# KW-T276

## Material Safety Data Sheet

In Accordance with MOEL Public notice 2025-50
MSDS Number: AA06900-0000000556
Issue date: 6/28/1996 Revision date: 7/24/2026 Version: 9.0

## 1. Product and company identification

### 1.1. Product Name

Product form : Article
Trade name : KW-T276

### 1.2. Recommended use of the chemical and restrictions on use

#### 1.2.1. Recommended use

Use Categories : 35 - Welding and soldering products, flux products.
Recommended use : Welding and soldering products, flux products.

#### 1.2.2. Restrictions on use

Not for use other than intended.

### 1.3. Supplier information

- Supplier

Company : KISWEL
Address : (51544) South Korea 704, Gongdan-ro, Seongsan-gu, Changwon-si, Gyeongnam, Korea
Tel. : 055)269-7200
Fax : 055)266-4487

## 2. Hazards identification

### 2.1. Hazard Classification

| | |
|---|---|
| Respiratory sensitisation, Category 1 | H334 |
| Skin sensitisation, Category 1 | H317 |
| Carcinogenicity, Category 2 | H351 |
| Specific target organ toxicity - Repeated exposure, Category 1 | H372 |
| Hazardous to the aquatic environment – Chronic Hazard, Category 4 | H413 |

### 2.2. Label elements including precautionary statements

#### 2.2.1. Hazard pictograms (GHS KR)



#### 2.2.2. Signal word (GHS KR)

Danger.

#### 2.2.3. Hazard statements (GHS KR)

H317 - May cause an allergic skin reaction
H334 - May cause allergic reactions, asthma or shortness of breath and etc if inhaled
H351 - Suspected of causing cancer (Inhalation)
H372 - Causes damage to organs (respiratory system) through prolonged or repeated exposure (Inhalation)
H413 - May cause long lasting harmful effects to aquatic life

#### 2.2.4. Precautionary statements (GHS KR)

**Precaution:**

P201 - Obtain special instructions before use.
P202 - Do not handle until all safety precautions have been read and understood.
P260 - Do not breathe gas, dust, fume.
P261 - Avoid breathing gas, dust, fume.
P264 - Wash hands, forearms and face thoroughly after handling.
P270 - Do not eat, drink or smoke when using this product.
P272 - Contaminated work clothing should not be allowed out of the workplace.

P273 - Avoid release to the environment.
P280 - Wear eye protection, protective clothing, face protection, protective gloves.
P284 - In case of inadequate ventilation wear respiratory protection.

**Treatment:**

P302+P352 - IF ON SKIN: Wash with plenty of soap and water.
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P308+P313 - IF exposed or concerned: Get medical attention.
P314 - Get medical attention if you feel unwell.
P321 - Take immediate medical attention treatment.
P333+P313 - If skin irritation or rash occurs: Get medical attention.
P342+P311 - If experiencing respiratory symptoms: Call a doctor.
P362+P364 - Take off contaminated clothing and wash it before reuse.

**Storage:**

P405 - Store locked up.

**Disposal:**

P501 - Dispose of contents/container according to waste related regulations.

### 2.3. Other Hazard which are not included in the classification criteria

Not applicable

## 3. Composition/information on ingredients

Product form : Article

| Substance name | Other Names | CAS-No. and Identifier number | Concentration (%) |
|---|---|---|---|
| Nickel | Nickel metal / Nickel, elemental / Nickel, metallic / Nickel, metal / C.I. 77775 | CAS-No.: 7440-02-0<br>KECI-No.: KE-25818 | 56 – 60 |
| Chromium | No data available | CAS-No.: 7440-47-3 | 14 – 17 |
| Molybdenum | Molybdenum metal / Molybdenum, elemental / Molybdenum, metal / Molybdenum, metallic / molybdenum | CAS-No.: 7439-98-7<br>KECI-No.: KE-25427 | 15 – 17 |
| Iron | Iron, elemental / Direct reduced Iron / Iron, reduced / Elemental iron / IRON POWDER / iron | CAS-No.: 7439-89-6<br>KECI-No.: KE-21059 | 4 – 7 |
| Tungsten | Tungsten, elemental / Tungsten, metal / Tungsten metal / Tungsten trioxide / tungsten | CAS-No.: 7440-33-7<br>KECI-No.: KE-35000 | 1 – 3 |
| Coblat | No data available | CAS-No.: 7440-48-4 | 1 – 2.5 |
| Manganese | Manganese, elemental / Manganese metal / manganese | CAS-No.: 7439-96-5<br>KECI-No.: KE-22999 | 0.1 – 1 |

## 4. First-aid measures

### 4.1. Eye contact

Rinse eyes with water as a precaution.

### 4.2. Skin contact

Wash skin with plenty of water.
Take off contaminated clothing.
If skin irritation or rash occurs: Get medical advice/attention.

### 4.3. Inhalation

Remove person to fresh air and keep comfortable for breathing.
If experiencing respiratory symptoms: Call a poison center or a doctor.

### 4.4. Ingestion

Call a poison center or a doctor if you feel unwell.

### 4.5. Indication of immediate medical attention and notes for physician

Other medical advice or treatment : Treat symptomatically.

## 5. Fire-fighting measures

### 5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media : Water spray.
Dry powder.
Foam.

Unsuitable extinguishing media : No data available

### 5.2. Special hazards arising from the substance or mixture

No data available

### 5.3. Special protective equipment and precautions for fire-fighters

Protection during firefighting : Do not attempt to take action without suitable protective equipment.
Self-contained breathing apparatus.
Complete protective clothing.

