

# Standard Operating Procedure

## Sodium Hydride

*This is SOP is not complete until it has been signed and dated by the PI and relevant lab personnel.*

Print a copy and insert into your  
*Laboratory Safety Manual and Chemical Hygiene Plan.*  
Refer to instructions for assistance.

<b>Department:</b>	Chemistry & Biochemistry - Chemical Engineering
<b>Date SOP was written:</b>	December 14, 2012
<b>Date SOP was approved by PI/lab supervisor:</b>	January 18, 2013
<b>Principal Investigator:</b>	Prof. Susannah Scott
<b>Internal Lab Safety Coordinator/Lab Manager:</b>	Stephanie Goubert-Renaudin
<b>Lab Phone:</b>	805-893-8941
<b>Office Phone:</b>	805-893-7403
<b>Emergency Contact:</b>	EH&S 24 hour line: 805-893-3194 <i>(Name and Phone Number)</i>
<b>Location(s) covered by this SOP:</b>	ESB 3324 and 3328. <i>(Building/Room Number)</i>

**Type of SOP:**     Process     Hazardous Chemical     Hazardous Class

### Purpose

Sodium Hydride is widely used as a dessicant for solvents and can be used as a strong base in organic synthesis.

**Sodium Hydride (NaH) is strongly water reactive.** In contact with water, it releases flammable gas (Hydrogen) which may ignite spontaneously. Sodium hydride is sold by many chemical suppliers usually as a mixture of 60% sodium hydride (w/w) in mineral oil. Such dispersion is safer to handle and weigh than pure NaH. The pure white solid is prepared by rinsing the oil with Pentane (a highly flammable compound) or Tetrahydrofuran – THF (a Peroxide Forming Chemical - PFC), care being taken because the washings will contain traces of NaH that can ignite in air. Reactions involving NaH require an inert atmosphere, such as nitrogen or argon gas. Typically NaH is used as a suspension in Tetrahydrofuran, a solvent that resists deprotonation but solvates many organo-sodium compounds.

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If not handled properly, NaH can pose a serious threat to the health and safety of laboratory personnel, emergency responders and chemical waste handlers. Hence, it is important to follow safety protocols to handle this chemical. This SOP helps to understand how to properly store, handle and dispose of sodium hydride.

## Physical & Chemical Properties/Definition of Chemical Group

CAS#	7646-69-7
Class:	<b><u>Water Reactive and Pyrophoric (metal hydride)</u></b>
Molecular Formula:	HNa
Form (Physical State):	Light grey, powder
Melting Point:	800 °C (1472 °F) (for dry 95% HNa)
Flash Point:	185°C (365 °F) (for dry 95% HNa)

## Potential Hazards/Toxicity

Pictogram



## Potential Health Effects

**Inhalation** May be harmful if inhaled. May cause respiratory tract irritation.

**Skin** May be harmful if absorbed through skin. May cause skin irritation.

**Eyes** May cause eye irritation.

**Ingestion** May be harmful if swallowed.

## Personal Protective Equipment (PPE)

**NOTE:** Specific information on PPE selection is to be added to the Protocol/Procedure section.

## Respiratory protection

Since sodium hydride is usually handled/used inside a glove box (under inert atmosphere), a respirator is not normally required.

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Refer to 8 CCR 5144 for selection of respirators. A respiratory protection program that meets 8 CCR 5144 must be followed whenever workplace conditions warrant use of a respirator.

Respirators should be used only under any of the following circumstances:

- As a last line of defense (i.e., after engineering and administrative controls have been exhausted).

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- When Permissible Exposure Limit (PEL) has exceeded or when there is a possibility that PEL will be exceeded.
- Regulations require the use of a respirator.
- An employer requires the use of a respirator.
- There is potential for harmful exposure due to an atmospheric contaminant (in the absence of PEL)
- As PPE in the event of a chemical spill clean-up process

**NOTE:** Lab personnel intending to use/wear a respirator mask must be trained and fit-tested by EH&S. This is a regulatory requirement.

### **Hand Protection**

Handle with the appropriate gloves. [Nitrile or neoprene gloves](#) are recommended. 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.

**NOTE:** Consult with your preferred glove manufacturer to ensure that the gloves you plan on using are compatible with sodium hydride.

Refer to glove selection chart from the links below:

[http://www.ansellpro.com/download/Ansell\\_8thEditionChemicalResistanceGuide.pdf](http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf)

OR

<http://www.allsafetyproducts.biz/page/74172>

OR

<http://www.showabestglove.com/site/default.aspx>

OR

<http://www.mapaglove.com/>

### **Eye protection**

Safety glasses with side shields or tightly fitting safety goggles.

### **Skin and body protection**

A flame resistant lab coat must be.

