# Environmental Analytical Chemistry

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<td>21</td>
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<tr>
<td>15</td>
</tr>
</tbody>
</table>
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

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

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presep® Multilayer Silica Gel</td>
<td>5 units</td>
<td>295-41651</td>
</tr>
</tbody>
</table>

<Related Products>

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Grade</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2% Potassium Hydroxide-impregnated Silica Gel</td>
<td>for Dioxins Analysis</td>
<td>100 g</td>
<td>167-19251</td>
</tr>
<tr>
<td>10% Silver Nitrate-impregnated Silica Gel</td>
<td></td>
<td>100 g</td>
<td>197-11611</td>
</tr>
<tr>
<td>22% Sulfuric Acid-impregnated Silica Gel</td>
<td></td>
<td>100 g</td>
<td>194-11621</td>
</tr>
<tr>
<td>44% Sulfuric Acid-impregnated Silica Gel</td>
<td></td>
<td>100 g</td>
<td>191-11631</td>
</tr>
<tr>
<td>55% Sulfuric Acid-impregnated Silica Gel</td>
<td></td>
<td>100 g</td>
<td>197-13811</td>
</tr>
<tr>
<td>Sodium Sulfate</td>
<td></td>
<td>250 g</td>
<td>194-12221</td>
</tr>
<tr>
<td>Wakogel® DX</td>
<td></td>
<td>100 g</td>
<td>238-01781</td>
</tr>
</tbody>
</table>
**Presep® Active Carbon-impregnated Silica Gel**

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

**Column configuration**
- Glass column tube
- Cotton ball
- Activated carbon-impregnated silica gel or activated carbon-blended silica gel
- Glass fiber filter
- Cotton ball

**Example of use**
- Glass reservoir
- Luer Stop Valve
- Presep® Cylinder Adapter (PTFE)
- Presep® Active Carbon-impregnated Silica Gel
- Presep® Active Carbon-blended Silica Gel

**Product Name** | **Package Size** | **Wako Cat. No.**
--- | --- | ---
Presep® Active Carbon-impregnated Silica Gel | 10 each | 297-43051
Presep® Active Carbon-blended Silica Gel | 10 each | 299-41551

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

**Column configuration**
- PTFE seal
- Columnar absorbent cotton
- Activated carbon-impregnated silica gel, 1 g
- Columnar absorbent cotton
- PTFE seal

**Example of use**
- Connection of drip funnel

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

**Examples of reagent blank of dioxins of active carbon silica gel**

<table>
<thead>
<tr>
<th>Dioxins</th>
<th>Active Carbon-impregnated Silica Gel</th>
<th>Active Carbon-blended Silica Gel</th>
</tr>
</thead>
<tbody>
<tr>
<td>T4CDDs</td>
<td>0.2↓</td>
<td>0.2↓</td>
</tr>
<tr>
<td>P5CDDs</td>
<td>0.2↓</td>
<td>0.2↓</td>
</tr>
<tr>
<td>H6CDDs</td>
<td>0.2↓</td>
<td>0.2↓</td>
</tr>
<tr>
<td>H7CDDs</td>
<td>0.5↓</td>
<td>0.5↓</td>
</tr>
<tr>
<td>O8CDD</td>
<td>2↓</td>
<td>2↓</td>
</tr>
<tr>
<td>T4CDFs</td>
<td>0.2↓</td>
<td>0.2↓</td>
</tr>
<tr>
<td>P5CDFs</td>
<td>0.2↓</td>
<td>0.2↓</td>
</tr>
<tr>
<td>H6CDFs</td>
<td>0.2↓</td>
<td>0.2↓</td>
</tr>
<tr>
<td>H7CDFs</td>
<td>0.5↓</td>
<td>0.5↓</td>
</tr>
<tr>
<td>OCDF</td>
<td>2↓</td>
<td>2↓</td>
</tr>
</tbody>
</table>

**Fractionation Performance Test**

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

![Reaction pathway diagram]

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,2’,3-Trihydroxybiphenyl Standard</td>
<td>100 mg</td>
<td>208-15551</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Wako Cat. No.</th>
<th>Package Size</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acetone, 99.8+% (cGC)</strong></td>
<td>010-17831/016-17833</td>
<td>1 L/3 L</td>
<td>Density (20°C): 0.789-0.792 g/mL</td>
</tr>
<tr>
<td><strong>Decane, 99.5+% (cGC)</strong></td>
<td>048-28543/042-28541</td>
<td>2 mL×5/100 mL</td>
<td>Density (20°C): 0.727-0.736 g/mL</td>
</tr>
<tr>
<td>Product Name</td>
<td>Wako Cat. No.</td>
<td>Package Size</td>
<td>Specifications</td>
</tr>
<tr>
<td>-------------------------------------</td>
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</tr>
<tr>
<td><strong>Dichloromethane</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[Methylene Chloride]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>99.5+% (cGC, except MeOH)</td>
<td>048-26321</td>
<td>1 L</td>
<td>Density (20°C): 1.320~1.331 g/mL</td>
</tr>
<tr>
<td>Stabilizer: Methanol [0.2~0.5%]</td>
<td>044-26323</td>
<td>3 L</td>
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<tr>
<td><strong>Diethylene Glycol</strong>, 99.0+% (cGC)</td>
<td>040-28645</td>
<td>500 mL</td>
<td>Solubility in water: to pass test</td>
</tr>
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<td></td>
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<td>Density (20°C): 1.116~1.123 g/mL</td>
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<tr>
<td><strong>Diethyl Ether</strong>, 99.5+% (cGC)</td>
<td>049-27451</td>
<td>1 L</td>
<td>Density (20°C): 0.712~0.714 g/mL</td>
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<tr>
<td><strong>Ethanol (99.5)</strong>, 99.5+% (cGC)</td>
<td>050-06661</td>
<td>1 L</td>
<td>Density (20°C): 0.789~0.792 g/mL</td>
</tr>
<tr>
<td>[Ethyl Alcohol (99.5)]</td>
<td>056-06663</td>
<td>3 L</td>
<td></td>
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<tr>
<td><strong>Fluorobenzene</strong>, 98.0+% (cGC)</td>
<td>061-04551</td>
<td>200 mL</td>
<td>Density (20°C): 1.025~1.035 g/mL</td>
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<tr>
<td><strong>Hexane</strong>, 96.0+% (cGC) [n-Hexane]</td>
<td>083-07391</td>
<td>1 L</td>
<td>Density (20°C): 0.658~0.662 g/mL</td>
</tr>
<tr>
<td></td>
<td>089-07393</td>
<td>3 L</td>
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<tr>
<td><strong>Methanol</strong>, 99.8+% (cGC) [Methyl Alcohol]</td>
<td>136-13461</td>
<td>1 L</td>
<td>Density (20°C): 0.791~0.793 g/mL</td>
</tr>
<tr>
<td></td>
<td>132-13463</td>
<td>3 L</td>
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<tr>
<td><strong>Nonane</strong>, 98.0+% (cGC) [n-Nonane]</td>
<td>148-07351</td>
<td>2 mL × 5</td>
<td>Density (20°C): 0.713~0.721 g/mL</td>
</tr>
<tr>
<td></td>
<td>142-07354</td>
<td>100 mL</td>
<td></td>
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</tr>
<tr>
<td><strong>Petroleum Ether</strong></td>
<td>160-20231</td>
<td>1 L</td>
<td>Boiling range (30~60°C): 90+vol%</td>
</tr>
<tr>
<td>Content: 5~15 %</td>
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<tr>
<td><strong>10% Sodium Chloride Solution</strong></td>
<td>192-12641</td>
<td>1 L</td>
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<tr>
<td><strong>Toluene</strong>, 99.7+% (cGC) [cGC]</td>
<td>203-14141</td>
<td>1 L</td>
<td>Density (20°C): 0.864~0.868 g/mL</td>
</tr>
<tr>
<td></td>
<td>209-14143</td>
<td>3 L</td>
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<tr>
<td><strong>Dimethyl Sulfoxide</strong>, 99.0+% (cGC)</td>
<td>041-29395</td>
<td>500 mL</td>
<td>Density (20°C): 1.100~ 1.106 g/mL</td>
</tr>
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<Related Products>

