**Standard Operating Procedure**

**Sodium Azide**

***This is an SOP template and is not complete until:*** *1) lab specific information is entered into the box below 2) lab specific protocol/procedure is added to the protocol/procedure section and
3) SOP has been signed and dated by the PI and relevant lab personnel.*

 Print a copy and keep with your
*Chemical Hygiene Plan* and/or *Lab Safety Resources Binder*

|  |  |
| --- | --- |
| **Department:** | Click here to enter text. |
| **Date SOP was approved by PI/lab supervisor:** | Click here to enter a date. |
| **Principal Investigator:** | Click here to enter text. |
| **Lab Safety Coordinator/Lab Manager:** | Click here to enter text. |
| **Lab Phone:** | Click here to enter text. |
| **Office Phone:** | Click here to enter text. |
| **Emergency Contact:** | Click here to enter text. |
| *(Name and Phone Number)* |
| **Location(s) covered by this SOP:** | Click here to enter text. |
| *(Building/Room Number)* |

**Type of SOP:** ☐ Process X Hazardous Chemical ☐Equipment

1. **Purpose**

This standard operating procedure outlines the handling and use of sodium azide. Review this document and supply the information required in order to make it specific to your laboratory. In accordance with this document, laboratories should use appropriate controls, personal protective equipment, and disposal techniques when handling sodium azide.

Sodium Azide is a colorless, odorless, crystalline solid that is readily soluble in water. It is used as a preservative of samples and stock solutions in laboratories. Typically, it is used in strengths of 0.1 to 2.0%. Pure Sodium Azide and concentrated solutions of Sodium Azide are acutely toxic and can be reactive when heated near their decomposition temperature. Dilute solutions of Sodium Azide should not be poured down the drain because it can react with metals in plumbing systems to form explosive metal halides.

1. **Procedure/Scope:**

This SOP documents the safe usage and handling of sodium azide.

[Identify when the procedure is to be followed]

[Include laboratory procedure and specify hazardous stages of the procedure]

1. **Physical & Chemical Properties/Definition of Chemical Group**

CAS#: 26628-22-8

Class: Potentially Explosive Compound

Molecular formula: NaN3

Form: Solid

Overview of Potential Hazards

* Mutagen and possible carcinogen
* Water Reactive
* Potentially Explosive Compound (PEC)
* Acutely toxic

**Acute Effects**

**Eye**: Redness, pain, irritation. Contact with dust or vapor may cause systemic toxicity.

**Skin**: Irritation, redness, blisters. May be fatal if absorbed through the skin.

**Ingestion**: Irritation of the digestive tract, abdominal pain, nausea, sweating, vomiting, diarrhea. May cause low blood pressure, rapid heartbeat, skin discoloration, and possible coma. May be fatal if swallowed.

**Inhalation**: Severe irritation of the respiratory tract with sore throat, coughing, nasal stuffiness, blurred vision, shortness of breath and delayed lung edema. The vapor of hydrazoic acid may be present where sodium azide is handled. Symptoms of acute exposure to hydrazoic acid include eye irritation, headache, dramatic decrease in blood pressure, weakness, pulmonary edema and collapse.

**Routes of Exposure**

Sodium azide may enter the body through all routes of exposure

**Chronic Effects**

Chronic exposure to sodium azide may result in liver and kidney damage. Repeated exposure may cause damage to the spleen. Laboratory studies have shown mutagenic effects, development of tumors in animals, and blood effects.

**Physical Hazard**

Sodium azide rapidly hydrolyzes in water, when mixed with water or an acid, to form hydrazoic acid, a highly toxic and explosive gas. It is thermally unstable and if heated to 275ºC, sodium azide may undergo violent decomposition.

Sodium azide also form explosive compounds when it comes in contact with or dries on metal surfaces. It can also react with metal pipes in laboratory sinks, traps and drains, so do not dispose of down the sink! If introduced to the waste water treatment system in large volume or in high concentrations, the desirable anti-bacterial characteristics of this chemical can damage the water treatment process of your city and county.

It will also react with metal spatulas and metal lab equipment to form shock sensitive salts. It reacts with lead, copper, silver, gold and metal halides to form heavy metal azides which are explosive.

1. **Safety Data Sheet (SDS) Location**

Online SDS can be accessed at (<http://oregonstate.edu/ehs/sds>). A hard copy can be found at Oak Creek Building with Environmental Health & Safety.

1. **Personal Protective Equipment (PPE)**

Laboratory personnel must always wear a lab coat when working in a lab. Closed-toed shoes are also required at all times.

**Hand Protection**

Double nitrile gloves must be worn.

Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

**Eye Protection**

Face shield and safety glasses

**Skin and Body Protection**

Long pants or clothing that covers the body to the ankles and closed-toe solid top shoes must be worn when handling sodium azide. Flame retardant and chemical impermeable (Blue Lab) coats must be worn, fully buttoned. If working with larger amounts where a splash to the body/arms is possible, then additional body protection should be worn, i.e., chemical resistant apron, oversleeves, etc.

1. **Equipment and Supplies**

[List any equipment or supplies need for the procedure above.]

1. **Engineering Controls**
* Fume hoods, or other locally exhausted ventilation, must be used when handling sodium azide in both solution and powdered form. Work at least 6” inside the hood, never place your head in the hood, set the sash at the lowest position possible
* Concentrating solutions on a rotary evaporator or drying under vacuum should also take place within a chemical fume hood.
* Never use a metal spatula when manipulating Sodium Azide.

1. **Administrative Controls:**
* Anyone who uses Sodium Azide is required to review this SOP and the attached Safety Data Sheet (SDS) prior to work.
* Storage should take place in a secure, cool, ventilated area, with a tightly closed container.
* Keep segregated away from acids and other incompatibles such as metals and oxidizing or reducing reagents.
* Keep quantities to a minimum and only order what you will be using.
* An eye wash must be available in the room with a safety shower accessible nearby.
* If using large quantities or heating sodium azide in a chemical reaction, a blast shield should be in place.
1. **Best Practices for Safe Handling:**

The inherent health hazards associated with Sodium Azide apply regardless of its usage. On the other hand, the explosive hazards vary greatly depending on how Sodium Azide is manipulated. Using Sodium Azide as part of a synthetic chemistry method greatly increases the risk due to the potential for forming azides of greater instability than the original Sodium Azide. Below are some recommended and required practices for safe use of Sodium Azide.

Sodium azide should not be allowed to come into contact with the following as they can form sensitive, unstable compounds:

* Heavy metals or their salts (including barium, lead, and copper)
* nitric acid and other acids (acids can also form the highly toxic and volatile hydrazoic acid)
* Chlorinated solvents such as dichloromethane and chloroform
* bromine
* dimethyl sulfate

Do not pour Sodium Azide solutions into a copper or lead drain. These may form heavy metal azides which are much less soluble and may precipitate out and accumulate.

Bottles containing pure powders or solutions of Sodium Azide at 5% or greater must be opened and handled only in a chemical hood. During use, the sash must be lowered to operating height or below. Containers of Sodium Azide must always be closed when not in use.

Never expose organic azides to ground glass joints as the glass-on-glass friction may cause the azide to decompose explosively.

Never use elevated temperature distillation or sublimation as purification techniques. Purification should be limited to extraction, precipitation and other suitable methods.

Concentrating azide-containing reaction mixtures and products through rotary evaporation have caused documented explosions. This should be avoided or the possibility of explosion taken into account through the proper engineering controls. In some instances it is thought that the azide penetrating the ground glass joints was responsible, though other mechanisms for the explosions are also possible.

Never use metal spatulas for weighing and transferring azides. Never scratch solid azides.

Keep the hood clear of any unnecessary chemicals and equipment. Clearly label your containers, and post a sign on the fume hood as notification that there is an azide experiment in progress.

 When weighing dry powder and the scale cannot be located inside the enclosure, use the following procedure:

1. Tare the container with lid.
2. Add the chemical inside the fume hood using a plastic or ceramic spatula. Do NOT use a metal spatula.
3. Close the container.
4. Weigh the container.
5. Add the solvent inside the hood.

If solutions are manipulated in a way that generates aerosols (e.g., sonicating or pressurizing), do this inside the hood if the container has to be open, or keep the container closed.

Clean the work area by wiping with soap and water once your work is done.

Clearly label all equipment and instruments that come into contact with sodium azide, and thoroughly flush them with water to avoid the build-up of azide salts. Be careful servicing metal parts that have come into contact with sodium azide.

1. **First Aid Procedures**

If an accident happens the following documents must be completed:

* Online OSU HR Advocate Public Incident Reporting Form within 24 hours of the incident
* If the employee’s incident resulted in the need for medical treatment, have the employee complete the worker section of the SAIF 801 Form and fax to risk management at 541-737-4855 within 24 hours.

**If inhaled**

Move to fresh air. If the person is not breathing, give artificial respiration. Avoid mouth to mouth contact. Call 911 from a phone. Call EHS at 541-737-2273 after emergency services have been contacted to report the incident.

**In case of skin contact**

Immediately (within seconds) flush affected area for at least 15 minutes. Remove all contaminated clothing. Call 911 immediately. Call EH&S at 541-737-2273.

