EUROPEAN COMMISSION
JOINT RESEARCH CENTRE
Institute for Reference Materials and Measurements

CERTIFIED REFERENCE MATERIAL
BCR® – 614
Solution S0

CERTIFICATE OF ANALYSIS

POLYCHLORODIBENZO-*P*-DIOXINS (PCDDs) AND POLYCHLORODIBENZOFURANS (PCDFs) IN N-NONANE		
Congener	Mass fraction	
	Certified value [1] [µg/kg]	Uncertainty [2] [µg/kg]
2,3,7,8-T_4CDD	0.137	0.004
1,2,3,7,8-P_5CDD	0.698	0.014
1,2,3,4,7,8-HCDD	0.688	0.021
1,2,3,6,7,8-HCDD	0.696	0.006
1,2,3,7,8,9-HCDD	0.705	0.008
1,2,3,4,6,7,8-HCDD	1.400	0.020
1,2,3,4,6,7,8,9-O_8CDD	1.396	0.007
2,3,7,8-T_4CDF	0.139 7	0.001 1
1,2,3,7,8-P_5CDF	0.707	0.013
2,3,4,7,8-P_5CDF	0.698	0.005
1,2,3,4,7,8-HCDF	0.700	0.006
1,2,3,6,7,8-HCDF	0.698	0.005
1,2,3,7,8,9-HCDF	0.699	0.009
2,3,4,6,7,8-HCDF	0.694	0.007
1,2,3,4,6,7,8-HCDF	1.396	0.008
1,2,3,4,7,8,9-HCDF	1.394	0.030
1,2,3,4,6,7,8,9-O_8CDF	1.397	0.024

[1] The certified mass fraction has been calculated from the purity of the individual PCDD/F compounds as assessed in a comprehensive study and the gravimetric preparation of the solution. The value is traceable to the International System of Units (SI).

[2] The certified uncertainties have been calculated by combining contributions from the purity study and the gravimetric preparation and are expanded uncertainties with a coverage factor k = 2, corresponding to a level of confidence of about 95 %.

Continued on Page 2.

POLYCHLORODIBENZO-*P*-DIOXINS (PCDDs) AND POLYCHLORODIBENZOFURANS (PCDFs) IN N-NONANE		
Congener	Mass fraction	
	Certified value [1] [µg/kg]	Uncertainty [2] [µg/kg]
^{13}C-2,3,7,8-T_4CDD	13.95	0.06
^{13}C-1,2,3,7,8-P_5CDD	13.9	0.4
^{13}C-1,2,3,4,7,8-HCDD	13.98	0.07
^{13}C-1,2,3,6,7,8-HCDD	13.94	0.24
^{13}C-1,2,3,7,8,9-HCDD	13.95	0.10
^{13}C-1,2,3,4,6,7,8-HCDD	27.9	0.6
^{13}C-1,2,3,4,6,7,8,9-O_8CDD	27.87	0.16
^{13}C-2,3,7,8-T_4CDF	13.96	0.09
^{13}C-1,2,3,7,8-P_5CDF	13.94	0.24
^{13}C-2,3,4,7,8-P_5CDF	13.95	0.06
^{13}C-1,2,3,4,7,8-HCDF	13.90	0.07
^{13}C-1,2,3,6,7,8-HCDF	13.93	0.10
^{13}C-1,2,3,7,8,9-HCDF	13.93	0.10
^{13}C-2,3,4,6,7,8-HCDF	13.93	0.09
^{13}C-1,2,3,4,6,7,8-HCDF	27.92	0.20
^{13}C-1,2,3,4,7,8,9-HCDF	27.87	0.24
^{13}C-1,2,3,4,6,7,8,9-O_8CDF	27.88	0.25
^{13}C-1,2,3,4-T_4CDD	13.94	0.08

1) The certified mass fraction has been calculated from the purity of the individual PCDD/F compounds as assessed in a comprehensive study and the gravimetric preparation of the solution. The value is traceable to the International System of Units (SI).

2) The certified uncertainties have been calculated by combining contributions from the purity study and the gravimetric preparation and are expanded uncertainties with a coverage factor k = 2, corresponding to a level of confidence of about 95 %.

This certificate is valid for one year after purchase.

Sales date:

The minimum sample intake is not critical. The sample can be considered as homogeneous.

NOTE

This material has been certified by BCR (Community Bureau of Reference, the former reference materials programme of the European Commission). The certificate has been revised under the responsibility of IRMM.

Brussels, November 2001
Revised: June 2007

Signed:

Prof. Dr. Hendrik Emons
Unit for Reference Materials
EC-JRC-IRMM
Retieseweg 111
2440 Geel, Belgium

Indicative Values		
Congener	Mass fraction expressed in concentration units [1] [µg/L]	Uncertainty expressed in concentration units [1] [µg/L]
2,3,7,8-T_4CDD	0.098 3	0.002 9
1,2,3,7,8-P_5CDD	0.501	0.010
1,2,3,4,7,8-HCDD	0.494	0.015
1,2,3,6,7,8-HCDD	0.500	0.004
1,2,3,7,8,9-HCDD	0.506	0.006
1,2,3,4,6,7,8-HCDD	1.005	0.014
1,2,3,4,6,7,8,9-O_8CDD	1.001	0.005
2,3,7,8-T_4CDF	0.100 2	0.000 8
1,2,3,7,8-P_5CDF	0.507	0.009
2,3,4,7,8-P_5CDF	0.501	0.004
1,2,3,4,7,8-HCDF	0.502	0.005
1,2,3,6,7,8-HCDF	0.501	0.004
1,2,3,7,8,9-HCDF	0.502	0.007
2,3,4,6,7,8-HCDF	0.498	0.005
1,2,3,4,6,7,8-HCDF	1.001	0.006
1,2,3,4,7,8,9-HCDF	1.001	0.022
1,2,3,4,6,7,8,9-O_8CDF	1.002	0.017
^{13}C-2,3,7,8-T_4CDD	10.01	0.05
^{13}C-1,2,3,7,8-P_5CDD	10.00	0.23
^{13}C-1,2,3,4,7,8-HCDD	10.03	0.05
^{13}C-1,2,3,6,7,8-HCDD	10.00	0.17
^{13}C-1,2,3,7,8,9-HCDD	10.01	0.07
^{13}C-1,2,3,4,6,7,8-HCDD	20.0	0.4
^{13}C-1,2,3,4,6,7,8,9-O_8CDD	20.00	0.12
^{13}C-2,3,7,8-T_4CDF	10.02	0.07
^{13}C-1,2,3,7,8-P_5CDF	10.00	0.17
^{13}C-2,3,4,7,8-P_5CDF	10.01	0.05
^{13}C-1,2,3,4,7,8-HCDF	9.97	0.05
^{13}C-1,2,3,6,7,8-HCDF	10.00	0.08
^{13}C-1,2,3,7,8,9-HCDF	10.00	0.07
^{13}C-2,3,4,6,7,8-HCDF	10.00	0.06
^{13}C-1,2,3,4,6,7,8-HCDF	20.03	0.15
^{13}C-1,2,3,4,7,8,9-HCDF	20.00	0.17
^{13}C-1,2,3,4,6,7,8,9-O_8CDF	20.01	0.18
^{13}C-1,2,3,4-T_4CDD	10.00	0.06

[1] For the conversion to concentration units (µg/L) a density value for n-nonane at 20 °C of 0.7176 g/mL was used. It is stressed that these values are not certified.

DESCRIPTION OF THE SAMPLE

The solution of natural and labelled PCDD and PCDF congeners in n-nonane is presented in brown glass ampoules sealed under helium gas. The ampoule contains about 1 mL solution. The solution is intended for very low level determinations of PCDD/Fs, e. g. in case of milk analysis.

ANALYTICAL METHOD USED FOR CERTIFICATION

The identity of the individual congeners was assessed by ^{1}H-NMR, the purity of the crystals was verified by HRGC with FID, ECD and HRMS as final detection, HPLC with diode array detection and ICP-MS for inorganic impurities. The solutions were prepared in n-nonane of verified purity on calibrated analytical balances.

PARTICIPANTS

- Centre d'Analyse et de Recherche sur les Substances Organiques, CARSO, Lyon (FR)
- European Commission, Joint Research Centre, Institute for Reference Materials and Measurements, Geel (BE)
- University of Amsterdam, Amsterdam (NL)
- Vlaamse Instelling voor Technologisch Onderzoek, VITO, Mol (BE)

SAFETY INFORMATION

To avoid injury to persons or contamination of laboratories, the ampoule should be handled only by trained staff. National regulations regarding storage, use, disposal, and relocation of such materials may apply and should be strictly adhered to.

INSTRUCTIONS FOR USE

The solution BCR-614 S0 is intended as GC-HRMS calibration solution and is ready for use. Before attempting any sampling, the solution should be allowed to attain room temperature and should be re-homogenised thoroughly, e.g. by sonication. Before use, it is recommended to weigh each ampoule, to check for solvent evaporation losses, on a calibrated analytical balance and verify the mass indicated on the acrylic glass tube used for packing each individual ampoule.
Please note that an additional solution (BCR-614 S9) may be used to check the instrumental performance, particularly with regard to the chromatographic separation of the 2,3,7,8-Cl substituted congeners from potential interfering compounds. With the current technology, the separation of all analytes from interfering isomers in environmental samples requires the analysis to be performed on at least two capillary columns with different polarity. More details are given in the certification report of BCR-614 in the chapter on instructions for use.
Special laboratory safety precautions should be observed when opening the glass ampoule. Opening must be performed in a fume hood situated in a restricted access area, wearing the appropriate protective clothing and gloves. After opening the content should be transferred to a vial suitable for storage of standard solutions. Throughout the use it is recommended to check for solvent evaporation losses by controlling the mass of the vial each time before and after sampling.

