

MATERIAL SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

National Institute of Standards and Technology
Standard Reference Materials Program
100 Bureau Drive, Stop 2300
Gaithersburg, Maryland 20899-2300

SRM Number: 4321C
MSDS Number: 4321C
SRM Name: Natural Uranium
Radioactivity Standard

Date of Issue: 11 May 2007

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Description: SRM 4321C consists of radioactive Natural Uranium nitrate, and nitric acid dissolved in 5 mL of distilled water. The resulting solution is 1.0 M nitric acid. The solution is contained in a flame-sealed NIST borosilicate-glass ampoule.

Substance: Radioactive Natural Uranium Nitrate in 1.0 M Nitric Acid

Other Designations: Radioactive Natural Uranium Nitrate in **1 M Nitric Acid** (nitric acid solution, 1.0 normal; 1.0 N nitric acid; nitric acid 6 %).

SRM 4321C is a radioactive material with a massic activity of approximately $500 \text{ Bq}\cdot\text{g}^{-1}$. The SRM ampoule contains Uranium-238, Uranium-235 and Uranium-234 with a total activity of approximately 2600 Bq. Uranium decays by alpha-particle emission. The progeny of Uranium-238, Uranium-235 and Uranium-234 have a total activity of approximately 2600 Bq and decay by alpha- and beta-particles emission. None of these particles escape from the SRM ampoule. During the decay process X-Rays and gamma rays with energies from 11 keV to 2.0 MeV are emitted. Most of these photons escape from the SRM ampoule but their intensities are so small that they do not represent a radiation hazard.

2. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

Component:	Nitric Acid
CAS Number:	7697-37-2
EC Number (EINECS):	231-741-2
SRM Nominal Concentration:	1 M (approximately 6 %)
EC Classification:	C
EC Risk (R):	35
EC Safety (S):	1, 2, 23, 26, 36, 37, 39, 45

3. HAZARDS IDENTIFICATION

Nitric Acid	
NFPA Ratings (Scale 0–4):	Health = 3 Fire = 0 Reactivity = 0
Major Health Hazards:	Respiratory tract burns. Skin burns. Eye burns. Mucous membrane burns.
Potential Health Effects	
Inhalation:	Inhalation of fumes may cause irritation and burning of the nose, throat, and upper respiratory tract with coughing and choking.
Skin Contact:	Skin contact of dilute solutions of nitric acid may cause mild irritation to possible chemical burns. Repeated or prolonged contact may result in dermatitis.
Eye Contact:	Direct contact with acidic substances may cause severe irritation, conjunctivitis, corneal necrosis, and burns with impairment or permanent loss of vision. The degree of injury depends on the concentration and duration of contact.

Ingestion: Ingestion can cause pain and burns of the mouth, throat, esophagus, and stomach. May also cause nausea, vomiting, diarrhea, chills, shock, and intense thirst.

**Listed as a Carcinogen/
Potential Carcinogen:**

Yes	No	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	In the National Toxicology Program (NTP) Report on Carcinogens.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	In the International Agency for Research on Cancer (IARC) Monographs.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	By the Occupational Safety and Health Administration (OSHA).

4. FIRST AID MEASURES

Nitric Acid

Skin Contact: Rinse affected area with copious amounts of water for at least 15 minutes while removing contaminated clothing followed by washing the area with soap and water. Obtain medical assistance if necessary.

Eye Contact: Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Obtain medical assistance immediately.

Inhalation: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing by qualified personnel. Get medical attention if necessary.

Ingestion: If ingestion occurs, contact poison control center or physician immediately. Give large quantities of water or milk. Never give anything by mouth to an unconscious person. If vomiting occurs, keep head lower than hips to prevent aspiration. If person is unconscious, turn head to side. Obtain immediate medical assistance.

5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Nitric acid is not considered a fire hazard. May ignite on contact with combustible materials.

Extinguishing Media: Use regular dry chemical, soda ash, or water.

Fire Fighting: **DO NOT** touch spilled material. Move container from fire area if it can be done without risk. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products.

Flash Point (°C): Not available.

Autoignition Temp. (°C): Not available.

Flammability Limits in Air

UPPER (Volume %): Not available.

LOWER (Volume %): Not available.

6. ACCIDENTAL RELEASE MEASURES

Occupational Release: **DO NOT** touch spilled material. Avoid contact with combustible materials. Notify safety personnel of spill. Spills should be handled according to radioactive spill procedures. In addition to the radioactive material, the material contains an acid and is corrosive.

Disposal: Refer to Section 13, "Disposal Considerations".

