

Learning by Accident

««« Submitted by a member of the STAO Safety Committee

Learning by Accident is an ongoing *Crucible* feature, in which real-life lab accidents or incidents are recounted and explained. The goal is to highlight the consequence of ignoring safety rules so that science educators will be further encouraged to become knowledgeable, and to take appropriate action, in areas of safety that affect their daily activities in the science classroom. Submissions are encouraged. Anonymity will be guaranteed. Please send written descriptions to Ian Mackellar, STAO Safety Committee Past-Chair, Box 191, MAITLAND, ON K0E 1P0.

‘Aqua Regia’ - BEWARE!!

‘Aqua Regia’ is made by mixing concentrated HCl and concentrated HNO₃ acids in a roughly 3:1 ratio. It is an excellent cleaner for inorganically stained and hard-to-clean glassware. I use a Winchester bottle to make 2.5 L of the solution.

The first time I made it, it was at the end of the school day. I capped the bottle and left it in the fume hood overnight. The next day I learned that the bottle had somehow been broken and the contents spilled on the classroom floor. There was a night school class that evening which was evacuated quickly while the fire fighters came in to hose down and clean up the area.

After waiting a week I made another batch but this time kept it in the prep room on the lowest shelf out of sight and possible mischief. The next morning I learned that the caretakers found the solution on the prep room floor and the bottle broken again.

Who broke those bottles? I consulted with a professor of analytical chemistry at a local university and he immediately explained how this mixture initially produces chlorine gas. By capping those bottles I had allowed the pressure of the gas to build up sufficiently to burst the bottle. I

had created a time bomb! Consequently I leave freshly made ‘Aqua Regia’ in the bottle for 24 hours without the cap on and have not had an explosion since then.

Comments from the STAO Safety Committee

‘Aqua Regia’ is a very corrosive mixture which is not stable. If needed, wear eye protection and protective gloves and use a fume hood. Do **NOT** attempt to stopper and store, but use at once. Any darkening beyond a yellow colour indicates appreciable decomposition and the mixture should be disposed of at once by pouring into a large excess of water.

Because of its extremely hazardous nature, the STAO Safety Committee does **NOT** recommend the use of ‘Aqua Regia’ in school science laboratories. This chemical has associated risks that are so great they outweigh the educational value of its use. Indeed, your local District School Board may have included ‘Aqua Regia’ in its list of banned chemicals.

Immediate use of laboratory-grade detergents is recommended for the normal cleaning of glassware. The longer glassware sits the harder it is to clean. Consider discarding any glassware which is too soiled to clean rather than attempt to clean it with ‘Aqua Regia’.