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIOXIN TRAP BEADS</td>
<td>200 g</td>
<td>040-27481</td>
</tr>
<tr>
<td>Active Carbon-impregnated Silica Gel</td>
<td>10 g</td>
<td>019-11941</td>
</tr>
<tr>
<td>Copper, Reduced, Granular, 300-850 µm (20-50 mesh)</td>
<td>50 g</td>
<td>032-19571</td>
</tr>
<tr>
<td>Phthalocyanine Immobilized Silica Gel</td>
<td>5 g</td>
<td>160-21831</td>
</tr>
<tr>
<td></td>
<td>25 g</td>
<td>168-21832</td>
</tr>
</tbody>
</table>
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-poly(methacrylate) 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-III C18 RS.
3. Blank caused by solvent can be reduced by combining with a solvent for PFOS or PFOA analysis.

PFCs additive recovery test

<table>
<thead>
<tr>
<th>Sample Name</th>
<th>Presep® PFC-II Recovery (%)</th>
<th>Presep®-C PFC Recovery (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFBS</td>
<td>106</td>
<td>106</td>
</tr>
<tr>
<td>PFOA</td>
<td>109</td>
<td>109</td>
</tr>
<tr>
<td>PFOS</td>
<td>107</td>
<td>107</td>
</tr>
<tr>
<td>PFDS</td>
<td>107</td>
<td>107</td>
</tr>
<tr>
<td>PFBA</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>PPeA</td>
<td>116</td>
<td>116</td>
</tr>
<tr>
<td>PFNA</td>
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<td>109</td>
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<td>PFDA</td>
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<td>PFUnDA</td>
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<td>PFTeDA</td>
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<td>PFHexDA</td>
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<td>105</td>
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<td>PFODA</td>
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<td>PFOA</td>
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<tr>
<td>PFNA</td>
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<td>PFHexDA</td>
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<td>105</td>
</tr>
<tr>
<td>PFODA</td>
<td>103</td>
<td>103</td>
</tr>
</tbody>
</table>

The components indicated by boldface are assayed in product test.

Chromatograms of PFCs additive recovery test (Presep®-C PFC (short))
LC/MS/MS measurement of PFCs

**HPLC analysis conditions**
- Column: Wakopak® Wakosil-II 3C18 RS (2.0 mm × 150 mm)
- Eluent: A) 10 mmol/L CH3COONH4 in H2O, B) CH3CN
- Gradient: 0:10 min, B = 35-40%, 10-15 min, B = 35%
- Flow Rate: 0.2 mL/min at 40°C
- Injection: 10 ng/mL (D): DuPont type, (W): Waters type

**MS/MS conditions**
- Curtain GAS: 30
- Collision Gas: 3
- IonSpray Voltage: -4, 500
- Temperature: 400°C
- Ion Source Gas1: 70
- Ion Source Gas2: 80

---

**Solid-Phase Extraction Columns**

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presep®-C PFC (Short)</td>
<td>10 each × 5</td>
<td>297-49651</td>
</tr>
<tr>
<td>Presep® PFC-II</td>
<td>10 each × 10</td>
<td>291-33441</td>
</tr>
</tbody>
</table>

**<Related Products>**

**HPLC Column**

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Size</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wakopak® Wakosil-II 3C18RS</td>
<td>2.0 mm × 150 mm (D)</td>
<td>1 unit</td>
<td>236-50431</td>
</tr>
<tr>
<td></td>
<td>2.0 mm × 150 mm (W)</td>
<td>1 unit</td>
<td>232-50433</td>
</tr>
</tbody>
</table>

**Solvents**

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Grade</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultrapure Water</td>
<td>for PFOS - PFOA Analysis</td>
<td>1 L</td>
<td>216-01361</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 L</td>
<td>212-01363</td>
</tr>
<tr>
<td>Acetonitrile</td>
<td></td>
<td>1 L</td>
<td>011-22251</td>
</tr>
<tr>
<td>Methanol</td>
<td></td>
<td>1 L</td>
<td>130-15941</td>
</tr>
</tbody>
</table>

