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SAFETY DATA SHEET

Version: 1.0

Revision Date: 5/31/2016

Print Date: 5/31/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product Name : ADVAMET[®] Fe-Ni-Co Feedstock for MIM
SDS Number : AMPSDS.18
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)

Skin Sensitisation (Category 1), H317

Respiratory Sensitisation (Category 1), H334

Carcinogenicity (Category 2), H351

Specific target organ toxicity – repeated exposure, Inhalation (Category 1), H372

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

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

2.2 GHS Label Elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard Statement(s)

H317

May cause an allergic skin reaction.

H334

May cause allergy or asthma symptoms or breathing difficulties if inhaled.

H351

Suspected of causing cancer.

H372

Causes damage to organs through prolonged or repeated exposure if inhaled.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201

Obtain special instructions before use.

P202

Do not handle until all safety precautions have been read and understood.

P260

Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.

P264

Wash skin thoroughly after handling.

P270

Do not eat, drink or smoke when using this product.

P272

Contaminated work clothing should not be allowed out of the workplace.

P273

Avoid release to the environment.

P280

Wear protective gloves/ protective clothing/ eye protection/ face protection.

P302 + P352

IF ON SKIN: Wash with plenty of soap and water.

P304 + P341

IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing.

P308 + P313

If exposed or concerned: Get medical advice/ attention.

P321

Specific treatment (see supplemental first aid instructions on this label).

P333 + P313

If skin irritation or rash occurs: Get medical advice/ attention.

P342 + P311

If experiencing respiratory symptoms: Call a POISON CENTER or doctor/ physician.

P363

Wash contaminated clothing before reuse.

P370 + P378

In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.

P391

Collect spillage.

P405

Store locked up.

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:

The International Agency for Research on Cancer (IARC) Monograph Supplement 7 includes the following information on nickel:

Three investigations that examined the possible cancer risk associated with exposure to nickel and nickel compounds in nickel alloy plants showed no significant increase in mortality from cancer. In one of these, excess mortality from lung cancer was noted in maintenance workers; however, it was unclear whether the risk was directly associated with nickel exposures. Workers at a gaseous diffusion plant who were exposed to high-purity metallic nickel powder did not exhibit any increase in mortality from respiratory-tract cancers. An incidence study at a hydrometallurgical nickel refining plant in Canada did not indicate an increased risk of cancer. Exposure was to metallic nickel and nickel concentrate dust.

International Agency for Research on Cancer (IARC) Group 2A is defined as:

Group 2A: The agent (mixture) is *probably carcinogenic to humans*.

The exposure circumstance entails exposures that are probably carcinogenic to humans.

This category is used when there is *limited evidence of carcinogenicity* in humans and *sufficient evidence of carcinogenicity* in experimental animals. In some cases, an agent may be classified in this category when there is *inadequate evidence of carcinogenicity* in humans and *sufficient evidence of carcinogenicity* in experimental animals and strong evidence that the carcinogenesis is mediated by a mechanism that also operates in humans. Exceptionally, an agent may be classified in this category solely on the basis of *limited evidence of carcinogenicity* in humans. An agent may be assigned to this category if it clearly belongs, based on mechanistic considerations, to a class of agents for which one or more members have been classified in Group 1 or Group 2A.

International Agency for Research on Cancer (IARC) Group 2B is defined as:

Group 2B: *The agent (mixture) is possibly carcinogenic to humans.*

The exposure circumstance entails exposures that are possibly carcinogenic to humans.

This category is used for agents, mixtures and exposure circumstances for which there is *limited evidence* of carcinogenicity in humans and less than *sufficient evidence* of carcinogenicity in experimental animals. It may also be used when there is *inadequate evidence* of carcinogenicity in humans but there is *sufficient evidence* of carcinogenicity in experimental animals. In some instances, an agent, mixture or exposure circumstance for which there is *inadequate evidence* of carcinogenicity in humans but *limited evidence* of carcinogenicity in experimental animals together with supporting evidence from other relevant data may be placed in this group.

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	53 – 55	N	n/a
Nickel	Ni	8.908	7440-02-0	231-111-4	28.5 – 29.5	Y	IARC 2B; Skin Sens. 1; Carc. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H317, H351, H372, H410

Cobalt	Co	8.9	7440-48-4	231-158-0	16.5 – 17.5	Y	IARC 2A; IARC 2B; Resp. Sens. 1; Skin Sens. 1; Aquatic Chronic 4; H317, H334, H413
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.

