SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

Product Identifier
SRM Number: 1640a
SRM Name: Trace Elements in Natural Water
Other Means of Identification: Not applicable.

Recommended Use of This Material and Restrictions of Use
This Standard Reference Material (SRM) is intended for use in evaluating methods used in the determination of trace elements in fresh water. SRM 1640a consists of acidified spring water with mass fractions and mass concentrations assigned for 29 elements, 22 of which were gravimetrically added. The solution contains nitric acid at a volume fraction of approximately 2 %. A unit of SRM 1640a consists of 250 mL of solution in a high-density polyethylene (HDPE) bottle sealed inside an aluminized Mylar pouch.

Company Information
National Institute of Standards and Technology
Standard Reference Materials Program
100 Bureau Drive, Stop 2300
Gaithersburg, Maryland 20899-2300
Telephone: 301-975-2200
FAX: 301-948-3730
E-mail: SRMMSDS@nist.gov
Website: http://www.nist.gov/srm

2. HAZARDS IDENTIFICATION

Classification
Physical Hazard: Not classified.
Health Hazard: Skin Corrosion/Irritation Category 1B
Serious Eye Damage/Eye Irritation Category 1

Label Elements
Symbol

Signal Word
DANGER

Hazard Statement(s)
H314 Causes severe skin burns and eye damage.

Precautionary Statement(s)
P260 Do not breathe mists.
P264 Wash hands thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P301 + P330 + P331 If swallowed: Rinse mouth. Do NOT induce vomiting.
P304 + P340 If inhaled: Remove person to fresh air and keep comfortable for breathing.
P303 + P361 + P353 If on skin (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305 + P351 + P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P363 Wash contaminated clothing before reuse.
P310 Immediately call a poison center or doctor/physician.
P390 Absorb spillage to prevent material damage.
SRM 1640a

P405 Store locked up.
P501 Dispose of contents/container according with local regulations.

Hazards Not Otherwise Classified: Not applicable.

Ingredients(s) with Unknown Acute Toxicity: Not applicable.

3. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

Substance: Nitric Acid Solution

Other Designations:
Nitric Acid (Aqua fortis; hydrogen nitrate; azotic acid; engraver’s acid)

Components are listed in compliance with OSHA’s 29 CFR 1910.1200; for the actual values see the Certificate of Analysis.

<table>
<thead>
<tr>
<th>Hazardous Component(s)</th>
<th>CAS Number</th>
<th>EC Number (EINECS)</th>
<th>Nominal Mass Concentration (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric Acid</td>
<td>7697-37-2</td>
<td>231-714-2</td>
<td>2</td>
</tr>
<tr>
<td>Non-Hazardous Component(s)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>7732-18-5</td>
<td>231-791-2</td>
<td>&lt;98</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

Description of First Aid Measures:

Inhalation: If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration or oxygen by qualified personnel. Seek immediate medical attention.

Skin Contact: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get immediate medical attention. Thoroughly clean and dry contaminated clothing before reuse.

Eye Contact: Immediately flush eyes, including under the eyelids with copious amounts of water for at least 15 minutes. Seek immediate medical attention.

Ingestion: Contact a poison control center immediately for instructions. Give water to rinse out mouth. Never give liquids to a person with reduced awareness or becoming unconscious. If vomiting occurs, keep head lower than hips to prevent aspiration. If not breathing, give artificial respiration by qualified personnel. Seek immediate medical attention.

Most Important Symptoms/Effects, Acute and Delayed: Acid burns to skin, eyes, and lungs.

Indication of any immediate medical attention and special treatment needed, if necessary: If any of the above symptoms are present, seek immediate medical attention.

5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Negligible fire hazard. See Section 9, “Physical and Chemical Properties” for flammability properties.

Extinguishing Media:
Suitable: Use extinguishing media appropriate to the surrounding fire.
Unsuitable: None listed.

Specific Hazards Arising from the Chemical: Thermal decomposition will form oxides of nitrogen.

