

Material Safety & Health Data Sheet

[This MSDS is compiled by the provisions of Korea's Industrial Safety and Health Law #41 specifies.]

1. Information about chemical product and manufacturer

- A. Product name Stainless Steel Wire 302
- B. Recommended use of the chemical and restrictions on use:
Recommended use of the chemical: No date
restrictions on use of the Product: No date
- C. Manufacturer/Supplier/Distributor Information
- | | |
|-----------------------|--|
| Name | KOS Ltd. |
| Address | 40-134, 3ga, Hangangro, Yongsan-gu, Seoul, Korea |
| Emergency phone Numbe | TEL : 82-2-3406-0114 / Fax : 82-2-2273-6358 |

2. Hazards identification

- a. Hazard. Risk Classifier reproduction-toxicity : 1B
Specific target organ toxicity (single exposure): 2
Specific target organ toxicity (repeated exposure): 2

- b. Label elements including precautionary statements
symbol



Signal Word: Danger

Hazard. Risk Statement: H360 May damage fertility or the unborn child.
H371 May cause damage to organs
H373 May cause damage to organs through prolonged or repeated exposure

Precautionary Statement:
Precautionary P201 Obtain special instructions before use..

P202 Do not handle until all safety precautions have been read and understood.

P260 Do not breathe dust/fume/gas/mist/vapours/spray..

P264 Wash ... thoroughly after handling

P270 Do not eat, drink or smoke when using this product.

P281 Use personal protective equipment as required.

Response P308+P313 IF exposed or concerned: Get medical advice/attention.

309+P311 IF exposed or if you feel unwell: Call a POISON CENTER or doctor/physician.

P314 Get medical advice/attention if you feel unwell.

Storage P405 Store locked up.

Disposal P501 Dispose of contents/container to ...

c. Other Hazard.Risk which are not included in the classification criteria:

C	Health	1
	Fire	1
	reactivity	0
Si	Health	0
	Fire	0
	reactivity	0
Mn	Health	1
	Fire	3
	reactivity	1
P	Health	3
	Fire	1
	reactivity	1
S	Health	1
	Fire	1
	reactivity	0
Ni	Health	No date
	Fire	No date
	reactivity	No date
Cr	Health	1
	Fire	3
	reactivity	0
Mo	Health	1
	Fire	1
	reactivity	0
Cu	Health	2
	Fire	3

	reactivity	0
N	Health	3
	Fire	0
	reactivity	0

3.Composition/Information on ingredients

Chemical Name	Other Name	CAS Number	Conetent((%)
C	ACTIVATED CARBON	7440-44-0	0.15 Max.
Si	SILICON POWDER, AMORPHOUS	7440-21-3	1.0 Max.
Mn	COLLOIDAL MANGANESE	7439-96-5	2.0 Max.
P	RED PHOSPHOROUS	7723-14-0	0.045 Max
S	SULPHUR	7704-34-9	0.03 Max
Ni	NICKEL ELEMENT	7440-02-0	8.0~10.0
Cr	CHROME	7440-47-3	17.0~19.0
Mo	MOLYBDATE	7732-98-7	0.5 Max.
Cu	-	7440-50-8	0.6 Max.
N	NITROGEN	7727-37-9	0.10 Max.
Fe	FERRIUM	7439-89-6	Bal.

4.First aid measures

- a. Eye contact: Need quick medical action.
If immediately wash in the running water over 20 minutes when contact with material.
- b. Skin contact: Seek medical advice when contact with material or feel inconvenience.
Isolate contaminated area after remove/take off immediately all contaminated clothing.
If immediately wash in the running water over 20 minutes when contact with material.
IF exposed or if you feel unwell: Call a POISON CENTER or doctor/physician.
- c. Inhalation: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
IF exposed or if you feel unwell: Call a POISON CENTER or doctor/physician.
IF exposed: Call a POISON CENTER or doctor/physician.

- d. Ingestion: IF exposed or if you feel unwell: Call a POISON CENTER or doctor/physician.
If swallowed and inhaled, do not mouth to mouth resuscitation and use the properly breathing device.
- e. Indication of immediate medical attention and notes for physician: Contact medical team and take a emergency measure such a follow-up survey when you expose it.
Medical personnel recognized that material and have protection measure

5. Fire-Fighting measures

- a. Suitable (and unsuitable) extinguishing media: Use the alcohol form, carbon dioxide and water spray when extinguish related th material
Use the dry sand or soil when extinguishment by smothering.
- b. Specific hazards arising from the chemical It may be generated toxic gas at high temperature.
If heating the container which it can explode
Can burn some of it but can not easily ingnite.
Nonflammability, Material is not burn but it disassemble in heat and corrosive/toxic fume
- c. Special protective equipment and precautions for fire-fighters:
- C The rescuer have to appropriate protector.
Keep safe distance and extinguish the fire
Becareful some of it will be delivered liquid condition.
It will move out of fire area when it is not danger
You have to protect the area and stay a fire goes out If you can't extinguish the fire.
- Si The rescuer have to appropriate protector.
Keep safe distance and extinguish the fire
Becareful some of it will be delivered liquid condition.
It will move out of fire area when it is not danger
You have to protect the area and stay a fire goes out If you can't extinguish the fire.
- Mn The rescuer have to appropriate protector.
Keep safe distance and extinguish the fire
Becareful some of it will be delivered liquid condition.