### **Hygiene measures**

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

## Engineering Controls

**NOTE:** Specific information on engineering controls is to be added to the Protocol/Procedure section.

Sodium hydride must be stored and used under inert atmosphere/conditions. Work with sodium hydride should be conducted in a glove box unless other controls are designated in the Protocol/Procedure section.

## First Aid Procedures

*Notify supervisor and EH&S immediately (805-893-3194).*

### If inhaled

Move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

### In case of skin contact

Take off contaminated clothing immediately. Wash off with soap and plenty of water for 15 minutes. Take victim immediately to hospital. Consult a physician.

### In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately. Continue to wash eyes during transport to the hospital.

### If swallowed

Do not induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

## Special Handling and Storage Requirements

**NOTE:** Specific information on handling and storage is to be added to the Protocol/Procedure section.

## Working alone

Certain extremely hazardous operations should not be performed if the PI or Lab Safety Contact(s) are not present. Never work alone with extremely hazardous materials/operations. See the Protocol/Procedure section below for specific prohibitions (if any) on working alone.

Note: Do not work alone or during off hours, when there are few people around to help.

## Precautions for safe handling

- Avoid formation of Sodium hydride dust and aerosols
- Provide appropriate exhaust ventilation at places where dust is formed.
- Keep away from sources of ignition – Open flames/Bunsen Burner

## Conditions for safe storage

- Keep container tightly closed in a dry and well-ventilated place.
- Hazard communication label on the container must read '*Water Reactive*': ~~W~~
- Never allow product to get in contact with water or water based compounds during storage.

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- **Note:** Do not leave the container on the bench top even momentarily.
- Do not leave the container near the lab sink, emergency eyewash and safety shower.
- Do not store in humid air/moisture.
- Handle and store under inert gas (such as Nitrogen, Argon etc.)
- Recommended handling inside a **glove box**.
- Keep in a dry place (such as a desiccator or a dry box or glove box).

#### **Chemical stability**

Stable under recommended storage/handling conditions

#### **Conditions to avoid**

Heat, flames and sparks.

Exposure to moisture, water & water based compounds.

#### **Materials to avoid**

Alcohols, Carbon dioxide (CO<sub>2</sub>)

#### **Hazardous decomposition products**

Hazardous decomposition products formed under fire conditions. - Sodium/sodium oxides

Reacts with water to form: - Hydrogen gas

### **Spill and Accident Procedure**

#### **Fire-fighting & Extinguishing media**

##### **Suitable extinguishing media**

**Class D fire extinguisher or the use of sand, ground limestone, dry clays or graphite.**

**DO NOT use Water**

##### **Special protective equipment for fire-fighters**

Wear Self-Contained Breathing Apparatus for fire-fighting if necessary.

#### **Personal precautions**

- Wear respiratory protection.
- Avoid dust formation.
- Avoid breathing vapors, mist or gas.
- Ensure adequate ventilation.
- Evacuate personnel to safe areas.
- Avoid breathing dust.

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

- Sweep up and shovel.
- Contain spillage, and then collect with an electrically protected vacuum cleaner.
- **Do not flush with water.**
- Keep in suitable, closed containers for disposal.

### **Chemical Spill Dial 9-911 and EH&S (805-893-3194)**

**Spill** – Assess the extent of danger. Help contaminated or injured persons. Evacuate the spill area. Avoid breathing vapors. If possible, confine the spill to a small area using a spill kit or absorbent material. Keep others from entering contaminated area (e.g., use caution tape, barriers, etc.).

**Small (<1 L)** – If you have training, you may assist in the clean-up effort. Use appropriate personal protective equipment and clean-up material for chemical spilled. Double bag spill waste in clear plastic bags, label and take to the next chemical waste pick-up.

**Large (>1 L)** – Dial **9-911 from campus phones (and 805-893-3446 from a cell phone)** and EH&S (805-893-3194) for assistance.

**Chemical Spill on Body or Clothes** – Remove clothing and rinse body thoroughly in emergency shower for at least 15 minutes. Seek medical attention. *Notify supervisor and EH&S immediately.*

**Chemical Splash Into Eyes** – Immediately rinse eyeball and inner surface of eyelid with water from the emergency eyewash station for 15 minutes by forcibly holding the eye open. Seek medical attention. *Notify supervisor and EH&S immediately.*

### Medical Emergency Dial **9-911** (from campus phones)

**Life Threatening Emergency, After Hours, Weekends and Holidays** – Dial **9-911** (or 805-893-3446 from a cell phone) or go to the Emergency Room of Goleta Valley Cottage Hospital at 351 South Patterson Avenue, Goleta (Phone number: 805-967-3411) *Note: All Serious injuries must be reported to EH&S within 8 hours.*