STORAGE

Upon receipt the unopened containers should be stored at a maximum temperature of 4 ºC in the dark.
However, the European Commission cannot be held responsible for changes that happen during storage of the material at the customer's premises, especially of opened samples.

LEGAL NOTICE

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(b) assume any liability with respect to, or for damages resulting from, the use of any information, material, apparatus, method or process disclosed in this document save for loss or damage arising solely and directly from the negligence of IRMM or any of its subsidiaries.

NOTE

A technical report on the production of BCR-614 Solution S0 is available on the internet (http://www.irmm.jrc.be). A paper copy can be obtained from IRMM on request.

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EUROPEAN COMMISSION
JOINT RESEARCH CENTRE
Institute for Reference Materials and Measurements

CERTIFIED REFERENCE MATERIAL
BCR® – 614
Solution S1

CERTIFICATE OF ANALYSIS

POLYCHLORODIBENZO-*P*-DIOXINS (PCDDs) AND POLYCHLORODIBENZOFURANS (PCDFs) IN N-NONANE		
Congener	Mass fraction	
	Certified value [1] [µg/kg]	Uncertainty [2] [µg/kg]
2,3,7,8-T_4CDD	0.273	0.008
1,2,3,7,8-P_5CDD	1.394	0.027
1,2,3,4,7,8-HCDD	1.37	0.05
1,2,3,6,7,8-HCDD	1.391	0.010
1,2,3,7,8,9-HCDD	1.408	0.015
1,2,3,4,6,7,8-HCDD	2.80	0.04
1,2,3,4,6,7,8,9-O_8CDD	2.787	0.010
2,3,7,8-T_4CDF	0.279 0	0.002 1
1,2,3,7,8-P_5CDF	1.412	0.025
2,3,4,7,8-P_5CDF	1.395	0.008
1,2,3,4,7,8-HCDF	1.398	0.011
1,2,3,6,7,8-HCDF	1.393	0.009
1,2,3,7,8,9-HCDF	1.397	0.017
2,3,4,6,7,8-HCDF	1.387	0.012
1,2,3,4,6,7,8-HCDF	2.787	0.012
1,2,3,4,7,8,9-HCDF	2.78	0.06
1,2,3,4,6,7,8,9-O_8CDF	2.79	0.05

[1] The certified mass fraction has been calculated from the purity of the individual PCDD/F compounds as assessed in a comprehensive study and the gravimetric preparation of the solution. The value is traceable to the International System of Units (SI).

[2] The certified uncertainties have been calculated by combining contributions from the purity study and the gravimetric preparation and are expanded uncertainties with a coverage factor k = 2, corresponding to a level of confidence of about 95 %.

Continued on Page 2.

POLYCHLORODIBENZO-*P*-DIOXINS (PCDDs) AND POLYCHLORODIBENZOFURANS (PCDFs) IN N-NONANE		
Congener	Mass fraction	
	Certified value [1] [µg/kg]	Uncertainty [2] [µg/kg]
^{13}C-2,3,7,8-T_4CDD	13.95	0.06
^{13}C-1,2,3,7,8-P_5CDD	13.9	0.4
^{13}C-1,2,3,4,7,8-HCDD	13.98	0.07
^{13}C-1,2,3,6,7,8-HCDD	13.93	0.24
^{13}C-1,2,3,7,8,9-HCDD	13.94	0.10
^{13}C-1,2,3,4,6,7,8-HCDD	27.9	0.6
^{13}C-1,2,3,4,6,7,8,9-O_8CDD	27.86	0.16
^{13}C-2,3,7,8-T_4CDF	13.96	0.09
^{13}C-1,2,3,7,8-P_5CDF	13.93	0.24
^{13}C-2,3,4,7,8-P_5CDF	13.94	0.06
^{13}C-1,2,3,4,7,8-HCDF	13.89	0.07
^{13}C-1,2,3,6,7,8-HCDF	13.93	0.11
^{13}C-1,2,3,7,8,9-HCDF	13.92	0.10
^{13}C-2,3,4,6,7,8-HCDF	13.93	0.09
^{13}C-1,2,3,4,6,7,8-HCDF	27.90	0.20
^{13}C-1,2,3,4,7,8,9-HCDF	27.86	0.24
^{13}C-1,2,3,4,6,7,8,9-O_8CDF	27.87	0.25
^{13}C-1,2,3,4-T_4CDD	13.93	0.07

1) The certified mass fraction has been calculated from the purity of the individual PCDD/F compounds as assessed in a comprehensive study and the gravimetric preparation of the solution. The value is traceable to the International System of Units (SI).

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Brussels, November 2001
Revised: June 2007

Signed: _____

Prof. Dr. Hendrik Emons
Unit for Reference Materials
EC-JRC-IRMM
Retieseweg 111
2440 Geel, Belgium

Indicative Values		
Congener	Mass fraction expressed in concentration units [1] [µg/L]	Uncertainty expressed in concentration units [1] [µg/L]
2,3,7,8-T_4CDD	0.196	0.006
1,2,3,7,8-P_5CDD	1.000	0.020
1,2,3,4,7,8-HCDD	0.986	0.030
1,2,3,6,7,8-HCDD	0.998	0.007
1,2,3,7,8,9-HCDD	1.011	0.011
1,2,3,4,6,7,8-HCDD	2.006	0.028
1,2,3,4,6,7,8,9-O_8CDD	2.000	0.007
2,3,7,8-T_4CDF	0.200 2	0.001 5
1,2,3,7,8-P_5CDF	1.013	0.018
2,3,4,7,8-P_5CDF	1.001	0.006
1,2,3,4,7,8-HCDF	1.003	0.008
1,2,3,6,7,8-HCDF	1.000	0.006
1,2,3,7,8,9-HCDF	1.002	0.012
2,3,4,6,7,8-HCDF	0.995	0.009
1,2,3,4,6,7,8-HCDF	2.000	0.009
1,2,3,4,7,8,9-HCDF	2.00	0.05
1,2,3,4,6,7,8,9-O_8CDF	2.00	0.04
^{13}C-2,3,7,8-T_4CDD	10.01	0.05
^{13}C-1,2,3,7,8-P_5CDD	10.00	0.23
^{13}C-1,2,3,4,7,8-HCDD	10.03	0.05
^{13}C-1,2,3,6,7,8-HCDD	10.00	0.17
^{13}C-1,2,3,7,8,9-HCDD	10.01	0.07
^{13}C-1,2,3,4,6,7,8-HCDD	20.0	0.4
^{13}C-1,2,3,4,6,7,8,9-O_8CDD	19.99	0.11
^{13}C-2,3,7,8-T_4CDF	10.01	0.07
^{13}C-1,2,3,7,8-P_5CDF	10.00	0.17
^{13}C-2,3,4,7,8-P_5CDF	10.00	0.05
^{13}C-1,2,3,4,7,8-HCDF	9.97	0.05
^{13}C-1,2,3,6,7,8-HCDF	9.99	0.08
^{13}C-1,2,3,7,8,9-HCDF	9.99	0.07
^{13}C-2,3,4,6,7,8-HCDF	9.99	0.06
^{13}C-1,2,3,4,6,7,8-HCDF	20.02	0.14
^{13}C-1,2,3,4,7,8,9-HCDF	19.99	0.17
^{13}C-1,2,3,4,6,7,8,9-O_8CDF	20.00	0.18
^{13}C-1,2,3,4-T_4CDD	10.00	0.05

[1] For the conversion to concentration units (µg/L) a density value for n-nonane at 20 °C of 0.7176 g/mL was used. It is stressed that these values are not certified.

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The solution of natural and labelled PCDD and PCDF congeners in n-nonane is presented in brown glass ampoules sealed under helium gas. The ampoule contains about 1 mL solution.

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The identity of the individual congeners was assessed by ^{1}H-NMR, the purity of the crystals was verified by HRGC with FID, ECD and HRMS as final detection, HPLC with diode array detection and ICP-MS for inorganic impurities. The solutions were prepared in n-nonane of verified purity on calibrated analytical balances.

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INSTRUCTIONS FOR USE

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Please note that an additional solution (BCR-614 S9) may be used to check the instrumental performance, particularly with regard to the chromatographic separation of the 2,3,7,8-Cl substituted congeners from potential interfering compounds. With the current technology, the separation of all analytes from interfering isomers in environmental samples requires the analysis to be performed on at least two capillary columns with different polarity. More details are given in the certification report of BCR-614 in the chapter on instructions for use.
Special laboratory safety precautions should be observed when opening the glass ampoule. Opening must be performed in a fume hood situated in a restricted access area, wearing the appropriate protective clothing and gloves. After opening the content should be transferred to a vial suitable for storage of standard solutions. Throughout the use it is recommended to check for solvent evaporation losses by controlling the mass of the vial each time before and after sampling.

