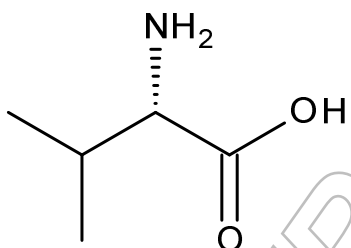




Certificate of Analysis

Reference Standard

Valine (L-Valine)



Molecular Formula: C₅H₁₁NO₂
Molecular Weight: 117.15
CAS Number: 72-18-4

Catalogue Number: LGCFOR1455.00
Lot Number: 68031
Long-term Storage: 2 to 8 °C, dark
Appearance: white solid
Melting Point: 284 °C (dec.)
Assay 'as is': 99.6 %

Date of shipment: **2017-September-05**

This certificate is valid for two years from the date of shipment provided the substance is stored under the recommended conditions unopened in the original container.

LGC Quality | ISO 9001:2008
DQS 102448 QM08

LoGiCal®
produced by LGC

LGC GmbH, Im Biotechnologiepark, TGZ II, D-14943 Luckenwalde, Germany

© 2012 LGC limited. All rights reserved. LGC Standards is part of the LGC Group.
LoGiCal is a registered trademark of LGC Standards GmbH

6 Pages

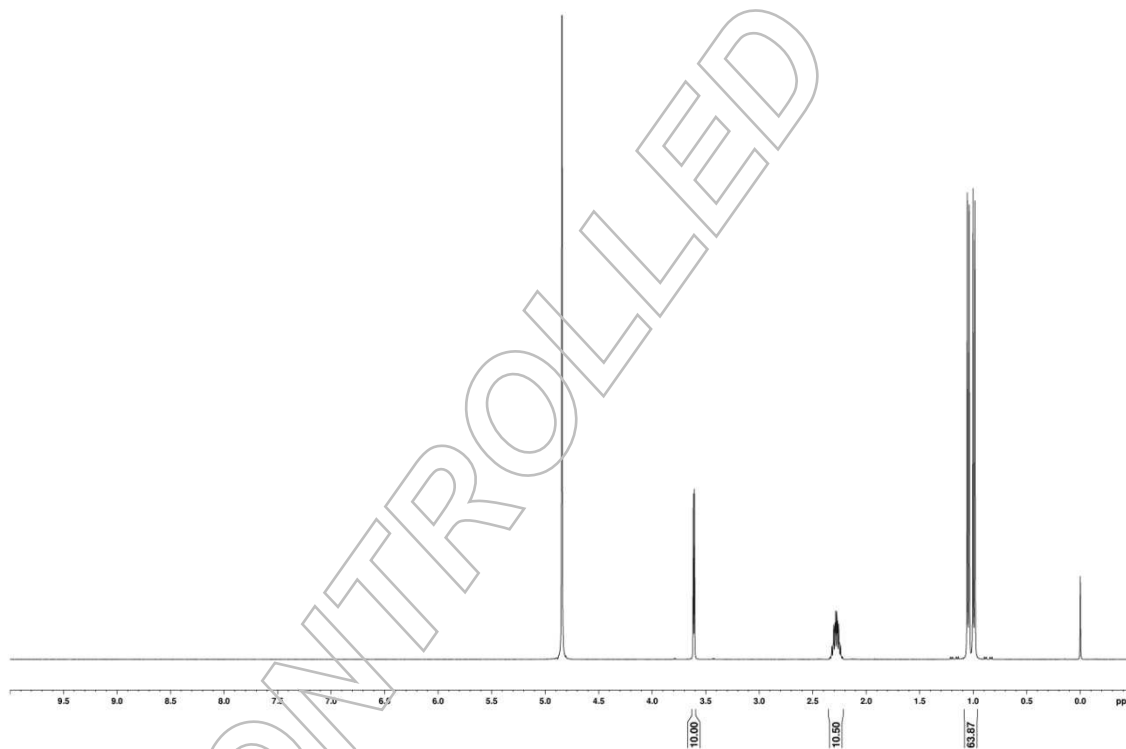


I. Identity

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

Ia. ^1H -NMR Spectrum

Conditions: 400 MHz, D_2O

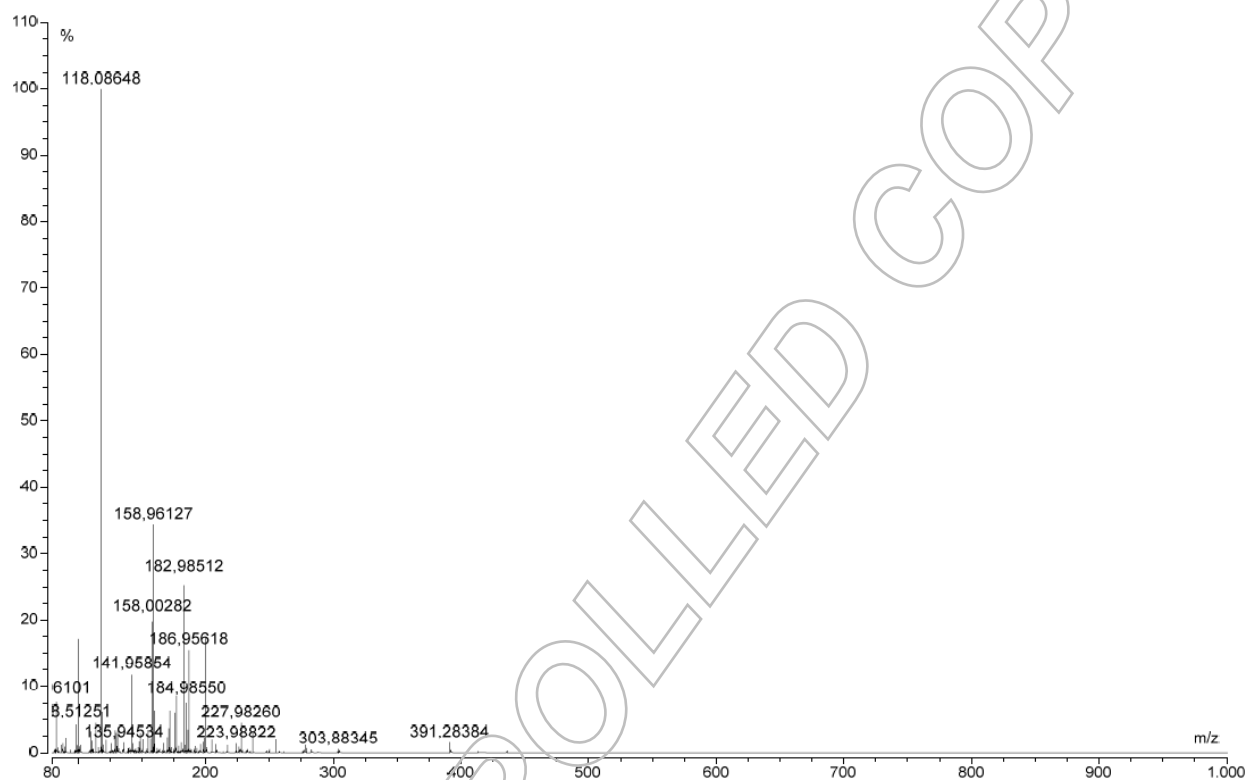


The structure is confirmed by the signals of the spectrum and their interpretation.



Ib. Mass Spectrum

Method: 3.5 kV ESI+; capillary temperature: 269 °C



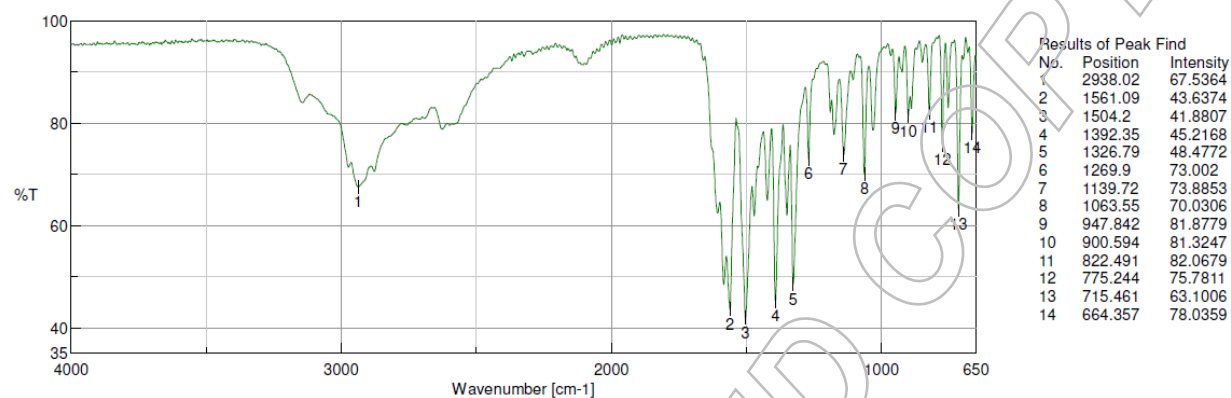
Theoretical value: 118.08626

The signal of the MS spectrum is consistent with the theoretical value and its interpretation is consistent with the structural formula.



Ic. IR Spectrum

Method: Attenuated Total Reflection Fourier Transform Infrared (ATR-FTIR) Spectroscopy



The signals of the IR spectrum and their interpretation are consistent with the structural formula.

