

Tonimet

Section 1. Identification of the Substance and Company

1.1 Product Identification:

Product Name: Tonimet

Synonyms: Tonimet granule, Tonimet Briquette, Tonimet compact

EC No: 231-111-4

CAS No: 7440-02-0

REACH Registration number: see Section 15

1.2 Uses

Identified Uses:

Formulation or re-packing; Use of nickel metal in the production of stainless, special steels and special alloys

Formulation or re-packing; Use of nickel metal in the production of integrated steel and iron

Formulation or re-packing; Use of nickel metal in electric arc furnace carbon steel manufacturing

Formulation or re-packing; Use of nickel metal in the production of brazing alloys

Formulation or re-packing; Use of nickel metal and nickel containing alloys for the production of steel and other alloy powders by atomisation

Use at industrial sites; Use of nickel-containing stainless, special steels and special alloys

Use at industrial sites; Use of nickel-containing integrated steel and iron

Use at industrial sites; Use of nickel-containing carbon steel

Uses Advised Against:

Use of nickel-containing High Sulphur stainless steel for surgical implants (AISI grade 303 or ISO 7153-1 reference grade N)

Use of nickel and nickel compounds in tattoo inks or permanent makeup products.

Use of nickel containing food contact materials for which release into foodstuff would exceed more than 0.14mg/kg food of nickel

1.3 Company Identification

Manufactured by:

Vale Japan Limited,

Matsusaka Plant

345-32 Ryoshicho,

Matsusaka City, Mie Prefecture

515-0802, Japan

Distributed by:

Vale Canada Limited

200 Bay St., Royal Bank Plaza

Suite 1600, South Tower, PO Box 70

Toronto, ON
Canada, M5J 2K2
Email: msds@vale.com

Imported by:

In North & South America:

Vale Americas Inc.
140 E. Ridgewood Avenue
Suite 415, South Tower
Paramus, NJ 07652
U.S.A.

In Asia (Except India, & Pakistan):

Vale Base Metals Asia Pacific PTE. LTD.
One Temasek Avenue #39-01
Millenia Tower
Singapore, 039192

In Europe, Middle East, Africa, India, & Pakistan:

Vale International SA
Route de Pallatex 29
1162 Saint-Prex
Switzerland

REACH Only Representative for Vale Japan Limited:

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T12Y275, Bishopstown
Cork, Republic of Ireland
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Email: Chris.Terrett@h2compliance.com

For Fire, Spill, or chemical emergency call CHEMTREC: +1 703 527-3887

For Europe call CHEMTREC: +(44) 870 8200418

Section 2. Hazards Identification

2.1 Classification of the Substance:

Skin Sensitization – Category 1
Respiratory Sensitization – Category 1
Carcinogenicity – Category 1A
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 by inhalation
H372 - Causes damage to lungs through prolonged or repeated inhalation exposure

Precautionary Statements:

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

2.2: Label elements

Product identifier: Tonimet

CAS #: Nickel (7440-02-0) 93-97%%

Cobalt (7440-48-4) 1.3%

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 by inhalation
H372 - Causes damage to lungs through prolonged or repeated inhalation exposure

Precautionary Statements:

P202 - Do not handle until all safety precautions have been read and understood
P261 - Avoid breathing dust or fume. Wear respiratory protective equipment if fine dusts are generated.
P280 - Wear protective gloves and protective clothing
P302+352 - If on skin: Wash with plenty of soap and water.
P501 - Dispose of contents/container in accordance to local; regional; national and international regulations

(NOTE: P-statements have been reduced).

For full text of Precautionary Statements see section 15.

