I. Product and Supplier Information

Product Name: N-Methyl-2-Pyrrolidone
MSDS Number: UPS10704
Product Number: 10704
Publication Date: Dec. 12, 2001
Product Synonyms: NMP, M-Pyrol, 1-Methyl-2-Pyrrolidinone
Chemical Family or Formula: Cyclic tertiary amine and ketone \((\text{CH}_3\text{-N}<\text{CH}_2\text{CH}_2\text{CH}_2\text{C}=\text{O})\)

Supplier: Ultra Pure Solutions, Inc.
11485 Commercial Parkway
Castroville, CA 95012
Phone: 831-632-2120
Fax: 831-632-2521
email: ultrapuresln@earthlink.net

II. Composition and Information on Ingredients

<table>
<thead>
<tr>
<th>CAS #</th>
<th>SARA 313</th>
<th>Material or Component</th>
<th>Exposure Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>872-50-4</td>
<td>Yes</td>
<td>N-Methyl-2-pyrrolidone</td>
<td>100 None Not established 10 ppm skin</td>
</tr>
</tbody>
</table>

NE= Not Established "De minimis" = Threshold reporting limit for SARA 313 for this material.

III. Hazards Identification

Hazard Classification:
Combustible liquid and vapor. NOT its DOT classification.
Irritating to skin, eyes, and mucous membranes.

Routes of Entry:
Inhalation, skin contact, ingestion

Chemical Interactions:
Avoid contact with all strong reducing or oxidizing agents.

Medical Conditions Aggravated:
None found.

Human Threshold Response Data
Odor Threshold: Not established
Irritation Threshold: Not established

Hazard Category Classifications and Ratings

<table>
<thead>
<tr>
<th>Hazard Categories</th>
<th>Health</th>
<th>Fire</th>
<th>Pressure</th>
<th>Reactivity</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>OSHA 29 CFR 1910.1200 and SARA 302/311/312/313.</td>
</tr>
<tr>
<td>Delayed</td>
<td>Yes</td>
<td>No*</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

HMIS Hazard Ratings: Health 2 Fire 1 Instability 0 Other B (Goggles, gloves)
Immediate (Acute) Health Effects

Inhalation Toxicity:
Harmful if inhaled or swallowed.

Inhalation Irritation:
Irritation of nose and throat.

Skin Contact:
Skin contact may cause pain, redness, and severe irritation.

Skin Absorption:
May be absorbed through the skin.

Eye Contact
Causes eye irritation with tearing, pain or blurred vision.

Ingestion Irritation:
Irritating to digestive system.

Ingestion Toxicity:
Causes diarrhea, nausea, vomiting.

Acute Target Organ Toxicity:
Not reported

Prolonged (Chronic) Health Effects

Carcinogenicity:
This product is not known or reported to be carcinogenic by any reference source including IARC, OSHA or NTP, or ACGIH.

Reproductive and Developmental Toxicity:
Mutagenic effects on bacteria and reproductive effects on laboratory animals have been observed.

Sensitization:
None reported.

Inhalation:
Prolonged or repeated exposure may cause more severe irritation.

Skin Contact:
Prolonged or repeated skin exposure will aggravate symptoms described above.

Skin Absorption:
Reported effects from chronic exposure include damage to kidneys, liver and CNS.

Ingestion:
Chronic ingestion unlikely.

General:
Prolonged or repeated exposure may cause eye, liver, kidney or lung damage.

Chronic Target Organ Toxicity:
Skin, respiratory tract, kidney, liver.

Supplemental Health Hazard Information:
No additional health information available.

IV. First Aid

Inhalation:
Remove individual to fresh air. If not breathing, give artificial respiration or oxygen as appropriate. Seek medical attention.

Skin Contact:
Flush skin with water for 15 minutes and remove contaminated clothing. Wash clothing before reuse. Destroy contaminated shoes.

Eyes:
Immediately flush eyes with plenty of water for at least 15 minutes while holding eyelids apart.

Ingestion:
Immediately seek medical advice.
V. Fire Fighting Measures

Flammability Summary (OSHA):
Flammable
Flammable Properties:
Flash Point \(186^\circ\)F, 86°C
Autoignition Temperature: 270°C
Upper Flammable/Explosive Limit, % in air 9.5
Lower Flammable/Explosive Limit, % in air 1.3

Fire/Explosion Hazards: Flammable liquid. Vapor can travel distances to ignition sources and flash back.
- OSHA Class II Combustible Liquid. Follow appropriate National Fire Protection Association (NFPA) codes.
- Hot organic chemical vapors or mists are susceptible to sudden spontaneous combustion when mixed with air.
- Ignition may occur at temperatures below published autoignition or ignition temperatures. Ignition temperatures decrease with increasing vapor volume and vapor-air contact time and are influenced by pressure changes.
- Ignition may occur at typical elevated temperature process conditions, especially in processes operating under vacuum if subjected to the sudden ingress of air, or with sudden escape of hot vapors into outside air.

