Australian Government
Department of Industry, Science and Resources

National Measurement Institute

CIPM MRA

NATA
WORLD RECOGNISED ACCREDITATION

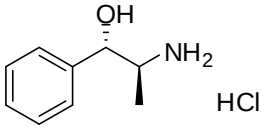
CERTIFIED REFERENCE MATERIAL CERTIFICATE OF ANALYSIS

NMIA M297: (+)-Cathine hydrochloride

Report ID: M297.2020.03

Chemical Formula: $C_9H_{13}NO.HCl$

Molecular Weight: 187.7 g/mol (HCl), 151.2 g/mol (base)



Certified value

Batch No.	CAS No.	Purity (mass fraction)
06-D-14	**2153-98-2(HCl)** **492-39-7 (base)**	**98.9 ± 0.7%**

The uncertainty has been calculated according to ISO Guide 35 and is stated at the 95% confidence limit (k = 2).

IUPAC name: (1*S*, 2*S*)-2-Amino-1-phenyl-1-propanol hydrochloride (1:1)

Expiration of certification: The property values are valid till 23 July 2030, i.e. ten years from the date of re-certification provided the **unopened** material is handled and stored in accordance with the recommendations below. The material as issued in the unopened container and stored as recommended below should be suitable for use beyond this date, subject to confirmation of batch stability from the issuing body. The expiry date/shelf life does not apply to sample bottles that have been opened. In such cases it is recommended that the end-user conduct their own in-house stability trials.

Description: White powder sourced from an external supplier, and certified for identity and purity by NMIA. Packaged in amber glass bottles with a septum and crimped aluminium cap or screw top cap.

Intended use: This certified reference material is suitable for use as a primary calibrator.

Instructions for use: Equilibrate the bottled material to room temperature before opening.

Recommended storage: When not in use this material should be stored at or below 25 ºC in a closed container in a dry, dark area.

Metrological traceability: The certified purity value is traceable to the SI unit for mass (kg) through Australian national standards via balance calibration. In the mass balance approach all impurities are quantified as a mass fraction and subtracted from 100%.

Stability: This material has demonstrated stability over a minimum period of three years. The measurement uncertainty at the 95% confidence interval includes a stability component which has been estimated from annual stability trials. The long-term stability of the compound in solution has not been examined.

Homogeneity assessment: The homogeneity of the material was assessed using purity assay by GC-FID on seven randomly selected 1-2 mg sub samples of the material. The material was judged to be sufficiently homogeneous at this level of sampling as the variation in analysis results between samples was not significantly different at a 95% confidence level from that observed on repeat analysis of the same sample.

Safety: Treat as a hazardous substance. Use appropriate work practices when handling to avoid skin or eye contact, ingestion or inhalation of dust. Refer to the provided safety data sheet.

S. R. Davies

Dr Stephen R. Davies,
Team Leader,
Chemical Reference Materials, NMI.
12 October 2022

This report supersedes any issued prior to 12 October 2022.

NATA Accreditation No. 198 / Corporate Site No. 14214.

CIPM MRA notice: This certificate is consistent with the capabilities that are included in Appendix C of the CIPM MRA drawn up by the CIPM. Under the CIPM MRA, all participating institutes recognize the validity of each other's calibration and measurement certificates for the quantities, ranges and measurement uncertainties specified in Appendix C. The "CIPM MRA Logo" and this statement attest only to the measurement(s) applied for determining the certified values on the certificate (for details see http://www.bipm.org).

Legal notice: Terms and Conditions associated with the provision of this reference material can be found on the NMIA website.

Characterisation Report:

The identity was confirmed by a range of spectroscopic techniques, NMR, IR and MS. The certified purity value was obtained by mass balance from a combination of traditional analytical techniques, including GC-FID, thermogravimetric analysis, Karl Fischer analysis and ^{1}H NMR spectroscopy. The purity value is calculated as per Equation 1.

Purity = (100 % - I_{ORG}) x (100 % - I_{VOL} – I_{NVR}) Equation 1

I_{ORG} = Organic impurities of related structure, I_{VOL} = volatile impurities, I_{NVR} = non-volatile residue.

Supporting evidence is provided by qualitative elemental microanalysis.

