



MATERIAL SAFETY DATA SHEET

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: NON-FLAMMABLE GAS MIXTURE
Containing One or More of the Following Components in a Nitrogen Balance Gas:
Oxygen 0-23.5%; Toluene, 0.0005-0.6%

SYNONYMS: Not Applicable

CHEMICAL FAMILY NAME: Not Applicable

FORMULA: Not Applicable

Document Number: 129

Note: The Material Safety Data Sheet is for this gas mixture supplied in cylinders with 33 cubic feet (935 liters) or less gas capacity (DOT - 39 cylinders). This MSDS has been developed for various gas mixtures with the composition of components within the ranges listed in Section 2 (Composition and Information on Ingredients). Refer to the product label for information on the actual composition of the product.

| | |
|--------------------------------------|--|
| PRODUCT USE: | Calibration of Monitoring and Research Equipment |
| SUPPLIER/MANUFACTURER'S NAME: | Precision Gas Products, Inc. |
| ADDRESS: | 2455 Cawthra Road, Unit#21 Mississauga, ON L5A3P1 |
| EMERGENCY PHONE: | CHEMTREC: 1-800-424-9300 |
| BUSINESS PHONE: | 1-905-949-2626 |
| Fax: | 1-905-949-2688 |

2. COMPOSITION and INFORMATION ON INGREDIENTS

| CHEMICAL NAME | CAS # | mole % | EXPOSURE LIMITS IN AIR | | | | | |
|---------------|-----------|-------------|---|-------------|----------------------------------|--|----------------------|--|
| | | | ACGIH-TLV | | OSHA-PEL | | NIOSH IDLH ppm | OTHER ppm |
| | | | TWA ppm | STEL ppm | PEL ppm | STEL ppm | | |
| Toluene | 108-88-3 | 0.0005-0.6% | 50 (skin) | NE | 200 100 (Vacated 1989 PEL) | 300 (ceiling) 500, 10 min peak per 8 hour shift 150 (Vacated 1989 PEL) | 500 | NIOSH RELs: TWA: 100 STEL: 150 DFG MAKs: TWA: 50 PEAK = 4•MAK 15 min., average value, 1 hr interval Carcinogen: EPA-D IARC-3, TLV-A4 |
| Oxygen | 7782-44-7 | 0-23.5% | There are no specific exposure limits for Oxygen. | | | | | |
| Nitrogen | 7727-37-9 | Balance | There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%. | | | | | |

NE = Not Established.

See Section 16 for Definitions of Terms Used.

NOTE (1): ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This gas mixture has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This is a colorless gas mixture which is either odorless, or has a slight, solvent odor, due to the presence of Toluene. Releases of this gas mixture may produce oxygen-deficient atmospheres (especially in confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated. Toluene, a component of this gas mixture, may cause eye irritation and central nervous system effects at relatively low concentrations (which are within the ranges present in this gas mixture). Such central nervous system effects can include drowsiness, headache, and dizziness.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this product is by inhalation or eye contact with the expanding gas mixture.

INHALATION: Due to the small size of an individual cylinder of this product, no unusual health effects from over-exposure to the gas mixture are anticipated under routine circumstances of use. The chief health hazard associated with this gas mixture is when this product contains less than 19.5% Oxygen and is released in a small, poorly-ventilated area (i.e. an enclosed or confined space). Under this circumstance, an oxygen-deficient environment may occur. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of over-exposure, death may occur. The effects associated with various levels of oxygen are as follows:

CONCENTRATION OF OXYGEN

12-16% Oxygen:
10-14% Oxygen:
6-10% Oxygen:
Below 6%:

Another potential hazard associated with this gas mixture is related to the inhalation of Toluene at relatively low concentrations (within ranges present in this gas mixture). The effects associated with various levels of Toluene vapors are as follows:

CONCENTRATION

~50 ppm:
50-100 ppm:
Above 100 ppm:
Over 200 ppm:
Over 500 ppm:
10,000 ppm (est)

OBSERVED EFFECT

Breathing and pulse rate increase, muscular coordination slightly disturbed.
Emotional upset, abnormal fatigue, disturbed respiration.
Nausea, vomiting, collapse, or loss of consciousness.
Convulsive movements, possible respiratory collapse, and death.