Special Protective Equipment and Precautions for Fire-Fighters: Avoid inhalation of material or combustion byproducts. Wear full protective clothing and NIOSH approved self-contained breathing apparatus (SCBA).

NFPA Ratings (0 = Minimal; 1 = Slight; 2 = Moderate; 3 = Serious; 4 = Severe)

Health = 2     Fire = 0     Reactivity = 0
6. ACCIDENTAL RELEASE MEASURES

**Personal Precautions, Protective Equipment and Emergency Procedures:** Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment; see Section 8, “Exposure Controls and Personal Protection”.

**Methods and Materials for Containment and Clean up:** Do not touch spilled material. Notify safety personnel of spills. Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Isolate hazard area and deny entry.

7. HANDLING AND STORAGE

**Safe Handling Precautions:** See Section 8, “Exposure Controls and Personal Protection”.

**Storage:** Store and handling in accordance with all current regulations and standards. Keep separated from incompatible substances (see Section 10, “Stability and Reactivity”).

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

**Exposure Limits:**

<table>
<thead>
<tr>
<th>Component</th>
<th>NIOSH (REL)</th>
<th>ACGIH (TLV)</th>
<th>OSHA (PEL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric Acid</td>
<td>5 mg/m³ (2 ppm; TWA)</td>
<td>5 mg/m³ (2 ppm; TWA)</td>
<td>5 mg/m³ (2 ppm; TWA)</td>
</tr>
<tr>
<td></td>
<td>10 mg/m³ (4 ppm; STEL)</td>
<td>10 mg/m³ (4 ppm; STEL)</td>
<td>10 mg/m³ (4 ppm; STEL)</td>
</tr>
<tr>
<td></td>
<td>65 mg/m³ (25 ppm; IDLH)</td>
<td>65 mg/m³ (25 ppm; IDLH)</td>
<td>65 mg/m³ (25 ppm; IDLH)</td>
</tr>
</tbody>
</table>

**Engineering Controls:** Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

**Personal Protection:** In accordance with OSHA 29 CFR 1910.132, subpart I, wear appropriate Personal Protective Equipment (PPE) to minimize exposure to this material.

**Respiratory Protection:** If workplace conditions warrant a respirator, a respiratory protection program that meets OSHA 29CFR 1910.134 must be followed. Refer to NIOSH 42 CFR 84 for applicable certified respirators.

**Eye/Face Protection:** Wear splash resistant safety goggles with a face shield. An eye wash station should be readily available near areas of use.

**Skin and Body Protection:** Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Chemical-resistant gloves should be worn at all times when handling chemicals.
9. PHYSICAL AND CHEMICAL PROPERTIES

NOTE: The physical and chemical data provided are for the pure components. No physical or chemical data are available for this solution of acidified water.

### Descriptive Properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Nitric Acid (2 % of this SRM)</th>
<th>Water (&lt;98 % of this SRM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance (physical state, color, etc.):</td>
<td>Colorless to yellow liquid</td>
<td>Clear liquid</td>
</tr>
<tr>
<td>Molecular Formula:</td>
<td>HNO₃</td>
<td>H₂O</td>
</tr>
<tr>
<td>Molar Mass (g/mol):</td>
<td>63.01</td>
<td>18.02</td>
</tr>
<tr>
<td>Odor:</td>
<td>Irritating odor</td>
<td>Odorless</td>
</tr>
<tr>
<td>Odor threshold:</td>
<td>Not available</td>
<td>Not available</td>
</tr>
<tr>
<td>pH:</td>
<td>1 (1 M)</td>
<td>7</td>
</tr>
<tr>
<td>Evaporation rate:</td>
<td>Not available</td>
<td>Not available</td>
</tr>
<tr>
<td>Melting point/freezing point (°C):</td>
<td>–42 (–43 °F)</td>
<td>0 (32 °F)</td>
</tr>
<tr>
<td>Relative Density (g/L):</td>
<td>Not available</td>
<td>1</td>
</tr>
<tr>
<td>Vapor Pressure (mmHg):</td>
<td>47.9 (20 °C)</td>
<td>17.5 (20 °C)</td>
</tr>
<tr>
<td>Vapor Density (air = 1):</td>
<td>3.2</td>
<td>Not available</td>
</tr>
<tr>
<td>Viscosity (cP):</td>
<td>Not available</td>
<td>Not available</td>
</tr>
<tr>
<td>Solubility(ies):</td>
<td>Miscible with water and ether</td>
<td>Alcohol</td>
</tr>
<tr>
<td>Partition coefficient (n-octanol/water):</td>
<td>Not available</td>
<td>Not available</td>
</tr>
<tr>
<td>Particle Size (if relevant):</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

