NICKEL NITRATE

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

NICKEL(II) NITRATE

OTHER NAMES

N2-O6-Ni, $Ni(NO_3)_2$, "nitric acid, nickel salt hexahydrate", "nickel dinitrate"

PROPER SHIPPING NAME

NICKEL NITRATE

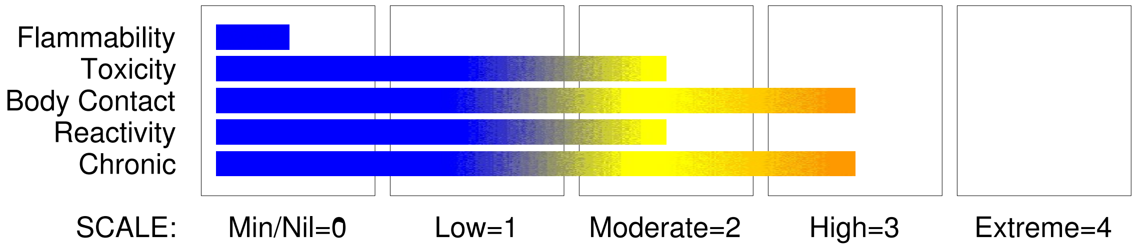
PRODUCT USE

Used in nickel plating; as an intermediate in the preparation of nickel catalysts and in the manufacture of brown ceramic colours.

SUPPLIER

Company: S D FINE- CHEM LIMITED
Address:
315- 317, T.V. INDUSTRIAL ESTATE,
248, WORLI,
MUMBAI- 400030.INDIA.
technical@sdfine.com
Telephone: 91- 22- 24959898
Telephone: 91- 22- 24959899
Fax: 91- 22- 24937232

HAZARD RATINGS



Section 2 - HAZARDS IDENTIFICATION

GHS Classification

Acute Toxicity (Inhalation) Category 4
Acute Toxicity (Oral) Category 4
Carcinogen Category 1B
Chronic Aquatic Hazard Category 1

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Organ Damage Category 1
Oxidizing Solid Category 3
Reproductive Toxicity Category 1B
Respiratory Irritation Category 3
Respiratory Sensitizer Category 1
Serious Eye Damage Category 1
Skin Corrosion/Irritation Category 2
Skin Sensitizer Category 1

EMERGENCY OVERVIEW

HAZARD

DANGER
Determined by using GHS criteria:
H335 H275 H332 H302 H315 H334 H317 H350 H360 H372 H318 H410
May cause respiratory irritation
May intensify fire; oxidizer
Harmful if inhaled
Harmful if swallowed
Causes skin irritation
May cause allergic or asthmatic symptoms or breathing difficulties if inhaled
May cause allergic skin reaction
May cause cancer by inhalation
May damage the unborn child
Causes damage to organs through prolonged or repeated exposure by inhalation.
Causes serious eye damage
Very toxic to aquatic life with long lasting effects

PRECAUTIONARY STATEMENTS

Prevention

Avoid breathing dust/fume/gas/mist/vapours/spray.
Wash thoroughly after handling.
Do not breathe dust/fume/gas/mist/vapours/spray.
Use only outdoors or in a well ventilated area.
Do not handle until all safety precautions have been read and understood.
Use personal protective equipment as required.
Obtain special instructions before use.
In case of inadequate ventilation wear respiratory protection.
Contaminated clothing should not be allowed out of the workplace.
Do not eat, drink or smoke when using this product.
Wash hands thoroughly after handling.
Keep away from heat.
Take any precaution to avoid mixing with combustible or incompatible materials.

Response

Wear eye/face protection.
If eye irritation persists, get medical advice/attention.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

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If skin irritation occurs, seek medical advice/attention.
If experiencing respiratory symptoms call a POISON CENTER or doctor/physician.
Specific treatment: refer to Label or MSDS.
If exposed or concerned: Get medical attention advice.
IF INHALED: If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing.
Wash contaminated clothing before reuse.
Wash/Decontaminate removed clothing before reuse.
Remove/Take off immediately all contaminated clothing
IF ON SKIN: Gently wash with plenty of soap and water.
Immediately call a POISON CENTER or doctor/physician.
Get medical advice/attention if you feel unwell.
If skin irritation or rash occurs, seek medical advice/attention.
IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
Call a POISON CENTER or doctor/physician if you feel unwell.

