MATERIAL SAFETY DATA SHEET

1. IDENTIFICATION

MATHESON TRI-GAS, INC.
150 Allen Road Suite 302
Basking Ridge, New Jersey 07920
Information: 1-800-416-2505

Emergency Contact:
CHEMTREC 1-800-424-9300
Calls Originating Outside the US:
703-527-3887 (Collect Calls Accepted)

PRODUCT NAME: NITROGEN TRIFLUORIDE

TRADE NAMES/SYNONYMS:
MTG MSDS 146; NITROGEN FLUORIDE (NF3); PERFLUOROAMMONIA; TRIFLUOROAMINE; TRIFLUOROAMMONIA; TRIFLUORAMINE; TRIFLUORAMMONIA; UN 2451; F3N; MAT16650

CHEMICAL FAMILY: halogens

PRODUCT USE: industrial

RESTRICTIONS ON USE: none known

2. HAZARDS IDENTIFICATION

GHS CLASSIFICATION:
Oxidizing gas, Category 1
Gas under pressure, Liquefied gas
Acute toxicity, Category 4
Specific target organ systemic toxicity following single exposure, Category 1
Specific target organ systemic toxicity following repeated exposure, Category 2

GHS SYMBOL:

GHS SIGNAL WORD: DANGER

GHS HAZARD STATEMENT:
May cause or intensify fire; oxidizer
Contains gas under pressure; may explode if heated
Harmful if inhaled
Causes damage to organs
May cause damage to organs through prolonged or repeated exposure

GHS PRECAUTIONARY STATEMENTS: Do not breathe gas. Do not eat, drink, or smoke when using this product. Keep away from clothing and other combustible materials. Use only outdoors or in a well-ventilated area. Wash thoroughly after handling. Keep reduction valves free from grease and oil. In case of fire, stop leak if safe to do so. IF exposed: Call a POISON CENTER or doctor/physician if you feel unwell. Specific treatment may be needed, see first aid section of Safety Data Sheet. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Store in a well-ventilated place. Protect from sunlight. Store locked up. Keep container tightly closed. Dispose in accordance with all applicable regulations.

EMERGENCY OVERVIEW:
PHYSICAL HAZARDS: Containers may rupture or explode if exposed to heat. Strong oxidizer. Contact with combustible material may cause fire.

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: harmful if inhaled, irritation, nausea, vomiting, difficulty breathing, irregular heartbeat, headache, drowsiness, dizziness, bluish skin color, lung congestion, blood disorders, convulsions, coma
LONG TERM EXPOSURE: blood disorders, kidney damage, liver damage
SKIN CONTACT:
LONG TERM EXPOSURE: no information on significant adverse effects
EYE CONTACT:
LONG TERM EXPOSURE: no information on significant adverse effects
INGESTION:
SHORT TERM EXPOSURE: ingestion of a gas is unlikely
LONG TERM EXPOSURE: ingestion of a gas is unlikely

3. COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENT: NITROGEN TRIFLUORIDE
CAS NUMBER: 7783-54-2
EC NUMBER (EINECS): 232-007-1
PERCENTAGE: 100.0

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

SKIN CONTACT: If frostbite or freezing occur, immediately flush with plenty of lukewarm water (105-115 F; 41-46 C). DO NOT USE HOT WATER. If warm water is not available, gently wrap affected parts in blankets. Get immediate medical attention.

EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: If a large amount is swallowed, get medical attention.

SYMPTOMS/EFFECTS:
ACUTE: cyanosis, blood damage
DELAYED: cyanosis, blood damage, liver damage, kidney damage

ANTIDOTE: methylene blue, intravenous; ascorbic acid, intravenous.

NOTE TO PHYSICIAN: For inhalation, consider oxygen.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Oxidizer. May ignite or explode on contact with combustible materials.

EXTINGUISHING MEDIA: water

Large fires: Flood with water. Apply water from a protected location or from a safe distance.

