

Product Stewardship Summary

Furfuryl Alcohol

General Statement

Furfuryl alcohol is used as a monomer in the synthesis of furan resins for uses in polymer matrix composites, cements, adhesives and coatings. Furfuryl alcohol is a moderate to high hazard material, and the risk of adverse health effects associated with occupational and consumer use of this chemical is anticipated to be low to moderate.

Chemical Identity

Name: Furfuryl Alcohol

Brand Names: Not Applicable

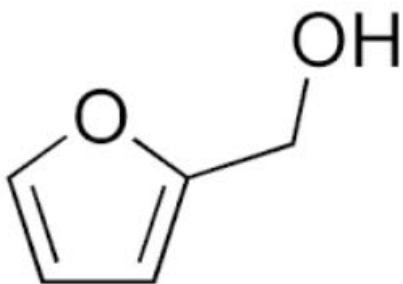
Chemical name (IUPAC): Furan-2-ylmethanol

CAS number(s): 98-00-0

EC number: 603-018-00-2

Molecular formula: $C_5H_6O_2$

Structure:



Uses and Applications

Ashland uses furfuryl alcohol in the production of various other chemicals such as furan resins. Ashland does not manufacture or sell furfuryl alcohol.



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Physical/Chemical Properties

Phys/Chem Safety Assessment

| Property | Value |
|--|---|
| Form | Dense liquid |
| Physical state | Liquid |
| Color | Colorless |
| Odor | Faint burning odor |
| Density | 1.1296 g/cm ³ at 20°C |
| Melting / boiling point | -31°C /171°C |
| Flammability | 2nd degree |
| Explosive properties | Moderate, when exposed to heat or flame |
| Self-ignition temperature | 490°C |
| Vapor pressure | 0.609 mm Hg at 25°C |
| Mol weight | 98.101 g/mo |
| Water solubility | 1000 mg/L at 25°C |
| Flash point | 75°C |
| Octanol-water partition coefficient (Log _{k_{ow}}) | 0.28 |

Exposure, Hazard and Safety Assessment

The following section describes possible exposure scenarios and hazards associated with furfuryl alcohol. 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 assessments, below, report 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 nature of the exposure.

Human Health Effects

Human Exposure Assessment

Consumer: Consumer usage of furfuryl alcohol is unlikely as the substance is manufactured and handled in industrial settings in closed systems. It is not a directly added component to consumer personal care products.

Worker: Workers are unlikely to be exposed to furfuryl alcohol, as the substance is manufactured and handled in enclosed operations with local exhaust ventilation used whenever possible. Personal protective wear will be used when handling this material. In the case of accidental or unintended exposure, workers should follow the recommended safety measures listed in the Safety Data Sheet (SDS).

Human Hazard Assessment:

Furfuryl alcohol has potential to elicit both acute (oral, inhalation, and dermal routes) and repeat dose (inhalation route) toxicity. It can cause serious skin and serious eye irritation. Inhalation can cause respiratory irritation. Furfuryl alcohol is suspected of causing cancer and there is limited evidence of a carcinogenic effect. Furfuryl alcohol is neither mutagenic or genotoxic and is not associated with adverse effects on fertility or development.

| Effect Assessment | Result |
|---|--|
| Acute Toxicity Oral / inhalation / dermal | Toxic if swallowed Toxic in contact with skin Toxic if inhaled |
| Irritation / corrosion Skin / eye / respiratory test | Causes serious skin irritation. Causes serious eye irritation. Irritating to the eyes and respiratory system |
| Toxicity after repeated exposure Oral / inhalation / | Harmful; danger of serious damage to health by prolonged exposure through |
| Genotoxicity / Mutagenicity | Not classified |
| Carcinogenicity | Suspected of causing cancer Limited evidence of a carcinogenic effect |
| Reproductive Toxicity | No classified |
| STOT | May cause damage to respiratory tract through prolonged or repeated exposure of inhalation |

Human Health Safety Assessment

Consumer: Furfuryl alcohol is used as a chemical intermediate and a solvent, and as such is not a direct add into consumer products. Consumers will not come into contact with furfuryl alcohol as there is no known consumer uses for furfuryl alcohol.

