Flammables and Combustibles

Standard Operating Procedure

Revision Date: 06/20/22

This standard operating procedure (SOP) outlines the handling and use of flammable and combustible materials. Review this document and supply the information required in order to make it specific to your laboratory. In accordance with this document, laboratories should use appropriate controls, personal protective equipment, and disposal techniques when handling flammable and combustible materials.

# Description [Provide additional information as it pertains to your research protocol]

Flammable and combustible liquids can burn and are classified, or grouped, as either flammable or combustible by their flashpoints. Flammable liquids will ignite and burn easily at normal working temperatures. Combustible liquids have the ability to burn at temperatures that are usually above working temperatures. Flammable liquids have a flashpoint below 37.8°C (100°F) while Combustible liquids have a flashpoint at or above 37.8°C (100°F) and below 93.3°C (200°F).

## Process [Write the steps for using the chemical in your research protocol]

# Potential Hazards [Provide additional information as it pertains to your research protocol]

Flammability - **Check Safety Data Sheet of the material for other hazards**.

Definitions –

* Flammable gas – a gas that, at 68°F or less and standard pressure, forms a flammable mixture with air at a concentration of 13% by volume or less OR that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12% by volume, regardless of the lower limit.
* Flammable liquid – a liquid having a flash point below 100°F.
* Flammable solid – a solid, other than a blasting agent or explosive, that (1) has an ignition temperature below 212°F, or (2) is capable of causing a fire through friction, absorption of moisture, or spontaneous chemical change, or (3) burns so vigorously and persistently as to create a serious hazard.
* Combustible liquid – a liquid having a flash point at or above 100°F.

# Engineering Controls [Provide additional information as it pertains to your research protocol]

Work in a chemical fume hood if air concentrations above 10% of the lower flammable limit may be reached, if the chemical is irritating to the eyes and respiratory system, and/or is toxic by inhalation.

# Work Practice Controls [Provide additional information as it pertains to your research protocol]

* Alert others in your lab of the materials you will be working with.
* Review SDSs before working with material.
* Know the location of the nearest fire extinguisher before beginning work.
* Use in the smallest practical quantities for the experiment being performed.
* Avoid using ignition sources (Bunsen burners, hot plates, electrical equipment with frayed or cracked wiring, etc.) and/or creating static electricity in areas where highly flammable chemicals are used.
* Ensure proper grounding. Be sure to ground metal containers when transferring flammable liquids.
* Keep containers of flammable chemicals closed at all times when not in use to prevent accumulation of flammable vapor concentrations.

# Personal Protective Equipment [Provide additional information as it pertains to your research protocol]

* Wear nitrile laboratory gloves, lab coat (flame-resistant lab coats for handling large volumes), safety glasses, clothing that minimizes exposed skin, and close-toed shoes for all work with flammables. If working with flammable liquids that may splash, wear chemical splash goggles.
* If a flammable liquid is also toxic, check glove guide for appropriate gloves and/or minimize glove contact with the liquid.
* Avoid wearing flammable clothing (such as many synthetics) when working with flammable materials.

| Gloving Material | Advantages and Disadvantages |
| --- | --- |
|  Butyl rubber | * Good for ketones and esters
* Poor for gasoline and aliphatic, aromatic, and halogenated hydrocarbons
* Expensive
* Only available as re-useable
* Poor touch sensitivity
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| Neoprene | * Good for acids, bases, alcohols, fuels, peroxides, hydrocarbons, and phenols
* Poor for halogenated and aromatic hydrocarbons
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|  Viton | * Good for chlorinated and aromatic solvents
* Low surface tension repels most liquids
* Good resistance to cuts and abrasions
* Poor for ketones
* Expensive
* Only available as re-useable
* Poor touch sensitivity
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|  Vinyl - polyvinyl alcohol (pva) | * Good for aromatic and chlorinated solvents
* Poor for water-based solutions (dissolves in water)
* Avoid: Contact with water or water-based solutions, water solubles
* Only available as re-useable
* Poor touch sensitivity
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# Transportation and Storage

* Flammable chemicals should be stored in appropriate areas within the laboratory and away from any potentially incompatible materials.
* Transport flammables in secondary containment, preferably a polyethylene or solvent bottle carrier.
* Suitable fire control devices (such as fire extinguishers) must be available at locations where flammable or combustible liquids are stored.
* Open flames shall not be permitted in flammable liquid storage areas. Flammable and combustible liquids must not be stored in a manner that hinders safe egress.
* If large quantities (>60 gallons) of flammable or combustible liquids are stored, a specially-designed storage room may be required.
* Store these materials in a separate room from water-reactive materials.
* Flammable and combustible liquids may be stored in a flammable storage cabinet. All such storage cabinets must meet NFPA 30 requirements.
* Flammable liquids shall not be stored in unapproved or residential-type refrigerators.
* Secondary containment is recommended for liquids.
* Avoid storing on the floor.

# Waste Disposal

Because most spent, unused, and expired chemicals/materials are considered hazardous wastes, they must be properly disposed of. **Do not dispose of chemical wastes by dumping them down a sink, flushing in a toilet or discarding in regular trash containers, unless authorized by Environment, Health & Safety (EHS) Hazardous Materials Management (HMM)**. Contact EHS-HMM at (734) 763-4568 for waste containers, labels, manifests, waste collection and for any questions regarding proper waste disposal. Also, refer to the EHS [Hazardous Waste](http://ehs.umich.edu/haz-waste/) Web page for more information.

# Training of Personnel

All personnel shall read and fully adhere to this SOP when handling a flammable or combustible material.

# Certification

I have read and understand the above SOP. I agree to contact my Lab Director if I plan to modify this procedure.

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| Laboratory Director | Revision Date |

### Major Revisions (Tracking purposes only -- Do not print as part of SOP)

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| Date | Revision |
| 09-14-18 | EHS name and logo were added, updated the formatting, and revised the content under Exposure/Unintended Content (AKJ). |
| 03-04-19 | Reviewed and updated. |
| 06-20-22 | Reviewed (WBD) |