Material Safety Data Sheet
2-Furaldehyde, reagent ACS, 98+%

ACC# 00651

Section 1 - Chemical Product and Company Identification

MSDS Name: 2-Furaldehyde, reagent ACS, 98+%
Catalog Numbers: AC410810030, AC410815000
Synonyms: 2-Formylfuran; 2-Formylofuran; Fural; Furale; 2-Furanaldehyde; 2-Furancarbonal; 2-Furancarboxaldehyde; Furfural; 2-Furfural; Furfuraldehyde; Furfurale; Furfurol;Furfurole; 2-Furil-metanale; Furole; alpha-Furole; 2-Furylaldehyde; 2-Furylcarboxaldehyde.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
98-01-1	2-Furaldehyde	98+	202-627-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: oily, colorless to light yellow liquid. Flash Point: 60 deg C.
Warning! Causes eye and skin irritation and possible burns. Harmful if inhaled or swallowed. **Flammable liquid and vapor.** Causes digestive and respiratory tract irritation. Air sensitive. Light sensitive. May cause liver and kidney damage. Refrigerate upon arrival below 4°C/39°F. Possible sensitizer.
Target Organs: Kidneys, liver, respiratory system, eyes, nervous system, skin.

Potential Health Effects

Eye: May cause irreversible eye injury. Causes eye irritation and possible burns.
Skin: May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. May cause photosensitive skin reactions in certain individuals. Effects of contact may be delayed. Causes skin irritation and possible burns. Substance is readily absorbed through the skin.
Ingestion: Harmful if swallowed. Causes gastrointestinal irritation with nausea, vomiting and diarrhea. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. Effects may be delayed 2 to 4 hours.
Inhalation: Harmful if inhaled. May cause allergic respiratory reaction. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema. Vapors may cause dizziness or suffocation. Causes irritation of the mucous membrane and upper respiratory tract.
Chronic: Prolonged or repeated eye contact may cause conjunctivitis. May cause liver and kidney damage. Repeated exposure may cause sensitization dermatitis. Laboratory experiments have resulted in mutagenic effects. Animal studies have reported the development of tumors.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid imme diately.
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Notes to Physician: Effects may be delayed. Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Will burn if involved in a fire. Use water spray to keep fire-exposed containers cool. Containers may explode in the heat of a fire. Flammable liquid and vapor. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas.
Extinguishing Media: Use water spray to cool fire-exposed containers. Water may be ineffective. Use dry chemical, carbon dioxide, or alcohol-resistant foam. Do NOT use straight streams of water.
Flash Point: 60 deg C (140.00 deg F)
Autoignition Temperature: 316 deg C (600.80 deg F)
Explosion Limits, Lower:2.10 vol %

Upper: 19.30 vol %
NFPA Rating: (estimated) Health: 3; Flammability: 2; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Wash area with soap and water. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. Place under an inert atmosphere. A vapor suppressing foam may be used to reduce vapors.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Do not breathe dust, vapor, mist, or gas. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep away from heat, sparks and flame. Do not ingest or inhale. Store protected from light. Handle under an inert atmosphere. Store protected from air. Use only in a chemical fume hood. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Do not store in direct sunlight. Keep refrigerated. (Store below 4°C/39°F.) Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area. Storage under a nitrogen blanket has been recommended. Store protected from light and air. Store under an inert atmosphere. Store in air tight containers.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
2-Furaldehyde	2 ppm TWA; Skin - potential significant contribution to overall exposure by the cutaneous r oute	100 ppm IDLH	5 ppm TWA; 20 mg/m3 TWA

OSHA Vacated PELs: 2-Furaldehyde: 2 ppm TWA; 8 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: oily, colorless to light yellow
Odor: almond-like
pH: Not available.
Vapor Pressure: 1.7 mm Hg @ 20C
Vapor Density: 3.3 (Air=1)
Evaporation Rate: Not available.
Viscosity: 1.49 cP @ 25C
Boiling Point: 162 deg C
Freezing/Melting Point:-36 deg C
Decomposition Temperature: Not available.
Solubility: Slightly soluble.
Specific Gravity/Density:1.1600g/cm3
Molecular Formula:C5H4O2
Molecular Weight:96.09

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures. Substance undergoes color change upon exposure to light and air. Volatile in steam. May undergo polymerization on contact with strong mineral acids or alkalies.
Conditions to Avoid: Light, ignition sources, exposure to air, excess heat.
Incompatibilities with Other Materials: Strong oxidizing agents, strong acids, strong bases, alkalies, sodium hydrogen carbonate, mineral acids, air.
Hazardous Decomposition Products: Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.
Hazardous Polymerization: May occur.