## 6. Accidental release measures

### 6.1. Personal precautions, protective equipment and emergency procedures

Ventilate spillage area.
Do not breathe dust/fume/gas/mist/vapours/spray.
Avoid contact with skin and eyes.
Do not attempt to take action without suitable protective equipment.
For further information refer to section 8: "Exposure controls/personal protection".

### 6.2. Environmental precautions and protective procedures

Avoid release to the environment.

### 6.3. Methods and material for containment and cleaning up

Collect spillage.
Mechanically recover the product.
Notify authorities if product enters sewers or public waters.
Dispose of materials or solid residues at an authorized site.

## 7. Handling and storage

### 7.1. Precautions for safe handling

Precautions for safe handling : Ensure good ventilation of the work station.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Wear personal protective equipment.
Do not breathe dust/fume/gas/mist/vapours/spray.
Avoid contact with skin and eyes.

Hygiene measures : Contaminated work clothing should not be allowed out of the workplace.

Wash contaminated clothing before reuse.
Do not eat, drink or smoke when using this product.
Always wash hands after handling the product.

### 7.2. Conditions for safe storage

Storage conditions : Store locked up.
Store in a well-ventilated place.
Keep cool.

## 8. Exposure controls & personal protection

### 8.1. Control parameters (e.g. occupational exposure limit values, biological limit values)

| Manganese (7439-96-5) | |
|---|---|
| **Korea - Occupational Exposure Limits** | |
| Local name | 망간 및 무기 화합물 # Manganese&Inorganic compounds, as Mn |
| ISHA OEL TWA | 1 mg/m³<br>1 mg/m³ (흄) # (Fume) |
| ISHA OEL STEL | 3 mg/m³ (흄) # (Fume) |
| ISHA PEL TWA | 1 mg/m³ |
| Regulatory reference | 고용노동부고시 제2020-48호 # MOEL Public Notice. No. 2020-48 |
| **China - Occupational Exposure Limits** | |
| OEL PC-TWA | 0.15 mg/m³ |
| OEL PC-TWA (Highly Toxic Goods) | 0.15 mg/m³ (dust and fume) |
| OEL PC-STEL (Highly Toxic Goods) | 0.45 mg/m³ (dust and fume) |
| Catalogue of Occupational Hazard Factors | Category 3 - Chemicals |
| **India - Occupational Exposure Limits** | |
| PEL (OEL TWA) | 1 mg/m³ (fume) |
| PEL (OEL STEL) | 0.03 mg/m³ (fume) |
| PEL (OEL C) | 5 mg/m³ (dust) |
| **Indonesia - Occupational Exposure Limits** | |
| NAB (OEL TWA) | 0.1 mg/m³ (inhalable particulate)<br>0.02 mg/m³ (respirable particulate) |
| Chemical category | A4 - not classifiable as a human carcinogen |
| **Singapore - Occupational Exposure Limits** | |
| PEL (OEL TWA) | 1 mg/m³ (dust and fume) |
| OEL STEL | 3 mg/m³ (fume) |
| **Singapore - BTLV** | |
| BTLV | 50 µg/l Parameter: Manganese - Medium: urine |
| **Taiwan - Occupational Exposure Limits** | |
| OEL TWA | 1 mg/m³ (category C3 special chemical-fume) |
| OEL STEL | 2 mg/m³ (category C3 special chemical-fume) |
| OEL C | 5 mg/m³ (category C3 special chemical) |

| Manganese (7439-96-5) | |
|---|---|
| **Vietnam - Occupational Exposure Limits** | |
| OEL TWA | 0.3 mg/m³ |
| OEL STEL | 0.6 mg/m³ |
| **Australia - Occupational Exposure Limits** | |
| OES TWA | 1 mg/m³ (dust and fume) |
| OES STEL | 3 mg/m³ (fume) |
| **USA - ACGIH® - Threshold Limit Values** | |
| ACGIH® TLV® TWA | 0.02 mg/m³ (respirable particulate matter)<br>0.1 mg/m³ (inhalable particulate matter) |
| ACGIH® chemical category | Not Classifiable as a Human Carcinogen |
| **USA - IDLH - Occupational Exposure Limits** | |
| IDLH | 500 mg/m³ |
| **USA - NIOSH - Occupational Exposure Limits** | |
| NIOSH REL TWA | 1 mg/m³ (fume) |
| NIOSH REL STEL | 3 mg/m³ |
| **USA - OSHA - Occupational Exposure Limits** | |
| OSHA PEL C | 5 mg/m³ (fume) |

| Nickel (7440-02-0) | |
|---|---|
| **Korea - Occupational Exposure Limits** | |
| Local name | 니켈 (금속) # Nickel (Metal) |
| ISHA OEL TWA | 1 mg/m³ (metal) |
| ISHA PEL TWA | 0.2 mg/m³ |
| Remark (KR) | 발암성 2 # Carcinogenicity 2 |
| Regulatory reference | 고용노동부고시 제2020-48호 # MOEL Public Notice. No. 2020-48 |
| **China - Occupational Exposure Limits** | |
| OEL PC-TWA | 1 mg/m³ |
| Chemical category | Possibly carcinogenic to humans |
| OEL PC-TWA (Highly Toxic Goods) | 1 mg/m³ |
| OEL PC-STEL (Highly Toxic Goods) | 2.5 mg/m³ |
| Catalogue of Occupational Hazard Factors | Category 3 - Chemicals |
| **Indonesia - Occupational Exposure Limits** | |
| NAB (OEL TWA) | 1.5 mg/m³ (inhalable particulate) |
| Chemical category | A5 - not suspected as human carcinogen |
| **Singapore - Occupational Exposure Limits** | |
| PEL (OEL TWA) | 1 mg/m³ |
| **Taiwan - Occupational Exposure Limits** | |
| OEL TWA | 1 mg/m³ |
| OEL STEL | 2 mg/m³ |

