



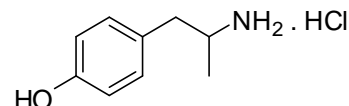
CERTIFIED REFERENCE MATERIAL CERTIFICATE OF ANALYSIS

NMIA D824b: (\pm)-4-Hydroxyamphetamine hydrochloride

Report ID: D824b.2021.03

Chemical Formula: $C_9H_{13}NO \cdot HCl$

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



Certified value

Batch No.	CAS No.	Purity (mass fraction)
09-D-16	876-26-6 (HCl salt) 103-86-6 (base)	98.2 \pm 0.6%

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

IUPAC name: 4-(2-Aminopropyl)phenol hydrochloride

Expiration of certification: The property values are valid till 18 February 2031, 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: Off-white powder prepared by synthesis or sourced from an external supplier, 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 °C 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 ten 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 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 from a combination of traditional analytical techniques and quantitative nuclear magnetic resonance (qNMR). The techniques used in the mass balance approach include GC-FID, thermogravimetric analysis, Karl Fischer analysis and ¹H NMR spectroscopy. The purity value is calculated as per Equation 1.

$$\text{Purity} = (100 \% - I_{\text{ORG}}) \times (100 \% - I_{\text{VOL}} - I_{\text{NVR}}) \quad \text{Equation 1}$$

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

Supporting evidence is provided by elemental microanalysis.

GC-FID:	Instrument:	Varian CP-3800
	Column:	VF-1MS, 30 m × 0.32 mm I.D. × 0.25 μm HP-5, 30 m × 0.32 mm I.D. × 0.25 μm (2012)
	Program:	120 °C (10 min), 25 °C/min to 300 °C (3 min)
	Injector:	250 °C
	Detector Temp:	320 °C
	Carrier:	Helium
	Split ratio:	20/1
	Relative mass fraction of the main component:	
	Initial analysis:	Mean = 99.1%, s = 0.03% (10 sub samples in duplicate, July 2009)
	Re-analysis:	Mean = 98.7%, s = 0.18% (5 sub samples in duplicate, June 2010)
	Re-analysis:	Mean = 98.8%, s = 0.13% (5 sub samples in duplicate, June 2011)
	Re-analysis:	Mean = 98.7%, s = 0.02% (5 sub samples in duplicate, May 2012)
	Re-analysis:	Mean = 98.9%, s = 0.02% (5 sub samples in duplicate, April 2015)
	Re-analysis:	Mean = 99.1%, s = 0.03% (5 sub samples in duplicate, March 2018)
	Re-analysis:	Mean = 99.1%, s = 0.02% (5 sub samples in duplicate, February 2021)
QNMR:	Instrument:	Bruker Avance III-400
	Field strength:	400 MHz
	Solvent:	D ₂ O
	Internal standard:	Potassium hydrogen maleate (98.6% mass fraction)
	Purity estimate:	Mean = 98.1%, s = 0.25% (5 sub samples, August 2009)
Karl Fischer analysis:	Moisture content 0.5% mass fraction (July 2009)	
	Moisture content 0.4% mass fraction (June 2010)	
	Moisture content 0.5% mass fraction (June 2011)	
	Moisture content 0.5% mass fraction (May 2012)	
	Moisture content 0.8% mass fraction (April 2015 and March 2018)	
	Moisture content 0.5% mass fraction (February 2021)	
Thermogravimetric analysis:	Initial non-volatile residue < 0.1 % mass fraction (August 2009)	
	Volatile content not determined due to volatility of the material.	

Spectroscopic and other characterisation data

GC-MS:	Instrument: Agilent 6890/5973 Column: VF-1ms, 15 m × 0.25 mm I.D. × 0.25 μm Program: 60 °C (1min), 15 °C/min to 300 °C (5 min) Injector: 250 °C Transfer line temp: 300 °C Carrier: Helium, 1.0 mL/min Split ratio: 20/1 The retention time of the parent compound is reported along with the major peaks in the mass spectrum. The latter are reported as mass/charge ratios and (in brackets) as a percentage relative to the base peak. 6.8 min: 151 (M ⁺ , 1), 107 (12), 77 (8), 44 (100) <i>m/z</i>
ESI-MS:	Instrument: Micromass Quatro Micro Operation: Positive ion mode, direct infusion at 5 μL/min Ionisation: ESI spray voltage at 3.5 kV positive ion EM voltage: 650 V Cone voltage: 10 V Peak: 152 (M+H ⁺ , 75) <i>m/z</i>
TLC:	Conditions: Kieselgel 60F ₂₅₄ . MeOH/NH ₃ (95/5) Single spot observed, R _f = 0.61. Visualisation with UV at 254 nm
IR:	Instrument: Biorad FTS300MX FT-IR Range: 4000-400cm ⁻¹ , KBr powder Peaks: 3277, 3158, 2910, 2598, 2508, 2471, 2361, 2002, 1616, 1518, 1505, 1259, 1241, 1221, 1203, 846, 809, 781, 558 cm ⁻¹
¹ H NMR:	Instrument: Bruker Avance III-400 Field strength: 400 MHz Solvent: MeOH-d ₄ (3.31 ppm) Spectral data: δ 1.25 (3H, d, <i>J</i> = 6.5 Hz), 2.71 (1H, dd, <i>J</i> = 8.1, 13.7 Hz), 2.89 (1H, dd, <i>J</i> = 6.2, 13.7 Hz), 3.44 (1H, m), 6.78 (2H, dd, <i>J</i> = 2.0, 6.5 Hz), 7.07 (2H, d, <i>J</i> = 8.5 Hz) ppm Isopropanol and diethyl ether were observed in the ¹ H NMR at 0.2-0.3 % and 0.2% mass fraction respectively (July 2009 and 2010)
¹³ C NMR:	Instrument: Bruker Avance III-400 Field strength: 101 MHz Solvent: MeOH-d ₄ (49.00 ppm) Spectral data: δ 18.3, 41.0, 50.5, 116.7, 127.9, 131.4, 157.8 ppm
Melting point:	165-169 °C
Microanalysis:	Found: C = 55.2 %; H = 7.2 %; N = 7.1 % (July 2009) Calculated: C = 57.6 %; H = 7.5 %; N = 7.5 % (Calculated for C ₉ H ₁₄ ClNO)