

# The Chemical Safety Mechanism

University of Wisconsin-Madison  
Office of Chemical Safety

## Improper Handling of Unwanted Chemicals Can Lead to Disaster

A number of recent laboratory accidents on campuses across the country have happened due to the mismanagement of unwanted chemicals in the laboratories. At the University of Maryland an explosion occurred in an organic chemistry lab. This appears to have resulted from strong acid waste material inadvertently having been added to an organic reagent bottle and not to a waste container.<sup>1</sup> As a result of the accident two students received first and second-degree chemical burns and multiple superficial lacerations about their body<sup>2</sup>. A similar incident occurred at Texas Tech University where a glass waste bottle over-pressurized and exploded when nitric acid and ethanol were inadvertently mixed. Fortunately no one was in the lab at the time and no injuries resulted.<sup>3</sup>

The University of Wisconsin is not immune to these types of events. A fire occurred in a campus laboratory when a researcher placed a commonly used catalyst, palladium on carbon (Pd/C), into a plastic waste container in the lab. The fire was confined to the trash receptacle and resulted in no injuries or damage to the facility. It was fortunate that a member of the custodial staff was near the lab when the fire started and was able to put the fire out before potentially spreading.



Photos of Trash Receptacle after Fire

Many materials such as Raney Nickel, Pd/C, hydrides, and sodium and potassium used for chemical reactions still remain active after work-up. Pd/C is regularly used as a catalyst in hydrogenations and has been responsible for numerous accidents in academic labs nationwide. These catalysts require special

handling and disposal procedures after manipulations, and cannot be simply placed in the trash. According to *Prudent Practices in the Laboratory*, “palladium on carbon catalysts containing adsorbed hydrogen are pyrophoric, particularly when dry and at elevated temperatures”. It also states that it “may ignite on exposure to air, particularly when containing adsorbed hydrogen”<sup>3</sup>. In this case the Pd/C apparently sat in the trash for hours before it dried enough to ignite the combustible material.

These types of incidents can be avoided by following some of the simple steps outlined below:

- **Know the characteristics of your materials.** Before beginning any work involving chemicals do a proper literature search for possible hazards associated with the chemical. There are numerous internet sites that can provide information on physical and health hazards of chemicals.
- **Segregate your used chemicals.** Some chemicals are incompatible with other chemicals, such as acids with bases; oxidizers with organic solvents; sodium with chloroform and aqueous solutions; perchloric acid with acetic acid etc. Chemicals must not be mixed together in a container if you are not sure about their properties and compatibility.
- **Label your containers.** This is a requirement! Incidents occur because people don’t know what is in each container. Labeling will help prevent accidental mixing of incompatible compounds.
- **Use the appropriate container for your unwanted material.** Glass containers are often not the appropriate container to collect your used chemicals. Should these explode they can send dangerous glass shards. For other chemicals, such as acids, glass is more appropriate.
- **Use secondary containment for liquids.** Sometimes during inspections we will see solvents collected (from HPLC or other instruments) into glass containers on the floor. We recommend against this. These can be broken or knocked-over. However, at a minimum we require secondary containment (such as a plastic tub).
- **Follow the established guidelines** regarding the proper disposal of your unwanted chemicals or hazardous waste. Information can be found in at the Chemical Safety Office website ([www.chemsafety.wisc.edu](http://www.chemsafety.wisc.edu)) or in the *UW-Madison Laboratory Safety Guide*.
- **Make sure everyone is trained.** Hands-on training and proper knowledge are necessary for handling the unwanted materials in laboratories.

As always, you can contact us if you have any questions.

#### REFERENCES:

- (1) <http://cenblog.org/the-safety-zone/2011/09/explosion-at-the-university-of-maryland/>
- (2) <http://pgfdpio.blogspot.com/2011/09/university-of-maryland-chemical.html>
- (3) <http://www.depts.ttu.edu/vpr/integrity/csb-response/downloads/Incident-Report-for-Chemistry-332-10.14.2011.pdf>
- (4) *Prudent Practices in Laboratory*, National Research Council 1995.

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