Australian Government
Department of Industry, Science and Resources

National Measurement Institute

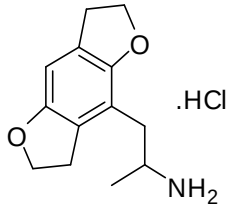
REFERENCE MATERIAL PRODUCT INFORMATION SHEET

NMIA D1059: (±)-2,3,6,7-Tetrahydro-α methyl-benzo[1,2-b:4,5-b']difuran-4-ethanamine hydrochloride

Report ID: D1059.2021.02

Chemical Formula: $C_{13}H_{17}NO_2$.HCl

Molecular Weight: 255.7 g/mol (HCl), 219.2 g/mol (base)



Property value

Batch No.	CAS No.	Purity estimate
15-D-15	178557-11-4 (HCl) 219986-80-8 (base)	95.4 ± 1.5%

IUPAC name: (±)-2,3,6,7-Tetrahydro-α-methyl-benzo[1,2-b:4,5-b']difuran-4-ethanamine hydrochloride (1:1).

Expiration of certification: The property values are valid till 10 June 2026 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: Off-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 reference material should be used for qualitative analysis only.

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.

Stability: This material has demonstrated stability over a minimum period of five 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 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.
20 October 2022

This report supersedes any issued prior to 28 September 2022.

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

Characterisation Report:

The identity was confirmed by a range of spectroscopic techniques, NMR, IR and MS. The purity value was obtained by mass balance from a combination of traditional analytical techniques, including HPLC with UV detection, 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.

Warning: This material is sensitive to the quality of the silanised glass liner when injected at elevated temperature (~ 250 ºC) into a GC instrument.

GC-FID:	Instrument:	Varian CP-3800
	Column:	VF-1ms, 30 m × 0.32 mm I.D. × 0.25 μm
	Program:	120 °C (1 min), 10 °C/min to 230 °C, 30 °C/min to 300 °C (3 min)
	Injector:	200 °C
	Detector Temp:	320 °C
	Carrier:	Helium
	Split ratio:	20/1
	Relative peak area response of the main component as the free base:	
	Initial analysis:	Mean = 98.1%, s = 0.04% (7 sub samples in duplicate, May 2015)
GC-FID:	Instrument:	Varian CP-3800
	Column:	HP-5, 30 m × 0.32 mm I.D. × 0.25 μm
	Program:	120 °C (1 min), 10 °C/min to 230 °C, 30 °C/min to 300 °C (3 min)
	Injector:	200 °C
	Detector Temp:	320 °C
	Carrier:	Helium
	Split ratio:	20/1
	Relative peak area response of the main component as the free base:	
	Initial analysis:	Mean = 98.2%, s = 0.03% (7 sub samples in duplicate, May 2015)
HPLC:	Instrument:	Shimadzu Binary pump LC-20AB, SIL-20 A HT autosampler
	Column:	Waters XBridge C-18, 5 μm (4.6 mm x 150 mm)
	Column oven:	40 °C
	Mobile Phase:	A = MilliQ water; B = Acetonitrile 0-15 min 25%B, 15-16 min 25-80%B, 16-20 min 80%B, 20-21 min 80-25%B, 21-30 min 25%B The aqueous phase was buffered at pH 10.8 using 20 mM NH_4OAc and NH_4OH.
	Flow rate:	1.0 mL/min
	Detector:	Shimadzu SPD-M20A PDA operating at 208 nm
	Relative peak area response of the main component:	
	Initial analysis:	Mean = 97.0%, s = 0.09% (5 sub samples in duplicate, April 2016)
	Re-analysis:	Mean = 97.4%, s = 0.05% (5 sub samples in duplicate, April 2017)
	Re-analysis:	Mean = 97.1%, s = 0.04% (5 sub samples in duplicate, June 2021)
Karl Fischer analysis:		Moisture content 0.5% mass fraction (May 2015) Moisture content 0.6% mass fraction (April 2016, 2017 and 2021)
Thermogravimetric analysis:		Volatiles content < 0.1% and non-volatile residue 0.6% mass fraction (May 2015)

Spectroscopic and other characterisation data

GC-MS:	Instrument:	Agilent 6890/5973
	Column:	HP-1MS, 30 m x 0.25 mm I.D. x 0.25 µm
	Program:	60 °C (1 min), 10 °C/min to 300 °C (5 min)
	Injector:	250 °C,
	Split ratio:	20/1
	Transfer line temp:	280 °C
	Carrier:	Helium, 1.0 mL/min
	Scan range:	50-550 *m/z*
	The retention times of the free base compound and *N*-acetyl derivative are 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 (16.5 min):	219 (M^+, 14), 176 (100), 147 (4), 115 (6), 91 (8), 65 (4), 44 (87) *m/z*
	N-Acetyl (19.5 min):	261 (M^+, 36), 202 (100), 176 (31), 147 (5), 115 (7), 91 (12), 86 (17), 44(71) *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:	20 V
	Peak:	220.1 ($M+H^+$) *m/z*
IR:	Instrument:	Bruker Alpha Platinum ATR
	Range:	4000-400 cm^{-1}, neat
	Peaks:	2895, 1513, 1447, 1209, 1179, 1146, 1102, 980, 959, 864, 735 cm^{-1}
^{1}H NMR:	Instrument:	Bruker Avance III-500
	Field strength:	500 MHz
	Solvent:	D_2O (4.79 ppm)
	Spectral data:	δ 1.28 (3H, d, *J* = 6.7 Hz), 2.80 (1H, dd, *J* = 6.8, 14.2 Hz), 2.84 (1H, dd, *J* = 7.1, 14.2 Hz), 3.13 (4H, m), 3.65 (1H, sextet, *J* = 6.8 Hz), 4.55 (4H, m), 6.67 (1H, s) ppm
		Propan-2-ol estimated at 0.7% mass fraction was observed in the ^{1}H NMR
^{13}C NMR:	Instrument:	Bruker Avance III-500
	Field strength:	126 MHz
	Solvent:	DMSO-d_6 (39.52 ppm)
	Spectral data:	δ 17.7, 28.7, 29.9, 32.7, 46.3, 70.99, 71.01, 104.4, 114.9, 125.77, 125.80, 152.1, 153.6 ppm
Melting point:		271-272 °C
Microanalysis:	Found:	C = 60.9%; H = 7.3%; N = 5.4%; Cl = 13.6% (May, 2015)
	Calculated:	C = 61.1%; H = 7.1%; N = 5.5%; Cl = 13.9% (Calculated for $C_{13}H_{17}NO_2$.HCl)