Section 11 - Toxicological Information

RTECS#:

CAS# 98-01-1: LT7000000
LD50/LC50:
CAS# 98-01-1:
Draize test, rabbit, eye: 100 mg/24H Moderate;
Draize test, rabbit, skin: 20 mg/24H Moderate;
Draize test, rabbit, skin: 500 mg/24H Mild;
Inhalation, rat: LC50 = 175 ppm/6H;
Oral, mouse: LD50 = 400 mg/kg;
Oral, rat: LD50 = 65 mg/kg;
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Carcinogenicity:
CAS# 98-01-1:

- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans
- **California:** Not listed.
- **NTP:** Not listed.
- **IARC:** Not listed.

Epidemiology: Oral, rat: TDLo = 30900 mg/kg/2Y-C (Tumorigenic - equivocal tumorigenic agent by RTECS criteria - Liver - tumors).; Oral, mouse: TDLo = 90125 mg/kg/2Y-C (Tumorigenic - Carcinogenic by RTECS criteria - Liver tumors).
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: 2-Furaldehyde was positive in the histidine reversion-Ames test. DNA Inhibition: Human, HeLa cell = 3 mmol/L.; Sister Chromatid Exchange: Human, Lymphocyte = 70 umol/L.; Mutation in Mammalian Somatic Cells: Mouse, Lymphocyte = 200 mg/L.; Cytogenetic Analysis: Hamster, Lung = 1 gm/L.; Cytogenetic Analysis: Hamster, Ovary = 2500 umol/L.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: LC50 = 32 mg/L; 96 Hr; UnspecifiedWater flea Daphnia: EC50 = 36 mg/L; 24 Hr; UnspecifiedFish: Bluegill/Sunfish: TLm = 24 ppm; 96 Hr; Unspecified (fresh water)Fish: Harlequin fish: LC50 = 23 mg/L; 48 Hr; Unspecified If released to soil, 2-furaldehyde is expected to display high mobility and it has the potential to leach into groundwater. Limited data suggests that it may undergo biodegradation in soil. Volatilization from the soil surface to the atmosphere may occur; however it is not expected to be a rapid process. If released to water, 2-furaldehyde is expected to undergo microbial degradation, under both aerobic and anaerobic conditions.
Environmental: 2-Furaldehyde is not expected to adsorb to sediment or suspended organic matter, nor is it expected to bioconcentrate in fish and aquatic organisms. Hydrolysis is not expected to be a significant fate process under environmental conditions. In the atmosphere, furfural is expected to exist predominately in the vapor phase. Destruction by the vapor phase reaction with photochemically produced hydroxyl radicals is expected to be an important process with an estimated half-life of 0.44 days. Atmospheric removal by wet deposition may be a significant process.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 98-01-1: waste number U125 (Ignitable waste).

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	FURALDEHYDES	FURALDEHYDES
Hazard Class:	6.1	6.1(3)
UN Number:	UN1199	UN1199
Packing Group:	II	II

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 98-01-1 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 98-01-1: Effective 6/1/87, Sunset 6/1/97
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs
CAS# 98-01-1: 5000 lb final RQ; 2270 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 98-01-1: immediate, fire.
Section 313 No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 98-01-1 is listed as a Hazardous Substance under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 98-01-1 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols:
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Risk Phrases:
R 21 Harmful in contact with skin.
R 23/25 Toxic by inhalation and if swallowed.
R 36/37 Irritating to eyes and respiratory system.
R 40 Limited evidence of a carcinogenic effect.

Safety Phrases:
S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 36/37/39 Wear suitable protective clothing, gloves and eye/face protection.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)
CAS# 98-01-1: 2
Canada - DSL/NDSL
CAS# 98-01-1 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of D1B, D2B, B3.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.
Canadian Ingredient Disclosure List
CAS# 98-01-1 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 5/21/1999
Revision #5 Date: 10/03/2005