It will move out of fire area when it is not danger

You have to protect the area and stay a fire goes out If you can't extinguish the fire.

P

The rescuer have to appropriate protector.

Keep safe distance and extinguish the fire

Becareful some of it will be delivered liquid condition.

It will move out of fire area when it is not danger

You have to protect the area and stay a fire goes out If you can't extinguish the fire.

S

The rescuer have to appropriate protector.

Keep safe distance and extinguish the fire

Becareful some of it will be delivered liquid condition.

It will move out of fire area when it is not danger

You have to protect the area and stay a fire goes out If you can't extinguish the fire.

Ni

The rescuer have to appropriate protector.

Keep safe distance and extinguish the fire

Becareful some of it will be delivered liquid condition.

It will move out of fire area when it is not danger

You have to protect the area and stay a fire goes out If you can't extinguish the fire.

Cr

The rescuer have to appropriate protector.

Keep safe distance and extinguish the fire

Becareful some of it will be delivered liquid condition.

It will move out of fire area when it is not danger

You have to protect the area and stay a fire goes out If you can't extinguish the fire.

Mo

The rescuer have to appropriate protector.

Keep safe distance and extinguish the fire

Becareful some of it will be delivered liquid condition.

It will move out of fire area when it is not danger

You have to protect the area and stay a fire goes out If you can't extinguish . the fire

Cu The rescuer have to appropriate protector.
Keep safe distance and extinguish the fire
Becareful some of it will be delivered liquid condition.
It will move out of fire area when it is not danger
You have to protect the area and stay a fire goes out If you can't extinguish the fire.

N The rescuer have to appropriate protector.
Keep safe distance and extinguish the fire
Becareful some of it will be delivered liquid condition.
It will move out of fire area when it is not danger
You have to protect the area and stay a fire goes out If you can't extinguish the fire.

6. Accidental release measures

a. Personal precautions, protective equipment and emergency procedures: Do not inhale dust, fume, mist, steam and spray.
Follow prevention measure of the section 8.personal protection after wiping the spilth.
Contaminated area should be isolated.
Do not enter or anyone who is not properly dressed person without personal protection.
Remove the source of ignition.
If it is not danger that stop the leak.
Do not touch the demaged container or leak without properly protection.
Cover plastic sheet to prevent the spread of leak Plastic sheet
Pay attention to avoid material and condition.

b. Environmental precautio Flow in waterway, drain, basement or closed space.
and protective procedures:

c. Methods and materials for containment and cleaning up: You absorb the spilled it with inert material(ex. Dried sand or soil) and put in the chemical waste container
Absorb the liquid and wash off the contaminated area with detergent and water.

7. Handling and storage

a. Precautions for safe handling: Do not handle until all safety precautions have been read and understood.
Wash up handling part of body after handling it.

Do not eat, drink and smoke when you use this product.
 Follow the prevention measure of all MSDS/Label because it remain the waste products after the container is empty.
 Be careful use the handling and storage.
 Be careful open the stopper before open.
 Do not enter the storage area without properly ventilation.
 Pay attention to avoid material and condition.
 Have to store the storing place with locking device.

b. Conditions for safe storage Immediately put in the drum regulator or properly arrange the drum.
 Keep off food and drinking water.

8.Exposure controls & personal protection

a. Control parameters (e.g. occupational exposure limit values, biological limit values):

Internal Regulations

C	TWA - 5mg/m ³ Total Dust:#2
Si	TWA - 10mg/m ³
Mn	TWA - 1mg/m ³ Mn and inorganic compounds TWA - 1mg/m ³ STEL - 3mg/m ³ Fume
P	TWA - 0.1mg/m ³ , P(yellow)
S	No Data
Ni	TWA - 0.1mg/m ³ Ni (soluble compounds) TWA - 1mg/m ³ Ni(Metal) TWA - 0.5mg/m ³ (Ni(insoluble inorganic compounds) TWA - 1mg/m ³ Mn and inorganic compounds TWA - 1mg/m ³ STEL - 3mg/m ³ Fume
Cr	TWA - 0.5mg/m ³ Cr(#2) compounds TWA - 0.5mg/m ³ Cr(#3) compounds TWA - 0.01mg/m ³ Cr(#6) compounds (insoluble inorganic compounds), TWA - 0.05mg/m ³ (Cr(#6)compounds(water soluble Cr(#6)compounds(water soluble)

TWA - 0.5mg/m³ Cr(Metal)
TWA - 0.05mg/m³ Cr ore, processed goods (Cr acid)

Mo TWA - 10mg/m³ Mo(insoluble compounds)(Total Dust)
TWA - 5mg/m³ Mo(insoluble compounds)(respiratory dust)
TWA - 0.01mg/m³ Mo(water soluble compounds)

Cu TWA - 1mg/m³ STEL - 2mg/m³ Cu(dust and mist)
TWA - 0.1mg/m³ Cu(Fume)

N No Data

ACGIH Regular

C No Data

Si No Data

Mn TWA 0.2 mg/m³

P No Data

S No Data

Ni TWA 0.1 mg/m³(soluble inorganic compounds)
TWA 0.2 mg/m³(insoluble inorganic compounds)