Section 3. Composition

Substance
Tonimet Granule:

Mixture

Composition	
Nickel Metal	87%
Nickel Oxide	10%

Hazardous Ingredients	Typical Composition	C.A.S.	EINECS/ EC Label No.
Nickel	95%	7440-02-0	231-111-4
Cobalt	1.3%	7440-48-4	231-158-0
Iron	0.6%	7439-89-6	231-096-4
Copper	0.1%	7440-50-8	231-159-6
Sulphur	0.003%	7704-34-9	231-722-6

Tonimet Briquette:

Composition	
Nickel Metal	85%
Nickel Oxide	10%

Hazardous Ingredients	Typical Composition	C.A.S.	EINECS/ EC Label No.
Nickel	93%	7440-02-0	231-111-4
Cobalt	1.3%	7440-48-4	231-158-0
Silica	1.2%	7631-86-9	231-545-4
Iron	0.6%	7439-89-6	231-096-4
Sodium Oxide	0.5%	1313-59-3	215-208-9
Copper	0.1%	7440-50-8	231-159-6
Sulphur	0.003%	7704-34-9	231-722-6

Tonimet Compact:

Composition	
Nickel Metal	96%
Nickel Oxide	1.5%

Hazardous Ingredients	Typical Composition	C.A.S.	EINECS/ EC Label No.
Nickel	97%	7440-02-0	231-111-4
Cobalt	1.3%	7440-48-4	231-158-0
Iron	0.6%	7439-89-6	231-096-4

Copper	0.1%	7440-50-8	231-159-6
Sulphur	0.003%	7704-34-9	231-722-6

Section 4. First Aid Measures

<i>Ingestion:</i>	No specific first aid required.
<i>Inhalation:</i>	IF INHALED: Remove person to fresh air and keep comfortable for breathing. If experiencing respiratory symptoms: Call a POISON CENTRE or doctor /physician
<i>Skin:</i>	Remove contaminated clothing, and wash affected areas thoroughly with water. If skin irritation or rash occurs: Get medical advice/attention. Show label if possible.
<i>Eyes:</i>	Irrigate eyeball thoroughly with water for at least 10 minutes. If discomfort persists, seek medical attention.
<i>Most important symptoms & affects, both acute/ delayed</i>	Inhalation: Cough, sore throat, wheezing, increased difficulty in breathing Skin contact: Rash Eye contact: Redness
<i>Indication of immediate medical attention and special treatment needed</i>	No special requirements

Section 5. Fire Fighting Measures

<i>Suitable extinguishing media:</i>	Any, type to be selected according to materials stored in the immediate neighbourhood.
<i>Special risks:</i>	Non-flammable. May oxidize to Nickel Oxide if exposed to high temperatures within a fire. Keep containers cool with water spray.
<i>Special protective equipment for fire fighting:</i>	None needed. Wear protective equipment if required for other materials within the immediate vicinity.

Section 6. Accidental Release Measures

<i>Person related precautionary measures:</i>	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.
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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

Precautions for Safe Handling:

Prevent the generation of inhalable dusts e.g. by the use of suitable ventilation. Do not inhale dust. 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. Contaminated work clothing should not be allowed out of the workplace.

Conditions for Safe Storage:

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)	Nickel Oxide [1313-99-1] (mg/m ³)	Cobalt [7440-48-4] (mg/m ³)
ACGIH TLV-TWA ¹	1.5 *	0.2 * ‡ as Ni	0.02
UK WEL TWA ²	0.5	0.5 as Ni	0.1
Japan	1	0.1 as Ni	0.05
Korea	1	0.1 as Ni	0.02
China	1	1 as Ni	0.05

* - as Ni in inhalable fraction

‡ Insoluble inorganic fraction

DNEL's

	Unit	DNEL
Inhalation		
Acute local	mg Ni/m ³	11.9
Long-term local	mg Ni/m ³	0.05

	Unit	DNEL
Inhalation		
Long-term local	mg Co/m ³	0.04

8.1.2 Environmental Limits:

PNEC's

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

Compartment	Unit	PNEC
Freshwater	µg Co/L	0.62
Marine	µg Co/L	2.36
Terrestrial	mg Co/kg	10.9

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

Irregular shapes, silver grey in colour

Physical state at 20°C and 101.3 kPa	solid
Melting / freezing point	1455°C
Boiling point	2730°C
Decomposition temperature	Not applicable
Relative density	8.9 g/cm ³ at 25°C
Vapour pressure	1 mm Hg at 1810°C.
Vapour density	Not applicable

