SAFETY DATA SHEET

Intermediate Nickel Containing Product

SECTION 1: Identification of the substance/mixture and of the company/ undertaking

1.1 Product identifier

Product name : Intermediate Nickel Containing Product

Product code : Not available.

Product description : Solid, granular, dark grey black material

Product type : Solid.

Other means of identification : Clydach Nickel Residue, Conc 1, Dried Effluent Residue (DER), Reduced Nickel Oxide, Reduced sinter, Reduced FMW, Coarse discharge, Kiln Cleanings, ETP Cleanings

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses
Transported intermediate used for the recovery of metal values. Handled under strictly controlled conditions

Uses advised against

Not applicable.

1.3 Details of the supplier of the safety data sheet

Vale Canada Limited, 200 Bay Street, Royal Bank Plaza, Suite 1500, South Tower, PO Box 70, Toronto, Ontario, Canada, M5J 2K2, Email: msds@vale.com

e-mail address of person responsible for this SDS : msds@vale.com

National contact

Manufacturer
Vale Europe Limited, Clydach Refinery, Clydach, Swansea, UK, SA6 5QR, Email: msds@vale.com

Distribution
Vale Europe Limited, Clydach Refinery, Clydach, Swansea, UK, SA6 5QR, Email: msds@vale.com
Vale Canada Limited, 200 Bay Street, Royal Bank Plaza, Suite 1500, South Tower, PO Box 70, Toronto, Ontario, Canada, M5J 2K2, Email: msds@vale.com
Vale Holdings BV, Piet Heinkade 55, 1019GM, Amsterdam, The Netherlands, Telephone Number 31 20 308 5644 214, Email: msds@vale.com

Only representative
REACH Only Representative for Vale: HH Compliance, Rubicon Building, CIT Campus, T12Y275, Bishopstown, Cork, Republic of Ireland; OR Manager, Telephone number: +353-21-486-81121, Email C Terrett: info@h2compliance.com

1.4 Emergency telephone number

National advisory body/Poison Center

Telephone number : None identified.

Supplier

Telephone number : For Fire, Spill, or Chemical Emergency call CHEMTREC: +1 703 527-3887; for Europe call CHEMTREC: +(44) 870 8200418

Hours of operation : 24-hour telephone and/or website

Information limitations : Emergency essential information

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Product definition : Mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Acute Tox. 4, H302
Skin Irrit. 2, H315
Skin Sens. 1, H317
Acute Tox. 4, H332
Resp. Sens. 1, H334
Muta. 2, H341
Carc. 1A, H350
Repr. 1B, H360
STOT RE 1, H372
Aquatic Acute 1, H400
Aquatic Chronic 1, H410

The product is classified as hazardous according to Regulation (EC) 1272/2008 as amended.

Ingredients of unknown toxicity : 100 percent of the mixture consists of component(s) of unknown acute dermal toxicity

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

2.2 Label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Harmful if swallowed or if inhaled.
Causes skin irritation.
May cause an allergic skin reaction.
May cause allergy or asthma symptoms or breathing difficulties if inhaled.
Suspected of causing genetic defects.
May cause cancer.
May damage fertility or the unborn child.
Causes damage to organs through prolonged or repeated exposure.
Very toxic to aquatic life with long lasting effects.

Precautionary statements

Prevention : Obtain special instructions before use. Wear protective gloves, protective clothing, eye protection, face protection, or hearing protection. Wear respiratory protection. Avoid release to the environment. Do not breathe dust. Do not eat, drink or smoke when using this product. Wash thoroughly after handling.

Response : Collect spillage. IF exposed or concerned: Get medical advice or attention. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor if you feel unwell. If experiencing respiratory symptoms: Call a POISON CENTER or doctor. Take off contaminated clothing and wash it before reuse. IF ON SKIN: Wash with plenty of water. If skin irritation or rash occurs: Get medical advice or attention.

Storage : Not applicable.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazardous ingredients : nickel
nickel monoxide
nickel sulfate
trinickel disulfide
cobalt oxide
nickel dihydroxide

SECTION 2: Hazards identification

Supplemental label elements : Not applicable.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Restricted to professional users.

Special packaging requirements

Containers to be fitted with child-resistant fastenings : Not applicable.

Tactile warning of danger : Not applicable.

