Material Safety Data Sheet

[This sheet was made by Industrial Safety and Health Act, Article 41, in Korea]

Hot Dip Aluminum Coated Steel Sheet(ALCOT)

1. Chemical Product and Company Identification

A. Product Name : Hot Dip Aluminum Coated Steel Sheet(ALCOT)

B. Recommended Use of Product and restrictions on use

- Recommended Use of Product : Home appliance, Furniture, Car etc.
- restrictions on use : N/A

C. Manufacturer / Supplier / Distributor Information

- Name: KG Steel
- Address : 1228, Bukbusaneom-ro, Songak-Eup, Dangjin-Si, Chungnam province, 343-823, Korea
- Emergency phone number : +82-41-351-8527 / +82-41-351-8115

2. Hazards Identification

A. Hazard. Risk Classification

Reproductive toxicity : Classification 1B

Chronic aquatic environment hazard : Classification 2

B. Label elements including precautionary statements

Symbol

Signal Word : Hazards

Hazard-Risk Statement

H360 May damage fertility or the unborn child

H411 Toxic to aquatic life with long lasting effects

Precautionary Statement

Prevention

P201 Obtain special instructions before use

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

P273 Avoid release to the environment

Response:

P280 Wear protective gloves/protective clothing/eye protection/ face protection/hearing protection/...

P308+P313 If exposed or concerned : Call a poison center/ doctor/...

P391 Collect spillage

Storage

P405 Store locked up

Disuse

P501 Dispose of contents/container

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

Aluminum

Health : 0 Fire : N/A Reaction : 1

Manganese

Health : 0 Fire : N/A Reaction : 1

Iron

Health : 2 Fire : N/A Reaction : N/A

3. Composition/Information on ingredients

Name	Other name	CAS No	Percentage
Aluminum	Aluminium	7429-90-5	Max 1.2%
Manganese	Mangan	7439-96-5	Max 1%
Iron	Ferrium	7439-89-6	Max 97.4%

※ Please refer to the MSDS of iron

※ C, Si and Ti may be added in minor amounts during manufacturing

※ This product is solid finished product. There is no possibility of exposure to chemicals contained in the product. It may be partially exposed in the melting state such as cutting, melting etc.

4. First aid measures

A. Eye contact

Rinse cautiously with water for several minutes

Get medical advice/attention

B. Skin contact

Get medical advice/attention

Remove contaminated clothing and shoes and isolate contaminated areas

Wash skin and eyes with running water for more than 20 minutes

Avoid dispersal of contaminants

C. Inhalation

If exposed or concerned, Get medical advice/attention

Remove person to fresh air

Make it warm and stable

D. Ingestion

If exposed or concerned, call a doctor

Do not use artificial respiration with mouth-to-mouth method and use appropriate respiratory medical equipment

E. Doctor's notes

Contact medical staff and take special first aid measures such as follow-up surveillance

Have the medical personnel know about the material and take protective measures.

5. Fire-Fighting measures

A. Suitable (and unsuitable) extinguishing media

Use alcohol foam, carbon dioxide or water spray

Use dry sand or soil for extinguishment by smothering

B. Specific hazards arising from the chemical

Can generate toxic gas by decomposing at high temperature.

Some can burn, but not easily ignite

Non-flammable materials do not burn, but can generate corrosive/toxic fumes by decomposing at high temperatures.

C. Special protective equipment and precautions for fire-fighters

Aluminum

Escape the area and extinguish the fire by maintaining a safe distance

Extinguish the fire at maximum distance or use unmanned fire fighting equipment

Manganese

Rescuers should wear appropriate protectice equipment

Escape the area and extinguish the fire at a safe distance

Move container from fir area if it is not hazardous

If it is impossible to extinguish the fire, protect the surroundings and let the fire extinguish itself

Iron

Move container from fir area if it is not hazardous

If it is impossible to extinguish the fire, protect the surroundings and let the fire extinguish itself

6. Accidental release measures

A. Personal precautions, protective equipment and emergency procedures

Isolate contaminated areas

Do not enter if you do not need to enter or do not have protective equipment

Remove all ignition sources

Do not touch a damaged container or spill without adequate protection

Cover with plastic sheet to prevent spreading

Avoid dust formation

Note the substances and conditions to avoid

B. Environmental precautions and protective procedures

Do not discharge into the environment

Prevent entry into waterways and sewers

C. Methods and materials for containment and cleaning up

Collect the spills.