| Nickel (7440-02-0) | |
|---|---|
| **Thailand - Occupational Exposure Limits** | |
| OEL TWA | 1 mg/m³ |
| **Vietnam - Occupational Exposure Limits** | |
| OEL TWA | 0.05 mg/m³ |
| OEL STEL | 0.25 mg/m³ |
| **Australia - Occupational Exposure Limits** | |
| OES TWA | 1 mg/m³ |
| **USA - ACGIH® - Threshold Limit Values** | |
| ACGIH® TLV® TWA | 1.5 mg/m³ (inhalable particulate matter) |
| ACGIH® chemical category | Not Suspected as a Human Carcinogen |
| **USA - ACGIH® - Biological Exposure Indices** | |
| BEI | 5 µg/l Parameter: Nickel - Medium: urine - Sampling time: post-shift at end of workweek (background) |
| **USA - IDLH - Occupational Exposure Limits** | |
| IDLH | 10 mg/m³ |
| **USA - NIOSH - Occupational Exposure Limits** | |
| NIOSH REL TWA | 0.015 mg/m³ |
| **USA - OSHA - Occupational Exposure Limits** | |
| OSHA PEL TWA | 1 mg/m³ |

| Chromium (7440-47-3) | |
|---|---|
| **Korea - Occupational Exposure Limits** | |
| Local name | 크롬 # Chromium |
| ISHA OEL TWA | 0.5 mg/m³ (금속) # (Metal)<br>0.5 mg/m³ (2가)화합물 # (II) compounds, as Cr<br>0.5 mg/m³ (3가)화합물 # (III) compounds, as Cr |
| Remark (KR) | 발암성 1A # Carcinogenicity 1A |
| Regulatory reference | 고용노동부고시 제2020-48호 # MOEL Public Notice. No. 2020-48 |

| Molybdenum (7439-98-7) | |
|---|---|
| **Korea - Occupational Exposure Limits** | |
| Local name | 몰리브덴 (불용성화합물) # Molybdenum (Insoluble compounds) |
| ISHA OEL TWA | 10 mg/m³ 흡입성 # (Inhalable fraction)<br>5 mg/m³ 호흡성 # (Respirable fraction) |
| Regulatory reference | 고용노동부고시 제2020-48호 # MOEL Public Notice. No. 2020-48 |
| **Indonesia - Occupational Exposure Limits** | |
| NAB (OEL TWA) | 5 mg/m³ (respirable particulate) |
| Chemical category | A3 - confirmed animal carcinogen |
| **Australia - Occupational Exposure Limits** | |
| OES TWA | 10 mg/m³ |

| **Molybdenum (7439-98-7)** | |
|---|---|
| **USA - ACGIH® - Threshold Limit Values** | |
| ACGIH® TLV® TWA | 10 mg/m³ (inhalable particulate matter)<br>3 mg/m³ (respirable particulate matter) |
| **USA - IDLH - Occupational Exposure Limits** | |
| IDLH | 5000 mg/m³ |

| **Iron (7439-89-6)** | |
|---|---|
| **Korea - Occupational Exposure Limits** | |
| Local name | 철염(가용성) # Iron salts (Soluble, as Fe) |
| ISHA OEL TWA | 1 mg/m³ |
| Regulatory reference | 고용노동부고시 제2020-48호 # MOEL Public Notice. No. 2020-48 |
| **Indonesia - Occupational Exposure Limits** | |
| NAB (OEL TWA) | 1 mg/m³ |

| **Tungsten (7440-33-7)** | |
|---|---|
| **Korea - Occupational Exposure Limits** | |
| Local name | 텅스텐 # Tungsten |
| ISHA OEL TWA | 1 mg/m³ (가용성화합물)호흡성 # (Soluble compounds) (Respirable fraction)<br>5 mg/m³ (텅스텐 및 불용성화합물)호흡성 # (Metal and Insoluble compounds) (Respirable fraction) |
| ISHA OEL STEL | 3 mg/m³ (가용성화합물)호흡성 # (Soluble compounds) (Respirable fraction)<br>10 mg/m³ (텅스텐 및 불용성화합물)호흡성 # (Metal and Insoluble compounds) (Respirable fraction) |
| Regulatory reference | 고용노동부고시 제2020-48호 # MOEL Public Notice. No. 2020-48 |
| **China - Occupational Exposure Limits** | |
| OEL PC-TWA | 5 mg/m³ |
| OEL PC-STEL | 10 mg/m³ |
| Catalogue of Occupational Hazard Factors | Category 3 - Chemicals |
| **Indonesia - Occupational Exposure Limits** | |
| NAB (OEL TWA) | 5 mg/m³ |
| NAB PSD (OEL STEL) | 10 ppm |
| **USA - ACGIH® - Threshold Limit Values** | |
| ACGIH® TLV® TWA | 3 mg/m³ (respirable particulate matter) |
| **USA - NIOSH - Occupational Exposure Limits** | |
| NIOSH REL TWA | 5 mg/m³ |
| NIOSH REL STEL | 10 mg/m³ |

| **Coblat (7440-48-4)** | |
|---|---|
| **Korea - Occupational Exposure Limits** | |
| Local name | 코발트및 그 무기화합물 # Cobalt and inorganic compounds |
| ISHA OEL TWA | 0.02 mg/m³ |
| Remark (KR) | 발암성 2 # Carcinogenicity 2 |
| Regulatory reference | 고용노동부고시 제2020-48호 # MOEL Public Notice. No. 2020-48 |

### 8.2. Appropriate engineering controls

Appropriate engineering controls : Ensure good ventilation of the work station.
Environmental exposure controls : Avoid release to the environment.

