1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name: 1-Methyl-2-pyrrolidinone

Product Number: 328634
Brand: Sigma-Aldrich
Index-No.: 606-021-00-7

CAS-No.: 872-50-4

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company: Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO  63103
USA
Telephone: +1 800-325-5832
Fax: +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #: (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 4), H227
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Reproductive toxicity (Category 1B), H360
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)
H227: Combustible liquid.
H315: Causes skin irritation.
H319: Causes serious eye irritation.
H335: May cause respiratory irritation.
H360: May damage fertility or the unborn child.

Precautionary statement(s)
P201: Obtain special instructions before use.
P202: Do not handle until all safety precautions have been read and
understood.
P210  Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P261  Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264  Wash skin thoroughly after handling.
P271  Use only outdoors or in a well-ventilated area.
P280  Wear protective gloves/ protective clothing/ eye protection/ face protection.
P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P332 + P313 If skin irritation occurs: Get medical advice/ attention.
P337 + P313 If eye irritation persists: Get medical advice/ attention.
P362  Take off contaminated clothing and wash before reuse.
P370 + P378 In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233 Store in a well-ventilated place. Keep container tightly closed.
P403 + P235 Store in a well-ventilated place. Keep cool.
P405  Store locked up.
P501  Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances
Synonyms:
- N-Methyl-2-pyrrolidone
- 1-Methyl-2-pyrrolidone
- NMP
- M-PYROL™

Formula: C₅H₉NO
Molecular weight: 99.13 g/mol
CAS-No.: 872-50-4
EC-No.: 212-828-1
Index-No.: 606-021-00-7
Registration number: 01-2119472430-46-XXXX

Hazardous components

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-methyl-2-pyrrolidone</td>
<td>Included in the Candidate List of Substances of Very High Concern (SVHC) according to Regulation (EC) No. 1907/2006 (REACH)</td>
<td>&lt;= 100 %</td>
</tr>
<tr>
<td>Flam. Liq. 4; Skin Irrit. 2; Eye Irrit. 2A; Repir. 1B; STOT SE 3; H227, H315, H319, H335, H360</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.
In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11.

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media
Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas. For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Store under inert gas. Moisture sensitive.
Storage class (TRGS 510): Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated.
8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-methyl-2-pyrrolidone</td>
<td>872-50-4</td>
<td>TWA</td>
<td>10.000000 ppm</td>
<td>USA, Workplace Environmental Exposure Levels (WEEL)</td>
</tr>
</tbody>
</table>

Remarks

<table>
<thead>
<tr>
<th>Component</th>
<th>Parameters</th>
<th>Value</th>
<th>Biological specimen</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-methyl-2-pyrrolidone</td>
<td>5-Hydroxy-N-methyl-2-pyrrolidone</td>
<td>100.0000 mg/l</td>
<td>Urine</td>
<td>ACGIH - Biological Exposure Indices (BEI)</td>
</tr>
</tbody>
</table>

Remarks: End of shift (As soon as possible after exposure ceases)

Biological occupational exposure limits

<table>
<thead>
<tr>
<th>Component</th>
<th>Parameters</th>
<th>Value</th>
<th>Biological specimen</th>
<th>Basis</th>
</tr>
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<tr>
<td>N-methyl-2-pyrrolidone</td>
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<td>100.0000 mg/l</td>
<td>Urine</td>
<td>ACGIH - Biological Exposure Indices (BEI)</td>
</tr>
</tbody>
</table>

Remarks: End of shift (As soon as possible after exposure ceases)

Derived No Effect Level (DNEL)

<table>
<thead>
<tr>
<th>Workers Area</th>
<th>Exposure routes</th>
<th>Health effect</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin contact</td>
<td>Skin contact</td>
<td>Acute systemic effects</td>
<td>208mg/kg BW/d</td>
</tr>
<tr>
<td>Inhalation</td>
<td>Skin contact</td>
<td>Long-term systemic effects</td>
<td>19.8mg/kg BW/d</td>
</tr>
</tbody>
</table>

Predicted No Effect Concentration (PNEC)

<table>
<thead>
<tr>
<th>Compartment</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>5 mg/l</td>
</tr>
<tr>
<td>Soil</td>
<td>0.138 mg/kg</td>
</tr>
<tr>
<td>Marine water</td>
<td>0.025 mg/kg</td>
</tr>
<tr>
<td>Fresh water</td>
<td>0.25 mg/l</td>
</tr>
<tr>
<td>Fresh water sediment</td>
<td>0.805 mg/kg</td>
</tr>
<tr>
<td>Onsite sewage treatment plant</td>
<td>10 mg/l</td>
</tr>
</tbody>
</table>

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: butyl-rubber
Minimum layer thickness: 0.3 mm
Break through time: 480 min
Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)
Splash contact
Material: Nature latex/chloroprene
Minimum layer thickness: 0.6 mm
Break through time: 35 min
Material tested:Lapren® (KCL 706 / Aldrich Z677558, Size M)
data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**Body Protection**
Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