Cr TWA 0.5 mg/m³

Mo TWA 10mg/m³

Cu TWA 0.2 mg/m³, 1 mg/m³

N Simple suffocant

Biological exposure Critena

C No Data

Si No Data

Mn No Data

P No Data

S No Data

Ni No Data

Cr No Data

Mo No Data

Cu No Data

N No Data

b. Appropriate Use process isolation, ventilation or another engineering management to

engineering controls: lower level of air under leakage threshold. Facilities which storage and use this material installs cleansing and shower devices.

c. Personal protective equipment

Respiratory protection:

C Total Dust: #2 dust
You have to wear disposable respirators which fits physicochemical characteristic and certified by KOHSA
You have to wear reusable respirators with properly type of filter when exposure concentration is low than 50mg/m³.
You have to wear loose-fitting motor operated respirators with hood/helmet type or continous flow disposable respirators when exposure concentration is low than 125mg/m³.
You have to wear loose-fitting motor operated respirators with hood/helmet type or continous flow disposable respirators when exposure concentration is low than 250mg/m³.
You have to wear loose-fitting motor operated respirators with hood/helmet type or power & supplied air respirators when exposure concentration is low than 5000mg/m³.
You have to wear SCBA with properly type of filter or power & supplied air respirators(SCBA) when exposure concentration is low than 5000mg/m³.

Si
You have to wear disposable respirators which fits physicochemical characteristic and certified by KOHSA.
You have to wear reusable respirators with properly type of filter when exposure concentration is low than 100mg/m³.
You have to wear loose-fitting motor operated respirators with hood/helmet type or continous flow disposable respirators when exposure concentration is low than 250mg/m³.
You have to wear loose-fitting motor operated respirators with hood/helmet type or continous flow disposable respirators when exposure concentration is low than 500mg/m³.
You have to wear reusable respirators with properly type of filter motor operatec respirators with hood/helmet when exposure concentration is low than 10,000mg/m³.
You have to wear SCBA with properly type of filter or power & supplied air respirators(SCBA) when exposure concentration is low than 1,000,000mg/m³.

Mn

You have to wear disposable respirators which fits physicochemical characteristic and certified by KOHSA.

You have to wear reusable respirators with properly type of filter when exposure concentration is low than 10mg/m³.

You have to wear loose-fitting motor operated respirators with hood/helmet type or continous flow disposable respirators when exposure concentration is low than 25mg/m³.

You have to wear loose-fitting motor operated respirators with hood/helmet type or continous flow disposable respirators when exposure concentration is low than 50mg/m³.

You have to wear reusable respirators with properly type of filter motor operatec respirators with hood/helmet when exposure concentration is low than 1,000mg/m³.

You have to wear SCBA with properly type of filter or power & supplied air respirators(SCBA) when exposure concentration is low than 10,000mg/m³.

P

You have to wear disposable respirators which fits physicochemical characteristic and certified by KOHSA.

S

You have to wear disposable respirators which fits physicochemical characteristic and certified by KOHSA.

Ni

You have to wear disposable respirators which fits physicochemical characteristic and certified by KOHSA.

You have to wear reusable respirators with properly type of filter when exposure concentration is low than 1mg/m³.

You have to wear loose-fitting motor operated respirators with hood/helmet type or continous flow disposable respirators when exposure concentration is low than 2.5mg/m³.

You have to wear loose-fitting motor operated respirators with hood/helmet type or continous flow disposable respirators when exposure concentration is low than 5mg/m³.

You have to wear reusable respirators with properly type of filter motor operatec respirators with hood/helmet when exposure concentration is low than 100mg/m³.

You have to wear SCBA with properly type of filter or power & supplied air respirators(SCBA) when exposure concentration is low than 10,000mg/m³.

Cr

Cr(#2) compounds

You have to wear disposable respirators which fits physicochemical characteristic and certified by KOHSA.

Cr(#3) compounds

You have to wear disposable respirators which fits physicochemical characteristic and certified by KOHSA.

Cr(#6) compounds (Insoluble inorganic compounds)

You have to wear disposable respirators which fits physicochemical characteristic and certified by KOHSA.

(Cr(#6)compounds(water soluble Cr(#6)compounds(water soluble)

You have to wear disposable respirators which fits physicochemical characteristic and certified by KOHSA.

Cr(Metal)

You have to wear disposable respirators which fits physicochemical characteristic and certified by KOHSA.

Cr ore, processed goods (Cr acid)

You have to wear disposable respirators which fits physicochemical characteristic and certified by KOHSA.

Mo

You have to wear disposable respirators which fits physicochemical characteristic and certified by KOHSA.

You have to wear reusable respirators with properly type of filter when exposure concentration is low than 10mg/m³.

You have to wear loose-fitting motor operated respirators with hood/helmet type or continous flow disposable respirators when exposure concentration is low than 25mg/m³.

You have to wear loose-fitting motor operated respirators with hood/helmet type or continous flow disposable respirators when exposure concentration is low than 50mg/m³.

You have to wear reusable respirators with properly type of filter motor operatec respirators with hood/helmet when exposure concentration is low than 1,000mg/m³.

Cu

Cu(dust and mist)

You have to wear disposable respirators which fits physicochemical characteristic and certified by KOHSA.

You have to wear reusable respirators with properly type of filter when exposure concentration is low than 10mg/m³.

