SAFETY DATA SHEET

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

1.1 Product identifiers

Product name: Nickel(II) oxide

Product Number: 637130
Brand: Aldrich
Index-No.: 028-003-00-2
CAS-No.: 1313-99-1

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

Identified uses: Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company: Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone: +1 314 771-5765
Fax: +1 800 325-5052

1.4 Emergency telephone

Emergency Phone #: 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

- Skin sensitization (Category 1), H317
- Carcinogenicity, Inhalation (Category 1A), H350
- Specific target organ toxicity - repeated exposure, Inhalation (Category 1), Lungs, H372
- Long-term (chronic) aquatic hazard (Category 4), H413

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

| ! | ! |

Signal Word: Danger

Aldrich - 637130
Hazard statement(s)
H317  May cause an allergic skin reaction.
H350  May cause cancer by inhalation.
H372  Causes damage to organs (Lungs) through prolonged or repeated exposure if inhaled.
H413  May cause long lasting harmful effects to aquatic life.

Precautionary statement(s)
P201  Obtain special instructions before use.
P202  Do not handle until all safety precautions have been read and understood.
P260  Do not breathe dust.
P264  Wash skin thoroughly after handling.
P270  Do not eat, drink or smoke when using this product.
P272  Contaminated work clothing must not be allowed out of the workplace.
P273  Avoid release to the environment.
P280  Wear protective gloves/ protective clothing/ eye protection/ face protection.
P302 + P352  IF ON SKIN: Wash with plenty of soap and water.
P308 + P313  IF exposed or concerned: Get medical advice/ attention.
P333 + P313  If skin irritation or rash occurs: Get medical advice/ attention.
P363  Wash contaminated clothing before reuse.
P405  Store locked up.
P501  Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel oxide</td>
<td>Skin Sens. 1; Carc. 1A; STOT RE 1; Aquatic Chronic 4; H317, H350, H372, H413</td>
<td>&lt;= 100 %</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.
SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/shower. Consult a physician.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Nickel/nickel oxides
Not combustible.
Ambient fire may liberate hazardous vapours.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information
Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.
SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Avoid generation and inhalation of dusts in all circumstances. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert. For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
Advice on safe handling
Work under hood. Do not inhale substance/mixture.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Storage conditions
Tightly closed. Dry. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorized persons.
Handle and store under inert gas.

Storage class
Storage class (TRGS 510): 6.1C: Combustible, acute toxic Cat.3 / toxic compounds or compounds which causing chronic effects

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters
Ingredients with workplace control parameters
The life science business of Merck KGaA, Darmstadt, Germany operates as MilliporeSigma in the US and Canada

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
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</thead>
<tbody>
<tr>
<td>Nickel oxide</td>
<td>1313-99-1</td>
<td>TWA</td>
<td>1 mg/m³</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.2 mg/m³</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
</tbody>
</table>

Remarks: Confirmed human carcinogen

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWA</td>
<td>USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values)</td>
</tr>
<tr>
<td>TWA</td>
<td>USA. NIOSH Recommended Exposure Limits</td>
</tr>
</tbody>
</table>

Potential Occupational Carcinogen

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Basis</th>
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</thead>
<tbody>
<tr>
<td>PEL</td>
<td>California permissible exposure limits for chemical contaminants (Title 8, Article 107)</td>
</tr>
</tbody>
</table>

### Biological occupational exposure limits

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Parameters</th>
<th>Value</th>
<th>Biological specimen</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel oxide</td>
<td>1313-99-1</td>
<td>Nickel</td>
<td>5 µg/l</td>
<td>Urine</td>
<td>ACGIH - Biological Exposure Indices (BEI)</td>
</tr>
</tbody>
</table>

Remarks: End of shift at end of workweek

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel</td>
<td>ACGIH - Biological Exposure Indices (BEI)</td>
</tr>
<tr>
<td></td>
<td>End of shift at end of workweek</td>
</tr>
</tbody>
</table>

### 8.2 Exposure controls

**Appropriate engineering controls**
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

**Personal protective equipment**

**Eye/face protection**
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

**Skin protection**
Handle with impervious gloves.

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Material tested: KCL 741 Dermatril® L

