






LABORATORY SAFETY GUIDELINE

Nitric Acid [CAS No. 7697-37-2]

All users of nitric acid solutions must review this document. Users of concentrations $\geq 90\%$ should contact their EHS Laboratory Safety Advisor and department safety officer.

HAZARDS

	Nitric acid can contribute oxygen to a fire. It can cause the fire to burn hotter and faster. It also reacts violently with a variety of substances, generating heat and toxic vapors. Please see the list of incompatible chemicals below for some examples.
	Inhalation of nitric acid vapor can lead to coughing, shortness of breath, and fluid build-up in the lungs (pulmonary edema). Solutions with $>90\%$ nitric acid give off visible white or red vapors upon contact with air.
	Nitric acid can cause severe burns on any body part it contacts (e.g., skin, eyes, mouth, throat, lungs).

Nitric acid is incompatible and can react violently with many substances. Examples include but are not limited to:

- Acetic anhydride
- Acetone
- Acetonitrile
- Alcohols
- Alkali metals
- Amines
- Ammonia
- Benzene
- Bases
- Carbides*
- Copper
- Dichloromethane
- Dimethyl sulfoxide
- Flammable liquids and gases
- Formic acid
- Heavy metals
- Hydrogen sulfide*
- Ketones
- Metallic powders*
- Phosphorus
- Reducing agents
- Thiols
- Toluene
- Turpentine*

* indicates an explosive reaction

The reaction time can be highly variable ranging from a few minutes to days – therefore, sometimes the mixture seems compatible at first. For this reason, violent reactions involving nitric acid waste are not uncommon. **It is very important to confirm chemical compatibility before mixing any other chemical waste with nitric acid. Also, never place a sealed cap on nitric acid waste containers. Using a sealed cap can lead to container over-pressurization and subsequent rupture. Only use vented caps on nitric acid waste containers (available through VWR).**

PRECAUTIONS

Before starting work:

- Determine if you can use a less hazardous substance in place of nitric acid;
- Review manufacturer's Safety Data Sheet and additional chemical information at <http://www.ehs.harvard.edu/safety-data-sheets-sds>;
- Ensure that a written experimental protocol including safety information is available;
- Be familiar with general University emergency procedures in the [EHS Emergency Response Guide](#);
- Order the most dilute solutions available that will meet experimental needs. Order only the quantity that you need;
- Identify the location of the nearest eyewash and shower and verify that they are accessible;
- Locate and verify that appropriate nitric acid spill cleanup materials are available, including the following:
 - [Amphomag Universal Spill Neutralizer](#) (solid)
 - [Ansul Spill-X-A Acid Neutralizer/Solidifier](#) (solid)
 - Absorbent (polypropylene pads, vermiculite, perlite)
- Ensure another person who knows nitric acid emergency procedures is in the area.

During work:

- AVOID INHALATION! Perform all operations in a certified chemical fume hood, wet bench or other approved ventilated enclosure.
- AVOID CONTACT! Use appropriate personal protective equipment (PPE):

- Lab coat, acid-resistant apron over long pants and shirt, and closed toed shoes
- Chemical protective goggles (safety glasses with side shields are NOT sufficiently protective)
- Work behind sash or wear a face shield when splash risk is high
- Wear appropriate chemically protective gloves:
 - Standard nitrile gloves (≥ 4 mil) offer resistance to incidental drops of solution. If you notice some nitric acid on your glove, change it right away.
 - Butyl rubber or neoprene gloves offer additional protection (e.g., immersion in nitric acid).
- Wash hands thoroughly each time gloves are removed.
- Use materials and containers appropriate for nitric acid use and remain aware of potential incompatibilities.
- Keep all containers tightly closed when not in use and during transport.

After completing the work:

- Dispose of nitric acid waste by following Harvard University [Hazardous Waste Procedures](#)
 - Hazardous Waste Classification: Corrosive
 - Do not store waste in glass or metal containers! Primary and secondary containers must be plastic (e.g., polyethylene)
 - Because nitric acid is incompatible with MANY chemicals, it is best to keep a separate nitric acid waste stream and to store the waste container in its own secondary container.
 - Never place a sealed cap on nitric acid waste containers. Using a sealed cap can lead to container over-pressurization and subsequent rupture. Only use vented caps on nitric acid waste containers (available through VWR).
- Return container to storage area following Harvard University [Laboratory Chemical Storage Guide](#)
 - Storage Group IA [Inorganic Acids]
 - Store in designated plastic (polyethylene) secondary container.
 - Store in original containers or other appropriate plastic containers. Do not store in glass or metal containers.
- Wash hands before leaving lab.

EMERGENCY PROCEDURES

First Aid

SKIN CONTACT

- Flush skin with tepid water for 15 minutes using the closest available sink, portable drench hose or safety shower. Remove any exposed clothing as well as any jewelry that may be trapping nitric acid.
- Call 911 on a landline phone for medical assistance (or provide location if calling on a mobile phone).

EYE CONTACT

- Using eyewash, flush eyes while holding eyelids open;
- Call 911 for medical assistance;
- Continue flushing eyes with water until emergency medical personnel arrive.

INHALATION

- If nitric acid mist or vapors are inhaled, immediately move to get fresh air;
- Call 911 for medical assistance.

INGESTION

- Do not induce vomiting.
- Call 911 on land line phone for medical assistance.
- Never give anything by mouth to an unconscious person

Spill Response

OUTSIDE FUME HOOD OR VENTILATED ENCLOSURE

- Alert others and evacuate to a safe distance and prevent entry.
- Contact the University Operations Center at (617) 495-5560 [HMS/HSDM (617) 432-1901]
- Remain in a safe location until EH&S or other response personnel arrive.

INSIDE FUME HOOD OR VENTILATED ENCLOSURE (< 500 ml)

- Contact the University Operations Center at (617) 495-5560 [HMS/HSDM (617) 432-1901]
- If trained and confident, apply acid neutralizer wearing PPE described above including face shield. Otherwise close fume hood and await support.
- Absorb with polypropylene, vermiculite, or perlite absorbent only after neutralization.