You have to wear loose-fitting motor operated respirators with hood/helmet type or continous flow disposable respirators when exposure concentration is

low than 25mg/m³.

You have to wear loose-fitting motor operated respirators with hood/helmet type or continuous flow disposable respirators when exposure concentration is low than 50mg/m³.

You have to wear reusable respirators with properly type of filter motor operated respirators with hood/helmet when exposure concentration is low than 1,000mg/m³.

You have to wear SCBA with properly type of filter or power & supplied air respirators(SCBA) when exposure concentration is low than 10,000mg/m³.

Cu(Fume)

You have to wear disposable respirators which fits physicochemical characteristic and certified by KOHSA.

You have to wear reusable respirators with properly type of filter when exposure concentration is low than 1mg/m³.

You have to wear loose-fitting motor operated respirators with hood/helmet type or continuous flow disposable respirators when exposure concentration is low than 2.5mg/m³.

You have to wear loose-fitting motor operated respirators with hood/helmet type or continuous flow disposable respirators when exposure concentration is low than 5mg/m³.

You have to wear reusable respirators with properly type of filter motor operated respirators with hood/helmet when exposure concentration is low than 1,00mg/m³.

You have to wear SCBA with properly type of filter or power & supplied air respirators(SCBA) when exposure concentration is low than 1,000mg/m³.

N

You have to wear disposable respirators which fits physicochemical characteristic and certified by KOHSA.

9. Physical and chemical properties

a. Appearance:

physical state	solid (liquid >2800°F)
color	Gray metallic

b. Odour: Odorless

c. Odour threshold: No Data

d. pH	No Data
e. Melting point/freezing point:	No Data
f. Initial boiling point and boiling range:	solid (liquid >2800°F)
g. Flash point :	No Data
h. Evaporation rate:	No Data
i. Flammability (solid, gas):	No Data
j. Upper/lower flammability or explosive limits:	No Data
k. Vapor pressure:	No Data
l. Solubility:	Insolubility
m. Vapor density:	No Data
n. Relative density:	7
o. Partition coefficient: n-octanol/water:	No Data
p. Auto-ignition temperature:	No Data
q. Decomposition temperature:	No Data
r. Viscosity:	No Data
s. Molecular mass:	No Data



10. Stability and reactivity

a. Chemical stability and possibility of hazardous reactions:

- C This is unstable at room temperature. It may ignite caused by friction, heat, spark and flame. It may ignite caused by powder, dust, chip, boring, lathe and cutting etc.
It may reignite after extinguish the fire.
Some of flammability/combustibility material may rapidly burn.
You could be severely burnt skin and eye when you contact molten metal.
It may cause simulated and toxic gas in a fire.
- Si Heating may explode the container. . It may ignite caused by friction, heat, spark and flame. It may reignite after extinguish the fire.
It explosively reacts with water
Some of material burn with blazing heat. Dust and fume may forms air and explosiveness mixture. It may cause simulated and toxic gas in a fire.
If you inhale or contact steam, material and decomposition product you may be caused seriously injured and death.
Oxide In Metal fire is seriously health warning.
It is generated toxic gas since it breaks down at high temperature.
- Mn It may cause fire and explosive since it explosively reacts polymerization reactions.
Heating may cause an explosion.
May catch fire by friction, heat, spark and flame.
It may reignite after extinguish the fire.
It explosively reacts with water
Some of material burn with blazing heat.
Dust and fume may forms air and explosiveness mixture.
If you inhale or contact steam, material and decomposition product you may be caused seriously injured and death.
It may cause fire and explosive since it explosively reacts polymerization reactions.
Heating may cause an explosion.
- P It is generated toxic gas since it breaks down at high temperature.
It may cause fire and explosive since it explosively reacts polymerization reactions.
It may ignite caused by friction, heat, spark and flame.
It may explode and explosively burn by powder, dust, chip, boring, lathe and

cutting

It may reignite after extinguish the fire.

Some of flammability/combustibility material may rapidly burn with flash.

You could be severely burnt skin and eye when you contact molten metal.

You could be severely burnt skin and eye.

S

It may cause simulated and toxic gas in a fire.

It may ignite caused by friction, heat, spark and flame.

It may explode and explosively burn by powder, dust, chip, boring, lathe and cutting.

It may reignite after extinguish the fire.

Some of flammability/combustibility material may rapidly burn with flash.

You could be severely burnt skin and eye when you contact molten metal.

Ni

You could be severely burnt skin and eye.

It may cause simulated and toxic gas in a fire.

Heating may explode the container.

It may ignite caused by friction, heat, spark and flame.

It explosively reacts with water.

It may reignite after extinguish the fire.

Some of material burn with blazing heat.

Dust and fume may forms air and explosiveness mixture.

If you inhale or contact steam, material and decomposition product you may be caused seriously injured and death.

Cr

Oxide cause serious health harmful in metal fire.

It is generated toxic gas since it breaks down at high temperature.

It may cause fire and explosive since it explosively reacts polymerization reactions.

Heating may explode the container.

It may ignite by frction, heat, spark, flame.

It may reignite after extinguish the fire.

It explosively reacts with water

Some of material burn with blazing heat.

Dust and fume may forms explosiveness mixture.

Mo

If you inhale or contact steam, material and decomposition product you may be caused seriously injured and death.

