PhytoLab GmbH & Co. KG Dutendorfer Straße 5-7 91487 Vestenbergsgreuth

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Reference Substances
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Certificate of analysis

Article:	89517 (-)-Menthol
Certificate # / Lot Number:	170136
Material batch:	14295
Sample-ID:	107275
End of analysis:	12/2023
Expiry date:	08/2029

Test	Unit	Specified value	Testresult
Appearance, SOP 100005		crystals	conform
Color, SOP 100006		colorless	conform
Identification (1H-NMR-spectroscopy), (outsourced), SOP 206010		conform	conform
Identification (13C-NMR-spectroscopy), (outsourced), SOP 206020		conform	conform
Identification (GCMS,EI), SOP 204160		conform	conform
Identification (IR-spectroscopy, Ph.Eur. 10.3, 2.2.24 / USP43 NF37 <197>), SOP 206000		conform	conform
Purity test (TLC), SOP 211159		conform	conform
Water content, (half-micro determination, Karl Fischer method), Ph.Eur. 10.0, 2.5.12, method A/ USP 43 <921>, method Ia, SOP 304302 Vers. 2017-09: Mean value	%		0.04
Specific optical rotation, according to Ph.Eur. 10.0, 2.2.7 (optical rotation), PV 305501: (c = 1.00; MeOH)			-48.54

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Test	Unit	Specified value	Testresult
(-)-Menthol (GC), method 2 (% AU), SOP 400454	%	≥ 95.00	100.00
Inorganic impurities, (ICP-MS), for reference substances, SOP 811701: Calcium	%		<0.1
Potassium	%		<0.1
Magnesium	%		<0.1
Sulfur	%		<1.0
Sodium	%		<0.1
Phosphorus	%		<0.1
Aluminium	%		<0.1
Residual solvents, (headspace-GC), SOP 805765:	%		
Residual solvents (LOQ: 0.050)			<0.050
Content, SOP 890000, calculated in (%): (100 - water - residual solvents - inorganic impurities) x chromatographic purity / 100	%		100

This PhytoLab phyproof© reference standard is by definition a primary reference standard and does not need to be qualified against any other reference standard. The identity of the reference standard has been substantiated by at least two independent analytical methods such as IR, NMR, UV or MS analysis. A mass balance approach, which takes chromatographic purity into account, as well as the contents of water, residual solvents, inorganic impurities, and the counter ion (if the reference standard is present as a salt) is applied in the calculation of the absolute purity as given in this COA (see description of SOP 8900XX).

The absolute purity value (and not just the chromatographic purity result obtained by

means of HPLC or GC) must be used in all quantitative calculations as the chromatographic techniques do not yet account for water, residual solvents and inorganic impurities.

Vestenbergsgreuth, 01/Aug/2024

Nicole Fuchs

QC Reference Substances

This is a computer print and valid without signature. A signed certificate of analysis can be taken on request.

PhytoLab
SAFEGUARDING BOTANICAL QUALITY.

Certificate of analysis

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Further information:

Shelf life/stability: The stated expiry date applies when the reference substance is stored in the original unopened container within the specified temperature range. PhytoLab does not guarantee the stability of the reference substance once the vial has been opened.

Long-term storage and handling: The reference standard should be stored in the original unopened vial, protected against light and humidity in an airtight container, within the temperature range given on the label and accompanying data sheet. If stored below room temperature, the vial should be warmed up to room temperature in a desiccator before it is opened in order to avoid condensation of humidity. The user assumes responsibility for deciding how previously opened reference standard vials should be used and the user must ensure that the contents of opened vials are still suitable for their intended use.

Exact weight: the exact weight of each vial is given on the label of the inner vial to two decimal places. This information may be used to produce stock solutions of a known concentration without having to weigh in the reference substance again. If used for this purpose, the content of the vial must be quantitatively transferred to a volumetric flask and filled up to the required level. Please note that PhytoLab is unable to guarantee the stability of the reference standard in solution.