Storage

Store locked up.
Store away from combustibles and incompatible materials

Disposal

Dispose of contents and container in accordance with relevant legislation.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
nickel(II) nitrate	13138-45-9	>97

Section 4 - FIRST AID MEASURES

SWALLOWED

· IF SWALLOWED, REFER FOR MEDICAL ATTENTION, WHERE POSSIBLE, WITHOUT DELAY.
· For advice, contact a Poisons Information Centre or a doctor.
· Urgent hospital treatment is likely to be needed.
· In the mean time, qualified first-aid personnel should treat the patient following observation and employing supportive measures as indicated by the patient's condition.
· If the services of a medical officer or medical doctor are readily available, the patient should be placed in his/her care and a copy of the MSDS should be provided. Further action will be the responsibility of the medical specialist.
· If medical attention is not available on the worksite or surroundings send the patient to a hospital together with a copy of the MSDS.
· Where medical attention is not immediately available or where the patient is more than 15 minutes from a hospital or unless instructed otherwise:
· INDUCE vomiting with fingers down the back of the throat, ONLY IF CONSCIOUS. Lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
NOTE: Wear a protective glove when inducing vomiting by mechanical means.

EYE

If this product comes in contact with the eyes:
· Wash out immediately with fresh running water.
· Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
· If pain persists or recurs seek medical attention.
· Removal of contact lenses after an eye injury should only be undertaken by skilled

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personnel.

SKIN

If skin contact occurs:
- Immediately remove all contaminated clothing, including footwear.
- Flush skin and hair with running water (and soap if available).
- Seek medical attention in event of irritation.

INHALED

- If dust is inhaled, remove from contaminated area.
- Encourage patient to blow nose to ensure clear passage of breathing.
- If irritation or discomfort persists seek medical attention.

NOTES TO PHYSICIAN

The toxicity of nitrates and nitrites result from their vasodilating properties and their propensity to form methaemoglobin.
- Most produce a peak effect within 30 minutes.
- Clinical signs of cyanosis appear before other symptoms because of the dark pigmentation of methaemoglobin.
- Initial attention should be directed towards improving oxygen delivery, with assisted ventilation, if necessary. Hyperbaric oxygen has not demonstrated conclusive benefits.
- Institute cardiac monitoring, especially in patients with coronary artery or pulmonary disease.
- Hypotension should respond to Trendelenburg's position and intravenous fluids; otherwise dopamine may be needed.
- Naloxone, glucose and thiamine should be given if a multiple ingestion is suspected.
- Decontaminate using Ipecac Syrup for alert patients or lavage for obtunded patients who present within 2-4 hours of ingestion.
- Symptomatic patients with methaemoglobin levels over 30% should receive methylene blue.(Cyanosis alone, is not an indication for treatment). The usual dose is 1-2 mg/kg of a 1% solution (10 mg/ml) IV over 5 minutes; repeat, using the same dose if symptoms of hypoxia fail to subside within 1 hour.

[Ellenhorn and Barceloux: Medical Toxicology]

BIOLOGICAL EXPOSURE INDEX - BEI

These represent the determinants observed in specimens collected from a healthy worker who has been exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
1. Methaemoglobin in blood	1.5% of haemoglobin	During or end of shift	B, NS, SQ

B: Background levels occur in specimens collected from subjects NOT exposed
NS: Non-specific determinant;also observed after exposure to other materials
SQ: Semi-quantitative determinant - Interpretation may be ambiguous; should be used as a screening test or confirmatory test.

- In cases of nickel poisoning, dimercaptol delivered by deep intramuscular injection may be a suitable antidote. (Patients should not exhibit renal or hepatic dysfunction.) The use of diethyldithiocarbamate is the subject of ongoing research.
- Irritant contact dermatoses or eczemas may respond to applications of weak antiseptic packs, antibiotic ointments (tetracycline or erythromycin) or inert pastes and ointments. Systemic antibiotics are advisable in the presence of lymphangitis or lymphadenitis.

