COSMOSIL

# COSMOSIL COSMOCORE

High Performance Liquid Chromatography

10th Edition

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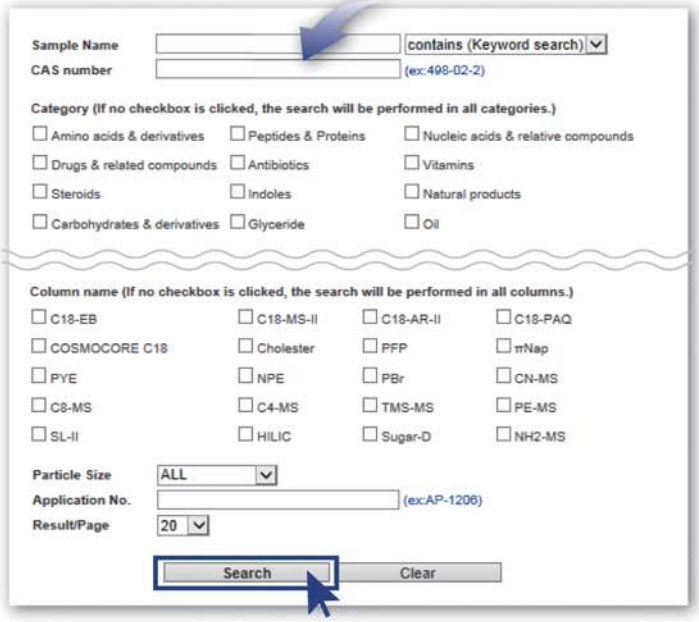
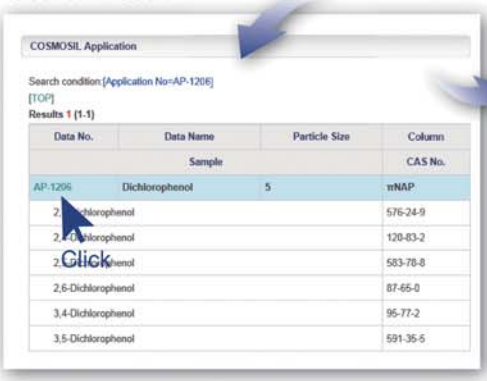


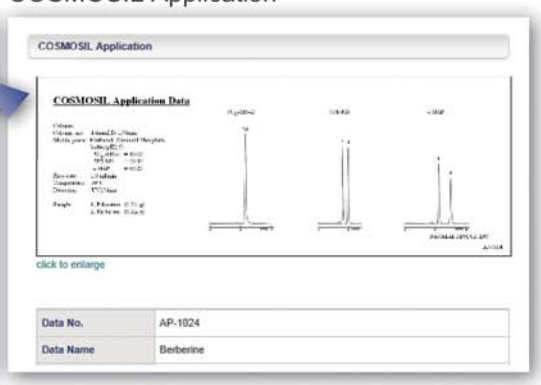

Applications are searched by

1. Sample Category
2. Sample Name
3. CAS No.
4. Column Name
5. Particle Size

Search Result




COSMOSIL Application



# INDEX



COSMOSIL

# COSMOSIL / COSMOGEL Packing Material List

## Core-Shell Columns

| Sample | Separation Mode | Packing Material | Bonded Phase | Bonding Type | Average Particle Size (μm) | Average Pore Size (Å) | Carbon Content (%) | Special Features and Applications | USP Category | Page |
|---|---|---|---|---|---|---|---|---|---|---|
| Organic compounds (low M.W.) | Reversed phase | $C_{18}$ | Octadecyl group | Polymeric | 2.6 | 90 | 7 | Multi-purpose $C_{18}$ column | L1 | 5, 6 |
| | | Cholester | Cholesteryl group | Mono-meric | | | - | Usable under the same condition as $C_{18}$. Unique rigid cholesteryl structure improves separation. | L101 | 5, 8 |
| | | PBr NEW | Pentabromobenzyl group | | | | | Separate hydrophilic compounds under reversed-phase conditions. | - | 5,10 |

## HPLC Columns

| Sample | Separation Mode | Packing Material | Bonded Phase | Bonding Type | Average Particle Size (μm) | Average Pore Size (Å) | Carbon Content (%) | Special Features and Applications | USP Category | Page |
|---|---|---|---|---|---|---|---|---|---|---|
| Organic compounds (low M.W.) | Reversed phase | $C_{18}$-MS-II | Octadecyl group | Mono-meric | 2.5 | 130 | 18 | Multi-purpose $C_{18}$ column | L1 | 14, 15 |
| | | | | | 3, 5,15 | 120 | 16 | | | |
| | | $C_{18}$-AR-II | | Polymeric | 3, 5,15 | 120 | 17 | Features strong acid resistance, good for acidic compounds and peptides. | | 14, 17 |
| | | $C_{18}$-PAQ | | | 5,15 | | 11 | Good for hydrophilic compounds, and stable performance under 100% aqueous conditions. | | 14, 19 |
| | | $C_{18}$-EB | | Mono-meric | 3 | | 14.5 | Good for basic compounds | | 14, 21 |
| | | Cholester | Cholesteryl group | Mono-meric | 2.5 | 130 | 21 | Usable under the same conditions as $C_{18}$. Unique rigid cholesteryl structure improves separation. | L101 | 22, 23 |
| | | | | | 5 | 120 | 20 | | | |
| | | PBr | Pentabromobenzyl group | | 5 | 120 | 8 | Separate hydrophilic compounds under reversed-phase conditions. | - | 22, 25 |
| | | πNAP | Naphthylethyl group | | 2.5 | 130 | 14 | Stronger π-π interaction than phenyl column. | | 22, 26 |
| | | | | | 5 | 120 | 11 | | | |
| | | PYE | Pyrenylethyl group | | 5 | 120 | 18 | The most powerful π-π interaction | | 22, 28 |
| | | NPE | Nitrophenylethyl group | | | | 9 | Separation utilizing dipole-dipole interaction. | | 22, 29 |
| | | PFP | Pentafluorophenyl group | | | | 10 | Separation utilizing weak dipole-dipole interaction. | L43 | 30, 31 |
| | | CN-MS | Cyanopropyl group | | | | 7 | Enables separation of different hydrophobic samples without using gradients. | L10 | 30, 32 |
| | | $C_{22}$-AR-II | Docosyl group | Polymeric | | | 19 | Alkyl chain columns, excluding $C_{18}$ column | - | 30, 33 |
| | | $C_8$-MS | Octyl group | Mono-meric | | | 10 | | L7 | |
| | | $C_4$-MS | Butyl group | | | | 7 | | L26 | |
| | | TMS-MS | Trimethyl group | | | | 5 | | L13 | |
| | | PE-MS | Phenylethyl group | | | | 10 | π-π interaction | L11 | |
| | Normal phase | SL-II | -- | - | 3, 5,15 | 120 | - | Suitable for preparative separation. | L3 | 34 |
| | Hydrophilic interaction | HILIC | Triazole | - | 2.5 | 130 | - | Retains highly polar compounds that would not be retained in a $C_{18}$ olumn. | L104 | 35 |
| | | | | | 5 | 120 | | | | |
| Mono- and Oligo-saccharides | Hydrophilic interaction | Sugar-D | Secondary/Tertiary amine | - | 5 | - | - | A novel stationary phase for mono- and oligosaccharides. | - | 37, 38 |
| | | $NH_2$-MS | Aminopropyl group | Polymeric | | 120 | 4 | Primary amino bonded column | L8 | 37, 39 |
| Proteins | Reversed phase | Protein-R | Octadecyl group | Polymeric | 5 | 300 | - | Wide-pore column with the advantages of both $C_{18}$ and $C_4$ | L1 | 40 |
| | | $C_{18}$-AR-300 | | | | | 12 | Wide pore type | L1 | 41 |
| | | $C_8$-AR-300 | Octyl group | | | | 7 | | L7 | |
| | | $C_4$-AR-300 | Butyl group | | | | 6 | | L26 | |
| | | Ph-AR-300 | Phenyl group | | | | 7 | | L11 | |
| | Gel permeation | Diol-120-II | Diol group | - | 5 | 120 | - | Silica-based gel filtration column Sample MW (Protein) 5,000-100,000 Da | L20 | 43 |
| | | Diol-300-II | | | | 300 | | Silica-based gel filtration column Sample MW (Protein) 10,000-700,000 Da | | |
| | | Diol-1000-II NEW | | | | 1000 | | Silica-based gel filtration column Sample MW (Water Soluble Polymer) 50,000–500,000 Da | | |
| | Ion-exchange | IEX Type Q | Trimethylaminopropyl type | - | 5 | 1000 | - | Anion-exchange type (purification) | | 45 |
| | | IEX Type Q-N | | | | - | | Anion-exchange type (ultra-fast analysis, precise analysis) | | |
| | | IEX Type S | Sulfopropyl type | | | 1000 | | Cation-exchange type (purification) | | |
| | | IEX Type S-N | | | | - | | Cation-exchange type (ultra-fast analysis, precise analysis) | | |
| | | IEX Type M | Trimethylaminopropyl type /Sulfopropyl type | | | 1000 | | Amphoteric ion-exchange type (purification) | | |
| | | IEX Type M-N | | | | - | | Amphoteric ion-exchange type (precise analysis) | | |
| | Hydrophobic interaction | HIC | -- | - | 5 | 300 | - | Little loss in enzyme activity and the tertiary structure of proteins | | 47 |

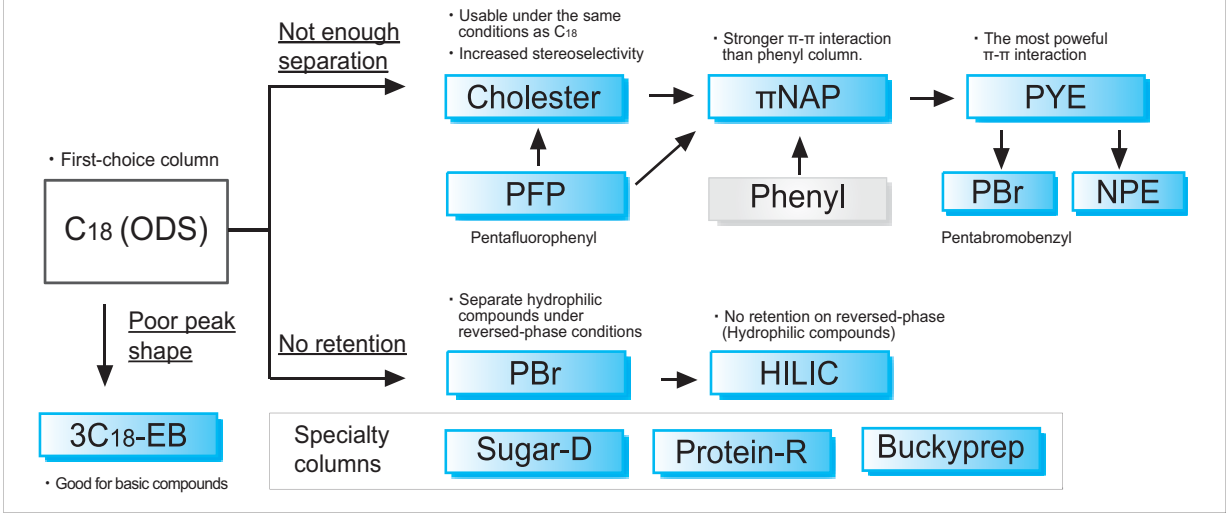
| Sample | Separation Mode | Packing Material | Bonded Phase | Bonding Type | Average Particle Size (µm) | Average Pore Size ( Å ) | Carbon Content (%) | Special Features and Applications | USP Category | Page |
|---|---|---|---|---|---|---|---|---|---|---|
| Fullerenes | -- | Buckyprep | Pyrenylpropyl group | Mono-meric | 5 | 120 | 17 | Standard column for fullerene separation. | | 48, 49 |
| | | Buckyprep-D | Nitro-carbazoyl group | | | | - | Good for derivatized fullerenes | | 48, 50 |
| | | Buckyprep-M | Phenothiazinyl group | | | | 13 | Good for metallofullerenes | | 48, 51 |
| | | PBB | Pentabromobenzyl group | | | | 8 | Good for preparative separation of $C_{60}$ or $C_{70}$. | | 48, 52 |
| | | NPE | Nitrophenylethyl group | | | | 9 | Separation of derivatized fullerenes | | 48, 53 |
| | | PYE | Pyrenylethyl group | | | | 18 | Separation of fullerenes | | 48, 52 |
| Carbon nanotubes | Gel permeation | CNT-300 | Hydrophilic group (neutral) | - | 5 | 300 | - | Separation of soluble carbon nanotubes. | | 54 |
| | | CNT-1000 | | | | 1000 | | | | |
| | | CNT-2000 | | | | 2000 | | | | |

## SFC Columns

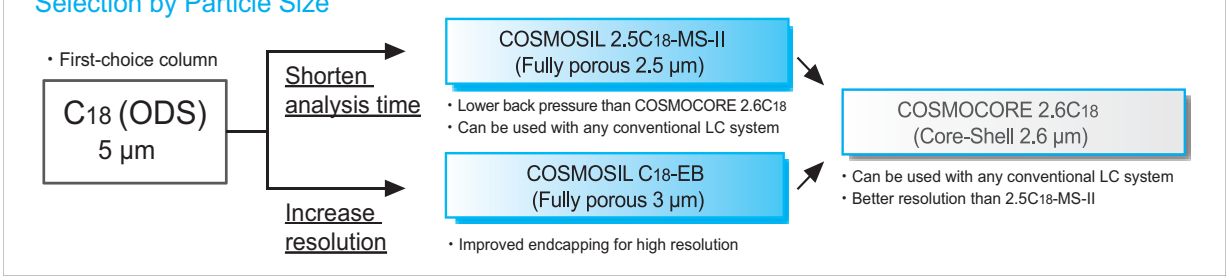
| Sample | Separation Mode | Packing Material | Bonded Phase | Bonding Type | Average Particle Size (µm) | Average Pore Size ( Å ) | Carbon Content (%) | Special Features and Applications | USP Category | Page |
|---|---|---|---|---|---|---|---|---|---|---|
| - | SFC | HP NEW | 3-Hydroxyphenyl group | Polymeric | 3, 5 | 120 | - | Good for hydrophilic compounds. Stronger retention for basic compounds than PY | - | 55, 56 |
| | | PY NEW | Pyridinyl group | | | | | Similar separation properties as 2-Ethylpyridine, with stronger retention. | | 55, 57 |
| | | Quinoline NEW | Quinoline group | Mono-meric | 2.5, 5 | 130 | | Alternate selectivity to HP and PY. | | 55, 58 |
| | | Cholester | Cholesteryl group | | 2.5 | 130 | 21 | Usable under the same conditions as $C_{18}$. Unique rigid cholesteryl structure improves separation. | L101 | 55, 59 |
| | | | | | 5 | 120 | 20 | | | |
| | | PBr | Pentabromobenzyl group | | 5 | 120 | 8 | Separate hydrophilic compounds under reversed-phase conditions. | | 55, 59 |

# Column Selection Guide

### Selection by Stationary Phase Type



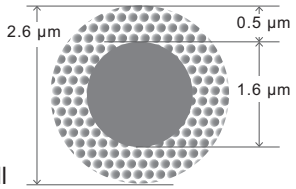

### Selection by Particle Size



# I. HPLC Columns

## 1. Core-Shell Columns

### (1) COSMOCORE Series



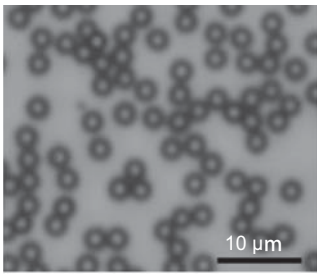
Schematic diagram of a silica particle

#### About Core-Shell Particles

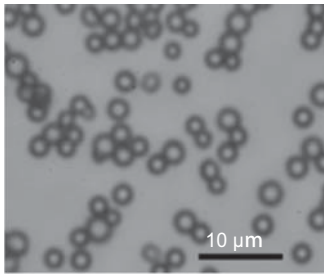
Core-shell particles consist of a nonporous core inside a porous shell. By using these core-shell particles, one can achieve sharper peaks compared to fully porous silica gel particles of the same diameter.

#### Uniform Particle Size Distribution Compared to 1.7 µm Particles

Compared to fully porous particles, core-shell particles have a more uniform particle diameter; therefore, core-shell particles can be packed in the column more uniformly to minimize sample diffusion.



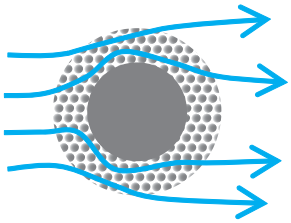
COSMOCORE 2.6C18 (200x)

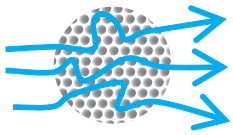


Fully porous 1.7 µm particles (200x)

#### Mass Transfer Equivalent to Fully Porous sub-2 µm Particles

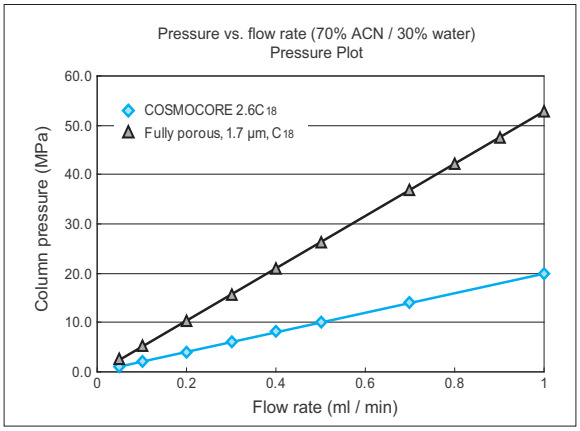
Mass transfer refers to the time it takes for a sample molecule to enter and leave a particle. In general, lower mass transfer time corresponds to less diffusion and sharper peaks. Even though COSMOCORE 2.6C18 has a larger particle diameter than fully porous sub-2 µm particles, the mass transfer characteristics are similar.

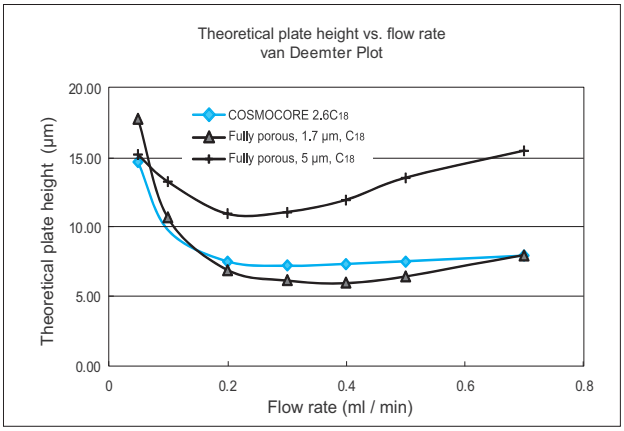

COSMOCORE 2.6C18


Fully porous sub-2 µm particle

#### Reduced Back Pressure and Faster Analyses

COSMOCORE 2.6C18 delivers performance equivalent to sub-2 µm particles at faster flow rate and analysis time while maintaining a lower back pressure. COSMOCORE can also be used in longer column size to gain additional resolution.



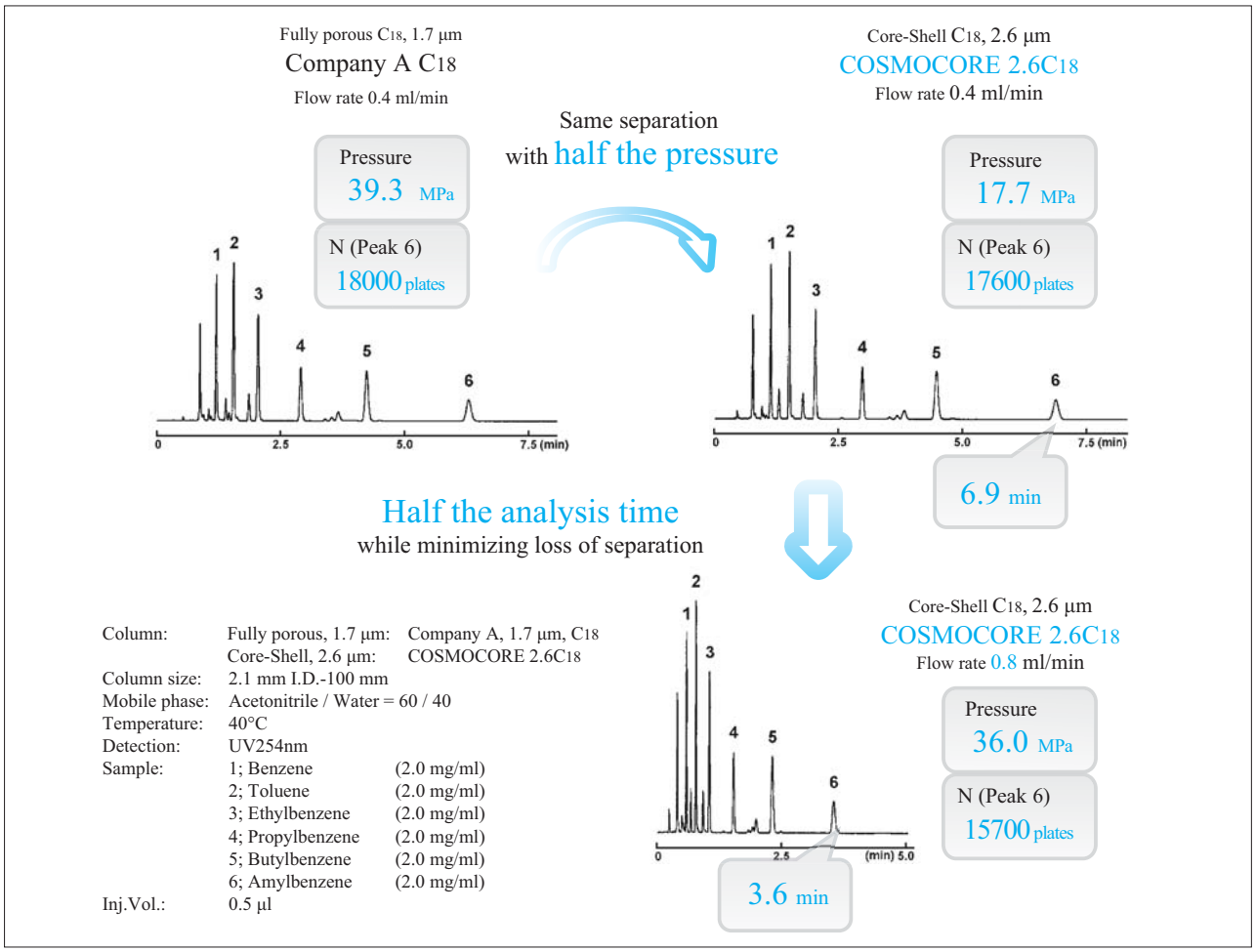




Column size: 2.1 mm I.D. x 50 mm
Mobile phase: Acetonitrile / Water = 70 / 30
Temperature: 40ºC
Sample: Amylbenzene

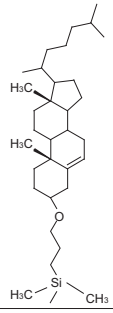
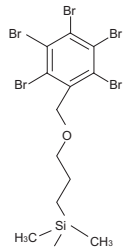
## Same performance and lower back pressure compared to sub-2 µm particles

### Reduced Back Pressure

COSMOCORE 2.6C18 maintains the same performance as sub-2 µm particles with half the back pressure.




