Australian Government
Department of Industry, Science, Energy and Resources

National Measurement Institute

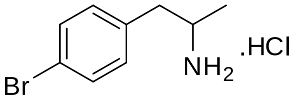
CERTIFIED REFERENCE MATERIAL CERTIFICATE OF ANALYSIS

NMIA D1032: (±)-4-Bromoamphetamine hydrochloride

Report ID: D1032.2022.01

Chemical Formula: $C_9H_{12}BrN.HCl$

Molecular Weight: 250.6 g/mol (HCl), 214.1 g/mol (base)



Certified value

Batch No.	CAS No.	Purity (mass fraction)
14-D-32	**58400-88-7 (HCl)** **13235-83-1 (base)**	**98.8 ± 1.3%**

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

IUPAC name: 1-(4-Bromophenyl)-2-propanamine hydrochloride.

Expiration of certification: The property values are valid till 19 January 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. The material will be re-tested on an annual basis to ensure that the property values are still valid. In the event a product fails the stability trial, notification will be sent to all impacted customers.

Description: White powder prepared by synthesis, 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%. 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: This material has demonstrated stability over a minimum period of 3 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.
21 January 2022

This report supersedes any issued prior to 21 January 2022.

NATA logo notice: Accredited for compliance with ISO 17034. Accreditation No. 198 / Corporate Site No. 14214. The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Characterisation Report:

The identity was confirmed by a range of spectroscopic techniques, NMR, IR and MS. The certified purity value was obtained from a combination of traditional analytical techniques and quantitative nuclear magnetic resonance (qNMR). The techniques used in the mass balance approach include GC-FID, 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

The purity value by qNMR was obtained using a combination of the three-proton doublet at 1.26 ppm, the two-proton doublet at 2.88 ppm and the two-proton doublet at 7.18 ppm measured against a certified internal standard of maleic acid.

Supporting evidence is provided by elemental microanalysis.

GC-FID:	Instrument:	Agilent 6890, 7890, 8890 and Varian CP-3800		
	Column:	VF-1MS, 30 m × 0.32 mm I.D. × 0.25 µm [2014] or HP-1, 30 m × 0.32 mm I.D. × 0.25 µm [2015, 2016, 2017, 2022]		
	Program:	60 °C (1 min), 10 °C/min to 100 °C, 15 ºC/min to 300 ºC (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 = 99.1%, s = 0.01% (7 sub samples in duplicate, September 2014)		
	Re-analysis:	Mean = 99.0%, s = 0.04% (5 sub samples in duplicate, September 2015)		
	Re-analysis:	Mean = 99.0%, s = 0.03% (5 sub samples in duplicate, August 2016)		
	Re-analysis:	Mean = 98.9%, s = 0.02% (5 sub samples in duplicate, July 2017)		
	Re-analysis:	Mean = 99.1%, s = 0.02% (5 sub samples in duplicate, January 2022)		
Karl Fischer analysis:		Moisture content ≤ 0.2% mass fraction (September 2014, August 2016) Moisture content ≤ 0.1% mass fraction (September 2015, August 2017, January 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 (1.26 ppm) = 98.5%, s = 0.1% (3 sub samples, September 2014)		
	Initial analysis:	Mean (2.18 ppm) = 98.4%, s = 0.2% (3 sub samples, September 2014)		
	Initial analysis:	Mean (7.18 ppm) = 99.0%, s = 0.7% (3 sub samples, September 2014)		

Spectroscopic and other characterisation data

GC-MS:	Instrument:	HP6890/5973
	Column:	TG1-MS, 30 m x 0.25 mm I.D. x 0.25 µm
	Program:	60 °C (1 min), 10 °C/min 100 °C, 15 °C/min to 300 °C (3 min)
	Injector:	180 °C
	Split ratio:	20/1
	Transfer line temp:	280 °C
	Carrier:	Helium
	Scan range:	50-550 *m/z*
	The retention time of the free base is reported 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 (9.9 min):	214 (1), 212 (1), 171 (10), 169 (10), 90 (19), 89 (20), 63 (10), 44 (100) *m/z*
ESI-MS:	Instrument:	Micromass Quatro LC Micro
	Operation:	Positive ion mode, direct infusion at 10 µL/min
	Ionisation:	ESI spray voltage at 3.5 kV positive ion
	EM voltage:	650 V
	Cone voltage:	10 V
	Peak:	214.3($M^{Br79}+H^+$), 216.2 ($M^{Br81}+H^+$) *m/z*
^{1}H NMR:	Instrument:	Bruker Avance III-500
	Field strength:	500 MHz
	Solvent:	D_2O (4.79 ppm)
	Spectral data:	δ 1.27 (3H, d, *J* = 6.6 Hz), 2.88 (1H, s), 2.89 (1H, s), 3.59 (1H, sextet, *J* = 6.7 Hz), 7.19 (2H, d, *J* = 8.4 Hz), 7.54 (2H, d, *J* = 8.5 Hz) ppm Isopropanol estimated at 0.1% mass fraction was observed in the ^{1}H NMR
^{1}H NMR:	Instrument:	Bruker Avance III-500
	Field strength:	500 MHz
	Solvent:	DMSO-*d₆* (2.50 ppm)
	Spectral data:	δ 1.11 (3H, d, *J* = 6.5 Hz), 2.68 (1H, dd, *J* = 8.7, 13.4 Hz), 3.03 (1H, dd, *J* = 5.4, 13.4 Hz), 3.37 (1H, ddq, *J* = 5.4, 8.7, 6.5 Hz), 7.23 (2H, d, *J* = 8.3 Hz), 7.51 (2H, d, *J* = 8.3 Hz) ppm
^{13}C NMR:	Instrument:	Bruker Avance III-500
	Field strength:	126 MHz
	Solvent:	D_2O
	Spectral data:	δ 17.4, 39.4, 48.8, 120.6, 131.2, 131.8, 135.1 ppm
Microanalysis:	Found:	C = 43.4%; H = 5.2%; N = 5.6%; Cl = 14.0% Br = 31.9% (September, 2014)
	Calculated:	C = 43.1%; H = 5.2%; N = 5.6%; Cl = 14.2% Br = 31.9% (Calculated for $C_9H_{12}BrN.HCl$)