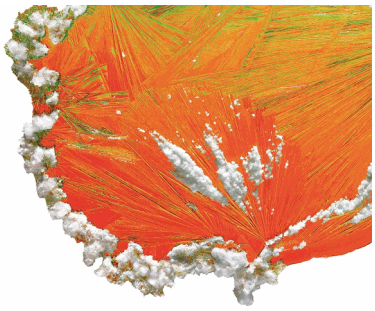


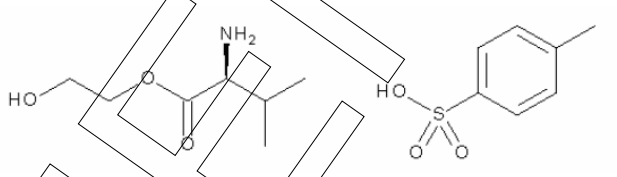
Certificate of Analysis

ISO 9001

Reference Material

Product name

2-Hydroxyethyl L-Valinate para-Toluenesulfonate



Product code
MM0619.19-0025

Lot number
1028532

CAS number
86150-61-0

Appearance
white solid

Molecular weight
333.40

Melting point (DSC)
137 °C

Molecular formula
$C_7H_{15}NO_3$ $C_7H_8O_3S$

Long-term storage
2 to 8 °C, dark

Assay "as is"
95.8 %

Date of shipment: **04 Nov 2019**

Producer confirms that this reference material (RM) meets the specification detailed on this Certificate of Analysis for **one year** from the date of shipment, provided the substance is stored under the recommended conditions unopened in the original container.

Release by:	**Date of Release:**		
Dr. Sabine Schröder	Luckenwalde, 07 Oct 2019		Product Release

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Product information

For laboratory use only. Not suitable for human or animal consumption.

Before usage of the RM, it should be allowed to warm to room temperature. No drying required, as the certified value is already corrected for the content of water and other volatile materials.

The product quality is controlled by regularly performed quality control tests (retests).

Further content

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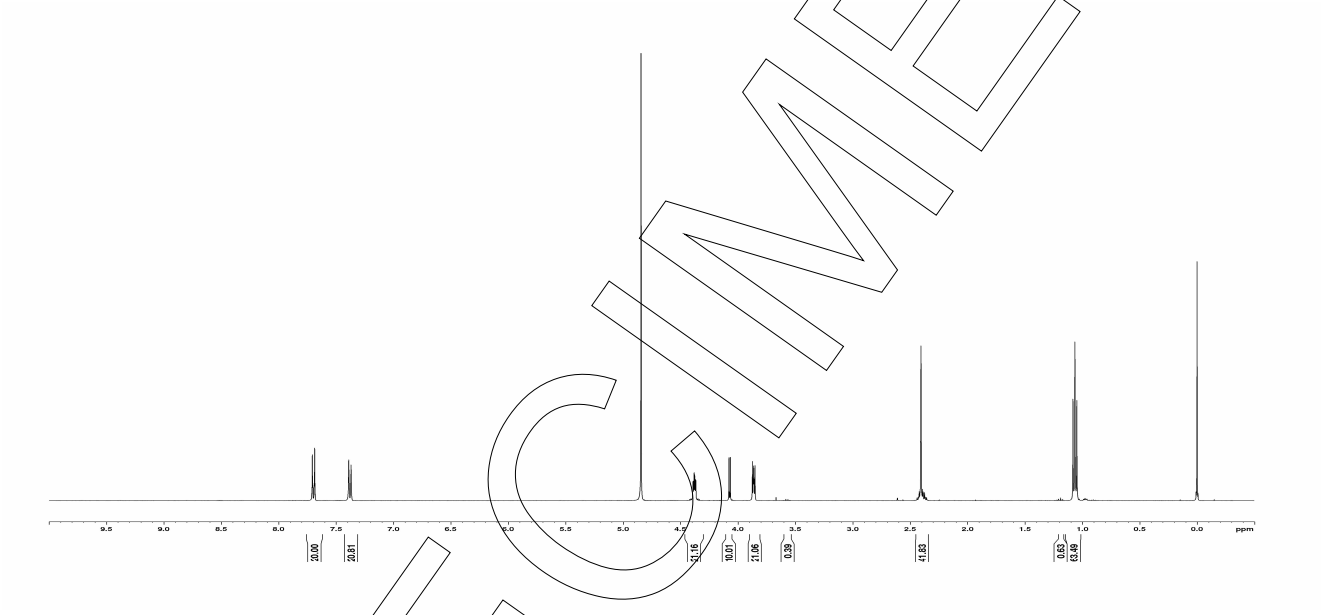
Identity

The identity of the reference material was established by following analyses.

