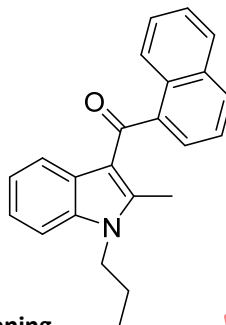


Certificate of Analysis

JWH-015 Certified Reference Material
(2-methyl-1-propyl-1H-indol-3-yl)-1-naphthalenyl-methanone

Item #: ISO60121
Batch #: 0446349
CAS Registry Number: 155471-08-2

Expiry: (valid from date of certification)
Provided as: 1mg/mL (nominal) solution in Methanol
Volume per ampule: not less than 5mL*
***Ampules are overfilled. It is advised that labs use measured volumes.**
Storage and Handling: Store unopened at -20°C. Warm to RT prior to opening.
Safety: Flammable, Poison



Compound Information

Chemical Formula	C ₂₃ H ₂₁ NO
Formula Weight	327.4 amu

Certified Concentration

Solution Purity	99.14%	
Certified Concentration	Verified Concentration	Acceptance Criteria
0.9998 ± 0.0013 mg/mL	1.009 mg/mL	≤5%
Uncertainty of concentration is expressed as and expanded uncertainty in accordance with ISO 17025 and Guide 34 at the approximate 95% confidence interval using a coverage factor of k=2 and incorporates uncertainty of the corrected purity, solution preparation uncertainty, homogeneity, and stability uncertainties.		
Concentration is calculated based on product mass, solution mass, corrected purity and density at 20°C. Concentration is verified by comparison of the average of multiple analyses to an independent calibration solution.		

Neat Material Quality Information

Qualifier	Method	Limit	Result	Meets Specification
Chromatographic Purity, HPLC	Cayman Method TST SD31	≥98%	99.13% ± 0.18%	Y
Identity, LCMS	Cayman Method TST SD13, +ESI	327.8 – 328.8 amu	328.1 amu	Y
Identity, GCMS	Cayman Method TST SD12	Conforms to Structure	Conforms	Y
FTIR	USP<851> (diamond ATR)	Conforms to Structure	Conforms	Y
Melting Point	USP<741>	102.0 ± 2.0 °C	103.6 °C	Y
% LOD	Cayman Method TST SD24	≤3.0%	0.60% ± 0.48%	Y
% ROI	Cayman Method TST SD06	≤2.0%	0.22% ± 0.34%	Y
*Identity, NMR	¹ H (CDCl ₃)	Conforms to Structure	Conforms	Y
**Corrected Purity			98.32% ± 0.20%	

*NMR is provided as supplemental info but is not within scope of ISO accreditation

**Corrected purity is determined as follows: Corrected Purity = [(100 - % LOD - % ROI)*Chromatographic Purity/100]

Measurement Uncertainty

All measurement uncertainties are expressed as expanded uncertainties in accordance with ISO 17025 and Guide 34 at the approximate 95% confidence interval using a coverage factor of k=2.

Cayman Chemical certifies that this standard meets the specifications stated in this certificate and warrants this product to meet the stated acceptance criteria through the expiration date when stored unopened as recommended.