* Preplacement and periodic medical examinations of workers exposed to nickel are recommended. Preplacement examination should evaluate any history of skin allergies or asthma, other exposure to nickel, smoking history, condition allergies or asthma, other exposures to nickel, smoking history, condition of nasal cavity and lungs. Periodic examinations should include chest X-rays.

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Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

FOR SMALL FIRE:

- USE FLOODING QUANTITIES OF WATER.
- DO NOT use dry chemicals, CO2 or foam.

FOR LARGE FIRE:

- Flood fire area with water from a protected position.

FIRE FIGHTING

- Alert Fire Brigade and tell them location and nature of hazard.
- May be violently or explosively reactive.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.
- Fight fire from a safe distance, with adequate cover.
- Extinguishers should be used only by trained personnel.
- Use water delivered as a fine spray to control fire and cool adjacent area.
- Avoid spraying water onto liquid pools.
- DO NOT approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.
- If fire gets out of control withdraw personnel and warn against entry.
- Equipment should be thoroughly decontaminated after use.

FIRE/EXPLOSION HAZARD

- Will not burn but increases intensity of fire.
- Heating may cause expansion or decomposition leading to violent rupture of containers.
- Heat affected containers remain hazardous.
- Contact with combustibles such as wood, paper, oil or finely divided metal may produce spontaneous combustion or violent decomposition.
- May emit irritating, poisonous or corrosive fumes.

Decomposition may produce toxic fumes of: nitrogen oxides (NOx), metal oxides.

FIRE INCOMPATIBILITY

Avoid storage with reducing agents.

Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous.

Personal Protective Equipment

Breathing apparatus.
Gas tight chemical resistant suit.
Limit exposure duration to 1 BA set 30 mins.

Section 6 - ACCIDENTAL RELEASE MEASURES

EMERGENCY PROCEDURES

MINOR SPILLS

- Clean up all spills immediately.
- No smoking, naked lights, ignition sources.
- Avoid all contact with any organic matter including fuel, solvents, sawdust, paper or cloth and other incompatible materials, as ignition may result.
- Avoid breathing dust or vapours and all contact with skin and eyes.
- Control personal contact by using protective equipment.
- Contain and absorb spill with dry sand, earth, inert material or vermiculite.

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- DO NOT use sawdust as fire may result.
- Scoop up solid residues and seal in labelled drums for disposal.
- Neutralise/decontaminate area.

MAJOR SPILLS

- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- May be violently or explosively reactive.
- Wear breathing apparatus and protective gloves.
- Prevent, by any means available, spillage from entering drains or water courses.
- No smoking, flames or ignition sources.
- Increase ventilation.
- Contain spill with sand, earth or other clean, inert materials.
- NEVER USE organic absorbents such as sawdust, paper or cloth.
- Use spark-free and explosion-proof equipment.
- Collect any recoverable product into labelled containers for possible recycling.
- Avoid contamination with organic matter to prevent subsequent fire and explosion.
- DO NOT mix fresh with recovered material.
- Collect residues and seal in labelled drums for disposal.
- Wash area and prevent runoff into drains.
- Decontaminate equipment and launder protective clothing before storage and re-use.
- If contamination of drains or waterways occurs advise emergency services.

EMERGENCY RESPONSE PLANNING GUIDELINES (ERPG)

The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour WITHOUT experiencing or developing

life-threatening health effects is:
nickel(II) nitrate 50 mg/m^3

irreversible or other serious effects or symptoms which could impair an individual's ability to take protective action is:
nickel(II) nitrate 50 mg/m^3

other than mild, transient adverse effects without perceiving a clearly defined odour is:
nickel(II) nitrate 1.5 mg/m^3

The threshold concentration below which most people will experience no appreciable risk of health effects:
nickel(II) nitrate 1.5 mg/m^3

American Industrial Hygiene Association (AIHA)

Ingredients considered according to the following cutoffs

Very Toxic (T+)	>= 0.1%	Toxic (T)	>= 3.0%
R50	>= 0.25%	Corrosive (C)	>= 5.0%
R51	>= 2.5%		
else	>= 10%		

where percentage is percentage of ingredient found in the mixture

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SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS

X X X X X 0

+: May be stored together
O: May be stored together with specific preventions

continued...

