

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

GT&S, INC
(FORMERLY MG INDUSTRIES)
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SUBSTANCE: OXYGEN, COMPRESSED GAS

TRADE NAMES/SYNONYMS:

OXYGEN; DIOXYGEN; MOLECULAR OXYGEN; OXYGEN MOLECULE; PURE OXYGEN; UN 1072; O2; MGI12831; RTECS RS2060000

CHEMICAL FAMILY: inorganic, gas

CREATION DATE: May 07 1990

REVISION DATE: Sep 13 2007

2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: OXYGEN, COMPRESSED GAS

CAS NUMBER: 7782-44-7

EC NUMBER (EINECS): 231-956-9

EC INDEX NUMBER: 008-001-00-8

PERCENTAGE: 100

3. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=0 REACTIVITY=0

EMERGENCY OVERVIEW:

COLOR: colorless

PHYSICAL FORM: compressed gas

ODOR: odorless

MAJOR HEALTH HAZARDS: No significant target effects reported.

PHYSICAL HAZARDS: Containers may rupture or explode if exposed to heat. May ignite combustibles.

POTENTIAL HEALTH EFFECTS:

INHALATION:



SHORT TERM EXPOSURE: irritation, changes in body temperature, nausea, difficulty breathing, irregular heartbeat, dizziness, disorientation, hallucinations, mood swings, pain in extremities, tremors, lung congestion, convulsions

LONG TERM EXPOSURE: irritation, chest pain, lung damage

SKIN CONTACT:

SHORT TERM EXPOSURE: frostbite, blisters

LONG TERM EXPOSURE: no information on significant adverse effects

EYE CONTACT:

SHORT TERM EXPOSURE: irritation, frostbite, blurred vision

LONG TERM EXPOSURE: no information on significant adverse effects

INGESTION:

SHORT TERM EXPOSURE: ingestion of a gas is unlikely, frostbite

LONG TERM EXPOSURE: ingestion of a gas is unlikely

CARCINOGEN STATUS:

OSHA: No

NTP: No

IARC: No

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. 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: Contact with liquid: 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.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Negligible fire hazard. Oxidizer. May ignite or explode on contact with combustible materials. Containers may rupture or explode if exposed to heat.

EXTINGUISHING MEDIA: carbon dioxide, regular dry chemical

Large fires: Use regular foam or flood with fine water spray.

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. Use extinguishing agents appropriate for surrounding fire. Cool containers with water. Apply water from a protected location or from a safe distance.

6. ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL RELEASE:

Stop leak if possible without personal risk. Avoid contact with combustible materials. Keep unnecessary people away, isolate hazard area and deny entry. Ventilate closed spaces before entering.

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.101. Keep separated from incompatible substances.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:

OXYGEN, COMPRESSED GAS:

No occupational exposure limits established.

VENTILATION: Provide local exhaust ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: For the gas: Eye protection not required, but 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: For the gas: Protective clothing is not required. For the liquid: Wear appropriate protective, cold insulating clothing.

GLOVES: Wear insulated gloves.

RESPIRATOR: 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.

For Unknown Concentrations or Immediately Dangerous to Life or Health -

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.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: gas
COLOR: colorless
PHYSICAL FORM: compressed gas
ODOR: odorless
TASTE: tasteless
MOLECULAR WEIGHT: 31.9988
MOLECULAR FORMULA: O₂
BOILING POINT: -297 F (-183 C)
FREEZING POINT: -360 F (-218 C)
VAPOR PRESSURE: 760 mmHg @ -183 C
VAPOR DENSITY (air=1): 1.1
SPECIFIC GRAVITY: Not applicable
DENSITY: 1.309 g/L @ 25 C
WATER SOLUBILITY: 3.2% @ 25 C
PH: Not applicable
VOLATILITY: Not applicable
ODOR THRESHOLD: Not available
EVAPORATION RATE: Not applicable
VISCOSITY: 0.02075 cP @ 25 C
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not applicable
SOLVENT SOLUBILITY:
Soluble: alcohol

10. STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid contact with combustible materials. Protect from physical damage and heat. Containers may rupture or explode if exposed to heat.

INCOMPATIBILITIES: combustible materials, halo carbons, metals, bases, reducing agents, amines, metal salts, oxidizing materials

OXYGEN:

ACETALDEHYDE: Rapid oxidation progressing to explosion.

ACETYLENE: Mixtures of the gases may explode on heating or compression; the liquids form a powerful explosive.

POLY(ACRYLONITRILE-BUTADIENE): Forms impact-sensitive mixture with the liquid.

SEC-ALCOHOLS: Forms explosive peroxides.

ALKALI METALS: Ignition.

ALKALINE-EARTH METALS: Ignition.

