

FORTUNA DISCLOSURE RESPONSE

Commenter Background:**Name:**

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Education:

B.S. Chemical Engineering, University of Pennsylvania 1969.

M.S. Chemical Engineering, University of Illinois 1971.

Work Experience:

31-1/2 years with major pharmaceutical firm.

As Executive Director of Process Engineering, managed a staff of 60 engineers responsible for the development of safe, environmentally sound, and cost-effective facility designs for new bulk chemical products throughout the world.

Served as Director of Safety and the Environment evaluating safety and operating hazards, conducting risk analyses, and implementing chemical waste and volatile organic emissions (VOC) reduction programs.

General Overview:**WWW.EARTHWORKSACTION.ORG - Excerpts From Hydraulic Fracturing 101**

Many fracturing fluids contain chemicals that can be toxic to humans and wildlife, and chemicals that are known to cause cancer. These include potentially toxic substances such as diesel fuel, which contains benzene, ethylbenzene, toluene, xylene, naphthalene and other chemicals; polycyclic aromatic hydrocarbons; **methanol; formaldehyde; ethylene glycol**; glycol ethers; hydrochloric acid; and sodium hydroxide. Very small quantities of chemicals such as benzene, which causes cancer, are capable of contaminating millions of gallons of water.

In general, many hydraulic fracturing fluids in pure form are toxic to humans. However, there is a lack of acute and chronic toxicity data, as well as immunotoxicity, carcinogenicity, genotoxicity, endocrine disruption and developmental data for individual hydraulic fracturing chemical constituents. Toxicological data do not exist for many fracturing fluids (may be proprietary), the mixtures of hydraulic fracturing chemicals, and their individual chemical components.

The Argonne National Laboratory reports that several chemicals used during fracturing operations (i.e., **biocides, corrosion inhibitors, breakers**, organic components such as benzene and naphthalene) "can be lethal at levels as low as 0.1 ppm".

More so, there is limited toxicity data for the resultant hydraulic fracturing wastes. There are potentials for chemical interactions between fracturing chemicals, or between injected chemicals and naturally occurring chemicals in the underground fracturing rock stratum to produce new compounds of unknown toxicity. Some byproducts of biodegradation could be more toxic than the originally injected chemicals. Not only may these byproducts be toxic to humans, but they may also be toxic to microorganisms that biodegrade fracturing fluid chemicals; e.g., degradation of aromatic compounds such as toluene, can yield phenolic acid and benzoic acid intermediates. Various microbial populations may be inhibited by compound such as phenol and toluene, particularly at high concentrations. Where acidizing is performed for fracturing, the acids can leach out highly toxic elements of arsenic, mercury, lead and selenium from their host rocks during drilling. Other environmental elements of environmental concern include cadmium, cobalt, chromium, nickel and uranium. Additionally, some companies tag the tail end of their proppant with a radioactive tracer during hydraulic fracturing operations.

WWW.EARTHWORKSACTION.ORG - Excerpts From "Our Drinking Water At Risk: What EPA and the Oil and Gas Industry Don't Want Us to Know About Hydraulic Fracturing"

The use of Manufacturing Safety Data Sheets (MSDSs) by gas drilling companies to characterize the hazards of fracturing fluids is not necessarily that meaningful from a public health perspective. MSDSs are designed to inform those who handle, ship, and use the product(s) about the products' physical and chemical characteristics, and its direct/immediate health effects to prevent injury. The sheets are also designed to inform emergency response crews in the case of accidents or spills.

--- The data in MSDSs do not generally take into consideration the health impacts resulting from chronic or long-term, continuous, and/or intermittent exposure. Many products that have MSDSs have not gone through a rigorous and extensive scientific peer-review process that would permit conclusions to be drawn about "safe" and/or "hazardous" exposure levels.

--- In many cases the chemicals listed equal less than 100% of the product. In case of mixtures, the health effects are not often chemical-specific.

--- Proprietary fracturing chemicals do not have to be disclosed in MSDSs.

--- Some states require MSDSs to cover only the chemicals that have OSHA standards (about 500 chemicals).

--- MSDS sheets do not include all of the ingredients in a certain material, but only those that make up greater than 1% of the total constituents of that material.

