Australian Government
Department of Industry, Innovation and Science

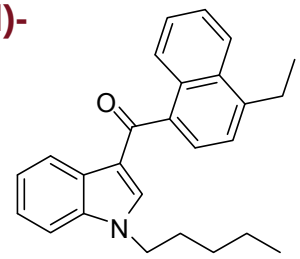
National Measurement Institute

CIPM MRA

NATA
ACCREDITED FOR TECHNICAL COMPETENCE

CERTIFIED REFERENCE MATERIAL CERTIFICATE OF ANALYSIS

NMIA D984: (4-Ethyl-1-naphthalenyl)-(1-pentyl-1H-indol-3-yl)-methanone (JWH-210)



Report ID: D984.2018.02

Chemical Formula: $C_{26}H_{27}NO$

Molecular Weight: 369.5 g/mol

Certified value

Batch No.	CAS No.	Purity (mass fraction)
12-D-12	824959-81-1	99.3 ± 1.4%

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

IUPAC name: (4-Ethyl-1-naphthyl)(1-pentyl-1H-indol-3-yl)methanone

Expiration of certification: The property values are valid till 7 June 2024, i.e. six 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 approach all impurities are quantified as a mass fraction and subtracted from 100%.

Stability: This material has demonstrated stability over a minimum period of three 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.
17 February 2020

This report supersedes any issued prior to 17 February 2020

NATA logo notice: Accredited for compliance with ISO 17034. Accreditation No. 198 / Corporate Site No. 20844. The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

CIPM MRA notice: This certificate is consistent with the capabilities that are included in Appendix C of the CIPM MRA drawn up by the CIPM. Under the CIPM MRA, all participating institutes recognize the validity of each other's calibration and measurement certificates for the quantities, ranges and measurement uncertainties specified in Appendix C. The "CIPM MRA Logo" and this statement attest only to the measurement(s) applied for determining the certified values on the certificate (for details see http://www.bipm.org).

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.

GC-FID:	Instrument:	Varian CP-3800
	Column:	VF-1MS, 30 m × 0.32 mm I.D. × 0.25 μm
	Program:	275 °C (17 min), 20 °C/min to 300 °C (5 min)
	Injector:	250 °C
	Detector Temp:	320 °C
	Carrier:	Helium
	Split ratio:	20/1
	Relative mass fraction of main component:	
	Initial analysis:	Mean = 99.8%, s = 0.008% (10 samples in duplicate, September 2012)
	Re-analysis:	Mean = 99.8%, s = 0.007% (5 sub samples in duplicate, July 2013)
	Re-analysis:	Mean = 99.8%, s = 0.003% (5 sub samples in duplicate, June 2014)
	Re-analysis:	Mean = 99.8%, s = 0.005% (5 sub samples in duplicate, July 2015)
GC-FID:	Instrument:	Varian CP-3800
	Column:	HP-5, 30 m × 0.32 mm I.D. × 0.25 μm
	Program:	275 °C (17 min), 20 °C/min to 300 °C (5 min)
	Injector:	250 °C
	Detector Temp:	320 °C
	Carrier:	Helium
	Split ratio:	20/1
	Relative mass fraction of main component:	
	Initial analysis:	Mean = 99.8%, s = 0.006% (10 samples in duplicate, September 2012)
	Re-analysis:	Mean = 99.8%, s = 0.01% (6 sub samples in duplicate, June 2018)
Karl Fischer analysis:		Moisture content 0.3% mass fraction (August 2012 & June 2014) Moisture content 0.4% mass fraction (July 2013, June 2015 & June 2018)
Thermogravimetric analysis:		Volatile content 0.3% and non volatile residue < 0.1% mass fraction (September 2012)

Spectroscopic and other characterisation data

GC-MS:	Instrument:	Agilent 6890/5973
	Column:	TG-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
	Transfer line temp:	280 °C
	Carrier:	Helium, 1.0 mL/min
	Split ratio:	20/1
	The retention time of the parent compound is reported with the major peaks in the mass spectrum. The latter is reported as mass/charge ratios and (in brackets) as a percentage relative to the base peak.	
	Parent (22.2 min):	369 (M^+, 100), 352 (55), 340 (25), 312 (48), 298 (12), 283 (11), 270 (14), 254 (16), 214 (47), 183 (19), 144 (24) *m/z*
HS-GC-MS:	Instrument:	Agilent 6890/5973/G1888
	Column:	DB-624, 30 m x 0.25 mm I.D. x 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:	Ethyl acetate, *tert*-butyl methyl ether
TLC:	Conditions:	Kieselgel 60F_{254}. Chloroform/methanol (9/1) Single spot observed, R_f = 0.79. Visualisation with UV at 254 nm
IR:	Instrument:	Biorad FTS300MX FT-IR
	Range:	4000-400cm^{-1}, KBr powder
	Peaks:	3071, 3056, 2966, 2935, 2871, 2857, 1619, 1608, 1519, 1466, 1394, 1378, 1181, 1130, 1101, 867, 859, 825, 749, 736, 612, 431 cm^{-1}
^{1}H NMR:	Instrument:	Bruker Avance 400
	Field strength:	400 MHz
	Solvent:	$CDCl_3$ (7.26 ppm)
	Spectral data:	δ 0.86 (3H, t, *J* = 7.0 Hz), 1.20-1.36 (4H, m), 1.45 (3H, t, *J* = 7.6 Hz), 1.81 (2H, quintet, *J* = 7.3 Hz), 3.20 (2H, quartet, *J* = 7.6 Hz), 4.07 (2H, t, *J* = 7.3 Hz), 7.34-7.42 (5H, m), 7.47 (1H, m, *J* = 1.2, 7.0 Hz), 7.55 (1H, m, *J* = 1.4, 6.8 Hz), 7.60 (1H, d, *J* = 7.2 Hz), 8.14 (1H, d, *J* = 8.2 Hz), 8.26 (1H, dd, *J* = 0.7, 8.5 Hz), 8.51 (1H, m) ppm *tert*-Butyl methyl ether (0.11%) and ethyl acetate (0.02%) mass fraction was observed in the ^{1}H NMR
^{13}C NMR:	Instrument:	Bruker Avance 400
	Field strength:	100 MHz
	Solvent:	$CDCl_3$ (77.16 ppm)
	Spectral data:	δ 14.0, 15.1, 22.3, 26.3, 29.0, 29.6, 47.3, 110.1, 117.8, 122.9, 123.1, 123.6, 123.7, 124.0, 126.1, 126.2, 126.4, 126.9, 127.2, 131.3, 132.2, 137.2, 137.7, 138.0, 142.7, 192.4 ppm
Melting point:		85-90 °C
Microanalysis:	Found:	C = 83.8%; H = 7.2%; N = 3.7% (September 2012)
	Calculated:	C = 84.5%; H = 7.4%; N = 3.8% (Calculated for $C_{26}H_{27}NO$)