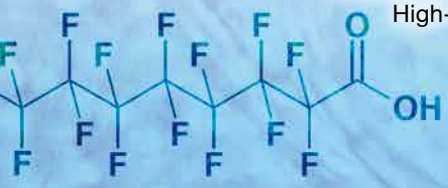
FUJIFILM
Value from Innovation

Wako

Environmental Analytical Chemistry



Alphabetical Index

1. Dioxins Analysis

1-1. Presep® Series for Dioxins Clean up

For analysis of dioxins, samples are treated for cleanup by multilayer silica gel column chromatography or activated carbon silica gel chromatography. These cartridge columns are filled with solid-phase carriers for the treatment.

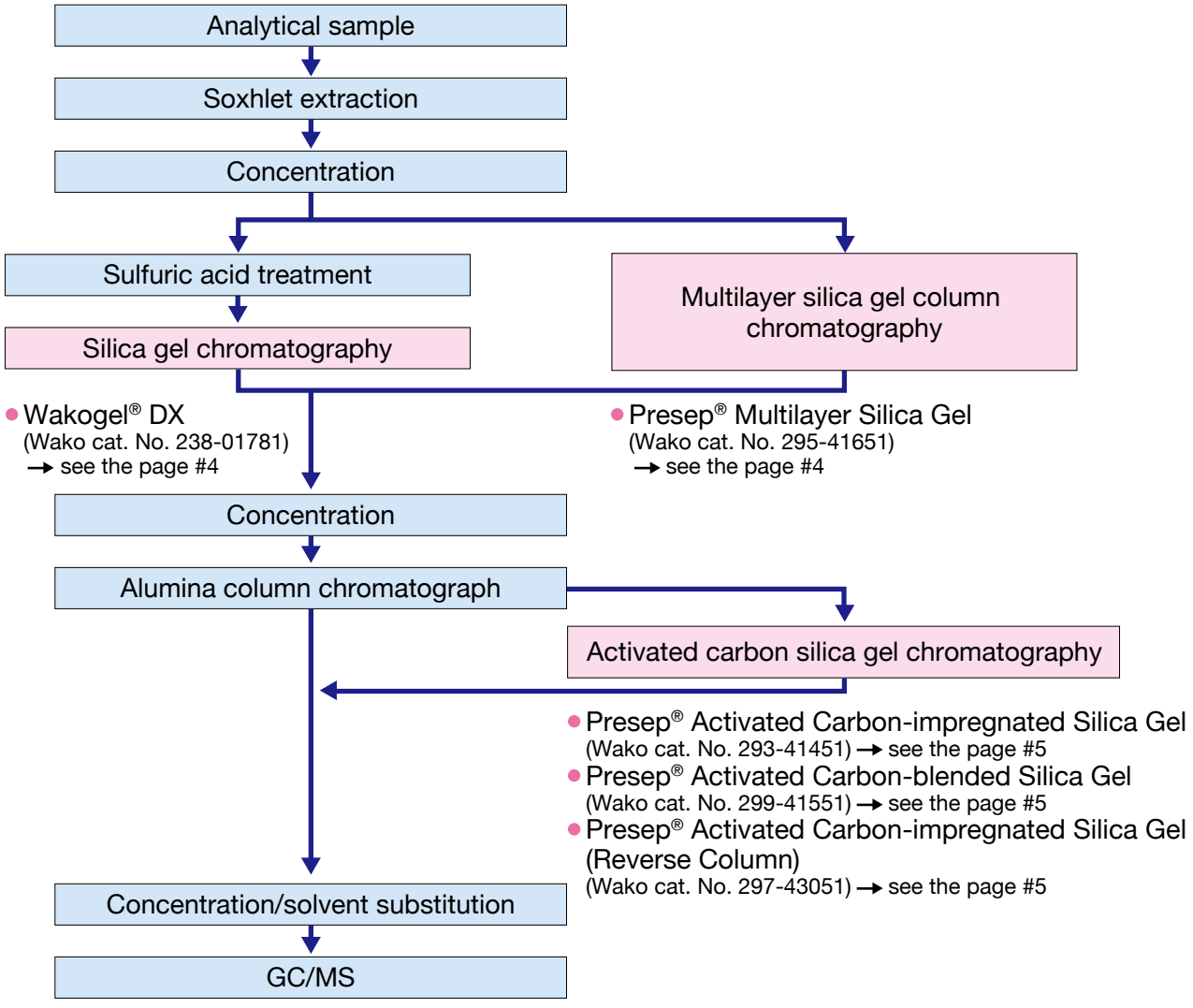
Features

Design conforming to JIS K 0311 (Method for determination of dioxins and coplanar PCB in exhaust gas) and JIS K 0312 (Method for determination of dioxins and coplanar PCB in industrial water and waste water)

1. The column plug and moisture-proof aluminum packaging bag are used to prevent quality deterioration during storage to keep stable quality.
2. Suitability for analysis of dioxins * (Blank test for dioxins and coplanar PCB by high-resolution GC/MS has been implemented.)
3. The use of eluent is reduced by the use of reverse elution method. (Presep® Active Carbon-impregnated Silica Gel Reverse Column)

* Except Presep® Multilayer Silica Gel

Dioxins analysis flow

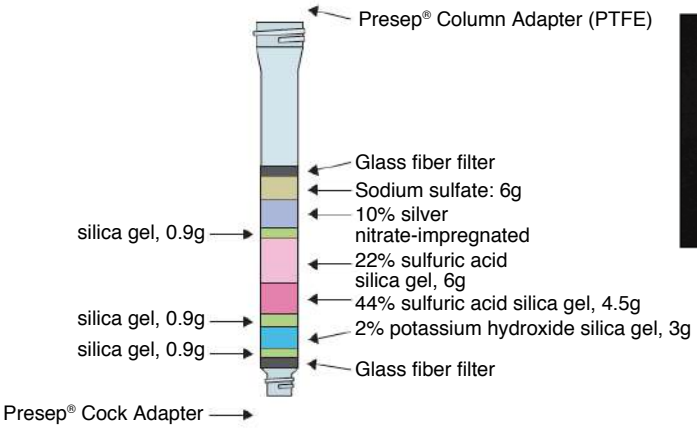


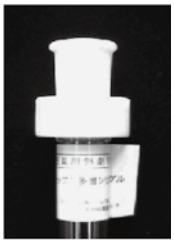
Presep® Multilayer Silica Gel

As one of the pretreatment processes of dioxins analysis, clean up using a multilayer silica gel column with various kinds of chemically modified silica gel laminated is carried out in order to efficiently remove foreign substances such as compounds containing sulfur, polycyclic aromatic hydrocarbons, coloring substances, *etc*. which coexist in measured specimens. However, the packing operation of preparing the multilayer silica gel column to be used for this analysis is extremely troublesome. Wako has launched a product with various kinds of chemically modified silica gel laminated in a glass column.

Column configuration

Column chromatography tube: Glass tube with inside diameter of 15 mm

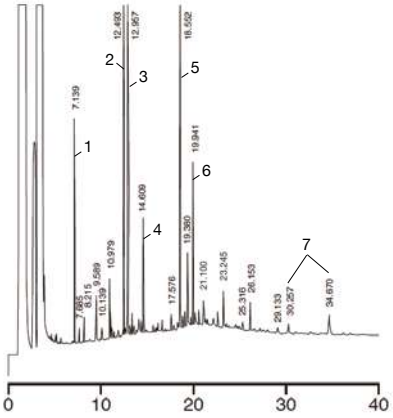




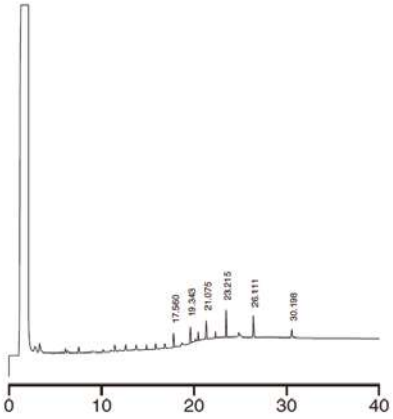
Product Name	Package Size	Wako Cat. No.
Presep® Multilayer Silica Gel	5 units	295-41651

Example of clean up of soil extracted sample using Presep® Multilayer Silica Gel after treatment.

[Before treatment]



[After treatment]



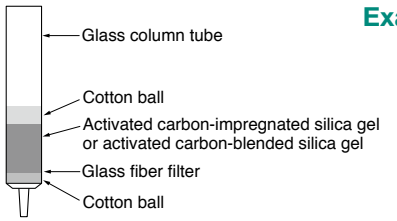
1. 2,4,6-Trichlorophenol
2. Propyzamide
3. Anthracene
4. *N,N*-Bis (1-methylethyl)-benzamide
5. Lenacil
6. Bis(2ethylhexyl)phthalate
7. Terpenes

<Related Products>

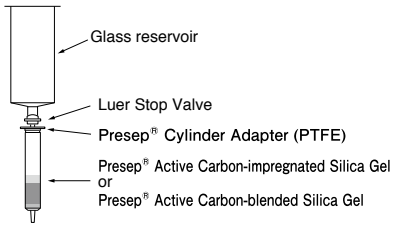
Product Name	Grade	Package Size	Wako Cat. No.
2% Potassium Hydroxide-impregnated Silica Gel	for Dioxins Analysis	100 g	167-19251
10% Silver Nitrate-impregnated Silica Gel		100 g	197-11611
22% Sulfuric Acid-impregnated Silica Gel		100 g	194-11621
44% Sulfuric Acid-impregnated Silica Gel		100 g	191-11631
55% Sulfuric Acid-impregnated Silica Gel		100 g	197-13811
Sodium Sulfate		250 g	194-12221
Wakogel® DX		100 g	238-01781

Presep® Active Carbon-impregnated Silica Gel
Presep® Active Carbon-blended Silica Gel

Column configuration



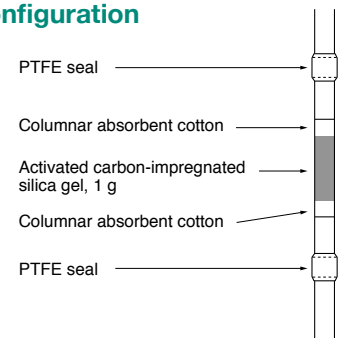
Example of use



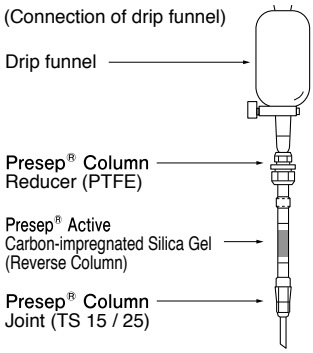
Product Name	Package Size	Wako Cat. No.
Presep® Active Carbon-impregnated Silica Gel	10 each	293-41451
Presep® Active Carbon-blended Silica Gel	10 each	299-41551

Presep® Active Carbon-impregnated Silica Gel (Reverse Column)