## Specifications

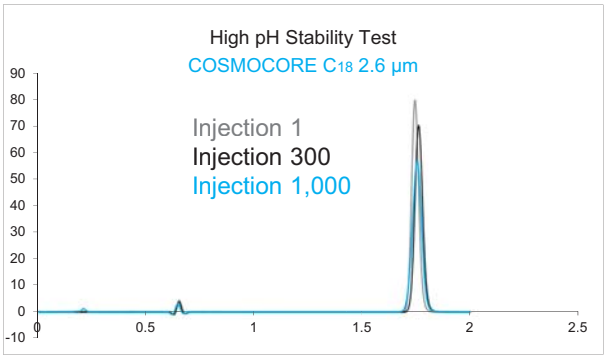
| Packing Material | 2.6C18 | 2.6Cholester | 2.6PBr |
|---|---|---|---|
| Silica Gel | Core-shell type silica gel | | |
| Average Particle Size | 2.6 µm | | |
| Average Core Diameter | 1.6 µm | | |
| Average Pore Size | approx. 90 Å | | |
| Specific Surface Area | approx. 150 $m^2/g$ | | |
| Bonded Phase Structure |  |  |  |
| Bonded Phase | Octadecyl group | Cholesteryl group | Pentabromobenzyl Group |
| Main interaction | Hydrophobic interaction | Hydrophobic interaction<br>Molecular shape selectivity | Hydrophobic interaction<br>Dispersion force |
| End-Capping Treatment | Near-perfect treatment | | |
| Usable pH Range | 1.5 - 10 | 2 - 7.5 | |
| Maximum Pressure | 60 MPa | | |

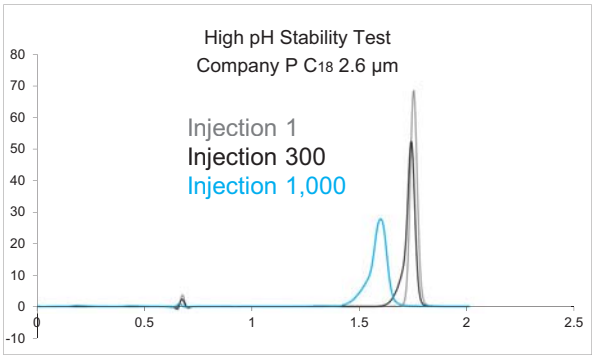
# COSMOCORE 2.6C18

- Ultra-high performance LC results with conventional HPLC equipment
- Same number of theoretical plates as sub-2 µm columns with half the back pressure
- Increased loading capacity
- Excellent pH stability (1.5-10)

## Excellent pH Stability

Under accelerated pH 10.4, 40°C stability test, COSMOCORE C18 shows superior stability compared with other core-shell C18 phases.




| | | | |
|---|---|---|---|
| Column size: | 2.1 mm x 100 mm | Mobile phase: | 0.35% Ammonium hydroxide/ acetonitrile = 90/10 (pH 10.4) |
| Sample: | Caffeine (0.05 mg/ml) | Injection volume: | 1 µl |
| Flow rate: | 0.4 ml/min. | Temperature: | 40 °C |

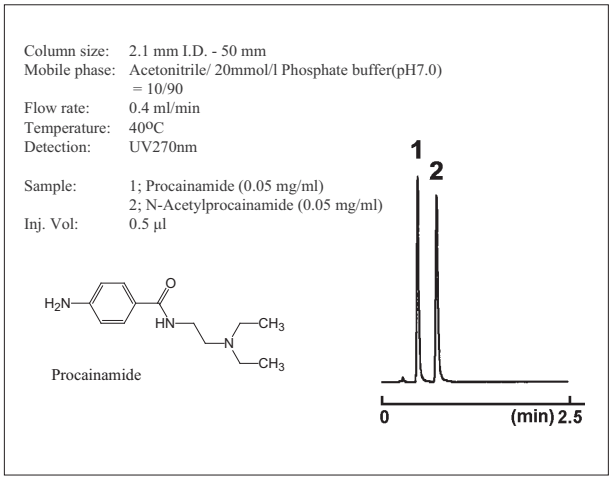
## Sharp Peaks with Many Types of Compounds

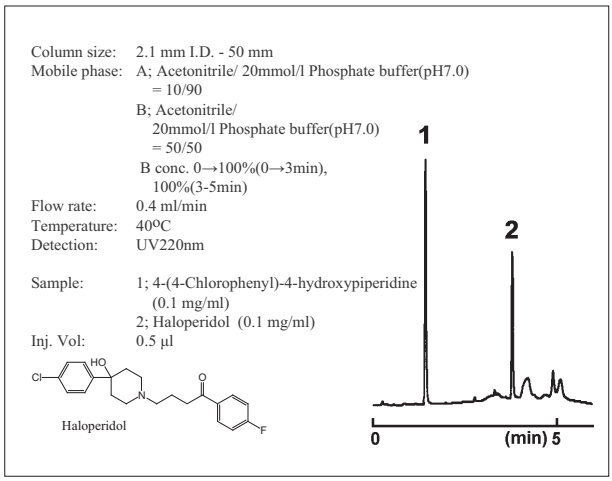
COSMOCORE 2.6C18 features a special end capping treatment that effectively shields residual silanol groups, yielding sharp peaks for basic compounds and metal coordination complexes.

### Basic Compounds

- **Amitriptyline**

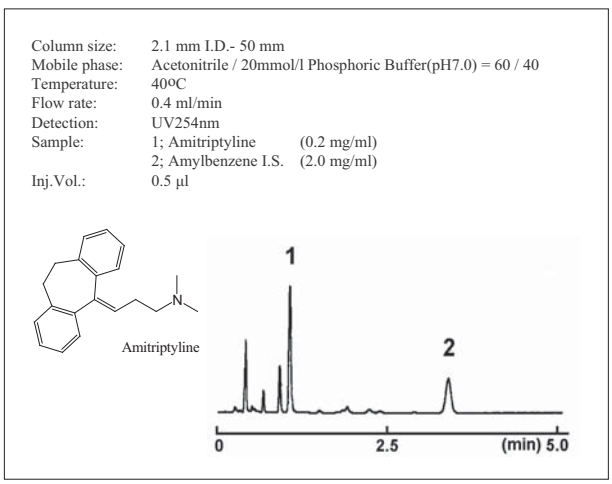
- **Haloperidol**

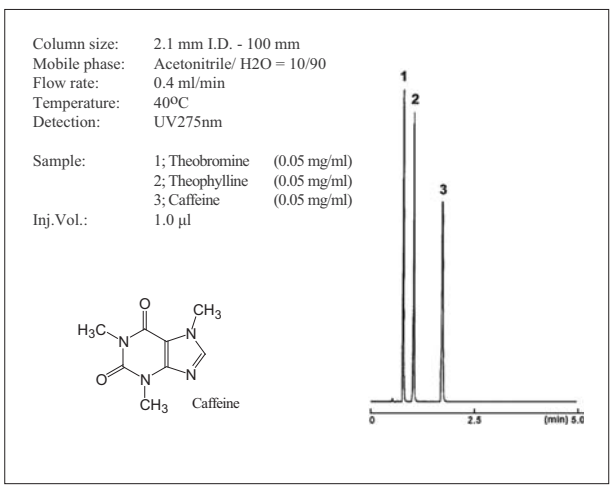



- **Procainamide**

- **Caffeine**

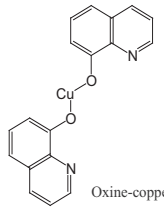


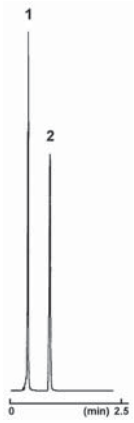
## Metal Coordination Complexes

- **Oxine-Copper**

Column size: 2.1 mm I.D.-50 mm
Mobile phase: Acetonitrile / 20mmol/l Phosphoric Acid = 10 / 90
Temperature: 40°C
Flow rate: 0.4 ml/min
Detection: UV254nm
Sample: 1; Oxine-copper (0.003 mg/ml)
2; Caffeine (I.S.) (0.3 mg/ml)
Inj.Vol.: 0.5 µl



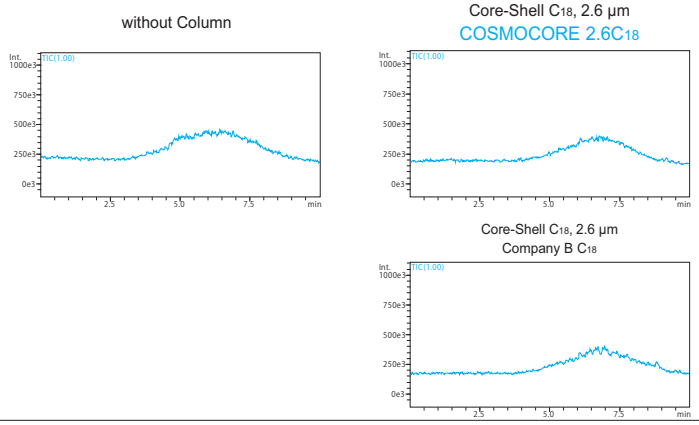
Oxine-copper




## Low Bleed-Suitable for LC-MS

COSMOCORE 2.6C18 has low column bleed and consequently low MS noise level.

Column size: 2.1 mm I.D.-50 mm
Mobile phase: A: 0.1% Formic Acid
B: Acetonitrile
B conc.
5→100% (0 - 5 min), 100% (5 -10 min),
100→5% (10 - 11 min), 5% (11 - 17 min)
Flow rate: 0.2 ml/min
Temperature: 40°C
Detection: MS (TIC (+), MW 50-1000)




## Ordering Information

- Analytical Columns (Particle Size: 2.6 µm)

**COSMOCORE 2.6C18 Packed Columns**

| Column Size I.D. x Length (mm) | Product Number | Column Size I.D. x Length (mm) | Product Number | Column Size I.D. x Length (mm) | Product Number |
|---|---|---|---|---|---|
| 2.1 x 30 | 12632-31 | 3.0 x 30 | 12611-01 | 4.6 x 30 | 12601-31 |
| 2.1 x 50 | 12631-41 | 3.0 x 50 | 12609-51 | 4.6 x 50 | 12600-41 |
| 2.1 x 75 | 12630-51 | 3.0 x 75 | 12608-61 | 4.6 x 75 | 12599-91 |
| 2.1 x 100 | 12614-71 | 3.0 x 100 | 12607-71 | 4.6 x 100 | 12598-01 |
| 2.1 x 150 | 12612-91 | 3.0 x 150 | 12602-21 | 4.6 x 150 | 12597-11 |
| | | | | 4.6 x 250 | 12596-21 |

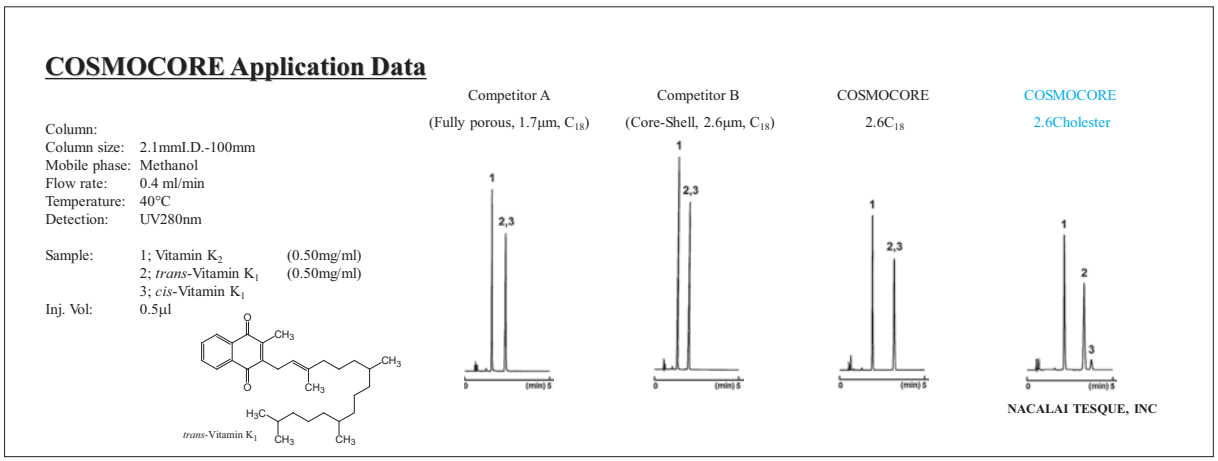
COSMOCORE's connector is the same type as Waters UPLC® columns.
For UHPLC-compatible prefilters, refer to page 13.

# COSMOCORE 2.6Cholester

- Cholesterol-bonded reversed-phase core-shell column
- Usable under the same conditions as $C_{18}$ columns
- Better selectivity for cis-trans isomers, polyphenols, and natural products

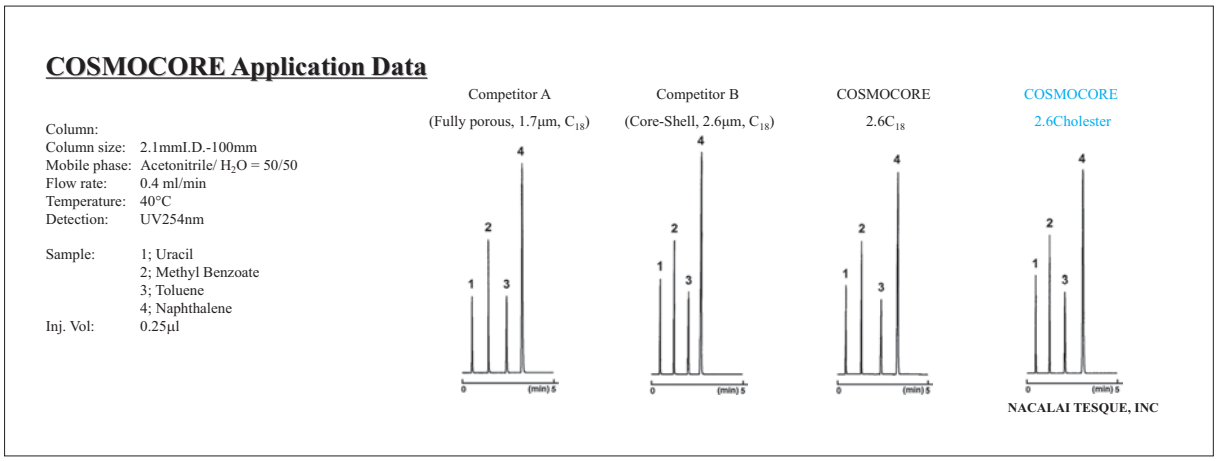
## Comparison with $C_{18}$

COSMOCORE 2.6Cholester offers improved separation for cis-trans isomers than $C_{18}$ under typical reversed-phase mobile phase.



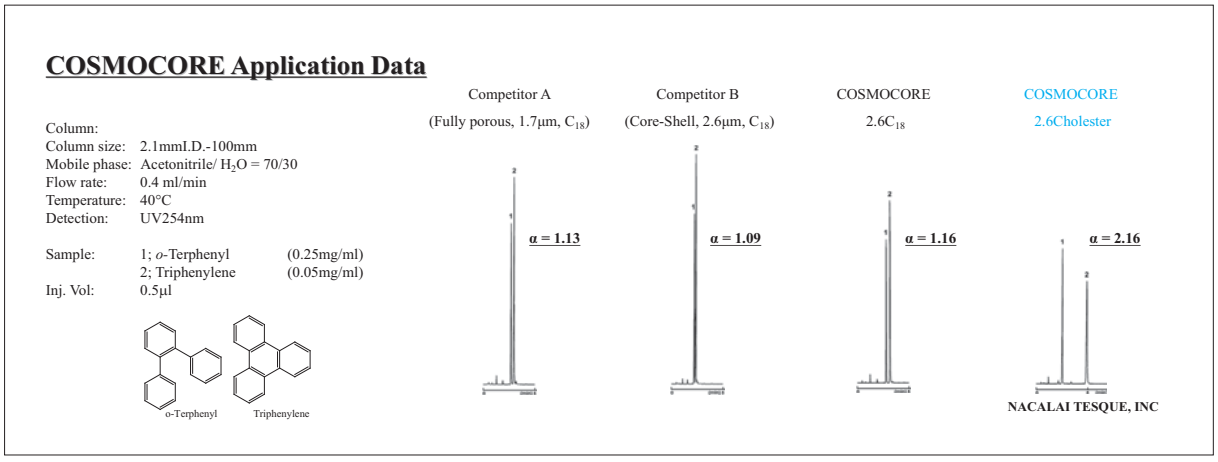

## Separation Properties

COSMOCORE 2.6Cholester has about the same hydrophobicity as $C_{18}$. It is not necessary to change the analytical conditions when replacing $C_{18}$ Columns with COSMOCORE 2.6Cholester.




## Molecular Shape Selectivity

COSMOCORE 2.6Cholester has excellent shape slectivity due to its structural rigidity. COSMOCORE 2.6Cholester retains planar triphenylene longer than non planar *o*-terphenyl.



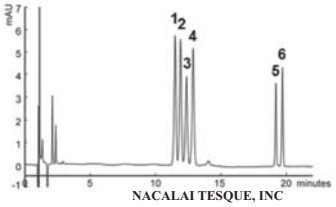
## Applications

- **Vitamin D metabolites**

**COSMOCORE Application Data**

Column: COSMOCORE 2.6Cholester
Column size: 2.1mmI.D.-150mm
Mobile phase: A; 0.1% Formic acid-$H_2O$
B; Methanol
B conc. 75→82% (0→11min), 95% (11→25min)
Flow rate: 0.3 ml/min
Temperature: 50°C
Detection: UV265nm

Sample:
1; *25*-Hydroxyvitamin $D_3$
2; *3-epi-25*-Hydroxyvitamin $D_3$
3; *25*-Hydroxyvitamin $D_2$
4; *3-epi-25*-Hydroxyvitamin $D_2$
5; Vitamin $D_2$ [Calciferol]
6: Vitamin $D_3$




NACALAI TESQUE, INC

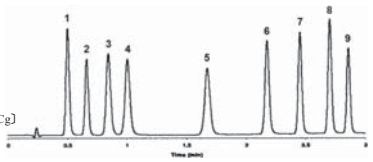
*Data courtesy of a customer*

AP-1514

- **Catechins**

**COSMOCORE Application Data**

Column: COSMOCORE 2.6Cholester
Column size: 2.1mmI.D.-50mm
Mobile phase: A; Acetonitrile/ 0.1% $H_3PO_4$ = 10/90
B; Acetonitrile/ 0.1% $H_3PO_4$ = 40/60
B conc. 0→100% 3min Linear gradient
Flow rate: 0.6 ml/min
Temperature: 30°C
Detection: UV280nm
Sample:
1; (-)-Gallocatechin[(-)-GC]
2; Caffeine
3; (-)-Epigallocatechin[(-)-EGC]
4; (-)-Catechin[(-)-C]
5; (-)-Epicatechin[(-)-EC]
6; (-)-Epigallocatechin Gallate[(-)-EGCg]
7; (-)-Gallocatechin Gallate[(-)-GCg]
8; (-)-Epicatechin Gallate[(-)-ECg]
9; (-)-Catechin Gallate[(-)-Cg]




NACALAI TESQUE, INC

*Data courtesy of a customer*

## Ordering Information

- Analytical Columns (Particle Size: 2.6 µm)

**COSMOCORE 2.6Cholester Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 2.1 x 30 | 12858-91 |
| 2.1 x 50 | 12859-81 |
| 2.1 x 75 | 12860-41 |
| 2.1 x 100 | 12861-31 |
| 2.1 x 150 | 12862-21 |

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 3.0 x 30 | 12863-11 |
| 3.0 x 50 | 12864-01 |
| 3.0 x 75 | 12866-81 |
| 3.0 x 100 | 12867-71 |
| 3.0 x 150 | 12868-61 |

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 30 | 12869-51 |
| 4.6 x 50 | 12870-11 |
| 4.6 x 75 | 12871-01 |
| 4.6 x 100 | 12872-91 |
| 4.6 x 150 | 12873-81 |
| 4.6 x 250 | 12875-61 |

COSMOCORE's connector is the same type as Waters UPLC® columns.
For UHPLC-compatible prefilters, refer to page 13.

