Material Safety Data Sheet

Version 2.8 MSDS Number 300000000103
Revision Date 08/22/2007 Print Date 07/27/2008

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Nitrogen Trifluoride
Chemical formula	:	NF3
Synonyms	:	Nitrogen trifluoride
Product Use Description	:	General Industrial
Company	:	Air Products and Chemicals, Inc 7201 Hamilton Blvd. Allentown, PA 18195-1501 GST No. 123600835 RT0001 QST No. 102753981 TQ0001
Telephone	:	1-610-481-4911 Corporate 1-800-345-3148 Chemicals Cust Serv 1-800-752-1597 Gases/Electronics Cust Serv
Emergency telephone number	:	800-523-9374 USA 01-610-481-7711 International

2. COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS Number	Concentration (Volume)
Nitrogen trifluoride	7783-54-2	100 %

Concentration is nominal. For the exact product composition, please refer to Air Products technical specifications.

3. HAZARDS IDENTIFICATION

Emergency Overview

Avoid breathing gas.
High pressure, oxidizing gas.
Vigorously accelerates combustion.
Keep oil, grease, and combustibles away.
May react violently with combustible materials.

Potential Health Effects

Inhalation	:	Exposure to NF3 can lead to the destruction of red blood cells. Acute or repeated exposures can reduce the blood's ability to transport oxygen.
Eye contact	:	May cause eye irritation. No adverse effect.
Skin contact	:	No adverse effect.

Ingestion : Ingestion is not considered a potential route of exposure.

Exposure Guidelines

Primary Routes of Entry : Inhalation

Target Organs : Blood.
May cause kidney and liver damage.

Symptoms : Cyanosis. Weakness, dizziness, and confusion are some of the effects associated with reduction of the oxygen supply in blood.

Aggravated Medical Condition

None known.

4. FIRST AID MEASURES

General advice : Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

Eye contact : Seek medical advice.

Skin contact : Wash with water and soap as a precaution.

Ingestion : Ingestion is not considered a potential route of exposure.

Inhalation : Move to fresh air. If breathing has stopped or is labored, give assisted respirations. Supplemental oxygen may be indicated. If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation immediately.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media : All known extinguishing media can be used.

Specific hazards : Exposure to high temperatures may yield toxic by-products which may be corrosive in the presence of moisture. Most cylinders are designed to vent contents when exposed to elevated temperatures.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions : Evacuate personnel to safe areas. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Ventilate the area.

Environmental precautions : Do not discharge into any place where its accumulation could be dangerous. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up : Ventilate the area.

Additional advice : If possible, stop flow of product. Increase ventilation to the release area and

monitor concentrations. If leak is from cylinder or cylinder valve, call the Air Products emergency telephone number. If the leak is in the user's system, close the cylinder valve, safely vent the pressure, and purge with an inert gas before attempting repairs.

7. HANDLING AND STORAGE

Handling

Only experienced and properly instructed persons should handle compressed gases. Protect cylinders from physical damage; do not drag, roll, slide or drop. Do not allow storage area temperature to exceed 50°C (122℉). Before using the product, determine its id entity by reading the label. Know and understand the properties and hazards of the product before use. When doubt exists as to the correct handling procedure for a particular gas, contact the supplier. Do not remove or deface labels provided by the supplier for the identification of the cylinder contents. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Leave valve protection caps in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use. Use an adjustable strap wrench to remove over-tight or rusted caps. Before connecting the container, check the complete gas system for suitability, particularly for pressure rating and materials. Before connecting the container for use, ensure that back feed from the system into the container is prevented. Ensure the complete gas system is compatible for pressure rating and materials of construction. Ensure the complete gas system has been checked for leaks before use. Employ suitable pressure regulating devices on all containers when the gas is being emitted to systems with lower pressure rating than that of the container. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing a leak to occur. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Close container valve after each use and when empty, even if still connected to equipment. Never attempt to repair or modify container valves or safety relief devices. Damaged valves should be reported immediately to the supplier. Do not use containers as rollers or supports or for any other purpose than to contain the gas as supplied. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit. Do not smoke while handling product or cylinders. Never re-compress a gas or a gas mixture without first consulting the supplier. Never attempt to transfer gases from one cylinder/container to another. Always use backflow protective device in piping. When returning cylinder install valve outlet cap or plug leak tight. Never permit oil, grease, or other readily combustible substances to come into contact with valves or containers containing oxygen or other oxidants. Do not use rapidly opening valves (e.g. ball valves). Open valve slowly to avoid pressure shock. Never pressurize the entire system at once. Use only with equipment cleaned for oxygen service and rated for cylinder pressure. Never use direct flame or electrical heating devices to raise the pressure of a container. Containers should not be subjected to temperatures above 50℃ (122℉). Prolo nged periods of cold temperature below -30℃ (-20℉) should be avoided.

