CHEMICAL WET BENCH

STANDARD OPERATING PROCEDURES (SOPs) 2020 (v.1)

NCPRE FABRICATION LAB

SO - Sreejith KP Co SO-SandeepK

CONTACT: sreejithanni@ee.iitb.ac.in, sandeeo.kumbhar@gmail.com

9930837262, 9969347860

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INTRODUCTION

This document describes the standard operating procedure for the preparation of solutions involving the mixing and eventual disposing of different chemicals. Chemical solutions could be used for etching, cleaning, surface activation etc. It is important to note that reading this document **IS NOT** considered as a sufficient training for the use of chemicals and wet benches. Users must undergo regular training with an authorized user of the tool. Chemicals involved are toxic and dangerous. **NEVER** do something you are not absolutely sure of. **ALWAYS** ask in case of doubt.

CHEMICAL SAFETY MANUAL

Please go through the chemical safety manuals before starting any wet chemistry process. Click on following link

For IITB

https://www.iitb.ac.in/safety/sites/www.safety.iitb.ac.in/files/Chemical%20Safety_0.pdf

For IITB-Nanofabrication facility

http://iitbnf.iitb.ac.in/iitbnf/images/headers/manuals/iitbnf_safety_manual.pdf

General rules to be followed in chemical area-

- Users MUST have received the wet bench training by an authorized user or system owner.
- Users MUST go through the material safety data sheet (MSDS) for each chemical that is being used prior to work and appropriate precautions must be taken.
- Before mixing any chemical, user must be aware of the chemical reactions that may occur and the damages it may cause.
- Users are NOT ALLOWED to bring new chemicals inside the cleanroom without approval of concerned faculty in-charge of the lab.
- ALWAYS wear the Personal Protective Equipment (PPE) at all the times while working in chemical area: chemical apron, then full face mask and lastly the tri-polymer chemical resistant gloves.
- Identify the chemical carefully when taking the bottle(s) from the cabinet.
- User MUST label any lab ware with the name of the chemical/process. If you leave the wet bench unattended, indicate name of the chemical along with the expected time of disposal (as applicable), your name contact number, date of process, expected time of disposal etc. Use chemical form for the same.
- DO NOT leave solutions unattended when there are chances for strong reactions to occur (hot RCA, Piranha mixtures, etc.).
- User MUST properly rinse the wafers/samples in DI water in between when using several incompatible chemicals during a process (e.g. solvents and acids, RCA-1 and hydro-fluoric acid (HF)).
- In order to avoid cross-contamination all lab ware will be kept as a set in designated boxes for the process (do not use lab ware from one bench at another bench).

SAFETY PRECAUTIONS

➢ Safety Symbols:

Warning:

NEVER touch clothes, goggles, face shield or any surface outside the acid/base wet benches while wearing the chemical gloves because abrasive chemicals might be left on the gloves and cause injuries. Remove the complete PPE if you leave the wet bench area and use other device like computer, microscope, etc.

Any hot chemical or mixture (e.g. TMAH, KOH, Piranha, RCA 1/2) must be cooled down (< 40°C) before disposing of it.

➢ Chemical storage

- Use separate cabinet to store the fresh chemicals to avoid cross reactions.

➢ Hot plate usage safety

- DO NOT use plastic ware directly on the hot plate.
- Avoid touching the hot surface.
- DO NOT use flammable or combustible materials.
- The probe/ thermometer MUST be immerged in the solution for proper temperature regulation.
- NEVER leave a heated solution unattended.
- The wire of the hot plate should not be in contact with plate while system is ON, to avoid any short circuit/ accident.

➢ Chemical spill kit-

Spill kit contain neutralizers for all chemicals (acids, bases and organics) and PH indicators with other required accessories as shown in fig.

1. While handling the chemicals in case there is a chemical spill on the wet bench or on the floor, NCPRE fabrication staff needs to be contacted.

Or

2. If any fabrication lab user found the spill of some unknown liquid on the wet bench or on the floor, please inform to NCPRE fabrication staff and leave the area.
The authorized NCPRE staff member will use spill kit to take care of the chemical spill.

CLEANING METHOD

- Wet bench should be clean with DI water and lint-free cloth.
- The lab wares should be clean multiple times with DI water and should wipe with lint free cloth or dry with PN2 after completing the process.

STANDARD OPERATIONAL PROCEDURE

1. Before entering and starting the process in the chemistry room, wear complete Personal protective Equipment (hair net, face mask, apron, safety glasses and shoes.)
2. Before starting the process:
    - TURN ON the blower of the fume hood (Green-ON, Red-OFF)
    - Green gloves (acid proof) - to be used for hydrofluoric acid (HF), Phosphoric acid, hydrochloric acid (HCl) & Sulphuric acid (H_2SO_4), etc.
    - Do not dispose used chemicals in the sink.
    - Check for the availability of the particular used chemical bottle.
    - Then start the process.
3. Use only standard glass/ quartz Petri dishes/ beakers for acetone, isopropyl alchohol (IPA), TCE, etc.
4. Use only Teflon Petri dishes/ beakers for HF, HNA, BHF, etc.
5. Rinse Petri and Teflon dishes at least thrice with DI water before and after the process and place them back in their appropriate boxes.

6. Used chemicals to be transferred into their respective ‘used chemical’ bottle carefully. Label them appropriately.
7. Rinse the chemical resistant gloves with DI water and dry them with a wipe. Remove & place in the appropriate location.
8. Clean up the wet benches after use. Dispose of all wipes used and do not leave any wipes on the deck of the bench.
9. After the completing the slot, SWITCH OFF the blower and light. (If no one else is in line).
10. Make a Log entry of the usage.
11. Hang the aprons at their proper place.

Note:

1. Due to limited space, only one user is permitted at each wet bench at a time.
2. The usage of chemical warning form is compulsory if one is leaving his/ her chemicals on the work bench.

Some Standard allowed recipes-

RCA I & II