1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers
Product name: Cobalt(II,III) oxide
Product Number: 637025
Brand: Aldrich
CAS-No.: 1308-06-1

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA
Telephone: +1 800-325-5832
Fax: +1 800-325-5052

1.4 Emergency telephone number
Emergency Phone #: +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture
GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
- Respiratory sensitisation (Category 1), H334
- Skin sensitisation (Category 1), H317
- Carcinogenicity (Category 1A), H350
- Acute aquatic toxicity (Category 3), H402
- Chronic aquatic toxicity (Category 3), H412

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
Hazard statement(s)
H317 May cause an allergic skin reaction.
H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H350 May cause cancer.
H412 Harmful to aquatic life with long lasting effects.

Precautionary statement(s)
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
**2.3 Hazards not otherwise classified (HNOC) or not covered by GHS** - none

**3. COMPOSITION/INFORMATION ON INGREDIENTS**

**3.1 Substances**

<table>
<thead>
<tr>
<th>Formula</th>
<th>Co₃O₄</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molecular weight</td>
<td>240.80 g/mol</td>
</tr>
<tr>
<td>CAS-No.</td>
<td>1308-06-1</td>
</tr>
</tbody>
</table>

**Hazardous components**

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tricobalt tetraoxide</td>
<td>Resp. Sens. 1; Aquatic Acute 3; Aquatic Chronic 3; H334, H412</td>
<td>&lt;= 100 %</td>
</tr>
<tr>
<td>Nickel monoxide</td>
<td>Skin Sens. 1; Carc. 1A; STOT RE 1; Aquatic Chronic 4; H317, H350, H372, H413</td>
<td>&gt;= 0.1 - &lt; 1 %</td>
</tr>
</tbody>
</table>

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

**4. FIRST AID MEASURES**

**4.1 Description of first aid measures**

**General advice**
Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

**If inhaled**
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

**In case of skin contact**
Wash off with soap and plenty of water. Consult a physician.

**In case of eye contact**
Flush eyes with water as a precaution.

**If swallowed**
Never give anything by mouth to an unconscious person. Rinse mouth with water. 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
5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs. Provide appropriate exhaust ventilation at places where dust is formed. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Hygroscopic. Keep in a dry place. Storage class (TRGS 510): Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tricobalt tetraoxide</td>
<td>1308-06-1</td>
<td>TWA</td>
<td>0.020000 mg/m³</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
</tbody>
</table>

Remarks
- Pulmonary function
- Asthma
- Myocardial effects
- Substances for which there is a Biological Exposure Index or Indices
(see BEI® section)
Confirmed animal carcinogen with unknown relevance to humans
varies

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Value</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWA</td>
<td>0.02 mg/m³</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
</tbody>
</table>

Pulmonary function
Asthma
Myocardial effects
Substances for which there is a Biological Exposure Index or Indices
(see BEI® section)
Confirmed animal carcinogen with unknown relevance to humans
varies

Nickel monoxide 1313-99-1

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Value</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWA</td>
<td>1.000000 mg/m³</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</td>
</tr>
<tr>
<td>TWA</td>
<td>0.015000 mg/m³</td>
<td>USA. NIOSH Recommended Exposure Limits</td>
</tr>
</tbody>
</table>

Potential Occupational Carcinogen
See Appendix A

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Value</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWA</td>
<td>0.200000 mg/m³</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
</tbody>
</table>

Lung cancer
Confirmed human carcinogen
varies

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Value</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<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>TWA</td>
<td>0.2 mg/m³</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
</tbody>
</table>

Lung cancer
Confirmed human carcinogen
varies

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Value</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWA</td>
<td>0.015 mg/m³</td>
<td>USA. NIOSH Recommended Exposure Limits</td>
</tr>
</tbody>
</table>

Potential Occupational Carcinogen
See Appendix A

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Value</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEL</td>
<td>0.1 mg/m³</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>Tricobalt tetraoxide 1308-06-1</td>
<td>Cobalt</td>
<td>15 µg/l</td>
<td>Urine</td>
<td>ACGIH - Biological Exposure Indices (BEI)</td>
<td></td>
</tr>
</tbody>
</table>

Remarks
End of shift at end of workweek

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Value</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cobalt</td>
<td>Urine</td>
<td>ACGIH - Biological Exposure Indices (BEI)</td>
</tr>
</tbody>
</table>

8.2 Exposure controls

**Appropriate engineering controls**
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.
Personal protective equipment

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

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove’s outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance
   Form: powder
   Colour: black

b) Odour
   No data available

c) Odour Threshold
   No data available

d) pH
   No data available

e) Melting point/freezing point
   Melting point/range: 895 °C (1,643 °F) - lit.