**Non-Life Threatening Emergency** – Go to the Student Health Building, Building 588 (phone number: 893-5361, hours: M, T, R, F 8am-4.30pm, W 9am - 4.30pm, R 5pm to 7pm by appointment). After hours go to the Emergency Room of Goleta Valley Cottage Hospital at 351 South Patterson Avenue, Goleta (Phone number: 805-967-3411) *Note: All serious injuries must be reported to EH&S within 8 hours.*

**Needle stick/puncture exposure** (as applicable to chemical handling procedure) – Wash the affected area with antiseptic soap and warm water for 15 minutes. For mucous membrane exposure, flush the affected area for 15 minutes using an eyewash station. Page the needle stick nurse \ and then enter your extension. After hours go to the nearest emergency room: the Emergency Room of Goleta Valley Cottage Hospital at 351 South Patterson Avenue, Goleta (Phone number: 805-967-3411). *Note: All needle stick/puncture exposures must be reported to EH&S within 8 hours.*

### Decontamination/Waste Disposal Procedure

**NOTE:** *Sodium Hydride hazardous waste must be stored away from oxidizing agents/oxidizing chemical waste, acids/acid waste and alcohols (solvent waste).*

General hazardous waste disposal guidelines:

#### Label Waste

- Affix an on-line hazardous waste tag on all waste containers using the UCSB Hazardous Waste Program 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
- Waste must be under the control of the person generating & disposing of it

#### Dispose of Waste

- Dispose of regularly generated chemical waste within 6 months
- Call EH&S for questions
- Empty Containers

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- Dispose as hazardous waste if it once held extremely hazardous waste (irrespective of the container size)
  - Consult waste pick-up schedule
- Prepare for transport to pick-up location
- Check on-line waste tag
  - Write date of pick-up on the waste tag
  - Use secondary containment

## Material Safety Data Sheet (MSDS) Location

MSDS can be accessed online at:

<http://www.sigmaaldrich.com/catalog/product/aldrich/452912?lang=en&region=US>

## Protocol/Procedure

**Please see attached SOP “Procedures for Safe Use of Pyrophoric Solids” (on line link: [http://web.chem.ucsb.edu/~moretto/SOP\\_Pyrophoric.pdf](http://web.chem.ucsb.edu/~moretto/SOP_Pyrophoric.pdf))**

Prior to starting the reaction, locate the extinguisher, eyewash and safety shower.

Sodium hydride is used in the lab as a strong inorganic base.

Sodium hydride is stored in a sealed container in a ventilated cabinet.

A flame retardant labcoat, nitrile or neoprene gloves and safety goggles have to be worn at all times when handling sodium hydride.

## Handling

- Sodium hydride is ideally used in a sealed glove box flushed with inert gas.
- Sodium hydride may be handled in the air for brief periods of time, but the containers must be flushed with inert gas before storage.
- Gather all necessary experimental equipment first to avoid prolonged exposure of sodium hydride to air.
- The mineral oil of sodium hydride dispersions can be rinsed off using a hydrocarbon solvent such as hexane. This is easily accomplished in a glove box or can be done in a hood under carefully controlled conditions. Weigh out desired amount of dispersion and seal in a flask under nitrogen. Add dry hexane via syringe, swirl, and solid sodium hydride will settle. Slowly syringe off hexane and then carefully discard into a separate flask containing isopropanol. Repeat rinse procedure.
- AVOID low boiling rinses such as ether and pentane that tend to condense water upon evaporation.

**Disposal/ Quenching:** Small amounts of unused or unwanted sodium hydride must be destroyed by careful quenching of the residue. Transfer the materials to an appropriate reaction flask for quenching. Dilute significantly with an unreactive solvent such as heptane or toluene. Due to the exothermic nature of the reaction, the flask can be placed in an ice water cooling bath. AVOID low boiling diluents such as ether and pentane that tend to condense water upon evaporation. Slowly add isopropanol to quench sodium hydride. Upon completion, add ethanol or methanol as a more reactive quenching agent to ensure completion. Finally, add water dropwise to make sure there are no pockets of reactive materials.

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When the solution is unreactive, it is basic and can be disposed in the appropriate basic waste container, kept closed at all times.

**NOTE: Any deviation from this SOP requires approval from PI.**

**Documentation of Training** *(signature of all users is required)*

- Prior to conducting any work with Sodium Hydride, designated personnel, i.e. approved users listed below, 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 his/her laboratory personnel with a copy of this SOP and a copy of the Sodium Hydride MSDS provided by the manufacturer.
- The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training as required by EH&S.

I have read and understand the content of this SOP:

Name	Signature	Trainer	Date
Prof. Susannah Scott			
Stephanie Goubert-Renaudin			
Gary Kwanyi Ng			
Alessandro Gallo			
Anthony Crisci			
Haibo Yu			
Taeho Hwang			
Bethany Wigington			
Daniel Coller			
Zachary Jones			
Youhong Wang			

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Jinghong Zhou			
Jason Fendi			

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