

## CERTIFIED REFERENCE MATERIAL

20 components; 1000mg/l each of Triethylamine [CAS:121-44-8] ; Pyridine [CAS:110-86-1] ; N-Ethyldiisopropylamine [CAS:7087-68-5] ; Tetrahydrofuran [CAS:109-99-9] ; 2-Methyltetrahydrofuran [CAS:96-47-9] ; Aniline [CAS:62-53-3] ; Diphenylamine [CAS:122-39-4] ; o-Toluidine [CAS:95-53-4] ; o-Anisidine [CAS:90-04-0] ; 3-Anisidine [CAS:536-90-3] ; 4-Anisidine [CAS:104-94-9] ; p-Toluidine [CAS:106-49-0] ; Nitrobenzene [CAS:98-95-3] ; 1,2-Dinitrobenzene [CAS:528-29-0] ; 1,3-Dinitrobenzene [CAS:99-65-0] ; 1-Chloro-2-nitrobenzene [CAS:88-73-3] ; 1-Chloro-3-nitrobenzene [CAS:121-73-3] ; 1-Chloro-4-nitrobenzene [CAS:100-00-5] ; 2,5-Dichloronitrobenzene [CAS:89-61-2] ; 3,4-Dichloronitrobenzene [CAS:99-54-7] in Methanol

Lot N: 698767  
Barcode: 92643659

Ref N: RD0302291.5

Certification Date: 12.06.2020

Component	Certified Value* and uncertainty [ $\mu\text{g/ml}$ ]	CAS	Chemical Formula
Triethylamine	1000.6 $\pm$ 9.6	121-44-8	C <sub>6</sub> H <sub>15</sub> N
Pyridine	1018.7 $\pm$ 9.7	110-86-1	C <sub>5</sub> H <sub>5</sub> N
N-Ethyldiisopropylamine	1005.6 $\pm$ 9.6	7087-68-5	N/A
Tetrahydrofuran	1003.7 $\pm$ 9.6	109-99-9	C <sub>4</sub> H <sub>8</sub> O
2-Methyltetrahydrofuran	1002.7 $\pm$ 9.6	96-47-9	C <sub>5</sub> H <sub>10</sub> O
Aniline	1038.7 $\pm$ 9.9	62-53-3	C <sub>6</sub> H <sub>7</sub> N
Diphenylamine	1020.0 $\pm$ 15.3	122-39-4	C <sub>12</sub> H <sub>11</sub> N
o-Toluidine	1014.7 $\pm$ 9.7	95-53-4	C <sub>7</sub> H <sub>9</sub> N
o-Anisidine	1007.6 $\pm$ 9.6	90-04-0	C <sub>7</sub> H <sub>9</sub> NO
3-Anisidine	1015.2 $\pm$ 9.7	536-90-3	C <sub>7</sub> H <sub>9</sub> NO
4-Anisidine	999.9 $\pm$ 15.2	104-94-9	C <sub>7</sub> H <sub>9</sub> NO
p-Toluidine	999.7 $\pm$ 15.2	106-49-0	C <sub>7</sub> H <sub>9</sub> N
Nitrobenzene	1013.7 $\pm$ 9.7	98-95-3	C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub>
1,2-Dinitrobenzene	1006.3 $\pm$ 15.3	528-29-0	C <sub>6</sub> H <sub>4</sub> N <sub>2</sub> O <sub>4</sub>
1,3-Dinitrobenzene	1006.3 $\pm$ 16.0	99-65-0	C <sub>6</sub> H <sub>4</sub> N <sub>2</sub> O <sub>4</sub>
1-Chloro-2-nitrobenzene	1001.0 $\pm$ 15.2	88-73-3	C <sub>6</sub> H <sub>4</sub> ClNO <sub>2</sub>
1-Chloro-3-nitrobenzene	1005.6 $\pm$ 16.0	121-73-3	C <sub>6</sub> H <sub>4</sub> ClNO <sub>2</sub>
1-Chloro-4-nitrobenzene	1004.3 $\pm$ 15.3	100-00-5	C <sub>6</sub> H <sub>4</sub> ClNO <sub>2</sub>
2,5-Dichloronitrobenzene	1007.7 $\pm$ 15.3	89-61-2	C <sub>6</sub> H <sub>3</sub> Cl <sub>2</sub> NO <sub>2</sub>
3,4-Dichloronitrobenzene	1009.9 $\pm$ 15.2	99-54-7	C <sub>6</sub> H <sub>3</sub> Cl <sub>2</sub> NO <sub>2</sub>

