

SAFETY DATA SHEET

Date Printed : July 31, 2023

Version : 2nd

Regulation : According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

1. Identification

1.1 Product identifier

1.1.1 Product name: Caustic soda (45%)

1.1.2 Other means of identification:

1.2 Recommended use of the chemical and restrictions on use

1.2.1 Recommended use: Raw material for metal and detergent, neutralizing agent

1.2.2. Restrictions on use : Material composed of Al, Zn, Sn, and Cu rapidly corrodes when in contact with caustic soda (sodium hydroxide), and therefore should be avoided; do not use for purposes other than those recommended.

1.3 Details of the supplier of the safety data sheet

1.3.1 Manufacturer

Company name: Hanwha Solutions Co, Ltd.

Address: Yeosu plant, Hanwha Solutions Co, Ltd., 117, Yeosusandan 3-ro, Yeosu-si, Jeollanam-do, Korea

Prepared by: CA Production 1, 2 Team

Contact Telephone (Yeosu plant) +82-61-688-1774

1.3.2 Supplier & Distributor

Company name: Hanwha Solutions Co, Ltd.

Address: 21F, Hanwha Bldg., Janggyo-dong, Jung-gu, Seoul, Korea

Prepared by: CA Domestic Sales Team

Contact Telephone: +82-10-9969-7873

1.4 Emergency phone number

Emergency phone: +82-10-9969-7873

2. Hazard(s) identification

2.1 Classification of the substance or mixture

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

Physical / Chemical Hazards:

Corrosive to metals : Category 1

Health Hazards:

Acute toxicity (dermal) : Category 4

Skin corrosion/irritation: Category 1

Serious eye damage /eye irritation: Category 1

Environmental Hazards:

Not classified

2.2 Label elements, including precautionary statements

o Pictogram and symbol:



o Signal word: Danger

o Hazard statements:

- H290 May be corrosive to metals
- H312 Harmful in contact with skin
- H314 Causes severe skin burns and eye damage.
- H318 Causes serious eye damage.

o Precautionary statements:

- P234 Keep on in original container
- P260 Do not breathe dust/fume/gas/mist/vapours/spray.
- P264 Wash your hands thoroughly after handling.
- P280 Wear protective gloves/protective clothing/eye protection/face protection.

o Treatment statements:

- P301+P330+P331 If swallowed: Rinse mouth. Do not induce vomiting.
- P302+P352 : If on skin: Wash with plenty of soap and water.
- P303+P361+P353 If on skin (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
- P304+P340 If inhaled: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
- P305+P351+P338 Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- P310 Immediately call a poison center or doctor/physician.
- P312 : Call a poison center or doctor/physician you feel unwell.
- P321 Specific treatment (Reference to supplemental).
- P363 Wash contaminated clothing before reuse.
- P390 Absorb spillage to prevent material damage.

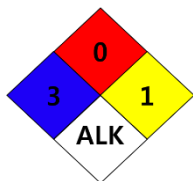
o Storage statements:

- P405 Store locked up.
- P406 Store in corrosive resistant container with a resistant inner liner.

o Waste statements:

- P501 Dispose the contents/container in accordance with local/regional/national/international regulations.

2.3 Other hazard information not included in hazard classification (NFPA)



- o Health:** 3
- o Flammability:** 0
- o Reactivity:** 1
- o Specific hazard:** ALK

3. Composition/information on ingredients

Component	Common name and synonyms	CAS No.	Conc. / %
Sodium Hydroxide	Caustic soda	1310-73-2	45.0 ~ 45.5
Water	Dihydrogen oxide	7732-18-5	54.5 ~ 55.0

4. First aid measures

4.1 Description of first aid measures

Eye contact

- Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
- In the case of difficulty of opening the lids, administer an analgesic eye wash (Oxybuprocaine).
- Call a physician or poison control center immediately.
- Call emergency medical service.