Storage

Containers should be stored in a purpose build compound which should be well ventilated, preferably in the open air. Full containers should be stored so that oldest stock is used first. Stored containers should be periodically checked for general condition and leakage. Observe all regulations and local requirements regarding storage of containers. Protect containers stored in the open against rusting and extremes of weather. Containers should not be stored in conditions likely to encourage corrosion. Containers should be stored in the vertical position and properly secured to prevent toppling. The container valves should be tightly closed and where appropriate valve outlets should be capped or plugged. Container valve guards or caps should be in place. Keep containers tightly closed in a cool, well-ventilated place. Store containers in location free from fire risk and away from sources of heat and ignition. Full and empty cylinders should be segregated. Do not allow storage temperature to exceed 50℃ (122℉). Display "No Smoking or Open Flames" signs in the storage areas. Return empty containers in a timely manner. Flammable storage areas should be separated from oxygen and other oxidizers by a minimum distance of 20 ft. (6.1 m.) or by a barrier of non-combustible material at least 5 ft. (1.5 m.) high, having a fire resistance rating of at least 1/2 hour.

Technical measures/Precautions

Containers should be segregated in the storage area according to the various categories (e.g. flammable, toxic, etc.) and in accordance with local regulations.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Personal protective equipment

Respiratory protection	:	Users of breathing apparatus must be trained.
Hand protection	:	Sturdy work gloves are recommended for handling cylinders. The breakthrough time of the selected glove(s) must be greater than the intended use period.
Eye protection	:	Safety glasses recommended when handling cylinders.
Skin and body protection	:	Safety shoes are recommended when handling cylinders.
Special instructions for protection and hygiene	:	Ensure adequate ventilation, especially in confined areas. Gloves must be clean and free of oil and grease.

Exposure limit(s)

Nitrogen trifluoride	Time Weighted Average (TWA): ACGIH	10 ppm	-
Nitrogen trifluoride	Recommended exposure limit (REL): NIOSH	10 ppm	29 mg/m3
Nitrogen trifluoride	PEL: OSHA Z1	10 ppm	29 mg/m3
Nitrogen trifluoride	Time Weighted Average (TWA): OSHA Z1A	10 ppm	29 mg/m3
Nitrogen trifluoride	Time Weighted Average (TWA) Permissible Exposure Limit (PEL): US CA OEL	10 ppm	29 mg/m3
Nitrogen trifluoride	Time Weighted Average (TWA): OSHA Z2	-	2.5 mg/m3

9. PHYSICAL AND CHEMICAL PROPERTIES

Form	:	Compressed gas.
Color	:	Colorless gas
Odor	:	Odorless.
Molecular Weight	:	71 g/mol
Relative vapor density	:	2.4 (air = 1)
Relative density	:	1.5 (water = 1)
Vapor pressure	:	Not applicable.
Density	:	0.187 lb/ft3 (0.0030 g/cm3) at 70 ℉ (21 ℃) Note: (as vapor)

Specific Volume	:	5.43 ft3/lb (0.3390 m3/kg) at 70 ℉ (21 ℃)
Boiling point/range	:	-200 ℉ (-129 ℃)
Critical temperature	:	-38 ℉ (-39 ℃)
Melting point/range	:	-341 ℉ (-207 ℃)
Autoignition temperature	:	Not applicable.
Water solubility	:	0.061 g/l

10. STABILITY AND REACTIVITY

Stability	:	Stable under normal conditions.
Conditions to avoid	:	Heat.
Materials to avoid	:	Flammable materials. Organic materials. Avoid oil, grease and all other combustible materials.
Hazardous decomposition products	:	High temperature disassociation can produce very reactive fluorine species that may react with surrounding material to form additional toxic fluoride compounds.

11. TOXICOLOGICAL INFORMATION

Acute Health Hazard

Ingestion	:	No data is available on the product itself.
Inhalation	:	LC50 (1 h) : 6700 ppm Species : Rat. Rats exposed to 1000 ppm of Nitrogen Trifluoride for 4 hours exhibited methemoglobinemia (cyanosis). These effects were not observed when rats were exposed to 3000 ppm for 10 minutes.
Skin.	:	No data is available on the product itself.