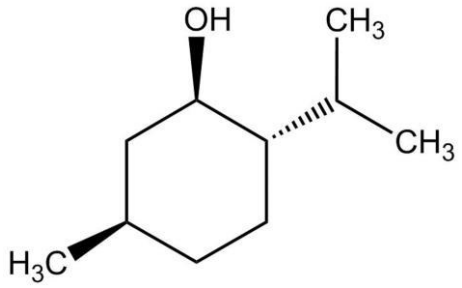
Intended use: this reference standard is solely intended for laboratory analytical purposes, research & development, and scientific teaching and training purposes. It may not be used for any other purpose and particularly not for use in, or the production of, food, animal feed, human or veterinary drugs, cosmetics, medicinal products or diagnostic agents, including in-vitro diagnostic agents. PhytoLab is unable to guarantee the suitability of this reference standard for any particular application other than its qualitative and quantitative use in chromatography and identification testing.

Further information about this reference standard can be found on the accompanying data sheet or in our webshop. Spectral and chromatographic data, and a description of the applied chromatographic method, are provided in the attachments to this COA. A detailed explanation of all data given on the COA can be found in the guide that is available from the download area in our webshop, where you can also download all of the safety data sheets.

Product Data Sheet

(-)-Menthol

Product #: 89517



Physicochemical Data

CAS #:	2216-51-5
Molecular formula:	C10H20O
Molecular weight [g/mol]:	156.27
Synonyms	Levomenthol
Substance class:	Isoprenoids
Subgroup 1:	Terpenoid-type
Subgroup 2:	Monoterpenes
Subgroup 3:	Monocyclic monoterpenes
Solubility:	freely soluble in diethyl ether, ethanol and petroleum ether; practically insoluble in water Please note that this solubility information is based on in-house experience or taken from published data. It is not meant to guarantee solubility up to a specific concentration, nor does it guarantee stability of the reference substance in solution.

Additional Information

Source:	synthetic
Long-term storage conditions:	2-8 °C

Manufacturer:

Phytolab GmbH & Co.KG
Dutendorfer Straße 5-7
91487 Vestenbergsgreuth
Germany

Tel.: +49 9163 88-395
Fax: +49 9163 88-456
Mail: ref-substances@phytolab.de
Shop: https://phyproof.phytolab.com

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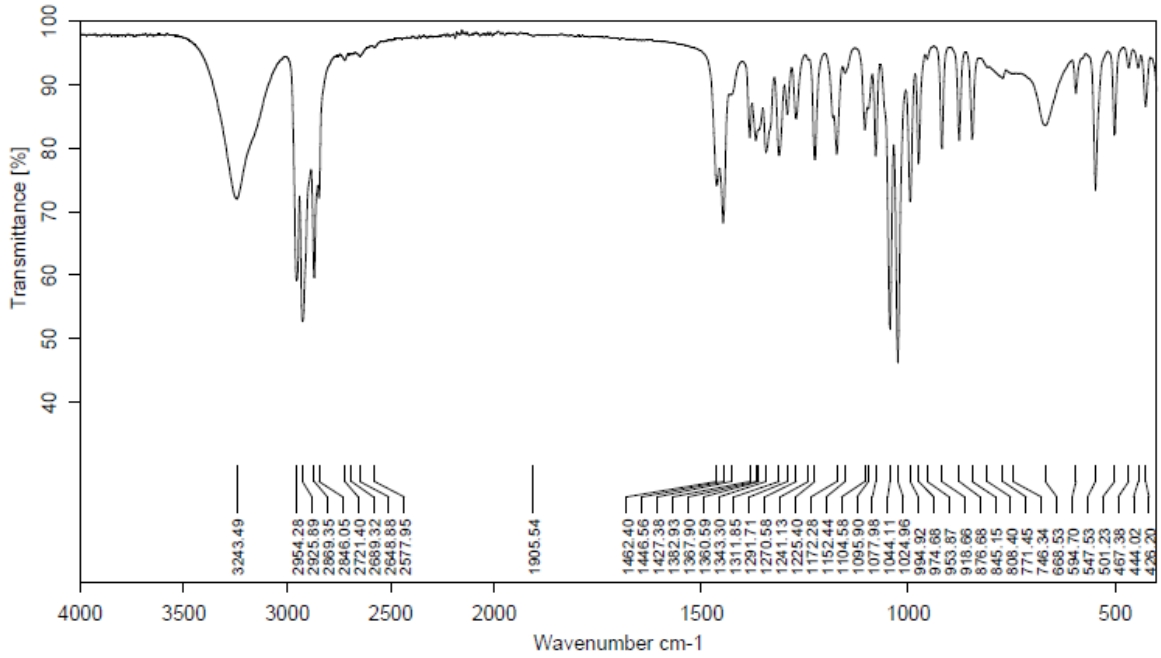
Supplements

