Australian Government
Department of Industry, Science and Resources

National Measurement Institute

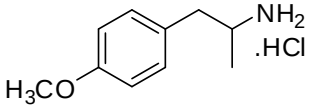
CERTIFIED REFERENCE MATERIAL CERTIFICATE OF ANALYSIS

NMIA D756b: (±)-4-Methoxyamphetamine hydrochloride

Report ID: D756b.2022.02 (Bottled 160531)

Chemical Formula: $C_{10}H_{15}NO.HCl$

Molecular Weight: 201.7 g/mol (HCl), 165.2 g/mol (base)



Certified value

Batch No.	CAS No.	Purity (mass fraction)
15-D-20	3706-26-1 (HCl) 64-13-1 (base)	99.5 ± 0.6%

The uncertainty is stated at the 95% confidence limit.

IUPAC name: 1-(4-Methoxyphenyl)-2-propanamine hydrochloride (1:1)

Expiration of certification: The property values are valid till 23 March 2027, i.e. five 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 prepared by synthesis, certified for identity and purity by NMIA. Packaged in amber glass bottles with a septum and crimped aluminium 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%. Quantitative NMR provides an independent direct measure of the mass fraction of the analyte of interest, calibrated with an internal standard certified for purity (mass fraction).

Stability: In the absence of stability data the measurement uncertainty at the 95% coverage interval has been expanded to accommodate any potential change in the property value. The stability component has been estimated from stability trials conducted on similar materials by NMI Australia over the last 10 years. 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 ten 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.

Caution: 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.
15 September 2022

This report supersedes any issued prior to 15 September 2022.

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

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 elemental microanalysis and quantitative NMR.

GC-FID:	Instrument:	Agilent 6890N
	Column:	HP-1 Capillary, 30 m × 0.32 mm I.D. × 0.25 µm
	Program:	60 °C (1 min), 10 °C/min to 150 °C, 20 °C/min to 300 °C (3 min)
	Injector:	180 °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% (10 samples in duplicate, August 2015)
	Re-analysis:	Mean = 99.7%, s = 0.02% (5 sub samples in duplicate, July 2016)
GC-FID:	Instrument:	Agilent 7890
	Column:	HP-1MS, 29.55 m × 0.32 mm × 0.25 µm
	Program:	60 °C (1 min), 10 °C/min to 150 °C, 20 °C/min to 300 °C (3 min)
	Injector:	180 °C or 200 °C
	Detector Temp:	320 °C
	Carrier:	Helium
	Split ratio:	20/1
	Relative mass fraction of the main component as the free base:	
	Re-analysis:	Mean = 99.7%, s = 0.04% (5 sub samples in duplicate, June 2019)
	Re-analysis:	Mean = 99.9%, s = 0.01% (5 sub samples in duplicate, March 2022)
Thermogravimetric analysis:		Volatiles content < 0.1% and non-volatile residue < 0.2% mass fraction (August 2015)
Karl Fischer analysis:		Moisture content 0.1% mass fraction (August 2015, July 2016, May 2019 and April 2022)
QNMR:	Instrument:	Bruker Avance-III-500
	Field strength:	500 MHz
	Solvent:	D_2O (4.79 ppm)
	Internal standard:	Maleic acid (98.7% mass fraction)
	Initial analysis:	Mean (2.9 ppm) = 99.7%, s = 0.2% (4 sub samples, August 2015)
	Initial analysis:	Mean (3.6 & 3.8 ppm) = 100.1%, s = 0.2% (4 sub samples, August 2015)
	Initial analysis:	Mean (7.2 ppm) = 99.8%, s = 0.2% (4 sub samples, August 2015)

Spectroscopic and other characterisation data

GC-MS:	Instrument:	HP5890/5971
	Column:	30 m x 0.25 mm I.D. x 0.25 µm
	Program:	60 °C, 10 °C/min to 100 °C, 15 °C/min to 250 °C
	Injector:	180 °C
	Transfer line temp:	340 °C
	Carrier:	Helium, 1.0 mL/min
	Split ratio:	20/1
	The retention time of the free base is reported with the peaks in the mass spectrum. The latter are reported as mass/charge ratio and (in brackets) as a percentage relative to the base peak.	
	9.15 min:	165 (M^+, 3), 150 (3), 134 (4), 122 (100), 121 (42), 107 (9), 91 (13), 78 (22) *m/z*
TLC:	Conditions:	Kieselgel 60F_{254} (Ethyl acetate/diethylamine, 20:1) Single spot observed, R_f = 0.2 (3 replicates)
IR:	Instrument:	Bruker Alpha FT-IR
	Range:	4000-400 cm^{-1}, neat
	Peaks:	2913, 1612, 1506, 1251, 1178, 1031, 807 cm^{-1}
^{1}H NMR:	Instrument:	Bruker Avance III 500
	Field strength:	500 MHz
	Solvent:	MeOH-d_4 (3.31ppm)
		δ 1.29 (3H, d, *J* = 6.6 Hz), 2.75 (1H, dd, *J* = 8.3, 13.8 Hz), 2.94 (1H, dd, *J* = 6.1, 13.8 Hz), 3.47 (1H, m), 3.78 (3H, s), 6.91 (2H, d, *J* = 8.7 Hz), 7.18 (2H, d, *J* = 8.7 Hz) ppm Isopropanol and diethyl ether estimated at 0.2% and 0.1% mass fraction respectively were observed in the ^{1}H NMR
^{13}C NMR:	Instrument:	Bruker DMX-600
	Field strength:	126 MHz
	Solvent:	CD_3OD (49.0 ppm)
	Spectral data:	δ 18.2, 40.9, 50.4, 55.7, 115.3, 129.2, 131.4, 160.4 ppm
Melting point:		211-212 °C
Microanalysis:	Found:	C = 59.6%; H = 8.2%; N = 7.0% (August 2015)
	Calc.:	C = 59.6%; H = 8.0%; N = 6.9% (Calculated for $C_{10}H_{15}NO.HCl$)