

## Laboratory Standard Operating Procedure

Name of Procedure: Concentrated Acids

Lab Location Chem. Sci. 409

### 1. Type of SOP: (Select what the SOP addresses)

Procedural  Hazardous Material  Equipment Specific  Other

Prepared by: M. Tanasova Date Established 05/12/2015 Revision date: 08/27/15

2. **Prior Approval Required:** This procedure is considered hazardous enough to warrant prior approval from the laboratory supervisor. Yes  No

Supervisor Signature \_\_\_\_\_

**Hazards- The following materials and equipment associated with this procedure present exposure or physical health hazards. Safety precautions are prudent and mandatory:**

Concentrated acids are very corrosive and dangerous chemicals that are commonly encountered in the laboratory. Some acids are also shock sensitive and when subjected to improper handling they can explode. Concentrated acids may be fatal if inhaled; and can cause severe eye and skin burns, severe respiratory and digestive tract burns. Contact with other materials may cause a fire. All operations involving concentrated acids MUST be conducted in the fume hood and the investigator MUST wear appropriate PPE (see Section B).

Some common acids used frequently in Materials Science & Engineering are:

(~65%) Nitric acid (HNO<sub>3</sub>) [[MSDS](#)]

(~32%) Hydrochloric Acid (HCl) [[MSDS](#)]

(~96%) Sulphuric Acid (H<sub>2</sub>SO<sub>4</sub>) [[MSDS](#)]

These are not the only acids used just some of the more common. NOTE: Special precautions beyond those listed here are required when working with [hydrofluoric acid](#). This SOP should be read and understood prior to the commencement of relevant work and used to complement supervised practical familiarization with the various techniques described.

**Designated area:** Concentrated acids are only allowed to be handled in fume hoods. Filling and rinsing of the bottles should only be done near a sink, but with secondary containment tray in the sink. Upon leaving a designated work area, remove any personal protective equipment worn and wash hands, forearms, face, and neck. After each use (or day), wipe down the immediate work area and equipment to prevent accumulation of chemical residue. At the end of each project, thoroughly decontaminate the designated area before resuming normal laboratory work in the area.

### Procedures for Safe Handling of Concentrated Acids

*C1. Before commencing work:* Read and familiarize yourself with the Material Safety Data Sheets (MSDS) for each of the hazardous materials that you will be using. MSDS are easily

found from supplier websites, or are available in hard-copy form in many Gilbert Hall laboratories (e.g., in Gilbert 202 on top of element shelf). Ensure that a suitable acid spill kit is available in the event of an exposure. NOTE: A special spill kit is required for hydrofluoric acid, as detailed in the [SOP](#) for that material.

*C2. General handling, transportation, and storage:* When transporting concentrated acids you MUST place the acid bottle into a plastic transport container. Store all acids/acid waste in labeled chemically compatible containers (e.g., polyethylene or Teflon). Do not store in glass, metal, and ceramic containers, as they are not compatible with some acids. Store all concentrated acid containers inside acid cabinets (under fume hoods) within an appropriate secondary containment tray in case of bottle breakage. Place a secondary containment tray in the fume hood when handling and pouring concentrated acids to safe guard against an uncontrolled release in the event of an overfill or spill. When pouring from a large acid bottle, first pour into a clean beaker then, pour the acid from the beaker into a graduated cylinder (this will help reduce the risk of spillage). When diluting acids, to avoid a potentially dangerous exothermic event, **remember to slowly pour the acid into the water, never the water into the acid.**

*Precise process description:* The following instructions summarize the essential advice contained within this SOP.

1. Verify that emergency eyewash/shower is accessible and tested within last month.
2. Verify that fume hoods are currently certified and that flow alarms are working.
3. Check the location and expiration of the Acid Spill Kit and that a copy of the MSDS for the concentrated acid being used is available.
4. Make sure that you have read and understood the contents of this SOP.
5. It is essential that you wear a face shield over your safety glasses, nitrile gloves (preferable), and the neoprene aprons to ensure proper protection for concentrated acid spills.
6. FUMEHOOD: Place any glassware being used to collect the acid in a secondary containment tray. Make sure the fumehood shield is down as far as possible but not interfering with the work being done.
7. When pouring the acid, pour the acid into a clean beaker, then pour the acid from the beaker into a graduated measuring cylinder. Always pour the acids inside a secondary container in case of a spill. Remember to always pour acid into water slowly (especially for sulphuric acid).
8. Once the acid has been dispensed; properly label the bottle using the safety data label.
9. Wash any glassware which was used to handle the acid; rinse three times with deionized water, and collect the first three washes as hazardous waste.

