

Certificate of Analysis

2-pyrrolidinone

PurCert Standard for GC

(Secondary Reference Standard)

| | | | |
|-------------------|----------------------------------|--------------|-----------|
| Product Number | PSR37818 | CAS No. | 616-45-5 |
| Brand | PureSynth | Lot No. | P07T |
| Molecular Formula | C ₄ H ₇ NO | Date of Mfg. | July.2021 |
| Molecular Weight | 85.11g/mol | Date of Exp. | June.2025 |

| Test | Specification | Result |
|--------------------------------------|---|------------------|
| Description | White or Colorless to Almost white or Almost colorless powder to lump to clear liquid | Colorless liquid |
| Clarity | Clear | Clear |
| Assay (GC-FID) | ≥ 99.5 % | 99.66% |
| Water (by KF) | ≤ 0.2% | 0.1619% |
| Identification by ¹ H NMR | Conform to structure | Conforms |
| Identification by GC-MS | Conform to molecular | Conforms |
| Identification by IR | Conform to structure | Conforms |

***Traceable to Internal Reference standard.**

Storage Condition: Store at ambient temperature and keep container tightly closed in a dry and well-Ventilated place.

Remark: The batch complies with the prescribed quality of the above specification.

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Assay by GC-FID

METHOD: G.C- FID conditions:

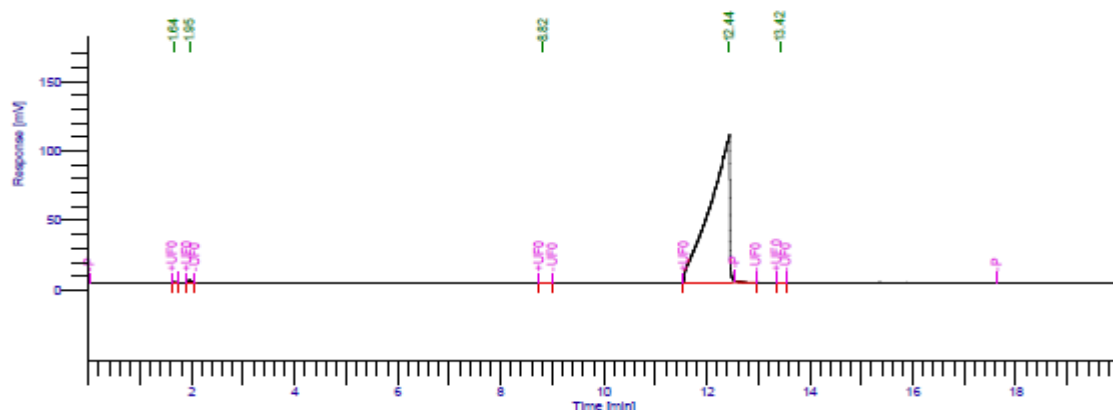
Column: Agilent Technologies DB-FFAP 30mx 0.530mm, 1.0micron

Instrument: PerkinElmer, GC 2014,

Detector: FID, **Carrier gas:** Nitrogen

Temp programming: Initial 50°C hold for 1min, 5°C Ramp/ min., 100 °C hold for 1 min., 25°C Ramp up to 250°C hold for 2 min., Run time 20 min.

| | | | |
|-----------------------|--------------------------|-----------------|-------------------------------------|
| Software Version | : 6.3.4.0700 | Date | : 21-09-2021 1.07.06 PM |
| Operator | : Admin | Sample Name | : AR21000536-2-PYRROLIDINONE- P 07T |
| Sample Number | : 1 | | |
| AutoSampler | : BUILT-IN | Study | : GC Purity] |
| Instrument Name | : Clarus 680 | Rack/Vial | : 0/27 |
| Instrument Serial # | : None | Channel | : A |
| Delay Time | : 0.00 min | A/D mV Range | : 1000 |
| Sampling Rate | : 12.5000 pts/s | End Time | : 20.00 min |
| Sample Volume | : 1.000000 ul | | |
| Sample Amount | : 1.0000 | | |
| Data Acquisition Time | : 21-09-2021 12.25.41 PM | Area Reject | : 0.000000 |
| | | Dilution Factor | : 1.00 |
| | | Cycle | : 1 |



