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MATERIAL
SAFETY DATA
SHEET

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|---|---|
| **PRODUCT NAME**<br>Nitrogen Trifluoride | **CAS #** 7783-54-2 |
| **TRADE NAME AND SYNONYMS**<br>Nitrogen trifluoride (D.O.T.) | **DOT I.D. No.:** UN 2451 |
| **CHEMICAL NAME AND SYNONYMS**<br>Nitrogen Trifluoride | **DOT Hazard Class:** Division 2.2 |
| **ISSUE DATES AND REVISIONS**<br>Revised: September 27, 2010 | **Formula** $NF_3$<br>**Chemical Family:** Inorganic Flouride |

## HEALTH HAZARD DATA

**TIME WEIGHTED AVERAGE EXPOSURE LIMIT**
TWA = 10 Molar PPM (ACGIH 1994-1995). OSHA 1993 PEL (8 Hr. TWA) = 10 Molar PPM.

**SYMPTOMS OF EXPOSURE**
Symptoms include headache, weakness, dizziness, confusion and other manifestations associated with a reduced oxygen supply in the blood.

No hazard from skin contact has been recognized.

**TOXICOLOGICAL PROPERTIES**
Inhalation: Monkey LC50:10,000 ppm (1%)

The toxicity of nitrogen trifluoride is related to its capacity to form methemoglobin, a modified form of hemoglobin incapable of transporting oxygen, and its ability to destroy red blood cells (hemolysis). Upon cessation of exposure, methemoglobin spontaneously reverts to hemoglobin. However, at high levels of conversion, therapeutic intervention may be indicated (oxygen, methylene blue, exchange transfusion). The occurence of hemolysis requires careful monitoring for degree of anemia and the potential for impaired kidney function. No hazard from skin contact is recognized.

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**RECOMMENDED FIRST AID TREATMENT**
PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO NITROGEN TRIFLUORIDE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS.

An individual exposed to nitrogen trifluoride should be removed from the contaminated area as quickly as possible. If there is evidence of chemical cyanosis, administer oxygen. Headache or other symptoms may also be alleviated by oxygen. Seek medical assistance promptly.

Note to the Physician: Human data on nitrogen trifluoride are limited. Methemoglobin production and hemolysis are nonspecific effects which require monitoring and appropriate supportive measures. Close observation for pulmonaryand renal impairment is indicated.

## HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Nitrogen trifluoride reacts similar to oxygen up to temperatures of 660ºF (350ºC) in that it is relatively inert towards most materials. However it may form flammable or explosive mixtures with gaseous fuels. Above 1830ºF (1000ºC) it should ignite most materials it contacts.

## PHYSICAL DATA

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| **BOILING POINT**<br>-200.2ºF (-129ºC) | **LIQUID DENSITY AT BOILING POINT**<br>95.7 lb/ft$^3$ (1533 kg/m$^3$) |
| **VAPOR PRESSURE**<br>@ 70ºF (21.1ºC) Above the critical temp. of -38.65ºF (-39.25ºC) | **GAS DENSITY AT 700F. 1 atm**<br>0.186 lb/ft$^3$ (2.98 kg/m$^3$) |
| **SOLUBILITY IN WATER**<br>Insoluble | **FREEZING POINT**<br>-340.2ºF (-206.8ºC) |
| **EVAPORATION RATE**<br>N/A (Gas) | **SPECIFIC GRAVITY (AIR=1)**<br>@ 70ºF (21.1ºC) = 2.48 |
| **APPEARANCE AND ODOR** Colorless, odorless gas | |

## FIRE AND EXPLOSION HAZARD DATA

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| **FLASH POINT (Method used)**<br>N/A | **AUTO IGNITION TEMPERATURE**<br>N/A | **FLAMMABLE LIMITS % BY VOLUME (See Page 4)**<br>LEL N/A UEL N/A |
| **EXTINGUISHING MEDIA**<br>Carbon dioxide may be used for small fires with $NF_3$ as the oxidizer. | | **ELECTRICAL CLASSIFICATION**<br>Nonhazardous |

**SPECIAL FIRE FIGHTING PROCEDURES**

Fires with nitrogen trifluoride as the oxidizer can best be extinguished by shutting off the source of nitrogen trifluoride.