SYMPTOM OF EXPOSURE

Slight drowsiness and headache.
Irritation of the nose, throat and respiratory tract.
Fatigue and dizziness.
Symptoms similar to drunkenness, giddiness, numbness, and mild nausea.
Mental confusion and incoordination, loss of appetite, a bad taste.
At this concentration Toluene causes visual disturbances and further depression of the central nervous system which can result in unconsciousness and death.

3. HAZARD IDENTIFICATION (Continued)

OTHER HEALTH EFFECTS: Very short exposure (3-5 minutes) of the eyes of vapors to Toluene at a concentration of 300 ppm causes slight irritation. Longer exposures (6-7 hours) to levels above 100 ppm will cause irritation.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Over-exposure to this gas mixture may cause the following health effects:

ACUTE: Due to the small size of the individual cylinder of this product, no unusual health effects from exposure to the gas mixture are anticipated under routine circumstances of use. The most significant hazard associated with this gas mixture when it contains less than 19.5% oxygen is the potential for exposure to oxygen-deficient atmospheres. Symptoms of oxygen deficiency include respiratory difficulty, ringing in ears, headaches, shortness of breath, wheezing, headache, dizziness, indigestion, nausea, unconsciousness, and death. The skin of a victim of over-exposure may have a blue color. Additionally, due to the presence of the Toluene component, this gas mixture may cause eye irritation and central nervous system effects in relatively low concentrations. Central nervous system effects may include drowsiness, dizziness, headaches.

CHRONIC: In rare cases, chronic over-exposure to Toluene (a component of this gas mixture) has led to anemia and other problems with the blood and bone marrow. Animal studies indicate Toluene may have adverse reproductive effects. Refer to Section 11 (Toxicology Information) for additional information on the components of this gas mixture. Chronic exposure to oxygen-deficient atmospheres (below 18% oxygen in air) may affect the heart and nervous system.

TARGET ORGANS: ACUTE: Respiratory system, central nervous system, eyes. CHRONIC: Blood system, reproductive system, heart, cardiovascular system, central nervous system.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

| | | |
|--|-------------|-------|
| HEALTH HAZARD | (BLUE) | 1 |
| FLAMMABILITY HAZARD | (RED) | 0 |
| PHYSICAL HAZARD | (YELLOW) | 0 |
| PROTECTIVE EQUIPMENT | | |
| EYES | RESPIRATORY | HANDS |
| BODY | | |
| See Section 8 | | |
| For Routine Industrial Use and Handling Applications | | |

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS GAS MIXTURE WITHOUT ADEQUATE FIRE-RETARDANT AND PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus must be worn.

No unusual health effects are anticipated after exposure to this gas mixture, due to the small cylinder size. If any adverse symptom develops after over-exposure to this gas mixture, remove victim(s) to fresh air as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation if necessary. Victim(s) who experience any adverse effect after over-exposure to this gas mixture must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take a copy of the label and the MSDS to physician or other health professional with victim(s).

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Acute or chronic respiratory conditions, central nervous system conditions, and eye disorders may be aggravated by over-exposure to the components of this gas mixture.

RECOMMENDATIONS TO PHYSICIANS: Administer oxygen, if necessary; treat symptoms and eliminate exposure.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): Not applicable.

Upper (UEL): Not applicable.

FIRE EXTINGUISHING MATERIALS: Non-flammable gas mixture. Use extinguishing media appropriate for surrounding fire.

