

# NITRIC ACID SAFETY



Nitric acid is a highly corrosive mineral acid and strong oxidizer used primarily for nitration of organic molecules and washing glassware or metal equipment. Nitric acid reacts violently with alcohols, alkalis, reducing agents, combustible materials, organic materials, metals, acids, cyanides, terpenes, charcoal, and acetone. It produces exothermic reactions, as well as toxic, corrosive, and flammable vapors.

## REDUCE USAGE

Reducing or eliminating usage of nitric acid can reduce the level of risk in your workspace. Conduct a [risk assessment](#) to determine whether nitric acid is really needed for your project or process. Aqua Regia and other nitric acid solutions have been historically used for washing lab ware, but they are all highly reactive and should not be stored long-term. Vendors offer cleaning products that may be used as alternatives for glassware washing, and citric acid is a common alternative for metal cleaning.



## HEALTH HAZARDS OF EXPOSURE

Nitric acid may be harmful if inhaled, ingested, or absorbed through the skin. It is extremely destructive to mucous membranes and upper respiratory tract tissues. It causes severe skin and eye burns, and may cause blindness and permanent eye damage. Inhalation may cause spasms, inflammation and edema of the bronchi or larynx. Effects may be delayed. Large doses may result in cyanosis or a drastic fall in blood pressure, coma, and possibly death. Chronic exposure may cause erosion of the teeth, jaw necrosis, and kidney damage.

## SAFE USE PRACTICES

- Minimize/eliminate use and storage of nitric acid whenever possible.
- Develop a [standard operating protocol \(SOP\)](#), and include details for waste practices. Have a separate SOP for Aqua Regia practices.
- Train all lab members and students on nitric acid practices.
- Always use inside a chemical fume hood and in proximity to eyewash and safety shower stations.
- Avoid contact with skin, eyes, and clothing. Wear compatible gloves, safety goggles, and a lab coat.
- Containers should remain closed when not in use.
- **Avoid contact with metals!** Nitric acid is extremely corrosive in the presence of aluminum, copper, and oxides and attacks all base metals.
- Keep away from direct sunlight, sources of ignition, combustible materials, and incompatible materials: alkali metals, bases, reducing agents, cyanides, aldehydes, acetone, powdered metals, ammonia, and acetic anhydride, acids, and all organic materials including organic solvents.
- Store in glass containers that are secured, dry, cool (<23°C/73.4°F) and clearly labeled.
- When diluting, always add acid to water.
- Use in the smallest practical quantities for the experiment being performed. Make up concentrated solutions in amounts that will be used up in the work shift/day.
- Inspect containers monthly for discoloration. Submit a [Chemical Waste Collection Request](#) for any discolored nitric acid.
- Do not over purchase; only a minimum amount should be stored in the laboratory.

## STORAGE PRACTICES

- Store in original container.
- Keep container upright and tightly closed in acid storage cabinet.
- Do not store at or above eye level.
- Storage containers must be dry, as nitric acid can react with water or steam to produce heat and toxic, corrosive, and flammable vapors.
- Use secondary containers (Nalgene/ polypropylene tray or tub) to segregate nitric acid from other acids in your acids cabinet.
- Quantities greater than 500mL must be stored in a separate cabinet from other chemicals.
- **Be aware that contaminated containers may pressurize and/or explode!**
- **Do not seal or store Aqua Regia baths long-term!** Aqua Regia solutions can oxidize to form toxic gases, and pressurized containers may explode.



## WASTE PRACTICES

- Use labeled and dated safety-coated glass bottles (PTFE) for nitric acid waste; avoid using empty organic solvent bottles.
- Proper waste segregation can help avoid laboratory accidents and explosions. **Do not mix nitric acid waste with any other waste streams**, including other inorganic acids.
- Use secondary containers (Nalgene/ polypropylene tray or tub) to segregate from other waste and chemical containers.
- Segregation of nitric acid waste from different processes or experiments is recommended to prevent reactions with particulates.

## EMERGENCY PROCEDURES

**Skin exposures:** remove contaminated clothing and shoes, rinse for 15 minutes in the safety shower and wash with soap. Send someone to call 911 as soon as possible.

**Eye exposures:** call 911 as soon as possible, remove contact lenses, and flush eyes for 15 minutes in the

eye wash; continue rinsing eyes during transport to hospital.

**Inhalation exposures:** remove to fresh air and call 911.

- Bring the Safety Data Sheet (SDS) with you to show medical and emergency personnel.
- Immediately evacuate area if fumes present a serious health risk and ensure others are aware of the spill.

During normal business hours (Monday – Friday, 8 a.m. – 5 p.m.), call EH&S at 206.543.0467 for further assistance. After hours, call 911 for further assistance.

## INCIDENT REPORTING

Any spill incident requires the involved person or supervisor to complete and submit the [Online Accident Reporting System \(OARS\)](#) form to EH&S within 24 hours (or eight hours if serious injury or hospitalization results).

- Follow up with the Employee Health Center at 206-685-1026.
- Outside of business hours, call UWPD at 911 from a campus phone.
- At medical centers and other locations, follow internal emergency procedures.

## CLEANING UP SPILLS

Confine spills using a spill kit or absorbent material. Keep others from entering contaminated area (e.g., use caution tape, barriers, etc.).

**For spills < 1 Liter:** use appropriate personal protective equipment. Absorb nitric acid with an inert dry material (earth, sand, or other non-combustible material), place in an appropriate waste container, and neutralize with dilute sodium carbonate. Double bag and securely fasten spill materials. Label as hazardous waste.

**For spills > 1 Liter:** call EH&S at 206.543.0467 during normal business hours for further assistance (Monday – Friday, 8 a.m. – 5 p.m.). After hours, call 911 for further assistance.

Refer to the [Nitric Acid SOP Template](#) on the EH&S website [www.ehs.washington.edu](http://www.ehs.washington.edu)  
Please contact EH&S Lab Safety at 206.685.3993 / [labcheck@uw.edu](mailto:labcheck@uw.edu) for more information