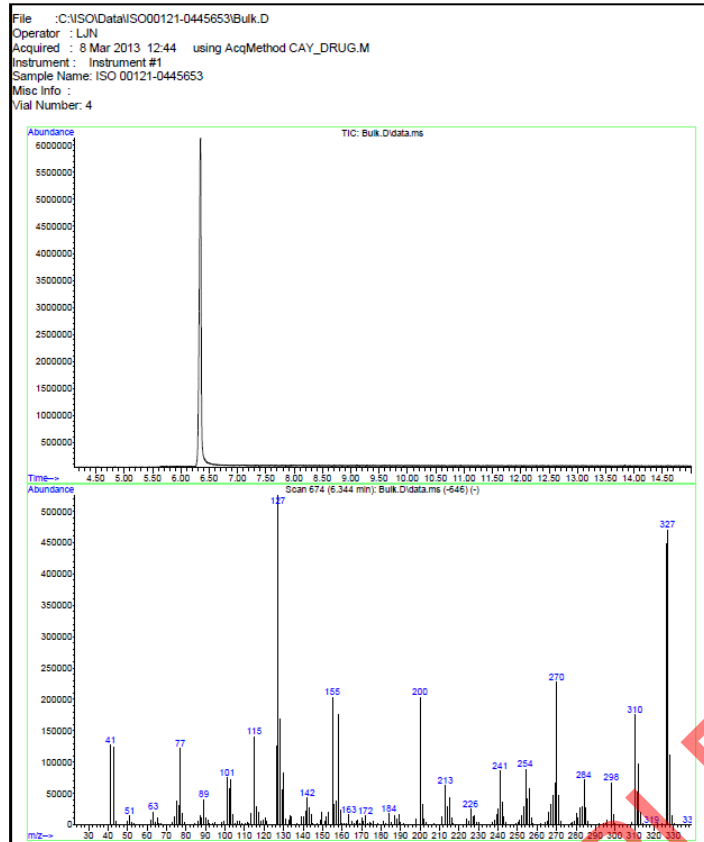
Approval:

Title: Cayman Chemical ISO Quality Manager

Certification Date:

Supplemental Data (Neat Material)

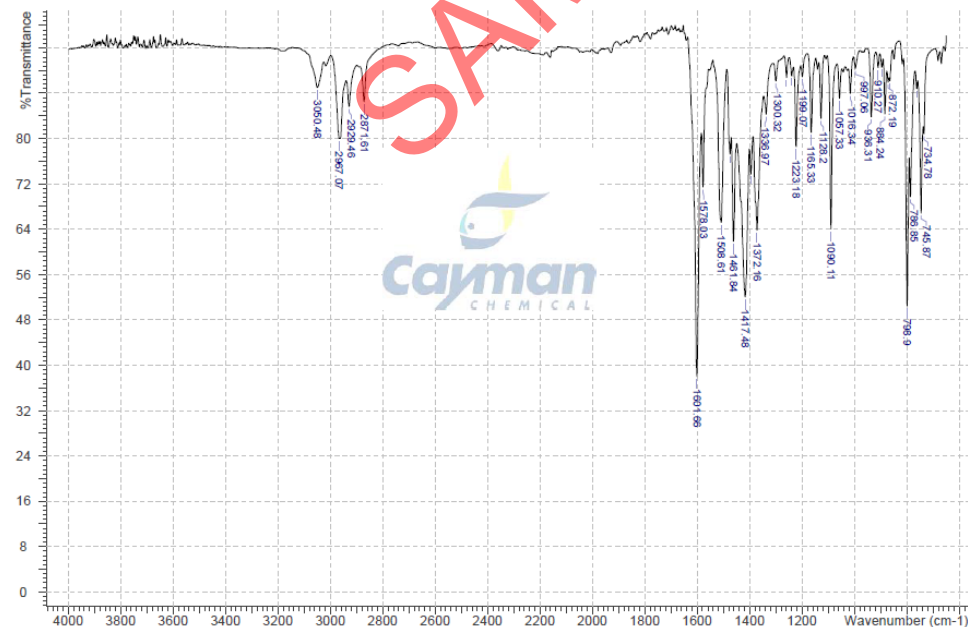
GC-MS



Conditions

Agilent 6890 GC/5973 MSD
30m x 0.32mm, 0.5um Rtx-5MS column
He carrier gas; Flow: 2mL/min
Inlet temp: 300°C 15:1 split
Oven Program:
240°C for 1minute, ramp to 300°C at 30°C /
minute, hold at 300°C for 27 minutes
Transfer line temp: 300°C
70ev EI MS 40-600 m/z
Apex spectrum – background (1 minute window
in front of peak)
Tune File: stune