X: *Must not be stored together*

Personal Protective Equipment advice is contained in Section 8 of the MSDS.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Avoid personal contact and inhalation of dust, mist or vapours.
- Provide adequate ventilation.
- Always wear protective equipment and wash off any spillage from clothing.
- Keep material away from light, heat, flammables or combustibles.
- Keep cool, dry and away from incompatible materials.
- Avoid physical damage to containers.
- DO NOT repack or return unused portions to original containers. Withdraw only sufficient amounts for immediate use.
- Contamination can lead to decomposition leading to possible intense heat and fire.
- When handling NEVER smoke, eat or drink.
- Always wash hands with soap and water after handling.
- Use only good occupational work practice.
- Observe manufacturer's storing and handling directions.

SUITABLE CONTAINER

- DO NOT repack. Use containers supplied by manufacturer only.

For low viscosity materials

- Drums and jerricans must be of the non-removable head type.
- Where a can is to be used as an inner package, the can must have a screwed enclosure.

For materials with a viscosity of at least 2680 cSt. (23 deg. C) and solids:

- Removable head packaging and
- cans with friction closures may be used.

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Where combination packages are used, and the inner packages are of glass, there must be sufficient inert cushioning material in contact with inner and outer packages *.

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In addition, where inner packagings are glass and contain liquids of packing group I and II there must be sufficient inert absorbent to absorb any spillage *.

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* unless the outer packaging is a close fitting moulded plastic box and the substances are not incompatible with the plastic.

STORAGE INCOMPATIBILITY

- A mixture of aluminium powder, water and metal nitrate may explode due to a self accelerating reaction.
- Mixtures of metal nitrates with alkyl esters may explode due to the formation of unstable alkyl nitrates.
- Mixtures of a nitrate with phosphorous, tin(II) chloride and other reducing agents may react explosively.
- Mixtures of metal nitrates and phosphinates may explode on heating.
- Mixtures containing nitrates and organic materials are potentially dangerous, especially if acidic materials or heavy metals are present.
- Metal nitrates are incompatible with cyanides, thiocyanates, isothiocyanates and hypophosphites.

Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous.
Avoid storage with reducing agents.
Oxidising agents as a class are not necessarily combustible themselves, but can increase the risk and intensity of fire in many other substances.

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Metals and their oxides or salts may react violently with chlorine trifluoride. Chlorine trifluoride is a hypergolic oxidiser. It ignites on contact (without external source of heat or ignition) with recognised fuels - contact with these materials, following an ambient or slightly elevated temperature, is often violent and may produce ignition. The state of subdivision may affect the results.
Segregate from organic matter, aluminium, boron phosphide, cyanides, esters, combustible materials, phospham, phosphorus, sodium hypophosphite, stannous chloride, thiocyanates.
Avoid contact with wood, paper, sulfur, aluminium,.phosphorus, hydroxylamine, phosphinates, alkyl esters, tin (II) chloride, and flammable liquids.

STORAGE REQUIREMENTS

- Store in original containers.
- Keep containers securely sealed as supplied.
- Store in a cool, well ventilated area.
- Keep dry.
- Store under cover and away from sunlight.
- Store away from flammable or combustible materials, debris and waste. Contact may cause fire or violent reaction.
- Store away from incompatible materials and foodstuff containers.
- DO NOT stack on wooden floors or pallets.
- Protect containers from physical damage.
- Check regularly for leaks.
- Observe manufacturer's storage and handling recommendations.