STORAGE

Upon receipt the unopened containers should be stored at a maximum temperature of 4 ºC in the dark.
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EUROPEAN COMMISSION
JOINT RESEARCH CENTRE
Institute for Reference Materials and Measurements

CERTIFIED REFERENCE MATERIAL
BCR® – 614
Solution S2

CERTIFICATE OF ANALYSIS

POLYCHLORODIBENZO-*P*-DIOXINS (PCDDs) AND POLYCHLORODIBENZOFURANS (PCDFs) IN N-NONANE		
Congener	Mass fraction	
	Certified value [1] [µg/kg]	Uncertainty [2] [µg/kg]
2,3,7,8-T_4CDD	1.09	0.04
1,2,3,7,8-P_5CDD	5.57	0.11
1,2,3,4,7,8-HCDD	5.49	0.17
1,2,3,6,7,8-HCDD	5.56	0.04
1,2,3,7,8,9-HCDD	5.63	0.06
1,2,3,4,6,7,8-HCDD	11.18	0.16
1,2,3,4,6,7,8,9-O_8CDD	11.15	0.04
2,3,7,8-T_4CDF	1.116	0.008
1,2,3,7,8-P_5CDF	5.65	0.10
2,3,4,7,8-P_5CDF	5.58	0.03
1,2,3,4,7,8-HCDF	5.59	0.05
1,2,3,6,7,8-HCDF	5.57	0.04
1,2,3,7,8,9-HCDF	5.59	0.07
2,3,4,6,7,8-HCDF	5.55	0.05
1,2,3,4,6,7,8-HCDF	11.15	0.05
1,2,3,4,7,8,9-HCDF	11.14	0.24
1,2,3,4,6,7,8,9-O_8CDF	11.16	0.19

[1] The certified mass fraction has been calculated from the purity of the individual PCDD/F compounds as assessed in a comprehensive study and the gravimetric preparation of the solution. The value is traceable to the International System of Units (SI).

[2] The certified uncertainties have been calculated by combining contributions from the purity study and the gravimetric preparation and are expanded uncertainties with a coverage factor k = 2, corresponding to a level of confidence of about 95 %.

Continued on Page 2.

POLYCHLORODIBENZO-*P*-DIOXINS (PCDDs) AND POLYCHLORODIBENZOFURANS (PCDFs) IN N-NONANE		
Congener	Mass fraction	
	Certified value [1] [µg/kg]	Uncertainty [2] [µg/kg]
^{13}C-2,3,7,8-T_4CDD	13.95	0.06
^{13}C-1,2,3,7,8-P_5CDD	13.9	0.4
^{13}C-1,2,3,4,7,8-HCDD	13.98	0.07
^{13}C-1,2,3,6,7,8-HCDD	13.93	0.24
^{13}C-1,2,3,7,8,9-HCDD	13.94	0.10
^{13}C-1,2,3,4,6,7,8-HCDD	27.9	0.6
^{13}C-1,2,3,4,6,7,8,9-O_8CDD	27.86	0.16
^{13}C-2,3,7,8-T_4CDF	13.96	0.09
^{13}C-1,2,3,7,8-P_5CDF	13.93	0.24
^{13}C-2,3,4,7,8-P_5CDF	13.94	0.06
^{13}C-1,2,3,4,7,8-HCDF	13.89	0.07
^{13}C-1,2,3,6,7,8-HCDF	13.93	0.11
^{13}C-1,2,3,7,8,9-HCDF	13.93	0.10
^{13}C-2,3,4,6,7,8-HCDF	13.93	0.09
^{13}C-1,2,3,4,6,7,8-HCDF	27.90	0.20
^{13}C-1,2,3,4,7,8,9-HCDF	27.86	0.24
^{13}C-1,2,3,4,6,7,8,9-O_8CDF	27.87	0.25
^{13}C-1,2,3,4-T_4CDD	13.93	0.08

1) The certified mass fraction has been calculated from the purity of the individual PCDD/F compounds as assessed in a comprehensive study and the gravimetric preparation of the solution. The value is traceable to the International System of Units (SI).

2) The certified uncertainties have been calculated by combining contributions from the purity study and the gravimetric preparation and are expanded uncertainties with a coverage factor k = 2, corresponding to a level of confidence of about 95 %.

This certificate is valid for one year after purchase.

Sales date:

The minimum sample intake is not critical. The sample can be considered as homogeneous.

NOTE

This material has been certified by BCR (Community Bureau of Reference, the former reference materials programme of the European Commission). The certificate has been revised under the responsibility of IRMM.

Brussels, November 2001
Revised: June 2007

Signed: _____

Prof. Dr. Hendrik Emons
Unit for Reference Materials
EC-JRC-IRMM
Retieseweg 111
2440 Geel, Belgium

Indicative Values		
Congener	Mass fraction expressed in concentration units [1] [µg/L]	Uncertainty expressed in concentration units [1] [µg/L]
2,3,7,8-T_4CDD	0.785	0.023
1,2,3,7,8-P_5CDD	4.00	0.08
1,2,3,4,7,8-HCDD	3.94	0.12
1,2,3,6,7,8-HCDD	3.992	0.027
1,2,3,7,8,9-HCDD	4.04	0.05
1,2,3,4,6,7,8-HCDD	8.02	0.11
1,2,3,4,6,7,8,9-O_8CDD	8.000	0.027
2,3,7,8-T_4CDF	0.801	0.006
1,2,3,7,8-P_5CDF	4.05	0.07
2,3,4,7,8-P_5CDF	4.004	0.022
1,2,3,4,7,8-HCDF	4.01	0.04
1,2,3,6,7,8-HCDF	3.999	0.024
1,2,3,7,8,9-HCDF	4.01	0.05
2,3,4,6,7,8-HCDF	3.98	0.04
1,2,3,4,6,7,8-HCDF	8.00	0.04
1,2,3,4,7,8,9-HCDF	7.99	0.17
1,2,3,4,6,7,8,9-O_8CDF	8.01	0.14
^{13}C-2,3,7,8-T_4CDD	10.01	0.05
^{13}C-1,2,3,7,8-P_5CDD	10.00	0.23
^{13}C-1,2,3,4,7,8-HCDD	10.03	0.05
^{13}C-1,2,3,6,7,8-HCDD	10.00	0.17
^{13}C-1,2,3,7,8,9-HCDD	10.01	0.07
^{13}C-1,2,3,4,6,7,8-HCDD	20.0	0.4
^{13}C-1,2,3,4,6,7,8,9-O_8CDD	19.99	0.11
^{13}C-2,3,7,8-T_4CDF	10.01	0.07
^{13}C-1,2,3,7,8-P_5CDF	10.00	0.17
^{13}C-2,3,4,7,8-P_5CDF	10.00	0.05
^{13}C-1,2,3,4,7,8-HCDF	9.97	0.05
^{13}C-1,2,3,6,7,8-HCDF	9.99	0.08
^{13}C-1,2,3,7,8,9-HCDF	9.99	0.07
^{13}C-2,3,4,6,7,8-HCDF	9.99	0.06
^{13}C-1,2,3,4,6,7,8-HCDF	20.02	0.15
^{13}C-1,2,3,4,7,8,9-HCDF	19.99	0.17
^{13}C-1,2,3,4,6,7,8,9-O_8CDF	20.00	0.18
^{13}C-1,2,3,4-T_4CDD	10.00	0.06

[1] For the conversion to concentration units (µg/L) a density value for n-nonane at 20 °C of 0.7176 g/mL was used. It is stressed that these values are not certified.

DESCRIPTION OF THE SAMPLE

The solution of natural and labelled PCDD and PCDF congeners in n-nonane is presented in brown glass ampoules sealed under helium gas. The ampoule contains about 1 mL solution.

ANALYTICAL METHOD USED FOR CERTIFICATION

The identity of the individual congeners was assessed by ^{1}H-NMR, the purity of the crystals was verified by HRGC with FID, ECD and HRMS as final detection, HPLC with diode array detection and ICP-MS for inorganic impurities. The solutions were prepared in n-nonane of verified purity on calibrated analytical balances.

PARTICIPANTS

- Centre d'Analyse et de Recherche sur les Substances Organiques, CARSO, Lyon (FR)
- European Commission, Joint Research Centre, Institute for Reference Materials and Measurements, Geel (BE)
- University of Amsterdam, Amsterdam (NL)
- Vlaamse Instelling voor Technologisch Onderzoek, VITO, Mol (BE)

SAFETY INFORMATION

To avoid injury to persons or contamination of laboratories, the ampoule should be handled only by trained staff. National regulations regarding storage, use, disposal, and relocation of such materials may apply and should be strictly adhered to.

INSTRUCTIONS FOR USE

The solution BCR-614 S2 is intended as GC-HRMS calibration solution and is ready for use. Before attempting any sampling, the solution should be allowed to attain room temperature and should be re-homogenised thoroughly, e.g. by sonication. Before use, it is recommended to weigh each ampoule, to check for solvent evaporation losses, on a calibrated analytical balance and verify the mass indicated on the acrylic glass tube used for packing each individual ampoule.
Please note that an additional solution (BCR-614 S9) may be used to check the instrumental performance, particularly with regard to the chromatographic separation of the 2,3,7,8-Cl substituted congeners from potential interfering compounds. With the current technology, the separation of all analytes from interfering isomers in environmental samples requires the analysis to be performed on at least two capillary columns with different polarity. More details are given in the certification report of BCR-614 in the chapter on instructions for use.
Special laboratory safety precautions should be observed when opening the glass ampoule. Opening must be performed in a fume hood situated in a restricted access area, wearing the appropriate protective clothing and gloves. After opening the content should be transferred to a vial suitable for storage of standard solutions. Throughout the use it is recommended to check for solvent evaporation losses by controlling the mass of the vial each time before and after sampling.

STORAGE

Upon receipt the unopened containers should be stored at a maximum temperature of 4 ºC in the dark.
However, the European Commission cannot be held responsible for changes that happen during storage of the material at the customer's premises, especially of opened samples.

