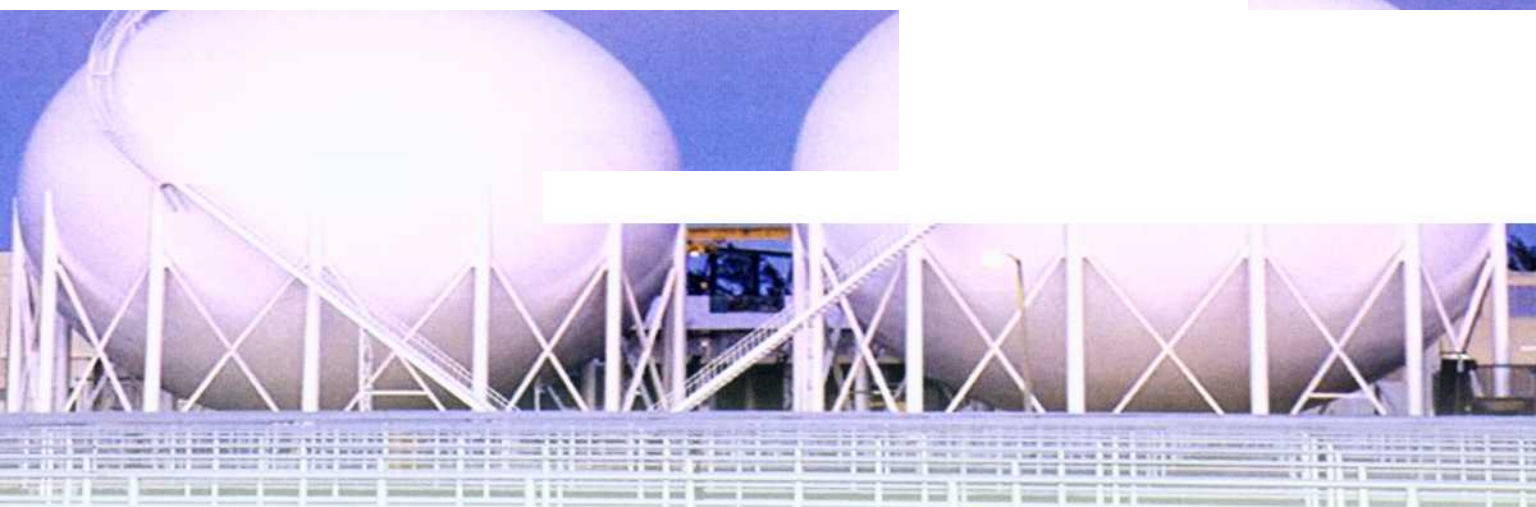


MATERIAL SAFETY DATA SHEET



METHANE

CHEMICAL PRODUCT

PRODUCT NAME: Methane, Compressed

CHEMICAL NAME: Methane

CHEMICAL FAMILY: Flammable gas

SYMBOL: CH₄

SYNONYMS: None

[USES]: Fuel and for general analytic/synthetic chemical uses.

INGREDIENT COMPOSITION INFORMATION

CHEMICAL NAME	Mole %	EXPOSURE LIMITS IN AIR					
		ACGIH		OSHA		IDLH ppm	OTHER
		TLV ppm	STE ppm	PEL ppm	STEL ppm		
Methane	>99%	There are no specific exposure limits for Methane. Methane is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%					
Maximum Impurities	<1%						

NE=Not Established

C=Ceiling Limit

HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Methane is an odorless, colorless gas, or odorless liquid in its cryogenic form. Both the liquid and the gas pose a serious fire hazard when accidentally released. The liquid will rapidly boil to the gas at standard temperatures and pressures. As a gas, it will act as a simple asphyxiant and present a significant health hazard by displacing the oxygen in the atmosphere. The gas is lighter than air and may spread long distances. Distant ignition and flashback are possible. The liquid gas can cause frostbite to any contaminated tissue. Flame or high temperature impinging on a localized area of the cylinder of methane can cause the cylinder to rupture without activating the cylinder's relief devices. Provide adequate fire protection during emergency response situation. Allow the released gas to dissipate in the atmosphere.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant route of overexposure for this gas is by inhalation. The following paragraphs describe symptoms of exposure by route of exposure.

INHALATION: High concentrations of this gas can cause an oxygen deficient environment. 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 overexposure, death may occur. The effects associated with various levels of oxygen are as follows:

OTHER POTENTIAL HEALTH EFFECTS:

Contact with cryogenic liquid or rapidly expanding gases (which are released under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after contact with the liquid can quickly subside.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An explanation in lay terms. Overexposure to Methane may cause the following health effects:

ACUTE: The most significant hazard associated with this gas is inhalation of oxygen deficiency. Symptoms include respiratory difficulty, headache, dizziness, and nausea. At high concentrations, unconsciousness or death may occur. Contact with cryogenic liquid or rapidly expanding gases may cause frostbite.

CHRONIC: There are currently no known adverse health effects associated with chronic exposure to Methane.

TARGET ORGAN: Respiratory system.

FIRST AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO METHANE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus and Fire-Retardant Personal Protective Equipment should be worn. Adequate fire protection must be provided during rescue situations.

