health Effects:</p> <p>INGESTION: None reported by the manufacturer.</p> <p>EYES: None reported by the manufacturer.</p> <p>SKIN: Prolonged or repeated contact may cause contact dermatitis (localized redness or rash).</p> <p>INHALATION: Long term exposure to welding and allied processes gases, dusts and fumes may contribute to pulmonary irritation or pneumoconiosis.</p>						
2.7	<p>Target Organs: Eyes and respiratory system.</p>						

NA = Not Available; ND = Not Determined; NE = Not Established; NF = Not Found; C = Ceiling Limit; See Section 16 for Additional Definitions of Terms Used
NOTE: all WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-2004 format.

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3. COMPOSITION & INGREDIENT INFORMATION

CHEMICAL NAME(S)	CAS No.	RTECS No.	EINECS No.	%	EXPOSURE LIMITS IN AIR (mg/m ³)								
					ACGIH		NOHSC			OSHA			OTHER
					ppm		ppm			ppm			
					TLV	STEL	ES-TWA	ES-STEL	ES-PEAK	TLV	STEL	IDLH	NIOSH
IRON	7439-89-6	NO4565500	231-096-4	≥ 59.0	(5.0)	NA	NF	NF	NF	(10.0)	NA	NA	(0.5)
CHROMIUM #	7440-47-3	GB4200000	231-157-5	< 22.0	(0.5)	NA	(0.5)	NF	NF	(1.0)	NA	NA	
NIOBIUM	7440-03-1	QT9900000	231-113-5	< 5.0	NA	NA	NF	NF	NF	NA	NA	NA	
BORON *	7440-42-8	ED7350000	231-151-2	< 5.0	(10.0)	NA	NF	NF	NF	(15.0)	NA	NA	
MOLYBDENUM	7439-98-7	QA4680000	231-107-2	< 5.0	(10.0)	NA	(10.0)	NF	NF	(15.0)	NA	(5000)	
CARBON *	7440-44-0	FF5250100	231-153-3	< 2.0	(3.5)	NA	NF	NF	NF	(3.5)	NA	(1750)	
MANGANESE	7439-96-5	OO9275000	231-105-1	< 1.0	(10.0)	NA	(1.0)	NF	NF	(10.0)	NA	(500)	(1.0)
SILICON	7440-21-3	VW0400000	231-130-8	< 1.0	(10.0)	NA	(10.0)	NF	NF	(10.0)	NA	NA	

4. FIRST AID MEASURES

4.1	First Aid:	<p>INGESTION: DO NOT INDUCE VOMITING. Contact ChemTrec at +1 (703) 527-3887 or the nearest Poison Control Center or local emergency telephone number for assistance and instructions. Seek immediate medical attention. If vomiting occurs spontaneously, keep victim's head lowered (forward) to reduce the risk of aspiration.</p> <p>EYES: Flush eyes thoroughly with copious amounts of water for at least 15 minutes, holding eyelid(s) open to ensure complete flushing. If irritation persists, seek immediate medical attention.</p> <p>SKIN: Remove contaminated clothing and wash affected areas with soap and water. If irritation persists, seek prompt medical attention. Do not wear contaminated clothing until after it has been properly cleaned.</p> <p>INHALATION: Remove victim to fresh air at once. If breathing is difficult, administer supplemental oxygen and seek immediate medical attention. If breathing stops, perform artificial respiration.</p>
4.2	Medical Conditions Aggravated by Exposure:	<p>Individuals with allergies or impaired respiratory function may have symptoms worsened by exposure to welding fumes; however, such reaction cannot be predicted due to the variation in the composition and in the quantity of the decomposition products.</p>

