

Ferro Nickel

(ACCORDING TO EC-REGULATION 1907/2006 (REACH) & 1272/2008 (CLP))

Section 1. Identification of the Substance and Company

1.1 Product Identification:

Product Name: Ferro Nickel

Synonyms: FeNi

Chemical Family: Alloy

CAS No: 11110-39-7

EC No: Not Available

Nickel:

CAS No: 7440-02-0

EC #: 231-111-4

Cobalt:

CAS No.: 7440-48-4

EC #: 231-158-0

Iron:

CAS No: 7439-89-6

EC #: 231-096-4

REACH Registration number: see Section 3

1.2 Uses

Identified Uses:

- Stainless, special steels and special alloys manufacturing
- Integrated steel and iron
- EAF carbon steel manufacturing
- Production of brazing alloys
- Use of nickel metal and nickel containing alloys for the production of steel and other alloys powder by atomisation.

Uses Advised Against:

- Use of nickel in articles intended for direct and prolonged contact with the skin where the release of nickel exceed the limit set out in Directives 94/27/EC and 2004/6/EC and REACH regulation 1907/2009 (Annex XVII).
- Use of nickel in nickel-containing food contact materials for which migration into foodstuff would exceed more than 0.1 mg/kg of nickel in accordance with the Council of Europe Guidelines on metals and alloys used as food contact materials (2002)
- Use of nickel in immersion-type kettles which would release more than 0.05 mg/l of nickel into the water in accordance with the Council of Europe Guidelines on metals and alloys used as food contact materials (2002)
- Use of nickel in commercially available "do-it-yourself" home electroplating kits.

Exposure Scenarios: See Annex 1

1.3 Company Identification

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For Fire, Spill, or chemical emergency call CHEMTREC: + (44) 870-8200418

Section 2. Hazards Identification

2.1 Classification of the Substance:

2.1.1 Classification according Regulation (EC) No. 1272/2008

Skin Sensitization – Category 1
Respiratory Sensitization – Category 1
Carcinogenicity – Category 1B
Specific Target Organ Toxicity, Repeated exposure – Category 1

Hazard Pictograms: GHS07 - Exclamation mark, GHS08 - Health Hazard

Signal Word: Danger

Hazard Statements: H317 – May cause an allergic skin reaction.
H334 – May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H350i – May cause cancer via inhalation
H372 – Causes damage to lungs through prolonged or repeated inhalation exposure

Precautionary Statements: P201, P202, P260, P261, P264, P270, P272, P280, P284, P302+P352, P304+P340, P308+P313, P314, P321, P333+P313, P342+P311, P362+P364, P405, P501

2.2: Label elements

Labelling according to Regulation (EC) No 1272/2008

Product identifier: Ferro Nickel

CAS #: 11110-39-7

Contains: Iron [7439-89-6] 65-75%, Nickel [7440-02-0] 25-45%, Cobalt [7440-48-4] 0.6-1.1%

Symbols: GHS07 - Exclamation mark, GHS08 - Health Hazard



Signal Word: Danger

Hazard Statements: H317, H334, H350i, H372

Precautionary Statements: P202, P261, P280, P284, P302+P352, P501

(NOTE: P-statements have been reduced as per CLP regulation, the full list can be found in Section 15).

For full text of Precautionary statements see section 15.

2.3: Other Hazards

The PBT and vPvB criteria of Annex XIII of the REACH regulation does not apply to inorganic substances, such as nickel metal.

