1. Identification

Product Name: 2-Furaldehyde
Cat No.: BKF94; F94-500
CAS-No: 98-01-1
Synonyms: Furfural; 2-Furancarboxaldehyde
 Recommended Use: Laboratory chemicals.
Uses advised against: Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company: Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number
CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

| Flammable liquids | Category 3 |
| Acute oral toxicity | Category 3 |
| Acute dermal toxicity | Category 4 |
| Acute Inhalation Toxicity - Dusts and Mists | Category 2 |
| Skin Corrosion/irritation | Category 2 |
| Serious Eye Damage/Eye Irritation | Category 2 |
| Specific target organ toxicity (single exposure) | Category 3 |
| Target Organs - Respiratory system. | |
| Specific target organ toxicity - (repeated exposure) | Category 2 |
| Target Organs - Kidney, Liver, spleen. | |

Label Elements

Signal Word: Danger

Hazard Statements
Flammable liquid and vapor
Toxic if swallowed
Harmful in contact with skin
Fatal if inhaled
Causes skin irritation
2-Furaldehyde

Revision Date 18-Jan-2018

Causes serious eye irritation
May cause respiratory irritation
May cause damage to organs through prolonged or repeated exposure

Precautionary Statements

Prevention
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Wear protective gloves/protective clothing/eye protection/face protection
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear respiratory protection
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Keep cool

Response
Get medical attention/advice if you feel unwell

Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Immediately call a POISON CENTER or doctor/physician
Call a POISON CENTER or doctor/physician if you feel unwell

Skin
Call a POISON CENTER or doctor/physician if you feel unwell
If skin irritation occurs: Get medical advice/attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse

Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention

Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Rinse mouth

Fire
In case of fire: Use CO2, dry chemical, or foam for extinction

Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed

Disposal
Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)
None identified

3. Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
</table>

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4. First-aid measures

General Advice
If symptoms persist, call a physician. Show this safety data sheet to the doctor in attendance.

Eye Contact
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Keep eye wide open while rinsing. Immediate medical attention is required.

Skin Contact
Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.

Inhalation
Move to fresh air. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required. Artificial respiration and/or oxygen may be necessary. Move to fresh air in case of accidental inhalation of vapors. If not breathing, give artificial respiration.

Ingestion
Call a physician or Poison Control Center immediately. Clean mouth with water and drink afterwards plenty of water. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person.

Most important symptoms and effects
Breathing difficulties. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Notes to Physician
Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Cool closed containers exposed to fire with water spray.

Unsuitable Extinguishing Media
No information available

Flash Point
60 °C / 140 °F

Method -
No information available

Autoignition Temperature
315 °C / 599 °F

Explosion Limits
Upper 19.30%
Lower 2.10%

Sensitivity to Mechanical Impact
No information available

Sensitivity to Static Discharge
No information available

Specific Hazards Arising from the Chemical
Combustible material. Containers may explode when heated. Flammable. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back.

Hazardous Combustion Products
Carbon monoxide (CO) Carbon dioxide (CO₂)

Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

<table>
<thead>
<tr>
<th>Health</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>2</td>
<td>1</td>
<td>N/A</td>
</tr>
</tbody>
</table>

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6. Accidental release measures

### Personal Precautions

Use personal protective equipment. Ensure adequate ventilation. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas. Remove all sources of ignition. Take precautionary measures against static discharges.

### Environmental Precautions

Should not be released into the environment. See Section 12 for additional ecological information. Do not flush into surface water or sanitary sewer system. Prevent further leakage or spillage if safe to do so. Prevent product from entering drains.

### Methods for Containment and Clean Up

- Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

### Handling

Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Do not breathe vapors/dust. Do not ingest. Take precautionary measures against static discharges. Pay attention to flashback. Do not take internally.

### Storage

Keep away from heat and sources of ignition. Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure controls / personal protection

### Exposure Guidelines

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
<th>Mexico OEL (TWA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TWA: 0.2 ppm</td>
<td>(Vacated) TWA: 2 ppm</td>
<td>IDLH: 100 ppm</td>
<td>TWA: 2 ppm</td>
</tr>
<tr>
<td>Furfural</td>
<td>Skin</td>
<td>(Vacated) TWA: 8 mg/m³</td>
<td></td>
<td>TWA: 8 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Skin</td>
<td></td>
<td>STEL: 10 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA: 5 ppm</td>
<td></td>
<td>STEL: 40 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA: 20 mg/m³</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Legend**

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

### Engineering Measures

Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure adequate ventilation, especially in confined areas.

