**Standard Operating Procedure for**

**Working with Nitric Acid**

Created by: Kathryn Mireles, Feb. 2016

**OVERVIEW**

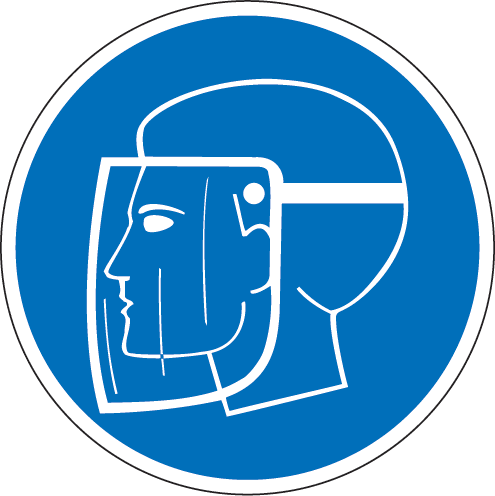
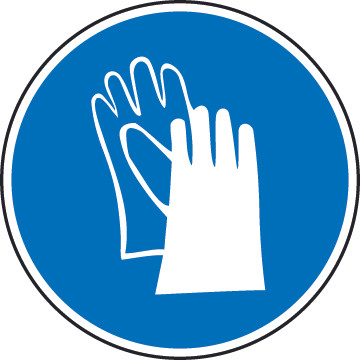
Nitric acid is a clear, yellow inorganic acid which is a strong oxidizer. Because of this nitric acid reacts violently with many organic materials and some of the byproducts may cause the reactions to become explosive. Care must be taken when handling and storing Nitric and the procedures are described below.

Spontaneous combustion may occur if contact is made with the following: 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.

Red-Brown gas is generated during oxidation reactions. This gas is NO2 and is highly toxic. Exercise extreme care during these reactions and ensure fume hood glass level is always ~8 inches from bottom when these reactions are taking place.

**SAFETY**

**Personal protective equipment (PPE) required**

Symbols from International Organization of Standards (ISO 3864-2) (http://www.safetysign.com/iso-mandatory-symbol-labels)

Eye and face protection – Face shield AND safety goggles

* Nitric acid is often diluted with water producing a large amount of heat and corrosive fumes. A face shield is required in case of any splashing or accidental violent reactions.
* Safety goggles are needed to protect the eyes from any splashing or fumes. **Safety glasses are not recommended because they still allow vapors to contact the eye.**

Hand protection

* Gloves must be worn when handling chemicals. Ideally concentrated (68%+) Nitric acid should be handled using Viton or butyl rubber gloves. Upon dilution to <50 v% the use of two layers of Nitrile gloves is acceptable. Upon contact of dilute nitric on the glove, the glove in contact may be removed and replaced.

Body Protection

* A lab coat must always be worn when handling chemicals.
* Close-toed shoes that cover the top of the foot are required when in the lab.
* Long pants are required when in the lab.

**Emergency Protocols**

When you may have been exposed and what to do:

* Skin: Irritation, burning and/or yellowing of skin is indicative of contact with nitric acid. Remove any contaminated clothing immediately and flush area with water for >10 minutes. If a large area of the body has been exposed, you should use the emergency shower. If there has been contact with the eyes, use the eye wash station for >10 minutes.
* Inhalation: Irritation to respiratory system. Move to fresh air and seek medical attention.

Immediate danger

* If something happens and you think you, others, or the building is in immediate danger do not hesitate to call 911 and activate the building alarm while evacuating the building.

Chemical spills

* Minor spills
  + Must meet the following requirements to be cleaned up by lab worker (from EH&S):
    - Chemical is known; can be cleaned in ≤10 to15 minutes
    - Employees are trained to clean up spills
    - Same PPE can be worn as in normal work activity
    - Clean-up supplies available (Spill Kit)
* Major spills
  + Evacuate the area and call 911 for further instruction

**Emergency Contact Information**

Dr. Michael Kessler – Principal Investigator

**Office**: 509-335-8654 **Cell**: 509-332-9963

Mitch Rock – Lab Manager

**Cell**: 515-520-1660

michaelr.kessler@wsu.edu

darman.rock@wsu.edu

**PROCEDURE for dilution**

1. Make sure you are wearing the proper personal protective equipment (gloves, goggles, lab coat, face shield).
2. Gather the necessary glassware for proper transfer of and dilution or nitric acid and always work under a chemical fumehood. Typically required materials: Beaker for dilution, glass stirring rod, pipet, pre-labeled storage bottle, DI water wash bottle, graduated cylinder for measurement.
3. Check glassware to make sure there are no cracks or chips present. The dilution of Nitric always generates heat which may cause the cracks to propagate and break the glassware. Glassware should also be completely clean and free of any organic chemicals or residue to avoid violent reactions with acid.
4. Begin by filling beaker with about half of the final volume of water required.
5. Transfer Nitric into a small beaker and measure the required amount of acid in a graduated cylinder. **Always add concentrated acid to water** and not water to acid. See appendix for dilute solution examples.
6. Add measured acid to beaker with water carefully and slowly while stirring. Mixing will generate heat! Allow solution to cool before moving to the next step of procedure. Keep solution labeled and move to pre-labeled bottle as soon as possible.
7. Use wash bottle to rinse all glassware and dispose of this wash solution into the proper storage container. See below.

**Clean up and waste disposal and storage**

IMPORTANT NOTE: **Acid waste and organic waste should never be mixed** even if one is in very small quantities. Please review Safety and Documentation at <https://kessler.wsu.edu/group/> to view a report showing one if the possible outcomes. Improper addition of organic chemicals WILL build pressure and may even cause spontaneous combustion.

The Nitric acid bottle should immediately be stored once a suitable amount has been collected for the experiment. Cap should be on tightly to prevent spills. If any acid has dripped on the side of the bottle, please wipe before placing back into storage. Any Nitric solution waste should be placed into an acid **glass** chemical waste bottle SPECIFICALLY designated for nitric acid and should be fitted with a pressure releasing cap. A funnel should be used when disposing more waste into the container. This waste may be placed into the same secondary containment as the original nitric acid bottle. A Chemical Collection Request should be filled as soon as possible so that waste is not stored for long periods of time.

**APPENDIX**