In addition, Goods of Class 5.1, packing group III should be stored in packages and be separated from buildings, tanks, and compounds containing other dangerous goods in tanks, and from property boundaries by a distance of at least 5 metres.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (mg/m3)	Revised IDLH Value (ppm)
nickel(II) nitrate	10	

MATERIAL DATA

NOTE: Detector tubes for nickel, measuring in excess of 0.25 mg/m3 (as Ni) are commercially available.
Use control measures / protective gear to avoid personal contact. Animal inhalation studies in rats and guinea pigs with soluble nickel chloride of 0.1 - 1 mg nickel/m3 show a mild irritation of the lungs.
Animal inhalation studies with insoluble nickel dusts (other than nickel sulfide) at concentrations of 1 to 3 mg/m3 show no difference in respiratory cancer between exposed and control animals.
These studies do not provide evidence that there is no excess risk of lung and nasal cancer and in view of limited exposure data and the absence of guidance for a TLV based on epidemiological studies of nickel induced respiratory tract cancer it has been necessary to incorporate the results of animal studies that have demonstrated the production of pulmonary pathology. These studies have shown consistent pulmonary damage following inhalation of 0.1 to 1 mg/m3 insoluble inorganic nickel compounds. Individuals who may be hypersusceptible or otherwise unusually responsive to industrial chemicals may not be adequately protected against adverse health effects from nickel or its compounds at concentrations below the recommended or proposed TLV.

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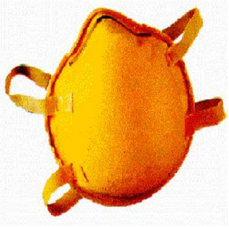
PERSONAL PROTECTION

EYE

- Chemical goggles.
- Full face shield may be required for supplementary but never for primary protection of eyes
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59].

HANDS/FEET

Wear chemical protective gloves, eg. PVC.
Wear safety footwear or safety gumboots, eg. Rubber.
DO NOT wear cotton or cotton-backed gloves.
DO NOT wear leather gloves.
Promptly hose all spills off leather shoes or boots or ensure that such footwear is protected with PVC over-shoes.
Suitability and durability of glove type is dependent on usage. Factors such as:
- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity,

are important in the selection of gloves.
NOTE: The material may produce skin sensitisation in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.

OTHER

- Overalls.
- PVC Apron.
- PVC protective suit may be required if exposure severe.
- Eyewash unit.
- Ensure there is ready access to a safety shower.

RESPIRATOR

Protection Factor	Half- Face Respirator	Full- Face Respirator	Powered Air Respirator
10 x ES	P1 Air- line*	- -	PAPR- P1 -
50 x ES	Air- line**	P2	PAPR- P2
100 x ES	-	P3	-
		Air- line*	-
100+ x ES	-	Air- line**	PAPR- P3

* - Negative pressure demand ** - Continuous flow.

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The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.
For further information consult your
Occupational Health and Safety Advisor.

ENGINEERING CONTROLS

Local exhaust ventilation usually required. If risk of overexposure exists, wear approved respirator. Correct fit is essential to obtain adequate protection. Supplied-air type respirator may be required in special circumstances. Correct fit is essential to ensure adequate protection.
An approved self contained breathing apparatus (SCBA) may be required in some situations.
Provide adequate ventilation in warehouse or closed storage area. Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.

Type of Contaminant:	Air Speed:
solvent, vapours, degreasing etc., evaporating from tank (in still air).	0.25- 0.5 m/s (50- 100 f/min.)
aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers, welding, spray drift, plating acid fumes, pickling (released at low velocity into zone of active generation)	0.5- 1 m/s (100- 200 f/min.)
direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1- 2.5 m/s (200- 500 f/min.)
grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).	2.5- 10 m/s (500- 2000 f/min.)

Within each range the appropriate value depends on:

Lower end of the range	Upper end of the range
1: Room air currents minimal or favourable to capture	1: Disturbing room air currents
2: Contaminants of low toxicity or of nuisance value only.	2: Contaminants of high toxicity
3: Intermittent, low production.	3: High production, heavy use
4: Large hood or large air mass in motion	4: Small hood- local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min) for extraction of solvents generated in a tank 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

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Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

Green, deliquescent, odourless crystals; mixes with water.
Soluble in alcohol. Solubility in water @ 20C : 238.5 g/100 ml.
pH of 5% solution @ 25C : 3.5-5.5
Saturated aqueous (70% by wt.) solution is not Class 5.1 Dangerous goods
ref UN 34.4.2.5

PHYSICAL PROPERTIES

Solid.
Mixes with water.