In case of powder leakage, cover with plastic sheet to prevent spreading and keep dry

7. Handling and storage

A. Precautions for safe handling

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

Handle / store carefully

Do not breathe vapors from heated material

Do not go into storage area, if there is no adequate ventilation

Note the substances and conditons to avoid

Be careful of high temperatures

B. Conditions for safe storage

Store in lockable storage area

8. Exposure controls & personal protection

A. Control parameters

Domestic regulations

Aluminum

TWA : 2㎎/㎥ Aluminium (Soluble salt)

TWA : 10㎎/㎥ Aluminium (metal dust)

TWA : 2㎎/㎥ Aluminium (alkyl)

TWA : 5㎎/㎥ Aluminium (welding fume)

TWA : 5㎎/㎥ Aluminium (Pyro powder)

Manganese

TWA : 1㎎/㎥ Manganese and inorganic compounds

TWA : 3㎎/㎥ Manganese(fume)

Iron

TWA : 1㎎/㎥

ACGIH

Aluminum

TWA 1 ㎎/㎥

Manganese

TWA 0.02 ㎎/㎥ Manganese and inorganic compounds (Respirable dust)

TWA 0.02 ㎎/㎥ Manganese(fume) (Respirable dust)

TWA 0.1 ㎎/㎥ Manganese and inorganic compounds (Inhalable dust)

TWA 0.1 ㎎/㎥ Manganese(fume) (Inhalable dust)

Iron : N/A

Biological exposure standard

Aluminum : N/A

Manganese : N/A

Iron : N/A

B. Appropriate engineering controls

Use process isolation, local exhaust, or keep air level below exposure standard

C. Personal protective equipment

Respiratory protection

Aluminum(Soluble salt)

Wear respiratory protection which has been approved by the Korean Occupational Safety and Health Administration in accordance with physicochemical properties of the particulate matter to be exposed.

If the exposure level is lower than 20mg/m³, wear a respiratory protective gear of half mask type that have appropriate type filter.

If the exposure concentration is lower than 50mg/m³, wear a dust mask of loose-fitting hood /powered helmet type or continuous-flow type that have appropriate type filter.

If the exposure concentration is lower than 100mg/m³, wear a respiratory protective gear of full type or powered and half type or Air-fed continuous-flow / pressure-demanding type that have appropriate type filter.

If the exposure concentration is lower than 2000mg/m³, wear a ventilation mask of full type or hood/helmet type or Pressure-demanded type that have appropriate type filter.

If the exposure concentration is lower than 20000mg/m³, wear self-contained breathing apparatus (SCBA) or self-contained breathing apparatus with pressure-demand self-contained breathing apparatus (SCBA) with appropriate filter.

Aluminium(metal dust)

Wear respiratory protection which has been approved by the Korean Occupational Safety and Health Administration in accordance with physicochemical properties of the particulate matter to be exposed.

If the exposure concentration is lower than 100mg/m³, wear a dust mask of loose-fitting hood /powered helmet type or continuous-flow type that have appropriate type filter.

If the exposure concentration is lower than 500mg/m³, wear a respiratory protective gear of full type or powered and half type or Air-fed continuous-flow / pressure-demanding type that have appropriate type filter.

If the exposure concentration is lower than 10000mg/m³, wear a ventilation mask of full type or hood/helmet type or Pressure-demanded type that have appropriate type filter.

If the exposure concentration is lower than 100000mg/m³, wear self-contained breathing apparatus (SCBA) or self-contained breathing apparatus with pressure-demand self-contained breathing apparatus (SCBA) with appropriate filter.

Aluminum(Alkyl)

Wear respiratory protection which has been approved by the Korean Occupational Safety and Health Administration in accordance with physicochemical properties of the particulate matter to be exposed.

