



## MATERIAL SAFETY DATA SHEET

PRODUCT NAME: Acetylene  
 CHEMICAL NAME: Acetylene  
 CHEMICAL FAMILY: Not Applicable  
 SYMBOL:  $C_2H_2$   
 SYNONYMS: Not Applicable

### CHEMICAL PRODUCT

# ACETYLENE

**Uses:**

**Welding, cutting, chemical synthesis, manufacture of carbon black, and synthetic chemical uses**

### INGREDIENT COMPOSITION INFORMATION

Chemical Name	Mole %	Exposure Limits in Air					Other
		ACGIH		OSHA		IDLH	
		TLV	STEL	PEL	STEL		
Simple Asphyxiant				NE	NE	NE	NIOSH REL: 2500 ppm, ceiling
<b>Acetylene</b>	>98.5%						
<b>Maximum Impurities</b>	<1%						

NE = Not Established    C=Ceiling Limit

### HAZARD IDENTIFICATION

**EMERGENCY OVERVIEW:**

Acetylene is a colorless, flammable gas, with a garlic-like odor, that is dissolved in acetone. The main health hazard associated with a release of this gas is asphyxiation by displacement of oxygen. Acetylene gas poses an extreme fire hazard when accidentally released. The gas is lighter than air, and may spread long distances. Distant ignition and flashback are possible. Flame or high temperature impinging on a localized area of the cylinder of this product can cause the cylinder to explode without activating the cylinder's relief devices. Acetylene gas may decompose explosively at elevated temperatures and pressures. Acetylene can form very explosive metallic salts (such as with copper, mercury, and silver). Provide adequate fire protection during emergency response situations.

**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:**

At concentration below the LEL of 2.5% (25000 ppm) this gas is essentially non-toxic. At higher concentrations, acetylene has anesthetic effects. Symptoms of overexposure to such high concentrations may include drowsiness, dizziness, and a general feeling of weakness. 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. The skin of a victim of overexposure may have a blue color.

CONCENTRATION

SYMPTOM OF EXPOSURE

12-16% Oxygen:	Breathing and pulse rate increased, muscular coordination slightly disturbed.
10-14% Oxygen:	Emotional upset, abnormal fatigue, disturbed respiration.
6-10% Oxygen:	Nausea and vomiting, collapse or loss of consciousness.
Below 6%:	Convulsive movements, possible respiratory collapse, and death.

When administered with oxygen at concentrations of 10% or greater, acetylene produces varying degrees of temporary narcosis.

OTHER POTENTIAL HEALTH EFFECTS: The gas is generally non-irritating to the skin and eyes. Acetylene is dissolved in acetone. Any skin or eye contact with the acetone component of this product may be slightly irritating to contaminated skin or eyes.

HEALTH EFFECTS OR RISKS FROM EXPOSURE:

Overexposure to acetylene may cause the following health effects (in lay terms):

ACUTE: The most significant hazard associated with acetylene is inhalation of oxygen-deficient atmospheres. Symptoms of oxygen deficiency include respiratory difficulty, ringing in ears, headaches, shortness of breath, wheezing, headache, dizziness, indigestion, and nausea. At high concentrations, unconsciousness or death may occur.

CHRONIC: There are currently no known adverse health effects associated with chronic exposure to the components of this compressed gas.

TARGET ORGANS: Respiratory system, central nervous system.

## FIRST AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO ACETYLENE 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 victim(s) to fresh air as quickly as possible. If it is necessary to administer supplemental oxygen or cardio-pulmonary resuscitation only trained personnel should perform these procedures.

SKIN EXPOSURE: If the liquid portion of this product (acetone) is spilled on skin, immediately begin decontamination with running water.

Minimum flushing is for 15 minutes. Remove exposed or contaminated clothing taking care not to contaminate eyes. Victim must seek immediate medical attention if redness or irritation develops.

EYE EXPOSURE: If the liquid portion of this product (acetone) splashes into eyes, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Victim(s) must be taken for medical attention. Take a copy of the label and the MSDS to the physician or other health professional with victim(s).

## FIRE FIGHTING MEASURES

AUTOIGNITION TEMPERATURE: 406-440 ° C

FLAMMABLE LIMITS: (In air by volume, %): 2.5-81% by volume

LOWER (LEL): 2.5%

UPPER (UEL): 81%

100% with substantial energy source and under certain conditions of pressure, container size and shape.

FIRE EXTINGUISHING MATERIALS:

Extinguish fires of this gas by shutting off the source of the gas. Use water spray to cool fire exposed structures and equipment.

UNUSUAL FIRE AND EXPLOSION HAZARDS:

When involved in a fire, this material ignites to produce toxic gases including carbon monoxide and carbon dioxide. Acetylene gas is extremely flammable and can readily form explosive mixtures with air over a very wide range. An explosion hazard exists in confined spaces when the gas is released. Pure acetylene can explode under certain conditions of elevated pressure, temperature, and container size. Acetylene reacts with active metals to form explosive acetylide compounds.