Molecular Weight: 290.8
Melting Range (°C): 56.7
Solubility in water (g/L): Miscible
pH (1% solution): 4 - 5% aqueous
Volatile Component (%vol): Not applicable
Relative Vapour Density (air=1): Not applicable
Lower Explosive Limit (%): Not applicable
Autoignition Temp (°C): Not available.
State: Divided solid

Boiling Range (°C): 136.7
Specific Gravity (water=1): 2.07
pH (as supplied): Not applicable
Vapour Pressure (kPa): Negligible
Evaporation Rate: Not applicable
Flash Point (°C): Not applicable
Upper Explosive Limit (%): Not applicable
Decomposition Temp (°C): Not Applicable
Viscosity: Not Applicable

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY

- Presence of incompatible materials.
- Product is considered stable under normal handling conditions.
- Prolonged exposure to heat.
- Hazardous polymerisation will not occur.

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual.
Strong evidence exists that the substance may cause irreversible but non-lethal mutagenic effects following a single exposure.
Nickel is poorly absorbed from the gastrointestinal tract. It is transported in the plasma bound to serum albumin and various small organic ligands. Excretion in the urine is substantially complete in 4-5 days. Serum nickel is influenced by environmental nickel or nickel concentrations in the air with faecal nickel about 100 times urinary nickel. Parenterally administered nickel is rapidly distributed to kidney, pituitary, lung, skin, adrenal and ovary and testis. In vivo binding with metallothionein has been demonstrated. A nickel binding protein has also been identified in plasma; it has been tentatively identified as an alpha-1-glycoprotein with a serum alpha-1-macroglobulin complex.
Nickel salts cause vomiting, following ingestion, as a result of astringent and irritant

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effects. In common with other irritant-emetics the lethal dose varies widely. Absorption is generally poor and systemic poisoning is rare. Systemic effects include increased blood sugar levels (hyperglycaemia), capillary damage (especially in the brain and adrenals), kidney damage, heart damage (myocardial weakness) and central nervous system depression.
The substance and/or its metabolites may bind to haemoglobin inhibiting normal uptake of oxygen. This condition, known as "methaemoglobinemia", is a form of oxygen starvation (anoxia).

Symptoms include cyanosis (a bluish discolouration skin and mucous membranes) and breathing difficulties. Symptoms may not be evident until several hours after exposure.

At about 15% concentration of blood methaemoglobin there is observable cyanosis of the lips, nose and earlobes. Symptoms may be absent although euphoria, flushed face and headache are commonly experienced. At 25-40%, cyanosis is marked but little disability occurs other than that produced on physical exertion. At 40-60%, symptoms include weakness, dizziness, lightheadedness, increasingly severe headache, ataxia, rapid shallow respiration, drowsiness, nausea, vomiting, confusion, lethargy and stupor. Above 60% symptoms include dyspnea, respiratory depression, tachycardia or bradycardia, and convulsions. Levels exceeding 70% may be fatal.

EYE

When applied to the eye(s) of animals, the material produces severe ocular lesions which are present twenty-four hours or more after instillation.
Evidence exists, or practical experience predicts, that the material may cause eye irritation in a substantial number of individuals and/or may produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals.
Repeated or prolonged eye contact may cause inflammation characterised by temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.

SKIN

Open cuts, abraded or irritated skin should not be exposed to this material.
Evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.
Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.
The material may accentuate any pre-existing dermatitis condition.
Skin contact is not thought to produce harmful health effects (as classified under EC Directives using animal models). Systemic harm, however, has been identified following exposure of animals by at least one other route and the material may still produce health damage following entry through wounds, lesions or abrasions. Good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting.

INHALED

Limited evidence exists, or practical experience predicts, that the material produces irritation of the respiratory system in a significant number of individuals following inhalation.

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Persons with impaired respiratory function, airway diseases and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.
The material is not thought to produce either adverse health effects or irritation of the respiratory tract following inhalation (as classified by EC Directives using animal models). Nevertheless, adverse systemic effects have been produced following exposure of animals by at least one other route and good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.
Regular exposure to nickel fume, as the oxide, may result in "metal fume fever" a sometimes debilitating upper respiratory tract condition resembling influenza.

