

# Material Safety Data Sheet

| HAZARD WARNINGS   | RISK PHRASES   | PROTECTIVE CLOTHING   |
|---|--|---|
|    | Combustible material; avoid heat and sources of ignition.<br>Corrosive to eyes and skin on contact.<br>Toxic compound, do not ingest or inhale. Avoid all contact with this material.<br><b>CARCINOGEN. MINIMIZE EXPOSURE.</b><br><b>MUTAGEN. MINIMIZE EXPOSURE.</b><br>Photosensitizing material. |  |

## Section I. Chemical Product and Company Identification

|                  |  |                                 |   |
|------------------|--|---------------------------------|---|
| Chemical Name    | <b>Furfural</b>                              |                                 |   |
| Catalog Number   | F0073  | Supplier                        | TCI America<br>9211 N. Harborsgate St.<br>Portland OR<br>1-800-423-8616                   |
| Synonym          | 2-Formylfuran; 2-Furaldehyde                 |                                 |   |
| Chemical Formula | C <sub>5</sub> H <sub>4</sub> O <sub>2</sub> |                                 |   |
| CAS Number       | 98-01-1                                      | In case of<br>Emergency<br>Call | <b>Chemtrec®</b><br><b>(800) 424-9300 (U.S.)</b><br><b>(703) 527-3887 (International)</b> |

## Section II. Composition and Information on Ingredients

| Chemical Name | CAS Number | Percent (%) | TLV/PEL  | Toxicology Data   |
|---------------|------------|-------------|--|---|
| Furfural      | 98-01-1    | 99% (GC)    | This chemical is classified as a carcinogen. There is no acceptable exposure limit for a carcinogen.<br>This compound is classified as a mutagen. There is no acceptable exposure limit for a mutagen. | Rat LD <sub>50</sub> (oral) 65 mg/kg<br>Mouse LD <sub>50</sub> (intraperitoneal) 102 mg/kg<br>Rat LC <sub>50</sub> (inhalation) 175 ppm/6H<br>Human TC <sub>Lo</sub> (inhalation) 310 µg/m <sup>3</sup> |

## Section III. Hazards Identification

|                        |  |
|------------------------|--|
| Acute Health Effects   | Corrosive to skin, eyes, and respiratory system. Liquid or spray mist may produce tissue damage, particularly in mucous membranes of the eyes, mouth and respiratory tract. Skin contact may produce burns. Eye contact can result in corneal damage or blindness. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Corrosive materials may cause serious injury if ingested.<br>Toxic if ingested or inhaled. Avoid prolonged contact with this material. Overexposure may result in serious illness or death.<br>Follow safe industrial hygiene practices and always wear proper protective equipment when handling this compound.   |
| Chronic Health Effects | <b>CARCINOGENIC EFFECTS</b> : Carcinogenic by RTECS criteria.<br><b>MUTAGENIC EFFECTS</b> : Not available.<br><b>TERATOGENIC EFFECTS</b> : Tumorigenic Effects.<br>Rat TDLo Oral 30900 mg/kg/103 weeks.<br>TOXIC Effects:<br>Tumorigenic - Carcinogenic by RTECS criteria.<br>Liver - Angiosarcoma<br>Mouse TDLo Oral 90125 mg/kg/103 weeks intermittent<br>TOXIC Effects:<br>Carcinogenic by RTECS criteria<br>Liver - Tumors<br>Kidney, Ureter, and Bladder - Kidney Tumors<br>Mouse TDLo Oral 90125 mg/kg/2 years continuous<br>TOXIC Effects:<br>Tumorigenic - Carcinogenic by RTECS criteria<br>Liver - Tumors<br><b>DEVELOPMENTAL TOXICITY:</b> Reproductive Effects.<br>Rat TDLo Intraperitoneal 150 mg/kg, female 6-15 days of pregnancy.<br>TOXIC Effects:<br>Effects on Embryo or Fetus - Fetotoxicity<br>Mouse TDLo Intraperitoneal 360 mg/kg, male 6 days prior to mating.<br>TOXIC Effects:<br>Paternal Effects - Spermatogenesis |

**Section IV. First Aid Measures**

|              |   |
|--------------|---|
| Eye Contact  | Check for and remove any contact lenses. DO NOT use an eye ointment. Flush eyes with running water for a minimum of 15 minutes, occasionally lifting the upper and lower eyelids. Seek medical attention. Treat symptomatically and supportively.   |
| Skin Contact | If the chemical gets spilled on a clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical touches the victim's exposed skin, such as the hands: Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Seek medical attention. Treat symptomatically and supportively. Wash any contaminated clothing before reusing. |
| Inhalation   | If the victim is not breathing, perform mouth-to-mouth resuscitation. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, oxygen can be administered. Seek medical attention if respiration problems do not improve.   |
| Ingestion    | DO NOT INDUCE VOMITING. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive.   |

