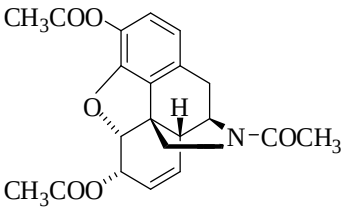
Australian Government
Department of Industry, Science and Resources

National Measurement Institute

NATA
WORLD RECOGNISED ACCREDITATION

CERTIFIED REFERENCE MATERIAL CERTIFICATE OF ANALYSIS

NMIA D863: Triacetylnormorphine



Report ID: D863.2013.04

Chemical Formula: $C_{22}H_{23}NO_6$

Molecular Weight: 397.4 g/mol

Certified value

Batch No.	CAS No.	Purity (mass fraction)
04-D-09	65846-34-6	97.5 ± 1.3 %

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

IUPAC name: (5α,6α)-17-Acetyl-7,8-didehydro-4,5-epoxymorphinan-3,6-diyl diacetate

Expiration of certification: The property values are valid till 25th November 2018, 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: 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 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 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 five years. The measurement uncertainty at the 95% coverage interval includes a stability component which has been estimated from annual stability trials. Note: This compound is sensitive to hydrolysis in basic or acidic media. Prepare working solutions in non-protic solvents only

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.

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.
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 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 elemental microanalysis.

CAUTION: **This compound is sensitive to hydrolysis in basic or acidic media. Prepare working solutions in non-protic solvents only.**

GC-FID:	Instrument:	Agilent 6890N
	Column:	HP-1, 30 m x 0.32 mm I.D. x 0.25 µm
	Program:	200 °C (2 min), 10 °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 = 97.1%, s = 0.07% (7 sub samples in duplicate, April 2004)
	Re-analysis:	Mean = 98.5%, s = 0.05% (6 sub samples in duplicate, November 2008)
	Re-analysis:	Mean = 98.1%, s = 0.06% (7 sub samples in duplicate, September 2013)
Karl Fischer analysis:		Moisture content < 0.2% mass fraction (November 2007 and November 2008) Moisture content 0.22% mass fraction (September 2013)
Thermogravimetric analysis:		Volatiles content ca 0.3%, non-volatile residue < 0.2% mass fraction (July 2004 and December 2008)

Spectroscopic and other characterisation data

GC-MS:	Instrument:	HP 5890/5471A
	Column:	BPX-5, 30 m x 0.25 mm I.D. x 0.25 µm
	Program:	160 °C, 20 °C/min to 300 °C (20 min)
	Injector:	250 °C
	Transfer line temp:	320 °C
	Carrier:	Helium, 1.0 mL/min
	Split ratio:	20/1
	The retention time is reported with the major peaks in the mass spectrum. The latter are reported as mass to charge ratios and (in brackets) as a percentage relative to the base peak.	
	16.8 min:	397 (M^+, 12), 355 (19), 313 (8), 252 (10), 236 (15), 209 (94), 181 (16), 152 (10), 87 (100), 72 (27) *m/z*
IR:	Instrument:	Biorad FTS 3000 MXFT-IR
	Range:	4000-400 cm^{-1}, KBr
	Peaks:	2970, 2940, 1742, 1734, 1641, 1492, 1423, 1370, 1236, 1049, 772 cm^{-1}
^{1}H NMR:	Instrument:	Bruker DMX-600
	Field strength:	600 MHz
	Solvent:	D_6-DMSO (2.5 ppm)
	Duplicate resonances appear due to restricted rotation about the amide bond. Rotamers observed in ca. 3:2 ratio at room temperature.	
^{13}C NMR:	Instrument:	Bruker DMX-600
	Field strength:	151 MHz
	Solvent:	D_6-DMSO (39.5 ppm)
	Spectral data:	δ 20.3, 20.3, 21.7, 21.8, 28.8, 29.5, 33.7, 34.3, 34.5, 38.5, 42.4, 42.5, 46.5, 52.1, 67.3, 67.3, 88.0, 88.1, 119.5, 119.5, 122.2, 128.7, 128.7, 128.9, 130.6, 131.2, 131.3, 149.0, 168.1, 168.1, 168.3, 169.7 ppm
TLC:	Conditions:	Kieselgel 60F_{254}. Chloroform/Acetone (60:40) Single spot observed, R_f = 0.38 (2 sub samples)
Melting point:		163-165 °C
Microanalysis:	Found:	C = 66.2%; H = 5.7%; N = 3.4%
	Calc:	C = 66.5%; H = 5.8%; N = 3.5% (Calculated for $C_{22}H_{23}NO_6$)