



SAFETY DATA SHEET

Version: 1.1

Revision Date: 10/13/2015

Print Date: 12/22/2015

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product Name : ADVAMET® Ferritic/Martensitic Stainless Steel (Nickel-free)
Feedstock for MIM
SDS Number : AMPSDS.04
CAS-No. : Mixture
Chemical Family : Polymer/Metal Powder Composite

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Feedstock for manufacture of MIM engineered goods

1.3 Details of the supplier of the safety data sheet

Company : Advanced Metalworking Practices, LLC
4511 W. 99th Street
CARMEL IN 46032
USA

Telephone : +1 317-337-0441

1.4 Emergency telephone number

Emergency Phone # : +1 317-337-0441

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Acute aquatic toxicity (Category 3), H402

Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label Elements, including precautionary statements

Signal word : Warning

Hazard Statement(s)
H412 : Harmful to aquatic life with long lasting effects.

Precautionary statement(s)	
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P391	Collect spillage.
P402 + P404	Store in a dry place. Store in a closed container.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

EU Risk Phrases:

International Agency for Research on Cancer (IARC) Group 3 is defined as:

Group 3: The agent (mixture or exposure circumstance) is not classifiable as to its carcinogenicity to humans.

This category is used most commonly for agents, mixtures and exposure circumstances for which the evidence of carcinogenicity is inadequate in humans and inadequate or limited in experimental animals. Exceptionally, agents (mixtures) for which the evidence of carcinogenicity is inadequate in humans but sufficient in experimental animals may be placed in this category when there is strong evidence that the mechanism of carcinogenicity in experimental animals does not operate in humans.

Agents, mixtures and exposure circumstances that do not fall into any other group are also placed in this category.

Potential Health Effects: Although there are no test data, there are no reported cases of any health problems from exposure to this product. As a normal precaution, excessive dusting or inhalation of fines should be avoided. Respirators should be worn if there is excessive dusting.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Ingredients : The percentage concentrations are presented for industrial hygiene purposes. They do not represent certification of content.

Component	Formula	Density (g/cm ³)	CAS-No.	EC-No.	Wt. %	Hazardous Component?	Hazardous Classification
Iron	Fe	7.874	7439-89-6	231-096-4	68 – 96	N	n/a
Carbon	C	2.26	7782-42-5	231-955-3	0 – 1.2	N ¹	n/a
Manganese	Mn	7.21	7439-96-5	231-105-1	0 – 13	Y ¹	Aquatic Acute 3; Aquatic Chronic 3; H402, H412
Silicon	Si	2.329	7440-21-3	231-130-8	0 – 1	N ¹	n/a
Chromium	Cr	7.19	7440-47-3	231-157-5	4 – 27	N	IARC 3
Molybdenum	Mo	10.28	7439-98-7	231-107-2	0 – 4	N ¹	n/a
Organic Binder	n/a	~1.000	n/a	n/a	3 – 15*	N	n/a

For the full text of the H-Statements mentioned in this Section, see Section 16.

*Binder is listed as a percentage of the feedstock. Other percentages refer to percentage of metals.

¹Not present in all grades of ferritic/martensitic stainless steels (nickel-free). See Quality Certification for actual metal composition.

3.2 Other Substance Designations

Compound	CAS-No.	Hazardous Classification
Ferrochrome	11114-46-8	IARC 3

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

Remove exposed person to fresh air immediately. If not breathing, give artificial respiration. Seek medical attention.

In case of ingestion

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Ingestion is unlikely, but if it should occur accidentally, consult a physician. No serious side effects are likely from ingestion.

In case of skin contact

If burns are caused by molten material, hospital treatment is required.

If non-molten skin contact occurs, minimize skin contact. Wash off with soap and plenty of water. Seek medical attention if irritation persists.

In case of eye contact

Avoid rubbing eyes and wash with warm, gently running water for at least 15 minutes. If irritation persists, consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see Section 2.2) and/or in Section 11.