LEGAL NOTICE

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(b) assume any liability with respect to, or for damages resulting from, the use of any information, material, apparatus, method or process disclosed in this document save for loss or damage arising solely and directly from the negligence of IRMM or any of its subsidiaries.

NOTE

A technical report on the production of BCR-614 Solution S2 is available on the internet (http://www.irmm.jrc.be). A paper copy can be obtained from IRMM on request.

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EUROPEAN COMMISSION
JOINT RESEARCH CENTRE
Institute for Reference Materials and Measurements

CERTIFIED REFERENCE MATERIAL
BCR® – 614
Solution S3

CERTIFICATE OF ANALYSIS

POLYCHLORODIBENZO-*P*-DIOXINS (PCDDs) AND POLYCHLORODIBENZOFURANS (PCDFs) IN N-NONANE		
Congener	Mass fraction	
	Certified value [1] [µg/kg]	Uncertainty [2] [µg/kg]
2,3,7,8-T_4CDD	5.47	0.16
1,2,3,7,8-P_5CDD	27.9	0.6
1,2,3,4,7,8-HCDD	27.5	0.9
1,2,3,6,7,8-HCDD	27.81	0.19
1,2,3,7,8,9-HCDD	28.17	0.30
1,2,3,4,6,7,8-HCDD	55.9	0.8
1,2,3,4,6,7,8,9-O_8CDD	55.74	0.19
2,3,7,8-T_4CDF	5.58	0.04
1,2,3,7,8-P_5CDF	28.2	0.5
2,3,4,7,8-P_5CDF	27.90	0.16
1,2,3,4,7,8-HCDF	27.96	0.22
1,2,3,6,7,8-HCDF	27.87	0.17
1,2,3,7,8,9-HCDF	27.9	0.4
2,3,4,6,7,8-HCDF	27.73	0.23
1,2,3,4,6,7,8-HCDF	55.74	0.24
1,2,3,4,7,8,9-HCDF	55.7	1.2
1,2,3,4,6,7,8,9-O_8CDF	55.8	1.0

[1] The certified mass fraction has been calculated from the purity of the individual PCDD/F compounds as assessed in a comprehensive study and the gravimetric preparation of the solution. The value is traceable to the International System of Units (SI).

[2] The certified uncertainties have been calculated by combining contributions from the purity study and the gravimetric preparation and are expanded uncertainties with a coverage factor k = 2, corresponding to a level of confidence of about 95 %.

Continued on Page 2.

POLYCHLORODIBENZO-*P*-DIOXINS (PCDDs) AND POLYCHLORODIBENZOFURANS (PCDFs) IN N-NONANE		
Congener	Mass fraction	
	Certified value [1] [µg/kg]	Uncertainty [2] [µg/kg]
^{13}C-2,3,7,8-T_4CDD	13.95	0.06
^{13}C-1,2,3,7,8-P_5CDD	13.9	0.4
^{13}C-1,2,3,4,7,8-HCDD	13.98	0.07
^{13}C-1,2,3,6,7,8-HCDD	13.93	0.24
^{13}C-1,2,3,7,8,9-HCDD	13.95	0.10
^{13}C-1,2,3,4,6,7,8-HCDD	27.9	0.6
^{13}C-1,2,3,4,6,7,8,9-O_8CDD	27.87	0.16
^{13}C-2,3,7,8-T_4CDF	13.96	0.09
^{13}C-1,2,3,7,8-P_5CDF	13.93	0.24
^{13}C-2,3,4,7,8-P_5CDF	13.94	0.06
^{13}C-1,2,3,4,7,8-HCDF	13.90	0.07
^{13}C-1,2,3,6,7,8-HCDF	13.93	0.11
^{13}C-1,2,3,7,8,9-HCDF	13.93	0.10
^{13}C-2,3,4,6,7,8-HCDF	13.93	0.09
^{13}C-1,2,3,4,6,7,8-HCDF	27.91	0.20
^{13}C-1,2,3,4,7,8,9-HCDF	27.87	0.24
^{13}C-1,2,3,4,6,7,8,9-O_8CDF	27.88	0.25
^{13}C-1,2,3,4-T_4CDD	13.93	0.07

1) The certified mass fraction has been calculated from the purity of the individual PCDD/F compounds as assessed in a comprehensive study and the gravimetric preparation of the solution. The value is traceable to the International System of Units (SI).

2) The certified uncertainties have been calculated by combining contributions from the purity study and the gravimetric preparation and are expanded uncertainties with a coverage factor k = 2, corresponding to a level of confidence of about 95 %.

This certificate is valid for one year after purchase.

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The minimum sample intake is not critical. The sample can be considered as homogeneous.

NOTE

This material has been certified by BCR (Community Bureau of Reference, the former reference materials programme of the European Commission). The certificate has been revised under the responsibility of IRMM.

Brussels, November 2001
Revised: June 2007

Signed: _____

Prof. Dr. Hendrik Emons
Unit for Reference Materials
EC-JRC-IRMM
Retieseweg 111
2440 Geel, Belgium

Indicative Values		
Congener	Mass fraction expressed in concentration units [1] [µg/L]	Uncertainty expressed in concentration units [1] [µg/L]
2,3,7,8-T_4CDD	3.92	0.12
1,2,3,7,8-P_5CDD	20.0	0.4
1,2,3,4,7,8-HCDD	19.7	0.6
1,2,3,6,7,8-HCDD	19.96	0.14
1,2,3,7,8,9-HCDD	20.21	0.21
1,2,3,4,6,7,8-HCDD	40.1	0.6
1,2,3,4,6,7,8,9-O_8CDD	40.00	0.14
2,3,7,8-T_4CDF	4.003	0.029
1,2,3,7,8-P_5CDF	20.3	0.4
2,3,4,7,8-P_5CDF	20.02	0.11
1,2,3,4,7,8-HCDF	20.06	0.16
1,2,3,6,7,8-HCDF	20.00	0.12
1,2,3,7,8,9-HCDF	20.04	0.24
2,3,4,6,7,8-HCDF	19.90	0.17
1,2,3,4,6,7,8-HCDF	40.00	0.17
1,2,3,4,7,8,9-HCDF	40.0	0.9
1,2,3,4,6,7,8,9-O_8CDF	40.0	0.7
^{13}C-2,3,7,8-T_4CDD	10.01	0.05
^{13}C-1,2,3,7,8-P_5CDD	10.00	0.23
^{13}C-1,2,3,4,7,8-HCDD	10.03	0.05
^{13}C-1,2,3,6,7,8-HCDD	10.00	0.17
^{13}C-1,2,3,7,8,9-HCDD	10.01	0.07
^{13}C-1,2,3,4,6,7,8-HCDD	20.0	0.4
^{13}C-1,2,3,4,6,7,8,9-O_8CDD	20.00	0.11
^{13}C-2,3,7,8-T_4CDF	10.02	0.07
^{13}C-1,2,3,7,8-P_5CDF	10.00	0.17
^{13}C-2,3,4,7,8-P_5CDF	10.01	0.05
^{13}C-1,2,3,4,7,8-HCDF	9.97	0.05
^{13}C-1,2,3,6,7,8-HCDF	10.00	0.08
^{13}C-1,2,3,7,8,9-HCDF	10.00	0.07
^{13}C-2,3,4,6,7,8-HCDF	10.00	0.06
^{13}C-1,2,3,4,6,7,8-HCDF	20.03	0.14
^{13}C-1,2,3,4,7,8,9-HCDF	20.00	0.17
^{13}C-1,2,3,4,6,7,8,9-O_8CDF	20.00	0.18
^{13}C-1,2,3,4-T_4CDD	10.00	0.05

[1] For the conversion to concentration units (µg/L) a density value for n-nonane at 20 °C of 0.7176 g/mL was used. It is stressed that these values are not certified.

DESCRIPTION OF THE SAMPLE

The solution of natural and labelled PCDD and PCDF congeners in n-nonane is presented in brown glass ampoules sealed under helium gas. The ampoule contains about 1 mL solution.

ANALYTICAL METHOD USED FOR CERTIFICATION

The identity of the individual congeners was assessed by ^{1}H-NMR, the purity of the crystals was verified by HRGC with FID, ECD and HRMS as final detection, HPLC with diode array detection and ICP-MS for inorganic impurities. The solutions were prepared in n-nonane of verified purity on calibrated analytical balances.

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- University of Amsterdam, Amsterdam (NL)
- Vlaamse Instelling voor Technologisch Onderzoek, VITO, Mol (BE)

SAFETY INFORMATION

To avoid injury to persons or contamination of laboratories, the ampoule should be handled only by trained staff. National regulations regarding storage, use, disposal, and relocation of such materials may apply and should be strictly adhered to.

INSTRUCTIONS FOR USE

The solution BCR-614 S3 is intended as GC-HRMS calibration solution and is ready for use. Before attempting any sampling, the solution should be allowed to attain room temperature and should be re-homogenised thoroughly, e.g. by sonication. Before use, it is recommended to weigh each ampoule, to check for solvent evaporation losses, on a calibrated analytical balance and verify the mass indicated on the acrylic glass tube used for packing each individual ampoule.
Please note that an additional solution (BCR-614 S9) may be used to check the instrumental performance, particularly with regard to the chromatographic separation of the 2,3,7,8-Cl substituted congeners from potential interfering compounds. With the current technology, the separation of all analytes from interfering isomers in environmental samples requires the analysis to be performed on at least two capillary columns with different polarity. More details are given in the certification report of BCR-614 in the chapter on instructions for use.
Special laboratory safety precautions should be observed when opening the glass ampoule. Opening must be performed in a fume hood situated in a restricted access area, wearing the appropriate protective clothing and gloves. After opening the content should be transferred to a vial suitable for storage of standard solutions. Throughout the use it is recommended to check for solvent evaporation losses by controlling the mass of the vial each time before and after sampling.

