

Certificate of Analysis

CERTIFIED REFERENCE MATERIAL

27 components: 100mg/l each of n-Heptane (C7) [CAS:142-82-5] ; n-Octane (C8) [CAS:111-65-9] ; n-Nonane (C9) [CAS:111-84-2] ; n-Decane (C10) [CAS:124-18-5] ; n-Undecane (C11) [CAS:1120-21-4] ; n-Dodecane (C12) [CAS:112-40-3] ; n-Tridecane (C13) [CAS:629-50-5] ; n-Tetradecane (C14) [CAS:629-59-4] ; n-Pentadecane (C15) [CAS:629-62-9] ; n-Hexadecane (C16) [CAS:544-76-3] ; n-Heptadecane (C17) [CAS:629-78-7] ; n-Octadecane (C18) [CAS:593-45-3] ; n-Nonadecane (C19) [CAS:629-92-5] ; n-Eicosane (C20) [CAS:112-95-8] ; n-Heneicosane (C21) [CAS:629-94-7] ; n-Docosane (C22) [CAS:629-97-0] ; n-Tricosane (C23) [CAS:638-67-5] ; n-Tetracosane (C24) [CAS:646-31-1] ; n-Pentacosane (C25) [CAS:629-99-2] ; n-Hexacosane (C26) [CAS:630-01-3] ; n-Heptacosane (C27) [CAS:593-49-7] ; n-Octacosane (C28) [CAS:630-02-4] ; n-Nonacosane (C29) [CAS:630-03-5] ; n-Triacontane (C30) [CAS:638-68-6] ; n-Hentriacontane (C31) [CAS:630-04-6] ; n-Dotriacontane (C32) [CAS:544-85-4] ; n-Tritriacontane (C33) [CAS:630-05-7] in n-Hexane

Lot N: 990338
Barcode: 93170086

Ref N: RD0179181

Certification Date: 03.04.2024

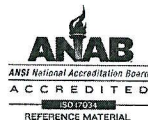
Component	Certified Value* and uncertainty [µg/ml]	CAS	Chemical Formula
n-Heptane (C7)	100.60 ± 1.39	142-82-5	C ₇ H ₁₆
n-Octane (C8)	99.87 ± 1.45	111-65-9	C ₈ H ₁₈
n-Nonane (C9)	100.39 ± 1.36	111-84-2	C ₉ H ₂₀
n-Decane (C10)	100.70 ± 0.98	124-18-5	C ₁₀ H ₂₂
n-Undecane (C11)	99.99 ± 0.97	1120-21-4	C ₁₁ H ₂₄
n-Dodecane (C12)	100.60 ± 0.97	112-40-3	C ₁₂ H ₂₆
n-Tridecane (C13)	100.09 ± 0.97	629-50-5	C ₁₃ H ₂₈
n-Tetradecane (C14)	100.60 ± 0.97	629-59-4	C ₁₄ H ₃₀
n-Pentadecane (C15)	102.10 ± 1.03	629-62-9	C ₁₅ H ₃₂
n-Hexadecane (C16)	101.30 ± 0.98	544-76-3	C ₁₆ H ₃₄
n-Heptadecane (C17)	100.10 ± 0.97	629-78-7	C ₁₇ H ₃₆
n-Octadecane (C18)	100.80 ± 0.98	593-45-3	C ₁₈ H ₃₈
n-Nonadecane (C19)	100.51 ± 2.03	629-92-5	C ₁₉ H ₄₀
n-Eicosane (C20)	100.61 ± 2.04	112-95-8	C ₂₀ H ₄₂
n-Heneicosane (C21)	100.21 ± 2.03	629-94-7	C ₂₁ H ₄₄
n-Docosane (C22)	100.11 ± 2.03	629-97-0	C ₂₂ H ₄₆
n-Tricosane (C23)	100.71 ± 2.04	638-67-5	C ₂₃ H ₄₈
n-Tetracosane (C24)	100.51 ± 2.04	646-31-1	C ₂₄ H ₅₀
n-Pentacosane (C25)	101.21 ± 2.04	629-99-2	C ₂₅ H ₅₂
n-Hexacosane (C26)	100.51 ± 2.04	630-01-3	C ₂₆ H ₅₄
n-Heptacosane (C27)	101.21 ± 2.04	593-49-7	C ₂₇ H ₅₆
n-Octacosane (C28)	99.72 ± 2.03	630-02-4	C ₂₈ H ₅₈
n-Nonacosane (C29)	100.61 ± 2.04	630-03-5	C ₂₉ H ₆₀
n-Triacontane (C30)	100.21 ± 2.03	638-68-6	C ₃₀ H ₆₂
n-Hentriacontane (C31)	100.61 ± 1.82	630-04-6	C ₃₁ H ₆₄
n-Dotriacontane (C32)	100.37 ± 1.51	544-85-4	C ₃₂ H ₆₆
n-Tritriacontane (C33)	100.66 ± 2.12	630-05-7	C ₃₃ H ₆₈