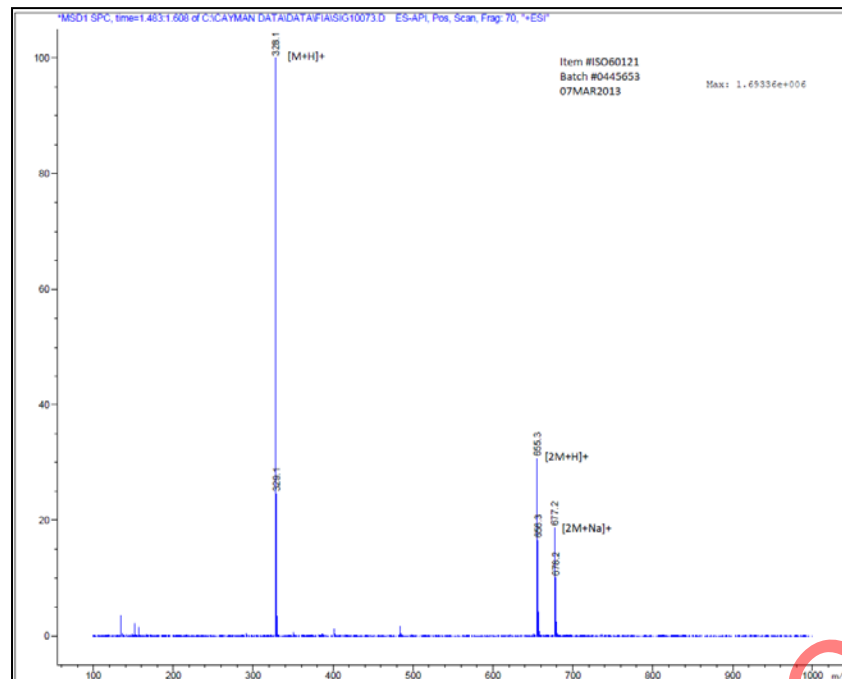
FTIR



Conditions

Thermo Nicolet iS10 FTIR /
Diamond SmartATR (single
bounce)
32 scans / 32 background
scans
Range: 650-4000cm⁻¹
Resolution: 4.000
ATR and background corrected

