

Safety Data Sheet

Section 1: Identification of the Substance/Mixture and of the Company/Undertaking

1.1 Product identifier

Product Name • **Ferrophosphorous (FeP)**

Synonyms • Fe₂P; Fe₃P

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

Relevant identified use(s) • Raw material used in the manufacturing of other metal alloys

1.3 Details of the supplier of the safety data sheet

Manufacturer • Greenville Metals, Inc.
99 Crestview Drive – Extension
Transfer, PA 16154
United States
<http://www.pccforgedproducts.com/brands/greenville>
SDS@greenvillemetals.com

Telephone (General) • 724-509-1861

1.4 Emergency telephone number

Manufacturer • 724-509-1861 - SDS@greenvillemetals.com

Section 2: Hazards Identification

EU/EEC

According to: Regulation (EC) No 1272/2008 (CLP)/REACH 1907/2006 [amended by 2015/830]

2.1 Classification of the substance or mixture

CLP

- Acute Toxicity Oral 3 - H301
- Skin Sensitization 1 - H317
- Carcinogenicity 2 - H351
- Specific Target Organ Toxicity Repeated Exposure 2 - H373
- Hazardous to the aquatic environment Chronic 3 - H412

2.2 Label Elements

CLP

DANGER



- Hazard statements** • H301 - Toxic if swallowed
H317 - May cause an allergic skin reaction
H351 - Suspected of causing cancer.
H373 - May cause damage to organs through prolonged or repeated exposure.
H412 - Harmful to aquatic life with long lasting effects
- Prevention** • P201 - Obtain special instructions before use.
P202 - Do not handle until all safety precautions have been read and understood.
P260 - Do not breathe dust.

- P264 - Wash 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.

- Response** • P302+P352 - IF ON SKIN: Wash with plenty of water.
- P362+P364 - Take off contaminated clothing and wash it before reuse.
- P321 - Specific treatment, see supplemental first aid information.
- P333+P313 - If skin irritation or rash occurs: Get medical advice/attention.
- P301+P310 - IF SWALLOWED: Immediately call a POISON CENTER/doctor.
- P330 - Rinse mouth.
- P308+P313 - IF exposed or concerned: Get medical advice/attention.
- P314 - Get medical advice/attention if you feel unwell.

- Storage/Disposal** • P405 - Store locked up.
- P501 - Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

- Supplemental information** • 0 - 8 percent of this product consists of an ingredient of unknown toxicity.

2.3 Other Hazards

- CLP • According to Regulation (EC) No. 1272/2008 (CLP) this material is considered hazardous.

United States (US)

According to: OSHA 29 CFR 1910.1200 HCS

2.1 Classification of the substance or mixture

OSHA HCS 2012

- Acute Toxicity Oral 2
- Skin Corrosion 1
- Skin Sensitization 1A
- Serious Eye Damage 1
- Respiratory Sensitization 1B
- Carcinogenicity 2
- Reproductive Toxicity 2
- Specific Target Organ Toxicity Repeated Exposure 1

2.2 Label elements

OSHA HCS 2012

DANGER



- Hazard statements** • Fatal if swallowed
- Causes severe skin burns and eye damage.
- May cause an allergic skin reaction
- Causes serious eye damage
- May cause allergy or asthma symptoms or breathing difficulties if inhaled
- Suspected of causing cancer.
- Suspected of damaging fertility or the unborn child.
- Causes damage to organs through prolonged or repeated exposure.

Precautionary statements

- Prevention** • Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Do not breathe dust.
- Wash thoroughly after handling.
- Do not eat, drink or smoke when using this product.
- Contaminated work clothing should not be allowed out of the workplace.
- Wear protective gloves/protective clothing/eye protection/face protection.

- In case of inadequate ventilation wear respiratory protection.
- Response** • IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
 If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician.
 If on skin: Wash with plenty of water.
 Immediately call a POISON CENTER/doctor.
 Specific treatment, see supplemental first aid information.
 Wash contaminated clothing before reuse.
 If skin irritation or rash occurs: Get medical advice/attention.
 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
 IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
 Rinse mouth.
 Do NOT induce vomiting.
 IF exposed or concerned: Get medical advice/attention.
 Get medical advice/attention if you feel unwell.

- Storage/Disposal** • Store locked up.
 Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Supplemental information • 0 - 8 percent of this product consists of an ingredient of unknown toxicity.

2.3 Other hazards

- OSHA HCS 2012**
- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.

Canada

According to: WHMIS 2015

2.1 Classification of the substance or mixture

WHMIS 2015

- Acute Toxicity Oral 2
- Skin Corrosion 1
- Skin Sensitization 1A
- Serious Eye Damage 1
- Respiratory Sensitization 1B
- Carcinogenicity 2
- Reproductive Toxicity 2
- Specific Target Organ Toxicity Repeated Exposure 1

2.2 Label elements

WHMIS 2015

DANGER



- Hazard statements** • Fatal if swallowed
 Causes severe skin burns and eye damage.
 May cause an allergic skin reaction
 Causes serious eye damage
 May cause allergy or asthma symptoms or breathing difficulties if inhaled
 Suspected of causing cancer.
 Suspected of damaging fertility or the unborn child.
 Causes damage to organs through prolonged or repeated exposure.