(-)-Menthol **Batch # 14295**
Product # 89517

Identity tests:

IR spectrum



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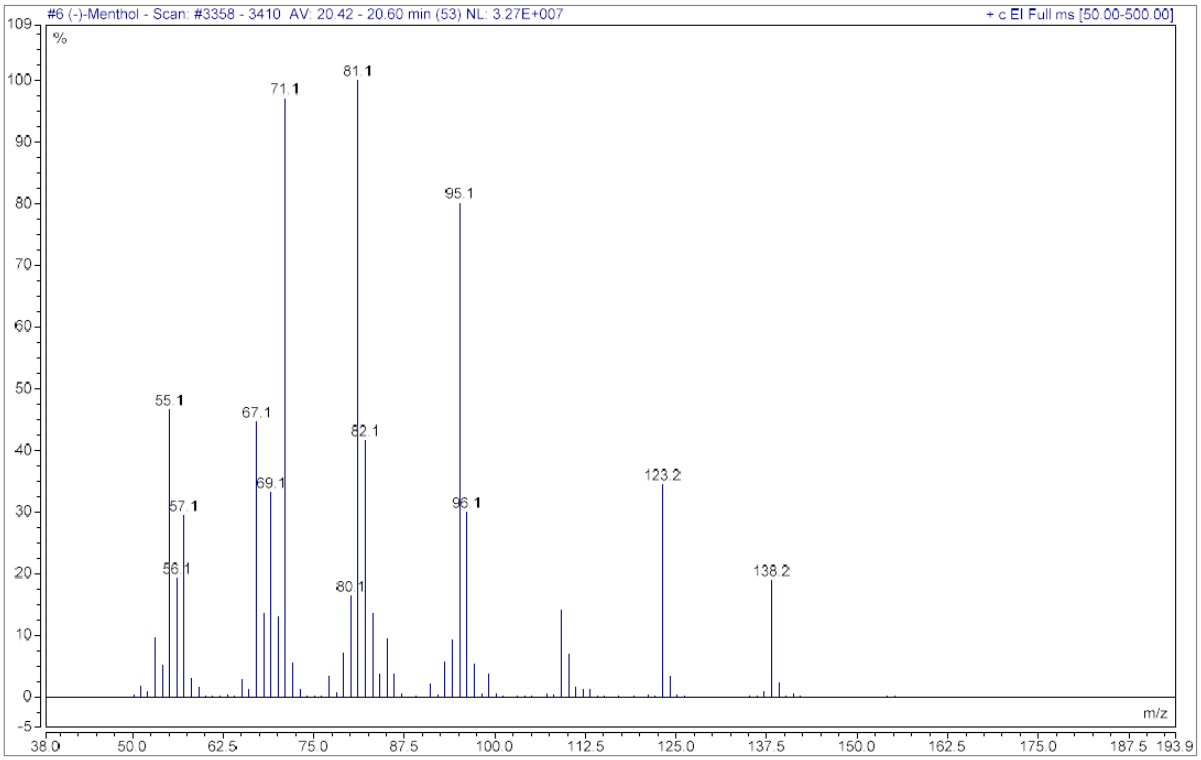
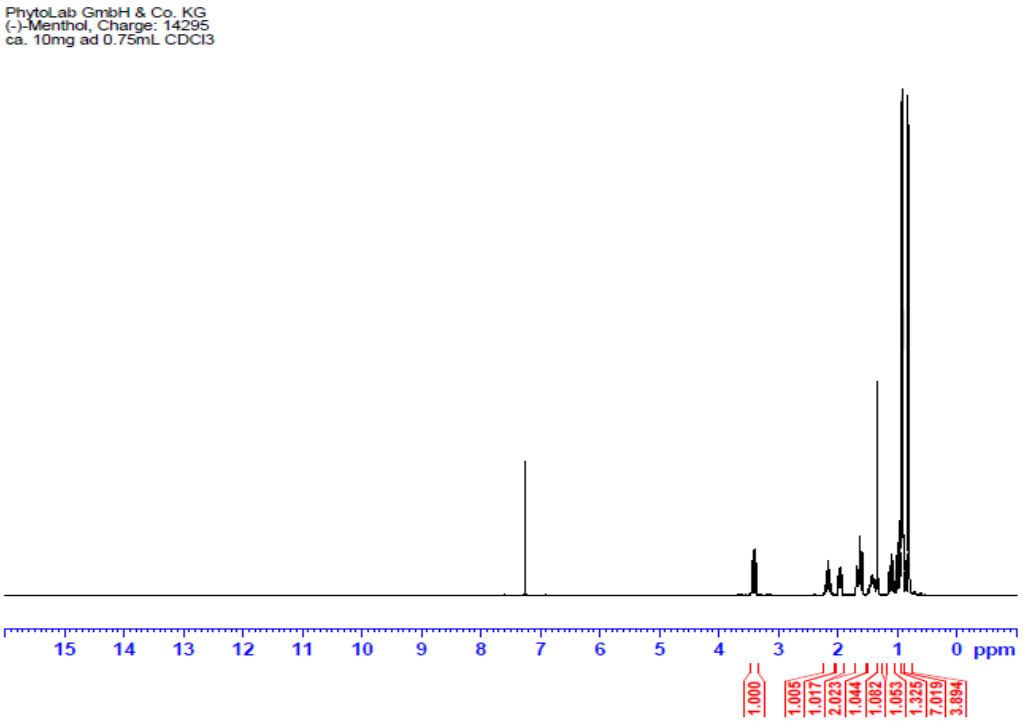
MS spectrum (EI)

