

STANDARD OPERATING PROCEDURE

Updated: July 14, 2015

High Temperature Box Furnaces

Procedures for Lindberg Blue High Temperature Furnaces, Small MTK, and Carbolite furnaces

Users are responsible for using the furnaces described according to these procedures.

Precautions:

Use the proper safety equipment and safety protocols when using these furnaces. They reach a temperature of 1100/1400/1700 Celsius. The elements for the furnaces are exposed and can be easily damaged if bumped or scraped. They are very expensive to replace. The furnace elements are operated at a high current and can be dangerous if touched.

Always use the provided hearth plate on the bottom of the furnace.
Never place materials that are hazardous or contains burn-off products that can damage the furnace unsealed in the furnace.

Procedure:

1. Determine the type of process required before beginning. If your process doesn't require temperatures above 1100 Celsius then please use a small box furnace.
2. Check that the furnace is available. Talk to a person if his/her initials are on the white board next to the furnace that you would like to use.
3. Fill out the furnace use log on the white board. Write down date, name, batch number, composition and weight of elements used, temperature profile and any other comments in the growth log book located in the laboratory.
4. Program the furnace: See controller manual.
5. Place the material carefully in the furnace. Do not touch the edges. Do not put material in the furnace that is too big or that could boil over, sputter, touch heating elements or in any other way cause damage to the furnace or heating elements. It is best to maintain a 1" clearance around all items in the furnace to assure proper convective currents around your sample.
6. Material should be placed in the furnace at room temperature and before starting the program.

7. High temperature gloves, face shields, and furnace tongs are provided for user safety.

8. Do not set materials from the furnace onto any wood surfaces. The high temperature refractory bricks are in the lab for that purpose.

9. In case the growth fails or explodes in the furnace, shut down the temperature controller, wait for the furnace to cool down to room temperature and clean the hearth plate from any contamination if possible (In case of As, Se, Te, S do not attempt to clean the furnace! Let the lab manager and PI know about the accident. Let DES know about the accident. Do not use this furnace.) If the hearth plate cannot be cleaned (material reacted with the hearth plate), the hearth plate will have to be replaced. To replace the hearth plate (Lindberg Blue Box furnace): put the gloves on, shut down the temperature controller, disconnect temperature controller from the power outlet, open the back panel of the furnace, disconnect the lower three heating elements (pay attention to the connection of the heating elements, they have to be connected exactly the same way afterwards), take heating elements out one by one (be VERY careful, heating elements are FRAGILE). All three bottom heating elements have to be taken out. Gently and slightly lift the hearth plate from the front of the furnace and take it out from the groove at the back wall of the furnace. Dispose the old hearth plate in the hazardous waste. Pick up major debris from the inside of the furnace. Use the vacuum with HEPA filter to vacuum inside the furnace. Place the new hearth plate in the groove at the back wall first and then gently put it on the little ledge at the front of the furnace. Put heating elements back, connect them properly, arrange the braided connectors so that they do not touch the back panel of the furnace, make sure that elements do not short each other – braided connectors are not touching each other and not touching any screw or any other metallic part. Put the back panel back. Plug in temperature controller, turn it on.

10. Do not hesitate to ask questions.

11. A burn kit is available in the lab. If an accident occurs that is life threatening, call 911 immediately. If a minor accident occurs, it is recommended that user notify PI and also fill out an accident report.

Radioactive Material Furnace

Only the users that had the training to work with the radioactive material may use the radiation furnace. The operational procedures for this furnace are the same as for the furnaces above, except in case of explosion, the debris would have to be disposed in the radioactive waste.