### 8.3. Personal protection equipment

**Respiratory protection**

[In case of inadequate ventilation] wear respiratory protection.

**Eye protection**

Safety glasses

**Hand protection**

Protective gloves

**Skin and body protection**

Wear suitable protective clothing

**Personal protective equipment symbol(s):**



## 9. Physical and chemical properties

| | | | |
|---|---|---|---|
| a) | Appearance | : | No data available |
| | Physical state | : | Solid |
| b) | Odour | : | No data available |
| c) | Odour threshold | : | No data available |
| d) | pH | : | No data available |
| e) | Melting / freezing point | : | No data available / Not applicable |
| 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) | : | Non flammable. |
| j) | Upper / lower flammability or explosive limits | : | Not applicable |
| k) | Vapour pressure | : | No data available |
| l) | Solubility | : | No data available |
| m) | Vapour density | : | No data available |
| n) | Relative density | : | No data available |
| o) | Partition coefficient n-octanol/water (Log Kow) | : | No data available |
| p) | Auto-ignition temperature | : | Not applicable |
| q) | Decomposition temperature | : | No data available |
| r) | Viscosity, kinematic | : | Not applicable |
| | Viscosity, dynamic | : | No data available |
| s) | Molecular mass | : | No data available |

## 10. Stability and reactivity

### 10.1. Chemical stability and Possibility of hazardous reactions

The product is non-reactive under normal conditions of use, storage and transport.
Stable under normal conditions.
No dangerous reactions known under normal conditions of use.

### 10.2. Conditions to avoid

None under recommended storage and handling conditions (see section 7).

### 10.3. Incompatible materials

No data available

### 10.4. Hazardous decomposition products

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

## 11. Toxicological information

### 11.1. Information on the likely routes of exposure

Oral : Not classified
Skin and eyes contact : Skin sensitization - May cause an allergic skin reaction.
Inhalation : Respiratory sensitization - May cause allergic reactions, asthma or shortness of breath and etc if inhaled.

### 11.2. Health hazards information

**Acute toxicity (oral):**

Not classified

**Acute toxicity (dermal):**

Not classified

**Acute toxicity (inhalation):**

Not classified

| Manganese (7439-96-5) | |
|---|---|
| LD50 oral rat | > 2000 mg/kg bodyweight Animal: rat, Animal sex: female, Guideline: OECD Guideline 420 (Acute Oral Toxicity - Fixed Dose Method), Guideline: EU Method B.1 bis (Acute Oral Toxicity - Fixed Dose Procedure) |
| LC50 Inhalation - Rat | > 5.14 mg/l air Animal: rat, Guideline: OECD Guideline 403 (Acute Inhalation Toxicity), Guideline: EU Method B.2 (Acute Toxicity (Inhalation)) |
| LC50 Inhalation - Rat (Dust/Mist) | > 5.14 mg/l Source: ECHA |
| LC50 Inhalation - Rat (Vapours) | 1.5 – 5 mg/l/4h |

| Nickel (7440-02-0) | |
|---|---|
| LD50 oral rat | > 9000 mg/kg bodyweight Animal: rat, Guideline: OECD Guideline 401 (Acute Oral Toxicity) |
| LC50 Inhalation - Rat | > 10.2 mg/l (Exposure time: 1 h) |

| Chromium (7440-47-3) | |
|---|---|
| LD50 oral rat | > 5000 mg/kg Source: ECHA |
| LC50 Inhalation - Rat | > 5.41 mg/l air Animal: rat, Guideline: OECD Guideline 403 (Acute Inhalation Toxicity) |
| LC50 Inhalation - Rat (Dust/Mist) | > 5.41 mg/l Source: ECHA |

| Molybdenum (7439-98-7) | |
|---|---|
| LD50 oral rat | > 2000 mg/kg Source: ECHA |
| LD50 dermal rat | > 2000 mg/kg bodyweight Animal: rat, Guideline: OECD Guideline 402 (Acute Dermal Toxicity) |
| LD50 dermal rabbit | > 2000 mg/kg Source: ECHA |
| LC50 Inhalation - Rat | > 5.84 mg/l/4h |

| | |
|---|---|
| LC50 Inhalation - Rat (Dust/Mist) | > 3.92 mg/l Source: ECHA |
| LC50 Inhalation - Rat (Vapours) | > 5.02 mg/l/4h |

| **Iron (7439-89-6)** | |
|---|---|
| LD50 oral rat | 98600 mg/kg bodyweight Animal: rat, Animal sex: male, Guideline: OECD Guideline 401 (Acute Oral Toxicity) |
| LC50 Inhalation - Rat | > 250 mg/m³ air (6 h, Rat, Male, Experimental value, Inhalation (dust)) |