Section 3. Composition

Substance Mixture (alloy)

Hazardous Ingredients	Typical Composition	C.A.S. Number	EINECS/EC Label No.
Ferronickel (Fe _{1.87} Ni)	>98.5 %	11110-39-7	N/A
INDIVIDUAL INGREDIENTS			
Nickel (Ni)	25 - 45	7440-02-0	231-111-4
Cobalt (Co)	0.6-1.1	7440-48-4	231-158-0
Silicon (Si)	≤ 0.06	7440-21-3	231-130-8
Copper (Cu)	≤ 0.20	7440-50-8	231-159-6
Chromium (Cr)	≤ 0.05	7440-47-3	231-157-5
Phosphorus (P)	≤ 0.03	7723-14-0	231-768-7
Sulphur (S)	≤ 0.06	7704-34-9	231-722-6
Carbon (C)	≤ 0.06	7440-44-0	231-153-3
Iron (Fe)	Balance	7439-89-6	231-096-4

REACH Registration #'s:

Nickel: 01-2119438727-29-xxxx– Mineracao Onca Puma (Vale Europe Limited acting as Only Representative)

Iron: 01-2119462838-24-xxxx – Mineracao Onca Puma (Vale Europe Limited acting as Only Representative)

Section 4. First Aid Measures

Ingestion: No specific first aid required.

Inhalation: IF INHALED: Remove person to fresh air and keep comfortable for breathing. If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician.

Skin: IF ON SKIN: Wash with plenty of water. Remove contaminated clothing, and wash affected areas thoroughly with water. If skin irritation or rash occurs: Get medical advice/attention. Show label if possible.

Eyes: Irrigate eyeball thoroughly with water for at least 10 minutes. If discomfort persists seek medical attention.

Most important symptoms and affects, both acute and delayed

Inhalation: Cough, sore throat, wheezing, increased difficulty in breathing.
Skin contact: Rash
Eye contact: Redness

Indication of immediate medical attention and special treatment needed

No special requirements

Section 5. Fire Fighting Measures

Suitable extinguishing media:

Any, type to be selected according to materials stored in the immediate neighbourhood.

Special risks:

Non-flammable. May oxidize to Nickel Oxide if exposed to high temperatures within a fire. Keep containers cool with water spray.

Special protective equipment for fire fighting:

None needed. Wear protective equipment if required for other materials within the immediate vicinity.

Section 6. Accidental Release Measures

Person related precautionary measures:

Avoid generation of dusty atmospheres. Do not inhale dusts. Contaminated work clothing should not be allowed out of the workplace. Use personal protective equipment as required. Wash hands, and face thoroughly after handling.

Environmental Protection measures:

No specific measures needed.

Procedures for cleaning/absorption:

Pick up and replace in original container. Nickel-containing material is normally collected to recover nickel values.

Section 7. Handling and Storage

7.1 Precautions for Safe Handling:

Provide adequate ventilation. Do not inhale dust. Wear appropriate nationally approved respirators if handling is likely to cause the concentration limits of airborne particulates to exceed the locally prescribed exposure limits. Wear suitable protective clothing and gloves. Contaminated work clothing should not be allowed out of the workplace. Do not eat, drink or smoke when using this product.

7.2 Conditions for Safe Storage:

Store locked up. Keep in the container supplied, and keep container closed when not in use. Local regulations should be followed regarding the storage of this product.

Section 8. Exposure Controls / Personal Protection

8.1.1 Exposure Limits:

	Nickel [7440-02-0] (mg/m ³)	Cobalt [7440-48-4] (mg/m ³)
ACGIH TLV-TWA ¹	1.5 *	0.02
UK WEL TWA ²	0.5	0.1
Japan	1	0.05
Korea	1	0.02
China	1	0.05

* - as Ni in inhalable fraction

8.1.2 Environmental Limits:

PNEC's and DNEL's provided are for nickel metal

PNEC's

Compartment	Unit	PNEC
Freshwater	µg Ni/L (bioavailable)	7.1
Marine	µg Ni/L	8.6
Terrestrial	mg Ni/kg	29.9

DNEL's

	Unit	DNEL
Inhalation		
Acute local	mg Ni/m ³	4.0
Long-term local	mg Ni/m ³	0.05

PNEC's and DNEL's provided are for cobalt metal

PNEC's

Compartment	Unit	PNEC
Freshwater	µg Co/L	0.51
Marine	µg Co/L	2.36
Terrestrial	mg Co/kg	7.9

DNEL's

	Unit	DNEL
Inhalation		
Industrial - long term – local effects	µg Co/m ³	4.0

8.2.1 Occupational exposure controls:

As supplied this product does not pose a health hazard by inhalation. Mechanical extraction ventilation may be required if user operations change it to other physical or chemical forms, whether as end products, intermediates or fugitive emissions, which are inhalable. Maintain airborne nickel levels as low as possible. Avoid repeated skin contact.

