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Standard Operating Procedure (SOP)

High Temperature Furnaces, Heat Treating Materials.

#1 General Process Description

High temperature furnaces in the Materials Science & Engineering Department use high voltage to generate temperatures above 500°C. All work described in this SOP will have to be conducted in JHE 244. You MUST have WHMIS training prior to working in the lab. Contact Person is Ed McCaffery Laboratory Manager (Room JHE 248 ext 24985).

#2 Hazards of Furnace/ Class of Hazard

In order to heat treat a material, high voltage is needed to generate temperature greater than 500°C. With the high voltage come inherent dangers of electrocution, make sure the furnace is properly grounded and no loose wires are connected to the furnace. Working with high temperatures between 200 – 600°C; materials will not appear hot; but will cause severe tissue damage with improper handling.

#3 Personal Protective Equipment (PPE)

Before using the furnace, ensure that you will at least meet the following protective requirements:

1. Safety Glasses
2. Thermal gloves
3. Aluminized Heat Resistant Jacket
4. Closed-toe shoes with socks
5. Long pants (no shorts!)
6. Lab coat
7. Face shield

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Before proceeding you must have read and are familiar with the MSDS for each of the hazardous materials in this SOP. All Material Safety Data Sheets (MSDS) are located in room JHE 248 top shelf East Wall.

#4 Engineering / Ventilation Controls

There is no ventilation controls for the furnaces, if you are however heat treating a material which could pose a health risk special precautions must be adhered.

#5 Special Handling Procedures and Storage Requirements

When placing material into or removing the material out of the furnace you MUST be wearing all personal protective equipment. The thermal gloves used in the furnace lab are only rated to 500°C any material above this temperature MUST be handled by tongs. Users should check the personal protective equipment prior to using them to ensure that the equipment is not defective.

Please review the last page for emergency contact and notifications.

#6 Accident Procedures

If you drop your sample on the work bench and it catches fire, call 88. Remain nearby, and follow "McMaster University Fire Instructions".

If you accidentally drop the sample on your self Don't panic! Remain calm. Immediately go to the sink and rinse with cold water to try and reduce the burn.

If a fire occurs because of the sample, leave the room and contact technical staff; if the fire is out of control engage the fire alarm for the building; and contact emergency response 88, then EOHSS at 24352, stay nearby to provide information to responders. DO NOT TRY to extinguish the fire because of serious health hazard. Contact Emergency Response **(88)**, then and Lisa Morine Ext 23314 and Ed McCaffery Ext 24895.

#7 Waste Disposal

Not Applicable

#8 Training requirements

Prior to entering and working in the laboratory you must have completed the EOHSS WHMIS training. You will have to retain training documentation for at least one year. Any person conducting work in JHE 244 using this SOP must receive training on the contents of this SOP.

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#9 Approval Required

Any person using the high temperature furnaces must be trained by one of the Technical staff of the Materials Science and Engineering prior to using the furnace. Under no circumstances it is allowed to work with the high temperature furnace, while being alone in the laboratory. Always ask a second person to be in the lab with you. If you have to work with a high temperature furnace and you are alone, you have to ask for approval from your Supervisor then Laboratory Manager Ed McCaffery.

#10 Decontamination

If there is any mess, make sure the area is cool, then clean up with paper towel or dust broom.

#11 Designated Area

Upon leaving a designated work area, remove any personal protective equipment worn and wash hands. After each use (or day), wipe down the immediate work area. At the end of each project, thoroughly decontaminate the designated area before resuming normal laboratory work in the area.

#12 Precise Process Description

1. **It is essential that you wear a face shield over your safety glasses, thermal resistant gloves, and the aluminized heat retardant jacket to ensure proper protection from radiant heat.**
2. Make sure the sample is **DRY** free of oil or any other organics.
3. Make note that most materials will not glow below 600°C but at this temperature will cause severe burn.
4. The furnaces are electrical and draw over 50 Amps this is a very dangerous current which can kill.
5. Open the door to the furnace, and wearing all of your PPE (personal protective equipment) and using metal tongs place the sample into the furnace.
6. Note that temperature variation is always large in a furnace, using a second thermocouple close to sample will ensure that the temperature is correct. The thermocouple for the controller is usually at the back of the furnace and there is always temperature gradient from front to back of the furnace. Once the sample has been heated for the appropriate time, depending on what type of cooling is required, remove the sample from the furnace again wearing all of your PPE to quench the sample. If you are going to water or oil quench grip the sample with the metal tongs and quickly but carefully immerse the sample into the solution and agitate until the sample is at room temperature. If the sample is being annealed or normalized remove the sample from the furnace and place it onto a metal table properly labeling the area that there is a hot sample on the table.

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LOCK OUT TAG OUT PROCEDURE

For routine maintenance the furnace MUST be LOCKED OUT AND TAGGED OUT!

1. Turn power switch off to machine.
2. Turn off power to main breaker on wall.
3. Put your own lock into the lock out hole, and place tag with lock.
4. Check the power is now off first with a volt meter check there is no power at the terminal.
5. Perform maintenanc.
6. Once maintenance is complete remove lock and tag and turn on main breaker.
7. Follow "Precise Process Description".

Laboratory Spill Response Procedures

Health Threatening Situation - In the event of an imminent or actual health-threatening emergency (threatening local or public health, safety, or welfare; or the environment outside the immediate area):

1) CALL **88** FOR THE EMERGENCY RESPONSE REMAIN IN THE AREA TO ADVISE RESPONDERS.
2) ACTIVATE LOCAL ALARM SYSTEMS
3) Once personal safety is established, call EOHSS at Ext 24352 and proceed with local notifications, below.

Non-Health Threatening Situation – In the event of a major burn:

1) Notify McMaster Responders: **Call 88** (24 hours/day, 7 days/week), then

2) Provide local notifications:

Name	**Phone Number**	**Title**
Ed McCaffery	Ext 24985	Lab Manager/ Principal Investigator
Lisa Morine	Ext 23314	EOHSS

Local Response Situation – In the event of a minor burn:

1) Notify personnel in the area and restrict access.
2) If a fire breaks out and is controllable, make a record in your lab inspection report, or call 88 Emergency Response to record the fire, and notify your supervisor.

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Disclaimer: The SOP as written contains our best understanding at this time on how to work safely with this piece of equipment. When new information is found that would improve the safe use of this equipment it will be added in a timely manner. As it stands we cannot be held liable for misuse or abuse of these instructions through negligence on the user's part or based on the content of these notes.