2.3 Other hazards

Product meets the criteria for PBT or vPvB according to Regulation (EC) No. 1907/2006, Annex XIII : This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

Other hazards which do not result in classification : None known.

SECTION 3: Composition/information on ingredients

3.2 Mixtures : Mixture

Product/ingredient name	Identifiers	%	Classification	Specific Conc. Limits, M-factors and ATEs	Type
nickel	EC: 231-111-4 CAS: 7440-02-0 Index: 028-002-00-7	≥50 - ≤75	Skin Sens. 1, H317 Carc. 2, H351 STOT RE 1, H372 Aquatic Acute 1, H400 Aquatic Chronic 1, H410	M [Acute] = 10000 M [Chronic] = 10	[1]
nickel monoxide	EC: 215-215-7 CAS: 1313-99-1 Index: 028-003-00-2	≥50 - ≤75	Skin Sens. 1, H317 Carc. 1A, H350i STOT RE 1, H372 Aquatic Chronic 4, H413	-	[1] [2]
nickel sulfate	EC: 232-104-9 CAS: 7786-81-4 Index: 028-009-00-5	≥10 - ≤25	Acute Tox. 4, H302 Acute Tox. 4, H332 Skin Irrit. 2, H315 Resp. Sens. 1, H334 Skin Sens. 1, H317 Muta. 2, H341 Carc. 1A, H350i Repr. 1B, H360D STOT RE 1, H372 Aquatic Acute 1, H400 Aquatic Chronic 1, H410	ATE [Oral] = 500 mg/kg ATE [Inhalation (vapours)] = 11 mg/l Skin Irrit. 2, H315: C ≥ 20% Skin Sens. 1, H317: C ≥ 0.01% STOT RE 1, H372: C ≥ 1% STOT RE 2, H373: 0.1% ≤ C < 1% M [Acute] = 1 M [Chronic] = 1	[1] [2]
trinickel disulfide	EC: 234-829-6 CAS: 12035-72-2	≥25 - ≤50	Acute Tox. 3, H331 Skin Sens. 1, H317	ATE [Inhalation (dusts and mists)]	[1] [2]

SECTION 3: Composition/information on ingredients

	Index: 028-007-00-4		Muta. 2, H341 Carc. 1A, H350i STOT RE 1, H372 Aquatic Acute 1, H400 Aquatic Chronic 1, H410	= 0.92 mg/l M [Acute] = 1 M [Chronic] = 1	
copper(II) oxide	EC: 215-269-1 CAS: 1317-38-0 Index: 029-016-00-6	≤10	Acute Tox. 4, H302 Aquatic Acute 1, H400 Aquatic Chronic 1, H410	ATE [Oral] = 470 mg/kg M [Acute] = 100 M [Chronic] = 10	[1]
cobalt oxide	EC: 215-154-6 CAS: 1307-96-6 Index: 027-002-00-4	≤1	Acute Tox. 3, H301 Resp. Sens. 1, H334 Skin Sens. 1, H317 Aquatic Acute 1, H400 Aquatic Chronic 1, H410	ATE [Oral] = 202 mg/kg M [Acute] = 10 M [Chronic] = 10	[1]
nickel dihydroxide	EC: 235-008-5 CAS: 12054-48-7 Index: 028-008-00-X	≤0.3	Acute Tox. 4, H302 Acute Tox. 2, H330 Skin Irrit. 2, H315 Resp. Sens. 1, H334 Skin Sens. 1, H317 Muta. 2, H341 Carc. 1A, H350i Repr. 1B, H360D STOT RE 1, H372 Aquatic Acute 1, H400 Aquatic Chronic 1, H410 **See Section 16 for the full text of the H statements declared above.**	ATE [Oral] = 1515 mg/kg ATE [Inhalation (vapours)] = 1.2 mg/l M [Acute] = 1 M [Chronic] = 1	[1] [2]

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment, are PBTs, vPvBs or Substances of equivalent concern, or have been assigned a workplace exposure limit and hence require reporting in this section.

Type

[1] Substance classified with a health or environmental hazard
[2] Substance with a workplace exposure limit

Occupational exposure limits, if available, are listed in Section 8.

SECTION 4: First aid measures

4.1 Description of first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In the event of any complaints or symptoms, avoid further exposure.