Body Protection
protective clothing

Respiratory protection
required when dusts are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

| a) Appearance          | Form: powder          |
|                       | Color: green, black  |
| b) Odor               | No data available    |
| c) Odor Threshold     | No data available    |
| d) pH                 | No data available    |
| e) Melting point/freeze point | Melting point: 1,955 °C (3,551 °F) - (ECHA) |
| f) Initial boiling point and boiling range | No data available |
| g) Flash point        | ()Not applicable     |
| h) Evaporation rate   | No data available    |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapor pressure     | No data available    |
| l) Vapor density      | No data available    |
| m) Density            | 6.67 g/cm^3 at 25 °C (77 °F) - lit. |
|                       | Relative density     | 6.7521 °C - OECD Test Guideline 109 |
| n) Water solubility   | 0.002 g/l at 20 °C (68 °F) - OECD Test Guideline 105 - insoluble |
| o) Partition coefficient: n-octanol/water | Not applicable for inorganic substances |
p) Autoignition temperature > 400 °C (> 752 °F) - Relative self-ignition temperature for solids does not ignite
q) Decomposition temperature No data available
r) Viscosity No data available
s) Explosive properties No data available
t) Oxidizing properties none

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature).

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
no information available

10.5 Incompatible materials
Strong acids

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - > 5,000 mg/kg  
(OECD Test Guideline 401)
LC50 Inhalation - Rat - male and female - 4 h - > 5.08 mg/l - aerosol
(OECD Test Guideline 403)
Dermal: No data available
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation - 4 h  
(OECD Test Guideline 404)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation
Respiratory or skin sensitization
May cause allergic skin reaction. Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Germ cell mutagenicity
Test Type: In vitro mammalian cell gene mutation test
Test system: mouse lymphoma cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 476
Result: negative

Carcinogenicity
Positive evidence from human epidemiological studies (inhalation)
IARC: 1 - Group 1: Carcinogenic to humans (Nickel oxide)
NTP: Known - Known to be human carcinogen (Nickel oxide)
OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA’s list of regulated carcinogens.

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
Inhalation - Causes damage to organs through prolonged or repeated exposure.
  - Lungs
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Aspiration hazard
No data available

11.2 Additional Information
RTECS: QR8400000
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.
Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity
Toxicity to fish
semi-static test LC50 - Oncorhynchus mykiss (rainbow trout) - 15.3 mg/l - 96 h
Remarks: (ECHA)

Toxicity to daphnia and other aquatic invertebrates
static test LC50 - Ceriodaphnia dubia (water flea) - 0.027 mg/l - 48 h
Remarks: (ECHA)
Toxicity to algae static test ErC50 - Pseudokirchneriella subcapitata - 0.081 - 0.148 mg/l - 72 h (OECD Test Guideline 201)

Toxicity to bacteria EC50 - activated sludge - 33 mg/l - 30 min (ISO 8192)

Toxicity to fish (Chronic toxicity) flow-through test NOEC - Cyprinodon variegatus (sheepshead minnow) - 21.7 mg/l - 28 d

Remarks: (ECHA)

12.2 Persistence and degradability
The methods for determining biodegradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential
Bioaccumulation Fucus vesiculosus - 21 d - 0.00001 mg/l (Nickel oxide)

Bioconcentration factor (BCF): 675
(Tested according to Annex V of Directive 67/548/EEC.)

Remarks: The product may be accumulated in organisms.

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties
No data available

12.7 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods
Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

SECTION 14: Transport information

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Aldrich - 637130
Not dangerous goods

Further information
Not classified as dangerous in the meaning of transport regulations.

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

<table>
<thead>
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SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

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</table>

Pennsylvania Right To Know Components

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</thead>
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<td>2010-08-02</td>
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</tbody>
</table>

California Prop. 65 Components
, which is/are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.Nickel oxide

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<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel oxide</td>
<td>1313-99-1</td>
<td>2007-09-28</td>
</tr>
</tbody>
</table>

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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