Precautionary statements

- Prevention** • Obtain special instructions before use.
 Do not handle until all safety precautions have been read and understood.
 Do not breathe dust.
 Wash thoroughly after handling.

Do not eat, drink or smoke when using this product.
Contaminated work clothing should not be allowed out of the workplace.
Wear protective gloves/protective clothing/eye protection/face protection.
In case of inadequate ventilation wear respiratory protection.

- Response** • IF INHALED: Remove person to fresh air and keep comfortable for breathing.
If experiencing respiratory symptoms: Call a POISON CENTER/doctor.
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower.
Immediately call a POISON CENTER/doctor.
Wash contaminated clothing before reuse.
Specific treatment, see supplemental first aid information.
If skin irritation or rash occurs: Get medical advice/attention.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
IF SWALLOWED: Immediately call a POISON CENTER/doctor.
Rinse mouth.
Do NOT induce vomiting.
IF exposed or concerned: Get medical advice/attention.
Get medical advice/attention if you feel unwell.

- Storage/Disposal** • Store locked up.
Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Supplemental information • 0 - 8 percent of this product consists of an ingredient of unknown toxicity.

2.3 Other hazards

WHMIS 2015

- In Canada, the product mentioned above is considered hazardous under the Workplace Hazardous Materials Information System (WHMIS).

Section 3 - Composition/Information on Ingredients

3.1 Substances

- Material does not meet the criteria of a substance.

3.2 Mixtures

Composition					
Chemical Name	Identifiers	%	LD50/LC50	Classifications According to Regulation/Directive	Comments
Iron	CAS:7439-89-6 EC Number:231-096-4	70% TO 90%	NDA	EU CLP: Acute Tox. 4, H302; Aquatic Chronic 4, H413 OSHA HCS 2012: Acute Tox. 4 (orl) WHMIS 2015: Acute Tox. 4 (orl)	NDA
Phosphorus	CAS:7723-14-0 EC Number:231-768-7 EU Index:015-002-00-7	10% TO 27%	NDA	EU CLP: Annex VI, Table 3.1: Flam. Sol. 1, H228; Aquatic Chronic 3, H412 OSHA HCS 2012: Flam. Sol. 2; Acute Tox. 2 (Orl); Skin Corr. 1; Eye Dam. 1 WHMIS 2015: Flam. Sol. 2; Acute Tox. 2 (Orl); Skin Corr. 1; Eye Dam. 1	NDA
Vanadium	CAS:7440-62-2 EC Number:231-171-1	0% TO 2%	NDA	EU CLP: Not Classified OSHA HCS 2012: Not Classified WHMIS 2015: Not Classified	NDA
Titanium, massive	CAS:7440-32-6 EC Number:231-142-3	0% TO 2%	NDA	EU CLP: Pyr. Sol. 1, H250 OSHA HCS 2012: Pyr. Sol. 1; Comb. Dust WHMIS 2015: Pyr. Sol. 1; Comb. Dust	NDA

Nickel, massive, ≥ 1 mm	CAS: 7440-02-0 EC Number: 231- 111-4	0% TO 2%	NDA	EU CLP: Annex VI, Table 3.1: Skin Sens. 1, H317; Carc. 2, H351 (Inhl); STOT RE 1, H372 (Lungs / Orl/Dermal/Inhl); Aquatic Chronic 3, H412 OSHA HCS 2012: Flam. Sol. 1; Comb. Dust; Resp. Sens. 1B; Skin Sens. 1A; Carc. 2 (Inhl); STOT RE 2 (Lungs / Orl, Inhl) WHMIS 2015: Flam. Sol. 1; Comb. Dust; Resp. Sens. 1B; Skin Sens. 1A; Carc. 2 (Inhl); STOT RE 2 (Lungs / Orl, Inhl)	NDA
Manganese (powder)	CAS: 7439-96-5 EC Number: 231- 105-1	0% TO 2%	Ingestion/Oral-Rat LD50 • 9 g/kg	EU CLP: Flam. Sol. 2, H228; Eye Irrit. 2, H319; Repr. 2, H361 (Orl); STOT RE 1, H372 (CNS, Lungs / Inhl) OSHA HCS 2012: Flam. Sol. 2; Comb. Dust; Eye Irrit. 2; Repr. 2 (Orl); STOT RE 1 (CNS, Lungs; Inhl); Hazard Not Otherwise Classified - Health Hazard - Metal fume fever WHMIS 2015: Flam. Sol. 2; Comb. Dust; Eye Irrit. 2; Repr. 2 (Orl); STOT RE 1 (CNS, Lungs/Inhl)	NDA
Chromium, massive	CAS: 7440-47-3 EC Number: 231- 157-5	0% TO 2%	NDA	EU CLP: Not Classified OSHA HCS 2012: Comb. Dust WHMIS 2015: Comb. Dust	NDA

See Section 16 for full text of H-statements.