SECTION 4: First aid measures

Skin contact : Wash with plenty of soap and water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Get medical attention. In the event of any complaints or symptoms, avoid further exposure. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. If necessary, call a poison center or physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

4.2 Most important symptoms and effects, both acute and delayed

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Adverse symptoms may include the following:
wheezing and breathing difficulties
asthma
reduced fetal weight
increase in fetal deaths
skeletal malformations

Skin contact : Adverse symptoms may include the following:
irritation
redness
reduced fetal weight
increase in fetal deaths
skeletal malformations

Ingestion : Adverse symptoms may include the following:
reduced fetal weight
increase in fetal deaths
skeletal malformations

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

5.2 Special hazards arising from the substance or mixture

SECTION 5: Firefighting measures

Hazards from the substance or mixture : This material is very toxic to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous combustion products : Decomposition products may include the following materials:
sulfur oxides
metal oxide/oxides

5.3 Advice for firefighters

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Clothing for fire-fighters (including helmets, protective boots and gloves) conforming to European standard EN 469 will provide a basic level of protection for chemical incidents.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

6.2 Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

6.3 Methods and materials for containment and cleaning up

Small spill : Move containers from spill area. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Place spilled material in a designated, labeled waste container. Dispose of via a licensed waste disposal contractor.

Large spill : Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Dispose of via a licensed waste disposal contractor.

6.4 Reference to other sections : See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal protective equipment.
See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

7.1 Precautions for safe handling

SECTION 7: Handling and storage

Protective measures : Put on appropriate personal protective equipment (see Section 8). Persons with a history of skin sensitization problems or asthma, allergies or chronic or recurrent respiratory disease should not be employed in any process in which this product is used. Avoid exposure - obtain special instructions before use. Avoid exposure during pregnancy. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not ingest. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

7.2 Conditions for safe storage, including any incompatibilities

Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Seveso Directive - Reporting thresholds

Danger criteria

Category	Notification and MAPP threshold	Safety report threshold
E1	100 tonne	200 tonne

7.3 Specific end use(s)

Recommendations : Not available.

Industrial sector specific solutions : Not available.

SECTION 8: Exposure controls/personal protection

The information in this section contains generic advice and guidance. Information is provided based on typical anticipated uses of the product. Additional measures might be required for bulk handling or other uses that could significantly increase worker exposure or environmental releases.

8.1 Control parameters

Occupational exposure limits

Product/ingredient name	Exposure limit values
nickel monoxide	**EU OEL (Europe, 1/2022). [nickel compounds] Skin sensitizer. Inhalation sensitizer.** TWA: 0.1 mg/m³, (as nickel) 8 hours.
nickel sulfate	**EU OEL (Europe, 1/2022). [nickel compounds] Skin sensitizer. Inhalation sensitizer.** TWA: 0.1 mg/m³, (as nickel) 8 hours.
trinickel disulfide	**EU OEL (Europe, 1/2022). [nickel compounds] Skin sensitizer. Inhalation sensitizer.** TWA: 0.1 mg/m³, (as nickel) 8 hours.
nickel dihydroxide	**EU OEL (Europe, 1/2022). [nickel compounds] Skin sensitizer. Inhalation sensitizer.** TWA: 0.1 mg/m³, (as nickel) 8 hours.

Biological exposure indices

No exposure indices known.

SECTION 8: Exposure controls/personal protection

Recommended monitoring procedures : Reference should be made to monitoring standards, such as the following: European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