STORAGE

Upon receipt the unopened containers should be stored at a maximum temperature of 4 ºC in the dark.
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LEGAL NOTICE

NOTE

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EUROPEAN COMMISSION
JOINT RESEARCH CENTRE
Institute for Reference Materials and Measurements

CERTIFIED REFERENCE MATERIAL
BCR® – 614
Solution S4

CERTIFICATE OF ANALYSIS

POLYCHLORODIBENZO-*P*-DIOXINS (PCDDs) AND POLYCHLORODIBENZOFURANS (PCDFs) IN N-NONANE		
Congener	Mass fraction	
	Certified value [1] [µg/kg]	Uncertainty [2] [µg/kg]
2,3,7,8-T_4CDD	27.3	0.8
1,2,3,7,8-P_5CDD	139.3	2.7
1,2,3,4,7,8-HCDD	137	5
1,2,3,6,7,8-HCDD	139.1	1.0
1,2,3,7,8,9-HCDD	140.8	1.5
1,2,3,4,6,7,8-HCDD	280	4
1,2,3,4,6,7,8,9-O_8CDD	278.7	1.0
2,3,7,8-T_4CDF	27.89	0.21
1,2,3,7,8-P_5CDF	141.2	2.5
2,3,4,7,8-P_5CDF	139.5	0.8
1,2,3,4,7,8-HCDF	139.8	1.1
1,2,3,6,7,8-HCDF	139.3	0.9
1,2,3,7,8,9-HCDF	139.6	1.7
2,3,4,6,7,8-HCDF	138.7	1.2
1,2,3,4,6,7,8-HCDF	278.7	1.2
1,2,3,4,7,8,9-HCDF	278	6
1,2,3,4,6,7,8,9-O_8CDF	279	5

[1] The certified mass fraction has been calculated from the purity of the individual PCDD/F compounds as assessed in a comprehensive study and the gravimetric preparation of the solution. The value is traceable to the International System of Units (SI).

[2] The certified uncertainties have been calculated by combining contributions from the purity study and the gravimetric preparation and are expanded uncertainties with a coverage factor k = 2, corresponding to a level of confidence of about 95 %.

Continued on Page 2.

POLYCHLORODIBENZO-*P*-DIOXINS (PCDDs) AND POLYCHLORODIBENZOFURANS (PCDFs) IN N-NONANE		
Congener	Mass fraction	
	Certified value [1] [µg/kg]	Uncertainty [2] [µg/kg]
^{13}C-2,3,7,8-T_4CDD	13.95	0.06
^{13}C-1,2,3,7,8-P_5CDD	13.9	0.4
^{13}C-1,2,3,4,7,8-HCDD	13.98	0.07
^{13}C-1,2,3,67,8-HCDD	13.93	0.24
^{13}C-1,2,3,7,8,9-HCDD	13.94	0.10
^{13}C-1,2,3,4,6,7,8-HCDD	27.9	0.6
^{13}C-1,2,3,4,6,7,8,9-O_8CDD	27.86	0.16
^{13}C-2,3,7,8-T_4CDF	13.96	0.09
^{13}C-1,2,3,7,8-P_5CDF	13.93	0.24
^{13}C-2,3,4,7,8-P_5CDF	13.94	0.06
^{13}C-1,2,3,4,7,8-HCDF	13.89	0.07
^{13}C-1,2,3,6,7,8-HCDF	13.93	0.11
^{13}C-1,2,3,7,8,9-HCDF	13.92	0.10
^{13}C-2,3,4,6,7,8-HCDF	13.93	0.09
^{13}C-1,2,3,4,6,7,8-HCDF	27.90	0.20
^{13}C-1,2,3,4,7,8,9-HCDF	27.86	0.24
^{13}C-1,2,3,4,6,7,8,9-O_8CDF	27.87	0.25
^{13}C-1,2,3,4-T_4CDD	13.93	0.08

1) The certified mass fraction has been calculated from the purity of the individual PCDD/F compounds as assessed in a comprehensive study and the gravimetric preparation of the solution. The value is traceable to the International System of Units (SI).

2) The certified uncertainties have been calculated by combining contributions from the purity study and the gravimetric preparation and are expanded uncertainties with a coverage factor k = 2, corresponding to a level of confidence of about 95 %.

This certificate is valid for one year after purchase.

Sales date:

The minimum sample intake is not critical. The sample can be considered as homogeneous.

NOTE

This material has been certified by BCR (Community Bureau of Reference, the former reference materials programme of the European Commission). The certificate has been revised under the responsibility of IRMM.

Brussels, November 2001
Revised: June 2007

Signed: _____

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Unit for Reference Materials
EC-JRC-IRMM
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2440 Geel, Belgium

Indicative Values		
Congener	Mass fraction expressed in concentration units [1)] [µg/L]	Uncertainty expressed in concentration units [1)] [µg/L]
2,3,7,8-T_4CDD	19.6	0.6
1,2,3,7,8-P_5CDD	100.0	2.0
1,2,3,4,7,8-HCDD	98.6	3.0
1,2,3,6,7,8-HCDD	99.8	0.7
1,2,3,7,8,9-HCDD	101.1	1.1
1,2,3,4,6,7,8-HCDD	200.6	2.8
1,2,3,4,6,7,8,9-O_8CDD	200.0	0.7
2,3,7,8-T_4CDF	20.02	0.15
1,2,3,7,8-P_5CDF	101.3	1.8
2,3,4,7,8-P_5CDF	100.1	0.6
1,2,3,4,7,8-HCDF	100.3	0.8
1,2,3,6,7,8-HCDF	100.0	0.6
1,2,3,7,8,9-HCDF	100.2	1.2
2,3,4,6,7,8-HCDF	99.5	0.9
1,2,3,4,6,7,8-HCDF	200.0	0.9
1,2,3,4,7,8,9-HCDF	200	5
1,2,3,4,6,7,8,9-O_8CDF	200	4
^{13}C-2,3,7,8-T_4CDD	10.01	0.05
^{13}C-1,2,3,7,8-P_5CDD	10.00	0.23
^{13}C-1,2,3,4,7,8-HCDD	10.03	0.05
^{13}C-1,2,3,67,8-HCDD	10.00	0.17
^{13}C-1,2,3,7,8,9-HCDD	10.01	0.07
^{13}C-1,2,3,4,6,7,8-HCDD	20.0	0.4
^{13}C-1,2,3,4,6,7,8,9-O_8CDD	19.99	0.11
^{13}C-2,3,7,8-T_4CDF	10.01	0.07
^{13}C-1,2,3,7,8-P_5CDF	10.00	0.17
^{13}C-2,3,4,7,8-P_5CDF	10.00	0.05
^{13}C-1,2,3,4,7,8-HCDF	9.97	0.05
^{13}C-1,2,3,6,7,8-HCDF	9.99	0.08
^{13}C-1,2,3,7,8,9-HCDF	9.99	0.07
^{13}C-2,3,4,6,7,8-HCDF	9.99	0.06
^{13}C-1,2,3,4,6,7,8-HCDF	20.02	0.15
^{13}C-1,2,3,4,7,8,9-HCDF	19.99	0.17
^{13}C-1,2,3,4,6,7,8,9-O_8CDF	20.00	0.18
^{13}C-1,2,3,4-T_4CDD	10.00	0.06

[1)] For the conversion to concentration units (µg/L) a density value for n-nonane at 20 °C of 0.7176 g/mL was used. It is stressed that these values are not certified.

DESCRIPTION OF THE SAMPLE

The solution of natural and labelled PCDD and PCDF congeners in n-nonane is presented in brown glass ampoules sealed under helium gas. The ampoule contains about 1 mL solution.

ANALYTICAL METHOD USED FOR CERTIFICATION

The identity of the individual congeners was assessed by ^{1}H-NMR, the purity of the crystals was verified by HRGC with FID, ECD and HRMS as final detection, HPLC with diode array detection and ICP-MS for inorganic impurities. The solutions were prepared in n-nonane of verified purity on calibrated analytical balances.

PARTICIPANTS

- Centre d'Analyse et de Recherche sur les Substances Organiques, CARSO, Lyon (FR)
- European Commission, Joint Research Centre, Institute for Reference Materials and Measurements, Geel (BE)
- University of Amsterdam, Amsterdam (NL)
- Vlaamse Instelling voor Technologisch Onderzoek, VITO, Mol (BE)

SAFETY INFORMATION

To avoid injury to persons or contamination of laboratories, the ampoule should be handled only by trained staff. National regulations regarding storage, use, disposal, and relocation of such materials may apply and should be strictly adhered to.

INSTRUCTIONS FOR USE

The solution BCR-614 S4 is intended as GC-HRMS calibration solution and is ready for use. Before attempting any sampling, the solution should be allowed to attain room temperature and should be re-homogenised thoroughly, e.g. by sonication. Before use, it is recommended to weigh each ampoule, to check for solvent evaporation losses, on a calibrated analytical balance and verify the mass indicated on the acrylic glass tube used for packing each individual ampoule.
Please note that an additional solution (BCR-614 S9) may be used to check the instrumental performance, particularly with regard to the chromatographic separation of the 2,3,7,8-Cl substituted congeners from potential interfering compounds. With the current technology, the separation of all analytes from interfering isomers in environmental samples requires the analysis to be performed on at least two capillary columns with different polarity. More details are given in the certification report of BCR-614 in the chapter on instructions for use.
Special laboratory safety precautions should be observed when opening the glass ampoule. Opening must be performed in a fume hood situated in a restricted access area, wearing the appropriate protective clothing and gloves. After opening the content should be transferred to a vial suitable for storage of standard solutions. Throughout the use it is recommended to check for solvent evaporation losses by controlling the mass of the vial each time before and after sampling.