Section 4 - First Aid Measures

4.1 Description of first aid measures

Inhalation

- Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Do not use mouth-to-mouth method if victim inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. If signs/symptoms continue, get medical attention.

Skin

- For minor skin contact, avoid spreading material on unaffected skin. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Remove and isolate contaminated clothing. If irritation develops and persists, get medical attention.

Eye

- In case of contact with substance, immediately flush eyes with running water for at least 20 minutes. If eye irritation persists: Get medical advice/attention.

Ingestion

- Rinse mouth. Do not give anything by mouth to an unconscious person. Do NOT induce vomiting. Do not use mouth-to-mouth method if victim ingested the substance. Obtain medical attention immediately if ingested.

4.2 Most important symptoms and effects, both acute and delayed

- Refer to Section 11 - Toxicological Information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to Physician

- All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.

Section 5 - Firefighting Measures

5.1 Extinguishing media

Suitable Extinguishing Media • Drench with water applied as spray or fog.

Unsuitable Extinguishing Media • CO₂ and dry powders may not be effective. They may chill the surface, but the interior mass may continue to glow for extended periods.

5.2 Special hazards arising from the substance or mixture

Unusual Fire and Explosion Hazards

- Ferrophosphorous is a non-flammable material in lump form. However, in powder form material glows on ignition and burns without visible flame. Contact of molten material with limited amount of water may result in explosion.

Hazardous Combustion Products

- No data available

5.3 Advice for firefighters

- Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection. Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible. Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection. SMALL FIRES: Move containers from fire area if you can do it without risk.

Section 6 - Accidental Release Measures**6.1 Personal precautions, protective equipment and emergency procedures****Personal Precautions**

- Ventilate enclosed areas. Do not walk through spilled material. Wear appropriate personal protective equipment, avoid direct contact. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Emergency Procedures

- As an immediate precautionary measure, isolate spill or leak area for at least 25 meters (75 feet) in all directions. If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Keep unauthorized personnel away. Stay upwind. Keep out of low areas. Do not get water inside container.

6.2 Environmental precautions

- Avoid run off to waterways and sewers.

6.3 Methods and material for containment and cleaning up**Containment/Clean-up Measures**

- Avoid generating dust. Carefully shovel or sweep up spilled material and place in suitable container. Cover powder spill with plastic sheet or tarp to minimize spreading.

6.4 Reference to other sections

- Refer to Section 8 - Exposure Controls/Personal Protection and Section 13 - Disposal Considerations.

Section 7 - Handling and Storage**7.1 Precautions for safe handling****Handling**

- Use only with adequate ventilation. Handle and open container with care. Wear appropriate personal protective equipment, avoid direct contact. Do not breathe dust. Do not get in eyes, on skin, or on clothing. Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco.

7.2 Conditions for safe storage, including any incompatibilities**Storage**

- Keep container/package tightly closed in a cool, well-ventilated place.

7.3 Specific end use(s)

- Refer to Section 1.2 - Relevant identified uses.

Section 8 - Exposure Controls/Personal Protection**8.1 Control parameters**

Exposure Limits/Guidelines				
	Result	ACGIH	NIOSH	OSHA
Manganese (powder)	Ceilings	Not established	Not established	5 mg/m ³ Ceiling (fume)
	TWAs	0.02 mg/m ³ TWA (respirable fraction); 0.1 mg/m ³ TWA (inhalable fraction)	1 mg/m ³ TWA (fume)	Not established
	STELs	Not established	3 mg/m ³ STEL	Not established
Vanadium (7440-62-2)	Ceilings	Not established	0.05 mg/m ³ Ceiling (except Vanadium metal and Vanadium carbide, dust and fume, as V, 15 min) <i>as Vanadium compounds</i>	0.5 mg/m ³ Ceiling (respirable dust, as V ₂ O ₅); 0.1 mg/m ³ Ceiling (fume, as V ₂ O ₅)
	STELs	Not established	3 mg/m ³ STEL (listed under Ferrovandium dust)	Not established
	TWAs	Not established	1 mg/m ³ TWA (listed under Ferrovandium dust)	Not established
Chromium, massive (7440-47-3)	TWAs	0.5 mg/m ³ TWA	0.5 mg/m ³ TWA	1 mg/m ³ TWA
Nickel, massive, ≥ 1 mm (7440-02-0)	TWAs	1.5 mg/m ³ TWA (inhalable fraction)	0.015 mg/m ³ TWA	1 mg/m ³ TWA

8.2 Exposure controls

Engineering Measures/Controls

- Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Ensure that dust handling systems (such as exhaust ducts, dust collectors, vessels and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is not leakage from the equipment).

Personal Protective Equipment

Respiratory

- For limited exposure use an N95 dust mask. For prolonged exposure use an air-purifying respirator with high efficiency particulate air (HEPA) filters. Follow the OSHA respirator regulations found in 29 CFR 1910.134. Use a NIOSH/MSHA approved respirator if exposure limits are exceeded or symptoms are experienced.