5. FIREFIGHTING MEASURES

5.1	Flashpoint & Method:	NA			
5.2	Autoignition Temperature:	NA			
5.3	Flammability Limits:	Lower Explosive Limit (LEL):	NA	Upper Explosive Limit (UEL):	NA
5.4	Fire & Explosion Hazards:	This product is not flammable.			
5.5	Extinguishing Methods:	Water, CO₂, Halon or Dry Chemical			
5.6	Firefighting Procedures:	<p>Fight fires as for surrounding materials. Firefighters should wear a MSHA/NIOSH approved or equivalent self contained breathing apparatus (SCBA) and protective clothing. Fire should be fought from a safe distance. Keep containers cool until well after the fire is out. Prevent runoff from fire control or dilution from entering sewers, drains, drinking water supply, or any natural waterway.</p>			





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6. ACCIDENTAL RELEASE MEASURES

6.1 Spills:
Spilled product may produce a slip hazard. Before cleaning any spill, individuals involved in spill cleanup must wear appropriate Personal Protective Equipment including gloves, glasses and NIOSH approved (or equivalent) dust respirator. Carefully vacuum or sweep up the spilled powder. Dispose of properly in accordance with local, state and federal regulations. Wash all affected areas. Remove any contaminated clothing and wash thoroughly before reuse.

7. HANDLING & STORAGE INFORMATION

7.1 Work & Hygiene Practices:
Avoid contact to eyes, skin, and mucous membranes. Avoid inhalation of vapors, gases, fumes and dusts. Wash thoroughly after handling and use. Do not smoke, eat, drink, chew gum or tobacco, or apply cosmetics within the working area. Do not store or bring tobacco products, gum, food, drinks or cosmetics within the working area. Otherwise follow the standards of good industrial hygiene practices.

7.2 Storage & Handling:
No unusual methods are required. Keep product contained and retain all warning and identity labels. Preferred storage is a sheltered warm area with temperature and humidity control to prevent high humidity and "going through the dew point." Keep away from incompatible materials listed in Section 10. Open containers slowly on a stable surface. Keep container tightly closed when not in use.

7.3 Special Precautions:
Read and understand the manufacturer's instructions and the precautionary label on this product. See American National Standard Z-49.1, "Safety in Welding, Cutting and Allied Processes," published by the American Welding Society, P. O. Box 351040, Miami, FL 33135 and OSHA Publication 2206 (29 C.F.R. 1910), U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954 for additional details regarding fire and explosion control, exposure control and other special precautions.

8. EXPOSURE CONTROLS & PERSONAL PROTECTION

8.1 Ventilation & Engineering Controls:
Use industrial hygiene monitoring equipment to ensure that exposure does not exceed threshold limit values. Use with adequate ventilation (e.g., open doors and windows, local exhaust ventilation). Ensure appropriate decontamination equipment is available (e.g., sink, safety shower, eye-wash station). Use in a chemical fume hood when working with large quantities of product and provide adequate ventilation (e.g., local exhaust ventilation, fans).

8.2 Respiratory Protection:
Keep the exposure within legal limits. In the worker's breathing zone and the general area, the fumes and gases must be kept below the TLVs and the equivalent exposure must compute to less than one. Keep exposure as low as possible.
Use respirable fume respirator or air supplied respirator when welding in confined space or where local exhaust or ventilation does not keep exposure below the TLV. Where respiratory protection is necessary, NIOSH approved respiratory protection should be used. The selection of the appropriate respiratory protection (dust respirator, etc.) should be based on the actual or potential airborne contaminants and their concentrations present. However, at least a NIOSH approved type TC-21-C dust mask is recommended.

8.3 Eye Protection:
Wear helmet or use face shield with filter lens according to ANSI Z87.1. Provide protective screens and flash goggles, if necessary, to shield others. Wear safety glasses with UV protective side shields or goggles. Wear contact lenses in combination with safety eyewear, except where the contact lenses create a likelihood of injury from intense heat, highly particulate atmosphere, or where their use is prohibited.

