

The Biomarker Catalogue

A black silhouette of a person in profile, facing right, holding a bow and arrow. The figure is positioned behind a thick red horizontal band that spans the width of the page. The figure's legs are visible below the band.

Page 107-166
Environmental

A decorative pattern of white hexagons arranged in a honeycomb lattice, located in the bottom left corner of the page.

The collection of reference standards
- 2008 -



Chapter III: Applications

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Chapter III-1: Environmental applications

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Priority pollutants

“Dirty dozens”

The Stockholm Convention agreed to phase out 12 important compounds or groups of substances that are causing adverse human effects and that are all considered persistent organic pollutants (POPs).

The 12 substances or classes of substances are:

PCBs	Pages 354-357
Dioxins	Page 358
Dibenzofurans	Page 351
Hexachlorobenzene (HCB)	Page 286
Various pesticides:	Pages 367-372
Aldrin	
Chlordane	
Dichlorodiphenyltrichloroethane (DDT)	
Dieldrin	
Endrin	
Heptachlor	
Mirex	
Toxaphene	

EU water policy

In the field of water pollution, the EU Commission (European Commission Directive 2000/60/EC) proposes 32 priority substances to be phased out and 11 substances identified as hazardous.

In addition to the 12 compound groups listed by the Stockholm convention, these are:

Halogenated compounds:	
PBDEs (pentabrominated diphenylether)	Pages 358-360
Chloroalkanes, C10-C13	Page 362
Hexachlorobenzene	Page 286
Hexachlorobutadiene	Page 365
Hexachlorocyclohexane	Page 370
Pentachlorobenzene	Page 286
Nonylphenols	Page 373
PAHs	Pages 295-353
Tributyltin compounds	Pages 384-387
Mercury	
Cadmium	



Pollution from petroleum products

Oil spills is probably the type of pollution that occurs most widely. Hundreds of millions of gallons of petroleum has been spilled over the last centuries into landfills and marine waters from tankers, pipelines, production sites and underground storage tanks. Also input from seeps, natural disasters (e.g. Catarina) and wars (The gulf war) play an important role in the total petroleum input to the environment.

Typically groups of compounds analyzed in petroleum spill analysis are:

- Biomarkers: Oil Spill Identification
- AlkylPAHS, HydroPAHS: Oil spill identification and environmental assessment of productions sites
- Total Hydrocarbon Analysis: Oil spill identification, Production sites and waste water analysis
- Hydrocarbons in water: Production sites and waste water analysis
- Phenol, surfactants, production chemicals: Production sites

Oil spill identification and biomarker fingerprinting

Petroleum samples from different sources are easily distinguished by their chemical composition. This is used in several aspects of oil spill analysis, like determination of oil spill leakages and identification of illegal marine spills. Also the biodegradation is studied using biomarker analysis due to the legal and huge economic aspects of petroleum spills.

The composition of a spilled oil may vary considerably from the original oil due to evaporation, weathering etc. Several EPA and ASTM methods have been modified in order to improve the specificity and sensitivity of oil and petroleum products analysis. Specific methods have been developed by groups in Europe, Canada and USA.

Chiron offers a wide range of specific compounds and mixtures specifically designed for the use in connection with these methods. Custom made mixes are available on order and request at reasonable prices.

The type of compounds used are

- Biomarkers, hopanes and steranes
- PAHs, alkylPAHs and dibenzothiophene profiling
- n-Alkanes, pristane, phytane, monoaromatics
- Adamantanes and sesquiterpanes

An excellent and recent book has been reported by Wang and Stout: “Oil Spill Environmental Forensics, Fingerprinting and Source Identification”, Elsevier 2007.

Available biomarkers, PAHs and alkanes

(See the Compounds section for available single hopane and sterane biomarkers, alkylPAHs and alkanes)

Special mixes of biomarkers are made on request

For alkylPAH mixes, see the PAH section below, page 129 or inquire for custom mixes.

For alkane mixes, see the Petroleum applications section, page 167.

For reference consult the following reference methods and literature:

- Wang et al.; *Marine Pollution Bulletin* 47 (2003) 423-452, *Journal of Chromatography A*, 1038 (2004) 201-214.
- NORTEST Methods (see the Methods section, page 104)
- ASTM method D 5739-06 (see the Methods section, page 67)
- Check this catalogue for a complete set of alkylated PAHs (the Compounds section, page 295 and onward) and Biomarkers (the Compounds section, page 225 and onward).



Methods

- NORDTEST Technical Reports 497, 498, 499: www.nordtest.org
Proposed CEN method
Revision of the Nordtest Methodology for Oil Spill Identification.

The project is a collaboration between the National Forensic Oil Spill Identification laboratories in Finland, Denmark, Norway, Sweden and Battelle Laboratories in the USA. The technical reports summarize the results of an extensive literature study. A database of diagnostic ratios for presently 28 crude oils and oil products has been established. GC chromatograms and ion chromatograms of diagnostic biomarkers for these oils are given. This method is proposed for the CEN system.

This report lists biomarkers to be analysed and gives recommendations for internal standards:

- ASTM D 5739-06 Standard Practice for Oil Spill Identification by Gas Chromatography and Positive Ion Electron Impact Resolution Mass Spectrometry

Spills from petroleum production

Waste from offshore operated fields is an increasing concern. Typical pollutants from such installations include:

- BTEX
- PAH/NPD
- Phenols
- Organic acids
- Metals
- Radioactive elements
- Dispersed oil in water (Hydrocarbon Oil in Water)

References:

SFT: FOR-2001-09-03 No.1157: <http://www.sft.no>

OLF Recommended Guidelines for produced water: <http://www.olf.no/hms/retningslinjer/?14821>

Hydrocarbon oil in water

OiW

ISO 9377-2 Water Quality – Determination of hydrocarbon oil index

The method of choice for the determination of oil and grease in water is ISO-Standard 9377-2, based on extraction with a hydrocarbon solvent like pentane or hexane. This test determines the hydrocarbon oil index in water by means of gas chromatography. The method is suitable for surface water, waste water, and water from sewage treatment plants, and allows the determination of the hydrocarbon oil index in concentrations above 0.1 mg/L.

The index is the sum of compounds with retention times between n-decane and n-tetracontane. Substances complying with this definition are long-chain or branched aliphatic, alicyclic, aromatic or alkylsubstituted aromatic hydrocarbons.

The former method ISO/TR 11046 from 1994 for the determination of mineral-oil content of soils and sediments has been withdrawn and is replaced by ISO 09377-2.

ISO 9377-2-Mod. This is a modified method for oil in water analysis of produced water from offshore petroleum production installations.

ISO 9377-2 is not applicable for volatile hydrocarbons, and a modification of the method is proposed by the OSPAR commission in order to include the determination of certain hydrocarbons with boiling points between 98 and 174 °C from produced water.

The OSPAR Reference Method of Analysis for the Determination of the Dispersed Oil Content in Produced Water: Reference Number 2005-15.



Chiron offers a full range of products for ISO 9377-2 and the modified method. Several customized mixes and products which are not listed in the catalogue. Please inquire for a detailed offer. See the Methods section for the details of these two methods, page 18 and onward.

PAHs, hydroPAHs and thiophenes

PAHs are typical constituents of petroleum.

In particular one finds a range of

- Alkyl-naphthalenes, -fluorenes, -phenanthrenes, -chrysenes, -pyrenes, -fluoranthenes etc.
- Large PAHs
- Tetralines, decalines and hydrogenated 3-7 ring PAHs
- Alkylated sulfur-containing compounds like thiophenes, benzothiophenes, dibenzothiophenes etc.

Chiron offers the widest range of PAHs available, including single components PAHs, PASHs and PANHs, hydroxy-, nitro- and aminoPAHs, internal standards and custom mixes, and recently “the John Fetzer Collection of Large PAHs and hydroPAHs”. (All these compounds are included in the present catalogue.)

- AlkylPAH and dibenzothiophene and NPD mixes and cocktails: see the PAH section, page 129.
- To view the complete set of PAHs available, see the Compounds section, page 295.

International PAH-methods:

ASTM D 5186-03	SFC-method
ASTM D 5580-02	Gasoline
ASTM D 5739-06	Oil spill
ASTM D 5769-04	Aromatics in gasoline
ASTM D 6370-04	Aviation fuels
ASTM D 6591-06	Middle distillates
ISO 7981.1:2005	Water quality – six PAHs by tlc
ISO 7981.2:2005	Water quality – six PAHs by HPLC
ISO 15753:2006	PAH in Animal and vegetable fats and oils
ISO 17993:2002	Water quality – 15 PAHs by HPLC
EPA 525.2	Water – Organics and PAHs by GC
EPA 527	Drinking water – pesticides and PBDEs by GC/MS
EPA 610	PAH in wastewater by HPLC and GC
EPA 8100	PAHs in water by GC-FID
EPA 8260	Volatile Compounds by GC-MS
EPA 8270C	Semivolatile Compounds by GC-MS
EPA 8310	Polycyclic Aromatic Hydrocarbons in Ground water and wastes

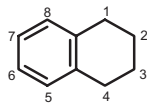
Alkylated tetralines and decalines

Alkylated decalines occur in oil and are used as indicators of petroleum pollutions in the Norwegian Standard NS, and have to be monitored and reported to the SFT by the production companies. Being the only company, Chiron now offers mixtures and single compounds as calibration standards for alkyldecaline analysis.

C1-C8 Decalines: See the Compounds section, page 238 or inquire.



Tetralines (1,2,3,4-tetrahydronaphthalenes)



Cycloalkanoaromatics (naphthenoaromatics) are usually the major constituents of the high boiling fraction of hydrocarbons. Mono- and diaromatics are especially abundant compared to polyaromatics in paraffinic-naphthenic crude oils from detrital sedimentary series.

0741.10	Tetraline (99%)	[119-64-2]	1000µg/mL, 1 mL in iso-octane
0742.11	5-Methyltetraline (99%)	[2809-64-5]	1000µg/mL, 1 mL in iso-octane
0743.11	6-Methyltetraline (99%)	[1680-51-9]	1000µg/mL, 1 mL in iso-octane
0744.12	2-Ethyltetraline (99%)	[32367-54-7]	1000µg/mL, 1 mL in iso-octane
0745.12	5-Ethyltetraline (99%)	[42775-75-7]	1000µg/mL, 1 mL in iso-octane
0746.12	6-Ethyltetraline (99%)	[22531-20-0]	1000µg/mL, 1 mL in iso-octane
0747.12	1,4-Dimethyltetraline (99%)	[4175-54-6]	1000µg/mL, 1 mL in iso-octane
0748.12	1,8-Dimethyltetraline (99%)	[25419-33-4]	1000µg/mL, 1 mL in iso-octane
0749.12	2,6-Dimethyltetraline (99%)	[7524-63-2]	1000µg/mL, 1 mL in iso-octane
0750.12	2,7-Dimethyltetraline (99%)	[13065-07-1]	1000µg/mL, 1 mL in iso-octane
0751.12	5,7-Dimethyltetraline (99%)	[21693-54-9]	1000µg/mL, 1 mL in iso-octane
0753.13	1,1,6-Trimethyltetraline (99%)	[475-03-6]	1000µg/mL, 1 mL in iso-octane
0752.13	1,5,8-Trimethyltetraline (98%)	[21693-51-6]	1000µg/mL, 1 mL in iso-octane
0756.13	2,5,8-Trimethyltetraline (99%)	[30316-17-7]	1000µg/mL, 1 mL in iso-octane
0754.14	2,2,5,7-Tetramethyltetraline (98%)	[23342-25-8]	1000µg/mL, 1 mL in iso-octane
0755.18	6,7-Diethyl-1,1,4,4-tetramethyltetraline (99%)	[55741-10-1]	1000µg/mL, 1 mL in iso-octane
0076.16	Tetraline Kit		

Hydronaphthalenes and decalines

0708.10	1,2-Dihydronaphthalene (99%)	[447-53-0]	1000µg/mL, 1 ml in iso-octane
0717.10	Hexahydronaphthalene (96%)	[41375-99-9]	1000µg/mL, 1 ml in iso-octane
0719.10	cis-Decalin (99%)	[493-01-6]	1000µg/mL, 1 ml in iso-octane
0718.10	trans-Decalin (99%)	[493-02-7]	1000µg/mL, 1 ml in iso-octane
1393.11	1-Methyldecalin (mixture of isomers)	[2958-75-0]	500µg/mL, 1 ml in iso-octane
1395.13	2-Isopropyldecalin (mixture of isomers)		500µg/mL, 1 ml in iso-octane
1394.15	1,1,4,4,5-Pentamethyldecalin (mix of isomers)		500µg/mL, 1 ml in iso-octane
0077.7	Hydronaphthalene Kit		
	7 samples (7 compounds), 1 vial of each		

Alkylated decalines occur in oil and are used as indicators of petroleum pollution in the Norwegian Standard, and have to be monitored and reported to the SFT by the production companies on the shelf. Chiron now offers mixtures and single compounds as calibration standards for alkyldecaline analysis.

C1-C8 Decalines: 2-Alkylated Decalines: Please inquire.



Alkylphenols

Alkylphenols are used as surfactants in the drilling fluid.

The alkylphenols can be analyzed directly by GC-FID, GC-MS, GC-ECD etc. Derivatization prior to analysis is common in many standard methods, i.e. to pentafluorobenzoyl esters, methyl ethers and acetates.

Chiron offers single pure solutions of alkylphenols, and large range of internal standard, and reagents for derivatization.

Custom synthesis and custom manufactured solutions are available on request.

Please consult the phenol section below and the Compounds section.

Total hydrocarbon analysis

THP

Petroleum spills from petroleum storage need to be analysed and quantified. The analytical chemists are challenged due to the weathering of the spills in the environment. Also, the spills may be a mixture of several petrochemical products or origin from different sources.

Chiron offers the largest range of single pure aromatics, aliphatics and naphthenic compounds on the market. Also, Chiron has prepared a broad range of standard products and special custom designed products for THP analysis:

BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
UST	Underwater Storage Tank Remediation
GRO	Gasoline Range Organics
DRO	Diesel Range Organics
RRO	Residual Range Organics
EPH	Extractable Petroleum Hydrocarbons

BTEX

S-4257-200-ME

S-4257-200-5ME

BTEX Mixture 1

6 Analytes, each 200 µg/mL in methanol; units: 1x1 mL, 1x5 mL

1300.6	Benzene	[71-43-2]	1267.8	o-Xylene	[95-47-6]
1264.7	Toluene	[108-88-2]	1266.8	m-Xylene	[108-38-3]
1268.8	Ethylbenzene	[100-41-4]	1265.8	p-Xylene	[106-42-3]

S-4218-2K-ME

S-4218-2K-5ME

BTEX Mixture 2

6 Analytes, each 2000 µg/mL in methanol; units: 1x1 mL, 1x5 mL

1300.6	Benzene	[71-43-2]	1267.8	o-Xylene	[95-47-6]
1264.7	Toluene	[108-88-2]	1266.8	m-Xylene	[108-38-3]
1268.8	Ethylbenzene	[100-41-4]	1265.8	p-Xylene	[106-42-3]

S-4219-2K-ME

S-4219-2K-5ME

BTEX Mixture 3

7 Analytes, each 2000 µg/mL in methanol; units: 1x1 mL, 1x5 mL

1300.6	Benzene	[71-43-2]	1267.8	o-Xylene	[95-47-6]
1264.7	Toluene	[108-88-2]	1266.8	m-Xylene	[108-38-3]
1268.8	Ethylbenzene	[100-41-4]	1265.8	p-Xylene	[106-42-3]
2151.5	MTBE	[1634-04-4]			



S-4423-50-PE
S-4426-50-5PE

ISO 9377-2 Mod Standard Mixture of n-Alkanes + BTEX I

C7+C10+ C20+C40+BTEX in n-Pentane

Determination of Hydrocarbon Oil in Water Index

10 Analytes, each 50 µg/mL in n-pentane; units: 1x1 mL, 1x5 mL, 1x10 mL

1300.6	Benzene	B	[71-43-2]	1265.8	p-Xylene	p-X	[106-42-3]
1264.7	Toluene	T	[108-88-2]	1240.7	n-Heptane	C7	[142-82-5]
1268.8	Ethylbenzene	E	[100-41-4]	1875.10	n-Decane	C10	[124-18-5]
1267.8	o-Xylene	o-X	[95-47-6]	1140.20	n-Eicosane	C20	[112-95-8]
1266.8	m-Xylene	m-X	[108-38-3]	1160.40	n-Tetracontane	C40	[4181-95-7]

S-4424-50-PE
S-4424-50-5PE

ISO 9377-2 Mod Standard Mixture of n-Alkanes + BTEX II

C7+C8+C9+C10+C20+C40+BTEX in n-Pentane

Determination of Hydrocarbon Oil in Water Index

12 Analytes; each 50 µg/mL in n-pentane; units: 1x1 mL, 1x5 mL, 10x1 mL

1300.6	Benzene	B	[71-43-2]	1268.8	Ethylbenzene	E	[100-41-4]
1264.7	Toluene	T	[108-88-2]	1245.9	n-Nonane	C9	[111-84-2]
1267.8	o-Xylene	o-X	[95-47-6]	1875.10	n-Decane	C10	[124-18-5]
1266.8	m-Xylene	m-X	[108-38-3]	1140.20	n-Eicosane	C20	[112-95-8]
1265.8	p-Xylene	p-X	[106-42-3]	1160.40	n-Tetracontane	C40	[4181-95-7]
1240.7	n-Heptane	C7	[142-82-5]				
1242.8	n-Octane	C8	[111-65-9]				

S-4395-50-PE
S-4395-50-5PE

ISO 9377-2 Mod Standard Mixture of n-Alkanes + BTEX III

C7+C8+C9+C10-C40 (all even)+BTEX in n-Pentane

Determination of Hydrocarbon Oil in Water Index

25 Analytes, each 50 µg/mL in n-pentane; units: 1mL, 1x5mL, 10x1mL

1300.6	Benzene	B	[71-43-2]	1138.18	n-Octadecane	C18	[593-45-3]
1264.7	Toluene	T	[108-88-2]	1140.20	n-Eicosane	C20	[112-95-8]
1268.8	Ethylbenzene	E	[100-41-4]	1142.22	n-Docosane	C22	[696-97-0]
1267.8	o-Xylene	o-X	[95-47-6]	1144.24	n-Tetracosane	C24	[646-31-1]
1266.8	m-Xylene	m-X	[108-38-3]	1146.26	n-Hexacosane	C26	[630-01-3]
1265.8	p-Xylene	p-X	[106-42-3]	1148.28	n-Octacosane	C28	[630-02-4]
1240.7	n-Heptane	C7	[142-82-5]	1150.30	n-Triacontane	C30	[638-68-6]
1242.8	n-Octane	C8	[111-65-9]	1152.32	n-Dotriacontane	C32	[544-85-4]
1245.9	n-Nonane	C9	[111-84-2]	1154.34	n-Tetracontane	C34	[14167-59-0]
1875.10	n-Decane	C10	[124-18-5]	1156.36	n-Hexatriacontane	C36	[630-06-8]
1132.12	n-Dodecane	C12	[112-40-5]	1158.38	n-Octatriacontane	C38	[7194-85-6]
1134.14	n-Tetradecane	C14	[629-59-4]	1160.40	n-Tetracontane	C40	[4181-95-7]
1136.16	n-Hexadecane	C16	[544-76-3]				

F-BTEX Internal Standards

The concept of F-PAH is now introduced by Chiron as a complete range of fluorinated internal standards for GC-MS analysis of the BTEX range compounds.



S-4193-2K-ME
S-4193-2K-4ME
S-4193-2K-10ME

F-BTEX ISTD Mixture

4 Analytes, each 2000 µg/mL in methanol; units: 1x4.5mL, 1x10mL

2017.6	Fluorobenzene	[462-06-6]
2018.7	2-Fluorotoluene	[95-52-3]
2010.12	1-Ethyl-4-fluorobenzene	[459-47-2]
2021.8	3-Fluoro-o-xylene (2,3-Dimethylfluorobenzene)	[443-82-3]

Gasoline

S-4220-2K-ME
S-4220-2K-5ME

GRO Mixture 1

9 Analytes, each 2000 µg/mL in methanol; units: 1x1mL, 1x5 mL

1300.6	Benzene	[71-43-2]	0711.10	Naphthalene	[91-20-3]
1264.7	Toluene	[108-88-2]	1236.6	3-Methylpentane	[96-14-0]
1268.8	Ethylbenzene	[100-41-4]	1270.9	1,2,4-Trimethylbenzene	[95-63-6]
1267.8	o-Xylene	[95-47-6]	1269.9	1,3,5-Trimethylbenzene	[108-67-8]
1266.8	m-Xylene	[108-38-3]			

S-4221-2K-ME
S-4221-2K-5ME

GRO Mixture 2, PVOC

8 Analytes, each 2000 µg/mL in methanol; units: 1x1mL, 1x5 mL

1300.6	Benzene	[71-43-2]	1266.8	m-Xylene	[108-38-3]
1264.7	Toluene	[108-88-2]	2151.5	MTBE	[1634-04-4]
1268.8	Ethylbenzene	[100-41-4]	1270.9	1,2,4-Trimethylbenzene	[95-63-6]
1267.8	o-Xylene	[95-47-6]	1269.9	1,3,5-Trimethylbenzene	[108-67-8]

S-4222-ASS-ME
S-4222-ASS-5ME

GRO Mixture 3, EPH Gasoline Range

9 Analytes, each concentration as listed in methanol; units: 1x1 mL, 1x5 mL

1300.6	Benzene	[71-43-2]	500 µg/mL
1264.7	Toluene	[108-88-2]	1500 µg/mL
1268.8	Ethylbenzene	[100-41-4]	1500 µg/mL
1266.8	m-Xylene	[108-38-3]	1000 µg/mL
1270.9	1,2,4-Trimethylbenzene	[95-63-6]	1000 µg/mL
1240.7	Heptane	[142-82-5]	500 µg/mL
1235.6	2-Methylpentane	[107-83-5]	1500 µg/mL
0443.8	2,2,4-Trimethylpentane	[540-84-1]	1500 µg/mL
1267.8	o-Xylene	[95-47-6]	1000 µg/mL

S-4223-K-ME
S-4223-K-5ME

GRO Mixture 4, UST Modified Gasoline Range

10 Analytes, each 1000 µg/mL in methanol; units: 1x1 mL, 1x5 mL

1300.6	Benzene	[71-43-2]	1265.8	p-Xylene	[106-42-3]
1264.7	Toluene	[108-88-2]	1270.9	1,2,4-Trimethylbenzene	[95-63-6]
1268.8	Ethylbenzene	[100-41-4]	1269.9	1,3,5-Trimethylbenzene	[108-67-8]
1267.8	o-Xylene	[95-47-6]	2151.5	MTBE	[1634-04-4]
1266.8	m-Xylene	[108-38-3]	0711.10	Naphthalene	[91-20-3]



2047.6-5K-ME

Internal Standards for Gasoline Range Analysis:

1-Chloro-4-fluorobenzene, 5000 µg/mL in methanol; units: 1x1 mL, 5x1 mL

2048.7-10K-ME

Calibration (Surrogate) Standard

αα-*Trifluorotoluene*, 10000 µg/mL in methanol; units: 1x1 mL, 5x1 mL

Diesel

S-4226-K-HX

DRO Mixture 1, UST Modified Diesel Range

10 Analytes, each 1000 µg/mL in hexane; unit: 1x1 mL

1875.10	n-Decane	[124-18-5]	1140.20	n-Eicosane	[112-95-8]
1132.12	n-Dodecane	[112-40-5]	1142.22	n-Docosane	[629-97-0]
1134.14	n-Tetradecane	[629-59-4]	1144.24	n-Tetracosane	[646-31-1]
1136.16	n-Hexadecane	[544-76-3]	1146.26	n-Hexacosane	[630-01-3]
1138.18	n-Octadecane	[593-45-3]	1148.28	n-Octacosane	[630-02-4]

For other hydrocarbon mixtures see the PIONA section, page 180 and onward.