| **Tungsten (7440-33-7)** | |
|---|---|
| LD50 oral rat | > 2000 mg/kg bodyweight Animal: rat, Guideline: OECD Guideline 401 (Acute Oral Toxicity) |
| LD50 dermal rat | > 2000 mg/kg bodyweight Animal: rat, Guideline: OECD Guideline 402 (Acute Dermal Toxicity) |
| LC50 Inhalation - Rat | > 5.4 mg/l/4h Animal: rat, Guideline: OECD Guideline 403 (Acute Inhalation Toxicity) |
| LC50 Inhalation - Rat (Dust/Mist) | > 5.4 mg/l Source: ECHA |

| **Coblat (7440-48-4)** | |
|---|---|
| LD50 oral rat | ≈ 550 mg/kg bodyweight Animal: rat, Animal sex: female, Guideline: OECD Guideline 425 (Acute Oral Toxicity: Up-and-Down Procedure), 95% CL: 215,9 - 1140 |
| LD50 dermal rat | > 2000 mg/kg bodyweight Animal: rat, Guideline: OECD Guideline 402 (Acute Dermal Toxicity) |
| LC50 Inhalation - Rat | ≤ 0.05 mg/l air Animal: rat, Animal sex: male, Guideline: OECD Guideline 436 (Acute Inhalation Toxicity: Acute Toxic Class Method) |
| LC50 Inhalation - Rat (Dust/Mist) | ≤ 0.05 mg/l Source: ECHA |

**Skin corrosion/irritation:**

Not classified

**Serious eye damage/irritation:**

Not classified

**Respiratory sensitization:**

May cause allergic reactions, asthma or shortness of breath and etc if inhaled.

**Skin sensitization:**

May cause an allergic skin reaction.

**Carcinogenicity:**

Suspected of causing cancer (Inhalation).

| **Nickel (7440-02-0)** | |
|---|---|
| IARC group | 2B - Possibly carcinogenic to humans |
| National Toxicity Program (NTP) Status | Reasonably anticipated to be Human Carcinogen |

| **Chromium (7440-47-3)** | |
|---|---|
| IARC group | 3 - Not classifiable |

| **Coblat (7440-48-4)** | |
|---|---|
| IARC group | 2B - Possibly carcinogenic to humans |

**Mutagenicity:**

Not classified

**Reproductive toxicity:**

Not classified

| Molybdenum (7439-98-7) | |
|---|---|
| LOAEL (animal/male, F0/P) | 100 mg/kg bodyweight Animal: rat, Animal sex: male, Guideline: OECD Guideline 416 (Two-Generation Reproduction Toxicity Study) |
| NOAEL (animal/male, F0/P) | 42.5 mg/kg bodyweight Animal: rat, Animal sex: male, Guideline: OECD Guideline 416 (Two-Generation Reproduction Toxicity Study) |

**STOT-single exposure:**

Not classified

| Coblat (7440-48-4) | |
|---|---|
| STOT-single exposure | May cause respiratory irritation. |

**STOT-repeated exposure:**

Causes damage to organs (respiratory system) through prolonged or repeated exposure (Inhalation).

| Nickel (7440-02-0) | |
|---|---|
| LOAEC (inhalation, rat, dust/mist/fume, 90 days) | 0.004 mg/l air Animal: rat, Guideline: OECD Guideline 412 (Subacute Inhalation Toxicity: 28-Day Study) |
| STOT-repeated exposure | Causes damage to organs through prolonged or repeated exposure. |

| Chromium (7440-47-3) | |
|---|---|
| LOAEC (inhalation, rat, dust/mist/fume, 90 days) | ≥ 0.0044 mg/l air Animal: rat, Guideline: OECD Guideline 413 (Subchronic Inhalation Toxicity: 90-Day Study) |

| Molybdenum (7439-98-7) | |
|---|---|
| NOAEL (oral, rat, 90 days) | 17 mg/kg bw/day |
| NOAEC (inhalation, rat, dust/mist/fume, 90 days) | > 0.1 mg/l air Animal: rat, Guideline: OECD Guideline 413 (Subchronic Inhalation Toxicity: 90-Day Study) |
| STOT-repeated exposure | May cause damage to organs through prolonged or repeated exposure. |

| Tungsten (7440-33-7) | |
|---|---|
| NOAEC (inhalation, rat, dust/mist/fume, 90 days) | > 0.652 mg/l air Animal: rat, Guideline: OECD Guideline 412 (Subacute Inhalation Toxicity: 28-Day Study) |

| Coblat (7440-48-4) | |
|---|---|
| LOAEC (inhalation, rat, dust/mist/fume, 90 days) | 0.31 mg/l air Animal: rat |
| NOAEL (oral, rat, 90 days) | 3 mg/kg bodyweight Animal: rat, Guideline: OECD Guideline 408 (Repeated Dose 90-Day Oral Toxicity Study in Rodents) |

**Aspiration hazard:**

Not classified

| KW-T276 | |
|---|---|
| Viscosity, kinematic | Not applicable |
| **Manganese (7439-96-5)** | |
| Density | 7200 kg/m³ |

| Nickel (7440-02-0) | |
|---|---|
| Viscosity, kinematic (calculated value) (40 °C) | Not applicable (solid) |
| Density | 8.9 g/cm³ (at 25 °C) |
| Viscosity, kinematic | Not applicable (solid) |
| Viscosity, dynamic | Not applicable (solid) |

| Molybdenum (7439-98-7) | |
|---|---|
| Density | 10.2 g/cm³ (at 20 °C) |

| Iron (7439-89-6) | |
|---|---|
| Density | 7.87 g/cm³ Type: 'density' Temp.: 20 °C |

| Tungsten (7440-33-7) | |
|---|---|
| Density | 19.3 g/cm³ (at 20 °C) |

| Coblat (7440-48-4) | |
|---|---|
| Density | 8.86 g/cm³ Type: 'density' Temp.: 20 °C |

## 12. Ecological information

### 12.1. Aquatic and terrestrial ecotoxicity

Ecology - general : Very toxic to aquatic life.
May cause long lasting harmful effects to aquatic life.