8.4 Hand Protection:
Wear head, hand and body protection that help to prevent injury from hot metal, sparks, slag, infrared radiation, UV radiation, abrasions, contusions and heat stress. Protective clothing will not generally prevent shock except for leather if kept dry. Gloves made of leather with inside seams (or those that give equal performance) are preferred.

8.5 Body Protection:
Wear head, hand and body protection that help to prevent injury from radiation, sparks and electrical shock. Wear flame resistant ear plugs to keep sparks out of ears. See ANSI Z-49.1. The clothing may include heat/fire resistant gloves, overalls, aprons, sleeves, footwear, welder's spats and head cover. Wear garments made of leather, heavyweight tightly woven wool or cotton. Keep clothing clean (free of oil, grease or solvents) and in good repair. Do not wear clothing with frayed edges, tears or holes. Do not roll up sleeves or trousers (pants should not be cuffed).

HEALTH	1
FLAMMABILITY	0
REACTIVITY	0
SPECIAL EQUIPMENT	E
EYES	SKIN
LUNGS	



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9. PHYSICAL & CHEMICAL PROPERTIES

9.1	Density:	7.2 – 7.8 g/cm ³
9.2	Boiling Point:	NA
9.3	Melting Point:	NA
9.4	Evaporation Rate:	NA
9.5	Vapor Pressure:	NA
9.6	Molecular Weight:	NA
9.7	Appearance & Color:	Solid, wire, steel-grey color
9.8	Odor Threshold:	Odorless
9.9	Solubility:	NE
9.10	pH	NA
9.11	Viscosity:	NA
9.12	Other Information:	NA

10. STABILITY & REACTIVITY

10.1	Stability:	Stable under normal conditions of use (see section 7).
10.2	Hazardous Decomposition Products:	Irritating vapors and toxic gases (e.g., carbon monoxide and carbon dioxide) when involved in fire.
10.3	Hazardous Polymerization:	Will not occur.
10.4	Conditions to Avoid:	Use or storage near incompatible substances.
10.5	Incompatible Substances:	Strong oxidizing agents, strong acids and bases.

11. TOXICOLOGICAL INFORMATION

11.1	Toxicity Data:	This product has not been tested on animals to obtain toxicological data. (* Boron and carbon in a pure dust form can be a health hazard. Long term exposure to boron dust can be poisonous and affect the nervous system. Long term exposure to carbon dust can cause pneumoconiosis. However, their presence in this alloy is not believed to present a health hazard due to their relatively low concentration and chemical form. (# Chromium and its compounds are listed in the current annual report on carcinogens (prepared by the National Toxicology Program). Their presence in this alloy is not believed to present a carcinogenic or any other health hazard due to their relatively low concentration and chemical form.
11.2	Acute Toxicity:	See section 2.5
11.3	Chronic Toxicity:	See section 2.6
11.4	Suspected Carcinogen:	Chromium, in some forms (e.g., hexavalent chromium) is considered carcinogenic. However, this alloy does not contain any hexavalent chromium. Therefore, this alloy is not believed to present a carcinogenic or any other health hazard due to their relatively low concentration and chemical form.
11.5	Reproductive Toxicity:	This product is not reported to produce reproductive toxicity in humans.
	Mutagenicity:	This product is not reported to produce mutagenic effects in humans.
	Embryotoxicity:	This product is not reported to produce embryotoxic effects in humans.
	Teratogenicity:	This product is not reported to produce teratogenic effects in humans.
	Reproductive Toxicity:	This product is not reported to produce reproductive effects in humans.
11.6	Irritancy of Product:	See section 2.3
11.7	Biological Exposure Indices:	NE
11.8	Physician Recommendations:	Treat symptomatically.



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12. ECOLOGICAL INFORMATION

12.1	Environmental Stability: This product will slowly corrode in soil.
12.2	Effects on Plants & Animals: There is no specific data available for this product.
12.3	Effects on Aquatic Life: Releases of large volumes of this product are not expected to be harmful or fatal to overexposed aquatic life.

