Vacuum Oven

Standard Operating Procedure

Lab: [Engineering Science Building 155]

Department: Materials Science and Engineering

PI: Paul V. Braun

Written by: Jungwoo Shin

Section 1: Overview

Type of SOP: ☒Process ☐Hazardous Material ☐Hazardous Class of Materials ☒Equipment

Synopsis:

The vacuum oven is used to dry liquid, power or solid materials under vacuum or atmosphere at elevated temperatures.

Section 2: Risk Assessment Summary (Hazards and control measures)

Equipment Hazards:

Improper use of this oven under vacuum can lead to property damages, such as breakage of glass window, or physical hazards, such as skin or eye injury. Release of evaporated gases or solvent from drying materials can also cause strong odor or sore throat or eyes. Serious skin burn could occur from coming into contact with hot surfaces inside the oven.

Hazardous Conditions:

The oven door must be kept tightly closed under operation. Improper sealing or loose valve can cause release of evaporated gas into open space. Opening the oven door under operation could cause direct contact of evaporated materials into skin or eyes.

Technique Hazards:

Abrupt depressurizing can cause or burst of vapors or powders. Sudden release of vacuum valve under vacuum can cause reverse flow of vacuum pump oil.

Personal Protective Equipment

Safety glasses for eye protection.
Lab coat and nitrile glove for body protection.

Engineering Controls

Mechanical vacuum pump (optional for vacuum drying)

Section 3: Procedures

Sample Loading:

1. Turn on the vacuum oven.
2. Check the temperature of the oven.
3. Check the inside of the oven and clean up if there is any contamination and replace Al foil if damaged.
4. Place samples inside the vacuum oven. Liquid materials should be placed in the visible container.
5. Close and latch the vacuum oven door.
6. Make sure that both vent and vacuum valves are closed.
7. Turn on the vacuum pump and open the vacuum valve slowly. NOTE: liquid materials should be dried at atmospheric pressure first.
8. Set the temperature. Make sure that the temperature is below 200 ^{o}C.
9. Wait until the pressure reaches the desired value.
10. Check if there is any leakage by monitoring pressure gauge.
11. Close the vacuum valve and turn off the vacuum pump.
12. Open the leak valve attached to the vacuum pump and vent the vacuum line.
13. Close the leak valve.

Sample Unloading:

14. Turn off the heater and wait until the temperature cools down below 100 ^{o}C.
15. Visually check the inside of the oven to make sure that the oven is safe to open.
16. Slowly open the vent valve.
17. Wait until the pressure reaches to atmospheric pressure.
18. Open the vacuum oven door.
19. Carefully remove samples from the vacuum oven.
20. Clean the inside of the oven and the rubber seal of the vacuum oven door.
21. Close and latch the vacuum oven door.

Section 4: Waste Disposal/Cleanup

Clean up after use and replace Al foil inside the oven if damaged.

Section 5: Emergency Response

For physical hazards, call 911.

Section 6: Additional Information

Advice:

1. Liquid should be dried at the atmospheric pressure first.
2. Sealed containers can cause explosion under vacuum. Recommend to use transparent open containers.
3. Be careful when drying powder materials during depressurizing.

Checklist:

☐ *Read (Material) Safety Data Sheets for drying materials.*

☐ *Aware any potential health risk from vapor or flying dust from drying materials.*

Training Documentation

Signing this document means that you have read and understand all aspects of this Standard Operating Procedure. The supervisor is the person that acknowledges you took the training and understand the procedure. They can be a lab manager or researcher assigned by the PI to oversee this particular SOP.

Name (Printed)	Name (Signed)	Supervisor	Date