**Wayne State University**

**Office of Environmental Health and Safety (OEHS)**

**Standard Operating Procedure (SOP)**

**Preparation and use of dilute Sodium azide (NaN3) solutions (concentration ≤ 5% or ≤ 0.8M)**

Enter Lab Specific SOP Title Here

**** **** ****

***Note –Text in gray italics indicate instructions to complete this SOP.***

| **#1 CONTACT INFORMATION** |  |
| --- | --- |
| **SOP Title** | Click or tap here to enter text. |
| **SOP Prepared By** | Click or tap here to enter text. |
| **Date Prepared** | Click or tap here to enter text. |
| **SOP Revised By** | Click or tap here to enter text. |
| **Date Revised** | Click or tap here to enter text. |
| **Responsible Person** | *[Name of PI, Lab Supervisor, or Autonomous Researcher, as appropriate]*Click or tap here to enter text. |
| **Locations** | **This procedure may be performed in the following location(s):**Building name & Room # Building name & Room # Building name & Room # Building name & Room #  |
| **Approval Signature** | *[Obtain prior approval, as appropriate. See section #10 of this template.]*Signature  |
| **Emergency Contact Name(s)** | Click or tap here to enter text. |
| **Emergency Contact Number(s)** | *[Enter at least one 24/7 emergency contact number of a lab member]*Enter contact number(s)  |
|  | **WSU Police: (313) 577-1200** |

| **#2 THIS SOP IS DEVELOPED FOR A:** |
| --- |
| [ ]  **Specific laboratory procedure or experiment***[Examples: synthesis of chemiluminescent esters; folate functionalization of polymeric micelles; etc.]*[ ]  **Generic laboratory procedure that covers several chemicals***[Examples: distillation; chromatography; etc.]*[ ]  **Generic use of specific chemical or class of chemicals with similar hazards***[Examples: organic azides, mineral acids, etc.]* |

| **#3 PROCESS OR EXPERIMENT DESCRIPTION** |
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| *[Provide a brief description of your process or experiment, including its purpose. Do not provide a detailed sequential description as this will be covered by section #6 of this template. Include the frequency and the duration below.]*Click or tap here to enter text. |
| **Frequency** | [ ]  One time[ ]  Daily[ ]  Weekly[ ]  Monthly[ ]  Other: Enter text |
| **Duration per experiment** | *[Minutes/ Hours/ etc.]*Click or tap here to enter text. |

| **#4 HAZARD SUMMARY & SAFETY LITERATURE REVIEW** |
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| 1. Sodium Azide
	1. Physical Hazards
* Form highly toxic, shock sensitive and explosive metal azides and other compounds in contact with or dries on heavy metal (e.g. lead, copper, zinc, cadmium, nickel) surfaces (e.g. metal spatulas, other metal lab equipment including metal plumbing) or other incompatible materials including but not limited to halogenated hydrocarbons (e.g. dichloromethane, chloroform, other halogenated aliphatic or benzylic solvents), carbon disulfide, dimethyl sulfate, bromine, acids (e.g. nitric acid) and water.
* Thermally unstable. May undergo violent decompositions at temperatures ≥ 275°C and vapors may form explosive mixtures with air, presenting an explosion hazard indoors, outdoors, and in sewers.
	1. Health Hazards

Acute toxicity: Oral (Category 2), Inhalation (Category 2), Dermal (Category 1).Specific target organ toxicity - repeated exposure, Oral (Category 2), Brain* Sodium azide has a higher acute toxicity (oral/dermal) than sodium cyanide. Ingesting a small amount can be lethal (LD50 = 27 mg/kg for rats).
* Sodium azide can form strong complexes with hemoglobin and consequently blocks oxygen transport resulting in rapid breathing, restlessness, dizziness, weakness, headache, nausea, vomiting, rapid heart rate, convulsions, and respiratory failure.
* Direct skin contact of NaN3 may cause skin burns and blisters.
* Sodium azide reacts with acids or hydrolyzes with water to form highly toxic hydrazoic acid, a low boiling, volatile liquid. Unlike NaN3, hydrazoic acid gas (produced due to high volatility) has a sharp, pungent order and inhalation may result in serious illness (such as lung irritation, bronchitis, or lung edema).
	1. Environmental Hazards

Short-term (acute) aquatic hazard (Category 1)Long-term (chronic) aquatic hazard (Category 1)1. Other Hazards