If the exposure level is lower than 20mg/m³, wear a respiratory protective gear of half mask type that have appropriate type filter.

If the exposure concentration is lower than 50mg/m³, wear a dust mask of loose-fitting hood /powered helmet type or continuous-flow type that have appropriate type filter.

If the exposure concentration is lower than 100mg/m³, wear a respiratory protective gear of full type or powered and half type or Air-fed continuous-flow / pressure-demanding type that have appropriate type filter.

If the exposure concentration is lower than 2000mg/m³, wear a ventilation mask of full type or hood/helmet type or Pressure-demanded type that have appropriate type filter.

If the exposure concentration is lower than 20000mg/m³, wear self-contained breathing apparatus (SCBA) or self-contained breathing apparatus with pressure-demand self-contained breathing apparatus (SCBA) with appropriate filter.

Aluminum(welding fume)

Wear respiratory protection which has been approved by the Korean Occupational Safety and Health Administration in accordance with physicochemical properties of the particulate matter to be exposed.

If the exposure level is lower than 50mg/m³, wear a respiratory protective gear of half mask type that have appropriate type filter.

If the exposure concentration is lower than 125mg/m³, wear a dust mask of loose-fitting hood /powered helmet type or continuous-flow type that have appropriate type filter.

If the exposure concentration is lower than 250mg/m³, wear a respiratory protective gear of full type or powered and half type or Air-fed continuous-flow / pressure-demanding type that have appropriate type filter.

If the exposure concentration is lower than 5000mg/m³, wear a ventilation mask of full type or hood/helmet type or Pressure-demanded type that have appropriate type filter.

If the exposure concentration is lower than 50000mg/m³, wear self-contained breathing apparatus (SCBA) or self-contained breathing apparatus with pressure-demand self-contained breathing apparatus (SCBA) with appropriate filter.

Aluminum(pyro powder)

Wear respiratory protection which has been approved by the Korean Occupational Safety and Health Administration in accordance with physicochemical properties of the particulate matter to be exposed.

If the exposure level is lower than 50mg/m³, wear a respiratory protective gear of half mask type that have appropriate type filter.

If the exposure concentration is lower than 125mg/m³, wear a dust mask of loose-fitting hood /powered helmet type or continuous-flow type that have appropriate type filter.

If the exposure concentration is lower than 250mg/m³, wear a respiratory protective

gear of full type or powered and half type or Air-fed continuous-flow / pressure-demanding type that have appropriate type filter.

If the exposure concentration is lower than 5000mg/m³, wear a ventilation mask of full type or hood/helmet type or Pressure-demanded type that have appropriate type filter.

If the exposure concentration is lower than 50000mg/m³, wear self-contained breathing apparatus (SCBA) or self-contained breathing apparatus with pressure-demand self-contained breathing apparatus (SCBA) with appropriate filter.

Manganese(Manganese and inorganic compounds)

Wear respiratory protection which has been approved by the Korean Occupational Safety and Health Administration in accordance with physicochemical properties of the particulate matter to be exposed.

If the exposure level is lower than 10mg/m³, wear a respiratory protective gear of half mask type that have appropriate type filter.

If the exposure concentration is lower than 25mg/m³, wear a dust mask of loose-fitting hood /powered helmet type or continuous-flow type that have appropriate type filter.

If the exposure concentration is lower than 50mg/m³, wear a respiratory protective gear of full type or powered and half type or Air-fed continuous-flow / pressure-demanding type that have appropriate type filter.

If the exposure concentration is lower than 1000mg/m³, wear a ventilation mask of full type or hood/helmet type or Pressure-demanded type that have appropriate type filter.

If the exposure concentration is lower than 10000mg/m³, wear self-contained breathing apparatus (SCBA) or self-contained breathing apparatus with pressure-demand self-contained breathing apparatus (SCBA) with appropriate filter.

Manganese(fume)

Wear respiratory protection which has been approved by the Korean Occupational Safety and Health Administration in accordance with physicochemical properties of the particulate matter to be exposed.