Skin contact

- If on skin (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
- Take off contaminated clothing and shoes immediately.
- Wash off immediately with plenty of water.
- Call a physician or poison control center immediately.
- Wash contaminated clothing before reuse.
- For hot product, immediately immerse in or flush the affected area with large amounts of cold water to dissipate heat.
- Remove and isolate contaminated clothing and shoes.
- For minor skin contact, avoid spreading material on unaffected skin.

Inhalation

- Move to fresh air.
- Oxygen or artificial respiration if needed.
- Call a physician immediately.

Ingestion

- Call a physician or poison control center immediately.
- If swallowed, rinse mouth with water (only if the person is conscious).
- Do NOT induce vomiting.
- Let plenty of water be drunk in small gulps.
- Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

4.2 Most important symptoms and effects, both acute and delayed

Symptoms and effects: Serious irritation to the eyes and corrosion to the skin

4.3 Indication of immediate medical attention and notes for physician

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Use dry sand or earth to smother fire.

5. Fire-fighting measures

5.1 Extinguishing media

- Suitable extinguishing media

Use alcohol foam, carbon dioxide, dry fire extinguisher or water spray when fighting fires involving this material.

- **Unsuitable extinguishing media:** Not available

5.2 Specific hazards arising from the chemical

- May be corrosive to metals.

- Material may produce irritating and highly toxic gases from decomposition by heat and combustion during burning
- Containers may explode when heated.
- Some may produce flammable hydrogen gas upon contact with metals.
- Non-combustible, substance itself does not burn but may decompose upon heating, then produce corrosive and/or toxic fumes.
- Some are oxidizers and may ignite combustibles.
- TOXIC; inhalation, ingestion or skin contact with material may cause severe injury or death.
- Contact with molten substance may cause severe burns to skin and eyes.
- Thermal decomposition products: Sodium Hydroxide fumes

5.3 Special protective equipment and precautions for fire-fighters

- Rescuers should put on appropriate protective gear.
- Evacuate area and fight fire from a safe distance.
- Dike fire-control water for later disposal; do not scatter the material.
- Move containers from fire area if you can do it without risk.
- Do not get water inside containers.
- Fire involving Tanks; Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Fire involving Tanks; Cool containers with flooding quantities of water until well after fire is out.
- Fire involving Tanks; Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- Fire involving Tanks; Always stay away from tanks engulfed in fire.
- Fire involving Tanks; For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

- Clean up spills immediately, observing precautions in Protective Equipment section.
- Eliminate all ignition sources.
- Stop leak if you can do it without risk.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Cover with plastic sheet to prevent spreading.
- Please note that there are materials and conditions to avoid.
- Avoid contact with skin, eyes and clothing.

6.2 Environmental precautions

- Atmosphere: Not available
- Land: Not available
- Underwater: Prevent entry into waterways, sewers, basements of confined areas.
Runoff from fire control may be corrosive and/or toxic and cause pollution.

6.3 Methods and materials for containment and cleaning up

- Absorb spillage to prevent material damage.
- Absorb spills with inert material (e.g., dry sand or earth), then place in a chemical waste container.
- Absorb the liquid and scrub the area with detergent and water.
- Use water spray to reduce vapors. Call for assistance on disposal.
- Neutralize the residue with a dilute solution of acetic acid.

7. Handling and storage

7.1 Precautions for safe handling

- Wash your hands thoroughly after handling.
- Use only outdoors or in a well-ventilated area.
- Follow all MSDS/label precautions even after container is emptied because they may retain product residues.
- Use carefully in handling/storage.
- Loosen closure cautiously before opening.
- Avoid breathing vapors from heated material.
- Avoid prolonged or repeated contact with skin.
- Do not enter storage area unless adequately ventilated.
- Please note that there are materials and conditions to avoid.
- Please work with reference to engineering controls and personal protective equipment.