Internal standards for Diesel Range Analysis

0674.19-2K-HX	5- <i>Androstane</i>	2000 µg/mL in hexane, 1 mL
2051.18-10K-DC	1-Chlorooctadecane	10 000 µg/mL in dichloromethane, 1 mL

Calibration (Surrogate) Standards for Diesel Range Analysis

1601.12-10K-DC	2-Fluorobiphenyl	10000 µg/mL in dichloromethane
0348.18-2K-AC	<i>o</i> -Terphenyl	2000 µg/mL in acetone
0348.18-10K-DC	<i>o</i> -Terphenyl	10000 µg/mL in dichloromethane

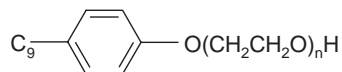


Surfactants

Surfactants like nonylphenol ethoxylates (NPE), phthalates, adipates and linear alkylbenzene sulfonates (LAS) are common waste water pollutants. Recently perfluorinated carboxylic acids are recognized as potential environmental hazards due to the severe functions and persistency of these compounds. Chiron now offers standards for perfluorinated carboxylic compounds.

Alkylphenol ethoxylates

NEW



Octyl- and nonylphenol ethoxylates are widely used as surfactants in soap. Due to their potential endocrine disruptive behavior, these compounds are now banned or restricted in several countries.

A range of new ethoxylated nonylphenol isomers, pure isomer-mixtures and single n-nonyl derivatives for use as calibration standards, are now available, only from Chiron. These standards are useful as external calibration standards for GC and GC-MS analysis of waste water and waste water sludges.

Internal standards

2327.14-100-IO	4-n-Octylphenol-d17		100µg/mL	isooctane	1mL
2414.15-K-5IP	4-n-Nonylphenol-2,3,5,6-d4-OD	[358730-95-7]	1000µg/mL	isopropanol	5x5mL
2414.15-K-5AC	4-n-Nonylphenol-2,3,5,6-d4-OD	[358730-95-7]	1000µg/mL	acetone	5x5mL

Deuterated and ¹³C labelled alkylethoxylates: Please inquire

Native standards

4-n-Octylphenol ethoxylates					
1445.14-K-IO	4-n-Octylphenol	[1806-26-4]	1000µg/mL	isooctane	1mL
2286.16-K-IO	4-n-Octylphenol EO	[51437-89-9]	1000µg/mL	isooctane	1mL
2287.18-K-IO	4-n-Octylphenol 2EO	[51437-90-2]	1000µg/mL	isooctane	1mL
2309.20-K-IO	4-n-Octylphenol 3EO	[51437-91-3]	1000µg/mL	isooctane	1mL
3688.22-K-IO	4-n-Octylphenol 4EO	[51437-92-4]	1000µg/mL	isooctane	1mL
2367.4-KIT	n-Octylphenol EO Kit (Not including 3688.12)				Kit
4-tert-Octylphenol ethoxylates					
1446.14-K-IO	4-tert-Octylphenol	[140-66-9]	1000µg/mL	isooctane	1mL
3689.16-K-IO	4-tert-Octylphenol EO, Please inquire	[2315-67-5]	1000µg/mL	isooctane	1mL
3753.18-K-IO	4-tert-Octylphenol 2EO, Please inquire	[2315-61-9]	1000µg/mL	isooctane	1mL
3754.20-K-IO	4-tert-Octylphenol 3EO, Please inquire	[2315-62-0]	1000µg/mL	isooctane	1mL
Nonylphenol ethoxylates (nonyl isomer mixtures)					
2044.15-K-IO	4-Nonylphenol, mixture of nonyl isomers	[84852-15-3]	1000µg/mL	isooctane	1mL
1833.17-K-IO	p-Nonylphenol EO	[104-35-8]	1000µg/mL	isooctane	1mL
1832.19-K-IO	p-Nonylphenol 2EO	[20427-84-3]	1000µg/mL	isooctane	1mL
1976.21-K-IO	p-Nonylphenol 3EO	[51437-95-7]	1000µg/mL	Isooctane	1mL
1977.23-K-IO	p-Nonylphenol 4EO	[7311-27-5]	1000µg/mL	Isooctane	1mL
2366.5-KIT	Nonylphenol EO Kit (5 compounds)				Kit
4-n-Nonylphenol ethoxylates					
1450.15-K-IO	4-n-Nonylphenol	[104-40-5]	1000µg/mL	isooctane	1mL
1978.17-K-IO	p-n-Nonylphenol EO		1000µg/mL	Isooctane	1mL
1979.19-K-IO	p-n-Nonylphenol 2EO	[20427-84-3]	1000µg/mL	Isooctane	1mL
3755.3-KIT	n-Nonylphenol ethoxylates Kit				Kit



Metabolites

1980.17-K-IO	2-(4-Nonylphenoxy) acetic acid isomer mixture	[3115-49-9]	1000µg/mL	Isooctane	1mL
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Commercial mixes

S-4097-100MG	Imbentin-N/020 (n=0-4)			neat	100mg
S-4098-100MG	Imbentin-N/040 (n=1-7)			neat	100mg
S-4099-100MG	Imbentin-N/040 (n=2-9)			neat	100mg
2368.3-KIT	Imbentin Kit (3 samples)				Kit

Special mixes

Please inquire

Phthalates and adipates

Chiron offers to prepare mixed solutions of a large number of phthalate and adipate esters. Choose from the compounds listed below. Please inquire if you do not find the compound you need.

Phthalates

Internal standards

2478.10-100-IO	Dimethyl phthalate-3,4,5,6-d ₄	[93951-89-4]	100µg/mL	isooctane	1mL
2892.12-K-IO	Diethyl phthalate-3,4,5,6-d ₄	[93952-12-6]	1000µg/mL	isooctane	1mL
2479.16-100-IO	Di-n-butyl phthalate-3,4,5,6-d ₄	[93952-11-5]	100µg/mL	isooctane	1mL
3124.18-100-IO	Di-n-pentyl phthalate-3,4,5,6-d ₄	[358730-89-9]	100µg/mL	isooctane	1mL
2893.18-K-IO	Di-n-pentyl phthalate-3,4,5,6-d ₄	[358730-89-9]	1000µg/mL	isooctane	1mL
3125.18-100-IO	Benzyl-n-butyl phthalate-3,4,5,6-d ₄	[93951-88-3]	100µg/mL	isooctane	1mL
2361.24-100-IO	Di-n-octyl phthalate-3,4,5,6-d ₄	[93952-13-7]	100µg/mL	isooctane	1mL
2894.24-K-IO	Bis(2-ethylhexyl) phthalate-3,4,5,6-d ₄	[93951-87-2]	1000µg/mL	isooctane	1mL

Native standards

2094.10-10MG	Dimethyl phthalate	[131-11-3]	neat		10mg
1225.12-10MG	Diethyl phthalate	[84-66-2]	neat		10mg
2102.16-10MG	Di-iso-butyl phthalate	[84-69-5]	neat		10mg
1226.16-10MG	Di-n-hexyl phthalate	[84-74-2]	neat		10mg
2097.14-10MG	Bis(2-methoxyethyl) phthalate	[34006-76-3]	neat		10mg
2099.18-10MG	Di-n-pentyl phthalate Diamyl phthalate	[131-18-1]	neat		10mg
2096.16-10MG	Bis(2-ethoxyethyl) phthalate	[605-54-9]	neat		10mg
1227.19-10MG	Butylbenzyl phthalate	[85-68-7]	neat		10mg
2055.20-100-HX	Diphenyl isophthalate	[744-45-6]	100µg/mL	hexane	1mL
2056.20-100-HX	Diphenyl phthalate	[84-62-8]	100µg/mL	hexane	1mL
2100.20-10MG	Dicyclohexyl phthalate	[84-61-7]	neat		10mg
2098.20-10MG	Bis(4-methyl-2-pentyl) phthalate	[259139-51-0]	neat		10mg
2101.20-10MG	Di-n-hexyl phthalate	[84-75-3]	neat		10mg
2054.22-100-HX	Dibenzyl phthalate	[523-31-9]	100µg/mL	hexane	1mL
2103.22-10MG	Hexyl 2-ethylhexyl phthalate	[75673-16-4]	neat		10mg
2095.20-10MG	Bis(2-n-butoxyethyl) phthalate	[117-83-9]	neat		10mg
1224.24-10MG	Bis(2-ethylhexyl)phthalate	[117-81-7]	neat		10mg
1223.24-10MG	Di-n-octyl phthalate	[117-84-0]	neat		10mg
1229.26-10MG	Di-iso-nonyl phthalate (isomer mixture)	[28553-12-0]	neat		10mg
2110.26-10MG	Di-n-nonyl phthalate	[84-76-4]	neat		10mg
3029.28-10MG	Di-iso-decyl phthalate	[26761-40-0]	neat		10mg
3126.26-KIT-MX	Mono+Diphthalate Kit				Kit

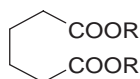
**NEW**

Metabolites (phthalate biomarkers)

It has been shown that dialkylphthalates are metabolized in the body to endocrine-active monoalkylphthalates. Ref: Stahlhet et.al., *Environ. Health Prospect.* Doi:10.1289/ehp.9882 (<http://dx.doi.org/>) March 2007

3805.9-K-IO	Monomethyl phthalate	[4376-18-5]	1000µg/mL	isooctane	1mL
3806.10-K-IO	Monoethyl phthalate	[2306-33-4]	Please inquire		
3807.12-K-IO	Mono-n-butyl phthalate	[131-70-4]	1000µg/mL	isooctane	1mL
3590.15-K-IO	Mono-n-hexyl phthalate	[24539-57-9]	1000µg/mL	isooctane	1mL
3808.15-K-IO	Monobenzyl phthalate	[2528-16-7]	1000µg/mL	isooctane	1mL
3809.16-K-IO	Mono(2-ethylhexyl) phthalate	[4376-20-9]	1000µg/mL	isooctane	1mL

Adipates



Internal standard

2276.22-K-IO	Bis(2-ethylhexyl) adipate-d ₈		1000µg/mL	isooctane	1mL
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Native adipates

1228.22-10MG	Bis(2-ethylhexyl) adipate	BEHA	[103-23-1]	neat		10mg
2212.22-K-IO	Di-n-octyl adipate		[123-79-5]	1000µg/mL	isooctane	1mL
2213.22-K-IO	Di-iso-octyl adipate		[1330-86-5]	1000µg/mL	isooctane	1mL
2214.24-K-IO	Di-n-nonyl adipate		[151-32-6]	1000µg/mL	isooctane	1mL
2218.24-K-IO	Di-iso-nonyl adipate		[33703-08-1]	1000µg/mL	isooctane	1mL
3127.5-KIT	Adipate Kit					Kit

Phthalate and adipate mixes

S-4002-K-IO

Surfactants Mixture 1

S-4002-K-10IO

7 Analytes, each 1000µg/mL in isooctane; units: 10x1 mL, 1x10 mL

1225.12	Diethyl phthalate	DEP	[84-66-2]
1228.22	Bis(2-ethylhexyl) adipate	BEHA	[103-23-1]
1223.24	Di-n-octyl phthalate	DNOP	[117-84-0]
1227.17	Benzyl butyl phthalate	BBP	[85-68-7]
1224.24	Bis(2-ethylhexyl) phthalate	BEHP	[117-81-7]
1229.26	Diisononyl phthalate	DINP	[28553-12-0]
1226.16	Di-n-butyl phthalate	DBP	[84-74-2]

S-4074-100-5T

Surfactant Mixture 2

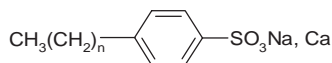
2 Analytes, each 100µg/mL in toluene; unit: 1x5 mL

1224.24	Bis(2-ethylhexyl) phthalate	BEHP	[117-81-7]
1223.24	Di-n-octyl phthalate	DNOP	[117-84-0]



LAS (linear alkylbenzene sulfonates) and ABS (alkylbenzenesulfonates)

NEW



Linear alkylsulfonates (LAS or linear alkylbenzenesulfonates) are man-made surface active agents.

LAS are produced with the benzenesulfonate group at the end or in the chain, and it gives rise to different chemical properties. Commercial mixtures typically have an alkyl chain of C10-C14. LAS is often referred to as “soft type” alkyl benzenesulfonates. LAS are biodegradable due to its linear alkyl chain.

Alkyl benzenesulfonates (ABS or branched alkyl benzenesulfonates) have a branched alkyl chain and are not easily biodegraded. ABS are often referred to as a “hard type” alkylbenzenesulfonate.

ABS are essentially replaced by LAS on the surfactant market.

LAS and ABS standards

2909.14-100-ME	Sodium p-n-octylbenzenesulfonate	[6149-03-7]	100µg/mL	methanol	1mL
2910.16-100-ME	Sodium p-n-decylbenzenesulfonate	[2627-06-7]	100µg/mL	methanol	1mL
2911.17-100-ME	Sodium p-n-undecylbenzenesulfonate	[20466-34-6]	100µg/mL	methanol	1mL
2560.18-100-ME	Calcium p-n-dodecylbenzenesulfonate	[26264-06-2]	100µg/mL	methanol	1mL
2561.18-100-ME	Sodium p-n-dodecylbenzenesulfonate	[2211-98-5]	100µg/mL	methanol	1mL
2561.18-K-ME	Sodium p-n-dodecylbenzenesulfonate	[2211-98-5]	1000µg/mL	methanol	1mL
2562.19-100-ME	Sodium p-n-tridecylbenzenesulfonate	[14356-40-2]	100µg/mL	methanol	1mL
2562.19-K-ME	Sodium p-n-tridecylbenzenesulfonate	[14356-40-2]	1000µg/mL	methanol	1mL
2562.19-100-ME	Sodium p-n-tridecylbenzenesulfonate	[14356-40-2]	100µg/mL	methanol	1mL
2912.20-100-ME	Sodium p-n-tetradecylbenzenesulfonate	[1797-33-7]	100µg/mL	methanol	1mL
2913.7-KIT	LAS Kit				Kit

Commercial technical mixes

3722.18-K-ME	Dodecylbenzenesulfonic acid, mixture of C12	LAS 12, soft	[27176-87-0]	1000µg/mL	methanol	1mL
3722.18-100MG	Dodecylbenzenesulfonic acid, mixture of C12	LAS 12, soft	[27176-87-0]	neat		100mg
3723.18-K-ME	Sodium dodecylbenzenesulfonate, mixture of C10-C14	ABS 10-14 Na, Hard	[25155-30-0]	1000µg/mL	methanol	1mL
3723.18-100MG	Sodium dodecylbenzenesulfonate, mixture of C10-C14	ABS 10-14 Na, Hard	[25155-30-0]	neat		100mg
3724.18-K-ME	Sodium dodecylbenzenesulfonate, mixture of C10-C14	LAS 10-14, Soft	[69669-44-9]	1000µg/mL	methanol	1mL
3724.18-100MG	Sodium dodecylbenzenesulfonate, mixture of C10-C14	LAS 10-14, Soft	[69669-44-9]	neat		100mg
3724.18-100MG	Sodium dodecylbenzenesulfonate, mixture of C10-C14, 38% water	LAS 10-14, Soft	[69669-44-9]	neat		100mg

International methods (see the Methods section for details)

EPA 506 Rev 1.1, page 87.

EPA 606, page 93.

EPA 8061 A, page 99.

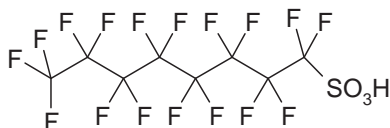


NEW

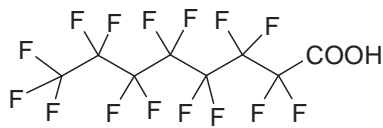
Linear perfluoroalkyl sulfonates acids and alcohols PFAs

Perfluorooctane sulfonate (PFOS) and related perfluorinated compounds, e.g. perfluorohexane sulfonate (PFHS), perfluorobutane sulfonate (PFBS), perfluorooctane sulfonamide (FOSA) and perfluorooctanoic acid (PFOA) have received wide attention during the last three years.

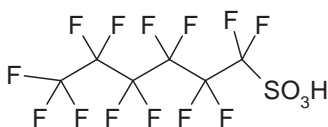
The extraordinary strength of the carbon-fluorine bond contributes to the stability of the fluorochemicals. These compounds repel water and oil. PFOS etc. also reduce the surface tension for materials such as coatings for textiles, papers, packaging, fire-fighting foams, herbicides and pesticides.



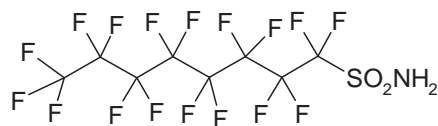
PFOS



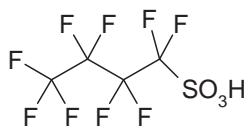
PFOA



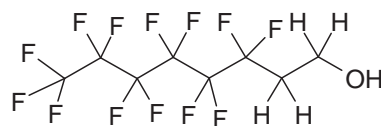
PFHS



FOSA



PFBS



6:2 PTOH

Internal standards

Internal standards based on deuterium/¹³C isotope labelling and other cost-efficient standards are under development and will be available.

Native standards (for details, see the Compounds section page 383)

Chiron offer a large range of standards for all groups of commercial perfluoro alkane derivatives.

Metabolites

These compounds are extremely stable and degrade very slowly.

However, the current switch to telomeric acids has given rise to studies on the degradation of these substances.

Several telomers are available and telomeric metabolites are in development, including internal standards.



Phenols and phenol analysis

Phenols are widely used in the industry as additives as well as intermediates.

Alkylphenols are commonly used as surfactants, oil additives, antioxidants, herbicides, insecticides, polymers and polymerization reagents, vitamins etc. Ethoxylated nonylphenols are used as surfactants in detergents. Alkylphenols also occur as by-products of various industrial uses, i. e. pulp and paper processing, coke production and gas liquification.

Chlorophenols are formed by the use of chlorine as a bactericide in water treatment plants. Chlorophenols are also added to enhance the anti-bacterial properties of products. However, due to an increased lipophilicity, the chlorophenols tend to bioaccumulate. This increases the toxicity, and these compounds are thus banned in certain countries.

Alkylated derivatives of the nitrophenols are commonly used as herbicides and pesticides. These substances tend to be more toxic than those without the nitrofunction.

Toxic and environmental hazards

Phenols are toxic compounds. They are easily absorbed via the skin, by inhalation or by ingestion. Being soluble in both polar and non-polar solvents they are highly mobile in soil and in aquatic systems and are suspected endocrine disruptors. Nonylphenol ethoxylates are listed as priority pollutants in water by the EU Commission.

The large quantities of detergents used in households, industries and agricultural applications constitute a major issue of concern. Nonionic phenolic surfactants are quite resistant to biodegradation due to the branched carbon alkyl chain, and their metabolites may reach the surface and groundwater. These compounds are commonly found in the waste water and the sludge from waste water treatment plants.

Phenolic compounds are extensively used both in the onshore as well as the offshore petroleum industry, and are a hazard of contamination of fresh water and the sea. It is estimated that phenols up to alkyl-C5 contributes with approximately 5 % of the total environmental risk in offshore-operated fields.

As a consequence, a number of methods have been developed to test for the content of phenols in drinking water, from water treatment plants, in soil and as industrial waste in onshore as well as off-shore activities.

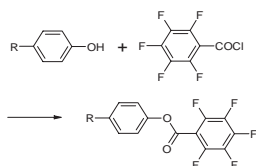
Methods of analysis

Low molecular weight phenols are often analyzed by GC-FID, GC-ECD or GC-MS methods, using columns like DB-XLB and DB-5ms columns from Agilent, or similar types.

Phenols

Derivatization

Phenols are often derivatized before determination, and analyzed as pentafluorobenzoyl- (PFB), TMS-ether, or methyl derivatives. In MS the PFB compound will have a molecular ion of m/z 194 units higher than that of the parent compound.



Derivatization by PFBCl before analysis by GC-ECD or GC-MS.