**DANGER!** Fires impinging (direct flame) on the outside surface of unprotected pressure storage vessels of acetylene can be very dangerous. Direct flame exposure on the cylinder wall can cause an explosion either by BLEVE (Boiling Liquid Expanding Vapor Explosion), or by exothermic decomposition. This could cause a catastrophic failure of the vessel releasing the contents into a massive fireball and explosion. 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 fires in large areas, use unmanned hose holders or monitor nozzles. If this is not possible, withdraw from area and allow fire to burn.

Explosion Sensitivity to Mechanical Impact: Not Sensitive.

Explosion Sensitivity to Static Discharge: Static discharge may cause this gas to ignite explosively.

**SPECIAL FIRE-FIGHTING PROCEDURES:** The best fire-fighting technique may be simply to let the burning gas escape from the pressurized cylinder, tank car, or pipeline. Stop the leak before extinguishing fire. If the fire is extinguished 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. Structural fire fighters must wear self-contained breathing apparatus and full protective equipment. Because of the potential for a BLEVE, evacuation of non-emergency personnel is essential. If water is not available for the cooling or protection of vessel exposures, evacuate the area.

**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 and protect people. Adequate fire protection must be provided.

Minimum personal protective equipment should be Level B: fire-retardant protective clothing, mechanically-resistant gloves 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 to dissipate. Monitor the surrounding area for oxygen and combustible gas levels. Combustible gas concentration must be below 10% of the LEL (LEL = 2.5%) prior to entry of any response personnel. The atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without self-contained breathing apparatus. 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.

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 acetylene IN YOU. Do not eat or drink while handling chemicals.

Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of acetylene could occur without any significant warning symptoms.

**STORAGE AND HANDLING PRACTICES:** Cylinders should be stored upright and be firmly secured to prevent falling or being knocked over. This will prevent acetone from being released from the cylinder. 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.

Use non-sparking ventilation systems, approved explosion-proof equipment, and appropriate electrical systems. Keep storage area clear of materials which can burn. Have appropriate extinguishing equipment in the storage area (e.g., sprinkler system, portable fire extinguishers).

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, away from process and production areas, and away from elevators, building and room exits or main aisles leading to exits. Post "No Smoking or Open Flames" signs in storage or use areas. Avoid storage for over six months and keep the smallest amount necessary on-site at any one-time. Separate acetylene cylinders from oxygen, chlorine, and other oxidizers by at least 20 ft (6.1 m), or use a barricade at least 1.53m (5 ft) high of noncombustible material with a fire resistance rating of at least ½ hour.

Keep the quantity stored as small as possible. If minimal quantities are exceeded, a special room must be built for the storage of acetylene. Consider installation of leak detection and alarm for storage area.

It is important to note that acetylene, in its free state, under pressure, may decompose violently. The higher the pressure, the smaller the initial force necessary to cause a reaction. Therefore, never use the free gas outside the cylinder at pressures in excess of 15 psig. If pressures exceeding this limit are utilized, special explosion and fire safety precautions must be implemented.

**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 halogens and oxidizers such as oxygen, chlorine, or fluorine. Use a check valve or trap in the discharge line to prevent hazardous backflow. 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 (where 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. Valves should be closed tightly, to prevent evaporation of acetone. Replace valve protection cap. Mark empty cylinders "EMPTY".

**NOTE:** Use only DOT or ASME code containers designed for acetylene storage. Earth-ground and bond all lines and equipment associated with this product. 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 Accidental Release Measures. Make certain 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 to ensure oxygen levels are above 19.5% in the work area. Local exhaust ventilation is preferred, because it prevents acetylene dispersion into the work place by eliminating it at its source. If appropriate, install automatic monitoring equipment to detect the level of oxygen and the presence of potentially explosive air-gas mixtures.

**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 acetylene.

**EYE PROTECTION:** Splash goggles or safety glasses, for protection from rapidly expanding gases and splashes of the acetone.

**HAND PROTECTION:** Wear mechanically resistant gloves when handling cylinders of acetylene. Wear Solvex or neoprene gloves if operations could lead to a potential exposure to acetone.