UNSUITABLE EXTINGUISHING MEDIA: None known.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Flood with water. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Evacuate if fire gets out of control or containers are directly exposed to fire. Evacuation radius: 800 meters (1/2 mile).

FIRE FIGHTING PROTECTIVE EQUIPMENT: Wear full protective fire fighting gear including self contained breathing apparatus (SCBA) for protection against possible exposure.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS:
Wear personal protective clothing and equipment, see Section 8.

EMERGENCY PROCEDURES:
Stop leak if possible without personal risk. Reduce vapors with water spray. Ventilate closed spaces before entering. Keep unnecessary people away, isolate hazard area and deny entry.

ENVIRONMENTAL PRECAUTIONS:
Avoid release to the environment. Keep out of water supplies and sewers.

METHODS AND MATERIALS FOR CONTAINMENT AND CLEANUP:
Stop leak if safe to do so - Prevent entry into waterways, drains, or confined areas. Avoid contact with combustible materials. Eliminate all ignition sources if safe to do so. Ventilate closed spaces before entering. Damaged cylinders should be handled only by specialists.

7. HANDLING AND STORAGE

HANDLING: Do not breathe gas, fumes, vapor, or spray. Wash thoroughly after handling. When using, do not eat, drink or smoke. Subject to handling regulations: U.S. OSHA 29 CFR 1910.119.

STORAGE: Store and handle in accordance with all current regulations and standards. Store in a well-ventilated area. Protect from sunlight. Keep container tightly closed. Store in a secure area. Subject to storage regulations: U.S. OSHA 29 CFR 1910.101. Keep separated from incompatible substances.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

EXPOSURE LIMITS:
NITROGEN TRIFLUORIDE:
10 ppm (29 mg/m3) OSHA TWA
10 ppm ACGIH TWA
10 ppm (29 mg/m3) NIOSH recommended TWA 10 hour(s)

BIOLOGICAL LIMIT VALUES:
NITROGEN TRIFLUORIDE:
Biological limit values for methemoglobin inducers should be used.

ENGINEERING CONTROLS: Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear chemical safety goggles. A faceshield is recommended. For the liquid: Wear splash resistant safety goggles. Contact lenses should not be worn. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing. For the liquid: Wear appropriate protective, cold insulating clothing.

GLOVES: Wear chemical resistant, insulated gloves.

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH: 1000 ppm 250 mg/m3

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.
100 ppm
Any air-purifying half-mask respirator equipped with cartridge(s) providing protection against the compound of concern.
Any supplied-air respirator.
250 ppm
Any supplied-air respirator operated in a continuous-flow mode.
Any powered, air-purifying respirator with cartridge(s) providing protection against this substance.
500 ppm
Any air-purifying respirator with a full facepiece and a canister providing protection against this substance.
Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted canister providing protection against the compound of concern.
Any powered, air-purifying respirator with a tight-fitting facepiece and cartridge(s) providing protection against this substance.
Any supplied-air respirator with a tight-fitting facepiece that is operated in a continuous-flow mode.
Any self-contained breathing apparatus with a full facepiece.
Any supplied-air respirator with a full facepiece.
1000 ppm
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode.
Emergency or planned entry into unknown concentrations or IDLH conditions -
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Escape -
Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted canister providing protection against the compound of concern.
Any appropriate escape-type, self-contained breathing apparatus.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: gas
COLOR: colorless
ODOR: damp, moldy odor
MOLECULAR WEIGHT: 71.00
MOLECULAR FORMULA: F3-N
BOILING POINT: -129 to -120 C
FREEZING POINT: -217 to -207 C
FLASH POINT: Not available
LOWER FLAMMABLE LIMIT: Not available
UPPER FLAMMABLE LIMIT: Not available
AUTOIGNITION: Not available

DECOMPOSITION POINT: Not available
VAPOR PRESSURE: 1500 mmHg @ -119 C
VAPOR DENSITY (air=1): 2.46
SPECIFIC GRAVITY: Not applicable
DENSITY: 2.96 g/L @ 20 C
WATER SOLUBILITY: slightly soluble
PH: Not applicable
VOLATILITY: Not applicable
ODOR THRESHOLD: Not available
EVAPORATION RATE: Not applicable
VISCOSITY: 0.018 cP @ 25 C
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not applicable
OCTANOL/WATER PARTITION COEFFICIENT (LOG Kow): Not available

10. STABILITY AND REACTIVITY

STABILITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid contact with combustible materials. May ignite or explode on contact with combustible materials. Keep out of water supplies and sewers.