### Personal Protective Equipment

#### Eye/face Protection

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. Tightly fitting safety goggles. Face-shield.

#### Skin and Body Protection

Wear appropriate protective gloves and clothing to prevent skin exposure. Long sleeved clothing. Apron. Impervious gloves.

#### Respiratory Protection

Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

#### Hygiene Measures

When using, do not eat, drink or smoke. Provide regular cleaning of equipment, work area and clothing.
9. Physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical State</td>
<td>Liquid</td>
</tr>
<tr>
<td>Appearance</td>
<td>Amber - Brown</td>
</tr>
<tr>
<td>Odor</td>
<td>bitter almond</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>No information available</td>
</tr>
<tr>
<td>pH</td>
<td>3.5-4.5</td>
</tr>
<tr>
<td>Melting Point/Range</td>
<td>-37 °C / -34.6 °F</td>
</tr>
<tr>
<td>Boiling Point/Range</td>
<td>159 - 161 °C / 318.2 - 321.8 °F @ 760 mmHg</td>
</tr>
<tr>
<td>Flash Point</td>
<td>60 °C / 140 °F</td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>No information available</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Flammability or explosive limits</td>
<td></td>
</tr>
<tr>
<td>Upper</td>
<td>19.30%</td>
</tr>
<tr>
<td>Lower</td>
<td>2.10%</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>1 mbar @ 20 °C</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>No information available</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>1.160</td>
</tr>
<tr>
<td>Solubility</td>
<td>Slightly soluble in water</td>
</tr>
<tr>
<td>Partition coefficient; n-octanol/water</td>
<td>No data available</td>
</tr>
<tr>
<td>Autoignition Temperature</td>
<td>315 °C / 599 °F</td>
</tr>
<tr>
<td>Decomposition Temperature</td>
<td>No information available</td>
</tr>
<tr>
<td>Viscosity</td>
<td>1.49 cP at 25 °C</td>
</tr>
<tr>
<td>Molecular Formula</td>
<td>C5 H4 O2</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>96.08</td>
</tr>
</tbody>
</table>

10. Stability and reactivity

Reactive Hazard: None known, based on information available

Stability: Light sensitive. Air sensitive.


Incompatible Materials: Strong oxidizing agents, Strong bases, Strong acids

Hazardous Decomposition Products: Carbon monoxide (CO), Carbon dioxide (CO₂)

Hazardous Polymerization: No information available.

Hazardous Reactions: None under normal processing.

11. Toxicological information

Acute Toxicity

<table>
<thead>
<tr>
<th>Component</th>
<th>LD50 Oral</th>
<th>LD50 Dermal</th>
<th>LC50 Inhalation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furfural</td>
<td>100 mg/kg (Rat)</td>
<td>&gt;2000 mg/kg (Rabbit)</td>
<td>0.53-1.63 mg/L/4h (Rat)</td>
</tr>
</tbody>
</table>

Toxicologically Synergistic Products: No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation: Irritating to eyes, respiratory system and skin

Sensitization: No information available

Carcinogenicity: The table below indicates whether each agency has listed any ingredient as a carcinogen. Limited evidence of a carcinogenic effect.
<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>IARC</th>
<th>NTP</th>
<th>ACGIH</th>
<th>OSHA</th>
<th>Mexico</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furfural</td>
<td>98-01-1</td>
<td>Not listed</td>
<td>Not listed</td>
<td>A3</td>
<td>Not listed</td>
<td>A3</td>
</tr>
</tbody>
</table>

ACGIH: (American Conference of Governmental Industrial Hygienists)
A1 - Known Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen

Mexico - Occupational Exposure Limits - Carcinogens
A1 - Confirmed Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Confirmed Animal Carcinogen
A4 - Not Classifiable as a Human Carcinogen
A5 - Not Suspected as a Human Carcinogen

Mutagenic Effects
Mutagenic effects have occurred in humans.

Reproductive Effects
No information available.