Column configuration



Example of use



Product Name	Package Size	Wako Cat. No.
Presep® Acitive Carbon-impregnated Silica Gel (Reverse Column)	5 each	297-43051

Examples of reagent blank of dioxins of active carbon silica gel

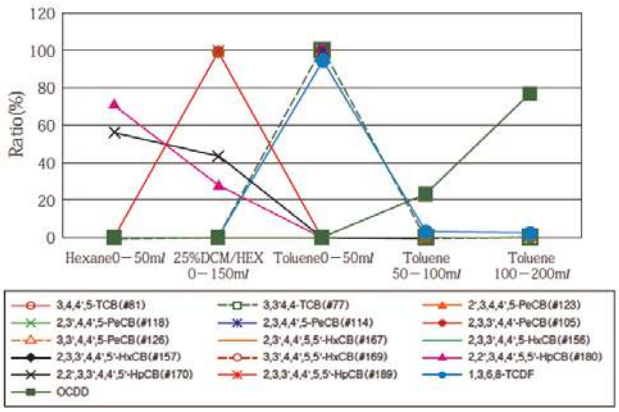
(unit : pg/g)

Dioxins	Active Carbon-impregnated Silica Gel	Active Carbon-blended Silica Gel
T4CDDs	0.2 ↓	0.2 ↓
P5CDDs	0.2 ↓	0.2 ↓
H6CDDs	0.2 ↓	0.2 ↓
H7CDDs	0.5 ↓	0.5 ↓
O8CDD	2 ↓	2 ↓
T4CDFs	0.2 ↓	0.2 ↓
P5CDFs	0.2 ↓	0.2 ↓
H6CDFs	0.2 ↓	0.2 ↓
H7CDFs	0.5 ↓	0.5 ↓
OCDF	2 ↓	2 ↓

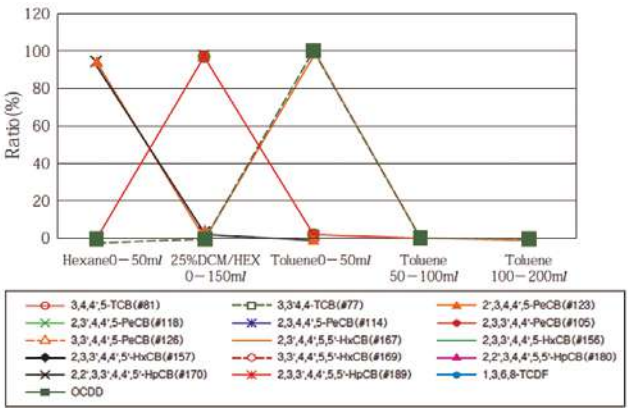
Dioxins	Active Carbon-impregnated Silica Gel	Active Carbon-blended Silica Gel
3,4,4',5-T4CB (#81)	1 ↓	1 ↓
3,3',4,4'-T4CB (#77)	1 ↓	1 ↓
2,3',4,4',5-P5CB (#118)	1 ↓	1 ↓
2,3,4,4',5-P5CB (#114)	1 ↓	1 ↓
2,3,3',4,4'-P5CB (#105)	1 ↓	1 ↓
3,3',4,4',5-P5CB (#126)	1 ↓	1 ↓
2',3,4,4',5-P5CB (#123)	1 ↓	1 ↓
2,3',4,4',5,5'-H6CB (#167)	1 ↓	1 ↓
2,3,3',4,4',5-H6CB (#156)	1 ↓	1 ↓
2,3,3',4,4',5'-H6CB (#157)	1 ↓	1 ↓
3,3',4,4',5,5'-H6CB (#169)	1 ↓	1 ↓

Fractionation Performance Test

[Presep® Active Carbon-impregnated Silica Gel]



[Presep® Active Carbon-blended Silica Gel]



<Related Products>

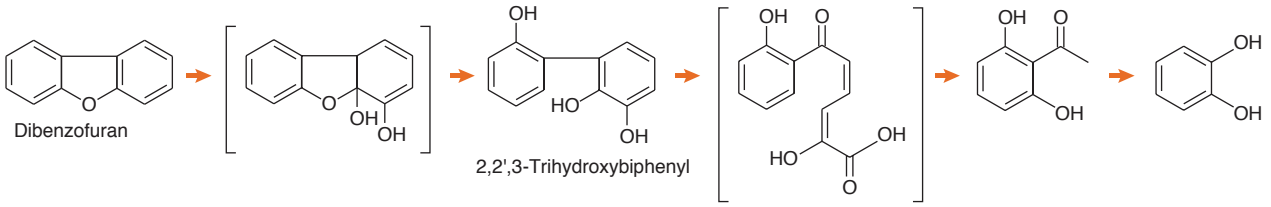
Product Name	Use	Package Size	Wako Cat. No.
Presep® Column Adapter (TS15/25)	Part for connecting Presep® Multilayer Silica Gel and separating funnel with interchangeable ground joint	1 each	295-42251
Presep® Column Adapter (TS19/38)		1 each	299-45951
Presep® Column Adapter Packing	Refill Teflon packing (white) for Presep® Column Adapter	5 each	298-50051
Presep® Column Joint (TS15/25)	(1) Joint to be fitted on the sample elution side of Presep® Active Carbon-impregnated Silica Gel (Reverse Column) (2) These joints are usable also as adapters on the eluent injection side by fitting a separating funnel with interchangeable ground joint.	1 each	291-42851
Presep® Column Joint (TS19/38)		1 each	297-42951
Presep® Column Reducer (PTFE)	Connection of Presep® Active Carbon-impregnated Silica Gel (Reverse Column) and adapter on eluent injection side	1 each	295-42751
Presep® Cock Adapter	Adapter with cock to be fitted on sample elution side (under chromatographic column) of Presep® Multilayer Silica Gel.	1 each	299-42151
Presep® Cock Adapter Packing	Refill Teflon packing (brown) for Presep® Cock Adapter	5 each	294-50151
Presep® Cylinder Adapter (PTEE)	Connection of Luer Stop Valve and reservoir (solvent reservoir) in the case of use of Presep® Alumina, Activated DX, Presep® Active Carbonimpregnated Silica Gel or Presep® Active Carbon-blended Silica Gel	5 each 20 each	291-41751 297-41753

1-2. Standard

2,2',3-Trihydroxybiphenyl

Environmental pollution caused by dioxins has spread worldwide and has become a serious social issue. Environmental dioxins can be degraded by heat or chemical treatments, but there is a demerit because the treatment of dioxins in soil or river sludge is very expensive.
Recently, degradation using microorganisms has been investigated as one of the dioxin treatments and the search for microorganisms using dioxins as a carbon source is being carried out.
This product is used for substrates of dioxin-degrading microorganisms.

Reaction pathway



Product Name	Package Size	Wako Cat. No.
2,2',3-Trihydroxybiphenyl Standard	100 mg	208-15551

1-3. Solvents for Dioxins Analysis

These products are used to determine Dibenzo-*p*-dioxins, Dibenzofurans, and Coplanar PCBs by high resolution GC/MS, and ensures a sufficiently low concentration.

Product Name	Wako Cat. No.	Package Size	Specifications				
				Suitability for dioxins determination			(unit)
Acetone, 99.8+% (cGC)	010-17831 016-17833	1 L 3 L	Density (20°C): 0.789~0.792 g/mL	Dibenzo-*p*-dioxin	(Cl: 4 ~ 6) (Cl: 7 or 8)	: ≤1 : ≤5	pg/L
				Dibenzofuran	(Cl: 4 ~ 6) (Cl: 7 or 8)	: ≤1 : ≤5	
				Coplanar PCB	–	: ≤10	
Decane, 99.5+% (cGC)	048-28543 042-28541	2 mL × 5 100 mL	Density (20°C): 0.727~0.735 g/mL	Dibenzo-*p*-dioxin	(Cl: 4 ~ 6) (Cl: 7 or 8)	: ≤10 : ≤50	fg/μL
				Dibenzofuran	(Cl: 4 ~ 6) (Cl: 7 or 8)	: ≤10 : ≤50	
				Coplanar PCB	–	: ≤10	

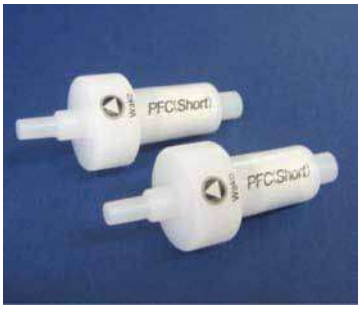
Product Name	Wako Cat. No.	Package Size	Specifications	Suitability for dioxins determination			(unit)
Dichloromethane [Methylene Chloride] 99.5+% (cGC, except MeOH) Stabilizer: Methanol [0.2~0.5%]	048-26321 044-26323	1 L 3 L	Density (20°C): 1.320~1.331 g/mL	Dibenzo-*p*-dioxin	(Cl: 4 ~ 6) (Cl: 7 or 8)	: ≤1 : ≤5	pg/L
				Dibenzofuran	(Cl: 4 ~ 6) (Cl: 7 or 8)	: ≤1 : ≤5	
Diethylene Glycol, 99.0+% (cGC)	040-28645	500 mL	Solubility in water: to pass test Density (20°C): 1.116~1.123 g/mL	Dibenzo-*p*-dioxin	(Cl: 4 ~ 6) (Cl: 7 or 8)	: ≤5 : ≤25	pg/L
				Dibenzofuran	(Cl: 4 ~ 6) (Cl: 7 or 8)	: ≤5 : ≤25	
				Coplanar PCB	(2,3',4,4',5-PeCB) (Other Co-PCB)	: ≤100 : ≤50	
Diethyl Ether, 99.5+% (cGC)	049-27451	1 L	Density (20°C): 0.712~0.714 g/mL	Dibenzo-*p*-dioxin	(Cl: 4 ~ 6) (Cl: 7 or 8)	: ≤1 : ≤5	pg/L
				Dibenzofuran	(Cl: 4 ~ 6) (Cl: 7 or 8)	: ≤1 : ≤5	
Ethanol (99.5), 99.5+% (cGC) [Ethyl Alcohol (99.5)]	050-06661 056-06663	1 L 3 L	Density (20°C): 0.789~0.792 g/mL	Coplanar PCB	–	: ≤10	
Fluorobenzene, 98.0+% (cGC)	061-04551	200 mL	Density (20°C): 1.025~1.035 g/mL	Dibenzo-*p*-dioxin	(Cl: 4 ~ 7) (Cl: 8)	: ≤5 : ≤10	fg/μL
				Dibenzofuran	(Cl: 4 ~ 7) (Cl: 8)	: ≤5 : ≤10	
				Coplanar PCB	–	: ≤5	
Hexane, 96.0+% (cGC) [n-Hexane]	083-07391 089-07393	1 L 3 L	Density (20°C): 0.658~0.662 g/mL	Dibenzo-*p*-dioxin	(Cl: 4 ~ 6) (Cl: 7 or 8)	: ≤1 : ≤5	pg/L
				Dibenzofuran	(Cl: 4 ~ 6) (Cl: 7 or 8)	: ≤1 : ≤5	
Methanol, 99.8+% (cGC) [Methyl Alcohol]	136-13461 132-13463	1 L 3 L	Density (20°C): 0.791~0.793 g/mL	Coplanar PCB	–	: ≤10	
Nonane, 98.0+% (cGC) [n-Nonane]	148-07351 142-07354	2 mL × 5 100 mL	Density (20°C): 0.713~0.721 g/mL	Dibenzo-*p*-dioxin	(Cl: 4 ~ 6) (Cl: 7 or 8)	: ≤5 : ≤10	fg/μL
				Dibenzofuran	(Cl: 4 ~ 6) (Cl: 7 or 8)	: ≤5 : ≤10	
				Coplanar PCB	–	: ≤5	
Petroleum Ether Content: 5~15 %	160-20231	1 L	Boiling range (30~60°C): 90+vol%	Dibenzo-*p*-dioxin	(Cl: 4 ~ 6) (Cl: 7 or 8)	: ≤1 : ≤5	pg/L
				Dibenzofuran	(Cl: 4 ~ 6) (7, 8 chlorinated)	: ≤1 : ≤5	
				Coplanar PCB	–	: ≤10	
10% Sodium Chloride Solution	192-12641	1 L	–	Dibenzo-*p*-dioxin	(Cl: 4) (Cl: 5 or 6) (Cl: 7 or 8)	: ≤1 : ≤2 : ≤5	pg/L
				Dibenzofuran	(Cl: 4) (Cl: 5 or 6) (Cl: 7 or 8)	: ≤1 : ≤2 : ≤5	
				Coplanar PCB	–	: ≤5	
Toluene, 99.7+% (cGC)	203-14141 209-14143	1 L 3 L	Density (20°C): 0.864~0.868 g/mL	Dibenzo-*p*-dioxin	(Cl: 4 ~ 6) (Cl: 7 or 8)	: ≤1 : ≤5	pg/L
				Dibenzofuran	(Cl: 4 ~ 6) (Cl: 7 or 8)	: ≤1 : ≤5	
				Coplanar PCB	–	: ≤10	
Dimethyl Sulfoxide, 99.0+% (cGC)	041-29395	500 mL	Density (20°C):1.100 ~ 1.106 g/mL	Dibenzo-*p*-dioxin	(Cl: 4 ~ 7) (Cl: 8)	: ≤5 : ≤10	fg/μL
				Dibenzofuran	(Cl: 4 ~ 7) (Cl: 8)	: ≤5 : ≤10	
				Coplanar PCB	–	: ≤5	

