

Piranha Cleaning

Standard Operating Procedure

Lab: ESB 155

Department: Materials Science and Engineering

PI: Paul V. Braun

Written By: JUNJIE WANG

Updated By: OSMAN SAFA CIFCI (10/2016)

Section 1: Overview

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

Synopsis:

This SOP is written to standardize the operating procedure of Piranha solution cleaning and protect the users from potential hazards.

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

Materials:

Material (name, CAS #, other ID)	Hazards
Hydrogen peroxide, 7722-84-1	Skin and eye contact (irritant), inhalation (lung corrosive), ingestion
Sulfuric acid, 7664-93-9	Very hazardous in case of skin, eye contact, inhalation, ingestion

Hazardous Conditions:

Overheating: Overheating the solution can cause vigorous bubbling or even boiling and can cause splash.

Technique Hazards:

No watch glass cover: can cause splash and harm to people working near the acid hood.
Fill more than 2/3 of container: can cause splash and harm to people working near the acid hood
Presence of organics, wash bottle: can cause explosion
Use metal tweezers in hot Piranha: sample contamination, can cause explosion

Personal Protective Equipment

Nitrile gloves, Safety glasses, Lab coat, Close-toe shoes, face shield (available in ESB 155)

Engineering Controls

All of the processes must be in the acid hood only, pull the sash down when the cleaning is ongoing!

Section 3: Procedures

Cleaning procedures:

- i) Sign in the logbook (time, date, name, amount, composition).
- ii) Put CLEAN and DRY container with samples on hotplate. The samples have to be clean (make sure there is no dirt residue, organics, etc.).
- iii) Get the H_2SO_4 from the acid cabinet, add desired amount to the container, put it back.
- iv) Get the H_2O_2 from the small refrigerator, add desired amount to the container (H_2O_2 : H_2SO_4 1:3 by vol.), put it back.
- v) Cover the container with watch glass and then turn on the hotplate, set to heating level 5.
- vi) Wait for about 30 mins (could be longer if necessary), turn off the hotplate, move the container with the watch glass carefully to the side.
- vii) Wait until the solution cools down, use teflon forceps to hold the samples and rinse with water.
- viii) Sign out the logbook (time). After 24 hours and within 48 hours, Piranha solution should be disposed of into the waste bottle if it will not be reused. The disposed amount needs to be filled after you disposed of the solution. Then check the last column of the logbook after this.

For H_2SO_4/H_2O_2 : NO organics and wash bottles are allowed in the acid hood.

Reuse of Piranha solution: Piranha could be reused ONLY for some non-rigorous experiment. Label the container with the date of the first experiment and your name, and when reusing it, add additional H_2O_2 (no more than 15% by volume). Signing of the logbook is required for reuse of Piranha. All reusable Piranha solutions older than 7 days are required to be disposed of into waste bottle.

Section 4: Waste Disposal/Cleanup

NEVER dispose of hot Piranha solution. Watch out for spills while wasting Piranha into waste bottle. NEVER close the lid of Piranha waste bottle (leave it open). Clean up after experiment. In case of small spills, use $NaHCO_3$ (at the right hand side of the hood) to neutralize the acid. DO NOT leave empty containers in acid hood.

Section 5: Emergency Response

- i) In case of emergency, the victim should be removed from the contaminated area, placed under a safety shower while emergency personal is contacted (911).
- ii) All contaminated clothing should be removed immediately with appropriate gloves and safely discarded.
- iii) In case of contact with the skin, the affected area must be immediately rinsed with large amounts of water for at least 15 mins.
- iv) In case of contact with the eye, irrigate the eye for at least 30 mins, keeping the eyelids apart and away from eyeballs during irrigation. Place ice pack on eyes until reaching emergency room
- v) In case of inhalation, it may irritate the respiratory tract. Conscious persons should be assisted to an area with fresh, uncontaminated area. Seek medical attention in the event of respiratory irritation, cough or tightness in the chest. Symptoms may be delayed.

First-aid kit is available in ESB 155.

Section 6: Additional Information

Advice:

- 1. Use the smallest amount of Piranha possible.*
- 2. Try to have someone around if you are doing it off hours.*
- 3. Choose a gentler way of cleaning your samples if you can.*

Checklist:

- Read (Material) Safety Data Sheets.*
- Proper fire extinguisher is nearby.*
- Another researcher is nearby and knows the hazards present.*
- All calculations are done prior to beginning the procedure.*
- The required glassware is of the proper size to accommodate all steps of the procedure.*