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.
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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.
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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
Nickel	7440-02-0	TWA	1.5 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Dermatitis Pneumoconiosis Not suspected as a human carcinogen		
		TWA	1 mg/m ³	USA. Occupational Exposure Limits (OSHA) – Table Z-1 Limits for Air Contaminants – 1910.1000
		TWA	0.015 mg/m ³	USA. NIOSH Recommended Exposure Limits
	Remarks	Potential Occupational Carcinogen See Appendix A		
Cobalt	7440-48-4	TWA	0.100 mg/m ³	USA. Occupational Exposure Limits (OSHA) – Table Z-1 Limits for Air Contaminants – 1910.1000
		TWA	0.050 mg/m ³	USA. NIOSH Recommended Exposure Limits
		TWA	0.020 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Pulmonary Function Asthma Myocardial effects Substances for which there is a Biological Exposure Index or Indices (see BEI section) Confirmed animal carcinogen with unknown relevance to humans		
	BEI	Urine	15 µg/L	ACGIH – Biological Exposure Indices (BEI) taken at End of Shift at End of Workweek
	BEI	Blood	1 µg/L	ACGIH – Biological Exposure Indices (BEI) taken at End of Shift at End of Workweek

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 other binder constituents 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 – Rat – male and female – 6,171 mg/kg (Cobalt)
Remarks: Behavioral – Somnolence (general depressed activity).
Behavioral – Ataxia, Diarrhea

Inhalation : No data available.

Dermal : No data available.

Skin corrosion/irritation : No data available.

Serious eye damage/irritation : No data available.

Respiratory/skin sensitization : No data available.

Germ cell mutagenicity : S. typhimurium – Result: Not mutagenic in Ames Test. (Iron)

Carcinogenicity : This product contains components (Nickel and Cobalt) that have been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies:

IARC: 2A – Group 2A: Probably carcinogenic to humans (Cobalt)
2B – Group 2B: Possibly carcinogenic to humans (Nickel and Cobalt)

NTP: Reasonably anticipated to be a human carcinogen (Nickel)

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. (Nickel)

Aspiration hazard : No data available.
Additional information :
RTECS: QR5950000 – Nickel – Stomach – Irregularities – Based on human evidence.
RTECS: GF8750000 – Cobalt – Kidney injury may occur; damage to the eyes; lung irritation;
throat irritation; rash; vomiting; diarrhea.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish : Iron – static test – *Morone saxatilis* – 13.6 mg/l – 96 hr
Nickel – LC50 – *Cyprinus carpio* (Carp) – 1.3 mg/l – 96 hr
Cobalt – LC50 – *Danio rerio* (zebra fish) – 100.01 mg/l – 96 hr

Toxicity to daphnia and other : Nickel – EC50 – *Daphnia magna* (Water flea) – 1 mg/l – 48 hr

12.2 Persistence and degradability

No data available.

12.3 Bioaccumulative potential

No data available.

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. Very toxic 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: Nickel (Metallic)	CAS-No.: 7440-02-0	Revision date: 07-01-2007
Cobalt	CAS-No.: 7440-48-4	Revision date: 07-01-2007

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right to Know Components

Chemical: Nickel (Metallic)	CAS-No.: 7440-02-0	Revision date: 07-01-2007
Cobalt	CAS-No.: 7440-48-4	Revision date: 07-01-2007

Pennsylvania Right to Know Components

Chemical: Iron	CAS-No.: 7439-89-6	Revision date: N/A
Nickel (Metallic)	CAS-No.: 7440-02-0	Revision date: 07-01-2007
Cobalt	CAS-No.: 7440-48-4	Revision date: 07-01-2007

New Jersey Right to Know Components

Chemical: Iron	CAS-No.: 7439-89-6	Revision date: N/A
Nickel (Metallic)	CAS-No.: 7440-02-0	Revision date: 07-01-2007
Cobalt	CAS-No.: 7440-48-4	Revision date: 07-01-2007

California Prop. 65 Components

WARNING! This product contains chemicals known to the State of California to cause cancer.

Chemical: Nickel (Metallic)	CAS-No.: 7440-02-0	Revision date: 09-28-2007
Cobalt	CAS-No.: 7440-48-4	Revision date: 07-01-2007

16. OTHER INFORMATION**Full text of H-Statements referred to under sections 2 and 3.**

Aquatic Acute	Acute aquatic toxicity.
Aquatic Chronic	Chronic aquatic toxicity.
Carc.	Carcinogenicity.
IARC 2A	International Agency for Research on Cancer (IARC) Group 2A.
IARC 2B	International Agency for Research on Cancer (IARC) Group 2B.
H317	May cause an allergic skin reaction.
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.

H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure if inhaled.
H410	Very toxic to aquatic life with long lasting effects.
H413	May cause long lasting harmful effects to aquatic life.
Resp. Sens.	Respiratory sensitisation
Skin Sens.	Skin sensitisation.
STOT RE	Specific target organ toxicity – repeated exposure.

Further information

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