PPE

Respiratory protection: If required, use an approved respirator with particulate filters.

Eye protection: None

Hand & Skin Protection: Wear suitable protective clothing and gloves, which should be selected specifically for the working place, depending on concentration and quantity of the hazardous material (overalls and leather/rubber gloves). Wash skin thoroughly after handling and before eating, drinking or smoking. Change contaminated clothing frequently. Launder clothing and gloves as needed. Use of skin-protective barrier cream advised.

Section 9. Physical and Chemical Properties

Silver-grey odourless metal.

Physical state at 20°C and 101.3 kPa	solid
Melting / freezing point	1455°C
Boiling point	2730°C
Relative density	3.8 g/cm ³
Vapour pressure	Not applicable
Surface tension	Not applicable
Water solubility	Not applicable
Partition coefficient n-octanol/water (log value)	Not applicable
Flash point	Not applicable
Flammability	Non-flammable
Explosive properties	Non-explosive
Self-ignition temperature	Auto flammability is not applicable to massive nickel metal.
Oxidising properties	Non-oxidising
Granulometry	3 - 50 mm
Stability in organic solvents and identity of relevant degradation products	Not applicable
Dissociation constant	Not applicable
Viscosity	Not applicable
Magnetic Properties	Ferromagnetic

Section 10. Stability and Reactivity

- | | | |
|------|---|---|
| 10.1 | <i>Reactivity</i> | Stable under normal conditions. |
| 10.2 | <i>Chemical stability</i> | Stable under normal conditions. |
| 10.3 | <i>Possibility of hazardous reactions</i> | Stable under normal conditions. |
| 10.4 | <i>Conditions to avoid</i> | This product can react vigorously with acids to liberate hydrogen, which can form explosive mixtures with air. Under special conditions nickel can react with carbon monoxide in reducing atmospheres to form nickel carbonyl, Ni(CO) ₄ , a toxic gas. |
| 10.5 | <i>Incompatible materials</i> | Acids, Strong oxidising agents. |
| 10.6 | <i>Hazardous Decomposition Product(s)</i> | Nickel carbonyl gas |

Section 11. Toxicological Information

The toxicological properties of this product are unknown. The toxicology of the reported ingredients is summarized below.

Nickel

Acute Toxicity:

a) *Oral:* Non toxic - LD₅₀ ORAL RAT >9000 mg/kg

b) *Inhalation:* No information available

c) *Dermal:* No information available.

Corrosivity/Irritation:

a) *Respiratory Tract:* None

b) *Skin:* See sensitization section.

c) *Eyes:* Mechanical irritation may be expected.

Sensitization:

a) *Respiratory tract:* Nickel metal induced asthma is very rare. 3 case reports are available; the data is not sufficient to conclude that nickel metal is classified as a respiratory sensitizer.

b) *Skin:* Nickel metal is a well-known skin sensitizer. Direct and prolonged skin contact with metallic nickel may induce nickel allergy and elicit nickel allergic skin reactions in those people already sensitized to nickel, so called nickel allergic contact dermatitis.

c) *Pre-existing conditions:* Individuals known to be allergic to nickel should avoid contact with nickel whenever possible to reduce the likelihood of nickel allergic contact dermatitis reactions (skin rashes). Repeated contact may result in persistent chronic palmar/hand dermatitis in a smaller number of individuals, despite efforts to reduce or avoid nickel exposure.

