UCDAVIS
COLLEGE OF ENGINEERING
Center for Nano-MicroManufacturing

Haz Waste Management

Process:
Once finished with a hazardous chemical, you will need to dispose of it by aspiration, decanting or bottling. Aspirate whenever possible! You will also need to rinse clean any empty or nearly empty chemical bottles. For hazardous solids, you can discard in the Haz Waste bucket or Sharps bucket.

Aspiration

(Suctioning away chemicals)

Materials:
Waste inorganic liquid chemicals like acids, bases and fluorides. Water for rinsing.

Incompatible Materials:
No organics like solvents, strippers, or the TMAH common in developers. No toxic "heavy" metals like Chrome or Aluminum ions. No concentrated Sulfuric Acid or concentrated Acetic Acid, though these are ok if diluted by more than 5 volumes of water.

Hazards, Exposure Actions and PPE:
Refer to chemical specific SOP. Aspiration creates little additional hazard.

Acceptable Locations For Use:
Wet process stations 3, 8, 9, acid & base fume hood[2].

Additional Process Notes:
Often the safest and most convenient option for chemical disposal, the aspirator is a plastic tube available at some benches that sucks chemicals to the neutralization system. If chemical is heated, allow it to cool beneath 45C[4]. Press the plenum[2] flush button to start the aspirator suction. Any material sucked into the aspirator will be flushed to NCNC's neutralization system along with many volumes of water. Submerge the aspirator tube into the bath, and hold it there until bath's contents have been removed as completely as possible. It is ok for the aspirator to 'slurp', though stop aspirating if you notice any splatter. At this point, rinse the bath with DI water and use the Aspirator to flush the water away- you may notice a puff of hazardous mist if too much chemical remained in the bath. Repeat water rinse and flush a few times, or until pH paper shows the bath to be clean. The aspirator is on a timer, so you may need to restart it by pushing the plenum[2] flush button again. Finally, give the bath a final rinse using a DI water gun over a sink to remove the last remnants of chemicals. To prevent spreading hazardous residues, always rinse off your gloves before leaving[1].

Decanting to Sink

(Pouring chemicals down the drain)

Materials:
Waste inorganic liquid chemicals like etchants or cleaners. Water for rinsing.

Incompatible Materials:
No organics like solvents, strippers, or the TMAH common in developers. No toxic "heavy" metals like Chrome or Aluminum ions. No toxic "heavy" metals like Chrome or Aluminum ions.

Hazards, Exposure Actions and PPE:
Refer to chemical specific SOP. Take special care to not fumble your bath when decanting.

Acceptable Locations For Use:
Wet process stations 3, 8, 9, acid & base fume hood[2].

Additional Process Notes:
If chemical is heated, allow it to cool beneath 45C[4]. Run the sink's water for 15 seconds. Carefully pour[3] the bath's contents into the sink, while keeping your hands and face either protected or away from the sink in case of hazardous fumes[1]. Run water down the sink for another 30 seconds to dilute the chemical as it flushes away. At this point, rinse your bath with DI water and pour it down the sink as well- you may notice a puff of hazardous mist if too much chemical remained on your bath. Repeat water rinse a few times, or until pH paper shows the bath to be clean. To prevent spreading hazardous residues, always rinse off your gloves before leaving[1].

Bottling

Materials:
Inorganic liquid chemicals like etchants or cleaners. Water for rinsing.

Incompatible Materials:
Any material can be bottled, though each individual bottle will have incompatibles[3].

Hazards, Exposure Actions and PPE:
Refer to chemical specific SOP. Bottling chemicals into the wrong accumulation bottle can cause explosions, fires, and violent eruptions of toxic fumes. Please ask us when in doubt! Expect heating if mixing concentrated chemicals into a spent chemical accumulation bottle. Never tightly cap waste bottles of oxidizers, even though they may generate toxic fumes. Tightly capping oxidizers with an improper cap can cause pressurization and an explosion.

Acceptable Locations For Use:
Bring spent chemical bottle to wherever your bath is. Most sinks are convenient[2].

Additional Process Notes:
Take care to choose the proper waste bottle for your process as choosing the wrong bottle can be deadly[3]. Your process' SOP will suggest the bottle in the Disposal section. You can also refer to the spent process materials flow chart for information on choosing the right bottle.
If your chemical is heated, allow it to cool beneath 45C[4]. Place waste bottle into a convenient sink, and insert a funnel. Carefully pour bath into the funnel. If any chemical spills out, keep pouring and rinse off the bottle when done[3]. At this point, rinse the bath with more DI water and pour it down the sink- you may notice a puff of hazardous fumes if too much chemical remained in the bath. Repeat water rinse and pour a few times, or until pH paper shows the bath to be clean. Rinse out funnel similarly. To prevent spreading hazardous residues, always rinse off your gloves before leaving[1].

