Material Safety Data Sheet

[This material was composed according to the Article No.110 of occupation safety and health acts.]

This product is a solidified finished product. Therefore, there is no risk of exposure to chemicals.
However, since there is a possiblility of some exposure in a molten state such as cutting and melting, this data was prepared based on processing operations.

Product	PosMAC1.5

1. Chemical Product and Company Identification

a. Product Name: PosMAC1.5

b. Recommended use of the chemical and restrictions on use

Recommended use of product	Steel manufacturing
Limit on using product	Do not use except for purpose

c. Supplier information

Company name	POSCO STEELEON
Address	173 Cheolgang-ro, Nam-gu, Pohang-si, Gyeongsangbuk-do
Emergency numbers	82-54-280-6114

2. Hazard Identification

a. GHS Classification

Water reactive materials and mixtures : Classification 1
Pyrophoric solid : Classification 1
Reproductive toxicity : Classificaton 1B
Specific target organ toxicity(1 exposure) : Classificaton 2
Specific target organ toxicity(repeated exposure) : Classificaton 2
Chronic aqatic environment hazard : Classificaton 1

b. GHS label elements

Hazard symbols

Signal word: Danger

Hazard statements

H250 Self ignited when exposed to air
H260 Generates self-igniting flammable gas when in contact with water
H360 May damage fertility or the unborn child
H371 May couse damage to organs.
H373 May cause damage to organs through prolonged or repeated exposure
H411 Toxic to aquatic life with long-lasting effects.

Precautionary statements

Prevention

P201 Obtain special instructions before use..
P202 Do not handle until all safety precautions have been read and understood.
P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking
P260 Do not breathe dust/fume/gas/mist/vapors/spray.
P270 Do not eat, drink or smoke when using this product.
P281 Wear appropriate personal protective equipment

Response

P332 + P313 If exposure or exposure is feasible, seek medical action or advice
P337 + P313 If skin irritation develops, seek medical action or advice.
P362 Remove contaminated clothing and wash it before reuse.

Storage

P402 Store in a dry place.
P407 Maintain air gap between stacks/pallets.

Disposal

P501 Dispose of contents/container in accordance with local/regional/national/ internatonal regulation.

3. Composition/Information on Ingredients

Chemical name	Other name	CAS No	Content(%)
Iron	FERRIUM	7439-89-6	87.5~95%
Zinc	Zinc, elemental	7440-66-6	9% Max.
Manganese	Colloidal manganese	7439-96-5	2.5 Max.

※ It may contain minor amounts of other ingredients(Al 0.5% Max., Mg 0.5% Max. etc.)

4. First aid Measures

a. Eye contact
If it gets into your eyes, wash carefully with water for a few minutes. If possible. remove contact lenses. Keep washing.
If eye irritation persists seek medical action or advice.

b. Skin contact
If skin irritation develops, seek medical action or advice.
Remove contaminated clothing and wash before reuse.
In the case of hot material, immerse or wash affected areas in lot of cold water to remove heat.

c. Inhalation contact
Take emergency medical care.
If exposure or expoures is feasible seek medical action or advice.
Go to a place with fresh air.

d. Ingestion contact
Wash your mouth.
If feel uncomfortable with swallowing, get the medical attention.

e. Other precautions
The doctor must be aware of the substance and protective measures.

5. Firefighting Measures

a. Suitable (unsuitable) extinguishing media
Use alcohol foam, carbon dioxide or water spray for extinguishing fire related to this material.
Use dry sand for extinguishment by smothering.

b. Specific hazards arising from the chemical
During burning, pyrolysis or combustion may produce irritating and highly toxic gases.
Some materials may burn quickly with flash.
Some materials may burn but not eaily ignite.
Some materials may explode explosively upon fire or heating.
Non-flammable substances may not burn but decompose on heating, resulting in corrosive / toxic fumes.

c. Spical protective actons for firefighters
Rescuers should wear appropriate protective equipment.
Extinguish the area and keep it at an emergenct distance.
Move the container from the fire area if not dangerous.
If the fire fighting is not possible, protect the surrounding area and make the fire consume on its own.

6. Accidental Release Measures

a. Personal precautions, protecive equipment and emergency procedures
Remove all ignition sources as very fine particles may cause fire or explosion.
Remove all ignition sources.
Do not touch the container or leaks without wearing appropriate protective clothing.
Do not clean and dispose without supervision of a professional.
Avoid dust formation.
Note the substances and conditions to avoid.

b. Environmental precautions
Do not release the substance to the environment.
Do not flow the substance into waterway, sewage, basement or confined area.

c. Methods and materials for contanment and cleaning up
Collect the spillage.
Put in a waste container.