### Thermal Stability Properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Nitric Acid (2 % of this SRM)</th>
<th>Water (&lt;98 % of this SRM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autoignition Temperature (°C):</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Thermal Decomposition (°C):</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Initial boiling point and boiling range (°C):</td>
<td>83 (181 °F)</td>
<td>100 (212 °F)</td>
</tr>
<tr>
<td>Explosive Limits, LEL (Volume %):</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Explosive Limits, UEL (Volume %):</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Flash Point (°C):</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Flammability (solid, gas):</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

10. STABILITY AND REACTIVITY

**Reactivity:** Not reactive per SARA 311/312 and NFPA.

**Stability:** X Stable _____ Unstable

**Possible Hazardous Reactions:** None listed.

**Conditions to Avoid:** Contact with combustible or incompatible materials.

**Incompatible Materials:** Acids, combustible materials, halo carbons, amines, bases, oxidizing materials, metals, halogens, metal salts, metal oxides, reducing agents, peroxides, metal carbide, cyanides.

**Fire/Explosion Information:** See Section 5, “Fire Fighting Measures”.

**Hazardous Decomposition:** Thermal decomposition will produce oxides of nitrogen.

**Hazardous Polymerization:** _____ Will Occur X Will Not Occur
11. TOXICOLOGICAL INFORMATION

Route of Exposure:  

- X Inhalation  
- X Skin  
- X Ingestion

Symptoms Related to the Physical, Chemical and Toxicological Characteristics: Burning pain and severe skin corrosion, and eye damage.

Potential Health Effects (Acute, Chronic and Delayed):

- **Inhalation**: Inhalation of nitric acid can damage the mucous membranes and upper respiratory tract. Short term exposure may cause irritation and inflammation of the upper respiratory tract, coughing, choking, sore throat, shortness of breath, headache, dizziness, and nausea. Long term exposure to acid fumes may cause damage to teeth, bronchial irritation, chronic cough, bronchial pneumonia, and gastrointestinal disturbances.

- **Skin Contact**: Nitric acid can cause severe skin burns. Severity of the damage depends on the concentration and duration of exposure. Effects of acid burns may be delayed.

- **Eye Contact**: Nitric acid can cause severe eye irritation, corneal burns, permanent eye damage, or blindness. Severity of the damage depends on the concentration and duration of exposure.

- **Ingestion**: If ingested, nitric acid can cause severe burns and damage to the gastrointestinal tract

Numerical Measures of Toxicity:

- **Acute Toxicity**: Not classified.
  - Nitric acid, Rat, Inhalation LC50: 130 mg/m³ (4 h)

- **Skin Corrosion/Irritation**: This SRM contains >1 % of nitric acid and it is classified as Category 1B.

- **Serious Eye damage/ Eye irritation**: This SRM contains >1 % nitric acid and it is classified as Category 1.

- **Respiratory Sensitization**: No data available.

- **Skin Sensitization**: No data available.

- **Germ Cell Mutagenicity**: No data available.

- **Carcinogenicity**: Not classified.
  - Listed as a Carcinogen/Potential Carcinogen  
    - ___ Yes  
    - ___ X No  
  - Nitric acid is not listed in NTP, IARC or OSHA as a carcinogen.

- **Reproductive Toxicity**: Not classified.
  - Nitric acid, Rat, Oral TDLo: 21 150 mg/kg (pregnant 1-21 days)
  - Nitric acid, Rat, Oral TDLo: 2345 mg/kg (pregnant 18 days)

- **Specific Target Organ Toxicity, Single Exposure**: Not classified.