Symptoms include malaise, fever, weakness, nausea and may appear quickly if operations occur in closed or poorly ventilated areas. Pulmonary oedema, pulmonary fibrosis and asthma has been reported in welders using nickel alloys; level of exposure are generally not available and case reports are often confounded by mixed exposures to other agents.

Inhalation of freshly formed metal oxide particles sized below 1.5 microns and generally between 0.02 to 0.05 microns may result in "metal fume fever". Symptoms may be delayed for up to 12 hours and begin with the sudden onset of thirst, and a sweet, metallic or foul taste in the mouth. Other symptoms include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalised feeling of malaise. Mild to severe headache, nausea, occasional vomiting, fever or chills, exaggerated mental activity, profuse sweating, diarrhoea, excessive urination and prostration may also occur. Tolerance to the fumes develops rapidly, but is quickly lost. All symptoms usually subside within 24-36 hours following removal from exposure.

CHRONIC HEALTH EFFECTS

Long term exposure to high dust concentrations may cause changes in lung function (i.e. pneumoconiosis) caused by particles less than 0.5 micron penetrating and remaining in the lung. A prime symptom is breathlessness. Lung shadows show on X-ray.
Practical evidence shows that inhalation of the material is capable of inducing a sensitisation reaction in a substantial number of individuals at a greater frequency than would be expected from the response of a normal population.
Pulmonary sensitisation, resulting in hyperactive airway dysfunction and pulmonary allergy may be accompanied by fatigue, malaise and aching. Significant symptoms of exposure may persist for extended periods, even after exposure ceases. Symptoms can be activated by a variety of nonspecific environmental stimuli such as automobile exhaust, perfumes and passive smoking.
Practical experience shows that skin contact with the material is capable either of inducing a sensitisation reaction in a substantial number of individuals, and/or of producing a positive response in experimental animals.
Toxic: danger of serious damage to health
by prolonged exposure through inhalation.
Serious damage (clear functional disturbance or morphological change which may have toxicological significance) is likely to be caused by repeated or prolonged exposure. As a rule the material produces, or contains a substance which produces severe lesions. Such damage may become apparent following direct application in subchronic (90 day) toxicity studies or following sub-acute (28 day) or chronic (two-year) toxicity tests.
There is sufficient evidence to provide a strong presumption that human exposure to the material may result in developmental toxicity, generally on the basis of:
- clear results in appropriate animal studies where effects have been observed in the absence of marked maternal toxicity, or at around the same dose levels as other toxic effects but which are not secondary non-specific consequences of the other toxic effects.

Exposure to the material may result in a possible risk of irreversible effects. The material may produce mutagenic effects in man. This concern is raised, generally, on the basis of
appropriate studies using mammalian somatic cells in vivo. Such findings are often supported by positive results from in vitro mutagenicity studies.

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Nickel dusts, fumes and salts are potent contact allergens and sensitisers producing a dermatitis known as "nickel" rash.

In the absence of properly designed ventilation systems or where respiratory protective devises are inadequate, up to 10% of exposed workers are expected to be symptomatic.

TOXICITY AND IRRITATION

TOXICITY	IRRITATION
Oral (rat) LD50: 1620 mg/kg	Nil Reported
Intravenous (Mouse) LD: 9 mg/kg	

Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's oedema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type. Other allergic skin reactions, e.g. contact urticaria, involve antibody-mediated immune reactions. The significance of the contact allergen is not simply determined by its sensitisation potential: the distribution of the substance and the opportunities for contact with it are equally important. A weakly sensitising substance which is widely distributed can be a more important allergen than one with stronger sensitising potential with which few individuals come into contact. From a clinical point of view, substances are noteworthy if they produce an allergic test reaction in more than 1% of the persons tested.
Allergic reactions which develop in the respiratory passages as bronchial asthma or rhinoconjunctivitis, are mostly the result of reactions of the allergen with specific antibodies of the IgE class and belong in their reaction rates to the manifestation of the immediate type. In addition to the allergen-specific potential for causing respiratory sensitisation, the amount of the allergen, the exposure period and the genetically determined disposition of the exposed person are likely to be decisive.
Factors which increase the sensitivity of the mucosa may play a role in predisposing a person to allergy. They may be genetically determined or acquired, for example, during infections or exposure to irritant substances. Immunologically the low molecular weight substances become complete allergens in the organism either by binding to peptides or proteins (haptens) or after metabolism (prohaptens).
Particular attention is drawn to so-called atopic diathesis which is characterised by an increased susceptibility to allergic rhinitis, allergic bronchial asthma and atopic eczema (neurodermatitis) which is associated with increased IgE synthesis.
Exogenous allergic alveolitis is induced essentially by allergen specific immune -complexes of the IgG type; cell-mediated reactions (T lymphocytes) may be involved. Such allergy is of the delayed type with onset up to four hours following exposure.