[List nonchemical hazards, e.g., biological hazards, electrical hazards, mechanical hazards, nonionizing radiation, or ionizing radiation.]Enter text. If not applicable, enter “N/A”.1. References

*[List all references you are using for the safe and effective design of your process or experiment, including safety literature and peer-reviewed journal articles. Safety resources are available from* [*OEHS website*](https://research.wayne.edu/oehs)*.]* Enter text. If not applicable, enter “N/A”.  |

| **#5 STORAGE REQUIREMENTS** |
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| ***[Describe special handling and storage requirements for hazardous chemicals in your laboratory, especially for explosives, water reactive/pyrophoric materials, highly flammable materials, oxidizers and corrosives.]***Click or tap here to enter text. |

| **#6 STEP-BY-STEP OPERATING PROCEDURE** |
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| [*Include any personal protective equipment, engineering controls, and designated work areas in the left hand column in the table below.*1. ***Guidance on Personal Protective Equipment(PPE) - To assist with your PPE selection, refer to Section 8 “Exposure controls/personal protection” of SDS or PPE guides such as*** [*Ansell Chemical Protection Guide*](https://www.ansellguardianpartner.com/chemical/home#hp)***,*** [*VWR North Safety Hand Protection Chemical Resistance Guide*](https://eta-safety.lbl.gov/sites/all/files/VWR%20Chemical%20Resistance%20Gloves%20Chart.pdf)***. Respiratory protection is generally not required for lab research, provided the appropriate engineering controls are employed. For additional guidance on respiratory protection, consult with OEHS, 313-577-1200.***
2. ***Guidance on Engineering and Ventilation Controls – Review safety literature and peer-reviewed journal articles to determine appropriate engineering and ventilation controls for your process or experiment. Guidance is available from OEHS (313-577-1200).***
3. ***De*signated work area(s)** – These areas are intended to limit and minimize possible sources of exposure to highly hazardous materials [e.g. – highly flammable, highly reactive (e.g. water reactive/pyrophoric), toxic (e.g. acute toxins, reproductive toxins, mutagens), biohazards, radioactive materials]. The entire laboratory, a portion of the laboratory, or a laboratory fume hood or bench may be considered a designated work area

Describe the possible risks involved with failure to follow a step in the SOP in the right hand column.] |

| **Step-by-Step Description of Your Process or Experiment** | **Potential Risks if Step is Not Done or Done Incorrectly (if any)** |
| --- | --- |
| 1. Don personal protective Equipment

[x]  Appropriate street clothing (long pants/skirt, closed toed shoes)[ ]  Gloves. Type & thickness: Enter text.[ ]  Safety glasses[ ]  Safety goggles[ ]  Face shield[ ]  Standard Lab coat – Type: Enter text.[ ]  Flame-resistant lab coat – Type: Enter text.[ ]  Disposable gown[ ]  Chemical resistant apron – Type: Enter text.[ ]  Air purifying respirator (e.g. N95, cartridge respirator, etc.) Type: Enter text.*[Requires fit testing and adherence to* [*WSU Respiratory Protection Program*](https://research.wayne.edu/oehs/health-safety/respirators)*]*[ ]  Other: List all other required PPE. Enter text.*Describe if specific activities require additional or specific PPE.* Click or tap here to enter text. | Enter text. |
| 1. Check the location/accessibility/certification of the safety equipment that serves your lab:
 |  |
| **ITEM AND STATUS** |  |
| [ ]  Chemical Fume Hood – Location & certification date: Enter text.[ ]  Biological Safety Cabinet – Location & certification date: Enter text.[ ]  Glove Box – Location: Enter text.[ ]  Other – Description & location: Enter text. | Enter text. |
| Eyewash – Location: Enter text.Safety Shower – Location & certification date: Enter text. | Enter text. |
| First Aid Kit – Location: Enter text. | Enter text. |
| Chemical Spill Kit – Type & location: *[The chemicals being used may require a specific, commercially available chemical spill kit (e.g. hydrofluoric acid neutralizing spill kit). If this is a lab-assembled, basic chemical spill kit, please describe contents.]*Kit description | Enter text. |
| Fire Extinguisher – Type & location: Enter text. | Enter text. |
| Fire Alarm Manual Pull Station – Location: Enter text. | Enter text. |
| Telephone – Location: Enter text. | Enter text. |
| 1. Designated work area(s) - Enter text.
 | Enter text. |
| 1. Procedure – *[Describe the steps in the procedure. Add steps as required.]*