# COSMOCORE 2.6PBr

- Separate hydrophilic compounds under reversed-phase conditions
- Retain hydrophilic compounds longer than $C_{18}$
- Greater sample loading capacity than HILIC
- High performance similar to sub-2 µm particles with lower back pressure

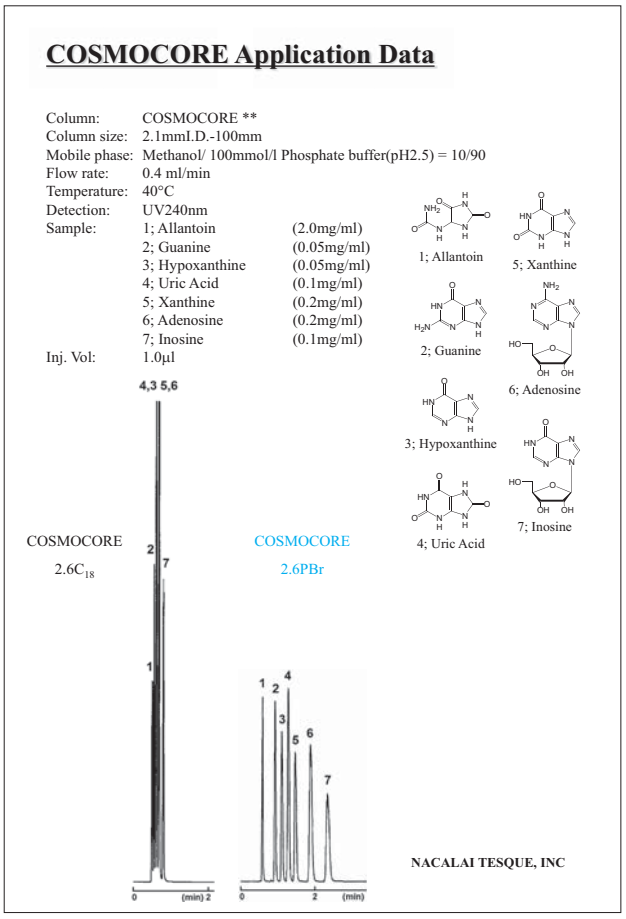
< Suitable Samples >

- Hydrophilic compounds
- Nucleic acids and derivatives
- Surfactants
- Glycosides
- Peptides

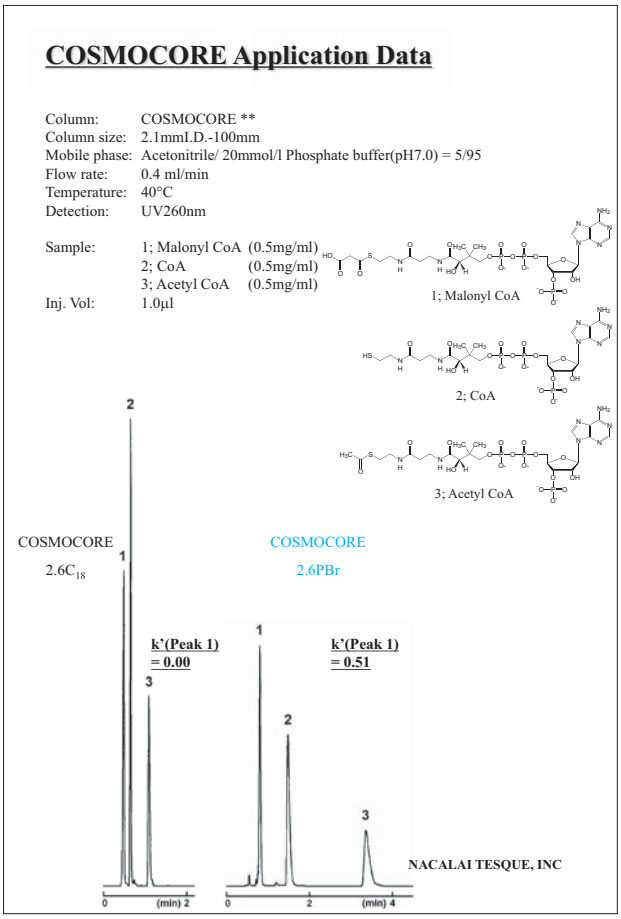
## Separation of Hydrophilic Compounds (low retention on $C_{18}$)

COSMOCORE 2.6PBr retains hydrophilic compounds stronger than $C_{18}$ columns under the same reversed-phase conditions.

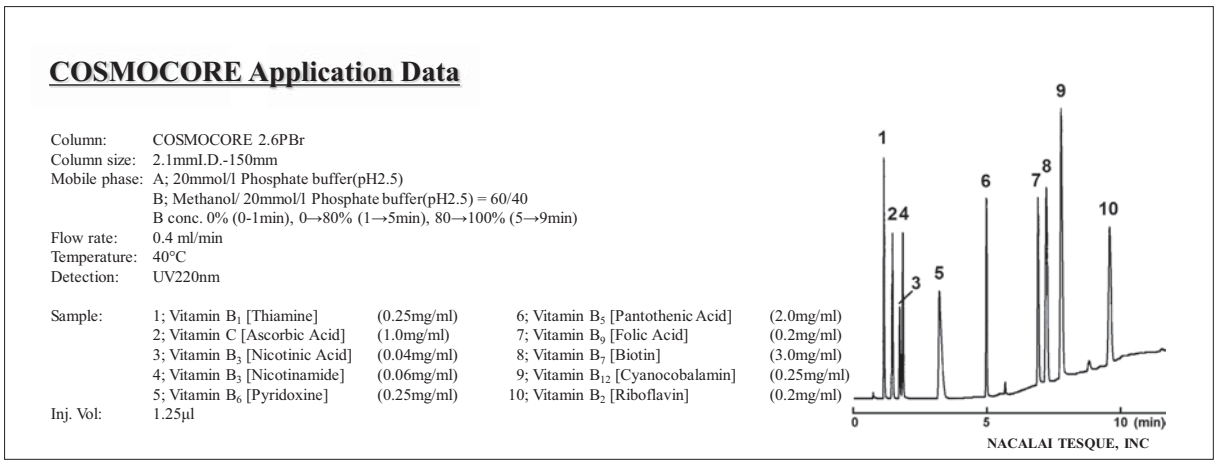
- **Nucleic Acid Metabolites**




- **Malonyl CoA, CoA, Acetyl CoA**



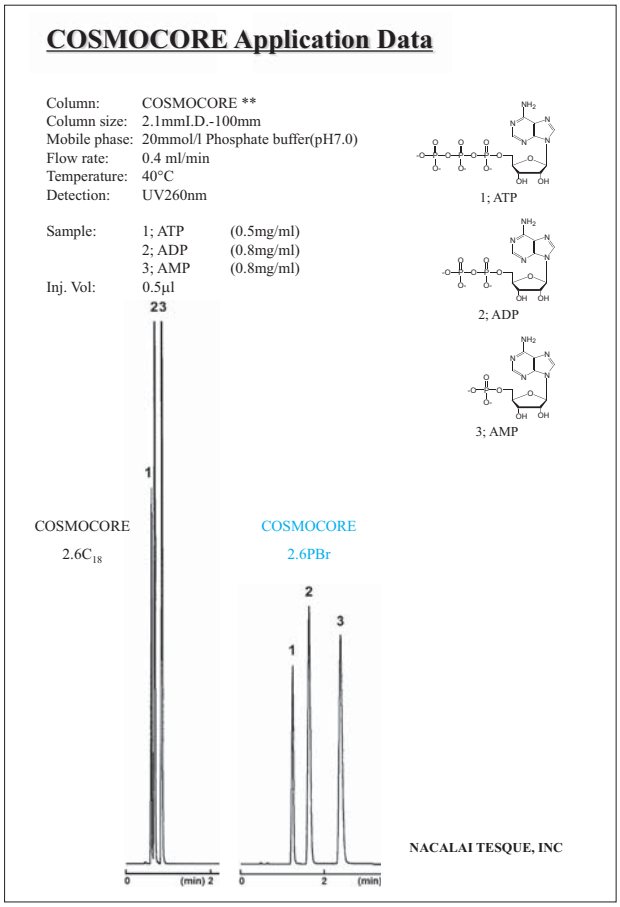

- **Water-Soluble Vitamins**



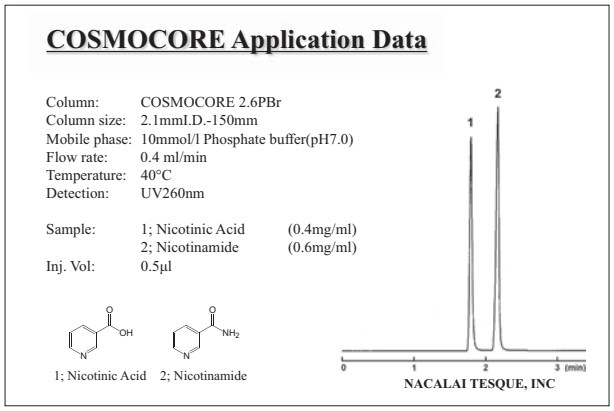
## Separation of Hydrophilic Compounds (compounds with similar hydrophobicity)

COSMOCORE 2.6PBr can separate compounds with similar hydrophobicity, utilizing several kinds of molecular interactions, including dispersion force generated by the bromine atoms.

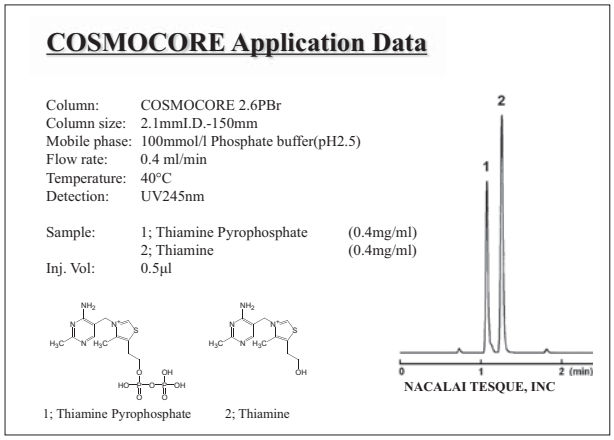
- **ATP, ADP, AMP**




- **Vitamin B3 (Nicotinic Acid, Nicotinamide)**



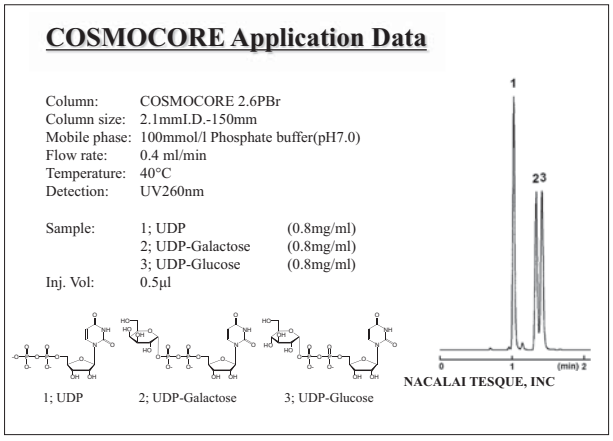

- **Thiamine Pyrophosphate, Thiamine**



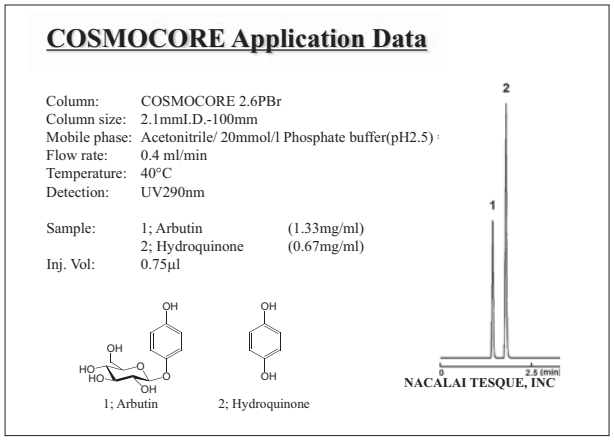

## Separation of Hydrophilic Compounds (Glycosides)

Glycosides with identical aglycones but different glycosyl groups can also be separated.

- **UDP Glycosides**




- **Arbutin and Hydroquinone**




## Ordering Information

- Analytical Columns (Particle Size: 2.6 µm)

**COSMOCORE 2.6PBr Packed Column**

| Column Size I.D. x Length (mm) | Product Number | Column Size I.D. x Length (mm) | Product Number | Column Size I.D. x Length (mm) | Product Number |
|---|---|---|---|---|---|
| 2.1 x 30 | 13692-21 | 3.0 x 30 | 13698-61 | 4.6 x 30 | 13705-51 |
| 2.1 x 50 | 13693-11 | 3.0 x 50 | 13699-51 | 4.6 x 50 | 13712-51 |
| 2.1 x 75 | 13694-01 | 3.0 x 75 | 13700-01 | 4.6 x 75 | 13714-31 |
| 2.1 x 100 | 13695-91 | 3.0 x 100 | 13701-91 | 4.6 x 100 | 13715-21 |
| 2.1 x 150 | 13697-71 | 3.0 x 150 | 13703-71 | 4.6 x 150 | 13719-81 |
| | | | | 4.6 x 250 | 13734-71 |

COSMOCORE's connector is the same type as Waters UPLC® columns.

For UHPLC-compatible prefilters, refer to page 13.

# (2) Instrument Settings and Compatibility

**When using with a conventional (non-UHPLC) instrument**

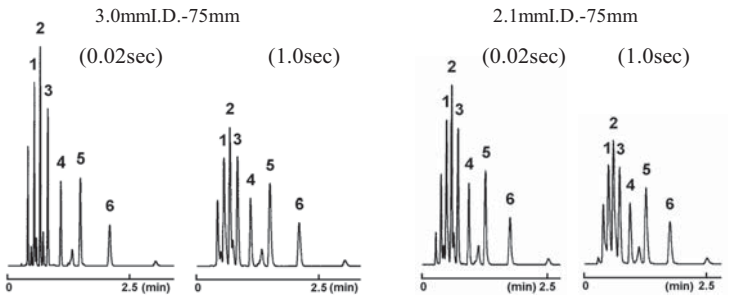
COSMOCORE columns are designed for use with UHPLC instruments. In addition, due to their low backpressure, they can be used with conventional instruments. However, it is necessary to change the following settings.

## Detector Response Time

Because UHPLC analyses are done at high flow rates, a slow response time can adversely affect peak shape. We recommend setting the response time to 0.1 sec or less.

**COSMOCORE Application Data**

| | | |
|---|---|---|
| Column: | COSMOCORE 2.6C$_{18}$ | |
| Column size: | | |
| Mobile phase: | Acetonitrile/ Water = 70 /30 | |
| Flow rate: | 3.0mmI.D.-75mm | 1.0 ml/min |
| | 2.1mmI.D.-50mm | 0.4ml/min |
| Temperature: | 40°C | |
| | UV254nm | |
| Sample: | 1; Benzene | (2.0mg/ml) |
| | 2; Toluene | (2.0mg/ml) |
| | 3; Ethylbenzene | (2.0mg/ml) |
| | 4; Propylbenzene | (2.0mg/ml) |
| | 5; Butylbenzene | (2.0mg/ml) |
| | 6; Amylbenzene | (2.0mg/ml) |
| Inj.Vol.: | 3.0mmI.D.-75mm | 1.0µl |
| | 2.1mmI.D.-50mm | 0.5µl |

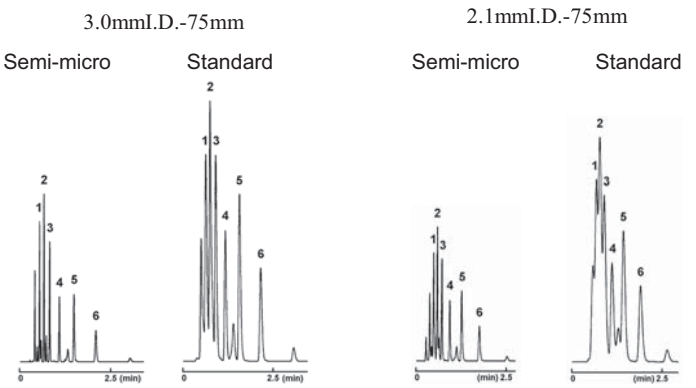



## Other Instrument Parameters

UHPLC is more vulnerable to the effects of dead volume than conventional chromatography. When using a 2.1 mm I.D. column, please use a semi-micro detector cell, injector, and piping (0.1mm).

**COSMOCORE Application Data**

| | | |
|---|---|---|
| Column: | COSMOCORE 2.6C$_{18}$ | |
| Column size: | | |
| Mobile phase: | Acetonitrile/ Water = 70/30 | |
| Flow rate: | 3.0mmI.D.-75mm | 1.0 ml/min |
| | 2.1mmI.D.-50mm | 0.4ml/min |
| Temperature: | 40°C | |
| Detection: | UV254nm | |
| Sample: | 1; Benzene | (2.0mg/ml) |
| | 2; Toluene | (2.0mg/ml) |
| | 3; Ethylbenzene | (2.0mg/ml) |
| | 4; Propylbenzene | (2.0mg/ml) |
| | 5; Butylbenzene | (2.0mg/ml) |
| | 6; Amylbenzene | (2.0mg/ml) |
| Inj.Vol.: | 3.0mmI.D.-75mm | 1.0µl |
| | 2.1mmI.D.-50mm | 0.5µl |




## Fittings and Adapters

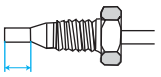
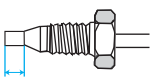
COSMOCORE columns use the same connectors as Waters UPLC® (UHPLC) columns. This is different from our conventional COSMOSIL columns, which use the conventional Waters HPLC-compatible connectors.

(UPLC® is a registered trademark of Waters Corporation.)

**1. Differences between end fitting**

| Connection Type | | Column | |
|---|---|---|---|
| | | HPLC(COSMOSIL) | UHPLC (COSMOCORE) |
| Instrument | HPLC | No adapter required | Adapter required |
| | UHPLC | Adapter required | No adapter required |

HPLC: Conventional Waters-compatible connector
UHPLC: Waters UPLC®-compatible connector

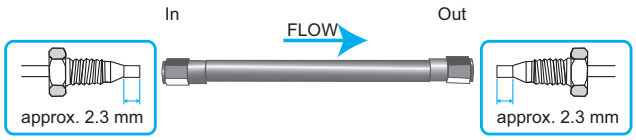
| | HPLC | UHPLC |
|---|---|---|
| Connector Shape |  approx. 3.3 mm |  approx. 2.3 mm |

The length of tubing that extends from the ferrule differs from HPLC to UHPLC.

## 2. COSMOCORE-compatible fittings

### 1) UHPLC instrument fittings

No adapter needed; just connect as-is.

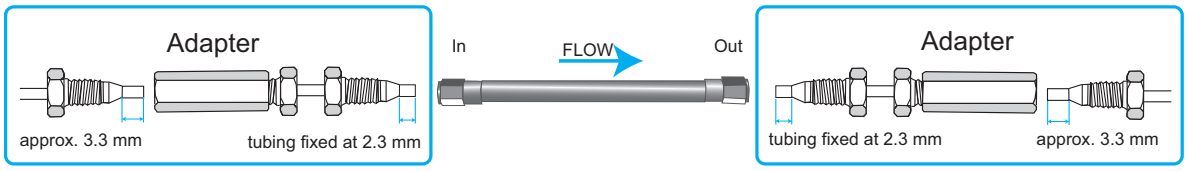



### 2) HPLC instrument fittings

An adapter or movable (high-pressure) fitting is required to connect the fittings to the column. See the examples for different fittings below.

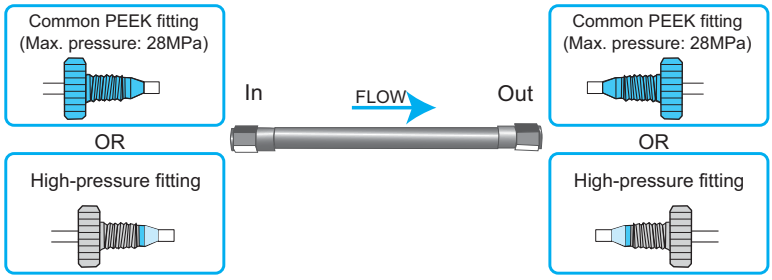
### SUS ferrules (HPLC) fixed on the tubing

The column can be connected by using an adapter (SUS union + tubing fixed to UHPLC length).




### PEEK fittings

PEEK fittings do not fix the length of tubing at the end, so they can be used with both types of column. However, please be cautious of their pressure tolerance.




## Ordering Information

- Adapter List

| Product Name | Description | Product Number | PKG Size |
|---|---|---|---|
| Low & Zero Dead Volume Union | Material: SUS<br>Bore diameter: 0.35 mm | P0402 | 1 PKG |
| COSMOSIL Column Connecting Tube (0.1 mm I.D.) | I.D.: 0.1 mm | 12570-41 | 1 PKG |
| COSMOSIL Column Connecting Tube (0.25 mm I.D.) | I.D.: 0.25 mm | 37843-69 | 1 PKG |

- UHPLC-compatible prefilter

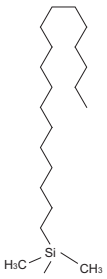
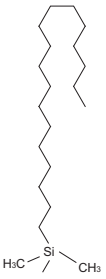
| Product Name | In | Out | Contents | Product Number | PKG Size |
|---|---|---|---|---|---|
| U-Fil UHPLC-compatible prefilter | UHPLC | UHPLC | Filter: 0.5 µm | 12571-31 | 1 SET |
| | HPLC | UHPLC | Tubing connecting diameter:1/16 | 12572-21 | 1 SET |
| U-Fil replacement filter | - | - | Filter: 0.5 µm<br>Material: SUS316L | 15767-91 | 5 units / PKG |

# 2. HPLC Columns

## (1) Reversed Phase Columns

### $C_{18}$ (ODS) Series

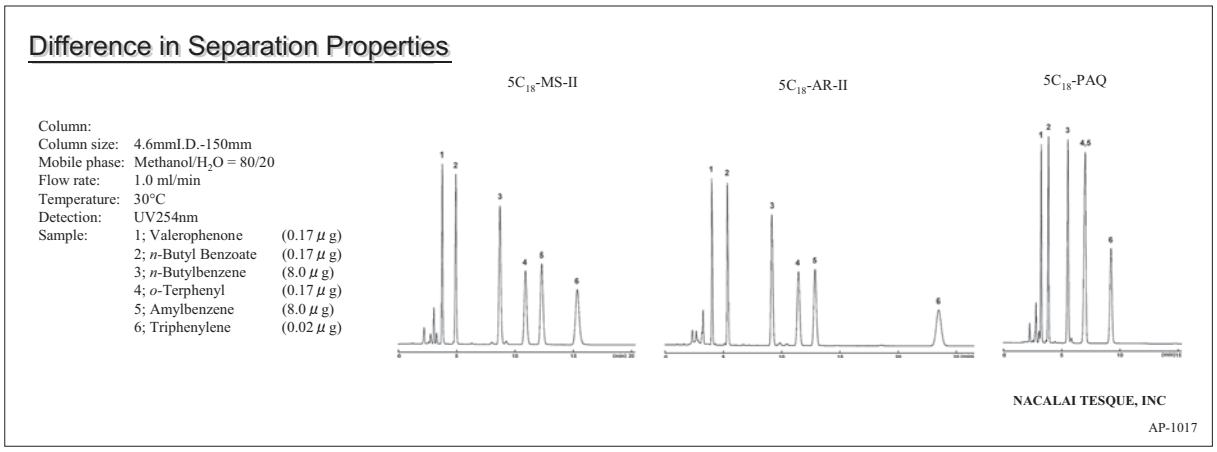
#### Specifications

| Packing Material | $C_{18}$-MS-II | $C_{18}$-AR-II | $C_{18}$-PAQ | $C_{18}$-EB |
|---|---|---|---|---|
| Silica Gel | High purity porous spherical silica | | | |
| Average Particle Size | 2.5, 3 , 5, 15 µm | 3, 5, 15 µm | 5, 15 µm | 3 µm |
| Average Pore Size | approx. 120 Å | | | |
| Specific Surface Area | approx. 300 $m^2/g$ | | | |
| Bonded Phase Structure |  |  | |  |
| Bonded Phase | Octadecyl group | | | |
| Bonding Type | Monomeric | Polymeric | | Monomeric |
| Main Interaction | Hydrophobic interaction | | | |
| End-Capping Treatment | Near-perfect treatment | | | |
| Carbon Content | approx. 16% | approx. 17% | approx. 11% | approx. 14.5% |
| Usable pH Range | 2~10* | 1.5~7.5* | 2~7.5 | 2-10* |
| Features | •Multi-purpose $C_{18}$ Column | •Features strong acid resistance.<br>•Good for acidic compounds and peptides. | •Good for hydrophilic compounds.<br>•Stable performance under 100% aqueous conditions. | •Good for basic compounds |

*Optimal pH range of silica-based columns is between 2 and 7.5. Extreme pH may significantly decrease column lifetime.