<Related Products>

Product Name	Package Size	Wako Cat. No.
DIOXIN TRAP BEADS	200 g	040-27481
Active Carbon-impregnated Silica Gel	10 g	019-11941
Copper, Reduced, Granular, 300-850 μm (20-50 mesh)	50 g	032-19571
Phthalocyanine Immobilized Silica Gel	5 g 25 g	160-21831 168-21832

2. PFCs Analysis

Presep®-C PFC (short)
Presep®-C PFC-II



Accumulation of perfluorocarbons in the body is a concern because of high lipid-solubility and degradation difficulty. Various environmental laboratories have examined analytical methods since it was listed as an item to be investigated by the Ministry of the Environment in fiscal 2002, in Japan.

Presep®-C PFC (short) and Presep®-C PFC-II are solid-phase extraction columns filled with a divinyl benzene-polymethacrylate resin-based filler. Presep® PFC-II is filled with a new polymer developed for the purpose of highly efficient recovery of wide range of PFCs. These columns are used as pretreatment columns for PFCs, such as perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS).

Features

1. Trace PFCs in water can be highly efficiently recovered. Presep® PFC-II can recover 16 PFCs.
2. 16 components can be analyzed simultaneously and quickly by combining with Wakopak® Wakosil-II 3C18 RS.
3. Blank caused by solvent can be reduced by combining with a solvent for PFOS or PFOA analysis.

PFCs additive recovery test

● PFCs reference standard is added to purified water, and the recovery is measured. Analyzed components: 16 components

Solid-phase extraction conditions

Column conditioning:

Column : Presep® PFC-II		Column : Presep®-C PFC	
① CH_3OH	with 0.1 % NH_4OH 10 mL	① CH_3OH	10 mL
② CH_3OH	5 mL	② H_2O	5 mL※1
③ H_2O	5 mL※1		

Collection/concentration operation

Water sample (additive recovery experiment: Addition of standard to 1 L of purified water)

↓

Feed of water into column (flow velocity: 10 to 20 mL/min)

↓

Drying (air purging※2 or nitrogen gas purging)

↓

Elution: Amount of solvent: 2 mL※3 (Elution solvent) Presep® PFC-II : CH_3OH with 0.1 % NH_4OH 2 mL

Presep®-C PFC : CH_3OH 2 mL

↓

LC/MS/MS measurement

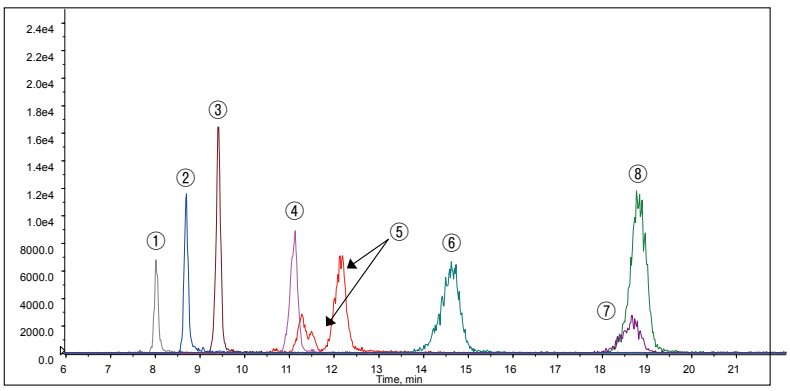
※1 : Ion exchange water fed into unused Presep® cartridge which has been exposed to recovery experiment is used. Ultrapure water for PFOs/PFOA analysis (212-01363) can be used.
※2 : Contamination from air can be prevented by connecting unused Presep® in the previous stage of the column which has collected the sample and sucking air.
※3 : The eluate is concentrated by nitrogen gas purging according to the measurement sensitivity, and the quantity is measured.

Results of recovery of additives in purified water

Sample Name	Presep® PFC-II Recovery (%)	Presep® C-PFC Recovery (%)
PFBS	**106**	—
PFHxS	116	76
PFOS	**107**	**86**
PFDS	107	91
PFBA	120	—
PFPeA	**116**	—
PFHxA	109	—
PFHpA	110	—
PFOA	**110**	**88**
PFNA	109	96
PFDA	110	91
PFUnDA	108	90
PFDoDA	**109**	89
PFTeDA	97	—
PFHexDA	105	—
PFODA	103	—

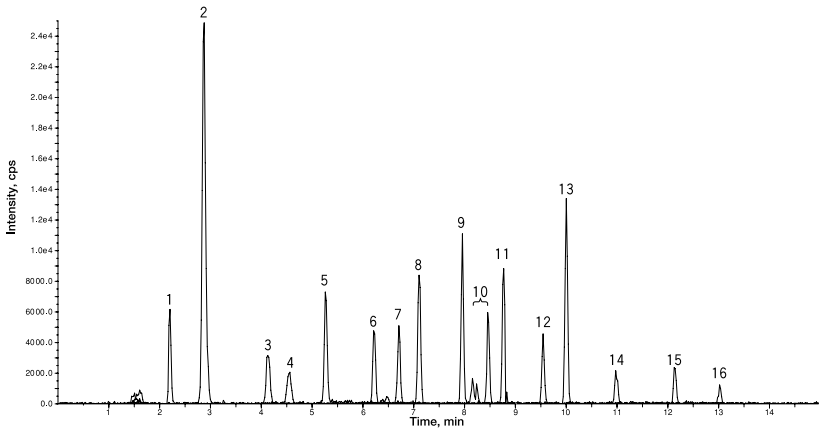
※The components indicated by boldface are assayed in product test.

Chromatograms of PFCs additive recovery test (Presep® -C PFC (short))



① PFOA	⑤ PFOS
② PFHxS	⑥ PFUnDA
③ PFNA	⑦ PFDoDA
④ PFDA	⑧ PFDS

LC/MS/MS measurement of PFCs



peak No.	name	Q1/Q3
1	PFBA	212.9/168.9
2	PFPeA	262.8/219.1
3	PFHxA	312.9/268.6
4	PFBS	298.8/79.6
5	PFHpA	362.8/318.7
6	PFOA	412.9/368.9
7	PFHxS	398.8/79.6
8	PFNA	462.7/418.8
9	PFDA	512.9/469.0
10	PFOS	498.8/79.6
11	PFUnDA	562.9/519.0
12	PFDoDA	612.9/568.9
13	PFDS	598.9/79.9
14	PFTeDA	712.9/669.0
15	PFHexDA	812.9/769.0
16	PFODA	912.8/168.9

HPLC analysis conditions

Column : Wakopak® Wakosil-Ⅱ 3C18 RS (2.0 mm × 150 mm)
Eluent : A) 10 mmol/L CH_3COONH_4 in H_2O
B) CH_3CN
Gradient : 0-10 min. B = 35-90%,10-15 min. B = 35%
Flow Rate : 0.2 mL/min. at 40℃
Injection Vol : 10 ng/mL (CH_3OH) (PFBA 50 ng/mL, PFODA 20 ng/mL), 5 μL

MS/MS conditions

Curtain GAS : 30
Collision Gas : 3
IonSpray Voltage : −4,500
Temperature : 400℃
Ion Source Gas1 : 70
Ion Source Gas2 : 80

Solid-Phase Extraction Columns

Product Name	Package Size	Wako Cat. No.
Presep®-C PFC (Short)	10 each × 5	297-49651
Presep® PFC-Ⅱ	10 each × 10	291-33441

<Related Products>

HPLC Column

Product Name	Size	Package Size	Wako Cat. No.
Wakopak® Wakosil-Ⅱ3C18RS	2.0 mm × 150 mm (D) 2.0 mm × 150 mm (W)	1 unit 1 unit	236-50431 232-50433

(D); DuPont type, (W); Waters type

Solvents

Product Name	Grade	Package Size	Wako Cat. No.
Ultrapure Water	for PFOS · PFOA Analysis	1 L 3 L	216-01361 212-01363
Acetonitrile		1 L	011-22251
Methanol		1 L	130-15941