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

## **PHYSICAL and CHEMICAL PROPERTIES**

**RELATIVE DENSITY:** GAS @101.325 kpa @ 0.0°C (Air=1)=0.908

**pH:** Not applicable

**ABSOLUTE DENSITY:** GAS @ 101.325 kpa @ 0.0°C = 1.1747 Kg/m<sup>3</sup>

**FREEZING POINT:** (@ 10 psig): -84°C (-119°F)

**SOLUBILITY IN WATER:** @ 101.325 kpa (practical pressure of Acetylene)

**BOILING POINT:** -75°C (-103°F) @ 25°C = 0.94 cm<sup>3</sup>/1 cm<sup>3</sup> water

**EXPANSION RATIO:** Not applicable.

**ODOR THRESHOLD:** 226 ppm

**VAPOR PRESSURE (psia):** 649.6

**SPECIFIC VOLUME:** 15.6°C, 101.325 kpa = 14.43 ft<sup>3</sup> /lb

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

**APPEARANCE AND COLOR:** Colorless gas with a garlic-like odor dissolved in acetone.

**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.

## **STABILITY AND REACTIVITY**

**STABILITY:** Acetylene is stable at standard temperatures and pressures. Gaseous acetylene may decompose violently at elevated temperatures and pressures. Acetylene must not be used at pressures greater than 15 psig. The higher the pressure, the more likely it is for a reaction to occur.

**DECOMPOSITION PRODUCTS:** Carbon and hydrogen. When ignited in the presence of oxygen, carbon monoxide and carbon dioxide are formed.

**MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE:** Acetylene is not compatible with the following materials: Strong oxidizers (e.g. chlorine, bromine pentafluoride, oxygen, oxygen difluoride and nitrogen trifluoride), brass (with a copper content exceeding 65%), calcium hypochlorite, various heavy metals (copper, silver, mercury) and the salts of these metals, halogens (bromine, chlorine, iodine, fluorine), hydrides ( e.g. sodium hydride, cesium hydride), ozone, perchloric acid; potassium.

**HAZARDOUS POLYMERIZATION:** Can occur when heated or under pressure.

**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. Liquid nitrogen should not be used as a trap, as it may cause acetylene to condense to its liquid or solid state, both of which are explosive.

## **TOXICOLOGICAL INFORMATION**

**TOXICITY DATA:** The following information is for acetylene.

TCLo (inhalation, human) = 20 pph; central nervous system, respiratory system effects.

LCLo (inhalation, human) = 50 pph/5 minutes

LCLo (inhalation, human) = 500,000 ppm/5 minutes

Other data pertaining to the effects of acetylene inhalation on humans are as follows.

Concentration Symptoms:

100,000 ppm: Intoxication (drowsiness, dizziness, giddiness).

200,000 ppm: Severe intoxication.

300,000 ppm: Loss of coordination.

350,000 ppm: Unconsciousness after 5 minutes of exposure.

**Effects on Short-Term Inhalation:** Animals have shown tolerance to 10% acetylene. In studies with dogs, cats, and rabbits, acetylene acts as an anesthetic at 20% exposure. Recovery occurs if the oxygen level is maintained. In an oxygen-deficient environment, death may occur after 5-10 minutes. Rodents exposed to 25, 50, and 80 percent acetylene in oxygen for 1-2 hours daily (93 hours total exposure), evidenced no weight change or cellular damage. Mixtures of 80% acetylene/20% oxygen caused a rise in blood pressure in an exposed cat.

**SUSPECTED CANCER AGENT:** Acetylene is not considered to be, nor suspected to be a cancer-causing agent.

**IRRITANCY OF PRODUCT:** Acetylene is not irritating; however, contact with the acetone component of acetylene can be slightly irritating to contaminated skin or eyes.

**SENSITIZATION TO THE PRODUCT:** Acetylene is not known to cause sensitization in humans.

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

**Mutagenicity:** No mutagenicity effects have been described for acetylene.

**Embryotoxicity:** No embryotoxic effects have been described for acetylene.

**Teratogenicity:** No teratogenicity effects have been described for acetylene.

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

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.

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

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

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

## **ECOLOGICAL INFORMATION**

**ENVIRONMENTAL STABILITY:** This gas will be dissipated rapidly in well-ventilated areas. The following environmental data are available for this gas:

**Water Solubility (acetylene)** = 100 vol./100 vol. at 18 EC. Acetylene is not expected to be harmful to aquatic life. Only moderately toxic to fish. volatility and low solubility suggest it would be rare for water to become critically polluted from accidental releases. Acetylene is biodegraded through various plant and bacterial systems by inactivating atmospheric acetylene through their nitrogen- fixing mechanisms.

**EFFECT OF MATERIAL ON PLANTS or ANIMALS:** Any adverse effect on animals would be related to oxygen deficient environments and the anesthetic properties of acetylene at high concentrations of exposure.

**EFFECT OF CHEMICAL ON AQUATIC LIFE:** The following aquatic toxicity data are available for acetylene.

LC50 (river trout): 33 hours, 200 mg/l.

## **DISPOSAL CONSIDERATIONS**

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

## **TRANSPORT INFORMATION**

**THIS MATERIAL IS HAZARDOUS.**

**PROPER SHIPPING NAME:** Acetylene, dissolved

**HAZARD CLASS NUMBER and DESCRIPTION:** 2.1 (Flammable Gas)

**PACKING GROUP:** Not Applicable

**DOT LABEL(S) REQUIRED:** Flammable Gas