# **Standard Operating Procedure (SOP) Title: Use of Hotplate with magnetic stirrer**

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| Assessor: | Joshua Linfoot | | | Location of work: | MSRH 502 |
| Principal Investigator: | | | Prof Alan Spivey | | |
| Date of approval: | | 13/09/2021 | | Date for review: | 13/09/2022 |

## **Justifying the hazards:**

The temperature of a hotplate can be controlled by thermocouple or the heating element itself.

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| Identify hazards with specific risk assessments and a College or a departmental approval process | | | |
| [Ionising radiation sources](https://www.imperial.ac.uk/safety/safety-by-topic/laboratory-safety/) |  | [Biological sources](https://www.imperial.ac.uk/safety/safety-by-topic/laboratory-safety/) (microorganisms, human/animal tissues, plants) |  |
| [Class 3R, 3B or 4 Lasers](https://imperiallondon.sharepoint.com/sites/fons/faculty/safety/lasers/SitePages/laserhome.aspx) |  | [Offsite work](http://www.imperial.ac.uk/safety/safety-by-topic/off-site-working/) |  |
| Confirm if [Lone working](https://www.imperial.ac.uk/safety/safety-by-topic/lone-working/) is permitted with this SOP?  If it is permitted, describe the control measures for lone workers: | | | |

## **Preparing for the SOP:**

* **DON’T** leave the hotplate dirty.
* **DON’T** use faulty or damaged equipment until it is repaired.
* **DON’T** touch or operate with wet hands.
* **DON’T** locate combustible material near the hot plate.
* **DO** use lab jacks to lift the hotplate only.
* **DO** ensure you have plenty of space around the hot plate to work.

## **Procedure:**

# **Before use:**

1. Mineral or silicone oil baths, sand and heating blocks/heating mantles can be used to provide uniform heating of the sample (Note: heating of paraffin oil ate temperatures higher than 120 °C and silicon oil higher than 140 °C, should be avoided). An appropriately sized magnetic stirring bar should be immersed in the oil bath to ensure uniform bath heating.
2. Immerse the sample flask into the bath and support using a clamp attached to the support rod.
3. Turn on stirring and adjust the stirring speed slowly if needed.
4. Turn the heating function on and set the thermostat to the desired setting. If present, immerse the thermocouple in the oil bath or into the special inlets of the heating blocks.

## Allow around 10 minutes for hot plate and sample temperatures to stabilise. Note: a longer time will be needed for temperature equilibration of especially large volume oil baths.

# **While using:**

Minimise the movement of hotplate once in operation.

Monitor the temperature regularly.

# **After use:**

1. When heating is complete, turn the unit off.
2. Place a note nearby informing others that the hotplate is still hot.
3. Allow the hotplate to cool to room temperature before moving.

## **Disposal:**

If the equipment is to be disposed of, ensure it is decontaminated, and then disposed of via the ‘Waste Electrical and Electronic Equipment route ([WEEE](http://www.imperial.ac.uk/estates-facilities/buildings/services/waste-disposal/waste-disposal-forms/weee-forms/))’.

## **Personal Protective Equipment (PPE):**

Lab coat, appropriate gloves, safety glasses

## **Risk Analysis of SOP and emergency procedures:**

(In addition to [Safe Lab Practice](https://imperiallondon.sharepoint.com/sites/fons/faculty/safety/SitePages/Basic%20Laboratory%20Rules%20for%20All%20Laboratories%20in%20FoNS.aspx))