4.3 Indication of any immediate medical attention and special treatment needed

No data available.

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Carbon dioxide (or others specified for fires of metal powders and plastics such as dry sand, dry chemical, water spray, or alcohol-resistant foam).

5.2 Special hazards arising from the substance or mixture

Various metal oxides depending upon exact composition; carbon monoxide and carbon dioxide formation; fumes from combustion of polymers.

5.3 Advice for firefighters

Fire fighters should be equipped with self-contained breathing apparatus and protective clothing.

5.4 Further information

No data available.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Avoid breathing dust or contact with skin or eyes. Wear approved respirator, gloves, and other protective gear to minimize contact. For other precautions and exposure control, see Sections 2.2 and 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge to environment must be avoided. Dispose of any spillage in conformity with applicable laws and regulations.

If leakage is to water, report to local environmental authorities for appropriate clean up measures.

6.3 Methods and materials for containment and cleaning up

Right container or direct leakage point upwards to prevent further loss of material. If there is an open drain nearby, cover to prevent leakage to water. Collect spills by sweeping up and shoveling or vacuuming into a grounded HEPA filtered unit depending upon the size of the spill. Transfer spilled material to a suitable, closed container for disposal according to local regulations (see Section 13). No emergency berms should be required as the material is solid.

If leakage is on roads or to the ground, restrict access to clean up zone to authorized personnel only and follow above prescribed method. If spill is large, keep nuisance dust cloud formation to a minimum while sweeping and shoveling.

6.4 Reference to other sections

For disposal, see Section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. The physical form of the product makes it unlikely that it will become airborne under normal usage. However, care should be taken to avoid excessive dusting, contact with acids and other strongly oxidizing substance or exposure to high temperatures. The material can be processed safely at the temperatures required for its intended purpose. Avoid spillage. For precautions, see Section 2.2

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. The material should always be stored away from acids and oxidizing chemicals and stored below 100°F.

7.3 Specific end use(s)

Apart from the uses mentioned in Section 1.2, no other specific uses are stipulated.

8. EXPOSURE CONTROL/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control Parameters	Basis
Manganese	7439-96-5	TWA	0.200 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC)		
		C	5 mg/m ³	USA. Occupational Exposure Limits (OSHA) – Table Z-1 Limits for Air Contaminants – 1910.1000 Ceiling limit is to be determined from breathing-zone air samples.
		TWA	1 mg/m ³	USA. NIOSH Recommended Exposure Limits
		ST	3 mg/m ³	USA. NIOSH Recommended Exposure Limits
Silicon	7440-21-3	TWA	5 mg/m ³	USA. Occupational Exposure Limits (OSHA) – Table Z-1 Limits for Air Contaminants – 1910.1000
		TWA	5 mg/m ³	USA. NIOSH Recommended Exposure Limits
	Remarks	Does not occur free in nature, but is found in silicon dioxide (silica) & in various silicates		
Chromium	7440-47-3	TWA	0.500 mg/m ³	USA. NIOSH Recommended Exposure Limits
	Remarks	See Appendix C		
		TWA	1 mg/m ³	USA. Occupational Exposure Limits (OSHA) – Table Z-1 Limits for Air Contaminants – 1910.1000
		TWA	0.5 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Liver Impairment Not classifiable as a human carcinogen Upper Respiratory Tract irritation Skin irritation		
Molybdenum	7439-98-7	TWA	15 mg/m ³	USA. Occupational Exposure Limits (OSHA) – Table Z-1 Limits for Air Contaminants – 1910.1000
		TWA	3 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	See Appendix D – Substances with No Established RELs		

8.2 Exposure Controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practices. Wash hands before breaks and at the end of the workday.

Personal Protective Equipment

Eye/face protection

Face Shield/safety glasses for eye protection must be tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).