STORAGE

Upon receipt the unopened containers should be stored at a maximum temperature of 4 ºC in the dark.
However, the European Commission cannot be held responsible for changes that happen during storage of the material at the customer's premises, especially of opened samples.

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NOTE

A technical report on the production of BCR-614 Solution S4 is available on the internet (http://www.irmm.jrc.be). A paper copy can be obtained from IRMM on request.

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EUROPEAN COMMISSION
JOINT RESEARCH CENTRE
Institute for Reference Materials and Measurements

CERTIFIED REFERENCE MATERIAL
BCR® – 614
Solution S5

CERTIFICATE OF ANALYSIS

POLYCHLORODIBENZO-*P*-DIOXINS (PCDDs) AND POLYCHLORODIBENZOFURANS (PCDFs) IN N-NONANE		
Congener	Mass fraction	
	Certified value [1] [µg/kg]	Uncertainty [2] [µg/kg]
2,3,7,8-T_4CDD	109	4
1,2,3,7,8-P_5CDD	557	11
1,2,3,4,7,8-HCDD	549	17
1,2,3,6,7,8-HCDD	556	4
1,2,3,7,8,9-HCDD	563	6
1,2,3,4,6,7,8-HCDD	1118	16
1,2,3,4,6,7,8,9-O_8CDD	1115	4
2,3,7,8-T_4CDF	1116	0.8
1,2,3,7,8-P_5CDF	565	10
2,3,4,7,8-P_5CDF	558	3
1,2,3,4,7,8-HCDF	559	5
1,2,3,6,7,8-HCDF	557	4
1,2,3,7,8,9-HCDF	559	7
2,3,4,6,7,8-HCDF	555	5
1,2,3,4,6,7,8-HCDF	1115	5
1,2,3,4,7,8,9-HCDF	1114	24
1,2,3,4,6,7,8,9-O_8CDF	1116	19

[1] The certified mass fraction has been calculated from the purity of the individual PCDD/F compounds as assessed in a comprehensive study and the gravimetric preparation of the solution. The value is traceable to the International System of Units (SI).

[2] The certified uncertainties have been calculated by combining contributions from the purity study and the gravimetric preparation and are expanded uncertainties with a coverage factor k = 2, corresponding to a level of confidence of about 95 %.

Continued on Page 2.

POLYCHLORODIBENZO-*P*-DIOXINS (PCDDs) AND POLYCHLORODIBENZOFURANS (PCDFs) IN N-NONANE		
Congener	Mass fraction	
	Certified value [1] [µg/kg]	Uncertainty [2] [µg/kg]
^{13}C-2,3,7,8-T_4CDD	13.95	0.06
^{13}C-1,2,3,7,8-P_5CDD	13.9	0.4
^{13}C-1,2,3,4,7,8-HCDD	13.98	0.07
^{13}C-1,2,3,6,7,8-HCDD	13.93	0.24
^{13}C-1,2,3,7,8,9-HCDD	13.95	0.10
^{13}C-1,2,3,4,6,7,8-HCDD	27.9	0.6
^{13}C-1,2,3,4,6,7,8,9-O_8CDD	27.86	0.16
^{13}C-2,3,7,8-T_4CDF	13.96	0.09
^{13}C-1,2,3,7,8-P_5CDF	13.93	0.24
^{13}C-2,3,4,7,8-P_5CDF	13.94	0.06
^{13}C-1,2,3,4,7,8-HCDF	13.89	0.07
^{13}C-1,2,3,6,7,8-HCDF	13.93	0.11
^{13}C-1,2,3,7,8,9-HCDF	13.93	0.10
^{13}C-2,3,4,6,7,8-HCDF	13.93	0.09
^{13}C-1,2,3,4,6,7,8-HCDF	27.90	0.20
^{13}C-1,2,3,4,7,8,9-HCDF	27.86	0.24
^{13}C-1,2,3,4,6,7,8,9-O_8CDF	27.87	0.25
^{13}C-1,2,3,4-T_4CDD	13.93	0.08

1) The certified mass fraction has been calculated from the purity of the individual PCDD/F compounds as assessed in a comprehensive study and the gravimetric preparation of the solution. The value is traceable to the International System of Units (SI).

2) The certified uncertainties have been calculated by combining contributions from the purity study and the gravimetric preparation and are expanded uncertainties with a coverage factor k = 2, corresponding to a level of confidence of about 95 %.

This certificate is valid for one year after purchase.

Sales date:

The minimum sample intake is not critical. The sample can be considered as homogeneous.

NOTE

This material has been certified by BCR (Community Bureau of Reference, the former reference materials programme of the European Commission). The certificate has been revised under the responsibility of IRMM.

Brussels, November 2001
Revised: June 2007

Signed:

Prof. Dr. Hendrik Emons
Unit for Reference Materials
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Retieseweg 111
2440 Geel, Belgium

Indicative Values		
Congener	Mass fraction expressed in concentration units [1] [µg/L]	Uncertainty expressed in concentration units [1] [µg/L]
2,3,7,8-T_4CDD	78.5	2.3
1,2,3,7,8-P_5CDD	400	8
1,2,3,4,7,8-HCDD	394	12
1,2,3,6,7,8-HCDD	399.1	2.7
1,2,3,7,8,9-HCDD	404	5
1,2,3,4,6,7,8-HCDD	802	11
1,2,3,4,6,7,8,9-O_8CDD	799.9	2.7
2,3,7,8-T_4CDF	80.1	0.6
1,2,3,7,8-P_5CDF	405	7
2,3,4,7,8-P_5CDF	400.4	2.2
1,2,3,4,7,8-HCDF	401	4
1,2,3,6,7,8-HCDF	399.9	2.4
1,2,3,7,8,9-HCDF	401	5
2,3,4,6,7,8-HCDF	398	4
1,2,3,4,6,7,8-HCDF	800	4
1,2,3,4,7,8,9-HCDF	799	17
1,2,3,4,6,7,8,9-O_8CDF	801	14
^{13}C-2,3,7,8-T_4CDD	10.01	0.05
^{13}C-1,2,3,7,8-P_5CDD	10.00	0.23
^{13}C-1,2,3,4,7,8-HCDD	10.03	0.05
^{13}C-1,2,3,6,7,8-HCDD	10.00	0.17
^{13}C-1,2,3,7,8,9-HCDD	10.01	0.07
^{13}C-1,2,3,4,6,7,8-HCDD	20.0	0.4
^{13}C-1,2,3,4,6,7,8,9-O_8CDD	19.99	0.11
^{13}C-2,3,7,8-T_4CDF	10.02	0.07
^{13}C-1,2,3,7,8-P_5CDF	10.00	0.17
^{13}C-2,3,4,7,8-P_5CDF	10.00	0.05
^{13}C-1,2,3,4,7,8-HCDF	9.97	0.05
^{13}C-1,2,3,6,7,8-HCDF	9.99	0.08
^{13}C-1,2,3,7,8,9-HCDF	9.99	0.07
^{13}C-2,3,4,6,7,8-HCDF	9.99	0.06
^{13}C-1,2,3,4,6,7,8-HCDF	20.02	0.15
^{13}C-1,2,3,4,7,8,9-HCDF	19.99	0.17
^{13}C-1,2,3,4,6,7,8,9-O_8CDF	20.00	0.18
^{13}C-1,2,3,4-T_4CDD	10.00	0.06

[1] For the conversion to concentration units (µg/L) a density value for n-nonane at 20 °C of 0.7176 g/mL was used. It is stressed that these values are not certified.

DESCRIPTION OF THE SAMPLE

The solution of natural and labelled PCDD and PCDF congeners in n-nonane is presented in brown glass ampoules sealed under helium gas. The ampoule contains about 1 mL solution.

ANALYTICAL METHOD USED FOR CERTIFICATION

The identity of the individual congeners was assessed by ^{1}H-NMR, the purity of the crystals was verified by HRGC with FID, ECD and HRMS as final detection, HPLC with diode array detection and ICP-MS for inorganic impurities. The solutions were prepared in n-nonane of verified purity on calibrated analytical balances.

PARTICIPANTS

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- European Commission, Joint Research Centre, Institute for Reference Materials and Measurements, Geel (BE)
- University of Amsterdam, Amsterdam (NL)
- Vlaamse Instelling voor Technologisch Onderzoek, VITO, Mol (BE)

SAFETY INFORMATION

To avoid injury to persons or contamination of laboratories, the ampoule should be handled only by trained staff. National regulations regarding storage, use, disposal, and relocation of such materials may apply and should be strictly adhered to.

INSTRUCTIONS FOR USE

The solution BCR-614 S5 is intended as GC-HRMS calibration solution and is ready for use. Before attempting any sampling, the solution should be allowed to attain room temperature and should be re-homogenised thoroughly, e.g. by sonication. Before use, it is recommended to weigh each ampoule, to check for solvent evaporation losses, on a calibrated analytical balance and verify the mass indicated on the acrylic glass tube used for packing each individual ampoule.
Please note that an additional solution (BCR-614 S9) may be used to check the instrumental performance, particularly with regard to the chromatographic separation of the 2,3,7,8-Cl substituted congeners from potential interfering compounds. With the current technology, the separation of all analytes from interfering isomers in environmental samples requires the analysis to be performed on at least two capillary columns with different polarity. More details are given in the certification report of BCR-614 in the chapter on instructions for use.
Special laboratory safety precautions should be observed when opening the glass ampoule. Opening must be performed in a fume hood situated in a restricted access area, wearing the appropriate protective clothing and gloves. After opening the content should be transferred to a vial suitable for storage of standard solutions. Throughout the use it is recommended to check for solvent evaporation losses by controlling the mass of the vial each time before and after sampling.