Remove victims(s) to fresh air as quickly as possible. Trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. Only trained personnel should administer supplemental oxygen. In case of frostbite, place the frostbitten part in warm water. **DO NOT USE HOT WATER.** If warm water is not available, or is impractical to use, wrap the affected area in the armpit. Victims(s) must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to physician or other health professional with victims.

FIRE FIGHTING MEASURES

Flash point (closed Cup) -187 C (-306F)

Autoignition Temperature: 537 C (999F)

Flammable limits (in air by volume, %)

Lower (LEL) : 5.0%

Upper (UEL) 15.0%

FIRE EXTINGUISHING MATERIALS: Extinguish fires of this gas by shutting the source of the gas. Use water spray to cool fire-exposed containers and equipment.

UNUSUAL FIRE AND EXPLOSION HAZARDS: When involved in a fire, this gas will ignite and produce toxic gases including carbon monoxide and carbon [dioxide](#). An extreme explosion hazard exists in areas in which the gas has been released, but the material has not yet ignited.

DANGER: Fires impinging (direct flame) on the outside surface of unprotected pressure storage vessels of methane can be very dangerous and lead to container failure. The resulting fire and explosion can result in severe equipment damage and personnel injury or death over a large area around the vessel. For massive fire in large areas, use unmanned hose holder or monitor nozzles, if this is not possible, withdraw from area and allow fire to burn.

RESPONSE TO FIRE INVOLVING CRYOGEN: Cryogenic liquids can be particularly dangerous during fires because of their potential to rapidly freeze water. Careless use of water may cause heavy icing. Furthermore, relatively warm water greatly increases the evaporation

rate of Methane. If large concentrations of Methane gas are present, the water vapor in the surrounding air will condense, creating a dense fog that may make it difficult to find fire exits or equipment. Liquid Methane, when exposed to the atmosphere, will produce a cloud of ice/fog in the air upon its release. A flammable mixture will exist within the vapor cloud and it is advisable that personnel keep well outside the area of visible moisture.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion sensitivity to Static Discharge: Static discharge may cause Methane to ignite explosively.

Special Fire-Fighting Procedures: Structural fire-fighters must wear self-contained Breathing Apparatus and full protective equipment. The best fire-fighting technique may be simply to let the boring gas escape from the pressurized cylinder, tank car, or pipeline. Stop the leak before extinguishing. Before the leak is sealed, the still-leaking gas could explosively re-ignite without warning and cause extensive damage, injury, or fatality. In this case, increase ventilation (in enclosed areas) to prevent flammable or explosive mixture formation. For large releases consider evacuation.

ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a release, clear the affected area, protect people, and respond with trained personnel. Adequate fire protection must be provided. Minimum Personal Protective Equipment should be Level B: **Fire-Retardant protective clothing, gloves resistant to tears, and Self-Contained Breathing Apparatus.**

Use only non-sparking tools and equipment. Locate and seal the source of the leaking gas. Protect personnel attempting the shut-off with water-spray. Allow the gas, which is lighter than air, to dissipate. Liquid Methane, when exposed to the atmosphere, will produce a cloud of ice/fog in the air upon its release. A flammable mixture will exist within the vapor cloud, and it is advisable that personnel keep well outside the area of visible moisture. If cryogenic liquid is released, keep area clear and allow the liquid to evaporate. The gas that is then formed should be allowed to dissipate. Monitor the surrounding area for combustible gas levels and oxygen. The atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus. Combustible gas concentration must be below 10% of the LEL (LEL = 5.0%) prior to entry. Attempt to close the main source valve prior to entering the area. If this does not stop the release (or if it is not possible to reach the valve), allow the gas to release in-place or remove it to a safe area and allow the gas to be released there.

RESPONSE TO CRYOGENIC RELEASE: Clear the affected area and allow the liquid to evaporate and the gas to dissipate. After the gas is formed, follow the instructions provided in the previous paragraphs. If the area must be entered by emergency personnel, SCBA, Kevlar gloves, and appropriate foot and leg protection must be worn.

THIS IS AN EXTREMELY FLAMMABLE GAS. Protection of all personnel and the area must be maintained.

HANDLING AND STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting Methane IN YOU. Do not eat or drink while handling chemicals. Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of Methane could occur without any significant warning symptoms.

STORAGE AND HANDLING PRACTICES: Cylinders should be stored in dry, well-ventilated areas away from sources of heat. Compressed gases can present significant safety hazards. Store containers away from heavily trafficked areas and emergency exits. Post "No Smoking or Open Flames" signs in storage or use areas.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: Protect cylinders against physical damage. Store in cool, dry, well-ventilated area, away from sources of heat, ignition and direct sunlight. Do not allow area where cylinders are stored to exceed 52°C (125°F). Isolate from oxidizers such as oxygen, chlorine, or fluorine.

Use a check valve or trap in the discharge line to prevent hazardous backflow. Post "No Smoking or Open Flame" signs in storage

and use areas. Cylinders should be stored upright and be firmly secured to prevent falling or being knocked over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting. Never tamper with pressure relief devices in valves and cylinders. Electrical equipment should be non-sparking or explosion proof. The following rules are applicable to work situations in which cylinders are being used:

Before Use: Move cylinders with a suitable hand truck. Do not drag, slide, or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap, if provided, in place until cylinder is ready for use.