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

Density 0.7934 g/cm<sup>3</sup> at 20°C

Starting Material	Purity, Batch
Triethylamine	99.6% (41335055)
Pyridine	99.9% (41341827)
N-Ethyldiisopropylamine	99.7% (41353653)
Tetrahydrofuran	99.9% (41339039)
2-Methyltetrahydrofuran	99.9% (41350478)
Aniline	99.9% (41298374)
Diphenylamine	99.8% (41328217)
o-Toluidine	99.9% (41318331)
o-Anisidine	99.5% (41296103)
3-Anisidine	98.4% (41328859)
4-Anisidine	99.2% (41337158)



p-Toluidine	99.9% (41371268)
Nitrobenzene	99.8% (41373828)
1,2-Dinitrobenzene	99.9% (41345641)
1,3-Dinitrobenzene	99.5% (41171882)
1-Chloro-2-nitrobenzene	99.7% (41345528)
1-Chloro-3-nitrobenzene	99.5% (41192108)
1-Chloro-4-nitrobenzene	99.9% (41373941)
2,5-Dichloronitrobenzene	99.9% (41328798)
3,4-Dichloronitrobenzene	99.2% (41345344)

Storage Conditions: Store in a freezer at -18°C and protected from light

Expiry Date: 12.07.2021

**Concept of Certification and traceability statement:**

*This certified reference material is produced by gravimetric measurement and dissolving the individual substances in Methanol.*

*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 – Testing (ANAB Cert No AT-1836)*

*- Accredited according to ISO 17034 - Reference Material Producer (ANAB Cert No AR-1835)*

## Additional Information Gravimetric Data

Component	Purity %	Source Lot No	Weighed quantity, g	Final quantity, kg.10 <sup>-3</sup>	Bulk/Standard Solution lot No	Concentration mg/kg	Chemist ID
Triethylamine	99.6	41335055	0.1002	8.1777	92643710	12203.8	DG
		92643710	1.2299	11.9004	92643659	1261.26	DG
Pyridine	99.9	41341827	0.1017	8.1777	92643710	12423.8	DG
		92643710	1.2299	11.9004	92643659	1283.99	DG
N-Ethyl-diisopropylamine	99.7	41353653	0.1006	8.1777	92643710	12264.8	DG
		92643710	1.2299	11.9004	92643659	1267.57	DG
Tetrahydrofuran	99.9	41339039	0.1002	8.1777	92643710	12240.6	DG
		92643710	1.2299	11.9004	92643659	1265.06	DG
2-Methyltetrahydrofuran	99.9	41350478	0.1001	8.1777	92643710	12228.4	DG
		92643710	1.2299	11.9004	92643659	1263.80	DG
Aniline	99.9	41298374	0.1037	8.1777	92643710	12668.1	DG
		92643710	1.2299	11.9004	92643659	1309.25	DG
Diphenylamine	99.8	41328217	0.01533	11.9004	92643659	1285.62	DG
o-Toluidine	99.9	41318331	0.1013	8.1777	92643710	12375.0	DG
		92643710	1.2299	11.9004	92643659	1278.95	DG
o-Anisidine	99.5	41296103	0.101	8.1777	92643710	12288.9	DG
		92643710	1.2299	11.9004	92643659	1270.05	DG
3-Anisidine	98.4	41328859	0.1029	8.1777	92643710	12381.7	DG
		92643710	1.2299	11.9004	92643659	1279.65	DG
4-Anisidine	99.2	41337158	0.01512	11.9004	92643659	1260.39	DG
p-Toluidine	99.9	41371268	0.01501	11.9004	92643659	1260.05	DG
Nitrobenzene	99.8	41373828	0.1013	8.1777	92643710	12362.5	DG
		92643710	1.2299	11.9004	92643659	1277.67	DG
1,2-Dinitrobenzene	99.9	41345641	0.01511	11.9004	92643659	1268.44	DG
1,3-Dinitrobenzene	99.5	41171882	0.01517	11.9004	92643659	1268.38	DG
1-Chloro-2-nitrobenzene	99.7	41345528	0.01506	11.9004	92643659	1261.71	DG
1-Chloro-3-nitrobenzene	99.5	41192108	0.01516	11.9004	92643659	1267.53	DG
1-Chloro-4-nitrobenzene	99.9	41373941	0.01508	11.9004	92643659	1265.92	DG
2,5-Dichloronitrobenzene	99.9	41328798	0.01513	11.9004	92643659	1270.12	DG
3,4-Dichloronitrobenzene	99.2	41345344	0.01527	11.9004	92643659	1272.89	DG