1. Identification of the substance/preparation and of the company/undertaking

1.1 Identification of the substance or preparation:

**Synonyms:** 2-furan carbinol; 2 hydroxymethylfuran; 2-furan methanol

- CAS No.: 98-00-0
- EC index No.: 603-018-00-2
- EINECS No.: 202-626-1
- RETCS No.: LU9100000
- NFPA code: 3-2-1
- Molecular weight: 98.10
- Formula: C₅H₆O₂

1.2 Use of the substance or the preparation:
- Raw material for chemistry
- Application in resins
- Application in foundry, colour, lac, synthetic and electro industry
- Application in cover materials
- Application in pharmaceutical products

1.3 Company/undertaking identification:

International Furan Chemicals B.V.
Rotterdam Airportplein 7
3045 AP Rotterdam (The Netherlands)
Tel.: +31 10 238 05 55
Fax: +31 10 238 05 50

1.4 Telephone number for emergency:

+32 14 58 45 45
Brandweerinformatiecentrum voor gevaarlijke stoffen (B.I.G.)
Technische Schoolstraat 43 A, B-2440 Geel

2. Composition/information on ingredients

<table>
<thead>
<tr>
<th>Hazardous ingredients</th>
<th>CAS No.</th>
<th>Conc. in %</th>
<th>Hazard symbol</th>
<th>Risks (R-phrases)</th>
</tr>
</thead>
<tbody>
<tr>
<td>furfuryl alcohol</td>
<td>98-00-0</td>
<td>&gt;98</td>
<td>Xn</td>
<td>20/21/22 (1)</td>
</tr>
<tr>
<td></td>
<td>202-626-1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) For R-phrases in full: see heading 16

3. Hazards identification

- Harmful by inhalation, in contact with skin and if swallowed
- Acute overexposure: irritating to eyes, skin and/or respiratory tract.
4. First aid measures

4.1 Eye contact:
- Rinse immediately with plenty of water
- Do not apply neutralizing agents
- If irritation persists: consult a doctor/medical service

4.2 Skin contact:
- Soap may be used
- Rinse immediately with plenty of water
- Remove clothing before washing
- If irritation persists: consult a doctor/medical service

4.3 After inhalation:
- Remove the victim into fresh air
- Unconscious: maintain adequate airway and respiration
- If breathing problems develop: consult a doctor/medical service

4.4 After ingestion:
- Immediately after ingestion: give lots of water to drink
- Never give water to an unconscious person
- Do not induce vomiting
- Consult a doctor/medical service

5. Fire-fighting measures

5.1 Suitable extinguishing media:
- Water
- Water spray
- Alcohol foam
- BC powder
- Carbon dioxide

5.2 Unsuitable extinguishing media:
- No data available

5.3 Special exposure hazards:
- Material presenting a fire hazard
- On burning: CO and CO2 are formed

5.4 Instructions:
- Cool tanks/drums with water spray/remove them into safety

5.5 Special protective equipment for firefighters:
- Heat/fire exposure: compressed air/oxygen apparatus
- Heat/fire exposure: gas-tight suit

6. Accidental release measures

6.1 Personal protection/precautions: see heading 8.1/8.3/10.3

6.2 Environmental precautions:
- Contain leaking substance, pump over in suitable containers
- Plug the leak, cut off the supply

6.3 Methods of cleaning up:
- Take up liquid spill into absorbent material e.g.: sand/earth, vermiculite or kieselguhr
- Absorbed substance: shovel in closing drums
- Clean contaminated surfaces with an excess of water
- Wash clothing and equipment after handling
7. Handling and storage

7.1 Handling:
- Observe normal hygiene standards
- Use earthed equipment
- Remove contaminated clothing immediately
- Clean contaminated clothing

7.2 Storage:
- Keep container tightly closed
- Store in a dry area
- Store in a dark area
- Ventilation at floor level
- Keep away from: heat sources, oxidizing agents, acids, peroxides

<table>
<thead>
<tr>
<th>Storage temperature</th>
<th>°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity limit</td>
<td>kg</td>
</tr>
<tr>
<td>Storage life</td>
<td>days</td>
</tr>
</tbody>
</table>

Materials for packaging:
- suitable: steel, aluminium, glass, polypropylene
- to avoid: No data available