f) Initial boiling point and boiling range
   No data available

g) Flash point
   No data available

h) Evaporation rate
   No data available

i) Flammability (solid, gas)
   No data available

j) Upper/lower flammability or explosive limits
   No data available

k) Vapour pressure
   No data available

l) Vapour density
   No data available

m) Relative density
   6.11 g/mL at 25 °C (77 °F)

n) Water solubility
   0.00156 g/l at 20 °C (68 °F) - OECD Test Guideline 105 - slightly soluble

o) Partition coefficient: n-octanol/water
   No data available

p) Auto-ignition temperature
   No data available

q) Decomposition temperature
   > 900 °C (> 1,652 °F) -

r) Viscosity
   No data available

s) Explosive properties
   No data available
t) Oxidizing properties No data available

9.2 Other safety information

- Bulk density: 0.78 g/l

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Avoid moisture.

10.5 Incompatible materials
Reducing agents

10.6 Hazardous decomposition products
- Hazardous decomposition products formed under fire conditions: Cobalt/cobalt oxides
- Other decomposition products: No data available
- In the event of fire: see section 5

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 - 4 h: > 5.06 mg/l (OECD Test Guideline 436)
  - LD50 Dermal - Rat - male and female: > 2,000 mg/kg (OECD Test Guideline 402)
  - No data available

- Skin corrosion/irritation
  - Skin - Rat
    - Result: No skin irritation

- Serious eye damage/eye irritation
  - Eyes - Rabbit
    - Result: No eye irritation (OECD Test Guideline 405)

- Respiratory or skin sensitisation
  - in vivo assay - Mouse
    - Result: Does not cause skin sensitisation. (OECD Test Guideline 429)

- Germ cell mutagenicity
  - No data available
    - in vitro assay
      - mouse lymphoma cells
        - Result: negative

- OECD Test Guideline 475
  - Rat - male and female
    - Result: negative

- Carcinogenicity
IARC: 1 - Group 1: Carcinogenic to humans (Nickel monoxide)
NTP: Known to be human carcinogen (Nickel monoxide)
OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available
Effects due to ingestion may include: Burning pain in mouth, throat and stomach. Prolonged or repeated exposure may cause: Fatigue, Cardiac irregularities, Convulsions, Vomiting
Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence (Nickel monoxide)

12. ECOLOGICAL INFORMATION

12.1 Toxicity
Toxicity to daphnia and other aquatic invertebrates
EC50 - Daphnia magna (Water flea) - > 136 mg/l - 48 h

Toxicity to algae
EC50 - Pseudokirchneriella subcapitata (green algae) - 88 mg/l - 72 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

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 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Harmful to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.
Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel monoxide</td>
<td>1313-99-1</td>
<td>1993-04-24</td>
</tr>
<tr>
<td>Tricobalt tetraoxide</td>
<td>1308-06-1</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel monoxide</td>
<td>1313-99-1</td>
<td>1993-04-24</td>
</tr>
</tbody>
</table>

Pennsylvania Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tricobalt tetraoxide</td>
<td>1308-06-1</td>
<td>2007-07-01</td>
</tr>
<tr>
<td>Nickel monoxide</td>
<td>1313-99-1</td>
<td>1993-04-24</td>
</tr>
</tbody>
</table>

New Jersey Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tricobalt tetraoxide</td>
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</tr>
<tr>
<td>Nickel monoxide</td>
<td>1313-99-1</td>
<td>1993-04-24</td>
</tr>
</tbody>
</table>

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute  Acute aquatic toxicity
Aquatic Chronic Chronic aquatic toxicity
Carc.  Carcinogenicity
H317  May cause an allergic skin reaction.
H334  May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H350  May cause cancer.
H372 Causes damage to organs (\$/*_ORG_REP_INHA/\$/) through prolonged or repeated exposure if inhaled.

H402 Harmful to aquatic life.

H412 Harmful to aquatic life with long lasting effects.

H413 May cause long lasting harmful effects to aquatic life.

Resp. Sens. Respiratory sensitisation

Skin Sens. Skin sensitisation

STOT RE Specific target organ toxicity - repeated exposure

**HMIS Rating**

Health hazard: 2

Chronic Health Hazard: *

Flammability: 0

Physical Hazard 0

**NFPA Rating**

Health hazard: 2

Fire Hazard: 0

Reactivity Hazard: 0

**Further information**

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**Preparation Information**

Sigma-Aldrich Corporation

Product Safety – Americas Region

1-800-521-8956

Version: 4.9 Revision Date: 05/24/2016 Print Date: 10/19/2018