7. Handling and Storage

a. Precautions for safe handling
Do not handle until all safety precautions have been read and understood.
Wash thoroughly after handling.

	Do not expose to cutting, welding, soldering, bonding, punching, grinding or heat exposure, flame, sparks, static electricity or other sources of ignition. Handle/ stores carefully Avoid prolonged or repeated skin contact. Note the substances and conditons to avoid.
b. Conditions for safe storage, including any incompatibilites	Keep away from heat, sparks, flames, and heat. -No smoking. Keep away from food and drink. Store in a dry place. Maintain a clearance between the load.

8. Exposure Controls / Personal Protection

a. Leakage threshold of chmical materials and biological leakage threshould etc.

ACGIH regulations	
Iron, Zinc	No data available
Magnesium	Manganese and inorganic compounds, as Mn
Biological exposure limit	
Iron, Zinc, Magnesium	No data available
b. Engineering Controls	Use local exhaust ventilation when dust and fumes are generated and keep below exposure limits.
c. Personal protective equipment	
Protct respiratory organ	Wear respiratory protection which has been approved by the Korean Occupational Safety and Health Administration in accordance with physicochemical properies of the pariculate matter to be exposed.
Protect eyes	Wear protective glass to protect eyes from dust and particles etc.
Protect hands	Wear protective gloves suitable for work.
Protect human body	Wear protective clothes suitable for work.

9. Physical and Chemical Properties

a. Appearance	
Physical state	Solid
Color	Metallic gray
b. Odor	odorless
c. Odor threshold	No data available
d. pH	No data available
e. Melting point/freezing point	No data available
f. Initial boiling point and boiling range	No data available
g. Flash point	No data available
h. Evaporation rate	No data available
i. Flammability (solid. Gas)	No data available
j. Upper/lower flammability or explosoive limit	No data available
k. Vapor pressure	No data available
l. Solubility	No data available
m, Vapor density	No data available
n. Relative density	No data available
o. n-octanol/water	No data available
p. Auto-ignition temperature	No data available
q. Decomposition temperature	No data available
r. Viscosity	No data available
s. Molecular volume	No data available

Iron

a. Appearance	
Physical state	Solid
Color	White or gray
b. Odor	None
c. Odor threshold	No data available

d. pH	(Not applicable)
e.Melting point/freezing point	1535℃
f. Initial boiling point and boiling range	2750℃
g. Flash point	No data available
h. Evaporation rate	No data available
i. Flammability (solid. Gas)	No data available
j. Upper/lower flammability or explosive limits	-/-
k. Vapor pressure	1mmHg (at 1787℃)
l. Solubility	(Water solubility: non-soluble, solvent solubility: soluble, acid, solubility: alkali, alcohol, eth
m, Vapor density	No data available
n. Relative density	7.86 ((water =1))
o. n-octanol/water	(None)
p. Auto-ignition temperature	No data available
q. Decomposition temperature	No data available
r. Viscosity	No data available
s. Molecular volume	55.85

Zinc

a. Appearance	
Physical state	Solid (powder)
Color	Gray ~ blue
b. Odor	odorless
c. Odor threshold	(Not applicable)
d. pH	No data available
e.Melting point/freezing point	419℃
f. Initial boiling point and boiling range	907~℃
g. Flash point	No data available
h. Evaporation rate	No data available
i. Flammability (solid. Gas)	Inflammable
j. Upper/lower flammability or explosive limits	-/-
k. Vapor pressure	0.1kPa (487℃)
l. Solubility	(reactive)
m, Vapor density	No data available
n. Relative density	7.14 (water=1)
o. n-octanol/water	-0.47 (estimate)
p. Auto-ignition temperature	460℃ (applied to the minute powder.)
q. Decomposition temperature	No data available
r. Viscosity	No data available
s. Molecular volume	65.38