Eye/Face

- Wear safety goggles.

Skin/Body

- Wear appropriate gloves. Wear long sleeves and/or protective coveralls.

Environmental Exposure Controls

- Follow best practice for site management and disposal of waste.

Key to abbreviations

ACGIH = American Conference of Governmental Industrial Hygiene

STEL = Short Term Exposure Limits are based on 15-minute exposures

NIOSH = National Institute of Occupational Safety and Health

TWA = Time-Weighted Averages are based on 8h/day, 40h/week exposures

OSHA = Occupational Safety and Health Administration

Section 9 - Physical and Chemical Properties

9.1 Information on Basic Physical and Chemical Properties

Material Description

Physical Form	Solid	Appearance/Description	Metallic gray powder with little/no odor.
---------------	-------	------------------------	---

Color	Metallic gray.	Odor	Little/no odor.
Odor Threshold	Data lacking		
General Properties			
Boiling Point	Data lacking	Melting Point/Freezing Point	Data lacking
Decomposition Temperature	Data lacking	pH	Data lacking
Specific Gravity/Relative Density	Data lacking	Water Solubility	Negligible < 0.1 %
Viscosity	Data lacking	Explosive Properties	Data lacking
Oxidizing Properties:	Data lacking		
Volatility			
Vapor Pressure	Data lacking	Vapor Density	Data lacking
Evaporation Rate	Data lacking		
Flammability			
Flash Point	Data lacking	UEL	Data lacking
LEL	Data lacking	Autoignition	Data lacking
Flammability (solid, gas)	Data lacking		
Environmental			
Octanol/Water Partition coefficient	Data lacking		

9.2 Other Information

- No additional physical and chemical parameters noted.

Section 10: Stability and Reactivity

10.1 Reactivity

- No dangerous reaction known under conditions of normal use.

10.2 Chemical stability

- Stable under normal temperatures and pressures. Stable .

10.3 Possibility of hazardous reactions

- Hazardous polymerization will not occur.

10.4 Conditions to avoid

- Avoid generating dust.

10.5 Incompatible materials

- Contact with molten material with limited amount of water may result in an explosion.

10.6 Hazardous decomposition products

- None

Section 11 - Toxicological Information

11.1 Information on toxicological effects

Components	
Iron (70% TO 90%)	7439 -89- 6
	<p>Acute Toxicity: Ingestion/Oral-Rat LD50 • 750 mg/kg; <i>Blood:Changes in serum composition (e.g., TP, bilirubin cholesterol); Biochemical:Enzyme inhibition, induction, or change in blood or tissue levels:Transaminases;</i> Ingestion/Oral-Child TDLo • 77 mg/kg; <i>Behavioral:Irritability; Gastrointestinal:Nausea or vomiting; Blood:Normocytic anemia;</i></p> <p>Multi-dose Toxicity: Ingestion/Oral-Rat TDLo • 105 mg/kg 5 Week(s)-Continuous; <i>Liver:Tumors; Tumorigenic:Active as anti-cancer agent; Tumorigenic:Protects against induction of experimental tumors</i></p>
	<p>Acute Toxicity: Ingestion/Oral-Rat LD50 • 9 g/kg; Inhalation-Man TCLo • 2300 µg/m³; <i>Brain and Coverings:Other</i></p>

