

# Ferronickel

## Hazardous Ingredients:

Hazardous Ingredients	Typical Composition	C.A.S. Number	EINECS/EC Label No.
Ferronickel (Fe <sub>1.87</sub> Ni)	>99 %	11110-39-7	N/A
INDIVIDUAL INGREDIENTS			
Nickel (Ni)	25 - 45	7440-02-0	231-111-4
Cobalt (Co)	0.6-1.8	7440-48-4	231-158-0
Silicon (Si)	≤ 1	7440-21-3	231-130-8
Copper (Cu)	≤ 0.20	7440-50-8	231-159-6
Chromium (Cr)	≤ 0.10	7440-47-3	231-157-5
Phosphorus (P)	≤ 0.03	7723-14-0	231-768-7
Sulfur (S)	≤ 0.03	7704-34-9	231-722-6
Carbon (C)	≤ 0.03	7440-44-0	231-153-3
Iron (Fe)	Balance	7439-89-6	231-096-4

- (I) – Inhalable fraction
- (T) – Thoracic fraction
- (R) – Respirable fraction

## Physical and Chemical Data

Silver-grey odourless metal.

Physical state at 20°C and 101.3 kPa	solid
Melting / freezing point	1440°C
Boiling point	2900°C
Relative density	3.8 g/cm <sup>3</sup>
Vapour pressure	Not applicable
Surface tension	Not applicable
Water solubility	Not applicable
Partition coefficient n-octanol/water (log)	Not applicable
Flash point	Not applicable
Flammability	Non-flammable
Explosive properties	Non-explosive
Self-ignition temperature	Not applicable
Oxidising properties	Non-oxidizing
Granulometry	3 - 50 mm
Stability in organic solvents and identity of relevant degradation products	Not applicable
Dissociation constant	Not applicable
Viscosity	Not applicable

## Physical Hazards

Like other metal alloys, ferronickel can react with acids to liberate hydrogen gas, which can form explosive mixtures in air.

Under special conditions ferronickel metal can react with carbon monoxide in reducing atmospheres to form iron carbonyl,  $\text{Fe}(\text{CO})_5$ , and nickel carbonyl,  $\text{Ni}(\text{CO})_4$ , a toxic gas.

## Health Hazards

The toxicology of the material is unknown. The information provided is based on the toxicity of nickel.

### **Nickel**

#### *Acute Toxicity:*

a) *Oral:* Non toxic -  $\text{LD}_{50}$  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) *Preexisting 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) 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.

### Precautions for safe storage, handling and use

If user operations generate dust, use ventilation to keep exposure below the exposure limit for nickel. If ventilation alone cannot so control exposure, use NIOSH-approved respirators selected according to OSHA 29 CFR 1910.134. Maintain airborne nickel levels as low as possible. Maintain airborne nickel levels as low as possible.

Avoid repeated skin contact. Wear suitable gloves. Wash skin thoroughly after handling. Launder clothing and gloves as needed.

Do not store near acids.

### Spill, leak and disposal procedure

Collect spills by wet sweeping or by vacuuming with the vacuum exhaust passing through a high efficiency particulate arresting (HEPA) filter if the exhaust is discharged into the workplace.

Wear appropriate NIOSH-approved respirators if collection and disposal of spills is likely to cause the concentration of airborne contaminants to exceed the exposure limits.

Nickel-containing waste is normally collected to recover nickel values. Should waste disposal be deemed necessary, follow EPA and local regulations.

### Emergency and first aid procedures

<i>Ingestion:</i>	Seek medical attention.
<i>Inhalation:</i>	Supply fresh air. Seek medical attention.
<i>Skin:</i>	Wash thoroughly with water. For rashes seek medical advice. Show label or data sheet if possible.
<i>Eyes:</i>	Irrigate eyeball thoroughly with water for at least 10 minutes. Seek medical attention.
<i>Wounds:</i>	Cleanse thoroughly to remove any nickel particles.

### SARA Section 313 Supplier Notification

This product contains the following chemical(s) subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 and of 40 CFR 372:

#### **Nickel**

Refer to the Hazardous Ingredients section of this MSDS for the appropriate CAS numbers and percent by weight.

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### Preparation Information

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**Note:**

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

**Footnotes:**

- 1 OSHA Permissible Exposure Limit.
- 2 Threshold Limit Value of the American Conference of Governmental Industrial Hygienists.