Magnesium

a. Appearance	
Physical state	Solid
Color	Gray
b. Odor	None
c. Odor threshold	No data available
d. pH	(Not applicable)
e.Melting point/freezing point	651℃
f. Initial boiling point and boiling range	1100℃
g. Flash point	No data available
h. Evaporation rate	(Not applicable)
i. Flammability (solid. Gas)	No data available
j. Upper/lower flammability or explosive limits	-/- (0.03kg/m3 (lower))
k. Vapor pressure	(4.24E-09 mmHg at 25℃ (estimate))
l. Solubility	32.5g/100ml (25℃ (estimate))
m, Vapor density	(Not applicable)

n. Relative density	1.7
o. n-octanol/water	-0.57 (estimate)
p. Auto-ignition temperature	473℃
q. Decomposition temperature	No data available
r. Viscosity	No data available
s. Molecular volume	24.3

10. Stability and Reactivity

a. Chemical stability

Iron, Zinc, Manganese	No data available

b. Possiblily of hazardous reactions

Iron, Zinc, Manganese	Heat, Moisture

c. Material to be avoided

Iron, Zinc, Manganese	Water

d. Harmful ingredients during the decomposition

Iron, Zinc, Manganese	Irritant, Corrosive, Toxic Gas

11. Toxicological Information

a. Information on the likely routes of exposure

Iron, Zinc, Manganese	No data available

b. Information of health warning

Acute toxicity

Oral

Iron	LD50 98.6 ㎎/kg Rat (OECD TG 401申컷)
Zinc	LD50 > 2000 ㎎/kg Rat (OECD TG 401, GLP)
Manganese	LD50 > 2000 ㎎/kg Rat (OECD TG 420, GLP)

Percutaneous

Iron	LD50 20000 ㎎/kg Guinea pig
Zinc, Manganese	No data available

Intake

Iron	No data available
Zinc	Vapor LC50> 5.41 ㎎/㎥ 4 hr Rat (OECD TG 403, GLP)
Manganese	Vapor LC50> 5.14 ㎎/ℓ 4 hr Rat (OECD TG 403, GLP)

Skin corrosion or irritation

Iron	The skin corrosiveness/stimulating test by using the rabbit shows that it is not
Zinc	Human body/ non-stimulating
Manganese	Irritation test results in rabbits, no irritation OECD TG 404 GLP

Serious eye damage or irritation

Iron	The eye damage/stimulation test by using the rabbit shows that it is not stimulating. OECD TG 405
Zinc	The eye damage/stimulation test by using the rabbit shows that there was very small
Manganese	Eye damage / irritation test results on rabbits, no irritation OECD TG405

Respiratory hypersensitiveness

Iron, Zinc, Manganese	No data available

Skin hypersensitiveness

Iron	The skin sensitization test by using the male guinea pig shows that all oxidized iron Similar substances: 1309-37-1, 1317-61-9, 1310-14-1
Zinc	There is no oversensitivity
Manganese	The in vivo test for skin sensitization test by using female mouse LLNA shows that there OECD TG 429, GLP

Carcinogenic

Occupational safety and health Act

Iron, Zinc, Manganese	No data available

Publication of Ministry of Employment and Labor

Iron, Zinc, Manganese	No data available

IARC

Iron, Zinc, Manganese	No data available

OSHA

Iron, Zinc, Manganese	No data available

ACGIH

Iron, Zinc, Manganese	No data available

NTP

Iron, Zinc, Manganese	No data available

EU CLP

Iron, Zinc, Manganese	No data available

Reproductive cell mutagenicity

Iron	The in-vitro genetic mutation test by using the cultured cell of mammal shows that there were no carbonyl iron and electrolytic iron. OECD TG 476
Zinc	The in-vitro genetic mutation test from the recombination of similar division shows that its effect is negative. Similar substance: 7732-02-0
Manganese	Chromosomal aberration test using in vitro cultured mammalian cells does not cause chromosomal abnormalities.

Reproductive toxicity

Iron	No data available
Zinc	Rabbits were tested for developmental / teratogenicity toxicity tests, and had no effect on adult and fetal rabbits.
Manganese	Teratogenicity test by using the mouse shows the death or deformation of fetus and

Certain organ toxicity(Exposed once)

Iron, Zinc	No data available
Manganese	It causes the pneumonia. CICAD

Certain organ toxicity(Exposed repeatedly)

Iron, Zinc	No data available
Manganese	Causes Pneumonia(CICAD)

Absorption harmfulness

Iron, Zinc, Manganese	No data available

12. Ecological information

a. Ecotoxicology

Fishes

Iron	(Danio rerio: LC0 > 100,000 mg/L 96h similar substance: 51274-00-1 OECD TG 203)
Zinc	LC50 0.439 ㎎/ℓ 96 hr others (test specie: Cottus bairdii)
Manganese	LC50 > 3.6 ㎎/ℓ 96 hr Oncorhynchus mykiss (OECD TG 203, GLP)

