Standard Operating Procedure

Grignard Reagent Solutions

*Including*: Allylmagnesium bromide, *t*-Butylmagnesium chloride, Cyclohexylmagnesium bromide, Ethylmagnesium chloride, Ethynylmagnesium bromide, Isopropylmagnesium chloride, Methylmagnesium bromide, Phenylmagnesium bromide, Propylmagnesium chloride, and Vinylmagnesium bromide

Grignard reagent solutions include dozens of different alkyl, aryl, alkynyl, and alkenylmagnesium halides. The halide can be bromide, chloride or iodide. The solvent can be *t-*butyl methyl ether, diethyl ether, tetrahydrofuran, or toluene and the molarities typically range from 1 to 3 molar.

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

|  |  |
| --- | --- |
| **Department:** | Click here to enter text. |
| **Date SOP was written:** | Click here to enter a date. |
| **Date SOP was approved by PI/lab supervisor:** | Click here to enter a date. |
| **Principal Investigator:** | Click here to enter text. |
| **Internal 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 [ ]  Hazardous Class

**Purpose**

Grignard reagent solutions are all highly flammable and some may be pyrophoric and spontaneously ignite in contact with air. The solutions are corrosive. They react violently with water and vapors may form explosive mixture with air. They widely employed as potent nucleophiles and strong bases in organic synthesis, both industrially and in the laboratory.

Grignard reagents are powerful nucleophiles, strong bases and even occasionally reductants, depending on the other reactants. Grignard reagents add to carbonyl compounds such as aldehydes yielding a magnesium alkoxide derivative prior to workup. Grignard reagents are typically used in the synthesis of specific alcohols by addition to aldehydes, ketones and esters.

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

CAS#: various. Examples from the title list include 1730-25-2, 677-22-5, 931-51-1, 2386-64-3, 4301-14-8, 1068-55-9, 75-16-1, 100-58-3, 2234-82-4, 1826-67-1

Class: Pyrophoric, Flammable, Corrosive

Molecular Formula: Variable: R-Mg-X

Form (physical state): Liquid

Color: Colorless

Boiling point: N/A

**Potential Hazards/Toxicity**

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin. Inhalation may provoke the following symptoms: spasm, inflammation and edema of the bronchi, spasm, inflammation and edema of the larynx. Aspiration or inhalation may cause chemical pneumonitis and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. May be harmful if absorbed through the skin. Can cause burns to the skin and eyes.

**Personal Protective Equipment (PPE)**

**Respirator Protection**

If a respirator is the sole means of protection, please use a full-face supplied air 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).
* 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

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**

Wear gloves to prevent skin exposure. In a glove box, use the glove box gloves and sleeves. If this chemical is handled in a closed system in a certified fume hood, use appropriate chemical resistant gloves.

NOTE: Consult with your preferred glove manufacturer to ensure that the gloves you plan on using are compatible withspecific Grignard Reagents.

Refer to glove selection chart from the links below:

<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 (goggles and/or full face shield during activities which pose a splash hazard).

**Skin and Body Protection**

A flame resistant lab coat must be worn. Full length pants or equivalent as well as closed toe shoes must be worn.

**Hygiene Measures**

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling Grignard reagents.

**Engineering Controls**

Grignard reagents should be used in a glove box filled with inert gas, or in a closed system in a certified fume hood.

**First Aid Procedures**

**If inhaled**

Move person into fresh air. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. Get medical attention immediately.

**In case of skin contact**

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

**In case of eye contact**

Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention immediately

**If swallowed**

Do NOT induce vomiting unless directed to do so by medical personnel. If victim is conscious and alert, rinse mouth with 2-4 cupfuls of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

**Special Handling and Storage Requirements**

**Precautions for safe handling** Avoid contact with skin and eyes. Avoid inhalation of vapor or mist. Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build-up of electrostatic charge.

**Conditions for safe storage** Keep container tightly closed in a dry and well-ventilated place. Containers that are opened must be carefully resealed and kept upright to prevent leakage. Since Grignard reagents react violently with water, never allow product to get in contact with water during storage. Handle and store under nitrogen, protect from moisture. Avoid extremes in temperature and direct sunlight. Avoid storing next to strong oxidizing agents, fluorine, chlorine, and perchlorates. Incompatibilities with Other Materials: carbonyl containing compounds, acidic 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”]**

Contaminated instruments and benches should be decontaminated with soap and water. All waste and contaminated disposables should be disposed of as hazardous waste.

**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 lab specific Protocol/Procedure here)**

Click here to enter text.

**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 Grignard Reagents, 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.

**Principal Investigator SOP Approval**

Print name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Signature\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Approval Date:

I have read and understand the content of this SOP:

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