



The University of Akron
College of Polymer Science
and Polymer Engineering

Office of Operations - Safety Office

LESSONS LEARNED

November 2017 – Piranha Solution Near Miss

What happened?

Researcher was in the process of making a Piranha solution. This was the researcher's first time preparing the solution and was using procedures found in other papers. The researcher accidentally used hydrochloric acid instead of sulfuric acid. The researcher was concerned about the hazards of the mixture and the hood ability then evacuated everyone from the lab. The researcher did not have any symptoms resulting from the accidental solution but called a friend to transport to the hospital. The Safety Officer was contacted and EOHS personnel responded immediately.



What was the cause?

- Mixing hydrogen peroxide with hydrochloric acid can result in the production of chlorine gas which is extremely toxic. The student realized this and was concerned of a possible exposure.

What went wrong?

- **Researcher did not have SOPs to make the piranha solution. (See previous Lessons Learned)**
- Researcher was not supervised by experienced researcher during first attempt to make the solution.
- **Researcher was driven to the hospital by a friend. (See 2 previous Lessons Learned)**
- Researcher did not make sure the correct chemicals were being used.

What went right?

- Researcher was preparing the solution in a hood.
- Researcher was wearing safety glasses, gloves and a lab coat.
- Researcher addressed the safety of others and had the lab evacuated.
- No one was injured.
- Researcher recognized the mistake due to the unfamiliar color of the solution

What corrective action was taken?

- Standard operating procedure was made, laminated and posted in the lab.
- Review of safety to take place at next group meeting.

How can incidents like this be prevented?

- Written SOP should be written for routine experiments.
- Experienced researcher should be involved with training a new process.
- **Contact 330-972-2911 in an emergency. The hospital visit in this case could have been avoided if EOHS was contacted.**
- Understand all the hazards associated with a reaction or mixture before performing the experiment/cleaning of glassware.
- The mixing of piranha solution is a very exothermic process, utilize an ice bath to prevent boiling/overheating of solution.
- Understand the proper order of mixing solutions. When making piranha solution, hydrogen peroxide needs to be added to sulfuric acid because solutions with a hydrogen peroxide concentration greater than 50% can be explosive.
- Use the correct glassware when making solutions to measure materials. The volume markings on beakers are not very accurate, use graduated cylinders for more accurate measurements especially when the wrong ratio of reactants can be explosive.

Resources:

University of Cambridge Chemical guidance for the use of Piranha Solution

<https://www.safety.admin.cam.ac.uk/files/hsd176c.pdf>