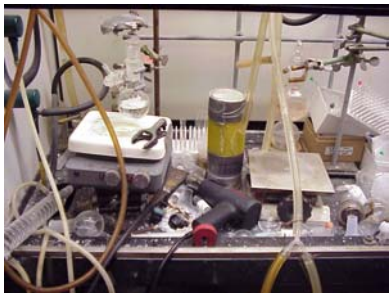
Safety Notes

Newsletter #12 **MARCH 2001**

3 ACCIDENTS – WINTER QUARTER 2001

Three accidents are being reviewed so that future accidents can be prevented!

The first was an explosion on February 8, 2001 when a researcher was using a heat gun to remove organic residues from a carborane compound. The compound had previously been treated with a peroxide and apparently contained a peroxide function or formed a peroxide adduct. The application of heat from a heat gun likely caused overheating and a violent detonation.

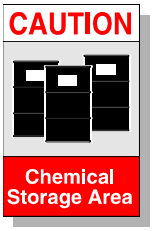


View 1 Fume hood after explosion

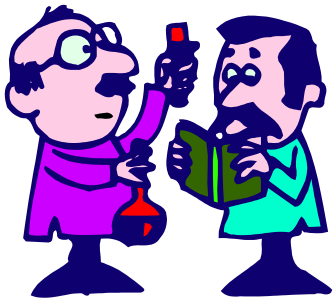
While the researcher was not "seriously" injured, glass fragments were scattered across the lab and many of them were showered on the hands, arms and chest of the researcher. The most damaging glass fragments were embedded in the right hand, which appeared cold and numb. The researcher was walked to the UCLA Emergency Medicine Center, treated and released. A follow up visit may be necessary to monitor the glass fragments in the hand.

The corrective actions that the researcher should take to avoid future problems include:

1. Avoid using strong oxidizing reagents when working with the particular carborane compounds being used.
2. When using peroxides, test for residual peroxides with peroxide test paper or KI/ starch solution.
3. Destroying residual peroxide functions before proceeding.
4. Lowering the hood sash.
5. Using a blast shield or the sliding plastic shield provided with the hood.
6. Using a clamp to hold the apparatus being heated, rather than holding it by hand.
7. Wearing the appropriate personal protective equipment; in this case lab coat, gloves, safety glasses.



The next accident occurred in the middle of the night, when nobody was present, in a laboratory fume hood. This was fortunate since the glass from this explosion was embedded into the floor in some places and the force destroyed the ceramic tops of two stirrer hotplates. It is thought that the cause was the mixing of incompatible wastes in two, 4 -liter glass bottles. One bottle contained organic wastes and the other acid wastes. Although none of the researchers recall mixing the wastes, it seems logical that this was the case. Incompatible wastes when mixed together, and sealed in a bottle, can build up enormous pressure and explode violently. This has been demonstrated many times in various labs at UCLA over the years, and the explosions are always violent and forceful.



There is also the possibility that solvents such as THF and diphenyl ether were disposed of in the container

and there was a buildup of peroxides, which caused the explosion.

Prevention

The best way to prevent an accident of this type from occurring is to follow approved methods for disposing of hazardous waste. The waste was being collected in glass bottles, a good way to collect wastes. However, the glass bottles were not adequately labeled. The words "Hazardous Waste" should be on each bottle, and the date that the first drop of waste was put in the bottle should be marked. The contents should be written on the bottle or on the tag attached to it. In this way, it would be clear to the researchers exactly what and how much was in each bottle and incompatible wastes would not have been mixed. Waste bottles should not be kept in a lab for more than 90 days, and by dating the bottles, researchers would have known that the waste was stored for too long and should be disposed as soon as possible.

View 2 Fume hood after explosion

The third accident of the Winter quarter occurred on February 13, 2001 when a researcher was distilling a crude reaction mixture which contained propargyl bromide and other compounds in an oil bath at 170°C. The reaction mixture exploded, shattering the glassware involved and two mercury thermometers used in the reaction. The shattered glassware and oil bath mixture was scattered across the lab. The researcher received cuts to the hands, which initially seemed superficial. A few weeks later, the researcher received medical attention, and had some glass shards removed from his hand.

Prevention:

The corrective actions taken by the researcher should include:

1. Knowing the potential hazard of propargyl bromide. It is listed in "Dangerous Properties of Industrial Materials" as a dangerous fire hazard and a shock sensitive material. It can detonate when heated to 220°C, by impact, or when heated when confined. It can react vigorously with oxidizing materials.
2. Testing for the completeness of the reaction and the presence of propargyl bromide before distillation.
3. Substitution of some other compound for propargyl bromide, if possible
4. Keeping the hood sash lowered when distillation is in progress.
5. Use of appropriate protective equipment, such as a blast shield, or the sliding plastic shield provided with the hood.
6. Wearing the appropriate personal protective equipment, i.e. safety goggles, lab coat, gloves.

Bill Peck
Chemical Safety Officer
(20)6-3661