Hazardous to the aquatic environment, short–term (acute) : Not classified

Hazardous to the aquatic environment, long–term (chronic) : May cause long lasting harmful effects to aquatic life.

| Manganese (7439-96-5) | |
|---|---|
| LC50 - Fish [1] | > 3.6 mg/l Test organisms (species): Oncorhynchus mykiss (previous name: Salmo gairdneri) |
| EC50 - Crustacea [1] | > 1.6 mg/l Test organisms (species): Daphnia magna |
| EC50 72h - Algae [1] | 4.5 mg/l Test organisms (species): Desmodesmus subspicatus (previous name: Scenedesmus subspicatus) |
| EC50 72h - Algae [2] | 2.8 mg/l Test organisms (species): Desmodesmus subspicatus (previous name: Scenedesmus subspicatus) |
| ErC50 algae | 3.43 mg/l |
| NOEC (chronic) | 1.7 mg/l Test organisms (species): Ceriodaphnia dubia Duration: '8 d' |
| BCF - Fish [1] | 81 (Pisces) |
| BCF - Other aquatic organisms [1] | 300000 (Mollusca) |
| BCF - Other aquatic organisms [2] | 125000 (Crustacea) |

| Nickel (7440-02-0) | |
|---|---|
| LC50 - Fish [1] | > 100 mg/l (Exposure time: 96 h - Species: Brachydanio rerio) |

| Nickel (7440-02-0) | |
|---|---|
| LC50 - Fish [2] | 1.3 mg/l (Exposure time: 96 h - Species: Cyprinus carpio [semi-static]) |
| EC50 - Crustacea [1] | > 100 mg/l (Exposure time: 48 h - Species: Daphnia magna) |
| EC50 - Crustacea [2] | 1 mg/l (Exposure time: 48 h - Species: Daphnia magna [Static]) |
| EC50 96h - Algae [1] | 0.174 – 0.311 mg/l (Species: Pseudokirchneriella subcapitata [static]) |
| EC50 72h - Algae [1] | 0.18 mg/l (Species: Pseudokirchneriella subcapitata) |
| NOEC chronic fish | 57 µg/l |
| NOEC chronic crustacea | 8.8 – 256 µg/l |
| BCF - Other aquatic organisms [1] | 8 – 45 (≤ 4 week(s), Cambarus sp., Flow-through system, Fresh water, Experimental value, Fresh weight) |

| Chromium (7440-47-3) | |
|---|---|
| LC50 - Fish [1] | 13.9 – 210 mg/l Source: GESTIS |
| EC50 - Crustacea [1] | 13.1 – 14.7 mg/l Test organisms (species): Daphnia magna |
| EC50 72h - Algae [1] | 0.1 – 17.8 mg/l Source: GESTIS |
| Partition coefficient n-octanol/water (Log Kow) | 0.23 |
| Partition coefficient n-octanol/water (Log Pow) | 0.23 Source: SRC |

| Molybdenum (7439-98-7) | |
|---|---|
| LC50 - Fish [1] | 609.1 mg/l Source: EHCA |
| EC50 - Crustacea [1] | > 100.5 mg/l |
| EC50 72h - Algae [1] | 289.2 mg/l Source: ECHA |
| BCF - Fish [1] | 260 – 500 (Tilapia rendalli) |
| Partition coefficient n-octanol/water (Log Pow) | 0.23 Source: SRC Access on Jan 2006 |

| Iron (7439-89-6) | |
|---|---|
| LC50 - Fish [1] | 8.65 mg/l Source: ECHA |
| LC50 - Other aquatic organisms [1] | 106.3 mg/l Source: ECHA |
| EC50 - Crustacea [1] | > 100 mg/l Test organisms (species): Daphnia magna |
| EC50 - Crustacea [2] | > 10000 mg/l Test organisms (species): Daphnia magna |
| EC50 72h - Algae [1] | 18 mg/l Source: ECHA |

| Tungsten (7440-33-7) | |
|---|---|
| LC50 - Fish [1] | > 181 mg/l Test organisms (species): Danio rerio (previous name: Brachydanio rerio) |
| EC50 - Crustacea [1] | > 163 mg/l Test organisms (species): Daphnia magna |
| EC50 72h - Algae [1] | > 17.7 mg/l Source: ECHA |
| NOEC chronic fish | ≥ 9.8 mg/l Test organisms (species): Danio rerio (previous name: Brachydanio rerio) Duration: '38 d' |

| Coblat (7440-48-4) | |
|---|---|
| LC50 - Fish [1] | 100 mg/l Source: ECHA |
| EC50 - Crustacea [1] | > 890 µg/l Test organisms (species): Daphnia magna |

| Coblat (7440-48-4) | |
|---|---|
| EC50 - Crustacea [2] | 5.89 mg/l Test organisms (species): Daphnia magna |

