

Standard Operating Procedure (SOP) for Glovebox

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INSTRUMENT SAFETY GUIDELINES

The glovebox is designed and only to be executed in accordance with this SOP and company manual. Failure to observe the following precautions could result in instrument failure and personal injuries:

- ❖ The glovebox is electrically powered. To avoid electric shock, please observe all standard precautions and general safety guidelines of electric instruments.
- ❖ Make sure the surrounding temperature is maintained between 15 °C and 25 °C and minimal change in ambient temperature throughout the day.
- ❖ Do NOT place heavy objects on the power cord as well as on the instrument, and keep any hot items away.
- ❖ Do NOT use flammable sprays (hair sprays, insecticide sprays, etc.) near the product.

IN AN EMERGENCY

If a problem is encountered, turn OFF the power switch according to the following procedure.

- ❖ Rotate the power switch located on the left side of the glovebox to **O_{OFF}**.
- ❖ Remove the power cord from the backside of the glovebox.
- ❖ *In case of a critical emergency call 203 (from local network) or +91 1332 28 4026 (from mobile) and inform GB contacts as soon as possible.*

1 INTRODUCTION

1.1 Purpose of SOP

This manual is intended to cover the general guidelines and typical operation procedures for the use of the glovebox (GB) located in Satapathi Lab. The GB is intended to be a water and oxygen free environment for the handling of either solid or liquid air-sensitive samples. The procedures below are designed to ensure safe operation of the glovebox, protect the glovebox, and preserve the integrity of the samples.

1.2 General Guidelines

- Only authorized users are permitted to use the glovebox
- All sample requirements must be met
- All procedures associated with safe handling of chemicals are to be strictly followed.
- *The points of contact for this equipment are Prof. Soumitra Satapathi, Dr. M Adil Afroz and Yukta*

1.3 Emergency Procedures

- Remain calm, describe in detail the incident in the log book, and inform a GB contact person about the incident.
- If glove is punctured or damaged, inform GB contacts as soon as possible, and place a port cover on the glove, if H₂O or oxygen levels are high.
- *In case of an emergency call 203 (from local network) or +91 1332 28 4026 (from mobile) and inform GB contacts as soon as possible.*

1.4 General Rules for Working in the GB

- Any work inside the GB or use of antechambers must be recorded in the logbook.
- Jewellery (watches, rings, bracelets, etc), can damage the gloves and must be removed.
- Clean gloves must be worn before inserting hands into GB gloves. DO NOT use any gloves which have come into contact with research materials, solvents, or other hazardous chemicals.
- Aluminium foil must be placed in the work area to collect spilled sample. The foil needs to be removed at the end of the experimental run.
- Avoid sharps (razors, scissors, ...) if possible.
- Authorization from a glovebox contact is required prior to the sharp items being placed in the GB.
- Use of long sleeve shirts or lab coat while in the GB is encouraged (not required).

1.5 Sample Rules

In general, liquids should be anhydrous (either by pre-treatment or purchased anhydrous) for use in the glovebox. Solvent containers need to be very well sealed and taped up before bringing into the glovebox antechamber to avoid solvent leakage into the pump and minimize shattered glass in case of a broken container. Solvent bottles must remain closed when the glovebox is not in use. Any solvents brought into the glovebox need to be removed and properly disposed of at the end of the experimental run.

Other necessary materials (Tissue papers, aluminium foil, etc.) are available inside the glovebox. Please inform GB contacts if any of these items need to be replenished. Special procedures are needed to introduce these to the glovebox, and only authorized users are permitted to do so.

All samples/chemicals must be appropriately labelled (chemical name, owner, and date)

- No samples/materials may be stored in the glovebox beyond the time-frame of the experiment.
- All trash generated as part of work in the glovebox (e.g., used tissue, weighing paper) must be removed upon completion of the work and is responsibility of the users.

1.6 Glovebox atmosphere

The glovebox operating parameters should not to be modified.

Recommended operating limits as indicated on the display are as follow

ΔP <30 mm H₂O

[O₂] <5 ppm

[H₂O] <1 ppm

Care must be exercised in using tools (e.g., scissors, forceps) which could damage the gloves.

Watch for and report low pressure or unusual H₂O and O₂ levels.

