DEPARTMENT OF
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Nitric Acid Fact Sheet

This fact sheet is for general safety awareness. Individual Standard Operating Procedures for all experiments and processes involving nitric acid must be developed by the laboratory.

PROPERTIES & HAZARDS

Nitric acid is a strong corrosive and strong oxidizer. In terms of reactivity, strong oxidizers react with some materials to produce heat and gas, which increases the flammability and ignitability of materials. Nitric acid ignites on contact with many organic chemicals and powdered metals, and produces heat and gas (often flammable hydrogen) upon reaction with some other classes of chemicals. As a strong oxidizer, it can increase the flammability and ignitability of materials. It is involved in a large number of laboratory accidents as it is commonly used and the reactivity hazards are not always adequately appreciated or controlled. Nitric acid is highly incompatible with organics, including organic acids, flammables, combustibles, reducing agents, bases, and metals. Mixing nitric acid with incompatibles has resulted in violent spontaneous reactions, ignition, and explosions. Closed containers holding an incompatible reaction can rupture.

Nitric acid also carries serious health hazards. Nitric acid can cause severe burns to the eyes, skin, and respiratory system. Inhalation can permanently damage mucous membranes and the lungs and cause pulmonary edema. Concentrated nitric acid burns may turn the skin yellow due to a reaction with proteins in the skin.

Hazard Classification and Category	Pictogram	Hazard Statement
Oxidizing Liquids– Category 3		May intensify fire; oxidizer
Corrosive to metals– Category 1		May be corrosive to metals
Acute toxicity, Inhalation – Category 3		Toxic if inhaled
Skin corrosion – Category 1A		Causes severe skin burns and eye damage
Serious eye damage – Category 1		Causes severe skin burns and eye damage

Most commercially available concentrated nitric acid is 68-70%. Nitric acid at concentrations greater than 86% is considered to be fuming nitric acid, which is significantly more hazardous. Laboratories using fuming nitric acid should develop an SOP specifically for that compound's safe use.

Nitric acid decomposes in the presence of heat or light. Decomposition produces nitrogen oxide gases which can discolor the acid to be yellow or brown.

CONTROLS

Selection of controls should be made using a risk-based approach that considers the degree of hazard, route of exposure and characteristics of the process that may potentially lead to exposure. If you need help selecting controls for a given procedure, contact ESSR for assistance.

Engineering Controls

- Chemical fume hood
- Safety shower and eyewash (within 55 feet of work area)

Personal Protective Equipment

- Gloves
  - A heavy-duty chemical resistant glove in a compatible material, such as neoprene, is recommended when handling concentrated nitric acid or more than 1L.
  - For work with smaller volumes, double gloving is recommended. Nitrile gloves are not recommended for concentrated (>70%) nitric acid as the concentrated acid can break through a nitrile glove in less than a minute. Ansell NeoTouch® gloves have a breakthrough time of 29 minutes with 70% nitric acid and are appropriate for splash protection (to be removed immediately after contamination). Note that this glove may not protect against other chemicals. For example, this glove is a poor choice for many organic chemicals. You may need double gloves of two different materials for adequate protection.
- Splash goggles
- Lab Coat
- Clothing that leaves no exposed skin on legs or feet
- Closed-toe shoes that fully cover the top of the foot
- Chemical Resistant Apron*
- Face Shield*

**For work with large volumes and/or when pouring.*

STORAGE

- Nitric acid should be stored by itself, if possible. If not, it should be stored only with compatible oxidizing acids.
- Storage locations should be located away from direct sunlight and sources of heat.
- Storage location should be plastic corrosive storage cabinets or metal cabinets coated with anti-corrosion liner.
- Containers should be stored within compatible secondary containment basins, trays, or tubs.
- Nitric acid should always be segregated from incompatible materials including, but not limited to, ammonia, organics (including organic acids like acetic acid), combustibles, reducing agents, and bases.
- Purchase only the amount of nitric acid required for research.

USE

- Use of concentrated nitric acid should be restricted to within a chemical fume hood.
- Intentional mixing of nitric acid with organic material (e.g., nital etch) must have separate detailed written procedure.
- Due to reactivity, nitric acid wastes should not be consolidated in existing waste streams. Old, discolored, or possibly contaminated nitric acid should be submitted separately as waste and not be consolidated with other nitric acid waste.

WASTE

- Waste should be managed so that incompatible materials are not mixed.
- Waste containers should be compatible with their contents and should be segregated by hazard class into separate secondary containers.
- For questions regarding waste management contact ESSR, Environmental Affairs at envaffairs@umd.edu.

SPILL CLEANUP

- Spill cleanup must follow the items specified in the Emergency Response Guide posted in the laboratory.
- If the laboratory is equipped and personnel are trained, minor spills can be handled by laboratory personnel.
- If a spill is beyond the capacity of the laboratory to address, call (301) 405-3333 from a safe location.

REFERENCES AND ADDITIONAL RESOURCES

1. OSHA A Guide to the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)
2. OSHA Occupational Exposure to Hazardous Chemicals in Laboratories
3. Nitric Acid Safety Data Sheet (SDS) - Fisher Scientific
4. NIH PubChem Compound Summary
5. Ansell Chemical Resistance Guide, 8th Edition

6. Cameo Chemicals; “Nitric acid, other than red fuming”
7. Cameo Chemicals; “Nitric acid, red fuming”