**Standards**

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Grade</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heptacosfluorotetradecanoic Acid Standard</td>
<td></td>
<td>100 mg</td>
<td>080-08641</td>
</tr>
<tr>
<td>1H,1H,2H,2H-Henicosafluoro-1-dodecanol Standard</td>
<td></td>
<td>100 mg</td>
<td>080-08761</td>
</tr>
<tr>
<td>Heptafluorobutanoic Acid Standard</td>
<td></td>
<td>100 mg</td>
<td>087-08877</td>
</tr>
<tr>
<td>Heptadecafluorononoanoic Acid Standard</td>
<td></td>
<td>100 mg</td>
<td>088-08868</td>
</tr>
<tr>
<td>Henicosafluoroundecanoic Acid Standard</td>
<td></td>
<td>100 mg</td>
<td>089-08961</td>
</tr>
<tr>
<td>Nonadecafluorodecanoic Acid Standard</td>
<td></td>
<td>100 mg</td>
<td>144-08551</td>
</tr>
<tr>
<td>Nonafluoropentanoic Acid Standard</td>
<td></td>
<td>100 mg</td>
<td>145-08581</td>
</tr>
<tr>
<td>Pentadecafluorooctanoic Acid Standard</td>
<td></td>
<td>500 mg</td>
<td>164-21851</td>
</tr>
<tr>
<td>Potassium Nonafluorobutanesulfonate Standard</td>
<td></td>
<td>100 mg</td>
<td>169-24341</td>
</tr>
<tr>
<td>Tricosafluorodecanoic Acid Standard</td>
<td></td>
<td>100 mg</td>
<td>204-17091</td>
</tr>
<tr>
<td>Tridecafluorohexanoic Acid Standard</td>
<td></td>
<td>100 mg</td>
<td>209-17041</td>
</tr>
<tr>
<td>Undecafluorohexanoic Acid Standard</td>
<td></td>
<td>100 mg</td>
<td>212-01341</td>
</tr>
</tbody>
</table>
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-S (ODS column), numerous peaks may be detected.

On the other hand, the amount of anionic surfactant is prescribed at 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 CH₃OH 5 mL
  ② H₂O 5 mL
- Sample: Water sample
  1 L 20 mL/min.
- Drying: Suction of air for 5 min
  (N₂ gas purging for 5 min)
- Elution: CH₃OH 5 mL
- (Concentration: To 2 mL by N₂ gas blowing)
- Omitted in this process
- HPLC analysis

Recovery

Comparison of recovery of additive (purified water)

Recovery (%)

Comparison of recovery of additive (tap water)

Recovery (%)

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

for other products, please visit the Wako Online Catalog   https://labchem-wako.fujifilm.com/
Analysis of standard solution for anionic surfactant test HPLC analysis conditions

<table>
<thead>
<tr>
<th>Eluent</th>
<th>CH₃CN/H₂O=65/35 (v/v), addition of 12.3 g of NaClO₄ per 1000 mL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection</td>
<td>Fluorescence detection, ex. 221 nm, em. 284 nm</td>
</tr>
<tr>
<td>Injection</td>
<td>each 10 mg/L (CH₃OH), 10 μL</td>
</tr>
<tr>
<td>Sample</td>
<td>Standard solution for anionic surfactant test</td>
</tr>
</tbody>
</table>

(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 (CH₃OH), injection of 10 μL

(Fig. 1) Fluorescence detection

(Fig. 2) UV detection

Environmental Analytical Chemistry
### HPLC Columns / Eluent

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Size</th>
<th>Grade</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wakopak® Wakosil AS-Aqua</strong></td>
<td>4.6 mm × 250 mm (D)</td>
<td>–</td>
<td>1 unit</td>
<td>234-63281</td>
</tr>
<tr>
<td></td>
<td>4.6 mm × 250 mm (W)</td>
<td></td>
<td>1 unit</td>
<td>230-63283</td>
</tr>
<tr>
<td><strong>Wakopak® Navi C18-5</strong></td>
<td>4.6 mm × 250 mm (D)</td>
<td>–</td>
<td>1 unit</td>
<td>235-60531</td>
</tr>
<tr>
<td><strong>Wakopak® Navi C18-5</strong></td>
<td>4.6 mm × 250 mm (W)</td>
<td></td>
<td>1 unit</td>
<td>231-60533</td>
</tr>
<tr>
<td><strong>Wakosil® AS-Aqua Eluent</strong></td>
<td></td>
<td></td>
<td>for HPLC</td>
<td>238-02261</td>
</tr>
</tbody>
</table>

### Solid-Phase Extraction Columns

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

### Related Products

#### Standards, Standard Solutions

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Grade</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anionic Surfactants Mixture Standard Solution</td>
<td></td>
<td>1 mL × 5A</td>
<td>013-20131</td>
</tr>
<tr>
<td>Sodium Decylbenzenesulfonate Standard Solution</td>
<td></td>
<td>1 mL × 5A</td>
<td>195-13111</td>
</tr>
<tr>
<td>Sodium Undecylbenzenesulfonate Standard Solution</td>
<td></td>
<td>1 mL × 5A</td>
<td>192-13121</td>
</tr>
<tr>
<td>Sodium Dodecylbenzenesulfonate Standard Solution</td>
<td></td>
<td>1 mL × 5A</td>
<td>199-13131</td>
</tr>
<tr>
<td>Sodium Tridecylbenzenesulfonate Standard Solution</td>
<td></td>
<td>1 mL × 5A</td>
<td>196-13141</td>
</tr>
<tr>
<td>Sodium Tetradecylbenzenesulfonate Standard Solution</td>
<td></td>
<td>1 mL × 5A</td>
<td>193-13151</td>
</tr>
<tr>
<td>Sodium p-n-Octylbenzenesulfonate Standard Solution</td>
<td></td>
<td>100 mg</td>
<td>194-17101</td>
</tr>
<tr>
<td>Sodium p-n-Octylbenzenesulfonate Standard Solution</td>
<td></td>
<td>1 mL</td>
<td>195-17131</td>
</tr>
</tbody>
</table>

### Solvents (for LC / MS, for HPLC)

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Grade</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formic Acid (abt.99%)</td>
<td>for HPLC</td>
<td>25 mL</td>
<td>063-04192</td>
</tr>
<tr>
<td>Formic Acid (abt.99%)</td>
<td>for LC/MS</td>
<td>1 mL × 5A</td>
<td>063-04533</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 mL</td>
<td>067-04531</td>
</tr>
<tr>
<td>0.1vol% Formic Acid-Acetonitrile</td>
<td>for LC/MS</td>
<td>1 L</td>
<td>082-04721</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 L</td>
<td>085-04723</td>
</tr>
<tr>
<td>Acetonitrile</td>
<td>for HPLC</td>
<td>1 L</td>
<td>019-08631</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 L</td>
<td>015-08633</td>
</tr>
<tr>
<td>Acetonitrile</td>
<td>for LC/MS</td>
<td>100 mL</td>
<td>016-19854</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 L</td>
<td>012-19851</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 L</td>
<td>018-19853</td>
</tr>
<tr>
<td>Methanol</td>
<td>for HPLC</td>
<td>1 L</td>
<td>138-06473</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 L</td>
<td>132-06471</td>
</tr>
<tr>
<td>Methanol</td>
<td>for LC/MS</td>
<td>100 mL</td>
<td>132-14524</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 L</td>
<td>138-14521</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 L</td>
<td>134-14523</td>
</tr>
<tr>
<td>Distilled Water</td>
<td>for HPLC</td>
<td>1 L</td>
<td>046-16971</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 L</td>
<td>042-16973</td>
</tr>
<tr>
<td>Ultrapure Water</td>
<td>for LC/MS</td>
<td>1 L</td>
<td>214-01301</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 L</td>
<td>210-01303</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Grade</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonylphenol</td>
<td>for Environment Analysis</td>
<td>100 mg</td>
<td>148-09291</td>
</tr>
<tr>
<td>p-n-Nonylphenol Standard</td>
<td></td>
<td>500 mg</td>
<td>146-06791</td>
</tr>
</tbody>
</table>

