International Atomic Energy Agency
Analytical Quality Control Services
Wagramer Strasse 5, P.O.Box 100, A-1400 Vienna, Austria

REFERENCE SHEET

REFERENCE MATERIAL
IAEA-383
ORGANOCHLORINE COMPOUNDS
PETROLEUM HYDROCARBONS AND STEROLS
IN
SEDIMENT SAMPLE

Date of issue: November 1998

PESTICIDES AND PCBs

Recommended Values
(Based on dry weight)

Analyte	Units	Concentration*	Confidence Interval **	N***
pp' DDE	ng/g	1.2	0.75 - 1.8	30
Aroclor 1254	ng/g	36	24 - 48	10
PCB No 28	ng/g	1	0.77 - 1.4	12
PCB No 31	ng/g	0.76	0.38 - 1.2	6
PCB No 52	ng/g	2.5	1.1 - 2.8	14
PCB No 101	ng/g	2.9	1.3 - 4.2	16
PCB No 105	ng/g	0.99	0.77 - 1.5	12
PCB No 110	ng/g	2.4	1.8 - 3.6	6
PCB No 118	ng/g	3.3	2.2 - 4.1	17
PCB No 128	ng/g	0.63	0.52 - 0.87	10
PCB No 138	ng/g	4.4	2.6 - 6.1	15
PCB No 149	ng/g	3.2	2.3 - 3.7	8
PCB No 153	ng/g	4.3	2.3 - 5.4	17
PCB No 170	ng/g	0.82	0.62 - 1.3	11
PCB No 180	ng/g	2.5	1.9 - 3.4	17
PCB No 183	ng/g	0.47	0.34 - 0.57	6
PCB No 187	ng/g	1.3	0.63 - 1.5	10
PCB No 194	ng/g	0.54	0.31 - 0.73	7
PCB No 209	ng/g	2.1	1.2 - 3	7

* *Median values expressed on a dry-weight basis.*
** *95% confidence intervals of the median,*
*** *Number of accepted laboratory means which were used for calculation of recommended, information values and confidence intervals.*

PESTICIDES AND PCBs

Recommended Values
(Based on dry weight)

Analyte	Units	Concentration*	Confidence Interval **	N***
n - C 17	ng/g	380	330 - 470	11
Phenanthrene	ng/g	160	140 - 190	17
2 Methyl phenanthrene	ng/g	31	24 - 38	7
1 Methyl phenanthrene	ng/g	24	18 - 28	10
Anthracene	ng/g	30	25 - 34	9
Chrysene	ng/g	170	120 - 220	16
Fluorene	ng/g	27	24 - 34	9
Fluoranthene	ng/g	290	260 - 350	16
Pyrene	ng/g	280	210 - 350	19
Benzo (b) fluoranthene	ng/g	150	96 - 190	8
Benzo (k) fluoranthene	ng/g	73	48 - 76	8
Benz (a) anthracene	ng/g	105	83 - 130	16
Perylene	ng/g	58	41 - 130	7
Benzo (e) pyrene	ng/g	160	120 - 210	12
Benzo (a) pyrene	ng/g	120	77 - 140	16
1 Methyl naphthalene	ng/g	14	11 - 28	6
Naphthalene	ng/g	96	52 - 110	12
Benzo (ghi) perylene	ng/g	110	69 - 230	16
Acenaphthylene	ng/g	47	31 - 59	8
Acenaphthene	ng/g	16	13 - 21	8

* *Median values expressed on a dry-weight basis.*

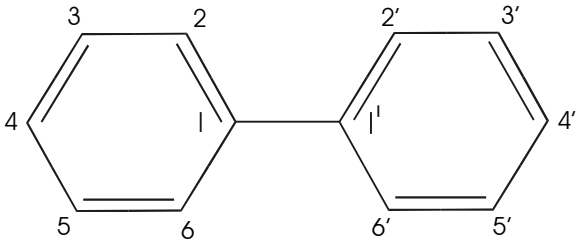
** *95% confidence intervals of the median,*

*** *Number of accepted laboratory means which were used for calculation of recommended, information values and confidence intervals.*

Systematic numbering of PCB congeners

IUPAC No	
	Trichlorobiphenyl
18	2,2',5
28	2,4,4'
31	2,4',5
	Tetrachlorobiphenyl
44	2,2',3,5'
49	2,2',4,5'
52	2,2',5,5'
66	2,3',4,4'
	Pentachlorobiphenyl
87	2,2',3,4,5'
95	2,2',3,5',6
97	2,2',3',4,5
99	2,2',4,4',5
101	2,2',4,5,5'
105	2,3,3',4,4'
110	2,3,3',4',6
118	2,3',4,4',5
	Hexachlorobiphenyl
128	2,2',3,3',4,4'
137	2,2',3,4,4',5
138	2,2',3,4,4',5'
141	2,2',3,4,5,5'
149	2,2',3,4',5',6
151	2,2',3,5,5',6