Flammability Solid

It is generated toxic gas since it breaks down at high temperature.
Material do not burn but it may generated Irritant,Toxic fume.
Some of material may burn but it doesn't easily burn.
Some of flammability/combustibility material may rapidly burn with flash.
Flammability/combustibility material
It may reignite after extinguish the fire.
It may ignite or explode by powder, dust, chip, boring, lathe and cutting etc.

Cu

Flammability Solid

It is generated toxic gas since it breaks down at high temperature.
If you inhale or contact steam, material and decomposition product you may be caused seriously injured and death.
Some of material burn with blazing heat. Dust and fume may forms air and explosiveness mixture.
Some of flammability/combustibility material may rapidly burn.
Heating may explode the container.
It may ignite by friction, heat, spark, flame.
It may reignite after extinguish the fire.
It explosively reacts with water
Some of material burn with blazing heat.

N

It may cause fire and explosive since it explosively reacts polymerization reactions.
Heating may explode the container.
It may ignite caused by friction, heat, spark and flame.
Included high-pressure gas ; Heating may explode
Heating may explode the container.

b. Conditions to avoid (e.g.static discharge, shock or vibration, etc):

C

Be generated friction, heat, spark and flame, powder, dust, chip, boring, lathe and cutting.

Si

Keep away from heat/sparks/open flames/hot surfaces. .No smoking.

Mn

Keep away from heat/sparks/open flames/hot surfaces. .No smoking.
Be generated friction, heat, spark and flame, powder, dust, chip, boring, lathe and cutting.

P	Keep away from heat/sparks/open flames/hot surfaces. .No smoking. Be generated friction, heat, spark and flame, powder, dust, chip, boring, lathe and cutting.
S	Keep away from heat/sparks/open flames/hot surfaces. .No smoking. Be generated friction, heat, spark and flame, powder, dust, chip, boring, lathe and cutting.
Ni	Keep away from heat/sparks/open flames/hot surfaces. .No smoking.
Cr	Keep away from heat/sparks/open flames/hot surfaces. .No smoking.
Mo	Generated powder, dust, chip, boring, lathe and cutting.friction, heat, spark and flame.
Cu	friction, heat, spark and flame Keep away from heat/sparks/open flames/hot surfaces. .No smoking.
N	Keep away from heat/sparks/open flames/hot surfaces. .No smoking.

c. Incompatible materials:

C	No Data
Si	Water
Mn	Water
P	No Data
S	No Data
Ni	Water
Cr	Water
Mo	Combustibility material, reducing material
Cu	Water
N	Heat

d. Hazardous decomposition products:

C	Irritant,Toxic gas
Si	It is generated very stimulating toxic gas by pyrolysis and combustion during burn.

Mn	Irritant, corrosive, Toxic gas
P	Irritant, Toxic gas
S	It is generated very stimulating toxic gas by pyrolysis and combustion during burn.
Ni	Irritant, corrosive, Toxic gas
Cr	It is generated very stimulating toxic gas by pyrolysis and combustion during burn.
Mo	Irritant/Toxic fume It is generated very stimulating toxic gas by pyrolysis and combustion during burn. Irritant, Toxic gas
Cu	Irritant, corrosive, Toxic gas
N	No data



11. Toxicological information

a. Information on the likely routes of exposure:

C	No data
Si	No data
Mn	Stimulation ,hypothermy or pyrexy, sicchasia, vomit,diarrhea,headache.
P	Cause pulmonary congestion. Information of Have no side effects
S	Respiration tract stimulation, difficulty with breathing simulation , eye stimulation ,eye damage
Ni	No data
Cr	No data
Mo	May cause simulation.
Cu	No data
N	No data

b. Health hazards information

Acute toxic:

Oral

C	respiration tract LD50 10,000 mg/kg Rat ※ Source: International Uniform Chemical Informal Database(IUCLID)(http://ecb.jrc.it/esis)
Si	LD50 3,160 mg/kg Rat ※ Source: IUCLID, NLM, TOMES
Mn	LD50 9,000 mg/kg Rat ※ Source: 3
P	LD50 11.5 mg/kg Rat
S	LD50 5000 mg/kg Rat
Ni	No data
Cr	No data
Mo	No data
Cu	No data
N	No data

Percutaneous

C	No data
Si	No data
Mn	No data
P	LD50 100 mg/kg Rat Guinea pig
S	LD50 2000 mg/kg Rat
Ni	No data
Cr	No data
Mo	No data
Cu	No data
N	No data

Inhalation

C	Steam LC50>64.4 mg/l Rat
Si	(Hamster/8mg/m3/No effects) ※Source: IUCLID
Mn	No data
P	No data
S	No data
Ni	No data
Cr	No data
Mo	No data
Cu	No data
N	No data

Skin corrosive/ irritant:

C	No data
Si	No data
Mn	Stimulation (Rabbit)
P	Non-Stimulation ((Rabbit)
S	No data
Ni	No data
Cr	No data
Mo	No data
Cu	No data
N	No data

Serious eye damage/eye irritation:.