If the exposure level is lower than 50mg/m³, wear a respiratory protective gear of

half mask type that have appropriate type filter.

If the exposure concentration is lower than 125mg/m³, wear a dust mask of loose-fitting hood /powered helmet type or continuous-flow type that have appropriate type filter.

If the exposure concentration is lower than 250mg/m³, wear a respiratory protective gear of full type or powered and half type or Air-fed continuous-flow / pressure-demanding type that have appropriate type filter.

If the exposure concentration is lower than 5000mg/m³, wear a ventilation mask of full type or hood/helmet type or Pressure-demanded type that have appropriate type filter.

If the exposure concentration is lower than 50000mg/m³, wear self-contained breathing apparatus (SCBA) or self-contained breathing apparatus with pressure-demand self-contained breathing apparatus (SCBA) with appropriate filter.

Iron

Wear respiratory protection which has been approved by the Korean Occupational Safety and Health Administration in accordance with physicochemical properties of the particulate matter to be exposed.

If the exposure level is lower than 10mg/m³, wear a respiratory protective gear of half mask type that have appropriate type filter.

If the exposure concentration is lower than 25mg/m³, wear a dust mask of loose-fitting hood /powered helmet type or continuous-flow type that have appropriate type filter.

If the exposure concentration is lower than 50mg/m³, wear a respiratory protective gear of full type or powered and half type or Air-fed continuous-flow / pressure-demanding type that have appropriate type filter.

If the exposure concentration is lower than 1000mg/m³, wear a ventilation mask of full type or hood/helmet type or Pressure-demanded type that have appropriate type filter.

If the exposure concentration is lower than 10000mg/m³, wear self-contained breathing apparatus (SCBA) or self-contained breathing apparatus with pressure-demand self-contained breathing apparatus (SCBA) with appropriate filter.

9. Physical and chemical properties

Aluminum

A. Appearance

Appearance : Solid(Powder)

Colour Sliver white~Gray

B. Odour : Odorless

C. Odour threshold : N/A

D. pH : N/A

E. Meting point/freezing point : 660℃

F. Initial boiling point and boiling range : 2327℃

G. Flash point : N/A

H. Evaporation rate : N/A

I. Flammability(solid, gas) : N/A

J. Upper/lower flammability or explosive limits : N/A

K. Vapour pressure : N/A

L. Solubility : (Insoluble)

M. Vapor density : N/A`

N. Specific gravity : 2.7

O. N-octanol/water Partition coefficient : N/A

P. Auto-ignition temperature : 590℃

Q. Decomposition temperature : N/A

R. Viscosity : N/A

S. Molecular weight : 26.98

Manganese

A. Appearance

Appearance : Solid(Powder)

Colour : Gray

B. Odour : N/A

C. Odour threshold : N/A

D. pH : N/A

E. Meting point/freezing point : 1244℃

F. Initial boiling point and boiling range : Aluminum : 1962℃

G. Flash point : N/A

H. Evaporation rate : N/A

I. Flammability(solid, gas) : Flammability

J. Upper/lower flammability or explosive limits : N/A

K. Vapour pressure : 1 Pa (955℃)

L. Solubility : (Insoluble)

M. Vapor density : N/A

N. Specific gravity : 7.47

O. N-octanol/water Partition coefficient : N/A

P. Auto-ignition temperature : N/A

Q. Decomposition temperature : N/A

R. Viscosity : N/A

S. Molecular weight : 54.94

Iron

A. Appearance

Appearance : Solid

Colour : White or Gray

B. Odour : N/A

C. Odour threshold : N/A

D. pH : N/A

E. Meting point/freezing point : 1535℃

F. Initial boiling point and boiling range: 2750℃

G. Flash point : None

H. Evaporation rate : None

I. Flammability(solid, gas) : None

J. Upper/lower flammability or explosive limits : None

K. Vapour pressure : 1 mmHg (at 1787℃)

L. Solubility : (Water solubility: Insolubility. Solvent availability : availability : acid.

Insolubility : alkali, Alcohol, ether)