#### Difference in Separation Properties (5 µm)

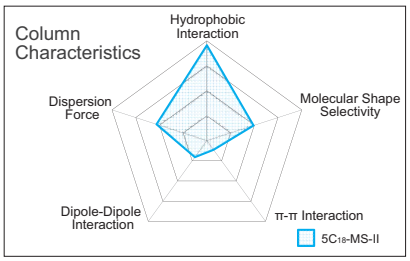
COSMOSIL 5$C_{18}$-AR-II retains planar compouds (such as triphenylene) longer compared to COSMOSIL 5$C_{18}$-MS-II. COSMOSIL 5$C_{18}$-PAQ has shorter retention time, and retains polar compounds (Such as valerophenone, *n*-butyl benzoate) longer.



# COSMOSIL C18-MS-II

- First-choice column of our ODS series
- Multi-purpose C18 column
- High reproducibility
- A wide range of applications

< Suitable Samples >
- Low-M.W. Compounds



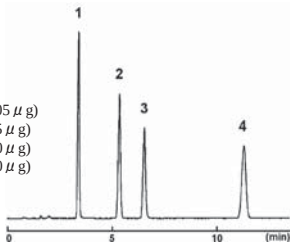

## Separation Property

The COSMOSIL 5C18-MS-II is a well-balanced column with better basic performance, such as sharper peaks for basic compounds and chelating compounds, strong hydrophobic interaction, low analytical pressure, and high theoretical plate number. COSMOSIL 5C18-MS-II is the first-choice column for reversed-phase chromatography.

### Separation Property

Column: $5C_{18}$-MS-II
Column size: 4.6mmI.D.-150mm
Mobile phase: Methanol/ $H_2O$ = 60/40
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV254nm

Sample:
1; Acetophenone (0.05 μg)
2; Methyl Benzoate (0.5 μg)
3; Benzene (2.0 μg)
4; Toluene (2.0 μg)




NACALAI TESQUE, INC

AP-0421

Table. Comparison of hydrophobic interaction, analytical pressure, and theoretical plate number

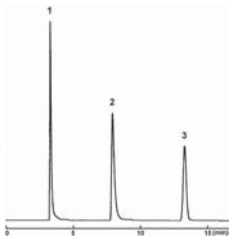
| Column | Hydrophobic Interaction α (Toluene/Benzene) | Pressure (MPa) | Theoretical Plate Number (Toluene) |
|---|---|---|---|
| COSMOSIL 5C18-MS-II | 1.96 | 8.3 | 14300 |
| Company A C18 | 1.99 | 13.0 | 16800 |
| Company B C18 | 1.94 | 8.0 | 14000 |
| Company C C18 | 1.69 | 11.2 | 5600 |
| Company D C18 | 1.84 | 10.5 | 14200 |

## Analysis of Basic Compounds and Metal Coordination Compounds

The COSMOSIL 5C18-MS-II column, taking advantage of a new end-capping treatment, can replace the original COSMOSIL C18 (ODS) column. A new end-capping treatment with polar groups for shielding effect has significantly improved peak shape for basic compounds. Ultra pure silica gel with low trace-metal content is used for COSMOSIL columns; thus the columns provide excellent peak shapes for chelating compounds.

### Basic Compounds

Column: $5C_{18}$-MS-II
Column size: 4.6mmI.D.-150mm
Mobile phase: Methanol/ 20mmol/l Phosphate buffer(pH7) = 20/80
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV254nm
Sample:
1; Procainamide (0.38 μg)
2; *N*-Acetylprocainamide (0.25 μg)
3; Benzylalcohol (5.63 μg)

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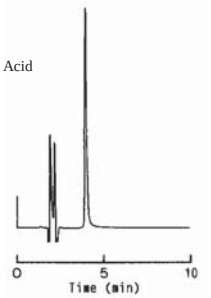
AP-1010

### Metal Coordination Compounds

Column: $5C_{18}$-MS-II
Column size: 4.6mmI.D.-150mm
Mobile phase: Acetonitrile / 20mmol/l Phosphoric Acid = 5/95
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV240nm

Sample: Oxine-copper




NACALAI TESQUE, INC

AP-0143

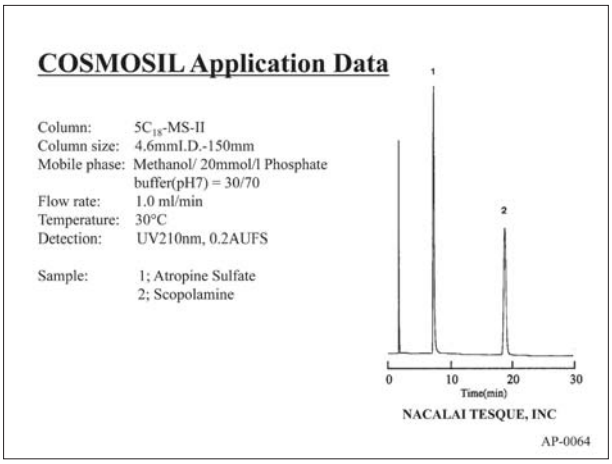
## High Reproducibility

The strict quality control system of Nacalai Tesque ensures the quality of the silica gel and bonding and end capping process, reducing variation between lots. We support customers with an individual Inspection Report which accompanies each and every COSMOSIL, COSMOCORE and COSMOGEL packed column (except guard columns) and an additional Certificate of Analysis for the COSMOSIL 5C18-MS-II (4.6 mm I.D. x 150 mm and 4.6 mm I.D. x 250 mm).

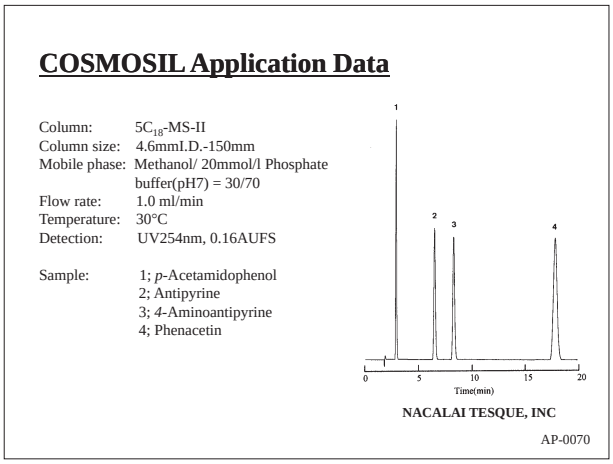
## A Wide Range of Applications

A wide selection of applications, e.g. drug molecules, is available to achieve appropriate separation parameters for target samples.

- **Parasympatholytic Agents**




- **Analgesic Antipyretic Drugs**




## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 µm)

**COSMOSIL 5C18-MS-II Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 1.0 x 50 | 02824-31 |
| 1.0 x 150 | 02896-01 |
| 2.0 x 30 | 05876-71 |
| 2.0 x 50 | 04355-21 |
| 2.0 x 100 | 05597-31 |
| 2.0 x 150 | 38025-91 |
| 2.0 x 250 | 05761-61 |
| 3.0 x 100 | 05458-51 |
| 3.0 x 150 | 34245-31 |
| 3.0 x 250 | 34254-11 |
| 4.6 x 30 | 34341-61 |
| 4.6 x 50 | 38017-01 |

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 100 | 38018-91 |
| 4.6 x 150* | 38019-81 |
| 4.6 x 150 3 lots set | 09397-73 |
| 4.6 x 250* | 38020-41 |
| 6.0 x 150 | 38021-31 |
| 6.0 x 250 | 38022-21 |
| 10 x 50 | 05789-21 |
| 10 x 150 | 34355-91 |
| 10 x 250 | 38023-11 |
| 20 x 150 | 05091-41 |
| 20 x 250 | 38024-01 |
| 28 x 250 | 05760-71 |

**COSMOSIL 5C18-MS-II Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 38014-31 |
| 4.6 x 10 Cartridge** | 38015-89 |
| 10 x 20 | 38016-11 |
| 20 x 20 | 05790-81 |
| 20 x 50 | 34371-71 |
| 28 x 50 | 34347-01 |

* Validated columns

** 2 cartridges included. Guard cartridge holder required; refer to page 71.

- Preparative Columns (Particle Size: 15 µm)

**COSMOSIL 15C18-MS-II Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 28 x 250 | 34525-61 |
| 50 x 250 | 05886-41 |
| 50 x 500 | 34531-71 |

**COSMOSIL 15C18-MS-II Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 28 x 50 | 05885-51 |
| 50 x 50 | 34527-41 |

- Fast LC Column (Particle Size: 3 µm)

**COSMOSIL 3C18-MS-II Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 2.0 x 50 | 05514-01 |
| 4.6 x 10 | 38065-71 |
| 4.6 x 50 | 38066-61 |
| 4.6 x 100 | 38067-51 |

- Analytical Columns (Particle Size: 2.5 µm)

**COSMOSIL 2.5C18-MS-II Packed Column**

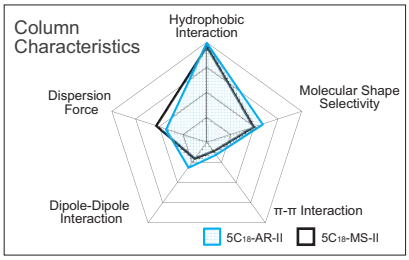
| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 2.0 x 50 | 08994-31 |
| 2.0 x 75 | 08995-21 |
| 2.0 x100 | 08996-11 |

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 3.0 x 50 | 08997-01 |
| 3.0 x 75 | 08998-91 |
| 3.0 x100 | 08999-81 |

# COSMOSIL C18-AR-II

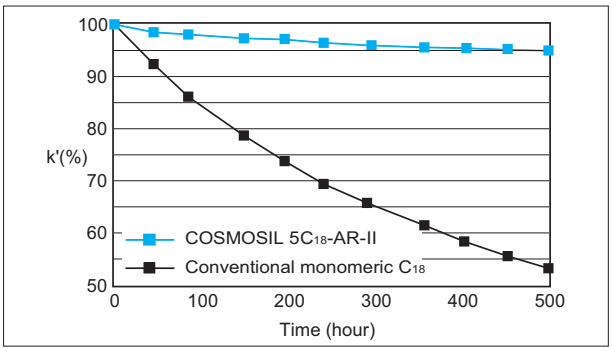
- Features strong acid resistance

< Suitable Samples >
- Peptides, acidic compounds, etc.




## Acid Resistance

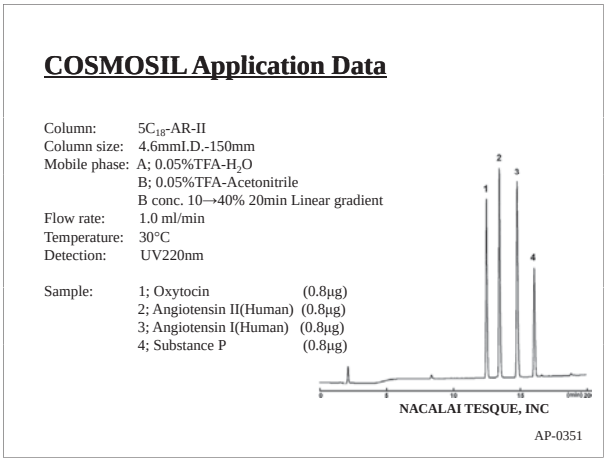
The COSMOSIL 5C18-AR-II packed column features a polymeric type of C18 reversed phase material. The acidic resistance of COSMOSIL 5C18-AR-II is much improved compared with commercially available monomeric type octadecyl stationary phases. It retains high performance even with acidic mobile phases commonly used to separate acidic compounds and peptides.



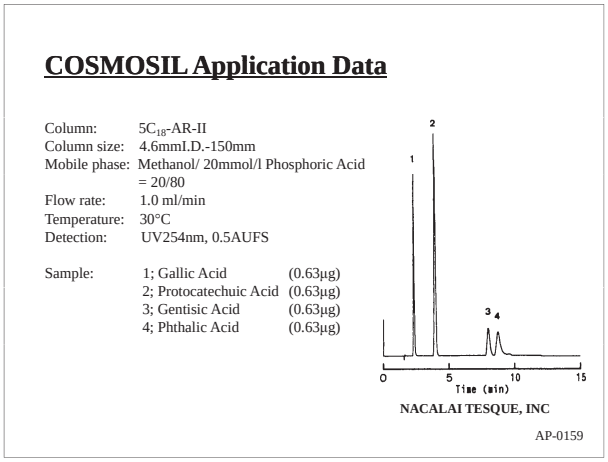

Decomposition test in 0.1% Trifluoroacetic acid solution at 60ºC.
Capacity factor (k') = Naphthalene,
Mobile phase: Methanol / H2O=70/30

## Applications

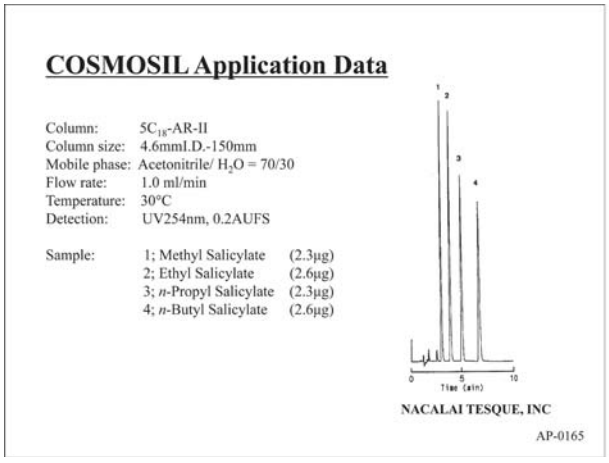
### • Peptides



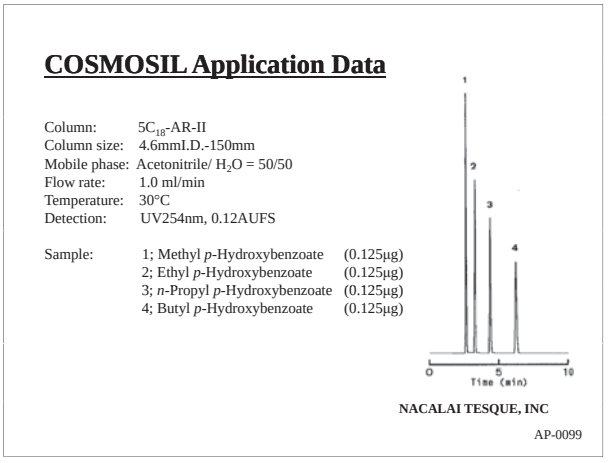

### • Organic Acids




### • Salicylic Acid Esters

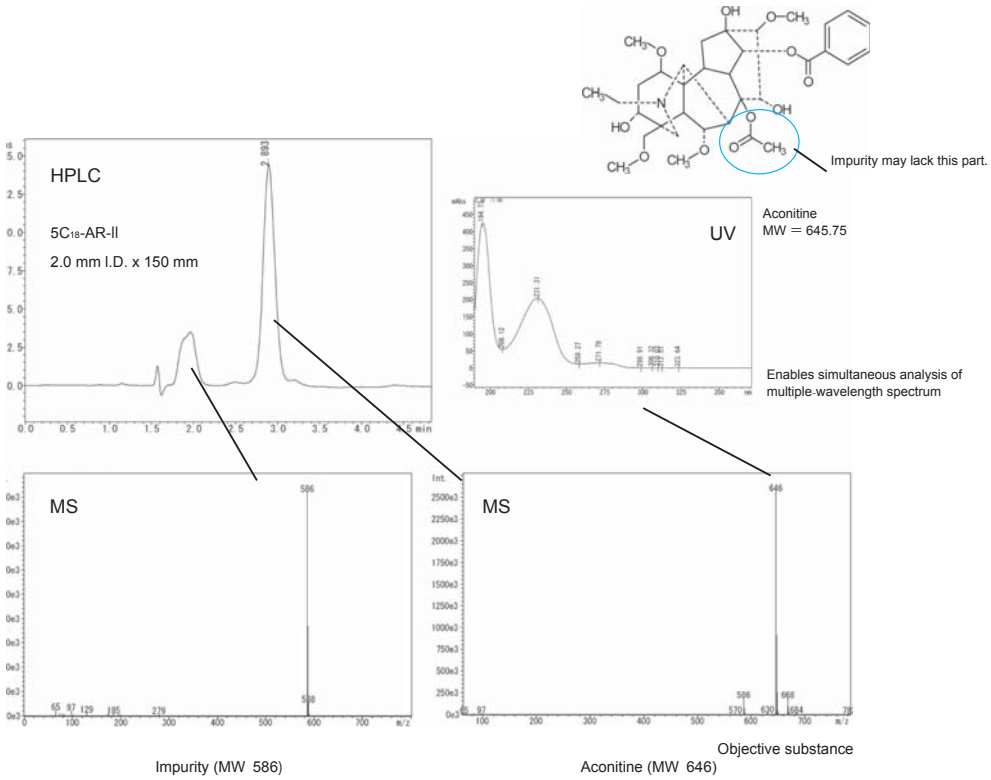



### • Parabens



## LC/MS Applications

- **Identification of herbal medicine constituents by LC/MS**




## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 µm)

**COSMOSIL 5C18-AR-II Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 1.0 x 50 | 02955-21 |
| 1.0 x 150 | 02951-61 |
| 2.0 x 30 | 05098-71 |
| 2.0 x 50 | 34400-81 |
| 2.0 x 100 | 34469-11 |
| 2.0 x 150 | 37992-51 |
| 2.0 x 250 | 05272-71 |
| 3.0 x 100 | 05791-71 |
| 3.0 x 150 | 38028-61 |
| 3.0 x 250 | 38029-51 |
| 4.6 x 30 | 05877-61 |
| 4.6 x 50 | 38142-51 |

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 100 | 38143-41 |
| 4.6 x 150* | 38144-31 |
| 4.6 x 150 3 lots set | 09396-83 |
| 4.6 x 250* | 38145-21 |
| 6.0 x 150 | 38146-11 |
| 6.0 x 250 | 38147-01 |
| 10 x 50 | 05369-21 |
| 10 x 150 | 34350-41 |
| 10 x 250 | 38149-81 |
| 20 x 150 | 34316-01 |
| 20 x 250 | 38150-41 |
| 28 x 250 | 34362-91 |

**COSMOSIL 5C18-AR-II Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 38141-61 |
| 4.6 x 10 Cartridge** | 38008-89 |
| 10 x 20 | 38148-91 |
| 20 x 20 | 34458-51 |
| 20 x 50 | 34479-81 |
| 28 x 50 | 34363-81 |

* Validated columns

** 2 cartridges included. Guard cartridge holder required; refer to page 71.

- Preparative Columns (Particle Size: 15 µm)

**COSMOSIL 15C18-AR-II Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 28 x 250 | 37978-51 |
| 50 x 250 | 38058-71 |
| 50 x 500 | 05884-61 |

**COSMOSIL 15C18-AR-II Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 28 x 50 | 38030-11 |
| 50 x 50 | 38057-81 |

- Fast LC Column (Particle Size: 3 µm)

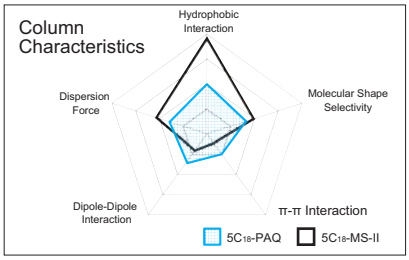
**COSMOSIL 3C18-AR-II Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 2.0 x 50 | 05478-91 |
| 4.6 x 10 | 38068-41 |
| 4.6 x 50 | 38069-31 |
| 4.6 x 100 | 38070-91 |

# COSMOSIL C18-PAQ

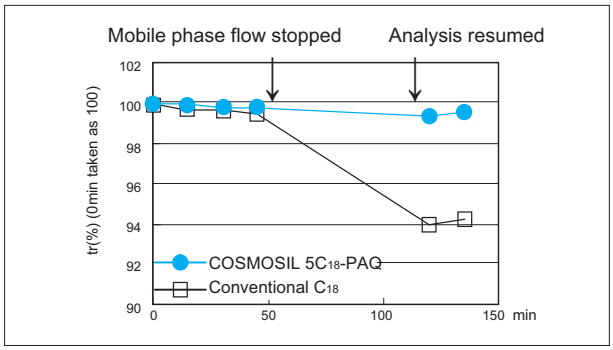
- Compatible with 100% water based mobile phase

< Suitable Samples >
- Hydrophilic compounds
- Organic acids, nucleic acid bases, etc.




## Stable Performance

Stable performance under 100% aqueous conditions




The figure shows the change of retention time for thymine with 100% aqueous mobile phase (20 mmol/l phosphate buffer, pH 7). The sample was analyzed 4 times (1 hour). Flow of mobile phase was then stopped for 1 hour. The sample was analyzed under the same conditions again after 1 hour. The conventional C18 column showed change of retention time, but COSMOSIL 5C18-PAQ maintained stable retention time.