Derivatizing agent

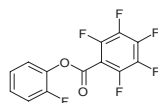
1647.7 Perfluorobenzoyl chloride 1 g

Internal standards

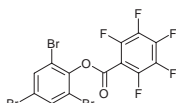
2057.6	2-Fluorophenol	[367-12-4]	1 g
2058.7	4-Fluoro-3-methylphenol	[452-70-0]	1 g
2059.7	4-Fluoro-2-methylphenol	[452-72-2]	1 g
2060.5	2,4,6-Tribromophenol	[118-79-6]	1 g
2061.6	2,4-Dibromophenol	[615-58-7]	1 g
2052.8	d ₄ -4-Ethylphenol	[340256-40-8]	100 mg

Internal standard PFB-derivatives

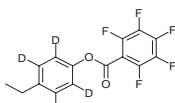
2088.13	2-Fluorophenol-PFB	1000µg/mL in isopropanol
2089.14	4-Fluoro-3-methylphenol-PFB	1000µg/mL in isopropanol
2090.14	4-Fluoro-2-methylphenol-PFB	1000µg/mL in isopropanol
2091.13	2,4,6-Tribromophenol-PFB	[937016-13-2] 1000µg/mL in isopropanol
2092.13	2,4-Dibromophenol-PFB	[136264-99-8] 1000µg/mL in isopropanol
2093.15	d ₄ -4-Ethylphenol-PFB	[100-58-8] 1000µg/mL in isopropanol



2088.13



1921.13



2093.15

Please inquire for individual PFB derivatives of additional analytes.

Internal standards

Chiron is offering a wide range of nearly fluoro- and deuterated alkylphenols as pure internal standards. See the Compounds section for available internal standards, page 374.

Alkylated phenols

Chiron is offering a range of nearly 50 alkylphenols and deuterated alkylphenols as pure chemical standards. See the Compounds section for available alkylphenols, page 375.

Alkylphenol mixes

S-4060-ASS-5AC

Alkylated phenol mixture 1

8 Analytes, each concentration as listed in acetone; unit: 1x5 mL

1358.7	p-Cresol	[106-44-5]	33.80 mg/mL
1364.8	3-Ethylphenol	[620-17-7]	6.54 mg/mL
1360.8	3,5-Dimethylphenol	[108-68-9]	6.54 mg/mL
1362.9	2,4,6-Trimethylphenol	[527-60-6]	3.80 mg/mL
1359.10	2-tert-Butylphenol	[88-18-6]	0.37 mg/mL



1361.10	3-tert-Butylphenol	[585-34-2]	0.37 mg/mL
1357.10	4-n-Butylphenol	[1638-22-8]	0.37 mg/mL
1363.11	4-Pentylphenol	[14938-35-3]	1.62 mg/mL

S-4093-5K-IO

Alkylated phenol mixture 2

29 Analytes, each 5000µg/mL in isoctane, pestipure; units: 1x1 mL, 5x1 mL

Prod.no.	Compound	Purity	CAS no.
1427.6	Phenol	99.9 %	[108-95-2]
1403.7	o-Cresol	99.6 %	[95-48-7]
1404.7	m-Cresol	98.1 %	[108-39-4]
1358.7	p-Cresol	99.1 %	[106-44-5]
1406.8	2,4-Dimethylphenol	99.8 %	[105-67-9]
1407.8	2,5-Dimethylphenol	>99 %	[95-87-4]
1360.8	3,5-Dimethylphenol	99.9 %	[108-68-9]
1411.8	4-Ethylphenol	99.2 %	[123-07-9]
1415.9	2-n-Propylphenol	99.7 %	[644-35-9]
1412.9	2,3,5-Trimethylphenol	98+%	[697-82-5]
1417.9	4-n-Propylphenol	98.4 %	[645-56-7]
1362.9	2,4,6-Trimethylphenol	99.9 %	[527-60-6]
1423.10	4-tert-Butylphenol	99.5 %	[98-54-4]
1424.10	4-Isopropyl-3-methylphenol	99.8 %	[3228-02-2]
1357.10	4-n-Butylphenol	98.0 %	[1638-22-8]
1430.11	2-tert-Butyl-4-methylphenol	99.2 %	[2409-55-4]
1429.11	4-tert-Butyl-2-methylphenol	98.2 %	[98-27-1]
1363.11	4-n-Pentylphenol	98 %	[14938-35-3]
1520.12	2,5-Diisopropylphenol	83.9 %	[35946-91-9]
1434.12	2,6-Diisopropylphenol	99.9 %	[2078-54-8]
1435.12	2-tert-Butyl-4-ethylphenol	99.2 %	[96-70-8]
1436.12	6-tert-Butyl-2,4-dimethylphenol (2-tert-Butyl-4,6-dimethylphenol)	99.3 %	[1879-09-0]
1440.13	4-n-Heptylphenol	99.9 %	[1987-50-4]
1446.14	4-tert-Octylphenol	96.5 %	[140-66-9]
1443.14	2,6-Di-tert-butylphenol	99.7 %	[128-39-2]
1445.14	4-n-Octylphenol	99.2 %	[1806-26-4]
1448.15	2,6-Di-tert-butyl-4-methylphenol	99.9 %	[128-37-0]
1450.15	4-n-Nonylphenol	99.3 %	[104-40-5]
1522.15	2-Methyl-4-tert-octylphenol	94.3 %	[2219-84-3]

S-4094-100-IO

Alkylated phenol mixture 3

31 Analytes, each 100µg/mL in isoctane, pestipure; units: 1x1 mL, 5x1mL

Prod.no.	Compound	Purity	CAS no.
1427.6	Phenol	99.9 %	[108-95-2]
1403.7	o-Cresol	99.6 %	[95-48-7]
1404.7	m-Cresol	98.1 %	[108-39-4]
1358.7	p-Cresol	99.1 %	[106-44-5]
1406.8	2,4-Dimethylphenol	99.8 %	[105-67-9]
1407.8	2,5-Dimethylphenol	>99 %	[95-87-4]
1360.8	3,5-Dimethylphenol	99.9 %	[108-68-9]
1411.8	4-Ethylphenol	99.2 %	[123-07-9]
1415.9	2-n-Propylphenol	99.7 %	[644-35-9]
1412.9	2,3,5-Trimethylphenol	98+%	[697-82-5]



1417.9	4-n-Propylphenol	98.4 %	[645-56-7]
1362.9	2,4,6-Trimethylphenol	99.9 %	[527-60-6]
1423.10	4-tert-Butylphenol	99.5 %	[98-54-4]
1424.10	4-Isopropyl-3-methylphenol	99.8 %	[3228-02-2]
1357.10	4-n-Butylphenol	98.0 %	[1638-22-8]
1430.11	2-tert-Butyl-4-methylphenol	99.2 %	[2409-55-4]
1429.11	4-tert-Butyl-2-methylphenol	98.2 %	[98-27-1]
1363.11	4-n-Pentylphenol	98 %	[14938-35-3]
1520.12	2,5-Diisopropylphenol	83.9 %	[35946-91-9]
1434.12	2,6-Diisopropylphenol	99.9 %	[2078-54-8]
1435.12	2-tert-Butyl-4-ethylphenol	99.2 %	[96-70-8]
1436.12	6-tert-Butyl-2,4-dimethylphenol (2-tert-Butyl-4,6-dimethylphenol)	99.3 %	[1879-09-0]
1440.13	4-n-Heptylphenol	99.9 %	[1987-50-4]
1446.14	4-tert-Octylphenol	96.5 %	[140-66-9]
1443.14	2,6-Di-tert-butylphenol	99.7 %	[128-39-2]
1445.14	4-n-Octylphenol	99.2 %	[1806-26-4]
1515.14	2,4-Di-sec-butylphenol	92.7 %	[1849-18-9]
1448.15	2,6-Di-tert-butyl-4-methylphenol	99.9 %	[128-37-0]
1450.15	4-n-Nonylphenol	99.3 %	[104-40-5]
1521.15	4,6-Di-tert-butyl-2-methylphenol	99.9 %	[616-55-7]
1522.15	2-Methyl-4-tert-octylphenol	94.3 %	[2219-84-3]

S-4419-100-510**Alkylated Phenol mixture 4**

3 Analytes, each 100 µg/mL in isooctane; unit: 1x5mL

Prod.no.	Compound	CAS no.
1437.12	4-n-Hexylphenol	[2446-69-7]
1442.14	2,4-Di-tert-butylphenol	[96-76-4]
1443.14	2,6-Di-tert-butylphenol	[128-39-2]

S-4440-ASS-510**Alkylated phenol mixture 5**

18 Analytes, each concentration as listet in isooctane; unit: 1x5mL

Prod.no.	Compound	CAS no.	Concentration
1427.6	Phenol	[108-95-2]	5000µg/mL
1404.7	m-Cresol	[108-39-4]	2000µg/mL
1411.8	4-Ethylphenol	[123-07-9]	200µg/mL
1406.8	2,4-Dimethylphenol	[105-67-9]	200µg/mL
1413.9	2,3,6-Trimethylphenol	[2416-94-6]	200µg/mL
1417.9	4-n-Propylphenol	[645-56-7]	200µg/mL
1422.10	4-sec-Butylphenol	[99-71-8]	200µg/mL
1357.10	4-n-Butylphenol	[1638-22-8]	200µg/mL
1430.11	2-tert-Butyl-4-methylphenol	[2409-55-4]	200µg/mL
1363.11	4-n-Pentylphenol	[14938-35-3]	200µg/mL
1437.12	4-n-Hexylphenol	[2446-39-7]	200µg/mL
1435.12	2-tert-Butyl-4-ethylphenol	[96-70-8]	200µg/mL
1503.13	2-Cyclohexyl-5-methylphenol	[1596-13-0]	200µg/mL
1440.13	4-n-Heptylphenol	[1987-50-4]	200µg/mL
1445.14	4-n-Octylphenol	[1806-26-4]	200µg/mL
1441.14	Di-sec-butylphenol, mixture of isomers	[5510-99-6]	200µg/mL
1450.15	4-n-Nonylphenol	[104-40-5]	200µg/mL
1448.15	2,6-Di-tert-butyl-4-methylphenol	[128-37-0]	200µg/mL



S-4411-ASS-IP

Deuterated alkylphenol mixture

6 Analytes, each concentration in isopropanol; unit: 1x1mL

Product description:

Prod.no.	Compound	CAS no.	Concentration
2280,7	p-Cresol-d ₈	[190780-66-6]	3000 µg/g
2399,8	3,5-Dimethylphenol-2,4,6-d ₃ , OD	-	2000 µg/g
2348,9	4-n-Propylphenol-d ₁₂	[352431-21-1]	2000 µg/g
2282,10	4-tert-Butyl-d ₉ -phenol-2,3,5,6-d ₄	[225386-58-3]	1000 µg/g
2410,11	4-n-Pentyl-d ₁₁ -phenol	-	1000 µg/g
2327,14	4-n-Octylphenol-d ₁₇	-	500 µg/g

Chloro- and nitrophenol standards

Custom solutions are available from these chloro- and nitrophenolic compounds:

2062.6	2-Chlorophenol	[95-57-8]
2063.7	2-Chloro-5-methylphenol	[615-74-7]
2064.6	2,4-Dichlorophenol	[120-83-2]
2065.6	2,5-Dichlorophenol	[583-78-8]
2066.6	2,3-Dichlorophenol	[576-24-9]
2067.6	3-Chlorophenol	[108-43-0]
2068.6	4-Chlorophenol	[106-48-9]
2069.6	2,6-Dichlorophenol	[87-65-0]
2070.7	4-Chloro-2-methylphenol	[1570-64-5]
2071.7	4-Chloro-3-methylphenol	[59-50-7]
2072.6	2,3,6-Trichlorophenol	[933-75-5]
2073.6	2,3,5-Trichlorophenol	[933-78-8]
2074.6	2,3,5,6-Tetrachlorophenol	[935-95-5]
2075.6	2,4,5-Trichlorophenol	[95-95-4]
2076.6	2,4,6-Trichlorophenol	[88-06-2]
2077.6	2,3,4-Trichlorophenol	[15950-66-0]
2078.6	3,5-Dichlorophenol	[591-35-5]
2080.6	3,4-Dichlorophenol	[95-77-2]
2081.6	2,3,4,5-Tetrachlorophenol	[4901-51-3]
2082.6	3,4,5-Trichlorophenol	[609-19-8]
2084.6	Pentachlorophenol	[87-86-5]
2085.6	2-Nitrophenol	[88-75-5]
2086.6	3-Nitrophenol	[554-84-7]
2087.6	4-Nitrophenol	[100-02-7]
2079.6	2,4-Dinitrophenol	[51-28-5]
2083.7	2-Methyl-4,6-Dinitrophenol	[534-52-1]

International methods

Please consult the Methods section for details.

- EPA 528 Rev. 1.0 Phenols in Drinking Water by Solid Phase Extraction and GC-MS, page 90.
- EPA 8041 A Phenols as PFB Derivatives by GC-ECD or FID, page 98.
- EPA 604 Phenols by GC-FID and Phenols as PFB Derivatives (GC-ECD), page 92.



PAH analysis and PAH mixtures

Polycyclic aromatic hydrocarbons (PAHs) and especially the sixteen ones chosen by the EPA as priority pollutants, the so-called EPA-PAHs, are analytes that have to be determined very frequently in environmental and food analysis, occupational monitoring and in toxicological studies.

The PAHs are known to possess highly carcinogenic and mutagenic properties. The toxic effects are related to benzo[a]pyrene which is set to a basis of 1.0. Large variations in the group of PAHs are observed. The toxicity is often related to structural patterns, so called QSARs, e.g. in the bay and the fjord regions. The carcinogenic impact can be put down to the metabolites of the corresponding parent PAHs. The metabolites are more water soluble, and are formed by epoxidation, hydroxylation, glucuronidation or sulfatation. The initial step is the activation via the Cyt. P450 system.

TOXICITY OF PAH-COMPOUNDS RELATIVE TO BENZO[A]PYRENE

	Ref.1	Ref.2	Ref.3	Ref.4-6	Ref. 8	Genotoxicity (Ref 7)	Cancerogen. (Ref 7)
Dibenzo[a,l]pyrene			100	100		(+)	+
Dibenzo[a,h]pyrene			1.0	1.2		(+)	+
Benzo[a]pyrene	1.0	1.0	1.0	1.0	1.0	+	+
Dibenzo[a,e]fluoranthene				1.0			
Dibenzo[a,e]pyrene				1.0		+	+
Dibenz[a,h]anthracene	1.0	1.0	1.0	0.89	1.0	+	+
Anthanthrene				0.28		+	+
Dibenz[a,i]pyrene			0.1			+	+
Benzo[b]fluoranthene	0.1	0.1	0.1	0.11	0.1	+	+
Indeno[1,2,3-cd]pyrene	0.1	0.1	0.1	0.067	0.1	+	+
Benzo[j]fluoranthene		0.1	0.1	0.045		+	+
Benzo[k]fluoranthene	0.1	0.1	0.1	0.037	0.01	+	+
Benzo[a]anthracene	0.1	0.1	0.1	0.014	0.1	+	+
Dibenz[a,c]anthracene	0.1						
Cyclopenta[cd]pyrene	0.1		0.1	0.012		+	+
Chrysene	0.01	0.01	0.1	0.026	0.001	+	+
5-Methylchrysene						+	+
Benzo[c]phenanthrene						(+)	+
Benzo[e]pyrene	0.01			0		+	(?)
Benzo[ghi]perylene	0.01	0.01		0.012		+	-
Triphenylene						+	-
Acenaphthylene	0.001	0.01				(?)	no studies
Fluoranthene	0.001	0.01				+	(?)
1-Methylphenanthrene	0.001					+	-
Coronene	0.001					(+)	(?)
Perylene	0.001					+	-
Benzo[ghi]fluoranthene						(+)	(-)
Naphthalene	0.001					-	?
Anthracene	0.01	0.01				-	-
Acenaphthene	0.001	0.001			0	(?)	(?)
Fluorene	0.001	0				-	-
Phenanthrene	0.001	0		0.00064		(?)	(?)
Pyrene	0.001	0.001		0		(?)	-
Benzo[a]fluorine						(?)	(?)
Benzo[b]fluorine						(?)	(?)



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- F. Kalberlah, N. Frijus-Plessen and M. Hassauer, Altlasten-Spektrum, **5**, pp 231-237 (1995).
- P. McClure and R. Scheny, Fifteenth International Symposium on Polycyclic Aromatic Compounds, Belgirate, Italy, 19-22 Sept 1995, p. 161.
- P. Müller, B. Leece and D. Raha, Fifteenth International Symposium on Polycyclic Aromatic Compounds, Belgirate, Italy, 19-22 Sept 1995, p. 159-160.
- P. Müller, B. Leece and D. Raha, Dose Respons Assessment PAH. Ottawa, Ontario Ministry of the Environment and Energy, p. 197 (1995).
- P. Müller, B. Leece and D. Raha, **Scientific Criteria Document for Multimedia Environmental Standards Development: Polycyclic Aromatic Hydrocarbons (PAH)** Dose Respons Assessment PAH. Ottawa, Ontario Ministry of the Environment and Energy, p. 203 (1996).
- IPCS (International Programme on Chemical Safety), Environmental Health Criteria **202**, WHO (1998).
- US Environmental Protection Agency, Provisional Guidance for Quantitative Risk Assessment of Polycyclic Hydrocarbons. EPA/600/R-93/089 (1993).

Internal standards

F-PAHs® internal standards

Monofluorinated PAHs (F-PAHs®) are closely similar to the parent PAHs in terms of chemical and physical properties.

The close similarities between the F-PAH® and the parent PAHs makes them ideal internal standards in a broad range of analytic and mechanistic applications and studies.

With the introduction of the mono F-PAH® standards, Chiron has set a new benchmark in PAH-analysis:

- Improved and more efficient results
- Cheaper than isotopically labelled counterparts, deuterium and ¹³C
- F-PAHs® are separated from the parent PAH by GC and HPLC
- F-PAHs® are easy to detect by MS and UV/Fluorescence
- Additional detection information with AED, NMR and MS techniques
- There is no scrambling, like sometimes observed with deuterium
- There is no known occurrence in nature, like methylated analogous

Single components F-PAHs (1, 5 or 10x1mL)

1313.10-10-IO	1-Fluoronaphthalene	[321-38-0]	10µg/mL	isooctane
1313.10-100-IO	1-Fluoronaphthalene	[321-38-0]	100µg/mL	isooctane
1314.12-10-T	5-Fluoroacenaphthylene	[17521-01-6]	10µg/mL	toluene
1314.12-100-T	5-Fluoroacenaphthylene	[17521-01-6]	100µg/mL	toluene
2364.11-100-IO	2-Fluoro-6-methylnaphthalene	[324-42-5]	100µg/mL	isooctane
1315.13-10-T	2-Fluorofluorene	[343-43-1]	10µg/mL	toluene
1315.13-100-T	2-Fluorofluorene	[343-43-1]	100µg/mL	toluene
1316.14-10-T	3-Fluorophenanthrene	[440-40-4]	10µg/mL	toluene
1328.14-10-T	2-Fluorophenanthrene	[523-41-1]	10µg/mL	toluene
1316.14-100-T	3-Fluorophenanthrene	[440-40-4]	100µg/mL	toluene
1328.14-100-T	2-Fluorophenanthrene	[523-41-1]	100µg/mL	toluene
2873.15-50-IO	3-Fluoro-6-methylphenanthrene	[84194-32-2]	50µg/mL	isooctane
1319.16-10-T	3-Fluorofluoranthene	[1691-66-3]	10µg/mL	toluene
1319.16-100-T	3-Fluorofluoranthene	[1691-66-3]	100µg/mL	toluene
1318.16-10-T	1-Fluoropyrene	[1691-65-2]	10µg/mL	toluene
1318.16-100-T	1-Fluoropyrene	[1691-65-2]	100µg/mL	toluene
1900.18-10-T	1-Fluorochrysene		10µg/mL	toluene
1900.18-100-T	1-Fluorochrysene		100µg/mL	toluene
1317.18-10-T	3-Fluorochrysene	[36288-22-9]	10µg/mL	toluene



1317.18-100-T	3-Fluorochrysene	[36288-22-9]	100µg/mL	toluene
2872.19-50-IO	9-Fluoro-5-methylchrysene	[64977-46-8]	50µg/mL	isooctane
1322.20-10-T	9-Fluorobenzo[k]fluoranthene	[113600-15-0]	10µg/mL	toluene
1322.20-100-T	9-Fluorobenzo[k]fluoranthene	[113600-15-0]	100µg/mL	toluene

Single components deuterated PAHs (neat or 1, 5 or 10x1mL for solutions)