GC Reports

| Peak # | Component Name | Time [min] | Area [uV*sec] | Height [uV] | Area [%] |
|--------|----------------|------------|---------------|-------------|----------|
| 1 | | 1.641 | 1679.41 | 565.42 | 0.06 |
| 2 | | 1.953 | 6775.06 | 1885.64 | 0.24 |
| 3 | | 8.816 | 891.25 | 115.29 | 0.03 |
| 4 | | 12.439 | 2789234.79 | 106545.31 | 99.66 |
| 5 | | 13.421 | 167.44 | 29.86 | 0.01 |
| | | 2798747.94 | 109141.53 | 100.00 | |

Missing Component Report
Component Expected Retention (Calibration File)

All components were found

Purity by GC-FID: 99.66 %

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IDENTIFICATION TESTS

GC-MS Spectrum:

METHOD: G.C-MS conditions:

Column: Agilent Technologies, Elite -5MS, 30 m X 0.25 mm, 1.0micron

Instrument: Perkin Elmer, **Carrier gas:** Helium

Source Temp.: 230°C, **Transfer line:** 250°C

Inlet Temp.: 180°C, **Diluent:** Methanol

Source energy: 70eV

Mass by GC-MS:

Product Name: 2-pyrrolidinone

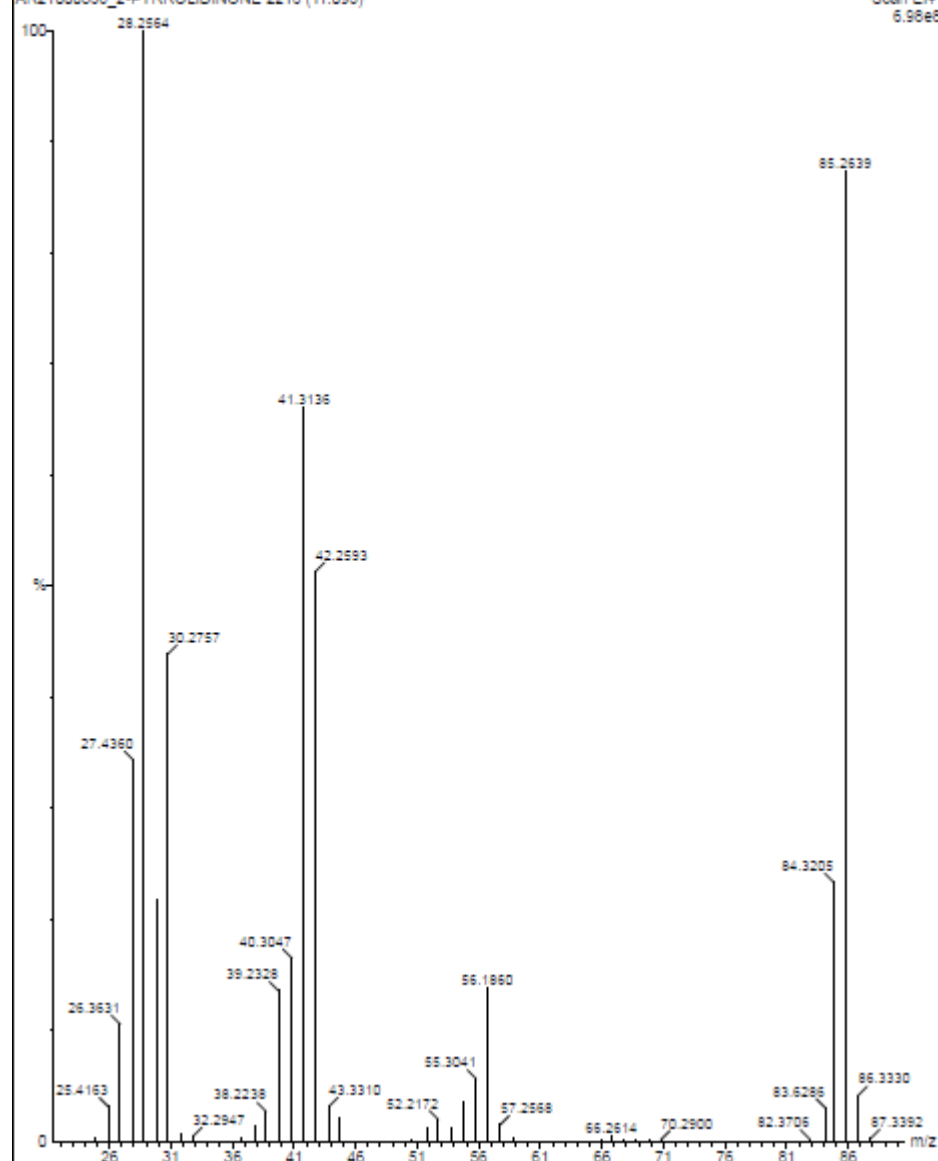
Product Code: PSR37818

2-PYRROLIDINONE

AR21000536_2-PYRROLIDINONE 2218 (11.093)

