KM-1000

Material Safety Data Sheet

In Accordance with MOEL Public notice No 2020-130
MSDS Number: AA06900-0000000200
Issue date: 11/3/2020 Revision date: 12/27/2021 Version: 1.0

1. Chemical product and company identification

1.1. Product identifier

Product form : Mixture
Trade name : KM-1000

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

Acute toxicity (oral), Category 5	H303
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 – 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)

H303 - May be harmful if swallowed.
H314 - Causes severe skin burns and eye damage.
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:

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.

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 KECI-No.: KE-21059	43 – 47
	Tungsten, elemental / Tungsten, metal / Tungsten metal / Tungsten trioxide / tungsten	CAS-No.: 7440-33-7 KECI-No.: KE-35000	31 – 35
Barium carbonate	Barium carbonate (1:1) / C.I. Pigment White 10 / Carbonic acid, barium salt (1:1) / barium carbonate	CAS-No.: 513-77-9 KECI-No.: KE-02035	4 – 7
CaF2	Calcium fluoride / Fluorspar / FLUORSPAR / CALCIUM FLUORIDE / Calcium difluoride / calcium fluoride	CAS-No.: 7789-75-5 KECI-No.: KE-04538	4 – 7

Substance name	Other Names	Product identifier number	Concentration (%)
	Silicic acid, sodium salt / SODIUM SILICATE / Sodium silicates	CAS-No.: 1344-09-8 KECI-No.: KE-31002	4 – 7
	Dextrins / DEXTRIN / Corn dextrins	CAS-No.: 9004-53-9 KECI-No.: KE-09627	1 – 3
	C.I. Pigment Black 10 / C.I. 77265 / graphite	CAS-No.: 7782-42-5 KECI-No.: KE-18101	1 – 3
Manganese	Manganese, elemental / Manganese metal / manganese	CAS-No.: 7439-96-5 KECI-No.: KE-22999	1 – 3

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.

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

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. Do not breathe dust/fume/gas/mist/vapours/spray. 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 locked up. Store in a well-ventilated place. Keep cool.

8. Exposure controls/personal protection

8.1. Occupational Exposure Limits

KM-1000

No data available

Barium carbonate (513-77-9)

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

(1344-09-8)

No data available

(9004-53-9)	
No data available	

(7440-33-7)	
Korea - Occupational Exposure Limits	
Local name	텅스텐 # Tungsten
ISHA OEL TWA	1 mg/m³ (가용성화합물)호흡성 # (Soluble compounds) (Respirable fraction) 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) 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) [ppm]	10 ppm
USA - ACGIH - Occupational Exposure Limits	
ACGIH OEL TWA	3 mg/m³ (respirable particulate matter)
USA - NIOSH - Occupational Exposure Limits	
NIOSH REL TWA	5 mg/m³
NIOSH REL STEL	10 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
China - Occupational Exposure Limits	
Catalogue of Occupational Hazard Factors	Category 1 - Dusts
Indonesia - Occupational Exposure Limits	
NAB (OEL TWA)	1 mg/m³

(7782-42-5)	
Korea - Occupational Exposure Limits	
Local name	흑연(천연 및 합성, Graphite 섬유제외) # Graphite (Natural & Synthetic, Except Graphite fibers)
ISHA OEL TWA	2 mg/m³ (natural, except graphite fibers-respirable fraction) 2 mg/m³ (synthetic, except graphite fibers-respirable fraction)
ISHA OEL TWA [ppm]	400 ppm 호흡성 # (Respirable fraction)

(7782-42-5)	
Regulatory reference	고용노동부고시 제2020-48호 # MOEL Public Notice. No. 2020-48
China - Occupational Exposure Limits	
OEL PC-TWA	4 mg/m³ (total dust) 2 mg/m³ (respirable dust)
Catalogue of Occupational Hazard Factors	Category 1 - Dusts
Indonesia - Occupational Exposure Limits	
NAB (OEL TWA)	2 mg/m³ (respirable particulate)
Singapore - Occupational Exposure Limits	
PEL (OEL TWA)	2 mg/m³ (respirable dust)
Australia - Occupational Exposure Limits	
OES TWA [1]	3 mg/m³ (containing no asbestos and <1% crystalline silica-respirable dust)
USA - ACGIH - Occupational Exposure Limits	
ACGIH OEL TWA	2 mg/m³ (all forms except graphite fibers-respirable particulate matter)
USA - IDLH - Occupational Exposure Limits	
IDLH	1250 mg/m³ (Graphite (natural))
USA - NIOSH - Occupational Exposure Limits	
NIOSH REL TWA	2.5 mg/m³ (natural-respirable dust)
USA - OSHA - Occupational Exposure Limits	
OSHA PEL TWA [1]	15 mg/m³ (synthetic-total dust) 5 mg/m³ (synthetic-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)

Manganese (7439-96-5)	
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) 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 : May be harmful if swallowed.

Skin and eyes contact : Causes severe skin burns. 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):

May be harmful if swallowed.