## Applications

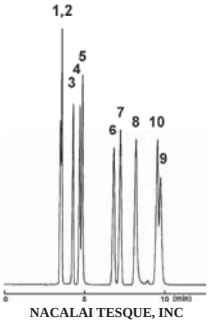
### • Organic Acids

**COSMOSIL Application Data**

Column: $5C_{18}$-PAQ
Column size: 4.6mmI.D.-250mm
Mobile phase: 20mmol/l Phosphate buffer(pH2.5)
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV210nm

Sample:

| | | |
|---|---|---|
| 1; | Glycolic Acid | (6.3µg) |
| 2; | Tartaric Acid | (4.0µg) |
| 3; | L-(-)-Malic Acid | (6.4µg) |
| 4; | Lactic Acid | (13µg) |
| 5; | Acetic Acid | (13µg) |
| 6; | Citric Acid | (6.3µg) |
| 7; | Succinic Acid | (13µg) |
| 8; | Maleic Acid | (0.06µg) |
| 9; | Propionic Acid | (13µg) |
| 10; | Fumaric Acid | (0.03µg) |




NACALAI TESQUE, INC

AP-1058

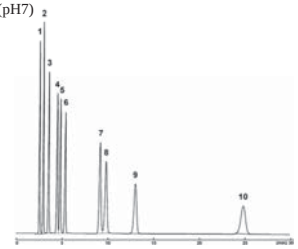
### • Nucleobases and Nucleosides

**COSMOSIL Application Data**

Column: $5C_{18}$-PAQ
Column size: 4.6mmI.D.-150mm
Mobile phase: 20mmol/l Phosphate buffer(pH7)
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV260nm

Sample:

| | | |
|---|---|---|
| 1; | Cytosine | (0.16µg) |
| 2; | Uracil | (0.16µg) |
| 3; | Cytidine | (0.32µg) |
| 4; | Uridine | (0.24µg) |
| 5; | Guanine | (0.16µg) |
| 6; | Thymine | (0.16µg) |
| 7; | Adenine | (0.08µg) |
| 8; | Guanosine | (0.24µg) |
| 9; | Thymidine | (0.24µg) |
| 10; | Adenosine | (0.16µg) |




NACALAI TESQUE, INC

AP-0375

### • dNTPs

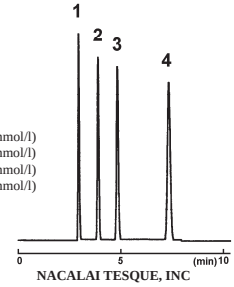
**COSMOSIL Application Data**

Column: $5C_{18}$-PAQ
Column size: 4.6mmI.D.-250mm
Mobile phase: 20mmol/l Phosphate buffer(pH7)
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV260nm, 0.16AUFS

Sample:

| | | |
|---|---|---|
| 1; | 2'-Deoxycytidine 5'-Triphosphate [dCTP] | (1mmol/l) |
| 2; | 2'-Deoxythymidine 5'-Triphosphate [dTTP] | (1mmol/l) |
| 3; | 2'-Deoxyguanosine 5'-Triphosphate [dGTP] | (1mmol/l) |
| 4; | 2'-Deoxyadenosine 5'-Triphosphate [dATP] | (1mmol/l) |

Injection 0.5µl




NACALAI TESQUE, INC

AP-0371

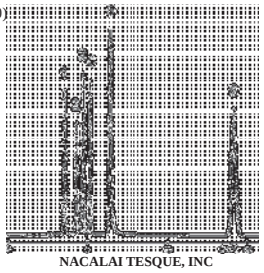
### • Catecholamines

**COSMOSIL Application Data**

Column: $5C_{18}$-PAQ
Column size: 4.6mmI.D.-250mm
Mobile phase: 20mmol/l Phosphate buffer(pH7.0)
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV270nm

Sample:

| | | |
|---|---|---|
| 1; | L-Noradrenaline | (0.38µg) |
| 2; | (±)-Epinephrine | (0.38µg) |
| 3; | DL-3-Methoxy-4-hydroxymandelic Acid | (0.56µg) |
| 4; | L-DOPA | (0.56µg) |
| 5; | Dopamine | (1.13µg) |
| 6; | Homovanillic Acid | (1.13µg) |



NACALAI TESQUE, INC

AP-1056

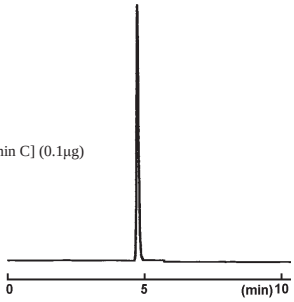
## Applications

- **Ascorbic Acid**

**COSMOSIL Application Data**

Column: $5C_{18}$-PAQ
Column size: 4.6mmI.D.-250mm
Mobile phase: 20mmol/l Phosphoric Acid
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV245nm, 0.16AUFS

Sample: *L*(+)-Ascorbic Acid [Vitamin C] (0.1µg)




NACALAI TESQUE, INC

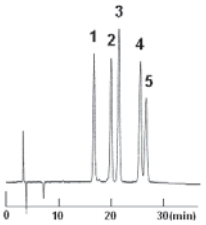
AP-0372

- **2-Phenylethyl Glycosides**

**COSMOSIL Application Data**

Column: $5C_{18}$-PAQ
Column size: 4.6mmI.D.-150mm
Mobile phase: Acetonitrile/ Methanol/ $H_2O$ = 8/4/8
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV210nm

Sample: 1; 2-Phenylethyl-β-melibioside
2; 2-Phenylethyl-β-gentiobioside
3; 2-Phenylethyl-β-lactoside
4; 2-Phenylethyl-β-cellobioside
5; 2-Phenylethyl-β-maltoside




NACALAI TESQUE, INC

*Data courtesy of Dr. K. Sakata, Dr. B. Shimizu, Institute for Chemical Research, Kyoto University*

## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 µm)

**COSMOSIL 5C18-PAQ Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 1.0 x 50 | 05792-61 |
| 1.0 x 150 | 05793-51 |
| 2.0 x 30 | 05878-51 |
| 2.0 x 50 | 05794-41 |
| 2.0 x 100 | 05470-71 |
| 2.0 x 150 | 34449-71 |
| 2.0 x 250 | 05795-31 |
| 3.0 x 100 | 05796-21 |
| 3.0 x 150 | 05797-11 |
| 3.0 x 250 | 05798-01 |
| 4.6 x 30 | 05879-41 |
| 4.6 x 50 | 34451-21 |

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 100 | 05799-91 |
| 4.6 x 150 | 02486-71 |
| 4.6 x 250 | 02485-81 |
| 6.0 x 150 | 34419-61 |
| 6.0 x 250 | 05800-41 |
| 10 x 50 | 05801-31 |
| 10 x 150 | 34466-41 |
| 10 x 250 | 34376-21 |
| 20 x 150 | 34476-11 |
| 20 x 250 | 34373-51 |
| 28 x 250 | 34456-71 |

**COSMOSIL 5C18-PAQ Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 02484-91 |
| 10 x 20 | 34457-61 |
| 20 x 20 | 05803-11 |
| 20 x 50 | 05804-01 |
| 28 x 50 | 34455-81 |

- Preparative Columns (Particle Size: 15 µm)

**COSMOSIL 15C18-PAQ Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 28 x 250 | 05888-21 |
| 50 x 250 | 05890-71 |
| 50 x 500 | 05891-61 |

**COSMOSIL 15C18-PAQ Guard Column**

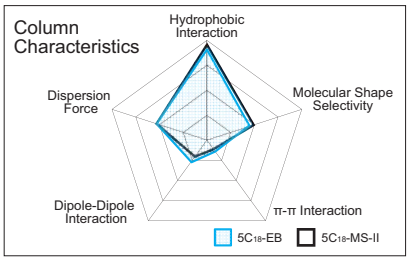
| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 28 x 50 | 05887-31 |
| 50 x 50 | 05889-11 |

# COSMOSIL C18-EB

- 3 µm C18 column with reduced tailing and high resolution
- Usable with simple mobile phases

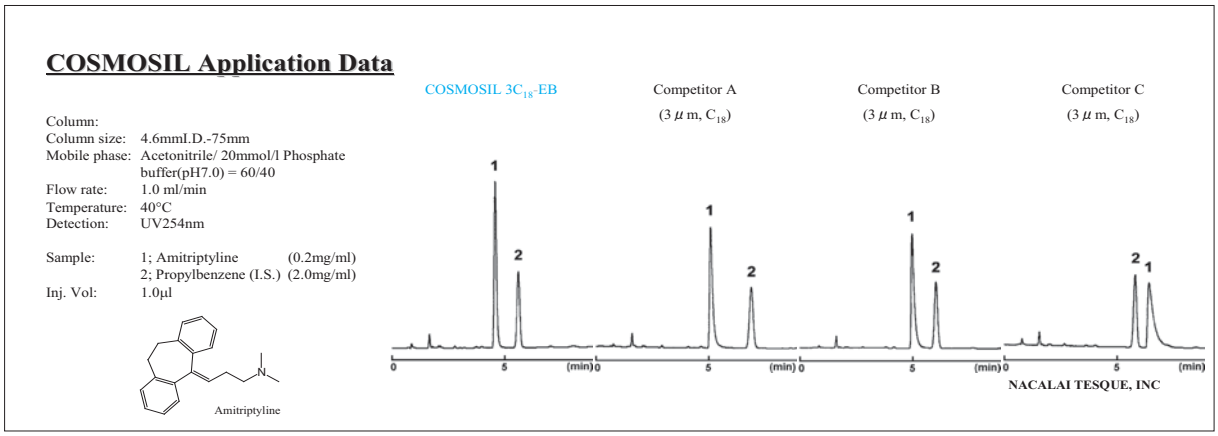
< Suitable Samples >

- For quality control of drugs
- Compounds that induce peak tailing, such as basic compounds




## Analysis of Basic Compounds

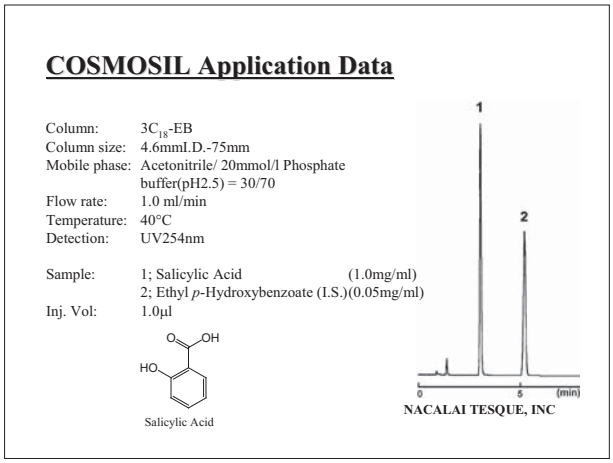
COSMOSIL 3C18-EB uses a new end-capping method to reduce the number of residual silanol groups, which can cause peak tailing with basic compounds.



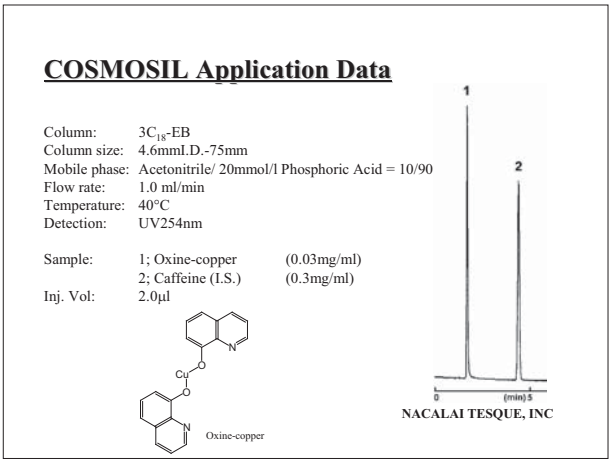

## Analysis of Acidic Compounds and Metal Coordination Compouds

COSMOSIL 3C18-EB utilizes a new end-capping method and high-purity silica gel to reduce tailing with metal coordination compounds.

- **Acidic Compounds**




- **Metal Coordination Compounds**




## Ordering Information

- Analytical Columns (Particle Size: 3 µm)

**COSMOSIL 3C18-EB Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 2.0 x 50 | 09794-21 |
| 2.0 x 75 | 09795-11 |
| 2.0 x 100 | 09796-01 |
| 2.0 x 150 | 09797-91 |
| 2.0 x 250 | 09798-81 |
| 3.0 x 50 | 09799-71 |
| 3.0 x 75 | 09800-21 |
| 3.0 x 100 | 09811-81 |
| 3.0 x 150 | 09814-51 |
| 3.0 x 250 | 09827-91 |
| 4.6 x 50 | 09840-01 |
| 4.6 x 75* | 09841-91 |
| 4.6 x 100* | 09842-81 |
| 4.6 x 150* | 09843-71 |
| 4.6 x 250 | 09844-61 |

**COSMOSIL 3C18-EB Guard Column**

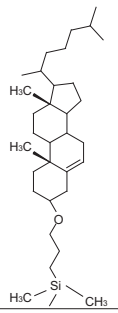
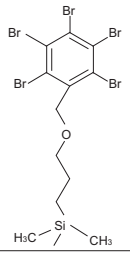
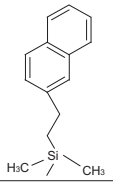
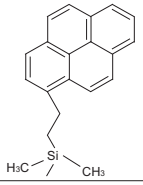
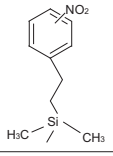
| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 2.0 x 10 Cartrige** | 11892-74 |
| 4.6 x 10 | 09839-41 |
| 4.6 x 10 Cartrige** | 11890-94 |

* Validated columns

** 2 cartridges included. Guard cartridge holder required; refer to page 71.

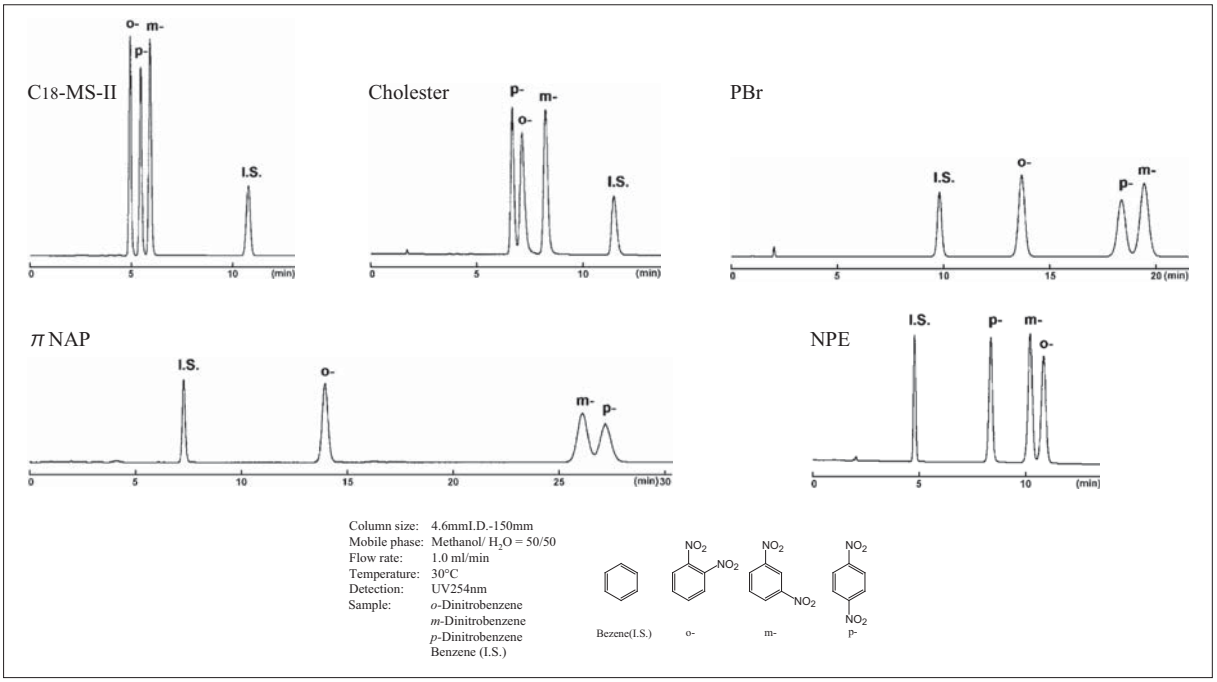
# Reversed Phase Specialty Columns

## Specifications

| Packing Material | Cholester | PBr | πNAP | PYE | NPE |
|---|---|---|---|---|---|
| Silica Gel | High purity porous spherical silica | | | | |
| Average Particle Size | 2.5, 5 µm | 5 µm | 2.5, 5 µm | 5 µm | |
| Average Pore Size | approx. 120 Å | | | | |
| Specific Surface Area | approx. 300 $m^2/g$ | | | | |
| Bonded Phase Structure |  |  |  |  |  |
| Bonded Phase | Cholesteryl group | Pentabromobenzyl group | Naphtylethyl group | Pyrenylethyl group | Nitrophenylethyl group |
| Bonding Type | Monomeric | | | | |
| Main Interaction | Hydrophobic interaction<br>Molecular shape selectivity | Hydrophobic interaction<br>Dispersion force | Hydrophobic interaction<br>π-π interaction | Hydrophobic interaction<br>π-π interaction<br>Dispersion force<br>Molecular shape selectivity | Hydrophobic interaction<br>π-π interaction<br>Dipole-dipole interaction |
| End-Capping Treatment | Near-perfect treatment | | | | |
| Carbon Content | approx. 20% | approx. 8% | approx. 11% | approx. 18% | approx. 9% |
| pH Range | 2-7.5 | | | | |
| Features | •Usable under the same conditions as $C_{18}$<br>•High molecular shape selectivity | •Separate hydrophilic compounds under reversed-phase conditions | •Stronger π-π interaction than phenyl columns | •Very strong π-π interaction | •Strong dipole-dipole interaction |

## Selectivity for positional isomers of dinitrobenzene

Different stationary phase exhibits different selectivity due to the use of forces that $C_{18}$ (hydrophobic interaction) does not have. By using these columns, you can achieve separation that cannot be done using only $C_{18}$.

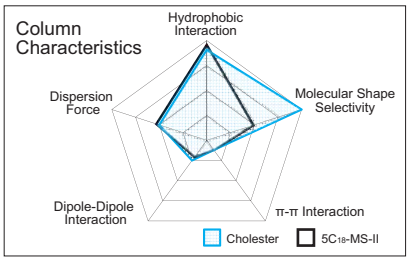


# COSMOSIL Cholester

- Cholesterol-bonded stationary phase
- Increased stereoselectivity and improved resolution for geometric isomers
- Usable under the same conditions as $C_{18}$

< Suitable Samples >

- Natural compouds, polyphenols, catechins, fat-soluble vitamins and flavones

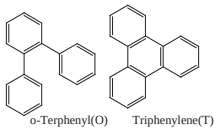


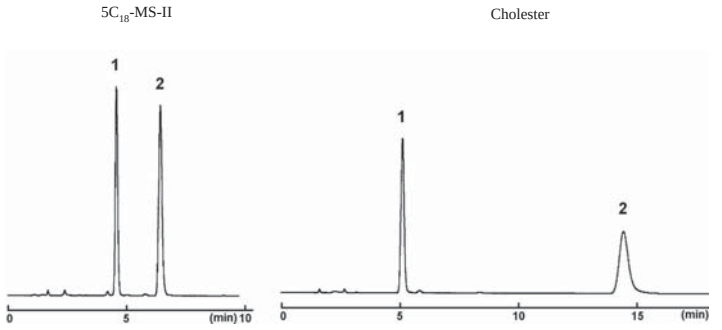

## Molecular Shape Selectivity

The stationary phase of Cholester has a very rigid structure and can distinguish different molecular shapes. Cholester retains planar triphenylene longer than non-planar *o*-terphenyl.

### Comparison of Molecular Shape Selectivity

Column:
Column size: 4.6mmI.D.-150mm
Mobile phase: Methanol/$H_2O$ = 90/10
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV254nm
Sample: 1; *o*-Terphenyl (0.1 μg)
2; Triphenylene (0.01 μg)



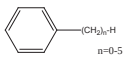

AP-1019

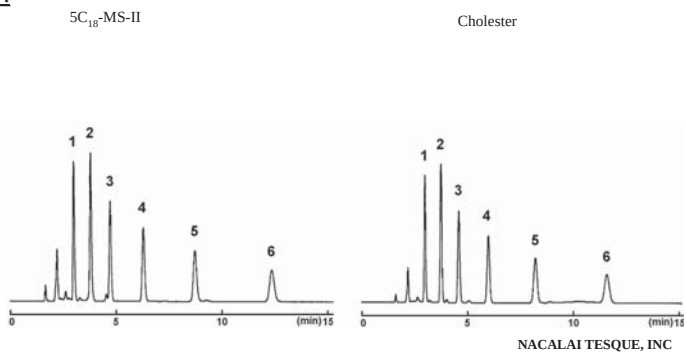
## Hydrophobic Interaction

The below figure shows the comparison of hydrophobic interactions with competitor's $C_{18}$ columns. Cholester provides about the same hydrophobicity as alkyl group bonded types ($C_{18}$, $C_{30}$). It is not necessary to change the analytical conditions when replacing $C_{18}$ or $C_{30}$ columns with Cholester.