0978.10-K-IO	Naphthalene-d ₈	[1146-65-2]	1000µg/mL	isooctane
0978.10-K-T	Naphthalene-d ₈	[1146-65-2]	1000µg/mL	toluene
0978.10-10MG	Naphthalene-d ₈	[1146-65-2]	neat	10mg
0387.11-K-IO	1-Methylnaphthalene-d ₁₀	[38072-94-5]	1000µg/mL	isooctane
1345.11-K-IO	2-Methylnaphthalene-d ₁₀	[7297-45-2]	1000µg/mL	isooctane
0388.12-K-IO	1,8-Dimethylnaphthalene-d ₁₂	[104489-29-4]	1000µg/mL	isooctane
1344.12-K-IO	2,6-Dimethylnaphthalene-d ₁₂	[350820-12-1]	1000µg/mL	isooctane
1336.12-K-T	Acenaphthylene-d ₈	[93951-97-4]	1000µg/mL	toluene
1336.12-10MG	Acenaphthylene-d ₈	[93951-97-4]	neat	10 mg
1524.12-100-T	Acenaphthene-d ₁₀	[15067-26-2]	100µg/mL	toluene
1524.12-K-T	Acenaphthene-d ₁₀	[15067-26-2]	1000µg/mL	toluene
1524.12-10MG	Acenaphthene-d ₁₀	[15067-26-2]	neat	10mg
1530.13-K-IO	Fluorene-d ₁₀	[81103-79-9]	1000µg/mL	isooctane
1530.13-10MG	Fluorene-d ₁₀	[81103-79-9]	neat	10mg
0389.14-K-T	Phenanthrene-d ₁₀	[1517-22-2]	1000µg/mL	toluene
0389.14-10MG	Phenanthrene-d ₁₀	[1517-22-2]	neat	10mg
0390.14-K-T	Anthracene-d ₁₀	[1719-06-8]	1000µg/mL	toluene
0391.15-K-IO	9-Methylanthracene-d ₁₂	[6406-97-9]	1000µg/mL	isooctane
0390.14-10MG	Anthracene-d ₁₀	[1719-06-8]	neat	10mg
1337.16-K-T	Fluoranthene-d ₁₀	[93951-69-0]	1000µg/mL	toluene
1337.16-10MG	Fluoranthene-d ₁₀	[93951-69-0]	neat	10mg
0329.16-100-T	Pyrene-d ₁₀	[1718-52-1]	100µg/mL	toluene
0329.16-200-T	Pyrene-d ₁₀	[1718-52-1]	200µg/mL	toluene
0329.16-K-T	Pyrene-d ₁₀	[1718-52-1]	1000µg/mL	toluene
0329.16-10MG	Pyrene-d ₁₀	[1718-52-1]	neat	10mg
0326.17-10MG	1-Methylpyrene-d ₉	[210487-07-3]	neat	10mg
0326.17-100-T	1-Methylpyrene-d ₉	[210487-07-3]	100µg/mL	toluene
1024.18-100-T	Chrysene-d ₁₂	[1719-03-5]	100µg/mL	toluene
1024.18-200-T	Chrysene-d ₁₂	[1719-03-5]	200µg/mL	toluene
1024.18-K-T	Chrysene-d ₁₂	[1719-03-5]	1000µg/mL	toluene
1024.18-2K-T	Chrysene-d ₁₂	[1719-03-5]	2000µg/mL	toluene
1024.18-10MG	Chrysene-d ₁₂	[1719-03-5]	neat	10mg
1087.18-100-T	Benz[a]anthracene-d ₁₂	[1718-53-2]	100µg/mL	toluene
1087.18-K-T	Benz[a]anthracene-d ₁₂	[1718-53-2]	1000µg/mL	toluene
1087.18-10MG	Benz[a]anthracene-d ₁₂	[1718-53-2]	neat	10mg
1538.18-K-T	Triphenylene-d ₁₂	[17777-56-9]	1000µg/mL	toluene
1538.18-K-T	Triphenylene-d ₁₂	[17777-56-9]	1000µg/mL	toluene
1088.20-100-T	Benzo[a]pyrene-d ₁₂	[63466-71-7]	100µg/mL	toluene
1088.20-K-T	Benzo[a]pyrene-d ₁₂	[63466-71-7]	1000µg/mL	toluene
1088.20-10MG	Benzo[a]pyrene-d ₁₂	[63466-71-7]	neat	10mg
1525.20-100-T	Benzo[e]pyrene-d ₁₂	[205440-82-0]	100µg/mL	toluene
1348.20-100-T	Benzo[b]fluoranthene-d ₁₂	[93951-98-5]	100µg/mL	toluene
1348.20-10MG	Benzo[b]fluoranthene-d ₁₂	[93951-98-5]	neat	10mg
1349.20-100-T	Benzo[k]fluoranthene-d ₁₂	[93952-01-3]	100µg/mL	toluene
1349.20-10MG	Benzo[k]fluoranthene-d ₁₂	[93952-01-3]	neat	10mg
1534.20-K-T	Perylene-d ₁₂	[1520-96-3]	1000µg/mL	toluene
1534.20-10MG	Perylene-d ₁₂	[1520-96-3]	neat	neat



1089.22-100-T	Benzo[ghi]perylene-d ₁₂	[93951-66-7]	100µg/mL	toluene
1089.22-200-T	Benzo[ghi]perylene-d ₁₂	[93951-66-7]	200µg/mL	toluene
1089.22-K-T	Benzo[ghi]perylene-d ₁₂	[93951-66-7]	1000µg/mL	toluene
1089.22-10MG	Benzo[ghi]perylene-d ₁₂	[93951-66-7]	neat	10mg
1531.22-K-T	Indeno[1,2,3-cd]pyrene-d ₁₂	[2053578-33-0]	1000µg/mL	toluene
1531.22-10MG	Indeno[1,2,3-cd]pyrene-d ₁₂	[2053578-33-0]	neat	10mg
1330.22-100-IO	Dibenz[a,h]anthracene-d ₁₄	[13250-98-1]	100µg/mL	isooctane
1330.22-100-T	Dibenz[a,h]anthracene-d ₁₄	[13250-98-1]	100µg/mL	toluene
1330.22-200-T	Dibenz[a,h]anthracene-d ₁₄	[13250-98-1]	200µg/mL	toluene
1330.22-10MG	Dibenz[a,h]anthracene-d ₁₄	[13250-98-1]	neat	10mg
1526.24-100-T	Coronene-d ₁₂	[16083-32-2]	100µg/mL	toluene
1526.24-K-T	Coronene-d ₁₂	[16083-32-2]	1000µg/mL	toluene
1529.24-100-T	Dibenzo[a,i]pyrene-d ₁₄	[158776-07-9]	100µg/mL	toluene
1529.24-K-T	Dibenzo[a,i]pyrene-d ₁₄	[158776-07-9]	1000µg/mL	toluene
1529.24-10MG	Dibenzo[a,i]pyrene-d ₁₄	[158776-07-9]	neat	10mg
1086.12-K-T	Biphenyl-d ₁₀	[1486-01-7]	1000µg/mL	toluene
1086.12-10MG	Biphenyl-d ₁₀	[1486-01-7]	neat	10mg

Internal unlabelled standards for GC- and HPLC-analysis of PAH compounds

Concentration: Neat or 1000 µg/mL, 1, 5, 10x1 mL

0393.12	n-Hexylbenzene	[1077-16-3]	in isooctane or 100mg neat (GC)
0728.12	2,3-Dimethylnaphthalene	[581-40-8]	in isooctane or 100mg neat (GC)
0768.16	3,6-Dimethylphenanthrene	[1576-67-6]	in isooctane or 10mg neat (GC)
0254.20	2,2'-Binaphthyl	[612-78-2]	in toluene or 10mg neat (GC)
1049.14	Anthracene	[120-12-7]	in toluene or 100mg neat (GC)
0306.21	6-Methylbenzo[a]pyrene	[2381-39-7]	in toluene or 10mg neat (HPLC)



Recommended internal standards

Recommended internal standards for GC-MS analysis.

The analytes are given in normal and the internal standards in bold letters.

Window 1:		MW			MW
0711.10	Naphthalene	128	0027.18	Benzo[c]phenanthrene	228
	Methylnaphthalene isomers	142	0201.18	Benz[a]anthracene	228
1313.10	1-Fluoronaphthalene	146	0001.18	Triphenylene	228
0978.10	Naphthalene-d8	136	0212.18	Chrysene	228
			1319.16	3-Fluorofluoranthene	220
			1318.16	1-Fluoropyrene	220
			1317.18	3-Fluorochrysene	246
			0329.16	Pyrene-d₁₀	212
			1087.18	Benzo[a]anthracene-d₁₂	240
Window 2:			Window 5:		
Biphenyl		154	0263.20	Benzo[b]fluoranthene	252
0729.12	2,6-Dimethylnaphthalene	156	0264.20	Benzo[j]fluoranthene	252
0002.12	Acenaphthylene	152	0265.20	Benzo[k]fluoranthene	252
0732.12	Acenaphthene	154	0262.20	Benzo[a]fluoranthene	252
1314.12	5-Fluoroacenaphthylene	170	0236.20	Benzo[e]pyrene	252
1712.12	4-Fluorobiphenyl	172	0239.20	Benzo[a]pyrene	252
1086.12	Biphenyl-d₁₀	164	0220.20	Perylene	264
			1322.20	9-Fluorobenzo[k]fluoranthene	270
			1088.20	Benzo[a]pyrene-d₁₂	264
Window 3:			Window 6:		
0217.13	Fluorene	166	0204.22	Dibenz[a,j]anthracene	278
0816.14	Phenanthrene	178	0203.22	Dibenz[a,h]anthracene	278
1049.14	Anthracene	178	0202.22	Dibenz[a,c]anthracene	278
1316.14	3-Fluorophenanthrene	196		Benzochrysenes	278
0389.14	Phenanthrene-d₁₀	188	0215.22	Picene	278
			0277.22	Indeno[1,2,3-cd]pyrene	278
			0222.22	Benzo[ghi]perylene	276
			1089.20	Benzo[ghi]perylene-d₁₂	288
Window 4:					
	Methylphenanthrene isomers	192			
	Dimethylphenanthrene isomers	206			
0029.22	Pentaphene	278			
0235.16	Pyrene	202			
0260.16	Fluoranthene	202			
	Methylfluoranthene isomers	216			
	Methylpyrene isomers	216			
0035.18	Cyclopenta[cd]pyrene	226			
0261.18	Benzo[ghi]fluoranthene	226			

Recommended "all-in-one" F-PAHs® cocktails for GC-MS applications

S-4102-200-T

F-PAHs All in One Cocktail 1, Window 1-4

5 Analytes, each 200 µg/mL in toluene; units: 1x1 mL, 5x1 mL

Compounds	Window
1313.10 1-Fluoronaphthalene	1 [321-38-0]
1712.12 4-Fluorobiphenyl	2 [324-74-3]
1316.14 3-Fluorophenanthrene	3 [440-40-4]
1318.16 1-Fluoropyrene	4 [1691-65-2]
1317.18 3-Fluorochrysene	4 [36288-22-9]

**S-4103-ASS-T****F-PAHs All in One Cocktail 2, Window 1-5**

6 Analytes, each concentration as listed in toluene; units: 1x1 mL, 5x1 mL

Compounds		Window		
1313.10	1-Fluoronaphthalene	1	[321-38-0]	200 µg/mL
1712.12	4-Fluorobiphenyl	2	[324-74-3]	200 µg/mL
1316.14	3-Fluorophenanthrene	3	[440-40-4]	200 µg/mL
1318.16	1-Fluoropyrene	4	[1691-65-2]	200 µg/mL
1317.18	3-Fluorochrysene	4	[36288-22-9]	200 µg/mL
1322.20	9-Fluorobenz[o]fluoranthene	5	[113600-15-0]	100 µg/mL

Recommended internal standards mixtures for GC-FID applications**S-4006-500-5DC****Internal Standard for GC-analysis of PAH compounds**

4 Analytes, each 500 µg/mL in dichloromethane; unit: 1x5 mL

0393.12	1-Phenylhexane	[1077-16-3]
0728.12	2,3-Dimethylnaphthalene	[581-40-8]
0768.16	3,6-Dimethylphenanthrene	[1576-67-6]
0254.20	2,2'-Binaphthyl	[612-78-2]

"All-in-one" deuterated PAHs® cocktails for GC-MS**Window 1-6:****S-4124-200-T****S-4124-500-5T****Perdeuterated Internal Standard - PAH-Mixture 6**

7 Analytes, each 200 µg/mL in toluene; units: 1x1 mL, 1x5 mL

Compounds		Window	
0978.10	Naphthalene-d ₈	1	[1146-65-2]
1086.12	Biphenyl-d ₁₀	2	[1486-01-7]
0389.14	Phenanthrene-d ₁₀	3	[1517-22-2]
0329.16	Pyrene-d ₁₀	4	[1718-52-1]
1087.18	Benz[a]anthracene-d ₁₂	5	[1718-53-2]
1088.20	Benzo[a]pyrene-d ₁₀	5	[63466-71-7]
1089.22	Benzo[ghi]perylene-d ₁₂	6	[93951-66-7]

Window 1-3+5**S-4048-2K-T****S-4048-2K-5T****Perdeuterated Internal Standard - PAH-Mixture 1**

4 Analytes, each 2000 µg/mL in toluene; units: 1x1 mL, 1x5 mL

Compounds		Window	
0978.10	Naphthalene-d ₈	1	[1146-65-2]
1086.12	Biphenyl-d ₁₀	2	[1486-01-7]
0389.14	Phenanthrene-d ₁₀	3	[1517-22-2]
1088.20	Benzo[a]pyrene-d ₁₀	5	[63466-71-7]



Window 1-3+5
S-4125-200-T
S-4125-200-5T

Perdeuterated Internal Standard - PAH-Mixture 7

4 Analytes, each 2000 µg/mL in toluene; units: 1x1 mL, 1x5 mL

Compounds		Window	
0978.10	Naphthalene-d ₈	1	[1146-65-2]
1086.12	Biphenyl-d ₁₀	2	[1486-01-7]
0389.14	Phenanthrene-d ₁₀	3	[1517-22-2]
1088.20	Benzo[a]pyrene-d ₁₀	5	[63466-71-7]

Window 1-5:
S-4126-200-T
S-4126-200-5T

Perdeuterated Internal Standard - PAH-Mixture 8

5 Analytes, each 2000 µg/mL in toluene; units: 1x1 mL, 1x5 mL

Compounds		Window	
0978.10	Naphthalene-d ₈	1	[1146-65-2]
1086.12	Biphenyl-d ₁₀	2	[1486-01-7]
0389.14	Phenanthrene-d ₁₀	3	[1517-22-2]
0329.16	Pyrene-d ₁₀	4	[1718-52-1]
1088.20	Benzo[a]pyrene-d ₁₀	5	[63466-71-7]

See also page 142 for other deuterated PAH-mixes.

NEW

16 EPA and 15 EU "all-in-one" deuterated standards

S-4513-100-5T Perdeuterated Internal standard - All-in-one 16 EPA priority PAHs

S-4514-100-5T Perdeuterated Internal standard - All-in-one 15 EU priority PAHs

Native single PAH-standards, metabolites and derivatives

See the Compounds section, page 295 and onward.



International methods

Priority PAH's recommended by various authorities

Chiron No.		EPA***	WHO/	EAA	NS 9815 EEC*	Italy**	MW
0711.10	Naphthalene	x					128
0002.12	Acenaphthylene	x					152
0732.12	Acenaphthene	x					154
0217.13	Fluorene	x					166
0816.14	Phenanthrene	x		x	X		178
1049.14	Anthracene	x		x	X		178
0260.16	Fluoranthene	x	x	x	X		202
0235.16	Pyrene	x		x	X		202
0259.17	Benzo[a]fluorene			x	x		216
0218.17	Benzo[b]fluorene			x	x		216
0201.18	Benz[a]anthracene	x		x	x	x	228
0212.18	Chrysene	x		x	x		228
0001.18	Triphenylene			x			228
0263.20	Benzo[b]fluoranthene	x	x	x	x	x	252
0264.20	Benzo[j]fluoranthene					x	252
0265.20	Benzo[k]fluoranthene	x	x	x	x	x	252
0239.20	Benzo[a]pyrene	x	x	x	x	x	252
0236.20	Benzo[e]pyrene			x	x		252
0203.22	Dibenz[a,h]anthracene	x		x	x	x	278
0222.22	Benzo[ghi]perylene	x	x	x	x		276
0277.22	Indeno[1,2,3-cd]pyrene	x	x	x	x		276
0244.24	Dibenzo[a,e]pyrene			x	x	x	302
0242.24	Dibenzo[a,h]pyrene			x			302
0241.24	Dibenzo[a,i]pyrene			x			302
Chiron No.:		S-4063- 4065	S-4062	S-4113	S-4008	Request	

EPA	The US Environmental Protection Agency Method 610 etc.
WHO	World Health Organisation
EEC	European Economic Community
EAA	European Aluminium Association
NS	Norwegian Standard
Italy	Italian National Advisory Toxicological Com. for Health Related Studies

*	Drinking water
**	Air
***	EPA-Methods:

International PAH-methods:

ASTM D 5186-03	SFC-method
ASTM D 5580-02	Gasoline
ASTM D 5739-06	Oil spill
ASTM D 5769-04	Aromatics in gasoline
ASTM D 6370-04	Aviation fuels
ASTM D 6591-06	Middle distillates
ISO 7981.1:2005	Water quality – six PAHs by tlc
ISO 7981.2:2005	Water quality – sixPAHs by HPLC
ISO 15753:2006	PAH in Animal and vegetable fats and oils



ISO 17993:2002	Water quality – 15 PAHs by HPLC
EPA 525.2	Water – Organics and PAHs by GC
EPA 527	Drinking water – pesticides and PBDEs by GC/MS
EPA 610	PAH in wastewater by HPLC and GC
EPA 8100	PAHs in water by GC-FID
EPA 8260	Volatile Compounds by GC-MS
EPA 8270C	Semivolatile Compounds by GC-MS
EPA 8310	Polycyclic Aromatic Hydrocarbons in Ground water and wastes

Reference PAH cocktails according to international methods

EPA-PAHs

Single components EPA-PAHs

Pack sizes for solutions: 1x1mL, 5x1mL, 10x1mL, and neat compound.

0711.10	Naphthalene	(99%)	[91-20-3]	1000 µg/mL	10mg
0002.12	Acenaphthylene	(99%)	[208-96-8]	1000 µg/mL	10mg
0732.12	Acenaphthene	(99%)	[83-32-9]	1000 µg/mL	10mg
0217.13	Fluorene	(99%)	[86-73-7]	1000 µg/mL	10mg
0816.14	Phenanthrene	(99%)	[85-01-8]	1000 µg/mL	10mg
1049.14	Anthracene	(99%)	[120-12-7]	1000 µg/mL	10mg
0260.16	Fluoranthene	(99%)	[206-44-0]	200 µg/mL*	10mg
0235.16	Pyrene	(99%)	[129-00-0]	200 µg/mL*	10mg
0201.18	Benz[a]anthracene	(99%)	[56-55-3]	200 µg/mL*	10mg
0212.18	Chrysene	(99%)	[218-01-9]	200 µg/mL*	10mg
0263.20	Benzo[b]fluoranthene	(99%)	[205-99-2]	200 µg/mL*	10mg
0265.20	Benzo[k]fluoranthene	(99%)	[207-08-9]	200 µg/mL*	10mg
0239.20	Benzo[a]pyrene	(99%)	[50-32-8]	200 µg/mL*	10mg
0203.22	Dibenz[a,h]anthracene	(99%)	[215-58-7]	200 µg/mL*	10mg
0222.22	Benzo[ghi]perylene	(99%)	[191-24-2]	200 µg/mL*	10mg
0277.22	Indeno[1,2,3-cd]pyrene	(99%)	[193-39-5]	200 µg/mL*	10mg

1708.16 Single EPA-PAH Kit Solutions

1959.16 Single EPA-PAH Kit Neat, 10 mg each

* Also available as 1000 µg/mL



The universal "all-in-one" 16 EPA-PAH solutions from Chiron

Designed for calibration of GC/GC-MS and HPLC applications according to EPA methods 550.1/610/8100/8270C/8310

For other blends see page 136.