Section 12 - ECOLOGICAL INFORMATION

Transport and distribution of nickel particulates between different environmental compartments, is strongly influenced by particle size. Fine particulate matter has a longer residence time in the environment and is carried a long distance from its source; larger particles are deposited near the emission source. Atmospheric residence time for nickel particulates is estimated to be 5.4-7.9 days. Water solubility and bioavailability is affected by soil pH; decrease in pH generally mobilises nickel, thus acid rain can mobilise nickel from the soil and increase nickel concentrations in ground water. Nickel bioaccumulates in the food chain but is not bioconcentrated.
Drinking Water Standards:
Nickel 50 ug/l (UK max.)
20 ug/l (WHO guideline)
Soil Guidelines:
Dutch Criteria: 35 mg/kg (target)
210 mg/kg (intervention).
Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters.
Wastes resulting from use of the product must be disposed of on site or at approved waste

continued...

sites.
DO NOT discharge into sewer or waterways.

Section 13 - DISPOSAL CONSIDERATIONS

For small quantities:
- Dissolve the material (in water or acid solution as appropriate) or convert it to a water soluble state with appropriate oxidising agent.
- Precipitate as the sulfide, adjusting the pH to neutral to complete the precipitation.
- Filter off sulfide solids for recovery or disposal to approved land-fill.
- Destroy excess sulfide in solution with, for example, sodium hypochlorite, neutralise, and flush to sewer (subject to local regulation).
- Recycle wherever possible or consult manufacturer for recycling options.
- Consult State Land Waste Management Authority for disposal.
- Bury residue in an authorised landfill.
- Recycle containers if possible, or dispose of in an authorised landfill.
- Containers may still present a chemical hazard/ danger when empty.
- Return to supplier for reuse/ recycling if possible.

Otherwise:
- If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill.
- Where possible retain label warnings and MSDS and observe all notices pertaining to the product.

Section 14 - TRANSPORTATION INFORMATION

Labels Required: OXIDIZING AGENT
HAZCHEM: 1Y

UNDG:

Dangerous Goods Class:	5.1	Subrisk:	None
UN Number:	2725	Packing Group:	III

Shipping Name:NICKEL NITRATE

Air Transport IATA:

ICAO/IATA Class:	5.1	ICAO/IATA Subrisk:	None
UN/ID Number:	2725	Packing Group:	III
ERG Code:	5L		

Shipping name:NICKEL NITRATE

Maritime Transport IMDG:

IMDG Class:	5.1	IMDG Subrisk:	None
UN Number:	2725	Packing Group:	III
EMS Number:	F- A, S- Q		

Shipping name:NICKEL NITRATE

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Section 15 - REGULATORY INFORMATION

REGULATIONS

nickel(II) nitrate (CAS: 13138-45-9) is found on the following regulatory lists;
International Agency for Research on Cancer (IARC) Carcinogens
OECD Representative List of High Production Volume (HPV) Chemicals

nickel(II) nitrate (CAS: 13478-00-7) is found on the following regulatory lists;
International Agency for Research on Cancer (IARC) Carcinogens
OECD Representative List of High Production Volume (HPV) Chemicals

No data available for nickel(II) nitrate as CAS: 16699-63-1.

Section 16 - OTHER INFORMATION

INGREDIENTS WITH MULTIPLE CAS NUMBERS

Ingredient Name	CAS
nickel(II) nitrate	13138- 45- 9, 13478- 00- 7, 16699- 63- 1

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