<Related Products>

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Grade</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone 5,000</td>
<td>for Pesticide Residue &amp; PCB Analysis</td>
<td>1 L</td>
<td>011-19201</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 L</td>
<td>017-19203</td>
</tr>
<tr>
<td>Dichloromethane 5,000</td>
<td>for Pesticide Residue &amp; PCB Analysis</td>
<td>1 L</td>
<td>043-28451</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 L</td>
<td>049-28453</td>
</tr>
<tr>
<td>Hexane 5,000</td>
<td></td>
<td>1 L</td>
<td>083-07911</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 L</td>
<td>089-07939</td>
</tr>
<tr>
<td>Sodium Sulfate</td>
<td></td>
<td>500 g</td>
<td>197-07125</td>
</tr>
</tbody>
</table>

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, assuring 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 CH3CN/50mmol/L HCOONH4=55/45(v/v)
Flow rate : 1.0mL/min
Temperature : 40℃
Detection : UV 225nm
Injection : 1mg/mL(CH3OH), 5μL

Standards

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Grade</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anionic Surfactants Mixture Standard Solution</td>
<td>for Water Analysis</td>
<td>1 mL × 5A</td>
<td>013-20131</td>
</tr>
<tr>
<td>Sodium p-n-Octylbenzenesulfonate Standard</td>
<td></td>
<td>100 mg</td>
<td>194-17101</td>
</tr>
<tr>
<td>Sodium p-n-Octylbenzenesulfonate Standard Solution</td>
<td></td>
<td>1 mL</td>
<td>195-17131</td>
</tr>
</tbody>
</table>

Analytical Columns

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Size</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wakopak® Wakosil AS-Aqua</td>
<td>4.6 mm × 250 mm (D)</td>
<td>1 unit</td>
<td>234-63281</td>
</tr>
<tr>
<td></td>
<td>4.6 mm × 250 mm (W)</td>
<td>1 unit</td>
<td>230-63283</td>
</tr>
<tr>
<td>Wakopak® Navi C18-5</td>
<td>4.6 mm × 250 mm (D)</td>
<td>1 unit</td>
<td>235-60531</td>
</tr>
<tr>
<td></td>
<td>4.6 mm × 250 mm (W)</td>
<td>1 unit</td>
<td>231-60533</td>
</tr>
</tbody>
</table>
Aniline

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Assay</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aniline</td>
<td>99.0+% (Titration)</td>
<td>100 mL</td>
<td>019-03991</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500 mL</td>
<td>019-03996</td>
</tr>
</tbody>
</table>

\[\text{p-(1,1,3,3-Tetramethylbutyl)phenol (4-\text{tert-Octylphenol})}\]

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Grade</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[\text{p-(1,1,3,3-Tetramethylbutyl)phenol Standard}]</td>
<td>for Environment Analysis</td>
<td>500 mg</td>
<td>208-14451</td>
</tr>
</tbody>
</table>

2,4-Dichlorophenol

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Grade</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[\text{2,4-Dichlorophenol Standard}]</td>
<td>for Environment Analysis</td>
<td>500 mg</td>
<td>049-26611</td>
</tr>
</tbody>
</table>

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 actinomycetes 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

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Grade</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[\text{Geosmin Standard}]</td>
<td></td>
<td>20 mg</td>
<td>077-01911</td>
</tr>
<tr>
<td>[\text{Geosmin Standard Solution}] (0.1mg/ml Methanol Solution)</td>
<td></td>
<td>1 mL</td>
<td>072-03421</td>
</tr>
<tr>
<td>[\text{2-Methylisoborneol Standard}]</td>
<td>for Water Analysis</td>
<td>20 mg</td>
<td>132-07071</td>
</tr>
<tr>
<td>[\text{2-Methylisoborneol Standard Solution}] (0.1mg/ml Methanol Solution)</td>
<td></td>
<td>1 mL</td>
<td>134-10581</td>
</tr>
<tr>
<td>[\text{2-Methylisoborneol-Geosmin Mixture Standard Solution}] (each 0.1mg/ml Methanol Solution)</td>
<td></td>
<td>1 mL</td>
<td>131-12431</td>
</tr>
</tbody>
</table>

<Related Products>

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Note</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[\text{2,4,6-Trichloroanisole Standard}]</td>
<td>for Water Analysis</td>
<td>100 mg</td>
<td>209-18901</td>
</tr>
<tr>
<td>[\text{Sodium Chloride}]</td>
<td></td>
<td>500 g</td>
<td>192-10745</td>
</tr>
<tr>
<td>[\text{Sodium Azide}]</td>
<td>98.0+% (Titration)</td>
<td>25 g</td>
<td>195-11092</td>
</tr>
<tr>
<td>[\text{Presep®-C C18 (ODS)}]</td>
<td>for Sample Pretreatment</td>
<td>10 each x 5</td>
<td>292-32251</td>
</tr>
</tbody>
</table>
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

\[
\begin{align*}
\text{NH}_2 & \text{N} \\
\text{N} & \text{N} \\
\text{NH}_2 & \text{N}
\end{align*}
\]

CAS No.: 108-78-1
C\(_3\)H\(_6\)N\(_6\)=126.12

- Ammeline

\[
\begin{align*}
\text{NH}_2 & \text{N} \\
\text{N} & \text{N} \\
\text{OH} & \text{N}
\end{align*}
\]

CAS No.: 645-92-1
C\(_3\)H\(_5\)N\(_5\)O\(_3\)=127.10

- Cyanuric acid (isocyanuric acid)

\[
\begin{align*}
\text{OH} & \text{N} \\
\text{N} & \text{N} \\
\text{OH} & \text{N}
\end{align*}
\]

CAS No.: 108-80-5
C\(_3\)H\(_5\)N\(_5\)O\(_3\)=129.07

- Ammelide

\[
\begin{align*}
\text{OH} & \text{N} \\
\text{N} & \text{N} \\
\text{NH}_2 & \text{N}
\end{align*}
\]

CAS No.: 645-93-2
C\(_3\)H\(_5\)N\(_5\)O\(_3\)=128.09

Application using Wakosil 5NH\(_2\)