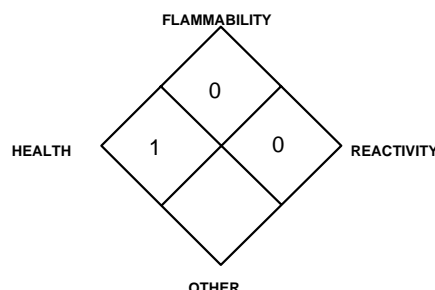
UNUSUAL FIRE AND EXPLOSION HAZARDS: This gas mixture is not flammable; however, containers, when involved in fire, may rupture or burst in the heat of the fire.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment.

NFPA RATING



6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Due to the small size and content of the cylinder, an accidental release of this product presents significantly less risk of an oxygen deficient environment and other safety hazards than a similar release from a larger cylinder. However, as with any chemical release, extreme caution must be used during emergency response procedures. In the event of a release in which the atmosphere is unknown, and in which other chemicals are potentially involved, evacuate immediate area. Such releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a leak, clear the affected area, protect people, and respond with trained personnel.

Allow the gas mixture to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for oxygen. Oxygen levels must be above 19.5% before non-emergency personnel are allowed to re-enter area.

If leaking incidentally from the cylinder, contact your supplier.

7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES: Be aware of any signs of dizziness or fatigue, especially if this gas mixture is used in a poorly-ventilated area; exposures to fatal concentrations of this gas mixture could occur without any significant warning symptoms, due to oxygen deficiency. Do not attempt to repair, adjust, or in any other way modify cylinders containing this gas mixture. If there is a malfunction or another type of operational problem, contact nearest distributor immediately.

STORAGE AND HANDLING PRACTICES: Cylinders should be firmly secured to prevent falling or being knocked-over. Cylinders must be protected from the environment, and preferably kept at room temperature (approximately 21°C [70°F]). Cylinders should be stored in dry, well-ventilated areas, away from sources of heat, ignition, and direct sunlight. Protect cylinders against physical damage.

Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. These cylinders are not refillable. **WARNING! Do not refill DOT 39 cylinders. To do so may cause personal injury or property damage.**

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: WARNING! Compressed gases can present significant safety hazards. During cylinder use, use equipment designed for these specific cylinders. Ensure all lines and equipment are rated for proper service pressure.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use gas mixture in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: No special ventilation systems or engineering controls are needed under normal circumstances of use. As with all chemicals, use this gas mixture in well-ventilated areas. If this gas mixture is used in a poorly-ventilated area, install automatic monitoring equipment to detect the levels of oxygen.

RESPIRATORY PROTECTION: No special respiratory protection is required under normal circumstances of use. Maintain Toluene levels below 50% of the TLV (TLV = 50 ppm) and oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection when Nitrous Oxide levels exceed 50% of the TLV (TLV = 50 ppm), oxygen levels are below 19.5%, or during emergency response to a release of this gas mixture. During an emergency situation, before entering the area, check the concentration of Nitrous Oxide and Oxygen. (continued on next page)

8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

RESPIRATORY PROTECTION: If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the Canadian CSA Standard Z94.4-93 and applicable standards of Canadian Provinces. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998).

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Wear leather gloves when handling cylinders. Chemically resistant gloves should be worn when using this gas mixture. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: No special protection is needed under normal circumstances of use. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR 1910.136.

9. PHYSICAL and CHEMICAL PROPERTIES

The following information is for Nitrogen, a main component of this gas mixture.

GAS DENSITY @ 32°F (0°C) and 1 atm: 0.072 lbs/ft³ (1.153 kg/m³)

BOILING POINT: 195.8°C (-320.4°F) -

SPECIFIC GRAVITY (air = 1) @ 70°F (21.1°C): 0.906

SOLUBILITY IN WATER vol/vol @ 32°F (0°C) and 1 atm: 0.023

EVAPORATION RATE (nBuAc = 1): Not applicable.

ODOR THRESHOLD: Not applicable.