Manganese (powder) (0% TO 2%)	7439-96-5	degenerative changes; Behavioral:Changes in motor activity (specific assay); Behavioral:Muscle weakness; Irritation: Eye-Rabbit • 500 mg 24 Hour(s) • Mild irritation; Skin-Rabbit • 500 mg 24 Hour(s) • Mild irritation; Multi-dose Toxicity: Inhalation-Human TClO • 0.5 mg/m ³ 39 Week(s)-Intermittent; Brain and Coverings:Other degenerative changes; Peripheral Nerve and Sensation:Sensory change involving peripheral nerve; Behavioral:Irritability; Inhalation-Mouse TClO • 0.7 mg/m ³ 24 Hour(s) 22 Week(s)-Continuous; Lungs, Thorax, or Respiration:Fibrosis (interstitial); Immunological Including Allergic:Decrease in cellular immune response; Inhalation-Rat TClO • 0.3 mg/m ³ 5 Hour(s) 26 Week(s)-Intermittent; Lungs, Thorax, or Respiration:Fibrosis (interstitial); Immunological Including Allergic:Decrease in cellular immune response; Reproductive: Ingestion/Oral-Mouse TDLo • 322.5 mg/kg (43D male); Reproductive Effects:Paternal Effects:Spermatogenesis; Ingestion/Oral-Rat TDLo • 50 mg/kg (20D post); Reproductive Effects:Specific Developmental Abnormalities:Central nervous system; Reproductive Effects:Effects on Newborn:Biochemical and metabolic; Reproductive Effects:Effects on Newborn:Behavioral
Nickel, massive, ≥ 1 mm (0% TO 2%)	7440-02-0	Acute Toxicity: Ingestion/Oral-Rat TDLo • 200 mg/kg; Nutritional and Gross Metabolic:Gross Metabolite Changes:Weight loss or decreased weight gain; Behavioral:Somnolence (general depressed activity); Multi-dose Toxicity: Ingestion/Oral-Mouse TDLo • 500 mg/kg 5 Day(s)-Intermittent; Lungs, Thorax, or Respiration:Fibrosis, focal (pneumoconiosis); Related to Chronic Data:Death in the Other Multiple Dose data type field; Inhalation-Rabbit TClO • 1 mg/m ³ 6 Hour(s) 13 Week(s)-Intermittent; Lungs, Thorax, or Respiration:Other changes; Lungs, Thorax, or Respiration:Changes in lung weight; Blood:Hemorrhage; Inhalation-Rat TClO • 0.4 mg/m ³ 40 Week(s)-Intermittent; Vascular:Thrombosis distant from injection site; Lungs, Thorax, or Respiration:Other changes; Related to Chronic Data:Death in the Other Multiple Dose data type field; Reproductive: Ingestion/Oral-Rat TDLo • 158 mg/kg (multigenerations); Reproductive Effects:Effects on Embryo or Fetus:Fetotoxicity (except death, e.g., stunted fetus); Reproductive Effects:Effects on Embryo or Fetus:Fetal death; Tumorigen / Carcinogen: Inhalation-Guinea Pig TClO • 15 mg/m ³ 91 Week(s)-Intermittent; Tumorigenic:Equivocal tumorigenic agent by RTECS criteria; Lungs, Thorax, or Respiration:Tumors; Lungs, Thorax, or Respiration:Bronchiogenic carcinoma
Phosphorus (10% TO 27%)	7723-14-0	Acute Toxicity: Ingestion/Oral-Rat LD50 • 11.5 mg/kg; Multi-dose Toxicity: Ingestion/Oral-Rat TDLo • 12 mg/kg 4 Day(s)-Intermittent; Liver:Hepatitis (hepatocellular necrosis), diffuse; Blood:Changes in serum composition (e.g., TP, bilirubin cholesterol); Biochemical:Enzyme inhibition, induction, or change in blood or tissue levels:Transaminases; Reproductive: Ingestion/Oral-Rat TDLo • 11 µg/kg (1-22D preg); Reproductive Effects:Effects on Fertility:Female fertility index; Reproductive Effects:Effects on Fertility:Post-implantation mortality; Reproductive Effects:Effects on Fertility:Litter size (e.g., # fetuses per litter; measured before birth)
Titanium, massive (0% TO 2%)	7440-32-6	Reproductive: Ingestion/Oral-Rat TDLo • 158 mg/kg (multigeneration); Reproductive Effects:Effects on Embryo or Fetus:Fetotoxicity (except death, e.g., stunted fetus); Reproductive Effects:Effects on Embryo or Fetus:Fetal death
Vanadium (0% TO 2%)	7440-62-2	Acute Toxicity: Subcutaneous-Rabbit LD50 • 59 mg/kg; Multi-dose Toxicity: Ingestion/Oral-Rat TDLo • 225 mg/kg 15 Day(s)-Continuous; Nutritional and Gross Metabolic:Gross Metabolite Changes:Weight loss or decreased weight gain

GHS Properties	Classification
Acute toxicity	EU/CLP • Acute Toxicity - Oral 3 - ATEmix (oral) = 105 mg/kg OSHA HCS 2012 • Acute Toxicity - Oral 2 - ATEmix (oral) = 30 mg/kg WHMIS 2015 • Acute Toxicity - Oral 2 - ATEmix (oral) = 30 mg/kg
Skin corrosion/Irritation	EU/CLP • Data lacking OSHA HCS 2012 • Skin Corrosion 1 WHMIS 2015 • Skin Corrosion 1
Serious eye damage/Irritation	EU/CLP • Data lacking OSHA HCS 2012 • Serious Eye Damage 1 WHMIS 2015 • Serious Eye Damage 1
Skin sensitization	EU/CLP • Skin Sensitizer 1 OSHA HCS 2012 • Skin Sensitizer 1A WHMIS 2015 • Skin Sensitizer 1A
	EU/CLP • Data lacking

Respiratory sensitization	OSHA HCS 2012 • Respiratory Sensitizer 1B WHMIS 2015 • Respiratory Sensitizer 1B
Aspiration Hazard	EU/CLP • Data lacking OSHA HCS 2012 • Data lacking WHMIS 2015 • Data lacking
Carcinogenicity	EU/CLP • Carcinogenicity 2; Suspected of causing cancer OSHA HCS 2012 • Carcinogenicity 2 WHMIS 2015 • Carcinogenicity 2
Germ Cell Mutagenicity	EU/CLP • Data lacking OSHA HCS 2012 • Data lacking WHMIS 2015 • Data lacking
Toxicity for Reproduction	EU/CLP • Data lacking OSHA HCS 2012 • Toxic to Reproduction 2 WHMIS 2015 • Toxic to Reproduction 2
STOT-SE	EU/CLP • Data lacking OSHA HCS 2012 • Data lacking WHMIS 2015 • Data lacking
STOT-RE	EU/CLP • Specific Target Organ Toxicity Repeated Exposure 2 OSHA HCS 2012 • Specific Target Organ Toxicity Repeated Exposure 1 WHMIS 2015 • Specific Target Organ Toxicity Repeated Exposure 1

Potential Health Effects

Inhalation

Acute (Immediate)

- May cause corrosive burns - irreversible damage. Processes such as cutting, grinding, crushing, or impact may result in generation of excessive amounts of airborne dusts in the workplace.