Chronic toxicity:

a) *Oral:* No information available

b) *Inhalation:* Animal studies (rats) show that repeated dose inhalation of nickel damages the lung. Chronic inflammation, lung fibrosis and accumulation of nickel particles were observed.

c) *Dermal:* Direct and prolonged skin contact with nickel metal may cause nickel sensitization resulting in nickel allergic contact dermatitis /skin rash.

Mutagenicity /

Reproductive toxicity: No data.

Carcinogenicity:

a) *Ingestion:* The U.S. National Institute for Occupational Safety and Health (NIOSH) concluded that there is no evidence that nickel metal is carcinogenic when ingested.

b) *Inhalation:* To date, there is no evidence that nickel metal causes cancer in humans based on epidemiology data from workers in the nickel producing and nickel consuming industries. A recent animal (rat) inhalation study showed no increased respiratory cancer risk for nickel metal powder indicating that no carcinogen classification is warranted for nickel metal. The U.S. National Toxicology Program has listed metallic nickel as reasonably anticipated to be a human carcinogen.

The International Agency for Research on Cancer (IARC)(Vol 49) found there was inadequate evidence that metallic nickel is carcinogenic to humans but since there was sufficient evidence that it is carcinogenic to animals, IARC concluded that metallic nickel is possibly carcinogenic to humans (Group 2B). In 1997, the ACGIH categorized elemental nickel as: A5 "Not Suspected as a Human Carcinogen". Epidemiological studies of workers exposed to nickel powder and to dust and fume generated in the production of nickel alloys and of stainless steel have not indicated the presence of a significant respiratory cancer hazard.

Cobalt

Acute Toxicity

a) *Oral:* LD₅₀ ORAL RAT 550 mg/kg. Acute Tox. 4; Harmful if swallowed.

b) *Inhalation:* Low acute toxicity. Main Symptoms: cough, sore throat, wheezing, increased difficulty in breathing.

c) *Dermal:* LD₅₀(Dermal) >2000mg/kg. Low acute toxicity.

Corrosivity/Irritation

a) *Respiratory Tract:* None

b) Skin: No data. Not classified. See sensitization section.

c) Eyes: Low acute toxicity. Main Symptoms: Redness.

Sensitization

a) Respiratory tract: Resp. Sens. 1; May cause allergy or asthma symptoms or breathing difficulties if inhaled.

b) Skin: Skin Sens. 1; May cause an allergic skin reaction. Repeated contact with metallic cobalt can cause cobalt sensitivity and allergic skin rashes.

c) Pre-existing conditions: Sensitized individuals may experience an allergic skin rash or asthma.

Chronic Toxicity

a) Oral: No information available.

b) Inhalation: No information available.

c) Dermal: No information available.

Mutagenicity /

Reproductive Toxicity: There is no evidence of mutagenic potential. Reproductive toxicity category 2; Suspected of damaging fertility. Specific effect: fertility impairment in males.

Carcinogenicity

a) Ingestion: No data. Not classified.

b) Inhalation: Carcinogenicity category 1B; May cause cancer by inhalation.

Specific Target Organ Toxicity:

a) Single Exposure: None anticipated.

b) Repeated Exposure: None anticipated.

Aspiration Hazard: None.

Section 12. Ecological Information

12.1 Toxicity Not classified as toxic to the aquatic environment

12.2 Persistence and degradability The PBT and vPvB criteria of Annex XIII to the Regulation does not apply to inorganic substances, such as nickel metal. The methods for determining the biological degradability are not applicable to inorganic substances

- 12.3 *Bioaccumulative potential* Nickel does not tend to bioaccumulate or biomagnify in aquatic or terrestrial systems.
- 12.4 *Mobility in soil* The substance is essentially insoluble in water.
- 12.5 *Results of PBT and vPvB assessment* Not classified as PBT or vPvB.
- 12.6 *Other adverse effects* None anticipated.

Section 13. Disposal Considerations

- 13.1 *Waste treatment methods* Recover or recycle if possible. Dispose of contents in accordance with local, state or national legislation.
- 13.2 *Additional Information* No information available.