Standards

Product Name	Grade	Package Size	Wako Cat. No.
Heptacosafluorotetradecanoic Acid Standard	for Environment Analysis	100 mg	080-08641
1*H*,1*H*,2*H*,2*H*-Henicosafluoro-1-dodecanol Standard		100 mg	080-08761
Heptafluorobutanoic Acid Standard		100 mg	087-08771
Heptadecafluorononanoic Acid Standard		100 mg	088-08681
Henicosafluoroundecanoic Acid Standard		100 mg	089-08611
Nonadecafluorodecanoic Acid Standard		100 mg	144-08551
Nonafluoropentanoic Acid Standard		100 mg	145-08581
Pentadecafluorooctanoic Acid Standard		500 mg	164-21851
Potassium Nonafluorobutanesulfonate Standard		100 mg	169-24341
Tricosafluorododecanoic Acid Standard		100 mg	204-17091
Tridecafluoroheptanoic Acid Standard		100 mg	209-17041
Undecafluorohexanoic Acid Standard		100 mg	212-01341

3. Water Quality Testing

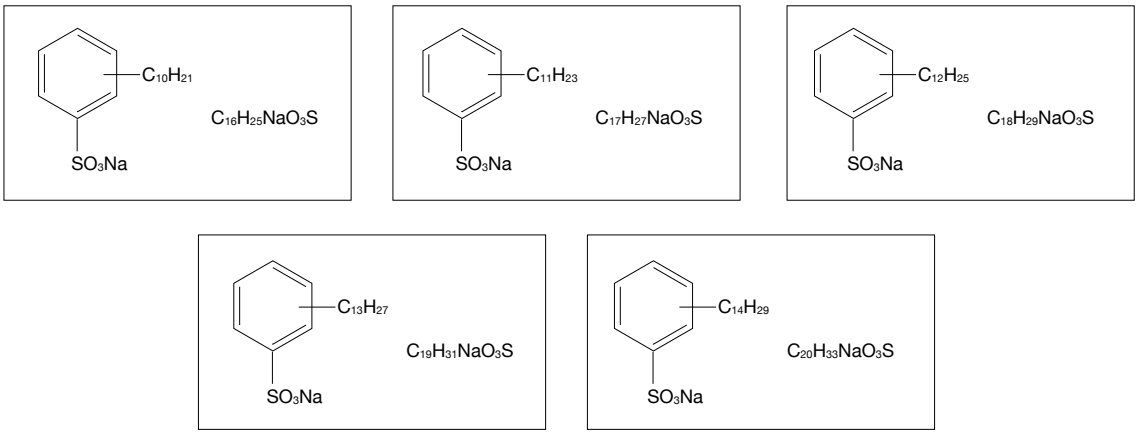
3-1. Anionic Surfactant Analysis

Complies with the revised Water Works Law (in Japan)

With water quality criteria and test methods being revised, so did the anionic surfactant analysis method; it has changed from flow injection absorptiometry to high performance liquid chromatography. HPLC-fluorescence detection is adopted in the revised law. With this method, a column packed with silica gel, which is chemically modified with octadecylsilyl group (ODS column) or a column with equivalent quality to ODS column, is used as the separating column. According to this method, when analysis of water is carried out using Wakopak® Navi C18-5 (ODS column), numerous peaks may be detected.

On the other hand, the amount of anionic surfactant is prescribed a the total amount in the water quality criteria. Therefore, if these peaks are reduced, it improves the detectability and simplifies the quantitative calculation. Wakopak® Wakosil AS-Aqua is packed with the filler which recognizes the number of carbon atoms and not the branched condition, and is the best column for simple analysis of anionic surfactants.

According to the change in the analysis method, anionic surfactants of C10-C14 including branched alkyl chain are available as a reference standard. Presep®-C C18, solid-phase extraction column, is also available for pretreatment of samples. This column is hardly affected by the quality of water samples and good recovery results are obtained. The combined use of these products is recommended.



Sample Pretreatment

Conforming to revised Waterworks Law (enforced on Apr. 1st, 2004 in Japan)

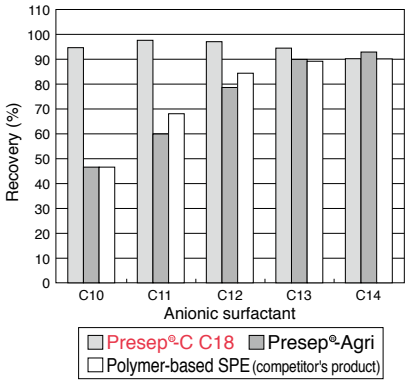
Solid-phase extraction conditions

Column : ☐ Presep®-C C18 (ODS)
☐ Presep®-Agri
☐ Polymer-based SPE (competitor's product)
↓
Conditioning : ① CH_3OH 5 mL
↓ ② H_2O 5 mL
Sample: Water sample※) 1 L 20 mL/min.
↓
Drying : Suction of air for 5 min
(N_2 gas purging for 5 min)
↓
Elution : CH_3OH 5 mL
↓
(Concentration: To 2 mL by N_2 gas blowing)
Omitted in this process
↓
HPLC analysis

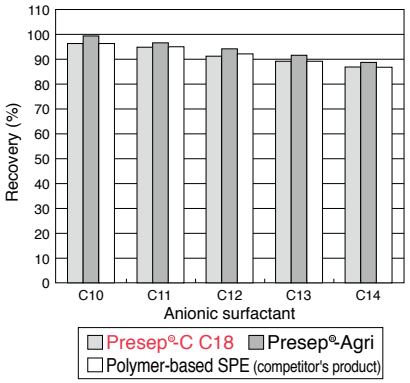
※) 1 L of purified water + 0.1 mg of each reference standard
1 L of tap water + 0.1 mg of each reference standard

Recovery

Comparison of recovery of additive (purified water)



Comparison of recovery of additive (tap water)



Presep®-C C18 is hardly affected by the quality of water sample and gives excellent recovery results.

Analysis of standard solution for anionic surfactant test HPLC analysis conditions

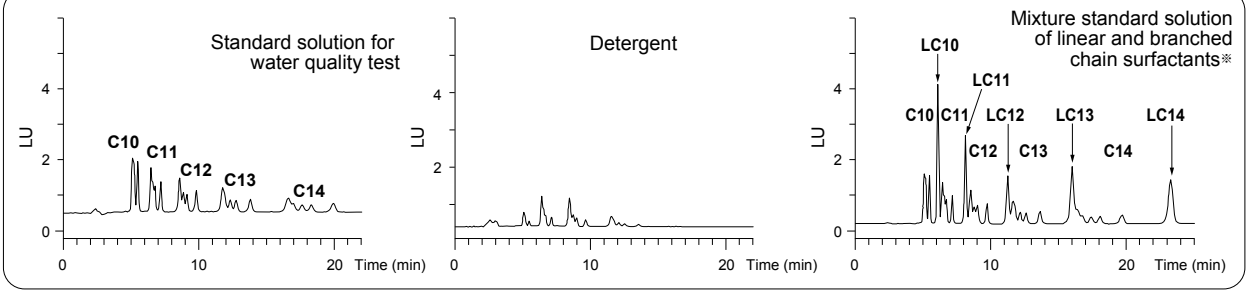
Analysis of standard solution for anionic surfactant test HPLC analysis conditions

HPLC analysis conditions

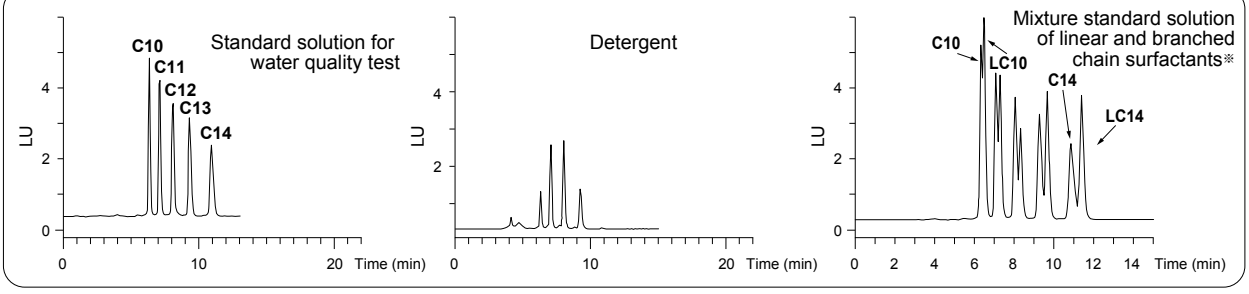
Eluent : CH_3CN/H_2O=65/35 (v/v)、addition of 12.3 g of $NaClO_4$ per 1000 mL
Detection : Fluorescence detection, ex. 221 nm, em. 284 nm
Injection : each 10 mg/L (CH_3OH)、10 µL
Sample : Standard solution for anionic surfactant test
(sodium alkylbenzene sulfonate: C10, C11, C12, C13 and C14)

※ Remarks
Linear Anionic Surfactant Standard Solutions (L) are commercially available. They show behaviors different from those of the actual detergent components (the standard solutions containing branched chains handled by Wako) in HPLC analysis. Wakopak® Wakosil AS-Aqua can recognize and separate linear chains and branched chains.

Column : Wakopak® Navi C18-5, 4.6 mm × 250 mm (Flow rate : 1.0 mL/min.)



Column : Wakopak® Wakosil AS-Aqua, 4.6 mm × 250 mm (Flow rate : 0.7 mL/min.)

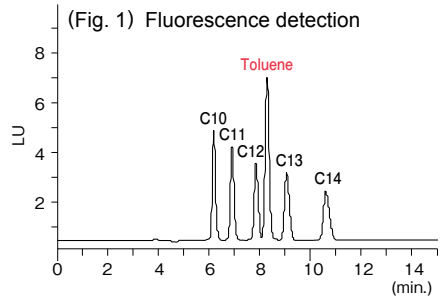


Separation of anionic surfactant standard solutions and toluene

Although toluene may be contained in the extracted sample for measurement depending on the pretreatment method, toluene and anionic surfactant are separately eluted in analysis using Wakopak® Wakosil AS-Aqua. It ensures analysis without interference from toluene peak.