Never tightly cap spent oxidizer bottles, or any other bottle you suspect might generate gas. Instead, leave the cap ¼ to ½ turn from tight.

Following is a list of common materials and what bottles they go in. If your chemical doesn't appear here feel free to prompt NCNC lab staff for advice. Acronyms can be found on NCNC's list of acronyms or with an internet search.

Aqueous Developers
MF-319 MFCD-26 AZ422

Flammables (important incompatibilities: no metal ions or organometallics)
PR Su8 developer Acetone IPA Methanol Toluene NMP DMSO PGMEA Chloroform Anisole Solid metals (lift off)

Organometalics (important incompatibilities: no solid metals)
Metal Ions Organometallics Silanes Spin-on-glass most adhesion promoters

Normal Fluorides (important incompatibilities: no strong acids / oxidizers)*
Metal ions HF BOE/BHF NH_3F

Aggressive Fluorides*
Metal ions HNA(mixed NH_4F, HNO_3 and Acetic acid) H_2O_2 HF HNO_3

Acetic Bearing Fluorides*
Metal ions HNA (mixed NH_4F, HNO_3 and Acetic acid)

Fluoride Strong Acid and Oxidizers*
Metal ions H_2O_2 HF HNO_3

Ordinary Acids* (important incompatibilities: no HNO_3, oxidizers or fluorides)
Metal ions HCl H_2SO_4 H_3PO_4 Acetic acid (mixed in water, not Glacial)

Acetate Bearing Acids* (important incompatibilities: no fluorides)
Metal ions Acetic acid PAN

Transiently Oxidizing Acids* (important incompatibilities: no fluorides)
Metal ions Piranha RCA2 H_2O_2

Persistently Oxidizing Acids* (important incompatibilities: no fluorides)
Metal ions HNO_3 SulphoNitric AquaRegia PAN

Ordinary Alkalis* (important incompatibilities: no oxidizers or fluorides)
Metal ions KOH NH_3 IPA H_2O Protek PR

Oxidizing Alkalis* (important incompatibilities: no fluorides)
Metal ions RCA1

* Best to aspirate or decant to neutralizer rather than bottling whenever possible. Only necessary to bottle if solution contains heavy metal ions or other un-neutralizable toxics.

*Additional SOPs available, see: 1. PPE Choice and Cleaning 2. Work Station Use 3. Pouring and Mixing 4. Hotplates

Discarding to Haz Waste Bucket

Materials:
Waste solids and solids wetted with organic chemicals.

Incompatible Materials:
No Acids, Bases or Oxidizers. No Sharps[3].

Hazards, Exposure Actions and PPE:
Refer to chemical specific SOP. Haz waste buckets create little additional hazard.

Acceptable Locations For Use:
Wet process stations 3, 8, 9, acid & base fume hood[2].

Additional Process Notes:
Open bucket and insert waste. Replace bucket lid when done. Notify lab staff when Haz Waste Bucket becomes full. Small amounts of dry photoresist are non-hazardous, so discard slightly used tekwipes in the normal trash.

Discarding to Sharps Bucket

Materials:
Sharp or shatter-able objects such as razor blades, glass, wafers, or syringe needles.

Incompatible Materials:
Avoid acids, bases or oxidizers, though tenth of a gram quantities are ok. Avoid organics, though gram quantities are ok.

Hazards, Exposure Actions and PPE:
Refer to chemical specific SOP. Sharps buckets create little additional hazard.

Acceptable Locations For Use:
Specially labeled five gallon buckets on the floor of the photolithography bays.

Additional Process Notes:
Open bucket and drop sharps in. Replace bucket lid when done. Notify lab staff when sharps bucket becomes full.

Bottle Rinsing

Materials:
Empty bottle with chemical residues to be cleaned.

Incompatible Materials:
Small bottles of resist will not easily rinse clean and should be discarded to the organics pass through or the haz waste bucket.

Hazards, Exposure Actions and PPE:
Refer to chemical specific SOP. Rinsing bottles creates little additional hazard. Concentrated acid bottles can create a small puff of fumes during the first rinse if insufficiently emptied.

Acceptable Locations For Use:
Any sink

Additional Process Notes:
If your chemical bottle is nearly empty after pouring from it, discard the rest of the chemical and rinse the bottle clean.

To clean a bottle, fill it partially with DI water, cap it tightly, shake it vigorously and then pour out the rinse water. Repeat 3-5 times. You can use pH strips to test the rinse water of acid and base bottles to help determine when you're done. After rinsing, remove the bottle's cap, cross out the bottle's label and re-label the bottle "Rinsed Clean" with a sharpie. Finally, you can find storage space for the rinsed clean bottle near the PPE storage.