VAPOR PRESSURE @ 70°F (21.1°C) psig: Not applicable.

FREEZING/MELTING POINT @ 10 psig: -210°C (-345.8°F)

pH: Not applicable.

MOLECULAR WEIGHT: 28.01

EXPANSION RATIO: Not applicable.

SPECIFIC VOLUME (ft³/lb): 13.8

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

The following information is for Oxygen, a main component of this gas mixture.

GAS DENSITY @ 32°F (0°C) and 1 atm: 0.083 lb/cu ft (1.326 kg/m³)

FREEZING/MELTING POINT @ 10 psig: -218.8°C (-361.8°F)

SPECIFIC GRAVITY (air = 1) @ 70°F (21.1°C): 1.105

SOLUBILITY IN WATER vol/vol @ 32°F (0°C) and 1 atm: 0.04.91

EVAPORATION RATE (nBuAc = 1): Not applicable.

ODOR THRESHOLD: Not applicable.

VAPOR PRESSURE @ 70°F (21.1°C) psig: Not applicable.

BOILING POINT: -183.0°C (-297.4°F)

pH: Not applicable.

MOLECULAR WEIGHT: 32.00

EXPANSION RATIO: Not applicable.

VOLUME (ft³/lb): 12.1

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

The following information is for the gas mixture.

APPEARANCE AND COLOR: This product is a colorless gas mixture which is odorless or which has a faint, solvent odor.

HOW TO DETECT THIS SUBSTANCE (warning properties): There are no unusual warning properties associated with a release of this gas mixture. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.

10. STABILITY and REACTIVITY

STABILITY: Normally stable in gaseous state.

DECOMPOSITION PRODUCTS: The thermal decomposition products of Toluene include carbon oxides. The other components of this gas mixture do not decompose, per se, but can react with other compounds in the heat of a fire.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Titanium will burn in Nitrogen (the main component of this gas mixture). Lithium reacts slowly with Nitrogen at ambient temperatures. A component of this gas mixture (Toluene) is also incompatible with strong oxidizers (i.e. chlorine, bromine pentafluoride, oxygen difluoride, and nitrogen trifluoride) and can react with nitric acid, sulfur dichloride, and sulfuric acid.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicology data are currently available for the components of this gas mixture:

NITROGEN:

There are no specific toxicology data for Nitrogen. Nitrogen is a simple asphyxiant, which acts to displace oxygen in the environment.

TOLUENE:

Eye effects-Human 300 ppm

Skin-Rabbit, adult 435 mg Mild irritation effects

Skin-Rabbit, adult 500 Moderate irritation effects

Eye effects-Rabbit, adult 870 mg Mild irritation effects

Eye effects-Rabbit, adult 2 mg/24 hours Severe irritation effects

Eye effects-Rabbit, adult 100 mg/30 seconds mms Mild irritation effects

LDLo (Oral-Human) 50 mg/kg

LD₅₀ (Oral-Rat) 5000 mg/kg

LD₅₀ (Intraperitoneal-Rat) 1332 mg/kg

LD₅₀ (Intraperitoneal-Mouse) 640 mg/kg

LD₅₀ (Unreported-Rat) 6900 mg/kg

LD₅₀ (Intraperitoneal-Mouse) 59 mg/kg

LD₅₀ (Subcutaneous-Mouse) 2250 mg/kg

LD₅₀ (Intravenous-Rat) 1960 mg/kg

LD₅₀ (Unreported-Mouse) 2 g/kg

LD₅₀ (Skin-Rabbit, adult) 12,124 mg/kg

LC₅₀ (Inhalation-Mouse) 400 ppm/24 hours

LCLo (Inhalation-Rat) 4000 ppm/4 hours

LCLo (Inhalation-Rabbit, adult) 55,000 ppm/40 minutes

TCLo (Inhalation-Human) 200 ppm: BRN, Central nervous system effects, Blood effects

