Nitric Acid Waste Bottle Reaction

What happened?

Graduate Student #2 found a beaker labelled "7% nitric acid in ethanol" and poured the contents into a nitric acid waste bottle in the fume hood. The student did not recap the bottle. Within 30 seconds, a fierce reaction started in the waste bottle, evidenced by foaming, splashing, and brown gas evolution. The student immediately fully lowered the hood sash, called to other lab occupants to evacuate, and phoned DPS from outside the lab.

Nitric Acid Hazards

Nitric acid is a strong oxidant, and if the nitric acid concentration in methanol/ethanol rises above 10%, violent and potentially explosive reactions may ensue.

Injury

No injuries were sustained. It was fortunate that the bottle was uncapped and that the student immediately took the correct actions of closing the hood and evacuating. A capped bottle would have explosively burst and may have caused severe injury.

Contributing Factors

- No eye protection was used by the student.
- Even though nital (dilute nitric acid in lower alcohols) was a commonly used etchant in the lab, the student was not well aware of the dangerous reactions which may occur between alcohols and higher concentrations of nitric acid.
- The waste bottle was inadequately labelled. The label should have specified "Concentrated nitric acid waste. Oxidizer. Do not add organics." Or, similar wording.

Corrective Actions

- SOPs for the safe handling and disposal of corrosive acids and etchant mixtures should be written. Personnel should be trained on SOP and PIs should retain signed internal training records.
- PIs should provide refresher training to all lab personnel on the appropriate use of PPE, and should maintain internal training records. PPE requirements should also be specified in SOPs.

Quick Tips

- Mixing nitric acids with organics is a "classic" and all-to-common cause of waste bottle explosions in laboratories.
- Use splash goggles instead of safety glasses when handling corrosives.
- Flammables and combustibles should not be stored in the same cabinet/cupboard as concentrated nitric acid or nitric acid waste.
- Dilute nitric acid in methanol/ethanol (nital) should not be stored.

- Potentially gas-producing waste required careful segregation. Vented caps should be employed