



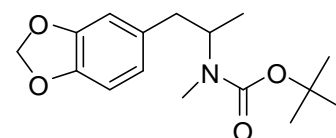
CERTIFIED REFERENCE MATERIAL CERTIFICATE OF ANALYSIS

NMIA D1069: (\pm)-N-tert-Butoxycarbonyl-3,4-methylenedioxy-methamphetamine

Report ID: D1069.2021.02

Chemical Formula: C₁₆H₂₃NO₄

Molecular Weight: 293.4 g/mol



Certified value

Batch No.	CAS No.	Purity (mass fraction)
17-D-03	1228259-70-8	99.2 \pm 1.4%

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

IUPAC name: 2-Methyl-2-propanyl [1-(1,3-benzodioxol-5-yl)-2-propanyl]methylcarbamate.

Expiration of certification: The property values are valid till 15 July 2024, i.e. three 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: Clear oil 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 °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%.

Stability: In the absence of long term 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 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.



Dr Stephen R. Davies,
Team Leader,
Chemical Reference Materials, NMI.
12 October 2022

This report supersedes any issued prior to 12 October 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 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 qualitative headspace GC-MS analysis of occluded solvents and elemental microanalysis.

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

GC-FID: Instrument: Varian CP-3800/Agilent 8890
Column: VF-1MS/HP-1MS, 30 m × 0.32 mm I.D. × 0.25 μm
Program: 60 °C (1 min), 20 °C/min to 180 °C (6 min), 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:
Initial analysis: Mean = 99.8%, s = 0.01% (7 sub samples in duplicate, March 2017)
Re-analysis: Mean = 99.9%, s = 0.02% (5 sub samples in duplicate, April 2018)
Re-analysis: Mean = 99.8%, s = 0.01% (5 sub samples in duplicate, April 2019)
Re-analysis: Mean = 99.8%, s = 0.05% (5 sub samples in duplicate, July 2021)

Karl Fischer analysis: Moisture content 0.5% mass fraction (March 2017 and April 2018)
Moisture content 0.3% mass fraction (April 2019, August 2021)

Thermogravimetric analysis: Non volatile residue < 0.2% mass fraction (March 2017). The volatile content (e.g. organic solvents and/or water) could not be determined by thermogravimetric analysis.

Spectroscopic and other characterisation data

GC-MS:	Parent compound: Instrument: Agilent 6890/5973 Column: HP-1MS, 30 m × 0.25 mm I.D. × 0.25 µm Program: 60 °C (1 min), 10 °C/min to 100 °C, 15 °C/min to 300 °C (3 min) Injector: 180 °C Split ratio: 20/1 Transfer line temp: 280 °C Carrier: Helium, 1.0 mL/min Scan range: 50-550 <i>m/z</i>
	The retention time of the parent compound 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 (14.1 min): 293 (M ⁺ , 1), 220 (5), 163 (6), 158 (13), 135 (27), 102 (33), 58 (100), 41 (49) <i>m/z</i>
ESI-MS:	Instrument: Micromass Quatro LC Micro Operation: Positive ion mode, direct infusion at 10 µL/min Ionisation: ESI spray voltage at 3.0 kV positive ion EM voltage: 650 V Cone voltage: 20 V Peak: 316.1 (M+Na ⁺) <i>m/z</i>
HS-GC-MS:	Instrument: Agilent 6890/5973/G1888 Column: DB-624, 30 m × 0.25 mm I.D. × 1.4 µm Program: 50 °C (5 min), 7 °C/min to 120 °C, 15 °C/min to 220 °C (8.3 min) Injector: 150 °C Transfer line temp: 280 °C Carrier: Helium, 1.2 mL/min Split ratio: 50/1 Solvents detected: None
TLC:	Conditions: Kieselgel 60F ₂₅₄ . Hexane/ethyl acetate (1:9) Single spot observed, R _f = 0.35. Visualisation with UV at 254 nm and/or vanillin stain.
IR:	Instrument: Bruker Alpha Platinum ATR Range: 4000-400 cm ⁻¹ , neat Peaks: 2974, 1684, 1489, 1441, 1345, 1334, 1244, 1141, 1038, 929, 802, 770 cm ⁻¹
¹ H NMR:	Instrument: Bruker Avance III-500 Field strength: 500 MHz Solvent: DMSO- <i>d</i> ₆ (2.50 ppm) at 340K Spectral data: δ 1.08 (3H, d, <i>J</i> = 6.9 Hz), 1.30 (9H, s), 2.62 (3H, s), 2.59 (1H, dd, <i>J</i> = 6.3, 13.9 Hz), 2.64 (1H, dd, <i>J</i> = 8.9, 13.9 Hz), 4.24 (1H, m), 5.92 (2H, s), 6.61 (1H, dd, <i>J</i> = 1.3, 7.8 Hz), 6.71 (1H, d, <i>J</i> = 1.3 Hz), 6.77 (1H, d, <i>J</i> = 7.9 Hz) ppm Ethyl acetate estimated at 0.03% and dichloromethane at 0.12% mass fraction was observed in the ¹ H NMR
¹³ C NMR:	Instrument: Bruker Avance III-500 Field strength: 126 MHz Solvent: DMSO- <i>d</i> ₆ (39.5 ppm) at 340K Spectral data: δ 17.5, 27.6, 27.8, 39.0*, 51.6, 77.9, 100.3, 107.6, 108.9, 121.5, 132.8, 145.2, 146.8, 154.4 ppm *Observed <i>via</i> HSQC correlation
Melting point:	N/A
Microanalysis:	Found: C = 65.4%; H = 7.7%; N = 4.6% (March 2017) Calculated: C = 65.5%; H = 7.9%; N = 4.8% (Calculated for C ₁₆ H ₂₃ NO ₄)