Some geological formations contain groundwater of high enough quality to be considered underground sources of drinking water. The EPA determined that in some cases, hydraulic fracturing chemicals are injected directly into USDWs during the course of normal fracturing operations. Additionally, even if hydraulic fracturing does not occur directly in USDWs, it is possible that USDWs adjacent to hydraulically fractured formations may become contaminated by fracturing fluids. The EPA states that many chemicals in hydraulic fracturing fluids are linked to human health effects. These effects include cancer; liver, kidney, brain, respiratory and skin disorders; birth defects; and other health problems. The draft EPA study included calculations showing that even when diluted with water at least nine hydraulic fracturing chemicals may be injected into USDWs at concentrations that pose a threat to human health. These chemicals are: benzene, phenanthrenes, naphthalene, 1-methylnaphthalene, 2-methylnaphthalene, fluorenes, aromatics, ethylene glycol and methanol. This important information was removed from the final study.

The toxicity of fracturing fluids wastes is a relevant issue for two reasons: 1) The toxicity of waste products can provide information on hazards associated with fluids trapped underground; and 2) Disposal practices, themselves, may create health hazards.

First, when fracturing fluids are injected underground they mix with groundwater and any naturally occurring compounds or elements (e.g., metals) in the coal formation. Not all fracturing fluids are removed. If the wastes brought to the surface were to be characterized (e.g., analyzed for toxicity or hazardous constituents), this information could provide valuable insight into the potential for the "wastes" that are trapped underground to contaminate underground sources of drinking water. Unfortunately, EPA does not provide any information on the toxicity of hydraulic fracturing wastes.

Second, the handling and storage of hydraulic fracturing fluid wastes may present a health hazard to workers and people living in close proximity to fractured wells. Some chemicals in fracturing fluids contain volatile components (i.e., components that can move from the liquid wastes into the air). Spraying fracturing fluid wastes through a diffuser and storing the wastes in pits or trenches may generate airborne contaminants at levels that affect human health. EPA did not study this issue. Nearby soils could become contaminated by the sprayed wastes, and some contaminants could be carried by rainwater into streams. Also, surface waters and groundwater could be contaminated if fracturing wastes seep through inadequately lined pits or if the pits overflow. EPA does not explore these issues.

NY DEPARTMENT OF ENVIRONMENTAL (DEC) - Final Scope For Draft Supplemental Generic Environmental Impact Statement (DSGEIS) On The Oil, Gas And Solution Mining Regulatory Program Well Permit Issuance For Horizontal Drilling And High-Volume Hydraulic Fracturing To Develop The Marcellus Shale And Other Low Permeability Gas Reservoirs

2.1.2.2 Fluid Removal from Well Site and Ultimate Disposition of Returned Fluids

Every well permit issued by the Department specifies that fluids must be removed from the well site by a hauler with a valid Part 364 Waste Transporter Permit issued by the Department. Fluids must be removed before the pit is reclaimed and "[under no circumstances may operators fill in a pit before removing waste fluids." 18 Pits must be reclaimed within 45 days of operations ending, unless the Department approves an extension for good cause after inspecting the pit's condition.

Potential destinations for removed fluids discussed in the GEIS include:

- Injection wells, which are regulated under both the Department's State Pollutant Discharge Elimination System ("SPDES") and the federal

- Underground Injection Control (“UIC”) program,
- Municipal sewage treatment facilities, and
- Out-of-state industrial treatment plants.

Injection Wells - Discussed in Chapter 15 of the GEIS, injection wells for disposal of brine associated with oil and gas operations are classified as Class IID in EPA’s Underground Injection Control program and require federal permits. As stated in Section 4.2.2.1 of this document, the requirement for a UIC permit is not affected by the fact that hydraulic fracturing itself is excluded from the Safe Drinking Water Act’s definition of “underground injection.” Even if the brine disposal well is authorized to accept spent fracturing fluid, the UIC permit is still required. Under the Department’s SPDES program, these wells have been categorized and regulated as discharges. The primary objective of both programs is protection of underground sources of drinking water, and neither the EPA nor the DEC issues a permit without a demonstration that injected fluids will remain confined in the disposal zone and isolated from fresh water aquifers.

A well permit issued by the Division of Mineral Resources is also required to drill or convert a well deeper than 500 feet for brine disposal. This permit is not issued until required UIC and SPDES permits have been approved. As noted in the 1992 Findings Statement, the permitting process for brine disposal wells “require[s] an extensive surface and subsurface evaluation which is in effect a supplemental EIS addressing technical issues. An additional site-specific environmental assessment and SEQR determination are required.” Because the Department is not seeking to reduce the level of site-specific review required for disposal wells, or to make generic SEQRA findings regarding their potential environmental impacts, the permitting process for brine disposal wells will not be reviewed in the DSGEIS.