DNELs/DMELs

Product/ingredient name	Type	Exposure	Value	Population	Effects
nickel	DNEL	Long term Inhalation	60 ng/m³	General population	Local
	DNEL	Long term Inhalation	60 ng/m³	General population	Systemic
	DNEL	Long term Oral	0.011 mg/kg bw/day	General population	Systemic
	DNEL	Long term Dermal	0.035 mg/cm²	General population	Local
	DNEL	Long term Dermal	0.035 mg/cm²	Workers	Local
	DNEL	Long term Inhalation	0.05 mg/m³	Workers	Local
	DNEL	Long term Inhalation	0.05 mg/m³	Workers	Systemic
	DNEL	Short term Oral	0.37 mg/kg bw/day	General population	Systemic
	DNEL	Short term Inhalation	0.8 mg/m³	General population	Local
	DNEL	Short term Inhalation	11.9 mg/m³	Workers	Local
nickel monoxide	DNEL	Long term Inhalation	60 ng/m³	General population	Local
	DNEL	Long term Inhalation	60 ng/m³	General population	Systemic
	DNEL	Long term Oral	0.011 mg/kg bw/day	General population	Systemic
	DNEL	Long term Dermal	0.012 mg/cm²	Workers	Local
	DNEL	Long term Inhalation	0.05 mg/m³	Workers	Local
	DNEL	Long term Inhalation	0.05 mg/m³	Workers	Systemic
	DNEL	Short term Oral	0.37 mg/kg bw/day	General population	Systemic
	DNEL	Short term Inhalation	1.8 mg/m³	General population	Local
	DNEL	Short term Inhalation	18.9 mg/m³	Workers	Local
nickel sulfate	DNEL	Long term Inhalation	60 ng/m³	General population	Local
	DNEL	Long term Inhalation	60 ng/m³	General population	Systemic
	DNEL	Long term Dermal	0.00044 mg/cm²	Workers	Local
	DNEL	Long term Oral	0.011 mg/kg bw/day	General population	Systemic
	DNEL	Long term Inhalation	0.05 mg/m³	Workers	Local
	DNEL	Long term	0.05 mg/m³	Workers	Systemic

SECTION 8: Exposure controls/personal protection

		Inhalation			
	DNEL	Short term Inhalation	0.1 mg/m³	General population	Local
	DNEL	Short term Oral	0.37 mg/kg bw/day	General population	Systemic
	DNEL	Short term Inhalation	1.6 mg/m³	Workers	Local
	DNEL	Short term Inhalation	8.8 mg/m³	General population	Systemic
	DNEL	Short term Inhalation	104 mg/m³	Workers	Systemic
trinickel disulfide	DNEL	Long term Inhalation	60 ng/m³	General population	Local
	DNEL	Long term Inhalation	60 ng/m³	General population	Systemic
	DNEL	Long term Dermal	0.004 mg/cm²	Workers	Local
	DNEL	Long term Oral	0.011 mg/kg bw/day	General population	Systemic
	DNEL	Long term Inhalation	0.05 mg/m³	Workers	Local
	DNEL	Long term Inhalation	0.05 mg/m³	Workers	Systemic
	DNEL	Short term Inhalation	0.06 mg/m³	General population	Local
	DNEL	Short term Oral	0.37 mg/kg bw/day	General population	Systemic
	DNEL	Short term Inhalation	0.8 mg/m³	Workers	Local
	DNEL	Short term Inhalation	12.9 mg/m³	General population	Systemic
	DNEL	Short term Inhalation	123 mg/m³	Workers	Systemic
copper(II) oxide	DNEL	Long term Oral	0.041 mg/kg bw/day	General population	Systemic
	DNEL	Short term Oral	0.082 mg/kg bw/day	General population	Systemic
	DNEL	Long term Inhalation	1 mg/m³	Workers	Local
	DNEL	Long term Inhalation	1 mg/m³	Workers	Systemic
	DNEL	Long term Dermal	137 mg/kg bw/day	Workers	Systemic
cobalt oxide	DNEL	Long term Inhalation	8 µg/m³	General population	Local
	DNEL	Long term Oral	12.1 µg/kg bw/day	General population	Systemic
	DNEL	Long term Inhalation	50.9 µg/m³	Workers	Local
nickel dihydroxide	DNEL	Long term Inhalation	60 ng/m³	General population	Local
	DNEL	Long term Inhalation	60 ng/m³	General population	Systemic
	DNEL	Long term Oral	0.011 mg/kg bw/day	General population	Systemic
	DNEL	Long term Inhalation	0.05 mg/m³	Workers	Local
	DNEL	Long term Inhalation	0.05 mg/m³	Workers	Systemic
	DNEL	Short term Oral	0.37 mg/kg bw/day	General population	Systemic
	DNEL	Long term Dermal	0.65 mg/cm²	Workers	Local

SECTION 8: Exposure controls/personal protection

	DNEL	Short term Inhalation	1.8 mg/m³	General population	Local
	DNEL	Short term Inhalation	18.9 mg/m³	Workers	Local
	DNEL	Short term Inhalation	159 mg/m³	General population	Systemic
	DNEL	Short term Inhalation	1403 mg/m³	Workers	Systemic

PNECs

Product/ingredient name	Compartment Detail	Value	Method Detail
Nickel	Fresh water	7.1 µg/l	-
	Fresh water sediment	109 mg/kg	-
	Marine water	8.6 µg/l	-
	Marine water sediment	109 mg/kg	-
	Soil	29.9 mg/kg	-

8.2 Exposure controls

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9: Physical and chemical properties

The conditions of measurement of all properties are at standard temperature and pressure unless otherwise indicated.