Surface tension	Not applicable
Water solubility	Not applicable
pH	Not applicable
Evaporation rate	Not applicable
Partition coefficient n-octanol/water (log	Not applicable
Flash point	Not applicable
Flammability	Non-flammable
Explosive properties	Non-explosive
Self-ignition temperature	Autoflammability is not applicable to massive nickel metal.
Oxidising properties	Non-oxidising
Granulometry	Granule: 0.2 – 0.8mm Briquette: 20mm x 30mm x 15mm T97 Granule: 0.2 – 0.8mm T97 Compact: 25mm diameter 15 mm thickness
Stability in organic solvents and identity of relevant degradation products	Not applicable
Dissociation constant	Not applicable
Viscosity	Not applicable

Section 10. Stability and Reactivity

<i>Reactivity</i>	Stable under normal conditions.
<i>Chemical stability</i>	Stable under normal conditions.
<i>Possibility of hazardous reactions</i>	Stable under normal conditions.
<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.
<i>Incompatible materials</i>	Acids, Strong oxidising agents.
<i>Hazardous Decomposition Product(s)</i>	Nickel carbonyl gas

Section 11. Toxicological Information³

As a mixture the toxicological properties of this product are unknown. The toxicology of the reported ingredients are 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 micron-sized metallic nickel powder 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.

Nickel Oxide

Acute Toxicity:

a) Oral:

Non toxic - LD₅₀ ORAL RAT >11,000 mg/kg (green); 9,990 (black)

b) Inhalation:

Non toxic - LD₅₀ INHAL RAT >5.08 mg/m³ (green); >5.15 mg/m³ (black)

c) Dermal:

No information available.

Corrosivity/Irritation:

a) Respiratory Tract:

No classification

b) Skin:

Not corrosive/irritating.

c) Eyes:

Mildly irritating.

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: Ni oxide is currently classified as a dermal sensitizer (R43) according to the 1st ATP to the CLP Regulation. Recent studies evaluating the bioaccessibility of a series of Ni compounds in synthetic sweat indicated very low nickel ion release from Ni oxide suggesting very low or no sensitization potency. Early Guinea pig maximization and Beuhler test results show low potential for nickel oxide to act as a dermal sensitizer.

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: Exposure related toxicities were noted following 13 weeks and two years of exposure to NiO in both rats and mice in the US NTP chronic rat inhalation study. Adverse effects in rodents were primarily limited to the lung (*e.g.*, increased tissue weight, inflammation, macrophage hyperplasia). The LOAEC from the chronic study in rats was 0.6 mg NiO/m³ or 0.5 mg Ni/m³.

c) Dermal: No information available.

Mutagenicity /

Reproductive toxicity: Not classified for reproductive/developmental toxicity. Not classified for mutagenicity.

Carcinogenicity:

a) Ingestion: No information available. Not classified

b) Inhalation: Cat. 1A; Human epidemiological and animal data suggest that at least some forms of nickel oxide can be carcinogenic to the respiratory tract of humans after inhalation

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. See Section 15 for further information.

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

Corrosivity/Irritation

a) Respiratory Tract: None

<i>b) Skin:</i>	No data. Not classified. See sensitization section.
<i>c) Eyes:</i>	Low acute toxicity. Main Symptoms: Redness.
Sensitization	
<i>a) Respiratory tract:</i>	Resp. Sens. 1; May cause allergy or asthma symptoms or breathing difficulties if inhaled.
<i>b) Skin:</i>	Skin Sens. 1; May cause an allergic skin reaction. Repeated contact with metallic cobalt can cause cobalt sensitivity and allergic skin rashes.
<i>c) Pre-existing conditions:</i>	Sensitized individuals may experience an allergic skin rash or asthma.
Chronic Toxicity	
<i>a) Oral:</i>	No information available.
<i>b) Inhalation:</i>	No information available.
<i>c) Dermal:</i>	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	
<i>a) Ingestion:</i>	Not classified.
<i>b) Inhalation:</i>	Carcinogenicity category 1B; May cause cancer by inhalation.
Specific Target Organ Toxicity:	
<i>a) Single Exposure:</i>	None anticipated.
<i>b) Repeated Exposure:</i>	None anticipated.
Aspiration Hazard:	None.

Section 12. Ecological Information

Toxicity: Not classified as hazardous to the aquatic environment.

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

Bioaccumulative Potential:

Nickel does not tend to bioaccumulate or biomagnify in aquatic or terrestrial systems.