C	No data
Si	Rabbit / Low Stimulation ※Source: IUCLID
Mn	Rabbit eytex assay result : Low stimulation
P	No data
S	No data
Ni	No data
Cr	Be able to stimulation
Mo	No data
Cu	No data
N	Skin, Eye and respiratory Irritation: Contact with liquid may cause frostbite & severe skin burns. /Nitrogen, refrigerated liquid

Respiratory sensitization:

C	No data
Si	No data
Mn	No data
P	No data
S	No data
Ni	An asthma attack ※Source:HSDB
Cr	Metial of Respiratory organ and Hypersensitive.
Mo	No data
Cu	No data
N	No data

Skin sensitization:

C	Skin cause hypersensitiveness
Si	No data

Mn	No data
P	No data
S	No data
Ni	Skin cause hypersensitiveness
Cr	If chromous ion which chrome, chromium alloy, chromium plating is liquated by moisture be exposure, It is able to cause skin hypersensitiveness. Be able to Skin cause hypersensitiveness
Mo	No data
Cu	No data
N	No data

Carcinogenicity:

C	Industrial Safety and Health Low No Data
Si	Notic of Ministry of Employment and Labor No Data
Mn	IARC No Data
P	OSHA No Data
S	ACGIH No Data NPT No Data EU CLP No Data
Ni	Industrial Safety and Health Low No Data Notic of Ministry of Employment and Labor 2 IARC Group 2B (Nickel, metallic and alloys) OSHA No Data ACGIH A5 NPT R EU CLP Carc.2
Cr	Industrial Safety and Health Low No Data Notic of Ministry of Employment and Labor (1A : chromium ore,finishing product(chromium acid)) IARC Group 3 (Chromium, metallic) OSHA No Data ACGIH A4 (1A : : chromium ore,finishing product(chromium acid)) NPT No Data EU CLP No Data
Mo	NPT No Data
Cu	No data
N	EU CLP No Data

Germ Cell Mutagenicity

C	No data
Si	No data
Mn	No data
P	No data
S	No data
Ni	No data
Cr	Chromosome aberration test of white rat
Mo	No data
Cu	No data
N	No data

Specific target organ toxicity(single exposure)

C	This dust creates low stimulation for lung.
Si	No data
Mn	Pneumonia(4)
P	No data
S	No data
Ni	Respiratory organ or Kidney
Cr	Metal fume heat.
Mo	Simulate respiratory tract.
Cu	Fumes can irritate Upper respiratory
N	Liquid may cause frostbite.

Specific target organ toxicity (repeated exposure):

C	No data
Si	No data
Mn	Effect for Respiratory organ or nervous system (4)
P	No data
S	No data
Ni	Respiratory organ (asthma, pulmonary fibrosis)
Cr	No data
Mo	No data
Cu	Liver damage
N	No data

Aspiration hazard:

C	No data
Si	No data

Mn	No data
P	No data
S	No data
Ni	No data
Cr	No data
Mo	No data
Cu	No data
N	No data

12. Ecological information

a. Aquatic and terrestrial ecotoxicity:

Fishes

C	No Data
Si	LC50 573.511 mg/l 96 hr
Mn	LC50 > 50 mg/l 96 hr
P	LC50 0.006 mg/l 96 hr
S	LC50 866 mg/l 96 hr <i>Brachydanio rerio</i>
Ni	No Data
Cr	No Data
Mo	LC50 800 mg/l 96 hr
Cu	LC 50 0.37 mg/l 96hr
N	No Data

Crustacean

C	No Data
Si	LC50 555.190 mg/l 48 hr
Mn	No Data
P	EC50 0.03 mg/l 48 hr
S	EC50 ≥ 5000 mg/l 48 hr <i>Daphnia magna</i>
Ni	No Data
Cr	No Data
Mo	No Data
Cu	EC50 0.0318 mg/l 48hr
N	No Data

Birds

C	No Data
Si	LC50 318.927 mg/l 96 hr

Mn	No Data
P	No Data
S	No Data
Ni	No Data
Cr	No Data
Mo	No Data
Cu	LC50 0.092 mg/l 15hr
N	No Data

b. Persistence and degradability:

Persistence

C	log Kow 0.78
Si	log Kow -1.50
Mn	No Data
P	No Data
S	log Kow 0.23 (estimate)
Ni	No Data
Cr	No Data
Mo	log Kow 0.23 (estimate)
Cu	log Kow -0.57 (estimate)
N	Lot Kow 0.67

Degradability

C	(BOD5 ca. 2mgO2/l , COD 2000mg/g)
Si	No Data
Mn	No Data
P	No Data
S	No Data
Ni	No Data
Cr	No Data
Mo	No Data
Cu	No Data
N	No Data

c. Bioaccumulative potential:

Accumulation

C	BCF 1.378
Si	No Data
Mn	No Data

P	BCF 281000
S	No Data
Ni	No Data
Cr	No Data
Mo	No Data
Cu	BCF 5830
N	BCF 5830

Biodegradable

C	No Data
Si	No Data
Mn	No Data
P	No Data
S	No Data
Ni	No Data
Cr	logKow = 0.23 (3)
Mo	No Data
Cu	No Data
N	No Data

d. Mobility in soil:

C	No Data
Si	No Data
Mn	No Data
P	No Data
S	No Data
Ni	No Data
Cr	logKow = 0.23 (3)
Mo	No Data
Cu	No Data
N	No Data

e. Other adverse effects:

C	No Data
Si	No Data
Mn	No Data
P	No Data
S	No Data
Ni	No Data



Cr	No Data
Mo	No Data
Cu	No Data
N	No Data

13. Disposal considerations

a. Disposal method:

C	Dispose of contents/container to specified contents in Wastes Control Act.
Si	Dispose of contents/container to specified contents in Wastes Control Act.
Mn	Dispose of contents/container to specified contents in Wastes Control Act.
P	Dispose of contents/container to specified contents in Wastes Control Act.
S	<ol style="list-style-type: none"> 1) Handle way of cohesion, precipitation, filter, dehydration after handle way with reaction of neutralization, oxidation, deoxidation 2) Handle way of evaporation, enrichment 3) Handle refinement with separation, distillation, extraction, filter 4) Reclaim that do not caused trouble to performance of Geosynthetic-soil Interface and leachate disposal facilities in reclamation facility.
Ni	Dispose of contents/container to specified contents in Wastes Control Act.
Cr	Dispose of contents/container to specified contents in Wastes Control Act.
Mo	Dispose of contents/container to specified contents in Wastes Control Act.
Cu	Dispose of contents/container to specified contents in Wastes Control Act.
N	Dispose of contents/container to specified contents in Wastes Control Act.

b. Disposal precaution

C	Dispose of contents/container to specified contents in relevant regulations .
Si	Dispose of contents/container to specified contents in relevant regulations .
Mn	Dispose of contents/container to specified contents in relevant regulations .
P	Dispose of contents/container to specified contents in relevant regulations .
S	Dispose of contents/container to specified contents in relevant regulations .

Ni	Dispose of contents/container to specified contents in relevant regulations .
Cr	Dispose of contents/container to specified contents in relevant regulations .
Mo	Dispose of contents/container to specified contents in relevant regulations .
Cu	Dispose of contents/container to specified contents in relevant regulations .
N	Dispose of contents/container to specified contents in relevant regulations .

14. Transport information

a. UN number:

C	1362
Si	1346
Mn	3089
P	1338
S	1350
Ni	3089
Cr	3089
Mo	3089
Cu	3089
N	1066

b. UN proper shipping name:

C	CARBON, ACTIVATED
Si	SILICON POWDER, AMORPHOUS
Mn	METAL POWDER, FLAMMABLE, N.O.S.
P	PHOSPHORUS, AMORPHOUS
S	SULPHUR
Ni	METAL POWDER,FLAMMABLE, N.O.S.
Cr	METAL POWDER,FLAMMABLE, N.O.S.
Mo	METAL POWDER,FLAMMABLE, N.O.S.
Cu	METAL POWDER,FLAMMABLE, N.O.S.
N	NITROGEN, COMPRESSED

c. Transport hazard class:

C	4
Si	4
Mn	4
P	4
S	4
Ni	4

Cr	4
Mo	4
Cu	4
N	2

d. Packing group

C	3
Si	3
Mn	2
P	3
S	3
Ni	2
Cr	2
Mo	2
Cu	2
N	2

e. Marine pollution (yes/no):

C	Not Applicable
Si	Not Applicable
Mn	Not Applicable
P	Not Applicable
S	Not Applicable
Ni	Not Applicable
Cr	Not Applicable
Mo	Not Applicable
Cu	Applicable
N	Not Applicable

f. Special precaution which a user to transport or conveyance either within or outside their premises:

be aware of or needs to comply with in connection with

In case of fire emergency

C	F-A
Si	F-A
Mn	F-G
P	F-A
S	F-A
Ni	F-G
Cr	F-G

Mo	F-G
Cu	F-G
N	F-C

Emergency procedure in spill

C	S-J
Si	S-G
Mn	S-G
P	S-G
S	S-G
Ni	S-G
Cr	S-G
Mo	S-G
Cu	S-G
N	S-G

15. Regulatory information

a. Industrial Safety and Health Act:

C	Material of Working Environment Measurement(measuring period:Months 6) Material of Exposure Criteria set-up
Si	Material of Working Environment Measurement(measuring period:Months 6) Material of Exposure Criteria set-up
Mn	Material of Working Environment Measurement(measuring period:Months 6) Material of Special Health Check target(check period: Montha 12) Material of Exposure Criteria set-up Material of Management target Toxic
P	Material of Working Environment Measurement(measuring period:Months 6) Material of Exposure Criteria set-up
S	Material of Working Environment Measurement(measuring period:Months 6) Material of Exposure Criteria set-up
Ni	Material of Working Environment Measurement(measuring period:Months 6) Material of Special Health Check target (check peiod: Montha 12) Material of Permission target

Material of Exposure Criteria set-up
Material of Criteria of Permission set-up
Material of Management target Toxic

Cr Material of Working Environment Measurement(measuring period:Months 6)
Material of Special Health Cheek (check peiod: Montha 12)
Material of Exposure Criteria set-up
Material of Criteria of Permission set-up
Material of Management target Toxic

Mo Material of Exposure Criteria set-up

Cu Material of Working Environment Measurement(measuring period:Months 6)
Material of Management target Toxic
Material of Special Health Cheek (check peiod: Montha 12)
Material of Exposure Criteria set-up

