

Standard Operating Procedures

Grignard Reagent Solutions- Pyrophorics

Department:	Chemistry
Date SOP was written:	April 16, 2014
Principal Investigator:	Dr. Greg Boyce
Location:	Whitaker Hall Room 243

Section 1: Process, Hazardous Chemical, or Hazardous Class

Chemical(s)	Use(s)
Grignard Reagents	1. Nucleophilic addition into carbonyl groups or as a base

Section 2: Definition of Chemical group and Properties

CAS#: various

Class: Pyrophoric, Flammable, Water Reactive, Target Organ Effect, Harmful by ingestion, Corrosive

Molecular Formula: RMgX (R=alkyl, X=halogen) Examples: methylmagnesium iodide, phenyl magnesium bromide, vinyl magnesium bromide.

Form (physical state): Liquid

Color: Colorless

Boiling point: N/A

Section 3: Potential Hazards



Pictograms:

Highly flammable liquid and vapor and can catch fire. Contact with water releases flammable gases and causes severe skin burns and eye damage.

Keep away from heat, sparks, open flames, direct sunlight and/or hot surfaces. Do not allow contact with air; may form explosive mixtures. Handle under inert gas and protect from moisture. Wear protective gloves, protective clothing, eye protection, and face protection. If in eyes, rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do and continue rinsing. Immediately call a poison center or doctor/physician. Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract.

Section 4: Personal Protective Equipment

Use what is listed below unless other lab-specific information is included in the Protocol/Procedure section.

Eye and Face Protection

ANSI-approved safety glasses with side shields or chemical splash goggles must be worn at all times when handling chemicals in the lab.

Skin and Body Protection

1. Gloves are required when handling hazardous chemicals.
 - a. Specific glove type recommendations are provided in the Protocol/Procedure section.
 - b. Inspect gloves prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Wash and dry hands after handling chemicals, before breaks, and at the end of the workday.
2. Lab coats are required when handling hazardous chemicals in the lab.
 - a. Nomex 3A flame-resistant lab coats are required when working with pyrophorics (H250) and explosives (H200, H201, H202, H203)
 - b. Flame resistant lab coats (Nomex or other material) should be worn when working with hazardous chemicals as a Category 1 or 2 flammable liquids (H224 and H225).
3. Cotton-based, non-synthetic clothing (including long pants; no skin exposed below the waist) should be worn.
4. Closed-toe and closed-heel shoes are required in the lab.

Section 5: Engineering Controls

The following is the set of engineering controls required:

- Grignard reagents should be used in a glove box filled with inert gas, or in a close system in a chemical fume hood. Keep the material under inert atmosphere (e.g., nitrogen, argon) when not in use.
- Only when absolutely necessary to transfer larger quantities of pyrophorics, use an appropriately designed, engineered system that is tested and properly used.
- Supplemental protective equipment like a blast shield, where appropriate, to protect from explosions when using peroxide formers, pyrophorics, water reactives, and potentially explosive chemicals.

Section 6: Special Handling and Storage Requirements

Working alone- Certain extremely hazardous operations should not be performed if the PI is not present (Dr. Boyce). Never work alone with extremely hazardous materials/operations.

Precautions for safe handling

- Avoid contact with skin and eyes. Avoid formation of vapors, dusts, mists, and aerosols.
- Use appropriate exhaust ventilation.
- Use appropriate personal protective equipment.
- Remove incompatible chemicals from immediate work area.

- Keep flammable, pyrophoric, potentially explosive and water reactive chemicals away from sources of ignition.
- Use care when preparing chemical solutions

Conditions for safe storage

- Keep quantities to a minimum.
- Keep containers tightly closed and in a cool, dry and well-ventilated location.
- Keep in proper storage cabinets and shelving. Use lowest shelf possible.
- Assure chemicals are properly labeled.
- Segregate incompatible chemicals.
- Store carcinogens in a designated area.

Section 7: Spill and Accident Procedures

Spill- Assess the extent of danger; if necessary request help by calling **911**. If you cannot assess the conditions of the environment well enough to be sure of your own safety, do not enter the area. If possible help contaminated or injured persons. Evacuate the spill area. Avoid breathing vapors from spill. 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.).

Minor Spill- In the event of a minor spill, if there is no potential hazardous chemical exposure, report the spill and proceed to clean it, if you are trained. 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 location.

Major Spill- Any hazardous chemical spill that involves chemical exposure, any chemical spill that due to size and/or hazard requires capabilities beyond your training, or any chemical spill that gives the perception (because of odor, for example) that there has been a hazardous release call **911** and report the spill for assistance.

- DO NOT use water to attempt to extinguish a reactive material fire as it can enhance the combustion of some reactive materials, e.g. metal compounds.
- Do not use combustible materials (paper towels) to clean up a spill, as these may increase the risk of igniting the reactive compound. Soda ash (powdered lime) or dry sand should be used to completely smother and cover any small spill that occurs. Also for a very small spill (i.e. tip of the needle) you can let the material burn itself out in the fume hood.
- A container of Metal X, soda ash (powdered lime) or dry sand should be kept within arm's length when working with a reactive material.
- If anyone is exposed, or on fire, drench in the safety shower with copious amounts of water.
- In the case of a metal fire, smothering the fire is a better course of action than use of water.
- The recommended fire extinguisher is a standard dry powder (ABC) type. Class D extinguishers are recommended for combustible solid metal fires (e.g, sodium, LAH), but

not for organolithium reagents. Contact the EH&S Fire Prevention team and/or review the MSDS for the appropriate fire extinguisher.

- Call 9-1-1 for emergency assistance and for assistance with all fires, even if extinguished.
- Associated fires, should be extinguished by remotely stopping the gas flow.

Section 8: Decontamination Procedures:

- Wearing proper PPE, laboratory work surfaces should be cleaned at the end of each work day.
- All materials - disposable gloves, wipers, bench paper, etc. - that are contaminated with chemicals should be disposed of as hazardous waste. Proper and complete hazardous waste labeling of containers is important.
- The contaminated waste should be placed in a metal container away from other combustibles to prevent fires. Verify the material is no longer pyrophoric before placing waste in with other combustible waste.

Section 9: Waste Disposal Procedures:

- Any container with a residue of hazardous reactive materials should never be left open to the atmosphere.
- Any unused or unwanted air reactive materials must be destroyed by transferring the materials to an appropriate reaction flask for hydrolysis and/or neutralization with adequate cooling. If you have large quantities of unreacted pyrophoric reagent material contact EH&S for guidance on disposal options.
- The empty container should be rinsed three times with an inert dry COMPATIBLE solvent; this rinse solvent must also be neutralized or hydrolyzed. Neutralization should be done in cold bath to better control the neutralization. The rinse solvent must be added to and removed from the container under an inert atmosphere.
- After the empty container is triple-rinsed, it should be left open in back of a hood or ambient atmosphere at a safe location for about a week.
- The empty container, solvent rinses and water rinse should be disposed of as hazardous waste and should not be mixed with incompatible waste streams.

Section 10: Material Safety Data Sheet Locations:

SDS can be accessed online at <http://ucmsds.com>