7.3 Specific uses:
- See information supplied by the manufacturer

8. Exposure controls/Personal protection

8.1 Exposure limit values:

- furfuryl alcohol

<table>
<thead>
<tr>
<th>Exposure Limit</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLV-TWA</td>
<td>mg/m³</td>
<td>10</td>
</tr>
<tr>
<td>TLV-STEL</td>
<td>mg/m³</td>
<td>15</td>
</tr>
<tr>
<td>OES-LTEL</td>
<td>mg/m³</td>
<td>20</td>
</tr>
<tr>
<td>OES-STEL</td>
<td>mg/m³</td>
<td>61</td>
</tr>
<tr>
<td>MAK</td>
<td>mg/m³</td>
<td>41</td>
</tr>
<tr>
<td>MAC-TGG 8 h</td>
<td>mg/m³</td>
<td>20</td>
</tr>
<tr>
<td>MAC-TGG 15 min.</td>
<td>mg/m³</td>
<td>200</td>
</tr>
<tr>
<td>VME-8 h</td>
<td>mg/m³</td>
<td>40</td>
</tr>
<tr>
<td>VLE-15 min.</td>
<td>mg/m³</td>
<td>-</td>
</tr>
<tr>
<td>GWBB-8 h</td>
<td>mg/m³</td>
<td>41</td>
</tr>
<tr>
<td>GWK-15 min.</td>
<td>mg/m³</td>
<td>61</td>
</tr>
<tr>
<td>Momentary value</td>
<td>mg/m³</td>
<td>-</td>
</tr>
<tr>
<td>EC</td>
<td>mg/m³</td>
<td>-</td>
</tr>
<tr>
<td>EC-STEL</td>
<td>mg/m³</td>
<td>-</td>
</tr>
</tbody>
</table>

Sampling methods:
- Furfuryl Alcohol NIOSH 2505
- Furfuryl Alcohol OSHA CSI
8.2 Exposure controls:

8.2.1 Occupational exposure controls:
- Measure the concentration in the air regularly
- Work under local exhaust/ventilation

8.2.2 Environmental exposure controls: see heading 13

8.3 Personal protection:

8.3.1 Respiratory protection:
- High gas/vapour concentration: gas mask with filter type A

8.3.2 Hand protection:
- Gloves
  suitable materials: Natural rubber
  Neoprene
- Breakthrough time: N.D.

8.3.3 Eye protection:
- Face shield

8.3.4 Skin protection:
- Protective clothing
  suitable materials: Natural rubber
  Neoprene

9. Physical and chemical properties

9.1 General information:

Appearance (at 20°C): Liquid
Odour: Mild and characteristic
Colour: Colourless to Light-yellow

9.2 Important health, safety and environmental information:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH value</td>
<td>4–6 (30 %)</td>
</tr>
<tr>
<td>Boiling point/boiling range</td>
<td>170 °C</td>
</tr>
<tr>
<td>Flashpoint</td>
<td>83 °C</td>
</tr>
<tr>
<td>Explosion limits (at 72.5-122°C)</td>
<td>1.8/16.3 Vol%</td>
</tr>
<tr>
<td>Vapour pressure (at 20°C)</td>
<td>0.53 hPa</td>
</tr>
<tr>
<td>Vapour pressure (at 50°C)</td>
<td>4.5 hPa</td>
</tr>
<tr>
<td>Relative density (at 20°C)</td>
<td>1.13</td>
</tr>
<tr>
<td>Water solubility</td>
<td>complete</td>
</tr>
<tr>
<td>Soluble in</td>
<td>ethanol, ether, chloroform, methanol, 1-propanol, iso-amylalcohol, ethyl acetate</td>
</tr>
<tr>
<td>Relative vapour density</td>
<td>3.4</td>
</tr>
<tr>
<td>Viscosity (at 25°C)</td>
<td>0.0046 Pa·s</td>
</tr>
<tr>
<td>Partition coefficient n-octanol/water</td>
<td>0.28</td>
</tr>
<tr>
<td>Evaporation rate ratio to butyl acetate</td>
<td>N.D.</td>
</tr>
<tr>
<td>ratio to ether</td>
<td>443</td>
</tr>
</tbody>
</table>

9.3 Other information:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melting point/melting range</td>
<td>-29 °C</td>
</tr>
<tr>
<td>Auto-ignition point</td>
<td>390 °C</td>
</tr>
<tr>
<td>Saturation concentration</td>
<td>2.1 g/m³</td>
</tr>
</tbody>
</table>
10. Stability and reactivity

10.1 Conditions to avoid/reactivity:
- Unstable on exposure to air
- Unstable on exposure to moisture
- Stable under normal conditions

10.2 Materials to avoid:
- Keep away from: heat sources, oxidizing agents, acids, peroxides

10.3 Hazardous decomposition products:
- Oxidizes slowly on exposure to air
- This reaction is accelerated on exposure to temperature rise
- Unstable in water
- On burning: CO and CO2 are formed
- Polymerizes on exposure to (strong) acids: heat release resulting in increased fire or explosion risk
- Violent to explosive reaction with (strong) oxidizers