STORAGE

Upon receipt the unopened containers should be stored at a maximum temperature of 4 ºC in the dark.
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NOTE

A technical report on the production of BCR-614 Solution S5 is available on the internet (http://www.irmm.jrc.be). A paper copy can be obtained from IRMM on request.

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JOINT RESEARCH CENTRE
Institute for Reference Materials and Measurements

CERTIFIED REFERENCE MATERIAL
BCR® – 614
Solution S6

CERTIFICATE OF ANALYSIS

POLYCHLORODIBENZO-*P*-DIOXINS (PCDDs) AND POLYCHLORODIBENZOFURANS (PCDFs) IN N-NONANE		
Congener	Mass fraction	
	Certified value [1] [µg/kg]	Uncertainty [2] [µg/kg]
^{13}C-1,2,3,7,8-P$_5$CDF	139.3	2.3
^{13}C-1,2,3,7,8,9-HCDF	139.4	0.9
^{13}C-1,2,3,4,7,8,9-HCDF	278.7	2.4

1) The certified mass fraction has been calculated from the purity of the individual PCDD/F compounds as assessed in a comprehensive study and the gravimetric preparation of the solution. The value is traceable to the International System of Units (SI).

2) The certified uncertainties have been calculated by combining contributions from the purity study and the gravimetric preparation and are expanded uncertainties with a coverage factor k = 2, corresponding to a level of confidence of about 95 %.

This certificate is valid for one year after purchase.

Sales date:

The minimum sample intake is not critical. The sample can be considered as homogeneous.

NOTE

This material has been certified by BCR (Community Bureau of Reference, the former reference materials programme of the European Commission). The certificate has been revised under the responsibility of IRMM.

Brussels, November 2001
Revised: June 2007

Signed:

Prof. Dr. Hendrik Emons
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2440 Geel, Belgium

Indicative Values		
Congener	Mass fraction expressed in concentration units [1)] [µg/L]	Uncertainty expressed in concentration units [1)] [µg/L]
^{13}C-1,2,3,7,8-P_5CDF	100.0	1.7
^{13}C-1,2,3,7,8,9-HCDF	100.0	0.7
^{13}C-1,2,3,4,7,8,9-HCDF	200.0	1.7

[1)] For the conversion to concentration units (µg/L) a density value for n-nonane at 20 °C of 0.7176 g/mL was used. It is stressed that these values are not certified.

DESCRIPTION OF THE SAMPLE

The solution of natural and labelled PCDD and PCDF congeners in n-nonane is presented in brown glass ampoules sealed under helium gas. The ampoule contains about 1 mL solution.

ANALYTICAL METHOD USED FOR CERTIFICATION

The identity of the individual congeners was assessed by ^{1}H-NMR, the purity of the crystals was verified by HRGC with FID, ECD and HRMS as final detection, HPLC with diode array detection and ICP-MS for inorganic impurities. The solutions were prepared in n-nonane of verified purity on calibrated analytical balances.

PARTICIPANTS

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- European Commission, Joint Research Centre, Institute for Reference Materials and Measurements, Geel (BE)
- University of Amsterdam, Amsterdam (NL)
- Vlaamse Instelling voor Technologisch Onderzoek, VITO, Mol (BE)

SAFETY INFORMATION

To avoid injury to persons or contamination of laboratories, the ampoule should be handled only by trained staff. National regulations regarding storage, use, disposal, and relocation of such materials may apply and should be strictly adhered to.

INSTRUCTIONS FOR USE

The solution BCR-614 S6 is intended as GC-HRMS calibration solution and is ready for use. Before attempting any sampling, the solution should be allowed to attain room temperature and should be re-homogenised thoroughly, e.g. by sonication. Before use, it is recommended to weigh each ampoule, to check for solvent evaporation losses, on a calibrated analytical balance and verify the mass indicated on the acrylic glass tube used for packing each individual ampoule.

Please note that an additional solution (BCR-614 S9) may be used to check the instrumental performance, particularly with regard to the chromatographic separation of the 2,3,7,8-Cl substituted congeners from potential interfering compounds. With the current technology, the separation of all analytes from interfering isomers in environmental samples requires the analysis to be performed on at least two capillary columns with different polarity. More details are given in the certification report of BCR-614 in the chapter on instructions for use.

Special laboratory safety precautions should be observed when opening the glass ampoule. Opening must be performed in a fume hood situated in a restricted access area, wearing the appropriate protective clothing and gloves. After opening the content should be transferred to a vial suitable for storage of standard solutions. Throughout the use it is recommended to check for solvent evaporation losses by controlling the mass of the vial each time before and after sampling.

STORAGE

Upon receipt the unopened containers should be stored at a maximum temperature of 4 ºC in the dark.

However, the European Commission cannot be held responsible for changes that happen during storage of the material at the customer's premises, especially of opened samples.

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NOTE

A technical report on the production of BCR-614 Solution S6 is available on the internet (http://www.irmm.jrc.be). A paper copy can be obtained from IRMM on request.

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EUROPEAN COMMISSION
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CERTIFIED REFERENCE MATERIAL
BCR® – 614
Solution S7

CERTIFICATE OF ANALYSIS

POLYCHLORODIBENZO-*P*-DIOXINS (PCDDs) AND POLYCHLORODIBENZOFURANS (PCDFs) IN N-NONANE		
Congener	Mass fraction	
	Certified value [1] [µg/kg]	Uncertainty [2] [µg/kg]
^{13}C-2,3,7,8-T_4CDD	139.5	0.6
^{13}C-1,2,3,7,8-P_5CDD	139	4
^{13}C-1,2,3,4,7,8-HCDD	139.8	0.7
^{13}C-1,2,3,6,7,8-HCDD	139.3	2.4
^{13}C-1,2,3,4,6,7,8-HCDD	279	6
^{13}C-1,2,3,4,6,7,8,9-O_8CDD	278.7	1.6
^{13}C-2,3,7,8-T_4CDF	139.5	0.9
^{13}C-2,3,4,7,8-P_5CDF	139.2	0.6
^{13}C-1,2,3,4,7,8-HCDF	138.9	0.6
^{13}C-1,2,3,6,7,8-HCDF	139.4	1.1
^{13}C-2,3,4,6,7,8-HCDF	139.4	0.8
^{13}C-1,2,3,4,6,7,8-HCDF	278.7	2.0
^{13}C-1,2,3,4,6,7,8,9-O_8CDF	278.7	2.5

1) The certified mass fraction has been calculated from the purity of the individual PCDD/F compounds as assessed in a comprehensive study and the gravimetric preparation of the solution. The value is traceable to the International System of Units (SI).

2) The certified uncertainties have been calculated by combining contributions from the purity study and the gravimetric preparation and are expanded uncertainties with a coverage factor k = 2, corresponding to a level of confidence of about 95 %.

This certificate is valid for one year after purchase.

Sales date:

The minimum sample intake is not critical. The sample can be considered as homogeneous.

NOTE

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Brussels, November 2001
Revised: June 2007

Signed:

Prof. Dr. Hendrik Emons
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Indicative Values		
Congener	Mass fraction expressed in concentration units [1)] [µg/L]	Uncertainty expressed in concentration units [1)] [µg/L]
^{13}C-2,3,7,8-T_4CDD	100.1	0.4
^{13}C-1,2,3,7,8-P_5CDD	99.9	2.4
^{13}C-1,2,3,4,7,8-HCDD	100.3	0.5
^{13}C-1,2,3,6,7,8-HCDD	100.0	1.7
^{13}C-1,2,3,4,6,7,8-HCDD	200	4
^{13}C-1,2,3,4,6,7,8,9-O_8CDD	200.0	1.1
^{13}C-2,3,7,8-T_4CDF	100.1	0.6
^{13}C-2,3,4,7,8-P_5CDF	99.9	0.4
^{13}C-1,2,3,4,7,8-HCDF	99.7	0.5
^{13}C-1,2,3,6,7,8-HCDF	100.0	0.8
^{13}C-2,3,4,6,7,8-HCDF	100.0	0.6
^{13}C-1,2,3,4,6,7,8-HCDF	200.0	1.4
^{13}C-1,2,3,4,6,7,8,9-O_8CDF	200.0	1.8

[1)] For the conversion to concentration units (µg/L) a density value for n-nonane at 20 °C of 0.7176 g/mL was used. It is stressed that these values are not certified.

DESCRIPTION OF THE SAMPLE

The solution of natural and labelled PCDD and PCDF congeners in n-nonane is presented in brown glass ampoules sealed under helium gas. The ampoule contains about 1 mL solution.

ANALYTICAL METHOD USED FOR CERTIFICATION

The identity of the individual congeners was assessed by ^{1}H-NMR, the purity of the crystals was verified by HRGC with FID, ECD and HRMS as final detection, HPLC with diode array detection and ICP-MS for inorganic impurities. The solutions were prepared in n-nonane of verified purity on calibrated analytical balances.

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- European Commission, Joint Research Centre, Institute for Reference Materials and Measurements, Geel (BE)
- University of Amsterdam, Amsterdam (NL)
- Vlaamse Instelling voor Technologisch Onderzoek, VITO, Mol (BE)

SAFETY INFORMATION

To avoid injury to persons or contamination of laboratories, the ampoule should be handled only by trained staff. National regulations regarding storage, use, disposal, and relocation of such materials may apply and should be strictly adhered to.