**In case of eye contact**

Use eye wash to flush eyes for 15 minutes. Call 911. Follow safety instruction for further assistance: <http://ehs.oregonstate.edu/sites/ehs.oregonstate.edu/files/pdf/si/eyewash_and_safety_shower_si.pdf>

**If ingested**

Do not induce vomiting. Contact 911 and/or poison control center if swallowed: 1(800)222-1222.

Note to physician: Accidental ingestion of sodium azide is potentially life-threatening. Treatment includes gastric lavage, followed by sodium catharsis. EKG and blood pressure monitoring and support are recommended.

1. **Special Storage & Handling Requirements**

**Handling**:

Do not store on metal shelves or use metal items (spatulas) to handle sodium azide.

Store in tightly closed containers in a cool, well-ventilated area away from heat, air, light and moisture.

Sodium azide and all other acutely toxic materials should be stored in a secondary container in a designated area from other chemicals. A refrigerator storing sodium azide must be labeled on the outside with a caution sign noting the presence of sodium azide and its hazards.

Store away from metals, acids, carbon disulfide, bromine, chromyl chloride, sulfuric acid, nitric acid, hydrazine and dimethyl sulfate.

When handling Sodium azide, use only in a certified chemical fume hood.

Sodium azide powder should be purchased in the smallest practical amount. Make stock solutions of 10%, if possible to minimize potential accidents.

Whenever handling pure sodium azide powder or concentrated solutions of 10% or more, that may require assistance in case of a spill or accident; it is recommended that a second trained individual be present in the lab or in the vicinity.

Wash hands thoroughly after handling (even if gloves were used).

**Storage:**

Dry powders must be in sealed shatter-resistant containers during transportation. If the container is not shatter- resistant, use a secondary container.

Store in a cabinet or drawer; do not store sodium azide on opens shelves or counters.

Do not store on metal shelves.

Store in tightly closed containers in a cool, well-ventilated area away from heat, air, light and moisture.

Store away from metals, acids, carbon disulfide, bromine, chromyl chloride, sulfuric acid, nitric acid, hydrazine and dimethyl sulfate.

Store sodium azide in a cool, dry area away from heat and open flames. Separate it from incompatible material such as halogenated hydrocarbons, metals, water, acids, and acid chlorides. Avoid contact with metal shelves or containers. Use secondary containment if necessary.

Keep away from heat and open flame.

Store in tightly closed containers in a secured, cool, and well-ventilated area away from water.

Keep sodium azide powder and strong solutions away from benzoyl chloride, potassium hydroxide, bromine, carbon disulfide, chromyl chloride, copper, dibromalonitrile, dimethyl sulfate, lead, barium carbonate, acids (especially sulfuric and nitric), and water.

**Transporting:**

Transport with secondary container, always follow OSU labeling requirements.

1. **Chemical Spill**

**OSU Chemical Spill Safety Instruction**: <http://ehs.oregonstate.edu/sites/ehs.oregonstate.edu/files/pdf/si/spill_response-chemicals_si.019.pdf>

**General Guidelines**

For cleaning up a small spill of sodium azide, do not use metal instruments.

**For liquid spills inside the hood and less than 250 ml in size:**

Preparation: Ensure employees have adequate Personal Protective Equipment and spill control materials before attempting to clean up a spill

1. Assess the magnitude of the spill and the associated hazards (broken glass, toxic fumes, risk of fire, etc.).

2. If the hazards can be safely mitigated with available personal protective equipment (PPE), do so. This includes informing co-workers of the spill, removing ignition sources, and moving equipment that may be damaged by the spilled chemicals. (Note: If the spill is more than 250 ml of liquid or any amount of solid, contact Public Safety at 541-737-7000 and ask them to notify EH&S.)

3. Once all hazards have been assessed, put on appropriate PPE (respiratory protection, goggles, body protection, gloves, impervious shoes/boots, etc.).

4. Apply the Pig Pads to the spill and give the pads time to absorb the chemical.

5. Use gloves and cardboard to move the used Pig Pads to a garbage bag. 6. Seal the garbage bag with a zip tie and label the bag with a Hazardous Waste Label.

7. Place the garbage bag in secondary containment (a cardboard box or plastic tote/bin) labeled “Hazardous Waste.” Place the box in a location in the laboratory where EH&S personnel will easily find it.

8. Request a Hazardous Waste Pickup (<http://oregonstate.edu/ehs/waste>).

9. Replenish you spill kit’s contents immediately.

**For spills outside the hood and greater than 250 ml in size:**

1. In general, if a chemical spill is greater than 250 ml in volume or is a particularly hazardous material (strong acid or base, carcinogen, highly reactive chemical, etc.), call Public Safety (541-737-7000), and tell them to contact the on-call EH&S personnel to respond to the spill.