## 12.2. Persistence and degradability

| KW-T276 | |
|---|---|
| Persistence and degradability | Rapidly degradable |

| Manganese (7439-96-5) | |
|---|---|
| Persistence and degradability | Biodegradability: not applicable. |
| Chemical oxygen demand (COD) | Not applicable |
| ThOD | Not applicable |
| BOD (% of ThOD) | Not applicable |

| Nickel (7440-02-0) | |
|---|---|
| Persistence and degradability | Biodegradability in soil: not applicable, Biodegradability: not applicable. |
| Chemical oxygen demand (COD) | Not applicable (inorganic) |
| ThOD | Not applicable (inorganic) |

| Chromium (7440-47-3) | |
|---|---|
| Persistence and degradability | Rapidly degradable |

| Molybdenum (7439-98-7) | |
|---|---|
| Persistence and degradability | Biodegradability: not applicable. |
| Chemical oxygen demand (COD) | Not applicable |
| ThOD | Not applicable |
| BOD (% of ThOD) | Not applicable |

| Iron (7439-89-6) | |
|---|---|
| Persistence and degradability | Biodegradability in soil: not applicable, Biodegradability: not applicable. |
| Chemical oxygen demand (COD) | Not applicable |
| ThOD | Not applicable |
| BOD (% of ThOD) | Not applicable |

| Tungsten (7440-33-7) | |
|---|---|
| Persistence and degradability | Rapidly degradable |

| Coblat (7440-48-4) | |
|---|---|
| Persistence and degradability | Rapidly degradable |

## 12.3. Bioaccumulative potential

| Manganese (7439-96-5) | |
|---|---|
| BCF - Fish [1] | 81 (Pisces) |

| Manganese (7439-96-5) | |
|---|---|
| BCF - Other aquatic organisms [1] | 300000 (Mollusca) |
| BCF - Other aquatic organisms [2] | 125000 (Crustacea) |
| Bioaccumulative potential | No bioaccumulation data available. |

| Nickel (7440-02-0) | |
|---|---|
| BCF - Other aquatic organisms [1] | 8 – 45 (≤ 4 week(s), Cambarus sp., Flow-through system, Fresh water, Experimental value, Fresh weight) |
| Bioaccumulative potential | Low potential for bioaccumulation (BCF < 500). |

| Chromium (7440-47-3) | |
|---|---|
| Partition coefficient n-octanol/water (Log Pow) | 0.23 Source: SRC |
| Partition coefficient n-octanol/water (Log Kow) | 0.23 |

| Molybdenum (7439-98-7) | |
|---|---|
| BCF - Fish [1] | 260 – 500 (Tilapia rendalli) |
| Partition coefficient n-octanol/water (Log Pow) | 0.23 Source: SRC Access on Jan 2006 |
| Bioaccumulative potential | No bioaccumulation data available. |

| Iron (7439-89-6) | |
|---|---|
| Bioaccumulative potential | No bioaccumulation data available. |

## 12.4. Mobility in soil

| Manganese (7439-96-5) | |
|---|---|
| Ecology - soil | No (test)data on mobility of the substance available. |

| Nickel (7440-02-0) | |
|---|---|
| Surface tension | Not applicable (solid) |
| Ecology - soil | No (test)data on mobility of the substance available. |

| Chromium (7440-47-3) | |
|---|---|
| Partition coefficient n-octanol/water (Log Pow) | 0.23 Source: SRC |
| Partition coefficient n-octanol/water (Log Kow) | 0.23 |

| Molybdenum (7439-98-7) | |
|---|---|
| Partition coefficient n-octanol/water (Log Pow) | 0.23 Source: SRC Access on Jan 2006 |
| Ecology - soil | Adsorbs into the soil. |

| Iron (7439-89-6) | |
|---|---|
| Surface tension | Not applicable (solid) |
| Ecology - soil | Adsorbs into the soil. |

### 12.5. Other adverse effects

Ozone : Not classified
Other adverse effects : No data available

## 13. Disposal considerations

### 13.1. Disposal method

Waste treatment methods : Dispose of contents/container in accordance with licensed collector's sorting instructions.

### 13.2. Disposal precaution

No data available

## 14. Transport information

In accordance with UN RTDG / ADR / IMDG / IATA

| UN RTDG | ADR | IMDG | IATA |
|---|---|---|---|
| **14.1. UN number** | | | |
| Not applicable | Not applicable | Not applicable | Not applicable |
| **14.2. UN proper shipping name** | | | |
| Not applicable | Not applicable | Not applicable | Not applicable |
| **14.3. Transport hazard class(es)** | | | |
| Not applicable | Not applicable | Not applicable | Not applicable |
| **14.4. Packing group** | | | |
| Not applicable | Not applicable | Not applicable | Not applicable |
| **14.5. Marine pollutant** | | | |
| Not applicable | Not applicable | Not applicable | Not applicable |
| No data available | | | |

### 14.6. Special precaution which a user to be aware of or needs to comply with in connection with transport or conveyance either within or outside their premises

