SECTION 1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

Product Description: 1-Methyl-2-pyrrolidinone
Cat No.: A12260
Synonyms: 1-Methyl-2-pyrrolidone; N-Methylpyrrolidone; NMP
CAS-No: 872-50-4
Molecular Formula: C5 H9 N O
Supplier: Alfa Aesar
Avocado Research Chemicals, Ltd.
Shore Road
Port of Heysham Industrial Park
Heysham, Lancashire LA3 2XY
United Kingdom
Office Tel: +44 (0) 1524 850506
Office Fax: +44 (0) 1524 850608

Emergency Telephone Number
Call Carechem 24 at
+44 (0) 1865 407333 (English only);
+44 (0) 1235 239670 (Multi-language)

E-mail address: uktech@alfa.com
www.alfa.com
Product Safety Department

Recommended Use: Laboratory chemicals.
Uses advised against: No Information available

SECTION 2. HAZARD IDENTIFICATION

Classification of the substance or mixture

<table>
<thead>
<tr>
<th>Flammable liquids.</th>
<th>Acute Oral Toxicity</th>
<th>Skin Corrosion/Irritation</th>
<th>Serious Eye Damage/Eye Irritation</th>
<th>Reproductive Toxicity</th>
<th>Specific target organ toxicity - (single exposure)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 4</td>
<td>Category 5</td>
<td>Category 2</td>
<td>Category 2</td>
<td>Category 1B</td>
<td>Category 3</td>
</tr>
</tbody>
</table>

Emergency Overview
Combustible liquid. May be harmful if swallowed. Causes skin irritation. Causes serious eye irritation. May cause respiratory irritation. May damage fertility or the unborn child. Sensitivity to light. Air sensitive, hygroscopic.

Physical State: Liquid
Appearance: Colorless
Odor: Mild amine
Signal Word

Danger

Hazard Statements
H227 - Combustible liquid
H303 - May be harmful if swallowed
H315 - Causes skin irritation
H319 - Causes serious eye irritation
H335 - May cause respiratory irritation
H360D - May damage the unborn child

Precautionary Statements

Prevention
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
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear eye protection/ face protection

Response
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P304 + P340 - IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing
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
P362 - Take off contaminated clothing and wash before reuse
P370 + P378 - In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction

Storage
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed

Disposal
P501 - Dispose of contents/ container to an approved waste disposal plant

Physical and Chemical Hazards
Combustible material. Hygroscopic.

Health Hazards
May be harmful if swallowed. Causes skin irritation. Causes serious eye irritation. May cause respiratory irritation. May damage fertility or the unborn child.

Environmental hazards
Contains no substances known to be hazardous to the environment or not degradable in waste water treatment plants. Will likely be mobile in the environment due to its water solubility. The product is water soluble, and may spread in water systems.

Other Hazards
No information available

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Methyl-2-pyrrolidone</td>
<td>872-50-4</td>
<td>99</td>
</tr>
</tbody>
</table>
SECTION 4. FIRST AID MEASURES

**General Advice**
Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.

**Eye Contact**
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. 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. If not breathing, give artificial respiration. 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.

**Ingestion**
Do not induce vomiting. Call a physician or Poison Control Center immediately.

**Most important symptoms and effects**
None reasonably foreseeable. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.

**Self-Protection of the First Aider**
Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

**Notes to Physician**
Treat symptomatically. Symptoms may be delayed.

SECTION 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.

**Extinguishing media which must not be used for safety reasons**
No information available.

**Specific Hazards Arising from the Chemical**
Combustible material. Containers may explode when heated. Keep product and empty container away from heat and sources of ignition.

**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.

SECTION 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.

**Methods for Containment and Clean Up**
Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Remove all sources of ignition.
Refer to protective measures listed in Sections 8 and 13.

SECTION 7. HANDLING AND STORAGE

Handling
Do not get in eyes, on skin, or on clothing. Wear personal protective equipment. Use only under a chemical fume hood. Do not breathe vapors or spray mist. Do not ingest. Keep away from open flames, hot surfaces and sources of ignition.