M. Vapor density : None

N. Specific gravity : 7.86 ((water=1))

O. N-octanol/water Partition coefficient : None

P. Auto-ignition temperature : None

Q. Decomposition temperature : None

R. Viscosity : None

S. Molecular weight : 55.85

10. Stability and reactivity

A. Chemical stability and possibility of hazardous reactions

Aluminum

Leaks are a fire / explosion hazard

May re-ignite after extinguish the fire

Can be ignited by heat, sparks and flames

May ignite on contact with water or moist air

Inhalation and contact with vapors, substances, and decomposition products may result in serious injury or death

May form corrosive solution in contact with water

Manganese

Can decompose at high temperature and generate toxic gas

Can be ignited by heat, sparks and flames

May re-ignite after extinguish the fire

Some materials burn with intense heat

Dust and fumes can form explosive mixtures with air

Inhalation and contact with vapors, substances, and decomposition products may result in serious injury or death

Oxides in metal fires have serious health hazards

Iron

Can be ignited by heat, sparks and flames

May re-ignite after extinguish the fire

Some materials burn with intense heat

Dust and fumes can form explosive mixtures with air

Inhalation and contact with vapors, substances, and decomposition products may result in serious injury or death

Oxides in metal fires have serious health hazards

B. Conditions to avoid : Friction, heat, spark, flame heat

Aluminum

Moisture

Heat, Spark, Flame etc Ignition source

Manganese

Friction, Heat, Spark, Flame

Heat

Iron

Friction, Heat, Spark, Flame

Heat

C. Incompatible materials : water

D. Hazardous decomposition products : Irritant, corrosive, toxic gas

11. Toxicological information

A. Information on the likely routes of exposure : N/A

B. Health hazards information

Acute toxic

Oral

AluminumLC50 > 15900 mg/kg Rat (OECD TG 401)

Manganese LC50 > 2000 mg/kg Rat (OECT TG 420, GLP)

Iron LC50 98600 mg/kg Rat (OECD TG 401 Male)

Dermal

Aluminum: N/A

Manganese : N/A

Iron : LC50 20000 mg/kg Guinea pig

Inhalation

Aluminum: Dust LC50 > 0.888 mg/ℓ 4 hr Rat (OECD TG 403, GLP)

Manganese : Dust LC50 > 5.14 mg/ℓ 4 hr Rat (OECD TG 403, GLP)

Iron : Dust LC50 > 100 mg/m³ 6 hr Rat Rat (Not applicable to classification due to lack of reliability of data such as mouse, hamster and guinea pig)

Skin corrosive/irritant

Aluminum: As a result of skin corrosion / irritation test on rabbits, no corrosivity Similar materials : aluminium oxide TBH OECD TG 404, GLP

Manganese : As a result of eye damage/ irritation test on rabbits, no stimulation OECD TG 405, GLP

Iron : As a result of eye damage / irritation test on rabbots, no stimulation OECD TG 405

Serious eye damage/eye irritation

Aluminum: As a result of eye damage / irritation test on rabbits, no stimulation Similar materials : aluminium oxide TBH FDA of the United States

Manganese : As a result of eye damage / irritation test on rabbots, no stimulation OECD TG 405, GLP

Iron : As a result of eye damage / irritation test on rabbits, no stimulation OECD TG 405

Respiratory sensitization

Aluminum: As a result of respiratory sensitization test for male mouse, no sensitization Similar materials : aluminium oxide

Manganese : N/A

Iron : N/A

Skin sensitization

Aluminum: As a result of the skin irritability test for male guinea pigs, no sensitization Similar materials : aluminium oxide AK 43/79 and aluminium oxide AK 44/79

Manganese : As a result of the skin sensitization LLNA test for female mouse, no sensitization OECD TG 429, GLP

Iron : As a result of the skin sensitization test for guinea pigs, all iron oxide materials are non-irritant Similar materials : 1309-37-1, 1317-61-9, 1310-14-1

Carcinogenicity

Industrial Safety and Health Act : N/A

Ministry of Labor examination : N/A

IARC : N/A

OSHA : N/A

ACGIH

Aluminum: A4 (Aluminum metal and insoluble compounds)

Manganese : A4

Iron : N/A

NTP : N/A

EU CLP : N/A

Germ cell Mutagenicity

Aluminum: As a result of DNA damage test in vitro, if there is no metabolic active system, it is negative Similar materials : AICl3 obtained from Sigma, As a result of chromosome aberration test using in vivo mammalian bone marrow cells, if there is no metabolic active system, it is negative Similar materials : AICl3 obtained from Sigma OECD TG 475 Aluminum causes a change in concentration-dependent biomes in the sister chromosome number and increases the pre-planned DNA integration.