9.1 Information on basic physical and chemical properties

Appearance

Physical state	:	Solid.
Color	:	Not available.
Odor	:	Not available.
Odor threshold	:	Not available.
Melting point/freezing point	:	450°C
Initial boiling point and boiling range	:	Not available.
Flammability	:	Not available.
Lower and upper explosion limit	:	Not applicable.
Flash point	:	Not applicable.
Auto-ignition temperature	:	370°C (698°F)
Decomposition temperature	:	Not available.
pH	:	Not available.
Viscosity	:	Not applicable.
Solubility in water	:	26.7 g/l
Partition coefficient: n-octanol/water	:	Not applicable.
Vapor pressure	:	Not available.
Relative density	:	5.59
Vapor density	:	Not applicable.
Explosive properties	:	Not available.
Oxidizing properties	:	Not available.

Particle characteristics

Median particle size	:	Not available.
Size distribution	:	

Distribution (dN)	Size
90	100 µm

SECTION 10: Stability and reactivity

10.1 Reactivity : No specific test data related to reactivity available for this product or its ingredients.

10.2 Chemical stability : The product is stable.

10.3 Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

10.4 Conditions to avoid : No specific data.

10.5 Incompatible materials : No specific data.

10.6 Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1 Information on hazard classes as defined in Regulation (EC) No 1272/2008

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
trinickel disulfide	LD50 Oral	Rat	>5 g/kg	-
copper(II) oxide	LD50 Oral	Rat	470 mg/kg	-
cobalt oxide	LD50 Oral	Rat	202 mg/kg	-
	TDLo Intratracheal	Rat	25 mg/kg	-
nickel dihydroxide	LC50 Inhalation Vapor	Rat	1200 mg/m³	4 hours
	LD50 Oral	Rat	1515 mg/kg	-

Conclusion/Summary : Harmful if swallowed. Harmful if inhaled.

Acute toxicity estimates

Product/ingredient name	Oral (mg/kg)	Dermal (mg/kg)	Inhalation (gases) (ppm)	Inhalation (vapors) (mg/l)	Inhalation (dusts and mists) (mg/l)
Intermediate Nickel Containing Product	1000	N/A	N/A	22	1.8
nickel sulfate	500	N/A	N/A	11	N/A
trinickel disulfide	N/A	N/A	N/A	N/A	0.92

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
nickel sulfate	Skin - Mild irritant	Woman	-	48 hours 5 %	-

Conclusion/Summary

Skin : Causes skin irritation.

Sensitization

Product/ingredient name	Route of exposure	Species	Result
cobalt oxide	Respiratory	Mammal - species unspecified	Sensitizing

Conclusion/Summary

Skin : May cause an allergic skin reaction.

Respiratory : May cause allergy or asthma symptoms or breathing difficulties if inhaled.

Mutagenicity

Product/ingredient name	Test	Experiment	Result
Intermediate Ni Containing Product			

Conclusion/Summary : Suspected of causing genetic defects.

Carcinogenicity

Product/ingredient name	Result	Species	Dose	Exposure
Intermediate Ni Containing Product				

Conclusion/Summary : May cause cancer.

Reproductive toxicity

Product/ingredient name	Maternal toxicity	Fertility	Development toxin	Species	Dose	Exposure
cobalt oxide	-	-	-	Mammal - species unspecified	Route of exposure unreported	-

Conclusion/Summary : May damage fertility or the unborn child.

SECTION 11: Toxicological information

Teratogenicity

Conclusion/Summary : Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Product/ingredient name	Category	Route of exposure	Target organs
Intermediate Nickel Containing Product	Category 1	-	-
nickel	Category 1	-	-
nickel monoxide	Category 1	-	-
nickel sulfate	Category 1	-	-
trinickel disulfide	Category 1	-	-
nickel dihydroxide	Category 1	-	-

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : Harmful if inhaled. May cause allergy or asthma symptoms or breathing difficulties if inhaled.