IUPAC No	
	Hexachlorobiphenyl
153	2,2',4,4',5,5'
156	2,3,3',4,4',5
158	2,3,3',4,4',6
	Heptachlorobiphenyl
170	2,2',3,3',4,4',5
174	2,2',3,3',4,5,6'
177	2,2',3,3',4',5,6
180	2,2',3,4,4',5,5'
183	2,2',3,4,4',5',6
185	2,2',3,4,5,5',6
187	2,2',3,4',5,5',6
189	2,3,3',4,4',5,5'
	Octachlorobiphenyl
194	2,2',3,3',4,4',5,5'
195	2,2',3,3',4,4',5',6
199	2,2',3,3',4,5,6,6'
200	2,2',3,3',4,5',6,6'
201	2,2',3,3',4,5,5',6
205	2,3,3',4,4',5,5',6
	Nonachlorobiphenyl
206	2,2',3,3',4,4',5,5',6
207	2,2',3,3',4,4',5,6,6'
	Decachlorobiphenyl
209	2,2',3,3',4,4',5,5',6,6'



CHLORINATED PESTICIDES

Information Values
(Based on dry weight)

Analyte	Units	Concentration*	Confidence Interval **	N***
HCB	**ng/g**	**38**	**17 - 57**	**35**
a **HCH**	**ng/g**	**0.29**	**0.13 - 3.7**	**8**
b **HCH**	**ng/g**	**0.57**	**0.26 - 9.7**	**5**
g **HCH (lindane)**	**ng/g**	**0.46**	**0.16 - 1.1**	**23**
pp' DDD		**1.8**	**0.8 - 3.6**	**28**
pp' DDT	**ng/g**	**2.4**	**0.86 - 6.1**	**24**
op DDE	**ng/g**	**0.21**	**0.062 - 0.73**	**3**
op DDD	**ng/g**	**1.2**	**0.54 - 2.5**	**6**
op DDT	**ng/g**	**0.39**	**0.067 - 0.82**	**3**
Heptachlor	**ng/g**	**1**	**0.51 - 2.5**	**9**
Heptachlor epoxide	**ng/g**	**1.5**	**0.42 - 5.9**	**8**
Aldrin	**ng/g**	**1.4**	**0.84 - 5.9**	**8**
Dieldrin	**ng/g**	**0.27**	**0.1 - 0.57**	**13**
Endrin	**ng/g**	**1.1**	**0.4 - 1.8**	**8**
a **Endosulfan**	**ng/g**	**0.31**	**0.15 - 0.57**	**6**
Endosulfan sulfate	**ng/g**	**1.7**	**0.92 - 7.1**	**3**
a **Chlordane**	**ng/g**	**0.47**	**0.06 - 0.73**	**3**
g **Chlordane**	**ng/g**	**1.4**	**0.8 - 1.9**	**3**
Aroclor 1260	**ng/g**	**22**	**14 - 34**	**10**

* *Median values expressed on a dry-weight basis.*

** *95% confidence intervals of the median,*

*** *Number of accepted laboratory means which were used for calculation of recommended, information values and confidence intervals.*

PCBs CONGENERS

Information Values
(Based on dry weight)