, 20-Sep-2021 + 14:06:02

Scan E1+
6.98e6



Identification by GC-MS: Conform to molecular

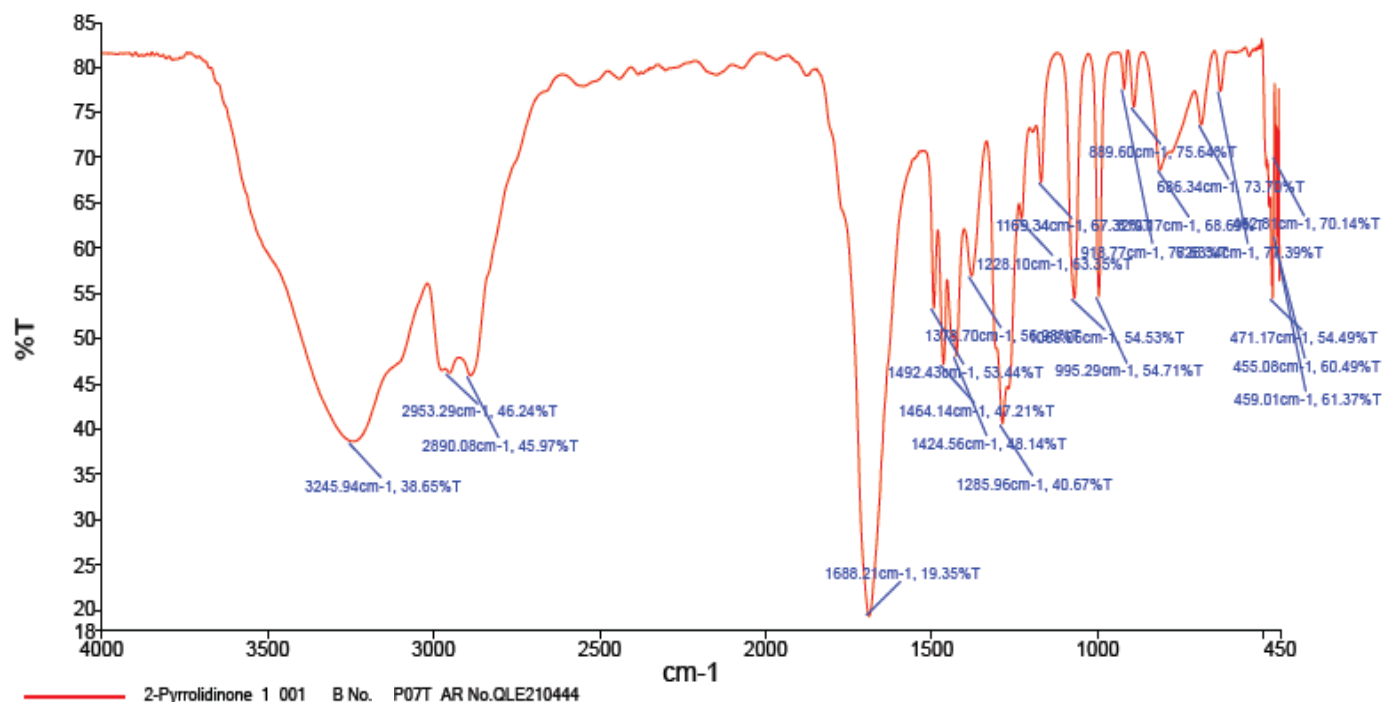
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Infrared spectrum:

Product Name: 2-pyrrolidinone

Product Code: PSR37818



| Source Spectra Results | |
|------------------------|-----------------|
| Spectrum Name | Number Of Peaks |
| 2-Pyrrolidinone_1 | 23 |

| List of Peak Area/Height | | |
|--------------------------|----------|--------|
| Peak Number | X (cm-1) | Y (%T) |
| 1 | 3245.94 | 38.65 |
| 2 | 2953.29 | 46.24 |
| 3 | 2890.08 | 45.97 |
| 4 | 1688.21 | 19.35 |
| 5 | 1492.43 | 53.44 |
| 6 | 1464.14 | 47.21 |
| 7 | 1424.56 | 48.14 |
| 8 | 1378.70 | 56.98 |
| 9 | 1285.96 | 40.67 |
| 10 | 1228.10 | 63.35 |
| 11 | 1169.34 | 67.32 |
| 12 | 1069.06 | 54.53 |
| 13 | 995.29 | 54.71 |
| 14 | 918.77 | 77.63 |
| 15 | 889.60 | 75.64 |
| 16 | 810.17 | 68.69 |
| 17 | 686.34 | 73.70 |
| 18 | 628.34 | 77.39 |
| 19 | 471.17 | 54.49 |
| 20 | 462.81 | 70.14 |
| 21 | 459.01 | 61.37 |
| 22 | 455.08 | 60.49 |
| 23 | 451.00 | 56.66 |

Identification by IR: Conform to structure

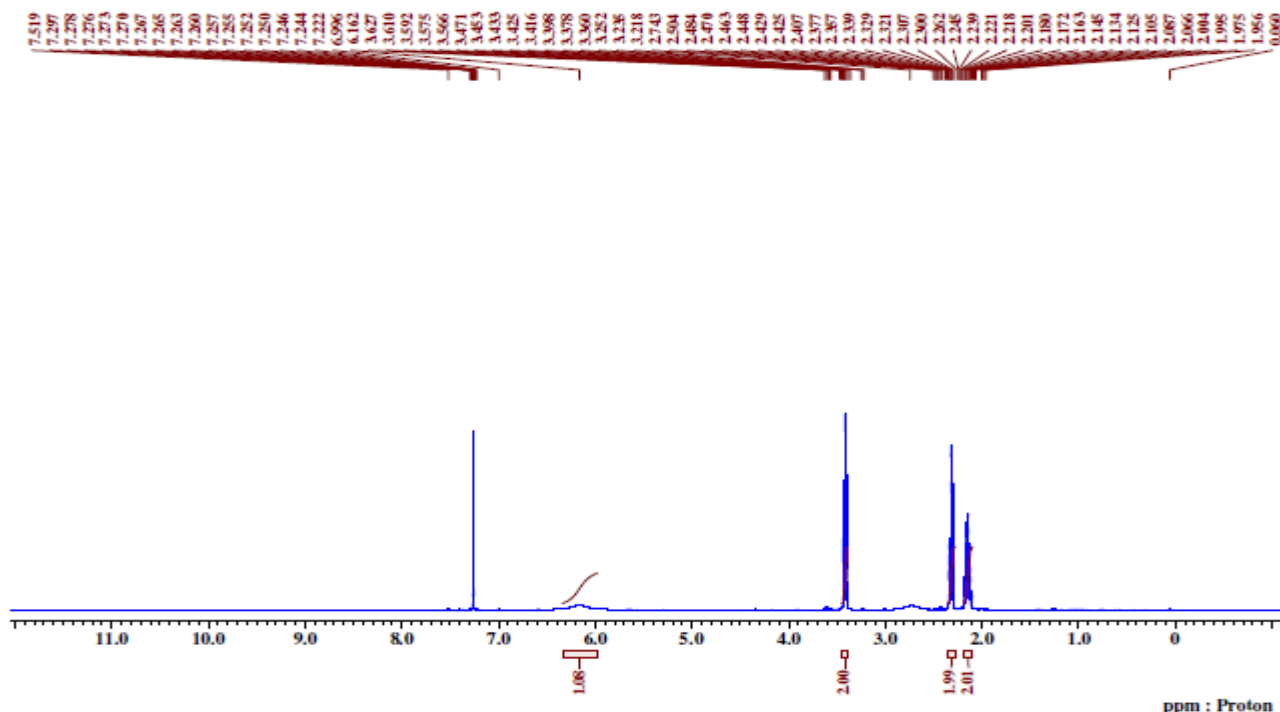
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¹H NMR Spectrum:

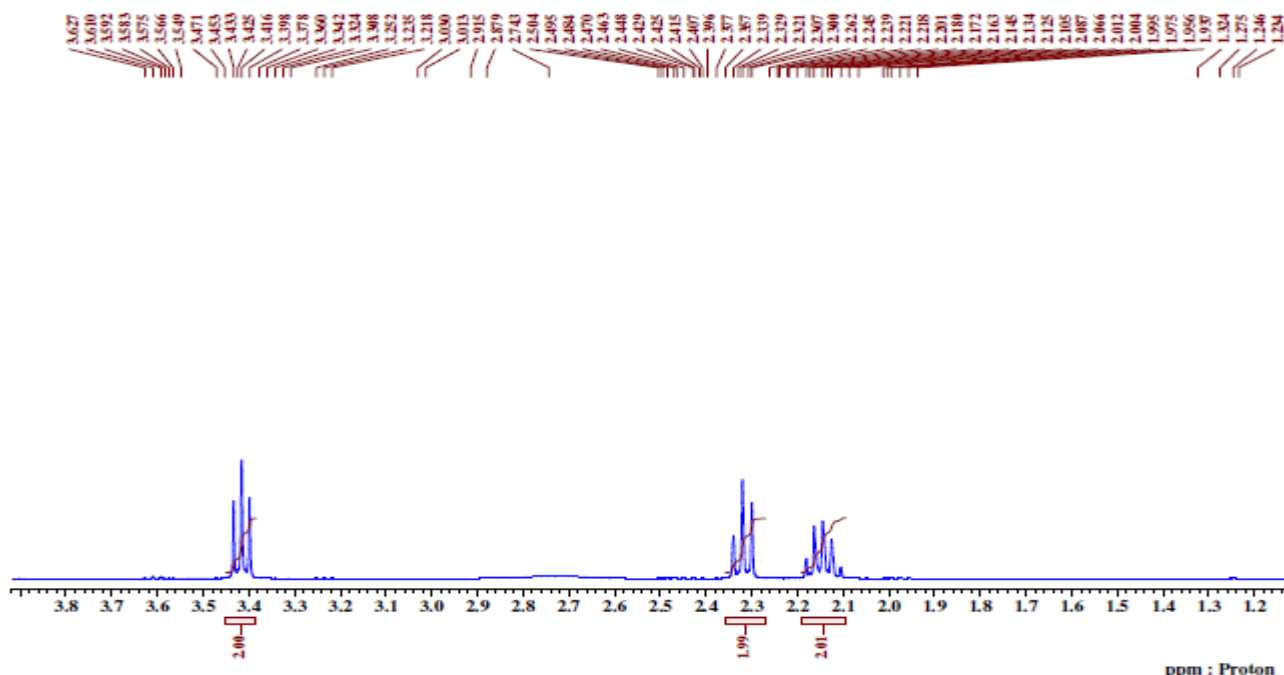
Product Name: 2-pyrrolidinone

Product Code: PSR37818



| | | | | | |
|---------------|------------------------|--------------|----------------------|------------|-----------------|
| Sample_Id | = 2-Pyrrolidinone- | P07 | Experiment Details | Dim_Title | = Proton |
| Author | = delta | Instrument | = JEOL[Delta v5.3.2] | Solvent | = CHLOROFORM-D |
| Operated by | = Vishnu | Spectrometer | = JNM-ECE400s/L1 | Scans | = 16 |
| Creation_Time | = 24-SEP-2021 17:17:21 | Experiment | = proton.jpg | Temp_Get | = 20[dc] |
| Revision_Time | = 24-SEP-2021 17:48:45 | X_Domain | = Proton | X_Acq_Time | = 1.16916224[s] |

¹H NMR Spectrum: Expansion



| | | | | | |
|---------------|------------------------|--------------|----------------------|------------|-----------------|
| Sample_Id | = 2-Pyrrolidinone- | P07 | Experiment Details | Dim_Title | = Proton |
| Author | = delta | Instrument | = JEOL[Delta v5.3.2] | Solvent | = CHLOROFORM-D |
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Identification by ¹H NMR: Conform to structure

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Maximum limits of impurities

WATER DETERMINATION

Method: Karl Fisher titration

Water Content (PSR37818) = **0.1619%**

Approved By
Head - Technical

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