NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
U.S. DEPARTMENT OF COMMERCE

Date of Issue:
18 February 2025

SAFETY DATA SHEET

1. Substance and Source Identification

Product Identifier

SRM Number: 1641f
SRM Name: Mercury in Water
Other Means of Identification: Not applicable.

Recommended Use of This Material and Restrictions of Use

This Standard Reference Material (SRM) is intended for the calibration of instruments and techniques used for the determination of mercury in natural waters. It is designed for the preparation of calibration solutions and for use as a "spike" sample in a "method-of-additions" analytical procedure. A unit of SRM 1641f consists of 10 ampoules, each ampoule containing approximately 10 mL of solution comprised of a trace amount of mercury in approximately 3 % mass fraction nitric acid and 2 % mass fraction hydrochloric acid, equivalent to amount-of-substance concentration (molarity) values of approximately 0.5 mol/L nitric acid and 0.5 mol/L hydrochloric acid.

Company Information

National Institute of Standards and Technology
Standard Reference Materials Program
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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 fumes, mists, vapors, or spray.
P264	Wash hands thoroughly after handling.
P280	Wear protective gloves, clothing, and eye protection.
P301 + P330 + P331	If swallowed: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water.
P304 + P340	If inhaled: Remove person to fresh air and keep comfortable for breathing.
P305 + P351 + P338	If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P310	Immediately call a doctor.
P363	Wash contaminated clothing before reuse.
P405	Store locked up.
P501	Dispose of contents and container according to 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/Hydrochloric Acid Solution

Other Designations:
Nitric Acid (aqua fortis; hydrogen nitrate; azotic acid; engraver's acid)
Hydrochloric Acid (hydrogen chloride acid)

The material contains trace amounts of mercury which has been reported to have toxic, mutagenic, and/or teratogenic properties, and should be handled with care. Components are listed in compliance with OSHA's 29 CFR 1910.1200; for the actual values see the NIST Certificate of Analysis.

Hazardous Component(s)	CAS Number	EC Number (EINECS)	Nominal Mass Concentration (%)
Nitric acid	7697-37-2	231-714-2	3
Hydrochloric acid	7647-01-0	231-595-7	2
Non-Hazardous Component(s)			
Water	7732-18-5	231-791-2	95

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).

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			
Components	**OSHA (PEL)**	**ACGIH (TLV)**	**NIOSH (REL)**
Nitric acid	TWA: 5 mg/m^3 (2 ppm)	TWA: 5 mg/m^3 (2 ppm) STEL: 10 mg/m^3 (4 ppm)	TWA: 5 mg/m^3 (2 ppm) STEL: 10 mg/m^3 (4 ppm) IDLH: 65 mg/m^3 (25 ppm)
Hydrochloric acid	Ceiling: 7 mg/m^3 (5 ppm)	Ceiling: 3 mg/m^3 (2 ppm)	Ceiling: 7 mg/m^3 (5 ppm) IDLH: 50 ppm

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

Descriptive Properties

Appearance (physical state, color, etc.)	colorless to yellow liquid
Molecular Formula	not applicable
Molar Mass (g/mol)	not applicable
Odor	irritating odor
Odor threshold	not available
pH	Acidic
Evaporation rate (ether = 1)	not available
Melting point/freezing point	not available
Relative Density as specific gravity (water = 1)	~1
Vapor Pressure	not available
Vapor Density (air = 1)	not available
Viscosity (cP)	not available

Descriptive Properties

Solubility(ies)	water and alcohol
Partition coefficient (n-octanol/water)	not available

Thermal Stability Properties

Autoignition Temperature	not applicable
Thermal Decomposition	not applicable
Initial boiling point and boiling range	~100 ºC (212 ºF)
Explosive Limits, LEL (Volume %)	not applicable
Explosive Limits, UEL (Volume %)	not applicable
Flash Point	not applicable
Flammability (solid, gas)	not applicable

10. STABILITY AND REACTIVITY

Reactivity: Stable at normal temperatures and pressure.

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, and cyanides.

Fire/Explosion Information: See Section 5, "Fire Fighting Measures".

Hazardous Decomposition: Thermal decomposition will produce oxides of nitrogen, hydrogen chloride gas, chlorine.

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.

Inhalation: Hydrochloric acid and 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: Hydrochloric acid and 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: Hydrochloric acid and 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, concentrated hydrochloric acid and nitric acid can cause burns to the gastrointestinal tract.

Numerical Measures of Toxicity:

Acute Toxicity: Not classified.

Nitric acid:	Rat, Inhalation LC50: 130 mg/m^3 (4 h)
Hydrochloric acid:	Rat, Inhalation LC50: 3124 ppm (1 h); 1.68 mg/L (1 h)
	Rat, Oral LD50: 238 mg/kg to 277 mg/kg
	Rabbit, Dermal LD50: >5010 mg/kg

Skin Corrosion/Irritation: Category 1B

This SRM contains >1 % hydrochloric acid and nitric acid and it is classified as Category 1B.

