**Standard Operating Procedures**

Laboratory Specific

**Chemical:** **Sodium Borohydride**

Please fill out the form completely.  Print a copy and insert into your

*Laboratory Safety Manual and Chemical Hygiene Plan*.

Refer to instructions for assistance.

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Department:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_                        Date when SOP was written:\_\_\_\_\_\_\_

Date when SOP was approved by the lab supervisor: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Principal Investigator:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Internal Laboratory Safety Coordinator/Lab Manager:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Laboratory Phone:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   Office Phone:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Emergency Contact:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*(Name and Phone Number)*

Location(s) covered by this SOP:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*(Building/Room Number)*

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

**Purpose**

Sodium Borohydride is a strong water reactive chemical. In contact with water releases flammable gases which may ignite spontaneously. It is both air and moisture sensitive. Sodium borohydride, *also known as sodium tetrahydridoborate*, is an inorganic compound with the formula NaBH4. Mixing water or an alcohol with the borohydride converts some of it into unstable hydride ester, which is more efficient at reduction, but the reductant will eventually decompose spontaneously to give hydrogen gas and borates. Hence, a written Standard Operating Procedure (SOP) is required to handle this chemical in a safe manner.

**Uses:** This white solid, usually encountered as a powder, is a versatile reducing agent that finds wide application in chemistry. The principle application of sodium borohydride is the production of sodium dithionite, which is used as a bleaching agent for wood pulp. Sulfur dioxide reacts with the borohydride. In a related process, sodium dithionite is used in the dyeing industry. Sodium borohydride can also be used in oxymercuration reactions. NaBH4 will reduce many organic carbonyls, depending on the precise conditions. Most typically, it is used in the laboratory for converting ketones and aldehydes to alcohols. It will reduce acyl chlorides and thiol esters. However, unlike the powerful reducing agent lithium aluminum hydride, NaBH4 typically will not reduce esters, amides, or carboxylic acids.

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

Sodium borohydride is an odorless white to gray-white microcrystalline powder which often forms lumps. It is soluble in water, with which it reacts vigorously.

|  |  |
| --- | --- |
| Molecular Formula | NaBH4 |
| Molar Mass | 37.83 g/mol |
| Appearance | white crystals hygroscopic |
| Density | 1.0740 g/cm3 |
| Melting Point | 400 °C |
| Bioling Point | 500 °C |
| Solubility in Water | soluble, reacts with water |
| Solubility | soluble in liquid ammonia, amines, pyridine |

**Potential Hazards/Toxicity**

**Emergency Overview**

**OSHA Hazards**

Water Reactive, Toxic by ingestion, Toxic by skin absorption, Corrosive

**GHS Label elements, including precautionary statements**

Pictogram

  

Signal word Danger

Hazard statement(s)

H260 In contact with water releases flammable gases which may ignite spontaneously.

H301 + H311 Toxic if swallowed or in contact with skin.

H314 Causes severe skin burns and eye damage.

Precautionary statement(s)

P223 Keep away from any possible contact with water, because of violent reaction and

possible flash fire.

P231 + P232 Handle under inert gas. Protect from moisture.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P310 Immediately call a POISON CENTER or doctor/physician.

**Potential Health Effects**

**Inhalation** May be harmful if inhaled. Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract.

**Skin** Toxic if absorbed through skin. Causes skin burns.

**Eyes** Causes eye burns.

**Ingestion** Toxic if swallowed. Causes burns.

**Personal Protective Equipment (PPE)**

**Respiratory protection**

**NOTE:** Since it is handled/used inside a glove box (under inert atmosphere), respirator is not required.

**Note:** During emergency response, wear Self Contained Breathing Apparatus (SCBA) for fire fighting. This is a regulatory requirement.

Lab personnel intending to use/wear a respirator mask must be trained and fit-tested by ORS and should contact occhealt@uga.edu. This is a UGA requirement described in more detail in the [UGA Respiratory Protection Plan](https://esd.uga.edu/sites/default/files/respiratoryprotection.pdf) and supported by the [Office of Research Occupational Health and Safety Program](https://research.uga.edu/ohsp/).

**Hand protection**

Handle with nitrile or neoprene gloves.

Gloves must be inspected prior to use.

Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with Sodium Borohydride.

Wash and dry hands.

**Eye protection**

Safety goggles.

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US).

**Skin and body protection**

Fire/flame resistant lab coat (100% cotton based)

Cotton based clothing/attire.

Full length pants or equivalent

Close toed shoes

**Hygiene measures**

Avoid contact with skin, eyes and clothing.

Wash hands before breaks and immediately after handling Sodium borohydride.

**Engineering Controls**

* Glove Box must be used to handle Sodium Borohydride.
* Must be stored and used under inert atmosphere/conditions.

**First Aid Procedures**

**General advice**

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

**If inhaled**

If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

**In case of skin contact**

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

**In case of eye contact**

Continue rinsing eyes during transport to hospital. Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

**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**

**Precautions for safe handling**

* Avoid contact with skin and eyes.
* Avoid formation of Sodium Borohydride dust and aerosols.
* Provide appropriate exhaust ventilation at places where dust is formed.
* Keep away from sources of ignition – No 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’.
* Never allow product to get in contact with water/water compounds during storage.
* Air and moisture sensitive.
* Store under inert gas (under Noble gases such as Nitrogen or Argon).
* Keep in a dry place (such as a desiccator or a dry box or glove box).

**Materials to avoid**

Oxidizing agents, chemically active metals, acids, water & water based compounds.

**Spill and Accident Procedure**

**Chemical Spill Dial 911**

**24-7 On-Call Response to Research, Environment, Health or Safety Concerns Dial 2-5561 from a campus phone or 706-542-5561 from a non-campus line.**

**Spill** – Follow the procedures set out in the [UGA Chemical and Laboratory Safety Manual.](http://research.uga.edu/docs/units/safety/manuals/Chemical-Laboratory-Safety-Manual.pdf)

[If there are any chemical-specific protocols for responding to a spill, insert them here or mark “none”:]

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# **Medical Emergency Dial 911**

**Life Threatening Emergency, After Hours, Weekends And Holidays** – Dial **911** or the emergency phone numbers listed at the beginning of the UGA Chemical and Laboratory Safety Manual

*Note: All incidents that result in an injury or property damage must be reported to ORS / ESD using a University Incident/Accident Report.*

**Non-Life Threatening Emergency** – Follow the instructions in the UGA Chemical and Laboratory Safety Manual.

*Note: All incidents that result in an injury or property damage must be reported to ORS / ESD using a University Incident/Accident Report.*

**Decontamination/Waste Disposal Procedure**

**For general hazardous waste disposal procedures, see Appendix H of the UGA Chemical and Laboratory Safety Manual.**

**Chemical Specific Procedures: [to be inserted or marked as “none”]**

**Safety Data Sheet (SDS) Location**

UGA personnel can access Online SDS through a link in the upper left corner of the ESD home page (<https://esd.uga.edu>) and logging in by using their UGA email user name and password.

**Protocol/Procedure**

***(Add specific description of procedure)***

**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 Borohydride, 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 his/her laboratory personnel with a copy of this SOP and access to the SDS provided by the manufacturer.
* The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training within the last 12 months.

I have read and understand the content of this SOP:

**Name Signature Date**

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