Method	Conditions	Result
^{1}H-NMR	400 MHz, D_2O	Structure confirmed



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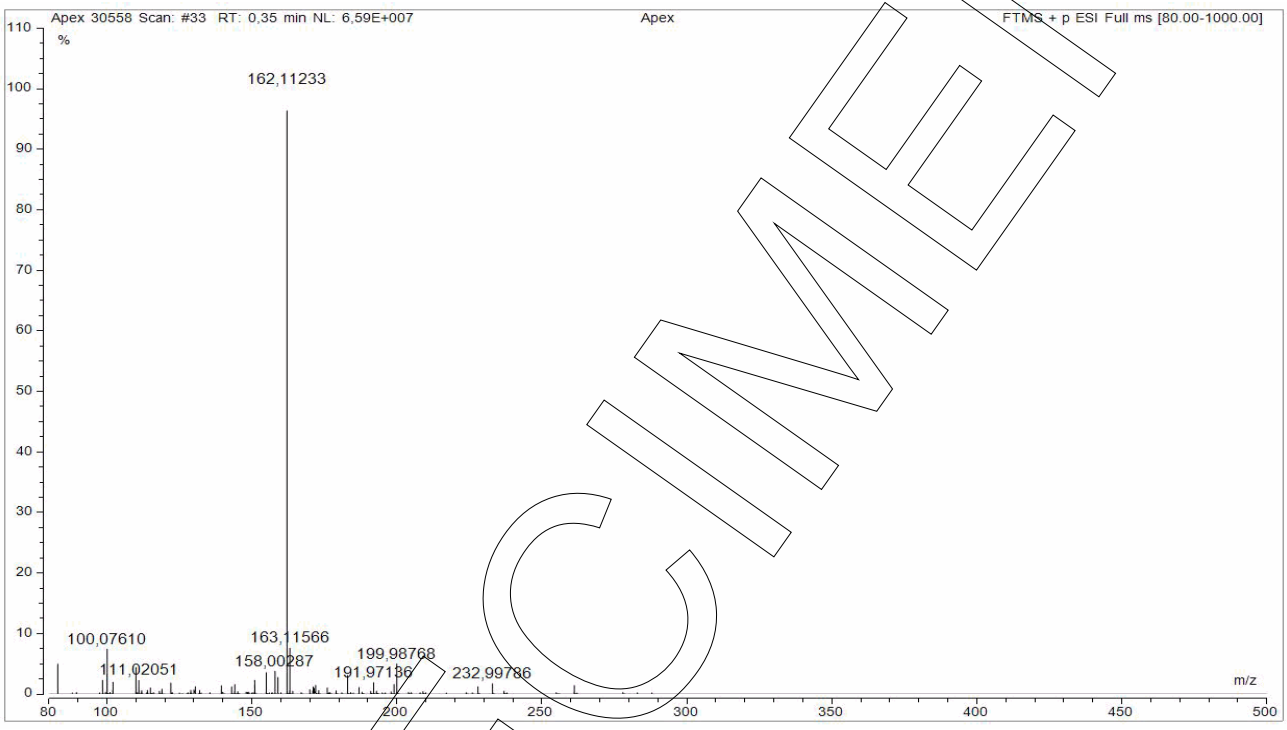
Method	Conditions	Result
MS	3.5 kV ESI+; capillary temperature: 269 °C Theoretical value: 162.11247	Structure confirmed