**Engineering Controls- Prior to performing this procedure, the following safety equipment must be accessible and ready for use: (Chemical fume hoods, laminar flow hood, chemical spill kits)**

All work with concentrated acids must be done in the fume hood, with no other persons working close enough to interfere or come into contact with the acid. A co-worker must be present in the immediate area in case of an emergency, the protective shield on the fume hood drawn down as much as possible, but allowing to work comfortably. Make sure when you are dispensing the acids that the bottle being dispensed in is far enough in the fume hood

so that fumes will not come back to the users face.

**Protective Equipment-Prior to performing this procedure, the following personal protective equipment must be obtained and ready for use: (ex. Acid resistant gloves, safety eyewear, lab coat, chemical splash apron)**

Before any acid is taken out of the acid-storage cabinets, ensure that at least the following protective equipment is available to you:-

1. Goggles (prescription glasses are not enough!) that seal around glasses
2. Gloves – preferably nitrile
3. Closed-toe shoes with socks
4. Long pants (no shorts!)
5. Face shield if not wearing goggles
6. Neoprene apron or Lab Coat
7. Chemical Spill Kit
8. No contact lenses

**Waste disposal-This procedure will result in the following regulated waste which must be disposed of in compliance with environmental regulations:**

If you have spilled a concentrated acid and soaked up it up using an absorbent (see Section B4), make sure that the material is disposed of into a neoprene bottle (4L). The waste container must be appropriately and accurately labeled as hazardous waste and called in for pick-up by EH&S. All glassware and measuring cylinders that have been used during the process of mixing of acid should be thoroughly rinsed with deionized water (3 times) and then soap and water (1 time). Collect the first three rinseate volumes as hazardous waste; no rinse water with pH below 5.5 may be disposed of down the drain.

**Accidental Spill- In the event that a hazardous material spills during this procedure, be prepared to execute the following emergency procedure:**

This is for all acids EXCEPT HF. If you accidentally spilled concentrated acid (e.g., while pouring an acid into the measuring cylinder): Don't panic! Remain calm. If the spill is minor (less than 30mL, "note a 5 inch x 7 inch paper towel will absorb 5 ml of water"), and will not pose a health issue; use the spill-containment kit; pour the absorbent; first make a circle encompassing the spill then pour the absorbent on top of the spill. Find a plastic/neoprene-disposal bottle and carefully place the soaked absorbent into the bottle, and place in Chemical Waste label on the container. To minimize contact with the acid during clean-up, use the small broom and dust pan to move the soaked absorbent into the bottle. All of this must be done in the fume hood. If the spill is significant; larger (> 30 mL) or you flipped over an entire bottle of acid, if the spill does not pose a health hazard; inform any other personal in the lab; then use the spill-containment kit underneath paper towel dispenser. Pour the absorbent around the spill then pour the absorbent all over the spill. If spill is greater than 30 ml, or cleanup takes longer than 15 minutes, document the cleanup activity. **IF THE CONCENTRATED ACID IS RUNNING OUT OF THE FUMEHOOD**, place spill-containment absorbent on the spill and contact EH&S: 7-2273 immediately and leave the laboratory making sure you notify any personal in that lab, but stay nearby to provide information to responders. **DO NOT TRY** to

place the soaked absorbent into the neoprene bottle, as fume evaporating from the concentrated acids pose a serious health hazard. If the spill runs underneath the fumehood; or lab equipment; or if it goes down sink call EH&S: 7-2273. If a fire breaks out because of the acid spill leave the area immediately, activate the fire alarm, and call 911. Stay close to the building to inform emergency personal of what started the fire and what other chemicals are in the immediate area of the fire.

**Further reading**

1. The following SOP was consulted during the construction of this document:<http://mse.mcmaster.ca/SAFETY/SOPs/Standard%20Operating%20Procedure%20Concentrated%20Acids.pdf>

**Prior Approval-** This procedure is considered hazardous enough to warrant prior approval from the laboratory director. **Yes**

**Certification-** I have read and understand the above SOP. I agree to contact my Supervisor if I plan to modify this procedure.

Signature \_\_\_\_\_ Name (print) \_\_\_\_\_

Date \_\_\_\_\_ Room \_\_\_\_\_