7.2 Conditions for safe storage, including any incompatibilities

- Store locked up.
- Keep only in original container.
- Do not store together with acids.
- Do not use aluminium containers. Do not use zinc containers. Do not use lead containers.
- Use stainless steel containers. Use containers made of Polyethylene. Use rubberized containers. Use glass containers.
- Empty drums should be completely drained, properly bunged, and promptly returned to a drum reconditioner, or properly disposed of.

8. Exposure controls/personal protection

Occupational Exposure limits

- o **ACGIH:** Ceiling=2mg/m³
- o **Biological exposure index:** Not available
- o **OSHA:** TWA=2mg/m³ (Final PELs), Ceiling=2mg/ m³ (Vacated PELs)
- o **NIOSH:** Ceiling=2mg/m³
- o **EU regulation:**
 - Austria: TWA=2mg/m³
 - Bulgaria: TWA=2mg/ m³ (alkaline aerosols)
 - Czech Republic: Ceiling=2mg/m³
- o **Other:**
 - Mexico: Ceiling=2mg/m³
 - Philippine: TWA= 2mg/m³
 - Singapore: STEL=2mg/m³

8.2 Exposure controls

Appropriate engineering controls

- Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.
- Facilities for storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

Individual protection measures, such as personal protective equipment

Respiratory protection

- Wear NIOSH or approved full or half face piece (with goggles) respiratory protective equipment when necessary.

Eye protection

- Wear breathable safety goggles to protect from particulate material causing eye irritation or other disorder.
- An eye wash unit and safety shower station should be available nearby work place.

Hand protection

- Wear appropriate protective gloves (PVC, Neoprene, Natural Rubber, butyl-rubber) by considering physical and chemical properties of chemicals.

Body protection

- Wear appropriate Alkali-resistant protective clothing by considering physical and chemical properties of chemicals.

9. Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance

Description :	Liquid
Color :	Colorless
Odor :	Odorless
Odor threshold :	Not available
pH :	>14
Melting point/freezing point :	7 °C ~ 8 °C
Initial boiling point and boiling range :	135 °C ~ 138 °C (45%)
Flash point :	Not available
Evaporation rate :	Not available
Flammability (solid, gas) :	Not flammable
Upper/lower flammability or explosive limits :	Not applicable
Vapor pressure :	1 mmHg(739 °C)
Vapor density :	Not available
Solubility :	52%(20 °C), 42%(0 °C)
Solubility in organic solvents :	Not available
Partition coefficient: n-octanol/water :	LogKow=-3.88
Auto ignition temperature :	Not auto-ignitable
Decomposition temperature :	Not available
Viscosity :	4.0cP(350 °C)

“NOTE: The physical data presented above are typical values and should not be construed as a specification”

10. Stability and reactivity

10.1 Reactivity/Chemical stability/Possibility of hazardous reactions:

- May be corrosive to metals.
- Containers may explode when heated.
- Some may produce flammable hydrogen gas upon contact with metals.
- Non-combustible, substance itself does not burn but may decompose upon heating, then produce corrosive and/or toxic fumes.
- Fire will produce irritating, corrosive and/or toxic gases.
- May decompose at high temperatures into forming toxic gases.

- Containers may explode when heated.

10.2 Conditions to avoid:

- Heat, sparks or flames
- Keep away from heat/sparks/open flames/hot surfaces. No smoking.
- Toxic gases may be accumulated in closed space.
- In contact with combustible materials, may ignites or exploded.

10.3 Incompatible materials:

- Combustibles, reducing agents
- Acetaldehyde, acids, Acrolein, Allyl chloride, Allyl alcohol+benzenesulfonic chloride, Aluminum, Ammonia + Silver nitrate, Ammonium salt, Benzene-1,4-diol, Bromine, Chloride trifluoride, Chloroform, Chlorohydrin, Chloride sulfate, Copper, Metal, Zinc, In aqueous solution, evolves hydrogen with metals. etc.