INCOMPATIBILITIES: combustible materials, bases, reducing agents, metals

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: halogenated compounds

POSSIBILITY OF HAZARDOUS REACTIONS: Will not polymerize.

11. TOXICOLOGICAL INFORMATION

NITROGEN TRIFLUORIDE:
LIKELY ROUTES OF EXPOSURE: inhalation, skin, eyes
ASPIRATION HAZARD: Not applicable.
SENSITIZER:
DERMAL: No data available.
RESPIRATORY: No data available.
EFFECTS FROM EXPOSURE:
IMMEDIATE: cyanosis, blood damage
DELAYED: cyanosis, blood damage, kidney damage, liver damage
IRRITATION DATA: No data available.
TOXICITY DATA: 6700 ppm/1 hour(s) inhalation-rat LC50; 26 mg/kg intraperitoneal-rat LD50; 2000 ppm/4 hour(s) inhalation-mouse LC50; 9600 ppm/1 hour(s) inhalation-dog LC50; 7500 ppm/1 hour(s) inhalation-monkey LC50; 7900 mg/m3 inhalation-rat LC50; 4250 mg/m3 inhalation-rat LC16; 200 mg/m3 inhalation-mammal TCLo; 100 ppm/7 hour(s)-19 week(s) intermittent inhalation-rat TDLo; 100 ppm/6

hour(s)-2 week(s) intermittent inhalation-rat TCLo; 85 gm/kg/29 day(s) intermittent intraperitoneal-rabbit TDLo; 98.7 mg/m3/122 day(s) intermittent inhalation-rat TCLo; 10.2 mg/m3/182 day(s) intermittent inhalation-rat TCLo; 1.18 mg/m3/182 day(s) intermittent inhalation-rat TCLo
CARCINOGEN STATUS: No data available.
TARGET ORGANS: blood
kidneys, liver
CHRONIC EFFECTS:
blood damage, liver damage, kidney damage
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: blood system disorders, liver disorders, kidney disorders
TUMORIGENIC DATA: No data available.
MUTAGENIC DATA: No data available.
REPRODUCTIVE EFFECTS DATA: No data available.

12. ECOLOGICAL INFORMATION

ECOTOXICITY DATA:
FISH TOXICITY: No data available.

INVERTEBRATE TOXICITY: No data available.

ALGAL TOXICITY: No data available.

FATE AND TRANSPORT:
BIODEGRADATION: No data available.

MOBILITY: No data available.

PERSISTENCE: No data available.

BIOACCUMULATION: No data available.

13. DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations. Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): D001.

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Nitrogen trifluoride
ID NUMBER: UN2451
HAZARD CLASS OR DIVISION: 2.2

LABELING REQUIREMENTS: 2.2; 5.1

MARITIME TRANSPORT IMDG: No classification assigned.

15. REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4): Not regulated.

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30): Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40): Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):
ACUTE: Yes
CHRONIC: Yes
FIRE: Yes
REACTIVE: No
SUDDEN RELEASE: Yes

SARA TITLE III SECTION 313 (40 CFR 372.65): Not regulated.

OSHA PROCESS SAFETY (29CFR1910.119):
NITROGEN TRIFLUORIDE: 5000 LBS TQ

STATE REGULATIONS:
California Proposition 65: Not regulated.

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: A, D1A.

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

CANADA INVENTORY (DSL/NDSL): Not determined.

16. OTHER INFORMATION

NFPA RATINGS (SCALE 0-4): HEALTH=1 FIRE=0 REACTIVITY=0

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