Crustacean

Iron	EC50 > 100 ㎎/ℓ 48 hr Daphnia magna (similar substnace CAS No. 1309-37-1 OECD TG 202)
Zinc	EC50 0.416 ㎎/ℓ 48 hr Ceriodaphnia dubia (OECD TG 202)
Manganese	EC50 > 1.6 ㎎/ℓ 48 hr Daphnia magna (OECD TG 202, GLP)

Birds

Iron	No data available
Zinc	NOEC 0.05 ㎎/ℓ 72 hr Selenastrum capricornutum (OECD TG 201, GLP)
Manganese	EC50 4.5 ㎎/ℓ 72 hr others (Test species : Desmodesmus subspicatus)

b. Persistence and degradability

Residue

Iron, Zinc, Manganese	No data available

Resolvability

Iron, Zinc, Manganese	No data available

c. Bioaccumulative potential

Condensability

Iron	No data available

Zinc	(fish)
Manganese	01< 81 BCF
Biodegradable	
Zinc	(The biodegradbility test cannot be applied.)
Iron, Manganes	No data available

d. Mobility in soil

Iron	log kd= 5.3
Zinc	No data available
Manganese	kd= ca. 994, OECD TG 106

e. Other adverse effects

Iron, Zinc, Manganese	No data availble

13. Disposal consideration

a. Disposal methods

Dispose of contents and container in accordance with local regulation.

b. Special precaution for disposal

Dispose of the container according to the related laws and regulations.

14. Transport information

a. UN No.

Iron	1383
Zinc	1436
Manganese	3089

b. Proper shipping name

Iron	Other pyrophoric metals or pyrophoric alloys
Zinc	ZINC POWDER or ZINC DUST
Manganese	Metal powder (inflammable) (except otherwise specified)

c. Hazard Class

Iron	4.2
Zinc	4.3
Manganese	4.1

d. IMDG Packing group

Iron, Zinc	Ⅱ
Manganese	Ⅰ

e. Marine pollutant

Iron	No data availble
Zinc	Applicable (MP)
Manganese	Non-applicable

f. Special precautions for user related to transport or transportation measures

Urgent emergency measurement

Iron, Zinc, Manganese	F-G

Emergency measurements in case of leakage

Iron	S-M
Zinc	S-O
Manganese	S-G

15. Regulatory information

a. Regulation according to Toxic Chemicals Control Act

Iron, Zinc, Manganese	No data available

b. Regulation according to Safety Control of Dangerous Substances Act

Iron	Class 2, iron powder 500kg
Zinc, Manganese	Class 2 metal powder 500kg

c. Regulation according to the Waste Control Act

Iron	Designated waste

Zinc, Manganese	No data available

d. Regulation according to foreign act

US control information(OSHA regulation)

Iron, Zinc, Manganese	Not applicable

US control information(CERCLA regulation)

Zinc	453.599kg 1000lb
Iron, Manganes	Not applicable

US control information(EPCRA 302 regulation)

Iron, Zinc, Manganese	Not applicable

US control information(EPCRA 304 regulation)

Iron, Zinc, Manganese	Not applicable

US control information(EPCRA 313 regulation)

Iron, Zinc, Manganese	Not applicable

US control information(Rotterdam convention substance)

Iron, Zinc, Manganese	Not applicable

US control information(Stockholm convention substance)

Iron, Zinc, Manganese	Not applicable

US control information(Monteal Protocol substance)

Iron, Zinc, Manganese	Not applicable

EU Classification information (confirmed classification results)

Zinc	Pyr. Sol. 1Water-react. 1Aquatic Acute 1Aquatic Chronic 1
Iron, Manganes	Not applicable

EU Classification information (danger statements)

Zinc	H250H260H400H410
Iron, Manganes	Not applicable

EU Classification information (safety statements)

Zinc	S2, S43, S46, S60, S61
Iron, Manganes	Not applicable

16. Other information

a. Data source

This Safety Data Sheet was compiled with data and information from the follwing sources : KOSHA, NITE, ESIS, NLM, SIDS, IPCS,ECHA, HSDB

b. First preparation date	May 22, 2017
c. No. of revision and last revision date	
No. of revision	6 times
Last revision date	March 12, 2024

d. Others

○ This MSDS was composed by referring to MSDS provided by Korea Occupational Safety & Health Agency.