<HPLC Conditions>

- Column: Wakosil 5NH\(_2\) (4.6×250 mm), 40°C
- Eluent: CH\(_3\)CN/5mM NaH\(_2\)PO\(_4\) (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 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)

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

![GC/MS Application Graph]

Standards of Melamine and the related compounds

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Grade</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melamine Standard</td>
<td>for Food Analysis</td>
<td>100 mg</td>
<td>132-15881</td>
</tr>
<tr>
<td>Isocyanuric Acid Standard</td>
<td>for HPLC</td>
<td>200 mg</td>
<td>091-05311</td>
</tr>
<tr>
<td>Ammeline Standard</td>
<td>for Food Analysis</td>
<td>100 mg</td>
<td>012-22041</td>
</tr>
<tr>
<td>Ammelide Standard</td>
<td>for Food Analysis</td>
<td>100 mg</td>
<td>019-22051</td>
</tr>
</tbody>
</table>
### 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

![Graph showing recovery percentages against acetonitrile and methanol concentrations]

**Recovery**

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFLAKING 25</td>
<td>25 unit</td>
<td>308-34201</td>
</tr>
<tr>
<td>AFLAKING 50</td>
<td>50 unit</td>
<td>304-34203</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Description</th>
<th>Grade</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimethyl Fumarate Standard, 99.0+% (cGC)</td>
<td>for Household Articles Test</td>
<td>100 mg</td>
<td>041-31061</td>
</tr>
</tbody>
</table>

Reference: The EU regulation

6. Metal Standard Solutions

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.

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Concentration (mg / L)</th>
<th>Solvent</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminium Standard Solution (Al 100)</td>
<td>100</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>016-18271</td>
</tr>
<tr>
<td>Aluminium Standard Solution (Al 1000)</td>
<td>1,000</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>016-15471</td>
</tr>
<tr>
<td>Antimony Standard Solution (Sb 100)</td>
<td>100</td>
<td>HCl</td>
<td>100 mL</td>
<td>013-18281</td>
</tr>
<tr>
<td>Antimony Standard Solution (Sb 1000)</td>
<td>1,000</td>
<td>HCl</td>
<td>100 mL</td>
<td>010-15491</td>
</tr>
<tr>
<td>Arsenic Standard Solution (As 100)</td>
<td>100</td>
<td>HNO₃ in Water, pH 5.0 with HCl</td>
<td>100 mL</td>
<td>013-15501</td>
</tr>
<tr>
<td>Arsenic Standard Solution (As 1000)</td>
<td>1,000</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>013-15481</td>
</tr>
<tr>
<td>Barium Standard Solution (Ba 1000)</td>
<td>1,000</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>027-15321</td>
</tr>
<tr>
<td>Bismuth Standard Solution (Bi 1000)</td>
<td>1,000</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>023-14201</td>
</tr>
<tr>
<td>Bismuth Standard Solution (Bi 10000)</td>
<td>1,000</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>021-12661</td>
</tr>
<tr>
<td>Boron Standard Solution (B 1000)</td>
<td>1,000</td>
<td>Water</td>
<td>100 mL</td>
<td>025-16581</td>
</tr>
<tr>
<td>Cadmium Standard Solution (Cd 100)</td>
<td>100</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>030-16211</td>
</tr>
<tr>
<td>Cadmium Standard Solution (Cd 1000)</td>
<td>1,000</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>036-16171</td>
</tr>
<tr>
<td>Calcium Standard Solution (Ca 100)</td>
<td>100</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>036-17891</td>
</tr>
<tr>
<td>Calcium Standard Solution (Ca 1000)</td>
<td>1,000</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>039-16161</td>
</tr>
<tr>
<td>Cesium Standard Solution (Cs 1000)</td>
<td>1,000</td>
<td>Water</td>
<td>100 mL</td>
<td>030-21341</td>
</tr>
<tr>
<td>Chromium Standard Solution (Cr 100)</td>
<td>100</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>037-16221</td>
</tr>
<tr>
<td>Chromium Standard Solution (Cr 1000)</td>
<td>1,000</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>030-16191</td>
</tr>
<tr>
<td>Cobalt Standard Solution (Co 100)</td>
<td>100</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>039-17901</td>
</tr>
<tr>
<td>Cobalt Standard Solution (Co 1000)</td>
<td>1,000</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>033-16181</td>
</tr>
<tr>
<td>Copper Standard Solution (Cu 100)</td>
<td>100</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>034-16231</td>
</tr>
<tr>
<td>Copper Standard Solution (Cu 1000)</td>
<td>1,000</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>033-16201</td>
</tr>
<tr>
<td>Gallium Standard Solution (Ga 1000)</td>
<td>1,000</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>070-05781</td>
</tr>
<tr>
<td>Indium Standard Solution (In 1000)</td>
<td>1,000</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>092-05841</td>
</tr>
<tr>
<td>Iron Standard Solution (Fe 100)</td>
<td>100</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>091-03851</td>
</tr>
<tr>
<td>Iron Standard Solution (Fe 1000)</td>
<td>1,000</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>094-03841</td>
</tr>
<tr>
<td>Lead Standard Solution (Pb 100)</td>
<td>100</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>127-04301</td>
</tr>
<tr>
<td>Lead Standard Solution (Pb 1000)</td>
<td>1,000</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>124-04291</td>
</tr>
<tr>
<td>Lithium Standard Solution (Li 1000)</td>
<td>1,000</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>129-05221</td>
</tr>
<tr>
<td>Magnesium Standard Solution (Mg 100)</td>
<td>100</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>136-13601</td>
</tr>
<tr>
<td>Magnesium Standard Solution (Mg 1000)</td>
<td>1,000</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>136-12121</td>
</tr>
<tr>
<td>Manganese Standard Solution (Mn 100)</td>
<td>100</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>139-12111</td>
</tr>
<tr>
<td>Manganese Standard Solution (Mn 1000)</td>
<td>1,000</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>133-12131</td>
</tr>
<tr>
<td>Molybdenum Standard Solution (Mo 1000)</td>
<td>1,000</td>
<td>HCl · HNO₃</td>
<td>100 mL</td>
<td>130-14961</td>
</tr>
<tr>
<td>Nickel Standard Solution (Ni 100)</td>
<td>100</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>144-06471</td>
</tr>
<tr>
<td>Nickel Standard Solution (Ni 1000)</td>
<td>1,000</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>147-06461</td>
</tr>
<tr>
<td>Potassium Standard Solution (K 100)</td>
<td>100</td>
<td>Water</td>
<td>100 mL</td>
<td>162-19941</td>
</tr>
<tr>
<td>Potassium Standard Solution (K 1000)</td>
<td>1,000</td>
<td>Water</td>
<td>100 mL</td>
<td>165-17471</td>
</tr>
<tr>
<td>Rubidium Standard Solution (Rb 1000)</td>
<td>1,000</td>
<td>Water</td>
<td>100 mL</td>
<td>186-01951</td>
</tr>
<tr>
<td>Selenium Standard Solution (Se 1000)</td>
<td>1,000</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>192-13861</td>
</tr>
<tr>
<td>Sodium Standard Solution (Na 100)</td>
<td>100</td>
<td>Water</td>
<td>100 mL</td>
<td>191-12111</td>
</tr>
<tr>
<td>Sodium Standard Solution (Na 1000)</td>
<td>1,000</td>
<td>Water</td>
<td>100 mL</td>
<td>199-10831</td>
</tr>
<tr>
<td>Strontium Standard Solution (Sr 1000)</td>
<td>1,000</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>199-13871</td>
</tr>
<tr>
<td>Tellurium Standard Solution (Te 1000)</td>
<td>1,000</td>
<td>HCl</td>
<td>100 mL</td>
<td>209-17921</td>
</tr>
<tr>
<td>Thallium Standard Solution (Tl 1000)</td>
<td>1,000</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>205-16301</td>
</tr>
<tr>
<td>Tin Standard Solution (Sn 1000)</td>
<td>1,000</td>
<td>HCl</td>
<td>100 mL</td>
<td>202-16311</td>
</tr>
<tr>
<td>Vanadium Standard Solution (V 1000)</td>
<td>1,000</td>
<td>HCl · HNO₃</td>
<td>100 mL</td>
<td>221-01851</td>
</tr>
<tr>
<td>Zinc Standard Solution (Zn 100)</td>
<td>100</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>261-01431</td>
</tr>
<tr>
<td>Zinc Standard Solution (Zn 1000)</td>
<td>1,000</td>
<td>HNO₃</td>
<td>100 mL</td>
<td>264-01421</td>
</tr>
</tbody>
</table>

