Safety Data Sheet

Material Name: Nitric Oxide/Nitrogen Gas Mixture

Section 1 - PRODUCT AND COMPANY IDENTIFICATION

Material Name
Nitric Oxide/Nitrogen Gas Mixture

Chemical Family
Inorganic gas mixture

Product Description
Classification determined in accordance with Compressed Gas Association standards.

Product Use
EPA Protocol Mixtures.

Restrictions on Use
None known.

Details of the supplier of the safety data sheet
MATHESON TRI-GAS, INC.
150 Allen Road, Suite 302
Basking Ridge, NJ 07920
General Information: 1-800-416-2505
Emergency #: 1-800-424-9300 (CHEMTREC)
Outside the US: 703-527-3887 (Call collect)

Section 2 - HAZARDS IDENTIFICATION

Classification in accordance with paragraph (d) of 29 CFR 1910.1200.
Gases Under Pressure - Compressed gas
Skin Corrosion/Irritation - Category 2
Serious Eye Damage/Eye Irritation - Category 2A
Simple Asphyxiant

GHS Label Elements
Symbol(s)

Signal Word
Warning

Hazard Statement(s)
Contains gas under pressure; may explode if heated.
Causes skin irritation.
Causes serious eye irritation.
May displace oxygen and cause rapid suffocation.

Precautionary Statement(s)
Prevention
Wear protective gloves/protective clothing/eye protection/face protection.
Wash thoroughly after handling.

Response
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do.
Continue rinsing.
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If eye irritation persists: Get medical advice/attention.
IF ON SKIN: Wash with plenty of soap and water.
If skin irritation occurs: Get medical advice/attention.
Take off contaminated clothing and wash before reuse.

Storage
Protect from sunlight. Store in a well-ventilated place.

Disposal
Dispose of contents/container in accordance with local/regional/national/international regulations.

Other Hazards
Rapid release of compressed gas may cause frostbite.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>CAS</th>
<th>Component Name</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>7727-37-9</td>
<td>Nitrogen</td>
<td>&gt;97.7</td>
</tr>
<tr>
<td>10102-43-9</td>
<td>Nitric oxide</td>
<td>&lt;2.3</td>
</tr>
</tbody>
</table>

Section 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
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.

Eyes
Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

Ingestion
If swallowed, get medical attention.

Most Important Symptoms/Effects
Acute
frostbite, suffocation, skin irritation, eye irritation

Delayed
No information on significant adverse effects.

Indication of any immediate medical attention and special treatment needed
For inhalation, consider oxygen.

Section 5 - FIRE FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media
regular dry chemical, carbon dioxide

Unsuitable Extinguishing Media
Do not use high-pressure water streams.

Special Hazards Arising from the Chemical
Negligible fire hazard. Containers may rupture or explode if exposed to heat.

Hazardous Combustion Products
oxides of nitrogen

Fire Fighting Measures
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. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck: Evacuation radius: 800 meters (1/2 mile).

**Special Protective Equipment and Precautions for Firefighters**

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

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**Section 6 - ACCIDENTAL RELEASE MEASURES**

**Personal Precautions, Protective Equipment and Emergency Procedures**
Wear personal protective clothing and equipment, see Section 8.

**Methods and Materials for Containment and Cleaning Up**
Keep unnecessary people away, isolate hazard area and deny entry. Stay upwind and keep out of low areas. Stop leak if possible without personal risk. Ventilate closed spaces before entering.

**Environmental Precautions**
Avoid release to the environment.

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**Section 7 - HANDLING AND STORAGE**

**Precautions for Safe Handling**
Wash hands thoroughly after handling.

**Conditions for Safe Storage, Including any Incompatibilities**
Protect from sunlight. Store in a well-ventilated place.

Store and handle in accordance with all current regulations and standards. Cylinders should be stored upright (with valve protection cap in place). Store in a dry place. Store below 52 C. Keep separated from incompatible substances.