Chronic (Delayed)

- Repeated or prolonged exposure to corrosive fumes may cause bronchial irritation with chronic cough. May cause allergy or asthma symptoms or breathing difficulties if inhaled. Chronic inhalation exposure to nickel in humans also results in respiratory effects, including a type of asthma specific to nickel, decreased lung function, and bronchitis.

Skin

Acute (Immediate)

- Causes severe skin burns and eye damage. May cause skin sensitization. Symptoms include redness, and skin rash.

Chronic (Delayed)

- Repeated or prolonged exposure to corrosive materials will cause dermatitis.

Eye

Acute (Immediate)

- Causes serious eye damage. Excessive concentrations of nuisance dust in the workplace may reduce visibility and may cause unpleasant deposits in eyes.

Chronic (Delayed)

- Repeated or prolonged exposure to corrosive materials or fumes may cause conjunctivitis.

Ingestion

Acute (Immediate)

- Fatal if swallowed. May cause irreversible damage to mucous membranes.

Chronic (Delayed)

- Repeated or prolonged exposure to corrosive materials or fumes may cause gastrointestinal disturbances.

Other

Chronic (Delayed)

- Exposure to Manganese dust and fumes can cause Manganism (Parkinson like disease)

Carcinogenic Effects

- Repeated and prolonged exposure may cause cancer.

Carcinogenic Effects			
	CAS	IARC	NTP
Nickel, massive, ≥ 1 mm	7440-02-0	Group 2B-Possible Carcinogen	Reasonably Anticipated to be Human Carcinogen

Reproductive Effects

- Repeated and prolonged exposure may cause reproductive effects.

Key to abbreviations

LD = Lethal Dose

TC = Toxic Concentration

TD = Toxic Dose

Section 12 - Ecological Information**12.1 Toxicity**

Components		
Iron (70% TO 90%)	7439-89-6	Aquatic Toxicity-Fish: 96 Hour(s) LC50 <i>Mudskipper</i> (<i>Periophthalmus waltoni</i>) 0.00648 mg/L 7 Day(s) NOEC <i>Brown Trout</i> (<i>Salmo trutta</i>) 0.305 mg/L Aquatic Toxicity-Crustacea: 7 Day(s) NOEC <i>Aquatic Sowbug, Isopod</i> (<i>Idotea balthica</i>) 0.5 mg/L
Nickel, massive, ≥ 1 mm (0% TO 2%)	7440-02-0	Aquatic Toxicity-Fish: 28 Day(s) NOEC <i>Cyprinus carpio</i> (<i>Common Carp</i>) 0.0035 µg/L Comments: Bioaccumulation of Micropollutants and Biomarker Responses in Caged Carp (<i>Cyprinus carpio</i>) Aquatic Toxicity-Crustacea: 7 Day(s) NOEC <i>Americamysis bahia</i> (<i>Opossum Shrimp</i>) 0.213 mg/L Comments: Results of Provision E5F Spiked Metals Toxicity Testing 2 to 9 April 1991 Aquatic Toxicity-Algae and Other Aquatic Plant(s): 96 Hour(s) EC50 <i>Pseudokirchneriella subcapitata</i> (<i>Green Algae</i>) 0.233 mg/L Comments: Comparison of the Relative Toxicity Relationships Based on Batch and Continuous Algal Toxicity Tests.

- Harmful to aquatic life with long lasting effects.

12.2 Persistence and degradability

- Material data lacking.

12.3 Bioaccumulative potential

- Material data lacking.

12.4 Mobility in Soil

- Material data lacking.

12.5 Results of PBT and vPvB assessment

- No PBT and vPvB assessment has been conducted.

12.6 Other adverse effects

- No studies have been found.

Section 13 - Disposal Considerations**13.1 Waste treatment methods****Product waste**

- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Packaging waste

- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Section 14 - Transport Information

14.1 UN number	14.2 UN proper shipping name	14.3 Transport hazard class(es)	14.4 Packing group	14.5 Environmental hazards

DOT	NDA	See DOT other information section below.	NDA	NDA	NDA
TDG					
IMO/IMDG					
ADN					
ADR/RID					
IATA/ICAO					

14.6 Special precautions for user • None specified.

14.7 Transport in bulk according to Annex II of Marpol and the IBC Code • Data lacking.

14.8 Other information

DOT • Ferrophosphorous, metallurgical is classified as ORM-A of the U.S. Department of Transportation under regulations of the Hazardous Material Transportation Act and packaging must conform to certain requirements when the material is transported by water (49 CFR S 172.101 and S 193.g35).