10.4 Hazardous decomposition products:

- Material may produce irritating and highly toxic gases from decomposition by heat and combustion during burning
- Corrosive and/or toxic fume

11. Toxicological information	
Information on toxicological effects	
(a) Acute toxicity	Category 4(Dermal)
Oral	<ul style="list-style-type: none"> • No valid studies available. • The substance is not expected to be systemically available and the effects are expected to be due to pH changes. • It is reported that consumption of caustic soda can cause corrosion of mouth burns, lips, mouth, tongue, pharynx and severe esophagus, abdominal pain, vomiting mixed with blood and large lump mucosa, and diarrhea mixed with blood.
Dermal	<ul style="list-style-type: none"> - Sodium Hydroxide • LD50(Rabbit) = 1350 mg/kg (NCIS)
Inhalation	<ul style="list-style-type: none"> • Dust formation is unlikely because of hygroscopic properties. Furthermore NaOH has a negligible vapour pressure and is rapidly neutralized in air by Carbon dioxide and therefore dust and vapour exposure are not expected. • The inhalation of aerosols of 5 % NaOH by a 25-year-old woman resulted in irreversible obstructive lung injury after working for one day in a poorly ventilated room. Besides NaOH the product contained also smaller amounts of calcium carbonate, soft soap and protein. • The substance is not expected to be systemically available and the effects are expected to be due to pH changes.
(b) Skin Corrosion/ Irritation	Category 1
	<ul style="list-style-type: none"> • Based on animal data it can be concluded that an NaOH solution of 8 % can be considered corrosive. Based on human data concentrations of 0.5–4 % were irritating. • pH > 14
(c) Serious Eye	Category 1

Damage/ Irritation	<ul style="list-style-type: none"> · The non-irritant level was 0.2-1.0 %, while the corrosive concentration was 1.2 % or higher than 2 %. · pH > 14
(d) Respiratory sensitization	Not available
(e) Skin Sensitization	Not classified
	<ul style="list-style-type: none"> · Based on this study sodium hydroxide has no skin sensitisation potential. Furthermore, NaOH has been used widely and for a long time and no human cases of skin sensitisation have been reported and therefore NaOH is not considered to be a skin sensitizer.
(f) Carcinogenicity	<ul style="list-style-type: none"> · IARC, NTP, OSHA, ACGIH, EU CLP 1272/2008, US EPA: Not listed · It should be realised that oral exposure to NaOH is negligible under normal handling and use conditions and there is no evidence that NaOH causes cancer. Repeated exposure other than high concentrations of corrosive conditions is that sodium ions have a much lower concentration than saline intake through dietary activity, and hydroxide ions cannot have a systemic effect on human homeostasis maintenance activities.
(g) Mutagenicity	Not classified
	<ul style="list-style-type: none"> · In vitro: Ames reversion test (<i>S. typhimurium</i>) with/ without metabolic activation: Negative · In vitro: Chromosome aberration test (<i>Chinese hamster ovary (CHO) K1 cells</i>) without metabolic activation: Negative, with metabolic activation: Positive (No valid studies available. (OECD SIDS)) Testing at non-physiological pH might give false-positive responses, which means that the effect of sodium hydroxide is of a methodical kind and not valid to assess the genotoxicity under realistic conditions. · In vivo: Micronucleus test (<i>Mouse bone-marrow cells</i>) : Negative
(h) Reproductive toxicity	Not classified
	<ul style="list-style-type: none"> · It can be stated that the substance will neither reach the foetus nor reach male and female reproductive organs, which shows that there is no risk for developmental toxicity and no risk for toxicity to reproduction.
(i) Specific target organ toxicity (single exposure)	Not available
(j) Specific target organ toxicity (repeat exposure)	Not classified
	<ul style="list-style-type: none"> · Under these conditions the uptake of OH⁻, via exposure to NaOH, is not expected to change the pH in the blood. For this reason, NaOH is not expected to be systemically available in the body under normal handling and use conditions.
(k) Aspiration Hazard	Not available