**Incompatible Materials**
metal oxides, metals, oxidizing materials, strong bases

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**Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION**

**Component Exposure Limits**

<table>
<thead>
<tr>
<th>Component</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>7727-37-9</td>
</tr>
<tr>
<td>ACIGH:</td>
<td>(See Appendix F: Minimal Oxygen Content )</td>
</tr>
<tr>
<td>Nitric oxide</td>
<td>10102-43-9</td>
</tr>
<tr>
<td>ACIGH:</td>
<td>25 ppm TWA</td>
</tr>
<tr>
<td>NIOSH:</td>
<td>25 ppm TWA ; 30 mg/m3 TWA</td>
</tr>
<tr>
<td></td>
<td>100 ppm IDLH</td>
</tr>
<tr>
<td>Europe:</td>
<td>25 ppm TWA (deleted with effect from August 21, 2018 ); 30 mg/m3 TWA (deleted with effect from August 21, 2018 )</td>
</tr>
<tr>
<td>OSHA (US):</td>
<td>25 ppm TWA ; 30 mg/m3 TWA</td>
</tr>
<tr>
<td>Mexico:</td>
<td>25 ppm TWA VLE-PPT ; 30 mg/m3 TWA VLE-PPT</td>
</tr>
<tr>
<td></td>
<td>35 ppm STEL [PPT-CT ]; 45 mg/m3 STEL [PPT-CT ]</td>
</tr>
</tbody>
</table>
Safety Data Sheet

Material Name: Nitric Oxide/Nitrogen Gas Mixture
ACGIH - Threshold Limit Values - Biological Exposure Indices (BEI)
Nitric oxide (10102-43-9)
1.5 % of hemoglobin Medium: blood Time: during or end of shift Parameter: Methemoglobin (background, nonspecific, semi-quantitative)

Engineering Controls
Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

Individual Protection Measures, such as Personal Protective Equipment
Eye/face protection
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.

Skin Protection
For the gas: Wear appropriate chemical resistant clothing. For the liquid: Wear appropriate protective, cold insulating clothing.

Respiratory Protection
Under conditions of frequent use or heavy exposure, respiratory protection may be needed. Respiratory protection is ranked in order from minimum to maximum. Consider warning properties before use. 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. Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

Glove Recommendations
For the gas: Wear appropriate chemical resistant gloves. For the liquid: Wear insulated gloves.

<table>
<thead>
<tr>
<th>Section 9 - PHYSICAL AND CHEMICAL PROPERTIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
</tr>
<tr>
<td>Odor</td>
</tr>
<tr>
<td>Odor Threshold</td>
</tr>
<tr>
<td>Melting Point</td>
</tr>
<tr>
<td>Boiling Point Range</td>
</tr>
<tr>
<td>Evaporation Rate</td>
</tr>
<tr>
<td>Autoignition Temperature</td>
</tr>
<tr>
<td>Lower Explosive Limit</td>
</tr>
<tr>
<td>Upper Explosive Limit</td>
</tr>
<tr>
<td>Vapor Density (air=1)</td>
</tr>
</tbody>
</table>
Safety Data Sheet

Material Name: Nitric Oxide/Nitrogen Gas Mixture

<table>
<thead>
<tr>
<th>Water Solubility</th>
<th>1.49 % (Nitrogen )</th>
<th>Partition coefficient: n-octanol/water</th>
<th>Not available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity</td>
<td>Not available</td>
<td>Kinematic viscosity</td>
<td>Not available</td>
</tr>
<tr>
<td>Solubility (Other)</td>
<td>Not available</td>
<td>Density</td>
<td>Not available</td>
</tr>
<tr>
<td>Physical Form</td>
<td>Compressed gas</td>
<td>Molecular Weight</td>
<td>Not available</td>
</tr>
</tbody>
</table>

Section 10 - STABILITY AND REACTIVITY

Reactivity
No reactivity hazard is expected.

Chemical Stability
Stable at normal temperatures and pressure.

Possibility of Hazardous Reactions
Will not polymerize.

Conditions to Avoid
Avoid heat, flames, sparks and other sources of ignition. Minimize contact with material. Containers may rupture or explode if exposed to heat. Avoid contact with water or moisture.