Section 15 - Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

SARA Hazard Classifications • Acute, Chronic

Inventory						
Component	CAS	Canada DSL	Canada NDSL	EU EINECS	EU ELNICS	TSCA
Chromium, massive	7440-47-3	Yes	No	Yes	No	Yes
Iron	7439-89-6	Yes	No	Yes	No	Yes
Manganese (powder)	7439-96-5	Yes	No	Yes	No	Yes
Nickel, massive, ≥ 1 mm	7440-02-0	Yes	No	Yes	No	Yes
Phosphorus	7723-14-0	Yes	No	Yes	No	Yes
Titanium, massive	7440-32-6	Yes	No	Yes	No	Yes
Vanadium	7440-62-2	Yes	No	Yes	No	Yes

Canada

Labor

Canada - WHMIS 1988 - Classifications of Substances

• Phosphorus	7723-14-0	B4, D1A, E (listed under Yellow phosphorus)
• Chromium, massive	7440-47-3	Uncontrolled product according to WHMIS classification criteria
• Manganese (powder)	7439-96-5	D2A; B4, D2A (powder)
• Nickel, massive, ≥ 1 mm	7440-02-0	D2A, D2B; B6, D2A (Raney)
• Vanadium	7440-62-2	Not Listed
• Iron	7439-89-6	Uncontrolled product according to WHMIS classification criteria
• Titanium, massive	7440-32-6	Not Listed

Canada - WHMIS 1988 - Ingredient Disclosure List

• Phosphorus	7723-14-0	1 %
• Chromium, massive	7440-47-3	0.1 %
• Manganese (powder)	7439-96-5	1 %
• Nickel, massive, ≥ 1 mm	7440-02-0	0.1 %
• Vanadium	7440-62-2	1 %
• Iron	7439-89-6	Not Listed
• Titanium, massive	7440-32-6	Not Listed

Environment**Canada - CEPA - Priority Substances List**

• Phosphorus	7723-14-0	Not Listed
• Chromium, massive	7440-47-3	Not Listed
• Manganese (powder)	7439-96-5	Not Listed
• Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
• Vanadium	7440-62-2	Not Listed
• Iron	7439-89-6	Not Listed
• Titanium, massive	7440-32-6	Not Listed

United States**Labor****U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals**

• Phosphorus	7723-14-0	Not Listed
• Chromium, massive	7440-47-3	Not Listed
• Manganese (powder)	7439-96-5	Not Listed
• Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
• Vanadium	7440-62-2	Not Listed
• Iron	7439-89-6	Not Listed
• Titanium, massive	7440-32-6	Not Listed

U.S. - OSHA - Specifically Regulated Chemicals

• Phosphorus	7723-14-0	Not Listed
• Chromium, massive	7440-47-3	Not Listed
• Manganese (powder)	7439-96-5	Not Listed
• Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
• Vanadium	7440-62-2	Not Listed
• Iron	7439-89-6	Not Listed
• Titanium, massive	7440-32-6	Not Listed

Environment**U.S. - CAA (Clean Air Act) - 1990 Hazardous Air Pollutants**

• Phosphorus	7723-14-0	
• Chromium, massive	7440-47-3	Not Listed
• Manganese (powder)	7439-96-5	Not Listed
• Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
• Vanadium	7440-62-2	Not Listed
• Iron	7439-89-6	Not Listed
• Titanium, massive	7440-32-6	Not Listed

U.S. - CERCLA/SARA - Hazardous Substances and their Reportable Quantities

• Phosphorus	7723-14-0	1 lb final RQ; 0.454 kg final RQ 5000 lb final RQ (no reporting of releases of this hazardous
--------------	-----------	---

• Chromium, massive	7440-47-3	substance is required if the diameter of the pieces of the solid metal released is >100 µm); 2270 kg final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is >100 µm)
• Manganese (powder)	7439-96-5	Not Listed 100 lb final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is >100 µm); 45.4 kg final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is >100 µm)
• Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
• Vanadium	7440-62-2	Not Listed
• Iron	7439-89-6	Not Listed
• Titanium, massive	7440-32-6	Not Listed

U.S. - CERCLA/SARA - Radionuclides and Their Reportable Quantities

• Phosphorus	7723-14-0	Not Listed
• Chromium, massive	7440-47-3	Not Listed
• Manganese (powder)	7439-96-5	Not Listed
• Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
• Vanadium	7440-62-2	Not Listed
• Iron	7439-89-6	Not Listed
• Titanium, massive	7440-32-6	Not Listed

U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances EPCRA RQs

• Phosphorus	7723-14-0	1 lb EPCRA RQ
• Chromium, massive	7440-47-3	Not Listed
• Manganese (powder)	7439-96-5	Not Listed
• Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
• Vanadium	7440-62-2	Not Listed
• Iron	7439-89-6	Not Listed
• Titanium, massive	7440-32-6	Not Listed