- **Specific Target Organ Toxicity, Repeated Exposure**: Not classified.

- **Aspiration Hazard**: No data available.

12. ECOLOGICAL INFORMATION

Ecotoxicity Data:

- **Component**: Nitric Acid
  - Mosquitofish (Gambusia affinis), LC50: 72 mg/L (96 h)

Persistence and Degradability: No data available.

Bioaccumulative Potential: No data available.

Mobility in Soil: No data available.

Other Adverse effects: No data available.

13. DISPOSAL CONSIDERATIONS

14. **Transportation Information**

**U.S. DOT and IATA:** UN1760, Corrosive liquid, n.o.s. (contains nitric acid), Hazard Class 8, Packing Group II.

15. **Regulatory Information**

**U.S. Regulations:**

- CERCLA Sections 102a/103 (40 CFR 302.4): Nitric Acid, 1000 lbs; 454 kg RQ.
- SARA Title III Section 302 (40 CFR 355.30): Nitric Acid, 1000 lbs TPQ.
- SARA Title III Section 304 (40 CFR 355.40): Nitric Acid, 1000 lbs EPCRA RQ.
- SARA Title III Section 313 (40 CFR 372.65): Nitric Acid: 1 % de minimis concentration.

**OSHA Process Safety (29 CFR 1910.119):**
Regulated for nitric acid at higher concentrations 500 lb TQ (≥94.5 % by weight).

**SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):**

- **ACUTE HEALTH:** Yes.
- **CHRONIC HEALTH:** No.
- **FIRE:** No.
- **REACTIVE:** No.
- **PRESSURE:** No.

**State Regulations:**
California Proposition 65: Not listed.

**U.S. TSCA Inventory:** Nitric acid and water listed.

**TSCA 12(b), Export Notification:** Not listed.

**Canadian Regulations:**
- **WHMIS Information:** Not provided for this material.
16. OTHER INFORMATION

Issue Date: 26 July 2013

Sources: ChemAdvisor, Inc., MSDS Nitric Acid, 13 March 2013.


CDC; NIOSH; NIOSH Pocket Guide to Chemical Hazards; Department of Health and Human Services (DHHS), Centers for Disease Control and Prevention (CDC), National Institute for Safety and Health; Nitric Acid, 18 November 2010; available at http://www.cdc.gov/niosh/npg/npgd0447.html (accessed July 2013).

Key of Acronyms:

ACGIH American Conference of Governmental Industrial Hygienists
ALI Annual Limit on Intake
CAS Chemical Abstracts Service
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
CFR Code of Federal Regulations
DOT Department of Transportation
EC50 Effective Concentration, 50%
EINECS European Inventory of Existing Commercial Chemical Substances
EPCRA Emergency Planning and Community Right-to-Know Act
IARC International Agency for Research on Cancer
IATA International Air Transportation Agency
IDLH Immediately Dangerous to Life and Health
LC50 Lethal Concentration, 50%
L5D0 Lethal Dose, 50%
LEL Lower Explosive Limit
MSDS Material Safety Data Sheet
NRC Nuclear Regulatory Commission
NTP National Toxicology Program
OSHA Occupational Safety and Health Administration
PEL Permissible Exposure Level
RCRA Resource Conservation and Recovery Act
REL Recommended Exposure Limit
RM Reference Material
RQ Reportable Quantity
SRM Standard Reference Material
TWA Time Weighted Average
U.S. EPA United States Environmental Protection Agency
NIST National Institute of Standards and Technology
TSCA Toxic Substances Control Act
WHMIS Workplace Hazardous Materials Information System

Disclaimer: Physical and chemical data contained in this SDS are provided only for use in assessing the hazardous nature of the material. The SDS was prepared carefully, using current references; however, NIST does not certify the data in the SDS. The certified values for this material are given in the NIST Certificate of Analysis.

Users of this SRM should ensure that the SDS in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmnds@nist.gov; or via the Internet at http://www.nist.gov/srm.