Manganese : As a result of chromosomal aberration test using in vitro cultured mammalian cells, no chromosomal animalies Similar materials : 7773-01-5 OECD TG 473, GLP

Iron : As a result of gene mutation test using in vitro cultured mammalian cels, carbonyl iron is positive and electrolytic iron is negative OECD TG 476

Germ cell toxicity

Aluminum: As a result of oral toxicity test on rats, NOAEL = 266 mg/kg bw/day (OECD TG 414) As a result of developmental and reproductive toxicity tests on pregnant rats, the fetus was removed between 6 and 18 days

Manganese : As a result of the teratogenicity test in mice, embryo lethality and malformed fetus (brain escape) occurred.
Reproductive toxicity expected

Iron : N/A

Specific target organ toxicity(Single exposure)

Aluminum: Inhalation of material may result in bubbly emphysema, bronchopneumonia and bleeding
In addition, Concentration of interstitial tissue progresses in liver, brain and spleen
Inhalation of substance worsens pulmonary tuberculosis
Be insufficient to classify due to toxic effect and lack of reliable data

Manganese : As a result of the teratogenicity test in mice, embryo lethality and malformed fetus (brain escape) occurred.
Reproductive toxicity expected

Iron : N/A

Specific target organ toxicity(Repeated exposure)

Aluminum: As a result of oral target organ systemic toxicity test uning male rats, NOAEL = 302 mg/kg diet
Similar materials : aluminium hydroxide OECD TG 407
Repeated, long-term lung exposure affect the nervous system
As a result of inhalation target organ systemic toxicity test using rats, LOAEC = 50mg/m³ air
Similar materials : Al powder OECD TG 413
Inhalation of the substance affects the central nervous system
As a result, the function is impaired
As a result of eating aluminum for 6 months in rats, aluminum concentration increased in bone, liver and kidney.
The change occurs especially in the kidneys and brain

Manganese : Influences respiratory and nervous system
As a result of repeated inhalation toxicity test for monkeys for 10

months, There is a toxic effect on pulmonary vascular lymphatic proliferation, interstitial lung accumulation, pulmonary necrosis with dust, appearance of bronchial secretions, hyperplastic lung wall, emphysema, and atelectasis. NOAEL = 0.7 mg/m³

Iron : As a result of oral target organ systemic toxicity test on rats, the liver are affected
As a result of inhalation target organ systemic toxicity test or rats, NOAEC = 5mg/m³

Aspiration hazard : N/A

Other harmful effects : N/A

12. Ministry of Labor examination

A. Ecotoxicity

Fish

Aluminum : N/A

Manganese : LC50 > 3.6 mg/ℓ 96 hr Oncorhynchus mykiss (OECD Guideline 203, GLP)

Iron : LC50 13.6 mg/ℓ 96 hr (Danio rerio, LC0, 96h, > 100,000mg/L,
Similar materials : 51274-00-1, OECD Guideline 203,
Brachydanio rerio, LL0, LC50, 96h, >10,000mg/L,
Similar materials : 1317-61-9

Crustacea

Aluminum : NOEC > 100 mg/ℓ 48 hr Daphnia magna

Manganese : EC50 > 1.6 mg/ℓ 48 hr Daphnia magna

Iron : EC50 > 100 mg/ℓ 48 hr Daphnia magna (Similar materials CAS No. 13039-37-1 OECD TG 202)

Algae

Aluminum : NOEC ≥ 0.052 mg/ℓ 72 hr Selenastrum capricornutum (OECD TG 201, GLP)