12. Ecological information

12.1 Toxicity	Not classified
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Acute toxicity	<ul style="list-style-type: none"> - Sodium Hydroxide <ul style="list-style-type: none"> • Fish: 48hr-LC₅₀ (<i>Leuciscus idus melanotus</i>)=189mg/L (static, freshwater) • Crustacean: 48hr-LC₅₀ (<i>Ceriodaphnia cf. dubia</i>)=40mg/L (static, freshwater) • Algae: Not available - Water <ul style="list-style-type: none"> • Fish: 96h-LC₅₀ = 16,062.827 mg/L (estimated) (ECOSAR Class : Neutral Organic SAR) (ECOSAR) • Crustacean: 48h-LC₅₀ (Daphnid) = 6,675.500 mg/L (estimated) (ECOSAR Class : Neutral Organic SAR) (ECOSAR) • Algae: 96h-ErC₅₀ (Green Algae) = 1,368.296 mg/L (estimated) (ECOSAR Class : Neutral Organic SAR) (ECOSAR)
Chronic toxicity	Not available
12.2 Persistence and degradability	<ul style="list-style-type: none"> - Sodium Hydroxide <ul style="list-style-type: none"> • The study does not need to be conducted if the substance is inorganic.
12.3 Bioaccumulative potential	Not available
12.4 Mobility in soil	<ul style="list-style-type: none"> - Sodium Hydroxide <ul style="list-style-type: none"> • log Kow = - 3.88 (estimated) (EPISUITE) • BCF = 3.162 (estimated) (EPISUITE) • The high water solubility and low vapour pressure indicate that NaOH will be found predominantly in the aquatic environment. NaOH is present in the environment as sodium and hydroxyl ions, which implies that it will not adsorb on particulate matter or surfaces and will not accumulate in living tissues. - Water <ul style="list-style-type: none"> • log Kow = - 1.38 (Pubchem) • BCF = 3.162 (estimated) (EPISUITE)
12.5 Hazardous to the ozone layer	Not classified
12.6 Other adverse effects	Not available

13. Disposal considerations

13.1 Disposal method

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations.

Dispose of container and unused contents in accordance with federal, state and local requirements.

13.2 Disposal precaution

Consider the required attentions in accordance with waste treatment management regulation.

14. Transport information

14.1 UN No.: 1824

14.2 UN Proper shipping name: SODIUM HYDROXIDE, SOLUTION

14.3 Transport Hazard class

ADR: UN1824, Sodium Hydroxide solution, 8, PG II

IMDG: UN1824, Sodium Hydroxide solution, 8, PG II

ICAO/IATA: UN1824, Sodium Hydroxide solution, 8, PG II

RID: UN1824, Sodium Hydroxide solution, 8, PG II

14.4 Packing group: II

14.5 Environmental hazards:

Marine pollutant: No

14.6 Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code): Not established

14.7 Special precautions for user

in case of fire: F-A

in case of leakage: S-B

15. Regulatory information

15.1 Safety, health and environmental regulation/legislation specific for the substance or mixture
USA Regulatory Information

< Sodium Hydroxide >

TSCA (Toxic Substances Control Act): Section 8(b) inventory : Present (ACTIVE)

Proposition 65: Not regulated

OSHA Regulation: This product is listed as a hazardous material under criteria of the Federal OSHA Hazard Communication Standard, 29 CFR 1910.1200.