GC-FID:	Instrument:	Agilent 6890
	Column:	HP-1, 29.5 m × 0.32 mm I.D. × 0.25 μm
	Program:	80 °C (1 min), 10 °C/min to 120 °C (5 min), 20 °C/min to 300 °C (3 min)
	Injector:	200 °C
	Detector Temp:	320 °C
	Carrier:	Helium
	Split ratio:	20/1
	Relative mass fraction of the main component as the free base:	
	Initial analysis:	Mean = 99.9%, s = 0.02% (7 sub samples in duplicate, November 2006)
	Re-analysis:	Mean = 99.7%, s = 0.04% (5 sub samples in duplicate, November 2008)
GC-FID:	Instrument:	Varian 3800
	Column:	HP-1, 29.5 m × 0.32 mm I.D. × 0.25 μm
	Program:	80 °C (1 min), 10 °C/min to 120 °C (5 min), 20 °C/min to 300 °C (3 min)
	Injector:	200 °C
	Detector Temp:	320 °C
	Carrier:	Helium
	Split ratio:	20/1
	Relative mass fraction of the main component as the free base:	
	Initial analysis:	Mean = 99.8%, s = 0.04% (7 sub samples in duplicate, January 2010)
	Re-analysis:	Mean = 99.8%, s = 0.05% (5 sub samples in duplicate, December 2012)
	Re-analysis:	Mean = 99.8%, s = 0.05% (5 sub samples in duplicate, October 2015)
	Re-analysis:	Mean = 99.9%, s = 0.04% (5 sub samples in duplicate, July 2020)

Note: The GC-FID purity value includes norephedrine which was not resolved from the main cathine peak using these chromatographic conditions.

Karl Fischer analysis:	Moisture content < 0.1% mass fraction (November 2006, September 2007, November 2008, December 2009, December 2012, October 2015 and July 2020)
Thermogravimetric analysis:	Volatiles content < 0.1% and non-volatile residue < 0.2% mass fraction

Spectroscopic and other characterisation data

GC-MS:	Parent compound:	
	Instrument:	Agilent 6890/5973
	Column:	ZB-5, 30 m × 0.25 mm I.D. × 0.30 μm
	Program:	60 °C (1 min), 10 °C/min to 100, 20 °C/min to 250 °C (1 min)
	Injector:	150 °C
	Split ratio:	50/1
	Transfer line temp:	280 °C
	Carrier:	Helium
	Scan range:	50-550 *m/z*
	The retention time of the free base isreported with the major peaks in the mass spectra. The latter are reported as mass/charge ratios and (in brackets) as a percentage relative to the base peak.	
	Free base (7.7 min):	132 (2), 117 (4), 105 (7), 77 (16), 44 (100) *m/z*
TLC:	Conditions:	Kieselgel 60F_{254}. Methanol/ammonia (98.5:1.5) Single spot observed, R_f = 0.4
IR:	Instrument:	Biorad FTS300MX FT-IR
	Range:	4000-400 cm^{-1},neat
	Peaks:	3393, 3007, 2016, 1602, 1473, 1394, 1335, 1276, 1197, 1138, 1041, 762, 701 cm^{-1}
^{1}H NMR:	Instrument:	Bruker DMX 600
	Field strength:	600 MHz
	Solvent:	MeOH-d_4 (3.31 ppm)
	Spectral data:	δ 1.14 (3H, d, *J* = 6.5 Hz), 3.41 (1H, m), 4.55 (1H, d, *J* = 8.5 Hz), 7.37 (1H, m), 7.41-7.47 (4H, m) ppm
	Norephedrine HCl estimated at 0.9% mass fraction was observed in the ^{1}H NMR (January 2006 and 2010)	
^{13}C NMR:	Instrument:	Bruker DMX 600
	Field strength:	151 MHz
	Solvent:	MeOH-d_4 (49 ppm)
	Spectral data:	δ 15.6, 54.6, 76.4, 128.0, 129.6, 129.8, 142.1 ppm
Melting point:		180-181 °C
Microanalysis:	Found:	C = 57.5%; H = 7.5%; N = 7.6% (November, 2006)
	Calculated:	C = 57.6%; H = 7.5%; N = 7.5% (Calculated for $C_9H_{13}NO.HCl$)