

MATERIAL SAFETY DATA SHEET

SRM Supplier: National Institute of Standards and Technology
Standard Reference Materials Program
Bldg. 202 Rm. 211
Gaithersburg, Maryland 20899

SRM Number: 3106
MSDS Number: 3106
SRM Name: Bismuth Standard Solution
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SECTION I. MATERIAL IDENTIFICATION

Material Name: Bismuth Standard Solution

Description: SRM 3106 is a single element solution prepared gravimetrically to contain a nominal 10 mg/mL of bismuth with a nitric acid volume fraction of 10 %.

Other Designations: Bismuth in Nitric Acid (aqua fortis; hydrogen nitrate; azotic acid; engravers acid); *Bismuth Nitrate (bismuth (III) nitrate; bismuth trinitrate) in Spectrometric Solution

Name	Chemical Formula	CAS Registry Number
Nitric Acid	HNO ₃	7697-37-2
Bismuth Nitrate	Bi(NO ₃) ₃	10361-44-1
Bismuth	Bi	7440-69-9

DOT Classification: Nitric Acid Solution, UN2031

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

*The addition of bismuth to nitric acid, along with other intermediate chemical reactions, forms bismuth nitrate 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 ppm or 5 mg/m ³
		OSHA TLV-TWA: 2 ppm or 5 mg/m ³
		Human, Oral: LD _{LO} : 430 mg/kg
Bismuth Nitrate	1.9	No ACGIH TLV-TWA established
		Mouse, Intravenous: LD _{LO} : 21 mg/kg
Bismuth	1	No ACGIH TLV-TWA established
		Man, Unreported Route: LD _{LO} : 221 mg/kg
		Oral, Rat: LD ₅₀ : 5 g/kg

SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS

Nitric Acid	Bismuth Nitrate	Bismuth
Appearance and Odor: a white to slightly yellow liquid that darkens to a brownish color upon aging and exposure to light; pungent odor	Appearance and Odor: crystals	Appearance and Odor: a white to red colored solid; odorless
Relative Molecular Mass: 63.02	Relative Molecular Mass: 395.01	Relative Atomic Mass: 208.98
Density: 1.05 (10 % nitric acid)	Density: 4.928	Density: 9.8
Solubility in Water: soluble	Solubility in Water: insoluble	Solubility in Water: insoluble
Solvent Solubility: decomposes in alcohol	Solvent Solubility: soluble in acids	Solvent Solubility: soluble in sulfuric and nitric acids

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

SECTION IV. FIRE AND EXPLOSION HAZARD DATA

Flash Point: N/A

Method Used: N/A

Autoignition Temperature: N/A

Flammability Limits in Air (Volume %): **UPPER:** N/A
 LOWER: N/A

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. Bismuth nitrate is a strong oxidizer that may ignite on contact with combustible materials. Bismuth is a negligible fire and explosion hazard.

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.

SECTION V. REACTIVITY DATA

Stability: X Stable _____ Unstable

Conditions to Avoid: Avoid contact with incompatible materials.

Incompatibility (Materials to Avoid): Keep nitric acid away from organic materials, plastics, rubber, and some forms of coatings. Nitric acid is incompatible with chlorine and metal ferrocyanide. Bismuth nitrate should be kept from esters, metal salts, and reductants.

See Section IV: *Unusual Fire and Explosion Hazards*

Hazardous Decomposition or Byproducts: Hazardous decomposition of nitric acid and/or bismuth nitrate can produce various nitrogen oxides, including nitric oxide (NO), nitrogen dioxide (NO₂), nitrous oxide (N₂O), as well as nitric acid mist or vapor. Thermal decomposition of bismuth may release toxic and/or hazardous gases.

Hazardous Polymerization: _____ Will Occur X Will Not Occur

SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

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.

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. It must be protected from moisture.

SECTION VIII. SOURCE DATA/OTHER COMMENTS

Sources: MDL Information Systems, Inc., MSDS *Nitric Acid*, 16 September 1999.
MDL Information Systems, Inc., MSDS *Bismuth*, 2 June 1999.
MDL Information Systems, Inc., MSDS *Bismuth Nitrate*, 7 December 1999
The Merck Index, 11th Ed., 1989.
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 on the NIST Certificate of Analysis.