Skin protection

Use heat-resistant gloves during handling of material in hot melt or near hot melt conditions. Handle fresh material with nitrile gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this

product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body protection

The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace. Tyvek® coveralls or arm covers along with normal industrial work attire is sufficient to protect against exposure under normal use of this product. All clothes should be thoroughly washed with soap and water before reuse.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate, use a full-face particle respirator type N100 (US) or P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent leakage or spillage. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	:	Grey granules or pellets
b)	Odor	:	Practically odorless, slight organic polymer smell
c)	Odor Threshold	:	No data available
d)	pH	:	Not applicable
e)	Melting point/freezing point	:	Binder: ~55°C; Metals: Various
f)	Initial boiling point and boiling range	:	Binder: N/A; Metals: Various
g)	Flash point	:	Not applicable
h)	Evaporation rate	:	No data available
i)	Flammability	:	No data available
j)	Upper/lower flammability or explosive limit	:	No data available
k)	Vapor pressure	:	No data available
l)	Vapor density	:	No data available
m)	Relative density	:	4.0 – 6.0 g/cm ³ at R.T.
n)	Bulk density	:	2 – 3 g/cm ³
o)	Water solubility	:	Insoluble
p)	Partition coefficient: n-octanol/water	:	No data available
q)	Auto-ignition temperature	:	No data available
r)	Decomposition temperature	:	No data available
s)	Viscosity	:	Varies greatly (10 ² -10 ⁶ Poise) depending upon binder and metal powder loading
t)	Explosive properties	:	No risk under normal use and conditions.
u)	Oxidizing properties	:	Not classified as oxidizing.

9.2 Other safety information

No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available, though hazardous polymerization is not likely

10.2 Chemical Stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

Metallic portions will react with acids.

10.4 Conditions to avoid

Thermal decomposition of binders is possible above 200 °C.

10.5 Incompatible materials

Store away from acids and oxidizing chemicals.

10.6 Hazardous decomposition products

Decomposition products – Water vapor, carbon monoxide, carbon dioxide, various hydrocarbons.

Hazardous decomposition products formed under fire conditions – Same as above with the inclusion of metal oxides.

In the event of fire: see Section 5.

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

No adverse health effects are expected if handled as recommended. Toxicological data is given (if known) for components with the highest expected toxic effect.

Acute toxicity	:	LD50 Oral – Mouse – > 2,000 mg/kg (Carbon)
Inhalation	:	LD50 Inhalation – Rat – 4 hr – > 5.4 mg/l (Molybdenum)
Dermal	:	LD50 Dermal – Rat – > 2,000 mg/kg (Molybdenum)
Skin corrosion/irritation	:	Skin – Rabbit – Result: Mild skin irritation – 24 hr (Manganese)
Serious eye damage/irritation	:	Eyes – Rabbit – Result: Mild eye irritation – 24 hr (Manganese, Silicon)
Respiratory/skin sensitization	:	Maximisation Test (GPMT) – Guinea pig – Result: Does not cause skin sensitization (Iron)
Germ cell mutagenicity	:	S. typhimurium – Result: Not mutagenic in Ames Test. (Iron)
Carcinogenicity	:	
IARC:		3 – Group 3: Not classifiable as to its carcinogenicity to humans (Chromium)
ACGIH:		No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:		No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by NTP.
OSHA:		No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.
Reproductive toxicity	:	No data available
Specific target organ toxicity - Single Exposure	:	No data available

Repeated Exposure : Inhalation – Causes damage to organs through prolonged or repeated exposure.
Aspiration hazard : No data available
Additional information :
RTECS: OO9275000 – Manganese – Stomach – Irregularities – Based on human evidence. Men exposed to manganese dust showed decrease in fertility. Chronic manganese poisoning primarily involves the central nervous system. Early symptoms include languor, sleepiness and weakness in the legs. A stolid mask-like appearance of the face, emotional disturbances such as uncontrollable laughter and a spastic gait with tendency to fall in walking are findings in more advanced cases. High incidence of pneumonia has been found in workers exposed to the dust or fume of some manganese compounds.
RTECS: GB4200000 – Chromium – Stomach – Irregularities – Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish : Iron – static test – *Morone saxatilis* – 13.6 mg/l – 96 hr
Chromium – LC50 – *Cyprinus carpio* (Carp) – 14.3 mg/L 96 hr
Molybdenum – LC50 – *Oncorhynchus mykiss* (Rainbow trout) – 800 mg/l – 96 hr; mortality LOEC – *Oncorhynchus mykiss* (Rainbow trout) – 500 mg/l – 96 hr