TCLo (Inhalation-Man) 100 ppm: Central nervous system effects

TCLo (Inhalation-Rat) 1500 mg/m³/24 hours: female 1-8 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus); Specific Developmental Abnormalities: musculoskeletal system

TCLo (Inhalation-Rat) 1000 mg/m³/24 hours: female 7-14 day(s) after conception: Reproductive: Specific Developmental Abnormalities: musculoskeletal system

TCLo (Inhalation-Rat) 2000 ppm/6 hours: female 7-17 day(s) after conception: Reproductive: Maternal Effects: other effects

Reproductive: Effects on Newborn: physical

TCLo (Inhalation-Rat) 800 mg/m³/6 hours: female 14-20 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus), Effects on Newborn: behavioral

TCLo (Inhalation-Rat) 1200 ppm/6 hours: female 9-12 day(s) after conception: Reproductive: Effects on Newborn: delayed effects

TCLo (Inhalation-Mouse) 400 ppm/7 hours (female 716 days post): Reproductive effects

TCLo (Inhalation-Mouse) 500 mg/m³/24 hours female 6-13 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus)

TCLo (Inhalation-Mouse) 1000 ppm/6 hours: female 2-17 day(s) after conception: Reproductive: Specific Developmental Abnormalities: musculoskeletal system

TCLo (Inhalation-Mouse) 400 ppm/7 hours: female 7-16 day(s) after conception: Reproductive: Specific Developmental Abnormalities: musculoskeletal system, Effects on Newborn: biochemical and metabolic

TCLo (Inhalation-Mouse) 200 ppm/7 hours: female 7-16 day(s) after conception: Reproductive: Specific Developmental Abnormalities: urogenital system

TCLo (Inhalation-Rabbit) 1 gm/m³/24 hours: female 7-20 day(s) after conception: Reproductive: Fertility: abortion

TCLo (Inhalation-Rabbit) 100 ppm/6 hours: female 6-18 day(s) after conception: Reproductive: Specific Developmental Abnormalities: cardiovascular (circulatory) system

TCLo (Inhalation-Hamster) 800 mg/m³/6 hours: female 6-11 day(s) after conception: Reproductive: Effects on Newborn: behavioral

TDL₀ (Oral-Rat) 7280 mg/kg: female 6-19 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus).

TDL₀ (Oral-Mouse) 9 g/kg (female 615 days post): Teratogenic effects

TDL₀ (Oral-Mouse) 9 gm/kg: female 6-15 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetal death

TDL₀ (Oral-Mouse) 15 gm/kg: female 6-15 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus)

TDL₀ (Oral-Mouse) 30 gm/kg: female 6-15 day(s) after conception: Reproductive: Specific Developmental Abnormalities: craniofacial (including nose and tongue)

Unscheduled DNA synthesis (Bacteria-Escherichia coli) 1 pph

Unscheduled DNA synthesis (Microorganism-not otherwise specified)1 pph/15 minutes-continuous

Sex Chromosome Loss and Nondisjunction (Oral-Drosophila melanogaster) 1 pph

Mutation Test Systems (Inhalation-grasshopper) 20 pph/16 hours

DNA damage (Rat-Liver) 30 µmol/L

Cytogenetic Analysis (Inhalation-Rat) 5400 µg/m³/16 weeks-intermittent

Cytogenetic Analysis (Subcutaneous-Rat) 9600 mg/kg/12 days-intermittent

oms-grasshopper-Inhalation 562 mg/L

Cytogenetic Analysis (Rat-Subcutaneous) 12 g/kg/12 days

Micronucleus test (Oral-Mouse) 200 mg/kg

Micronucleus test (Intraperitoneal-Mouse) 433 µg/kg/24 hours

SUSPECTED CANCER AGENT: The components of this gas mixture are listed by agencies tracking the carcinogenic potential of chemical compounds, as follows:

TOLUENE: ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen); EPA-D (Not Classifiable as to Human Carcinogenicity); IARC-3 (Unclassifiable as to Carcinogenicity in Humans).