Acute toxicity (dermal):

Not classified

Acute toxicity (inhalation):

Not classified

KM-1000	
ATE KR (oral)	4124.069 mg/kg bodyweight

Barium carbonate (513-77-9)	
LD50 oral rat	1690 mg/kg bodyweight Animal: rat, Guideline: OECD Guideline 401 (Acute Oral Toxicity), 95% CL: 1060 - 2010
LD50 dermal rat	> 2000 mg/kg bodyweight (OECD 402: Acute Dermal Toxicity, Rat, Read-across, Dermal)
LD50 dermal rabbit	> 2000 mg/kg Source: ECHA
LC50 Inhalation - Rat (Dust/Mist)	> 5 mg/l

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)

(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

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))

(7782-42-5)	
LD50 oral rat	> 2000 mg/kg Source: ECHA
LC50 Inhalation - Rat	> 2000 mg/m³ (Exposure time: 4 h)
LC50 Inhalation - Rat (Dust/Mist)	> 2 mg/l Source: ECHA

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 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

Barium carbonate (513-77-9)	
NOAEL (chronic, oral, animal/male, 2 years)	60 mg/kg bodyweight Animal: rat, Animal sex: male, Remarks on results: other:Effect type: carcinogenicity (migrated information)
NOAEL (chronic, oral, animal/female, 2 years)	75 mg/kg bodyweight Animal: rat, Animal sex: female, Remarks on results: other:Effect type: carcinogenicity (migrated information)

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.

(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)

(7782-42-5)	
NOAEC (inhalation, rat, dust/mist/fume, 90 days)	0.000279 mg/l air Animal: rat, Guideline: OECD Guideline 413 (Subchronic Inhalation Toxicity: 90-Day Study)
STOT-repeated exposure	Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard:

Not classified

Barium carbonate (513-77-9)	
Density	4.3 g/cm³ (at 20 °C)

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

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

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

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

(7782-42-5)	
Density	2213.6 kg/m³ (25 °C)

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.

Barium carbonate (513-77-9)	
LC50 - Fish [1]	> 3.5 mg/l Source: ECHA
EC50 72h - Algae [1]	> 1.15 mg/l Test organisms (species): Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum)
EC50 72h - Algae [2]	> 30.07 mg/l Test organisms (species): Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum)
ErC50 algae	> 100 mg/l (OECD 201: Alga, Growth Inhibition Test, 72 h, Pseudokirchneriella subcapitata, Static system, Fresh water, Experimental value, Bariumchloride)
BCF - Fish [1]	1.2 – 74.4 (Lepomis macrochirus, Fresh water, Weight of evidence)
Partition coefficient n-octanol/water (Log Pow)	-1.32 Source: EPISUITE

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

CaF2 (7789-75-5)	
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])
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)

(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'

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

(7782-42-5)	
LC50 - Fish [1]	> 100 mg/l Test organisms (species): Danio rerio (previous name: Brachydanio rerio)
EC50 - Crustacea [1]	> 100 mg/l Test organisms (species): Daphnia magna
EC50 72h - Algae [1]	19 mg/l Test organisms (species): Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum)
EC50 72h - Algae [2]	7.2 mg/l Test organisms (species): Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum)
ErC50 algae	> 100 mg/l Source: ECHA
NOEC (chronic)	47 mg/l Test organisms (species): Daphnia magna Duration: '21 d'

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)
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

Barium carbonate (513-77-9)	
Persistence and degradability	Biodegradability: not applicable.
Chemical oxygen demand (COD)	Not applicable (inorganic)
ThOD	Not applicable (inorganic)

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

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

(7782-42-5)	
Persistence and degradability	Biodegradability: not applicable.
Chemical oxygen demand (COD)	Not applicable
ThOD	Not applicable
BOD (% of ThOD)	Not applicable

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

Barium carbonate (513-77-9)	
BCF - Fish [1]	1.2 – 74.4 (Lepomis macrochirus, Fresh water, Weight of evidence)
Partition coefficient n-octanol/water (Log Pow)	-1.32 Source: EPISUITE
Bioaccumulative potential	Low potential for bioaccumulation (BCF < 500).

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

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

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

(7782-42-5)	
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

Barium carbonate (513-77-9)	
Mobility in soil	3.84 Source: EPA
Partition coefficient n-octanol/water (Log Pow)	-1.32 Source: EPISUITE
Ecology - soil	No (test)data on mobility of the substance available.

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.

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

7440-33-7: Tungsten
7439-89-6: Iron salts (Soluble, as Fe)
7782-42-5: Graphite (Natural & Synthetic, Except Graphite fibers)
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	513-77-9: Barium carbonate (contains above 1%) 7440-33-7: Tungsten and its compounds 7782-42-5: Graphite 7439-96-5: Manganese and its inorganic compounds
Hazardous Substances Subject to Workers Requiring Health Examination	Applicable	7440-33-7: Tungsten and its compounds 7439-96-5: Manganese and its inorganic compounds
Hazardous Substances Subject to Control	Applicable	513-77-9: Barium carbonate (contains above 1%) 7440-33-7: 텅스텐(Tungsten) 7439-89-6: Iron and its compounds 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 5 Metal powder (Designated quantity: 500kg); Class 2 Combustible solid - category 4 Iron Powder (Designated quantity: 500kg))
	Applicable	7440-33-7: Tungsten powder (Class 2 Combustible solid - category 5 Metal powder (Designated quantity: 500kg)) 7439-89-6: Iron powder (Class 2 Combustible solid - category 4 Iron 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: This safety data sheet was compiled with data and information from the following sources : RTECS, ECOSAR, HSDB, SIDS SIAP, ChemWATCH, CESAR, Chemical DB,This MSDS is prepared based on KOSHA, NITE, ESIS, NLM, SIDS, IPCS, NCIS, etc,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,Supplier's safety documents,ECHA (European Chemicals Agency),Classification according to Classification, Labelling and Packaging of Substances and Mixtures (SEA) Regulation published in the Official Journal numbered 28848 on December 11, 2013,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,No data available.

16.2. Issue date: 11/3/2020

16.3. Revision number and date: 1.0, 27/12/2021

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.