



REFERENCE SHEET

REFERENCE MATERIAL

IAEA-159

ORGANOCHLORINE COMPOUNDS AND PETROLEUM HYDROCARBONS IN A SEDIMENT SAMPLE

Date of issue: June 2007

PESTICIDES AND PCBs

Recommended Values
(Based on dry weight)

Analyte	Units	Concentration*	Standard Deviation**	N***
pp' DDE	ng/g	0.89	0.50	36
pp' DDD	ng/g	0.82	0.58	30
op DDD	ng/g	0.39	0.22	5
Heptachlor	ng/g	0.31	0.21	11
Dieldrin	ng/g	0.48	0.37	18
Aroclor 1260	ng/g	5.54	3.31	10
PCB No 18	ng/g	0.74	0.53	10
PCB No 28	ng/g	0.57	0.28	22
PCB No 44	ng/g	0.35	0.14	8
PCB No 52	ng/g	0.67	0.25	25
PCB No 66	ng/g	0.41	0.07	5
PCB No 101	ng/g	0.52	0.16	25
PCB No 118	ng/g	0.52	0.21	27
PCB No 138	ng/g	0.60	0.31	30
PCB No 149	ng/g	0.52	0.14	9
PCB No 153	ng/g	0.56	0.09	21
PCB No 170	ng/g	0.15	0.04	11
PCB No 180	ng/g	0.26	0.10	25
PCB No 194	ng/g	0.09	0.04	8

* Average values expressed on a dry-weight basis

** Standard deviation

*** Number of accepted laboratory means which were used for calculation of recommended, information values and standard deviations

PETROLEUM HYDROCARBONS

Recommended Values
(Based on dry weight)

Analyte	Unit	Concentration	Standard deviation	N*
n-C₁₇	ng/g	105	56	16
Pristane	ng/g	120	53	13
Phytane	ng/g	81	53	16
Naphthalene	ng/g	23	13	32
1 methyl naphthalene	ng/g	20	10	8
2 methyl naphthalene	ng/g	30	19	7
Phenanthrene	ng/g	59	29	45
1 methyl phenanthrene	ng/g	20	9.6	10
Anthracene	ng/g	11	5.1	22
Chrysene	ng/g	58	26	44
Fluorene	ng/g	13	7.7	17
Fluoranthene	ng/g	110	32	41
Pyrene	ng/g	100	38	50
Benzo[b]fluoranthene	ng/g	100	42	23
Benzo[k]fluoranthene	ng/g	49	14	18
Benz[a]anthracene	ng/g	54	20	45
Perylene	ng/g	27	11	9
Benzo[e]pyrene	ng/g	82	8.2	11
Benzo[a]pyrene	ng/g	58	26	44
Benzo[g,h,i]perylene	ng/g	95	45	42
Indeno[1,2,3-cd]pyrene	ng/g	120	34	25
Dibenz[a,h]anthracene	ng/g	25	14	17
Acenaphthylene	ng/g	6.4	5.4	11
Acenaphthene	ng/g	6.0	4.0	16
Dibenzothiophene	ng/g	6.5	2.8	5

* Average values expressed on a dry-weight basis

** Standard deviation

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Systematic numbering of PCB congeners.

IUPAC No		IUPAC No	
	Dichlorobiphenyl		Hexachlorobiphenyl
8	2,4'	128	2,2',3,3',4,4'
		138	2,2',3,4,4',5'
	Trichlorobiphenyl	149	2,2',3,4',5',6
18	2,2',5	153	2,2',4,4',5,5'
28	2,4,4'	156	2,3,3',4,4',5
31	2,4',5		Heptachlorobiphenyl
	Tetrachlorobiphenyl	170	2,2',3,3',4,4',5
44	2,2',3,5'	174	2,2',3,3',4,5,6'
49	2,2',4,5'	177	2,2',3,3',4',5,6
52	2,2',5,5'	180	2,2',3,4,4',5,5'
	Pentachlorobiphenyl	183	2,2',3,4,4',5',6
87	2,2',3,4,5'	187	2,2',3,4',5,5',6
101	2,2',4,5,5'		Octachlorobiphenyl
105	2,3,3',4,4'	194	2,2',3,3',4,4',5,5'
110	2,3,3',4',6	195	2,2',3,3',4,4',5,6
118	2,3',4,4',5	196	2,2',3,3',4,4',5',6

Chlorinated Pesticides and PCBs

Information Values (Based on dry weight)