Sample: Addition of 1 µL/mL of toluene to 10 µg/mL of mixture standard solution (CH_3OH), injection of 10 µL

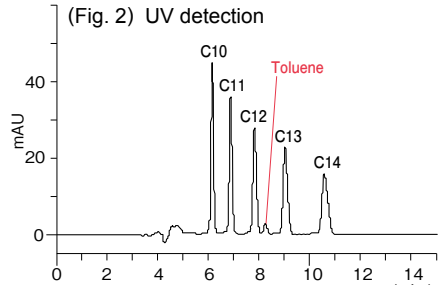
(Fig. 1) Fluorescence detection



<Anionic surfactants>

Sodium Decylbenzenesulfonate	: C10
Sodium Undecylbenzenesulfonate	: C11
Sodium Dodecylbenzenesulfonate	: C12
Sodium Tridecylbenzenesulfonate	: C13
Sodium Tetradecylbenzenesulfonate	: C14

(Fig. 2) UV detection



Column : Wakopak® Wakosil AS-Aqua (4.6 mm × 250 mm)
Eluent : CH_3CN/H_2O=65/35 (v/v), addition of 12.3 g of $NaClO_4$ per 1000 mL
Flow Rate : 0.7 mL/min. at 40℃
Detection : (Fig. 1) Fluorescence detection, ex. 221 nm, em. 284 nm
: (Fig. 2) UV detection, 255 nm
Injection : 10 mg/L (CH_3OH)、10 µL
Sample : Standard solution for anionic surfactant test
(sodium alkylbenzene sulfonate: C10, C11, C12, C13 and C14)

HPLC Columns / Eluent

Product Name	Size	Grade	Package Size	Wako Cat. No.
Wakopak® Wakosil AS-Aqua	4.6 mm × 250 mm (D) 4.6 mm × 250 mm (W)	–	1 unit 1 unit	234-63281 230-63283
Wakopak® Navi C18-5	4.6 mm × 250 mm (D) 4.6 mm × 250 mm (W)	–	1 unit 1 unit	235-60531 231-60533
Wakosil® AS-Aqua Eluent		for HPLC	1 L	238-02261

Solid-Phase Extraction Columns

Product Name	Amount of filler (mg / cartridge)	Grade	Package Size	Wako Cat. No.
Presep®-C C18 (ODS)	900	for Sample Pretreatment	10 each × 5	292-32251
Presep®-C C18 (ODS) (Short)	470		10 each × 5	297-47451
Presep® Agri	500 / 6 mL	for Pesticide Residue Analysis	50 each	291-26851
Presep®-C Agri (Short)	220		10 each × 5	296-32651

<Related Products>

Standards, Standard Solutions

Product Name	Grade	Package Size	Wako Cat. No.
Anionic Surfactants Mixture Standard Solution	for Water Analysis	1 mL × 5A	013-20131
Sodium Decylbenzenesulfonate Standard Solution		1 mL × 5A	195-13111
Sodium Undecylbenzenesulfonate Standard Solution		1 mL × 5A	192-13121
Sodium Dodecylbenzenesulfonate Standard Solution		1 mL × 5A	199-13131
Sodium Tridecylbenzenesulfonate Standard Solution		1 mL × 5A	196-13141
Sodium Tetradecylbenzenesulfonate Standard Solution		1 mL × 5A	193-13151
Sodium *p-n*-Octylbenzenesulfonate Standard		100 mg	194-17101
Sodium *p-n*-Octylbenzenesulfonate Standard Solution		1 mL	195-17131

Solvents (for LC / MS, for HPLC)

Product Name	Grade	Package Size	Wako Cat. No.
Formic Acid (abt.99%)	for HPLC	25 mL	063-04192
Formic Acid (abt.99%)	for LC/MS	1 mL × 5A 50 mL	063-04533 067-04531
0.1vol% Formic Acid-Acetonitrile	for LC/MS	1 L 3 L	062-04721 068-04723
Acetonitrile	for HPLC	1 L 3 L	019-08631 015-08633
Acetonitrile	for LC/MS	100 mL 1 L 3 L	016-19854 012-19851 018-19853
Methanol	for HPLC	1 L 3 L	138-06473 132-06471
Methanol	for LC/MS	100 mL 1 L 3 L	132-14524 138-14521 134-14523
Distilled Water	for HPLC	1 L 3 L	046-16971 042-16973
Ultrapure Water	for LC/MS	1 L 3 L	214-01301 210-01303

3-2. Standards

Nonylphenol standards

Nonylphenol is an endocrine disruptor.
Addition of nonylphenol to environmental standards designed for protection of aquatic organisms (as part of Standards based on the Basic Environment Law for Protection of Living Environment Related to Water Pollution (Japan)) is currently being discussed. “Solid-phase GC-MS” that can perform isomer-specific measurement is being considered as an analysis technique recommended by the standards.

Product Name	Grade	Package Size	Wako Cat. No.
Nonylphenol (mixture of isomers)	for Environment Analysis	100 mg	148-09291
***p-n*-Nonylphenol Standard**		500 mg	146-06791

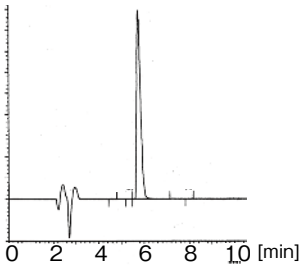
<Related Products>

Product Name	Grade	Package Size	Wako Cat. No.
Acetone 5,000	for Pesticide Residue & PCB Analysis	1 L 3 L	011-19201 017-19203
Dichloromethane 5,000		1 L 3 L	043-28451 049-28453
Hexane 5,000		1 L 3 L	083-07911 089-07393
Sodium Sulfate		500 g	197-07125

Linear Alkylbenzene Sulfonic acids and their salts (LAS)

The Ministry of the Environment has issued their second reports on additional items for environmental regulation of water quality to protect aquatic organisms. (in Japan)
In this reports, the Ministry has announced that they are currently discussing adding environmental measures for linear alkylbenzene sulfonic acids and their salts (LAS), in light of new data demonstrating the toxicity of these line of compounds. Qualitative HPLC analysis has been proposed as the primary method of me, asuring LAS, and this product can be used as an internal standard for such studies.

Example of analysis of Sodium *p-n*-Octylbenzenesulfonate



＜HPLC　分析条件＞
Column　：Wakopak® Navi C18-5 4.6mm×250mm
Eluent　：0.1vol%HCOOH in CH_3CN/
50mmol/L $HCOONH_4$=55/45(v/v)
Flow rate　：1.0mL/min
Temperature　：40℃
Detection　：UV 225nm
Injection　：1mg/mL(CH_3OH), 5 μL

Standards

Product Name	Grade	Package Size	Wako Cat. No.
Anionic Surfactants Mixture Standard Solution	for Water Analysis	1 mL × 5A	013-20131
Sodium *p-n*-Octylbenzenesulfonate Standard		100 mg	194-17101
Sodium *p-n*-Octylbenzenesulfonate Standard Solution		1 mL	195-17131

Analytical Columns

Product Name	Size	Package Size	Wako Cat. No.
Wakopak® Wakosil AS-Aqua	4.6 mm × 250 mm (D) 4.6 mm × 250 mm (W)	1 unit 1 unit	234-63281 230-63283
Wakopak® Navi C18-5	4.6 mm × 250 mm (D) 4.6 mm × 250 mm (W)	1 unit 1 unit	235-60531 231-60533

Aniline

Standard

Product Name	Assay	Package Size	Wako Cat. No.
Aniline	99.0+% (Titration)	100 mL 500 mL	019-03991 019-03996

p-(1,1,3,3-Tetramethylbutyl)phenol (4-*tert*-Octylphenol)

Standard

Product Name	Grade	Package Size	Wako Cat. No.
***p*-(1,1,3,3-Tetramethylbutyl)phenol Standard**	for Environment Analysis	500 mg	208-14451

2,4-Dichlorophenol

Standard

Product Name	Grade	Package Size	Wako Cat. No.
2,4-Dichlorophenol Standard	for Environment Analysis	500 mg	049-26611

3-3. Musty-Odor Standard Analysis

Geosmin and 2-Methylisoborneol

The moldy odor produced by environmental pollution in rivers and lakes is due to metabolic products of various abnormally proliferated actinomyces and algae. Geosmin in particular is considered to be most responsible for offensive odors in tap water because it has a strong earthy odor (or moldy odor) in a trace amount. It is used as a reference standard for analysis of geosmin.

Standards

Product Name	Grade	Package Size	Wako Cat. No.
Geosmin Standard	for Water Analysis	20 mg	077-01911
Geosmin Standard Solution (0.1mg/ml Methanol Solution)		1 mL	072-03421
2-Methylisoborneol Standard		20 mg	132-07071
2-Methylisoborneol Standard Solution (0.1mg/ml Methanol Solution)		1 mL	134-10581
2-Methylisoborneol-Geosmin Mixture Standard Solution (each 0.1mg/ml Methanol Solution)		1 mL	131-12431

<Related Products>

Product Name	Note	Package Size	Wako Cat. No.
2,4,6-Trichloroanisole Standard	for Water Analysis	100 mg	209-18901
Sodium Chloride		500 g	192-10745
Sodium Azide	98.0+% (Titration)	25 g	195-11092
Presep®-C C18 (ODS)	for Sample Pretreatment	10 each × 5	292-32251

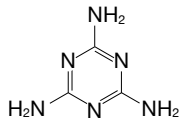
4. Food Analysis

4-1. Melamine Standards

Melamine occurs as monoclinic crystals and is used mainly as a raw material of melamine resin for decorative sheet, molded plateware, molded machines and electric parts, baking paint, and textile processing agent.
After the case of melamine contamination in pet foods in the U.S. in 2007, the Ministry of Health, Labour and Welfare has instructed to perform a monitoring test for proteins (including gluten) made from rice from China and wheat and for flour and powder prepared using flour.

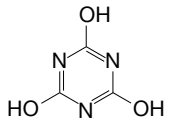
Structural Formula

Melamine



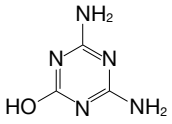
CAS No. : 108-78-1
$C_3H_6N_6$=126.12

Cyanuric acid (isocyanuric acid)



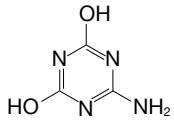
CAS No. : 108-80-5
$C_3H_3N_3O_3$=129.07

Ammeline



CAS No. : 645-92-1
$C_3H_5N_5O$=127.10

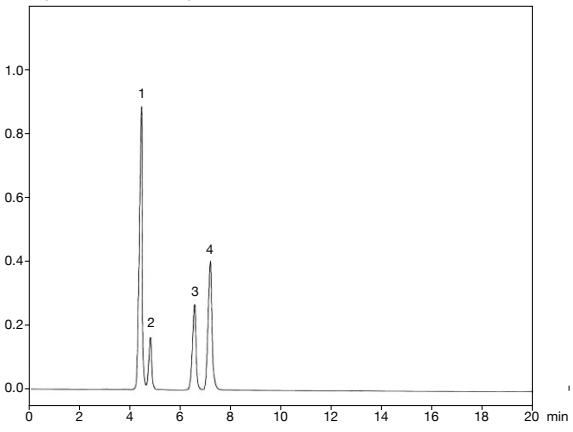
Ammelide



CAS No. : 645-93-2
$C_3H_4N_4O_2$=128.09

Application using Wakosil 5NH$_2$

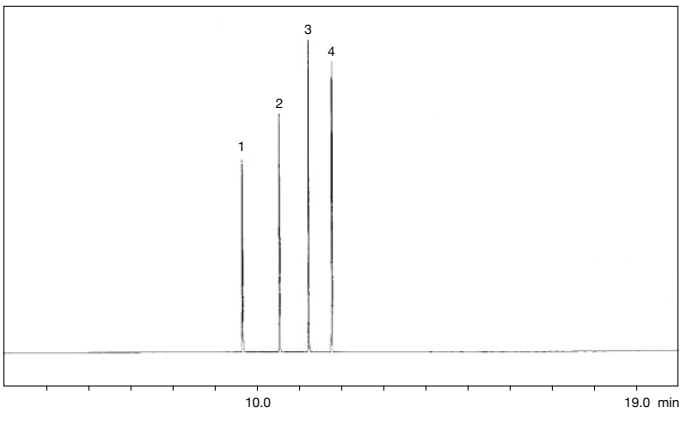
<HPLC Conditions>
Column : Wakosil 5NH$_2$ (4.6×250 mm), 40°C
Eluent : CH_3CN/5mM NaH_2PO_4 (pH7.0)=70:30 (v/v)
Flow Rate : 1.0mL/min.
Detection : UV210 nm
Sample : 1) Melamine
2) Isocyanuric Acid
3) Ammelide (1 mg/mL 0.1 M NaOH aq)
4) Ammeline (1 mg/mL 0.1 M NaOH aq) each 0.1mg/mL
Injection Volume : 10 µL