Please inquire for custom blends

EPA methods 550.1/610/8100/8270C/8310:

S-4063-100-5T	16 Priority PAH, Cocktail 1 100 µg of each/mL in toluene, 5 mL in screw cap bottle
S-4064-10-5CY	16 Priority PAH, Cocktail 2 10 µg of each/mL in cyclohexane, 5 mL in screw cap bottle
S-4065-10-5AN	16 Priority PAH, Cocktail 3 10 µg of each/mL in acetonitrile, 5 mL in screw cap bottle

15 EU PAHs (2005/108 recommendation)

NEW

0201,18-200-T	Benz[a]anthracene	[56-55-3]	200µg/mL
0212,18-200-T	Chrysene	[218-01-9]	200µg/mL
0263,20-200-T	Benzo[b]fluoranthene	[205-99-2]	200µg/mL
0264,20-200-T	Benzo[j]fluoranthene	[205-82-3]	200µg/mL
0265,20-200-T	Benzo[k]fluoranthene	[207-08-9]	200µg/mL
0239,20-200-T	Benzo[a]pyrene	[50-32-8]	200µg/mL
0035,18-200-T	Cyclopenta[cd]pyrene	[27208-37-3]	200µg/mL
0203,22-200-T	Dibenzo[a,h]anthracene	[215-58-7]	200µg/mL
0222,22-200-T	Benzo[ghi]perylene	[191-24-2]	200µg/mL
0244,24-200-T	Dibenzo[a,e]pyrene	[192-65-4]	200µg/mL
0242,24-200-T	Dibenzo[a,h]pyrene	[189-64-0]	200µg/mL
0241,24-200-T	Dibenzo[a,i]pyrene	[189-55-9]	200µg/mL
0243,24-200-T	Dibenzo[a,l]pyrene	[191-30-0]	200µg/mL
0277,22-200-T	Indeno[1,2,3-cd]pyrene	[193-39-5]	200µg/mL
0296,19-200-T	5-Methylchrysene	[3697-24-3]	200µg/mL
3958.15 -KIT	Single 15 EU PAH Kit		

The universal "all-in-one" 15 EU-PAH solutions from Chiron

S-4452-100-T	15 EU PAH Cocktail 15 Analytes, 100µg/mL each in toluene, 1x1mL ampolle or 1x5mL screw cap bottle.
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WHO/EU PAH in drinking water (=ISO 7981.1 and 2)

S-4062-ASS-5AN 6 Priority PAH in Acetonitrile - drinking water analysis (WHO/EU)

6 Analytes, each concentration as listed in acetonitrile; units: 1x5mL

0260.16	Fluoranthene	[206-44-0]	10 µg/mL
0277.22	Indenopyrene	[193-39-5]	2 µg/mL
0263.20	Benzo[b]fluoranthene	[205-99-2]	2 µg/mL
0265.20	Benzo[k]fluoranthene	[207-08-9]	2 µg/mL
0239.20	Benzo[a]pyrene	[50-32-8]	2 µg/mL
0222.20	Benzo[ghi]perylene	[191-24-2]	2 µg/mL

Other PAH mixes

Native

S-4001-K-T

PAH-Mixture A

13 Analytes, each 1000 µg/mL in toluene; units: 1x1 mL

1220.15	Bisphenol A	[80-05-7]
0712.11	1-Methylnaphthalene	[90-12-0]
0713.11	2-Methylnaphthalene	[91-57-6]
0884.12	Dibenzothiophene	[132-65-0]
0812.15	2-Methylphenanthrene	[2531-84-2]
0768.16	3,6-Dimethylphenanthrene	[1576-67-6]
0259.17	1H-Benzo[a]fluorene	[238-84-6]
0304.17	1-Methylpyrene	[2381-21-7]
0001.18	Triphenylene	[217-59-4]
0236.20	Benzo[e]pyrene	[192-97-2]
0220.20	Perylene	[198-55-0]
0706.13	2,3,5-Trimethylnaphthalene	[2245-38-7]
0729.12	2,6-Dimethylnaphthalene	[581-42-0]

S-4410-10-T

PAH Mixture D

7 Analytes, each 10 µg/mL in toluene; unit: 1x1.1 mL

Prod.no.	Compound	CAS No.
0201.18	Benz[a]anthracene	[56-55-3]
0263.20	Benzo[b]fluoranthene	[205-99-2]
0264.20	Benzo[j]fluoranthene	[205-82-3]
0265.20	Benzo[k]fluoroanthene	[207-08-9]
0277.22	Indeno[1,2,3-cd]pyrene	[193-39-5]
0203.22	Dibenz[a,h]anthracene	[53-70-3]
0239.20	Benzo[a]pyrene	[50-32-8]

**S-4413-ASS-T****PAH Mixture E**

25 Analytes, each concentration as listed in toluene; unit: 1x1 mL

Prod.no.	Compound	CAS No.	Conc.
0711,10	Naphthalene	[91-20-3]	50 µg/mL
0002,12	Acenaphthylene	[208-96-8]	200 µg/mL
0732,12	Acenaphthene	[83-32-9]	200 µg/mL
0217,13	Fluorene	[86-73-7]	200 µg/mL
0816,14	Phenanthrene	[85-01-8]	500 µg/mL
1049,14	Anthracene	[120-12-7]	500 µg/mL
0260,16	Fluoranthene	[206-44-0]	500 µg/mL
0235,16	Pyrene	[129-00-0]	500 µg/mL
0201,18	Benz[a]anthracene	[56-55-3]	500 µg/mL
0212,18	Chrysene	[218-01-9]	500 µg/mL
0263,20	Benzo[b]fluoranthene	[205-99-2]	500 µg/mL
0265,20	Benzo[k]fluoranthene	[207-08-9]	500 µg/mL
0239,20	Benzo[a]pyrene	[50-32-8]	500 µg/mL
0277,22	Indeno[1,2,3-cd]pyrene	[193-39-5]	500 µg/mL
0203,22	Dibenz[a,h]anthracene	[53-70-3]	500 µg/mL
0222,22	Benzo[ghi]perylene	[191-24-2]	500 µg/mL
0264,20	Benzo[j]fluoranthene	[205-82-3]	500 µg/mL
0256,22	Anthanthrene	[191-26-4]	500 µg/mL
0485,16	Benzo[b]naphtho[2,1-d]thiophene	[239-35-0]	500 µg/mL
0027,18	Benzo[c]phenanthrene	[195-19-7]	500 µg/mL
0035,18	Cyclopenta[cd]pyrene	[27208-37-3]	500 µg/mL
0241,24	Dibenzo[a,l]pyrene	[189-55-9]	500 µg/mL
0036,20	Cholanthrene	[479-23-2]	500 µg/mL
0236,20	Benzo[e]pyrene	[192-97-2]	500 µg/mL
0226,24	Coronene	[191-07-1]	500 µg/mL

S-4442-200-T**PAH Mixture G**

7 Analytes, each 200µg/mL in toluene; unit: 1x1.1 mL

Prod.no.	Compound	CAS.No.
0485.16	Benzo[b]naphtho[2,1-d]thiophene	[239-35-0]
0027.18	Benzo[c]phenanthrene	[195-19-7]
0035.18	Cyclopenta[cd]pyrene	[27208-37-3]
0036.20	Cholanthrene	[479-23-2]
0236.20	Benzo[e]pyrene	[192-97-2]
0256.22	Anthanthrene	[191-26-4]
0241.24	Dibenzo[a,i]pyrene	[189-55-9]

S-4443-100-T**PAH Mixture H**

S-4443-100-5T

5 Analytes, each 100µg/mL in toluene; units: 1x1 mL, 1x5 mL

Prod.no.	Compound	CAS.No.
0259.17	11H-Benzo[a]fluorene	[238-84-6]
0218.17	11H-Benzo[b]fluorene	[243-17-4]
0244.24	Dibenzo[a,e]pyrene	[192-65-4]
0242.24	Dibenzo[a,h]pyrene	[189-64-0]
0241.24	Dibenzo[a,i]pyrene	[189-55-9]



S-4445-200-T

PAH Mixture 1

7 Analytes, each 200µg/mL in toluene; units: 1x1.1mL

Prod.no.	Compound	CAS.No.
0711.10	Naphthalene	[91-20-3]
0712.11	1-Methylnaphthalene	[90-12-0]
0713.11	2-Methylnaphthalene	[91-57-6]
0816.14	Phenanthrene	[85-01-8]
0260.16	Fluroanthene	[206-44-0]
0235.16	Pyrene	[129-00-0]
0239.20	Benzo[a]pyrene	[50-32-8]

Alkyl-PAH

S-4087-40-CY

Methyl-PAH Mixture 1

7 Analytes, each 40 µg/mL in cyclohexane; unit: 1x1 mL

0005.21	3-Methylcholanthrene	[56-49-5]
0296.19	5-Methylchrysene	[3697-24-3]
0100.20	3,9-Dimethylbenz[a]anthracene	[316-51-8]
0301.20	7,12-Dimethylbenz[a]anthracene	[57-97-6]
0725.12	1,6-Dimethylnaphthalene	[575-43-9]
0876.16	1,3-Dimethylphenanthrene	[16664-45-2]
1038.18	4,5-Dimethylpyrene	[15679-25-1]

S-4086-500-IO

Trimethylnaphthalene Mixture 1

6 Analytes, each 500 µg/mL in isooctane; unit: 1x1 mL

0700.13	1,2,3-Trimethylnaphthalene	[879-12-9]
0701.13	1,2,4-Trimethylnaphthalene	[2717-42-2]
0704.13	1,4,5-Trimethylnaphthalene	[2131-41-1]
0705.13	1,4,6-Trimethylnaphthalene	[2131-42-2]
0706.13	2,3,5-Trimethylnaphthalene	[2245-38-7]
0441.13	2,3,6-Trimethylnaphthalene	[829-26-5]

Deuterated

S-4047-60-T

S-4047-60-5T

Deuterated Anthracene in Toluene

1 Analyte, 60 µg/mL in toluene; units: 1x1 mL, 1x5 mL

0390.14	Anthracene-d ₁₀	[1719-06-8]
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S-4076-K-T

S-4076-K-5T

Deuterated Surrogate Standard

5 Analytes, 1000 µg/mL in toluene; units: 1x1 mL, 1x5 mL

0978.10	Naphthalene-d ₈	[1146-65-2]
1086.12	Biphenyl-d ₁₀	[1486-01-7]
0389.14	Phenanthrene-d ₁₀	[1517-22-2]
1088.20	Benzo[a]pyrene-d ₁₂	[63466-71-7]
1089.22	Benzo[ghi]perylene-d ₁₂	[93951-66-7]



S-4080-100-T
S-4080-100-5T

Perdeuterated Internal Standard - PAH-Mixture 2

5 Analytes, 100 µg/mL in toluene; units: 1x1 mL, 1x5 mL

0978.10	Naphthalene-d ₈	[1146-65-2]
1086.12	Biphenyl-d ₁₀	[1486-01-7]
0389.14	Phenanthrene-d ₁₀	[1517-22-2]
1088.20	Benzo[a]pyrene-d ₁₀	[63466-71-7]
1330.22	Dibenz[a,h]anthracene-d ₁₄	[13250-98-1]

S-4081-K-CY
S-4081-K-5CY

Perdeuterated Internal Standard - PAH-Mixture 3

9 Analytes, each 1000 µg/mL in cyclohexane; units: 1x1 mL, 1x5 mL

0978.10	Naphthalene-d ₈	[1146-65-2]
1336.12	Acenaphthylene-d ₈	[93951-97-4]
0383.12	Dibenzothiophene-d ₈	[33262-29-2]
0389.14	Phenanthrene-d ₁₀	[1517-22-2]
0329.16	Pyrene-d ₁₀	[1718-52-1]
1337.16	Fluoranthene-d ₁₀	[93951-69-0]
1024.18	Chrysene-d ₁₂	[1719-03-5]
1088.20	Benzo[a]pyrene-d ₁₂	[63466-71-7]
1330.22	Dibenz[a,h]anthracene-d ₁₄	[13250-98-1]

S-4084-K-BD
S-4084-K-5BD

Perdeuterated Internal Standard PAH-Mixture 4

5 Analytes, each 1000 µg/mL in benzene-d₆; units: 1x1 mL, 1x5 mL

1337.16	Fluoranthene-d ₁₀	[93951-69-0]
1348.20	Benzo[b]fluoranthene-d ₁₂	[93951-98-5]
1349.20	Benzo[k]fluoranthene-d ₁₂	[93952-01-3]
1089.20	Benzo[ghi]perylene-d ₁₂	[93951-66-7]
1088.20	Benzo[a]pyrene-d ₁₂	[63466-71-7]

S-4405-100-BD

Perdeuterated Internal Standard – PAH Mixture 11

16 Analytes, each 100 µg/mL in benzene-d₆; unit: 1x1.1mL

Prod. No.	Compound	CAS No.
1524.12	Acenaphthene-d ₁₀	[15067-26-2]
1336.12	Acenaphthylene-d ₈	[93951-97-4]
0390.14	Anthracene-d ₁₀	[1719-06-8]
1087.18	Benzo[a]anthracene-d ₁₂	[1718-53-2]
1348.20	Benzo[b]fluoranthene-d ₁₂	[93951-98-5]
1349.20	Benzo[k]fluoranthene-d ₁₂	[93952-01-3]
1089.22	Benzo[g,h,i]perylene-d ₁₂	[93951-66-7]
1088.20	Benzo[a]pyrene-d ₁₂	[63466-71-7]
1024.18	Chrysene-d ₁₂	[1719-03-5]
1330.22	Dibenz[a,h]anthracene-d ₁₄	[13250-98-1]
1337.16	Fluoranthene-d ₁₀	[93951-69-0]
1530.13	Fluorene-d ₁₀	[81103-79-9]
1531.22	Indeno[1,2,3-cd]pyrene-d ₁₂	[203578-33-0]
0978.10	Naphthalene-d ₈	[1146-65-2]
0389.14	Phenanthrene-d ₁₀	[1517-22-2]
0329.16	Pyrene-d ₁₀	[1718-52-1]

See also deuterated PAH mixtures 1, 6, 7 and 8, pages 134-135.



Naphthalene-phenanthrene-dibenzothiophene-mixes

NPD

S-4034-ASS-IO

NPD Cocktail 1

20 Analytes, each concentration as listed in isooctane; unit: 1x1 mL

0712.11	1-Methylnaphthalene	[90-12-0]	500 µg/mL
0713.11	2-Methylnaphthalene	[91-57-6]	500 µg/mL
0722.12	1,3-Dimethylnaphthalene	[575-41-7]	500 µg/mL
0723.12	1,4-Dimethylnaphthalene	[571-58-4]	500 µg/mL
0724.12	1,5-Dimethylnaphthalene	[571-61-9]	500 µg/mL
0725.12	1,6-Dimethylnaphthalene	[575-43-9]	500 µg/mL
0726.12	1,7-Dimethylnaphthalene	[575-37-1]	500 µg/mL
0729.12	2,6-Dimethylnaphthalene	[581-42-0]	500 µg/mL
0731.12	2,7-Dimethylnaphthalene	[582-16-1]	500 µg/mL
0341.12	Biphenyl	[92-52-4]	500 µg/mL
0816.14	Phenanthrene	[85-01-8]	500 µg/mL
0811.15	1-Methylphenanthrene	[832-69-9]	250 µg/mL
0812.15	2-Methylphenanthrene	[2531-84-2]	250 µg/mL
0813.15	3-Methylphenanthrene	[832-71-3]	250 µg/mL
0815.15	9-Methylphenanthrene	[883-20-5]	250 µg/mL
0884.12	Dibenzothiophene	[132-65-0]	250 µg/mL
2501.13	1-Methyldibenzothiophene	[31317-07-4]	100 µg/mL
0886.13	2-Methyldibenzothiophene	[20928-02-3]	100 µg/mL
2499.13	3-Methyldibenzothiophene	[16587-52-3]	100 µg/mL
0887.13	4-Methyldibenzothiophene	[7372-88-5]	100 µg/mL

S-4083-K-T

NPD Cocktail 2

25 Analytes, each 1000 µg/mL in toluene; unit: 1x1 mL

0711.10	Naphthalene	[91-20-3]	
0887.13	4-Methyldibenzothiophene	[7372-88-5]	
0713.11	2-Methylnaphthalene	[91-57-6]	
0148.14	4-Ethyldibenzothiophene	[89816-99-9]	
0729.12	2,6-Dimethylnaphthalene	[581-42-0]	
0149.15	4-Propyldibenzothiophene	[132034-86-7]	
0716.13	2-Isopropyl naphthalene	[2027-17-0]	
0260.16	Fluoranthene	[206-44-0]	
0002.12	Acenaphthylene	[208-96-8]	
0235.16	Pyrene	[129-00-0]	
0732.12	Acenaphthene	[83-32-9]	
0201.18	Benz[a]anthracene	[56-55-3]	
0217.13	Fluorene	[86-73-7]	
0212.18	Chrysene	[218-01-9]	
0816.14	Phenanthrene	[85-01-8]	
0263.20	Benzo[b]fluoranthene	[205-99-2]	
1049.14	Anthracene	[120-12-7]	
0265.20	Benzo[k]fluoranthene	[207-08-9]	
0815.15	9-Methylphenanthrene	[883-20-5]	
0239.20	Benzo[a]pyrene	[50-32-8]	
1028.16	9-Ethylphenanthrene	[3674-75-7]	
0277.22	Indeno[1,2,3-cd]pyrene	[193-39-5]	
0782.16	1,2,6-Trimethylphenanthrene	[30436-55-6]	
0203.22	Dibenz[a,h]anthracene	[215-58-7]	
0884.12	Dibenzothiophene	[132-65-0]	
0222.22	Benzo[ghi]perylene	[191-24-2]	

**S-4046-200-IO****NPD Cocktail 3**

14 Analytes, each 200 µg/mL in isoctane; unit: 1x1 mL

0884.12	Dibenzothiophene	[132-65-0]
0441.12	2,3,6-Trimethylnaphthalene	[829-26-5]
0887.13	4-Methyldibenzothiophene	[7372-88-5]
0260.16	Fluoranthene	[206-44-0]
0449.14	2,8-Dimethyldibenzothiophene	[1207-15-4]
0816.14	Phenanthrene	[85-01-8]
0158.14	2,4,7-Trimethyldibenzothiophene	[216983-03-8]
0812.15	2-Methylphenanthrene	[2531-84-2]
0711.10	Naphthalene	[91-20-3]
0762.16	1,6-Dimethylphenanthrene	[20291-74-1]
0713.10	2-Methylnaphthalene	[91-57-6]
0783.17	1,2,8-Trimethylphenanthrene	[20291-75-2]
0728.12	2,3-Dimethylnaphthalene	[581-40-8]
0235.16	Pyrene	[129-00-0]

S-4104-200-IO**NPD Cocktail 4**

14 Analytes, each 200 µg/mL in isoctane; unit: 1x1 mL

0884.12	Dibenzothiophene	[132-65-0]
0441.12	2,3,6-Trimethylnaphthalene	[829-26-5]
0198.9	4-Methylbenzothiophene	[14316-11-8]
0260.16	Fluoranthene	[206-44-0]
0449.14	2,8-Dimethyldibenzothiophene	[1207-15-4]
0816.14	Phenanthrene	[85-01-8]
0158.14	2,4,7-Trimethyldibenzothiophene	[216983-03-8]
0812.15	2-Methylphenanthrene	[2531-84-2]
0711.10	Naphthalene	[91-20-30]
0762.16	1,6-Dimethylphenanthrene	[20291-74-1]
0713.11	2-Methylnaphthalene	[91-57-6]
0783.17	1,2,8-Trimethylphenanthrene	[20291-75-2]
0728.12	2,3-Dimethylnaphthalene	[581-40-8]
0235.16	Pyrene	[129-00-0]

S-4007-ASS-AC**PAH/NPD Stock Solution**

21 Analytes, each concentration as listed in acetone; units: 1x1 mL, 5x1 mL

0711.10	Naphthalene	[91-20-3]	1.86 µg/mL
0713.11	2-Methylnaphthalene	[91-57-6]	3.36 µg/mL
0722.12	1,3-Dimethylnaphthalene	[575-41-7]	3.51 µg/mL
0716.13	2-Isopropylnaphthalene	[2027-17-0]	1.87 µg/mL
0002.12	Acenaphthylene	[208-96-8]	0.009 µg/mL
0732.12	Acenaphthene	[83-32-9]	0.014 µg/mL
0217.13	Fluorene	[86-73-7]	0.21 µg/mL
0816.14	Phenanthrene	[85-01-8]	0.19 µg/mL
0815.15	9-Methylphenanthrene	[883-20-5]	0.31 µg/mL
1028.16	9-Ethylphenanthrene	[3674-75-7]	0.27 µg/mL
0884.12	Dibenzothiophene	[132-65-0]	0.04 µg/mL
0887.13	4-Methyldibenzothiophene	[7372-88-5]	0.09 µg/mL
0148.14	4-Ethyldibenzothiophene	[89816-99-9]	0.08 µg/mL
0260.16	Fluoranthene	[206-44-0]	0.008 µg/mL
0235.16	Pyrene	[129-00-0]	0.07 µg/mL



0201.18	Benz[a]anthracene	[56-55-3]	0.009 µg/mL
0212.18	Chrysene	[218-01-9]	0.021 µg/mL
0296.19	5-Methylchrysene	[3697-24-3]	0.02 µg/mL
0263.20	Benzo[b]fluoranthene	[205-99-2]	0.003 µg/mL
0239.20	Benzo[a]pyrene	[50-32-8]	0.001 µg/mL
0222.22	Benzo[ghi]perylene	[191-24-2]	0.0008 µg/mL

S-4068-ASS-T**Calibration Standard PAH/NPD**

Available in the following concentrations or as a complete set of 7x250µL.

