



SECTION 1 INTRODUCTION

Material Sodium Hydroxide, ca 100%

Synonyms caustic, caustic flake, caustic soda, lye, liquid caustic

Chemical Formula NaOH

CAS Number 1310-73-2

DOT Classification Corrosive material, UN1823, listed as a Hazardous Material for Transportation (49 CFR 172.101)

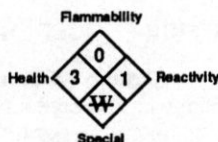
EPA Classification Listed as a RCRA Hazardous Waste (40 CFR 261.22, characteristic of corrosivity), a CERCLA Hazardous Substance (40 CFR 302.4)

Not listed as a SARA Extremely Hazardous Substance (40 CFR 355), or a SARA Toxic Chemical (40 CFR 372.65)

OSHA Classification Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

NFPA Hazard Rating

4 = Extreme
3 = High
2 = Moderate
1 = Slight
0 = Minimum
W = No Water



HMIS

H 3
F 0
R 1

Description Odorless, hygroscopic (readily absorbs water) white flakes, cakes, lumps, chips, pellets, or sticks. Produced by reacting calcium hydroxide with sodium carbonate, by electrolysis of sodium chloride, or from sodium metal and water vapor at low temperature. Used to hydrolyze fats and form soaps; in laundering and bleaching; in pulp and paper manufacture; in treating cellulose to make rayon and cellophane, explosives, dyestuffs, electrolytic extraction of zinc, reclaiming rubber, tin plating, oxide coating, etching and electroplating, vegetable oil refining, food industry for peeling fruits and vegetables, and veterinary medicine as a disinfectant.

Overview Sodium hydroxide has a variety of laboratory applications for chemistry and biology. As a solid or in concentrated solutions, it is very corrosive and may cause burns to human tissue. Avoid contact or inhalation of dust or vapor. Some of its reaction with other materials (strong acids, nitrocarbons, chlorocarbons) may be violent. Sodium hydroxide generates heat when in contact with water and may splatter. Handle sodium hydroxide with extreme caution. Wear chemical goggles, gloves, and an apron or laboratory coat when handling sodium hydroxide.

Manufacturer Always request an up-to-date MSDS from your chemical supplier. That sheet should include the manufacturers and their emergency phone numbers. This *Manual's* Resources/Manufacturers Index lists some larger manufacturers and available emergency phone numbers.

SECTION 2 USE AND STORAGE DATA

Preliminary Planning Considerations Plan and provide for safe disposal of all school-generated chemical waste. Check applicable regulations prior to use. Whenever possible, substitute less hazardous materials. Provide adequate ventilation or restrict use to fume hood to avoid exceeding the TLV (Sec. 4). Contact lens use when handling chemical materials is controversial. In some cases, soft lenses can actually protect eyes from chemicals. In other cases, chemical entrapment is presumed a possible hazard.

Particles adhering to contact lens surfaces can cause corneal damage. The slippery nature of this caustic material could severely hamper contact lens removal if this material is splashed in the eyes. For safety, wear safety glasses or goggles and appropriate protective clothing (e.g., gloves, lab coats) to work with sodium hydroxide. Employees and students should know the location of eyewash and shower facilities near chemical use areas. Check and document that eyewash stations and safety showers are working properly. **Usage Precautions and Procedure** Before using, read this material's container label and follow all precautions. Pellet form is probably the safest solid form for handling and dispensing. Keep containers tightly closed because sodium hydroxide is a hygroscopic material and if it cakes up due to water absorption, removal from the container becomes difficult. Because sodium hydroxide generates heat as it dissolves in water, slowly add sodium hydroxide to water with constant stirring to avoid violent chemical reactions. Do not smoke in usage or storage areas. Practice good house-keeping to avoid unintentionally mixing incompatibles. Do not allow chemical residue or dust buildup in lab or work areas. Small particles spilled and left on lab tables may absorb water to form drops of concentrated solution. Keep sodium hydroxide away from notebooks, textbooks, and personal belongings to avoid transporting chemical residues from the lab/work area. After working with chemical materials, and before eating, drinking, or smoking, always wash hands and face. Remove and launder contaminated clothing before reusing.

Additional Data Sodium hydroxide is stable at room temperature under normal handling and storage conditions. It slowly absorbs moisture from the air and reacts with carbon dioxide from the air to form sodium carbonate. Violent polymerization can occur when in contact with acrolein or acrylonitrile. Its incompatibilities include: water (generates heat and steam); metals such as aluminum, tin, zinc, and alloys such as steel (corrodes and forms flammable hydrogen gas); zinc or cinnamaldehyde (ignites on contact); mineral acids (form corresponding salts); weak-acid gases like hydrogen sulfide, sulfur dioxide, and carbon dioxide; trichloroethylene (forms spontaneously flammable, dichloroacetylene). An increase in temperature and pressure occurs in closed containers when sodium hydroxide is mixed with: acetic anhydride, glacial acetic acid, chlorohydrin, chlorosulfonic acid, ethylene chlorohydrin, glyoxal, oleum, 36% hydrochloric acid, 48.7% hydrofluoric acid, 70% nitric acid, or 96% sulfuric acid.

Preferred Storage Location and Methods Store in tightly closed and properly labeled containers in a cool, dry, well-ventilated area out of direct sunlight and away from water, acids, metals, flammable liquids, organic halogens, and other incompatibles. To separate incompatible chemicals, store by chemical family, not by alphabetical name. Protect all chemical containers from physical damage. Do not store sodium hydroxide in aluminum or steel containers above 140 °F (60 °C). Prohibit smoking in chemical storage areas. Purchase amounts sufficient for one year's use or less.