GC/MS Application (TMS derivetized Melamin and the related compounds)

<GC/MS Conditions>
[GC]
Column : BPX-5 0.25 µm, 0.25 mm × 30 m
Column Temp : 75°C (1 min)➡15°C/min)➡320°C (2.67 min)
Injection : 280°C
Carrier Gas : He 1.00 mL/min
Split Ratio : 1/30
Injection Volume : 1 µL

[MS]
Ionization Mode : EI
Interface : 290°C
Mode : SIM
Monitor Ion : 1) Isocyanuric Acid (m/z 345)
2) Ammelide (m/z 344)
3) Ammeline (m/z 328)
2) Melamine (m/z 342)



Standards of Melamine and the related compounds

Product Name	Grade	Package Size	Wako Cat. No.
Melamine Standard	for Food Analysis	100 mg	132-15881
Isocyanuric Acid Standard	for HPLC	200 mg	091-05311
Ammeline Standard	for Food Analysis	100 mg	012-22041
Ammelide Standard		100 mg	019-22051

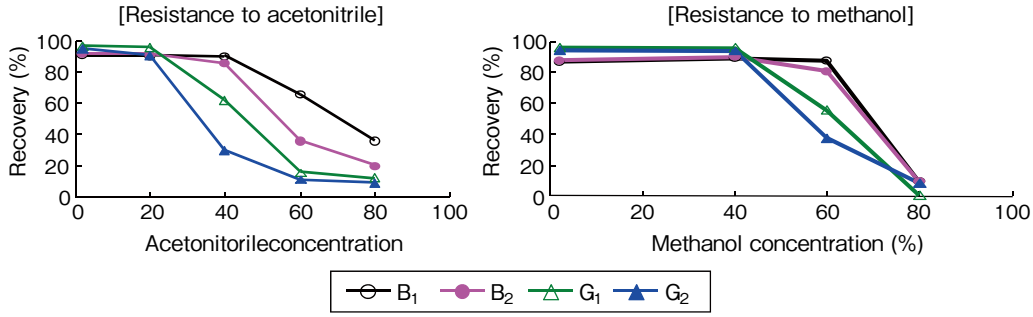
<Related Products>

Product Name	Size	Note	Package Size	Wako Cat. No.
Wakopak® Wakosil 5NH$_2$	4.6 mm × 250 mm (D) 4.6 mm × 250 mm (W)	–	1 unit 1 unit	238-57691 234-57693
Diethylamine	–	99.0+% (cGC)	25 mL 500 mL	047-01773 041-01776
Pyridine, Dehydrated	–	99.5+% (cGC)	100 mL 500 mL	161-18453 167-18455
Distilled Water	–	–	500 mL 2 L	043-16785 047-16783
Acetonitrile 300	–	for Pesticide Residue & PCB Analysis	1 L 3 L	015-11301 011-11303
2,4-Diamino-6-chloropyrimidine	–	98.0+% (Titration)	25 g 100 g	043-22432 045-22431

4-2. A Clean up of Aflatoxins

AFLAKING manufactured by HORIBA, Ltd. (Kyoto, Japan) has been developed to extract aflatoxin from food such as nuts, grain and spices.
AFLAKING is an immunoaffinity column developed for cleanup of aflatoxins from food. With conventional immunoaffinity columns, it was required to dilute organic solvent extracts to 2 % or so, and, as the result of this, turbidity was caused, and analysis of spices, etc. was difficult. AFLAKING is resistant to the solvents of 20 % acetonitrile and 40 % methanol which are widely used for extraction and ensures easy and quick cleanup of a wide range of food, such as nuts, cereals and spices. It can clean up aflatoxins B1, B2, G1 and G2 simultaneously. In addition, it can clean up aflatoxin M1. (M1 recovery: 87 %) It conforms to Notice No. 0728004 of Pharmaceutical and Food Safety Bureau of the Ministry of Health, Labour and Welfare.

High resistance to organic solvents



Recovery

	Roasted peanuts	Corn grits	Pearl barley	Paprika	White sesame seeds	Red pepper	Turmeric	Coriander
B_1	94	100	97	91	97	97	101	92
B_2	95	98	95	89	98	98	92	91
G_1	78	105	101	99	88	99	89	91
G_2	85	103	98	99	86	99	90	92

Note) Recovery (%) in the case of addition of 16 ng/g of total aflatoxin

Product Name	Package Size	Wako Cat. No.
AFLAKING 25	25 unit	308-34201
AFLAKING 50	50 unit	304-34203

5. Biocide

Dimethylfumarate (DMF) Standard

As of 1 May 2009 products containing a biocide Dimethylfumarate are prohibited from being placed or made available on the European communities market.
Since 2007, sofas exported to the UK from China which contained dimethylfumarate (DMF), a biocide preventing moulds that may deteriorate leather furniture or footwear during storage or transport in a humid climate have caused dermatitis in consumers who have been in contact with these sofas.
Number of victims: several thousand (in the UK, France, Poland, Finland, Sweden, etc.)
DMF was most often contained in little pouches fixed inside the furniture or added to the footwear boxes. It thus evaporated and impregnated the product, protecting it from moulds. However, it then also affected consumers who were in contact with the products. DMF penetrated through the clothes onto consumers' skin where it caused painful skin contact dermatitis, including itching, irritation redness, and burns; in some cases, acute respiratory troubles are reported. The dermatitis was particularly difficult to treat. The presence of DMF is thus a serious risk.
Method's Quantification Limit (MQL): 0.1 mg/kg of the weight of the product or part of the product.

Specification

Appearance	White, Crystals ~ crystalline powder
Solubility in acetone	to pass test
Melting Point	101 ~ 105°C
Assay (cGC)	99.0+%

Description	Grade	Package Size	Wako Cat. No.
Dimethyl Fumarate Standard, 99.0+% (cGC) [IUPAC Name] Dimethyl (E)-butenedioate [CAS No.] 624-49-7; [Einecs No.] 210-849-0 [Molecular Weight] 144.13 [Molecular Formula] $CH_3OCOCH:CHCOOCH_3$	for Household Articles Test	100 mg	041-31061

Reference: The EU regulation

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:074:0032:0034:EN:PD

6. Metal Standard Solutions

Metal Standard Solutions / JCSS

Wako has been qualified as an institution for calibration (a licensed trader) of standard pH solutions, standard metal solutions and standard ion solutions by the Minister of Economy, Trade and Industry in Japan and offers the standard solutions traceable according to the National Metrology Standard. These products are provided with a calibration certificate marked with JCSS to certify that it is traceable according to the National Metrology Standard and, at the same time, attests to the supply of accurate and highly reliable reagent.

Product Name	Concentration (mg / L)	Solvent	Package Size	Wako Cat. No.
Aluminium Standard Solution (Al 100)	100	HNO_3	100 mL	016-18271
Aluminium Standard Solution (Al 1000)	1,000	HNO_3	100 mL	016-15471
Antimony Standard Solution (Sb 100)	100	HCl	100 mL	013-18281
Antimony Standard Solution (Sb 1000)	1,000	HCl	100 mL	010-15491
Arsenic Standard Solution (As 100)	100	HNO_3 in Water, pH 5.0 with HCl	100 mL	013-15501
Arsenic Standard Solution (As 1000)	1,000		100 mL	013-15481
Barium Standard Solution (Ba 1000)	1,000	HNO_3	100 mL	027-15321
Bismuth Standard Solution (Bi 100)	100	HNO_3	100 mL	023-14201
Bismuth Standard Solution (Bi 1000)	1,000	HNO_3	100 mL	021-12661
Boron Standard Solution(B 1000)	1,000	Water	100 mL	025-16581
Cadmium Standard Solution (Cd 100)	100	HNO_3	100 mL	030-16211
Cadmium Standard Solution (Cd 1000)	1,000	HNO_3	100 mL	036-16171
Calcium Standard Solution (Ca 100)	100	HNO_3	100 mL	036-17891
Calcium Standard Solution (Ca 1000)	1,000	HNO_3	100 mL	039-16161
Cesium Standard Solution(Cs 1000)	1,000	Water	100 mL	030-21341
Chromium Standard Solution (Cr 100)	100	HNO_3	100 mL	037-16221
Chromium Standard Solution (Cr 1000)	1,000	HNO_3	100 mL	030-16191
Cobalt Standard Solution (Co 100)	100	HNO_3	100 mL	039-17901
Cobalt Standard Solution (Co 1000)	1,000	HNO_3	100 mL	033-16181
Copper Standard Solution (Cu 100)	100	HNO_3	100 mL	034-16231
Copper Standard Solution (Cu 1000)	1,000	HNO_3	100 mL	033-16201
Gallium Standard Solution (Ga 1000)	1,000	HNO_3	100 mL	070-05781
Indium Standard Solution (In 1000)	1,000	HNO_3	100 mL	092-05841
Iron Standard Solution (Fe 100)	100	HNO_3	100 mL	091-03851
Iron Standard Solution (Fe 1000)	1,000	HNO_3	100 mL	094-03841
Lead Standard Solution (Pb 100)	100	HNO_3	100 mL	127-04301
Lead Standard Solution (Pb 1000)	1,000	HNO_3	100 mL	124-04291
Lithium Standard Solution (Li 1000)	1,000	HNO_3	100 mL	129-05221
Magnesium Standard Solution (Mg 100)	100	HNO_3	100 mL	136-13601
Magnesium Standard Solution (Mg 1000)	1,000	HNO_3	100 mL	136-12121
Manganese Standard Solution (Mn 100)	100	HNO_3	100 mL	139-12111
Manganese Standard Solution (Mn 1000)	1,000	HNO_3	100 mL	133-12131
Molybdenum Standard Solution (Mo 1000)	1,000	$HCl \cdot HNO_3$	100 mL	130-14961
Nickel Standard Solution (Ni 100)	100	HNO_3	100 mL	144-06471
Nickel Standard Solution (Ni 1000)	1,000	HNO_3	100 mL	147-06461
Potassium Standard Solution (K 100)	100	Water	100 mL	162-19941
Potassium Standard Solution (K 1000)	1,000	Water	100 mL	165-17471
Rubidium Standard Solution (Rb 1000)	1,000	Water	100 mL	188-01951
Selenium Standard Solution (Se 1000)	1,000	HNO_3	100 mL	192-13861
Sodium Standard Solution (Na 100)	100	Water	100 mL	191-12111
Sodium Standard Solution (Na 1000)	1,000	Water	100 mL	199-10831
Strontium Standard Solution (Sr 1000)	1,000	HNO_3	100 mL	199-13871
Tellurium Standard Solution (Te 1000)	1,000	HCl	100 mL	209-17921
Thallium Standard Solution (Tl 1000)	1,000	HNO_3	100 mL	205-16301
Tin Standard Solution (Sn 1000)	1,000	HCl	100 mL	202-16311
Vanadium Standard Solution (V 1000)	1,000	$HCl \cdot HNO_3$	100 mL	221-01851
Zinc Standard Solution (Zn 100)	100	HNO_3	100 mL	261-01431
Zinc Standard Solution (Zn 1000)	1,000	HNO_3	100 mL	264-01421

7. Solvents

7-1. for Pesticide Residue and PCB Analysis

These products ensure safety as each contains no interfering substances in the 300-fold or 5000-fold concentrated solution, and are ideal for the extraction of pesticides from the test substances and for purification.