**UNUSUAL FIRE AND EXPLOSION HAZARDS**

Fires supported by nitrogen trifluoride as the oxidizer may generate toxic and reactive fluoride compounds.

## REACTIVITY DATA

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| **STABILITY**<br>Unstable | | **CONDITIONS TO AVOID**<br>Open flames and high [> 500ºF (260º•C)] temperatures. |
| Stable | X | |

**INCOMPATIBILITY (Materials to avoid)** Plastics, hydrocarbons and other organic materials

**HAZARDOUS DECOMPOSITION PRODUCTS** Tetrafluorohydrazine ($N_2F_4$) and active fluoride radicals

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| **HAZARDOUS POLYMERIZATION**<br>May Occur | | **CONDITIONS TO AVOID**<br>None |
| Will Not Occur | X | |

## SPILL OR LEAK PROCEDURES

**STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED**

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact your closest supplier location or call the emergency telephone number listed herein.

**WASTE DISPOSAL METHOD**

Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to your supplier for proper disposal. For emergency disposal, contact your closest supplier location or call the emergency telephone number listed herein.

## SPECIAL PROTECTION INFORMATION

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| **RESPIRATORY PROTECTION (Specify type)** Positive pressure air line with mask or self-contained breathing apparatus shou ld be available for emergency use. | | |
| **VENTILATION** Hood with forced ventilation | **LOCAL EXHAUST** To prevent accumulation above the TWA | **SPECIAL** N/A |
| | **MECHANICAL (Gen.)** N/A | **OTHER** N/A |
| **PROTECTIVE GLOVES** Plastic or Rubber | | |
| **EYE PROTECTION** Safety goggles or glasses | | |
| **OTHER PROTECTIVE EQUIPMENT** Safety shoes | | |

## SPECIAL PRECAUTIONS*

**SPECIAL LABELING INFORMATION**

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| DOT Shipping Name: | Nitrogen trifluoride | DOT Hazard Class: | Division 2.2 |
| DOT Shipping Label: | Nonflammable Gas, Oxidizer | I.D. No.: | UN 2451 |

**SPECIAL HANDLING RECOMMENDATIONS**

Use only in well-ventilated areas. Valve protection caps and valve outlet threaded plugs must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3,000 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations consult Compressed Gas Association Pamphlet P-1.

**SPECIAL STORAGE RECOMMENDATIONS**

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 125ºF (52ºC). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a “first in - first out” inventory system to prevent full cylinders being stored for excessive periods of time.

For additional storage recommendations consult Compressed Gas Association Pamphlet P-1.

**SPECIAL PACKAGING RECOMMENDATIONS**

Most metals are satisfactory for handling nitrogen trifluoride up to temperatures of approximately 160ºF (70ºC). Nickel and Monel® are recommended for higher temperatures. Wetted surfaces should be passivated with an “active” fluorine compound to establish a metal fluoride coating as additional protection. Teflon® and Kel-F® are the preferred gasket materials.

**OTHER RECOMMENDATIONS OR PRECAUTIONS**

Keep equipment scrupulously dry. Many of the metal fluorides are water soluble so that the passive film corrosion protection may be destroyed if wetted with water. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

(Continued on Page 4)

*Various Government Agencies (i.e. Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance.

HEALTH HAZARD DATA

TOXICOLOGICAL PROPERTIES: (Continued)

The results of the Ames Tests conducted on NF3 are reported as negative, without metabolic activation; weakly positive, with metabolic activation. Examination of these results and those of previously conducted tests suggest that the activity shown is attributable to $N_2F_2$, a recognized contaminant of $NF_3$.

Nitrogen trifluoride is not listed in the IARC, NTP or by OSHA as a carcinogen or potential carcinogen.

Persons in ill health where such illness would be aggravated by exposure to nitrogen trifluoride should not be allowed to work with or handle this product.

SPECIAL PRECAUTIONS

OTHER RECOMMENDATIONS OR PRECAUTIONS: (Continued)

Always secure cylinders in an upright position before transporting them. NEVER transport cylinders in trunks of vehicles, enclosed vans, truck cabs or in passenger compartments. Transport cylinders secured in open flatbed or in open pick-up type vehicles.

Reporting under SARA, Title III, Section 313 not required.

NFPA 704 No. for nitrogen trifluoride = 2 O O OX