7. HANDLING AND STORAGE

Storage: Store and handle in accordance with all current regulations and standards. Keep separated from incompatible substances. Store in a well-ventilated area.

Safe Handling Precautions: See Section 8, "Exposure Controls and Personal Protection" and the Certificate for SRM 4321C.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits:	Nitric Acid OSHA (PEL): 5 mg/m ³ (2 ppm) TWA ACGIH: 2 ppm TWA ACGIH: 4 ppm STEL NIOSH: 5 mg/m ³ (2 ppm) recommended TWA (10 h) WEL UK: 5.2 mg/m ³ (2 ppm) TWA WEL UK: 10 mg/m ³ (4 ppm) STEL
Ventilation:	Provide a local exhaust ventilation system. Ensure compliance with applicable exposure limits.
Eye Protection:	Wear safety goggles. An eye wash station should be readily available near areas of use.
Personal Protection:	Wear appropriate protective clothing and disposable chemically resistant gloves to prevent skin exposure.

9. PHYSICAL AND CHEMICAL PROPERTIES

Component:	Nitric Acid
Appearance:	Colorless, liquid.
Relative Molecular Weight:	63 g/mol
Molecular Formula:	HNO ₃
Water Solubility:	Miscible.

10. STABILITY AND REACTIVITY

Stability:	<input checked="" type="checkbox"/> Stable <input type="checkbox"/> Unstable Stable under ordinary conditions of use and storage.
Conditions to Avoid:	Avoid heat and combustible materials.
Incompatible Materials:	Nitric acid is incompatible with acids, combustible materials, halo carbons, amines, bases, oxidizing materials, metals, halogens, metal salts, metal oxides, reducing agents, peroxides, metal carbide, and cyanides.
Fire/Explosion Information:	See Section 5, "Fire Fighting Measures".
Hazardous Decomposition:	Oxides of nitrogen.
Hazardous Polymerization:	<input type="checkbox"/> Will Occur <input checked="" type="checkbox"/> Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Entry:	<input checked="" type="checkbox"/> Inhalation <input checked="" type="checkbox"/> Skin <input checked="" type="checkbox"/> Ingestion
Toxicity Data:	Nitric Acid Human, Oral LD ₅₀ : 430 mg/kg Rat, Inhalation LC ₅₀ : 260 mg/m ³ (30 min) Rat, Inhalation LC ₅₀ : 130 mg/m ³ (4 h) Investigated as a reproductive inhibitor.
Health Effects (Acute and Chronic):	See Section 3: "Hazards Identification" for potential health effects.

12. ECOLOGICAL INFORMATION

Ecotoxicity Data	Not available.
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13. DISPOSAL CONSIDERATIONS

Waste Disposal: Dispose in accordance with all applicable federal, state, and local regulations for radioactive materials. Keep out of water supplies and sewers.

14. TRANSPORTATION INFORMATION

SRM 4321C: Natural Uranium Radioactivity Standard (5 mL)
U.S. DOT and IATA: Radioactive Material, excepted package, limited quantity of material, UN2910, Hazard Class 7; Sub Risk: Nitric Acid, 6 %, Dangerous Goods in excepted quantities (5 mL).

15. REGULATORY INFORMATION

U.S. Regulations: CERCLA Sections 102a/103 (40 CFR 302.4): Nitric Acid: RQ 1 000 lbs
SARA Title III Section 302 (40 CFR 355.30): Nitric Acid: TPQ 1 000 lbs
SARA Title III Section 304 (40 CFR 355.40): Nitric Acid: RQ 1 000 lbs (gas)
SARA Title III Section 313 (40 CFR 372.65): Nitric Acid
OSHA Process Safety (29 CFR 1910.119): Nitric Acid: TQ 500 lbs
(≥ 94.5 % by weight))

California Proposition 65: Not regulated.

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

ACUTE: Yes.

CHRONIC: No.

FIRE: No.

REACTIVE: No.

SUDDEN RELEASE: No.

CANADIAN Regulations: WHMIS Classification: Not determined.

EUROPEAN Regulations: EC Classification:
C Corrosive.

EC Risk and Safety Phrases:

R 35 Causes severe burns.

S 1/2 Keep locked up and out of reach of children.

S 23 Do not breathe gas, fumes, vapor, or spray.

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S 36/37/39 Wear suitable protective clothing, gloves, and eye/face protection.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

National Inventory Status

U.S. Inventory (TSCA): Nitric Acid: Listed on inventory.

TSCA 12 (b)

Export Notification: Nitric Acid: Not listed.

16. OTHER INFORMATION

Sources: MDL Information Systems, Inc., MSDS *Nitric Acid*, 15 June 2006.

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