Incompatible Materials
metal oxides, metals, oxidizing materials, strong bases

Hazardous decomposition products
oxides of nitrogen

Section 11 - TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure

Inhalation
irritation, cough, nausea, vomiting, diarrhea, stomach pain, changes in blood pressure, central nervous system effects, difficulty breathing, emotional disturbances, weakness, loss of appetite, nosebleed, irregular heartbeat, fatigue, chest pain, headache, drowsiness, dizziness, fainting, tingling sensation, tremors, visual disturbances, loss of coordination, dilated pupils, bluish skin color, lung congestion, kidney damage, liver damage, heart damage, paralysis, blood disorders, convulsions, unconsciousness, coma, death, difficulty speaking, bone disorders

Skin Contact
frostbite, irritation

Eye Contact
frostbite, irritation, blurred vision, tearing

Ingestion
ingestion of harmful amounts is unlikely

Acute and Chronic Toxicity

Component Analysis - LD50/LC50
The components of this material have been reviewed in various sources and the following selected endpoints are published:

Nitric oxide (10102-43-9)
Inhalation LC50 Rat 1068 mg/m3 4 h

Product Toxicity Data

Acute Toxicity Estimate
No data available.

Immediate Effects
frostbite, suffocation, skin irritation, eye irritation
Delayed Effects
No information on significant adverse effects.

Irritation/Corrosivity Data
skin irritation, eye irritation

Respiratory Sensitization
No data available.

Dermal Sensitization
No data available.

Component Carcinogenicity
None of this product's components are listed by ACGIH, IARC, NTP, DFG or OSHA

Germ Cell Mutagenicity
No data available for the mixture.

Tumorigenic Data
No data available

Reproductive Toxicity
No data available for the mixture.

Specific Target Organ Toxicity - Single Exposure
No target organs identified.

Specific Target Organ Toxicity - Repeated Exposure
No data available.

Aspiration hazard
Not applicable.

Medical Conditions Aggravated by Exposure
respiratory disorders, skin disorders, eye disorders

Section 12 - ECOLOGICAL INFORMATION

Component Analysis - Aquatic Toxicity
No LOHI ecotoxicity data are available for this product's components.

Persistence and Degradability
No data available for the mixture.

Bioaccumulative Potential
No data available for the mixture.

Mobility
No data available for the mixture.

Other Toxicity
This gas will be dissipated rapidly in well ventilated areas.

Section 13 - DISPOSAL CONSIDERATIONS

Disposal Methods
Dispose in accordance with all applicable regulations.

Component Waste Numbers
The U.S. EPA has not published waste numbers for this product's components.

Section 14 - TRANSPORT INFORMATION

Component Marine Pollutants (IMDG)
Not a marine pollutant.

US DOT Information:
Shipping Name: COMPRESSED GAS, N.O.S. , ( Contains: Nitrogen , Nitric oxide )
Hazard Class: 2.2
UN/NA #: UN1956
Safety Data Sheet

Material Name: Nitric Oxide/Nitrogen Gas Mixture

SDS ID: 00244362

Required Label(s): 2.2

IMDG Information:
Shipping Name: COMPRESSED GAS, N.O.S., (Contains: Nitrogen, Nitric oxide)
Hazard Class: 2.2
UN#: UN1956
Required Label(s): 2.2

International Bulk Chemical Code
This material does not contain any chemicals required by the IBC Code to be identified as dangerous chemicals in bulk.

Section 15 - REGULATORY INFORMATION

U.S. Federal Regulations
This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), CERCLA (40 CFR 302.4), TSCA 12(b), and/or require an OSHA process safety plan.

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS</th>
<th>CA</th>
<th>MA</th>
<th>MN</th>
<th>NJ</th>
<th>PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric oxide</td>
<td>10102-43-9</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>SARA 302:</td>
<td>100 lb TPQ</td>
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<tr>
<td>CERCLA:</td>
<td>10 lb final RQ (releases to the air in amounts &lt;1000 pounds per 24 hours which are the result of combustion and combustion-related activities are exempt from the notification requirements per 40 CFR 302.6); 4.54 kg final RQ (releases to the air in amounts &lt;1000 pounds per 24 hours which are the result of combustion and combustion-related activities are exempt from the notification requirements per 40 CFR 302.6)</td>
<td></td>
<td></td>
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<tr>
<td>OSHA (safety):</td>
<td>250 lb TQ</td>
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</tr>
<tr>
<td>SARA 304:</td>
<td>10 lb EPCRA RQ Releases to the air in amounts &lt;1000 pounds per 24 hours which are the result of combustion and combustion-related activities are exempt from the notification requirements per 40 CFR 355.31)</td>
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</table>

SARA Section 311/312 (40 CFR 370 Subparts B and C) 2017 reporting categories
Gas Under Pressure; Skin Corrosion/Irritation; Serious Eye Damage/Eye Irritation; Simple Asphyxiant