Chronic Health Hazard

In a repeated dose study rats were exposed to NF3 concentrations of 0, 5, 20, 50, and 100 ppm, 6 hrs per day, 5 days per week for 13 weeks. Rats in the 100 ppm group (both sexes) and in the 50 ppm group (females) exhibited adverse blood effects indicative of hemolytic anemia. Mild to moderate red blood cell effects and increased methemoglobin were observed in rats exposed to >= 20 ppm. Organ weight, macroscopic and/or microscopic changes were noted in the liver, kidneys, spleen and bone marrow of the rats exposed to >= 5 ppm. These pathological effects were considered secondary responses to hemolytic anemia. Nitrogen Trifluoride (NF3) was tested at various times to determine its mutagenic potential. The current status of knowledge is as follows: NF3 sometimes produces a very weak mutagenic response in bacterial test systems (some of the Ames Salmonella strains and in one strain of E. coli) both with and without metabolic activation. The concentrations which produced

the sometimes positive responses vary from 0.5% (5000 ppm) to 5% (50,000 ppm). The test results are often equivocal (e.g. the same sample gives negative or borderline positive responses at different times), which is a characteristic of weak mutagens. NF3 was found to be non-mutagenic in the mammalian cell (mouse lymphoma) test system when the cells were exposed to NF3 concentrations of up to 10% (100,000 ppm) both with and without metabolic activation. NF3 was not mutagenic in the mouse micronucleus test when whole animals were exposed to 2500 ppm of NF3 by inhalation.

12. ECOLOGICAL INFORMATION

Ecotoxicity effects

Aquatic toxicity	:	No data is available on the product itself.
Toxicity to other organisms	:	No data available.

Persistence and degradability

Mobility	:	No data available.
Bioaccumulation	:	No data is available on the product itself.

Further information

This product has no known eco-toxicological effects.

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products	:	Return unused product in orginal cylinder to supplier. Contact supplier if guidance is required.
Contaminated packaging	:	Return cylinder to supplier.

14. TRANSPORT INFORMATION

DOT

Proper shipping name	:	Nitrogen trifluoride
Class	:	2.2 (5.1)
UN/ID No.	:	UN2451

IATA

Proper shipping name	:	Nitrogen trifluoride
Class	:	2.2 (5.1)
UN/ID No.	:	UN2451

IMDG

Proper shipping name	:	NITROGEN TRIFLUORIDE
Class	:	2.2 (5.1)
UN/ID No.	:	UN2451

TDG

Proper shipping name	:	NITROGEN TRIFLUORIDE, COMPRESSED
Class	:	2.2 (5.1)
UN/ID No.	:	UN2451

Further Information
Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Note: If regulated as a hazardous material (Dangerous Good) in transportation, please refer to shipping papers or contact Air Products for complete shipping description information.

15. REGULATORY INFORMATION

OSHA Hazard Communication Standard (29 CFR 1910.1200) Hazard Class(es)
Oxidizer. Compressed Gas.

Country	Regulatory list	Notification
USA	TSCA	Included on Inventory.
EU	EINECS	Included on Inventory.
Canada	DSL	Included on Inventory.
Australia	AICS	Not on Inventory.
Japan	ENCS	Included on Inventory.
South Korea	ECL	Included on Inventory.
China	SEPA	Included on Inventory.
Philippines	PICCS	Included on Inventory.

EPA SARA Title III Section 312 (40 CFR 370) Hazard Classification:
Acute Health Hazard Chronic Health Hazard Fire Hazard. Sudden Release of Pressure Hazard.

Fire Hazard. Sudden Release of Pressure Hazard.

US. California Safe Drinking Water & Toxic Enforcement Act (Proposition 65)
This product does not contain any chemicals known to State of California to cause cancer, birth defects or any other harm.

16. OTHER INFORMATION

NFPA Rating

Health	:	1
Fire	:	0
Instability	:	0
Special	:	OX

HMIS Rating

Health	:	1
Flammability	:	0

Physical hazard	:	3
REVISION NOTES	:	14. TRANSPORT INFORMATION
Prepared by	:	Air Products and Chemicals, Inc. Global EH&S Product Safety Department

For additional information, please visit our Product Stewardship web site at
http://www.airproducts.com/productstewardship/