Municipal sewage treatment facilities – Municipal sewage treatment facilities, known as Publicly Owned Treatment Works (“POTWs”) are regulated by the Department’s Division of Water (“DOW”). DOW notified POTW operators in a December 8, 2008 letter that they may not accept hydraulic fracturing wastewater or produced fluids from gas well development unless they have an approved pre-treatment or mini-pretreatment program, and an approved headworks analysis for these fluids. Any headworks analysis will require specific information regarding the fluids, including chemical makeup data, with specific attention paid to the concentration of total dissolved solids and aquatic toxicity data. Representative fluid samples will need to undergo laboratory testing to support a POTW’s headworks analysis, and such testing must be conducted by a laboratory certified by the New York State Department of Health (“NYSDOH”) Environmental Laboratory Approval Program (“ELAP”).

The Division of Mineral Resources has been providing, and will continue to provide, DOW with all information pertaining to the chemical composition of the hydraulic fracturing additives in an effort to assist in the review of any headworks analysis received. The Division of Water will review the headworks analysis and determine whether the POTW has adequately evaluated the effects of the proposed discharge on POTW operation, sludge disposal, effluent quality and POTW health and safety; whether the discharge will result in the discharge of a substance that will be subject to effluent limits, action levels, or monitoring requirements in the facility’s SPDES permit; and whether the proposed discharge contains any Bioaccumulative Chemicals of Concern or persistent toxic substances that may be subject to SPDES effluent limits or other Department permit requirements or controls. If necessary after the review of the headworks analysis, the Division of Water will modify a POTW’s SPDES permit so that the treatment operations are protected and discharge effluent limits and water quality standards are met in accordance with 6 NYCRR §750-1.18 (4).21 Such a modification would be subject to public review.

Specific Literature Information on Various Fracturing Chemicals

Formaldehyde

A cursory review by Oil and Gas Accountability Project (OGAP) shows that **formaldehyde is a known carcinogen**, chromic acetate is considered to be an “environmental hazard” in Pennsylvania, and hydrochloric acid is highly corrosive (see www.earthworksaction.org - “Our Drinking Water At Risk: What EPA and the Oil and Gas Industry Don’t Want Us to Know About Hydraulic Fracturing”).

US Department of Labor – Occupational Safety and Health Administration (OSHA) - Formaldehyde is common to the chemical industry. The 11th Report on Carcinogens classifies it as “reasonably anticipated to be a human carcinogen” and reported US production at 11.3 billion pounds in 1998. International production was over 46 billion pounds in 2004, according to the International Agency for Research on Cancer (IARC). It is well known as a preservative in medical laboratories, as an embalming fluid, and as a sterilizer. Its primary use is in the production of resins and as a chemical intermediate. Urea-formaldehyde (UF) and phenol formaldehyde (PF) resins are used in foam insulations, as adhesives in the production of particle board and plywood, and in the treating of textiles.

Methanol MSDS by Terra Nitrogen Corporation, Sioux City, Iowa

Emergency Overview:

Methanol is a colorless volatile liquid with a faintly sweet pungent odor similar to ethyl alcohol. The substance is fully soluble in water. Vapors of methanol are slightly heavier than air and may travel some distance to a source of ignition and flash back. Accumulations of vapors in confined spaces such as buildings or sewers may explode if ignited. There is potential for containers of liquid to rupture violently if exposed to fire or excessive heat for sufficient time duration. Methanol is listed as a “Poison-Class B”. It is harmful if swallowed or absorbed through the skin. Ingestion of as little as one ounce can cause irreversible injury to the nervous system, blindness, or death. It cannot be made nonpoisonous. Causes eye and respiratory system irritation and may cause skin irritation. Avoid liquid, mist, or vapor contact. Vapor inhalation or liquid penetration of the skin can cause central nervous system depression.

Potential Health Effects:

Primary Routes of Entry: Inhalation, skin contact/absorption, eye contact, and

ingestion.

General Acute Exposure: Liquid, mist, or vapors can cause eye, skin, and respiratory tract irritation and Central Nervous System (CNS) depression.

Inhalation:

Acute Exposure: Short-term exposure to high concentrations of methanol may cause CNS depression. Symptoms may include headache, weakness, drowsiness, lightheadedness, nausea, difficult breathing, drunkenness, eye irritation, blurred vision, blindness, loss of consciousness, vertigo, fatigue, convulsions, and possibly death, depending on exposure. Victims may improve and then get worse again up to 30 hours later.