For other products, please visit the Wako Online Catalog: https://labchem-wako.fujifilm.com
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)

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Grade</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone 300</td>
<td>for Pesticide Residue &amp; PCB Analysis</td>
<td>1 L</td>
<td>015-11281</td>
</tr>
<tr>
<td>Acetone 5,000</td>
<td></td>
<td>3 L</td>
<td>011-11283</td>
</tr>
<tr>
<td>Acetonitrile 300</td>
<td></td>
<td>1 L</td>
<td>011-19201</td>
</tr>
<tr>
<td>Acetonitrile 5,000</td>
<td></td>
<td>3 L</td>
<td>017-19203</td>
</tr>
<tr>
<td>Acetonitrile</td>
<td>for Tiuram Analysis</td>
<td>1 L</td>
<td>011-15281</td>
</tr>
<tr>
<td>Benzene 300</td>
<td></td>
<td>1 L</td>
<td>021-08631</td>
</tr>
<tr>
<td>Benzene 5,000</td>
<td></td>
<td>1 L</td>
<td>028-14751</td>
</tr>
<tr>
<td>tert-Butyl Methyl Ether 300</td>
<td></td>
<td>1 L</td>
<td>024-14351</td>
</tr>
<tr>
<td>tert-Butyl Methyl Ether 5,000</td>
<td></td>
<td>1 L</td>
<td>020-14831</td>
</tr>
<tr>
<td>Chloroform 300</td>
<td></td>
<td>1 L</td>
<td>039-11801</td>
</tr>
<tr>
<td>Chloroform 5,000</td>
<td></td>
<td>1 L</td>
<td>033-18641</td>
</tr>
<tr>
<td>Cyclohexane 300</td>
<td></td>
<td>1 L</td>
<td>038-16751</td>
</tr>
<tr>
<td>Cyclohexane 5,000</td>
<td></td>
<td>1 L</td>
<td>036-18631</td>
</tr>
<tr>
<td>Dichloromethane 300</td>
<td></td>
<td>1 L</td>
<td>133-08841</td>
</tr>
<tr>
<td>Dichloromethane 5,000</td>
<td></td>
<td>3 L</td>
<td>139-08843</td>
</tr>
<tr>
<td>Dichloromethane 5,000, 2-Methyl-2-butene added</td>
<td></td>
<td>1 L</td>
<td>043-28451</td>
</tr>
<tr>
<td>Diethyl Ether 300</td>
<td></td>
<td>1 L</td>
<td>042-30011</td>
</tr>
<tr>
<td>Diethyl Ether 5000</td>
<td></td>
<td>1 L</td>
<td>050-04461</td>
</tr>
<tr>
<td>Distilled Water, Hexane Washed</td>
<td>–</td>
<td>1 L</td>
<td>040-28081</td>
</tr>
<tr>
<td>Ethanol 300</td>
<td></td>
<td>3 L</td>
<td>046-28083</td>
</tr>
<tr>
<td>Ethanol 5,000</td>
<td></td>
<td>1 L</td>
<td>056-04441</td>
</tr>
<tr>
<td>Ethyl Acetate 300</td>
<td></td>
<td>3 L</td>
<td>052-04443</td>
</tr>
<tr>
<td>Ethyl Acetate 5,000</td>
<td></td>
<td>1 L</td>
<td>052-04421</td>
</tr>
<tr>
<td>Hexane 300</td>
<td></td>
<td>3 L</td>
<td>058-04423</td>
</tr>
<tr>
<td>Hexane 5,000</td>
<td></td>
<td>1 L</td>
<td>084-04761</td>
</tr>
<tr>
<td>Methanol 300</td>
<td></td>
<td>3 L</td>
<td>080-04763</td>
</tr>
<tr>
<td>Methanol 5,000</td>
<td></td>
<td>1 L</td>
<td>083-07911</td>
</tr>
<tr>
<td>Petroleum Ether 300</td>
<td></td>
<td>3 L</td>
<td>089-07913</td>
</tr>
<tr>
<td>Petroleum Ether 5,000</td>
<td></td>
<td>1 L</td>
<td>139-08821</td>
</tr>
<tr>
<td>Toluene 300</td>
<td></td>
<td>3 L</td>
<td>135-08823</td>
</tr>
<tr>
<td>Toluene 5,000</td>
<td></td>
<td>1 L</td>
<td>132-14161</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 L</td>
<td>139-14163</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 L</td>
<td>165-12971</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 L</td>
<td>162-20671</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 L</td>
<td>203-11601</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 L</td>
<td>209-11603</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 L</td>
<td>209-15581</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 L</td>
<td>205-15583</td>
</tr>
</tbody>
</table>
### 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.