Skin contact : Causes skin irritation. May cause an allergic skin reaction.

Ingestion : Harmful if swallowed.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Adverse symptoms may include the following:
wheezing and breathing difficulties
asthma
reduced fetal weight
increase in fetal deaths
skeletal malformations

Skin contact : Adverse symptoms may include the following:
irritation
redness
reduced fetal weight
increase in fetal deaths
skeletal malformations

Ingestion : Adverse symptoms may include the following:
reduced fetal weight
increase in fetal deaths
skeletal malformations

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

SECTION 11: Toxicological information

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

Conclusion/Summary : Not available.

General : Causes damage to organs through prolonged or repeated exposure. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Carcinogenicity : May cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : Suspected of causing genetic defects.

Reproductive toxicity : May damage fertility or the unborn child.

11.2 Information on other hazards

11.2.1 Endocrine disrupting properties

Not available.

11.2.2 Other information

Not available.

SECTION 12: Ecological information

12.1 Toxicity

Product/ingredient name	Result	Species	Exposure
nickel	Acute EC50 2 ppm Marine water	Algae - Macrocystis pyrifera - Young	4 days
	Acute EC50 450 µg/l Fresh water	Aquatic plants - Lemna minor	4 days
	Acute EC50 1000 µg/l Marine water	Daphnia - Daphnia magna	48 hours
	Acute IC50 0.31 mg/l Marine water	Crustaceans - Americamysis bahia - Juvenile (Fledgling, Hatchling, Weanling)	48 hours
	Acute LC50 47.5 ng/L Fresh water	Fish - Heteropneustes fossilis	96 hours
	Chronic NOEC 100 mg/l Marine water	Algae - Glenodinium halli	72 hours
	Chronic NOEC 3.5 µg/l Fresh water	Fish - Cyprinus carpio	4 weeks
nickel sulfate	Acute IC50 7.28 mg/l Marine water	Algae - Phaeodactylum tricornutum - Exponential growth phase	72 hours
	Acute IC50 4.59 mg/l Marine water	Algae - Phaeodactylum tricornutum - Exponential growth phase	96 hours
	Acute LC50 39177.81 µg/l Fresh water	Crustaceans - Stenocypris major - Adult	48 hours
	Acute LC50 180 µg/l Fresh water	Daphnia - Daphnia magna	48 hours
	Acute LC50 589.9 µg/l Fresh water	Fish - Danio rerio - Larvae	96 hours
copper(II) oxide	Acute LC50 2.6 mg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 >56000 ppm Fresh water	Fish - Gambusia affinis - Adult	96 hours

Conclusion/Summary : Not available.

12.2 Persistence and degradability

Conclusion/Summary : Not available.

12.3 Bioaccumulative potential

SECTION 12: Ecological information

Product/ingredient name	$LogP_{ow}$	BCF	Potential
nickel monoxide	-	5613	high
nickel sulfate	-	5613	high
trinickel disulfide	-	5613	high
cobalt oxide	-	15600	high
nickel dihydroxide	-	5613	high

12.4 Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Mobility : Not available.

12.5 Results of PBT and vPvB assessment

This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

12.6 Endocrine disrupting properties

Not available.

12.7 Other adverse effects

No known significant effects or critical hazards.

SECTION 13: Disposal considerations

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

13.1 Waste treatment methods

Product

Methods of disposal : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction.

Hazardous waste : The classification of the product may meet the criteria for a hazardous waste.

Packaging

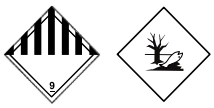
Methods of disposal : The generation of waste should be avoided or minimized wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

Special precautions : This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

SECTION 14: Transport information

	ADR/RID	ADN	IMDG	IATA
14.1 UN number or ID number	UN3077	UN3077	UN3077	UN3077

SECTION 14: Transport information

14.2 UN proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (nickel sulphate, nickel subsulphide)	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (nickel sulphate, nickel subsulphide)	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (nickel sulphate, copper oxide)	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (nickel sulphate, copper oxide)
14.3 Transport hazard class(es)	9 	9 	9 	9 
14.4 Packing group	III	III	III	III
14.5 Environmental hazards	Yes.	Yes.	Yes.	Yes.