Concentration: each 200, 100, 80, 40, 20, 10 or 5 µg/mL in toluene

0711.10	Naphthalene	[91-20-3]	0263.20	Benzo[b]fluoranthene	[205-99-2]
0393.12	1-Phenylhexane (n-Hexylbenzene)	[1077-16-3]	0265.20	Benzo[k]fluoranthene	[207-08-9]
0712.11	1-Methylnaphthalene	[90-12-0]	0239.20	Benzo[a]pyrene	[50-32-8]
0713.11	2-Methylnaphthalene	[91-57-6]	0236.20	Benzo[e]pyrene	[192-97-2]
0728.12	2,3-Dimethylnaphthalene	[581-40-8]	0220.20	Perylene	[198-55-0]
0002.12	Acenaphthylene	[208-96-8]	0277.22	Indeno[1,2,3-cd]pyrene	[193-39-5]
1100.12	Dibenzofuran	[132-64-91]	0203.22	Dibenz[a,h]anthracene	[215-58-7]
0217.13	Fluorene	[86-73-7]	0222.20	Benzo[ghi]perylene	[191-24-2]
0816.14	Phenanthrene	[85-01-8]	0244.24	Dibenzo[a,e]pyrene	[192-65-4]
1049.14	Anthracene	[120-12-7]	0242.24	Dibenzo[a,h]pyrene	[189-64-0]
0769.16	3,6-Dimethylphenanthrene	[66291-32-5]	0241.24	Dibenzo[a,i]pyrene	[189-55-9]
0260.16	Fluoranthene	[206-44-0]	0256.24	Anthanthrene	[191-26-4]
0235.16	Pyrene	[129-00-0]	0226.24	Coronene	[191-07-1]
0259.17	11H-Benzo[a]fluorene	[238-84-6]	0264.20	Benzo[j]fluoranthene	[205-82-3]
0218.17	11H-Benzo[b]fluorene	[243-17-4]	0201.18	Benz[a]anthracene	[56-55-3]
0212.18	Chrysene	[218-01-9]	0732.12	Acenaphthene	[83-32-9]
0254.20	2,2'-Binaphthyl	[612-78-2]			

S-4089-ASS-T**PAH/NPD Control Standard**

S-4089-ASS-5T

26 Analytes, each concentration as listed in toluene; units: 1x1 mL, 1x5 mL

0711.10	Naphthalene	[91-20-3]	500 µg/mL
0713.11	2-Methylnaphthalene	[91-57-6]	500 µg/mL
0729.12	2,6-Dimethylnaphthalene	[581-42-0]	500 µg/mL
0716.13	2-Isopropylnaphthalene	[2027-17-0]	300 µg/mL
0002.12	Acenaphthylene	[208-96-8]	100 µg/mL
0732.12	Acenaphthene	[83-32-9]	100 µg/mL
0217.13	Fluorene	[86-73-7]	100 µg/mL
0816.14	Phenanthrene	[85-01-8]	100 µg/mL
1049.14	Anthracene	[120-12-7]	100 µg/mL
0815.15	9-Methylphenanthrene	[883-20-5]	100 µg/mL
1028.16	9-Ethylphenanthrene	[3674-75-7]	100 µg/mL
0782.17	1,2,6-Trimethylphenanthrene	[30436-55-6]	100 µg/mL
0884.12	Dibenzothiophene	[132-65-0]	100 µg/mL
0887.13	4-Methyldibenzothiophene	[7372-88-5]	100 µg/mL
0148.14	4-Ethyldibenzothiophene	[89816-99-9]	100 µg/mL
0149.15	4-Propyldibenzothiophene	[132034-86-7]	100 µg/mL
0260.16	Fluoranthene	[206-44-0]	100 µg/mL
0235.16	Pyrene	[129-00-0]	100 µg/mL
0201.18	Benz[a]anthracene	[56-55-3]	100 µg/mL
0212.18	Chrysene	[218-01-9]	100 µg/mL
0263.20	Benzo[b]fluoranthene	[205-99-2]	100 µg/mL



0265.20	Benzo[k]fluoranthene	[207-08-9]	100 µg/mL
0239.20	Benzo[a]pyrene	[50-32-8]	100 µg/mL
0277.22	Indeno[1,2,3-cd]pyrene	[193-39-5]	100 µg/mL
0203.22	Dibenz[a,h]anthracene	[215-58-7]	100 µg/mL
0222.22	Benzo[ghi]perylene	[191-24-2]	100 µg/mL

S-4406-200-T
S-4406-200-2T

PAH/Dibenzothiophenes Mixture

20 Analytes, each 200 µg/mL in toluene; units: 1x1 mL, 1x2mL

Prod.no.	Compound	CAS No.
0712,11	1-Methylnaphthalene	[90-12-0]
0713,11	2-Methylnaphthalene	[91-57-6]
0725,12	1,6-Dimethylnaphthalene	[575-43-9]
0706,13	2,3,5-Trimethylnaphthalene	[2245-38-7]
0812,15	2-Methylphenanthrene	[2531-84-2]
0880,16	2,4-Dimethylphenanthrene	[15254-64-5]
0782,17	1,2,6-Trimethylphenanthrene	[30436-55-6]
0783,17	1,2,8-Trimethylphenanthrene	[20291-75-2]
0884,12	Dibenzothiophene	[132-65-0]
0886,13	2-Methyldibenzothiophene	[20928-02-3]
0449,14	2,8-Dimethyldibenzothiophene	[1207-15-4]
0158,15	2,4,7-Trimethyldibenzothiophene	[216983-03-8]
0236,20	Benzo[e]pyrene	[192-97-2]
0220,20	Perylene	[198-55-0]
0001,18	Triphenylene	[217-59-4]
0027,18	Benzo[c]phenanthrene	[195-19-7]
0264,20	Benzo[j]fluoranthene	[205-82-3]
0289,17	1-Methylfluoranthene	[25889-60-5]
0292,19	1-Methylchrysene	[3351-28-8]
1508,20	6-Ethylchrysene	[2732-58-3]

S-4416-100-AN

PAH/NPD Mixture

28 Analytes, each 100 µg/mL in acetonitrile; unit: 1x1.1 mL

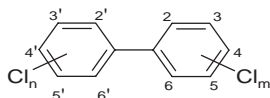
Prod.no.	Compound	CAS No.
0002,12	Acenaphthylene	[208-96-8]
0732,12	Acenaphthene	[83-32-9]
0217,13	Fluorene	[86-73-7]
1049,14	Anthracene	[120-12-7]
0260,16	Fluoranthene	[206-44-0]
0235,16	Pyrene	[129-00-0]
0201,18	Benz[a]anthracene	[56-55-3]
0212,18	Chrysene	[218-01-9]
0263,20	Benzo[b]fluoranthene	[205-99-2]
0265,20	Benzo[k]fluoranthene	[207-08-9]
0239,20	Benzo[a]pyrene	[50-32-8]
0222,22	Benzo[ghi]perylene	[191-24-2]
0277,22	Indeno[1,2,3-cd]pyrene	[193-39-5]
0203,22	Dibenz[a,h]anthracene	[53-70-3]
0711,10	Naphthalene	[91-20-3]
0816,14	Phenanthrene	[85-01-8]
0884,12	Dibenzothiophene	[132-65-0]
0712,11	1-Methylnaphthalene	[90-12-0]



0713,11	2-Methylnaphthalene	[91-57-6]
0815,15	9-Methylphenanthrene	[883-20-5]
0887,13	4-Methyldibenzothiophene	[7372-88-5]
0729,12	2,6-Dimethylnaphthalene	[581-42-0]
1028,16	9-Ethylphenanthrene	[3674-75-7]
0148,14	4-Ethylidibenzothiophene	[89816-99-9]
0716,13	2-Isopropylnaphthalene	[2027-17-0]
0782,17	1,2,6-Trimethylphenanthrene	[30436-55-6]
0149,15	4-Propyldibenzothiophene	[132034-86-7]
2157,6	Bromobenzene	[108-86-1]

POPs (Persistent organic pollutants)

PCBs



Polychlorinated biphenyls (PCBs) have been the subject of a broad range of studies and investigations because of their environmental persistency and bioaccumulation. Their abundance as pollutants stems from their worldwide manufacture as heavy-used industrial chemicals, e.g. Aroclors with the main application as dielectric fluid in capacitors and transformers. PCBs are formed as mixtures by the addition of chlorine to biphenyl.

PCB congeners can be classified as coplanar, dioxinlike with none or one orthosubstitution and nonplanar with substitutions in the ortho-positions. The co-planer PCBs shows a similar toxicity as the dibenzofurans and the dioxins. See also page 354 and onward.



Non-planar and coplanar PCBs compared with the conformation of dibenzofurans

F-PCBs® fluorinated internal standards for PCB analysis – a flexible and cost-efficient alternative

Mono- and difluorinated PCBs are closely similar to the parent PCBs in terms of physico-chemical properties, and are ideal internal or surrogate standards for GC-MS, GC-ECD, GC-FID and twodimensional GC.

The F-PCB® internal standards offered by Chiron have several advantages over the more traditionally used ^{13}C isotopes and unlabelled internal standards:

- Cost efficient. Much cheaper than the ^{13}C isotopes.
- Gives one single, pure isotope (F has only one isotope)
- Can be used with GC-ECD detection, ^{13}C can not since they coelute with the native.
- Do not discriminate from the native upon work-up.
- “Designer retention times” (ortho-, meta-, para-F) possible for optimal elution rate.

**NEW****Dioxin-like F-PCBs®**

Chiron No.	Compound	PCB No.	Conc. /1 mL
2863.12	5-Fluoro-3,3',4,4'-tetrachlorobiphenyl	F-PCB-77	10 µg/mL
2344.12	3'-Fluoro-3,4,4',5-tetrachlorobiphenyl	F-CB-81	10 µg/mL
2864.12	5'-Fluoro-2,3,3',4,4'-pentachlorobiphenyl	F-CB-105	10 µg/mL
2870.12	3'-Fluoro-2,3,4,4',5-pentachlorobiphenyl	F-CB-114	10 µg/mL
2865.12	5'-Fluoro-2,3',4,4',5-pentachlorobiphenyl	F-CB-118	10 µg/mL
2866.12	5'-Fluoro-3,3',4,4',5-pentachlorobiphenyl	F-CB-126	10 µg/mL
2871.12	5'-Fluoro-2,3,3',4,4',5-hexachlorobiphenyl	F-CB-156	10 µg/mL

F-PCB® internal standards

For complete listing see the Compounds section, pages 354-355.

Solutions of single internal standards in isooctane, 1 or 1.1mL

Chiron No.	Compound	PCB No.	Conc.
2654.12-100-IO	4-Chloro-4'-fluorobiphenyl	F-PCB-3 p	100 µg/mL
2745.12-100-IO	3'-Fluoro-3,5-dichlorobiphenyl	F-PCB-14	100 µg/mL
2655.12-100-IO	3-Fluoro-4,4'-dichlorobiphenyl	F-PCB-15	100 µg/mL
2656.12-100-IO	3-Fluoro-2,2',5-trichlorobiphenyl	F-PCB-18 m	100 µg/mL
2657.12-100-IO	3'-Fluoro-2,3,4'-trichlorobiphenyl	F-PCB-22 m	100 µg/mL
2228.12-100-IO	3'-Fluoro-2,4,4'-trichlorobiphenyl*	F-PCB-28 m	100 µg/mL
2223.12-100-IO	3'-Fluoro-2,4,5-trichlorobiphenyl	F-PCB-29 m	100 µg/mL
2224.12-100-IO	2'-Fluoro-2,4,6-trichlorobiphenyl	F-PCB-30 o	100 µg/mL
2225.12-100-IO	3'-Fluoro-2,4,6-trichlorobiphenyl	F-PCB-30 m	100 µg/mL
2229.12-100-IO	4'-Fluoro-2,4,6-trichlorobiphenyl	F-PCB-30 p	100 µg/mL
2658.12-100-IO	3'-Fluoro-3,4,4'-trichlorobiphenyl	F-PCB-37 m	100 µg/mL
2666.12v	3'-Fluoro-3,4',5-trichlorobiphenyl	F-PCB-39	100 µg/mL
2660.12-100-IO	3-Fluoro-2,2',5,5'-tetrachlorobiphenyl*	F-PCB-52 m	100 µg/mL
2869.12-100-IO	3'-Fluoro-2,3,5,6-tetrachlorobiphenyl	F-PCB-65	100 µg/mL
2222.12-100-IO	4'-Fluoro-2,3',4,5-tetrachlorobiphenyl	F-PCB-67	100 µg/mL
2863.12-10-IO	5-Fluoro-3,3',4,4'-tetrachlorobiphenyl	F-PCB-77	10 µg/mL
2344.12-10-IO	3'-Fluoro-3,4,4',5-tetrachlorobiphenyl	F-PCB-81	10 µg/mL
2864.12-10-IO	5'-Fluoro-2,3,3',4,4'-pentachlorobiphenyl	F-PCB-105	10 µg/mL
2870.12-10-IO	3'-Fluoro-2,3,4,4',5-pentachlorobiphenyl	F-PCB-114	10 µg/mL
2868.12-10-IO	3'-Fluoro-2,3,4',5,6-pentachlorobiphenyl	F-PCB-117	10 µg/mL
2865.12-10-IO	5'-Fluoro-2,3',4,4',5-pentachlorobiphenyl	F-PCB-118	10 µg/mL
2866.12-10-IO	5'-Fluoro-3,3',4,4',5-pentachlorobiphenyl	F-PCB-126	10 µg/mL
2871.12-10-IO	5'-Fluoro-2,3,3',4,4',5-hexachlorobiphenyl	F-PCB-156	10 µg/mL
2746.12-10-IO	3'-Fluoro-2,3,4,4',5,6-hexachlorobiphenyl	F-PCB-166	10 µg/mL

* Bold items are also on the Dutch Seven list



Native PCBs

Chiron offers single native PCBs in solution and as neat material for analysis and toxicological studies. Mixtures are offered according to international methods and on request. Please inquire for custom synthesis of bulk material.

Dutch seven PCBs

Solutions of single reference substances, internal standards and multiple component solution, 1 mL.

Chiron No.	Compound	PCB No.	Conc.
1999.12-100-IO	2,4,4'-Trichlorobiphenyl	PCB-28	100 µg/mL
2000.12-100-IO	2,2',5,5'-Tetrachlorobiphenyl	PCB-52	100 µg/mL
2001.12-100-IO	2,2',4,5,5'-Pentachlorobiphenyl	PCB-101	100 µg/mL
2002.12-100-IO	2,3',4,4',5'-Pentachlorobiphenyl	PCB-118	100 µg/mL
2003.12-100-IO	2,2',3,4,4',5'-Hexachlorobiphenyl	PCB-138	100 µg/mL
2004.12-100-IO	2,2',4,4',5,5'-Hexachlorobiphenyl	PCB-153	100 µg/mL
2005.12-100-IO	2,2',3,4,4',5,5'-Heptachlorobiphenyl	PCB-180	100 µg/mL
S-4236-100-IO	Dutch Seven PCBs – Multiple Comp. Solution		100 µg/mL

Dioxin-like PCBs

Chiron No.	Compound	PCB No.	Conc. /1 mL
2006.12-100-IO	3,3',4,4'-Tetrachlorobiphenyl	PCB-77	100 µg/mL
2007.12-100-IO	3,4,4',5-Tetrachlorobiphenyl	PCB-81	100 µg/mL
2008.12-100-IO	2,3,3',4,4'-Pentachlorobiphenyl	PCB-105	100 µg/mL
2009.12-100-IO	2,3,4,4',5-Pentachlorobiphenyl	PCB-114	100 µg/mL
2012.12-100-IO	3,3',4,4',5-Pentachlorobiphenyl	PCB-126	100 µg/mL
2013.12-100-IO	2,3,3',4,4',5-Hexachlorobiphenyl	PCB-156	100 µg/mL
2014.12-100-IO	2,3,3',4,4',5'-Hexachlorobiphenyl	PCB-157	100 µg/mL
2015.12-100-IO	2,3',4,4',5,5'-Hexachlorobiphenyl	PCB-167	100 µg/mL
2220.12-100-IO	3,3',4,4',5,5'-Hexachlorobiphenyl	PCB-169	100 µg/mL
2016.12-100-IO	2,3,3',4,4',5,5'-Heptachlorobiphenyl	PCB-189	100 µg/mL

Optional calibration standards

Chiron No.	Compound	PCB No.	Conc. /1 mL
2267.12-100-IO	2,2',3,4,4',5-Heptachlorobiphenyl	PCB-170	100 µg/mL
2005.12-100-IO	2,2',3,4,4',5,5'-Heptachlorobiphenyl	PCB-180	100 µg/mL

S-4237-2-IO

WHO Dioxin like PCB mixture,
11 Analytes, each 2 µg/mL in isoctane

Chiron No.	Compound	PCB No.
2006.12-2-IO	3,3',4,4'-Tetrachlorobiphenyl	PCB-77
2007.12-2-IO	3,4,4',5-Tetrachlorobiphenyl	PCB-81
2008.12-2-IO	2,3,3',4,4'-Pentachlorobiphenyl	PCB-105
2009.12-2-IO	2,3,4,4',5-Pentachlorobiphenyl	PCB-114
2002.12-2-IO	2,3',4,4',5-Pentachlorobiphenyl	PCB-118
2011.12-2-IO	2',3,4,4',5-Pentachlorobiphenyl	PCB-123
2012.12-2-IO	3,3',4,4',5-Pentachlorobiphenyl	PCB-126
2013.12-2-IO	2,3,3',4,4',5-Hexachlorobiphenyl	PCB-156
2014.12-2-IO	2,3,3',4,4',5'-Hexachlorobiphenyl	PCB-157
2015.12-2-IO	2,3',4,4',5,5'-Hexachlorobiphenyl	PCB-167
2016.12-2-IO	2,3,3',4,4',5,5'-Heptachlorobiphenyl	PCB-189



Technical mixtures

Available in concentrations 10-1000 ng/μL in isooctane

Chiron No.	Name
2124.12	Aroclor 1016
2125.12	Aroclor 1221
2661.12	Aroclor 1232
2126.12	Aroclor 1242
2127.12	Aroclor 1248
2128.12	Aroclor 1254
2129.12	Aroclor 1260

International standard methods for PCB analysis

ISO 17858-2004	Water quality - Dioxin-like PCBs by GC-MS
ISO 10382-2002	Soil quality – Organochlorine pesticides and PCBs by GC-ECD
ISO 6468-1996	Water quality – Organochlorine insecticides and PCBs by GC methods
EPA 505-1995	Organohalide pesticides and PCBs in water by GC
EPA 608-1984	Organochlorine pesticides and PCBs by GC and GC-MS (cf methods 625) in municipal discharges.
EPA 8082-1996	PCBs from solid and aqueous matrices by GC-ECD or GC-ELCD.
EPA 1668A-1999	PCB congeners in water, soil, sediments and tissue by HRGC/HRMS
EPA 8270C-1996	Semivolatiles from solid waste, soil, air, and water by GC-MS
“The Dutch Seven PCBs”	

S-4417-10-AN

PCB Mixture 1

7 Analytes, each 10 μg/mL in acetonitrile; unit: 10x1 mL

Prod.no.	Compound	Description	CAS No.
1999.12	2,4,4'-Trichlorobiphenyl	PCB 28	[7012-37-5]
2000.12	2,2',5,5'-Tetrachlorobiphenyl	PCB 52	[35693-99-3]
20001.12	2,2',4,5,5'-Pentachlorobiphenyl	PCB 101	[37680-73-2]
2003.12	2,2',3,4,4',5-Hexachlorobiphenyl	PCB 138	[35065-28-2]
2004.12	2,2',4,4',5,5'-Hexachlorobiphenyl	PCB 153	[35065-27-1]
2005.12	2,2',3,4,4',5,5'-Heptachlorophenyl	PCB 180	[35065-29-3]
2268.12	2,2',3,3',4,4',5,5'-Octachlorophenyl	PCB 194	[35694-08-7]

S-4418-1MG

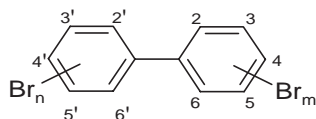
PCB Mixture 2

7 Analytes, each 1 mL neat

Prod.no.	Compound	Description	CAS No.
1999.12	2,4,4'-Trichlorobiphenyl	PCB 28	[7012-37-5]
2000.12	2,2',5,5'-Tetrachlorobiphenyl	PCB 52	[35693-99-3]
2001.12	2,2',4,5,5'-Pentachlorobiphenyl	PCB 101	[37680-73-2]
2002.12	2,3',4,4',5-Pentachlorobiphenyl	PCB 118	[31508-00-6]
2003.12	2,2',3,4,4',5-Hexachlorobiphenyl	PCB 138	[35065-28-2]
2004.12	2,2',4,4',5,5'-Hexachlorobiphenyl	PCB 153	[35065-27-1]
2005.12	2,2',3,4,4',5,5'-Heptachlorobiphenyl	PCB 180	[35065-29-3]



PBBs (Polybrominated biphenyls)

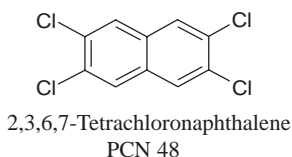
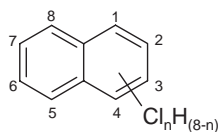
NEW

Native standards

3089.12-50-IO	2-Bromobiphenyl	PBB-1	[2052-07-5]	50µg/mL
3090.12-50-IO	3-Bromobiphenyl	PBB-2	[2113-57-7]	50µg/mL
3091.12-50-IO	4-Bromobiphenyl	PBB-3	[92-66-0]	50µg/mL
3092.12-50-IO	2,2'-Dibromobiphenyl	PBB-4	[13029-09-9]	50µg/mL
3093.12-50-IO	2,4-Dibromobiphenyl	PBB-7	[53592-10-2]	50µg/mL
3094.12-50-IO	2,5-Dibromobiphenyl	PBB-9	[57422-77-2]	50µg/mL
3095.12-50-IO	2,6-Dibromobiphenyl	PBB-10	[59080-32-9]	50µg/mL
3096.12-50-IO	4,4'-Dibromobiphenyl	PBB-15	[92-86-4]	50µg/mL
3097.12-50-IO	2,2',5-Tribromobiphenyl	PBB-18	[59080-34-1]	50µg/mL
3098.12-50-IO	2,3',5-Tribromobiphenyl	PBB-26	[59080-35-2]	50µg/mL
3099.12-50-IO	2,4',5-Tribromobiphenyl	PBB-31	[59080-36-3]	50µg/mL
2664.12-50-IO	2,4,5-Tribromobiphenyl	PBB-29	[118-79-6]	50µg/mL
2744.12-35-IO	2,4,6-Tribromobiphenyl	PBB-30	[59080-33-0]	35µg/mL
2744.12-50-IO	2,4,6-Tribromobiphenyl	PBB-30	[59080-33-0]	50µg/mL
3101.12-50-IO	3,4,5-Tribromobiphenyl	PBB-38	[115245-08-4]	50µg/mL
3102.12-50-IO	2,2',4,5'-Tetrabromobiphenyl	PBB-49	[60044-24-8]	50µg/mL
3103.12-50-IO	2,2',5,5'-Tetrabromobiphenyl	PBB-52	[59080-37-4]	50µg/mL
3104.12-50-IO	2,2',5,6'-Tetrabromobiphenyl	PBB-56	[60044-25-9]	50µg/mL
3105.12-50-IO	3,3',5,5'-Tetrabromobiphenyl	PBB-80	[16400-50-3]	50µg/mL
3106.12-50-IO	2,2',4,5,5'-Pentabromobiphenyl	PBB-101	[67888-96-4]	50µg/mL
3107.12-50-IO	2,2',4,5',6-Pentabromobiphenyl	PBB-103	[59080-39-6]	50µg/mL
3108.12-50-IO	2,2',4,4',5,5'-Hexabromobiphenyl	PBB-153	[59080-40-9]	50µg/mL
3110.12-50-IO	2,2',4,4',6,6'-Hexabromobiphenyl	PBB-155	[59261-08-4]	50µg/mL
3109.12-10-IO	3,3',4,4',5,5'-Hexabromobiphenyl	PBB-169	[60044-26-0]	10µg/mL
2679.12-50-IO	Octabromodiphenyl, techn.		[27858-07-7]	50µg/mL
2677.12-50-IO	Decabromodiphenyl	PBB-209	[13654-09-6]	50µg/mL
3111.26-KIT	PBB Kit			

Environmental

PCNs (Polychlorinated naphthalenes)

NEW

PCNs are polychlorinated naphthalenes. Although PCNs have been known for about 170 years, and have been commercially produced and **used over a period of 100 years**, only little attention is paid to their formation, sources, occurrence, fate and effects. Technical mixtures of PCNs have been commercially produced under the brand names Halowax (U.S.), Seekay (U.K) and Nibren wax (Germany) for uses similar to PCB mixtures (Aroclor), which also contain PCNs as impurities.

There are 75 PCN congeners.