Worker: Workers in chemical plants using furfuryl alcohol may be exposed during handling and transport. Dangerous exposures most commonly occur through inhalation, though dermal and oral exposures are also toxic. Furfuryl alcohol is to be manufactured and handled in closed environments with adequate ventilation. Ashland has PPE and training requirements in place to minimize the risk of worker exposure to furfuryl alcohol as well as procedures to safely respond to furfuryl alcohol exposures.

Environmental Effects

Environmental Exposures

Furfuryl alcohol is readily biodegradable and has low potential for bioaccumulation. Based on aquatic toxicity studies, there is a low potential for furfuryl alcohol to cause adverse effects in aquatic organisms.

Environmental Hazard Assessment

| Effect Assessment | Result |
|-------------------|---|
| Aquatic Toxicity | Low toxicity to fish, aquatic invertebrates, algae, and bacteria. |

| Fate and behavior | Result |
|---------------------------|--|
| Biodegradation | Furfuryl alcohol is classified as readily |
| Bioaccumulation potential | An estimated BCF of 3.2 is calculated for furfuryl |
| PBT / vPvB conclusion | Not PBT or vPvB |

Environmental Safety Assessment

If released into the environment, furfuryl alcohol is anticipated to have a minimal effect on the aquatic environment due to its low aquatic toxicity. It is inherently biodegradable and has a low potential for bioaccumulation.

Risk Management Recommendations

Exposure to furfuryl alcohol in the workplace can be controlled by sufficient ventilation, proper handling and storage techniques, and the use of appropriate personal protective equipment as recommended in the SDS. Consumer products that could possibly contain residual furfuryl alcohol should include appropriate safety labeling and provide applicable handling and disposal methods.

A selection of occupational exposure limits are provided below:

- ACGIH TLV: (8h TWA): 10 ppm -skin, eyes, mucous membrane
- NIOSH REL-TWA: 10ppm (40 mg/m³)
- NIOSH REL ST: 10ppm (40 mg/m³)
- OSHA PEL TWA: 50ppm (200mg/m³)

Regulatory Agency Review

Furfuryl alcohol is listed with the following regulatory agencies:

REACH registered substances

US TSCA Inventory

Australia Inventory of Chemical Substances

Canada Domestic Substances List

China Inventory of Existing Chemical Substances

Japan Inventory of Existing and New Chemical Substances

Korea Existing Chemicals Inventory

Philippine Inventory of Chemicals and Chemical Substances

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 associated with chemicals in use.

GHS Classification:

Eye Irritation, Category 2

Acute toxicity, Category 3

STOT-SE, Category 3

STOT Reproduction, Category 2

Skin Irritation, Category 2

Carcinogen, Category 2

Hazard Statements:

H301: Toxic if swallowed.

H331: Toxic if inhaled.

H311: Toxic in contact with skin.

H315: Causes skin irritation.

H319: Causes serious eye irritation.

H335: May cause respiratory irritation.

H351: Suspected of causing cancer

H373: May cause damage to organs respiratory tract through prolonged or repeated inhalation exposure

Signal Word: Danger

Precautionary Statements:

P280: Wear protective gloves/protective clothing/eye protection/face protection.

P301+P310: IF SWALLOWED: Immediately call a POISON CENTER/doctor/...

P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P304+P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing.

P403+P233: Store in a well-ventilated place. Keep container tightly closed.

P308+P313: IF exposed or concerned: Get medical advice/attention.

Hazard Pictograms:



Conclusion

Furfuryl alcohol is a useful chemical in the synthesis of furan resins for use in polymer matrices, cements, adhesives, and coatings. When handled responsibly, the potential for irritation and systemic toxicity can be minimized, allowing workers to use materials containing furfuryl alcohol safely.

Contact Information with Company

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Additional Information

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.
Ashland product stewardship summaries are located at <http://www.ashland.com/sustainability/product/product-stewardship>

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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 Ashland.

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.