ALKALINE-EARTH PHOSPHIDES: Incandescence on heating.

ALLYLIC COMPOUNDS: May form explosive peroxides.

ALUMINUM BOROHYDRIDE: Explosive reaction.

AMMONIA: Possible explosion.

BERYLLIUM BOROHYDRIDE: Explosive reaction.

BORON ARSENOTRIBROMIDE: Ignites on contact with the gas.

BORON TRICHLORIDE: Vigorous reaction on sparking.

BUTEN-3-YNE: Forms explosive peroxides.
CARBON: May ignite in the gas; forms explosive mixtures with the liquid.
CARBON DISULFIDE: Possible ignition.
CARBON MONOXIDE (LIQUID): Forms explosive mixture with the liquid.
CHLOROTRIFLUOROETHYLENE: Forms explosive peroxides.
COMBUSTIBLE MATERIALS: The flammability of combustible compounds greatly increases with an increase in oxygen concentration; some materials may become spontaneously combustible or explosive. Contact of combustible compounds with liquid oxygen is likely to result in a dangerous explosion.
CYANOGEN (LIQUID): Forms explosive mixture with the liquid.
CYCLOHEXANE-1,2-DIONE BIS(PHENYLHYDRAZONE): Forms explosive compound.
CYCLOOCTATETRAENE: May form explosive peroxides.
DIBORANE: Explosive mixture on heating.
DIBORON TETRAFLUORIDE: Explosive mixture.
DIMETHYLKETENE: Forms explosive peroxide.
DIMETHYL SULFIDE: Explosive reaction above 210 C.
DIOXANE: May form explosive peroxides.
ETHERS: May form explosive peroxides.
FLAMMABLE MATERIALS: The flammability of materials greatly increases as the oxygen concentration increases; some compounds may become spontaneously combustible or explosive. Contact with liquid oxygen is likely to result in dangerous explosions.
FLUORINE + HYDROGEN: Explosive mixture.
HALOGENATED HYDROCARBONS: Many halogenated hydrocarbons ignite or explode with the gas under pressure; contact with the liquid may result in a dangerous explosion.
HYDRAZINE: Forms explosive mixtures.
HYDROCARBONS: Mixtures with the gas may ignite or explode particularly under pressure or when heated; contact with the liquid is likely to result in a dangerous explosion.
HYDROGEN: Explosive mixture, particularly in the presence of a catalyst.
HYDROGEN SULFIDE: Explosive mixture.
LITHIATED DIALKYL NITROSAMINES: May form explosive compounds.
LITHIUM HYDRIDE (POWDER): Very powerful explosive with the liquid.
METALS: Many metals ignite or explode in the gas, particularly if heated or in powder form. Contact of metal powders with the liquid is likely to result in a dangerous explosion.
METAL HALIDES: Ignition.
METAL HYDRIDES: Ignition or explosion.
METHANE (LIQUID): Forms explosive mixture with the liquid.
METHOXYCYCLOOCTATETRAENE: Forms explosive compound.
NICKEL CARBONYL: Ignites or explodes at low pressure.
NITROGEN (LIQUID): Explosive if subjected to radiation.
NON-METAL HYDRIDES: May ignite or explode.
OXYGEN DIFLUORIDE: Explosive mixture.
PHENYLDICHLOROAMINE: Explosive reaction.
PHOSPHINE: Forms explosive mixture.
PHOSPHOROUS: Vigorous reaction.
PHOSPHORUS TRIBROMIDE: Explosive reaction.

PHOSPHOROUS TRIFLUORIDE: Explosive reaction.
PHOSPHOROUS TRIOXIDE: Ignition.
POLY(CYANOETHYLSILOXANE): Forms impact sensitive mixture with the liquid.
POLY(DIMETHYLSILOXANE): Forms impact sensitive mixture with the liquid.
POLYSTYRENE: Forms impact-sensitive mixture with the liquid.
POLYMERS: Contact with the liquid may result in rapid, hazardous oxidation with possible explosions.
POTASSIUM CARBONYL: Violent reaction.
POTASSIUM PEROXIDE: Violent reaction.
PROPYLENE OXIDE: Explosive mixture.
SILANE + CHLORINE: Explosive mixture.
SILANES: Ignition or explosion.
STYRENE: Forms explosive peroxide.
TEFLON (POLYTETRAFLUOROETHYLENE): Ignites at high temperature and reduced pressure.
TETRABORON DECAHYDRIDE: Explosive mixture.
TETRAFLUOROETHYLENE: Forms explosive peroxides.
TETRAFLUOROHYDRAZINE: Explosion in the presence of organic matter.
TETRAHYDROFURAN: Forms explosive peroxides.
TETRAPHOSPHORUS HEXAOXIDE: Ignition.
TRIRHENIUM CHLORIDE: May form explosive chlorine oxides on heating.
VINYL COMPOUNDS: May form explosive peroxides.