Mobility in soil:

The substance is essentially insoluble in water and therefore poorly mobile in soil

Results of PBT and vPvB assessment:

Not classified as PBT or vPvB.

Other adverse effects:

None anticipated.

Section 13. Disposal Considerations

Waste treatment methods:

Recover or recycle if possible. Dispose of contents in accordance with local, state or national legislation.

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	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.

MARPOL Annex V

Under the 7 Criteria contained within the MARPOL Annex V, This material is classified as:

	Harmful to the Marine Environment (HME)
X	Not Harmful to the Marine Environment (non-HME)

Section 15. Regulatory Information

Europe:

REACH Registration #'s:

01-2119438727-29-XXXX – Vale Japan Limited (H2 Compliance acting as Only Representative)

Exposure Scenarios: See Annex 1

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

Skin Sensitization – Category 1

Respiratory Sensitization – Category 1

Carcinogenicity – Category 1A

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 by 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. Wear respiratory protective equipment if fine dusts are generated.

P272 - Contaminated work clothing should not be allowed out of the workplace.

P280 - Wear protective gloves and protective clothing
P264 - Wash hands, and face thoroughly after handling.
P270 - Do not eat, drink or smoke when using this product.
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
P342+P311 – If experiencing respiratory symptoms: Call a POISON CENTER/doctor
P308+P313 - If exposed or concerned: Get medical advice/attention
P333+P313 - If skin irritation or rash occurs: Get medical advice/attention.
P314 - Get medical advice/attention if you feel unwell.
P321 - See Safety Data Sheet for specific treatment
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

Canada:

WHMIS 2015 Classification: Skin

Skin Sensitization – Category 1

Respiratory Sensitization – Category 1

Carcinogenicity – Category 1A

Specific Target Organ Toxicity, Repeated exposure – Category 1

All components are listed on the Canadian Domestic Substances List (DSL)

United States of America:

Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200) This product contains NICKEL which is 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. Refer to the Hazardous Ingredients section of this MSDS for the appropriate CAS numbers and percent by weight.

All components are listed on the US Toxic Substances Control Act (TSCA) inventory

Australia:

Classified as Hazardous according to ASCC criteria

All components are listed on the Australian Inventory of Chemical Substances (AICS)

P.R. Korea:

All components are listed in the Korean Toxic Substances Control Act inventory; KE-25818

Philippines:

All components are listed in the Philippine Inventory of Chemicals and Chemical Substances (PICCS)

Japan:

All components are listed in the Japanese Handbook of Existing and New Chemical Substances.

P.R. China:

All components are listed in the Inventory of Existing Substances in China (IECSC).

Section 16. Other Information

Indications of change:

- 1.0 – Original document
- 1.1 – Updated Only Representative for Vale Japan Limited.
- 1.2 - Update of uses and exposure scenarios, and DNEL/PNEC tables.

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)

Safety Data Sheet prepared by:
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SDS available online at <http://www.vale.com/canada/en/business/mining/nickel/pages/default.aspx>

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. 2016.
2. Maximum Exposure Limit of the Health and Safety Executive in the U.K. in EH40/2005.
3. 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.

ANNEX 1 – Exposure Scenarios

Exposure Scenarios can be obtained by clicking on the following link:

<http://www.vale.com/canada/EN/business/mining/product-safety-information/reach-scenarios-metals-powder/Pages/default.aspx>

If you are unable to retrieve the document or have difficulties, please use the following email address for assistance:
msds@vale.com

ES₁ - Formulation or re-packing; Use of nickel metal in the production of stainless, special steels and special alloys

ES₂ - Formulation or re-packing; Use of nickel metal in the production of integrated steel and iron

ES₃ - Formulation or re-packing; Use of nickel metal in electric arc furnace carbon steel manufacturing

ES₄ - Formulation or re-packing; Use of nickel metal in the production of brazing alloys

ES₆ - Formulation or re-packing; Use of nickel metal and nickel containing alloys for the production of steel and other alloy powders by atomisation

ES₈ - Use at industrial sites; Use of nickel-containing stainless, special steels and special alloys

ES₉ - Use at industrial sites; Use of nickel-containing integrated steel and iron

ES₁₀ - Use at industrial sites; Use of nickel-containing carbon steel