

3.19. Hot Oil Bath and Other Heating Sources – Procedures for Set-Up and Safe Operation

Personal injury or property damage can result from the use of hot oil or sand baths and other heating sources in the laboratory. Personal hazards include injury and burns from hot surfaces, liquids, vapors or flames. Contact burns may occur and range from minor to severe.

Use of these devices are frequently left unattended and must be monitored. Sources of ignition exist from electrical components, hot surfaces, hot liquids, or open flames. Uncontrolled fire or explosion may result in severe personal injury or injury to others and/or widespread property damage.

The following procedure applies to, but is not limited to, all of the following devices:

- Ovens,
- Hot plates,
- Heating mantles and tapes,
- Oil baths,
- Salt baths,
- Sand baths,
- Hot-air guns, and
- Microwave ovens.

3.19.1. Administrative Controls and Set-Up

3.19.1.1. Unattended Operations

- All unattended operations must have prior approval from the Principal Investigator, Lab Manager, or Lab Supervisor.
- Provide for containment of materials in the event of spills or failures.
- Label all containers and process equipment with the name of the material and special hazards.
- Post the contact name and number of the person performing the experiment on the lab door
- Keep lab lights on.

3.19.1.2. Ovens, Furnaces, Heating Mantles, and Other Devices

- Burners, induction heaters, ovens, furnaces, and other heat-producing equipment must be located a safe distance from areas where temperature-sensitive and flammable materials and compressed gases are handled.
- Drying ovens should only be used for their intended purpose and not overloaded with combustible materials.
- Always use the grounded three-prong plug on all electrical devices and when using variable transformers.
- Older models of Variacs will keep whatever is plugged into them electrically live even though the Variac is switched off. Touching this device and ground at the same time could complete a circuit with your body and lead to electrocution. Always disconnect a Variac from the outlet before working with the device plugged into it.
- Check all glassware before using to ensure it is free of cracks and other imperfections. Do not use if in doubt.
- Discard heating mantles if the ceramic is cracked or the fiberglass is brittle or damaged.
- Do not use any electrical equipment if the wire insulation is cracked, frayed or wires are exposed in any way.

3.19.1.3. Hot Oil and Sand Baths

- Do not leave an operating sand or oil bath unattended unless it is equipped with a high-temperature shutoff and with a warning label.
- Know the flash point of the material when using oil baths. Consult the chemical manufacturer's technical information prior to use. NEVER heat a bath fluid above its flash point. Watch for smoking of the oil; oil that is smoking is too hot and may burst into flames at any moment. If an oil bath starts to produce smoke, turn off the heat immediately.
- Baths should be mounted on a laboratory jack that can be lowered easily without danger of the bath tipping over to cool the bath in an emergency. Equipment should be clamped high enough above a hot plate or oil bath that if the reaction begins to overheat, the heater can be lowered immediately and replaced with a cooling bath without having to readjust the clamps holding the equipment setup.
- Place equipment in a central location in the fume hood such that an uncontrolled fire does not melt the rubber seal surrounding the inspection ports located at the sides of the fume hood.
- When using hot oil or sand for heating, mount the baths in such a way that they cannot be overturned or that water cannot fall into an oil or sand bath causing hazardous splattering.
- Oil expands in volume when heated. Do not overfill.
- Secondary containment for oil baths must be used to contain any possible spills.
- All oil baths must be labeled with the name of the oil and its maximum safe working temperature:

“Hot Mineral (Silicone) Oil”

“Do not allow the temperature to exceed ____ deg C”

- Store the oil or sand for reuse in a covered secondary container that is labeled with the name and maximum safe working temperature.

3.19.2. Engineering Controls

Use non-mercury thermometers, thermocouples, or bimetallic temperature indicators. Do not use a sand or oil bath unless it is equipped with a thermometer (non-mercury) or other temperature-indicating device.

- Heating equipment with circulation fans shall be equipped with an interlock arranged to disconnect current to the heating elements if the fan fails.
- Heated Constant Temperature Baths: **NEVER** heat a bath fluid above its flash point.
- Electrically heated constant temperature baths shall be equipped with over-temperature shutoff switches in addition to normal temperature controls.

3.19.3. Personal Protective Equipment

- Appropriate gloves, safety glasses and lab coats must be worn when handling chemicals, containers, apparatus, and heating equipment.

3.19.4. Emergency Response

- Regardless of the method used to heat something, a stuck contact, an electrical short circuit, uncontrolled chemical reaction, or other malfunction can cause a reaction to heat to dangerously high temperatures. Do not leave experiments unattended without prior approval, implementing proper precautions, and using the proper fail-safe devices.
- Know where the emergency gas shut off is for your lab when using Bunsen burners.
- Know where the nearest fire alarm pull box is in relation to your lab.
- Know how to use a fire extinguisher. Activate the fire alarm FIRST and use only 1 fire extinguisher (if you have been trained and are comfortable in using the extinguisher) before evacuating the area.