U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances TPQs

• Phosphorus	7723-14-0	100 lb TPQ (This material is a reactive solid. The TPQ does not default to 10000 pounds for non-powder, non-molten, non-solution form)
• Chromium, massive	7440-47-3	Not Listed
• Manganese (powder)	7439-96-5	Not Listed
• Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
• Vanadium	7440-62-2	Not Listed
• Iron	7439-89-6	Not Listed
• Titanium, massive	7440-32-6	Not Listed

U.S. - CERCLA/SARA - Section 313 - Emission Reporting

• Phosphorus	7723-14-0	1.0 % de minimis concentration (yellow or white)
• Chromium, massive	7440-47-3	1.0 % de minimis concentration
• Manganese (powder)	7439-96-5	1.0 % de minimis concentration
• Nickel, massive, ≥ 1 mm	7440-02-0	0.1 % de minimis concentration
• Vanadium	7440-62-2	1.0 % de minimis concentration (except when contained in an alloy)
• Iron	7439-89-6	Not Listed
• Titanium, massive	7440-32-6	Not Listed

U.S. - CERCLA/SARA - Section 313 - PBT Chemical Listing

• Phosphorus	7723-14-0	Not Listed
• Chromium, massive	7440-47-3	Not Listed
• Manganese (powder)	7439-96-5	Not Listed
• Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
• Vanadium	7440-62-2	Not Listed
• Iron	7439-89-6	Not Listed
• Titanium, massive	7440-32-6	Not Listed

United States - California**Environment****U.S. - California - Proposition 65 - Carcinogens List**

• Phosphorus	7723-14-0	Not Listed
• Chromium, massive	7440-47-3	Not Listed
• Manganese (powder)	7439-96-5	Not Listed
• Nickel, massive, ≥ 1 mm	7440-02-0	carcinogen, 10/1/1989 (metallic)
• Vanadium	7440-62-2	Not Listed
• Iron	7439-89-6	Not Listed
• Titanium, massive	7440-32-6	Not Listed

U.S. - California - Proposition 65 - Developmental Toxicity

• Phosphorus	7723-14-0	Not Listed
• Chromium, massive	7440-47-3	Not Listed
• Manganese (powder)	7439-96-5	Not Listed
• Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
• Vanadium	7440-62-2	Not Listed
• Iron	7439-89-6	Not Listed
• Titanium, massive	7440-32-6	Not Listed

U.S. - California - Proposition 65 - Maximum Allowable Dose Levels (MADL)

• Phosphorus	7723-14-0	Not Listed
• Chromium, massive	7440-47-3	Not Listed
• Manganese (powder)	7439-96-5	Not Listed
• Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
• Vanadium	7440-62-2	Not Listed
• Iron	7439-89-6	Not Listed
• Titanium, massive	7440-32-6	Not Listed

U.S. - California - Proposition 65 - No Significant Risk Levels (NSRL)

• Phosphorus	7723-14-0	Not Listed
• Chromium, massive	7440-47-3	Not Listed
• Manganese (powder)	7439-96-5	Not Listed
• Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
• Vanadium	7440-62-2	Not Listed
• Iron	7439-89-6	Not Listed
• Titanium, massive	7440-32-6	Not Listed

U.S. - California - Proposition 65 - Reproductive Toxicity - Female

• Phosphorus	7723-14-0	Not Listed
• Chromium, massive	7440-47-3	Not Listed
• Manganese (powder)	7439-96-5	Not Listed
• Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
• Vanadium	7440-62-2	Not Listed
• Iron	7439-89-6	Not Listed
• Titanium, massive	7440-32-6	Not Listed

U.S. - California - Proposition 65 - Reproductive Toxicity - Male

• Phosphorus	7723-14-0	Not Listed
• Chromium, massive	7440-47-3	Not Listed
• Manganese (powder)	7439-96-5	Not Listed
• Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
• Vanadium	7440-62-2	Not Listed
• Iron	7439-89-6	Not Listed
• Titanium, massive	7440-32-6	Not Listed

15.2 Chemical Safety Assessment

- No Chemical Safety Assessment has been carried out.

15.3 Other Information

- WARNING: This product contains a chemical known to the State of California to cause cancer.

Section 16 - Other Information**Relevant Phrases (code & full text)**

- H228 - Flammable solid
- H250 - Catches fire spontaneously if exposed to air
- H302 - Harmful if swallowed
- H319 - Causes serious eye irritation
- H361 - Suspected of damaging fertility or the unborn child.
- H372 - Causes damage to organs through prolonged or repeated exposure.
- H413 - May cause long lasting harmful effects to aquatic life

Revision Date

- 30/September/2016

Preparation Date

- 30/September/2016

Disclaimer/Statement of Liability

- All statements, technical information and recommendations are based on data which this company believes to be currently reliable, but no warranty of any kind is made with respect thereto. Since the company shall have no control of the use of the product described, the company assumes no liability for loss or damage incurred by proper or improper use of such product.

Key to abbreviations

NDA = No Data Available