



# TETRAMETHYLAMMONIUM HYDROXIDE

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**All users of tetramethylammonium hydroxide (TMAH) must review this document prior to its use.**

TMAH is a quaternary ammonium salt which is commonly encountered as concentrated solutions in water or methanol. It is 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. It presents significant health hazards, must be handled with extreme caution and should only be used if there is no safer alternative. There have been several recorded fatalities from skin exposure to TMAH solutions since 2007. Three of these 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 for at least 15 minutes is critical.**

## Potential Hazards/Toxicity

TMAH is extremely corrosive to skin, eyes and mucous membranes. In addition to causing chemical burns, skin contact with TMAH can cause systemic toxicity which can lead to respiratory failure.

Signs and symptoms of exposure include intense burning of the eyes, nose, throat, lungs and skin. Depending on the level and duration of exposure, 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.

**TMAH should not be handled when working alone.**

Users must familiarize themselves with chemical's Safety Data Sheet (SDS). SDSs are available through the Safety Data Sheet link on Yale's EHS webpage ([ehs.yale.edu](http://ehs.yale.edu)).

## Personal Protective Equipment (PPE)

*The University's Personal Protective Equipment Policy can be found on the EHS website ([ehs.yale.edu](http://ehs.yale.edu))*

### Eye Protection

Chemical splash goggles must be worn. When there is the potential for splash, a faceshield must be worn in addition to goggles.

### Hand Protection

Utility grade nitrile gloves must be worn over exam-style nitrile gloves whenever handling TMAH.

### Skin and Body Protection

Long pants or clothing that covers the body to the ankles and closed-toe solid top shoes must be worn in all laboratories. In addition, when handling TMAH, a fully buttoned lab coat must be worn. If working with large amounts or if there is a potential for splash to the body, then a chemical apron must be worn over the lab coat.

## Engineering Controls

TMAH must always be handled inside a fume hood.

## Storage/Handling

- Order the most dilute solutions available that will meet experimental need
- Order only the quantity that you need
- Store inside a corrosives cabinet in secondary containment
- Use materials and containers appropriate for TMAH use (avoid storing in metal containers)
- Keep away from incompatible materials such as strong acids, acid chlorides, acid anhydrides, chloroformates, copper, aluminum and oxidizing agents

## Emergency Procedures

### Fire Extinguishers

Both ABC dry powder and carbon dioxide extinguishers are appropriate for most fires involving TMAH.

### Eyewash/Safety Showers

An ANSI approved eyewash station that can provide quick drenching or flushing of the eyes must be immediately available within the laboratory and 10 seconds travel time for emergency use. An ANSI approved safety drench shower must also be available within the laboratory and 10 seconds travel time from where TMAH is used. Ensure the locations of the eyewashes and safety showers, and how to activate them, are known prior to an emergency.

## First Aid Procedures

### If inhaled

Remove to fresh air. Call 911 for immediate medical attention.

### In case of skin contact

Go to the nearest emergency shower if contaminated. Yell for assistance and rinse for 15 minutes, removing all articles of clothing to ensure contaminate is completely removed. Call 911 for immediate medical attention. Inform them that the exposure was to TMAH.

### In case of eye contact

Go to the nearest emergency eyewash. Yell for assistance and rinse for 15 minutes. Call 911 for immediate medical attention. Inform them that the exposure was to TMAH.

## Spills

- Call EHS for emergency assistance (203-785-3555)
- Evacuate the spill area
- Post someone or mark-off the hazardous area with tape and warning signs to keep other people from entering
- Stay nearby until emergency personnel arrive and provide them with information on the chemicals involved

## Waste Disposal

TMAH solutions/stock materials must be collected separately as hazardous waste. Do not combine TMAH waste with other hazardous waste streams.