2. Provide the following information:

o Your name and contact phone number

o Location of the spill (Building and room number)

o Approximate volume of spilled liquid

o Name of chemical

3. Do not attempt to clean up large and/or hazardous chemical spills.

4. Notify all other workers who could be affected by the spill and vacate the laboratory/floor/building, particularly if the chemical produces hazardous fumes or poses other potential health hazards.

5. Wait at the building entrance for EH&S personnel.

6. Serve as a point of contact and provide information about the spill, as requested by EH&S personnel.

**Personal precautions**

Individuals cleaning spills must wear appropriate PPE as described in the Personal Protective Equipment section of this document in order to prevent exposure to Sodium Azide. Double-gloving for all spill clean-ups is required. Solids must be cleaned up in a manner that prevents dust generation. DO NOT clean up a spill if you have not received proper training or if you do not feel you can handle the spill. Contact your supervisor or Environment, Health & Safety (EH&S) immediately.

**Environmental precautions**

Do not let product enter drains. Discharge into the environment must be avoided.

**Methods and materials for containment and cleaning up**

 A hard copy of this Safety Instruction

 A hard copy of the Pink Pig Absorbent Pad Chemical Compatibility Chart <http://www.newpig.com/wcsstore/NewPigUSCatalogAssetStore/Attachment/documents/ccg/HAZMAT.pdf>

 Bucket with screw-on lid

 6 Pink Pig Absorbent Pads (Item number MAT301 at [www.newpig.com](http://www.newpig.com))

 Heavy duty black plastic garbage bags

 Zip ties (to seal garbage bags)

 Hazardous Waste Labels (available at <http://oregonstate.edu/ehs/waste>)

 Cardboard rectangles/squares for handling used Pig Pads, if necessary

 Appropriate lab-specific PPE, such as lab coats, goggles, gloves, etc., should be available in each laboratory

1. **Other Emergencies**

**Medical Emergency Dial 911**

**Life Threatening Emergency, After Hours, Weekends and Holidays** – Dial **911** (This will connect you to Good Samaritan Hospital Corvallis where they will be able to treat the victim).

**Non-Life Threatening Emergency** – [Instructions on how to handle a non-life threating chemical exposure, process injury, or procedural injury.]

1. **Decontamination/Waste Disposal Procedure**

Sodium azide is a water-reactive poison. After working with sodium azide, decontaminate work space with 70-75% ethanol. Contaminated pipet tips, Eppendorf tubes, and gloves should be discarded as hazardous waste according to OSU EH&S waste disposal procedures.

Store liquid wastes in designated waste containers. Dispose of according the OSU EH&S hazardous waste guidelines. Drain disposal of sodium azide solutions is not permitted*.*

**Label Waste**

* Affix an EH&S hazardous waste label on all waste containers (<http://ehs.oregonstate.edu/sites/ehs.oregonstate.edu/files/pdf/hwlabelfull.pdf>) as soon as the first drop of waste is added to the container.

**Store Waste**

* Store hazardous waste in closed containers, in secondary containment and in a designated location. ([http://ehs.oregonstate.edu/sites/ehs.oregonstate.edu/files/pdf/si/waste\_hazardous\_disposal\_si.pdf)](http://ehs.oregonstate.edu/sites/ehs.oregonstate.edu/files/pdf/si/waste_hazardous_disposal_si.pdf%29).
* Double-bag dry waste using transparent bags
* Waste must be under the control of the person generating & disposing of it

**Dispose of Waste**

* Dispose of regularly generated chemical waste within 90 days
* Put in a waste request at: <http://ehs.oregonstate.edu/waste>
1. **References**

[Include any references useful to employees]

1. **Training Requirements**

Before working with sodium azide, the lab worker must have the approval of the designated personnel who shall provide specific training according to this SOP and in understanding the MSDS provided by the manufacturer. The lab worker must complete EH&S Laboratory Safety, Hazardous Waste and Safety data sheets training prior to working with any chemicals. The lab worker should provide documentation that he/she understands the hazards and has been trained in how to work with sodium azide safely.

**Documentation of Training**

* Prior to conducting any work with sodium azide designated personnel must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
* The Principal Investigator must provide this SOP and a copy of the SDS (can be available online) available to all laboratory personnel.
* The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training.

**Principal Investigator SOP Approval**

By signing and dating here the designee certifies that the Standard Operating Procedure (SOP) for *Insert SOP Name* is accurate and effectively provides standard operating procedures for laboratory personnel.

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Signature Printed Name/Title Date

I have read and understand the content of this SOP:

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| --- | --- | --- |
| **Name** | **Signature** | **Date** |
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