

Methyl Alcohol Safety

Safety Tips for Using Methyl Alcohol in School Laboratories



Introduction

Safe laboratory practices will prevent accidents when using methyl alcohol. It is essential that you understand the properties of methyl alcohol and observe comprehensive safety precautions for its storage, handling, and use.

Safety Precautions

Methyl alcohol is a very flammable liquid and a dangerous fire risk. It is also toxic by ingestion and inhalation. Ingestion of even small amounts can lead to blindness. Death from ingestion of less than 30 mL has been reported. Good ventilation is highly recommended whenever methyl alcohol is used. Mild headaches or dizziness may be symptoms of overexposure to methyl alcohol. Always wear chemical splash goggles, chemical-resistant gloves, and chemical-resistant apron whenever using methyl alcohol.

Properties

Methyl alcohol, also called methanol, is a low molecular weight (32.04 g/mol), low-boiling (64.7 °C, 148 °F) organic solvent. Because of its low boiling point, methyl alcohol readily evaporates at room temperature and its vapors are always present. Methyl alcohol vapors and liquid are extremely flammable. For many organic liquids it is the mixture of air and organic vapor above the liquid that is flammable. Volatile organic liquids will quickly vaporize in a fire to provide fuel to the fire. The flash point is the lowest temperature at which enough flammable vapor is present to form an ignitable mixture with air. The flash point for methyl alcohol is 52 °F, making it a Class 1B flammable liquid and an extreme fire risk at room temperature.

Two other properties of methyl alcohol contribute to its fire hazard. First, methyl alcohol vapors are heavier than air. Therefore, as methyl alcohol evaporates, the vapors will fill up the container, overflow, and then begin to spread out along a bench top or floor—always seeking the lowest level. Depending on the volume of methyl alcohol and the conditions, methyl alcohol vapors can easily travel more than 20 feet. When the vapors reach an ignition source (sparks, flame or heat), the vapor will flash back. During a flashback, the flame will travel along the vapor trail back to its source, resulting in an almost instantaneous flash fire. Because of this property, all methyl alcohol containers must be tightly sealed whenever they are not in use. Also, all ignition sources (sparks, electricity, matches, burners, flames, hot surfaces, etc.) must be removed from the area whenever methyl alcohol is being used.

The second property of methyl alcohol that leads to accidents is the color of its flame. Methyl alcohol burns with a non-luminous, bluish flame. It is very difficult to see methyl alcohol flames and hence it is very difficult to determine if the alcohol is on fire. Accidents occur when teachers mistakenly add more methyl alcohol to a container that is still burning with an almost invisible flame. **The result is catastrophic since the flame rapidly burns back into the methyl alcohol bottle, which then explodes in a fireball. Never add methyl alcohol to a hot or potentially burning container.**

Purchase and Storage

- Purchase smaller-sized bottles of methyl alcohol whenever possible to keep it fresh and to make storage and handling easier. It is easier to handle a 100- or 500-mL bottle than a 1- or 4-liter jug of liquid. Smaller bottles of methyl alcohol also contain less liquid to spill during an accident and less fuel for a potential fire.
- Always purchase methyl alcohol in plastic bottles or in PVC-coated glass bottles. PVC-coated bottles will not shatter and spill material when dropped.
- Store methyl alcohol with other flammable liquids in a dedicated flammables cabinet.
- Within the flammables cabinet, all the materials should be stored using the Flinn Scientific Chemical Storage Pattern. Store methyl alcohol in the Organic #2 compatible family with other alcohols, glycols, and sugars.
- The flammables cabinet should be located in a locked chemical storeroom to prevent theft. If not, the cabinet must be secured with a lock.

