Material Safety Data Sheet

Nonflammable Gas Mixture: Hydrogen Sulfide / Nitrogen / Sulfur Dioxide

Section 1. Chemical product and company identification

Product Name: Nonflammable Gas Mixture: Hydrogen Sulfide / Nitrogen / Sulfur Dioxide
Supplier: AIRGAS INC., on behalf of its subsidiaries
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

Product use: Synthetic/Analytical chemistry.
MSDS#: 007437
Date of Preparation/Revision: 8/15/2007.
In case of emergency: 1-866-734-3438

Section 2. Hazards identification

Physical state: Gas.
Emergency overview:
Warning!
CONTENTS UNDER PRESSURE.
POSSIBLE CANCER HAZARD
CONTAINS MATERIAL WHICH MAY CAUSE CANCER BASED ON ANIMAL DATA.
Do not puncture or incinerate container. Risk of cancer depends on duration and level of exposure.
Contact with rapidly expanding gases can cause frostbite.

Routes of entry:
Inhalation

Potential acute health effects:

Eyes: No known significant effects or critical hazards.
Skin: No known significant effects or critical hazards.
Inhalation: Acts as a simple asphyxiant.
Ingestion: Ingestion is not a normal route of exposure for gases

Potential chronic health effects:
CARCINOGENIC EFFECTS: Classified A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC [sulphur dioxide].
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.

Medical conditions aggravated by overexposure:
Acute or chronic respiratory conditions may be aggravated by overexposure to this gas.

See toxicological Information (section 11)

Section 3. Composition, Information on Ingredients

<table>
<thead>
<tr>
<th>Name</th>
<th>CAS number</th>
<th>% Volume</th>
<th>Exposure limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>7727-37-9</td>
<td>98 - 99</td>
<td>ACGIH TLV (United States, 1/2006). Notes: 1996 Adoption Refers to Appendix A -- Carcinogens. STEL: 13 mg/m³ 65534 times per shift, 15 minute(s). STEL: 5 ppm 65534 times per shift, 15 minute(s). TWA: 5.2 mg/m³ 65534 times per shift, 8 hour(s). TWA: 2 ppm 65534 times per shift, 8 hour(s).</td>
</tr>
<tr>
<td>Sulfur Dioxide</td>
<td>7446-09-5</td>
<td>0.0001 - 0.9</td>
<td>NIOSH REL (United States, 12/2001). STEL: 13 mg/m³ 65534 times per shift, 15 minute(s).</td>
</tr>
</tbody>
</table>
### Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training. If fumes are still suspected to be present, the rescuer should wear an appropriate mask or a self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

#### Eye contact

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

#### Skin contact

In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

#### Frostbite

Try to warm up the frozen tissues and seek medical attention.

#### Inhalation

If inhaled, remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.

#### Ingestion

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention if symptoms appear.
Section 5. Fire fighting measures

- **Flammability of the product**: Non-flammable.
- **Products of combustion**: These products are nitrogen oxides (NO, NO$_2$...).
- **Fire fighting media and instructions**: Use an extinguishing agent suitable for surrounding fires.

If involved in fire, shut off flow immediately if it can be done without risk. Apply water from a safe distance to cool container and protect surrounding area.

- **No specific hazard.**

- **Special protective equipment for fire-fighters**: Fire fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full facepiece operated in positive pressure mode.

Section 6. Accidental release measures

- **Personal precautions**: Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (Section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.

- **Environmental precautions**: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 7. Handling and storage

- **Handling**: Do not puncture or incinerate container. High pressure gas. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

- **Storage**: Keep container tightly closed. Keep container in a cool, well-ventilated area. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure Controls, Personal Protection

- **Engineering controls**: Use only with adequate ventilation. If user operations generate dust, fumes, vapor or mist, use process enclosures, local exhaust ventilation, or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

- **Personal protection**
  - **Eyes**: Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.
  - **Skin**: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
  - **Respiratory**: Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93

- **Hands**: Chemical-resistant, impervious gloves or gauntlets complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

- **Personal protection in case of a large spill**: A self-contained breathing apparatus should be used to avoid inhalation of the product.