During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Do not heat cylinder by any means to increase the discharge rate of the product from the cylinder. Use check valve or trap in discharge line to prevent hazardous backflow into the cylinder. Do not use oils or grease on gas-handling fittings or equipment.

After Use: Close main cylinder valve. Replace valve protection cap, if provided. Mark empty cylinders "EMPTY".

NOTE: Use only DOT or ASME code containers. Earth-ground and bond all lines and equipment associated with Methane. Close valve after each use and when empty. Cylinders must not be recharged except by or with the consent of owner.

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. Purge gas handling equipment with inert gas (e.g., nitrogen) before attempting repairs.

EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Local exhaust ventilation is preferred, because it prevents Methane dispersion into the work place by eliminating it at its source. If appropriate, install automatic monitoring equipment to detect the presence of potentially explosive air-gas mixtures and the level of oxygen. Monitoring devices should be installed near the ceiling.

RESPIRATORY PROTECTION: Maintain oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection if oxygen levels are below 19.5% or during emergency response to a release of Methane.

EYE PROTECTION: Splash goggles or safety glasses, for protection from rapidly expanding gases and splashes of liquid Methane.

HAND PROTECTION: Wear gloves resistant to tears when handling cylinders of Methane. Use low-temperature protective gloves when working with containers of liquid Methane.

BODY PROTECTION: Use body protection appropriate for task. Transfer of large quantities under pressure may require protective equipment appropriate to protect employees from splashes of liquefied product, as well as fire retardant items.

PHYSICAL and CHEMICAL PROPERTIES

ABSOLUTE DENSITY gas @ 101.325 kpa @: 0.6784 kg/m³

(0.042 35 lb/ft³) **SPECIFIC VOLUME:** @ 21.1°C, 101.325 kpa =23.7 ft³/lb

RELATIVE DENSITY, gas @ 101.325 kpa @ 0°C (Air=1) =0.555

SOLUBILITY IN WATER: @ 101.325 kpa (partial pressure of CH₄ @ 20°C =0.03308 cm³ 1Cm³)

BOILING POINT @ 101.325 kpa=-161.5

ODOR THRESHOLD: Not applicable. Odorless.

VAPOR PRESSURE (psia): Not applicable.

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable. pH: Not applicable.

APPEARANCE AND COLOR: Colorless, odorless gas, or colorless, odorless, cryogenic liquid.

HOW TO DETECT THIS SUBSTANCE (warning properties): There are no distinct warning properties. 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.

NOTE: This gas is lighter than air and must not be allowed to accumulate in elevated locations.

STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: When ignited in the presence of oxygen, this gas will burn to produce carbon monoxide, carbon dioxide.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong oxidizers (e.g., chlorine, bromine pentafluoride, oxygen, oxygen difluoride and nitrogen trifluoride).

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials and exposure to heat, sparks, and other sources of ignition. Cylinders exposed to high temperatures or direct flame can rupture or burst.

TOXICOLOGICAL INFORMATION

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

SUSPECTED CANCER AGENT: Methane is neither considered to be nor suspected to be a cancer-causing agent by these agencies.

IRRITANCY OF PRODUCT: Methane is not irritating; however, contact with rapidly expanding gases can cause frostbite to exposed tissue.

SENSITIZATION TO THE PRODUCT: Methane does not cause sensitization with prolonged or repeated contact.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of Methane on the human reproductive system.

Mutagenicity: No mutagenicity effects have been described for Methane.

Embryotoxicity: No embryotoxic effects have been described for Methane.

Teratogenicity: No teratogenicity effects have been described for Methane.

Reproductive Toxicity: No reproductive toxicity effects have been described for Methane.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational 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.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Acute or chronic respiratory conditions may be aggravated by overexposure to the components of Methane.

RECOMMENDATIONS TO **PHYSICIANS**: Administer oxygen if necessary. Treat symptoms and eliminate exposure.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) are not applicable for Methane.

ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: Methane occurs naturally in the atmosphere. This gas will be dissipated rapidly in well-ventilated areas.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Any adverse effect on animals would be related to oxygen-deficient environments. No adverse effect is anticipated to occur to plant-life, except for frost produced in the presence of rapidly expanding gases.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on the effects of Methane on aquatic life.

DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Product removed from the cylinder must be disposed off. Do not dispose locally.

TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS.

For Methane Gas:

PROPER SHIPPING NAME: Methane, compressed

HAZARD CLASS NUMBER and DESCRIPTION: 2.1 (Flammable Gas)

PACKING GROUP: Not Applicable

DOT LABEL(S) REQUIRED: Flammable Gas

For Liquefied Methane:

PROPER SHIPPING NAME: Methane, refrigerated liquid

HAZARD CLASS NUMBER and DESCRIPTION: 2.1 (Flammable Gas)

PACKING GROUP: Not Applicable

DOT LABEL(S) REQUIRED: Flammable Gas