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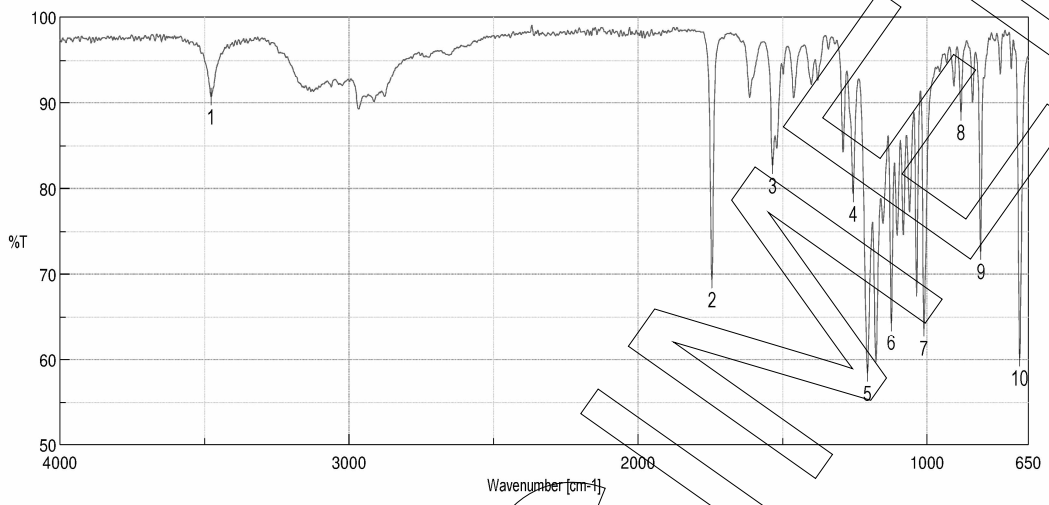
Method	Conditions	Result
IR	Attenuated Total Reflection Fourier Transform Infrared (ATR-FTIR) Spectroscopy	Structure confirmed



Results of Peak Find

No.	Position	Intensity
1	3477.03	90.6723
2	1744.3	69.3338
3	1535.06	82.6043
4	1256.4	79.3278
5	1206.26	58.3894
6	1124.3	64.3553
7	1011.48	63.639
8	883.238	88.8773
9	814.777	72.6388
10	679.785	60.1624

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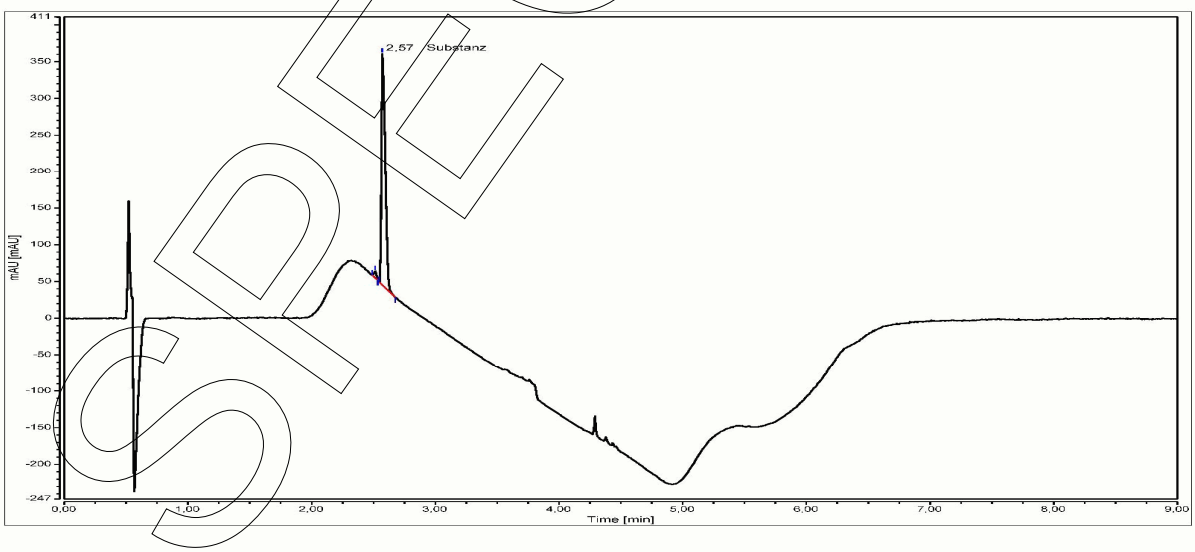
Assay

The assay of the reference material was assessed by following analyses.

Purity by High Performance Liquid Chromatography (HPLC)

HPLC Conditions:	
Column	Kinetex Phenyl-Hexyl; 1.7 µm, 100 x 2.1 mm
Column temperature	40 °C
Detector	DAD, 200 nm
Injector	Auto 3.00 µl; 0.051 mg/ml in Acetonitrile/Water 50/50 (v/v)
Flow rate	0.5 ml/min
Phase A	Water, 0.1 % HCOOH
Phase B	Acetonitrile, 0.1 % HCOOH
Gradient program	0-1 min A/B 98/2 1-4 min A/B to 2/98 4-5 min A/B to 98/2 5-9 min A/B 98/2 (v/v)

HPLC chromatogram and peak table



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Area percent report - sorted by signal				
Pk #	**Retention time**	**Area**	**Area %**	
1	2.514	0.2108	1.86	
2	2.572	11.1411	98.14	
Totals		**11.3519**	**100.00**	

The content of the analyte was determined as ratio of the peak area of the analyte and the cumulative areas of the purities, added up to 100 %. System peaks were ignored in calculation.