Analyte	Units	Concentration*	Confidence Interval **	N***
PCB No 18	**ng/g**	**0.5**	**0.27 - 0.78**	**4**
PCB No 44	**ng/g**	**1.1**	**0.92 - 1.2**	**4**
PCB No 49	**ng/g**	**1.1**	**0.89 - 1.3**	**5**
PCB No 66	**ng/g**	**2**	**1.8 - 3.1**	**4**
PCB No 87	**ng/g**	**0.7**	**0.55 - 0.91**	**3**
PCB No 95	**ng/g**	**3.6**	**2.7 - 4.5**	**4**
PCB No 97	**ng/g**	**0.41**	**0.26 - 0.9**	**3**
PCB No 99	**ng/g**	**1.3**	**0.59 - 1.8**	**5**
PCB No 137	**ng/g**	**0.17**	**0.09 - 0.22**	**3**
PCB No 141	**ng/g**	**0.64**	**0.34 - 1.1**	**4**
PCB No 151	**ng/g**	**0.58**	**0.37 - 1.1**	**3**
PCB No 156	**ng/g**	**0.47**	**0.24 - 0.78**	**7**
PCB No 158	**ng/g**	**0.39**	**0.18 - 0.57**	**4**
PCB No 174	**ng/g**	**0.67**	**0.42 - 0.92**	**4**
PCB No 177	**ng/g**	**0.56**	**0.35 - 0.73**	**4**
PCB No 185	**ng/g**	**0.14**	**0.073 - 0.18**	**3**
PCB No 189	**ng/g**	**0.07**	**0.041 - 1.4**	**4**
PCB No 195	**ng/g**	**0.24**	**0.13 - 0.29**	**5**
PCB No 199	**ng/g**	**0.091**	**0.01 - 0.35**	**3**
PCB No 200	**ng/g**	**0.16**	**0.051 - 0.22**	**3**
PCB No 201	**ng/g**	**0.71**	**0.28 - 0.74**	**3**
PCB No 205	**ng/g**	**0.033**	**0.027 - 0.05**	**3**
PCB No 206	**ng/g**	**0.48**	**0.44 - 1.1**	**5**
PCB No 207	**ng/g**	**0.094**	**0.05 - 0.19**	**3**

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PETROLEUM HYDROCARBONS

Information Values
(Based on dry weight)

Analyte	Units	Concentration*	Confidence Interval **	N***
UVF equival. Chrysene	mg/g	**13**	**1.8 - 28**	**6**
UVF equival. ROPME oil	mg/g	**96**	**12 - 225**	**7**
Total aliphatics	mg/g	**52**	**14 - 85**	**6**
Resolved aliphatics	mg/g	**9.6**	**6.7 - 24**	**9**
Unresolved aliphatics	mg/g	**52**	**11 - 79**	**7**
Pristane	ng/g	**87**	**36 - 240**	**10**
n - C 18	ng/g	**83**	**42 - 230**	**10**
Phytane	ng/g	**57**	**43 - 150**	**9**
S **n - Alkanes**	mg/g	**6.1**	**5.3 - 6.8**	**8**
Total aromatics	mg/g	**8.8**	**1.5 - 22**	**5**
Resolved aromatics	mg/g	**2.5**	**0.4 - 6**	**7**
Unresolved aromatics	mg/g	**6.6**	**1.1 - 16**	**5**
Biphenyl	ng/g	**29**	**19 - 30**	**3**
2 Methyl naphthalene	ng/g	**36**	**26 - 43**	**4**
2,6 dimethyl naphthalene	ng/g	**13**	**7.1 - 23**	**4**
Indeno(123cd) pyrene	ng/g	**150**	**130 - 160**	**8**
Dibenz (ah) anthracene	ng/g	**20**	**18 - 41**	**5**

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Designation

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

Description of the material

About 30 Kg of sediment from the lagoon of Venice (Italy) was collected. This sediment was deep-frozen, freeze-dried, ground and sieved through a 250 µm stainless steel sieve. This powder, with a particle size of less than 250 µm was homogeneized by mixing in a rotating drum for two weeks. Then, aliquots of about 35 grams were packed into glass bottles with aluminium screw caps and sealed with teflon tape.

Homogeneity

The homogeneity of the material for organochlorine compounds, petroleum hydrocarbons and sterols was checked by determining the concentration of some compounds (chlorinated pesticides, petroleum hydrocarbons and sterols) 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 2.0 %. Since the moisture content can change with the ambient humidity and temperature, it was recommended that the water content of this material always be determined in a separate subsample (not that taken for analysis) by drying to a constant weight (~24 hours) at 105°C. Results should always be reported on a dry weight basis.

Establishment of "recommended values"

An intercomparison exercise for determination of chlorinated compounds, petroleum hydrocarbons and sterols in IAEA-383 was carried out in 1997-1998 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
4 Quai Antoine 1er
BP. N° 800
MC 98 012 MONACO Cedex

These results will be used in the future for updating of the "recommended values" which are the best estimates as of November 1998. As usual, the origin of these additional results will be kept confidential.

References

International Atomic Energy Agency, Marine Environment Laboratory - MESL, Report IAEA/AL/ 115 (IAEA/MEL/ 65), World-wide and regional intercomparison for the determination of organochlorine compounds, petroleum hydrocarbons and sterols in the sediment sample IAEA-383, Monaco (1998).

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International Atomic Energy Agency
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Supplied by

Analytical Quality Control Services (AQCS)
Agency's Laboratories, Seibersdorf
International Atomic Energy Agency
P.O. Box 100
A-1400 Vienna, Austria

Prepared by

J. P. Villeneuve, F. Carvalho, C. Cattini