CERCLA Regulation: 1,000 lb final RQ; 454 kg final RQ

SARA 311/312 Hazard classes: Immediate (acute) health hazard

SARA 302 Regulation: Not regulated

SARA 304 Regulation: Not regulated

SARA 313 Regulation: Not regulated

Foreign Regulatory Information

Substance of Rotterdam Protocol: Not regulated

Substance of Stockholm Protocol: Not regulated

Substance of Montreal Protocol: Not regulated

Foreign Inventory Status

- Korea management information: Existing Chemical Substance (KE-31487),
Phase-in substance subject to registration (239),
Toxic Chemical (97-1-136)
- Japan management information: Existing and New Chemical Substances (ENCS): (1)-410, (2)-1972
- China management information: Inventory of Existing Chemical Substances (IECSC): Present (27689)
- Australia management information: Australian Inventory of Chemical Substances (AICS): Present
- Canada management information: Domestic Substances List (DSL): Present
- New Zealand management information: New Zealand Inventory of Chemicals (NZIoC): HSNO
Approval: HSR001547
- Philippines management information: Philippine Inventory of Chemicals and Chemical Substances (PICCS): Present

< Water >

TSCA (Toxic Substances Control Act): Section 8(b) inventory : Present (ACTIVE)

Proposition 65: Not regulated

CERCLA Regulation: Not regulated

SARA 302 Regulation: Not regulated

SARA 304 Regulation: Not regulated

SARA 313 Regulation: Not regulated

Foreign Regulatory Information

Substance of Rotterdam Protocol: Not regulated

Substance of Stockholm Protocol: Not regulated

Substance of Montreal Protocol: Not regulated

Foreign Inventory Status

- Korea management information: Existing Chemical Substance (KE-35400),
- China management information: Inventory of Existing Chemical Substances (IECSC): Present (32224)
- Australia management information: Australian Inventory of Chemical Substances (AICS): Present
- Canada management information: Domestic Substances List (DSL): Present
- New Zealand management information: New Zealand Inventory of Chemicals (NZIoC): May be used as a single component chemical under an appropriate group standard
- Philippines management information: Philippine Inventory of Chemicals and Chemical Substances (PICCS): Present

16. OTHER INFORMATION

16.1 Indication of changes:

Preparation date: March 5, 2020

Version: 2

Revision date: July 31, 2023

16.2 Key literature reference and sources for data:

- National chemicals information systems; <http://ncis.nier.go.kr>
- Pubchem; <http://pubchem.ncbi.nlm.nih.gov/>
- AKRON; <http://ull.chemistry.uakron.edu/erd/>
- IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; <http://monographs.iarc.fr>
- ECHA; <http://echa.europa.eu/web/guest>
- HSDB; <http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/>
- OECD SIDS; http://webnet.oecd.org/Hpv/UI/SIDS_Details.aspx?id=6E6AED5E-C43C-4930-A5FD-F3B4F5F558FF
- NIOSH(The National Institute for Occupational Safety and Health)
- ACGIH(American Conference of Governmental Industrial Hygienists)
- TOMES-LOLI@; <http://www.rightanswerknowledge.com/loginRA.asp>
- Cameo chemicals; <https://cameochemicals.noaa.gov/chemical/3598>
- National Emergency Management Agency-Korea dangerous material inventory management system; <http://www.nema.go.kr/hazmat/main/main.jsp>
- Waste Control Act enforcement regulation attached [1]
- ACT ON REGISTRATION, EVALUATION, ETC. OF CHEMICALS : Registration Dossier: Sodium Hydroxide (CAS No. 1310-73-2)

16.3 Abbreviations

ACGIH: American Conference of Governmental Industrial hygienists

NIOSH: The National Institute for Occupational Safety and Health

OSHA: Occupational Safety & Health Administration

IARC: International Agency for Research on Cancer

ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road

IMDG: International Maritime Dangerous Goods

ICAO/IATA: International Civil Aviation Organization/ International Air Transport Association

RID: Regulations Concerning the International Transport of Dangerous Goods by Rail

16.4 Other

- Product should be handled, stored, and used in accordance with the generally accepted industrial hygiene practices and in conformity with all the applicable legal regulations.
- The information provided herein is based on the knowledge possessed at this present time from the view point of safety requirements.
- It should, therefore, not be construed as guaranteeing specific properties.