Consult local authorities for acceptable exposure limits.
Nonflammable Gas Mixture: Hydrogen Sulfide / Nitrogen / Sulfur Dioxide

Section 9. Physical and chemical properties

- Molecular weight: Not applicable.
- Molecular formula: Not applicable.
- Boiling/condensation point: -209.99°C (-346°F) based on data for: nitrogen.
- Melting/freezing point: Not applicable.
- Critical temperature: The lowest known value is -146.9°C (-232.4°F) (nitrogen).
- Vapor density: The highest known value is 0.967 (Air = 1) (nitrogen).
- Specific Volume (ft³/lb): Not applicable.
- Gas Density (lb/ft³): The only known value is 0.072 (nitrogen).

Section 10. Stability and reactivity

- Stability and reactivity: The product is stable.
- Incompatibility with various substances: Reactive with alkalis, moisture.

Section 11. Toxicological information

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>Test</th>
<th>Route</th>
<th>Species</th>
<th>Result</th>
<th>Species</th>
<th>Period</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur Dioxide</td>
<td>LC50</td>
<td>Inhalation</td>
<td>Rat</td>
<td>2520 ppm (1 hour(s))</td>
<td>Pimephales promelas (LC50)</td>
<td>96 hour(s)</td>
<td>0.007 mg/l</td>
</tr>
<tr>
<td></td>
<td>LC50</td>
<td>Inhalation</td>
<td>Mouse</td>
<td>3000 ppm (0.5 hour(s))</td>
<td>Pimephales promelas (LC50)</td>
<td>96 hour(s)</td>
<td>0.007 mg/l</td>
</tr>
<tr>
<td>Hydrogen Sulfide</td>
<td>LC50</td>
<td>Inhalation</td>
<td>Rat</td>
<td>712 ppm (1 hour(s))</td>
<td>Pimephales promelas (LC50)</td>
<td>96 hour(s)</td>
<td>0.0071 mg/l</td>
</tr>
<tr>
<td></td>
<td>LC50</td>
<td>Inhalation</td>
<td>Mouse</td>
<td>634 ppm (1 hour(s))</td>
<td>Lepomis macrochirus (LC50)</td>
<td>96 hour(s)</td>
<td>0.009 mg/l</td>
</tr>
</tbody>
</table>

- Chronic effects on humans: CARCINOGENIC EFFECTS: Classified A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC [sulphur dioxide].
- Other toxic effects on humans: Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation (lung irritant).
- Specific effects:
  - Carcinogenic effects: Contains material which may cause cancer based on animal data. Risk of cancer depends on duration and level of exposure.
  - Mutagenic effects: No known significant effects or critical hazards.
  - Reproduction toxicity: No known significant effects or critical hazards.

Section 12. Ecological information

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>Species</th>
<th>Period</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen Sulfide</td>
<td>Oncorhynchus mykiss (LC50)</td>
<td>96 hour(s)</td>
<td>0.007 mg/l</td>
</tr>
<tr>
<td></td>
<td>Pimephales promelas (LC50)</td>
<td>96 hour(s)</td>
<td>0.007 mg/l</td>
</tr>
<tr>
<td></td>
<td>Pimephales promelas (LC50)</td>
<td>96 hour(s)</td>
<td>0.0071 mg/l</td>
</tr>
<tr>
<td></td>
<td>Lepomis macrochirus (LC50)</td>
<td>96 hour(s)</td>
<td>0.009 mg/l</td>
</tr>
<tr>
<td></td>
<td>Pimephales promelas (LC50)</td>
<td>96 hour(s)</td>
<td>0.0107 mg/l</td>
</tr>
<tr>
<td></td>
<td>Oncorhynchus mykiss (LC50)</td>
<td>96 hour(s)</td>
<td>0.012 mg/l</td>
</tr>
</tbody>
</table>

- Products of degradation: These products are nitrogen oxides (NO, NO₂...).
- Toxicity of the products of biodegradation: The products of degradation are less toxic than the product itself.
- Environmental fate: Not available.
- Environmental hazards: No known significant effects or critical hazards.
- Toxicity to the environment: Not available.
Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.