Toxicity to daphnia and other aquatic invertebrates : Manganese – EC50 – *Daphnia magna* (Water flea) – 40 mg/l
Chromium – EC50 – *Daphnia magna* (Water flea) – 0.07 mg/l – 48 hr

12.2 Persistence and degradability

No data available.

12.3 Bioaccumulative potential

Bioaccumulation : Chromium – *Oncorhynchus mykiss* (rainbow trout) – 30d – 50 µg/l
Bioconcentration factor (BCF): 1.03 – 1.22

12.4 Mobility in soil

No data available.

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted.

12.6 Other adverse effects

Product is essentially insoluble in water and can be readily separated from water using mechanical means. However, an environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Harmful to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Dispose of in accordance with national, state, and local regulations.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

Not classified as a dangerous good under transport regulations for land, sea or air.

IMDG

Not classified as a dangerous good under transport regulations for land, sea or air.

IATA

Not classified as a dangerous good under transport regulations for land, sea or air.

15. REGULATORY INFORMATION**SARA 302 components**

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302

SARA 313 components

SARA 313: The following components are subject to reporting levels established by SARA Title III, Section 313:

Chemical: Manganese	CAS-No.: 7439-96-5	Revision date: 07-01-2007
Chromium	CAS-No.: 7440-47-6	Revision date: 07-01-2007

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right to Know Components

Chemical: Manganese	CAS-No.: 7439-96-5	Revision date: 07-01-2007
Silicon	CAS-No.: 7440-21-3	Revision date: 03-01-2007
Chromium	CAS-No.: 7440-47-6	Revision date: 07-01-2007
Molybdenum	CAS-No.: 7439-98-7	Revision date: 04-24-1993

Pennsylvania Right to Know Components

Chemical: Iron	CAS-No.: 7439-89-6	Revision date: N/A
Manganese	CAS-No.: 7439-96-5	Revision date: 07-01-2007
Silicon	CAS-No.: 7440-21-3	Revision date: 03-01-2007
Chromium	CAS-No.: 7440-47-6	Revision date: 07-01-2007
Molybdenum	CAS-No.: 7439-98-7	Revision date: 04-24-1993

New Jersey Right to Know Components

Chemical: Iron	CAS-No.: 7439-89-6	Revision date: N/A
Manganese	CAS-No.: 7439-96-5	Revision date: 07-01-2007
Silicon	CAS-No.: 7440-21-3	Revision date: 03-01-2007
Chromium	CAS-No.: 7440-47-6	Revision date: 07-01-2007
Molybdenum	CAS-No.: 7439-98-7	Revision date: 04-24-1993

California Prop. 65 Components

This product does not contain any chemicals known to the State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Revision Updates

- 1.1 Increased Manganese Composition to a maximum of 14% from 1.5% in section 3.1. Added ACGIH information to Carcinogenicity section of 9.1.

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity.
Aquatic Chronic	Chronic aquatic toxicity.
IARC 3	International Agency for Research on Cancer (IARC) Group 3.
H402	Harmful to aquatic life.
H412	Harmful to aquatic life with long lasting effects.

Further information

ADVAMET® is a registered trademark of Advanced Metalworking Practices, LLC.

While Advanced Metalworking Practices, LLC has attempted to provide current and accurate information herein, Advanced Metalworking makes no representation regarding the accuracy or completeness of the information and assumes no liability for any loss, damage and/or injury of any kind which may result from or arise out of the use of or reliance on the information by any person or organization.