

# MATERIAL SAFETY DATA SHEET

SRM Supplier: National Institute of Standards and Technology  
Standard Reference Materials Program  
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Gaithersburg, Maryland 20899

SRM Number: 3137  
MSDS Number: 3137  
SRM Name: Niobium Standard Solution  
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## SECTION I. MATERIAL IDENTIFICATION

**Material Name:** Niobium Standard Solution

**Description:** SRM 3137 is a 50 mL single element solution prepared gravimetrically to contain a nominal 10 mg/g of niobium with approximate nitric acid and hydrofluoric acid combined volume fractions of 10 % and 2 %, respectively.

**Other Designations:** Niobium\* in Nitric Acid (aqua fortis; hydrogen nitrate; azotic acid; engraver's acid)/Hydrofluoric Acid (hydrogen fluoride; fluorhydric acid) Standard Solution

Name	Chemical Formula	CAS Registry Number
Nitric Acid	HNO <sub>3</sub>	7697-37-2
Hydrofluoric Acid	HF	7664-39-3
Niobium	Nb	7440-03-1

**DOT Classification:** Corrosive Liquid, Toxic  
N.O.S. (Nitric Acid and Hydrofluoric Acid) UN2922

**Manufacturer/Supplier:** It is available from a number of suppliers.

\*The addition of niobium to hydrofluoric acid and nitric acid, along with other intermediate chemical reactions, forms niobium compounds which will precipitate upon evaporation or drying of the solution.

## SECTION II. HAZARDOUS INGREDIENTS

Hazardous Components	Nominal Concentration (%)	Exposure Limits and Toxicity Data
Nitric Acid	10	ACGIH TLV-TWA: 2 mg/kg or 5 mg/m <sup>3</sup>
		OSHA TLV-TWA: 2 mg/kg or 5 mg/m <sup>3</sup>
		Human, Oral: LD <sub>LO</sub> : 430 mg/kg
Hydrofluoric Acid	2	ACGIH Ceiling: 3 mg/kg or 2.5 mg/m <sup>3</sup>
		OSHA TLV-TWA: 3 mg/kg or 2.5 mg/m <sup>3</sup>
		Man, Oral: TD <sub>LO</sub> : 143 mg/kg
		Human, Inhalation: LC <sub>LO</sub> : 50 mg/kg/30 min
		Man, Inhalation: TC <sub>LO</sub> : 100 mg/m <sup>3</sup> /5 min
Niobium	1	No TLV-TWA established

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**SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS**

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<b>Nitric Acid</b>	<b>Hydrofluoric Acid</b>	<b>Niobium</b>
<b>Appearance and Odor:</b> a colorless to slightly yellow liquid that darkens to a brownish color upon aging and exposure to light; irritating, pungent odor	<b>Appearance and Odor:</b> a colorless, fuming liquid; strong, irritating, pungent odor	<b>Appearance and Odor:</b> Gray, lustrous powder
<b>Relative Molecular Mass:</b> 63.02	<b>Relative Molecular Mass:</b> 20.01	<b>Relative Atomic Mass:</b> 92.91
<b>Density:</b> 1.0543 (10 % nitric acid)	<b>Density:</b> 0.987 to 0.991	<b>Density:</b> 8.57
<b>Solubility in Water:</b> soluble	<b>Solubility in Water:</b> soluble	<b>Solubility in Water:</b> insoluble
<b>Solvent Solubility:</b> decomposes in alcohol	<b>Solvent Solubility:</b> soluble in alcohol, benzene, toluene, <i>m</i> -xylene, and tetralin	<b>Solvent Solubility:</b> fused alkali, nitric acid/hydrofluoric acid mixtures, hot hydrochloric acid, hot sulfuric acid, and hot phosphoric acid

**NOTE:** The physical and chemical data provided are for the pure components. Physical and chemical data for this niobium/hydrofluoric acid/nitric acid solution do not exist. The actual behavior of the solution may differ from the individual components.

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**SECTION IV. FIRE AND EXPLOSION HAZARD DATA**

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**Flash Point:** Not applicable

**Method Used:** Not applicable

**Autoignition Temperature:** Not applicable

**Flammability Limits in Air (Volume %):**

**UPPER:** Not applicable

**LOWER:** Not applicable

**Unusual Fire and Explosion Hazards:** Although nitric acid does not burn, it is a powerful oxidizing agent that can react with combustible materials to cause fires. Hydrofluoric acid is a negligible fire hazard when exposed to heat and/or flames. Hydrofluoric acid may ignite or explode on contact with combustible materials.

**Extinguishing Media:** Use extinguishing media that is appropriate to the surrounding fire. Use a water spray to dilute nitric acid and to absorb liberated oxides of nitrogen.

**Special Fire Procedures:** Fire fighters should wear a self-contained breathing apparatus (SCBA) with a full face piece in the pressure demand or positive mode and other protective clothing.

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**SECTION V. REACTIVITY DATA**

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**Stability:**          X   Stable        \_\_\_\_\_ Unstable

**Conditions to Avoid:** Avoid heat and contact with combustible and other incompatible materials.

**Incompatibility (Materials to Avoid):** Avoid contact with acids, bases, amines, halogens, halo carbons, cyanides, metals, metal oxides, metal salts, metal carbides, peroxides, oxidizing materials, and reducing agents.

See Section IV: *Unusual Fire and Explosion Hazards*



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

**Inhalation:** If inhaled, move the victim to fresh air. If breathing is difficult, give oxygen; if the victim is not breathing, give artificial respiration. Obtain medical assistance if necessary.

**Ingestion:** If ingestion occurs, wash out mouth with water. **DO NOT** induce vomiting. Obtain medical assistance immediately.

**TARGET ORGAN(S) OF ATTACK:**      **Nitric Acid:** skin, teeth, eyes, and upper respiratory tract  
   **Hydrofluoric Acid:** skin and skeletal system  
   **Niobium:** lungs

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## SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

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**Steps to be Taken in Case Material Is Released or Spilled:** Notify safety personnel of spills. Surfaces contaminated with spills should be covered with soda ash or sodium bicarbonate to neutralize the acid. Place the neutralized material into containers suitable for eventual disposal, reclamation, or destruction.

**Waste Disposal:** Follow all federal, state, and local laws governing disposal.

**Handling and Storage:** Provide general and local explosion proof ventilation systems to maintain airborne concentrations below the TLV. Provide approved respiratory apparatus for nonroutine or emergency use. Use an approved filter and vapor respirator when the vapor or mist concentrations are high. Wear gloves and chemical safety glasses where contact with the liquid or high vapor concentrations may occur. An eye wash station and washing facilities should be readily available near handling and use areas. Wash exposed skin areas thoroughly after handling.

**NOTE:** Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them. **DO NOT** wear contact lenses in the laboratory.

Store this material at room temperature.

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## SECTION VIII. SOURCE DATA/OTHER COMMENTS

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**Sources:** MDL Information Systems, Inc., MSDS *Nitric Acid*, 16 September 1999.  
MDL Information Systems, Inc., MSDS *Hydrofluoric Acid*, 16 September 1999.  
MDL Information Systems, Inc., MSDS *Niobium*, 16 September 1999  
The Merck Index, 11th Ed., 1989.  
The Sigma Aldrich Library of Chemical Safety Data, Ed. II, 1988.

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