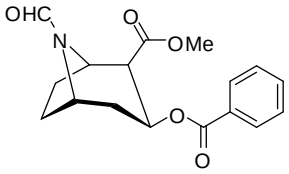
Australian Government
Department of Industry, Science and Resources

National Measurement Institute

NATA
WORLD RECOGNISED ACCREDITATION

REFERENCE MATERIAL PRODUCT INFORMATION SHEET

NMIA D857b: N-Formylnorcocaine



Report ID: D857b.2022.02

Chemical Formula: $C_{17}H_{19}NO_5$

Molecular Weight: 317.3 g/mol

Property value

Batch No.	CAS No.	Purity estimate
15-D-24	**137360-14-6**	**93.1± 2.0%**

IUPAC name: Methyl (1R)-3-(benzoyloxy)-8-formyl-8-azabicyclo[3.2.1]octane-2-carboxylate

Expiration of certification: The property values are valid till 29 March 2025, 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:** Viscous 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 reference material is recommended for qualitative analysis only and is not intended for use as a calibrator. The material does not have certified reference material status as metrological traceability of the stated purity value to the SI unit for mass (kg) has not been established.

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 4 ºC in a closed container in a dry, dark area.

Stability: This material has demonstrated stability over a minimum period of three 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 HPLC with UV detection 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.
19 September 2022

This report supersedes any issued prior to 19 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 purity estimate was obtained by quantitative nuclear magnetic resonance (qNMR). The one-proton multiplet at 5.5 ppm was measured against a certified internal standard of maleic acid. Supporting evidence is provided by HPLC with UV detection, thermogravimetric analysis, Karl Fischer analysis, ^{1}H NMR spectroscopy and elemental microanalysis.

HPLC:	Instrument:	Waters Model 1525 Binary pump, 717 plus
	Column:	Alltima C-18, 5 μm (4.6 mm x 150 mm)
	Column oven:	25 °C
	Mobile Phase:	Acetonitrile/Milli-Q water (38:62), Isocratic A = MilliQ water; B = Acetonitrile Gradient (2022) 0-8 min 38% B; 8-9 min 38-70% B; 9-13 min 70% B; 13-14 min 70-38% B.
	Flow rate:	1.0 mL/min
	Detector:	Waters 2998 PDA operating at 231.2 nm
	Relative peak area of the main component:	
	Initial analysis:	Mean = 97.9%, s = 0.004% (7 sub samples in duplicate, May 2016)
	Re-analysis:	Mean = 97.9%, s = 0.004% (5 sub samples in duplicate, May 2017)
	Re-analysis:	Mean = 97.5%, s = 2.49% (5 sub samples in duplicate, March 2022)
Karl Fischer analysis:		Moisture content 1.5% mass fraction (January 2016) Moisture content 3.6% mass fraction (May 2017) Moisture content 2.0% mass fraction (February 2022)
Thermogravimetric analysis:		Non-volatile residue < 0.2% mass fraction (January 2016). The volatile content (e.g. organic solvents and/or water) could not be determined by thermogravimetric analysis.
QNMR:	Instrument:	Bruker Avance-III-500
	Field strength:	500 MHz
	Solvent:	DMSO-d_6 (2.50 ppm)
	Internal standard:	Maleic acid (98.7% mass fraction)
	Initial analysis:	Mean (5.5 ppm) = 93.6%, s = 0.1% (2 sub samples, July 2016)

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 (3 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 time of the parent compound is reported along 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 (21.9 min):	289 (47), 195 (46), 168 (100), 136 (42), 108 (56), 105 (92), 95 (26), 82 (16), 80 (23), 77 (57), 68 (48), 51 (12), 41 (11) *m/z*
ESI-MS:	Instrument:	Micromass Quatro LC 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:	20 V
	Peak:	340.1 ($M+Na^+$) *m/z*
TLC:	Conditions:	Kieselgel 60F_{254}. 100% Ethyl acetate. Single spot observed, R_f = 0.2 – 0.3. Visualization with UV light (254 nm).
IR:	Instrument:	BioRad FTS3000MX FT-IR
	Range:	4000-400 cm^{-1}, neat
	Peaks:	3464, 2954, 1739, 1718, 1669, 1436, 1389, 1276, 1113, 1035, 714 cm^{-1}
^{1}H NMR:	Instrument:	Bruker Avance III-500
	Field strength:	500 MHz
	Solvent:	$CDCl_3$ (7.26 ppm)
	Spectral data:	Major rotamer (53%) δ 1.86-1.97 (2H, m), 2.0-2.2 (3H, m), 2.37 (1H, ddd, *J* = 2.9, 12.1, 12.1 Hz), 3.26 (1H, dd, *J* = 2.1, 6.6 Hz), 3.65 (3H, s), 4.32 (1H, bd, *J* = 7.2 Hz), 4.81 (1H, m), 5.54 (1H, m), 7.43 (2H, m), 7.56 (1H, m), 7.95 (2H, m), 8.04 (1H, s) ppm
		Minor rotamer (47%) δ 1.86-1.97 (2H, m), 2.0-2.2 (3H, m), 2.54 (1H, ddd, *J* = 3.1, 11.8, 11.8 Hz), 3.18 (1H, dd, *J* = 2.5, 6.2 Hz), 3.68 (3H, s), 4.28 (1H, m), 4.95 (1H, d, *J* = 5.4 Hz), 5.49 (1H, m), 7.43 (2H, m), 7.56 (1H, m), 7.97 (2H, m), 8.18 (1H, s) ppm
		Ethyl acetate (1.0%) estimated mass fraction was observed in the ^{1}H NMR.
^{13}C NMR:	Instrument:	Bruker DMX-600
	Field strength:	151MHz
	Solvent:	$CDCl_3$
	Spectral data:	δ 26.9, 27.4, 27.9, 28.4, 33.4, 35.4, 48.5, 48.7, 49.3, 51.1, 51.9, 52.0, 53.6, 55.5, 66.2, 66.3, 128.4, 128.4, 129.6, 129.7, 133.3, 133.3, 157.8, 158.0, 165.6, 165.7, 169.6, 170.0 ppm
Microanalysis:	Found:	C = 62.7%; H = 6.3%; N = 4.3% (January 2016)
	Calculated:	C = 64.3%; H = 6.0%; N = 4.4% (Calculated for $C_{17}H_{19}NO_5$)