HAZARDOUS DECOMPOSITION:

Thermal decomposition products: miscellaneous decomposition products

POLYMERIZATION: Will not polymerize.

11. TOXICOLOGICAL INFORMATION

OXYGEN, COMPRESSED GAS:

TOXICITY DATA: 100 pph/14 hour(s) inhalation-human TCLo; 80 pph inhalation-rat TCLo; 80 pph inhalation-guinea pig LCLo; 90 pph inhalation-dog LCLo; 80 pph inhalation-monkey LCLo; 100 pph/24 hour(s) inhalation-mouse LCLo; 70 pph/55 hour(s) inhalation-human TCLo; 90 pph/24 hour(s) inhalation-human TCLo; 90 pph/60 hour(s) inhalation-human TCLo; 100 pph/15 minute(s) inhalation-human TCLo; 100 pph/6 hour(s) inhalation-human TCLo; 30 pph inhalation-human TCLo; 95 pph/24 hour(s) inhalation-rat TCLo; 85 pph/12 hour(s) inhalation-mouse TCLo; 100 pph/24 hour(s)-3 day(s) continuous inhalation-rat TCLo; 95 pph/24 hour(s)-2 day(s) continuous inhalation-rat TCLo; 70 pph/24 hour(s)-20 day(s) continuous inhalation-rat TCLo; 90 pph/8 hour(s)-90 day(s) intermittent inhalation-guinea pig TCLo; 85 pph/24 hour(s)-5 day(s) continuous inhalation-rat TCLo; 95 pph/8 day(s) continuous inhalation-rat TCLo; 95 pph/2 day(s) continuous inhalation-mouse TCLo; 95 pph/3 day(s) continuous inhalation-mouse TCLo; 95 pph/4 day(s) continuous inhalation-mouse TCLo; 95 pph/7 day(s) continuous inhalation-rat TCLo; 100 pph/30 minute(s)-3 day(s) intermittent inhalation-guinea pig TCLo; 95 pph/60 hour(s) continuous inhalation-rat TCLo; 95 pph/2 day(s) continuous inhalation-rat TCLo

MUTAGENIC DATA: cytogenetic analysis - human lymphocyte 40 pph 4 day(s); cytogenetic analysis - hamster ovary 20 pph 3 day(s)-continuous; cytogenetic analysis - hamster lung 80 pph; sister chromatid exchange - hamster ovary 20 pph; mutation in mammalian somatic cells - hamster lung 95 pph 24 hour(s);

cytogenetic analysis - chicken embryo 80 pph

REPRODUCTIVE EFFECTS DATA: 12 pph inhalation-woman TCLO/10 minute(s) 26-39 week(s) pregnant female continuous; 10 pph inhalation-rat TCLO/12 hour(s) 22 day(s) pregnant female continuous; 10 pph inhalation-rat TCLO/9 hour(s) 22 day(s) pregnant female continuous; 10 pph inhalation-mouse TCLO/24 hour(s) 8 day(s) pregnant female continuous

ADDITIONAL DATA: Toxic action is greatly enhanced by exercise or by presence of moderate amounts of carbon dioxide.

HEALTH EFFECTS:

INHALATION:

ACUTE EXPOSURE:

OXYGEN: Pure oxygen, especially if not properly humidified, may cause mucous membrane irritation and pulmonary edema after 24 hours. Air normally contains 20-21% oxygen. As exposure to higher concentrations and/or greater than atmospheric pressure continues symptoms of toxicity may develop and increase in severity. Respiratory system effects may include a progressive decrease in vital capacity, tightness in the chest and discomfort, coughing, congestion, tracheobronchitis, pneumonia, edema, atelectasis and increased depth of respiration, rapid panting or asthma-like attacks, apnea in inspiratory position, fibroblastic proliferation, and hyperplasia of alveolar cells. Cardiovascular system effects may include bradycardia, hyperthermia or hypothermia and peripheral vasoconstriction. The nervous system may be affected with mood changes, nausea, dizziness, slowing of mental processes, malaise, hilarity, apprehension, paresthesias including tingling of fingers and toes, fasciculation of the lips and face, muscular twitching, visual and auditory hallucinations, general convulsions and epileptic seizures, loss of consciousness and collapse. At increased atmospheric pressures, vision may be affected. Symptoms may include photophobia, amblyopia, mydriasis, bilateral progressive constriction of visual field, impaired central vision, constriction of retinal vasculature, and possible loss of vision. However, no change in the visual fields or visual acuity was found after breathing pure oxygen for four and one-half hours at normal atmospheric pressures. Animal studies indicate exposure to oxygen under high pressure has caused hemolytic anemia. In pregnant women exposed to 100% oxygen for 20 minutes, the response was a fetal cardiac rate which decreased and became variable.