Step 1: Step 2: Step 3:  | Enter text. |
| 1. Dispose of hazardous solvents, solutions, mixtures, and reaction residues as hazardous chemical waste.
 | Enter text. |
| 1. Clean up /decontamination work area and lab equipment. *[Describe specific cleanup procedures for work areas and lab equipment that must be performed after completion of your process or experiment. For carcinogens and reproductive toxins, designated areas must be immediately wiped down following each use.]*

Enter text. | Enter text. |
| 1. Remove PPE and wash hands.
 | Enter text. |

| **#7 EMERGENCY PROCEDURES** |
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| With the exception of dilute solutions containing ≤ 5% or 0.8M NaN3, any exposure to NaN3 (solid any amount, solutions with concentration > 5% or 0.8 M) should be treated as a serious medical concern, requiring immediate decontamination and medical treatment. See the Emergency Response section of this SOP for first aid response, which MUST be followed by an evaluation in a medical emergency room.**\*\*Exposure to any amount of solid or solution of NaN3 concentration > 5% or 0.8M requires medical attention. Call WSU police (313-577-2222) immediately\*\**** **Fire Extinguishers** – An ABC dry powder extinguisher is appropriate if there is a fire involving NaN3. If unsure about the type of fire extinguisher in your laboratory, consult with OEHS and the WSU Fire Marshall.
* **Eyewash/Safety Showers** – Depending on the chemical hazard type, an eyewash station and safety shower may be required, easily accessed, and available within 10 seconds travel time for emergency use. Instruct personnel on the locations of eyewashes and safety showers, and how to activate them, prior to an emergency. Refer to [MIOSHA Fact Sheet: Eyewashes and Safety Showers](https://www.michigan.gov/documents/lara/lara_miosha_cet0199_628109_7.doc) to determine if an eyewash/safety shower is required for your specific chemical.

Please note: Additional hazards present in the laboratory may require that an eyewash or safety shower be present. This emergency equipment is required for treating exposures to workplace hazards such as chemical splashes, biological agents, welding sparks, metal shavings, or fine particulates like dust, dirt and sand.1. **Life Threatening Emergencies**
	1. **Fire, explosion, health-threatening hazardous material spill or release, compressed gas leak, or valve failure, etc.**
		1. Call WSU Police 313-577-2222
		2. Alert people in the vicinity and activate the local alarm systems.
		3. Evacuate the area and go to your Emergency Assembly Point (EAP): Enter EAP Location.
		4. Remain nearby to advise emergency responders.
		5. Once personal safety is established, call OEHS at 313-577-1200.

**Note:** For compressed gas leaks, shut off gas supply only if this can be done safely, without risk to personnel.* 1. **Injuries and Exposures**
		1. Remove the injured/exposed individual from the area, unless it is unsafe to do so because of the medical condition of the victim or the potential hazard to rescuers.
		2. Call WSU Police (313) 577-2222.
		3. Administer first aid as appropriate. Refer to the first aid section of chemical Safety Data Sheet.
			1. Eye contact: Promptly flush eyes with copious amounts of water for a prolonged period (at least 15 minutes). If applicable, after washing hands remove contact lenses while flushing with water. Seek medical attention.
			2. Ingestion: Do not induce vomiting. Rinse mouth with water. Never give anything by mouth to an unconscious person. Seek medical attention IMMEDIATELY.
			3. Skin contact: Remove any contaminated clothing. IMMEDIATELY flush all affected areas with water for 15 minutes using the nearest sink or safety shower (depending on size and location of exposure). Any clothing that has to be pulled over the head should be cut off the body instead. REMOVE GOGGLES LAST. Seek medical attention IMMEDIATELY
			4. Inhalation: Immediately move to a source of fresh air and call WSU Police (313-577-2222). DO NOT perform mouth-to-mouth resuscitation on a victim who is not breathing, due to the risk of exposing yourself.
1. Call (313) 577-1200 to report the exposure to OEHS.
2. After seeking medical attention, complete and submit the [Report of Injury](https://risk.wayne.edu/files/rofi.pdf) form to [WSU Enterprise Risk Management & Insurance Programs](https://risk.wayne.edu/) (5700 Cass, Suite 4622).
3. Bring to the hospital copies of Safety Data Sheets for all chemicals the victim was exposed.
4. **Non-Life Threatening Emergencies**
	1. **Injuries and Exposures**