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

### 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.

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

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

### Solvents and pH Adjusting Reagents

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic Acid</td>
<td>25 mL</td>
<td>010-19112</td>
</tr>
<tr>
<td>Formic Acid (abt. 99%)</td>
<td>25 mL</td>
<td>063-04192</td>
</tr>
<tr>
<td>Phosphoric Acid</td>
<td>25 mL</td>
<td>162-20492</td>
</tr>
<tr>
<td>Trifluoroacetic Acid</td>
<td>1 mL × 5A</td>
<td>206-10731</td>
</tr>
<tr>
<td></td>
<td>5 mL × 5A</td>
<td>206-10736</td>
</tr>
</tbody>
</table>

### Eluents for HPLC Analysis

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

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 solid-phase extraction.
5. High reproducibility ensured by strict quality control.

List of Fillers

<table>
<thead>
<tr>
<th>Kind</th>
<th>Filler</th>
<th>Particle size (μm)</th>
<th>Uses and characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>C18 (ODS)</td>
<td>C18(ODS)-bonded silica gel</td>
<td>63 – 212</td>
<td>Reversed phase partition : Separation of hydrophobic substances in water-soluble samples</td>
</tr>
<tr>
<td>NH₂</td>
<td>Aminopropylsilanized silica gel</td>
<td>38 – 63</td>
<td>Removal of acidic compounds, such as organic acids and fatty acids</td>
</tr>
<tr>
<td>Silica gel</td>
<td>Crushed silica gel</td>
<td>75 – 150</td>
<td>Normal phase adsorption: Separation of low- to medium-polarity components from nonaqueous solutions</td>
</tr>
<tr>
<td>Alumina gel</td>
<td>Basic (pH 9) alumina</td>
<td>44 – 149</td>
<td>Removal of interfering substances from pesticides and environment samples</td>
</tr>
<tr>
<td>Florisil®</td>
<td>MgO₂Si</td>
<td>75 – 150</td>
<td>Removal of lipid and pretreatment of pesticide residue in food</td>
</tr>
<tr>
<td>Na₂SO₄</td>
<td>Sodium sulfate (anhydrous)</td>
<td>-</td>
<td>Dehydration</td>
</tr>
<tr>
<td>Diatomaceous Earth, Granular</td>
<td>Granular diatomaceous earth</td>
<td>500 – 1400</td>
<td>Desolventization</td>
</tr>
<tr>
<td>Polyamide C-200</td>
<td>Polyamide resin</td>
<td>75 – 150</td>
<td>Pretreatment of paonilinor in Kakkonta extract</td>
</tr>
<tr>
<td>RPP</td>
<td>Styrene-divinylbenzene-methacrylate polymer</td>
<td>30, 60</td>
<td>Trapping of high-polarity substances which cannot be adsorbed by normal ODS</td>
</tr>
<tr>
<td>RPP-SAX</td>
<td>Divinylbenzene-methacrylate polymer</td>
<td>40 – 48</td>
<td>Selective extraction of acidic compounds and extraction of drug products and their metabolites from biological samples (urine and blood)</td>
</tr>
<tr>
<td>RPP-WAX</td>
<td></td>
<td>60</td>
<td>Polymer-based weakly basic anion exchange</td>
</tr>
<tr>
<td>DEA</td>
<td>Diethylaminomethyl Cl type</td>
<td></td>
<td>Polymer-based strongly basic anion exchange</td>
</tr>
<tr>
<td>QA</td>
<td>Trimethylaminoethyl Cl type</td>
<td></td>
<td>Polymer-based weakly acidic cation exchange</td>
</tr>
<tr>
<td>CM</td>
<td>Carboxymethyl Na type</td>
<td>45 – 90</td>
<td>Polymer-based strongly acidic cation exchange</td>
</tr>
<tr>
<td>S</td>
<td>Sulfonyl propyl Na type</td>
<td></td>
<td>Polymer-based weakly acidic cation exchange</td>
</tr>
<tr>
<td>PFC/PFC-II</td>
<td>Divinylbenzene-methacrylate polymer</td>
<td>50</td>
<td>Pretreatment for analysis of organofluorine compounds (PFCs)</td>
</tr>
<tr>
<td>Agri</td>
<td>Styrene-divinylbenzene-methacrylate polymer</td>
<td></td>
<td>Trapping of high-polarity substances which cannot be adsorbed by normal ODS</td>
</tr>
<tr>
<td>DNPH</td>
<td>Silica gel coated with 2,4-dinitrophenylhydrazine</td>
<td>Short:150 – 450 Long:75 – 150</td>
<td>Derivatization after adsorption of aldehydes and ketones</td>
</tr>
<tr>
<td>Ozone scrubber</td>
<td>High-purity potassium iodine</td>
<td>–</td>
<td>Removal of ozone</td>
</tr>
<tr>
<td>Multilayer silica gel</td>
<td>10% silver nitrate-silica gel, 22% sulfate silica gel, etc.</td>
<td>–</td>
<td>Pretreatment for analysis of dioxins</td>
</tr>
<tr>
<td>Activated carbon-blended silica gel</td>
<td>Activated carbon-blended silica gel</td>
<td>–</td>
<td>Pretreatment for analysis of dioxins</td>
</tr>
<tr>
<td>Activated carbon-impregnated silica gel</td>
<td>Activated carbon-impregnated silica gel</td>
<td>–</td>
<td>Pretreatment for analysis of dioxins</td>
</tr>
<tr>
<td>PolyChelate</td>
<td>Chelate resin modified with carboxymethylated polyethylenimine.</td>
<td>–</td>
<td>Trapping of metal elements</td>
</tr>
<tr>
<td>Dehydration</td>
<td>Hydrophobic Teflon membrane filter</td>
<td>–</td>
<td>Dehydration</td>
</tr>
</tbody>
</table>

For other products, please visit the Wako Online Catalog [https://labchem-wako.fujifilm.com/](https://labchem-wako.fujifilm.com/)
## Presep® Series ; Solid-Phase Extraction Columns

