



Environmental Health and Safety
Tufts University Standard Operating Procedures (SOP) for Sodium Azide

CAS #: 26628-22-8

Synonyms: Azide, Azium, NaN_3 .

NFPA 4 Health, 0 Fire, 0 Reactivity, HMIS 4-most hazardous poison.

Toxicity:

Sodium azide is a colorless, crystalline water soluble solid. It is used in dilute solutions as a preservative of biological samples and stock solutions in laboratories and a reagent in synthesis work. It can be explosive when heated near its decomposition temperature (300°C) or reacted with metals; heating sodium azide should be avoided. Sodium azide (solid or concentrated solutions) should never be flushed down the drain since this practice can cause explosions when the azide reacts with lead or copper to form shock sensitive copper or lead azide. Sodium azide has high acute toxicity oral toxicity (oral mouse $\text{LD}_{50}=27$ mg/kg) and dermal toxicity (dermal rabbit $\text{LD}_{50}=20$ mg/kg). Sodium azide readily penetrates intact skin, and any dermal exposure can significantly contribute to the overall exposure

The National Institute for Occupational Safety and Health (NIOSH) recommends airborne exposure limit of 0.11 ppm as hydrazoic acid or 0.3 mg/m³ as solid (powder) sodium azide, not to be exceeded at any time. The American Conference of Governmental Industrial Hygienists (ACGIH) recommends airborne exposure limit of 0.11 ppm as hydrazoic acid or 0.29 mg/m³ as sodium azide (0.1 ppm Ceiling, Skin), not to be exceeded at any time.

When sodium azide reacts with acid, hydrazoic acid (HN_3) is produced. Hydrazoic acid gas has a sharp pungent odor. Sodium Azide and hydrazoic acid form strong complexes with hemoglobin, and consequently block oxygen transport in the blood.

If inhaled, it may cause irritation to the respiratory tract and mucous membranes causing coughing, dizziness and fainting. Highly toxic if ingested, may cause nausea, vomiting, low blood pressure and rapid heartbeat. Skin contact causes irritation and pain as well as symptoms typical of ingestion.

Good Practices and Personal Protective Equipment (PPE):

Sodium azide powder should be purchased in the smallest practical amount. Whenever possible, sodium azide should be purchased as a pre-mixed stock solution of less than 5%. If Sodium Azide is being used as a preservative, Kathon and ProClin preservatives (see References) are two commercially available preservatives which are safer alternatives. If Sodium Azide must be used, **keep container sizes and quantities in the work area as small as possible** which allow for quick and easy clean up by appropriate personnel if a spill occurs. **Line work surfaces with removable absorbent paper.** A three month supply or less is a good rule of thumb. The locations of safety showers and eye wash stations must be clearly marked and easily accessible.

Use appropriate ventilation (laboratory chemical hood) and personal protective equipment (lab coat, nitrile gloves, and safety glasses) to minimize potential exposure. Store it in tightly closed containers in a secured, cool, and well-ventilated area away from water.

A danger of explosion exists from friction, heat or shock if heavy metal azides are allowed to form. Note that metal shelves and other metal items used to handle sodium azide (i.e., spatulas) can result in the formation of heavy metal azides and thus should be avoided. Solutions of sodium azide do not pose the danger of shock-sensitivity associated with the solid form; however, the hydrazoic acid generated when the sodium azide is dissolved is extremely toxic. Therefore, the solution should be prepared inside a laboratory chemical hood. If not dissolved, solid sodium azide should be stored in a plastic secondary container to prevent crystals on the outside of container from coming in contact with metal shelves. Avoid heating sodium azide as it may undergo violent decomposition if heated to its decomposition temperature of $\sim 275^{\circ}\text{C}$.

Incompatibilities:

Sodium azide reacts with heavy metals and metal salts to form highly explosive compounds. Store away from metals, acids, carbon disulfide, bromine, dibromomalonitrile, chromyl chloride, sulfuric acid, nitric acid, hydrazine and dimethyl sulfate.

Spills:

If you spill a small amount (minor spill) of sodium azide notify your supervisor for cleanup assistance. A major spill is any amount of chemical that the lab staff cannot easily and safely clean up without outside assistance. In this case, vacate the lab and call your supervisor and TUPD at 6-6911.

Small spill (inside a fume hood):

Don appropriate PPE (lab coat, nitrile gloves, safety glasses). Sodium azide crystals should be swept up and surfaces cleaned with pH-adjusted water (pH greater than 9.0). Cover spills of sodium azide solution with absorbent material, and clean surfaces with pH-adjusted water. Collect spilled material and clean up material into appropriately labeled waste container. Dispose of all contaminated materials as hazardous waste by placing in satellite accumulation area.