Detection: positive mode

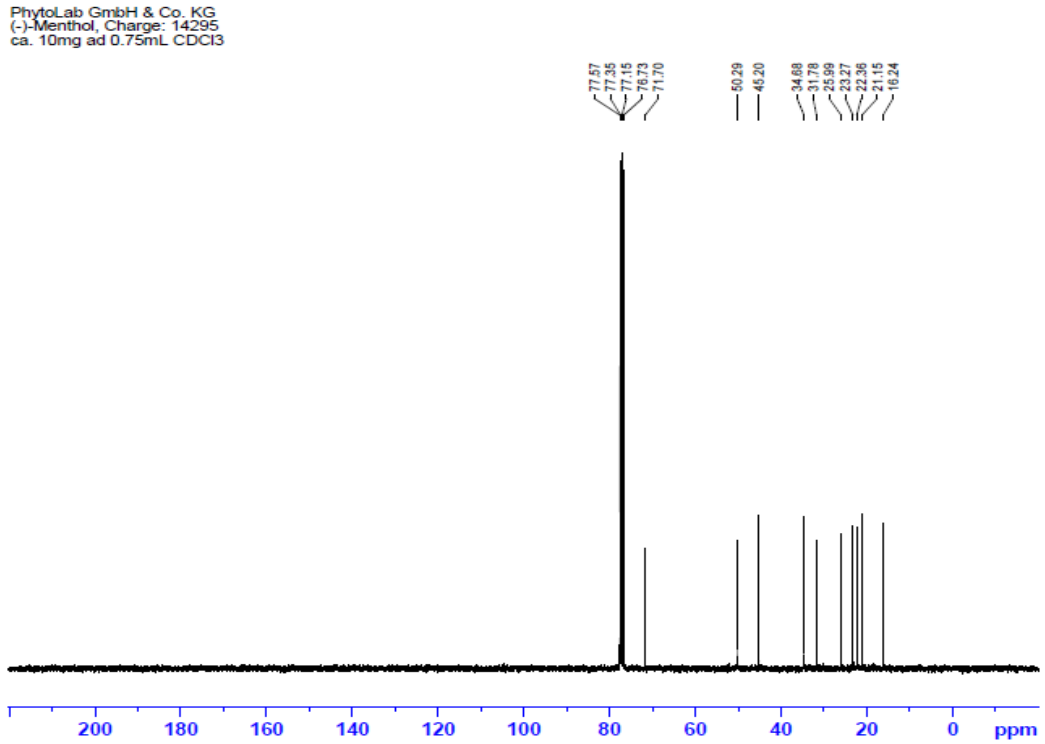


NMR spectra

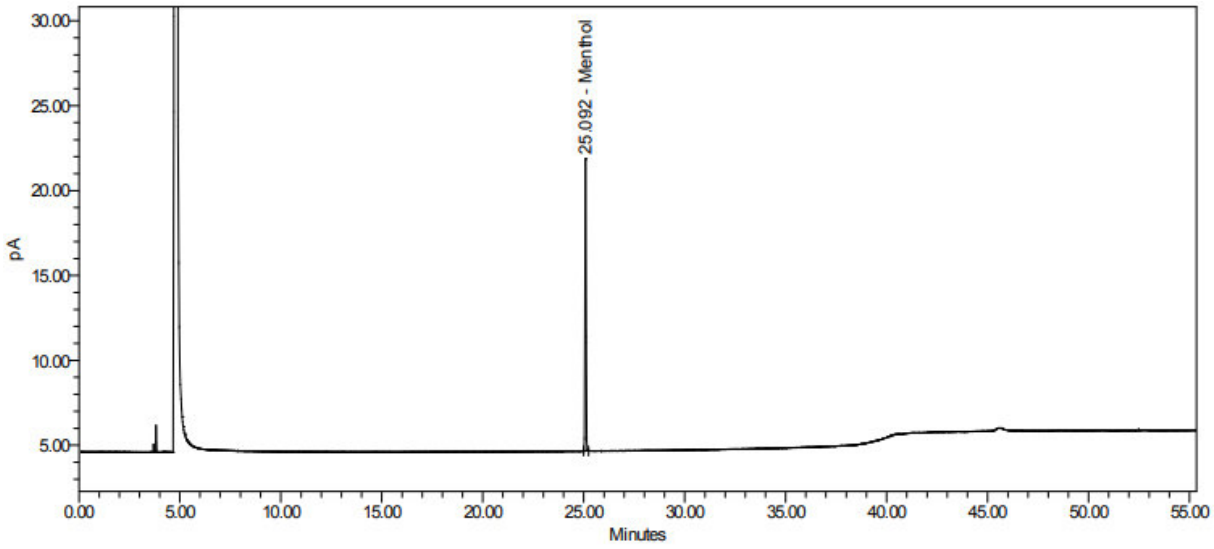
^{1}H-NMR



^{13}C-NMR



Chromatographic purity:



	RT	PrepNo	Name	Area	% Area	EP s/n
1	25.092	3A	Menthol	55.409	100.000	1812.396

Analytical conditions

Column:	DB-Wax; L: 60 m; Id: 0.25 mm; FT: 0.25 µm
Carrier Gas:	Helium 200 kPa constant pressure
temperature gradient	65 °C with 3 °C/min. to 180 °C with 10 °C/min to 200 °C / 15.0 min isoth.
Injection Volume:	1 µl, Split ratio:1:60
Injector Temperature:	225 °C
Sample concentration:	approx. 1.1 mg/1 ml
Sample preparation:	dissolved in ethanol
Detection:	FID 225 °C (O_2: 400 ml/min. H_2: 40 ml/min, Make-up N_2: 30 ml/min)
Special note:	-

Please note: Values on the certificate of analysis may vary as these are average values of at least three injections while above chromatogram and report is only one example. Non-integrated peaks originate from the blank injection.