

## Standard Operating Procedure

for work with

|                              |               |                           |                |
|------------------------------|---------------|---------------------------|----------------|
| Chemical name/class:         | Nitric Acid   | CAS #:                    | 7697-37-2      |
| PI:                          | Ken Henderson | Date:                     | 2/4/2013       |
| Building:                    | Stepan        | Room #:                   | Laboratory 386 |
| <b>Designated Work Area:</b> |               | <b>Only in fume hoods</b> |                |

### 1. Circumstances of Use:

Various. Includes cleaning of glassware.

### 2. Potential Hazards:

- Nitric acid is a very strong oxidizer that can ignite on contact or react explosively with many organic and inorganic substances.
- Contact with easily oxidizable substances (including many organic substances such as acetone, acetonitrile, various alcohols, dichloromethane, DMSO, and many others) may result in fires or explosions.
- Nitric acid also reacts violently with many inorganic substances including various bases, reducing agents, ammonia, and alkali metals, among others. Many reactions will yield toxic gases, including nitrogen dioxide (NO<sub>2</sub>) – see next bullet.
- Concentrated nitric acid can release vapors and toxic gases (including NO<sub>2</sub>), which can cause moderate to severe health effects, especially irritation to the eyes, skin, respiratory tract, and other mucosal membranes.
- If concentrated nitric acid contacts the skin, it can cause severe burns. Dilute concentrations that contact skin can cause mild irritation.
- Contact with eyes can cause severe burns and permanent eye damage.
- If high concentrations of nitric acid are inhaled, severe respiratory irritation can develop, along with possible delayed effects such as pulmonary edema, which can be fatal.
- Though not likely, ingestion of nitric acid can cause severe corrosion and burning of the mouth, esophagus, and stomach. As little as 10 ml of ingested nitric acid can be fatal.
- For further safety information, refer to Prudent Practice's [Laboratory Chemical Safety Summary for Nitric Acid](#).
- The OSHA Permissible Exposure Limit for nitric acid is 2 ppm (8 hours). The American Conference of Governmental Industrial Hygienists recommends a short-term exposure limit (15 minutes) of 4 ppm and an 8-hour limit of 2 ppm.

### 3. Engineering Controls:

- An eyewash and safety shower must be available in the immediate work area for any work with nitric acid.
- When working with nitric acid, always work in a clean fume hood that contains NO organic materials with the sash closed while reactions are in progress.

- Always use containers/glassware free from organic materials (and other incompatibles) for work with nitric acid.
- If mists are generated either mechanically or from vapor, work must be performed in a chemical fume hood to avoid inhalation.

4. **Work Practice Controls:**

- Work should be done in a way that avoids hand/glove contact with nitric acid; it should be noted that nitric acid penetrates standard nitrile gloves in 5 minutes or less.
- If gloves come in contact with nitric acid through a splash (or otherwise), they should be removed and changed immediately.
- Once work with nitric acid is complete, decontaminate the area by wiping it down with a soap and water solution.

5. **Personal protective equipment (PPE):**

- Goggles, lab coat, closed-toed shoes, double gloves (nitrile) or chemical resistant gloves (approved for contact with nitric acid) if there is an increased risk of glove contact. If neoprene gloves are available, they offer better protection than nitrile.
- Face shield and acid-resistant apron are recommended if working with a larger volume (>200ml).
- Latex gloves are NOT recommended for work with nitric acid (they offer little to no protection due to easy chemical penetration).
- If contact with gloves is unavoidable, gloves rated for work with nitric acid must be used. Thicker neoprene gloves typically have the best glove ratings for prolonged nitric acid exposure (e.g. [Chloroflex II from Best Glove Company](#)).

6. **Transportation and Storage:**

- Nitric acid should be stored in a well-ventilated area that is separated from organics and other combustible materials and incompatibles.
- Ensure primary and secondary containment is free from organic chemicals/solvents.
- Transport corrosives in secondary containment, preferably a polyethylene or other non-reactive acid/solvent bottle carrier.
- Store below eye level.
- Store away from metal (unless the metal has a corrosion-proof coating), and do not store under the sink.
- Avoid storing on the floor.

7. **Waste Disposal:**

Handle and store nitric acid wastes following the guidelines above while accumulating wastes and awaiting chemical waste pickup. Waste must be disposed of following the chemical hygiene plan.

8. **Exposures/Unintended contact:**

- If skin contact occurs, immediately remove contaminated clothing and rinse with water for at least 15 minutes.
- For eye exposures, immediately rinse eyes with copious amounts of water for at least 15 minutes, while occasionally lifting upper and lower lids, then promptly seek medical attention.
- If large amounts of vapors are inhaled, move person to fresh air immediately and seek medical attention.
- If nitric acid is ingested, seek medical attention immediately.

Contact RM&S for medical advice on occupational chemical exposures, **1-5037**. For an actual chemical exposure or injury, complete the work-related injury or illness report found at: <http://chemistry.nd.edu/safety/supervisors-report-of-injury-to-the-health-center.pdf>. If medical attention is needed, see <http://chemistry.nd.edu/safety/procedures-for-injury-illness-or-incident.pdf>.

9. **Spill Procedure:**

In the case of a release of pyrophoric material, fire, or explosion in the lab, leave the area immediately and contact the Police by calling **911** from a campus phone or 574-631-5555 from a cell phone. The Police will contact the fire department, facilities and/or RM&S as needed.

In the case of a small spill (<200 ml) contained in the fume hood, neutralize the spill by gradually adding alkaline material (sodium carbonate, lime) from the edges of the spill towards the center. Test the pH of the spilled material and continue neutralizing until the pH reaches the 6-9 range. Absorb with an inert material (vermiculite, dry sand). Do NOT use combustible materials, such as saw dust, to absorb nitric acid spills! Place materials in a chemical waste container and dispose of appropriately. Appropriate chemical resistant gloves should be used when cleaning up a spill due to possible prolonged glove contact with nitric acid. After spill has been completely absorbed, wipe contaminated area down with a soap and water solution.

If >200 mL of nitric acid is spilled outside of the fume hood, call RMS at 1-5037 during working hours or 911 from a campus phone, or 574-631-5555 from a cell phone after hours for assistance.

10. **Training of personnel:**

All personnel are required to complete the General Lab Safety session run by RM&S and complete the annual online refresher course. This session includes an introduction to general chemical safety.