Analyte	Unit	Concentration	Standard deviation	N*
HEOM	mg/g	0.53	0.29	8
HCB	ng/g	0.17	0.15	20
α HCH	ng/g	0.10	0.06	9
β HCH	ng/g	0.24	0.17	5
Lindane	ng/g	0.21	0.18	24
δ HCH	ng/g	0.57	0.60	4
pp' DDT	ng/g	0.71	0.69	30
op DDE	ng/g	0.19	0.09	4
op DDT	ng/g	2.32	4.33	4
Heptachlor epoxide	ng/g	2.84	3.31	5
Aldrin	ng/g	0.17	0.15	11
Endrin	ng/g	0.77	0.81	10
α Endosulfan	ng/g	1.11	1.02	7
β Endosulfan	ng/g	1.49	1.93	7
Endosulfan sulfate	ng/g	3.46	3.69	6
α Chlordane	ng/g	0.17	0.12	6
γ Chlordane	ng/g	0.67	0.80	6
Aroclor 1254	ng/g	14.3	8.38	12
PCB No 8	ng/g	0.37	0.21	3
PCB No 31	ng/g	0.28	0.05	7
PCB No 49	ng/g	0.32	0.09	4
PCB No 70	ng/g	0.62	0.30	3
PCB No 74	ng/g	0.20	0.03	3
PCB No 87	ng/g	0.44	0.25	4
PCB No 95	ng/g	1.26	1.17	3
PCB No 99	ng/g	0.40	0.20	4
PCB No 105	ng/g	0.41	0.31	12
PCB No 110	ng/g	0.54	0.16	7
PCB No 128	ng/g	0.27	0.27	7
PCB No 156	ng/g	0.32	0.43	8
PCB No 177	ng/g	0.20	0.10	4
PCB No 183	ng/g	0.27	0.32	4
PCB No 187	ng/g	0.39	0.05	3
PCB No 195	ng/g	0.08	0.03	3
PCB No 201	ng/g	0.15	0.12	3
PCB No 206	ng/g	0.34	0.47	3
PCB No 209	ng/g	0.14	0.21	4

* Average values expressed on a dry-weight basis

** Standard deviation

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Petroleum Hydrocarbons

Information Values
(Based on dry weight)

Analyte	Unit	Concentration	Standard deviation	N*
EOM	mg/g	0.65	0.37	7
UVF equivalent				
Chrysene	µg/g	14	9.5	5
UVF equivalent				
ROPME oil	µg/g	180	65	4
Total Aliphatics	µg/g	55	54	12
Resolved Aliphatics	µg/g	6.9	4.8	10
Unresolved Aliphatics	µg/g	62	48	8
n-C₁₈	ng/g	92	40	15
Σ n-Alkanes (C₁₄-C₃₄)	µg/g	3.9	2.4	16
Total Aromatics	µg/g	1.4	0.65	7
Resolved Aromatics	µg/g	0.90	0.29	7
Unresolved Aromatics	µg/g	8.4	9.8	5
Biphenyl	ng/g	11	3.6	4
2,6 dimethyl				
naphthalene	ng/g	21	4.2	4
2 methyl phenanthrene	ng/g	26	6.5	9
Triphenylene	ng/g	110	84	3
1 methyl pyrene	ng/g	17	4.8	3
Benzo[a]fluoranthene	ng/g	15	7.1	3

* Average values expressed on a dry-weight basis

** Standard deviation

*** Number of accepted laboratory means which were used for calculation of recommended, information values and standard deviations

Designation

This material can be useful when evaluating the accuracy of analytical procedures for the determination of chlorinated compounds and petroleum hydrocarbons in sediment samples, in the elaboration of new analytical procedures for sediment samples, and for educational purposes.

Description of the material

100 kg of sediment, provided by the Quasimeme Project, was collected in Kilbrannan Sound, in the river Clyde's estuary, Scotland. This sediment sample was dried, ground and sieved. This powder, about 26 kg, was homogenized by mixing in a stainless steel rotating drum for three weeks. Then, aliquots of about 45 grams were packaged into glass bottles with aluminium screw caps, labeled IAEA-159 and sealed with Teflon tape.

Homogeneity

The homogeneity of the material for organochlorine compounds and petroleum hydrocarbons was checked by determining the concentration of some compounds (chlorinated pesticides and petroleum hydrocarbons) in 10 replicate analyses taken randomly in the bulk of the powder. A one-way variance analysis indicated that the material could be considered homogeneous.

Moisture determination

The moisture content of the lyophilized sample as determined by drying to a constant weight at 105°C, was found to be 1.2 %. Since the moisture content can change with the ambient humidity and temperature, it is recommended that the water content of this material always be determined in a separate sub-sample (not that taken for analysis) by drying to a constant weight (~24 hours) at 105° C.

Establishment of "recommended values"

An intercomparison exercise for determination of chlorinated compounds and petroleum hydrocarbons in IAEA-159 was carried out in 2006-2007 and the results returned by the participating laboratories were used to establish "recommended values" for the concentrations of some compounds in this material.

More details about this intercomparison can be found in separate IAEA report.

Important note

The analysts are kindly requested to communicate any meaningful results from analysis of this material to:

International Atomic Energy Agency
Marine Environmental Studies Laboratory
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These results will be used in the future for updating of the "recommended values" which are the best estimates as of June 2007. As usual, the origin of these additional results will be kept confidential.

References

International Atomic Energy Agency, Marine Environment Laboratories - MESL, Report IAEA/AL/ 180 (IAEA/MEL/ 80), World-wide and regional intercomparison for the determination of organochlorine compounds, petroleum hydrocarbons and sterols in the sediment sample IAEA-159, Monaco (2007).

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