Suitability for Pesticide Residue and PCB Analysis

The 300- and 5000-fold concentrated solution guarantee the followings :
1 With the GC-ECD, the level of impurities does not exceed 1/2 of the peak of the organochlorine pesticide γ-BHC (20pg).
2 With GC-FPC, the level of impurities does not exceed 1/25 of the peak of the organophosphorous pesticide MPP (0.5ng)

Product Name	Grade	Package Size	Wako Cat. No.
Acetone 300	for Pesticide Residue & PCB Analysis	1 L 3 L	015-11281 011-11283
Acetone 5,000		1 L 3 L	011-19201 017-19203
Acetonitrile 300		1 L 3 L	015-11301 011-11303
Acetonitrile 5,000		1 L 3 L	013-19401 019-19403
Acetonitrile	for Tiuram Analysis	1 L 3 L	011-15281 017-15283
Benzene 300	for Pesticide Residue & PCB Analysis	1 L	021-08631
Benzene 5,000		1 L	028-14751
t-Butyl Methyl Ether 300		1 L	024-14351
t-Butyl Methyl Ether 5,000		1 L	020-14831
Chloroform 300		1 L	039-11801
Chloroform 5,000		1 L	033-18641
Cyclohexane 300		1 L 3 L	038-16751 034-16753
Cyclohexane 5,000		1 L	036-18631
Dichloromethane 300		1 L 3 L	133-08841 139-08843
Dichloromethane 5,000		1 L 3 L	043-28451 049-28453
Dichloromethane 5,000, 2-Methyl-2-butene added		1 L	042-30011
Diethyl Ether 300		1 L	050-04461
Diethyl Ether 5000		1 L	040-28461
Distilled Water, Hexane Washed	–	1 L 3 L	040-28081 046-28083
Ethanol 300	for Pesticide Residue & PCB Analysis	1 L 3 L	056-04441 052-04443
Ethanol 5,000		1 L	053-07011
Ethyl Acetate 300		1 L 3 L	052-04421 058-04423
Ethyl Acetate 5,000		1 L 3 L	052-06981 058-06983
Hexane 300		1 L 3 L	084-04761 080-04763
Hexane 5,000		1 L 3 L	083-07911 089-07913
Methanol 300		1 L 3 L	139-08821 135-08823
Methanol 5,000		1 L 3 L	132-14161 138-14163
Petroleum Ether 300		1 L	165-12971
Petroleum Ether 5,000		1 L	162-20671
Toluene 300		1 L 3 L	203-11601 209-11603
Toluene 5,000		1 L 3 L	209-15581 205-15583

7-2. for LC/MS

Liquid chromatography - mass spectrometry (LC/MS) is widely used in various fields including biological, food, and environmental analyses. In particular, recent breakthroughs in the development and upgrades of device interfaces have led to the use of LC/MS in microanalyses of environmental pollutants and chemical metabolites, *etc*. Following products are ideal LC/MS reagents to analyze trace components.

Product Name	Features	Specifications	Package Size	Wako Cat. No.
Acetic Acid	· Suitability test for LC/MS analysis performed · Reduced background noise	Assay (HPLC): 99.5+% Absorbance (1 → 4,250 nm): max. 0.50 Absorbance (1 → 4,254 nm): max. 0.10 Fluorescence test: to pass test Suitability for LC/MS analysis: to pass test	1 mL × 5A 50 mL	014-20063 018-20061
Acetonitrile	· Suitability test for LC/MS analysis performed · Guarantees noise level at m/z 50~2,000 · Use of aluminum caps Reduced risks of slight amounts of contaminants from plastic caps.	Assay (cGC): 99.8+% Density (20°C): 0.780 ~ 0.783 g/mL Fluorescence test: to pass test Suitability for LC/MS analysis: to pass test	100 mL 1 L 3 L	016-19854 012-19851 018-19853
Formic Acid (abt. 99%)	· Suitability test for LC/MS analysis performed · Reduced background noise	Assay (HPLC): 99.5+% Solubility in water: to pass test Absorbance (1 → 4,254 nm): max.1.00 Fluorescence test: to pass test Suitability for LC/MS analysis: to pass test	1 mL × 5A 50 mL	063-04533 067-04531
0.1vol% Formic Acid-Acetonitrile	· Suitability test for LC/MS analysis performed · Ready-to-Use eluent	Absorbance (200-400 nm): to pass test Fluorescence test: to pass test Water: max. 0.05%	1 L 3 L	062-04721 068-04723
Methanol	· Suitability test for LC/MS analysis performed · Guarantees noise level at m/z 50~2,000 · Use of aluminum caps Reduced risks of slight amounts of contaminants from plastic caps	Assay (cGC): 99.7+% Density (20°C): 0.789~0.792 g/mL Fluorescence test: to pass test Suitability for LC/MS analysis: to pass test	100 mL 1 L 3 L	132-14524 138-14521 134-14523
2-Propanol	· Suitability test for LC/MS analysis performed	99.7+% (Capillary GC) Density (20°C): 0.784~0.787 g/mL Fluorescence test: to pass test Suitability for LC/MS analysis: to pass test	1 L 3 L	168-25531 164-25533
Ultrapure Water	· Decreased total organic carbon levels · Guarantees the absorbance and fluorescence tests · Use of specially processed glass containers / aluminum caps	Density (20°C): 0.997 ~ 0.999 g/mL Refractive index nD20: 1.332 ~ 1.334 Absorbance (210~400 nm): max. 0.01 Fluorescence test: to pass test Total organic carbon (TOC): max. 4 ppb	1 L 3 L	214-01301 210-01303

7-3. for HPLC

Followings are high purity HPLC solvents. For improved reproducibility and detection sensitivity of chromatography, the stability of the analyte, stability of the mobile phase, clogging in the line and filter, sensitivity and stability of the detector have been considered, and the products have guaranteed quality with respect to change in refractive index due to water, peroxides, nonvolatile matters, or impurities in the solvent, UV absorption, and fluorescent substances, *etc*.

Product Name	Package Size	Wako Cat. No.
Acetone	1 L 3 L	014-08681 010-08683
Acetonitrile	1 L 3 L	019-08631 015-08633
Benzene	1 L	025-06691
1-Butanol	1 L	023-10801
t-Butyl Methyl Ether	1 L	024-12771
Chloroform	1 L 3 L	033-08631 039-08633
Chloroform, Amylene added	1 L 3 L	031-20531 037-20533

Product Name	Package Size	Wako Cat. No.
Cyclohexane	1 L 3 L	033-08511 039-08513
o-Dichlorobenzene	1 L	046-18671
Dichloromethane	1 L 3 L	136-06751 132-06753
N,N-Dimethylformamide	1 L 3 L	042-20621 048-20623
1,4-Dioxane	1 L	042-16691
Distilled Water	1 L 3 L	046-16971 042-16973
Ethanol (99.5)	1 L 3 L	056-03341 052-03343
Ethyl Acetate	1 L 3 L	057-03371 053-03373
Heptane	1 L	085-03691
1,1,1,3,3,3-Hexafluoro-2-propanol	100 mL 500 mL	085-06991 087-06995
Hexane	1 L 3 L	084-03421 080-03423
Methanol	1 L 3 L	138-06473 132-06471
1-Propanol	1 L	162-13461
2-Propanol	1 L 3 L	165-09161 161-09163
Tetrahydrofuran, with Stabilizer	1 L 3 L	200-19391 206-19393
Tetrahydrofuran, Stabilizer Free	1 L 3 L	209-06811 205-06813
Toluene	1 L	209-06791
0.1 vol% Trifluoroacetic Acid - Acetonitrile	1 L 3 L	206-16451 202-16453
2,2,4-Trimethylpentane	1 L	207-06731
1-Methyl-2-pyrrolidone	1 L	130-17641

Solvents and pH Adjusting Reagents

Product Name	Package Size	Wako Cat. No.
Acetic Acid	25 mL	010-19112
Formic Acid (abt. 99%)	25 mL	063-04192
Phosphoric Acid	25 mL	162-20492
Trifluoroacetic Acid	1 mL × 5A 5 mL × 5A	206-10731 206-10736

Eluents for HPLC Analysis

Product Name	Package Size	Wako Cat. No.
1 mol/L Ammonium Formate Solution	100 mL	011-21031
1 mol/L Ammonium Dihydrogenphosphate Solution	100 mL	015-21051
1 mol/L Ammonium Acetate Solution	100 mL	018-21041
0.25 mol/L Potassium Dihydrogenphosphate Solution	500 mL	168-19965
0.25 mol/L Sodium Dihydrogenphosphate Solution	500 mL	197-12135

8. Pretreatment Columns –Presep® Series

The solid-phase extraction method for pretreatment of samples is used widely in various fields, including pharmaceutical, food and environmental analyses, because the method is simple and uses smaller amounts of solvents. In addition, the method has various advantages, for example, it can treat many samples simultaneously in a short time.
Presep® series are categorized by their shapes; one is "Presep®-C type" which has a cartridge shape with closed both ends, the other is "Presep® syringe type" with one open and one closed ends.

Presep®-C (Short)　Presep®-C

Presep® Syringe Type with one end open

Features

1. The columns can be used for solid-phase extraction by any of the compression and decompression methods. (Presep®-C Type)
2. Some columns can be connected depending on the kind and amount of filler. (Presep®-C Type)
3. High flow velocity obtained by the sharp filler particle size distribution.
4. High recovery realized by the fillers designed for solidphase extraction.
5. High reproducibility ensured by strict quality control.