Skin:

Acute Contact: Upon prolonged or repeated contact, absorption through the skin may occur and produce toxic effects similar to those resulting from inhalation exposure. Repeated or prolonged skin contact may cause drying, cracking, and inflammation of the skin due to the defatting action of the product.

Eye:

Acute Contact: Eye irritation may occur upon short-term exposure, including a burning sensation, tearing, redness, or swelling. Upon direct contact with liquid, conjunctivitis and corneal burns may occur. The primary toxic effect of methanol is exerted upon the nervous system, particularly the optic nerves and possibly the retina. The condition can progress to permanent blindness.

Ingestion:

Ingestion may cause serious poisoning with effects similar to those of inhalation and absorption through the skin. **Toxic effects are more common after ingestion. Death from as little as one ounce has been reported.**

Neurologic:

Acute Exposure: Central Nervous System (CNS) depression may occur upon exposure.

Summary of Chronic Exposure:

Methanol is slowly eliminated from the body; hence repeated exposures may result in toxic levels in the blood and tissues. Due to its slow elimination, methanol should be regarded as a cumulative poison. Though single exposures to fumes may cause no harmful effect, daily exposure may result in the accumulation of sufficient methanol in the body to cause illness.

Note to the Physician: Coma resulting from massive exposures may last as long as 2-4 days. In the body, products formed by its oxidation are formaldehyde and formic acid.

CHEMICAL DATA SHEET EXCERPTS FOR FORMALDEYDE SOLUTION

(CAMEO CHEMICALS DATA SHEETS (Developed by the National Oceanic and Atmospheric Administration's [Office of Response and Restoration](#) in partnership with the Environmental Protection Agency's [Office of Emergency Management](#) and the U.S. Coast Guard's [Research and Development Center](#)).

| | |
|-----------------------------------|----------|
| FORMALDEHYDE, SOLUTION, FLAMMABLE | 4 3 0 |
|-----------------------------------|----------|

Chemical Identifiers

| UN/NA Number | CAS Number | CHRIS Code | DOT Hazard Label |
|--------------|------------|------------|-------------------------------|
| → 1198 | → 50-00-0 | FMS | FLAMMABLE LIQUID CORROSIVE |

NFPA 704: Red 4 -- Flammability: Extremely flammable

Blue 3 -- Health Hazard: Extremely hazardous - use full protection
yellow 0 -- Reactivity: Normally stable

General Description

A colorless aqueous solution of formaldehyde, which is a gas at ordinary conditions. Has a pungent irritating odor. Flash point varies from 122 to 141°F. Denser than water. The vapors are heavier than air and are highly irritating to the nose. Toxic if swallowed. Contact can cause severe injury to the skin accompanied by drying, cracking, and scaling. Used to make plastics, other chemicals, and fertilizers. Used as a preservative and a corrosion inhibitor.

Rate of onset: Immediate

Persistence: Hours

Odor threshold: 1 ppm

Source/use/other hazard: Disinfection/germicide; fungicide; textile; health care (tissue fixing).

Reactivity Alerts

none

Air & Water Reactions

The solution gives up formaldehyde vapors readily. These vapors are flammable over a wide vapor-air concentration range. Water soluble.

Fire Hazard

Toxic vapors such as carbon dioxide and carbon monoxide are generated during combustion. Explosion hazard: when aqueous formaldehyde solutions are heated above their flash points, a potential for explosion hazard exists. High formaldehyde concentration or methanol content lowers flash point. Reacts with nitrogen oxides at about 180; the reaction becomes explosive. Also reacts violently with perchloric acid-aniline, performic acid, nitromethane, magnesium carbonate, and hydrogen peroxide. When heated, irritant formaldehyde gas evolved from solution. The main products of decomposition are carbon monoxide and hydrogen. Metals such as platinum, copper, chromia, and alumina also catalyze the formation of methanol, methylformate, formic acid, carbon dioxide, and methane.

Reacts with peroxide, nitrogen oxide, and performic acid causing explosions. Can react with hydrogen chloride or other inorganic chlorides to form bis-chloromethylether (BCME), a known carcinogen.