### Comparison of Hydrophobic Interaction

Column:
Column size: 4.6mmI.D.-150mm
Mobile phase: Methanol/$H_2O$ = 80/20
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV254nm
Sample: 1; Benzene (1.67 μg)
2; Toluene (1.67 μg)
3; Ethylbenzene (1.67 μg)
4; *n*-Propylbenzene (1.67 μg)
5; *n*-Butylbenzene (1.67 μg)
6; Amylbenzene (1.67 μg)



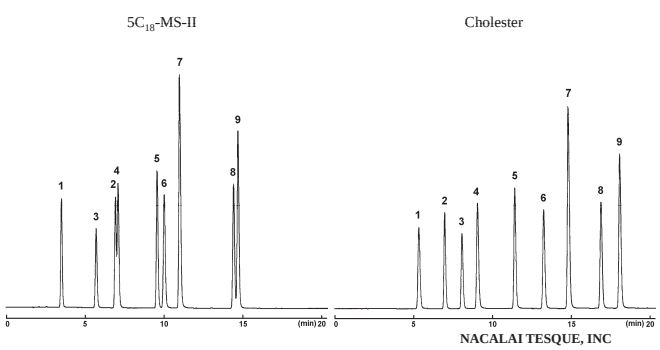

AP-1018

## Applications

- **Catechins**

### COSMOSIL Application Data

Column:
Column size: 4.6mmI.D.-150mm
Mobile phase: A: Acetonitrile/ 20mmol/l Phosphate buffer(pH2.5) = 10/90
B: Acetonitrile/ 20mmol/l Phosphate buffer(pH2.5) = 30/70
B conc. 0→100% 20min Linear gradient
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV280nm
Sample: 1; (-) - Gallocatechin 〔(-) - GC〕 (0.80mg/ml)
2; Caffeine (0.08mg/ml)
3; (-) - Epigallocatechin 〔(-) - EGC〕 (0.80mg/ml)
4; (-) - Catechin 〔(-) - C〕 (0.40mg/ml)
5; (-) - Epicatechin 〔(-) - EC〕 (0.40mg/ml)
6; (-) - Epigallocatechin Gallate 〔(-) - EGCg〕 (0.20mg/ml)
7; (-) - Gallocatechin Gallate 〔(-) - GCg〕 (0.40mg/ml)
8; (-) - Epicatechin Gallate 〔(-) - ECg〕 (0.20mg/ml)
9; (-) - Catechin Gallate 〔(-) - Cg〕 (0.20mg/ml)
Injection Vol. 1.0μl

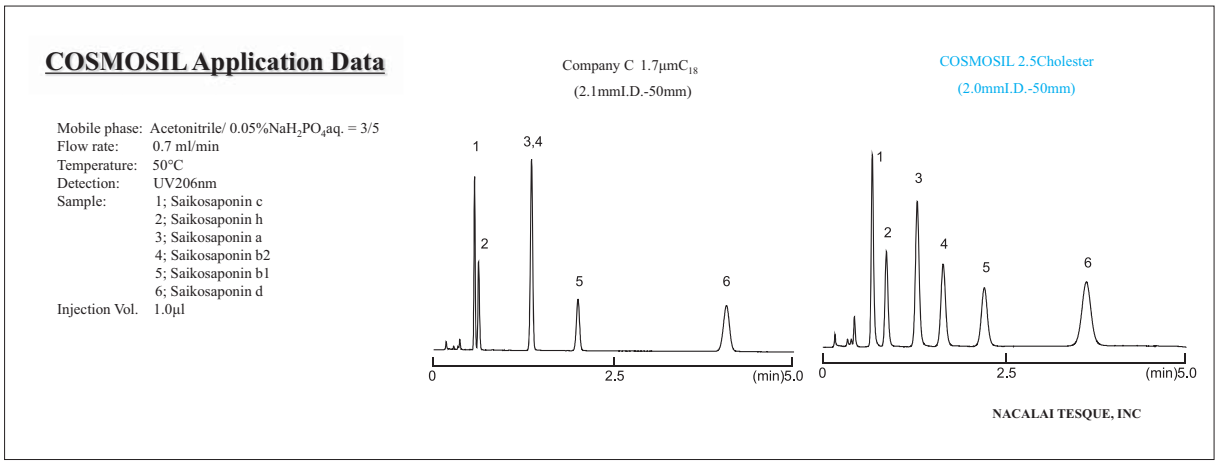



AP-1072

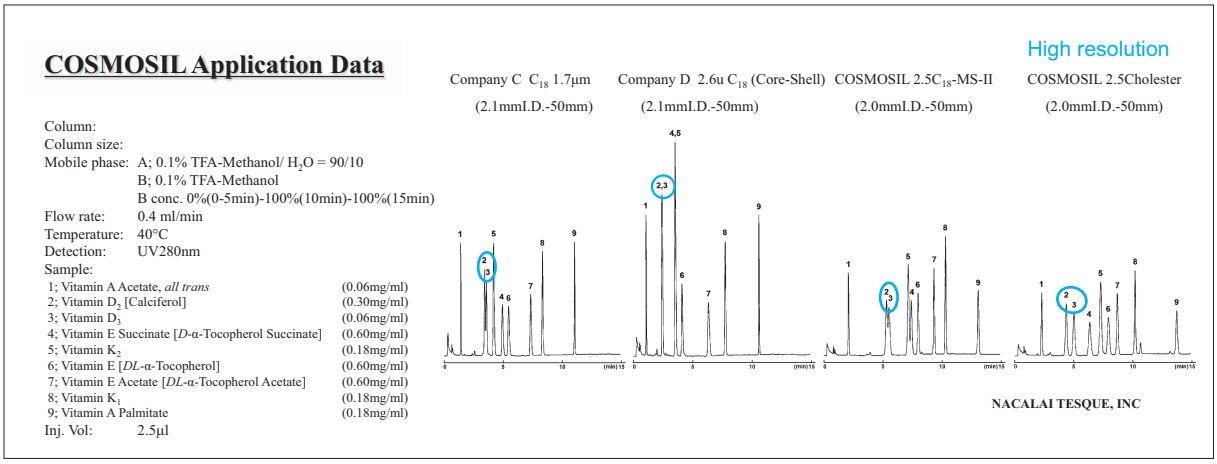
## Applications (Continued)

2.5 µm particles yield better performance and shorter analysis time compared to 5 µm particles.

- **Saikosaponins**




- **Water-Soluble Vitamins**




## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 µm)

**COSMOSIL Cholester Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 1.0 x 150 | 05968-71 |
| 1.0 x 250 | 05969-61 |
| 2.0 x 30 | 08565-51 |
| 2.0 x 50 | 06352-91 |
| 2.0 x 100 | 06948-01 |
| 2.0 x 150 | 05971-11 |
| 2.0 x 250 | 05972-01 |
| 3.0 x 150 | 05973-91 |
| 3.0 x 250 | 05974-81 |

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 150* | 05976-61 |
| 4.6 x 150 3 lots set* | 07970-03 |
| 4.6 x 250* | 05977-51 |
| 10 x 150 | 08011-91 |
| 10 x 250 | 05979-31 |
| 20 x 150 | 06088-71 |
| 20 x 250 | 05982-71 |
| 28 x 250 | 05985-41 |

* Validated Columns

**COSMOSIL Cholester Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 05975-71 |
| 10 x 20 | 05978-41 |
| 20 x 20 | 05980-91 |
| 20 x 50 | 05981-81 |
| 28 x 50 | 05983-61 |

- Analytical (Particle Size: 2.5 µm)

**COSMOSIL 2.5Cholester Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 2.0 x 50 | 09000-01 |
| 2.0 x 75 | 09047-11 |
| 2.0 x 100 | 09048-01 |

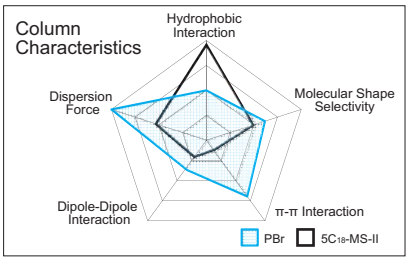
| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 3.0 x 50 | 09049-91 |
| 3.0 x 75 | 09050-51 |
| 3.0 x 100 | 09051-41 |

# COSMOSIL PBr

- Pentabromobenzyl-bonded stationary phase
- Separate hydrophilic compounds in reversed-phase conditions

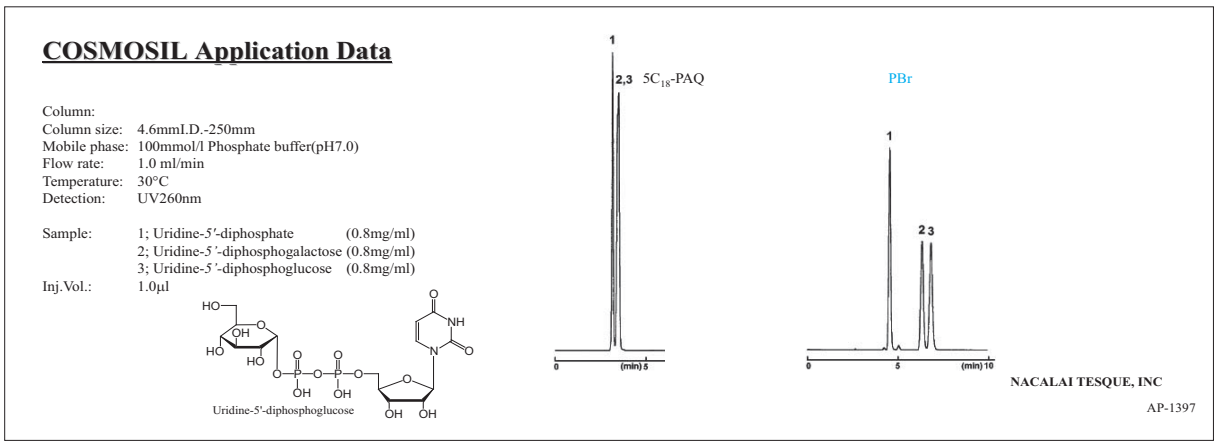
< Suitable Samples >

- Hydrophilic compounds
- Nucleotides, peptides, catecholamines and oligosaccharides



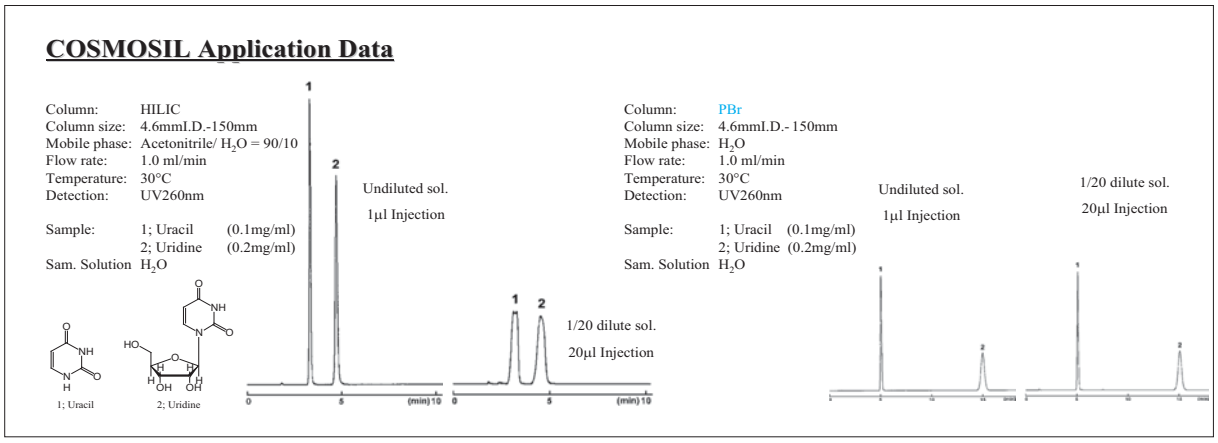

## Comparison with $C_{18}$

COSMOSIL PBr retains hydrophilic compounds stronger than $C_{18}$ columns under the same reversed-phase conditions.




## Comparison with HILIC

HILIC is widely recognized as a method for separating hydrophilic compounds. However, because it differs from the commonly used reversed-phase mode, setting mobile phase conditions can be difficult. In addition, the use of acetonitrile in high concentration can cause problems with peak shape when using water as a sample solvent. COSMOSIL PBr can retain hydrophilic compounds under reversed-phase conditions, and maintains good peak shape even when injecting large amounts of water.




## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 µm)

**COSMOSIL PBr Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 2.0 x 100 | 13245-81 |
| 2.0 x 150 | 12392-81 |
| 2.0 x 250 | 13247-61 |
| 3.0 x 50 | 12592-61 |
| 3.0 x 100 | 13249-41 |
| 3.0 x 150 | 13250-01 |
| 3.0 x 250 | 13251-91 |
| 4.6 x 50 | 13252-81 |
| 4.6 x 150 | 12394-61 |
| 4.6 x 250 | 12395-51 |

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 10 x 50 | 13253-71 |
| 10 x 100 | 13254-61 |
| 10 x 150 | 13255-51 |
| 10 x 250 | 12397-31 |
| 20 x 50 | 13257-31 |
| 20 x 100 | 13258-21 |
| 20 x 150 | 13259-11 |
| 20 x 250 | 12398-21 |
| 28 x 100 | 13260-71 |
| 28 x 150 | 13261-61 |
| 28 x 250 | 13262-51 |

**COSMOSIL PBr Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 Catrige* | 12444-14 |
| 10 x 20 | 12396-41 |
| 20 x 20 | 13256-41 |

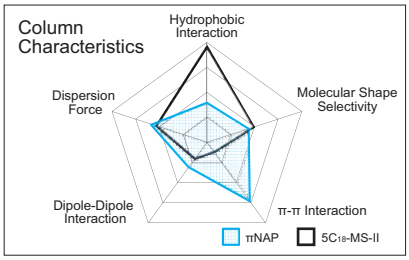
* 2 cartridges included. Guard cartridge holder required; refer to page 71.

# COSMOSIL πNAP

- Naphthalene-bonded stationary phase
- Enhanced π-π interactions

< Suitable Samples >

- Aromatic compounds and positional isomers




## Comparison of π-π Interactions

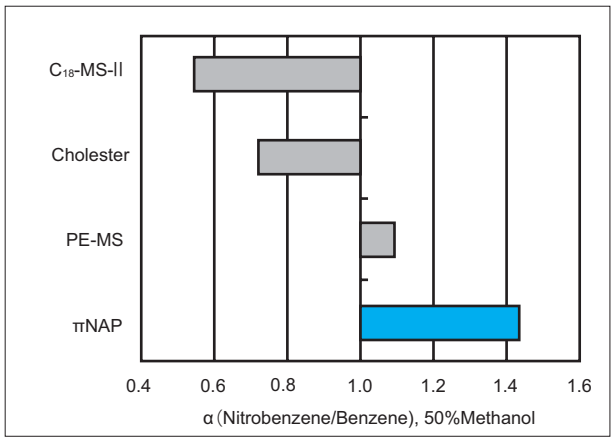
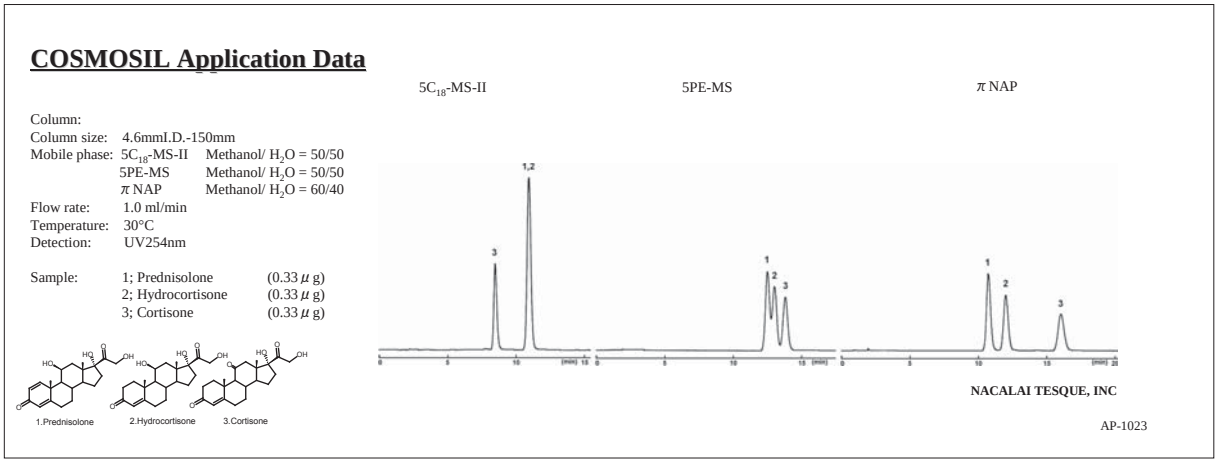



Figure. Comparison of π-π interaction

COSMOSIL πNAP shows stronger π-π interactions than phenyl columns. Its two fused aromatic rings retain nitrobenzene stronger than phenyl columns.

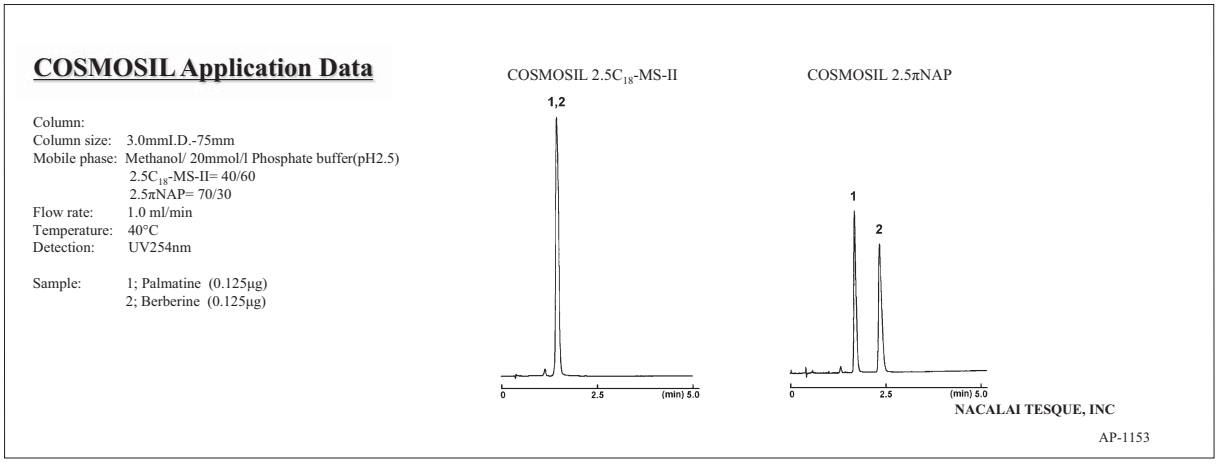
## Applications

- **Adrenal Cortical Hormones**




2.5 μm particles yield better performance and shorter analysis time compared to 5 μm particles.

- **Berberine**



## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 µm)

**COSMOSIL πNAP Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 1.0 x 150 | 08076-61 |
| 1.0 x 250 | 08077-51 |
| 2.0 x 30 | 08566-41 |
| 2.0 x 50 | 08567-31 |
| 2.0 x 100 | 08299-51 |
| 2.0 x 150 | 08078-41 |
| 2.0 x 250 | 08079-31 |
| 3.0 x 150 | 08080-91 |

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 3.0 x 250 | 08081-81 |
| 4.6 x 150 | 08085-41 |
| 4.6 x 250 | 08086-31 |
| 10 x 150 | 08088-11 |
| 10 x 250 | 08089-01 |
| 20 x 150 | 08092-41 |
| 20 x 250 | 08093-31 |
| 28 x 250 | 08095-11 |

**COSMOSIL πNAP Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 08082-71 |
| 10 x 20 | 08087-21 |
| 20 x 20 | 08090-61 |
| 20 x 50 | 08091-51 |
| 28 x 50 | 08094-21 |

- Analytical Columns (Particle Size: 2.5 µm)

**COSMOSIL πNAP Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 2.0 x 50 | 06062-91 |
| 2.0 x 75 | 06051-31 |
| 2.0 x 100 | 06052-21 |

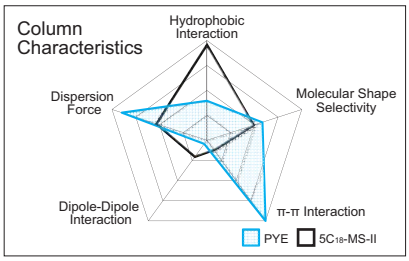
| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 3.0 x 50 | 06054-01 |
| 3.0 x 75 | 06055-91 |
| 3.0 x 100 | 06057-71 |

# COSMOSIL PYE

- Pyrenylethyl-bonded stationary phase
- Stronger π-π interactions

< Suitable Samples >

- Aromatic compounds, positional isomers, dioxins, and PCBs




## Comparison of π-π Interaction

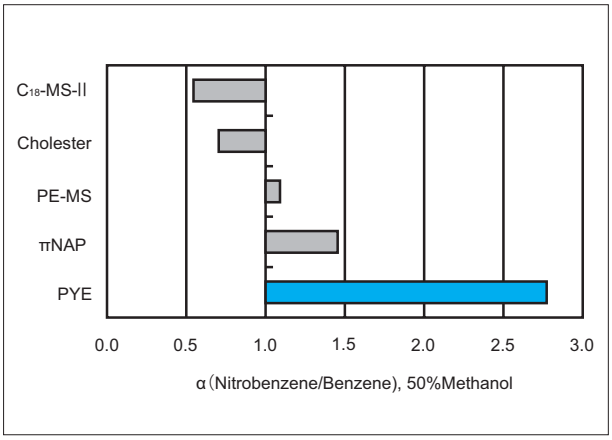
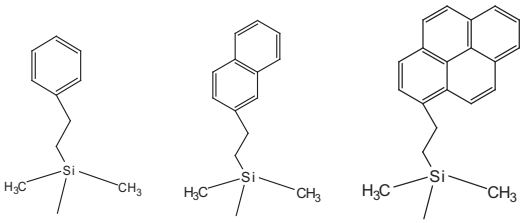


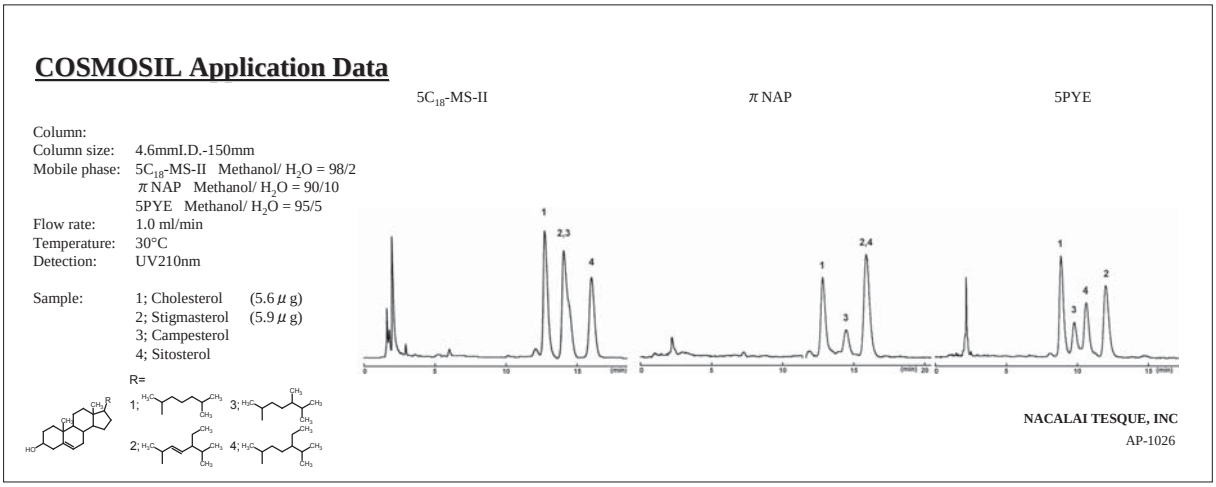

Figure. Comparison of π-π interactions

COSMOSIL PYE provides much stronger π-π interactions than πNAP page 26.




