



REFERENCE MATERIAL PRODUCT INFORMATION SHEET

Report ID: S044.2018.01 (Ampouled 171005)

This batch of ampoules was prepared from the bulk material on 5th October 2017.

Compound Name: **17 α -Methyl-4-chloroandrost-4-ene-3 α ,17 β -diol**

Description: White solid

Collection Number: S044

Chemical Formula: C₂₀H₃₁ClO₂

CAS Registry Number: 35937-40-7

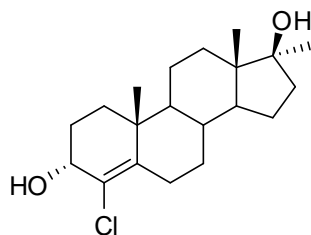
(Stereochemistry not defined at C3)

Structure:

Batch Number: 17-S-04

Molecular Weight: 338.9

Release date: 25th September 2017



Synonyms: 4-Chloro-17 α -methylandrost-4-ene-3 α ,17 β -diol

The compound is supplied as a dried aliquot in a sealed ampoule and is intended for a single use to prepare a standard solution containing S044. Open the ampoule and carefully rinse the interior at least three times with a suitable organic solvent (e.g. chloroform). This will transfer 972 \pm 20 μ g of anhydrous 17 α -methyl-4-chloroandrost-4-ene-3 α ,17 β -diol. The uncertainty is stated at the 95% coverage interval.

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
Column: HP-1, 30 m \times 0.32 mm I.D. \times 0.25 μ m
Program: 180 °C (1 min), 30 °C/min to 250 °C (10 min), 30 °C/min to 280 °C (8 min)
Injector: 250 °C Detector Temp: 320 °C
Carrier: Helium Split ratio: 20/1
Relative peak area of main component as the *bis*-TMS derivative:
Initial analysis: Mean = 99.4%, s = 0.01% (7 ampoules in duplicate, November 2017)
Re-analysis: Mean = 99.3%, s = 0.05% (5 ampoules in duplicate, September 2018)

The following analytical data were obtained on the bulk material subsequently used in the preparation of the ampoules.

The purity value was obtained from a combination of traditional analytical techniques by subtraction from 100% of total impurities by GC-FID, thermogravimetric analysis, Karl Fischer analysis and ¹H NMR spectroscopy. Supporting evidence is provided by headspace GC-MS analysis of occluded solvents and elemental microanalysis.

GC-FID: Instrument: Varian CP-3800
 Column: HP-1, 30 m × 0.32 mm I.D. × 0.25 μm
 Program: 180 °C (1 min), 30 °C/min to 250 °C (10 min), 30 °C/min to 280 °C (8 min)
 Injector: 250 °C Detector Temp: 320 °C
 Carrier: Helium Split ratio: 20/1
 Relative peak area of main component as the *bis*-TMS derivative:
 Initial analysis: Mean = 99.3%, s = 0.01% (7 sub samples in duplicate, August 2017)

Thermogravimetric analysis: Volatile content 2.6% and non volatile residue < 0.2% mass fraction (August 2017).

Karl Fischer analysis: Moisture content 0.1% mass fraction (August 2017)

Spectroscopic and other characterisation data

ESI-MS: Instrument: Micromass Quattro LC Micro
 Operation: Negative ion mode, direct infusion at 20 μL/min
 Ionisation: ESI spray voltage at 3.5 kV positive ion
 EM voltage: 500 V
 Cone voltage: 40 V
 Peak: 337.2 (M-Cl³⁵-H⁺), 339.1(M-Cl³⁷-H⁺) *m/z*

GC-MS: Parent compound:
 Instrument: Agilent 6890/5973
 Column: HP-1MS, 30 m x 0.25 mm I.D. x 0.25 μm
 Program: 180 °C (1 min), 15 °C/min to 240 °C (12 min), 30 °C/min 300 °C (3 min)
 Injector: 250 °C Transfer line temp: 280 °C
 Carrier: Helium, 1.0 mL/min Split ratio: 20/1