II. Purity

IIa. Water Content

Method: Karl Fischer titration

No significant amounts of water were detected (< 0.05 %).

IIb. Residual Solvents

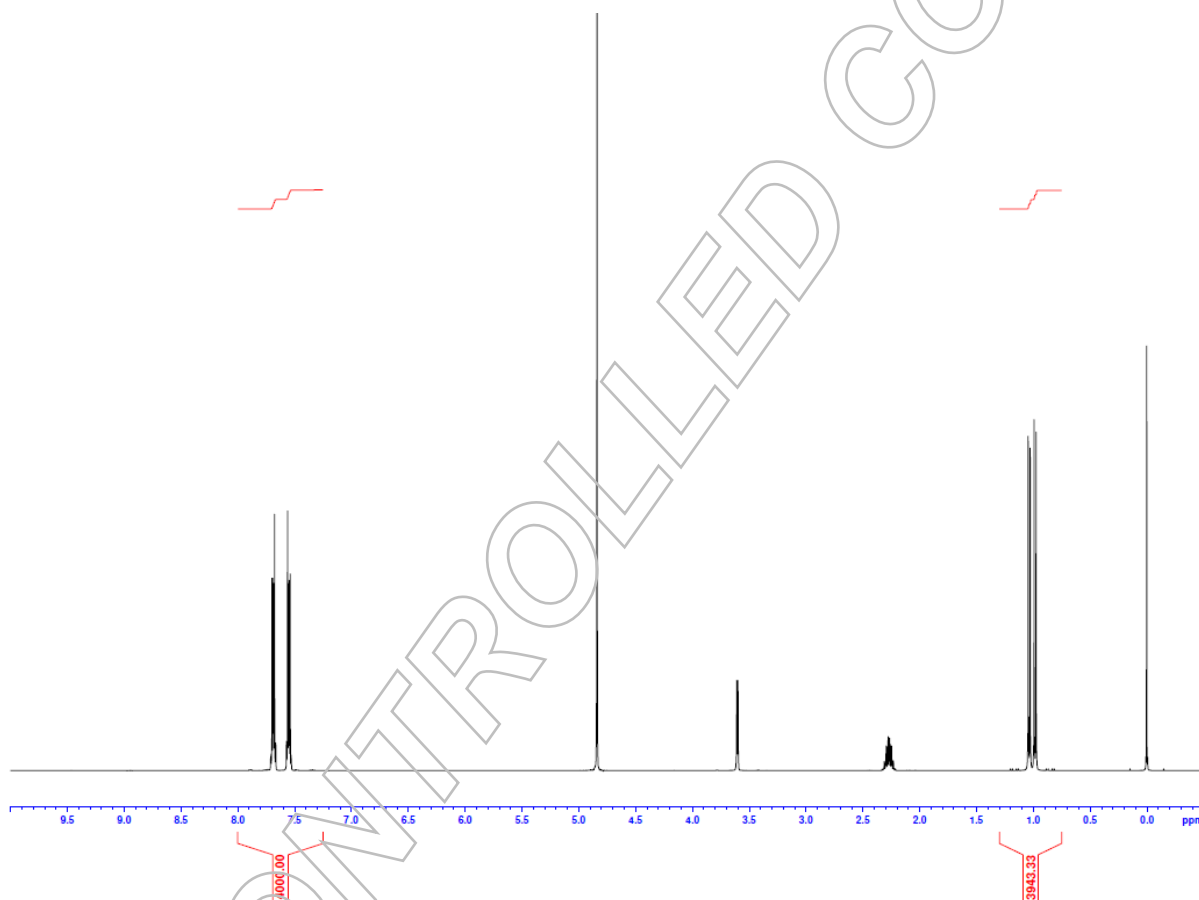
Method: ^1H -NMR

No significant amounts of residual solvents were detected (< 0.05 %).



III. Assay by Quantitative NMR Spectroscopy

The assay of the reference substance was established by quantitative NMR spectroscopy using D₂O as the solvent and with Potassium hydrogen phthalate (certified reference material, signal 7.25 – 8.00 ppm, 4 H) as internal standard.



Results:

Average	99.64 %
Number of results	n=6
Standard deviation	0.01 %



IV. Final Result

Water content	No significant amounts of water were detected (< 0.05 %).
Residual solvents	No significant amounts of residual solvents were detected (< 0.05 %).
Assay (quantitative NMR spectroscopy)	99.64 %

The assay is assessed to be 99.6 % 'as is'

The assay 'as is' is equivalent to the assay based on the not anhydrous and not dried substance respectively.

Release Date:

Luckenwalde, 2015-06-08

Dr. Sabine Schröder
Product Release