* WQP 5.15.1/2 The certified value was obtained gravimetrically and confirmed experimentally by GC/MS or HPLC

Density 0.6529 g/cm³ at 20°C

Starting Material

Purity, Batch



CPAchem Ltd. is ISO 17034 (Cert No AR-1835)
and ISO/IEC 17025 (Cert No AT-1836) accredited by ANAB

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n-Heptane (C7)	98.5% (41525944)
n-Octane (C8)	98.7% (41469705)
n-Nonane (C9)	98.4% (41498316)
n-Decane (C10)	99.4% (41503423)
n-Undecane (C11)	99.0% (41497234)
n-Dodecane (C12)	99.9% (41502778)
n-Tridecane (C13)	98.9% (41508145)
n-Tetradecane (C14)	99.9% (41442340)
n-Pentadecane (C15)	99.8% (41482513)
n-Hexadecane (C16)	99.8% (41471791)
n-Heptadecane (C17)	99.9% (41509722)
n-Octadecane (C18)	99.8% (41513811)
n-Nonadecane (C19)	99.6% (41524176)
n-Eicosane (C20)	99.8% (41487105)
n-Heneicosane (C21)	99.8% (41487778)
n-Docosane (C22)	99.8% (41529416)
n-Tricosane (C23)	99.9% (41503430)
n-Tetracosane (C24)	99.9% (41524312)
n-Pentacosane (C25)	99.9% (41449417)
n-Hexacosane (C26)	99.9% (41486542)
n-Heptacosane (C27)	99.9% (41487754)
n-Octacosane (C28)	99.8% (41496268)
n-Nonacosane (C29)	99.9% (41454268)
n-Triacontane (C30)	99.7% (41524305)
n-Hentriacontane (C31)	98.3% (41541210)
n-Dotriacontane (C32)	97.3% (41509777)
n-Tritriacontane (C33)	99.7% (41541203)

Storage Conditions: Store in a refrigerator at temperatures between 2°C to 8°C

Expiry Date: 03.05.2025

Concept of Certification and traceability statement:

This certified reference material is produced by gravimetric measurement and dissolving the individual substances in n-Hexane.

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA 4/02 and incorporates the uncertainties of the raw-material purity, the mass and the volume.

The metrological traceability is defined as the "property of a measurement result whereby the result can be related to a reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty".

The metrological traceability is ensured through gravimetric measurement and dissolving of certified reference material/s (traceable to SI) from laboratories/producers, accredited according to ISO 17034.

The measurement results are traceable to SI. All analytical balances used for the preparation of the solution are calibrated yearly under an in-house procedure with class E1 and class E2 analytical weights, traceable to SI (DKD), and are checked daily.

Class A laboratory glassware is used.

The results from temperature measurement are traceable to SI. The thermometers used for solution's calibration are calibrated from an ISO 17025 accredited laboratory. The ambient conditions are controlled with a hygrometer calibrated from an ISO 17025 accredited laboratory.

