MATERIAL SAFETY DATA SHEET
MSDS

Nickel Powder Type 210

** THIS DATA SHEET IS PREPARED IN COMPLIANCE WITH EU DIRECTIVE 2001/58/EC**

1. Substance and Company Identification

Nickel Powder Type 210 and 210H
Used in the production of batteries and electronic equipment and in powder metallurgy applications.

C.A.S. Number 7440-02-0

EINECS Number 231-111-4

Imported by:
Vale Inco Europe Ltd.
1st Floor, Gordon House
10 Greencoat Place
London, UK SW1 1PH

24 hr Emergency Tel: +44(0)1792-842501
Fax: +44(0)1792-841357

2. Hazards Identification

F – Flammable; Xn – Harmful - Category 3 Carcinogen
R11 – Highly Flammable
R40 - Limited evidence of a carcinogenic effect.
R43 - May cause sensitisation by skin contact.

If user operations change the substance to other physical or chemical forms, whether as end products, intermediates or fugitive emissions, the user must determine the health hazards of such forms.

3. Composition

Hazardous Ingredients	Typical Composition
Nickel	99%

4. First Aid Measures

Ingestion: Seek medical attention.

Inhalation: Seek medical attention.

Skin: Wash thoroughly with water. For rashes seek medical advice. Show label or data sheet if possible.

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

Wounds: Cleanse thoroughly to remove any nickel particles.

5. Fire Fighting Measures

Special risks: Nickel Powder Type 210 is classified as a flammable metal powder for transport purposes. It can be ignited by a spark, or contact with a hot surface. Burning metal powders can generate high temperatures and release considerable amounts of heat. May oxidize to nickel oxide if exposed to high temperatures within a fire. Keep containers cool with water spray if required.

Suitable extinguishing media: Package intact - Any, type to be selected according to materials stored in the immediate neighborhood. Spilled Powder – Use water mist or fine spray or eliminate oxygen by returning to and sealing the container. Beware of pressurized extinguish ants (fire extinguishers) which may disperse the powder and spread the fire.

Special protective equipment for fire fighting: None needed. Wear protective equipment if required for other materials within the immediate vicinity

6. Accidental Release Measures

Precautionary measures: Avoid generation of dusty atmospheres. Do not inhale dusts.

Environmental protection: No specific measures needed

Cleaning/absorption Procedures: 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

	TLV [1 3] (mg/m^3)	**WEL [2 3] (mg/m^3)**
Nickel	1.5	0.5

* - inhalable particle size fraction

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 & 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.

9. Physical and Chemical Properties

Silver grey, odourless metallic cylindroids.

Molecular weight	58.71
pH	N/A
Boiling point/ boiling range (^{o}C)	2732
Melting point/ melting range (^{o}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})	24
P_{max} (bar g)	2.7
Dust cloud minimum explosion concentration (mg/m^3)	N/A
Dust cloud minimum ignition temperature (^{o}C)	N/A
Dust cloud minimum ignition energy (mJ)	>500,000
Self Heating	yes
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)	0.8
Particle size (microns)	0.5-1.0
Magnetic properties	Ferromagnetic

10. Stability and Reactivity

Nickel Powder Type 210 is classified as a flammable metal powder for transport purposes. See Section 14 for further information.

Conditions to avoid: Exothermic reaction in air likely if ignition source provided.

Substances to avoid: 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 [4]

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:	There is limited information available from inhalation and intratracheal studies in animals. The U.S. National Toxicology Program has listed metallic nickel as reasonably anticipated to be a human carcinogen. 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.

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

12. Ecological Information

Material is classified as Environmentally Hazardous Substances for Transportation.

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

Ecotoxic effects: Non toxic

Biological data: Fish toxicity Br. rerio LC_{50}>100mg/1/96h;
Daphnia Toxicity: Daphnia magna EC_{50}:>100mg/1/48h;
Algeal Toxicity: Selenastrum capricornatum IC_{50}: 100mg/1/72 (suspension);
Bacterial toxicity: Pseudomonas fluorescens EC_{50}: 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

Classified as dangerous goods for all modes of transport.
Proper Shipping name: UN3089, Metal Powder, Flammable, N.O.S., Nickel, Class 4.1, Packing group II,

International Maritime Dangerous Goods Code	Regulated. After January 1, 2010 Packages will also require Environmentally Hazardous Substances label.
International Civil Aviation Organization Technical Instructions for the Carriage of Dangerous Goods by Air	Regulated - Packages also require Environmentally Hazardous Substances label.
U.S. Dept. of Transportation Regulations	Regulated
Canadian Transportation of Dangerous Goods Act	Regulated
European Agreement Concerning the International Carriage of Dangerous Goods by Road	Regulated – Packages also require Environmentally Hazardous Substances label. Drivers are required to carry Instructions in Writing and Dangerous Goods Declaration.

15. Regulatory Information

Nickel Powder Type 210 is classified as a flammable metal powder.

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 Labeling Directive) and in the UK in the Chemicals Hazard Information and Packaging for Supply Regulations 2002.

As such the following risk and safety phrases are applicable.

F – Flammable; Xn - Harmful - Category 3 Carcinogen;
R11 – Highly Flammable
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

Prepared by:

Vale Inco Limited
200 Bay St., Royal Bank Plaza
Suite 1600, South Tower, PO Box 70
Toronto, Ontario, Canada, M5J 2K2

Product Stewardship (416) 361-7801
MSDS available online at www.valeinco.com
msds@valeinco.com

Note:
Vale Inco believes that the information in this Material Safety Data Sheet is accurate. However, Vale Inco 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. *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 EH40/00.*
3. *Exposure Limits for user operations will depend on the relevant governmental regulations.*
4. *Describes possible health hazards of the product supplied. If user operations change it to other chemical forms, whether as end products, intermediates or fugitive emissions, the possible health hazards of such forms must be determined by the user.*