Bis-TMS derivative:
 Instrument: Shimadzu GCMS-QP2010 Ultra
 Column: HP Ultra 1, 25 m × 0.22 mm I.D. × 0.11 μm
 Program: 115 °C (0.8 min), 90 °C/min to 180 °C, 5 °C/min to 190 °C, 3 °C/min to 230 °C, 10 °C/min to 265 °C, 30 °C/min to 320 °C (4 min)
 Injector: 250 °C Transfer line temp: 250 °C
 Carrier: Helium, 1.2 mL/min Split ratio: 15/1

The retention times of the parent compound and *bis*-TMS derivative are 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 (14.5 min): 304 (29), 302 (83), 289 (28), 287 (76), 267 (38), 251 (21), 227 (10), 191 (24), 179 (24), 177 (25), 161 (37), 143 (25), 141 (31), 133 (36), 131 (34), 128 (32), 121 (30), 119 (36), 115 (38), 107 (52), 105 (100), 91 (88), 79 (45), 77 (44) *m/z*

Bis-TMS (18.8 min): 482 (M⁺, < 1), 467 (2), 447 (12), 357 (47), 341 (3), 267 (5), 143 (100), 130 (12), 75 (20), 73 (46) *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: No solvents detected

TLC: Conditions: Kieselgel 60F₂₅₄. Hexane/ethyl acetate (1/1)
Single spot observed, R_f = 0.74. Visualisation with vanillin

IR: Instrument: Bruker Alpha FT-IR
Range: 4000-400 cm⁻¹, neat
Peaks: 3254, 2971, 2932, 2874, 2847, 1450, 1373, 1312, 1290, 1150, 1084, 943,
819, 753, 705, 649, 551 cm⁻¹

¹H NMR: Instrument: Bruker Avance III 500
Field strength: 500 MHz Solvent: CDCl₃ (7.26 ppm)
Spectral data: 0.81-0.94 (2H, m), 0.88 (3H, s), 1.05 (3H, s), 1.15 (1H, m), 1.19 (3H, s),
1.24-1.33 (2H, m), 1.38 (1H, ddd, J = 3.8, 12.9, 26.9 Hz), 1.49-1.65 (6H, m),
1.71-1.88 (5H, m), 1.93 (1H, dddd, J = 2.1, 4.7, 14.3, 14.3 Hz), 2.93 (1H,
dddd, J = 2.8, 4.2, 14.3 Hz), 4.14 (1H, m) ppm
Methanol estimated at 2.4% mass fraction was observed in the ¹H NMR.

¹³C NMR: Instrument: Bruker Avance III 500
Field strength: 126 MHz Solvent: CDCl₃ (77.19 ppm)
Spectral data: δ 14.1, 18.3, 21.4, 23.4, 26.0, 26.8, 27.6, 31.2, 31.7, 31.8, 36.5, 39.1, 40.7,
45.5, 50.4, 54.5, 70.0, 81.8, 127.2, 143.9 ppm

Melting point: 218-219 °C

Microanalysis: Found: C = 69.9%; H = 9.4%; Cl = 10.2% (August 2017)
Calc: C = 70.1%; H = 9.3%; Cl = 10.2% (Calculated for C₂₀H₃₁ClO₂ with
2.4% methanol)

Expiration of certification

The property values are valid till 19th September 2021, 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 ampoules that have been opened. In such cases it is recommended that the end-user conduct their own in-house stability trials.

The long-term stability of the compound in solution has not been examined.

This material has been given a shelf life of three years from the date of re-certification. The material will be re-tested on an annual basis to ensure that the property values are still valid. In the event a product fails the stability trial, notification will be sent to all impacted customers.

In the absence of 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.

Homogeneity assessment

The homogeneity of the material was assessed using purity assay by GC-FID on seven randomly selected ampoules 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.

Recommended storage

When not in use, this material should be stored at or below 4 °C in a closed container in a dry, dark area.

Intended use

This reference material should be used for qualitative analysis only.

Caution

Treat as hazardous substance. Use appropriate work practices when handling to avoid skin or eye contact, ingestion or inhalation of dust.

Legal notice

Neither NMI nor any person acting on NMI's behalf assumes any liability with respect to the use of, or for damages resulting from the use of, this reference material or the information contained in this certificate.

Authorised by:

S. R. Davies

Dr Stephen R Davies
Team Leader,
Chemical Reference Materials, NMI
Dated: 25 September, 2018.

Characterisation data and property values specified in this report supersede those in all reports issued prior to 25th September 2018.