Inform GB contacts if O₂ levels are above 5 ppm.

2 GLOVEBOX OPERATION

Every transfer and action that happens in the GB must be recorded in the logbook.

2.1 Introducing items to the glovebox through the antechamber

1. Check the logbook to ensure that there are no samples in the antechamber. Furthermore, check to see if the inner antechamber door is fully closed. Log in your information if the antechamber is available.
2. Open the outer antechamber door. Place items into the chamber. Close the door.
3. Turn on the pump from touch screen.
4. Evacuate the antechamber by opening the vacuum valve. Wait for 10 min.
5. Refill the antechamber half way by opening the nitrogen valve.
6. Repeat steps 4 and 5 two more times.
7. Once the chamber is full, close the nitrogen valve.
8. Open the inner antechamber door. Move items in to the GB. Close the door.

Note:

- If you are bringing in a material with a closed lid, make sure the lid is only loosely placed on top of your container. This will prevent the container from breaking.

2.2 Removing items from the glovebox through antechamber

1. Check the logbook to ensure that there are no samples in the antechamber. Log in your information if the antechamber is available.
2. Turn on the pump from touch screen.
3. Evacuate the antechamber by opening the vacuum valve. Wait for 10 min.
4. Refill the antechamber half way by opening the nitrogen valve.
5. Repeat steps 4 and 5 two more times.
6. Once the chamber is full, close the nitrogen valve.

7. Open the inner antechamber door. Place items in to the chamber. Close the inner door.
8. Open the outer antechamber door. Move items out. Close the outer door.

2.3 Introducing solvents into the glovebox (REQUIRES APPROVAL AND SPECIAL TRAINING)

1. Check the logbook to ensure that there are no samples in the antechamber. Log in your information if the antechamber is available.
2. Open the outer antechamber door. Place the solvent containers into the chamber. Close the door. (Solvent containers must have tightly sealed to avoid solvent leakage and taped up to contain shattered glass in case of a broken container).
3. Turn on the pump from touch screen.
4. Evacuate the antechamber by no more than half way by opening the vacuum valve.
5. Refill the antechamber by opening the nitrogen valve.
6. Repeat steps 4 and 5 fifteen more times.
7. Refill the antechamber completely by opening the nitrogen valve.
8. Once the chamber is full, close the nitrogen valve.
9. Open the inner antechamber door. Move solvents into to the GB. Close the door.

Note: The above process used for solvents is called a soft purge.

2.4 Using solvents in the glovebox (REQUIRES APPROVAL AND SPECIAL TRAINING)

1. Check that no other samples are open inside the glovebox.
2. Make a note of the solvent usage in the glovebox log.
3. Stop the circulation.
4. Open solvents and perform work. Keep a close watch on the O₂ level. If this rises above 5 ppm, do flushing.
5. Upon completion of the solvent work (or after 30 minutes, whichever comes first), flush the glovebox for at least 10 minutes.
6. Close the flushing and start the circulation

3 USE OF NITROGEN GAS CYLINDER TO PROVIDE NITROGEN FLOW TO THE GLOVEBOX

In order for the glovebox (GB) to function and maintain an air-free environment, a constant flow must be coming from the nitrogen cylinder into the glovebox. In order to connect the cylinder to the glovebox, set low pressure level in the glovebox as zero (0) and high-pressure level as three (3). Then, connect the pressure gauge (regulator) coming from the GB to the cylinder. Make sure the gauge is set to 2 Kg/cm³ in order to provide a flow capable of supporting the GB.

Ensure there is a full backup cylinder at all times in the lab. If you switch the line over to the backup cylinder, please let M Adil Afroz know so that the empty cylinder can be refilled.

4 TRASH DISPOSAL

The glovebox has a container for trash. Place all your trash in this container. If the container is full, take the container out of the glovebox, and empty the container inside either the glass or lab trash depending on the material.

Once you have emptied the trash out, bring the container back into the box. If you are the person to fill up the trash, it is your responsibility to empty it.

Flushing/Purging the glovebox Will be added shortly

Regenerating the Catalyst Will be added shortly

5 FEEDBACK AND IMPROVEMENT

If you are using this procedure and have comments or suggested improvements for it, please submit your input to afroz.madil@gmail.com

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