### 9. PHYSICAL AND CHEMICAL PROPERTIES

#### 9.1 Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Appearance Form</td>
<td>liquid</td>
</tr>
<tr>
<td>Colour: colourless</td>
<td></td>
</tr>
<tr>
<td>b) Odour</td>
<td>No data available</td>
</tr>
<tr>
<td>c) Odour Threshold</td>
<td>No data available</td>
</tr>
<tr>
<td>d) pH</td>
<td>7.7 - 8</td>
</tr>
<tr>
<td>e) Melting point/freezing point</td>
<td>Melting point/range: -24 °C (-11 °F)</td>
</tr>
<tr>
<td>f) Initial boiling point and boiling range</td>
<td>202 °C (396 °F)</td>
</tr>
<tr>
<td></td>
<td>81 - 82 °C (178 - 180 °F) at 13 hPa (10 mmHg)</td>
</tr>
<tr>
<td>g) Flash point</td>
<td>91 °C (196 °F) - closed cup</td>
</tr>
<tr>
<td>h) Evaporation rate</td>
<td>No data available</td>
</tr>
<tr>
<td>i) Flammability (solid, gas)</td>
<td>No data available</td>
</tr>
<tr>
<td>j) Upper/lower flammability or explosive limits</td>
<td>Upper explosion limit: 9.5 % (V)</td>
</tr>
<tr>
<td></td>
<td>Lower explosion limit: 1.3 % (V)</td>
</tr>
<tr>
<td>k) Vapour pressure</td>
<td>0.39 - 0.43 hPa (0.29 - 0.32 mmHg) at 20 °C (68 °F)</td>
</tr>
<tr>
<td></td>
<td>1.32 hPa (0.99 mmHg) at 40 °C (104 °F)</td>
</tr>
<tr>
<td>l) Vapour density</td>
<td>3.42 - (Air = 1.0)</td>
</tr>
<tr>
<td>m) Relative density</td>
<td>1.028 g/mL at 25 °C (77 °F)</td>
</tr>
<tr>
<td>n) Water solubility</td>
<td>No data available</td>
</tr>
<tr>
<td>o) Partition coefficient: n-octanol/water</td>
<td>log Pow: -0.46</td>
</tr>
<tr>
<td>p) Auto-ignition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>q) Decomposition temperature</td>
<td>No data available</td>
</tr>
</tbody>
</table>
Viscosity: No data available

Explosive properties: No data available

Oxidizing properties: No data available

9.2 Other safety information

- Surface tension: 40.7 mN/m
- Relative vapour density: 3.42 - (Air = 1.0)

10. STABILITY AND REACTIVITY

10.1 Reactivity: No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions: No data available

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Strong acids, Strong oxidizing agents, Strong reducing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions.
- Carbon oxides, Nitrogen oxides (NOx)
Other decomposition products: No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
- LD50 Oral - Rat: 3,914 mg/kg
- LD50 Inhalation - Rat - 4 h: > 5100 ppm
- LD50 Dermal - Rabbit: 8,000 mg/kg
No data available

Skin corrosion/irritation
Serious eye damage/eye irritation
- Eyes - Rabbit: Result: Eye irritation

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

Reproductive toxicity
Damage to fetus possible
No data available

Specific target organ toxicity - single exposure
Inhalation - May cause respiratory irritation.

Specific target organ toxicity - repeated exposure
No data available
Aspiration hazard
No data available

Additional Information
RTECS: UY5790000
prolonged or repeated exposure can cause: Vomiting, Diarrhoea, Abdominal pain, Rats exposed to 1-methyl-2-pyrrolidinone at a concentration of 1 mg/L as an aerosol for 10 days showed depletion of hematopoietic cells in the bone marrow and atrophy of the lymphoid tissues of the thymus, spleen, and lymph nodes.
Bone marrow - Irregularities - Based on Human Evidence
Bone marrow - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity
Toxicity to fish LC50 - other fish - 4,000 mg/l - 96 h
LC50 - Leuciscus idus (Golden orfe) - > 500 mg/l - 96 h
Toxicity to daphnia and EC50 - Daphnia magna (Water flea) - > 1,000 mg/l - 24 h
other aquatic invertebrates
Toxicity to bacteria LC50 - Bacteria - > 9,000 mg/l

12.2 Persistence and degradability
Biodegradability Result: 90 % - Readily biodegradable

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
Product
This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
NA-Number: 1993 Class: NONE Packing group: III
Proper shipping name: Combustible liquid, n.o.s. (N-methyl-2-pyrrolidone)
Reportable Quantity (RQ):

Poison Inhalation Hazard: No

IMDG
Not dangerous goods

IATA
Not dangerous goods
15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-methyl-2-pyrrolidone</td>
<td>872-50-4</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazards
Fire Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-methyl-2-pyrrolidone</td>
<td>872-50-4</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

Pennsylvania Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-methyl-2-pyrrolidone</td>
<td>872-50-4</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

New Jersey Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-methyl-2-pyrrolidone</td>
<td>872-50-4</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Eye Irrit.          Eye irritation
Flam. Liq.          Flammable liquids
H227               Combustible liquid.
H315             Causes skin irritation.
H319             Causes serious eye irritation.
H335           May cause respiratory irritation.
H360           May damage fertility or the unborn child.
Repr.             Reproductive toxicity
Skin Irrit.         Skin irritation

HMIS Rating
Health hazard:       2
Chronic Health Hazard: *
Flammability:        2
Physical Hazard      0

NFPA Rating
Health hazard:       2
Fire Hazard:         2
Reactivity Hazard:   0
Health hazard:       2
Fire Hazard:         2
Reactivity Hazard:   0

Further information
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