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

Specific Use(s)
Use in laboratories

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

<table>
<thead>
<tr>
<th>Component</th>
<th>China</th>
<th>Taiwan</th>
<th>Hong Kong</th>
<th>The United Kingdom</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Methyl-2-pyrrolidone</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>STEL: 20 ppm 15 min</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>STEL: 80 mg/m³ 15 min</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TWA: 10 ppm 8 hr</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TWA: 40 mg/m³ 8 hr Skin</td>
</tr>
</tbody>
</table>

Monitoring methods
BS EN 14042:2003 Title Identifier: Workplace atmospheres. Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents. MDHS70 General methods for sampling airborne gases and vapours

Exposure Controls

Engineering Measures
Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location. Wherever possible, engineering control measures such as the isolation or enclosure of the process, the introduction of process or equipment changes to minimise release or contact, and the use of properly designed ventilation systems, should be adopted to control hazardous materials at source.

Personal protective equipment

Eye Protection
Goggles (European standard - EN 166)

Hand Protection
Protective gloves

<table>
<thead>
<tr>
<th>Glove material</th>
<th>Breakthrough time</th>
<th>Glove thickness</th>
<th>EU standard</th>
<th>Glove comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrile rubber</td>
<td>&lt; 30 minutes</td>
<td>0.38 mm</td>
<td>Level 2</td>
<td>Permeation rate 43 µg/cm²/min</td>
</tr>
<tr>
<td>Neoprene</td>
<td>&lt; 140 minutes</td>
<td>0.66 mm</td>
<td>Level 4</td>
<td>Permeation rate 19 µg/cm²/min</td>
</tr>
<tr>
<td>Butyl rubber</td>
<td>&gt; 480 minutes</td>
<td>0.50 mm</td>
<td>EN 374</td>
<td>As tested under EN374-3 Determination of Resistance to Permeation by Chemicals</td>
</tr>
</tbody>
</table>

Inspect gloves before use.
Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves.
(Refer to manufacturer/supplier for information)
Ensure gloves are suitable for the task: Chemical compatibility, Dexterity, Operational conditions, User susceptibility, e.g. sensitisation effects, also take into consideration the specific local conditions under which the product is used, such as the danger...
of cuts, abrasion. Remove gloves with care avoiding skin contamination.

**Skin and body protection**
Long sleeved clothing

**Respiratory Protection**
When workers are facing concentrations above the exposure limit they must use appropriate certified respirators. To protect the wearer, respiratory protective equipment must be the correct fit and be used and maintained properly.

**Large scale/emergency use**
Use a NIOSH/MSHA or European Standard EN 136 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

**Recommended Filter type:** Organic gases and vapours filter Type A Brown conforming to EN14387

**Small scale/Laboratory use**
Use a NIOSH/MSHA or European Standard EN 149:2001 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