Result (n = 3)	98.14 %; SD = 0.01 %

Volatile content

Water content	
Method	Karl Fischer titration
Result (n = 3)	0.18 %; SD = 0.02 %

Residual solvents	
Method	^{1}H-NMR
Result (n = 1)	Sum: 0.22 % 0.22 % Diethyl ether

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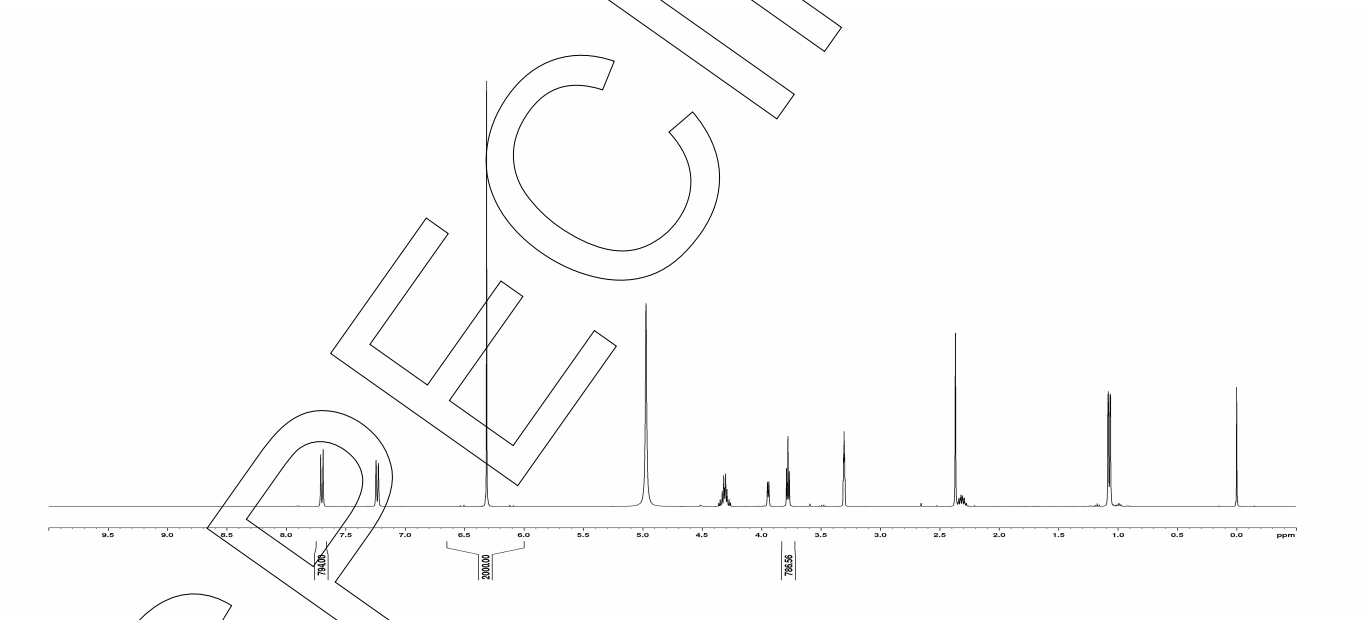
Final result

Assay "as is": **95.81 %**

The assay "as is" is assessed by quantitative NMR spectroscopy and is equivalent to the assay based on the not anhydrous and not dried substance respectively.

Method: Value assigning technique - quantitative NMR spectroscopy	
Conditions	400 MHz, CD_3OD
Internal standard	Maleic acid (certified reference material), signal 6.0 - 6.7 ppm, 2 H
Result (mass fraction, **n = 3**)	95.81 %; SD = 0.06 %

Quantitative NMR spectrum



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Revision table

Revision	Date	Reason for revision
00	07 Oct 2019	Release of the Certificate of Analysis - initial version

Product warranties for the RM are set out in the terms and conditions of purchase.

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