### **Always remember to include fire associated risks and control measures where appropriate**

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| Hazard | Raw risks | Current control measures | Residual risk  (Low/Med/High) |
| Hot surfaces, hot oil | Burns, fire | The desired oil temperature MUST BE lower than the flash point of the oil.  Use thick–walled, round-bottom flasks in oil baths for reflux or distillation reactions. Clamp the reaction flask at a safe bath height with an adjustable clamp. If the reaction begins to overheat, the bath height can be immediately adjusted, and the hot bath replaced with a cooling bath.  Use slip-resistant insulated thermal gloves for handling hot samples, oil baths and heating blocks.  Remove all flammable substances from the area when using hotplate. | Med |
| Oil, sand bath | Spills | Do not overfill the bath. A safe depth for an oil (or sand) bath is no more than two-thirds of the container height when the reaction flask is immersed.  Make sure to prevent water from leaking into hot oil baths, which can cause the oil to pop and splatter. In the event of fire, do not use water to extinguish.  Use a funnel to collect oil/sand into the storage stock container.  Replace with sand bath / heating block where possible. | Med |
| Electrical equipment and cables | Electrocution and electrical fire | Commercial equipment, do not modify.  Ensure regular portable appliance testing (PAT).  Visual inspection of equipment and cables prior to each use.  Clean any spills immediately.  Ensure plugs, sockets, cables and equipment positioned so as not to be at risk of ingress from liquids.  Ensure a CO2 extinguisher is available.  Ensure easy access to the power supply. | Low |
| Heavy item | Crushing injury | Make sure equipment is on a firm, level platform and it is located so that the oil-level sight-glass is visible.  No lifting or moving of equipment. | Low |
| Hazardous materials | Exposure via inhalation of hazardous reagents | No work with hazardous reagents outside of containment, ensure containment has appropriate extraction and filters (where relevant).  Ensure the equipment and sample preparations are area cleaned after each use.  (Include hazards and controls of associated reagents in this or separate risk assessment) | Low |
| Glass baths | Cuts and splinters from broken glass | Visually inspect glassware for cracks and other defects before and after use. If glassware is damaged, arrange for repair or dispose of. | Low |

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| **Additional control measures to minimise residual risks** | **Implementation date** |
| If the hotplate is placed in a fume cupboard, the electric cable must be laid under the air-foil, or in another safe location, to prevent damage and allow the fume cupboard sash to be fully closed. |  |

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| **Who may be harmed** | |
| Staff / students | Cleaners / Engineers |
| Supporting staff | Others (specify): |

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| **Emergency procedures** – describe the response(s) required by the user and lab members |
| In the event of an incident involving the **equipment itself,** turn off the power supply, unplug and place a sign on the equipment stating that it is not to be used. Arrange for repair.  **Electrical shock** - switch off power. Do not touch the affected individual until the power is definitely off. Seek immediate medical attention by calling 4444 (+44 20 7589 1000) and contacting a nearby First Aid officer. Use a non-conductive lever to remove them from electrical source (e.g. a dry wooden broom handle).  **Electrical fire** – If ignition occurs but extinction is managed in a controlled manner, ensure a SALUS report is completed at the earliest opportunity. If the fire is not controllable, you must activate a fire alarm call point and evacuate. Inform Fire Safety Officers or Security of where the fire is and what it involves when they arrive at the building.  **Burns** - run the site of injury under tepid water for 15 minutes if able (burn dressing available in first aid kits if location of the injury is awkward to rinse, e.g. leg) and contact a first aider. In the case of a serious burn, seek medical attention immediately.    If **crushing injury** - contact a first aider immediately – use ice/cool pack (if on hand only) to reduce immediate swelling – seek medical attention if required.  Clear up **broken glass** using dustpan and brush, tweezers or other suitable equipment to prevent exposure to the glass then place into the appropriate waste bin (clean or contaminated glassware).  If anyone is injured while using the equipment, contact first aider.  If any **cuts or exposures** to hazardous substances, ensure affected area is held under running water for at least 15 mins and the wound is encouraged to bleed, ask for first aid assistance. If water is not available use alcohol free wipe from the First Aid Kit and dress the wound. Seek further medical attention if required.  (Include emergency procedures associated with the use of hazardous substances if relevant) |

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| Recommended trainings and records: |
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| List of individuals competent to demonstrate safe work practice and train others (level 1 trainers): | Names of those that have been trained and can work unsupervised (level 2) and date training completed: |
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