13. DISPOSAL CONSIDERATIONS



13.1	Waste Disposal: Dispose of in accordance with federal, state, provincial or local regulations.
13.2	Special Considerations: NA

14. TRANSPORTATION INFORMATION

The basic description (ID Number, proper shipping name, hazard class & division, packing group) is shown for each mode of transportation. Additional descriptive information may be required by 49 CFR, IATA/ICAO, IMDG, TDGR, SCT and ADGR.

14.1	49 CFR (GND): NOT REGULATED	
14.2	IATA (AIR): NOT REGULATED	
14.3	IMDG (OCN): NOT REGULATED	
14.4	TDGR (Canadian GND): NOT REGULATED	
14.5	ADR/RID (EU): NOT REGULATED	
14.6	SCT (MEX): NOT REGULATED	
14.7	ADGR (AUS): NOT REGULATED	

15. REGULATORY INFORMATION

15.1	U.S. EPA SARA Reporting Requirements: The following chemicals are listed on the SARA Title III (EPCRA 313 Toxic Chemical List): Chromium and Manganese.	
15.2	U.S. EPA SARA Threshold Planning Quantity: NA	
15.3	U.S. EPA TSCA Inventory Status: All chemical substances of this product are listed on the TSCA inventory or are otherwise exempt from inventory status.	
15.4	U.S. EPA CERCLA Reportable Quantity (RQ): Chromium: 5,000 lbs (2,270 kgs)	
15.5	Other U.S. Federal Requirements: NA	
15.6	Other Canadian Regulations This product has been classified according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR. The components of this product are listed on the DSL/NDL. The following chemicals are listed on the Ingredient Disclosure List: Chromium, Manganese and Molybdenum. WHMIS Classification: D2A	
15.7	U.S. State Regulatory Information: None of the components on this list are listed in any state criteria lists.	
15.8	67/548/EEC (European Union) and Australia NOHSC:2011 (2003) Requirements: None of the components in this product is listed in Annex I of EU Directive 67/548/EEC. Harmful (Xn). R: 9-20-24/25 - Use only in well ventilated areas. Harmful by inhalation. Avoid contact with skin and eyes. S: 22-36/37/39-38-51 - Do not breathe gas/fumes/vapor/spray. Wear suitable protective clothing, gloves and eye/face protection. In case of insufficient ventilation wear suitable respiratory equipment. Use only in well-ventilated areas. Poisons Schedule Number: None Allocated.	



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16. OTHER INFORMATION

16.1 Other Information:
This material is used in the thermal spraying process. Consult the NanoSteel Company Material Safety Data Sheet, and applicable Federal, state, provincial and local health and safety laws before using this product. Local ventilation should be used during handling. Good housekeeping and personal hygiene are recommended. Some individuals may show sensitivity to exposure. Failure to observe proper practices may be hazardous to health.
Use only in well-ventilated areas. Harmful by inhalation. Avoid contact with skin and eyes. Do not breathe gas, fumes, vapor or spray. Wear suitable protective clothing, gloves and eye/face protection. In case of insufficient ventilation wear suitable respiratory protective equipment. Avoid overexposure to metal dust.

16.2 Terms & Definitions:
See last page of this MSDS.

16.3 Disclaimer:
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 this product. To the best of ShipMate's & NanoSteel's knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness is not guaranteed and no warranties of any type, either expressed or implied, are provided. The information contained herein relates only to the specific product(s). If this product(s) is combined with other materials, all component properties must be considered. Data may be changed from time to time. Be sure to consult the latest edition.