Extinguishing Media:
- Water spray, foam, dry chemical or CO2
- Do not allow contaminated water to enter sewers or waterways.

Fire Fighting Instructions:
In case of fire, use normal fire fighting equipment including a NIOSH approved self-contained breathing apparatus (SCBA). Use water to cool containers. Decontaminate equipment before returning to service.

Hazardous Combustion Products:
- Oxides of carbon and nitrogen.

VI. Accidental Release Measures

Personal Protection for Emergency Situations:
Evacuate the area of all unnecessary personnel. Eliminate any ignition sources until the area is determined to be free from explosion and fire hazards. Contain the release and eliminate its source if this can be done safely.

Spill Mitigation Procedures
Air Release:
- Low vapor pressure makes air release unlikely.

Water Release:
- This material is soluble in water. Contain all liquid for treatment and/or disposal as a (potential) hazardous waste. Notify all downstream users of possible contamination.

Land Release:
- Create a dike or trench to contain materials. Absorb spill with inert material (e.g., dry sand, clay, earth or commercial absorbent), then place in a chemical waste container. Decontaminate all clothing and the spill area using a detergent and flush with large amounts of water. Contain all contaminated water for disposal and/or treatment.

Additional Spill Information:
- Stop source of spill as soon as possible and notify appropriate personnel. Utilize emergency response personal protection equipment prior to the start of any response. Evacuate all non-essential personnel. Dispose of spill residues per guidelines under Section XIII, Disposal Considerations.

VII. Handling and Storage

Handling:
- Do not take internally. Avoid contact with skin, eyes and clothing. Upon contact with skin or eyes, wash with water. Avoid breathing vapor, mist or gas. Electrically ground all equipment when handling this product.
- Retained residue may make empty containers hazardous. Use CAUTION!
- Discard shoes if contaminated.

Storage
- Keep container closed. Store in a cool area away from ignition sources, oxidizer and acids.

Shelf Life Limitations:
- See label or certificate of analysis for shelf life if applicable.

Incompatible Materials for Storage:
- Refer to Section X, "Incompatible Materials."

VIII. Exposure Controls and Personal Protection
Ventilation:
General exhaust ventilation is generally sufficient to meet TLV, and for general worker safety and comfort.

Protective Equipment for Routine Use of Product Where Appropriate:
Respiratory Protection:
See previous paragraph. Low odor and vapor pressure makes ambient temperature handling a low hazard operation.

Respirator Type(s):
NIOSH approved with organic vapor cartridges with appropriate particulate filter may be permissible.

Skin: Wear tough, impervious butyl gloves to avoid skin contact. Discard gloves with tears, pinholes or wear.
Eyes: Use chemical safety glasses with side shields, safety goggles and/or a full face shield where splashing is possible.
Protective Clothing Type: Impervious butyl rubber apron, boots or suit, as appropriate.
Wear flame resistant clothing if handling above flash point.

Exposure Limit Data: See Section II

Chemical Name  NIOSH Level Immediately Dangerous to Life or Health:
Not found

### IX. Physical Data

<table>
<thead>
<tr>
<th>Physical State:</th>
<th>Liquid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color:</td>
<td>Colorless</td>
</tr>
<tr>
<td>Odor:</td>
<td>Slight amine</td>
</tr>
</tbody>
</table>

Molecular Weight: 99.1
Octanol/Water Coeff: No data

Solubility in Water: 100%
Bulk Density: Not applicable
Specific Gravity: 1.03 g/cc @20C

Vapor Density (Air = 1): 3.41
Vapor Pressure: (@ 25 Deg. C): 0.38 hPa @ 20C
Evaporation Rate (Butyl acetate = 1): 0.03
Volatiles % by vol.: 100
Boiling Point: 202C
Freezing Point: -24C

### X. Stability and Reactivity

Stability and Reactivity Summary:
Stable under normal conditions.

Reactive Properties:
Sensitivity to mechanical shock: None
Hazardous Polymerization: Will not occur
Conditions to Avoid: High temperature, ignition sources
Chemical Incompatibility: Acids, oxidizers
Incompatible materials: Compatible with standard metals of construction. May soften some plastics.

Hazardous Decomposition Product: Oxides of carbon and nitrogen formed if burned.

Decomposition Temperature: Not determined
Product May Be Unstable At Temperatures Above: No data

### XI. Toxicological Information

Component Animal Toxicology
Oral LD50 value: 5130 mg/kg (mus), 3914 mg/kg (rat)
Dermal LD50 value: 8000 mg/kg (rbt)  
Inhalation LC50 value: No data  
Product Animal Toxicity: Listed above, as product is pure NMP

Skin Irritation:  
This material is expected to be moderately irritating, but not a sensitizer.

Eye Irritation:  
This material is expected to be slight to moderately irritating.