Large spills / Spills outside of a chemical hood:

Isolate the area to prevent the spread of contamination (e.g. close doors to affected area, post warning signs, alert others in immediately vicinity to evacuate). If a small spill outside of a fume hood, don appropriate PPE (lab coat, nitrile gloves, safety glasses), vacuum or sweep up material and place into a suitable disposal container (non-metal). Avoid generating dusty conditions. Collect spilled material and clean up material into appropriately labeled waste container. Dispose of all contaminated material as hazardous waste.

If a large spill of a dilute solution (<5-10%) follow procedures above for a small spill. If a large spill of concentrated solutions (>5-10%), evacuate room/immediate area. Call TUPD at 6-6911 and TEHS. Close doors and post warning signs at entrances/exits notifying others of spill. Prevent unnecessary entry into area. Provide assistance and information to spill responders.

Accidents/Exposures:

Treat any exposure (ingestion, skin or inhalation) seriously no matter how slight it may seem at the moment. If leaving the area where sodium azide was spilled is not an option, stay as low to the ground as possible, because sodium azide fumes rise. If skin is exposed to sodium azide, remove contaminated clothing, rapidly wash the exposed area with soap and water for 15 minutes, and get medical care as quickly as possible. If inhaled, move to fresh air and consult a physician. If ingested, rinse mouth with water and seek medical attention. In case of eye contact flush eyes with water for 15 minutes and consult a physician.

Disposal:

Never flush sodium azide (solid or concentrated solution) down the drain — the azide can react with lead or copper in the drain lines and explode. If dilute solutions (0.1%-5%) are deactivated with nitrous acid as part of your experiment's protocol, then the deactivated solution may be disposed of down the drain if the pH is between 6 - 9. To determine if all the sodium azide was deactivated, the following colorimetric testing can be used to detect NaN_3 in your used solution: A drop of the solution is placed in the depression of a spot plate and treated with 1 or 2 drops of dilute hydrochloric acid. A drop of ferric chloride solution is added and the spot plate gently heated. A red color indicates hydrazoic acid and thus the presence of sodium azide in the solution.

If the sink trap and visible drain pipes are PVC and sodium azide is not the sole active ingredient and is present in a low concentrations (0.1% or less), it is permissible to dispose using the sewer system as long as you flush with copious amounts of water.

Sodium azide is among the P-listed hazardous wastes regulated by the US Environmental Protection Agency. Any discarded excess, off specification species, container residues or spill cleanup material, must be managed as a hazardous waste.

Sodium Azide meets the requirements of a hazardous waste. Waste Sodium Azide must be placed in a compatible container, labeled with the red hazardous waste tags provided by the safety office and the tags need to be properly filled out. On the back of the waste tag, check off the box marked "corrosive." Place the waste container in the satellite accumulation area in secondary containment. Make sure the waste bottle is fitted with a proper screw cap and notify the TEHS for disposal.

References:

- MSDS for Sodium Azide, Sigma Aldrich 2011.
- Genium's handbook of safety, health, and environmental data for common hazardous substances. 1999.
- Krister Forsber, S.Z Mansdorf. *Quick Selection Guide to Chemical protection Clothing 3rd edition.* 1997.
- Occupational Safety and Health Topics for Sodium Azide.*
http://www.osha.gov/dts/chemicalsampling/data/CH_267505.html
- U.S. Department of Health and Human Services, *NIOSH Pocket Guide to Chemical Hazards*, Publication No. 90-117, Cincinnati, Ohio, June 1990.
- NorthEastern University, Sodium Azide factsheet:
http://www.ehs.neu.edu/hazardous_waste/fact_sheets/sodium_azide/

- UC San Diego: Handling Sodium Azide.: <http://blink.ucsd.edu/safety/research-lab/chemical/specific/azide.html>
- University of Southern California, *Safety Guideline: Sodium Azide*. <http://capsnet.usc.edu/LabSafety/documents/SodiumAzide.pdf>
- Centers for Disease Control and Prevention: Emergency Preparedness and Response: Facts about Sodium Azide. <http://www.bt.cdc.gov/agent/sodiumazide/basics/facts.asp>
- Chemical & Engineering News: Safety Zone blog: sodium azide. <http://cenblog.org/the-safety-zone/2010/04/sodium-azide-acid-boom-2/>
- DHHS (NIOSH) Publication Number 78-127, August 16, 1976, Explosive Azide Hazard. http://www.cdc.gov/niosh/docs/1970/78127_13.html

Preservative Substitutes:

- Kathon Preservatives: Kathon CG/ICP Preservatives-Sigma Aldrich: <http://www.sigmaaldrich.com/analytical-chromatography/analytical-reagents/biocides/kathon.html>
- ProClin Preservatives: SAFC Biocides and Preservatives: <http://www.safcglobal.com/safc-supply-solutions/en-us/home/diagnostics/our-offer/product-breadth/biocides-amp-preservatives.html>