The other components of this gas mixture are not found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, and IARC; therefore, they are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

11. TOXICOLOGICAL INFORMATION (Continued)

IRRITANCY OF PRODUCT: Due to the presence of Toluene, this gas mixture can be irritating to contaminated eye tissue.

SENSITIZATION TO THE PRODUCT: This gas mixture is not known to cause skin or respiratory sensitization in humans. Due to the presence of Toluene, cardiac sensitization to stimulants (i.e. epinephrine, ephedrine) is a possible result of severe or chronic over-exposure to this gas mixture.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this gas mixture and its components on the human reproductive system.

Mutagenicity: No human mutagenicity effects have been described for the components of this gas mixture. The Toluene component of this gas mixture was not mutagenic in most of the numerous in vivo and in vitro tests. There is some evidence that Toluene can cause chromosome damage in vivo when administered to mice by injection, although conflicting results have been obtained.

Embryotoxicity: No human embryotoxic effects have been described for the components of this gas mixture. There is some evidence of embryotoxic effects in animals during clinical studies of Toluene exposures.

Teratogenicity: No human teratogenicity effects have been described for the components of this gas mixture. Toluene (a component of this gas mixture) did not cause birth defects, but exposures of pregnant rats to concentrations greater than 500 ppm resulted in fetotoxicity effects (i.e., reduced birth weights, delay in bone formation).

Reproductive Toxicity: No human reproductive toxicity effects have been described for the components of this gas mixture. Data on reproductive effects are available from clinical studies involving test animals exposed to relatively high doses of the Toluene component of this gas mixture.

A *mutagen* is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An *embryotoxin* is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A *teratogen* is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A *reproductive toxin* is any substance which interferes in any way with the reproductive process.

BIOLOGICAL EXPOSURE INDICES (BEIs): The following Biological Exposure Indices (BEIs) are currently applicable for the components of this gas mixture.

| CHEMICAL DETERMINANT | SAMPLING TIME | BEI |
|--|---|---|
| TOLUENE • o-Cresol in Urine • Hippuric Acid in Urine • Toluene in Blood | • End of Shift • End of Shift • Prior to Last Shift of Workweek | • 0.5 mg/L • 1.6 g/g creatinine • 0.05 mg/L |

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: The components of this gas mixture occur naturally in the atmosphere. The gas will be dissipated rapidly in well-ventilated areas. The following environmental data are applicable to the components of this gas mixture.

OXYGEN: Water Solubility = 1 volume Oxygen/32 volumes water at 20°C. Log K_{ow} = -0.65

NITROGEN: Water Solubility = 2.4 volumes Nitrogen/100 volumes water at 0°C. 1.6 volumes Nitrogen/100 volumes water at 20°C.

TOLUENE: K_{oc} = 2.73. Water Solubility = 534 mg/L. Biological Half-Life = 0.083 days. Bioconcentration Factors = 13.2 (eels, *Anguilla japonica*); 1.67 (Manila clam (*Tapes semidecussata*); 4.2 (mussel, *Mytilus edulis*); 380 (algae, *Chorella fusca*); 90 (golden ide fish). Toluene is rapidly volatilized from water and undergoes moderate biodegradation. The half-life in water is on the order of days to weeks.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on the effects of this gas mixture on plant and animal life.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on the effects of this has mixture on aquatic life. The following aquatic toxicity data are available for the Toluene component of this gas mixture.