SECTION 3 SPILL/DISPOSAL PROCEDURES

If Spilled Ventilate spill area. Promptly and thoroughly clean up spilled material. Cleanup personnel should protect against inhalation and skin or eye contact. Keep spilled sodium hydroxide away from water and easily ignitable

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materials (paper, wood). **Caution!** NaOH solutions may cause floor areas to become very slippery. For liquid (solution) spills, cover with an inert solid absorbent (vermiculite, dry sand, etc.) and scoop into appropriate containers (with secure lid) for disposal in accordance with existing regulations. As needed, dike spill area with inert absorbent material to contain spill. For dry spills, carefully collect spilled material and scoop into secure disposal or reclamation containers. Avoid creating airborne dust conditions. Vacuum (with appropriate filter) or wet mop to minimize dust dispersion.

Disposal of Small Quantities Handle emptied containers carefully since residues may remain. Always check regulations before disposal. Investigate recycling or reclamation rather than landfill disposal. If these methods are not practical, feasible, or in accord with existing regulations, contact your supplier or a licensed disposal contractor for specific treatment/disposal procedures.

Disposal of Larger Amounts Contact your supplier or a licensed disposal company.

Follow all applicable local, state, and Federal regulations for all waste disposal.

◆ SECTION 4 HEALTH HAZARDS

Sodium hydroxide is a severe skin, eye, and mucous membrane irritant. Damage is immediate and can become permanent without prompt medical attention.

1991-92 ACGIH TLV Ceiling: 2 mg/m³

1990 NIOSH REL Ceiling: 2 mg/m³

1991 OSHA PEL Ceiling: 2 mg/m³

IDLH Level* 250 mg/m³ (solution mists)

1985-6 Toxicity Data Rabbit, oral, LD₅₀: 500 mg/kg; no toxic effect noted. Rabbit, eye: 1 mg/24 hr produced severe irritation. Rabbit, skin: 500 mg/24 hr produced severe irritation.

Carcinogenicity Not listed by the IARC, NTP, or OSHA

Acute Effects Skin contact (25% to 50% solutions) causes slippery, soapy feeling that is not usually painful for 3 minutes after contact—even though skin damage begins immediately. If not immediately washed off, severe burns, tissue corrosion, deep ulcerations, and permanent scarring may result. Depending on the severity of exposure, dust or mist inhalation can cause mild irritation of the nose (at 2 mg/m³) to severe pneumonitis. Eye contact with sodium hydroxide causes corneal corrosion. Disintegration and sloughing of conjunctival and corneal epithelium may progress to temporary or permanent corneal opacification (cloudiness, becoming impervious to light) or symblepharon (adhesion of lid to the eyeball). Ingestion produces severe abdominal pain, corrosion of the lips, mouth, tongue, and pharynx, and vomiting (sometimes coffee grounds-like material due to digestive hemorrhage). Death commonly results from shock, asphyxia (oxygen loss due to interrupted breathing), or pneumonia by the second or third day after ingestion.

Chronic Effects Dermatitis may result from repeated exposures to dilute solutions. Lung, nose, throat, and mouth irritation may occur if exposed to low levels for long periods of time.

* See definition on page 9 of Glossary for Terms and Abbreviations.

◆ SECTION 5 FIRST AID PROCEDURES

Eye Contact Promptly flush eyes with plenty of running water for at least 15 min, including under eyelids. Do not let victim keep eyes tightly shut. Although splashed directly into one eye, sodium hydroxide may affect the other eye's sight if prompt medical attention is not received. Get prompt medical attention.

Skin Contact After flushing with large amounts of water, wash exposed areas with soap and water.

Inhalation Remove victim from area of exposure to fresh air and support breathing as necessary.

Ingestion Get prompt medical attention. Contact a poison control center*. Never give anything by mouth to an unconscious or convulsing person. *Do not induce vomiting!*

Get proper in-school, paramedic, or community medical attention and support.

* See listings on pages 2-8 of *Resources/Manufacturers Index*.

◆ SECTION 6 FIRE PROCEDURES AND DATA

Fire Hazards Although sodium hydroxide is noncombustible as a solid, when in contact with moisture or water sodium hydroxide can generate enough heat to ignite surrounding combustibles. Sodium hydroxide may melt and flow when heated. For major fires, or for fires involving large quantities, firefighters should wear appropriate protective clothing and respirators. Structural firefighters' protective clothing provides limited protection. Because fire may produce toxic thermal decomposition products, a self-contained breathing apparatus (SCBA) is recommended.

Flash Point and Method None reported

Autotemperature None reported

Flammability Limits in Air (vol. %) None reported

Hazardous Decomposition Products Thermal oxidative decomposition of sodium hydroxide can produce toxic sodium oxide (Na₂O) and sodium peroxide (Na₂O₂) fumes.

Extinguishing Media Use media appropriate to surrounding fire conditions. Avoid water spray because sodium hydroxide generates substantial heat. If you must use water, make sure it is as cold as possible. If possible without risk, remove containers from area.

◆ SECTION 7 PHYSICAL DATA

Boiling Point 2534 °F (1390 °C)

Melting Point 605 °F (318.4 °C)

Vapor Pressure 1 mm Hg at 1362° F (739 °C)

Solubility in Water 1 g/0.9 mL, 1g/0.3 mL boiling water

Other Solubilities 1 g/7.2 mL alcohol, 1 g/4.2 mL methanol, soluble in glycerol; insoluble in acetone and ether

pH (0.5% solution) 13

Molecular Weight 40.01

Specific Gravity (H₂O = 1) 2.13 at 77 °F (25 °C)

References 26, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 139, 140, 143, 146, 148, 149, 153, 159, 161, 163, 167; Genium's *Material Safety Data Sheets Collection*, No. 3 (11/91)

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