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Amount of filler (mg/cartridge)</th>
<th>Use</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presep® (Luer Lock) Polyamide C-200 Type M</td>
<td>2000 / 25 mL</td>
<td>for Sample Pretreatment (crude drug)</td>
<td>10 each × 5</td>
<td>298-33571</td>
</tr>
<tr>
<td>Presep®-C C18 (ODS) (Short)</td>
<td>470</td>
<td></td>
<td>10 each × 5</td>
<td>297-47451</td>
</tr>
<tr>
<td>Presep®-C C18 (ODS)</td>
<td>900</td>
<td></td>
<td>10 each × 5</td>
<td>292-32251</td>
</tr>
<tr>
<td>Presep® C18 (ODS)</td>
<td>2000 / 25 mL</td>
<td></td>
<td>100 each</td>
<td>296-34091</td>
</tr>
<tr>
<td>Presep® C18 (ODS) Type M</td>
<td>5000 / 25 mL</td>
<td></td>
<td>20 each</td>
<td>293-48553</td>
</tr>
<tr>
<td>Presep®-C NH₂ (Short)</td>
<td>400</td>
<td></td>
<td>10 each × 5</td>
<td>299-48751</td>
</tr>
<tr>
<td>Presep®-C NH₂</td>
<td>820</td>
<td></td>
<td>10 each × 5</td>
<td>295-48851</td>
</tr>
<tr>
<td>Presep®-C Silica Gel</td>
<td>800</td>
<td></td>
<td>50 each</td>
<td>294-31851</td>
</tr>
<tr>
<td>Presep®-C Alumina</td>
<td>1700</td>
<td></td>
<td>10 each × 5</td>
<td>290-32051</td>
</tr>
<tr>
<td>Presep®-C Florisil®</td>
<td>800</td>
<td></td>
<td>10 each × 5</td>
<td>290-31951</td>
</tr>
<tr>
<td>Presep® Florisil</td>
<td>1000 / 6 mL</td>
<td>for Sample Pretreatment</td>
<td>10 each × 5</td>
<td>291-44051</td>
</tr>
<tr>
<td>Presep®-C Na₂SO₄</td>
<td>2300</td>
<td></td>
<td>100 each</td>
<td>296-32151</td>
</tr>
<tr>
<td>Presep® Diatomaceous Earth, Granular</td>
<td>1000 / 6 mL, 2000 / 15 mL</td>
<td>for Sample Pretreatment</td>
<td>100 each</td>
<td>292-35051</td>
</tr>
<tr>
<td>Presep® (Luer Lock) Diatomaceous Earth, Granular Type M</td>
<td>4500 / 25 mL</td>
<td></td>
<td>100 each</td>
<td>298-35151</td>
</tr>
<tr>
<td>Presep®-C RPP (Short)</td>
<td>190</td>
<td></td>
<td>10 each × 5</td>
<td>297-41851</td>
</tr>
<tr>
<td>Presep®-C RPP (Long)</td>
<td>360</td>
<td></td>
<td>10 each × 3</td>
<td>293-41951</td>
</tr>
<tr>
<td>Presep® RPP</td>
<td>60 / 3 mL, 200 / 6 mL, 500 / 6 mL</td>
<td></td>
<td>10 each × 5</td>
<td>294-36851</td>
</tr>
<tr>
<td>Presep® RPP-SAX</td>
<td>60 / 3 mL</td>
<td></td>
<td>10 each × 10</td>
<td>297-33301</td>
</tr>
<tr>
<td>Presep® RPP-WAX</td>
<td>60 / 3 mL</td>
<td></td>
<td>10 each × 10</td>
<td>293-33941</td>
</tr>
<tr>
<td>Presep® DEA</td>
<td>250 / 6 mL</td>
<td></td>
<td>10 each × 5</td>
<td>292-61701</td>
</tr>
<tr>
<td>Presep® QA</td>
<td>250 / 6 mL</td>
<td></td>
<td>10 each × 5</td>
<td>296-61601</td>
</tr>
<tr>
<td>Presep® CM</td>
<td>250 / 6 mL</td>
<td></td>
<td>10 each × 5</td>
<td>298-61801</td>
</tr>
<tr>
<td>Presep® S</td>
<td>250 / 6 mL</td>
<td></td>
<td>10 each × 5</td>
<td>294-61901</td>
</tr>
<tr>
<td>Presep® PFC-II</td>
<td>60 / 3 mL</td>
<td>for Sample Pretreatment (PFCs)</td>
<td>10 each × 10</td>
<td>291-33441</td>
</tr>
<tr>
<td>Presep®-C PFC (Short)</td>
<td>220</td>
<td></td>
<td>10 each × 5</td>
<td>297-49651</td>
</tr>
<tr>
<td>Presep®-C Agri (Short)</td>
<td>220</td>
<td></td>
<td>10 each × 5</td>
<td>296-32651</td>
</tr>
<tr>
<td>Presep®-Agri</td>
<td>500 / 6 mL</td>
<td></td>
<td>50 each</td>
<td>291-26851</td>
</tr>
<tr>
<td>Presep®-C DNPH (Short)</td>
<td>400</td>
<td></td>
<td>20 each</td>
<td>291-43951</td>
</tr>
<tr>
<td>Presep®-C DNPH</td>
<td>800</td>
<td></td>
<td>20 each</td>
<td>290-34251</td>
</tr>
<tr>
<td>Presep®-C Ozone Scrubber</td>
<td>1300</td>
<td></td>
<td>20 each</td>
<td>293-40351</td>
</tr>
<tr>
<td>Presep® Multilayer Silica Gel</td>
<td></td>
<td></td>
<td>5 each</td>
<td>295-41651</td>
</tr>
<tr>
<td>Presep® Active Carbon-impregnated Silica Gel</td>
<td>1000</td>
<td>for Dioxins Analysis</td>
<td>10 each</td>
<td>293-41451</td>
</tr>
<tr>
<td>Presep® Active Carbon-impregnated Silica Gel (Reverse Column)</td>
<td>1000</td>
<td></td>
<td>5 each</td>
<td>297-43051</td>
</tr>
<tr>
<td>Presep® PolyChelate</td>
<td>250 / 3 mL</td>
<td>for Trapping of Metal Elements</td>
<td>10 each × 5</td>
<td>296-33491</td>
</tr>
<tr>
<td>Presep® Dehydration, 48WELL PLATE</td>
<td>3 mL</td>
<td>for Organic Synthesis</td>
<td>10 each</td>
<td>299-44351</td>
</tr>
</tbody>
</table>
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
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.

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
  - For glass barrel OD of ≥ 7.6 mm, needle length should be ≥ 70 mm
- <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.

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Bottle Size</th>
<th>Package Size</th>
<th>Wako Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-sealed Storage Bottle, Brown</td>
<td>1 mL</td>
<td>1 bottle</td>
<td>296-34731</td>
</tr>
<tr>
<td></td>
<td>2 mL</td>
<td>1 bottle</td>
<td>293-34741</td>
</tr>
<tr>
<td></td>
<td>5 mL</td>
<td>1 bottle</td>
<td>297-34761</td>
</tr>
<tr>
<td></td>
<td>10 mL</td>
<td>1 bottle</td>
<td>294-34771</td>
</tr>
</tbody>
</table>

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/

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