**Recommended half mask:-** Valve filtering: EN405; or; Half mask: EN140; plus filter, EN 141

When RPE is used a face piece Fit Test should be conducted

**Hygiene Measures**
Handle in accordance with good industrial hygiene and safety practice.

**Environmental exposure controls**
No information available.

### SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Appearance</strong></td>
<td>Colorless</td>
</tr>
<tr>
<td><strong>Physical State</strong></td>
<td>Liquid</td>
</tr>
<tr>
<td><strong>Odor</strong></td>
<td>Mild amine</td>
</tr>
<tr>
<td><strong>Odor Threshold</strong></td>
<td>7.7-8.0</td>
</tr>
<tr>
<td><strong>pH</strong></td>
<td>7.7-8.0</td>
</tr>
<tr>
<td><strong>Melting Point/Range</strong></td>
<td>-24 °C / -11.2 °F</td>
</tr>
<tr>
<td><strong>Softening Point</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Boiling Point/Range</strong></td>
<td>202 °C / 395.6 °F</td>
</tr>
<tr>
<td><strong>Flash Point</strong></td>
<td>91 °C / 195.8 °F</td>
</tr>
<tr>
<td><strong>Evaporation Rate</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Flammability (solid,gas)</strong></td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Explosion Limits</strong></td>
<td>Liquid</td>
</tr>
<tr>
<td><strong>Vapor Pressure</strong></td>
<td>0.7 mbar @ 25 °C</td>
</tr>
<tr>
<td><strong>Vapor Density</strong></td>
<td>3.4</td>
</tr>
<tr>
<td><strong>Specific Gravity / Density</strong></td>
<td>1.030</td>
</tr>
<tr>
<td><strong>Bulk Density</strong></td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Water Solubility</strong></td>
<td>Miscible</td>
</tr>
<tr>
<td><strong>Solubility in other solvents</strong></td>
<td>No information available</td>
</tr>
<tr>
<td><strong>Partition Coefficient (n-octanol/water)</strong></td>
<td>log Pow</td>
</tr>
<tr>
<td><strong>Component</strong></td>
<td>1-Methyl-2-pyrrolidone</td>
</tr>
<tr>
<td><strong>Autoignition Temperature</strong></td>
<td>346 °C / 654.8 °F</td>
</tr>
<tr>
<td><strong>Decomposition Temperature</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Viscosity</strong></td>
<td>1.67 mPa s at 20 °C</td>
</tr>
<tr>
<td><strong>Explosive Properties</strong></td>
<td>No information available</td>
</tr>
<tr>
<td><strong>Oxidizing Properties</strong></td>
<td>No information available</td>
</tr>
</tbody>
</table>

**Molecular Formula**
C5 H9 N O

**Molecular Weight**
99.13
SECTION 10. STABILITY AND REACTIVITY

Stability
Hygroscopic. Air sensitive. Light sensitive.

Hazardous Reactions
None under normal processing.

Hazardous Polymerization
No information available.

Conditions to Avoid
Incompatible products. Heat, flames and sparks. Exposure to air. Exposure to moist air or water. Exposure to light. Keep away from open flames, hot surfaces and sources of ignition.

Materials to avoid

Hazardous Decomposition Products

SECTION 11. TOXICOLOGICAL INFORMATION

Product Information

(a) 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>1-Methyl-2-pyrrolidone</td>
<td>LD50 = 3914 mg/kg (Rat)</td>
<td>LD50 = 8 g/kg (Rabbit)</td>
<td>LC50 &gt; 5.1 mg/L (Rat) 4 h</td>
</tr>
</tbody>
</table>

(b) skin corrosion/irritation;
Category 2

(c) serious eye damage/irritation;
Category 2

(d) respiratory or skin sensitization;
Respiratory
Based on available data, the classification criteria are not met
Skin
Based on available data, the classification criteria are not met

(e) germ cell mutagenicity;
Based on available data, the classification criteria are not met
Mutagenic effects have occurred in microorganisms

(f) carcinogenicity;
Based on available data, the classification criteria are not met
There are no known carcinogenic chemicals in this product

(g) reproductive toxicity;
Reproductive Effects
Category 1B
Experiments have shown reproductive toxicity effects on laboratory animals.
Developmental Effects
Substances known to cause developmental toxicity in humans. May cause harm to the unborn child.
Teratogenicity
Teratogenic effects have occurred in experimental animals.

(h) STOT-single exposure;
Category 3
Results / Target organs
Respiratory system

(i) STOT-repeated exposure;
Target Organs
None known.

(j) aspiration hazard;
Based on available data, the classification criteria are not met

Other Adverse Effects
Tumorigenic effects have been reported in experimental animals.
Symptoms / effects, both acute and delayed

Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity effects.

<table>
<thead>
<tr>
<th>Component</th>
<th>Freshwater Fish</th>
<th>Water Flea</th>
<th>Freshwater Algae</th>
<th>Microtox</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Methyl-2-pyrrolidone</td>
<td>LC50: 4000 mg/L, 96h static (Leuciscus idus)</td>
<td>EC50: 4897 mg/L, 48h (Daphnia magna)</td>
<td>EC50: 500 mg/L, 72h (Desmodesmus subspicatus)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LC50: 1400 mg/L, 96h static (Poecilia reticulata)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LC50: 1072 mg/L, 96h static (Pimephales promelas)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LC50: 832 mg/L, 96h static (Lepomis macrochirus)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Persistence and Degradability

Persistence

Persistence is unlikely.