Section 14. Transport information

<table>
<thead>
<tr>
<th>Regulatory information</th>
<th>UN number</th>
<th>Proper shipping name</th>
<th>Class</th>
<th>Packing group</th>
<th>Label</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOT Classification</td>
<td>UN1956</td>
<td>COMPRESSED GAS, N.O.S.</td>
<td>2.2</td>
<td>Not applicable (gas).</td>
<td>-</td>
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<tr>
<td>TDG Classification</td>
<td>UN1956</td>
<td>COMPRESSED GAS, N.O.S.</td>
<td>2.2</td>
<td>Not applicable (gas).</td>
<td>-</td>
<td>Explosive Limit and Limited Quantity Index 0.125 Passenger Carrying Road or Rail Index 75</td>
</tr>
<tr>
<td>Mexico Classification</td>
<td>UN1956</td>
<td>COMPRESSED GAS, N.O.S.</td>
<td>2.2</td>
<td>Not applicable (gas).</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Section 15. Regulatory information

United States

U.S. Federal regulations:
- TSCA 8(b) inventory: nitrogen; sulphur dioxide; hydrogen sulphide
- SARA 302/304/311/312 extremely hazardous substances: No products were found.
- SARA 302/304 emergency planning and notification: No products were found.
- SARA 302/304/311/312 hazardous chemicals: nitrogen
- SARA 311/312 MSDS distribution - chemical inventory - hazard identification: nitrogen: Sudden Release of Pressure
- Clean Water Act (CWA) 307: No products were found.
- Clean Water Act (CWA) 311: No products were found.
- Clean air act (CAA) 112 accidental release prevention: sulphur dioxide; hydrogen sulphide
- Clean air act (CAA) 112 regulated flammable substances: No products were found.
- Clean air act (CAA) 112 regulated toxic substances: sulphur dioxide; hydrogen sulphide

State regulations:
- Pennsylvannia RTK: nitrogen: (generic environmental hazard); sulphur dioxide: (environmental hazard, generic environmental hazard); hydrogen sulphide: (environmental hazard, generic environmental hazard)
- Massachusetts RTK: nitrogen; sulphur dioxide; hydrogen sulphide
- New Jersey: nitrogen; sulphur dioxide; hydrogen sulphide

Canada

WHMIS (Canada):
- Class A: Compressed gas.
- Class D-2A: Material causing other toxic effects (VERY TOXIC).
- CEPA DSL: nitrogen; sulphur dioxide; hydrogen sulphide
Section 16. Other information

United States
Label Requirements: CONTENTS UNDER PRESSURE. POSSIBLE CANCER HAZARD CONTAINS MATERIAL WHICH MAY CAUSE CANCER BASED ON ANIMAL DATA.

Canada
Label Requirements: Class A: Compressed gas. Class D-2A: Material causing other toxic effects (VERY TOXIC).

Hazardous Material Information System (U.S.A.)

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>1</td>
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<tr>
<td>Fire hazard</td>
<td>0</td>
</tr>
<tr>
<td>Reactivity</td>
<td>0</td>
</tr>
<tr>
<td>Personal protection</td>
<td>C</td>
</tr>
</tbody>
</table>

National Fire Protection Association (U.S.A.)

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>1</td>
</tr>
<tr>
<td>Instability</td>
<td>0</td>
</tr>
<tr>
<td>Special</td>
<td></td>
</tr>
</tbody>
</table>

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Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.