| | | |
|---|---|---|
| EC ₅₀ (<i>Pimephales promelas</i> , fathead minnow - embryos/larvae/minnows) = 55-72 mg/L/25-36 mg/L/26-31 mg/L - 96 hours. Effect - loss of equilibrium. | LC ₅₀ (<i>Crangon francisorium</i> , shrimp) = 4.3 ppm. 96 hours | LC ₅₀ (<i>Daphnia magna</i> , water flea) = 313 mg/L; 48 hours |
| LC ₅₀ (<i>Pimephales promelas</i> , fathead minnow) = 36.2 mg/L/96 hours | TLm (<i>Pimephales promelas</i> , fathead minnow) = 56-34 mg/L; 24-96 hours | LC ₅₀ (<i>nitocra spinipes</i> , copepod) = 24.2-74.2 mg/L; 24 hours |
| LC ₅₀ (Bluegill) = 17 mg/L/24 hours; 13 mg/L/96 hours; 21-23 °C | TLm (<i>Lebistes reticulats</i> , guppy): 63-59 mg/L; 24-96 hours | LC ₅₀ (<i>Artemia saluna</i> , Brine Shrimp) = 33 mg/L; 24 hours |
| LC ₅₀ (<i>Palaemonetes pugio</i> , grass shrimp) = 9.5 ppm/96 hours | LC ₅₀ (Channel Catfish) = 240 mg/L | LC ₅₀ (<i>Morone saxatilis</i> , striped bass) = 7.3 mg/L; 96 hours |
| LC ₅₀ (<i>Cancer magister</i> , crab larvae) = 28 ppm/96 hours | LC ₅₀ (<i>Pimephales promelas</i> , fathead minnow) = 534.27 mg/L; 96 hours | LC ₅₀ (<i>Cyprinodon vaiegatus</i> , sheephead minnow) = 277-485 mg/L; 96 hours |
| | LC ₅₀ (<i>Carassium auratas</i> , goldfish) = 57.68 mg/L; 96 hours | LC ₅₀ (<i>Aedes aegypti</i>) 22 mg/L |
| | LC ₅₀ (<i>Lebistes reticulats</i> , guppy) = 59.30 mg/L, 96 hours | LC ₅₀ (<i>Alandra granaria</i> , grain weevil) = 210 mg/L. |

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Cylinders with undesired residual product may be safely vented outdoors with the proper regulator. For further information, refer to Section 16 (Other Information).

14. TRANSPORTATION INFORMATION

THIS GAS MIXTURE IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (*Oxygen, Nitrogen)*or the gas component with the next highest concentration next to Nitrogen.)

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)

UN IDENTIFICATION NUMBER: UN 1956

PACKING GROUP: Not applicable.

DOT LABEL(S) REQUIRED: Class 2.2 (Non-Flammable Gas)

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MARINE POLLUTANT: The components of this gas mixture are not classified by the DOT as Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles can present serious safety hazards. If transporting these cylinders in vehicles, ensure these cylinders are not exposed to extremely high temperatures (as may occur in an enclosed vehicle on a hot day). Additionally, the vehicle should be well-ventilated during transportation.

Note: DOT 39 Cylinders ship in a strong outer carton (overpack). Pertinent shipping information goes on the outside of the overpack. DOT 39 Cylinders do not have transportation information on the cylinder itself.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This gas is considered as Dangerous Goods, per regulations of Transport Canada.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (*Oxygen, Nitrogen)*or the gas component with the next highest concentration next to Nitrogen.

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)

UN IDENTIFICATION NUMBER: UN 1956

PACKING GROUP: Not Applicable

HAZARD LABEL: Class 2.2 (Non-Flammable Gas)

SPECIAL PROVISIONS: None

EXPLOSIVE LIMIT AND LIMITED QUANTITY INDEX: 0.12

ERAP INDEX: None

PASSENGER CARRYING SHIP INDEX: None

PASSENGER CARRYING ROAD VEHICLE OR PASSENGER CARRYING RAILWAY VEHICLE INDEX: 75

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NOTE: Shipment of compressed gas cylinders via Public Passenger Road Vehicle is a violation of Canadian law (Transport Canada Transportation of Dangerous Goods Act, 1992).