Bioaccumulative Potential

Bioaccumulation is unlikely.

<table>
<thead>
<tr>
<th>Component</th>
<th>log Pow</th>
<th>Bioconcentration factor (BCF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Methyl-2-pyrrolidone</td>
<td>-0.46</td>
<td>No data available</td>
</tr>
</tbody>
</table>

Mobility in soil

The product is water soluble, and may spread in water systems. Will likely be mobile in the environment due to its water solubility. Highly mobile in soils.

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors.

Persistent Organic Pollutant

This product does not contain any known or suspected substance.

Ozone Depletion Potential

This product does not contain any known or suspected substance.

SECTION 13. DISPOSAL CONSIDERATIONS

Waste from Residues / Unused Products

Waste is classified as hazardous. Dispose of in accordance with the European Directives on waste and hazardous waste. Dispose of in accordance with local regulations.

Contaminated Packaging

Dispose of this container to hazardous or special waste collection point.

Other Information

Waste codes should be assigned by the user based on the application for which the product was used. Do not empty into drains.

SECTION 14. TRANSPORT INFORMATION

Road and Rail Transport

Not Regulated

IMDG/IMO

Not regulated

IATA

Not regulated
Special Precautions for User

No special precautions required

SECTION 15. REGULATORY INFORMATION

International Inventories

<table>
<thead>
<tr>
<th>Component</th>
<th>The Inventory of Hazardous Chemicals (2015 Edition)</th>
<th>List of dangerous goods GB 12268 - 2012</th>
<th>Taiwan Toxic Chemical Substances Inventory</th>
<th>IECSC</th>
<th>EINECS</th>
<th>TSCA</th>
<th>DSL</th>
<th>PICCS</th>
<th>ENCS</th>
<th>AICS</th>
<th>KECL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Methyl-2-pyrrolidone</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>212-828-1</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

National Regulations

SECTION 16. OTHER INFORMATION

Prepared By
Health, Safety and Environmental Department

Creation Date
12-Nov-2009

Revision Date
21-Feb-2018

Revision Summary

Training Advice
Chemical hazard awareness training, incorporating labelling, Safety Data Sheets (SDS), Personal Protective Equipment (PPE) and hygiene.
Use of personal protective equipment, covering appropriate selection, compatibility, breakthrough thresholds, care, maintenance, fit and standards.
First aid for chemical exposure, including the use of eye wash and safety showers.
Chemical incident response training.
Fire prevention and fighting, identifying hazards and risks, static electricity, explosive atmospheres posed by vapours and dusts.

Legend

CAS - Chemical Abstracts Service
EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
IECSC - Chinese Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
WEL - Workplace Exposure Limit
ACGIH - American Conference of Governmental Industrial Hygienists
DNEL - Derived No Effect Level
RPE - Respiratory Protective Equipment
LC50 - Lethal Concentration 50%
NOEC - No Observed Effect Concentration
PBT - Persistent, Bioaccumulative, Toxic
ADR - European Agreement Concerning the International Carriage of Dangerous Goods by Road
IMO/IMDG - International Maritime Organization/International Maritime

TSCA - United States Toxic Substances Control Act Section 8(b)
TWA - Time Weighted Average
ICAO/IATA - International Civil Aviation Organization/International Air Transport Association
PNEC - Predicted No Effect Concentration
ICMS - International Conference of Midwife's Societies
LD50 - Lethal Dose 50%
EC50 - Effective Concentration 50%
POC - Predicted Occlusive Concentration
vPvB - very Persistent, very Bioaccumulative

AICS - Australian Inventory of Chemical Substances
ENCS - Japanese Existing and New Chemical Substances
NZIoC - New Zealand Inventory of Chemicals

Key literature references and sources for data
Suppliers safety data sheet, Chemadvisor - LOLI, Merck, RTECS

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 Safety Data Sheet