U.S. State Regulations
The following components appear on one or more of the following state hazardous substances lists:

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS</th>
<th>CA</th>
<th>MA</th>
<th>MN</th>
<th>NJ</th>
<th>PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>7727-37-9</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Nitric oxide</td>
<td>10102-43-9</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

Not listed under California Proposition 65

Canada Regulations
Canadian WHMIS Ingredient Disclosure List (IDL)
Safety Data Sheet

Material Name: Nitric Oxide/Nitrogen Gas Mixture

Components of this material have been checked against the Canadian WHMIS Ingredients Disclosure List. The List is composed of chemicals which must be identified on MSDSs if they are included in products which meet WHMIS criteria specified in the Controlled Products Regulations and are present above the threshold limits listed on the IDL.

<table>
<thead>
<tr>
<th>Nitric oxide</th>
<th>10102-43-9</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 %</td>
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</tbody>
</table>

Component Analysis - Inventory

Nitrogen (7727-37-9)

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>DSL</td>
<td>EIN</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Nitric oxide (10102-43-9)

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>DSL</td>
<td>EIN</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Section 16 - OTHER INFORMATION

NFPA Ratings
Health: 2 Fire: 0 Reactivity: 0
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Summary of Changes
Updated: 06/22/2016

Key / Legend
ACGIH - American Conference of Governmental Industrial Hygienists; ADR - European Road Transport; AU - Australia; BOD - Biochemical Oxygen Demand; C - Celsius; CA - Canada; CA/MA/MN/NJ/PA - California/Massachusetts/Minnesota/New Jersey/Pennsylvania*; CAS - Chemical Abstracts Service; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CFR - Code of Federal Regulations (US); CLP - Classification, Labelling, and Packaging; CN - China; CPR - Controlled Products Regulations; DFG - Deutsche Forschungsgemeinschaft; DOT - Department of Transportation; DSD - Dangerous Substance Directive; DSL - Domestic Substances List; EC – European Commission; EEC - European Economic Community; EIN - European Inventory of (Existing Commercial Chemical Substances); EINECS - European Inventory of Existing Commercial Chemical Substances; ENCS - Japan Existing and New Chemical Substance Inventory; EPA - Environmental Protection Agency; EU - European Union; F - Fahrenheit; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; ICAO - International Civil Aviation Organization; IDL - Ingredient Disclosure List; IDLH - Immediately Dangerous to Life and Health; IMDG - International Maritime Dangerous Goods; ISHL - Japan Industrial Safety and Health Law; IUCLID - International Uniform Chemical Information Database; JP - Japan; Kow - Octanol/water partition coefficient; KR KECI Annex 1 - Korea Existing Chemicals Inventory (KECI) / Korea Existing Chemicals List (KECL); KR KECI Annex 2 - Korea Existing Chemicals Inventory (KECI) / Korea Existing Chemicals List (KECL) ; KR - Korea; LD50/LC50 - Lethal Dose/Lethal Concentration; LEL - Lower Explosive Limit; LLV - Level Limit Value; LOLI - List Of Lists™ - ChemADVISOR’s Regulatory Database; MAK - Maximum Concentration Value in the Workplace; MEL -
Safety Data Sheet

Material Name: Nitric Oxide/Nitrogen Gas Mixture

Maximum Exposure Limits: MX – Mexico; NDSL – Non-Domestic Substance List (Canada); NFPA - National Fire Protection Agency; NIOSH - National Institute for Occupational Safety and Health; NJTSR - New Jersey Trade Secret Registry; NTP - National Toxicology Program; NZ - New Zealand; OSHA - Occupational Safety and Health Administration; PEL - Permissible Exposure Limit; PH - Philippines; RCRA - Resource Conservation and Recovery Act; REACH - Registration, Evaluation, Authorisation, and restriction of Chemicals; RID - European Rail Transport; SARA - Superfund Amendments and Reauthorization Act; STEL - Short-term Exposure Limit; TCCA – Korea Toxic Chemicals Control Act; TDG - Transportation of Dangerous Goods; TLV - Threshold Limit Value; TSCA - Toxic Substances Control Act; TW – Taiwan; TWA - Time Weighted Average; UEL - Upper Explosive Limit; UN/NA - United Nations /North American; US - United States; VLE - Exposure Limit Value (Mexico); WHMIS - Workplace Hazardous Materials Information System (Canada).

Other Information

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