MATERIAL SAFETY DATA SHEET

SRM Supplier: National Institute of Standards and Technology
Standard Reference Materials Program
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SRM Number: 3116a
MSDS Number: 3116a
SRM Name: Erbium Standard Solution
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SECTION I. MATERIAL IDENTIFICATION

Material Name: Erbium Standard Solution

Description: SRM 3116a is a single element solution prepared gravimetrically to contain a nominal 10 mg/mL (or 10 mg/g) of erbium with a nitric acid volume fraction of 10 %.

Other Designations: **Erbium** in **Nitric Acid** (aqua fortis; hydrogen nitrate; azotic acid; engravers acid); **Erbium Nitrate*** (erbium nitrate pentahydrate; erbium trinitrate pentahydrate; erbium (III) nitrate pentahydrate) in **Standard Solution**

Name	Chemical Formula	CAS Registry Number
Nitric Acid	HNO_3	7697-37-2
Erbium Nitrate	$Er(NO_3)_3 \bullet 5H_2O$	10031-51-3
Erbium	Er	7440-52-0

DOT Classification: Nitric Acid Solution, UN2031

Manufacturer/Supplier: Available from a number of suppliers

* The addition of erbium to nitric acid, along with other intermediate chemical reactions, forms erbium 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 mg/kg or 5 mg/m^3
		OSHA TLV-TWA: 2 mg/kg or 5 mg/m^3
		Human, Oral: LD_{LO}: 430 mg/kg
Erbium Nitrate	2.7	No occupational exposure limits established*
		Rat, Intravenous: LD_{50}: 30 mg/kg
		Rat, Intraperitoneal: LD_{LO}: 230 mg/kg
		Mouse, Intraperitoneal: LD_{50}: 225 mg/kg
Erbium	1.0	No occupational exposure limits established*

*The suggested ACGIH TLV-TWA for particulates not otherwise regulated is: 10 mg/m^3 for total dust.

SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS

Nitric Acid	Erbium Nitrate	Erbium
Appearance and Odor: white to slightly yellow liquid that darkens to a brownish color upon aging and exposure to light; a strong, pungent odor	**Appearance and Odor:** large, reddish crystals; odorless	**Appearance and Odor:** soft, bright, gray metal; odorless
Relative Molecular Mass: 63.02	**Relative Molecular Mass:** 443.35	**Relative Atomic Mass:** 167.26
Density: 1.0543 (10 % nitric acid)	**Density:** not available	**Density:** 9.1
Solubility in Water: soluble	**Solubility in Water:** soluble	**Solubility in Water:** insoluble
Solvent Solubility: decomposes in alcohol	**Solvent Solubility:** soluble in acetone, alcohol, and ether	**Solvent Solubility:** soluble in acids

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

SECTION IV. FIRE AND EXPLOSION HAZARD DATA

Flash Point: not available **Method Used:** not available **Autoignition Temperature:** not available

Flammability Limits in Air (Volume %): **UPPER:** not available
LOWER: not available

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.

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 heat and contact with combustible and other 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 and ferrocyanide. Erbium nitrate is incompatible with metals, combustible materials, metal salts, acids, and reducing agents.

See Section IV: *Unusual Fire and Explosion Hazards*

Hazardous Decomposition or Byproducts: Hazardous decomposition of nitric acid can produce various nitrogen oxides, including nitric oxide (NO), nitrogen dioxide (NO_2), nitrous oxide (N_2O), as well as nitric acid mist or vapor. Thermal decomposition of erbium nitrate produces oxides of nitrogen and erbium.

Hazardous Polymerization: _____ **Will Occur** **X** **Will Not Occur**

SECTION VI. HEALTH HAZARD DATA

Route of Entry: **X** **Inhalation** **X** **Skin** **X** **Ingestion**

Health Hazards (Acute and Chronic): Nitric Acid: Nitric acid may be fatal if inhaled, swallowed, or absorbed through the skin. This material causes burns and is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin. Inhalation may be fatal as a result of spasm, inflammation, and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.

Erbium and Erbium Nitrate: Erbium and erbium nitrate may be harmful by inhalation, ingestion, or skin absorption. Exposure may cause irritation to skin, eyes, mucous membranes, and upper respiratory tract. Some rare earth elements may cause lung granulomas. Inhalation may cause itching, sensitivity to heat, and an increased awareness of odor and taste. Application to abraded skin may cause extensive injury resulting in epilation and scar formation. The oral toxicity of the rare earth metals and salts is low due to poor gastrointestinal absorption. Rare earth compounds may effect the blood's ability to clot.

Medical Conditions Generally Aggravated by Exposure: Nitric Acid: eye disorders, skin disorders, respiratory disorders, and allergies

Listed as a Carcinogen/Potential Carcinogen:

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens		X
In the International Agency for Research on Cancer (IARC) Monographs		X
By the Occupational Safety and Health Administration (OSHA)		X

EMERGENCY AND FIRST AID PROCEDURES:

Skin Contact: Remove contaminated shoes and clothing. Rinse affected area with large amounts of water followed by washing the area with soap and water. Watch for chemical irritations and treat them accordingly. 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.

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.

NOTE (Nitric Acid): Wash affected skin areas with 5 % solution of sodium bicarbonate ($NaHCO_3$). If ingested, the risk versus the benefit of the passage of a naso-gastric tube is debatable. Activated charcoal is of no value. **DO NOT** give the exposed person bicarbonate to neutralize the material.

TARGET ORGAN(S) OF ATTACK: **Nitric Acid:** skin, teeth, eyes, and upper respiratory tract
Erbium and Erbium Nitrate: skin, eyes, mucous membranes, upper respiratory tract, central nervous system, blood, and kidneys.

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 in its original container.

SECTION VIII. SOURCE DATA/OTHER COMMENTS

Sources:
MDL Information Systems, Inc., MSDS *Erbium*, 7 December 1999.
MDL Information Systems, Inc., MSDS *Erbium Nitrate*, 7 December 1999.
MDL Information Systems, Inc., MSDS *Nitric Acid*, 9 June 1998.
The Merck Index, 11th Ed., 1989.
The Sigma Aldrich Library of Chemical Safety Data, Ed. II, 1988.