

Product Stewardship Summary

Effective date: 1 September 2019

Supersedes: 15 December 2108

Formaldehyde

General Statement

Formaldehyde is a colorless, flammable gas with a pungent odor. Formaldehyde is used to make thousands of everyday products for home, school, and work. Formaldehyde is produced by the oxidation of methanol with air in the presence of a catalyst. Formaldehyde is also formed during the combustion of fuels and tobacco products, gas cookers and open fireplaces, as a by-product of manufacture and is naturally produced by plants and animals.

Exposure to the levels of formaldehyde typically found in the natural environment is not expected to be harmful to human health or the environment. Formaldehyde in work environments may cause adverse health effects in workers if exposure is not adequately controlled.

Chemical Identity

Name: Formaldehyde Aqueous Solution ~50%

Brand Names: Used in the production of products including Arofene™ and Pliobond™ lines

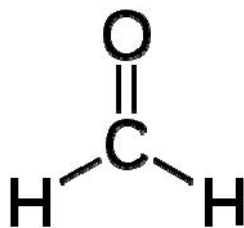
Chemical name (IUPAC): Formaldehyde

CAS number(s): 50-00-0

EC number: 200-001-8

Molecular formula: CH₂O

Structure:



Uses and Applications

Formaldehyde is used to produce chemical intermediates, formaldehyde containing resins and in the production of fertilizer, paper, and plywood. It is also used in the production of cosmetics and sugar, in well drilling fluids, as a preservative for grains and seed dressings, in the production of latex, in leather tanning, in embalming fluids, tissue preservation, in wood preservation, and in photographic film production. INEOS uses formaldehyde to produce phenol

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formaldehyde and urea formaldehyde resins and manufactures certain resins by reacting formaldehyde with polyacrylamide and guanidine-cyano blends.

In the United States, INEOS purchases formaldehyde (primarily as paraformaldehyde) from both US and international manufacturers. INEOS's phenol formaldehyde resins are used in the manufacture of adhesives and resins used in applications including:

- general purpose adhesive applications
- lamination
- imparting heat, friction and chemical resistance to equipment and parts

INEOS also produces other formaldehyde resins used as cleaners and retention aides in paper manufacture.

Physical/Chemical Properties

Phys/Chem Safety Assessment

Property	Value
Form	Colorless solution
Physical state	Liquid
Color	Colorless
Odor	Pungent
Density	1.15 g/cm ³ @ 18°C, 50% solution
Melting / boiling point	-9°C (50%) /99.4°C (45%)
Flammability	Not classified
Explosive properties	Not classified
Self-ignition temperature	424°C
Vapor pressure	1.32 hPa @ 20°C, 50% solution
Mol weight	30.02598 g/mol
Water solubility	50 g/L @ 25°C
Flash point	77°C @ (49% formaldehyde, 1.6% methanol)
Octanol-water partition coefficient (Logk _{ow})	0.35 @ 25°C

Exposure, Hazard and Safety Assessment

The following section describes possible exposures scenarios and hazards associated with formaldehyde. The exposure assessment describes both the amount of and the frequency with which a chemical substance reaches a person, a population of people, or the environment. Hazard refers to the inherent properties of a substance that make it capable of causing harm to human health or the environment. The safety assessment reports the possibility of a harmful event arising from exposure to a chemical or physical agent under specific conditions. Just because a substance may possess potentially harmful properties does not mean that it automatically poses a risk. It is not possible to make that determination without understanding the exposure.

Human Health Effects

Human Exposure Assessment

Consumer: The principal route of formaldehyde exposure for the general population and workers is by breathing air containing formaldehyde. Ambient air levels of formaldehyde for the general public can be attributed to emissions from industrial activities, building materials, consumer products, vehicle exhaust, and tobacco smoke. Air

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contamination levels for workers are due to handling, storing and processing of formaldehyde and formaldehyde containing polymers. Formaldehyde concentrations in unpopulated areas are about 0.2 ppb, in suburban areas is about 2 – 6 ppb and in heavily populated areas can range up to 20 ppb. There is usually more formaldehyde in indoor air than outdoor air due to release of formaldehyde from many home products such as latex paint, fingernail hardeners and polish, plywood and particle board, furniture and cabinets, carpets, some permanent press fabrics and some paper products.

Exposure can also occur by eating foods containing formaldehyde. Low levels of formaldehyde occur naturally in fruits, vegetables, meats and fish. People are not likely to be exposed to formaldehyde in drinking water as it does not last a long time in water.

Worker: Workers may come into skin contact with formaldehyde during handling, storing and processing of formaldehyde and formaldehyde containing polymers.

Human Hazard Assessment

Effect Assessment	Result
Acute Toxicity Oral / inhalation / dermal	H301: Toxic if swallowed H311: toxic in contact with skin H331: Toxic if inhaled
Irritation / corrosion Skin / eye / respiratory test	H314: Causes severe skin burns and eye damage. H318: Causes serious eye damage.
Sensitization	H317: May cause an allergic skin reaction.
Toxicity after repeated exposure Oral / inhalation / dermal	Not classified
Genotoxicity / Mutagenicity	Does not affect genetic system
Carcinogenicity	H351: Suspected of causing cancer. Route: Inhalation
Reproductive / Developmental Toxicity	Not applicable
Aspiration hazard	Not applicable

Human Health Safety Assessment

Consumer: Consumers may be exposed to toxic concentrations of formaldehyde from tobacco smoke. Formaldehyde exposure has also been reported from drywall and pressed wood furniture. Consumers are exposed to small amounts of formaldehyde gas from many natural and artificial sources.

