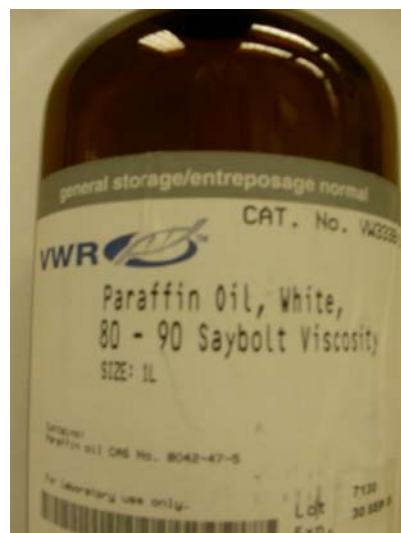


Standard Operating Procedure for Oil Bath

Dr. Ragauskas group safety meeting

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Purpose of the SOP is to establish guideline for the proper and safe storage, use and disposal of silicone oil baths. Common method of heating is to place a flask in a bath, usually on a hotplate.

Oil bath is universally used in lab as heating source:

- No moisture to affect reaction system, in control temperature, heating is stable
- Oil baths typically offer the advantages of a higher degree of control particularly at temperatures less than 200 °C and good heat transfer.
- Heating is uniform and easy to control with no lagging, and prompt and sharp starting and stopping.

Why SOP?

Safety, Safety and Safety



Both Mineral oil and paraffin oil are a mixture of heavier alkane hydrocarbons with the general formula C_nH_{2n+2} , they have a density of around 0.8 g/cm^3 , are insoluble in water. $n < 20$ for paraffin oil, and $15 < n < 40$ for mineral oil.

Silicone oils are polydimethylsiloxanes where two methyl groups attach to each silicon atom to form $(H_3C)[SiO(CH_3)_2]_nSi(CH_3)$.

Fluid	Approximate Operational Range (°C)	Flash Point (°C)*
water/ethylene glycol	-30 to 90	n/a
5 cSt silicone oil	-40 to 130	> 135
10 cSt silicone oil	-30 to 160	> 165
20 cSt silicone oil	10 to 230	> 235
50 cSt silicone oil	30 to 270	> 280
mineral oil	< 130	> 135
paraffin oil	0 to 190	> 195
bath salts	180 to 550	n/a
sand	< 300	n/a

*the lowest temperature at which it can form an ignitable mixture in air
cSt = centistokes and is proportional to the silicone's molecular weight

Potential Hazards:

- Electrical: the heating source is electrical. Never touch exposed wires, make sure system is grounded and use GFI outlets when possible.
- Fire: heating at temperatures above the flash point can cause smoking and combustion of the bath oil to occur.
- Chemical: heating of reaction solvents and mixtures may cause violent reactions and/or generation of vapors which may be chemical hazards such as toxic, corrosive, or flammable gasses or liquids.

Personal Protective Equipment:

- Respiratory equipment: only when hazardous vapor are generated from heating
- Eye protection: required
- Hand Protection:
 - in case of full contact and immersion: butyl rubber
 - in case of splash contact: latex
 - in case of handling hot glassware: heat-insulation gloves
- Protective Clothing: lab coats, closed toed shoes, and long sleeved clothing should be worn.

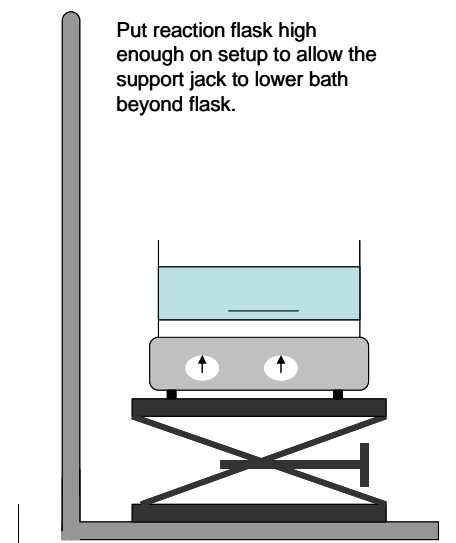


Guidelines for the safe and proper use of oil bath (silicon oil):

1. Always use in fume hood, make fume hood neat. Set-up oil bath on a stable surface, away from flammable and combustible materials including wood and paper.
2. No one else using fume hood when using oil bath.
3. Typically use a Pyrex crystallization dish as the vessel to hold the oil. One could also use either a metal pan or a heavy-walled porcelain dish (any heavy walled container).
4. Mount the reaction flask and baths in such a way that they cannot be overturned.
5. Never overfill bath fluid, keeping in mind the fluid may expand.



Put reaction flask high enough on setup to allow the support jack to lower bath beyond flask.



More guidelines for the safe and proper use of oil bath (silicon oil):

6. Material heated in such a bath should be mounted in such a way that it can be quickly and easily removed from the bath in an emergency.
7. Ensure heating source for baths are equipped with properly working electric systems, heat controls and a power source located in such a way the power can be cut off at anytime
8. An oil bath should always be monitored by using a thermometer or other thermal sensing device to ensure that it stabilizes at the desired temperature and does not exceed the flash point of the oil being used before leaving the bath unattended. Oil must not be overheated so that it smokes or decomposes or is in danger of ignition.
9. In the use of oil baths, care must be taken to avoid spilling water and other volatile substances into the baths. Such an accident can splatter hot material over a wide area and cause serious injuries. Be sure to secure any tubing delivering fluids to the hood, for instance water to a condenser, with clamp, wire or zip-tie.
10. Relocate bath only after the liquid inside has cooled.

Recommendations for the safe and proper use of oil bath (silicon oil):

1. Secondary containment (HDPE spill containment trays) could be used to restrain any possible spills.
2. Support jack could be used to facilitate safe and quick removal of heat from your reaction flask.
3. Proper labeling should identify the oil and its safe working temperature.
4. The addition of a paperclip to stir the oil bath could stabilize the bath's temperature distribution across its volume and ensure "hotspot" formation does not occur.
5. Use a shatter-proof oil bath container.

Handling, Storage, Cleanup and Disposal:

- Handling: n/a
- Storage: any flammable chemical storage
- Cleanup: take-up with liquid adsorbent material (Solvent Saf-T-Spill Kit) and forward for disposal. Clean affected area with soap and water.
- Disposal: don't allow to enter sewage system, forward for disposal in labeled waste container.

In case of emergency:

- If possible, lower support jack
- Try to cut power to the heating source and also stop any other gas or fluid being delivered to the fume hood
- Lower the fume hood glass sash and back away from the fume hood
- Evaluate the situation, either:
 - Call emergency contact information, and/or
 - Call emergency responders 404-894-2500 and 911, and/or
 - If containable fire, extinguish the fire by use of a fire extinguisher or vermiculite. All laboratories contain at least one Carbon Dioxide (Type B-C) or Dry Chemical (Type A-B-C) fire extinguisher.