List of Fillers

Kind	Filler	Particle size (μm)	Uses and characteristics
C18 (ODS)	C18(ODS)-bonded silica gel	63 ~ 212	Reversed phase partition : Separation of hydrophobic substances in water-soluble samples
NH_2	Aminopropylsilanized silica gel	38 ~ 63	Removal of acidic compounds, such as organic acids and fatty acids
Silica gel	Crushed silica gel	75 ~ 150	Normal phase adsorption: Separation of low- to medium-polarity components from nonaqueous solutions
Alumina	Basic (pH 9) alumina	44 ~ 149	Removal of interfering substances from pesticides and environment samples
Florisil®	MgO_3Si	75 ~ 150	Removal of lipid and pretreatment of pesticide residue in food
Na_2SO_4	Sodium sulfate (anhydrous)	-	Dehydration
Diatomaceous Earth, Granular	Granular diatomaceous earth	500 ~ 1400	Desolventization
Polyamide C-200	Polyamide resin	75 ~ 150	Pretreatment of paeoniflorin in Kakkonto extract
RPP	Styrene-divinylbenzene-methacrylate polymer	30, 60	Trapping of high-polarity substances which cannot be adsorbed by normal ODS Pretreatment of biological samples
RPP-SAX	Divinylbenzne-methacrylate polymer anion-exchange group bonding	40 ~ 48	Selective extraction of acidic compounds and extraction of drug products and their metabolites from biological samples (urine and blood)
RPP-WAX		60	
DEA	Diethylaminoethyl Cl type	45 ~ 90	Polymer-based weakly basic anion exchange
QA	Trimethylaminoethyl Cl type		Polymer-based strongly basic anion exchange
CM	Carboxymethyl Na type		Polymer-based weakly acidic cation exchange
S	Sulfonyl propyl Na type		Polymer-based strongly acidic cation exchange
PFC/PFC-II	Divinylbenzene-methacrylate polymer	50	Pretreatment for analysis of organofluorine compounds (PFCs)
Agri	Styrene-divinylbenzene-methacrylate polymer	50	Trapping of high-polarity substances which cannot be adsorbed by normal ODS Pretreatment for analysis of pesticide residue
DNPH	Silica gel coated with 2,4-dinitrophenylhydradine	Short:150 ~ 450 Long:75 ~ 150	Derivatization after adsorption of aldehydes and ketones
Ozone scrubber	High-purity potassium iodine	–	Removal of ozone
Multilayer silica gel	10% silver nitrate-silica gel, 22% sulfate silica gel, etc.	–	Pretreatment for analysis of dioxins
Activated carbon-blended silica gel	Activated carbon-blended silica gel		
Activated carbon-impregnated silica gel	Activated carbon-impregnated silica gel		
PolyChelate	Chelate resin modified with carboxymethylated polyethylenimine.	–	Trapping of metal elements
Dehydration	Hydrophobic Teflon membrane filter	–	Dehydration

Presep® Series ; Solid-Phase Extraction Columns

Product Name	Amount of filler (mg/cartridge)	Use	Package Size	Wako Cat. No.
Presep® (Luer Lock) Polyamide C-200 Type M	2000 / 25 mL	for Sample Pretreatment (crude drug)	10 each × 5	298-33571
Presep®-C C18 (ODS) (Short)	470	for Sample Pretreatment	10 each × 5	297-47451
Presep®-C C18 (ODS)	900		10 each × 5	292-32251
Presep® C18 (ODS)	2000 / 25 mL		100 each	296-34091
Presep® C18 (ODS) Type M	5000 / 25 mL		20 each 100 each	293-48553 297-48556
Presep®-C NH_2 (Short)	400		10 each × 5	299-48751
Presep®-C NH_2	820		10 each × 5	295-48851
Presep®-C Silica Gel	800		50 each	294-31851
Presep®-C Alumina	1700		10 each × 5	290-32051
Presep®-C Florisil®	800		10 each × 5	290-31951
Presep® Florisil	1000 / 6 mL		10 each × 5	291-44051
Presep®-C Na_2SO_4	2300		10 each × 5	296-32151
Presep® Diatomaceous Earth, Granular	1000 / 6 mL 2000 / 15 mL		100 each 100 each	292-35051 298-35151
Presep® (Luer Lock) Diatomaceous Earth, Granular Type M	4500 / 25 mL		100 each	291-33561
Presep®-C RPP (Short)	190		10 each × 5	297-41851
Presep®-C RPP (Long)	360		10 each × 3	293-41951
Presep® RPP	60 / 3 mL 200 / 6 mL 500 / 6 mL		10 each × 5 10 each × 5 10 each × 5	294-36851 290-36951 290-37051
Presep® RPP-SAX	60 / 3 mL		10 each × 10	297-33301
Presep® RPP-WAX	60 / 3 mL		10 each × 10	291-33941
Presep® DEA	250 / 6 mL		10 each × 5	292-61701
Presep® QA	250 / 6 mL		10 each × 5	296-61601
Presep® CM	250 / 6 mL		10 each × 5	298-61801
Presep® S	250 / 6 mL		10 each × 5	294-61901
Presep® PFC-II	60 / 3 mL	for Sample Pretreatment (PFCs)	10 each × 10	291-33441
Presep®-C PFC (Short)	220		10 each × 5	297-49651
Presep®-C Agri (Short)	220	for Pesticide Residue Analysis	10 each × 5	296-32651
Presep®-Agri	500 / 6 mL		50 each	291-26851
Presep®-C DNPH (Short)	400	for Collection of Aldehydes	20 each	291-43951
Presep®-C DNPH	800		20 each	290-34251
Presep®-C Ozone Scrubber	1300		20 each	293-40351
Presep® Multilayer Silica Gel		for Dioxins Analysis	5 each	295-41651
Presep® Active Carbon-impregnated Silica Gel	1000		10 each	293-41451
Presep® Acitive Carbon-impregnated Silica Gel (Reverse Column)	1000		5 each	297-43051
Presep® PolyChelate	250 / 3 mL	for Trapping of Metal Elements	10 each × 5	296-33491
Presep® Dehydration, 48WELL PLATE	3 mL	for Organic Synthesis	10 each	299-44351

9. High-sealed Storage Bottles

There high-performance hermetic container are ideal for storing volatile solvents, agrochemicals, dioxins, and other types of standard solutions. Specially designed to be completely airtight, the Perfluoro O-ring between the mouth and the cap ensures preventing swelling of the container affected by expansion and contraction due to temperature fluctuations and organic solvent vaporization. This enables long storage of various types of solvents at temperatures between ambient (room temperature) and the freezer (-20°C).

Features

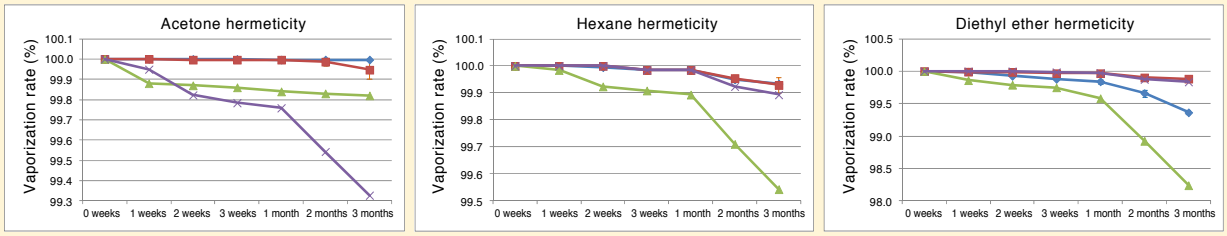
- Provides 99+% hermeticity when organic solvents are stored at room temperature or at freezer temperature as low as -20°C, for up to three months.
- Comes in sizes of 1 mL, 2 mL, 5 mL, and 10 mL
- A microsyringe is available for drawing samples directly from the specially designed upper extraction cap

Applications

- Storage of commercial standard solutions removed from ampoules
- Long storage of reagent samples

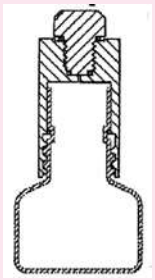
Hermeticity tests for various solvents

Used Wako's high-performance hermetic containers (10 mL) and their equivalent products by Company A (10 mL). Added acetone, hexane, and diethyl ether (10 mL each) respectively, sealed, and stored both at room temperature and at freezer temperature (-20°C). Measured the mass of each content at various intervals from a week to 3 months after the seal.



High-performance hermetic design*1

To avoid lower hermeticity due to expansion and contraction affected by temperature fluctuations, a screw-top is equipped in the inner wall of the mouth component.*2
In addition, solvent resistant Perfluoro O-ring, which is tolerant of temperature fluctuations is used between the mouth and the cap.



[Materials]
Container body: Glass
Cap: Teflon
O-ring: Perfluoro and Viton

*1: Japan Design Patent No. 1425874
*2: Patent Publication Number 2012-192978 (Japan)

Direct sample withdrawal with a microsyringe

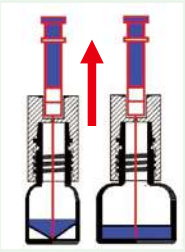
The specially designed withdrawal cap allows direct sample withdrawal with a microsyringe without compromising hermeticity.

[Recommended syringes]

<Needle length>
Syringes with the needles of the following lengths will reach the bottom of the bottle.
- For glass barrel OD of ≤ 7.6 mm, needle length should be ≥ 50 mm*3
- For glass barrel OD of ≥ 7.6 mm, needle length should be ≥ 70 mm*3

<Needle point>
- LC tip (with a 90° angle cut)

*3:When glass barrel OD exceeding 7.6 mm are used, the syringe cannot reach the end of the extraction cap. Please confirm the size of the OD when using syringes with volumes of ≥25 µL.



1 mL, 2 mL V-shaped bottom | 5 mL, 10 mL Flat bottom

Product Name	Bottle Size	Package Size	Wako Cat. No.
High-sealed Storage Bottle, Brown	1 mL	1 bottle	296-34731
	2 mL	1 bottle	293-34741
	5 mL	1 bottle	297-34761
	10 mL	1 bottle	294-34771

- Listed products are intended for laboratory research use only, and not to be used for drug, food or human use.
- Please visit our online catalog to search for other products from Wako : https://labchem-wako.fujifilm.com/
- This brochure may contain products that cannot be exported to your country due to regulations.
- Bulk quote requests for some products are welcomed. Please contact us.

FUJIFILM Wako Pure Chemical Corporation
1-2, Doshomachi 3-Chome
Chuo-Ku, Osaka 540-8605, Japan
Tel: 81-6-6203-3741
Fax: 81-6-6203-1999

FUJIFILM Wako Chemicals U.S.A. Corporation
Toll-Free (U.S. only): 1-877-714-1920
Head Office (Richmond, VA)
Tel: 1-804-714-1920
Fax: 1-804-271-7791

FUJIFILM Wako Chemicals Europe GmbH
European Office:
Fuggerstraβe 12, D-41468, Neuss, Germany
Tel: 49-2131-311-0
Fax: 49-2131-311100

13803GK