

SAFETY DATA SHEET

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

1. Information about product and manufacturer

- a) Product name: 631J1
- b) Recommended use of the chemical and restrictions on use:
Recommended use of the Chemical: No Data
Restrictions on use of the Product: No Data
- c) Manufacturer/Supplier/Distributor Information
Name: DSR CORP
Address: 75 Chonamgongdan-gil, Gwangyang-eup, Gwangyang-si, Jeonnam
Korea 545-801
Emergency: Quality Management Team
Phone Number: JaeBom Joo Tel 82 61 762 8351

2. Hazards identification

- a) Hazard. Risk Classification: 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: H360 May damage fertility or the unborn child.
Statement: 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.

P309+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 Data

Fire No Data

Reactivity No Data



Cr

Health	1
Fire	3
Reactivity	0

Al

Health	0
Fire	3
Reactivity	1

Fe

Health	1
Fire	3
Reactivity	0

3. Composition/Information on ingredients

Chemical Name	Other Name	CAS Number	Content(%)
C	ACTIVATED CARBON	7440-44-0	0.9Max
Si	SILICON POWDER,AMORPHOUS	7440-21-3	1.0Max
Mn	COLLOIDAL MANGANESE	7439-96-5	1.0Max
P	RED PHOSPHOROUS	7723-14-0	0.04Max
S	SULPHUR	7704-34-9	0.03Max
Ni	NICKEL	7440-02-0	7.0~8.5
Cr	CHROME	7440-47-3	16.0~18.0
Al	ALUMINUM METAL	7429-90-5	0.75~1.5
Fe	IRON	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
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 this 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 ignite

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 has to appropriate protector.

Si Keep safe distance and extinguish the fire.

Mn Be careful some of will be delivered liquid condition.

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

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

Ni

Cr

Al

Fe

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 damaged 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 precautions and protective procedures:

Flow in waterway, drain, basement or closed space.

c) Methods and materials for containment and cleaning up:

You absorb the spilled 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 remains 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/m³ Total Dust: #2

Si TWA – 10mg/m³

Mn TWA – 1mg/m³ Mn and inorganic compounds

TWA – 1mg/m³ STEL- 3mg/m³ Fume

- P TWA – 0.1mg/m³, P(yellow)
- S No Data
- Ni TWA – 0.1mg/m³ Ni (soluble compounds)
TWA – 1mg/m³ Ni (Metal)
TWA – 0.5mg/m³ Ni (insoluble inorganic compounds),
TWA – 1mg/m³ Mn and inorganic compounds
TWA – 1mg/m³ STEL – 3mg/m³ Fume
- Cr TWA-0.5mg/m³ Cr(#2) compounds
TWA-0.5mg/m³ Cr(#3) compounds
TWA-0.01mg/m³ Cr(#6) compounds(insoluble inorganic compounds),
TWA-0.05mg/m³ Cr(#6) compounds(water soluble Cr(#6)compounds(water soluble)
TWA-0.5mg/m³ Cr(Metal)
TWA-0.5mg/m³ Cr ore, processed goods (Cr acid)

- Al TWA-2mg/m³ Aluminum
TWA-10mg/m³ Aluminum(Soluble compounds)
TWA-2mg/m³ Aluminum(Alkil)
TWA-5mg/m³ Aluminum(Fume)
TWA-5mg/m³ Aluminum(Powder)

Fe No Data

ACGIH Regular

- C No Data
- Si No Data
- Mn TWA 0.2mg/m³
- P No Data
- S No Data
- Ni TWA 0.1mg/m³ (soluble inorganic compounds)
TWA 0.2mg/m³ (insoluble inorganic compounds)
- Cr TWA 0.5mg/m³
- Al TWA 1mg/m³ (Aluminum metal)
- Fe No Data

Biological exposure Criteria

- C No Data
- Si No Data
- Mn No Data



P	No Data
S	No Data
Ni	No Data
Cr	No Data
Al	No Data
Fe	No Data

b) Appropriate engineering controls:

Use process isolation, ventilation or another engineering management to lower level 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 continuous 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 continuous 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 continuous 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 continuous flow disposable respirators when exposure concentration is low than 500mg/m³.

You have to wear reusable respirators with properly type of filter motor operated 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 continuous 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.

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 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 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

Al (availability salt)

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 20mg/m³.

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

You have to wear loose-fitting motor operated respirators with hood/helmet type of continuous flow disposable respirators when exposure concentration is lower than 100mg/m³.

You have to wear loose-fitting motor operated respirators with hood/helmet type of continuous flow disposable respirators when exposure concentration is lower than 2000mg/m³.

You have to wear SCBA with properly type of filter or power & supplied air respirators (SCBA) when exposure concentration is low than 20000mg/m³(metal 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 100mg/m³.