Individual native PCNs

Chiron No.	Compound	PCN No.	CAS No.	Conc.
1993.10-50-IO	1-Chloronaphthalene	PCN-1	[90-13-1]	50µg/mL
1994.10-50-IO	2-Chloronaphthalene	PCN-2	[91-58-7]	50µg/mL
1995.10-50-IO	1,4-Dichloronaphthalene	PCN-5	[1825-31-6]	50µg/mL
1996.10-50-IO	1,5-Dichloronaphthalene	PCN-6	[1825-30-5]	50µg/mL
1997.10-50-IO	2,3-Dichloronaphthalene	PCN-10	[2050-75-1]	50µg/mL
3112.10-50-IO	2,6-Dichloronaphthalene	PCN-11	[2065-70-5]	50µg/mL
3621.10-50-IO	2,7-Dichloronaphthalene	PCN-12	[2198-77-8]	50µg/mL
3744.10-50-IO	1,2,3,4-Tetrachloronaphthalene	PCN-27	[20020-02-4]	50µg/mL
3752.10-50-IO	Tetrachloronaphthalene, mix			50µg/mL
1998.10-50-IO	Octachloronaphthalene	PCN-75	[2234-13-1]	50µg/mL
3113.10-KIT	PCN Kit			

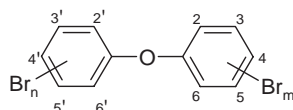
50µg/mL in isooctane, 1 or 1.1mL

PBNs (Polybrominated naphthalenes)

NEW

Chiron No.	Compound	PBN No.	CAS. No.	Conc.
3114.10-50-IO	1-Bromonaphthalene	PBN-1	[90-11-9]	50µg/mL
3115.10-50-IO	2-Bromonaphthalene	PBN-2	[580-13-2]	50µg/mL
3116.10-50-IO	1,4-Dibromonaphthalene	PBN-5	[83-53-4]	50µg/mL
3117.10-50-IO	2,3-Dibromonaphthalene	PBN-10	[13214-70-5]	50µg/mL
3118.10-50-IO	2,6-Dibromonaphthalene	PBN-11	[13720-06-4]	50µg/mL
3119.10-50-IO	2,7-Dibromonaphthalene	PBN-12	[58556-75-5]	50µg/mL
3120.6-KIT	PBN Kit			

PBDE flame retardants



PBDEs have been used as flame retardants over the past two decades, and are globally distributed in the environment. PBDEs accumulate in the food chain and there is a strong concern about the health effects of PBDE exposure. Both single and multi-component standards have been developed in convenient concentrations and solvents to assist researchers in this analysis. According to their presence in different technical mixtures and samples, we offer pure standards.

Neat material is available for toxicological studies. Please inquire for custom synthesis of bulk material.

F-PBDE® internal standards

Chiron No.	Compound	PBDE No.	Conc.
2258.12-50-IO	3'-Fluoro-2,4-dibromodiphenyl ether	F-PBDE-7	50 µg/mL
2257.12-50-IO	3'-Fluoro-3,4-dibromodiphenyl ether	F-PBDE-12	50 µg/mL
1926.12-50-IO	4'-Fluoro-2,3',4-tribromodiphenyl ether	F-PBDE-25	50 µg/mL
1927.12-50-IO	4'-Fluoro-2,3',6-tribromodiphenyl ether	F-PBDE-27	50 µg/mL
2160.12-50-IO	3'-Fluoro-,2,4,4'-tribromodiphenyl ether	F-PBDE-28	50 µg/mL
2161.12-50-IO	6-Fluoro-2,2',4,4'-tetrabromodiphenyl ether	F-PBDE-47	50 µg/mL



2506.12-50-IO	5,5'-Difluoro-2,2',4,4'-tetrabromodiphenyl ether	2F-PBDE-47	50 µg/mL
2162.12-50-IO	6-Fluoro-2,3',4,4'-tetrabromodiphenyl ether	F-PBDE-66	50 µg/mL
1928.12-50-IO	4'-Fluoro-2,3',4,6-tetrabromodiphenyl ether	F-PBDE-69	50 µg/mL
2503.12-50-IO	5,6-Difluoro-2,2',3,4,4'-pentabromodiphenyl ether	2F-PBDE-85	50 µg/mL
2505.12-50-IO	3,6-Difluoro-2,2',4,4',5-pentabromodiphenyl ether	2F-PBDE-99	50 µg/mL
2163.12-50-IO	3-Fluoro-2,2',4,4',6-pentabromodiphenyl ether	F-PBDE-100	50 µg/mL
2164.12-50-IO	3-Fluoro-2,3',4,4',6-pentabromodiphenyl ether	F-PBDE-119	50 µg/mL
2504.12-50-IO	3,5-Difluoro-2,3',4,4',6-pentabromodiphenyl ether	2F-PBDE-119	50 µg/mL
1929.12-50-IO	4'-Fluoro-2,3,3',4,5,6-hexabromodiphenyl ether	F-PBDE-160	50 µg/mL
2167.12-50-IO	2,4'-Difluoro-2,3,3',4,5,5',6,6'-octabromodiphenyl ether	2F-PBDE-201	50 µg/mL
2168.12-50-IO	4'-Fluoro-2,2',3,3',4,5,5',6,6'-nonabromodiphenyl ether	F-PBDE-208	50 µg/mL

References: Korytar et al.: *J.Chromatogr. A* 1065, 239-249 (2005); 1100, 200-207 (2005)
Liu et al.: *Chemosphere* 64, 250-263 (2006)
Fiksdahl et al.: *Tetrahedron* 62, 3564-72 (2006)

Native standards

Lake michigan study

Solutions of single reference substances

KIT: 9 compounds, 50 µg/mL each in isoctane

Chiron No.	Compound	PBDE No.	Conc.
1961.12-50-IO	2,4,4'-Tribromodiphenyl ether	PBDE-28	50 µg/mL
1962.12-50-IO	2,2',4,4'-Tetrabromodiphenyl ether	PBDE-47	50 µg/mL
1964.12-50-IO	2,3',4,4'-Tetrabromodiphenyl ether	PBDE-66	50 µg/mL
1966.12-50-IO	2,2',3,4,4'-Pentabromodiphenyl ether	PBDE-85	50 µg/mL
1967.12-50-IO	2,2',4,4',5-Pentabromodiphenyl ether	PBDE-99	50 µg/mL
1968.12-50-IO	2,2',4,4',6-Pentabromodiphenyl ether	PBDE-100	50 µg/mL
1970.12-50-IO	2,2',3,4,4',5'-Hexabromodiphenyl ether	PBDE-138	50 µg/mL
1971.12-50-IO	2,2',4,4',5,5'-Hexabromodiphenyl ether	PBDE-153	50 µg/mL
1972.12-50-IO	2,2',4,4',5,6'-Hexabromodiphenyl ether	PBDE-154	50 µg/mL
2653.9-KIT	Lake Michigan Study Kit		

S-4391-10-IO Multiple component solution of the above PBDEs, each 10 µg/mL (1mL)

Other relevant PBDEs

Solutions of single reference substances

KIT: 11 compounds, 50 µg/mL each in isoctane

Chiron No.	Compound	PBDE No.	Conc.
1960.12-50-IO	2,3',4-Tribromodiphenyl ether	PBDE-25	50 µg/mL
1963.12-50-IO	2,2',4,5'-Tetrabromodiphenyl ether	PBDE-49	50 µg/mL
1965.12-50-IO	2',3',4',6-Tetrabromodiphenyl ether	PBDE-71	50 µg/mL
1990.12-50-IO	2,4,4',6-Tetrabromodiphenyl ether	PBDE-75	50 µg/mL
1991.12-50-IO	3,3',4,4'-Tetrabromodiphenyl ether	PBDE-77	50 µg/mL
2867.12-50-IO	2,3',4,4',5-Pentabromodiphenyl ether	PBDE-118	50 µg/mL
1969.12-50-IO	2,3',4,4',6-Pentabromodiphenyl ether	PBDE-119	50 µg/mL
1973.12-50-IO	2,2',3,4,4',5',6-Heptabromodiphenyl ether	PBDE-183	50 µg/mL



1992.12-50-IO	2,3,3',4,4',5,6-Heptabromodiphenyl ether	PBDE-190	50 µg/mL
1975.12-50-IO	2,2',3,4,4',5,5',6-Octabromodiphenyl ether	PBDE-203	50 µg/mL
2647.12-50-IO	2,3,3',4,4',5,5',6-Octabromodiphenyl ether	PBDE 205	50 µg/mL
1811.12-50-IO	Decabromodiphenyl ether	PBDE-209	50 µg/mL
2665.12-KIT	PBDE Kit		

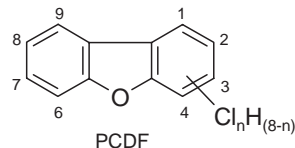
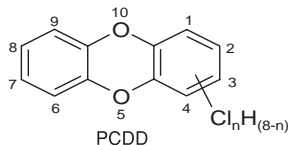
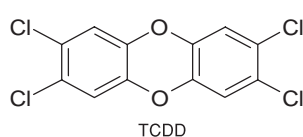
International methods

- ISO 22032:2006 Water quality – PBDEs by GC
- ISO/DIS 23061:2005 Soil quality – PBDEs by GC
- EPA 527.1:2005 Drinking water – Pesticides and PBDEs by GC-MS
- EPA 1614 PBDEs by HRGC/HRMS

Other flame retardants

2071.7-K-IP	4-Chloro-3-methylphenol	[59-50-7]	1000µg/mL
2061.6-K-IP	2,4-Dibromophenol	[615-58-7]	1000µg/mL
2670.14-50-IO	Decabromodiphenylethane	[84852-53-9]	50µg/mL
2671.5-50-IP	Dibromoneopentylglycol	[3296-90-0]	50µg/mL
2678.6-50-IO	Hexabromobenzene	[87-82-1]	50µg/mL
1894.6-50-IO	1,2,3,4,5,6-Hexabromocyclohexane	[1837-91-8]	50µg/mL
1893.12-K-IO	1,2,5,6,9,10-Hexabromocyclododecane	[3194-55-6]	1000µg/mL
2679.12-50-IO	Octabromodiphenyl, techn.	[27858-07-7]	50µg/mL
2672.6-50-IO	Pentabromophenol	[608-71-9]	50µg/mL
2673.7-50-IO	Pentabromotoluene	[87-83-2]	50µg/mL
2674.15-50-IO	Tetrabromobisphenol A	[79-94-7]	50µg/mL
2675.17-50-IO	Tetrabromobisphenol A dimethyl ether	[37853-61-5]	50µg/mL
2060.6-K-IP	2,4,6-Tribromophenol	[118-79-6]	1000µg/mL
2676.8-50-IO	Tetrabromophthalic anhydride	[632-79-1]	50µg/mL
1812.18-50-CY	Tetradecabromo-1,4-diphenoxybenzene	[58965-66-5]	50µg/mL

Dioxins and furans



Polychlorinated dioxins (PCDDs) and polychlorinated dibenzofuranes (PCDFs or “furans”) are formed during combustion processes, such as waste incineration, fires, and during certain manufacturing processes, but have no industrial applications and are not produced as such. The most toxic of these compounds is 2,3,7,8-tetrachlorodibenzo-p-dioxin, TCDD.

There are 75 PCDD congeners and 135 PCDF congeners.

PCDDs

PCDDs: individual solutions

50 µg/mL in toluene; name according to IUPAC:

2029.12-50-T	Dibenzo-p-dioxin	[262-12-4]
2030.12-50-T	1-Chlorodibenzo-p-dioxin	[39227-53-7]



2032.12-50-T	2-Chlorodibenzo-p-dioxin	[39227-54-8]
2031.12-50-T	2,7-Dichlorodibenzo-p-dioxin	[33857-26-0]
2033.12-50-T	1,2,4-Trichlorodibenzo-p-dioxin	[39227-58-2]
2034.12-50-T	1,2,3,4-Tetrachlorodibenzo-p-dioxin	[30746-58-8]
2036.12-50-T	Octachlorodibenzo-p-dioxin	[3268-87-9]

PCDFs

PCDFs: individual solutions

50 µg/mL in toluene; name according to IUPAC:

1100.12-50-T	Dibenzofuran	[132-64-91]
2038.12-50-T	2,8-Dichlorodibenzofuran	[5409-83-6]
2039.12-50-T	Octachlorodibenzofuran	[39001-02-0]

PCAs, SCCPs, C10-C13 polychloroalkanes

Polychloro-n-alkanes (PCAs) or chlorinated paraffins are a class of industrial chemicals used as high-temperature lubricants in metal-working machinery and as flame-retardant plasticizers in vinyl plastics. Less common applications include the use as flame-retardants in rubber, paints, adhesives and as sealants.

Industrially, the PCAs are synthesized by direct chlorination of n-alkane feedstock with molecular chlorine at elevated temperatures and pressures, and sometimes in the presence of UV-light. PCAs fall into three categories, C₁₀-C₁₃ (short, "SCCP"), C₁₄-C₁₇ (medium, "MCCP"), and C₂₀-C₃₀ (long, "LCCP"). They are further sub-categorized into their weight content of chlorine, 40-50%, 50-60% and 60-70%.

C10-C13 PCA ("SCCPs" short-chain-chlorinated-paraffines)

Listed as Priority Pollutants in the US, Canada, and Europe

In the US, C₁₀-C₁₃ PCAs have been placed on the US Environmental Protection Agency (EPA) Toxic Release Inventory, in Canada they are classified as "Track 1" Priority Toxic substances under the Canadian Environmental Protection Act, and in Europe the C₁₀-C₁₃ PCAs are included on the list of priority substances in the field of water policy submitted by the Commission of European Communities for the European Parliament and Council Decision.

Analysis of PCAs

PCAs are analyzed by GC using ECD detector, or more sophisticated by high resolution gas chromatography/electron capture negative ion-mass spectrometry (HRGC/ECNI-MS).

Chiron No.	Molecular formula	Compound	% Weight of Cl
Dichloro			
1664.8-K-IO	C ₈ H ₁₆ Cl ₂	1,2-Dichlorooctane	38,7
1665.9-K-IO	C ₉ H ₁₈ Cl ₂	1,2-Dichlorononane	36,0
1666.10-K-IO	C ₁₀ H ₂₀ Cl ₂	1,2-Dichlorodecane	33,6
1667.11-K-IO	C ₁₁ H ₂₂ Cl ₂	1,2-Dichloroundecane	31,5
1668.12-K-IO	C ₁₂ H ₂₄ Cl ₂	1,2-Dichlorododecane	29,6
1663.12-K-IO	C ₁₂ H ₂₄ Cl ₂	1,12-Dichlorododecane	29,6
1669.13-K-IO	C ₁₃ H ₂₆ Cl ₂	1,2-Dichlorotridecane	28,0
1670.14-K-IO	C ₁₄ H ₂₈ Cl ₂	1,2-Dichlorotetradecane	26,5
1879.8-K-IO		Dichloroalkane Kit	
Tetrachloro			
1672.8-K-IO	C ₈ H ₁₄ Cl ₄	1,2,7,8-Tetrachlorooctane	56,3
1660.8-K-IO	C ₈ H ₁₄ Cl ₄	1,1,1,3-Tetrachlorooctane	56,3



1673.9-K-IO	C ₉ H ₁₆ C ₁₄	1,2,8,9-Tetrachlorononane	53,3
1661.9-K-IO	C ₉ H ₁₆ C ₁₄	1,1,1,3-Tetrachlorononane	53,3
1671.10-K-IO	C ₁₀ H ₁₈ C ₁₄	1,2,9,10-Tetrachlorodecane	50,6
1662.10-K-IO	C ₁₀ H ₁₈ C ₁₄	1,1,1,3-Tetrachlorodecane	50,6
1674.11-K-IO	C ₁₁ H ₂₀ C ₁₄	1,2,10,11-Tetrachloroundecane	48,2
1649.11-K-IO	C ₁₁ H ₂₀ C ₁₄	1,1,1,3-Tetrachloroundecane	48,2
1675.12-K-IO	C ₁₂ H ₂₂ C ₁₄	1,2,11,12-Tetrachlorododecane	46,0
1651.12-K-IO	C ₁₂ H ₂₂ C ₁₄	1,1,1,3-Tetrachlorododecane	46,0
1653.13-K-IO	C ₁₃ H ₂₄ C ₁₄	1,1,1,3-Tetrachlorotridecane	44,0
1677.14-K-IO	C ₁₄ H ₂₆ C ₁₄	1,2,13,14-Tetrachlorotetradecane	42,2
1676.14-K-IO	C ₁₄ H ₂₆ C ₁₄	1,1,1,3-Tetrachlorotetradecane	42,2
1880.13-K-IO		Tetrachloroalkane Kit	
Hexachloro			
1658.9-K-IO	C ₉ H ₁₄ C ₁₆	1,1,1,3,8,9-Hexachlorononane	63,5
1659.10-K-IO	C ₁₀ H ₁₆ C ₁₆	1,1,1,3,9,10-Hexachlorodecane	61,0
1650.11-K-IO	C ₁₁ H ₁₈ C ₁₆	1,1,1,3,10,11-Hexachloroundecane	58,6
1652.12-K-IO	C ₁₂ H ₂₀ C ₁₆	1,1,1,3,11,12-Hexachlorododecane	56,4
1654.13-K-IO	C ₁₃ H ₂₂ C ₁₆	1,1,1,3,12,13-Hexachlorotridecane	54,4
1881.5-K-IO		Hexachloroalkane Kit	
Octachloro			
1656.8-K-IO	C ₈ H ₁₀ C ₁₈	1,1,1,3,6,8,8,8-Octachlorooctane	72,8
1622.10-K-IO	C ₁₀ H ₁₄ C ₁₈	1,1,1,3,8,10,10,10-Octachlorodecane	67,9
1623.11-K-IO	C ₁₁ H ₁₆ C ₁₈	1,1,1,3,9,11,11,11-Octachloroundecane	65,7
1624.12-K-IO	C ₁₂ H ₁₈ C ₁₈	1,1,1,3,10,12,12,12-Octachlorododecane	63,6
1625.13-K-IO	C ₁₃ H ₂₀ C ₁₈	1,1,1,3,11,13,13,13-Octachlorotridecane	61,7
1678.14-K-IO	C ₁₄ H ₂₂ C ₁₈	1,1,1,3,12,14,14,14-Octachlorotetradecane	59,8
1882.6-Kit		Octachloroalkane Kit	
1883.8-Kit		C ₈ -C ₉ PCA Kit	(8 samples, 1 vial each)
1884.20-Kit		C ₁₀ -C ₁₃ PCA (SCCP) Kit	(20 samples, 1 vial each)
1885.4-Kit		C ₁₄ PCA (MCCP) Kit	(4 samples, 1 vial each)

Pesticides, herbicides

Individual native and labelled internal standards are listed in the Compounds section, page 367 and onward.

International standards

ISO 6468: 1996	Water quality, Pesticides, PCBs and chlorobenzenes
ISO 10381:2002	Soil quality – organochlorine pesticides and PCBs
EPA 505:1995	Water – Organohalide pesticides by GC
EPA 527.1:2005	Drinking water – Pesticides and PBDEs by GC/MS

Special mixes

S-4401-10K-AN	Pesticide Mixture
S-4401-10K-2AN	6 Analytes, each 10 000 µg/mL in acetonitrile; units: 1x1, 1x2mL



Prod.no.	Compound	CAS No.
2768,8	Atrazine	[1912-249]
2769,9	Propazine	[139-40-2]
2770,7	Simazine	[122-34-9]
2771,9	Tertbutylazine	[5915-41-3]
2772,6	Atrazine-desethyl	[6190-65-4]
2773,5	Atrazine-desisopropyl	[1007-28-9]

S-4402-5-2CY**Chlorinated Pesticides**

6 Analytes, each 5 µg/mL in cyclohexane; units: 1x2mL

Prod.no.	Compound	CAS No.
2774,12	Aldrin	[309-00-2]
2775,12	Dieldrin	[60-57-1]
2026,6	Lindane	[58-89-9]
2776,10	Heptachlor	[76-44-8]
2777,10	Heptachlor-endo-epoxide (cis-)	[1024-57-3]
2778,10	Hepotachlor-exo-epoxide (trans-)	[28044-83-9]

S-4403-5K-CY

S-4403-5K-2CY

Phosphorous Containing Pesticides

5 Analytes, each 5000 µg/mL in cyclohexane; units: 1x1, 1x2 mL

Prod.no.	Compound	CAS No.
2779,12	Diazinon	[333-41-5]
2780,9	Ethion	[563-12-2]
1396,10	Malathion	[121-75-5]
2781,9	Fenitrothion	[122-14-5]
2782,10	Parathion-ethyl	[56-38-2]

S-4338-100-ME

S-4338-100-10ME

Conazoles Mixture

4 Analytes, each 100 µg/mL in methanol; units: 1x1 mL, 1x10 mL

Prod.no.	Compound	CAS no.
2319,15	Cyproconazole	[113096-99-4]
2320,15	Propiconazole	[60207-90-1]
2318,16	Tebuconazole	[107534-96-3]
2321,17	Epoxiconazole	[133855-98-8]

Chlorobenzenes

Internal standards

1957.6-K-IO	1,4-Dichlorobenzene-d ₄	[3855-82-1]	1000µg/mL	isooctane
2727.6-100-IO	Hexachlorobenzene- ¹³ C ₆	[93952-14-8]	100µg/mL	isooctane
2047.6-K-ME	1-Chloro-4-fluorobenzene, Internal standard for Gasoline Range Analysis	[352-33-0]	1000µg/mL	methanol
2047.6-K-ME	1-Chloro-4-fluorobenzene, Internal standard for Gasoline Range Analysis	[352-33-0]	1000µg/mL	methanol



Native chlorobenzenes

3360.6-K-IO	Chlorobenzene	[108-90-7]	1000µg/mL	isooctane
3364.6-K-IO	1,2-Dichlorobenzene	[95-50-1]	1000µg/mL	isooctane
3365.6-K-IO	1,3-Dichlorobenzene	[541-73-1]	1000µg/mL	isooctane
3366.6-K-IO	1,4-Dichlorobenzene	[106-46-7]	1000µg/mL	isooctane
3330.6-K-IO	1,2,3-Trichlorobenzene	[87-61-6]	1000µg/mL	isooctane
3519.6-K-IO	1,2,4-Trichlorobenzene	[120-82-1]	1000µg/mL	isooctane
3749.6-K-IO	1,3,5-Trichlorobenzene	[108-70-3]	1000µg/mL	isooctane
3750.6-K-IO	1,2,3,4-Tetrachlorobenzene	[634-66-2]	1000µg/mL	isooctane
3751.6-K-IO	1,2,3,5-Tetrachlorobenzene	[634-90-2]	1000µg/mL	isooctane
3656.6-K-IO	1,2,4,5-Tetrachlorobenzene	[95-94-3]	1000µg/mL	isooctane
2025.6-K-IO	Pentachlorobenzene	[608-93-5]	1000µg/mL	isooctane
1356.6-K-IO	Hexachlorobenzene	[118-74-1]	1000µg/mL	isooctane
3664.14-KIT-S	Chlorobenzene Kit (Natives in solution)			

Also available in neat form, see the Compounds section, page 286.

