Standard Operating Procedure: Working with Heating Mantles

RAGAUSKAS GROUP SAFETY MEETING

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Introduction

- Heating mantle: A term for certain pieces of lab equipment used to apply heat to containers, as an alternative to other forms of heated bath.
- Glassware containers can be placed in direct contact with the heating mantle without substantially increasing the risk of the glassware shattering.
Temperature Controller and Mantles

• Temperature controller is used to monitor and control the temperature of any applicable reaction very accurately.
• Mantles are designed to fit specific objects (e.g. round bottom flasks) and heat their contents to a desired experimental temperature.
• Autotransformer (MUST be kept outside the fumehood) could be used instead of temperature controller to control heating.
Types of Mantles

- **Economical Unimantle:**
  - Ideal for use in teaching and industrial lab
  - Temperature range from ambient to 400°C
  - Requires external energy regulator

- **Stirring and Heating Mantle:**
  - Designed for stirring and heating of liquid
  - Built-in electronic controller
Types of Mantles

- **Flexible Mantles:**
  - Flexible mesh envelopes the contour of vessel
  - Light weight construction
  - Ideal for flat or round bottom flasks

- **Cloth-Jacketed Mantles:**
  - Constructed of fiberglass cloth exterior
  - Flexible and soft
  - Fits into very small places
General Safety Rule

- All the heating devices must be approved for the environment in which it will be used. (i.e., flammable or explosive atmosphere, in the presence of combustible dusts, etc.)
- Regardless of the type of heating device used, never heat a sealed container.
- A risk assessment and thorough knowledge of the chemicals being heated must be completed prior to heating.
- Support the heating mantle with a ring to allow air circulation around it to prevent overheating of the exterior of the mantel.
- Boiling chips or magnetic stir bar must be added so the liquid boils smoothly without becoming superheated.
General Safety Rule

- Never support a heating mantle with combustible materials.
- Always monitor the reaction while it is being heated. Never leave an experiment until an equilibrium temperature has been reached.
- Heating mantles should not be used for vacuum distillation of **heat sensitive or unstable materials**.
- If an action requires an operator’s hand getting close to the mantle, a heat-resistant glove must be worn.
Warnings

- To avoid electrical shock, always:
  --- Do not operate the heating mantles in damp or wet locations.
  --- Disconnect the mantle from the power supply prior to maintenance and servicing.

- To avoid personal injury, always:
  --- Do not place hand around the edge or inside the mantle during operation.
Warning

• To avoid damage to the heating mantle:
  ---Never operate heating mantle without fluid within the flask.
  ---Fluid should not be allowed to come in contact with the cavity of the heating mantle.
  ---If the flask or vessel breaks or fluid spills into the cavity, immediately disconnect the mantle from the power source.
  ---Never operate the mantle at temperature above 450°C.
Equipment Maintenance

- No regular maintenance is required for the heating mantles and temperature controller. However, regular inspection is recommended.

- If the mantles are suffering from mechanical damage or contamination, the equipment should be repaired by a qualified repairer or disposed as an electric equipment appropriately.

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Personal Protective

- Burns and other injuries can occur when heating devices are not used properly.

- Use Thermal gloves or tongs to remove items from their heating units.

- Always use protective eyewear when using heating devices, such as heating mantles, hot plates and ovens.