**Section V. Fire and Explosion Data**

|                                      |  |                  |                   |
|--------------------------------------|--|------------------|-------------------|
| Flammability                         | Combustible.   | Auto-Ignition    | 314 °C (597.2 °F) |
| Flash Points                         | 58.33 °C (137 °F).   | Flammable Limits | Not available.    |
| Combustion Products                  | These products are toxic carbon oxides (CO, CO <sub>2</sub> ).   |                  |                   |
| Fire Hazards                         | No specific information is available regarding the flammability of this compound in the presence of various materials.   |                  |                   |
| Explosion Hazards                    | Risks of explosion of the product in presence of mechanical impact: Not available.<br>Risks of explosion of the product in presence of static discharge: Not available.<br>No additional information is available regarding the risks of explosion.            |                  |                   |
| Fire Fighting Media and Instructions | Combustible liquid.<br>SMALL FIRE: Use DRY chemicals, CO <sub>2</sub> , water spray or foam.<br>LARGE FIRE: Use water spray, fog or foam. DO NOT use water jet.<br>Consult with local fire authorities before attempting large scale fire-fighting operations. |                  |                   |

**Section VI. Accidental Release Measures**

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| Spill Cleanup Instructions | Combustible material. Corrosive material. Toxic material. Carcinogenic material. Mutagenic material. Photosensitizing material.<br>Keep away from heat and sources of ignition. Mechanical exhaust required. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. DO NOT get water inside container. DO NOT touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all sources of ignition. Consult federal, state, and/or local authorities for assistance on disposal. |
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**Section VII. Handling and Storage**

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| Handling and Storage Information | COMBUSTIBLE. CORROSIVE. TOXIC. CARCINOGEN. MUTAGEN. PHOTSENSITIZER. Handle with caution and minimize exposure. Keep container dry. Keep away from heat and sources of ignition. Mechanical exhaust required. Avoid excessive heat and light. DO NOT ingest. Do not breathe gas, fumes, vapor or spray. Never add water to this product. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label. Treat symptomatically and supportively.<br>Always store away from incompatible compounds such as oxidizing agents, acids. |
|----------------------------------|--|

**Section VIII. Exposure Controls/Personal Protection**

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|----------------------|---|
| Engineering Controls | Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash station and safety shower is proximal to the work-station location. |
| Personal Protection  | Face shield. Lab coat. Vapor respirator. Boots. Gloves. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.              |
| Exposure Limits      | This chemical is classified as a carcinogen. There is no acceptable exposure limit for a carcinogen.<br>This compound is classified as a mutagen. There is no acceptable exposure limit for a mutagen.  |

**Section IX. Physical and Chemical Properties**

|                       |                                     |                       |  |
|-----------------------|-------------------------------------|-----------------------|--|
| Physical state @ 20°C | Colorless to red-brown oily liquid. | Solubility            | Soluble in chloroform, petroleum ether, 8.3wt% in water @ 20 °C. >10% in acetone, >10% in benzene, >10% in ether, >10% in ethanol. |
| Specific Gravity      | 1.156                               | Partition Coefficient | Not available.   |
| Molecular Weight      | 96.08                               | Vapor Pressure        | Not available.   |
| Boiling Point         | 162 °C (323.6 °F)                   | Vapor Density         | 3.31   |
| Melting Point         | -36 °C (-32.8 °F)                   | Volatility            | Not available.   |
| Refractive Index      | 1.5261 @ 20 °C                      |                       |  |

Continued on Next Page

Emergency phone number (800) 424-9300

|                      |                |       |                         |
|----------------------|----------------|-------|-------------------------|
| Critical Temperature | Not available. | Odor  | Almond odor.            |
| Viscosity            | Not available. | Taste | Distinct caramel taste. |

### Section X. Stability and Reactivity Data

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|---------------------------|---|
| Stability                 | This material is stable if stored under proper conditions. (See Section VII for instructions) |
| Conditions of Instability | Sensitive to air, light and moisture. Avoid excessive heat and light.                         |
| Incompatibilities         | Reactive with oxidizing agents, acids.  |