CHRONIC EXPOSURE:

OXYGEN: Inhalation of pure oxygen for periods up to 16 hours per day for many days at atmospheric pressure has caused no observed injury to man. Administration at atmospheric pressures at concentrations of 60% and 80% may be followed by adverse effects, including severe cough, acute chest pain associated with a decrease in vital capacity, intra-alveolar edema and atelectasis. It is possible that prolonged low-level injury may produce severe fibrotic changes in the lungs. However, after a human was exposed to high concentrations of oxygen for 150 days, severe irreversible retinal atrophy occurred. Dogs exposed to pure oxygen for 48 hours were found to develop retinal and choroidal detachments. Reproductive effects have been reported in animal studies.

SKIN CONTACT:

ACUTE EXPOSURE:

OXYGEN: No adverse effects have been reported from the gas. Due to rapid evaporation, the cryogenic liquid may cause frostbite with redness, tingling and pain or numbness. In more severe cases, the skin may become hard and white and develop blisters.

CHRONIC EXPOSURE:

OXYGEN: No adverse effects have been reported.

EYE CONTACT:**ACUTE EXPOSURE:**

OXYGEN: May cause irritation if not properly humidified. Due to rapid evaporation, the cryogenic liquid may cause frostbite with redness, pain and blurred vision.

CHRONIC EXPOSURE:

OXYGEN: No adverse effects have been reported.

INGESTION:**ACUTE EXPOSURE:**

OXYGEN: Ingestion of a gas is unlikely. If the cryogenic liquid is swallowed, frostbite damage of the lips, mouth and mucous membranes may occur.

CHRONIC EXPOSURE:

OXYGEN: No data available.

12. ECOLOGICAL INFORMATION

Not 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: Oxygen, compressed

ID NUMBER: UN1072

HAZARD CLASS OR DIVISION: 2.2

LABELING REQUIREMENTS: 2.2; 5.1

**CANADIAN TRANSPORTATION OF DANGEROUS GOODS:**

SHIPPING NAME: Oxygen, compressed

UN NUMBER: UN1072

CLASS: 2.2; 5.1

LAND TRANSPORT ADR:

PROPER SHIPPING NAME: Oxygen, compressed

UN NUMBER: UN1072

CLASS: 2

CLASSIFICATION CODE: 10

LABELS: 2.2(+5.1)

LAND TRANSPORT RID:
PROPER SHIPPING NAME: Oxygen, compressed
UN NUMBER: UN1072
CLASS: 2
CLASSIFICATION CODE: 10
LABELS: 2.2; 5.1; (+13)

AIR TRANSPORT IATA:
PROPER SHIPPING NAME: Oxygen, compressed
UN/ID NUMBER: UN1072
CLASS OR DIVISION: 2.2
SUBSIDIARY RISK: 5.1
HAZARD LABELS: 2.2; 5.1

AIR TRANSPORT ICAO:
PROPER SHIPPING NAME: Oxygen, compressed
UN NUMBER: UN1072
CLASS OR DIVISION: 2.2
SUBSIDIARY RISK: 5.1
LABELS: 2.2; 5.1

MARITIME TRANSPORT IMDG:
PROPER SHIPPING NAME: Oxygen, compressed
UN NUMBER: UN1072
CLASS OR DIVISION: 2.2
SUBSIDIARY RISK(S): 5.1

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: No
CHRONIC: No
FIRE: Yes
REACTIVE: No
SUDDEN RELEASE: Yes

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

OSHA PROCESS SAFETY (29CFR1910.119): Not regulated.

STATE REGULATIONS:

California Proposition 65: Not regulated.

CANADIAN REGULATIONS:

WHMIS CLASSIFICATION: Not determined.

EUROPEAN REGULATIONS:

EC CLASSIFICATION (ASSIGNED):

O	Oxidizing
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EC Classification may be inconsistent with independently-researched data.

DANGER/HAZARD SYMBOL:**EC RISK AND SAFETY PHRASES:**

R 8	Contact with combustible material may cause fire.
S 2	Keep out of the reach of children.
S 17	Keep away from combustible material.

GERMAN REGULATIONS:

WATER HAZARD CLASS (WGK):

STATE OF CLASSIFICATION: VwVwS

CLASSIFICATION UNDER HAZARD TO WATER: 0

NATIONAL INVENTORY STATUS:

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

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

16. OTHER INFORMATION

MSDS SUMMARY OF CHANGES

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

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