Standard Operating Procedure

Nitric Acid (HNO3) use in SC 1110

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| **Department:** | Earth and Environmental Sciences |
| **Date SOP was written:** | 2/27/2018 |
| **Date SOP was approved by PI/lab supervisor:** | 2/27/2018 |
| **Principal Investigator:** | Daniel Morgan |
| **Internal Lab Safety Coordinator/Lab Manager:** | Richard Bradshaw |
| **Lab Phone:** | Located in SC 1110 (615) 322-2171 |
| **Office Phone:** | D. Morgan (615) 343-3154 (campus: 3-3154)  R. Bradshaw (615) 343-0839 (campus: 3-0839) |
| **Emergency Contact:** | D. Morgan (615) 934-4146 (cell)  R. Bradshaw (208) 260-2792 (cell) |
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| **Location(s) covered by this SOP:** | *SC 1110* |
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**Type of SOP:** ☐ Process ☒ Hazardous Chemical ☐ Hazardous Class

**Personal Protective Equipment (PPE)**

**Eye/Hearing Protection:**

Required: General lab attire: Long pants, closed toed shoes, lab coat, and ANSI approved, tight-fitting safety glasses/goggles (personal eye glasses are okay).

Additional Required Personal Protective Equipment for work with Nitric Acid: nitrile gloves (either 5 mil thick disposable gloves or thicker Atlas brand).

# **Other Protection:**

Pull long hair back and tuck into back of shirt or under lab coat.  
Remove any loose jewelry.

# **Medical Emergency Dial (615) 322-2222 for Vanderbilt Police**

**Life Threatening Emergency, After Hours, Weekends and Holidays** – Dial **(615) 322-2222 for Vanderbilt Police** or go to the nearest emergency room. *Note: All serious injuries must be reported to Environmental Health and Safety (EH&S) within 8 hours.*

**Non-Life Threatening Emergency** – Go to the Occupational Health Facility (OHNO3). After hours, go to the nearest emergency room. *Note: All serious injuries must be reported to EH&S within 8 hours.*

**Risks of working with Nitric Acid**

Nitric acid (HNO3) is a colorless to slightly yellow, strong oxidizing inorganic acid. Spontaneous ignition or combustion occurs due to contact with a variety of organic substances including but not limited to acetone, acetic anhydride, various alcohols, thiols, amines, dichloromethane, and certain aromatic compounds. Nitric acid also reacts violently with bases, metallic powders, carbides, reducing agents, metallic compounds, hydrogen sulfide, and combustible organic substances.

Nitric acid is listed by The Department of Homeland Security as a “Chemical of Interest”. Due to security issues associated with nitric acid, minimizing quantities of nitric acid is requested.

The health hazards of nitric acid are dependent upon the concentration and type of exposure. Concentrated nitric acid and its vapors are corrosive to the eyes, skin, and mucous membranes. Contact can cause severe burns and permanent damage. Inhalation of nitric acid vapors can lead to respiratory irritation causing coughing and shortness of breath. Inhalation of nitric acid vapors in high concentrations can lead to pulmonary edema. Ingestion of nitric acid will result in burning and corrosion of the mouth, throat, and stomach.

**Protocol/Procedure**

1. Any work with concentrated nitric acid (HNO3) must be done with another trained person in the lab with you. Never work with concentrated HNO3 alone.
2. When working with HNO3, you need to wear nitrile gloves. Either the disposable nitrile gloves or the thicker, reusable Atlas brand gloves found in the Hydrofluoric Acid Safety Gear drawer should be used.
3. Open bottles of HNO3 are stored in the “Acid Storage” cabinet under the fume hood. Try to limit the bottles of HNO3 to what fits in this acid storage cabinet. Because HNO3 can react and potentially combust with organic acids (like Acetic acid), HNO3 should never be stored with them. For this reason, Acetic acid is stored in another cabinet in the lab.
4. Before handling the HNO3 bottles, ensure that your gloves, sleeves, and lab coat are dry. Monitor your PPE for droplets of liquid that may be acid throughout any procedure that uses HNO3. All materials used during a procedure that uses HNO3 should be dry to be aware of any HNO3 spills that may occur.
5. Always work with HNO3 in the fume hood. HNO3 fumes are highly corrosive and can easily damage the lungs, eyes, or any exposed surfaces. Work at least 6 inches into the fume hood to ensure that fumes are pulled up the hood. The maximum working sash height is 18 inches.
6. To pour HNO3, remove the cap and place the cap on the fume hood with the inside of the cap facing upwards. This ensures that any drips on the inside of the cap stay in the cap. This also ensures that any HNO3 fumes do not etch the surface of the fume hood. 🡪 Maintain awareness that there may be HNO3 drips inside this cap and be sure not to brush your hand or sleeve against it. To help with this, place the cap away from your working area.
7. When pouring HNO3, hold the bottle firmly, and pour slowly and consistently.
8. After pouring the HNO3 acid, check the rim and sides of the bottle for drips. Check your gloves and sleeves for drips too.
9. When you have finished using the HNO3, put the cap back on the bottle and store it in the acid storage cabinet. Rinse all equipment that was used to pour HNO3 in the fume hood to clean the equipment.
10. Drips on the bottle should be wiped up quickly to avoid having the drip spread to more surfaces. Pure HNO3 is potentially combustible with paper products. Thus, get a kim wipe or paper towel slightly damp, and then blot the drip with the wipe. This helps dilute the HNO3 and makes it unlikely to lead to combustion. Do not press into the drip to avoid having the drip soak through the wipe and onto your gloves. When the drip has been absorbed, take the wipe to the sink and rinse the wipe with water. Let the water run for 30-60 seconds to fully rinse the wipe and dilute the acid.
11. Drips on your gloves and or sleeves should also be dealt with quickly to ensure that the acid does not spread to more surfaces. When you observe a drip on your glove or sleeve, go to the nearest sink and rinse the drip off of your glove or sleeve with water. Flush the drip for at least 30 seconds and make sure that it does not spread to other areas of your body.
12. If necessary, change your gloves and/or sleeves after rinsing them.
13. For larger spills, try to contain the spill with supplies from the spill kit. Do not risk getting the acid onto you while wiping up or containing the spill. If necessary, close down and evacuate the lab and notify EHS, the LM, and the PI immediately.
14. If you do get HNO3 acid on your body and are experiencing an acid burn, rinse the acid from your skin and ensure that you are not getting any more acid onto your body. Rinse in water for at least 15 minutes. Use the overhead shower and eye wash as necessary to accomplish this. Please use the phone to call 911 to notify them and have them pick you up to take you to the Vanderbilt University Medical Center Emergency Room as soon as possible. If it is possible to move on your own, going to the emergency room after rinsing off in the shower and/or eyewash may be faster than calling 911 and waiting for an ambulance to pick you up and take you to the emergency room.
15. Be sure to cap and adequately store HNO3 bottles when finished. Be sure to store HNO3 separately from any organic acids, like Acetic acid.
16. When you are finished working with HNO3, and all samples and HNO3 bottles are put away, remove the PPE and store it in the proper place. Disposable gloves should be thrown away.

**NOTE:**

Any deviation from this SOP requires approval from the PI/Lab Manager.

**Documentation of Training** (signature of all users is required)

* Prior to conducting any work in SC 1110, the PI or LM must provide training to his/her laboratory personnel specific to the hazards involved in working with this equipment, work area, and emergency procedures.
* The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP.
* The Principal Investigator must ensure that their laboratory personnel have attended appropriate laboratory safety training and are current with any refresher training required.

**I have read and understand the content of this SOP, and have completed the accompanying safety checklist:**

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