Developmental Effects
No information available.

Teratogenicity
No information available.

STOT - single exposure
Respiratory system

STOT - repeated exposure
Kidney Liver spleen

Aspiration hazard
No information available

Symptoms / effects, both acute and delayed
Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting delayed

Endocrine Disruptor Information

Other Adverse Effects
Tumorigenic effects have been reported in experimental animals.

12. Ecological information

Ecotoxicity
Contains a substance which is: Harmful to aquatic organisms. The product contains following substances which are hazardous for the environment.

<table>
<thead>
<tr>
<th>Component</th>
<th>Freshwater Algae</th>
<th>Freshwater Fish</th>
<th>Microtox</th>
<th>Water Flea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furfural</td>
<td>Not listed</td>
<td>LC50: 13.4 - 19.3 mg/L, 96h static (Pimephales promelas)</td>
<td>Not listed</td>
<td>EC50: = 29 mg/L, 24h (Daphnia magna)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LC50: 16.79 - 26.35 mg/L, 96h flow-through (Pimephales promelas)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Persistence and Degradability
Persistence is unlikely

Bioaccumulation/ Accumulation
No information available.

Mobility
Will likely be mobile in the environment due to its water solubility.

<table>
<thead>
<tr>
<th>Component</th>
<th>log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furfural</td>
<td>0.67</td>
</tr>
</tbody>
</table>

13. Disposal considerations

Waste Disposal Methods
Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

<table>
<thead>
<tr>
<th>Component</th>
<th>RCRA - U Series Wastes</th>
<th>RCRA - P Series Wastes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furfural</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
14. Transport information

DOT
- UN-No: UN1199
- Proper Shipping Name: FURALDEHYDES
- Hazard Class: 6.1
- Subsidiary Hazard Class: 3
- Packing Group: II

TDG
- UN-No: UN1199
- Proper Shipping Name: FURALDEHYDES
- Hazard Class: 6.1
- Subsidiary Hazard Class: 3
- Packing Group: II

IATA
- UN-No: UN1199
- Proper Shipping Name: FURALDEHYDES
- Hazard Class: 6.1
- Subsidiary Hazard Class: 3
- Packing Group: II

IMDG/IMO
- UN-No: UN1199
- Proper Shipping Name: FURALDEHYDES
- Hazard Class: 6.1
- Subsidiary Hazard Class: 3
- Packing Group: II

15. Regulatory information

International Inventories

<table>
<thead>
<tr>
<th>Component</th>
<th>TSCA</th>
<th>DSL</th>
<th>NDSL</th>
<th>EINECS</th>
<th>ELINCS</th>
<th>NLP</th>
<th>PICCS</th>
<th>ENCS</th>
<th>AICS</th>
<th>IECSC</th>
<th>KECL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furfural</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>202-627-7</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Legend:
- X - Listed
- E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
- F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
- N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
- P - Indicates a commenced PMN substance
- R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
- S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
- T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
- XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).
- Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
- Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313 Not applicable

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

<table>
<thead>
<tr>
<th>Component</th>
<th>CWA - Hazardous Substances</th>
<th>CWA - Reportable Quantities</th>
<th>CWA - Toxic Pollutants</th>
<th>CWA - Priority Pollutants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furfural</td>
<td>X</td>
<td>5000 lb</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Clean Air Act
Not applicable

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

<table>
<thead>
<tr>
<th>Component</th>
<th>Hazardous Substances RQs</th>
<th>CERCLA EHS RQs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furfural</td>
<td>5000 lb</td>
<td>-</td>
</tr>
</tbody>
</table>

California Proposition 65
This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

<table>
<thead>
<tr>
<th>Component</th>
<th>Massachusetts</th>
<th>New Jersey</th>
<th>Pennsylvania</th>
<th>Illinois</th>
<th>Rhode Island</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furfural</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
</tr>
</tbody>
</table>

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant: N
DOT Severe Marine Pollutant: N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade: Moderate risk, Grade 2

16. Other information

Prepared By: Regulatory Affairs
Acros Organics BVBA
Tel: 800-ACROS-01

Creation Date: 24-Apr-2009
Revision Date: 18-Jan-2018
Print Date: 18-Jan-2018

Revision Summary:
This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

End of SDS