Serious Eye damage/Eye irritation: Category 1

This SRM contains >1 % hydrochloric acid and 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 by NTP, IARC or OSHA as a carcinogen or a potential carcinogen.
Hydrochloric acid is listed by IARC as group 3, *not classifiable* and not listed by NTP and OSHA.

Reproductive Toxicity: Not classified.

Hydrochloric acid: Rat, Oral TCLo: 450 mg/kg (1 h, prior to copulation 1 d)
Nitric acid: Rat, Oral TDLo: 21 150 mg/kg (pregnant 1 d to 21 d)
Rat, Oral TDLo: 2345 mg/kg (pregnant 18 d)

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:

Nitric acid, Starfish (*Asterias rubens*) LC50 [renewal/aerated water]: 100 mg/L to 300 mg/L (48 h)
Hydrochloric acid, Shore crab (*Carcinus maenas*) LC50 (mortality): 240 mg/L (48 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

Waste Disposal: Dispose of waste in accordance with all applicable federal, state, and local regulations. Nitric acid subject to disposal regulations: U.S. EPA 40 CFR 262, Hazardous Waste Number: D001, D002. Hydrochloric acid subject to disposal regulations: U.S. EPA 40 CFR 262, Hazardous Waste Number: D002.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: UN1760, Corrosive liquid, n.o.s. (contains nitric acid and hydrochloric 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) final RQ.
Hydrochloric Acid, 5000 lbs (2270 kg) final RQ.

SARA Title III Sections 302 (40 CFR 355.30): Nitric Acid, 1000 lbs (454 kg) TPQ.
Hydrochloric Acid, 500 lbs TPQ (gas only).

SARA Title III Sections 304 (40 CFR 355.40): Nitric Acid, 1000 lbs (454 kg) EPCRA RQ.
Hydrochloric Acid, 5000 lbs RQ (gas only).

SARA Title III Sections 313 (40 CFR 372.65): Nitric Acid, 1.0 % de minimis concentrations.
Hydrochloric Acid, 1.0 % de minimis concentrations (acid aerosols including mists, vapors, gas, fog, and other airborne forms of any particle size).

OSHA Process Safety (29 CFR 1910.119): Nitric Acid at higher concentrations (≥94.5 %) is regulated.
Hydrochloric Acid, 5000 lbs (2270 kg) TQ (anhydrous) is regulated.

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, hydrochloric acid, and water are listed.

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

Canadian Regulations: WHMIS Information is not provided for this material.

16. OTHER INFORMATION

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Sources: ChemAdvisor, Inc., SDS *Nitric Acid*, 09 December 2015.

ChemAdvisor, Inc., SDS *Hydrochloric Acid*, 09 December 2015.

PubChem, National Library of Medicine,, *Nitric Acid CAS No. 7697-37-2*; available at https://pubchem.ncbi.nlm.nih.gov/compound/944 (accessed Feb 2025).

Key of Acronyms:

ACGIH	American Conference of Governmental Industrial Hygienists	NRC	Nuclear Regulatory Commission
ALI	Annual Limit on Intake	NTP	National Toxicology Program
CAS	Chemical Abstracts Service	OSHA	Occupational Safety and Health Administration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	PEL	Permissible Exposure Limit
CFR	Code of Federal Regulations	RCRA	Resource Conservation and Recovery Act
DOT	Department of Transportation	REL	Recommended Exposure Limit
EC50	Effective Concentration, 50 %	RM	Reference Material
EINECS	European Inventory of Existing Commercial Chemical Substances	RQ	Reportable Quantity
EPCRA	Emergency Planning and Community Right-to-Know Act	RTECS	Registry of Toxic Effects of Chemical Substances
IARC	International Agency for Research on Cancer	SARA	Superfund Amendments and Reauthorization Act
IATA	International Air Transport Association	SCBA	Self-Contained Breathing Apparatus
IDLH	Immediately Dangerous to Life and Health	SRM	Standard Reference Material
LC50	Lethal Concentration, 50 %	STEL	Short Term Exposure Limit
LD50	Lethal Dose, 50 %	TLV	Threshold Limit Value
LEL	Lower Explosive Limit	TPQ	Threshold Planning Quantity
MSDS	Material Safety Data Sheet	TSCA	Toxic Substances Control Act
NIOSH	National Institute for Occupational Safety and Health	TWA	Time Weighted Average
NIST	National Institute of Standards and Technology	UEL	Upper Explosive Limit
n.o.s.	Not Otherwise Specified	WHMIS	Workplace Hazardous Materials Information System