Standard Operating Procedure

Nitric Acid

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| **Department:** | Earth and Environmental Sciences |
| **Date SOP was written:** | 9/19/2013 |
| **Date SOP was approved by PI/lab supervisor:** | 9/19/2013 |
| **Principal Investigator:** | Jessica Oster |
| **Internal Lab Safety Coordinator/Lab Manager:** | Richard Bradshaw |
| **Lab Phone:** | Click here to enter text. |
| **Office Phone:** | J. Oster (615) 322-1461  R. Bradshaw (615) 343-0839 |
| **Emergency Contact:** | J. Oster (530) 574-5760  R. Bradshaw (208) 260-2792 |
|  |
| **Location(s) covered by this SOP:** | *SC5718* |
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**Type of SOP:** ☐ Process ☒Hazardous Chemical ☐ Hazardous Class

**Purpose**

Nitric acid (also known as aqua fortis) is an extremely corrosive acid and strong oxidizing agent. It may be harmful if ingested, inhaled, or absorbed through the skin. It can cause severe skin and eye burns resulting in irreversible damage. It is extremely destructive to the tissue of the mucous membranes and the upper respiratory tract. The main use of nitric acid is in the production of agricultural fertilizers. Its other uses include the production of nylon precursors, explosives, and rocket fuel.

**Physical & Chemical Properties/Definition of Chemical Group**

CAS#: 7697-37-2

Class: **Corrosive, oxidizer**

Molecular Formula: HNO3

Form (physical state): Liquid

Color: Colorless, light yellow

Boiling point: 83.9-100 °C

**Potential Hazards/Toxicity**

Nitric acid is an oxidizer that may intensify fires. Fire conditions may cause formation of hazardous nitrogen oxides. Nitric acid may be harmful if inhaled, ingested, or absorbed through the skin. It is extremely destructive to the tissue of the mucous membranes and upper respiratory tract. Causes severe skin and eye burns. May cause blindness and permanent eye damage. Inhalation may cause spasms, inflammation and edema of the bronchi or larynx, and pneumonitis. Other symptoms include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, vomiting, and pulmonary edema. Effects may be delayed. Large doses may cause conversion of hemoglobin to methemoglobin, producing cyanosis or a drastic fall in blood pressure, leading to collapse, coma, and possibly death. Chronic exposure may cause erosion of the teeth, jaw necrosis, and kidney damage.

**Personal Protective Equipment (PPE)**

**Respirator Protection**

Use a full-face respirator with multi-purpose combination (US) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator.

Respirators should be used only under any of the following circumstances:

* As a last line of defense (i.e., after engineering and administrative controls have been exhausted).
* When Permissible Exposure Limit (PEL) has exceeded or when there is a possibility that PEL will be exceeded.
* Regulations require the use of a respirator.
* An employer requires the use of a respirator.
* There is potential for harmful exposure due to an atmospheric contaminant (in the absence of PEL)
* As PPE in the event of a chemical spill clean-up process

Lab personnel intending to use/wear a respirator mask must be trained and fit-tested by VEHS. This is a regulatory requirement. (<http://www.safety.vanderbilt.edu/osha/respiratory-protection-standard.php>*). If you think that you need a respirator to conduct your work safely, contact VEHS at x2-2057 (322-2057) for evaluation of your process*.

**Hand Protection**

Handle with gloves. Viton gloves are recommended. Nitrile gloves are not recommended for concentrated (>70%) nitric acid according to the Ansell Chemical Resistance Guide.

NOTE: Consult with your preferred glove manufacturer to ensure that the gloves you plan on using are compatible with nitric acid.

Refer to glove selection chart from the links below:

<http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf>

OR

<http://www.allsafetyproducts.biz/page/74172>

OR

<http://www.showabestglove.com/site/default.aspx>

OR

<http://www.mapaglove.com/>

**Eye Protection**

ANSI approved, tight-fitting safety glasses/goggles. Face shields are also recommended.

**Skin and Body Protection**

Flame resistant lab coat, long pants, and closed-toe shoes. Safety apron also recommended.

**Hygiene Measures**

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

**Engineering Controls**

Chemical fume hood. Good ventilation.

**First Aid Procedures**

**If inhaled**

Move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

**In case of skin contact**

Wash off with soap and plenty of water for at least 15 minutes while removing contaminated clothing. Consult a physician.

**In case of eye contact**

Rinse thoroughly with plenty of water for at least 15 minutes lifting upper and lower eyelids and removing contact lenses. Consult a physician. Continue rinsing eyes during transport to hospital.