## Applications

- **Sterols**




## Caution

1. Methanol is the recommended mobile phase for COSMOSIL PYE. Acetonitrile is not recommended because it has many π electrons and interferes with π-π interactions between the sample and the stationary phase.
2. The stationary phase of COSMOSIL PYE, pyrenylethyl group, has a large UV absorption. When the stationary phase detaches from silica gel and elutes, even a slight quantity can be detected and causes baseline noise. In such cases, wash the column with tetrahydrofuran. Detachment of a small amount of the stationary phase does not deteriorate a column's separation ability.
3. COSMOSIL PYE column is not suitable for gradient analysis.

## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 μm)

**COSMOSIL 5PYE Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 1.0 x 150 | 02851-71 |
| 2.0 x 150 | 38042-61 |
| 2.0 x 250 | 34450-31 |
| 4.6 x 150 | 37837-91 |
| 4.6 x 250 | 37989-11 |
| 10 x 250 | 37996-11 |
| 20 x 250 | 38044-41 |

**COSMOSIL 5PYE Guard Column**

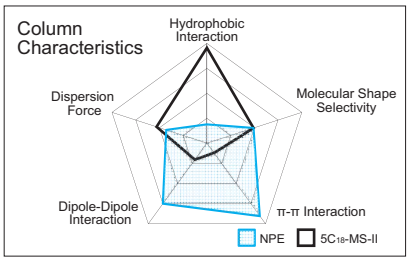
| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 37903-11 |
| 10 x 20 | 38041-71 |
| 20 x 20 | 05867-91 |
| 20 x 50 | 34475-21 |

# COSMOSIL NPE

- Nitrophenylethyl-bonded stationary phase
- Separation with dipole-dipole and π-π interactions

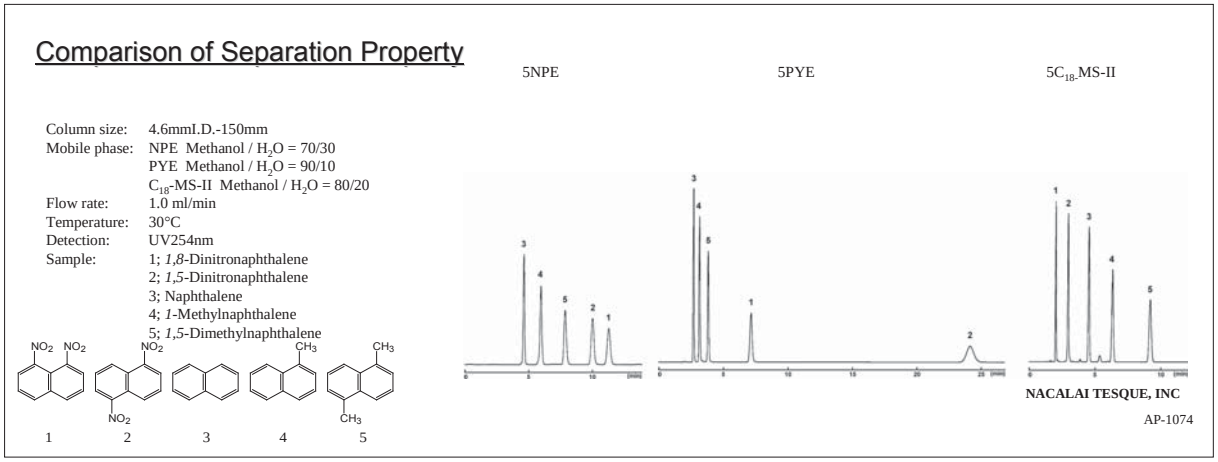
< Suitable Samples >

- Isomers and nitro compounds




## Selectivity for Dipole-Dipole Interactions

COSMOSIL NPE strongly retains *1,8*-dinitronaphthalene because of the strong dipole formed by the two nitro groups positioned on the same side of naphthalene.




## Caution

1. Methanol is recommended as a mobile phase for COSMOSIL NPE. Acetonitrile is not recommended because it has many π electrons and interferes with π-π interactions between the sample and the stationary phase.
2. The stationary phase of COSMOSIL NPE, nitrophenyl group, has a large UV absorption. When the stationary phase detaches from silica gel and elutes, even a slight quantity can be detected and causes baseline noise. In such a case, wash the column with tetrahydrofuran. Detachment of a small amount of the stationary phase does not deteriorate a column's separation ability.
3. COSMOSIL NPE column is not suitable for gradient analysis.

## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 µm)

**COSMOSIL 5NPE Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 1.0 x 150 | 05897-01 |
| 2.0 x 150 | 34328-51 |
| 2.0 x 250 | 34379-91 |

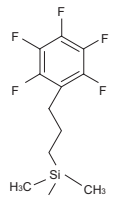
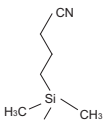
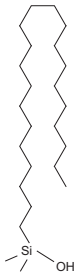
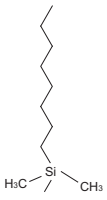
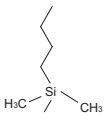
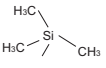
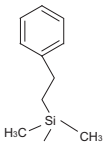
| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 150 | 37902-21 |
| 4.6 x 250 | 37990-71 |
| 10 x 250 | 05469-11 |
| 20 x 250 | 38046-21 |

**COSMOSIL 5NPE Guard Column**

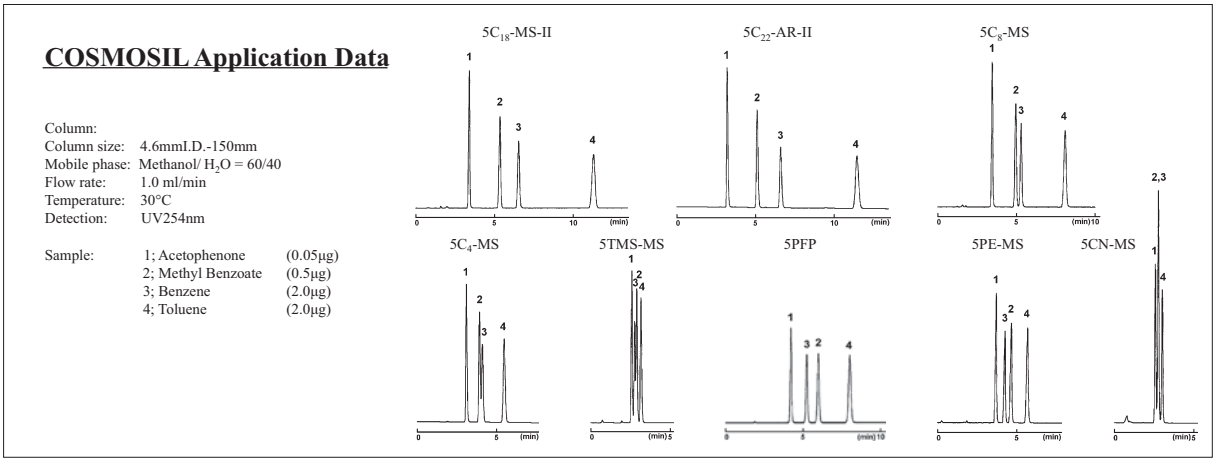
| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 37904-01 |
| 10 x 20 | 38045-31 |
| 20 x 20 | 05868-81 |
| 20 x 50 | 05869-71 |

# Other Reversed Phase Columns

## Specifications

| Packing Material | PFP | CN-MS | C22-AR-II | C8-MS | C4-MS | TMS-MS | PE-MS |
|---|---|---|---|---|---|---|---|
| Silica Gel | High purity porous spherical silica | | | | | | |
| Average Particle Size | 5 µm | | | | | | |
| Average Pore Size | approx. 120 Å | | | | | | |
| Specific Surface Area | approx. 300 $m^2/g$ | | | | | | |
| Bonded Phase Structure |  |  |  |  |  |  |  |
| Bonded Phase | Pentafluorophenyl group | Cyanopropyl group | Dococyl group | Octyl group | Butyl group | Trimethyl group | Phenylethyl group |
| Bonding Type | Monomeric | | Polymeric | Monomeric | | | |
| Main Interaction | Hydrophobic interaction<br>π-π interaction<br>Dipole-dipole | Hydrophobic interaction<br>π-π interaction | Hydrophobic interaction | | | | Hydrophobic interaction<br>π-π interaction |
| End-Capping Treatment | Near-perfect treatment | | | | | | |
| Carbon Content | approx. 10% | approx. 7% | approx. 19% | approx. 10% | approx. 7% | approx. 5% | approx. 10% |
| pH Range | 2-7.5 | | | | | | |

## Difference in Separation Characteristics

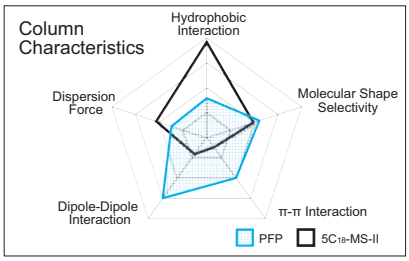


# COSMOSIL PFP

- Pentafluorophenyl-bonded stationary phase
- Alternative selectivity to $C_{18}$ columns

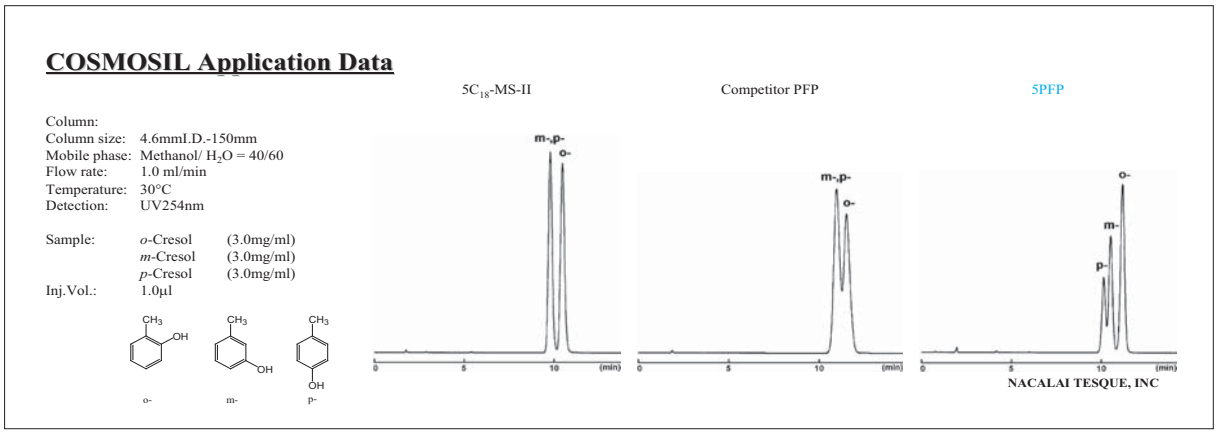
< Suitable Samples >

- Vitamin E, structural isomers and fluorides



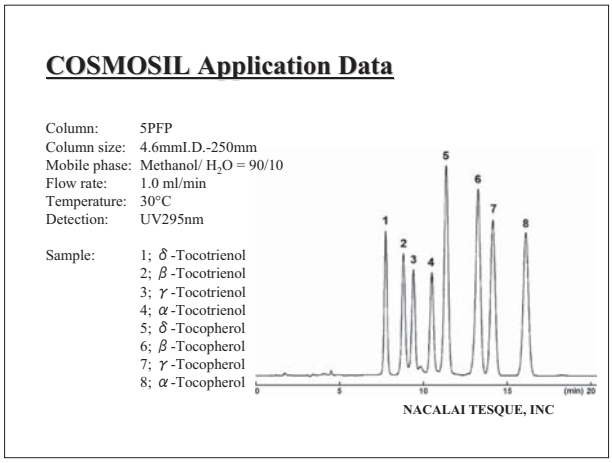

## Alternative Selectivity to $C_{18}$ Columns

COSMOSIL PFP provides different selectivity from $C_{18}$ Columns. Furthermore, it offers improved separation compared to other PFP columns.

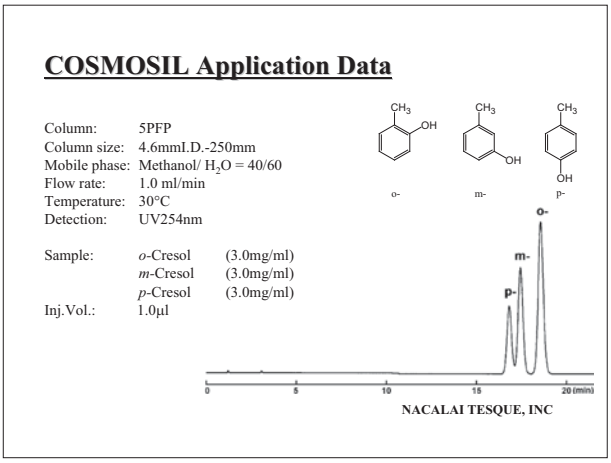



## Applications

- **Vitamin E**




- **Cresol Isomers**




## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 µm)

**COSMOSIL 5PFP Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 2.0 x 50 | 13263-41 |
| 2.0 x 100 | 13264-31 |
| 2.0 x 150 | 12381-21 |
| 2.0 x 250 | 13265-21 |
| 3.0 x 50 | 13266-11 |
| 3.0 x 100 | 13267-01 |
| 3.0 x 150 | 13268-91 |
| 3.0 x 250 | 13269-81 |
| 4.6 x 50 | 13270-41 |
| 4.6 x 100 | 13271-31 |
| 4.6 x 150 | 12383-01 |
| 4.6 x 250 | 12384-91 |

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 10 x 50 | 13272-21 |
| 10 x 100 | 13273-11 |
| 10 x 150 | 13274-01 |
| 10 x 250 | 12386-71 |
| 20 x 50 | 13276-81 |
| 20 x 100 | 13277-71 |
| 20 x 150 | 13278-61 |
| 20 x 250 | 12387-61 |
| 28 x 100 | 13280-11 |
| 28 x 150 | 13281-01 |
| 28 x 250 | 13282-91 |

**COSMOSIL 5PFP Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 Cartrige* | 12443-24 |
| 10 x 20 | 12385-81 |
| 20 x 20 | 13275-91 |
| 28 x 50 | 13279-51 |

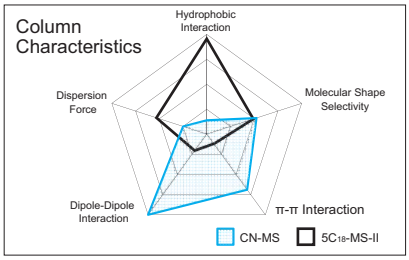
* 2 cartridges included. Guard cartridge holder required; refer to page 71.

# COSMOSIL CN-MS

- Cyanopropyl-bonded stationary phase
- Enables separation of different hydrophobic samples without using gradient

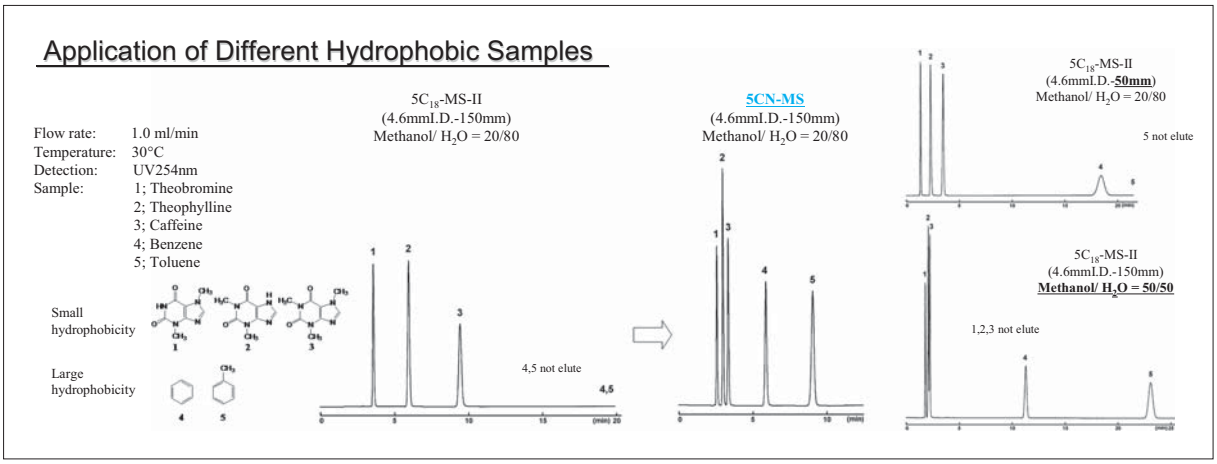
< Suitable Samples >

- Mixtures of natural compounds



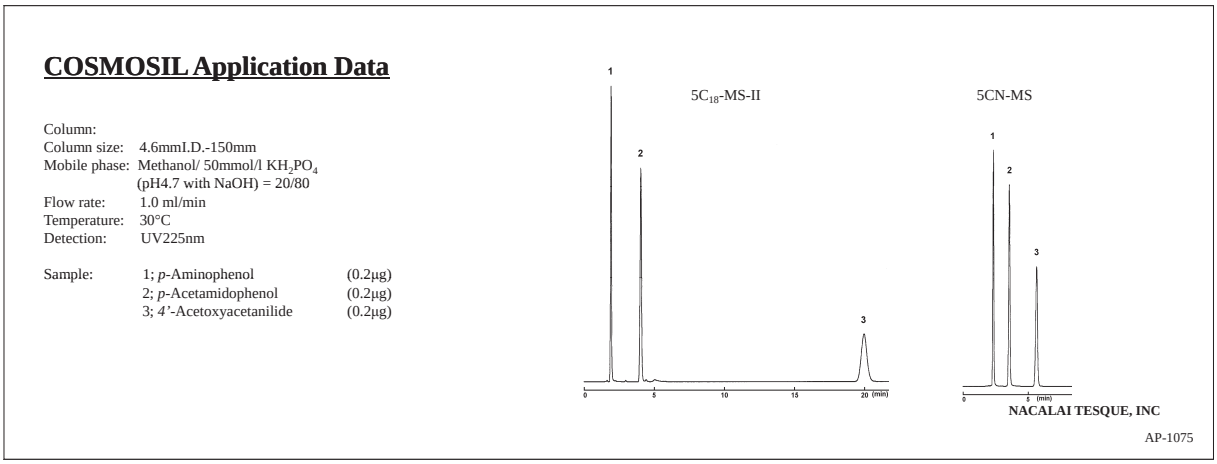

## Rapid Analysis

Gradient elution is commonly used for the samples containing both polar and non-polar compounds. However, gradient elution may cause reproducibility problems depending on the gradient mixer and pump, and needs equilibration time for each analysis. COSMOSIL 5CN-MS offers rapid analysis and great reproducibility using isocratic elution mode.




## Applications

- **Acetoaminophen**




## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 µm)

**COSMOSIL 5CN-MS Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 50 | 38233-61 |
| 4.6 x 100 | 38234-51 |
| 4.6 x 150 | 38235-41 |
| 4.6 x 250 | 38236-31 |

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 6.0 x 150 | 38237-21 |
| 6.0 x 250 | 38238-11 |
| 10 x 250 | 38239-01 |
| 20 x 250 | 38240-61 |

**COSMOSIL 5CN-MS Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 38231-81 |
| 10 x 20 | 38232-71 |

# COSMOSIL C22-AR-II, C8-MS, C4-MS, TMS-MS, PE-MS

## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 µm)

**COSMOSIL 5C22-AR-II Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 50 | 05848-41 |
| 4.6 x 100 | 05849-31 |
| 4.6 x 150 | 04598-51 |
| 4.6 x 250 | 04599-41 |
| 6.0 x 150 | 05850-91 |
| 6.0 x 250 | 05851-81 |
| 10 x 250 | 04969-91 |
| 20 x 250 | 05183-41 |

**COSMOSIL 5C22-AR-II Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 04881-21 |
| 10 x 20 | 05554-81 |

**COSMOSIL 5C8-MS Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 50 | 38153-11 |
| 4.6 x 100 | 38154-01 |
| 4.6 x 150 | 38155-91 |
| 4.6 x 250 | 38156-81 |
| 6.0 x 150 | 38157-71 |
| 6.0 x 250 | 38158-61 |
| 10 x 250 | 38159-51 |
| 20 x 250 | 38160-11 |

**COSMOSIL 5C8-MS Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 38151-31 |
| 10 x 20 | 38152-21 |

**COSMOSIL 5C4-MS Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 50 | 38163-81 |
| 4.6 x 100 | 38164-71 |
| 4.6 x 150 | 38165-61 |
| 4.6 x 250 | 38166-51 |
| 6.0 x 150 | 38167-41 |
| 6.0 x 250 | 38168-31 |
| 10 x 250 | 38169-21 |
| 20 x 250 | 38170-81 |

**COSMOSIL 5C4-MS Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 38161-01 |
| 10 x 20 | 38162-91 |

**COSMOSIL 5TMS-MS Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 50 | 38173-51 |
| 4.6 x 100 | 38174-41 |
| 4.6 x 150 | 38175-31 |
| 4.6 x 250 | 38176-21 |
| 6.0 x 150 | 38177-11 |
| 6.0 x 250 | 38178-01 |
| 10 x 250 | 38179-91 |
| 20 x 250 | 38180-51 |

**COSMOSIL 5TMS-MS Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 38171-71 |
| 10 x 20 | 38172-61 |

**COSMOSIL 5PE-MS Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 50 | 38183-21 |
| 4.6 x 100 | 38184-11 |
| 4.6 x 150 | 38185-01 |
| 4.6 x 250 | 38186-91 |
| 6.0 x 150 | 38187-81 |
| 6.0 x 250 | 38188-71 |
| 10 x 250 | 38189-61 |
| 20 x 250 | 38190-21 |

**COSMOSIL 5PE-MS Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 38181-41 |
| 10 x 20 | 38182-31 |

## (2) Normal Phase Columns

# COSMOSIL SL-II

- High purity silica gel (>99.99%) with special treatment
- Suitable for preparative separation

## Specifications

| Packing Material | SL-II |
|---|---|
| Silica Gel | High purity porous spherical silica |
| Average Particle Size | 3, 5, 15 µm |
| Average Pore Size | approx. 120 Å |
| Specific Surface Area | approx. 300 $m^2/g$ |
| Features | • High purity silica gel (>99.99%) with special treatment<br>• Suitable for preparative separation (higher resolution than medium-pressure or open chromatography) |

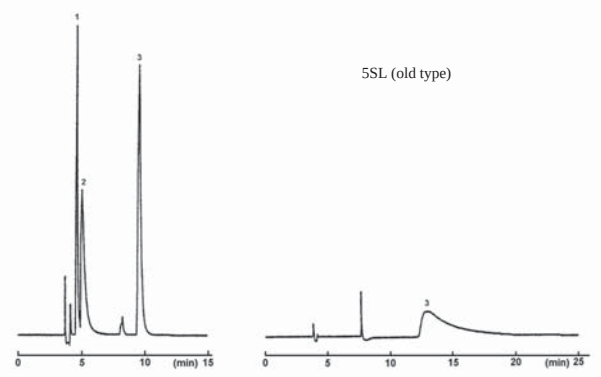
## Comparison with Old Type

COSMOSIL SL-II with high purity silica gel offers better peak shape for phenols with a simple mobile phase of ethanol or hexane. No acetic acid additives were required, unlike for the old type silica.