INSTRUCTIONS FOR USE

The solution BCR-614 S7 is intended as GC-HRMS calibration solution and is ready for use. Before attempting any sampling, the solution should be allowed to attain room temperature and should be re-homogenised thoroughly, e.g. by sonication. Before use, it is recommended to weigh each ampoule, to check for solvent evaporation losses, on a calibrated analytical balance and verify the mass indicated on the acrylic glass tube used for packing each individual ampoule.
Please note that an additional solution (BCR-614 S9) may be used to check the instrumental performance, particularly with regard to the chromatographic separation of the 2,3,7,8-Cl substituted congeners from potential interfering compounds. With the current technology, the separation of all analytes from interfering isomers in environmental samples requires the analysis to be performed on at least two capillary columns with different polarity. More details are given in the certification report of BCR-614 in the chapter on instructions for use.

Special laboratory safety precautions should be observed when opening the glass ampoule. Opening must be performed in a fume hood situated in a restricted access area, wearing the appropriate protective clothing and gloves. After opening the content should be transferred to a vial suitable for storage of standard solutions. Throughout the use it is recommended to check for solvent evaporation losses by controlling the mass of the vial each time before and after sampling.

STORAGE

Upon receipt the unopened containers should be stored at a maximum temperature of 4 ºC in the dark.
However, the European Commission cannot be held responsible for changes that happen during storage of the material at the customer's premises, especially of opened samples.

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NOTE

A technical report on the production of BCR-614 Solution S7 is available on the internet (http://www.irmm.jrc.be). A paper copy can be obtained from IRMM on request.

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EUROPEAN COMMISSION
JOINT RESEARCH CENTRE
Institute for Reference Materials and Measurements

CERTIFIED REFERENCE MATERIAL
BCR® – 614
Solution S8

CERTIFICATE OF ANALYSIS

POLYCHLORODIBENZO-*P*-DIOXINS (PCDDs) AND POLYCHLORODIBENZOFURANS (PCDFs) IN N-NONANE		
Congener	Mass fraction	
	Certified value [1] [µg/kg]	Uncertainty [2] [µg/kg]
^{13}C-1,2,3,7,8,9-HCDD	558	4
^{13}C-1,2,3,4-T_4CDD	557.4	2.7

1) The certified mass fraction has been calculated from the purity of the individual PCDD/F compounds as assessed in a comprehensive study and the gravimetric preparation of the solution. The value is traceable to the International System of Units (SI).

2) The certified uncertainties have been calculated by combining contributions from the purity study and the gravimetric preparation and are expanded uncertainties with a coverage factor k = 2, corresponding to a level of confidence of about 95 %.

This certificate is valid for one year after purchase.

Sales date:

The minimum sample intake is not critical. The sample can be considered as homogeneous.

NOTE

This material has been certified by BCR (Community Bureau of Reference, the former reference materials programme of the European Commission). The certificate has been revised under the responsibility of IRMM.

Brussels, November 2001
Revised: June 2007

Signed:

Prof. Dr. Hendrik Emons
Unit for Reference Materials
EC-JRC-IRMM
Retieseweg 111
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Indicative Values		
Congener	Mass fraction expressed in concentration units [1] [µg/L]	Uncertainty expressed in concentration units [1] [µg/L]
^{13}C-1,2,3,7,8,9-HCDD	400.5	2.7
^{13}C-1,2,3,4-T_4CDD	400.0	2.0

[1] For the conversion to concentration units (µg/L) a density value for n-nonane at 20 °C of 0.7176 g/mL was used. It is stressed that these values are not certified.

DESCRIPTION OF THE SAMPLE

The solution of natural and labelled PCDD and PCDF congeners in n-nonane is presented in brown glass ampoules sealed under helium gas. The ampoule contains about 0.5 mL solution.

ANALYTICAL METHOD USED FOR CERTIFICATION

The identity of the individual congeners was assessed by ^{1}H-NMR, the purity of the crystals was verified by HRGC with FID, ECD and HRMS as final detection, HPLC with diode array detection and ICP-MS for inorganic impurities. The solutions were prepared in n-nonane of verified purity on calibrated analytical balances.

PARTICIPANTS

- Centre d'Analyse et de Recherche sur les Substances Organiques, CARSO, Lyon (FR)
- European Commission, Joint Research Centre, Institute for Reference Materials and Measurements, Geel (BE)
- University of Amsterdam, Amsterdam (NL)
- Vlaamse Instelling voor Technologisch Onderzoek, VITO, Mol (BE)

SAFETY INFORMATION

To avoid injury to persons or contamination of laboratories, the ampoule should be handled only by trained staff. National regulations regarding storage, use, disposal, and relocation of such materials may apply and should be strictly adhered to.

INSTRUCTIONS FOR USE

The solution BCR-614 S8 is intended as GC-HRMS calibration solution and is ready for use. Before attempting any sampling, the solution should be allowed to attain room temperature and should be re-homogenised thoroughly, e.g. by sonication. Before use, it is recommended to weigh each ampoule, to check for solvent evaporation losses, on a calibrated analytical balance and verify the mass indicated on the acrylic glass tube used for packing each individual ampoule.

Please note that an additional solution (BCR-614 S9) may be used to check the instrumental performance, particularly with regard to the chromatographic separation of the 2,3,7,8-Cl substituted congeners from potential interfering compounds. With the current technology, the separation of all analytes from interfering isomers in environmental samples requires the analysis to be performed on at least two capillary columns with different polarity. More details are given in the certification report of BCR-614 in the chapter on instructions for use.

Special laboratory safety precautions should be observed when opening the glass ampoule. Opening must be performed in a fume hood situated in a restricted access area, wearing the appropriate protective clothing and gloves. After opening the content should be transferred to a vial suitable for storage of standard solutions. Throughout the use it is recommended to check for solvent evaporation losses by controlling the mass of the vial each time before and after sampling.

STORAGE

Upon receipt the unopened containers should be stored at a maximum temperature of 4 ºC in the dark.

However, the European Commission cannot be held responsible for changes that happen during storage of the material at the customer's premises, especially of opened samples.

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NOTE

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MATERIAL INFORMATION
BCR – 614
Solution 9

POLYCHLORODIBENZO-*P*-DIOXINS AND POLYCHLORODIBENZOFURANS (PCDD/Fs) IN N-NONANE

DESCRIPTION

The solution of natural and labelled PCDD and PCDF congeners in n-nonane is presented in brown glass ampoules sealed under helium gas. The ampoule contains about 1 mL solution. The solution is intended for very low level determinations of PCDD/Fs, e. g. in case of milk analysis.

MATERIAL INFORMATION DATA

Congener	Mass fraction	
	Value [1] [µg/kg]	Value [2] [µg/L]
2,3,7,8-T_4CDD	140	100
1,2,3,4,7,8-HCDD	140	100
1,2,3,6,7,8-HCDD	140	100
1,2,3,7,8,9-HCDD	140	100
2,3,7,8-T_4CDF	140	100
1,2,3,7,8-P_5CDF	140	100
2,3,4,7,8-P_5CDF	140	100
1,2,3,4,7,8-HCDF	140	100
1,2,3,6,7,8-HCDF	140	100
1,2,3,7,8,9-HCDF	140	100
2,3,4,6,7,8-HCDF	140	100
1,2,3,9-T_4CDD	140	100
1,2,3,4-T_4CDD	140	100
1,2,3,7/8-T_4CDD	140	100
1,2,7,8-T_4CDD	140	100
1,2,3,4,6,7-H_6CDD	140	100
2,3,4,7-T_4CDF	140	100
1,2,3,4,8-P_5CDF	140	100
1,2,3,4,6,7-H_6CDF	140	100
1,2,3,4,7,9-H_6CDF	140	100
1,2,3,6,8,9-H_6CDF	140	100
1,2,3,4,8,9-H_6CDF	140	100

[1] The mass fraction has been calculated from the gravimetric preparation.
[2] For the conversion to concentration units (µg/L) a density value for n-nonane at 20 °C of 0.7176 g/mL was used.

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INSTRUCTIONS FOR USE

BCR-614 S9 may be used to check the instrumental performance, particularly with regard to the chromatographic separation of the 2,3,7,8-Cl substituted congeners from potential interfering compounds. With the current technology, the separation of all analytes from interfering isomers in environmental samples requires the analysis to be performed on at least two capillary columns with different polarity. More details are given in the certification report of BCR-614 in the chapter on instructions for use.

Before attempting any sampling, the solution should be allowed to attain room temperature and should be re-homogenised thoroughly, e.g. by sonication. Before use, it is recommended to weigh each ampoule, to check for solvent evaporation losses, on a calibrated analytical balance and verify the mass indicated on the acrylic glass tube used for packing each individual ampoule.

Special laboratory safety precautions should be observed when opening the glass ampoule. Opening must be performed in a fume hood situated in a restricted access area, wearing the appropriate protective clothing and gloves. After opening the content should be transferred to a vial suitable for storage of standard solutions. Throughout the use it is recommended to check for solvent evaporation losses by controlling the mass of the vial each time before and after sampling.

STORAGE

Upon receipt the unopened containers should be stored at a maximum temperature of 4 ºC in the dark.

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SAFETY INFORMATION

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DISCLAIMER

The information given should be regarded as guidance values only and not as binding ones. BCR-614 Solution 9 is **not** a reference material.

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Geel, Belgium, June 2007

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