Worker: Exposure of humans to formaldehyde may result in eye, skin, nose, and throat irritation. Irritation is typically seen when formaldehyde exposure exceeds 0.4 to 3 ppm. Direct contact with formaldehyde and formaldehyde solutions may also cause chemical burns and skin contact has resulted in allergic skin reactions. Air concentrations greater than 5 ppm of formaldehyde cause increasing irritation and tearing and quickly become intolerable above 10 ppm. Breathing of formaldehyde at these air concentrations may result in respiratory tract irritation with possible progression to bronchitis, pulmonary edema and pneumonia.

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The International Agency for Research on Cancer (IARC) has determined that formaldehyde is carcinogenic to humans. IARC found a causal relationship between formaldehyde exposure and leukemia and sinonasal cancer. However, the standard of classification under GHS leads to a category 2 classification as a suspected carcinogen.

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Environmental Effects

Environmental Exposures

Formaldehyde is biodegradable and is not expected to persist in the environment. Formaldehyde in the air is expected to photolyze and has a half-life of a few hours. The initial oxidation product of formaldehyde in the environment is formic acid which has a predicted removal half-life of between 19 and 50 hours.

Environmental Hazard Assessment:

Effect Assessment	Result
Aquatic toxicity	Not classified

Fate and behavior	Result
Biodegradation	Readily biodegradable
Bioaccumulation potential	Not bioaccumulative
PBT / vPvB conclusion	This substance is not considered to be persistent, bioaccumulating and toxic (PBT) or very persistent and very bioaccumulating (vPvB)

Environmental Safety Assessment

Formaldehyde was shown to have low to moderate toxicity to a variety of fish species. Formaldehyde's potential impact on aquatic and soil environments is significantly reduced by the rapid rate at which it biodegrades in the environment.

Formaldehyde was not bioconcentrated in a variety of fish and shrimp.

Risk Management Recommendations

Exposure to formaldehyde in the workplace can be controlled by sufficient ventilation and proper handling and storage techniques. Examples include: ventilation system, proper protective equipment such as eye protection (i.e., splash proof goggles), normal work clothing which covers arms and legs, formaldehyde resistant gloves, and NIOSH approved respirator in situations where exposure exceeds allowable exposure limits and/or ventilation alone is not sufficient. In addition, formaldehyde may be handled as paraformaldehyde which is a solid.

Exposure to formaldehyde in the workplace is covered by established exposure limits. A partial list of references follows:

US OSHA PEL: 0.75 ppm (8h TWA)

ACGIH TLV: 0.3 ppm (8h TWA)

EU and member states: <http://osha.europa.eu/en/topics/ds/oel/index.stm/members.stm>

China: 0.5 mg/m³ (8h TWA)

Regulatory Agency Review

Formaldehyde:

- is on the list of REACH registered substances (EC) 1907/2006
- is on the US TSCA inventory
- is listed on Canada's DSL list
- is on the Australia Index of Chemical Substances

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- is on the China Inventory of Existing Chemical Substances
- is on the Japan Inventory of Existing and New Chemical Substances
- is on the Korea Existing Chemicals Inventory
- is on the New Zealand Inventory of Chemicals
- is on the Philippines Inventory of Chemicals and Chemical Substances
- has been listed by the International Agency for Research on Cancer (IARC) as a Group 1 carcinogen
- has been listed by the US National Toxicology Program (NTP) as a known human carcinogen

Regulatory Information / Classification and Labeling

Under the Globally Harmonized System for classification and labeling (GHS), substances are classified according to their physical, health, and environmental hazards. The hazards are communicated via specific labels and the (Extended) SDS. GHS attempts to standardize hazard communication so that the intended audience (workers, consumers, transport workers, and emergency responders) can better understand the hazards of the chemicals in use.

GHS Classification:

Acute toxicity (oral) – Category 3
Acute toxicity (dermal) – Category 3
Acute toxicity (inhalation) – Category 3
Skin corrosion/irritation – Category 1B
Serious eye damage/eye irritation – Category 1
Skin sensitization – Category 1
Germ cell mutagenicity – Category 2
Carcinogenicity – Category 1B

Hazard Statements:

H301: Toxic if inhaled
H311: Toxic in contact with skin
H314: Causes severe skin burns and eye damage
H317: May cause an allergic skin reaction
H331: Toxic if inhaled
H351: Suspected of causing cancer by inhalation

Signal Word:

Danger

Precautionary Statements:

P260 Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310 Immediately call a POISON CENTER or doctor/ physician.

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Hazard Pictograms:



Conclusion

Formaldehyde is a naturally occurring chemical which is used in the production of a large number of essential consumer products. Exposure to normal environmental levels of formaldehyde is unlikely to be hazardous. Exposure to higher-than-normal concentrations over a long period of time, such as from tobacco smoke, can lead to cancer.

Additional Information

For more information on Product Stewardship at INEOS Composites, visit our website's Safety, Health and Environment (SHE) page: www.ineos.com/composites-she

For more information on GHS, visit <http://www.osha.gov/dsg/hazcom/ghsguideoct05.pdf> or http://live.unece.org/trans/danger/publi/ghs/ghs_welcome_e.html.

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REACH registration is specific to Importers/Manufacturers that place the chemical on the EU market, and is specific to registered uses. Inclusion on the list of REACH Registered Substances does not automatically imply registration by INEOS.

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Inclusion on the New Zealand Inventory of Chemicals applies only to the pure substance listed. The importer of record must determine whether or not their substances are in compliance.

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Additional Information

For more information on Product Stewardship at INEOS Composites, visit our website's Safety, Health and Environment (SHE) page: www.ineos.com/composites-she

Disclaimer

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