Reproductive and Developmental Toxicity:  
Mutagenic effects on bacteria and reproductive effects on laboratory animals have been observed.

Ingestion and Inhalation: Single exposures caused pathological changes to bone marrow, kidneys, liver, and lungs. Repeated exposures aggravated acute symptoms and additionally caused pulmonary edema, cardiovascular system changes, decreased body weight, and other pathological effects.

Component Data:  
All data refer to NMP.

Mutagenicity:  
Mutagenic effects on bacteria and reproductive effects on laboratory animals have been observed.

Carcinogenicity:  
This chemical is not known or reported to be carcinogenic by any reference source including IARC, OSHA, NTP, or EPA.

**XII. Ecological Information**

Ecological Toxicity Values:

Environmental fate: No information found
Environmental Toxicity: Compound has very low toxicity.

**XIII. Disposal Considerations**

CARE MUST BE TAKEN TO PREVENT ENVIRONMENTAL CONTAMINATION FROM THE USE OF THIS MATERIAL.
THE USER OF THIS MATERIAL HAS THE RESPONSIBILITY TO DISPOSE OF UNUSED MATERIAL, RESIDUES AND CONTAINERS IN COMPLIANCE WITH ALL RELEVANT LOCAL, STATE AND FEDERAL LAWS.

Waste Disposal Summary:
Product as supplied qualifies as "Unlisted Hazardous Waste D001" RQ 100#, with the characteristic of ignitability.

Potential US EPA Waste Codes:
D001

Disposal Methods:
Dispose of in accordance with local, state and federal regulations for hazardous waste.

Components subject to land ban restrictions:
No components subject to land ban restrictions.

**XIV. Transportation Information**

<table>
<thead>
<tr>
<th>Proper Shipping Name, Hazard Class, UN/NA Number Packing Group, Emergency Response Guide Number</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not regulated for non bulk shipment of pure material. Note: Recycled NMP may have enough water to raise the Flash Point above 200F and be shippable &quot;Non regulated&quot; in bulk. For bulk shipments &gt;119 gallons: Combustible liquid, n.o.s., Combustible Liquid, NA1993, PG III</td>
<td>None</td>
</tr>
<tr>
<td>Labels required per 49 CFR 172.101:</td>
<td>None</td>
</tr>
<tr>
<td>Size for &quot;Limited quantity&quot; per 49 CFR 173.150-.155:</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Reportable Quantity (&quot;RQ&quot;) per 49 CFR172.101:</td>
<td>None</td>
</tr>
<tr>
<td>Passenger and Cargo Air &amp; Rail (172.101):</td>
<td>Not regulated</td>
</tr>
<tr>
<td>Eff. Jan 1, 2001 Cargo only:</td>
<td>Not regulated</td>
</tr>
<tr>
<td>Vessel Stowage:</td>
<td>Not regulated</td>
</tr>
</tbody>
</table>

**XV. Regulatory Information**

UNITED STATES:
Toxic Substances Control Act (TSCA):
The components of this product are listed on the TSCA Inventory of Existing Chemical Substances.
Pesticide acceptance indication: US EPA Registration Number:
Not applicable
California Prop. 65: Listed
Superfund Amendments and Reauthorization Act (SARA) Title III:
See Section II of this MSDS.
Hazard Categories Sections 311/312 (40 CFR 370.2):
Health:
  Acute: Yes
  Chronic: Yes
Fire: Yes
Pressure: No
Reactivity: No
Physical: None
Extremely Hazardous Substance Section 302 - Threshold Planning Quantity:
  Not applicable
Reportable Quantity (40 CFR 302.4):
  None
Supplier Notification Requirements (40 CFR 372.45), 313 Reportable Components
  See Section II of this MSDS.

State Right-to-Know Regulations Status of Ingredients
Pennsylvania: No information
New Jersey: No information
Massachusetts: No information

**XVI. Additional Information**

**MSDS REVISION STATUS:**
This MSDS is intended to provide adequate information for the safe industrial use of the product. It is NOT intended as a comprehensive reference for its component pure materials.

THIS MATERIAL SAFETY DATA SHEET (MSDS) HAS BEEN PREPARED IN COMPLIANCE WITH THE FEDERAL OSHA HAZARD COMMUNICATION STANDARD, 29 CFR 1910.1200. THE INFORMATION IN THIS MSDS SHOULD BE PROVIDED TO ALL WHO WILL USE, HANDLE, STORE, TRANSPORT, OR OTHERWISE BE EXPOSED TO THIS PRODUCT. WE BELIEVE THIS INFORMATION TO BE RELIABLE AND UP TO DATE AS OF ITS PUBLICATION DATE, BUT MAKE NO WARRANTY THAT IT IS. IF THIS MSDS IS MORE THAN THREE YEARS OLD YOU SHOULD CONTACT THE SUPPLIER TO MAKE CERTAIN THAT THE INFORMATION IS CURRENT.

MSDS data source: Alfa-Aesar 11/30/2001