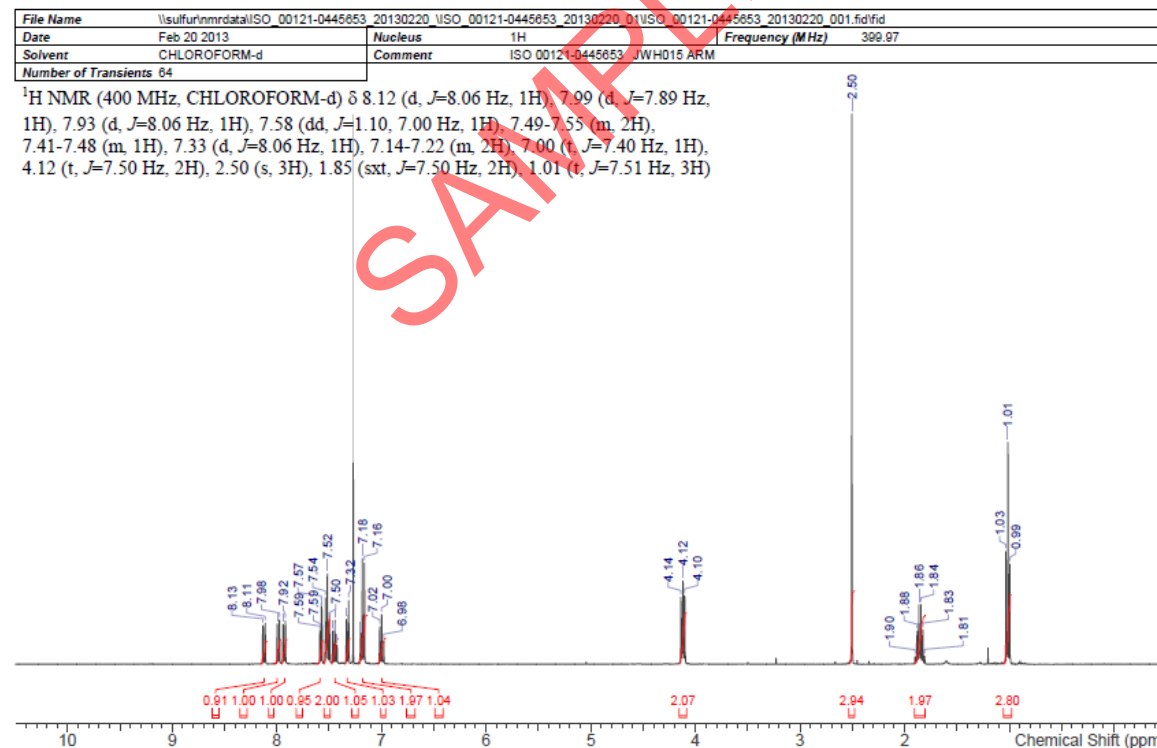
ESI-MS



Conditions

Agilent 1100 HPLC / G1956MSD
FIA-MS (no column)
Mobile phase: 50:50:0.1
MeCN/H₂O/formic acid
Flow: 1mL/min
+ESI 100-1000m/z range
Nebulizer: 60psi
Desolvation Gas: 13L/min
Desolvation Temp: 350°C
Electrospray Voltage: 4kV
MS collected across peak width at half height

NMR *not within scope of ISO 17025/Guide 34 accreditation



Conditions

Varian Inova
400MHz NMR
64 scans

Homogeneity

A minimum sample size of 1.1 µg was used to determine homogeneity. Homogeneity was determined by HPLC from 12 randomly selected bottles from early, middle and late fill positions.

	Result	Acceptance Criteria
%RSD	0.66%	≤3%

The recommended minimum quantity for use is 1.0 µg. Quantities below this have not been evaluated.

Stability

No decrease in the property value was observed at ambient conditions or 60°C after 2 weeks. This data supports shipping of this product at ambient temperature. Uncertainty of short term stability has been deemed insignificant to the overall uncertainty.

Long Term stability is in progress and uncertainty has not yet been included in combined uncertainty value. The final uncertainty result is incomplete until this uncertainty has been included.

Revision History

Revision #	Date	Reason for Revision
01		Initial version

Disclaimers

Material Safety Data

This material should be considered hazardous until information to the contrary becomes available. Do not ingest, swallow, or inhale. Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling. This information contains some but not all of the information required for the safe and proper use of this material. Before use, review the complete Material Safety Data Sheet, which has been sent via email to your institution.

Warranty and Limitation of Remedy

Cayman Chemical Company makes no warranty or guarantee of any kind, whether written or oral, expressed or implied, including without limitation, any warranty of fitness for a particular purpose, suitability and merchantability, which extends beyond the description of the chemicals hereof. Cayman warrants only to the original customer that the material will meet our specifications at the time of delivery. Cayman will carry out its delivery obligations with due care and skill. Thus, in no event will Cayman have any obligation or liability, whether in tort (including negligence) or in contract, for any direct, indirect, incidental or consequential damages, even if Cayman is informed about their possible existence.

This limitation of liability does not apply in the case of intentional acts or negligence of Cayman, its directors or its employees.

Buyer's exclusive remedy and Cayman's sole liability hereunder shall be limited to a refund of the purchase price, or at Cayman's option, the replacement, at no cost to Buyer, of all material that does not meet our specification.

Said refund or replacement is conditioned on Buyer giving written notice to Cayman within thirty (30) days after arrival of the material at its destination. Failure of Buyer to give said notice within thirty (30) days shall constitute a waiver of Buyer of all claims hereunder with respect to said material.

For further details, please refer to our Warranty and Limitations of Remedy located on our website and in our catalog.

This Certificate shall not be reproduced except in full, without written approval from the Cayman Chemical ISO Quality Manager