For injuries and exposures that are not considered serious or a medical emergency, visit:Henry Ford Occupational Health – Harbortown3300 East Jefferson, Suite 100Detroit MI 48207(313) 656-1618Monday – Friday 8:00 AM to 6:30 PMIf Henry Ford Occupational Health Center is closed or for serious injuries, visit:Henry Ford Hospital – Emergency Room2799 W. Grand Blvd.Detroit MI 48202(313) 916-8742ORDetroit Receiving Hospital - Emergency Room (Preferred for NaN3 exposure)4201 St. Antoine St, Detroit, MI 48201Phone: (313) 745-3000After seeking medical attention, complete and submit the [Report of Injury](https://risk.wayne.edu/files/rofi.pdf) form to [WSU Enterprise Risk Management & Insurance Programs](https://risk.wayne.edu/) (5700 Cass, Suite 4622).* 1. **Spills**

For any NaN3 spills (solid or liquid) which have impacted the environment (via the storm drain, soil, or air outside the building) or which cannot be cleaned up by local personnel due to size of spill, hazard level, or hazards are unknown:1. Call WSU Police 313-577-2222. These services are available 24 hours a day, 7 days a week.
2. Evacuate the spill area
3. Post someone or mark-off the hazardous area with tape and warning signs to keep other people from entering.
4. Remain in the vicinity until emergency personnel arrive and provide them with information on the chemicals involved.
5. For additional information regarding spill response procedures, refer to the [OEHS chemical spill response guidelines](http://research.wayne.edu/oehs/chemical/spills), [WSU Chemical Hygiene Plan](http://research.wayne.edu/oehs/pdf/chemical-hygiene-plan.pdf) and [American Chemical Society (ACS) guide for chemical spill response](https://www.acs.org/content/acs/en/about/governance/committees/chemicalsafety/publications/guide-for-chemical-spill-response.html).
6. Provide local notifications (local notifications are listed at the end of this section).
	1. **Local Cleanup of Small Spills**

In the event of a minor spill or release that can be safely cleaned up by local personnel using readily available equipment (e.g. absorbent materials) and appropriate PPE: 1. DO NOT use metal instruments or metal containers for spill cleanup.
2. Alert personnel in the immediate area of spill and restrict access.
3. If your skin, eyes, or airways have been exposed to NaN3, medical treatment is the priority. Spill clean-up should then be left to another lab personnel familiar with safe NaN3 spill clean-up procedures or OEHS emergency response group.
4. Eliminate all sources of ignition.
5. Increase ventilation in area of spill (turn on fume hood and open sash, open windows). Vent vapors to outside of building only.
6. Review the SDS for the spilled material, or use your knowledge, to assess the hazards and to determine the appropriate level of protection. **DO NOT** clean up spills requiring respiratory protection, such as spills of powder NaN3 outside of a chemical fume hood. Contact OEHS for help (313-577-1200).
7. Choose appropriate personal protective equipment (e.g. goggles, face shield, chemical resistant gloves, lab coat or apron).
8. Protect floor drains, sinks or other potential avenues of environmental release as much as possible. Make a dike around the outside edges of the spill using absorbent materials.
9. For solid spills: Cover spill with paper towels that have been dampened with alkaline water (pH >9), to minimize dust generation. Do not dry sweep or vacuum to cleanup solid or dry NaN3 spills.
10. For liquid spills: Cover the liquid with absorbent material (paper towel), working from the spill's outer edges toward the center.
11. Collect spill cleanup materials using a non-metallic scoop or other suitable items and place in a tightly closed non-metallic hazardous waste container.
12. After spilled material is removed, decontaminate surfaces with alkaline water (pH > 9).
13. Place all contaminated materials, including contaminated items such as gloves, in the non-metallic hazardous waste container.
14. Label waste container with completed hazardous waste tag (available from OEHS).
15. Submit online [waste pickup request](https://research.wayne.edu/oehs/hazardous/chemical-waste.php) to OEHS.

