Australian Government
Department of Industry, Science and Resources

National Measurement Institute

NATA
WORLD RECOGNISED ACCREDITATION

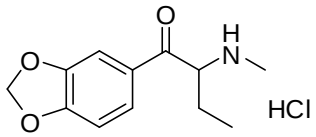
CERTIFIED REFERENCE MATERIAL CERTIFICATE OF ANALYSIS

NMIA D948: Butylone hydrochloride

Report ID: D948.2023.01

Chemical Formula: $C_{13}H_{15}NO_3$.HCl

Molecular Weight: 257.7 g/mol (HCl), 221.3 g/mol (base)



Certified value

Batch No.	CAS No.	Purity (mass fraction)
09-D-22	17762-90-2 (HCl) 802575-11-7 (base)	99.3 ± 1.7%

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

IUPAC name: 1-(1,3-Benzodioxol-5-yl)-2-(methylamino)-1-butanone hydrochloride.

Expiration of certification: The property values are valid till 09 October 2033, 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 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 all impurities are quantified as a mass fraction and subtracted from 100%.

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.

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.
11 October 2023

This report supersedes any issued prior to 11 October 2023.

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 qualitative elemental microanalysis.

GC-FID:	Instrument:	Agilent 6890 or 7890 or 8890
	Column:	HP-1, 30 m × 0.32 mm I.D. × 0.25 μm
	Program:	160 °C (15 min), 30 °C/min to 300 °C (5 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 = 99.4%, s = 0.11% (10 sub samples in duplicate, October 2009)
	Re-analysis:	Mean = 99.5%, s = 0.05% (5 sub samples in duplicate, February 2011)
	Re-analysis:	Mean = 99.5%, s = 0.02% (5 sub samples in duplicate, February 2012)
	Re-analysis:	Mean = 99.4%, s = 0.08% (5 sub samples in duplicate, January 2015)
	Re-analysis:	Mean = 99.7%, s = 0.05% (5 sub samples in duplicate, December 2019)
	Re-analysis:	Mean = 99.6%, s = 0.02% (5 sub samples in duplicate, October 2023)
GC-FID:	Instrument:	Varian CP-3800
	Column:	HP-5, 30 m × 0.32 mm I.D. × 0.25 μm
	Program:	160 °C (15 min), 30 °C/min to 300 °C (5 min)
	Injector:	250 °C
	Detector Temp:	320 °C
	Carrier:	Helium
	Split ratio:	20/1
	Relative mass fraction of the main componentas the free base:	
	Initial analysis:	Mean = 99.2%, s = 0.12% (10 sub samples in duplicate, October 2009)
GC-FID:	Instrument:	Varian CP-3800
	Column:	VF-1MS, 30 m × 0.32 mm I.D. × 0.25 μm
	Program:	160 °C (15 min), 30 °C/min to 300 °C (5 min)
	Injector:	250 °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 = 99.7%, s = 0.10% (10 sub samples in duplicate, October 2009)
Karl Fischer analysis:		Moisture content < 0.2 % mass fraction (October 2009, February 2011, February 2012, January 2015, November 2019 & October 2023)
Thermogravimetric analysis:		Non-volatile content < 0.2 % mass fraction (December 2019)

Spectroscopic and other characterisation data

GC-MS:	Instrument:	HP6890/5973
	Column:	VF-1MS, 15 m × 0.25 mm I.D. × 0.20 μm
	Program:	140 °C (15 min), 15 °C/min to 300 °C (5 min)
	Injector:	250 °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.	
	Parent (9.60 min):	192 (1), 149 (6), 73 (5), 72 (100), 70 (6), 65 (6), 63 (4), 57(6) *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:	500 V
	Cone voltage:	20 V
	Peak:	232 ($M^{Cl37}+H^+$), 230 ($M^{Cl35}+H^+$) *m/z*
TLC:	Conditions:	Kieselgel 60F_{254}. Methanol/ethyl acetate/diethylamine (20/80/1) Single spot observed, R_f = 0.3.
IR:	Instrument:	Bruker Alpha Platinum ATR
	Range:	4000-400cm^{-1}, KBr powder
	Peaks:	2941, 2714, 2500, 2422, 1667, 1605, 1466, 1458, 1267, 1119, 1039, 932, 877, 807, 743 cm^{-1}
^{1}H NMR:	Instrument:	Bruker Avance 400
	Field strength:	400 MHz
	Solvent:	D_2O (4.79 ppm)
	Spectral data:	δ 0.87 (3H, t, *J* = 7.7 Hz), 2.09 (2H, m), 2.76 (3H, s), 5.04 (1H, t, *J* = 5.3 Hz), 6.11 (2H, d, *J* = 2.0 Hz), 7.00 (1H, d, *J* = 8.4 Hz), 7.43 (1H, d, *J* = 1.7 Hz), 7.67 (1H, dd, *J* = 1.7, 8.2 Hz) ppm
^{13}C NMR:	Instrument:	Bruker Avance 400
	Field strength:	100 MHz
	Solvent:	D_2O
	Spectral data:	δ 7.4, 23.5, 31.6, 64.0, 102.6, 107.8, 108.5, 126.5, 127.6, 148.3, 153.6, 194.7 ppm
Melting point:		> 230 °C (dec)
Microanalysis:	Found:	C = 56.1%; H = 6.5%; N = 5.4% (October 2009)
	Calculated:	C = 55.9%; H = 6.3%; N = 5.4% (Calculated for $C_{12}H_{15}NO_3$.HCl)