**If swallowed**

Do not induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

**Special Handling and Storage Requirements**

**Precautions for safe handling:** Avoid contact with skin, eyes, and clothing. Avoid inhalation and ingestion. Keep away from heat and sources of ignition- No smoking.

**Conditions for safe storage:** Keep container tightly closed in a dry and well-ventilated area. Store in original container away from direct sunlight. Opened containers must be carefully resealed and stored upright to prevent leakage. Store away from combustible materials. Avoid alkali metals, reducing agents, cyanides, aldehydes, powdered metals organic materials, ammonia, acetic anhydride, acetonitrile, alcohols, and acrylonitrile.

**Spill and Accident Procedure**

***Chemical Spill Dial 911 and x2-2057 (or 835-4965 after hours)***

**Spill** – Assess the extent of danger. Help contaminated or injured persons. Evacuate the spill area. Avoid breathing vapors. If possible, confine the spill to a small area using a spill kit or absorbent material. Keep others from entering contaminated area (e.g., use caution tape, barriers, etc.).

**Small (<1 L)** – If you have training, you may assist in the clean-up effort. Use appropriate personal protective equipment and clean-up material for chemical spilled. Double bag spill waste in clear plastic bags, label and take to the next chemical waste pick-up.

**Large (>1 L)** – Dial **911** (or **(615) 421-1911** from cell phone) and EH&S for assistance.

**Chemical Spill on Body or Clothes** – Remove clothing and rinse body thoroughly in emergency shower for at least 15 minutes. Seek medical attention. *Notify supervisor and EH&S at x2-2057**immediately.*

**Chemical Splash Into Eyes** – Immediately rinse eyeball and inner surface of eyelid with water from the emergency eyewash station for 15 minutes by forcibly holding the eye open. Seek medical attention. *Notify supervisor and EH&S at x2-2057**immediately.*

# **Medical Emergency**

To contact the [Vanderbilt University Police Department](http://police.vanderbilt.edu/) in an emergency:

* Call **911** from any campus phone.
* Call **(615) 421-1911** from any other phone.

**Decontamination/Waste Disposal Procedure**

Wearing proper PPE, decontaminate equipment and bench tops using soap and water. Dispose of the used chemical and contaminated disposables as hazardous waste following the guidelines below.

**General hazardous waste disposal guidelines:**

* **Label Waste**
  + Affix a hazardous waste tag on all waste containers using the (pink) ‘HAZARDOUS WASTE’ tags provided by Vanderbilt Environmental Health and Safety as soon as the first drop of waste is added to the container
  + Store hazardous waste in closed containers, in secondary containment, and in a designated location
  + Double-bag dry waste using transparent bags.
  + Waste must be under the control of the person generating & disposing of it
* **Dispose of Waste**
  + Dispose of regularly generated chemical waste within 90 days
  + *Call VEHS at x2-2057 for questions*
  + Empty Containers
    - An empty container that has held an acute hazardous waste must be triple rinsed using a solvent (which might be water) capable of removing the acute hazardous waste prior to disposal of the container as regular trash. Each rinsing should be performed with an amount of solvent equal to approximately 5 percent of the volume of the container. The rinsate must be collected and disposed of as hazardous waste. The containers should be defaced of any chemical or hazardous waste labels and the cap should be removed prior to disposal as regular trash. Please see the VEHS Environmental Fact Sheet, "[Identifying Hazardous Waste in Your Laboratory](http://www.safety.vanderbilt.edu/waste/chemical-waste-identification.php)" for a definition of acute hazardous waste.
  + Submit an online request for the materials to be collected at: <https://sitemason.vanderbilt.edu/form/fGit0s>
    - Allow at least two business days for the materials to be collected.

**Safety Data Sheet (SDS) Location**

The SDS is stored in room 5718 in the binder marked “SDS” in the top drawer of the lab bench facing the lab entrance.

The SDS can also be found on the EES department server under “Research/MSDS”.

* [www.safety.vanderbilt.edu/msds/](http://www.safety.vanderbilt.edu/msds/)
* [www.safety.vanderbilt.edu/links/chemical-safety-databases.php](http://www.safety.vanderbilt.edu/links/chemical-safety-databases.php).

**Protocol/Procedure**

The Oster lab uses Nitric acid baths and refluxes as a cleaning step in dish washing and for the dissolution of carbonate materials. Refer to additional SOPs for these procedures in the SOP binder in the top drawer of the lab bench facing the entrance.

**NOTE**

Any deviation from this SOP requires approval from PI.

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

* Prior to conducting any work with nitric acid, designated personnel must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
* The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and a copy of the SDS provided by the manufacturer.
* 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:

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| **Name** | **Signature** | **Identification** | **Date** |
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