EF-200LT

Material Safety Data Sheet

In Accordance with MOEL Public notice No 2020-130
MSDS Number: AA06900-0000000011
Issue date: 11/3/2020 Revision date: 3/25/2025 Version: 4.3

1. Chemical product and company identification

1.1. Product identifier

Product form : Mixture
Trade name : EF-200LT

1.2. Recommended uses and restrictions

1.2.1. Recommended use

Welding and soldering products, flux products.

1.2.2. Restrictions on use

Not for use other than intended.

1.2.3. Use Categories

35 - Welding and soldering products, flux products

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

Acute toxicity (inhalation:dust,mist), Category 4	H332
Skin corrosion/irritation, Category 1	H314
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 – Acute Hazard, Category 1	H400
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)

H314 - Causes severe skin burns and eye damage.
H317 - May cause an allergic skin reaction.
H318 - Causes serious eye damage.
H332 - Harmful if inhaled.
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.
H400 - Very toxic to aquatic life.
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.
P271 - Use only outdoors or in a well-ventilated area.
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:

P301+P330+P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P302+P352 - IF ON SKIN: Wash with plenty of water/….
P303+P361+P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with 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/….
P312 - Call a POISON CENTER/doctor/… if you feel unwell.
P314 - Get medical advice/attention if you feel unwell.
P321 - Take … treatment.
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.
P363 - Wash contaminated clothing before reuse.
P391 - Collect spillage.

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 (%)
	Calcined magnesite / Magnesium oxide / MAGNESIUM OXIDE / Magnesia	CAS-No.: 1309-48-4 KECI-No.: KE-22728	27 – 35
	Aluminum oxide / .alpha.-Alumina / Alumina / Aluminium oxide / Aluminium oxide (Al2O3) / .alpha.-Aluminum oxide / Alundum / ALUMINA / Dialuminium trioxide / Dialuminum trioxide	CAS-No.: 1344-28-1 KECI-No.: KE-01012	14 – 20

Substance name	Other Names	Product identifier number	Concentration (%)
Silicon dioxide	Quartz (SiO2) / Silica, crystalline, quartz / Crystalline silica, quartz / .alpha.-Quartz / QUARTZ / Silica, crystalline, .alpha.-quartz / Crystalline silica in the form of quartz / Quartz, silica / Quartz (respirable fraction) / Silica dust / Silica, crystalline-.alpha.quartz / Silica, quartz / Silica, .alpha.-quartz / Silicon dioxide / Silica, crystalline / Quartz (crystalline silica) / Silica dust, crystalline / QUARTZ POWDER / Silica, crystalline (quartz)	CAS-No.: 14808-60-7 KECI-No.: KE-29983	11 – 17
CaF2	Calcium fluoride / Fluorspar / FLUORSPAR / CALCIUM FLUORIDE / Calcium difluoride / calcium fluoride	CAS-No.: 7789-75-5 KECI-No.: KE-04538	5 – 15
Calcium oxide	Lime / Quicklime / CALCIUM OXIDE / Quicklime (CaO) / Calcium oxide (CaO) / Lime (calcium oxide)	CAS-No.: 1305-78-8 KECI-No.: KE-04588	7 – 13
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 KECI-No.: KE-33900	≤ 10
Iron	Iron, elemental / Direct reduced Iron / Iron, reduced / Elemental iron / IRON POWDER / iron	CAS-No.: 7439-89-6 KECI-No.: KE-21059	≤ 10
Manganese	Manganese, elemental / Manganese metal / manganese	CAS-No.: 7439-96-5 KECI-No.: KE-22999	≤ 5
Silicon Metal	Silicon powder / Silicon powder, amorphous / Ammonium hexafluorosilicate / SILICON / silicon	CAS-No.: 7440-21-3 KECI-No.: KE-31029	0.5 – 2

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

Rinse skin with water/shower.
Take off immediately all contaminated clothing.
Call a physician immediately.

4.3. First-aid measures after inhalation

Remove person to fresh air and keep comfortable for breathing.
Call a poison center or a doctor if you feel unwell.

4.4. First-aid measures after ingestion

Rinse mouth.

Do not induce vomiting.
Call a physician immediately.

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.
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".
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

Collect spillage.
Mechanically recover the product.

7. Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	:	Do not breathe dust/fume/gas/mist/vapours/spray. Use only outdoors or in a well-ventilated area. Avoid contact with skin and eyes. Wear personal protective equipment.
Hygiene measures	:	Wash contaminated clothing before reuse. Contaminated work clothing should not be allowed out of the workplace. 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. Occupational Exposure Limits

EF-200LT
No data available

CaF2 (7789-75-5)	
China - Occupational Exposure Limits	
OEL PC-TWA	0.7 mg/m³ (mixed dust, respirable) 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

Silicon dioxide (14808-60-7)	
Korea - Occupational Exposure Limits	
Local name	산화규소(결정체 석영) # Silica (Crystalline quartz)
ISHA OEL TWA	0.05 mg/m³ 호흡성 # (Respirable fraction)
Remark (KR)	발암성 1A # Carcinogenicity 1A
Regulatory reference	고용노동부고시 제2020-48호 # MOEL Public Notice. No. 2020-48
China - Occupational Exposure Limits	
OEL PC-TWA	0.7 mg/m³ (containing 50-80% free SiO2-total dust) 0.3 mg/m³ (containing 50-80% free SiO2-respirable dust) 1 mg/m³ (containing 10-50% free SiO2-total dust) 0.7 mg/m³ (containing 10-50% free SiO2-respirable dust) 0.5 mg/m³ (containing >80% free SiO2-total dust) 0.2 mg/m³ (containing >80% free SiO2-respirable dust)
Chemical category	Carcinogenic to humans crystalline silica
Catalogue of Occupational Hazard Factors	Category 1 - Dusts
Indonesia - Occupational Exposure Limits	
NAB (OEL TWA)	0.025 mg/m³ (respirable particulate)
Chemical category	A2 - suspected human carcinogen
Singapore - Occupational Exposure Limits	
PEL (OEL TWA)	0.1 mg/m³ (respirable dust)
Thailand - Occupational Exposure Limits	
OEL TWA	0.025 mg/m³ (respirable dust)
Australia - Occupational Exposure Limits	
OES TWA	0.05 mg/m³ (respirable dust)
USA - ACGIH - Occupational Exposure Limits	
ACGIH OEL TWA	0.025 mg/m³ (respirable particulate matter)
ACGIH chemical category	Suspected Human Carcinogen
USA - IDLH - Occupational Exposure Limits	
IDLH	50 mg/m³ (respirable dust)

Silicon dioxide (14808-60-7)	
USA - NIOSH - Occupational Exposure Limits	
NIOSH REL TWA	0.05 mg/m³ (respirable dust)
USA - OSHA - Occupational Exposure Limits	
OSHA PEL TWA	50 µg/m³ (Respirable crystalline silica)

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) 5 mg/m³ (respirable dust)
OEL STEL	10 mg/m³ (inhalable dust)
Australia - Occupational Exposure Limits	
OES TWA	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) 0.3 mg/m³ (CIB 63-ultrafine, including engineered nanoscale)
USA - OSHA - Occupational Exposure Limits	
OSHA PEL TWA	15 mg/m³ (total dust)

Calcium oxide (1305-78-8)	
Korea - Occupational Exposure Limits	
Local name	산화칼슘 # Calcium oxide
ISHA OEL TWA	2 mg/m³
Regulatory reference	고용노동부고시 제2020-48호 # MOEL Public Notice. No. 2020-48
China - Occupational Exposure Limits	
OEL PC-TWA	2 mg/m³
Catalogue of Occupational Hazard Factors	Category 3 - Chemicals
India - Occupational Exposure Limits	
PEL (OEL TWA)	2 mg/m³
Indonesia - Occupational Exposure Limits	
NAB (OEL TWA)	2 mg/m³
Singapore - Occupational Exposure Limits	
PEL (OEL TWA)	2 mg/m³
Taiwan - Occupational Exposure Limits	
OEL TWA	5 mg/m³
OEL STEL	10 mg/m³
Thailand - Occupational Exposure Limits	
OEL TWA	5 mg/m³
Vietnam - Occupational Exposure Limits	
OEL TWA	2 mg/m³
OEL STEL	4 mg/m³
Australia - Occupational Exposure Limits	
OES TWA	2 mg/m³
USA - ACGIH - Occupational Exposure Limits	
ACGIH OEL TWA	2 mg/m³
USA - IDLH - Occupational Exposure Limits	
IDLH	25 mg/m³
USA - NIOSH - Occupational Exposure Limits	
NIOSH REL TWA	2 mg/m³
USA - OSHA - Occupational Exposure Limits	
OSHA PEL TWA	5 mg/m³

