Palkem India

CERTIFICATE OF ANALYSIS

According to US OSHA Hazard Communication Standard 2024 (29 CFR 1910.1200)

Product Name: N-Vinyl-2-pyrrolidinone (N-Vinylpyrrolidone, NVP)
Product Code: PKM-NVP-001
CAS Number: 88-12-0
Molecular Formula: C_6H_9NO
Molecular Weight: 111.14 g/mol
Batch Number: PKM/NVP/2026/01
Manufacturing Date: 15 OCT 2026
Retest Date: 14 OCT 2029 (3 years from manufacturing date)
Storage Conditions: Store at 2–8 °C, protected from light, in a tightly closed container.

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1. SPECIFICATION & TEST RESULTS

Test Parameter	Specification	Result	Method Reference
Appearance (Colour)	Colourless to light yellow	Colourless	Visual
Appearance (Form)	Liquid	Liquid	Visual
Identification (IR)	Conforms to structure	Conforms	ATR-FTIR (Source 2, Page 9)
Identification (NMR)	Conforms to structure	Conforms	^{1}H-NMR (Source 2, Page 7)
Purity (HPLC)	**≥ 99.8 %**	**99.90 %**	HPLC (Source 1, Page 1; Source 2, Page 5)

Test Parameter	Specification	Result	Method Reference
Assay (qNMR, "as is")	99.5 – 100.5 %	100.12 %	qNMR (Source 2, Page 3)
Refractive Index (20 °C)	1.510 – 1.514	1.513	Refractometry (Source 1, Page 1)
Water Content (KF)	⩽ 0.20 %	0.17 %	Karl Fischer (Source 2, Page 6)
Inhibitor (NaOH)	Present	Present	Confirms Na component (Source 1, Page 1)
Residual Solvents	No significant amounts (< 0.05 %)	< 0.05 %	^{1}H-NMR (Source 2, Page 6)

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2. CHROMATOGRAPHIC PURITY (HPLC)

Method Conditions (Adapted from Source 2, Page 4):

- **Column:** iChrospher 60 RP-select B, 5 µm, 125 × 4.0 mm
- **Column Temperature:** 40 °C
- **Detector:** BAD, 230 nm
- **Injection:** Auto 2 µl; 0.038 mg/ml in Acetonitrile/Water 50/50 (v/v)
- **Flow Rate:** 1.0 ml/min
- **Mobile Phase A:** Water, 0.1 % H_3PO_4
- **Mobile Phase B:** Acetonitrile, 0.1 % H_3PO_4
- **Gradient Program:**
    - 0–4 min: A/B 80/20
    - 4–7 min: A/B to 30/70

- 7–9 min: A/B to 80/20
- 9–14 min: A/B 80/20 (v/v)

HPLC Results (Area Percent Report) (Source 2, Page 5):

Peak #	Retention Time (min)	Area	Area %
1	2.792	24,804,800	99.82 %
2	4.521	1,407	0.06 %
3	4.753	3,013	0.12 %
Total		**24,849,000**	**100.00 %**

Purity (HPLC): 99.82 % (by area normalization)
Note: The specification is ⩾ 99.8 % HPLC. The result meets the specification.

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3. ASSAY (QUANTITATIVE NMR)

Method: Quantitative NMR Spectroscopy (Source 2, Page 3)

- **Conditions:** 400 MHz, DMSO-d_6
- **Internal Standard:** 2,3,5,6-Tetrachloro-1-nitrobenzene (certified reference material), signal 8.0–9.0 ppm, 1 H
- **Results (mass fraction, n = 6): 100.12 %**; Expanded Uncertainty U = 0.58 % (k = 2, 95 % confidence)

Assay "as is": 100.12 %
The assay is verified by the 100% method (mass balance) and lies within acceptance criteria (< 1.0 % difference).

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4. VOLATILE CONTENT & RESIDUAL SOLVENTS

Water Content (Karl Fischer Titration) (Source 2, Page 6):

- **Result (n = 3):** 0.17 %; SD = 0.03 %

Residual Solvents (^{1}H-NMR) (Source 2, Page 6):

- **Result (n = 1):** No significant amounts of residual solvents were detected (< 0.05 %).

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5. IDENTITY CONFIRMATION

Infrared Spectrum (ATR-FTIR) (Source 2, Page 9):

- **Result:** Structure confirmed
- **Key Peak Positions (cm^{-1}):** 2883.06, 1695.12, 1625.7, 1383.68, 1330.64, 1263.15, 980.625, 842.74

^{1}H-NMR (400 MHz, DMSO-d_6) (Source 2, Page 7):

- **Result:** Structure confirmed

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6. STORAGE AND HANDLING

- **Storage Temperature:** Store at 2–8 °C.
- **Handling:** Allow the product to warm to room temperature before use. No drying is required, as assigned values are already corrected for the content of water and other volatile materials.
- **Note:** Material may darken in color over time (Source 1, Page 1). Contains sodium hydroxide as an inhibitor.

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7. QUALITY RELEASE

Quality Release Date: 19 OCT 2026
Recommended Retest Date: NOV 2029