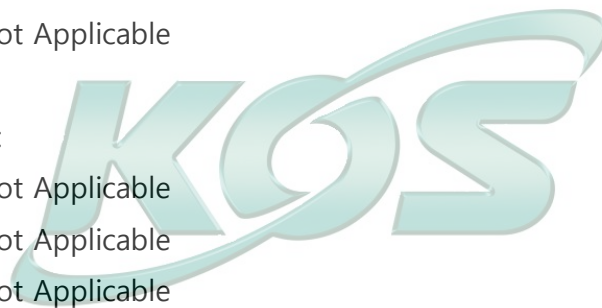
N Not Applicable

b. Toxic Chemical Control Act:

C Not Applicable
Si Not Applicable
Mn Not Applicable
P Not Applicable
S Not Applicable
Ni Not Applicable
Cr Not Applicable
Mo Not Applicable
Cu Not Applicable
N Not Applicable

c. Dangerous Material Safety Control Act:

C Not Applicable
Si #2 Metallic 500 kg
Mn Not Applicable
P Not Applicable
S #3 white phosphorus 20 kg
Ni Not Applicable
Cr Not Applicable



Mo	Not Applicable
Cu	Not Applicable
N	Not Applicable

d. Wastes Management Act:

C	specified waste
Si	specified waste
Mn	Not Applicable
P	Not Applicable
S	specified waste
Ni	Not Applicable
Cr	Not Applicable
Mo	specified waste
Cu	specified waste
N	Not Applicable

e. Other requirements in domestic and other countries:

regulation of Domestic

Persistent organic pollutant management Act:

C	Not Applicable
Si	Not Applicable
Mn	Not Applicable
P	Not Applicable
S	Not Applicable
Ni	Not Applicable
Cr	Not Applicable
Mo	Not Applicable
Cu	Not Applicable
N	Not Applicable

Regulation of foreign

American's Management Information(OSHA Regulation))

C	Not Applicable
Si	Not Applicable
Mn	Not Applicable
P	Not Applicable

S	Not Applicable
Ni	Not Applicable
Cr	Not Applicable
Mo	Not Applicable
Cu	Not Applicable
N	Not Applicable

American's Management Information (CERCLA Reg')

C	Not Applicable
Si	Not Applicable
Mn	Not Applicable
P	0.453599 kg 1 lb
S	Not Applicable
Ni	45.3599 kg 100 lb
Cr	2267.995 kg 5000 lb
Mo	2267.995 kg 5000 lb
Cu	2267.995 kg 5000 lb
N	Not Applicable

American's Management Information (EPCRA 302 Reg')

C	Not Applicable
Si	Not Applicable
Mn	Not Applicable
P	45.3599 kg 100 lb
S	Not Applicable
Ni	Not Applicable
Cr	Not Applicable
Mo	Not Applicable
Cu	Not Applicable
N	Not Applicable

American's Management Information (EPCRA 304 Reg')

C	Not Applicable
Si	Not Applicable
Mn	Not Applicable
P	0.453599 kg 1 lb
S	Not Applicable
Ni	Not Applicable
Cr	Not Applicable

Mo	Not Applicable
Cu	Not Applicable
N	Not Applicable

American's Management Information (EPCRA 313 Reg')

C	Not Applicable
Si	Not Applicable
Mn	Not Applicable
P	Not Applicable
S	Not Applicable
Ni	Not Applicable
Cr	Not Applicable
Mo	Not Applicable
Cu	Applicable
N	Not Applicable

American's Management Information (Material of Rotterdam Agreement)

C	Not Applicable
Si	Not Applicable
Mn	Not Applicable
P	Not Applicable
S	Not Applicable
Ni	Not Applicable
Cr	Not Applicable
Mo	Not Applicable
Cu	Not Applicable
N	Not Applicable



American's Management Information (Material of Stockholm Agreement)

C	Not Applicable
Si	Not Applicable
Mn	Not Applicable
P	Not Applicable
S	Not Applicable
Ni	Not Applicable
Cr	Not Applicable
Mo	Not Applicable
Cu	Not Applicable
N	Not Applicable

American's Management Information (Material of Montreal Protoco)

C	Not Applicable
Si	Not Applicable
Mn	Not Applicable
P	Not Applicable
S	Not Applicable
Ni	Not Applicable
Cr	Not Applicable
Mo	Not Applicable
Cu	Not Applicable
N	Not Applicable

EU Classification information(Decide Classification Result)

C	Not Applicable
Si	Not Applicable
Mn	Not Applicable
P	Not Applicable
S	Not Applicable
Ni	Carc. Cat. 3; R40R43
Cr	Not Applicable
Mo	Not Applicable
Cu	Not Applicable
N	Not Applicable

EU Classification information (Hazard Statement)

C	Not Applicable
Si	Not Applicable
Mn	Not Applicable
P	Not Applicable
S	Not Applicable
Ni	R40, R43
Cr	Not Applicable
Mo	Not Applicable
Cu	Not Applicable
N	Not Applicable

EU Classification information (Safety Statment)

C	Not Applicable
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Si	Not Applicable
Mn	Not Applicable
P	Not Applicable
S	Not Applicable
Ni	S2, S22, S36
Cr	Not Applicable
Mo	Not Applicable
Cu	Not Applicable
N	Not Applicable

16. Other information

a. Information source and references This MSDS is compiled by the provisions of Korea's Occupational Safety & Health Agency.

b. Issuing date: Feb. 4. 2014

c. Revision number and date: 0

Revision number:

Revision data of Final:

d. others:

- Writing : : KOS Ltd. Quality Assurance Team
- Review of Technical:

