



LABORATORY SAFETY GUIDELINE

Tetramethyl ammonium hydroxide (TMAH) [CAS No. 75-59-2]

All users of Tetramethyl ammonium hydroxide solution must review this document before use. TMAH is widely used in micro- or nanofabrication as an etchant and developer. TMAH is typically one of several ingredients in commercial etching/stripping mixtures, although it may also be used pure. Chemical users should contact their EHS Laboratory Safety Advisor and department safety officer if they have questions before beginning work.

HAZARDS

	Highly toxic liquid. Lethal if in contact with skin. It is highly soluble in water. Thus skin exposure to >1% TMAH solutions over a few percent of the body must be treated as a life-threatening event.
	It is a very strong base with a pH >13. Concentrations between 10 and 25% TMAH will cause 2 nd and 3 rd degree burns if exposed to skin. Corrodes certain metals.

Exposure may result in intense burning of the eyes, nose, throat, lungs and skin. Depending on the level and duration of exposure, signs and symptoms may include blurred or double vision; pinpoint pupils; changes in heart rate and blood pressure; abdominal cramping, nausea and vomiting; diarrhea, excessive salivation sweating or bronchial secretions; urinary incontinence; muscle twitching, tremors or convulsions. Since 2007, there have been several recorded fatalities from skin exposure to TMAH solutions. Three of the recorded fatalities occurred due to heart attacks despite immediate decontamination and prompt medical care. There is no known antidote for TMAH poisoning through either ingestion, skin, or eye contact – immediate removal of the material using a safety shower/eyewash is critical.

PRECAUTIONS

Before starting work:

- **Determine if you can use a less hazardous substance in place of Tetramethylammonium hydroxide;**
- Review manufacturer's Safety Data Sheet and additional chemical information at ehs.harvard.edu/safety-data-sheets-sds;
- Ensure that a written experimental protocol including safety information is available;
- Be familiar with general University emergency procedures in the [EHS Lab Emergency Response Guide](#);
- Order the most dilute solutions available that will meet experimental needs. Order only the quantity that you need;
- Identify the location of the nearest eyewash and shower and verify that they are accessible;
- Locate and verify that appropriate spill cleanup materials are available, including the following:
 - Base Neutralizer
 - pH paper and hazmat absorbent mats
 - Scraper to scoop into a hazardous waste bag
- Ensure another person who knows emergency procedures is in the area.

During work:

- **AVOID INHALATION!** Perform all operations in a certified chemical fume hood, wet bench or other approved ventilated enclosure. Sash lowered. Always work at least 6 inches into the fume hood and behind the sash;
- **AVOID CONTACT!** Use appropriate personal protective equipment (PPE):
 - Wear a lab coat, a garment covering to the ankles, and closed-toed shoes;
 - Chemical resistant apron over lab coat;
 - Face shield over safety glasses or goggles;
 - It is recommended to use a 4 to 6 mil nitrile inner glove and 12 to 14 mil outer glove (not to exceed 20 ml)

- Use materials and containers appropriate for TMAH use (avoid storing in metal containers) and remain aware of potential incompatibilities like strong acids, acid chlorides, acid anhydrides, chloroformates, copper, aluminum and oxidizing agents.
- Keep all containers tightly closed when not in use and during transport.

After completing the work:

- Dispose of TMAH waste following Harvard University [Hazardous Waste Procedures](#).
 - Hazardous Waste Classification: Toxic and Corrosive
 - Avoid the use of containers that have copper, aluminum and their alloys.
- Return container to storage area following Harvard University [Laboratory Chemical Storage Guide](#)
 - Store in original containers or other appropriate containers.
 - Store primary container in designated and compatible secondary containers.
 - Store away from acids and oxidizing agents.
- Wash hands and forearms thoroughly with soap and water before leaving the lab.

EMERGENCY PROCEDURES

First Aid

SKIN CONTACT

- Wash with plenty of tepid water for at least 15 minutes using the closest available sink, safety shower or drench hose. Remove any exposed clothing as well as any jewelry.
- Seek medical attention immediately;
- Call 911 and 5-5560 on a landline phone for medical assistance (or provide location if calling on a mobile phone).

EYE CONTACT

- Using eyewash, flush eyes while holding eyelids open;
- Seek medical attention; Call 911 on a landline phone for medical assistance (or provide location if calling on a mobile phone).

INHALATION

- Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen;
- Seek medical attention; Call 911 on a landline phone for medical assistance (or provide location if calling on a mobile phone).

INGESTION

- If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person
- Seek medical attention. Call 911 on a landline phone for medical assistance (or provide location if calling on a mobile phone).

Spill Response

OUTSIDE FUME HOOD OR VENTILATED ENCLOSURE

- Alert others and evacuate to a safe distance and prevent entry.
- Contact the University Operations Center at (617) 495-5560 [HMS/HSDM (617) 432-1901]
- Remain in a safe location until EH&S or other response personnel arrive.

INSIDE FUME HOOD OR VENTILATED ENCLOSURE (< 500 ml)

- If trained and confident, you may assist in the clean-up effort of small amounts, wearing PPE described above and using appropriate spill supplies.
 - Collect debris in appropriate container and move to your Satellite Accumulation Area. Label with appropriately completed hazardous waste tag and request a waste pickup.
- Otherwise close the fume hood sash and await support.
- Contact the University Operations Center at (617) 495-5560 [HMS/HSDM (617) 432-1901] if you need support or technical assistance.