

Special protective equipment for fire fighting:

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

6. Accidental Release Measures

Person related precautionary measures:

Avoid generation of dusty atmospheres. Do not inhale dusts.

Environmental protection measures:

No specific measures needed

Procedures for cleaning/absorption:

Collect spills by wet sweeping or vacuuming with the vacuum exhaust passing through a high efficiency particulate arresting (HEPA) filter if exhaust is discharged into the work place. Wear appropriate nationally approved respirators if collection and disposal of spills is likely to cause the concentration limits of airborne nickel to exceed the locally prescribed exposure limits. Nickel containing material is normally collected to recover nickel values.

7. Handling and Storage

Handling:

Prevent the generation of inhalable dusts e.g. by the use of suitable ventilation. Do not inhale dusts. Wear appropriate nationally approved respirators if handling is likely to cause the concentration limits of airborne nickel to exceed the locally prescribed exposure limits. Wear suitable protective clothing and gloves. As packed nickel product may constitute a manual handling risk.

Storage:

Keep in the container supplied, in dry conditions and keep the container closed when not in use. Containers should be stored under cover in a clean and dry environment. Local regulations should be followed regarding the storage of this material.

8. Exposure Controls/Personal Protection

Exposure limit values:

Occupational exposure limits expressed as Ni in inhalable particle size fraction:

TRK (mg/m ^{3*})	TLV (mg/m ^{3*})	WEL (mg/m ^{3*})
0.5	1.5	0.5

Maintain airborne nickel levels as low as possible.

Occupational exposure controls:

Ventilation is normally required when handling or using this product to keep airborne nickel below the nationally authorized limits. If ventilation alone cannot control exposure, respiratory protection must be used.

a) Respiratory protection:

Do not inhale dust. If ventilation alone cannot control exposure, respiratory protection (selected specifically for the working place, depending on concentration and quantity of the hazardous material) must be used.

b) Eye protection:

Avoid contact with eyes. Wear goggles or face shield or approved safety glasses.

c) Hand and skin protection:

Avoid skin contact. Wear suitable protective clothing and gloves, which should be selected specifically for the working place, dependant on the concentration and quantity of the hazardous material being handled. Wash skin thoroughly after handling and before eating, drinking or smoking. Launder clothing and gloves as needed. Use of skin protective barrier cream advised.

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9. Physical and Chemical Properties

Silver grey, odourless metallic powder.

Molecular weight	58.71
pH	N/A
Boiling point/ boiling range (°C)	2732
Melting point/ melting range (°C)	1453
Flash point	N/A
Auto flammability	N/A
Explosive properties	mildly explosive
Dust explosivity classification group	A
S _t classification	1
K _{ST} (bar ms ⁻¹)	38
P _{max} (bar g)	0.8
Dust cloud minimum explosion concentration (mg/m ³)	500,000
Dust cloud minimum ignition temperature (°C)	N/A
Dust cloud minimum ignition energy (mJ)	N/A
Oxidising properties	Not oxidising
Vapour pressure	N/A
Solubility - cold water	Insoluble
Solubility - hot water	Insoluble
Partition coefficient	N/A
Viscosity	N/A
Specific gravity of nickel (g/m ³)	8.9
Bulk density (g/m ³)	0.35 – 0.50
Particle size (microns)	2.0 - 2.8
Magnetic properties	Ferromagnetic

10. Stability and Reactivity

Conditions to be avoided: Hazardous exothermic reaction improbable. Not classified as flammable.

Substances to be avoided: 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. Metal powders when heated in reducing atmospheres may become pyrophoric.

Hazardous decomposition products: None

11. Toxicological Information

Acute Toxicity:

a) *Oral:*

Non toxic - LD₅₀ ORAL RAT >9000 mg/kg

The U.S. Food and Drug Administration (FDA) has affirmed that nickel is generally regarded as safe (GRAS) as a direct human food ingredient.

b) *Inhalation:*

One case has been reported of a fatality following extreme exposure at an estimated 382 mg Ni/m³. A plasma spraying operative died of pneumonia 13 days after exposure to nickel powder particles. The post mortem diagnosis was shock lung.

c) *Dermal:*

No information available.

Corrosivity / Irritation:

a) *Respiratory Tract:*

None

- 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) *Eyes:* Mechanical irritation may be expected.
- d) *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 small number of individuals, despite efforts to reduce or avoid nickel exposure.

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 potent skin sensitiser. Repeated /prolonged contact with metallic nickel may cause nickel sensitivity resulting in skin allergy. Persons with a known history of eczema or nickel dermatitis should avoid such contact.

Repeated dose 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 contact with nickel metal may cause nickel sensitivity resulting in skin allergy.

*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:* There is limited information available from inhalation and intratracheal studies in animals. 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.

c) *Injection:* Implants and injections of nickel metal in animals have produced tumors at the local sites. IARC (1999) concluded that there is sufficient evidence in experimental animals for the carcinogenicity of metallic nickel implants and for nickel alloy powder containing ~66% Ni 13-16% chromium and 7% for nickel alloy powder iron.

12. Ecological Information

Biologic degradation: Methods for the determination of biodegradability are not applicable to inorganic substances.

*Ecotoxic effects:**Biological data:*

Non toxic

Fish toxicity Br. rerio LC₅₀>100mg/1/96h;

Daphnia Toxicity: Daphnia magna EC₅₀>100mg/1/48h;

Algal Toxicity: Selenastrum capricornatum IC₅₀: 100mg/1/72 (suspension);

Bacterial toxicity: Pseudomonas fluorescens EC₅₀: 250mg/1/48h

Further Ecological Data:

Due to poor solubility of the product, no harmful effects on aquatic organisms are to be expected when handled and used with due care and attention.

13. Disposal Considerations

Nickel containing material is normally collected to recover nickel values. Should disposal be deemed necessary, follow local regulations.

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	Apply to nickel powders if they are less than 100 micron in particle size and if they are packaged in quantities greater than 100 pounds.
Canadian Transportation of Dangerous Goods Act	Not Regulated.
European Agreement Concerning the International Carriage of Dangerous Goods by Road	Not Regulated.

15. Regulatory Information

Nickel metal is classified as a Category 3 carcinogen "a substance which causes concern for man owing to the possible carcinogenic effect but in respect of which the available information is not adequate for making a satisfactory assessment", by the EU in Directive 67/548/EEC (Classification, Packaging and Labelling Directive) and in the UK in the Chemicals Hazard Information and Packaging for Supply Regulations 2002 and as such the following risk and safety phrases are applicable.

Xn - Harmful - Category 3 Carcinogen

R40 - Limited evidence of a carcinogenic effect.

R43 - May cause sensitisation by skin contact.

S22 - Do not breathe dust.

S36/37 - Wear suitable protective clothing and gloves.

16. Other Information

Medical staff should note that this data sheet has been lodged with the following Poisons Information Centre :
National Poison Centre Phone line : +44-(0)870-600-6266
E- Mail : wnpu@compuserve.com
Fax : +44-(0)2920-704357

17. Notes and Bibliography

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References are available, on request.

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