No data available

## 15. Regulatory information

### 15.1. Occupational Safety and Health Act

| | | |
|---|---|---|
| Hazardous Substances Prohibited for Manufacturing | Not applicable | |
| Hazardous Substances Requiring Permission | Not applicable | |
| Threshold Limit Values Chemicals | Applicable | 7439-96-5: Manganese&Inorganic compounds, as Mn<br>7440-02-0: Nickel<br>7440-47-3: Chromium<br>7439-98-7: Molybdenum<br>7439-89-6: Iron salts (Soluble, as Fe)<br>7440-33-7: Tungsten<br>7440-48-4: Cobalt and inorganic compounds |
| Hazardous Substances Below Permissible Level | Applicable | 7439-96-5: Manganese and its inorganic compounds<br>7440-02-0: Nickel and its insoluble inorganic compounds<br>7440-48-4: Cobalt and its inorganic compounds |
| Hazardous Substances Subject to Working Environment Measurement | Applicable | 7439-96-5: Manganese<br>7440-02-0: Nickel |

| | | |
|---|---|---|
| | | 7440-47-3: Chromium and its inorganic compounds (Measurement Cycle: 6 months) (contains above 1%)<br>7440-33-7: Tungsten<br>7440-48-4: Cobalt and its inorganic compounds (Measurement Cycle: 6 months) (contains above 1%) |
| Hazardous Substances Subject to Workers Requiring Health Examination | Applicable | 7439-96-5: Manganese and its inorganic compounds (Examination Cycle: 12 months)<br>7440-02-0: Nickel and its inorganic compounds (Examination Cycle: 12 months)<br>7440-47-3: Chromium and its compounds (Examination Cycle: 12 months) (contains above 1%)<br>7440-33-7: Tungsten and its compounds (Examination Cycle: 12 months)<br>7440-48-4: Cobalt (Examination Cycle: 12 months) (contains above 1%) |
| Hazardous Substances Subject to Control | Applicable | 7439-96-5: Manganese and its inorganic compounds<br>7440-02-0: Nickel and its inorganic compounds<br>7440-47-3: Chromium and its compounds(except Chromium(VI) compounds) (contains above 1%)<br>7439-89-6: Iron and its compounds<br>7440-33-7: Tungsten and its compounds<br>7440-48-4: Cobalt and its inorganic compounds (contains above 1%) |
| Substance Subject to Submission of PSM | Not applicable | |

## 15.2. Chemical Substances Control Act

| | | |
|---|---|---|
| Substance acutely hazardous to human health | Applicable | 7440-48-4: Cobalt<br>(Serial number: 2023-1-1139 (contains above 1%)) |
| Substance chronically hazardous to human health | Applicable | 7440-48-4: Cobalt<br>(Serial number: 2023-1-1139 (contains above 0.1%)) |
| Substance hazardous to the environment | Applicable | 7440-48-4: Cobalt<br>(Serial number: 2023-1-1139 (contains above 2.5%)) |
| Restricted Substances | Not applicable | |
| Prohibited Substances | Not applicable | |
| Substances Requiring Preparation for Accident | Not applicable | |

## 15.3. ACT ON REGISTRATION, EVALUATION, ETC. OF CHEMICALS (K-REACH)

| | | |
|---|---|---|
| Korea Existing Chemicals Inventory (KECI) | Applicable | 7439-96-5: Manganese (KECI-No. : KE-22999)<br>7440-02-0: Nickel ; Raney nickel (KECI-No. : KE-25818)<br>7440-47-3: Chromium (KECI-No. : KE-05970)<br>7439-98-7: Molybdenum (KECI-No. : KE-25427)<br>7439-89-6: Iron (KECI-No. : KE-21059)<br>7440-33-7: Tungsten (KECI-No. : KE-35000)<br>7440-48-4: Cobalt (KECI-No. : KE-06060) |
| Substances Subject to Intensive Control | Applicable | 7440-48-4: Coblat |
| Priority Existing Chemicals (PEC) | Not applicable | |
| CMR Substances | Applicable | 7440-48-4: Cobalt metal with Tungsten carbide |

## 15.4. Safety Control of Dangerous Substances Act

| | |
|---|---|
| Safety Control of Dangerous Substances Act | Not applicable |

## 15.5. Wastes Control Act

| | |
|---|---|
| Hazardous Substances in Designated wastes | Not applicable |
| Types of wastes | No data available |

## 15.6. Other Domestic and International Regulatory Information

### Other Domestic Regulations

| | |
|---|---|
| Persistent Organic Pollutants(POPs) Control Act | Not applicable |
| Ozone Depleting Substances(ODS) | Not applicable |
| PRTR Substances | Not applicable |

### EU Regulatory Information

| | |
|---|---|
| EU Candidate list (SVHC) | Contains no substance on the REACH candidate list |
| EU authorization list (REACH Annex XIV) | Contains no REACH Annex XIV substances |
| EU restriction list (REACH Annex XVII) | Applicable |

### US Regulatory Information

| | |
|---|---|
| CERCLA Section 103 (40CFR302.4) | Contains listed substances |
| EPCRA Section 302 (40CFR355.30) | Not applicable |
| EPCRA Section 304 (40CFR355.40) | Not applicable |
| EPCRA Section 313 (40CFR372.65) | Contains listed substances |

## 16. Other information

### 16.1. Information source and references

REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006,Classification according to Classification, Labelling and Packaging of Substances and Mixtures (SEA) Regulation published in the Official Journal numbered 28848 on December 11, 2013,ECHA (European Chemicals Agency),Supplier's safety documents,No data available,This MSDS is prepared based on Article 41 of the Occupational Safety and Health Act and Notice No.2016-19 of the Ministry of Employment and Labor (based on the availability of material safety and health data), taking into account the status of regulations related to Korea,This MSDS is prepared based on KOSHA, NITE, ESIS, NLM, SIDS, IPCS, NCIS, etc,This safety data sheet was compiled with data and information from the following sources : RTECS, ECOSAR, HSDB, SIDS SIAP, ChemWATCH, CESAR, Chemical DB.

### 16.2. Issue date

6/28/1996

### 16.3. Revision number and Revision date

| | | |
|---|---|---|
| Version | : | 9.0 |
| Revision date | : | 7/24/2026 |

### 16.4. Others

No data available

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.