

## Standard Operating Procedure Example

**Date:** 2/10/2018

**SOP Title:** Safe use of concentrated nitric acid

**Principal Investigator:** Dr. Alfred Nobel

**Trainer:** Dr. Alfred Nobel      **Trainer Signature:** \_\_\_\_\_

**AI N Room and Building:** ET-249

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### Section 1 – Process

Preparing diluted aqueous nitric acid solutions.

### Section 2 – Hazardous Chemicals

Concentrated nitric acid (HNO<sub>3</sub>), diluted nitric acid preparations.

Concentrated nitric acid (70.4%, 15.9M) is a colorless to slightly yellow, strong oxidizing inorganic acid.

### Section 3 – Potential Hazards

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.

Heat is released when the concentrated acid is mixed with water. If you add water to acid, you form an extremely concentrated solution of acid initially and the solution may boil very violently, splashing concentrated acid. If you add acid to water, the solution that forms is very dilute and the small amount of heat released is not enough to vaporize and spatter it. Always Add Acid to water, and never the reverse.

Spontaneous ignition or combustion can occur 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.

### Section 4 – Approvals Required

COE Safety approval required for large volume (> 4L) use. Concentrated nitric acid use in any volume is not permitted when personnel are working alone.

### Section 5 – Designated Area

Concentrated nitric acid is to be used in a fume hood with eyewash and safety shower close by, within 10 seconds. Adjust fume hood sash to proper operating height. At this height, it will serve as a splash shield. Make sure there is plenty of room and always work more than 6 inches from outer

edge of the fume hood. Hood should be cleared of organics, flammables, and other incompatible substances.

### **Section 6 – Special Handling Procedures and Storage Requirements**

Store nitric acid in tightly closed containers, in a well-ventilated area away from organic substances, caustic materials, and combustible materials. Store containers of nitric acid in secondary containment. Bottles of acid should be stored in an acid (corrosive) cabinet. While acids and bases are both considered to be corrosive, care must be taken to not store acids and bases in the same cabinet.

Oxidizing acids, such as nitric should be stored separately, in a secondary container within an acid cabinet.

Glacial acetic acid, although it is both a corrosive and flammable, should be stored with other, non-oxidizing acids segregated away from nitric or other oxidizing acids. Store in a flammables cabinet if oxidizing acids are present in the Corrosives Cabinet.

### **Section 7 – Personal Protective Equipment**

Chemical splash goggles: Wear chemical splash goggles with face shield when using quantities > 1 liter (L), or chemical splash goggles when using quantities < 1L.

Gloves: Neoprene to be used at concentrations above 30%, latex or nitrile below 30%. Avoid skin contact, serious burns may result.

Lab Coat: Worn at all times when splash potential exists while working with any quantity. Apron may be necessary to wear when working with large quantities.

Closed-toe shoes are required for all laboratory work. Long pants are required when working with the concentrated acid.

### **Section 8 – Engineering/Ventilation Controls**

Use concentrated acid in properly functioning fume hood. Confirm fume hood is certified and has adequate flow. A safety shower and eyewash must be available and accessible when working with corrosive liquids. Confirm safety shower/eyewash have been tested within the past month.

### **Section 9 – Spill and Accident Procedures**

Skin exposure: Rinse affected skin with plenty of water while removing contaminated clothing and shoes. Rinse for at least 15 minutes. Seek medical attention.

Eye exposure: Splashes may cause tissue destruction. Wash eyes for at least 15 minutes in eye/face wash, lifting the upper and lower eyelids occasionally (ask for assistance). Seek medical attention immediately.

Small spills: Do not attempt cleanup if you feel unsure of your ability to do so or if you perceive the risk to be greater than normal laboratory operations. See emergency spill procedure posted in lab.

Small spills of nitric acid (less than 10 ml of >50% nitric acid, or less than 100 ml of dilute nitric acid) should be absorbed by laboratory staff with an absorbent acid neutralizing pad (available from COE CHO), and then placed into a sealed container or bag for disposal through the Chemical Waste Program. Neutralize remaining liquid with sodium bicarbonate or other suitable mild caustic material. Do not use laboratory paper towels to cleanup nitric acid spills.