Using and Dispensing Methyl Alcohol

- Methyl alcohol should only be used in a lab that is well-ventilated or has a working purge fan to ventilate the lab. The laboratory should also be equipped with one or two ABC, dry chemical fire extinguishers and fire blankets in addition to the other normal safety equipment (safety eyewash, safety shower, etc.).
- Methyl alcohol should not be mixed with strong oxidizing agents. As methyl alcohol is oxidized, heat is evolved and may ignite the material, resulting in a fire.
- Never use methyl alcohol around any heat source, flames, or electrical equipment unless the amount of methyl alcohol is minimal and the conditions are completely controllable.
- Methyl alcohol vapors are heavier than air and will quickly travel along a lab bench or floor to an ignition source. Try to minimize the amount of methyl alcohol used and be aware that its vapors can travel great distances. Never use methyl alcohol around an ignition source.
- Dispense methyl alcohol from an operating fume hood.
- After dispensing methyl alcohol, always put the cap back on the bottle.
- Use lab mats and/or plastic trays when dispensing methyl alcohol to contain spills and drips.
- Students should dispense methyl alcohol from smaller bottles to limit spills and fumes. Do not allow students to dispense methyl alcohol from a 4-L jug. The possibility of contamination and the amount of liquid that could potentially fuel a fire are too large.
- Have spill clean-up materials readily available whenever methyl alcohol is used. If a spill occurs, immediately restrict unprotected personnel from area. Remove all ignition sources and ventilate the area. If the spill is too large to contain, the vapors too overpowering, or ignition sources cannot be completely removed, immediately evacuate the school and call the fire department. If the spill is small, contain the spill with sand or an absorbent material. Depending on the spill clean-up material and the amount—allow the methyl alcohol to evaporate off the sand or absorbent material in a fume hood or deposit it in a sealed bag or container.
- Absorbent spill pillows are a great absorbing system for methyl alcohol spills. The pillows quickly absorb 10–20 times their weight and disposal is easy.

Personal Protection Equipment and Safety Aids

- Operating eyewashes must be available in any classroom or laboratory where chemicals are used. Approved eyewashes must treat both eyes and provide clean potable water for at least 15 minutes.
- Chemical splash goggles must be worn anytime methyl alcohol is used. Safety glasses are not adequate protection.
- During demonstrations, it is very important that students wear chemical splash goggles anytime methyl alcohol is used. The possibility of an explosion or fire always exists and students (and teachers) must be protected. Demonstrations should be carried out behind a heavy duty safety shield.
- An ABC dry chemical fire extinguisher should always be present whenever methyl alcohol is used.

First Aid

- The major hazards for methyl alcohol are flammability, ingestion, and inhalation. If there is a spill or accident, immediately remove any flames or heat from the area and ventilate the area.
- If methyl alcohol is ingested, call emergency medical personnel immediately. As little as 30 mL can cause blindness or death. Seek medical attention immediately and follow their instructions. The suggested first aid for methyl alcohol ingestion is to empty the stomach and prevent further injury caused by absorption. Vomiting is usually induced.
- Symptoms of methyl alcohol inhalation are similar to ethyl alcohol inhalation and include slight irritation of the nose and eyes, head feels hot and face is flushed, headache, slight excitability and talkativeness, mental confusion, and headache. The suggested first aid for methyl alcohol inhalation is to remove the person from the contaminated area to an area of fresh air. If serious exposure occurs, immediately call emergency medical personnel for treatment.

- If methyl alcohol is splashed in the eyes, use eyewash to irrigate the eyes with fresh, potable water for at least 15 minutes. Make sure the eyelids are held open to properly irrigate them. Ask the victim to look up, down, and sideways to better reach all parts of the eye. After irrigating the eye, seek professional medical attention.
- If methyl alcohol is splashed onto bare skin, rinse the area with water for at least 15 minutes. Methyl alcohol may “dry out” the skin and cause minor dermatitis.
- If a large amount of methyl alcohol is splashed onto clothing, remove the clothing immediately and placing the clothing in a fume hood or outdoors. If methyl alcohol splashes onto your skin and clothing, first begin rinsing the affected areas with water (safety shower is ideal) and then remove clothing.

Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures governing the disposal of laboratory waste. For small amounts of methyl alcohol, one possible disposal method is Flinn Suggested Disposal Method #18a, evaporation in an operating fume hood. For larger amounts, a professional chemical waste disposal firm should be used. Always follow local regulations when disposing of hazardous materials.

Uses for Methyl Alcohol

If the science teacher does not feel comfortable using methyl alcohol or does not feel the proper safety equipment and/or precautions are in place—methyl alcohol should not be used. If an alternative alcohol can be used to give similar results, Flinn Scientific highly recommends using the higher boiling and less flammable alcohol. (e.g., ethyl, propyl, or isopropyl alcohol). There are several chemical demonstrations and laboratory activities where methyl alcohol has traditionally been used. Some examples include flame tests, the Whoosh Bottle demonstration, mini combustion demos such as the ping pong popper, distillations, and the preparation of esters.

Flinn Scientific recommends using isopropyl alcohol in the Whoosh Bottle demonstration. Methyl alcohol should not be used for this demonstration. Even with isopropyl alcohol, a glass vessel must never be used for the Whoosh Bottle demonstration. For a safe version of the Whoosh Bottle demonstration, please contact Flinn Scientific and request *The Whoosh Bottle* ChemFax (ChemFax #5943) or purchase Flinn’s Whoosh Bottle Kit, AP5943.

Methyl alcohol is often used in a mini-flame test demonstration where a metal salt and flammable liquid are burned to show colorful spectra. This should only be done as a teacher demonstration and not as a student activity. Flinn Scientific sells a flame test demonstration kit called Oooh, Aaaah Style Flame Tests (AP9303). The safety precautions presented in this kit must be rigorously followed. For a complete set of instructions and safety precautions for this flame test demonstration, please contact Flinn Scientific and request Publication No. 509.5. Always remove the methyl alcohol container from the demonstration area before igniting the salt mixtures and NEVER add more alcohol to the demonstration once it is underway. Do NOT repeat the demonstration.

Methyl alcohol can be safely used in mini-combustion reactions such as the ping pong popper demonstration. However, only a very small amount of methyl alcohol should be used and it should all vaporize before attempting combustion. Ethyl alcohol is a safer alternative for this demonstration.

There are many options for performing distillations and Flinn Scientific recommends separating higher boiling mixtures that are less volatile and less flammable. A good alternative may be isopropyl alcohol mixtures.

Methyl alcohol is a reagent used for preparing some organic esters. These reactions are normally performed on a micro-scale and without the use of flames. If care is taken during the dispensing of the alcohol and all safety precautions outlined in this *SafetyFax* are followed, then, methyl alcohol can be safely used to prepare esters.

Summary

Methyl alcohol is a common laboratory solvent and reagent used in many high school laboratories. It can safely be used in laboratory activities and teacher demonstrations if proper safety equipment is available and safety precautions are followed. However, if the science teacher does not feel comfortable using methyl alcohol or does not feel the proper safety equipment and/or precautions are in place—methyl alcohol should not be used.

Materials for using methyl alcohol safely are available from Flinn Scientific, Inc.

Catalog No.	Description
SE1034	Fire Extinguisher, ABC Dry Chemical, 5-lb
SE3001	Fire Extinguisher, ABC Dry Chemical, 10-lb
AP3218	Gloves, Neoprene
SE104	Flinn E-Z Pour Absorbent, 128-oz
SE101	Super Sorb [®] Absorbent, 20 lbs
SE265	Laboratory Spill Mat
SE150	Absorbent Spill Pillows, 250-mL
SE155	Absorbent Spill Pillows, 1-L
AP5943	Whoosh Bottle Demonstration Kit
M0054	Methyl Alcohol, Reagent, 500 mL
M0055	Methyl Alcohol, Reagent, 4 Liters
M0056	Methyl Alcohol, Reagent, 20 Liters
M0207	Methyl Alcohol, 4 Liters
M0208	Methyl Alcohol, 20 Liters
SE7021	Flinn 18-gallon Floor Flammables Cabinet
SE8021	Flinn Benchtop Flammables Cabinet

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.