11. Toxicological information

11.1 Acute toxicity:

Furfuryl alcohol

<table>
<thead>
<tr>
<th>Endpoint</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD50 oral rat</td>
<td>275 mg/kg</td>
</tr>
<tr>
<td>LD50 dermal rabbit</td>
<td>N.D. mg/kg</td>
</tr>
<tr>
<td>LD50 dermal rabbit</td>
<td>657 mg/kg</td>
</tr>
<tr>
<td>LC50 inhalation rat</td>
<td>N.D. mg/1/4 h</td>
</tr>
<tr>
<td>LC50 inhalation rat</td>
<td>N.D. ppm/4 h</td>
</tr>
</tbody>
</table>

11.2 Chronic toxicity:

Furfuryl alcohol

<table>
<thead>
<tr>
<th>Endpoint</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC carc. cat.</td>
<td>not listed</td>
</tr>
<tr>
<td>EC muta. cat.</td>
<td>not listed</td>
</tr>
<tr>
<td>EC repr. cat.</td>
<td>not listed</td>
</tr>
<tr>
<td>Carcinogenicity (TLV)</td>
<td>not listed</td>
</tr>
<tr>
<td>Carcinogenicity (MAC)</td>
<td>not listed</td>
</tr>
<tr>
<td>Carcinogenicity (VME)</td>
<td>not listed</td>
</tr>
<tr>
<td>Carcinogenicity (GWBB)</td>
<td>not listed</td>
</tr>
<tr>
<td>Carcinogenicity (MAK)</td>
<td>not listed</td>
</tr>
<tr>
<td>Mutagenicity (MAK)</td>
<td>not listed</td>
</tr>
<tr>
<td>Teratogenicity (MAK)</td>
<td>not listed</td>
</tr>
<tr>
<td>IARC classification</td>
<td>not listed</td>
</tr>
</tbody>
</table>

Furfuryl alcohol does not possess genotoxic potential (in vivo).
An NTP study (1999) concluded that there was some evidence of carcinogenic activity of furfuryl alcohol in male rats and male mice.

11.3 Routes of exposure:
- Ingestion, inhalation, eye and skin
  Warning! Substance is absorbed through the skin
11.4 Acute effects/symptoms:

**AFTER INHALATION**
- Slight irritation
- Irritation of the nasal mucous membranes

**EXPOSURE TO HIGH CONCENTRATIONS:**
- CNS depression
- Dizziness
- Coordination disorders

**AFTER INGESTION**

**AFTER ABSORPTION OF HIGH QUANTITIES:**
- Rapid respiration
- Nausea
- Diarrhoea
- Dizziness
- Change in urine output
- Symptoms similar to those listed under inhalation

**AFTER SKIN CONTACT**
- Slight irritation
- Dry skin

**AFTER EYE CONTACT**
- Irritation of the eye tissue

**ON CONTINUOUS EXPOSURE/CONTACT:**
- Inflammation/damage of the eye tissue

11.5 Chronic effects:
- No cumulative effect
- Not listed in carcinogenicity class (IARC, EC, TLV, MAK)
- Not listed in mutagenicity class (EC, MAK)
- Not classified as toxic to reproduction (EC)

**ON CONTINUOUS EXPOSURE/CONTACT:**
- Red skin
- Dry skin
12. Ecological information

12.1 Ecotoxicity:

Furfuryl alcohol:
- LC50 (96 h) : 32 mg/l (PIMEPHALES PROMELAS)
- EC50 (24 h) : 115 mg/l (DAPHNIA MAGNA)
- EC50 (24 h) : 100 mg/l (SCENEDESMUS QUADRICAUDA)

12.2 Mobility:
- Volatile organic compounds (VOC): 100%
- Soluble in water

For other physicochemical properties see section 9

12.3 Persistence and degradability:
- Biodegradation BOD5 : 30 % ThOD
- Water : Readily biodegradable in water test: 75%, 14d., mitil
- Soil : T ½ N.D.

12.4 Bioaccumulative potential:
- log POW : 0.28
- BCF : N.D.
- Slightly or not bioaccumulative

12.5 Other adverse effects:
- WGK : 1 (classification in compliance with Verwaltungsvorschrift wassergefährdender Stoffe (VwVwS) of 17 May 1999)
- Effect on the ozone layer : Not dangerous for the ozone layer (Council Regulation (EC) No 3093/94 , O.J. L333 of 22/12/94)
- Greenhouse effect : No data available
- Effect on waste water purification : No data available

13. Disposal considerations

13.1 Provisions relating to waste:
- Waste material code (Flanders): 015; 034
- KCA (the Netherlands): category 03
- Hazardous waste (91/689/EEC)

13.2 Disposal methods:
- Recycle by distillation
- Remove to an authorized waste incinerator for solvents
- Obtain the consent of pollution control authorities before discharging to wastewater treatment plants
- Do not discharge into surface water

