

# Fact Sheet

## Hot Plates

Using hot plates properly is an important part of research safety for both fire prevention and accurate research results. Proper use includes setting the temperature to a safe level, understanding the operation of your hot plate, and keeping your equipment in good repair.



### Hazards of Hot Plates

Hot plates can create many hazards within the lab, including burns, fires, and explosions. Fires have occurred in the past because of flammable materials being heated past their flash point or being left too close to hot plates, and explosions have occurred from overheating chemical reactions, causing a rise in pressure, inadvertent heating, or a temperature-induced run-away reaction.

### Using Hot Plates Safety

- *Know how the controls on your hot plate work.*
  - On some combination stirrer/hot plates, the stir and heat knobs can look very similar. Someone trying to turn the stirrer up may inadvertently turn the heat up instead. Make sure the controls are clearly labeled. If the original labels are worn off, re-label the knobs yourself.
  - Hot plates from different manufacturers may have the directions of the knobs reversed for what turns it on and off. For example, Brand A may turn to the left to turn off, while Brand B turns to the right. Somebody used to working with Brand A may accidentally turn the temperature up instead of off when working with Brand B.
  - Some hot plates (older models especially) allow the temperature knob to be turned all the way “through” off to high. Someone who thought they had turned a hot plate off may have accidentally turned it all the way, potentially causing serious issues.
  - Some models may have controls that make it easier to set temperatures incorrectly, or not completely turn off the hot plate.
  - Digital readouts may display a temperature, but have been known to be very inaccurate. Only a thermometer can give you a true reading of the temperature.
- *Set up your reaction in a fume hood when heating solvents.*
  - Heating materials can cause the generation of much more vapor than they would otherwise. Ensure vapors are exhausted effectively.
- *Unplug hot plates when not in use*
  - Old or broken hot plates may have broken or worn-out parts that cause them to spontaneously heat. In newer models, a firmware failure may cause the same issue.



This hot plate has very similar controls for heating and stirring.

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- *Don't set temperature above flash point*
  - If the temperature on the hot plate is set too high, it can heat the material higher than its flash point, which could cause a fire.
  - If possible, set a safe temperature limit for your hot plate. This sets an internal control on the maximum temperature the hot plate can reach (even if the main controls are set as high as possible). This will help prevent accidentally over-heating a material. In general, the maximum temperature limit should be at least 25° C lower than the flash point of the material being heated. To do this properly, you may need to review the operator's manual for your specific hot plate.
  - When purchasing new hot plates, look for the ability to limit the maximum temperature.
- *Calibrate thermometer and make sure it's secured in place*
  - If your thermometers are not calibrated properly, the reaction may be conducted at temperatures higher or lower than expected.
  - Make sure your thermometers are secured in place. A thermometer placed incorrectly in the container may fall out over the course of the reaction, resulting in the hot plate continuing to heat past the set temperature.
- *Follow guidelines for unattended reactions*
  - Do not leave ignitable materials such as flammables, paper, or cardboard near the hot plate, or stored in the same hood. Make sure there is adequate clearance around it.
  - Leave proper signage for an unattended reaction. Make sure it includes how to contact you, and the intended temperature of your reaction. If the temperature knob gets accidentally bumped by somebody else, it can overheat or ruin your experiment. The signage would let them know what it was meant to be set at.
- *Keep your hot plate in good repair.*
  - If your hot plate is no longer working properly, take it out of service by marking it with a tag or sign, and notify your lab manager to get it repaired or replaced. Unreliable hot plates can also ruin experiments, start fires, and cause many issues.



## Other Heating Options

Water or oil baths and heating mantles are other heating options that are often used in the lab. These have their own hazards associated with them and are not within the scope of this fact sheet. Consult other references, such as *Prudent Practices in the Laboratory*, for more information on how to work safely with these other heating methods.

## Questions

If you have any questions, contact your department's research safety specialist, or the main DEHS office at (612) 626-6002.