# K-8018

## Material Safety Data Sheet

In Accordance with MOEL Public notice No 2020-130
MSDS Number: AA06900-0000000110
Issue date: 11/3/2020 Revision date: 12/24/2021 Version: 1.0

## 1. Chemical product and company identification

### 1.1. Product identifier

Product form : Mixture
Trade name : K-8018

### 1.2. Recommended uses and restrictions

#### Use Categories

35 - Welding and soldering products, flux products

#### 1.2.1. Recommended use

Welding and soldering products, flux products.

#### 1.2.2. Restrictions on use

### 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. Classification of the substance or mixture

| | |
|---|---|
| Skin corrosion/irritation, Category 2 | H315 |
| Serious eye damage/eye irritation, Category 1 | H318 |
| Respiratory sensitisation, Category 1 | H334 |
| Skin sensitisation, Category 1 | H317 |
| Specific target organ toxicity - Single exposure, Category 2 | H371 |
| Specific target organ toxicity - Repeated exposure, Category 2 | H373 |
| Hazardous to the aquatic environment – Chronic Hazard, Category 3 | H412 |

### 2.2. Label elements

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



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

Danger.

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

H315 - Causes skin irritation.
H317 - May cause an allergic skin reaction.
H318 - Causes serious eye damage.
H334 - May cause allergic reactions, asthma or shortness of breath and etc if inhaled.
H371 - May cause damage to organs.
H373 - May cause damage to organs through prolonged or repeated exposure.
H412 - Harmful to aquatic life with long lasting effects.

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

**Precaution:**

P260 - Do not breathe dust/fume/gas/mist/vapours/spray.
P261 - Avoid breathing dust/fume/gas/mist/vapours/spray.
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 protective gloves/protective clothing/eye protection/face protection/hearing protection.
P284 - Wear respiratory protection.

**Treatment:**

P302+P352 - IF ON SKIN: Wash with plenty of water/….
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308+P311 - IF exposed or concerned: Call a POISON CENTER/doctor/….
P310 - Immediately call a POISON CENTER/doctor/….
P314 - Get medical advice/attention if you feel unwell.
P321 - Take … treatment.
P332+P313 - If skin irritation occurs: Get medical advice/attention.
P333+P313 - If skin irritation or rash occurs: Get medical advice/attention.
P342+P311 - If experiencing respiratory symptoms: Call a POISON CENTER/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. Hazards - Other hazards which do not result in classification - Hazard Risk

Not applicable

## 3. Composition/information on ingredients

Product form : Mixture

| Substance name | Other Names | Product identifier number | Concentration (%) |
|---|---|---|---|
| Iron | Iron, elemental / Direct reduced Iron / Iron, reduced / Elemental iron / IRON POWDER / iron | CAS-No.: 7439-89-6<br>KECI-No.: KE-21059 | 65 – 69 |
| | Chalk / Limestone (A noncombustible solid characteristic of sedimentary rock. It consists primarily of calcium carbonate.) / Natural calcium carbonate / Marble / Calcium carbonate / Limestone (sedimentary rock) / Calcite / Limestone ground / Acetate, 4-methyl-2-propyl-2H-tetrahydropyran-4-yl / Ground limestone | CAS-No.: 1317-65-3<br>KECI-No.: KE-21996 | 11 – 15 |
| CaF2 | Calcium fluoride / Fluorspar / FLUORSPAR / CALCIUM FLUORIDE / Calcium difluoride / calcium fluoride | CAS-No.: 7789-75-5<br>KECI-No.: KE-04538 | 3 – 7 |

| Substance name | Other Names | Product identifier number | Concentration (%) |
|---|---|---|---|
| | Silicic acid, sodium salt / SODIUM SILICATE / Sodium silicates | CAS-No.: 1344-09-8<br>KECI-No.: KE-31002 | 1 – 3 |
| Titanium Dioxide | C.I. 77891 / C.I. Pigment White 6 / Titanium oxide (TiO2) / CI 77891 / Titanium(IV) oxide / C.I. Pigment White 7 / Pigment White 6 / Titanium dioxide nanoparticles / TITANIUM DIOXIDE / Titanium oxide / Titanium dioxide(2) | CAS-No.: 13463-67-7<br>KECI-No.: KE-33900 | 1 – 3 |
| | Mica dust / Mica group minerals / Silicates, mica / C.I. 77019 / Mica-group minerals / MICA / C.I. Pigment White 20 / Pigment White 20 | CAS-No.: 12001-26-2<br>KECI-No.: KE-25420 | 1 – 3 |
| Manganese | Manganese, elemental / Manganese metal / manganese | CAS-No.: 7439-96-5<br>KECI-No.: KE-22999 | 1 – 3 |
| Silicon Metal | Silicon powder / Silicon powder, amorphous / Ammonium hexafluorosilicate / SILICON / silicon | CAS-No.: 7440-21-3<br>KECI-No.: KE-31029 | 0.5 – 2.5 |

## 4. First-aid measures

### 4.1. First-aid measures after eye contact

Rinse cautiously with water for several minutes.
Remove contact lenses, if present and easy to do. Continue rinsing.
Call a physician immediately.

### 4.2. First-aid measures after skin contact

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

### 4.3. First-aid measures after inhalation

Remove person to fresh air and keep comfortable for breathing.

### 4.4. First-aid measures after ingestion

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

### 4.5. 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.
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".
Dispose of materials or solid residues at an authorized site.

### 6.2. Environmental precautions and protective procedures

Avoid release to the environment.

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

Mechanically recover the product.

## 7. Handling and storage

### 7.1. Precautions for safe handling

Precautions for safe handling : Ensure good ventilation of the work station.
Avoid contact with skin and eyes.
Wear personal protective equipment.

Hygiene measures : 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 in a well-ventilated place.
Keep cool.

## 8. Exposure controls/personal protection

### 8.1. Occupational Exposure Limits

| K-8018 | |
|---|---|
| No data available | |

| CaF2 (7789-75-5) | |
|---|---|
| **China - Occupational Exposure Limits** | |
| OEL PC-TWA | 0.7 mg/m³ (mixed dust, respirable)<br>1 mg/m³ (mixed dust, total) |
| Catalogue of Occupational Hazard Factors | Category 1 - Dusts |
| **USA - ACGIH - Occupational Exposure Limits** | |
| ACGIH OEL TWA | 2.5 mg/m³ |

| (1344-09-8) |
|---|
| No data available |

| Titanium Dioxide (13463-67-7) | |
|---|---|
| **Korea - Occupational Exposure Limits** | |
| Local name | 이산화티타늄 # Titanium dioxide |
| ISHA OEL TWA | 10 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 | 8 mg/m³ (total dust) |
| Chemical category | Possibly carcinogenic to humans dust |
| Catalogue of Occupational Hazard Factors | Category 1 - Dusts |
| **Indonesia - Occupational Exposure Limits** | |
| NAB (OEL TWA) | 10 mg/m³ |
| Chemical category | A4 - not classifiable as a human carcinogen |
| **Singapore - Occupational Exposure Limits** | |
| PEL (OEL TWA) | 10 mg/m³ |
| **Taiwan - Occupational Exposure Limits** | |
| OEL TWA | 10 mg/m³ |
| OEL STEL | 15 mg/m³ |
| **Vietnam - Occupational Exposure Limits** | |
| OEL TWA | 6 mg/m³ (inhalable dust)<br>5 mg/m³ (respirable dust) |
| OEL STEL | 10 mg/m³ (inhalable dust) |
| **Australia - Occupational Exposure Limits** | |
| OES TWA [1] | 10 mg/m³ (containing no asbestos and <1% crystalline silica-inhalable dust) |
| **USA - ACGIH - Occupational Exposure Limits** | |
| ACGIH OEL TWA | 10 mg/m³ |
| ACGIH chemical category | Not Classifiable as a Human Carcinogen |
| **USA - IDLH - Occupational Exposure Limits** | |
| IDLH | 5000 mg/m³ |
| **USA - NIOSH - Occupational Exposure Limits** | |
| NIOSH REL TWA | 2.4 mg/m³ (CIB 63-fine)<br>0.3 mg/m³ (CIB 63-ultrafine, including engineered nanoscale) |
| **USA - OSHA - Occupational Exposure Limits** | |
| OSHA PEL TWA [1] | 15 mg/m³ (total dust) |

| (12001-26-2) | |
|---|---|
| **Korea - Occupational Exposure Limits** | |
| Local name | 운모 # Mica |
| ISHA OEL TWA | 3 mg/m³ 호흡성 # (Respirable fraction) |
| Regulatory reference | 고용노동부고시 제2020-48호 # MOEL Public Notice. No. 2020-48 |

| (12001-26-2) | |
|---|---|
| **China - Occupational Exposure Limits** | |
| OEL PC-TWA | 2 mg/m³ (total dust)<br>1.5 mg/m³ (respirable dust) |
| Catalogue of Occupational Hazard Factors | Category 1 - Dusts |
| **Indonesia - Occupational Exposure Limits** | |
| NAB (OEL TWA) | 3 mg/m³ (respirable particulate) |
| **Singapore - Occupational Exposure Limits** | |
| PEL (OEL TWA) | 3 mg/m³ (respirable dust) |
| **Taiwan - Occupational Exposure Limits** | |
| OEL TWA | 3 mg/m³ (respirable dust) |
| OEL STEL | 6 mg/m³ (respirable dust) |
| **Thailand - Occupational Exposure Limits** | |
| OEL TWA | 3 mg/m³ (respirable dust) |
| **Australia - Occupational Exposure Limits** | |
| OES TWA [1] | 2.5 mg/m³ (inspirable) |
| **USA - ACGIH - Occupational Exposure Limits** | |
| ACGIH OEL TWA | 0.1 mg/m³ (respirable particulate matter) |
| **USA - IDLH - Occupational Exposure Limits** | |
| IDLH | 1500 mg/m³ (containing <1% quartz) |
| **USA - NIOSH - Occupational Exposure Limits** | |
| NIOSH REL TWA | 3 mg/m³ (containing <1% Quartz-respirable dust) |

| (1317-65-3) | |
|---|---|
| **Korea - Occupational Exposure Limits** | |
| Local name | 석회석 # Lime stone |
| ISHA OEL TWA | 10 mg/m³ |
| Regulatory reference | 고용노동부고시 제2020-48호 # MOEL Public Notice. No. 2020-48 |
| **China - Occupational Exposure Limits** | |
| OEL PC-TWA | 8 mg/m³ (total dust)<br>4 mg/m³ (respirable dust) |
| Catalogue of Occupational Hazard Factors | Category 1 - Dusts |
| **Indonesia - Occupational Exposure Limits** | |
| NAB (OEL TWA) | 10 mg/m³ (not containing Asbestos and the crystal content is <1%) |
| **Singapore - Occupational Exposure Limits** | |
| PEL (OEL TWA) | 10 mg/m³ |
| **Thailand - Occupational Exposure Limits** | |
| OEL TWA | 15 mg/m³ (inhalable dust)<br>5 mg/m³ (respirable dust) |
| **USA - NIOSH - Occupational Exposure Limits** | |
| NIOSH REL TWA | 10 mg/m³ (total dust)<br>5 mg/m³ (respirable dust) |

| (1317-65-3) | |
|---|---|
| **USA - OSHA - Occupational Exposure Limits** | |
| OSHA PEL TWA [1] | 15 mg/m³ (total dust)<br>5 mg/m³ (respirable fraction) |

| 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 |
| **China - Occupational Exposure Limits** | |
| Catalogue of Occupational Hazard Factors | Category 1 - Dusts |
| **Indonesia - Occupational Exposure Limits** | |
| NAB (OEL TWA) | 1 mg/m³ |

| Silicon Metal (7440-21-3) | |
|---|---|
| **Korea - Occupational Exposure Limits** | |
| Local name | 실리콘 # Silicon |
| ISHA OEL TWA | 10 mg/m³ |
| Regulatory reference | 고용노동부고시 제2020-48호 # MOEL Public Notice. No. 2020-48 |
| **Indonesia - Occupational Exposure Limits** | |
| NAB (OEL TWA) | 10 mg/m³ (not containing Asbestos and the crystal content is <1%) |
| **Singapore - Occupational Exposure Limits** | |
| PEL (OEL TWA) | 10 mg/m³ |
| **Australia - Occupational Exposure Limits** | |
| OES TWA [1] | 10 mg/m³ (containing no asbestos and <1% crystalline silica-inhalable dust) |
| **USA - NIOSH - Occupational Exposure Limits** | |
| NIOSH REL TWA | 10 mg/m³ (total dust)<br>5 mg/m³ (respirable dust) |
| **USA - OSHA - Occupational Exposure Limits** | |
| OSHA PEL TWA [1] | 15 mg/m³ (total dust)<br>5 mg/m³ (respirable fraction) |

| 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 |

| Manganese (7439-96-5) | |
|---|---|
| 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) |
| **Vietnam - Occupational Exposure Limits** | |
| OEL TWA | 0.3 mg/m³ |
| OEL STEL | 0.6 mg/m³ |
| **Australia - Occupational Exposure Limits** | |
| OES TWA [1] | 1 mg/m³ (dust and fume) |
| OES STEL | 3 mg/m³ (fume) |
| **USA - ACGIH - Occupational Exposure Limits** | |
| ACGIH OEL 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) |

## 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

| **Respiratory protection:** |
| --- |
| In case of insufficient ventilation, wear suitable respiratory equipment |

| **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 | : | 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) | Solubility | : | No data available |
| m) | Vapour density | : | No data available |
| n) | Relative density | : | No data available |
| o) | Partition coefficient n-octanol/water | : | No data available |
| p) | Auto-ignition temperature | : | No data available |
| q) | Decomposition temperature | : | No data available |
| r) | Viscosity, kinematic | : | No data available |
| | 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 exposure routes

Oral : Not classified
Skin and eyes contact : Causes skin irritation. Causes serious eye damage. May cause an allergic skin reaction.
Inhalation : May cause allergic reactions, asthma or shortness of breath and etc if inhaled.

### 11.2. Health hazards

**Acute toxicity (oral):**

Not classified

**Acute toxicity (dermal):**

Not classified

**Acute toxicity (inhalation):**

Not classified

| CaF2 (7789-75-5) | |
|---|---|
| LD50 oral rat | 4250 mg/kg |
| LC50 Inhalation - Rat | > 5.07 mg/l air Animal: rat, Guideline: OECD Guideline 403 (Acute Inhalation Toxicity) |

| (1344-09-8) | |
|---|---|
| LD50 oral rat | 3400 mg/kg Source: SIDS |
| LD50 dermal rat | > 5000 mg/kg bodyweight Animal: rat, Guideline: EPA OPPTS 870.1200 (Acute Dermal Toxicity) |
| LC50 Inhalation - Rat | > 2.06 mg/l air Animal: rat, Guideline: EPA OPPTS 870.1300 (Acute inhalation toxicity) |

| Titanium Dioxide (13463-67-7) | |
|---|---|
| LD50 oral rat | > 5000 mg/kg bodyweight Animal: rat, Animal sex: female, Guideline: OECD Guideline 425 (Acute Oral Toxicity: Up-and-Down Procedure), Guideline: EPA OPPTS 870.1100 (Acute Oral Toxicity) |
| LC50 Inhalation - Rat | > 6.82 mg/l (Other, 4 h, Rat, Male, Experimental value, Inhalation (dust), 14 day(s)) |
| LC50 Inhalation - Rat (Dust/Mist) | > 3.43 mg/l Source: ECHA |

| (12001-26-2) | |
|---|---|
| LD50 oral rat | > 5000 mg/kg (Rat, Literature study, Oral) |

| (1317-65-3) | |
|---|---|
| LD50 oral rat | 6450 mg/kg (Rat, Literature study, Oral) |

| Iron (7439-89-6) | |
|---|---|
| LD50 oral rat | 98600 mg/kg bodyweight Animal: rat, Animal sex: male, Guideline: OECD Guideline 401 (Acute Oral Toxicity) |

| Iron (7439-89-6) | |
|---|---|
| LC50 Inhalation - Rat | > 250 mg/m³ air (6 h, Rat, Male, Experimental value, Inhalation (dust)) |

| Silicon Metal (7440-21-3) | |
|---|---|
| LD50 oral rat | > 5000 mg/kg bodyweight Animal: rat, Guideline: OECD Guideline 401 (Acute Oral Toxicity) |
| LD50 dermal rabbit | > 5000 mg/kg bodyweight Animal: rabbit |

| 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 |

**Skin corrosion/irritation:**

Causes skin irritation.