Manganese : EC50 4.5 mg/ℓ 72 hr other (test species : Desmodesmus subspicatus, OECD TG 201, GLP)

Iron : N/A

B. Persistence and degradability

Persistence : N/A

Degradability : N/A

C. Bioaccumulative potential

Accumulation

Aluminum : N/A

Manganese : BCF ≤ 81

Iron : N/A

Biodegradable : N/A

D. Mobility in soil : N/A

E. Other adverse effects

Aluminum : Crustacea Daphnia magna : NOEC = 0.076 mg/L reproduction, 0.137 mg/L immobilisation 21d OECD TG 211, GLP

E. Other adverse effects

Aluminum : Crustacea Daphnia magna : NOEC = 0.076 mg/L reproduction, 0.137 mg/L immobilisation 21d OECD TG 211, GLP

Manganese : Crustacea Ceriodaphnia dubia : NOEC = 1.7 mg/L 8d OECED TG 211, GLP

Fish Oncorhynchus mykis : NOEC = 0.77 mg/L 100d

Algae Ditylum brightwellii : EC50 = 1.5 mg/L 5d

Iron : N/A

13. Disposal considerations

A. Disposal method

Aluminum

1) Treat with neutralization, hydrolysis, oxidation and reduction.

2) Incinerate at high temperature or melt at high temperature.

3) Solidify

Manganese : N/A

Iron

Use one of the following methods

1. Solidify
2. Land a designated waste in a managed landfill
3. Incinerate spent catalysts containing flammable materials
4. In case of incinerating waste catalyst containing halogenated material, incinerate at high temperature

B. Disposal precaution

Aluminum: Dispose of contents container according to applicable regulations

Manganese : Dispose of contents container according to applicable regulations

Iron : Dispose of contents container according to applicable regulations

14. Transport information

A. UN Number (UN No.)

Aluminum : 1396

Manganese : 3089

Iron : 3089

B. UN proper shipping name

Aluminum : Aluminum powder(Not pyrophoric and not coated on the surface)
(ALUMINIUM POWDER, UNCOATED)

Manganese : Metal powder (Flammable)(Except that the name of the product is not specified)
METAL POWDER, FLAMMABLE,N.O.S.

Iron : Metal powder(Flammable)(Except that the name of the product is not specified)
METAL POWDER FLAMMABLE,N.O.S.

C. Transport hazard

Aluminum : 4.3

Manganese : 4.1

Iron : 4.1

D. Packing group

Aluminum : Ⅱ

Manganese : Ⅱ

Iron : Ⅱ

E. Environmental hazards

Aluminum : Applicable

Manganese : N/A

Iron : N/A

F. Special safety measures that the user needs or needs to know about transport or means of transport.

Emergency measures in case of fire F-G

Emergency measures in case of leak

Aluminum S-O

Manganese : S-G

Iron : S-G

15. Regulatory information

A. Industrial Safety and Health Act

Aluminum : Toxic substances to be controlled

Working environment measured material (Measurement Cycle: 6 months)

Substnaces subject to special medical examination

(Diagnostic Cycle : 12 months)

Exposure standard setting substance

Manganese : Toxic substances to be controlled

Substnaces subject to special medical examination

(Diagnostic Cycle : 12 months)

Exposure standard setting substance

Iron : Toxic substances to be controlled

Exposure standard setting substance

B. Toxic Chemical Control Act : N/A

C. Dangerous Material Safety Control Act

Aluminum : Class 2 metal powder500kg

Manganese : Class 2 metal powder 500kg

Iron : Class 2 iron powder 500kg

D. Wastes Management Act : Designated waste

Aluminum : Designated waste

Manganese : N/A

Iron : Designated waste

E. Other requirements in domestic and other countries

Domestic regulation

Residual Organic Pollutant Control Act : N/A

Foreign regulation

US Administration Information(OSHA Rule : N/A

US Administration Information(CERCLA Rule) : 453.599 kg 1000 lb

US Administration Information (EPCRA 302 Rule) : N/A

US Administration Information (EPCRA 304 Rule) : N/A

US Administration Information (EPCRA 313 Rule)