Both, purity of the starting materials and solvent, were checked using appropriate analytical instrument.

Intended use: For Laboratory Use Only

This CRM is intended for:

Calibration of TLC, GC/FID, GC/TCD, GC/ECD, GC/MS, GC/MS/MS, LC/UV, LC/MS and LC/MS/MS

Validation of analytical methods

Preparation of "working reference samples"

Detection limit and linearity studies

This statement is not intended to restrict the use for other purposes.

Instructions for the correct use of this certified reference material:

This CRM can be used directly or can be diluted in an appropriate solvent. Only a clean class A glassware should be used. Do not pipet from container.

Obtained concentration (in mg/l) after dilution is a result from the multiplication of certified value of CRM concentration and the CRM's volume used for dilution and divided into the flask's volume used for dilution. For quantitative analysis, we recommend analyzing this mixture separately, without mixing it with other solutions, to ensure accurate results for every compound.

Stability and storage:

This CRM is with a guaranteed stability until $\pm 5\%$ of the certified concentration for a period of 12 months. Stability is guaranteed of an unopened original packaging stored, as written in the section: Storage Conditions. Even if the product is stable at normal laboratory conditions, in order to increase its stability, we highly recommend it to be stored in a refrigerator.

The product should be used shortly after opening to avoid concentration changes due to evaporation. Warranty does not apply to a product stored after opening.

Hazardous situation:

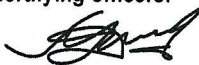
The normal laboratory safety precautions should be observed when working with this RM. Further details for the handling of this RM are available in a safety data sheet.

Level of homogeneity

This solution was mixed according to an in-house procedure (MQP 5.13.1) and is guaranteed to be homogeneous.

To ensure sufficient homogeneity of the sample prior to use thoroughly mix by inversion or sonicate.

Names of certifying officers:

Laboratory:  Margarita Dimitrova

Manager:  Krassimira Taralova

This document QF 5.17.1/1 version 1 is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31, ISO Guide 35, and Eurachem / CITAC Guides

This certificate relates solely to the lot number given above.

All processes (including generating of this certificate) are completely controlled by the specialized Computer-Aided-Manufacturing (CAM) software.

This Certified Reference Material was produced under a quality management system that is:

- Registered to ISO 9001 Quality Management System (Lloyd's Register Quality Assurance Ltd Cert No 0039638)
- Accredited according to ISO/IEC 17025
- Accredited according to ISO 17034

Additional Information

Gravimetric Data

Component	Purity %	Source Lot No	Weighed quantity, g	Final quantity, kg.10 ⁻³	Bulk/ Standard Solution lot No	Concentration mg/kg	Chemist ID
n-Heptane (C7)	98.5	41525944	0.01814	2.8011	94038668	6378.9	AS
		94038668	0.1577	6.5292	93170086	154.069	KR
n-Octane (C8)	98.7	41469705	0.01655	2.9342	94038644	5567.1	AS
		94038644	0.1794	6.5292	93170086	152.965	KR
n-Nonane (C9)	98.4	41498316	0.01924	2.8289	94038651	6692.4	AS
		94038651	0.15	6.5292	93170086	153.749	KR
n-Decane (C10)	99.4	41503423	0.1012	6.6483	93098151	15130.6	KR
		93098151	0.6654	6.5520	93098137	1536.63	KR
		93098137	0.6553	6.5292	93170086	154.223	KR
n-Undecane (C11)	99.0	41497234	0.1009	6.6483	93098151	15025.0	KR
		93098151	0.6654	6.5520	93098137	1525.90	KR
		93098137	0.6553	6.5292	93170086	153.146	KR
n-Dodecane (C12)	99.9	41502778	0.1006	6.6483	93098151	15116.5	KR
		93098151	0.6654	6.5520	93098137	1535.18	KR
		93098137	0.6553	6.5292	93170086	154.077	KR
n-Tridecane (C13)	98.9	41508145	0.1011	6.6483	93098151	15039.6	KR
		93098151	0.6654	6.5520	93098137	1527.38	KR
		93098137	0.6553	6.5292	93170086	153.294	KR
n-Tetradecane (C14)	99.9	41442340	0.1006	6.6483	93098151	15116.5	KR
		93098151	0.6654	6.5520	93098137	1535.18	KR
		93098137	0.6553	6.5292	93170086	154.077	KR
n-Pentadecane (C15)	99.8	41482513	0.1022	6.6483	93098151	15341.7	KR
		93098151	0.6654	6.5520	93098137	1558.06	KR
		93098137	0.6553	6.5292	93170086	156.373	KR
n-Hexadecane (C16)	99.8	41471791	0.1014	6.6483	93098151	15221.5	KR
		93098151	0.6654	6.5520	93098137	1545.85	KR
		93098137	0.6553	6.5292	93170086	155.148	KR
n-Heptadecane (C17)	99.9	41509722	0.1001	6.6483	93098151	15041.4	KR
		93098151	0.6654	6.5520	93098137	1527.56	KR
		93098137	0.6553	6.5292	93170086	153.313	KR