### Section XI. Toxicological Information

|                       |  |
|-----------------------|--|
| RTECS Number          | LT7000000  |
| Routes of Exposure    | Eye contact. Ingestion. Inhalation. Skin contact.  |
| Toxicity Data         | Rat LD <sub>50</sub> (oral) 65 mg/kg<br>Mouse LD <sub>50</sub> (intraperitoneal) 102 mg/kg<br>Rat LC <sub>50</sub> (inhalation) 175 ppm/6H<br>Human TC <sub>LO</sub> (inhalation) 310 µg/m <sup>3</sup>  |
| Chronic Toxic Effects | <b>CARCINOGENIC EFFECTS</b> : Carcinogenic by RTECS criteria.<br><b>MUTAGENIC EFFECTS</b> : Not available.<br><b>TERATOGENIC EFFECTS</b> : Tumorigenic Effects.<br>Rat TDLo Oral 30900 mg/kg/103 weeks.<br>TOXIC Effects:<br>Tumorigenic - Carcinogenic by RTECS criteria.<br>Liver - Angiosarcoma<br>Mouse TDLo Oral 90125 mg/kg/103 weeks intermittent<br>TOXIC Effects:<br>Carcinogenic by RTECS criteria<br>Liver - Tumors<br>Kidney, Ureter, and Bladder - Kidney Tumors<br>Mouse TDLo Oral 90125 mg/kg/2 years continuous<br>TOXIC Effects:<br>Tumorigenic - Carcinogenic by RTECS criteria<br>Liver - Tumors<br><b>DEVELOPMENTAL TOXICITY:</b> Reproductive Effects.<br>Rat TDLo Intraperitoneal 150 mg/kg, female 6-15 days of pregnancy.<br>TOXIC Effects:<br>Effects on Embryo or Fetus - Fetotoxicity<br>Mouse TDLo Intraperitoneal 360 mg/kg, male 6 days prior to mating.<br>TOXIC Effects:<br>Paternal Effects - Spermatogenesis |
| Acute Toxic Effects   | Corrosive to skin, eyes, and respiratory system. Liquid or spray mist may produce tissue damage, particularly in mucous membranes of the eyes, mouth and respiratory tract. Skin contact may produce burns. Eye contact can result in corneal damage or blindness. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Corrosive materials may cause serious injury if ingested. Toxic if ingested or inhaled. Avoid prolonged contact with this material. Overexposure may result in serious illness or death.<br>Follow safe industrial hygiene practices and always wear proper protective equipment when handling this compound.  |

### Section XII. Ecological Information

|                    |   |
|--------------------|---|
| Ecotoxicity        | Not available.  |
| Environmental Fate | Furfural is a naturally occurring compound which is also produced commercially. It may be released to the environment as a fugitive emission during its manufacture, formulation, or use in commercial products. Furfural may also be released to the environment in the smoke from burning wood. If released to soil, furfural 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, furfural is expected to undergo microbial degradation, under both aerobic and anaerobic conditions. Acclimation has been found to increase the rate of biodegradation, and high concentrations of furfural inhibit the rate. Furfural 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. Night time destruction by the vapor phase reaction with nitrate radicals may be an important process in urban areas. Limited data suggests that direct photochemical degradation of furfural may occur in the atmosphere. Atmospheric removal by wet deposition may be a significant process. Occupational exposure to furfural may occur by inhalation or dermal contact during its production, formulation or use. Exposure to the general population may occur by the ingestion of contaminated drinking water or ingestion of food in which it is contained. The general population may also receive exposure to furfural by inhalation of smoke from wood fires, or by inhalation or dermal contact during the use of commercial products which contain this aldehyde. |

**Section XIII. Disposal Considerations**

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| Waste Disposal | Recycle to process, if possible. Consult your local or regional authorities. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. Observe all federal, state, and local regulations when disposing of the substance. |
|----------------|---|

**Section XIV. Transport Information**

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|--------------------|--|
| DOT Classification | DOT CLASS 6.1: Toxic material.<br>DOT CLASS 3: Flammable liquid. |
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|            |        |
|------------|--------|
| PIN Number | UN1199 |
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|----------------------|--------------|
| Proper Shipping Name | Furaldehydes |
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|--------------------|----|
| Packing Group (PG) | II |
|--------------------|----|

|                |   |
|----------------|---|
| DOT Pictograms |   |
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**Section XV. Other Regulatory Information and Pictograms**

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|-------------------------------|--|
| TSCA Chemical Inventory (EPA) | This compound is <b>ON</b> the EPA Toxic Substances Control Act (TSCA) inventory list. |
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|                               |                |
|-------------------------------|----------------|
| WHMIS Classification (Canada) | Not available. |
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|                     |           |
|---------------------|-----------|
| EINECS Number (EEC) | 202-627-7 |
|---------------------|-----------|

|                     |   |
|---------------------|---|
| EEC Risk Statements | R23/24/25- Toxic by inhalation, in contact with skin and if swallowed.<br>R34- Causes burns.<br>R46- May cause heritable genetic damage.<br>R47- May cause birth defects. |
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|                          |                |
|--------------------------|----------------|
| Japanese Regulatory Data | Not available. |
|--------------------------|----------------|

**Section XVI. Other Information****Version 1.0****Validated on 4/14/2006.****Printed 4/14/2006.****Notice to Reader**

TCI laboratory chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our MSDS sheets are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated MSDS sheets for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, facial mask, fume hood). For proper handling and disposal, always comply with federal, state, and local regulations.