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: This gas mixture is subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

| CHEMICAL NAME | SARA 302 (40 CFR 355, Appendix A) | SARA 304 (40 CFR Table 302.4) | SARA 313 (40 CFR 372.65) |
|---------------|--------------------------------------|----------------------------------|-----------------------------|
| Toluene | No | Yes | Yes |

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Toluene = 1000 lb (454 kg)

OTHER U.S. FEDERAL REGULATIONS:

- Toluene is subject to the requirements of CFR 29 1910.1000. Toluene is listed on Table Z.2.
- Toluene is a Toxic Pollutant under Section 307(a)(1) of the Clean Water Act and is subject to effluent limitations.
- No component of this gas mixture subject to the reporting requirements of Section 112(r) of the Clean Air Act.
- The regulations of the Process Safety Management of Highly Hazardous Chemicals are not applicable to this gas mixture (29 CFR 1910.119).
- This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR Part 82).
- The components of this gas mixture are not listed as Regulated Substances, per 40 CFR, Part 68, of the Risk Management for Chemical Releases.

U.S. STATE REGULATORY INFORMATION: The components of this gas mixture are covered under the following specific State regulations:

Alaska - Designated Toxic and Hazardous Substances: Toluene.

California - Permissible Exposure Limits for Chemical Contaminants: Nitrogen, Toluene.

Florida - Substance List: Oxygen, Toluene.

Illinois - Toxic Substance List: Toluene.

Kansas - Section 302/313 List: Toluene.

Massachusetts - Substance List: Oxygen, Toluene.

Michigan - Critical Materials Register: Toluene.

Minnesota - List of Hazardous Substances: Toluene.

Missouri - Employer Information/Toxic Substance List: Toluene.

New Jersey - Right to Know Hazardous Substance List: Oxygen, Nitrogen, Toluene.

North Dakota - List of Hazardous Chemicals, Reportable Quantities: Toluene.

Pennsylvania - Hazardous Substance List: Oxygen, Nitrogen, Toluene.

Rhode Island - Hazardous Substance List: Oxygen, Nitrogen, Toluene.

Texas - Hazardous Substance List: Toluene.

West Virginia - Hazardous Substance List: Toluene.

Wisconsin - Toxic and Hazardous Substances: Toluene.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): The Toluene component of this gas mixture is listed on the California Proposition 65 Lists. **WARNING:** Toluene is known to the State of California to cause birth defects or other reproductive harm.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The components of this gas mixture are listed on the DSL Inventory.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The Toluene component of this gas mixture is on the CEPA Priorities Substances Lists.

CANADIAN WHMIS REGULATIONS: This gas mixture is categorized as a Controlled Product, Hazard Classes A and D2A, as per the Controlled Product Regulations.

16. OTHER INFORMATION

INFORMATION ABOUT DOT-39 NRC (Non-Refillable Cylinder) PRODUCTS

DOT 39 cylinders ship as hazardous materials when full. Once the cylinders are relieved of pressure (empty) they are not considered hazardous material or waste. Residual gas in this type of cylinder is not an issue because toxic gas mixtures are prohibited. Calibration gas mixtures typically packaged in these cylinders are Nonflammable n.o.s., UN 1956. A small percentage of calibration gases packaged in DOT 39 cylinders are flammable or oxidizing gas mixtures.

For disposal of used DOT-39 cylinders, it is acceptable to place them in a landfill if local laws permit. Their disposal is no different than that employed with other DOT containers such as spray paint cans, household aerosols, or disposable cylinders of propane (for camping, torch etc.). When feasible, we recommended recycling for scrap metal content. Precision Gas will do this for any customer that wishes to return cylinders to us prepaid. All that is required is a phone call to make arrangements so we may anticipate arrival. Scrapping cylinders involves some preparation before the metal dealer may accept them. We perform this operation as a service to valued customers who want to participate.

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.