Additional information

ADR/RID : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8.
Tunnel code (-)

ADN : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8.

IMDG : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8.

IATA : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 5.0.2.4.1, 5.0.2.6.1.1 and 5.0.2.8.

14.6 Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

14.7 Maritime transport in bulk according to IMO instruments : Not available.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

EU Regulation (EC) No. 1907/2006 (REACH)

Annex XIV - List of substances subject to authorization

Annex XIV

None of the components are listed.

Substances of very high concern

None of the components are listed.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Restricted to professional users.

Other EU regulations

SECTION 15: Regulatory information

Industrial emissions (integrated pollution prevention and control) - Air : Listed

Industrial emissions (integrated pollution prevention and control) - Water : Listed

Ozone depleting substances (1005/2009/EU)

Not listed.

Prior Informed Consent (PIC) (649/2012/EU)

Not listed.

Persistent Organic Pollutants

Not listed.

Seveso Directive

This product is controlled under the Seveso Directive.

Danger criteria

Category
E1

National regulations

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia : Not determined.

Canada : All components are listed or exempted.

China : All components are listed or exempted.

Eurasian Economic Union : **Russian Federation inventory**: All components are listed or exempted.

Japan : **Japan inventory (CSCL)**: Not determined.
Japan inventory (ISHL): Not determined.

New Zealand : All components are listed or exempted.

Philippines : All components are listed or exempted.

Republic of Korea : All components are listed or exempted.

Taiwan : All components are listed or exempted.

Thailand : Not determined.

Turkey : Not determined.

United States : All components are active or exempted.

Viet Nam : All components are listed or exempted.

SECTION 15: Regulatory information

15.2 Chemical Safety Assessment : This product contains substances for which Chemical Safety Assessments are still required.

SECTION 16: Other information

Indicates information that has changed from previously issued version.

Abbreviations and acronyms :
ATE = Acute Toxicity Estimate
CLP = Classification, Labelling and Packaging Regulation [Regulation (EC) No. 1272/2008]
DMEL = Derived Minimal Effect Level
DNEL = Derived No Effect Level
EUH statement = CLP-specific Hazard statement
N/A = Not available
PBT = Persistent, Bioaccumulative and Toxic
PNEC = Predicted No Effect Concentration
RRN = REACH Registration Number
SGG = Segregation Group
vPvB = Very Persistent and Very Bioaccumulative

Procedure used to derive the classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Classification	Justification
Acute Tox. 4, H302	Expert judgment
Skin Irrit. 2, H315	Expert judgment
Skin Sens. 1, H317	Expert judgment
Acute Tox. 4, H332	Expert judgment
Resp. Sens. 1, H334	Expert judgment
Muta. 2, H341	Expert judgment
Carc. 1A, H350	Expert judgment
Repr. 1B, H360	Expert judgment
STOT RE 1, H372	Expert judgment
Aquatic Acute 1, H400	Expert judgment
Aquatic Chronic 1, H410	Expert judgment

Full text of abbreviated H statements

H302	Harmful if swallowed.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H332	Harmful if inhaled.
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H341	Suspected of causing genetic defects.
H350	May cause cancer.
H350i	May cause cancer if inhaled.
H360	May damage fertility or the unborn child.
H360D	May damage the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Full text of classifications [CLP/GHS]

Acute Tox. 2	ACUTE TOXICITY - Category 2
Acute Tox. 3	ACUTE TOXICITY - Category 3
Acute Tox. 4	ACUTE TOXICITY - Category 4
Aquatic Acute 1	AQUATIC HAZARD (ACUTE) - Category 1
Aquatic Chronic 1	AQUATIC HAZARD (LONG-TERM) - Category 1
Aquatic Chronic 4	AQUATIC HAZARD (LONG-TERM) - Category 4
Carc. 1A	CARCINOGENICITY - Category 1A
Carc. 2	CARCINOGENICITY - Category 2
Muta. 2	GERM CELL MUTAGENICITY - Category 2
Repr. 1B	TOXIC TO REPRODUCTION - Category 1B
Resp. Sens. 1	RESPIRATORY SENSITIZATION - Category 1
Skin Irrit. 2	SKIN CORROSION/IRRITATION - Category 2
Skin Sens. 1	SKIN SENSITIZATION - Category 1

SECTION 16: Other information

STOT RE 1	SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 1

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