Bromobenzenes

2157.6-50-IO	Bromobenzene	[106-86-1]	50µg/mL	isooctane
3657.6-50-IO	1,2-Dibromobenzene	[583-53-9]	50µg/mL	isooctane
3658.6-50-IO	1,3-Dibromobenzene	[108-36-1]	50µg/mL	isooctane
3659.6-50-IO	1,4-Dibromobenzene	[106-37-6]	50µg/mL	isooctane
3660.6-50-IO	1,3,5-Tribromobenzene	[626-39-1]	50µg/mL	isooctane
3665.6-50-IO	1,2,4,5-Tetrabromobenzene	[636-28-2]	50µg/mL	isooctane
2673.7-50-IO	Pentabromotoluene	[87-83-2]	50µg/mL	isooctane
2678.6-50-IO	Hexabromobenzene	[87-82-1]	50µg/mL	isooctane
3666.8-KIT	Bromobenzene Kit			

Also available in neat form, see the Compounds section, page 287.

Chlorophenols

Monochlorophenols

2062.6-K-IP	2-Chlorophenol	[95-57-8]	1000µg/mL	isopropanol
2067.6-K-IP	3-Chlorophenol	[108-43-0]	1000µg/mL	isopropanol
2068.6-K-IP	4-Chlorophenol	[106-48-9]	1000µg/mL	isopropanol
2063.7-K-IP	2-Chloro-5-methylphenol	[615-74-7]	1000µg/mL	isopropanol
2070.7-K-IP	4-Chloro-2-methylphenol	[1570-64-5]	1000µg/mL	isopropanol
2071.7-K-IP	4-Chloro-3-methylphenol	[59-50-7]	1000µg/mL	isopropanol
2440.10-K-IP	2-Chloro-4-tert-butylphenol	[98-28-2]	1000µg/mL	isopropanol
2378.10-K-IP	6-Chloro-5-methyl-2-(1-methylethyl)phenol	[89-68-9]	1000µg/mL	isopropanol
2500.11-K-IP	2-Cyclopentyl-4-chlorophenol	[13347-42-7]	1000µg/mL	isopropanol
2441.13-K-IP	4-Chloro-2-benzylphenol	[120-32-1]	1000µg/mL	isopropanol
2446.10-KIT	Monochlorophenol Kit			



Dichlorophenols

2066.6-K-IP	2,3-Dichlorophenol	[576-24-9]	1000µg/mL	isopropanol
2064.6-K-IP	2,4-Dichlorophenol	[120-83-2]	1000µg/mL	isopropanol
2065.6-K-IP	2,5-Dichlorophenol	[583-78-8]	1000µg/mL	isopropanol
2069.6-K-IP	2,6-Dichlorophenol	[87-65-0]	1000µg/mL	isopropanol
2080.6-K-IP	3,4-Dichlorophenol	[95-77-2]	1000µg/mL	isopropanol
2078.6-K-IP	3,5-Dichlorophenol	[591-35-5]	1000µg/mL	isopropanol
2742.7-K-IP	2,4-Dichloro-6-methylphenol	[1570-65-6]	1000µg/mL	isopropanol
2379.8-K-IP	2,4-Dichloro-3,5-dimethylphenol	[133-53-9]	1000µg/mL	isopropanol
2738.10-K-IP	2,5-Dichloro-4-tert-butylphenol	[52780-22-0]	1000µg/mL	isopropanol
2380.9-KIT	Dichlorophenol Kit			

Trichlorophenols

2077.6-K-IP	2,3,4-Trichlorophenol	[15950-66-0]	1000µg/mL	isopropanol
2073.6-K-IP	2,3,5-Trichlorophenol	[933-78-8]	1000µg/mL	isopropanol
2072.6-K-IP	2,3,6-Trichlorophenol	[933-75-5]	1000µg/mL	isopropanol
2075.6-K-IP	2,4,5-Trichlorophenol	[95-95-4]	1000µg/mL	isopropanol
2076.6-K-IP	2,4,6-Trichlorophenol	[88-06-2]	1000µg/mL	isopropanol
2082.6-K-IP	3,4,5-Trichlorophenol	[609-19-8]	1000µg/mL	isopropanol
2381.6-KIT	Trichlorophenol Kit			

Tetra-/ pentachlorophenols

2081.6-K-IP	2,3,4,5-Tetrachlorophenol	[4901-51-3]	1000µg/mL	isopropanol
2149.6-K-IO	2,3,4,6-Tetrachlorophenol	[58-90-2]	1000µg/mL	isooctane
2074.6-K-IP	2,3,5,6-Tetrachlorophenol	[935-95-5]	1000µg/mL	isopropanol
2084.6-K-IO	Pentachlorophenol	[87-86-5]	1000µg/mL	isooctane
2084.6-K-IP	Pentachlorophenol	[87-86-5]	1000µg/mL	isopropanol
2386.4-KIT	Tetra-/Pentachlorophenol Kit			

Bromophenols

3822.6-K-IP	2-Bromophenol	[95-56-7]	1000µg/mL	isopropanol
2383.6-K-IP	4-Bromophenol	[106-41-2]	1000µg/mL	isopropanol
3721.6-K-IP	2,3-Dibromophenol	[57383-80-9]	1000µg/mL	isopropanol
2061.6-K-IP	2,4-Dibromophenol	[615-58-7]	1000µg/mL	isopropanol
2470.6-K-IP	2,5-Dibromophenol	[28165-52-8]	1000µg/mL	isopropanol
2472.6-K-IP	2,6-Dibromophenol	[608-33-3]	1000µg/mL	isopropanol
2507.6-K-IP	2,3,4-Tribromophenol	[138507-65-0]	1000µg/mL	isopropanol
2471.6-K-IP	2,3,6-Tribromophenol	[28165-57-3]	1000µg/mL	isopropanol
2060.6-K-IP	2,4,6-Tribromophenol	[118-79-6]	1000µg/mL	isopropanol
2508.6-K-IP	2,4,5-Tribromophenol	[14401-61-7]	1000µg/mL	isopropanol
2509.6-K-IP	2,3,4,6-Tetrabromophenol	[14400-94-3]	1000µg/mL	isopropanol
2672.6-50-IO	Pentabromophenol	[608-71-9]	50µg/mL	isooctane
2384.12-KIT	Bromophenol Kit			

Other

2027.4-K-IO	Hexachloro-1,3-butadiene	[87-68-3]	1000µg/mL	isooctane
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VOC (Volatile organic compounds)

S-4085-5K-ME

VOC Standard Mixture 1

13 Analytes, each 5000µg/mL in methanol; units: 1x1 mL, 5x1 mL

1350.1	Chloroform	[67-66-3]
1264.7	Toluene	[108-88-1]
1351.2	1,1,1-Trichloroethane	[71-55-6]
1268.8	Ethylbenzene	[100-41-4]
1352.1	Tetrachloroethane	[56-23-5]
1266.8	m-Xylene	[108-38-3]
1354.2	Trichloroethylene	[79-01-6]
1265.8	p-Xylene	[576-26-1]
1353.2	Tetrachloroethylene	[127-18-4]
1267.8	o-Xylene	[95-47-6]
1355.2	1,2-Dichloroethane	[107-06-2]
0711.10	Naphthalene	[91-20-3]
1300.6	Benzene	[71-43-2]

S-4092-K-5PE

VOC Chloro-Bromo-methane Mixture 1

4 Analytes, each 1000 µg/ml in n-pentane; unit: 1x 5 mL

1689.1	Bromoform	
1690.1	Bromodichloromethane	[75-27-4]
1350.1	Chloroform	[67-66-3]
1691.1	Chlorodibromomethane	[124-48-1]

This standard has been made for the determination of volatile halogenated in compounds in the water on offshore platforms

S-4420-ASS-2ME

VHO/THM Mixture

6 Analytes, each concentration as listed in methanol; unit: 5x2 mL

Prod.no.	Compound	CAS No.	Concentration
1350.1	Chloroform	[67-66-3]	1000µg/mL
1690.1	Bromodichloromethane	[75-27-4]	1000µg/mL
1689.1	Chlorodibromomethane	[75-25-2]	1000µg/mL
1355.2	1,2-Dichloroethane	[107-06-2]	1000µg/mL
1354.2	Trichloroethylene	[79-01-6]	1000µg/mL
1353.2	Tetrachloroethylene	[127-18-4]	100µg/mL



Miscellaneous mixtures

S-4227-10-2DC

GC-MS Test Mixture

16 Analytes, each 10 µg/mL in dichloromethane; unit: 5x2 mL

1400.3	Trimethylphosphate	[512-56-1]
0413.10	n-Decane	[124-18-5]
1365.8	2,6-Dimethylphenol	[576-26-1]
0415.12	n-Dodecane	[112-40-5]
1397.6	5-Chloro-2-methylaniline	[95-79-4]
0417.14	n-Tetradecane	[629-59-4]
1399.12	Tributylphosphate	[126-73-8]
0419.16	n-Hexadecane	[544-76-3]
0884.12	Dibenzothiophene	[132-65-0]
0421.18	n-Octadecane	[593-45-3]
1396.10	Malathion	[121-75-5]
0423.20	n-Eicosane	[112-95-8]
1398.19	Methylstearate	[112-61-8]
0401.22	n-Docosane	[629-97-0]
1242.8	n-Octane	[111-65-9]
0403.24	n-Tetracosane	[646-31-1]

S-4005-5K-AC

3,4-Dimercaptotoluene

5000µg/mL in acetone, 5 x 1 mL

S-4404-100-10AN

Phenone mixture

9 Analytes, each 100µg/mL in acetonitrile; unit: 1x10mL

Prod.no.	Compound	CAS no.
2754.8	Acetanilide	[103-84-4]
2751.8	Acetophenone	[98-86-2]
2749.9	Propiophenone	[93-55-0]
2758.10	Butyrophenone	[495-40-9]
2748.13	Benzophenone	[119-61-9]
2750.11	Valerophenone	[1009-14-9]
2752.12	Hexanophenone	[942-92-7]
2757.13	Heptanophenone	[1671-75-6]
2753.14	Octanophenone	[1674-37-9]

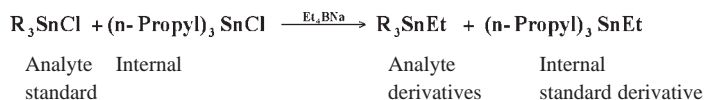


Organotin analysis

Organotin compounds are widely applied in the industry due to their antibacterial and fungicidal properties. Applications include preservation of wood, textiles, leather and paper, and as disinfectants. Due to their toxicity the use of trialkyltin compounds in marine antifouling paints is restricted. The trialkyltin compounds are partly degraded to the di- and monoalkyltin derivatives.

Quantification of organotin compounds

The principle is based on alkylation of the organotin chlorides to tetrasubstituted compounds which are analyzed by GC and GC/MS.



As a unique source, Chiron offers standards for the derived analytes for use as calibration standards, in addition to the derivatizing agent and the common trialkyltin chloride pollutants.

Ethyl derivatives

NEW

Analytes ethyl derivatives

1000µg/mL in isoctane; units: 1x1 mL, 5x1 mL

1886.14-K-IO	Ethyltributyltin
2120.12-K-IO	Di-n-butyl diethyltin
2119.10-K-IO	Mono-n-butyl triethyltin
2491.20-K-IO	Di-n-octyl diethyltin
2492.14-K-IO	Mono-n-octyl triethyltin
2498.20-K-IO	Ethyltricyclohexyltin
1887.20-K-IO	Ethyltriphenyltin
2117.16-K-IO	Diphenyl diethyltin
2118.12-K-IO	Monophenyl triethyltin

Internal standards ethyl derivatives

1000µg/mL in isoctane; units: 1x1 mL, 5x1 mL

1955.11-K-IO	Ethyltri-n-propyltin
2049.17-K-IO	Ethyltri-n-pentyltin
2493.18-K-IO	Di-n-heptyldiethyltin
2494.13-K-IO	Mono-n-heptyltriethyltin
2023.13-Kit	Ethylalkyl/Triaryl tin Kit (13 compounds, 13 vials)



Tin chlorides

Analytes: common tin pollutants

1000µg/mL in isooctane or neat as listed

1981.12	Tri-n-butyltin chloride	1 g or 1000µg/mL, 5 mL
1982.8	Di-n-butyltin dichloride	1 g or 1000µg/mL, 5 mL
1983.4	Mono-n-butyltin trichloride	1 g or 1000µg/mL, 5 mL
1985.18	Triphenyltin chloride	1 g or 1000µg/mL, 5 mL
1986.12	Diphenyltin dichloride	1 g or 1000µg/mL, 5 mL
1987.6	Monophenyltin trichloride	1 g or 1000µg/mL, 5 mL
2487.8	Mono-n-octyltin trichloride	1 g or 1000µg/mL, 5 mL
2488.16	Di-n-octyltin dichloride	1 g or 1000µg/mL, 5 mL
2695.24	Tri-n-octyltin chloride	100 mg or 1000µg/mL, 5 mL
2489.18	Tricyclohexyltin chloride	1 g or 1000µg/mL, 5 mL

Internal standards

1000µg/mL in isooctane or neat as listed.

1989.9	Tri-n-propyltin chloride	1 g or 1000µg/mL, 5 mL
2490.12	Tetra-n-propyltin	1 g or 1000µg/mL, 5 mL
2050.15	Tri-n-pentyltin chloride	1 g or 1000µg/mL, 5 mL
2495.7	Mono-n-heptyltin trichloride	100 mg or 1000µg/mL, 5 mL
2496.14	Di-n-heptyltin dichloride	100 mg or 1000µg/mL, 5 mL

Derivatizing agent

1944.8-IMG	Sodium tetraethyl borate	1 g
2024.16-KIT	Organotin Analysis Kit (16 compounds, 16 vials)	

S-4335-K-IO
S-4335-K-5IO

Organotin Standard Mixture 1
Each 1000µg/mL in isooctane; units: 5x1mL or 5x5mL

Prod.No.	Compound	CAS No.
1983.4	Mono-n-butyltin trichloride	[1118-46-3]
1982.8	Di-n-butyltin dichloride	[683-18-1]
1987.6	Mono phenyltin trichloride	[1124-19-2]
1981.12	Tri-n-butyltin chloride	[1461-22-9]
1985.18	Triphenyltin chloride	[639-58-7]
1986.12	Diphenyltin dichloride	[1135-99-5]

International methods

For details and mixtures see the methods section

- ISO 17353:2004 Water Quality - Determination of selected organotin compound by GC
- ISO/DIS 23161.2:2007 Soil Quality - Determination of selected organotin compound gas chromatographic methods

For these important methods, see the Methods section, pages 32 and 38.



Phosphates

NEW

Organophosphate compound like those used in hydraulic fluids are believed to possess neurotoxic effect and causing organophosphate induced neuropsychiatric disorder (COPIND). The potentially most toxic compounds are of the type tri-*o*-cresylphosphate (tri-*o*-tolylphosphate).

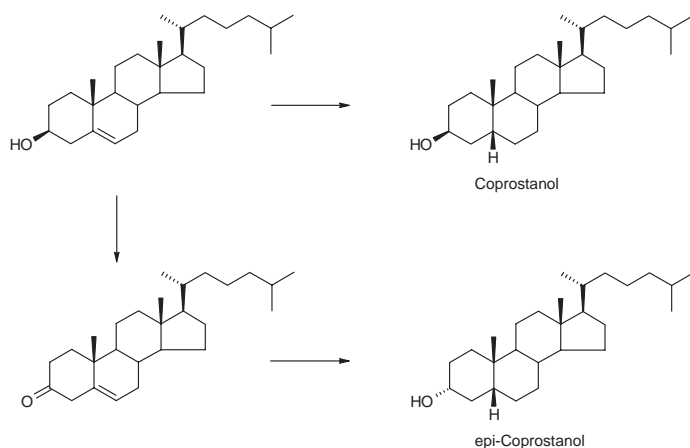
Native standards

Chiron No.	Compound		CAS No.	Concentration
1400.3-K-IO	Trimethyl phosphate	TMP	[512-56-1]	1000µg/mL
8026.6-K-IO	Triethyl phosphate		[78-40-0]	1000µg/mL
8027.9-K-IO	Tri- <i>n</i> -propyl phosphate		[513-08-6]	1000µg/mL
1399.12-K-IO	Tri- <i>n</i> -butyl phosphate	TBP (TnBP)	[126-73-8]	1000µg/mL
3966.12-K-IO	Triisobutyl phosphate	TiBP	[126-71-6]	1000µg/mL
2138.18-K-IO	Triphenyl phosphate	TPP	[115-86-6]	1000µg/mL
3967.19-K-IO	Tolyldiphenyl phosphate		[26444-49-5]	1000µg/mL
2135.21-K-IO	Tri- <i>o</i> -tolyl phosphate	ToTP	[78-30-8]	1000µg/mL
2134.21-K-IO	Tri- <i>m</i> -tolyl phosphate	TmTP	[563-04-2]	1000µg/mL
2136.21-K-IO	Tri- <i>p</i> -tolyl phosphate	TpTP	[78-32-0]	1000µg/mL
2137.21-K-IO	Tritolyl phosphate (isomer mix)	TTP	[1330-78-5]	1000µg/mL

NEW

Determination of the origin of faecal waste

Sewage waste analysis using faecal sterols





The deterioration of the water quality in rivers, lakes and coastal regions is a major challenge.

The use of sterol biomarker fingerprinting as an indicators of types of faecal input has been investigation and developed successfully over the past 25 years. This is an alternative to using microorganisms like *E. Coli* and *Streptococci* which have proven to be limited in their applications.

Coprostanol (5 β (H)-cholestan-3 β -ol) is one of the major sterols present in human faeces and is formed by bacterial reduction of cholesterol. A high value of epi-coprostanol (5 β (H)-cholestan-3 α -ol) suggest older faecal contaminations. Stanols does not occur naturally in fresh and marine sediments. Herbivore faeces (from e.g. cows) typically have a high content of 24-ethylcoprosatnol, while algal input will have high levels sterols derived of typical algal sterols (e.g. ethylstigmastanol).

Ref: *Environ. Sci.Technol.* 2007,41,792-802 and references therein.

Internal standard

Cat No	Compound	CAS No.	Quantity
1197.24-10MG	5 β (H)-Cholan-24-ol	[3110-99-4]	10mg
1197.24-25MG	5 β (H)-Cholan-24-ol	[3110-99-4]	25mg

Ref.: Rhys Leming

Native standards

Cat No	Compound	CAS No.	Quantity
2900.27-10MG	Cholest-5-en-3 β -ol	Cholesterol	10mg
	Cholest-5-en-3 α -ol	epi-Cholesterol	Inquire
2795.27-10MG	5 α (H)-Cholestan-3 β -ol	Cholestanol	10mg
2731.27-10MG	5 α (H)-Cholestan-3 α -ol	epi-Cholestanol	10mg
2351.27-10MG	5 β (H)-Cholestan-3 β -ol	Coprostanol	10mg
2730.27-10MG	5 β (H)-Cholestan-3 α -ol	epi-Coprostanol	10mg
3661.27-10MG	Cholest-4-ene-3-one		10mg
3624.27-10MG	5 α (H)-Cholestan-3-one	Cholestanone	10mg
2740.27-10MG	5 β (H)-Cholestan-3-one	Coprostanone	10mg
2734.28-5MG	24-Methylcholesta-5,22E-dien-3 β -ol	Brassicasterol	5mg
3767.29-10MG	24-Ethylcholest-5,22E-dien-3 β -ol	Stigmasterol	10mg
	24-Ethylcholest-5,22E-dien-3 α -ol	epi-Stigmasterol	Inquire
2732.29-10MG	24-Ethylcholest-5-en-3 β -ol	β -Sitosterol	10mg
	24-Ethylcholest-5-en-3 α -ol	epi- β -Sitosterol	Inquire
	24-Ethyl-5 α (H)-cholest-22E-en-3 β -ol		Inquire
	24-Ethyl-5 α (H)-cholest-22E-en-3 α -ol		Inquire
	24-Ethyl-5 β (H)-cholest-22E-en-3 β -ol		Inquire
24-Ethyl-5 β (H)-cholest-22E-en-3 α -ol		Inquire	
2717.29-10MG	24-Ethyl-5 α (H)-cholestan-3 β -ol	β -Sitostanol, Stigmastanol	10mg
3768.29-10MG	24-Ethyl-5 α (H)-cholestan-3 α -ol	epi- β -Sitosterol	
	(24-ethylepicholestanol)	epi-Stigmastanol	10mg
3047.29-10MG	24-Ethylcoprostanol		10mg
3582.29-10MG	24-Ethyl-5 β (H)-cholestan-3 α -ol	24-Ethyl-epi-coprostanol	10mg
	24-Ethylcholesta-4,22E-dien-3-one	Stigmastadienone	Inquire