n-Octadecane (C18)	99.8	41513811	0.1009	6.6483	93098151	15146.4	KR
		93098151	0.6654	6.5520	93098137	1538.23	KR
		93098137	0.6553	6.5292	93170086	154.383	KR
n-Nonadecane (C19)	99.6	41524176	0.01009	6.5520	93098137	1533.82	KR
		93098137	0.6553	6.5292	93170086	153.941	KR
n-Eicosane (C20)	99.8	41487105	0.01008	6.5520	93098137	1535.38	KR
		93098137	0.6553	6.5292	93170086	154.097	KR
n-Heneicosane (C21)	99.8	41487778	0.01004	6.5520	93098137	1529.29	KR
		93098137	0.6553	6.5292	93170086	153.486	KR
n-Docosane (C22)	99.8	41529416	0.01003	6.5520	93098137	1527.76	KR
		93098137	0.6553	6.5292	93170086	153.333	KR
n-Tricosane (C23)	99.9	41503430	0.01008	6.5520	93098137	1536.92	KR
		93098137	0.6553	6.5292	93170086	154.252	KR
n-Tetracosane (C24)	99.9	41524312	0.01006	6.5520	93098137	1533.87	KR
		93098137	0.6553	6.5292	93170086	153.945	KR
n-Pentacosane (C25)	99.9	41449417	0.01013	6.5520	93098137	1544.55	KR
		93098137	0.6553	6.5292	93170086	155.017	KR
n-Hexacosane (C26)	99.9	41486542	0.01006	6.5520	93098137	1533.87	KR
		93098137	0.6553	6.5292	93170086	153.945	KR
n-Heptacosane (C27)	99.9	41487754	0.01013	6.5520	93098137	1544.55	KR
		93098137	0.6553	6.5292	93170086	155.017	KR
n-Octacosane (C28)	99.8	41496268	0.00999	6.5520	93098137	1521.67	KR
		93098137	0.6553	6.5292	93170086	152.722	KR
n-Nonacosane (C29)	99.9	41454268	0.01007	6.5520	93098137	1535.39	KR
		93098137	0.6553	6.5292	93170086	154.099	KR
n-Triacontane (C30)	99.7	41524305	0.01005	6.5520	93098137	1529.29	KR
		93098137	0.6553	6.5292	93170086	153.486	KR
n-Hentriacontane (C31)	98.3	41541210	0.0117	2.8509	94038675	4034.2	AS
		94038675	0.2494	6.5292	93170086	154.097	KR
n-Dotriacontane (C32)	97.3	41509777	0.01569	2.8533	94038682	5350.4	AS
		94038682	0.1876	6.5292	93170086	153.731	KR
n-Tritriacontane (C33)	99.7	41541203	0.0096	2.7849	94038699	3436.8	AS
		94038699	0.2929	6.5292	93170086	154.175	KR