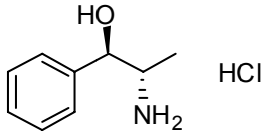
CERTIFIED REFERENCE MATERIAL
CERTIFICATE OF ANALYSIS

Report ID: M296.2014.01

Compound Name: **dl-Norephedrine hydrochloride**
Collection Number: M296
Chemical Formula: $C_9H_{14}ClNO$
CAS Number: 154-41-6
Structure: Relative stereochemistry



Description: White crystalline powder
Batch Number: 06-D-013
Molecular Weight: 187.7 (151.2 free base)
Release Date: 2nd April 2007

Synonyms: Phenylpropanolamine hydrochloride

Purity (mass fraction): 99.5 ± 0.6% (95% coverage interval)

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

GC-FID:	Instrument:	Agilent 6890	
	Column:	HP-1, 30 m × 0.32 mm I.D. × 0.25 µm	
	Program:	80 °C (1 min), 10 °C/min to 120 °C (5 min), 20 °C/min to 300 °C (3 min)	
	Injector:	200 °C	Detector Temp: 320 °C
	Carrier:	Helium	Split ratio: 20/1
	Relative peak area response of main component:		
	Initial analysis:	Mean = 99.9%, s = 0.01% (10 sub samples in duplicate, November 2006)	
	Re-analysis:	Mean = 99.7%, s = 0.06% (5 sub samples in duplicate, November 2008)	
	Re-analysis:	Mean = 99.6%, s = 0.03% (5 sub samples in duplicate, November 2014)	

GC-FID:	Instrument:	Varian CP-3800	
	Column:	VF-1ms, 30 m × 0.32 mm I.D. × 0.25 µm	
	Program:	80 °C (1 min), 10 °C/min to 120 °C (5 min), 20 °C/min to 300 °C (3 min)	
	Injector:	200 °C	Detector Temp: 320 °C
	Carrier:	Helium	Split ratio: 20/1
	Relative peak area response of main component:		
	Initial analysis:	Mean = 99.7%, s = 0.03% (5 sub samples in duplicate, January 2010)	

Thermogravimetric analysis: Volatile content < 0.1% and non volatile content < 0.2% mass fraction

Karl Fischer analysis: Moisture content ≤ 0.2% mass fraction (November 2007and 2008, December 2009 and October 2014)

Spectroscopic and other characterisation data

GC-MS:	Instrument:	Agilent 6890/5973	
	Column:	ZB-5, 30 m × 0.25 mm I.D. × 0.30 μm	
	Program:	60 °C (1 min), 10 °C/min to 100°C, 20 °C/min to 250 °C (1 min)	
	Injector:	150 °C	Transfer line temp: 280 °C
	Carrier:	Helium, 1 mL/min	Split ratio: 20/1
	The retention time of the free base is reported along with the major peaks in the mass spectrum. The latter are reported as mass/charge ratios. and (in brackets) as a percentage relative to the base peak. 7.8 min: 132 (1), 117 (4), 105 (7), 77 (16), 51 (7), 44 (100) m/z		
TLC:	Conditions:	Kieselgel $60F_{254}$. Methanol/Conc. NH_3 (98.5/1.5) Single spot observed, $R_f = 0.40$. Visualisation with ninhydrin	
IR:	Instrument:	Biorad FTS300MX FT-IR	
	Range:	4000-400cm^{-1}, KBr powder	
	Peaks:	3303, 3007, 2490, 1993, 1599, 1493, 1331, 1208, 1031, 748 cm^{-1}	
^{1}H NMR:	Instrument:	Bruker DMX 600	
	Field strength:	600 MHz	Solvent: d_4-methanol
	Spectral data:	δ 1.12 (3H, d, J = 6.8 Hz), 3.56 (1H, m), 5.01 (1H, d, J = 3.7 Hz), 7.34 (1H, t, J = 7.1 Hz), 7.40-7.47 (4H, m), ppm	
^{13}C NMR:	Instrument:	Bruker DMX 600	
	Field strength:	151 MHz	Solvent: d_4-methanol
	Spectral data:	δ 12.2, 53.7, 73.3, 127.1, 129.0, 129.5, 141.5 ppm	
Melting point:		193-195 °C	
Microanalysis:		Found: C = 57.5 %; H = 7.4 %; N = 7.5% (November 2006) Calc: C = 57.6 %; H = 7.5 %; N = 7.5% (Calculated for $C_9H_{14}ClNO$)	

Expiration of certification
The property values are valid till 6th November 2019, 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.

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

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.

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 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.

Metrological Traceability
The certified purity value is traceable to the SI unit for mass (kg) through Australian national standards via balance calibration. The purity was derived by subtraction of the mass of impurities from the mass of the reference material. Organic purity is traceable to the SI-derived coherent unit one through chromatographic separation and response factor determination of individual components. Volatile and non-volatile residue content is directly traceable to mass through use of Karl Fischer and thermogravimetric analysis.

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.

Intended Use
For ***in vitro*** laboratory 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: 13 November, 2014.

Characterisation data and property values specified in this report supersede those in all reports issued prior to 13th November 2014.