Very reactive, combines readily with many substances, 40% solution is powerful reducing agent. Incompatible with amines, azo compounds, dithiocarbamates, alkali and alkaline earth metals, nitrides, nitro compounds, unsaturated aliphatics and sulfides, organic peroxides, oxidizing agents, and reducing agents. Aqueous solutions are unstable. Commercial formaldehyde-alcohol solutions are stable. Gas is stable in absence of water. Avoid oxidizing and alkaline materials. Hazardous polymerization may occur. Compound will polymerize with active organic materials such as phenol. Will polymerize violently in the presence of caustics and nitrides; (amines) exothermic reaction, (Azo compound) exothermic reaction giving off nitrogen gas, (caustics) heat generation and violent polymerization, (dithiocarbamates) formation of flammable gases and toxic fumes, formation of carbon disulfide may result, (alkali and alkaline earth metals) heat generation and formation of a flammable hydrogen gas. (EPA, 1998)

Health Hazard

The probable oral lethal dose for humans is 0.5-5 g/kg, or between 1 ounce and 1 pint for a 150 pound person. Acute -- below 1 ppm, odor perceptible to most. 2-3 ppm, mild tingling of eyes. 4-5 ppm, increased discomfort, mild lacrimation. 10 ppm, profuse lacrimation; can be withstood only for few minutes. 10-20 ppm, breathing difficult, cough, severe burning of nose and throat. 50-100 ppm, acute irritation of respiratory tract, very serious injury likely. Skin -- primary irritation from strong solutions, gas. Delayed -- sensitization dermatitis. Suspected carcinogen. Effects in women include menstrual disorders and secondary sterility. Solutions splashed in eyes have caused injuries ranging from severe, permanent corneal opacification and loss of vision to minor discomfort. In people sensitized to formaldehyde, late asthmatic reactions may be provoked by brief exposures at approximately 3 ppm. (EPA, 1998). IDLH: 20.0 ppm; **A potential human carcinogen. (NIOSH, 2003)**

Reactivity Profile

FORMALDEHYDE, SOLUTION, reacts violently with strong oxidizing agents (hydrogen peroxide, performic acid, perchloric acid in the presence of aniline, potassium permanganate, nitromethane). Reacts with bases (sodium hydroxide, potassium hydroxide, ammonia), and with nitrogen dioxide (explosive reaction around 180°C). Reacts with hydrochloric acid to form highly toxic bis(chloromethyl) ether. Polymerization reaction with phenol may develop sudden destructive pressure [Bretherick, 5th ed., 1995, p.168].

First Aid

Signs and Symptoms of Acute Formaldehyde Exposure: Acute exposure to formaldehyde may result in irritation or burns to the skin, eyes, and mucous membranes; lacrimation (tearing); nausea; vomiting (may be bloody); abdominal pain; and diarrhea. Difficulty in breathing, cough, pneumonia, and pulmonary edema may occur. Sensitized people may experience asthmatic reactions, even when exposed briefly. Hypotension (low blood pressure) and hypothermia (reduced body temperature) may precede cardiovascular collapse. Lethargy, dizziness, convulsions, and coma may be noted. Nephritis (inflammation of the kidneys), hematuria (bloody urine), and liver toxicity have been reported.

Emergency Life-Support Procedures: Acute exposure to formaldehyde may require decontamination and life support for the victims. Emergency personnel should wear protective clothing appropriate to the type and degree of contamination. Air-purifying or supplied-air respiratory equipment should also be worn, as necessary. Rescue vehicles should carry supplies such as plastic sheeting and disposable plastic bags to assist in preventing spread of contamination.

Inhalation Exposure:

1. Move victims to fresh air. Emergency personnel should avoid self-exposure to formaldehyde.
2. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer oxygen or other respiratory support.
3. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.
4. Transport to a health care facility.

Dermal/Eye Exposure:

1. Remove victims from exposure. Emergency personnel should avoid self-exposure to formaldehyde.
2. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer oxygen or other respiratory support.
3. Remove contaminated clothing as soon as possible.
4. If eye exposure has occurred, eyes must be flushed with lukewarm water for at least 15 minutes.
5. Wash exposed skin areas twice with soap and water.
6. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.
7. Transport to a health care facility.