Fe 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) Odor:	Odorless
c) Odor 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:	7.4
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	<p>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.</p> <p>It may reignite after extinguish the fire.</p> <p>Some of flammability/combustibility material may rapidly burn.</p> <p>You could be severely burnt skin and eye when you contact molten metal.</p> <p>It may cause simulated and toxic gas in a fire.</p>
Si	<p>Heating may explode the container. It may ignite caused by friction, heat, spark and flame. It may reignite after extinguish the fire.</p> <p>It explosively reacts with water</p> <p>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.</p> <p>If you inhale or contact steam, material and decomposition product you may</p>

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

	<p>It may ignite caused by friction, heat, spark and flame.</p> <p>It explosively reacts with water.</p> <p>It may reignite after extinguish the fire</p> <p>Some of material burn with blazing heat.</p> <p>Dust and fume may forms air and explosiveness mixture.</p> <p>If you inhale or contact steam, material and decomposition product you may be caused seriously injured and death.</p>
Cr	<p>Oxide cause serious health harmful in metal fire.</p> <p>It is generated toxic gas since it breaks down at high temperature.</p> <p>It may cause fire and explosive since it explosively reacts polymerization reactions</p> <p>Heating may explode the container.</p> <p>It may ignite caused by friction, heat, spark, flame.</p> <p>It may reignite after extinguish the fire.</p> <p>It explosively reacts with water.</p> <p>Some of material burn with blazing heat</p> <p>Dust and fume forms explosiveness.</p> <p>If you inhale or contact steam, material and decomposition product you may be caused seriously injured and death.</p>
Al	<p>When contact water, it can create flammable gas.</p> <p>It may reignite after extinguish the fire.</p> <p>It may ignite caused by friction, heat, spark and flame.</p> <p>It explosively reacts with water.</p> <p>When contact water and moisture it can ignite.</p> <p>If you inhale or contact steam, Material and decomposition product you may be caused seriously injured and death</p> <p>When contact water, it can create corrosive solution.</p>
Fe	<p>It may cause fire and explosive since it explosively reacts polymerization reactions</p> <p>Heating may explode the container.</p> <p>It may ignite caused by friction, heat, spark, flame.</p> <p>It may reignite after extinguish the fire.</p> <p>It explosively reacts with water.</p> <p>Some of material burn with blazing heat</p> <p>Dust and fume may forms explosiveness.</p> <p>If you inhale or contact steam, material and decomposition product you may</p>

be caused seriously injured and death.

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
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	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.
Al	Keep away from heat/sparks/open flames/hot surfaces.
Fe	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
Al	Water
Fe	Water

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.
Al	Irritant, corrosive, Toxic gas
Fe	It is generated very stimulating toxic gas by pyrolysis and combustion during burn.

11. Toxicological information

a) Information on the likely routes of exposure:

C	No Data
Si	No Data
Mn	Stimulation, hypothermy or pyrexia, sicchasia, vomit, diarrhea, headache.
P	Cause pulmonary congestion, Information of Have no side effects
S	Respiration tract stimulation, difficulty with breathing stimulation, eye stimulation, eye damage
Ni	No Data
Cr	No Data
Al	It can absorb by inhale
Fe	No Data

b) Health hazards information

Acute toxic:

Oral

	respiration tract
C	LD50 10,000 mg/kg Rat ※ Source: International Uniform Chemical Information 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 5,000 mg/kg Rat
Ni	No Data
Cr	No Data
Al	No Data
Fe	LD50 984 mg/kg Rat ※ Source: IUCLID

Percutaneous

C	No Data
Si	No Data
Mn	No Data
P	LD50 100 mg/kg Rat Guinea pig
S	LD50 2,000 mg/kg Rat
Ni	No Data
Cr	No Data
Al	No Data
Fe	LD50 2000 mg/kg Rat Guinea pig

Inhalation

C	Steam LC50>64.4mg/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
Al	No Data
Fe	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
Al	No Data
Fe	Rabbit/Low Stimulation ※ Source: IUCLID

Serious eye damage/eye irritation:

C	No Data
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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
Al	No Data
Fe	Rabbit/Low Stimulation ※ Source: IUCLID

Respiratory sensitization:

C	No Data
Si	No Data
Mn	No Data
P	No Data
S	No Data
Ni	An asthma attack ※ Source: HSDB
Cr	Material of Respiratory organ and Hypersensitive.
Al	No Data
Fe	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
Al	No Data
Fe	No Data

Carcinogenicity:

C	Industrial Safety and Health Low	No Data
Si	Notice 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
	Notice 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
	Notice 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
Al	ACGIH A4(Aluminium insoluble compounds)	No Data
Fe		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
Al	No Data
Fe	No Data

Specific target organ toxicity(single exposure)

C	This dust creates law stimulation for lung.
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Si	No Data
Mn	Pneumonia(4)
P	No Data
S	No Data
Ni	Respiratory organ or Kidney
Cr	Metal fume heat.
Al	No Data
Fe	No Data

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
Al	Damage lung, mervous system
Fe	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
Al	No Data
Fe	No Data

12. Ecological information

a) Aquatic and terrestrial ecotoxicity:

Fishes

C	No Data
Si	LC50 573.511 mg/l 96hr

Mn	LC50 > 50 mg/l 96hr
P	LC50 0.006 mg/l 96hr
S	LC50 866 mg/l 96hr Brachydanio rerio
Ni	No Data
Cr	No Data
Al	No Data
Fe	LC50 13.6 mg/l 96 hr

Crustacean

C	No Data
Si	LC50 555.190 mg/l 48hr
Mn	No Data
P	EC50 0.03 mg/l 48hr
S	EC50 ≥ 5000 mg/l 48hr Daphnia magna
Ni	No Data
Cr	No Data
Al	No Data
Fe	No Data

Birds

C	No Data
Si	LC50 318.927 mg/l 96hr
Mn	No Data
P	No Data
S	No Data
Ni	No Data
Cr	No Data
Al	No Data
Fe	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(estimation)
Ni	No Data
Cr	No Data
Al	log Kow No Data
Fe	No Data

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
Al	No Data
Fe	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
Al	No Data
Fe	No Data

Biodegradable

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

Cr	log Kow = 0.23(3)
Al	No Data
Fe	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	log Kow = 0.23(3)
Al	No Data
Fe	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
Al	No Data
Fe	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	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.

	Dispose of contents/container to specified contents in Wastes Control Act.
Ni	Dispose of contents/container to specified contents in Wastes Control Act.
Cr	Dispose of contents/container to specified contents in Wastes Control Act.
Al	Dispose of contents/container to specified contents in Wastes Control Act.
Fe	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.
Al	Dispose of contents/container to specified contents in relevant regulations.
Fe	Dispose of contents/container to specified contents in relevant regulations.

14. Transport information

a) UN unnumber :

C	1362
Si	1346
Mn	3089
P	1338
S	1350
Ni	3089
Cr	3089
Al	1396
Fe	3089

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
Al	ALUMINUM POWDER, UNCOATED
Fe	METAL POWDER, FLAMMABLE, N.O.S

c) Transport hazard class:

C	4.2
Si	4.1
Mn	4.1
P	4.1
S	4.1
Ni	4.1
Cr	4.1
Al	4.3
Fe	4

d) Packing group

C	2
Si	3
Mn	3
P	2
S	3
Ni	3
Cr	2
Al	2
Fe	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

Al	Applicable
Fe	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

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

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
Al	S-O
Fe	S-G



15. Regulatory information

a) Industrial Safety and Health Act:

C	Material of Working Environment Measurement(measuring period:Months6) Material of Exposure Criteria set-up
Si	Material of Working Environment Measurement(measuring period:Months6) Material of Exposure Criteria set-up
Mn	Material of Working Environment Measurement(measuring period:Months6) Material of Special Health Cheek target(check period :Month 12)

P	Material of Exposure Criteria set-up Material of Management target Toxic
S	Material of Working Environment Measurement(measuring period:Months6) Material of Exposure Criteria set-up
Ni	Material of Working Environment Measurement(measuring period:Months6) Material of Exposure Criteria set-up Material of Working Environment Measurement(measuring period:Months6) Material of Special Health Check target(check period :Month 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:Months6) Material of Special Health Check (check period :Month 12) Material of Exposure Criteria set-up Material of Criteria of Permission set-up Material of Management target Toxic
Al	Material of Management target Toxic Material of Special Health Check(Check period: Month 12) Material of Working Environment Measurement(measuring period:Month 6) Material of Exposure Criteria set-up
Fe	Material of Working Environment Measurement(measuring period:Months6)

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
Al	Not Applicable

Fe 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 20kg
Ni	Not Applicable
Cr	Not Applicable
Al	Not Applicable
Fe	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
Al	Not Applicable
Fe	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
Al	Not Applicable



Fe 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
Al	Not Applicable
Fe	Not Applicable

American's Management Information (CERCLA Reg')

C	Not Applicable
Si	Not Applicable
Mn	Not Applicable
P	0.453599 kg 1lb
S	Not Applicable
Ni	45.3599 kg 100 lb
Cr	2267.995 kg 5000lb
Al	Not Applicable
Fe	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
Al	Not Applicable
Fe	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
Al	Not Applicable
Fe	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
Al	Not Applicable
Fe	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
Al	Not Applicable
Fe	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
Al	Not Applicable
Fe	Not Applicable

American's Management Information (Material of Montreal Protocol)

C	Not Applicable
Si	Not Applicable
Mn	Not Applicable
P	Not Applicable
S	Not Applicable
Ni	Not Applicable
Cr	Not Applicable
Al	Not Applicable
Fe	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
Al	Not Applicable
Fe	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
Al	R15, R17
Fe	Not Applicable

EU Classification information (Safety Statement)

C	Not Applicable
Si	Not Applicable
Mn	Not Applicable
P	Not Applicable
S	Not Applicable
Ni	S2, S22, S36
Cr	Not Applicable
Al	S2, S7/8, S43
Fe	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: 11-11-2013

c) Revision number and date: 22-06-2015

Revision number: 2

Revision data of Final:

d) Others:

-Writing DSR COPR Quality Management Team.(JaeBom Joo)

-Review of Technical: -