(1309-48-4)	
Korea - Occupational Exposure Limits	
Local name	산화마그네슘 # Magnesium oxide
ISHA OEL TWA	10 mg/m³
Regulatory reference	고용노동부고시 제2020-48호 # MOEL Public Notice. No. 2020-48
China - Occupational Exposure Limits	
OEL PC-TWA	10 mg/m³ (fume)

(1309-48-4)	
Indonesia - Occupational Exposure Limits	
NAB (OEL TWA)	10 mg/m³ (inhalable particulate)
Chemical category	A4 - not classifiable as a human carcinogen
Singapore - Occupational Exposure Limits	
PEL (OEL TWA)	10 mg/m³ (fume)
Taiwan - Occupational Exposure Limits	
OEL TWA	10 mg/m³ (fume)
OEL STEL	15 mg/m³ (fume)
Vietnam - Occupational Exposure Limits	
OEL TWA	5 mg/m³
OEL STEL	10 mg/m³
Australia - Occupational Exposure Limits	
OES TWA	10 mg/m³ (fume)
USA - ACGIH - Occupational Exposure Limits	
ACGIH OEL TWA	10 mg/m³ (inhalable particulate matter)
ACGIH chemical category	Not Classifiable as a Human Carcinogen
USA - IDLH - Occupational Exposure Limits	
IDLH	750 mg/m³ (fume)
USA - OSHA - Occupational Exposure Limits	
OSHA PEL TWA	15 mg/m³ (fume, total particulate)

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

Silicon Metal (7440-21-3)	
Australia - Occupational Exposure Limits	
OES TWA	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) 5 mg/m³ (respirable dust)
USA - OSHA - Occupational Exposure Limits	
OSHA PEL TWA	15 mg/m³ (total dust) 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 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) 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

Manganese (7439-96-5)	
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 - Occupational Exposure Limits	
ACGIH OEL TWA	0.02 mg/m³ (respirable particulate matter) 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)

(1344-28-1)	
Korea - Occupational Exposure Limits	
Local name	알파-알루미나 (산화 알루미늄) # a-Alumina (Aluminum oxide)
ISHA OEL TWA	10 mg/m³
Regulatory reference	고용노동부고시 제2020-48호 # MOEL Public Notice. No. 2020-48
China - Occupational Exposure Limits	
OEL PC-TWA	4 mg/m³ (total dust)
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
Thailand - Occupational Exposure Limits	
OEL TWA	15 mg/m³ (inhalable dust) 5 mg/m³ (respirable dust)
Australia - Occupational Exposure Limits	
OES TWA	10 mg/m³ (containing no asbestos and <1% crystalline silica-inhalable dust)
USA - OSHA - Occupational Exposure Limits	
OSHA PEL TWA	15 mg/m³ (total dust) 5 mg/m³ (respirable fraction)

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 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 exposure routes

Oral : Not classified

Skin and eyes contact : Skin corrosion/irritation - Causes severe skin burns.
Serious eye damage/eye irritation - Causes serious eye damage.
Skin sensitization - May cause an allergic skin reaction.

Inhalation : Acute toxicity (Inhalation:dust,mist) - Harmful if inhaled.
Respiratory sensitization - 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):

Inhalation:dust,mist - Harmful if inhaled.

EF-200LT	
ATE KR (dust,mist)	5 mg/l/4h

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)

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

Calcium oxide (1305-78-8)	
LD50 oral rat	> 2000 mg/kg bodyweight Animal: rat, Animal sex: female, Guideline: OECD Guideline 420 (Acute Oral Toxicity - Fixed Dose Method)
LD50 dermal rat	> 2000 mg/kg bodyweight Animal: rat, Guideline: OECD Guideline 402 (Acute Dermal Toxicity), Guideline: EU Method B.3 (Acute Toxicity (Dermal))
LD50 dermal rabbit	> 5000 mg/kg bodyweight Animal: rabbit, Guideline: other:US Federal Register 38: 187, Part 1500, Section 41, 1973.
LC50 Inhalation - Rat	> 6.04 mg/l/4h

(1309-48-4)	
LD50 oral rat	3990 mg/kg Source: HSDB
LD50 dermal rabbit	> 2000 mg/kg bodyweight (Rabbit, Literature study, Dermal)

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))

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

(1344-28-1)	
LD50 oral rat	> 10000 mg/kg Source: ECHA
LC50 Inhalation - Rat (Dust/Mist)	> 2.3 mg/l Source: ECHA

Skin corrosion/irritation:

Causes severe skin burns.

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

Silicon dioxide (14808-60-7)	
IARC group	1 - Carcinogenic to humans

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

Mutagenicity:

Not classified

Reproductive toxicity:

Not classified

Silicon Metal (7440-21-3)	
NOAEL (animal/male, F0/P)	5000 mg/kg bodyweight Animal: rat, Animal sex: male, Guideline: other:OECD Guideline 478 (Genetic Toxicology: Rodent Dominant Lethal Test)

(1344-28-1)	
NOAEL (animal/male, F0/P)	1000 mg/kg bodyweight Animal: rat, Animal sex: male, Guideline: OECD Guideline 422 (Combined Repeated Dose Toxicity Study with the Reproduction / Developmental Toxicity Screening Test)

STOT-single exposure:

May cause damage to organs.

STOT-repeated exposure:

May cause damage to organs through prolonged or repeated exposure.

Calcium oxide (1305-78-8)	
LOAEL (oral, rat, 90 days)	300 mg/kg bodyweight Animal: rat, Animal sex: male, Guideline: OECD Guideline 422 (Combined Repeated Dose Toxicity Study with the Reproduction / Developmental Toxicity Screening Test)
NOAEL (oral, rat, 90 days)	1000 mg/kg bodyweight Animal: rat, Guideline: OECD Guideline 422 (Combined Repeated Dose Toxicity Study with the Reproduction / Developmental Toxicity Screening Test)
NOAEC (inhalation, rat, dust/mist/fume, 90 days)	0.413 mg/l air Animal: rat, Animal sex: male, Guideline: OECD Guideline 412 (Subacute Inhalation Toxicity: 28-Day Study)

Silicon Metal (7440-21-3)	
NOAEL (oral, rat, 90 days)	> 5000 mg/kg bodyweight Animal: rat, Animal sex: male

(1344-28-1)	
LOAEC (inhalation, rat, dust/mist/fume, 90 days)	0.015 mg/l air Animal: rat, Guideline: OECD Guideline 452 (Chronic Toxicity Studies)
NOAEC (inhalation, rat, dust/mist/fume, 90 days)	0.07 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.

Aspiration hazard:

Not classified

EF-200LT	
Viscosity, kinematic	Not applicable

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

Silicon dioxide (14808-60-7)	
Density	2.635 – 2.66 g/cm³ (at 20 °C)

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)

Calcium oxide (1305-78-8)	
Viscosity, kinematic (calculated value) (40 °C)	Not applicable (solid)

Calcium oxide (1305-78-8)	
Density	3.3 g/cm³ Type: 'density' Temp.: 25 °C
Viscosity, kinematic	Not applicable (solid)
Viscosity, dynamic	760 mPa·s Temp.: '20°C' Parameter: 'dynamic viscosity (in mPa s)'

(1309-48-4)	
Density	3.58 g/cm³ (at 25 °C)

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

(1344-28-1)	
Density	3.94 g/cm³ (at 20 °C)

12. Ecological information

12.1. Ecotoxicity

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

Hazardous to the aquatic environment, short–term (acute) : Very toxic to aquatic life.

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'

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

Titanium Dioxide (13463-67-7)	
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'

Calcium oxide (1305-78-8)	
LC50 - Fish [1]	387 mg/l Test organisms (species): Poecilia reticulata
EC50 - Crustacea [1]	49.1 mg/l (OECD 202: Daphnia sp. Acute Immobilisation Test, 48 h, Daphnia magna, Static system, Fresh water, Read-across, Locomotor effect)
EC50 96h - Algae [1]	1130.3 mg/l Test organisms (species): Navicula seminulum
EC50 72h - Algae [1]	> 100 mg/l Test organisms (species): Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum)
ErC50 algae	184.57 mg/l (OECD 201: Alga, Growth Inhibition Test, 72 h, Pseudokirchneriella subcapitata, Static system, Fresh water, Read-across, GLP)
NOEC (chronic)	32 mg/l Test organisms (species): Crangon septemspinosa Duration: '14 d'
NOEC chronic fish	100 mg/l Test organisms (species): other:Tilapia nilotica Duration: '46 d'
BCF - Fish [1]	(no bioaccumulation)

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
EC50 72h - Algae [1]	4.5 mg/l Test organisms (species): Desmodesmus subspicatus (previous name: Scenedesmus subspicatus)

Manganese (7439-96-5)	
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)

(1344-28-1)	
LC50 - Fish [1]	0.078 – 0.108 mg/l Source: ECHA
EC50 96h - Algae [1]	> 0.024 mg/l Source: ECHA
EC50 72h - Algae [1]	1.05 mg/l Test organisms (species): Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum)
EC50 72h - Algae [2]	0.2 mg/l Test organisms (species): Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum)

12.2. Persistence and degradability

EF-200LT	
Persistence and degradability	Rapidly degradable

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

Silicon dioxide (14808-60-7)	
Persistence and degradability	Biodegradability: not applicable.
Chemical oxygen demand (COD)	Not applicable (inorganic)
ThOD	Not applicable (inorganic)

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

Calcium oxide (1305-78-8)	
Persistence and degradability	Biodegradability: not applicable.
Chemical oxygen demand (COD)	Not applicable (inorganic)
ThOD	Not applicable (inorganic)

(1309-48-4)	
Persistence and degradability	Biodegradability: not applicable.
Chemical oxygen demand (COD)	Not applicable (inorganic)

(1309-48-4)	
ThOD	Not applicable (inorganic)

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

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

(1344-28-1)	
Persistence and degradability	Rapidly degradable

12.3. Bioaccumulative potential

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

Silicon dioxide (14808-60-7)	
Bioaccumulative potential	No bioaccumulation data available.

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

Calcium oxide (1305-78-8)	
BCF - Fish [1]	(no bioaccumulation)
Bioaccumulative potential	Not bioaccumulative.

(1309-48-4)	
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.

Silicon dioxide (14808-60-7)	
Ecology - soil	No (test)data on mobility of the substance available.

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

Calcium oxide (1305-78-8)	
Surface tension	No data available in the literature
Ecology - soil	No (test)data on mobility of the substance available.

(1309-48-4)	
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

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 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	14808-60-7: Silica (Crystalline quartz) 13463-67-7: Titanium dioxide 1305-78-8: Calcium oxide 1309-48-4: Magnesium oxide 7439-89-6: Iron salts (Soluble, as Fe) 7440-21-3: Silicon 7439-96-5: Manganese&Inorganic compounds, as Mn 1344-28-1: a-Alumina (Aluminum oxide)
Hazardous Substances Below Permissible Level	Applicable	7439-96-5: Manganese and its inorganic compounds
Hazardous Substances Subject to Working Environment Measurement	Applicable	14808-60-7: Quartz 13463-67-7: Titanium dioxide 1309-48-4: Magnesium oxide 7439-96-5: Manganese and its inorganic compounds 1344-28-1: Aluminum and its compounds (contains above 1%)
Hazardous Substances Subject to Workers Requiring Health Examination	Applicable	14808-60-7: Mineral dusts 7439-96-5: Manganese and its inorganic compounds 1344-28-1: Aluminium and its compounds (contains above 1%)
Hazardous Substances Subject to Control	Applicable	13463-67-7: Titanium dioxide 1309-48-4: Magnesium oxide

		7439-89-6: Iron and its compounds 7439-96-5: Manganese and its inorganic compounds 1344-28-1: Aluminum and its compounds (contains above 1%)
Substance Subject to Submission of PSM	Not applicable	

15.2. Chemicals Control Act

Toxic Substances	Not applicable
Prohibited Substances	Not applicable
Restricted Substances	Not applicable
Substances Requiring Preparation for Accident	Not applicable

15.3. Safety Control of Dangerous Substances Act

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

15.4. Wastes Control Act

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

15.5. Other Domestic and International Regulatory Information

Act on Registration and Evaluation of Chemicals (K-REACH)

Korea Existing Chemicals Inventory (KECI)	Applicable	7789-75-5: Calcium fluoride (KECI-No. : KE-04538) 14808-60-7: Quartz (SiO2) (KECI-No. : KE-29983) 13463-67-7: Titanium dioxide (KECI-No. : KE-33900) 1305-78-8: Calcium oxide (KECI-No. : KE-04588) 1309-48-4: Magnesium oxide (KECI-No. : KE-22728) 7439-89-6: Iron (KECI-No. : KE-21059) 7440-21-3: Silicon (KECI-No. : KE-31029) 7439-96-5: Manganese (KECI-No. : KE-22999) 1344-28-1: Aluminium oxide ; Alumina (KECI-No. : KE-01012)
Priority Existing Chemicals (PEC)	Applicable	14808-60-7: Quartz (SiO2) (PEC-No. : 413)
Substances Subject to Intensive Control	Applicable	14808-60-7: Silicon dioxide
CMR Substances	Not applicable	

Other Domestic Regulations

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

16. Other information

16.1. Data sources

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,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,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,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.

16.2. Issue date

11/3/2020

16.3. Revision number and date

Version	:	4.3
Revision date	:	3/25/2025

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.