For additional information regarding spill response procedures, refer to the [OEHS chemical spill response guidelines](http://research.wayne.edu/oehs/chemical/spills), [WSU Chemical Hygiene Plan](http://research.wayne.edu/oehs/pdf/chemical-hygiene-plan.pdf) and [American Chemical Society (ACS) guide for chemical spill response](https://www.acs.org/content/acs/en/about/governance/committees/chemical-safety/publications-resources/guide-for-chemical-spill-response.html).1. **Lab Specific Emergency Procedures**

*[This section is for any emergency procedures different from standard responses, or for additional emergency information due to the nature of materials or task. Include information on gas leaks, chemical spills, and personal exposure/medical emergency as appropriate.]*Enter text. If not applicable, enter “N/A”.1. **Building Maintenance Emergencies**

For building maintenance emergencies (e.g. power outages, plumbing leaks, roof leaks, etc.) immediately call:* Between 7:00 AM - 4:00 PM Monday – Friday, Facilities Operations and Maintenance at 313-577-4315
* After business hours, Public Safety at 313-577-2222
1. **Local Notifications**

*[Identify the area management staff that must be contacted and include their work and after-hours numbers. This must include the principal investigator and may include the lab safety coordinator, facilities manager, and/or business manager.]*Enter text. |

| **#8 WASTE DISPOSAL** |
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| [Describe the quantities of waste you anticipate generating and appropriate waste disposal procedures. Include any special handling or storage requirements for your waste].Enter text.* Do not dispose of any NaN3 waste by dumping down a drain or discarding in regular trash containers.
* NaN3 waste (solutions, solid powder and other NaN3 contaminated solid waste) MUST be collected and disposed as hazardous chemical waste.
* Use plastic containers to collect waste (e.g. 5 gallon carboys or pails provided by OEHS).
* Empty containers of NaN3 should be disposed of as hazardous chemical waste.
* Request NaN3 waste be disposed of by OEHS. [Submit requests to OEHS](https://research.wayne.edu/oehs/forms/chem-waste) for waste containers, labels, and waste collection.
* NaN3 solutions should never be disposed of down the drain. Such disposal can result in the precipitation of insoluble explosive azides such as lead azide.
* Extra caution must be taken to make certain that NaN3 waste does not come in contact with acid. Acids will protonate the azide ion and form highly-toxic Hydrazoic acid (hydrogen azide, toxicity similar to that of hydrogen cyanide).

Contact OEHS at 313-577-1200 for waste containers, labels, manifests, waste collection and for any questions regarding proper waste disposal. Also, refer to the [OEHS Hazardous Waste Management web page](http://research.wayne.edu/oehs/hazardous/index.php) and [WSU Chemical Hygiene Plan](http://research.wayne.edu/oehs/pdf/chemical-hygiene-plan.pdf) for more information. |

| **#9 TRAINING REQUIREMENTS** |
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| **General Training** *(check all that apply)*: The courses listed below can be taken online through the [Collaborative Institutional Training Initiative (CITI) at the University of Miami](https://about.citiprogram.org/).[ ]  Laboratory Safety Training (general lab and chemical safety issues)[ ]  Hazard Communication[ ]  Shipping Biological Substances & Dry Ice Refresher TrainingInformation about [Shipping Dangerous Goods](https://research.wayne.edu/oehs/shipping).The trainings below are linked to specific training slides or documents.[ ]  [Laboratory-Specific Safety Training (](http://research.wayne.edu/oehs/docs/lab-safety-training-checklist.doc)link to Word Doc checklist)[ ]  [Controlled Substance Training](http://research.wayne.edu/oehs/training/lab.php#CS)[ ]  [Radiation Safety Training](https://research.wayne.edu/oehs/training/radiation) |
| **Laboratory Specific Training** *(check all that apply)*:[ ]  Review of SDS for chemicals involved in process/experiment[ ]  Review of this SOP[ ]  Other: Enter text. |
| **Location Where Training Records Are Maintained:** Enter text. |

| **#10 PRIOR APPROVALS AND CERTIFICATIONS** |
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| Notes: You **must** seek prior approval from your principal investigator (PI) or lab supervisor if you plan to use **restricted chemicals** (e.g. dimethyl mercury, hydrofluoric acid and toxic gasses).You should also consult your PI or lab supervisor if your experiments involve **high-risk chemicals and operations,** as special safety precautions may need to be taken. High-risk chemicals and operations may involve chemicals with a high level of acute toxicity, carcinogens, reproductive toxins, and highly reactive materials.[ ]  Prior approval from the PI or lab supervisor is required for this procedureComplete the following table confirming that all lab personnel using this SOP read and understand the above SOP and is agreed to contact PI if planned to modify this SOP.*[The table below should be completed after WSU Chemical Safety Committee approval.]* |

| **NAME** | **ACCESS ID #** | **SIGNATURE** | **DATE** |
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