16.4 Prepared for:
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16.5 Prepared by:
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DEFINITION OF TERMS

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

GENERAL INFORMATION:

CAS No.	Chemical Abstract Service Number
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EXPOSURE LIMITS IN AIR:

ACGIH	American Conference on Governmental Industrial Hygienists
TLV	Threshold Limit Value
OSHA	U.S. Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
IDLH	Immediately Dangerous to Life and Health

FIRST AID MEASURES:

CPR	Cardiopulmonary resuscitation - method in which a person whose heart has stopped receives manual chest compressions and breathing to circulate blood and provide oxygen to the body.
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HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: HMIS

HEALTH, FLAMMABILITY & REACTIVITY RATINGS:

0	Minimal Hazard
1	Slight Hazard
2	Moderate Hazard
3	Severe Hazard
4	Extreme Hazard

PERSONAL PROTECTION RATINGS:

A		G	
B		H	
C		I	
D		J	
E		K	
F		X	Consult your supervisor or S.O.P. for special handling directions.

Safety Glasses	Splash Goggles	Face Shield & Eye Protection	Gloves
Boots	Synthetic Apron	Full Suit	Dust Respirator
Vapor Respirator	Dust & Vapor Respirator	Full Face Respirator	Airline Hood/Mask or

Note: the dotted circle indicates that this respiratory protective equipment is required for high concentrations or for large volume spills or releases of product.

FLAMMABILITY LIMITS IN AIR:

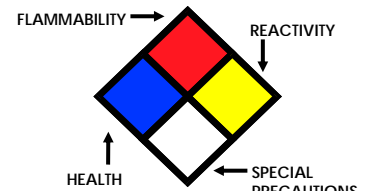
Autoignition Temperature	Minimum temperature required to initiate combustion in air with no other source of ignition
LEL	Lower Explosive Limit - lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source
UEL	Upper Explosive Limit - highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source

OTHER STANDARD ABBREVIATIONS:

NA	Not Available
NR	No Results
NE	Not Established
NF	Not Found
ND	Not Determined
ML	Maximum Limit
SCBA	Self-Contained Breathing Apparatus

NATIONAL FIRE PROTECTION ASSOCIATION: NFPA HAZARD RATINGS:

0	Minimal Hazard
1	Slight Hazard
2	Moderate Hazard
3	Severe Hazard
4	Extreme Hazard
ACD	Acidic
ALK	Alkaline
COR	Corrosive
-W	Use No Water
OX	Oxidizer



TOXICOLOGICAL INFORMATION:

LD₅₀	Lethal Dose (solids & liquids) which kills 50% of the exposed animals
LC₅₀	Lethal concentration (gases) which kills 50% of the exposed animal
ppm	Concentration expressed in parts of material per million parts
TD₀₁	Lowest dose to cause a symptom
TCLo	Lowest concentration to cause a symptom
TD₀₁, LD₀₁, & LD₀₁ or TC, TC₀₁, LC₀₁, & LC₀₁	Lowest dose (or concentration) to cause lethal or toxic effects
IARC	International Agency for Research on Cancer
NTP	National Toxicology Program
RTECS	Registry of Toxic Effects of Chemical Substances
BCF	Bioconcentration Factor
TL_m	Median threshold limit
log K_{ow} or log K_{oc}	Coefficient of Oil/Water Distribution

REGULATORY INFORMATION:

CPR	Canada's Controlled Product Regulations
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
EU	European Union (European Union Directive 67/548/EEC)
DSL	Canadian Domestic Substance List
NDSL	Canadian Non-Domestic Substance List
NOHSC	National Occupational Health & Safety Code (Australia)
PSL	Canadian Priority Substances List
TC	Transport Canada
TSCA	U.S. Toxic Substance Control Act
WHMIS	Canadian Workplace Hazardous Material Information System

EC INFORMATION:

C	E	F	N	O	T+	Xi	Xn
Corrosive	Explosive	Flammable	Harmful	Oxidizing	Toxic	Irritant	Harmful

WHMIS INFORMATION:

A	B	C	D1	D2	D3	E	F
Compressed	Flammable	Oxidizing	Toxic	Irritation	Infectious	Corrosive	Reactive