13.3 Packaging:
14. Transport information

14.1 Classification of the substance in compliance with UN Recommendations

<table>
<thead>
<tr>
<th>UN number</th>
<th>CLASS</th>
<th>SUB RISKS</th>
<th>PACKING</th>
<th>PROPER SHIPPING NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>2874</td>
<td>6.1</td>
<td>-</td>
<td>III</td>
<td>UN 2874, Furfuryl alcohol</td>
</tr>
</tbody>
</table>

14.2 ADR (transport by road)

<table>
<thead>
<tr>
<th>CLASS</th>
<th>PACKING</th>
<th>DANGER LABEL TANKS</th>
<th>DANGER LABEL PACKAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>III</td>
<td>6.1</td>
<td>6.1</td>
</tr>
</tbody>
</table>

14.3 RID (transport by rail)

<table>
<thead>
<tr>
<th>CLASS</th>
<th>PACKING</th>
<th>DANGER LABEL TANKS</th>
<th>DANGER LABEL PACKAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>III</td>
<td>6.1</td>
<td>6.1</td>
</tr>
</tbody>
</table>

14.4 ADNR (transport by inland waterways)

<table>
<thead>
<tr>
<th>CLASS</th>
<th>PACKING</th>
<th>DANGER LABEL TANKS</th>
<th>DANGER LABEL PACKAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>III</td>
<td>6.1</td>
<td>6.1</td>
</tr>
</tbody>
</table>

14.5 IMDG (maritime transport)

<table>
<thead>
<tr>
<th>CLASS</th>
<th>SUB RISKS</th>
<th>PACKING</th>
<th>MFAg</th>
<th>EMS</th>
<th>MARINE POLLUTANT</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>-</td>
<td>III</td>
<td>-</td>
<td>6.1-02</td>
<td>-</td>
</tr>
</tbody>
</table>

14.6 ICAO (air transport)

<table>
<thead>
<tr>
<th>CLASS</th>
<th>SUB RISKS</th>
<th>PACKING</th>
<th>PACKING INSTRUCTIONS PASSENGER AIRCRAFT</th>
<th>PACKING INSTRUCTIONS CARGO AIRCRAFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>-</td>
<td>III</td>
<td>611/Y611</td>
<td>618</td>
</tr>
</tbody>
</table>

14.7 Special precautions in connection with transport

: None

14.8 Limited quantities (LQ)

When substances and their packaging meet the conditions established by ADR/RID/ADNR in chapter 3.4, only the following prescriptions shall be complied with:

each package shall display a diamond-shaped figure with the following inscription:
- 'UN 2874'
or, in the case of different goods with different identification numbers within a single package:
- the letters 'LQ'
FURFURYL ALCOHOL

15. Regulatory information

Labelling in compliance with Directives 67/548/EEC and 1999/45/EC

R20/21/22 : Harmful by inhalation, in contact with skin and if swallowed
S(02) : (Keep out of reach of children)
S26 : In case of contact with eyes, rinse immediately with plenty of water and seek medical advice

16. Other information

The information provided on this MSDS 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 as 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 material or in any process, unless specified in the text.

N.A. = NOT APPLICABLE
N.D. = NOT DETERMINED
* = INTERNAL CLASSIFICATION

Full text of any R-phrases referred to under heading 2:

R20/21/22 : Harmful by inhalation, in contact with skin and if swallowed

Exposure limits:

TLV : Threshold Limit Value - ACGIH US 2002
OES : Occupational Exposure Standards - United Kingdom 1999
MEL : Maximum Exposure Limits - United Kingdom 1999
MAX : Maximale Arbeitsplatzkonzentrationen - Germany 2001
TRK : Technische Richtkonzentrationen - Germany 2001
MAC : Maximale aanvaarde concentratie - the Netherlands 2002
VME : Valeurs limites de Moyenne d’Exposition - France 1999
VLE : Valeurs limites d’Exposition à court terme - France 1999
GWBB : Grenswaarde beroepsmatige blootstelling - Belgium 2002
GWK : Grenswaarde kortstondige blootstelling - Belgium 2002
EC : Indicative occupational exposure limit values - directive 2000/39/EC

I : Inhalable fraction = T : Total dust = E : Einatembarer Aerosolanteil
R : Respirable fraction = A : Alveolengängiger Aerosolanteil/Alveolar dust
C : Ceiling limit
a: aerosol r: rook/Rauch (fume)
d: damp (vapour) st: stof/Staub (dust)
du: dust ve: vezel (fibre)
f: Faser (fibre) va: vapour
fi: fibre om: oil mist
fu: fume on: olievenel/Ölnebel (oil mist)
p: poussière (dust) part: particles

Chronic toxicity:

K : List of the carcinogenic substances and processes - The Netherlands 2002