Aluminum : Applicable

Manganese : Applicable

Iron : N/A

US Administration Information (Rotterdam Convention material) : N/A

US Administration Information (Stockholm Convention substance) : N/A

US Administration Information (Montreal Protocol substance) : N/A

EU Classification information (Confirmed classification result)

Aluminum: Pyr. Sol. 1

Water-react. 2

Manganese : N/A

Iron : N/A

EU Classification information (Risk phrases)

Aluminum: H250, H261

Manganese : N/A

Iron : N/A

EUClassification information (Safety phrases) : N/A

16. Other information

A. Source of material

Aluminum

ICSC (Appearance)

ICSC (Colour)

HSDB (E. Melting point/Freezing point)

HSDB (F. Initial boiling point and boiling range)

HSDB (L. Solubility)

HSDB (M. Specific gravity)

ICSC (P.Auto-ignition temperature)

HSDB (S. Molecular weight)

ECHA (Oral)

ECHA (Inhalation)

ECHA (Skin corrosion or irritation)

ECHA (Serious eye damage or irritation)

ECHA (Respiratory sensitization)

ECHA, HSDB (Germ cell Mutagenicity)

ECHA, HSDB (Germ cell toxicity)

HSDB (Specific target organ toxicity(Single exposure))

ECHA, ICSC, IPCS, HSDB (Specific target organ toxicity (Repeated exposure))

IUCLID(Crustacea)

ECHA(Algae)

ECHA(E. Other adverse effects)

Manganese

ECHA (Appearance)

ECHA (Colour)

HSDB (E. Meting point/freezing point)

HSDB (F. Initial boiling point and boiling range)

ECHA (I. Flammability(solid, gas)

HSDB (K. Vapour pressure)

1 (N.Specific gravity)

HSDB (S. Molecular weight)

ECHA (Oral)

ECHA (Inhalation)

ECHA (Skin corrosive/irritant)

ECHA (Serious eye damage/eye irritation)

ECHA (Skin sensitization)

ECHA (Germ cell Mutagenicity)

CICAD, NITE (Germ cell toxicity)

CICAD (Specific target organ toxicity(Single exposure))

NITE, CICAD (Specific target organ toxicity(Repeated exposure))

ECHA (Fish)

ECHA (Crustacea)

ECHA (Algae)

NITE (Persistence)

ECHA (D. Mobility in soil)

ECHA, NITE(E. Other adverse effects)

Iron

HSDB (Appearance)

HSDB (Colour)

HSDB (E.Melting point/Freezing point)

HSDB (F. Initial boiling point and boiling range)

HSDB (K. Vapour pressure)

ICSC (L. Solubility)

ICSC (N. Specific gravity)

pubchem (S. Molecular weight)

ECHA (Oral)

ECHA (Dermal)

ECHA (Skin corrosion or irritation)

ECHA (Serious eye damage or irritation)

ECHA (Skin sensitization)

ECHA (Germ cell mutagenicity)

(Reproductive toxicity)

NITE, CICAD (Specific target organ toxicity (Repeated exposure))

ECHA (Fish)

ECHA (Crustacean)

ECHA (D. Mobility in soil)

B. Issuing date : 2004.12

C. Revision number : 4 Times

D. Revision number : 2020.04.03

E. Others

This information is based on the industrial Safety and Health Act and the knowledge and related materials to date. However, the risk of hazardous substances is not written to all the risks of hazardous substances exist there may be unknown hazards of all chemicals in this material may be prescribed. Therefore, our customers and potential customers should review this information and precaution, look precautions carefully and verify suitability about applicable laws and regulations related to the use and disposal of this product.

This information is intended solely for the purpose of describing the health, safety and environmental requirements of the product handler and should not be construed as an endorsement of the characteristics or quality of the product.

Please understand that it is the sole responsibility of the user to evaluate the final suitability of the product, as it is impossible to control the actual application of this product. It is necessary to establish appropriate safety measures in accordance with the application and usage in case of special handling.

This document can be revised based on the new information.