**Serious eye damage/irritation:**

Causes serious eye damage.

**Respiratory sensitization:**

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

**Skin sensitization:**

May cause an allergic skin reaction.

**Carcinogenicity:**

Not classified

| Titanium Dioxide (13463-67-7) | |
|---|---|
| IARC group | 2B - Possibly carcinogenic to humans |

**Mutagenicity:**

Not classified

**Reproductive toxicity:**

Not classified

**STOT-single exposure:**

May cause damage to organs.

**STOT-repeated exposure:**

May cause damage to organs through prolonged or repeated exposure.

**Aspiration hazard:**

Not classified

| CaF2 (7789-75-5) | |
|---|---|
| Density | 3.18 g/cm³ Type: 'density' |

| (1344-09-8) | |
|---|---|
| Density | 1350 – 1380 kg/m³ |

| Titanium Dioxide (13463-67-7) | |
|---|---|
| Viscosity, kinematic (calculated value) (40 °C) | Not applicable (solid) |
| Density | 3.9 – 4.1 g/cm³ |
| Viscosity, kinematic | Not applicable (solid) |
| Viscosity, dynamic | Not applicable (solid) |

| (1317-65-3) | |
|---|---|
| Viscosity, kinematic (calculated value) (40 °C) | No data available in the literature |
| Viscosity, kinematic | No data available in the literature |
| Viscosity, dynamic | No data available in the literature |

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

| Silicon Metal (7440-21-3) | |
|---|---|
| Density | 2.33 g/cm³ Type: 'density' Temp.: 25 °C |
| Viscosity, dynamic | Not applicable (solid) |

| Manganese (7439-96-5) | |
|---|---|
| Density | 7200 kg/m³ |

## 12. Ecological information

### 12.1. Ecotoxicity

Ecology - general : Harmful to aquatic life with long lasting effects.

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

Hazardous to the aquatic environment, long–term (chronic) : Harmful to aquatic life with long lasting effects.

| CaF2 (7789-75-5) | |
|---|---|
| LC50 - Fish [1] | 51 mg/l Test organisms (species): other:summary of finidngs in various species |
| LC50 - Fish [2] | 165 mg/l Test organisms (species): other:summary of finidngs in various species |
| EC50 - Crustacea [1] | 97 – 270 mg/l (48 h, Daphnia magna, Static system, Fresh water, Literature, Fluorine ion) |
| EC50 96h - Algae [1] | 7444.076 mg/l Source: Ecological Structure Activity Relationships |
| EC50 72h - Algae [1] | > 100 mg/l Test organisms (species): Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum) |
| NOEC (chronic) | 14.1 mg/l Test organisms (species): Daphnia magna Duration: '21 d' |
| NOEC chronic fish | 4 mg/l Test organisms (species): Oncorhynchus mykiss (previous name: Salmo gairdneri) Duration: '21 d' |

| (1344-09-8) | |
|---|---|
| LC50 - Fish [1] | 1108 mg/l Test organisms (species): Danio rerio (previous name: Brachydanio rerio) |
| LC50 - Fish [2] | 3185 mg/l (Exposure time: 96 h - Species: Brachydanio rerio [semi-static]) |

| (1344-09-8) | |
|---|---|
| EC50 - Crustacea [1] | 1700 mg/l Test organisms (species): Daphnia magna |
| EC50 - Crustacea [2] | 160 mg/l (96 h, Amphipoda) |
| EC50 72h - Algae [1] | 207 mg/l Test organisms (species): Desmodesmus subspicatus (previous name: Scenedesmus subspicatus) |
| EC50 72h - Algae [2] | > 345.4 mg/l Test organisms (species): Desmodesmus subspicatus (previous name: Scenedesmus subspicatus) |
| BCF - Fish [1] | (no bioaccumulation expected) |

| Titanium Dioxide (13463-67-7) | |
|---|---|
| LC50 - Fish [1] | 155 mg/l Test organisms (species): other:Japanese Medaka |
| EC50 - Crustacea [1] | 19.3 mg/l Test organisms (species): Daphnia magna |
| EC50 - Crustacea [2] | 27.8 mg/l Test organisms (species): Daphnia magna |
| EC50 - Other aquatic organisms [1] | > 100 mg/l Test organisms (species): |
| EC50 72h - Algae [1] | > 100 mg/l Test organisms (species): Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum) |
| ErC50 algae | 61 mg/l (EPA 600/9-78-018, 72 h, Pseudokirchneriella subcapitata, Static system, Fresh water, Experimental value, Nominal concentration) |
| LOEC (chronic) | 5 mg/l Test organisms (species): Daphnia magna Duration: '21 d' |
| NOEC (chronic) | ≥ 2.92 mg/l Test organisms (species): Daphnia magna Duration: '21 d' |

| (1317-65-3) | |
|---|---|
| LC50 - Fish [1] | > 10000 mg/l (96 h, Oncorhynchus mykiss, Literature) |
| EC50 - Crustacea [1] | > 1000 mg/l (48 h, Daphnia magna, Literature) |
| EC50 72h - Algae [1] | > 200 mg/l (Desmodesmus subspicatus, Literature) |

| 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 |

| Silicon Metal (7440-21-3) | |
|---|---|
| LC50 - Fish [1] | 100 mg/l (Pisces) |
| EC50 72h - Algae [1] | 250 mg/l Test organisms (species): Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum) |
| ErC50 algae | 250 mg/l (Equivalent or similar to OECD 201, 72 h, Pseudokirchneriella subcapitata, Static system, Fresh water, Weight of evidence) |

| 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 |

| Manganese (7439-96-5) | |
|---|---|
| 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) |
| 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) |

### 12.2. Persistence and degradability

| CaF2 (7789-75-5) | |
|---|---|
| Persistence and degradability | Biodegradability: not applicable. |
| Chemical oxygen demand (COD) | Not applicable (inorganic) |
| ThOD | Not applicable (inorganic) |

| (1344-09-8) | |
|---|---|
| Persistence and degradability | Biodegradability: not applicable. |
| Chemical oxygen demand (COD) | Not applicable |
| ThOD | Not applicable |
| BOD (% of ThOD) | Not applicable |

| Titanium Dioxide (13463-67-7) | |
|---|---|
| Persistence and degradability | Biodegradability: not applicable. |
| Chemical oxygen demand (COD) | Not applicable (inorganic) |
| ThOD | Not applicable (inorganic) |

| (12001-26-2) | |
|---|---|
| Persistence and degradability | Biodegradability: not applicable. |
| Chemical oxygen demand (COD) | Not applicable (inorganic) |
| ThOD | Not applicable (inorganic) |

| (1317-65-3) | |
|---|---|
| Persistence and degradability | Biodegradability: not applicable. |
| Chemical oxygen demand (COD) | Not applicable (inorganic) |
| ThOD | Not applicable (inorganic) |

| Iron (7439-89-6) | |
|---|---|
| Persistence and degradability | Biodegradability in soil: not applicable.<br>Biodegradability: not applicable. |
| Chemical oxygen demand (COD) | Not applicable |
| ThOD | Not applicable |

| Iron (7439-89-6) | |
|---|---|
| BOD (% of ThOD) | Not applicable |

| Silicon Metal (7440-21-3) | |
|---|---|
| Persistence and degradability | Biodegradability: not applicable. |
| Chemical oxygen demand (COD) | Not applicable (inorganic) |
| ThOD | Not applicable (inorganic) |

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

### 12.3. Bioaccumulative potential

| CaF2 (7789-75-5) | |
|---|---|
| Bioaccumulative potential | No bioaccumulation data available. |

| (1344-09-8) | |
|---|---|
| BCF - Fish [1] | (no bioaccumulation expected) |
| Bioaccumulative potential | Bioaccumulation: not applicable. |

| Titanium Dioxide (13463-67-7) | |
|---|---|
| Bioaccumulative potential | Not bioaccumulative. |

| (12001-26-2) | |
|---|---|
| Bioaccumulative potential | No bioaccumulation data available. |

| (1317-65-3) | |
|---|---|
| Bioaccumulative potential | Bioaccumulation: not applicable. |

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

| Silicon Metal (7440-21-3) | |
|---|---|
| Bioaccumulative potential | Not bioaccumulative. |

| Manganese (7439-96-5) | |
|---|---|
| BCF - Fish [1] | 81 (Pisces) |
| BCF - Other aquatic organisms [1] | 300000 (Mollusca) |
| BCF - Other aquatic organisms [2] | 125000 (Crustacea) |
| Bioaccumulative potential | No bioaccumulation data available. |

### 12.4. Mobility in soil

| CaF2 (7789-75-5) | |
|---|---|
| Ecology - soil | No (test)data on mobility of the substance available. |

| (1344-09-8) | |
|---|---|
| Ecology - soil | No (test)data on mobility of the component(s) available. |

| Titanium Dioxide (13463-67-7) | |
|---|---|
| Surface tension | No data available in the literature |
| Ecology - soil | Low potential for mobility in soil. |

| (12001-26-2) | |
|---|---|
| Ecology - soil | No (test)data on mobility of the substance available. |

| (1317-65-3) | |
|---|---|
| Ecology - soil | No (test)data on mobility of the substance available. |

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

| Silicon Metal (7440-21-3) | |
|---|---|
| Ecology - soil | Highly mobile in soil. |

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

### 12.5. Other adverse effects

Ozone : Not classified
Other adverse effects : No data available

## 13. Disposal considerations

### 13.1. Disposal method

Dispose of contents/container in accordance with licensed collector's sorting instructions.

### 13.2. Disposal precaution

No data available

## 14. Transport information

| UN RTDG | ADR | IMDG | IATA |
|---|---|---|---|
| **14.1. UN number** | | | |
| Not applicable | Not applicable | Not applicable | Not applicable |

| UN RTDG | ADR | IMDG | IATA |
|---|---|---|---|
| **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 supplementary information available | | | |

### 14.6. Special precautions for user

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 | 13463-67-7: Titanium dioxide<br>12001-26-2: Mica<br>1317-65-3: Calcium carbonate<br>7439-89-6: Iron salts (Soluble, as Fe)<br>7440-21-3: Silicon<br>7439-96-5: Manganese&Inorganic compounds, as Mn |
| Hazardous Substances Below Permissible Level | Applicable | 7439-96-5: Manganese and its inorganic compounds |
| Hazardous Substances Subject to Working Environment Measurement | Applicable | 13463-67-7: Titanium dioxide<br>12001-26-2: Mica<br>7439-96-5: Manganese and its inorganic compounds |
| Hazardous Substances Subject to Workers Requiring Health Examination | Applicable | 7439-96-5: Manganese and its inorganic compounds |
| Hazardous Substances Subject to Control | Applicable | 13463-67-7: Titanium dioxide<br>7439-89-6: Iron and its compounds<br>7439-96-5: Manganese and its inorganic compounds |

### 15.2. Chemicals Control Act

No data available

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

No data available

### 15.4. Safety Control of Dangerous Substances Act

| | | |
|---|---|---|
| Safety Control of Dangerous Substances Act | Applicable | (Class 2 Combustible solid - category 4 Iron Powder (Designated quantity: 500kg); Class 2 Combustible solid - category 5 Metal powder (Designated quantity: 500kg)) |
| | Applicable | 7439-89-6: Iron powder<br>(Class 2 Combustible solid - category 4 Iron Powder (Designated quantity: 500kg))<br>7440-21-3: Silicon powder<br>(Class 2 Combustible solid - category 5 Metal powder (Designated quantity: 500kg)) |

7439-96-5: Manganese powder
(Class 2 Combustible solid - category 5 Metal powder (Designated quantity: 500kg))

## 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

### Domestic

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

### International

### 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) | Not applicable |

### US Regulatory Information

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

### International agreements

No data available

## 16. Other information

**16.1. Data sources:** 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:** 11/3/2020

**16.3. Revision number and date:** 1.0, 24/12/2021

**16.4. Other information:** 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.