Section 14. Transport Information

International Maritime Dangerous Goods Code	Not regulated.
International Civil Aviation Organization Technical Instructions for the Carriage of Dangerous Goods by Air	Not regulated.
U.S. Dept. of Transportation Regulations	Not regulated.
Canadian Transportation of Dangerous Goods Act	Not regulated.
European Agreement Concerning the International Carriage of Dangerous Goods by Road	Not regulated.

Section 15. Regulatory Information

Europe:

Classification according to Part 3 of Annex VI of EU Regulation No. 1272/2008

Skin Sensitization – Category 1

Respiratory Sensitization – Category 1

Carcinogenicity – Category 1B

Specific Target Organ Toxicity, Repeated exposure – Category 1

Symbols:

GHS07 - Exclamation mark, GHS08 - Health Hazard



Signal Word:

Danger

Hazard Statements:

H317 – May cause an allergic skin reaction.

H334 – May cause allergy or asthma symptoms or breathing difficulties if inhaled.

H350i – May cause cancer via inhalation
H372 – Causes damage to lungs through prolonged or repeated inhalation exposure

Precautionary Statements:

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 or fume
- P261 - Avoid breathing dust or fume
- P264 - Wash hands, and face 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.
- P280 - Wear protective gloves and protective clothing
- P284 - In case of inadequate ventilation wear respiratory protection.

Response:

- P302+P352 - If on skin: Wash with plenty of soap and water.
- P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
- P308+P313 - If exposed or concerned: Get medical advice/attention.
- P314 - Get medical advice/attention if you feel unwell.
- P321 - See Safety Data Sheet for specific treatment.
- 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.
- P362+P364 - Take off contaminated clothing and wash it before reuse.

Storage: P405 - store locked up

Disposal: P501 - Dispose of contents/container in accordance to local, regional, national and international regulations

Section 16. Other Information

Indications of change

- 1.0 – Original document
- 2.0 – Updated Ingredient information
- 3.0 – Updated classification as a result of Cobalt metal classification changes
- 4.0 – Removal of classification in regards to Directive 67/548/EEC, update of DNELs and PNECs

The following acronyms may be found in this document:

ACGIH	American Conference of Governmental Industrial Hygienists
DNEL	Derived No Effect Level
LTEL	Long Term Exposure Limit
LR	Lead Registrant

MMAD	Mass Median Aerodynamic Diameter
NIOSH	National Institute of Occupational Safety and Health
OEL	Occupational Exposure Limits
OR	Only Representative
OSHA	Occupational Safety and Health Administration
PBT	PBT: Persistent, Bioaccumulative and Toxic
PNEC	Predicted No Effect Concentration
STEL	Short Term Exposure Limit
STOT	Specific Target Organ Toxicity
TLV-TWA	Threshold Limit Value – Time Weighted Average
vPvB	very Persistent and very Bioaccumulative
WEL	Workplace Exposure Limit (UK HSE EH40)

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Note:

Vale Canada believes that the information in this Safety Data Sheet is accurate. However, Vale Canada makes no express or implied warranty as to the accuracy of such information and expressly disclaims any liability resulting from reliance on such information.

1. Threshold Limit Values of the American Conference of Governmental Industrial Hygienists. 2008.
2. Maximum Exposure Limit of the Health and Safety Executive in the U.K. in EH40/2005.

ANNEX 1 – Exposure Scenarios

Exposure Scenarios can be obtained by clicking on the following link: [Vale Nickel Exposure Scenarios](#). Exposure Scenarios are listed on the page according to GES # and by language.

If you are unable to retrieve the document or have difficulties, please contact one of the following email addresses for assistance: REACH@vale.com or msds@vale.com

GES 6 - Stainless, special steels and special alloys manufacturing.

GES 7 - Integrated steel and iron.

GES 8 - EAF carbon steel manufacturing.

GES 17 - Production of brazing alloys.

GES 35 - Use of nickel metal and nickel containing alloys for the production of steel and other alloys powder by atomisation.