Ingestion Exposure:

1. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer oxygen or other respiratory support.
2. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.
3. Give the victims water or milk: children up to 1 year old, 125 mL (4 oz or 1/2 cup); children 1 to 12 years old, 200 mL (6 oz or 3/4 cup); adults, 250 mL (8 oz or 1 cup). Water or milk should be given only if victims are conscious and alert.
4. Vomiting may be induced with syrup of Ipecac. If elapsed time since ingestion of formaldehyde is unknown or suspected to be greater than 30 minutes, do not induce vomiting and proceed to Step

5. Ipecac should not be administered to children less than 6 months of age. Warning: Ingestion of formaldehyde may result in sudden onset of seizures or loss of consciousness. Syrup of Ipecac should be administered only if victims are alert, have an active gag-reflex, and show no signs of impending seizure or coma. If ANY uncertainty exists, proceed to Step
5. The following dosages of Ipecac are recommended: children up to 1 year old, 10 mL (1/3 oz); children 1 to 12 years old, 15 mL (1/2 oz); adults, 30 mL (1 oz). Ambulate (walk) the victims and give large quantities of water. If vomiting has not occurred after 15 minutes, Ipecac may be readministered. Continue to ambulate and give water to the victims. If vomiting has not occurred within 15 minutes after second administration of Ipecac, administer activated charcoal.
5. Activated charcoal may be administered if victims are conscious and alert. Use 15 to 30 g (1/2 to 1 oz) for children, 50 to 100 g (1-3/4 to 3-1/2 oz) for adults, with 125 to 250 mL (1/2 to 1 cup) of water.
6. Promote excretion by administering a saline cathartic or sorbitol to conscious and alert victims. Children require 15 to 30 g (1/2 to 1 oz) of cathartic; 50 to 100 g (1-3/4 to 3-1/2 oz) is recommended for adults.
7. Transport to a health care facility. (EPA, 1998)

Dibromoacetonitrile

Dibromoacetonitrile is currently under test for chronic toxicity in mice and rats.

None of the available reproductive or developmental studies were adequate to use in the quantitative dose-response assessment. The data gap may be particularly relevant since cyanide, a metabolite of Dibromoacetonitrile, induces male reproductive system toxicity, and due to uncertainty regarding the significance of the testes effects observed in the 14-day National Toxicology Program (NTP) rat study.

CHEMICAL DATA SHEET EXCERPTS FOR DIBROMOACETONITRILE

(CAMEO CHEMICALS DATA SHEETS (Developed by the National Oceanic and Atmospheric Administration's Office of Response and Restoration in partnership with the Environmental Protection Agency's Office of Emergency Management and the U.S. Coast Guard's Research and Development Center).

| N/NA Number | CAS Number | CHRIS Code | DOT Hazard Label |
|----------------------|------------|------------|---------------------|
| 2810 | 3252-43-5 | None | KEEP AWAY FROM FOOD |

NFPA 704: data unavailable

General Description

PHYSICAL DESCRIPTION: Clear amber oily liquid. (NTP, 1992)

Hazards

Reactivity Alerts

none

Air & Water Reactions

This chemical may be sensitive to prolonged exposure to air and light. Slightly soluble in water.

Fire Hazard

Literature sources indicate that this compound is nonflammable. (NTP, 1992)

Health Hazard

SYMPTOMS: Symptoms of exposure to this compound include irritation of the eyes, mucous membranes and upper respiratory tract, burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting. It is a lachrymator.

ACUTE/CHRONIC HAZARDS:

This compound may be fatal by ingestion, inhalation or skin absorption. It is an irritant of the eyes, mucous membranes and upper respiratory tract. It is also a lachrymator. When heated to decomposition it emits highly toxic fumes of carbon monoxide, carbon dioxide, nitrogen oxides, bromine, hydrogen bromide gas and cyanides. (NTP, 1992)

Reactivity Profile

DIBROMOACETONITRILE is incompatible with strong acids, strong bases, strong oxidizing agents and strong reducing agents. (NTP, 1992). Nitriles may polymerize in the presence of metals and some metal compounds. They are incompatible with acids; mixing nitriles with strong oxidizing acids can lead to extremely violent reactions. Nitriles are generally incompatible with other oxidizing agents such as peroxides and epoxides. The combination of bases and nitriles can produce hydrogen cyanide. Nitriles are hydrolyzed in both aqueous acid and base to give carboxylic acids (or salts of carboxylic acids). These reactions generate heat. Peroxides convert nitriles to amides. Nitriles can react vigorously with reducing agents. Acetonitrile and propionitrile are soluble in water, but nitriles higher than propionitrile have low aqueous solubility. They are also insoluble in aqueous acids.

Belongs to the Following Reactive Group(s)

AEGL: data unavailable

ERPG: data unavailable

TEEL: data unavailable

IDLH: data unavailable