

CLOSE ENCOUNTERS OF THE LAB KIND

THE SANTAYANA REPORT

George Santayana was a Spanish-American philosopher, essayist, poet, and novelist. In 1905, he penned the famous aphorism “those who cannot remember the past are condemned to repeat it.” More than a century later, the saying reverberates with professionals the world over. The following is a summary of a recent incident at Columbia University. The information presented is intended to provide awareness and help readers plan against the occurrence of a similar situation in their laboratory or work area.

The Peril of Nitric Acid

In December 2014 Environmental Health & Safety published a *Santayana Report* about a [laboratory incident involving nitric acid](#) at another institution in New York State to raise awareness about similar hazard potential at Columbia University. Since the report’s publication a number of additional incidents involving nitric acid have occurred or been reported at institutions around the country, including an incident at Texas Tech that [injured four people](#) and another at Georgia Tech that resulted in the destruction of a chemical fume hood with debris being ejected up to 34 feet away! The frequency with which nitric acid incidents are reported exemplifies how careful all personnel must be when handling, storing, and collecting nitric acid as a hazardous waste in the laboratory.

The common theme underlying many nitric acid incidents is the mixture, often inadvertent, of nitric acid with an organic solvent. Nitric acid reacts vigorously with organic matter, generating heat, pressure, and toxic gases that can cause a sealed container to violently rupture. For this reason, extreme caution must be exercised when mixing nitric acid with another material or transferring nitric acid to another container. Even the residue on the inside of an “empty” container that once contained an organic solvent can be enough to result in a violent reaction.

In [this](#) don’t-try-this-at-home style demonstration, just a few milliliters of ethanol, an organic solvent, and concentrated nitric acid are intentionally mixed in an Erlenmeyer flask. The results speak for themselves. In just over two minutes, the reaction begins to vigorously boil and produce toxic gases. If this reaction were to occur inside a sealed container the results would be disastrous!



Lessons Learned

- Extreme caution must always be exercised when handling nitric acid, and especially during its collection as a hazardous waste, but that is not to say that it cannot be done safely. **There are several things you can do to ensure nitric acid is safely handled in your laboratory, including:**
 - Avoiding the inadvertent mixing of nitric acid with an incompatible material. **Nitric acid is incompatible with many materials, and is especially reactive when in contact with organic solvents, reducing agents, bases, and water.** More complete information about nitric acid incompatibilities can be obtained by viewing the safety data sheet through [ChemWatch](#).

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- Collecting nitric acid waste in an **empty** hazardous waste container that is **free from any other material or chemical residue**.
- Ensuring that all **laboratory containers**, including hazardous waste, are **clearly labeled with their common names** so that **all members of the laboratory are aware of the contents in each container**.
- Using a specially designed “**vented**” cap for your hazardous waste container **if you are concerned that a nitric acid mixture may develop pressure**. A vented cap allows gas generated by a chemical reaction inside a hazardous waste container to release slowly before pressure builds up and causes the container to violently rupture. Please contact the [EH&S Hazardous Materials Program](#) for further assistance.

For further information, or to view previous Santayana Reports, please visit our [lessons learned website](#).
For any other safety related matter, please contact the [EH&S office](#).