### Comparison with Old Type

Column:
Column size: 4.6mmI.D.-250mm
Mobile phase: Ethanol/Hexane = 10/90
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV254nm

Sample: 1; Benzoic Acid (4.0 µg)
2; Salicylic Acid (6.0 µg)
3; Salicylamide (4.0 µg)

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## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 µm)

**COSMOSIL 5SL-II Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 50 | 37999-81 |
| 4.6 x 100 | 38000-01 |
| 4.6 x 150 | 38001-91 |
| 4.6 x 250 | 38002-81 |
| 6.0 x 150 | 38003-71 |
| 6.0 x 250 | 38004-61 |
| 10 x 250 | 38005-51 |
| 20 x 250 | 38006-41 |
| 28 x 250 | 34358-61 |

**COSMOSIL 5SL-II Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 37997-01 |
| 10 x 20 | 37998-91 |
| 20 x 20 | 05874-91 |
| 20 x 50 | 05875-81 |
| 28 x 50 | 34359-51 |

- Preparative Columns (Particle Size : 15 µm)

**COSMOSIL 15SL-II Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 28 x 250 | 05893-41 |
| 50 x 250 | 05895-21 |
| 50 x 500 | 05896-11 |

**COSMOSIL15SL-II Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 28 x 50 | 05892-51 |
| 50 x 50 | 05894-31 |

- Fast LC column (Particle Size: 3 µm)

**COSMOSIL 3SL-II Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 38059-61 |
| 4.6 x 50 | 38060-21 |
| 4.6 x 100 | 38061-11 |

## (3) Hydrophilic Interaction Columns

# COSMOSIL HILIC

- Triazole bonded stationary phase
- Enhanced hydrophilic interaction
- Unique anion-exchange mechanism

< Suitable Samples >

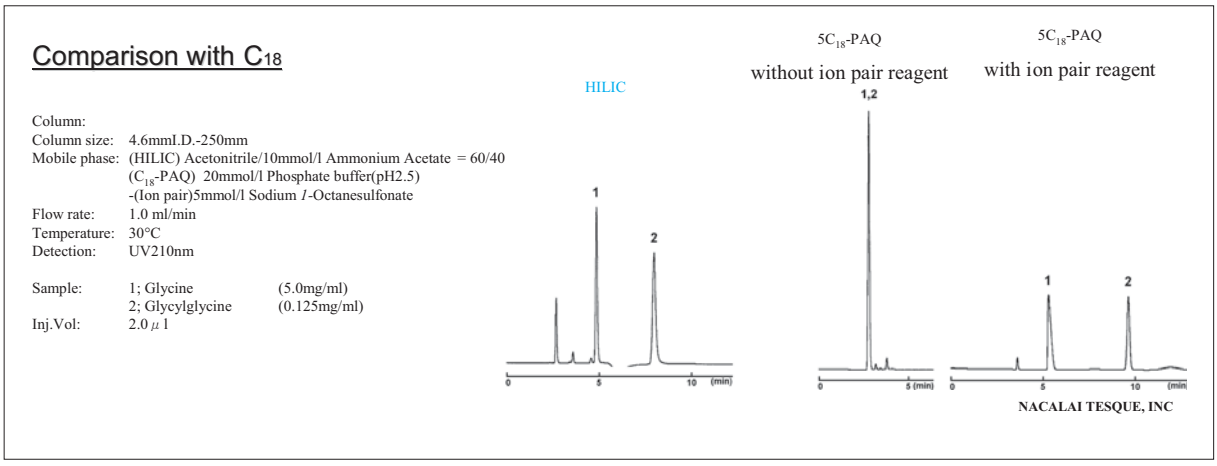
- Hydrophilic compounds that would not be retained in reversed phase chromatography
- Melamine and water-soluble viatamins

## Specifications

| Packing Material | HILIC |
|---|---|
| Silica Gel | High purity porous spherical silica |
| Average Particle Size | 2.5, 5 µm |
| Average Pore Size | approx. 120 Å |
| Specific Surface Area | approx. 300 $m^2/g$ |
| Bonded Phase | Triazole |
| Interaction | Hydrophilic interaction, anion exchange |
| Target Substance | Hydrophilic compounds, acidic compounds |
| Features | Suitable for compounds not retained by $C_{18}$ |

## Comparison with $C_{18}$

The hydrophilic interaction chromatography is a variation of normal phase chromatography where a polar stationary phase is used with a mobile phase which contains a high concentration of water-miscible organic solvent and a low concentration of aqueous eluent. The main retention mechanism is the partitioning of the polar analytes between the polar stationary and the non-polar mobile phase. As it is also called “aqueous normal phase”, the elution order is similar to that of normal phase and the sample elution is in the order of increasing hydrophilicity. Without using ion-pair reagent COSMOSIL HILIC retains highly polar analytes that would not be retained in reversed phase chromatography. It also shows a weak anion-exchange mechanism with the positively charged stationary phase, thus acidic compounds are strongly retained.



## Applications

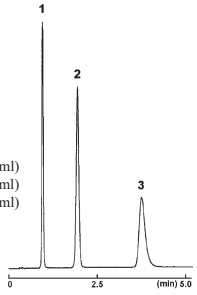
2.5 µm particles yield better performance and shorter analysis time compared to 5 µm particles.

### • Nucleotides

**COSMOSIL Application Data**

Column: 2.5HILIC
Column size: 2.0mmI.D.-50mm
Mobile phase: Acetonitrile/ 20mmol/l Phosphate buffer(pH7.0) = 50/50
Flow rate: 0.4 ml/min
Temperature: 40°C
Detection: UV260nm

Sample: 1; Adenosine-5'-monophosphate (0.25mg/ml)
2; Adenosine-5'-diphosphate (0.50mg/ml)
3; Adenosine-5'-triphosphate (0.50mg/ml)
Inj.Vol.: 0.5µl

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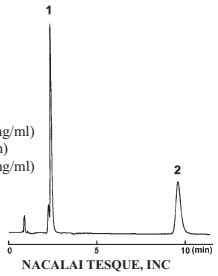
AP-1275

### • Phosphorylated Peptide

**COSMOSIL Application Data**

Column: 2.5HILIC
Column size: 2.0mmI.D.-150mm
Mobile phase: Acetonitrile/ 20mmol/l Phosphate buffer(pH7.0) = 70/30
Flow rate: 0.4 ml/min
Temperature: 40°C
Detection: UV220nm

Sample: 1; Angiotensin II(Human) (0.5mg/ml)
2; [Tyr($PO_3H_2$)$_4$]-Angiotensin II(Human) (0.5mg/ml)
Inj.Vol.: 2.0µl

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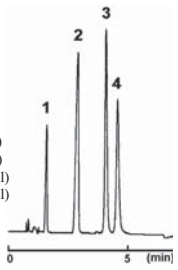
AP-1280

### • Umami Components

**COSMOSIL Application Data**

Column: 2.5HILIC
Column size: 2.0mmI.D.-150mm
Mobile phase: Acetonitrile/ 10mmol/l Phosphate buffer(pH7.0) = 50/50
Flow rate: 0.4 ml/min
Temperature: 40°C
Detection: UV210nm

Sample: 1; *L*-Glutamic Acid (2.5mg/ml)
2; Succinic Acid (4.0mg/ml)
3; Inosine-5′-monophosphate (0.25mg/ml)
4; Guanosine-5′-monophosphate (0.25mg/ml)
Inj.Vol.: 1.0µl

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AP-1276

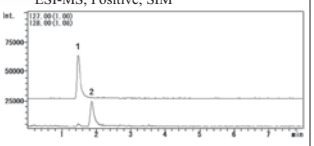
### • Melamine

**COSMOSIL Application Data**

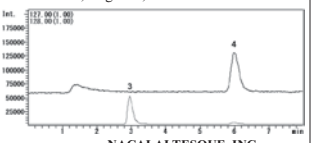
Column: 2.5HILIC
Column size: 2.0mmI.D.-50mm
Mobile phase: Acetonitrile/ 10mmol/l Ammonium Acetate = 80/20
Flow rate: 0.2 ml/min
Temperature: 40°C
Detection: ESI-MS

Sample:
1; Melamine (1mg/L)
2; Ammeline (1mg/L)
3; Cyanuric Acid (1mg/L)
4; Ammelide (1mg/L)
Inj.Vol.: 5.0µl

ESI-MS, Positive, SIM




ESI-MS, Negative, SIM

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AP-1286

## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 µm)

**COSMOSIL HILIC Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 1.0 x 150 | 07869-11 |
| 1.0 x 250 | 07870-71 |
| 2.0 x 30 | 08568-21 |
| 2.0 x 50 | 07052-91 |
| 2.0 x 100 | 08569-11 |
| 2.0 x 150 | 07054-71 |
| 2.0 x 250 | 07489-91 |
| 3.0 x 150 | 07871-61 |
| 3.0 x 250 | 07872-51 |

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 150* | 07056-51 |
| 4.6 x 150 3 lots set | 09385-23 |
| 4.6 x 250* | 07057-41 |
| 10 x 250 | 07059-21 |
| 20 x 250 | 07060-81 |
| 28 x 250 | 07875-21 |

* Validated Columns

**COSMOSIL HILIC Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 07055-61 |
| 10 x 20 | 07058-31 |
| 20 x 20 | 07854-91 |
| 20 x 50 | 07873-41 |
| 28 x 50 | 07874-31 |

- Analytical Columns (Particle Size: 2.5 µm)

**COSMOSIL HILIC Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 2.0 x 50 | 11766-21 |
| 2.0 x 75 | 11768-01 |
| 2.0 x 100 | 11769-91 |
| 2.0 x 150 | 11770-51 |

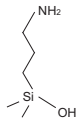
| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 3.0 x 50 | 11771-41 |
| 3.0 x 75 | 11772-31 |
| 3.0 x 100 | 11773-21 |
| 3.0 x 150 | 11773-21 |

# (4) Mono- and Oligosaccharide Analysis Columns

## Introduction

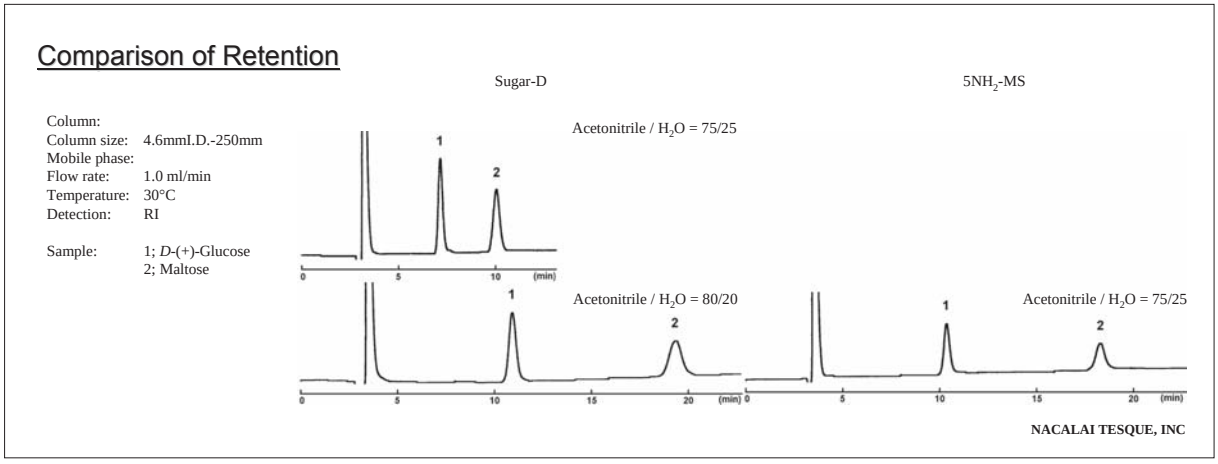
Saccharides are not retained on standard $C_{18}$ columns because of their low hydrophobicity. COSMOSIL Sugar-D and $NH_2$-MS are specifically designed for separation of saccharides. COSMOSIL $C_{18}$-PAQ is recommended for hydrophobic glycosides or saccharide derivatives.

## Specifications

| Packing Material | Sugar-D | $NH_2$-MS |
|---|---|---|
| Silica Gel | High purity porous spherical silica | |
| Average Particle Size | 5 µm | |
| Average Pore Size | — | approx. 120 Å |
| Specific Surface Area | — | approx. 300 $m^2/g$ |
| Bonded Phase Structure | — |  |
| Bonded Phase | Secondary/tertiary amine | Aminopropyl group |
| Bonding Type | — | Polymeric |
| Target Substances | Monosaccharides, oligosaccharides | |
| End-Capping Treatment | — | Near-perfect treatment |
| Carbon Content | — | approx. 4% |
| Features | •First choice for saccharide analysis<br>•High durability<br>•Good quantitative analysis | •Different selectivity from Sugar-D |

## Comparison of Retention

The conventional aminopropyl column is slightly more retentive than Sugar-D. The retention time can be adjusted by increasing the concentration of acetonitrile in the mobile phase by 5%-10% as shown below.

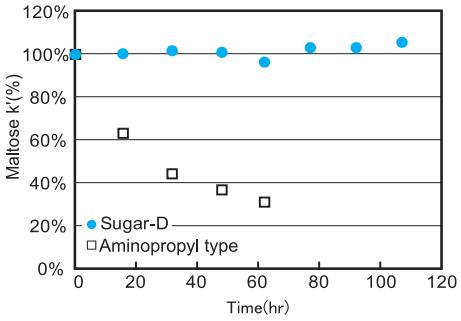


# COSMOSIL Sugar-D

- Novel stationary phase for saccharides
- Superior durability compared to conventional amino columns
- Minimized undesirable adsorption

## Comparison of Durability

The decrease of retention time was compared between COSMOSIL Sugar-D and conventional aminopropyl bonded stationary phase with a severe 100% water eluent between tests. The capacity factor of Sugar-D did not decrease.

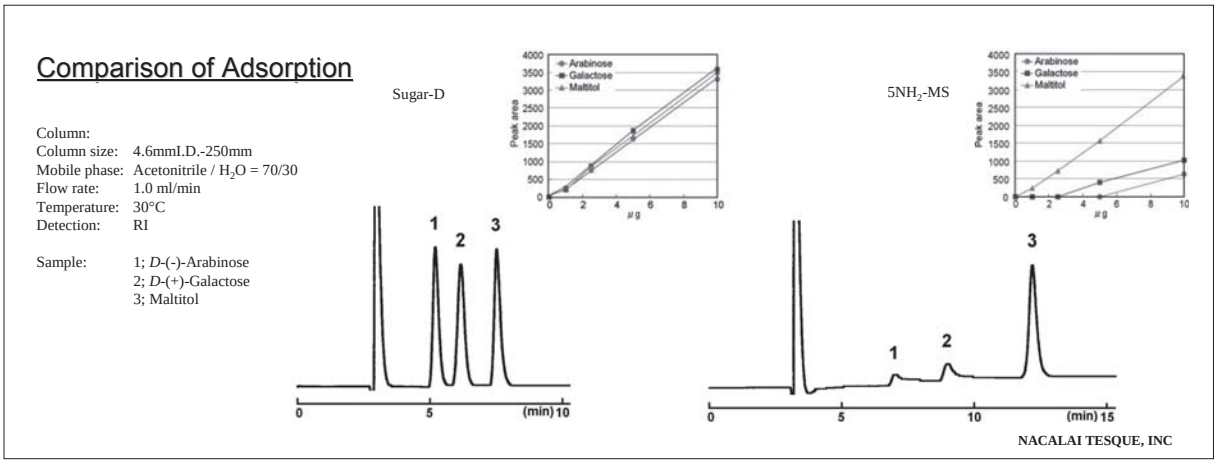



Decomposition Condition

| | |
|---|---|
| Solution | Water |
| Flow Rate | 1.0 ml/min |
| Temperature | Room Temperature |
| Column | 4.6 mm I.D. x 250 mm |
| Mobile Phase | Acetonitrile : Water = 70 : 30 |
| Flow Rate | 1.0 ml/min |
| Temperature | 30ºC |
| Detection | RI |
| Sample | Maltose |

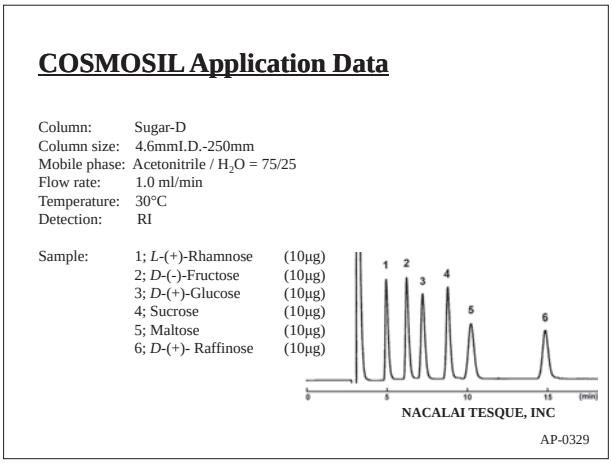
## Comparison of Adsorption

Certain types of saccharides, such as arabinose or galactose, are partially or temporarily adsorbed on conventional aminopropyl stationary phases, causing tailing or no elution at all. COSMOSIL Sugar-D provides superior separation and high recovery for these saccharides.

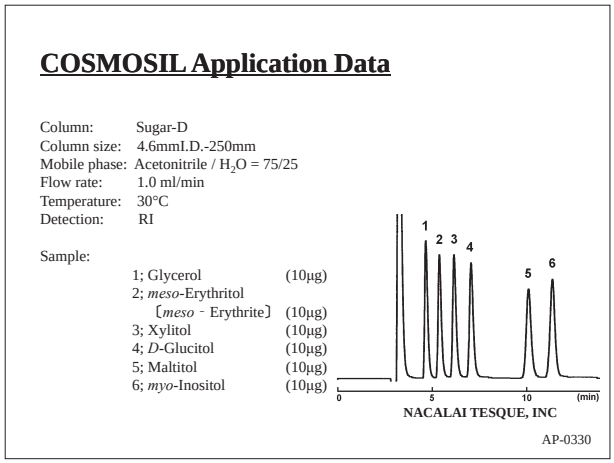



## Applications

- **Mono- and Oligosaccharides**




- **Polyols**



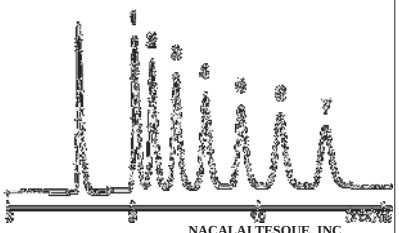
## Applications

- **Oligomaltoses**

**COSMOSIL Application Data**

Column: Sugar-D
Column size: 4.6mmI.D.-250mm
Mobile phase: Acetonitrile / $H_2O$ = 65/35
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: RI

Sample:
1; *D*-(+)-Glucose (10µg)
2; Maltose (10µg)
3; Maltotriose (10µg)
4; Maltotetraose (10µg)
5; Maltopentaose (10µg)
6; Maltohexaose (10µg)
7; Maltoheptaose (10µg)



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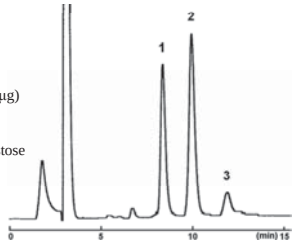
- **Oligofructoses**

**COSMOSIL Application Data**

Column: Sugar-D
Column size: 4.6mmI.D.-250mm
Mobile phase: Acetonitrile / $H_2O$ = 70/30
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: RI

Sample: Fructooligosaccharides (50µg)
1; *1*-Kestose
2; Nystose
3; *1*-Fructofuranosyl-*D*-nystose

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AP-0320

## Ordering Information

- Analytical / Preparative Columns (Particle Size : 5 µm)

**COSMOSIL Sugar-D Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 2.0 x 250 | 05689-31 |
| 3.0 x 150 | 05690-91 |
| 3.0 x 250 | 05691-81 |

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 150 | 05395-71 |
| 4.6 x 250 | 05397-51 |
| 10 x 250 | 05692-71 |
| 20 x 250 | 05693-61 |

**COSMOSIL Sugar-D Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 05394-81 |
| 10 x 20 | 05696-31 |
| 20 x 50 | 05694-51 |

# COSMOSIL $NH_2$-MS

- Aminopropyl-bonded stationary phase
- Different selectivity from Sugar-D

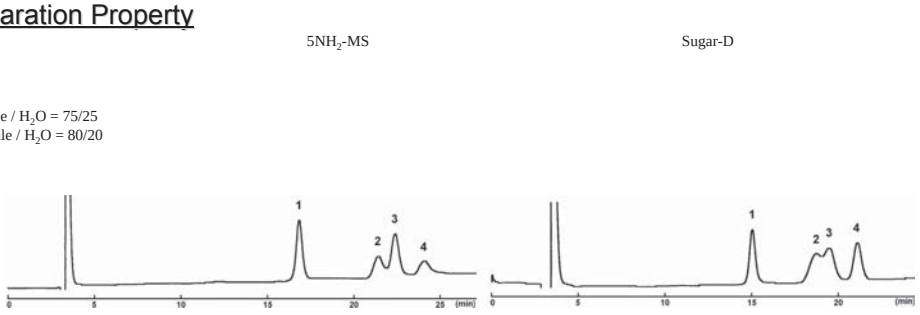
## Comparison of Adsorption

$NH_2$-MS offers better separation than Sugar-D for some samples.

**Comparison of Separation Property**

Column:
Column size: 4.6mmI.D.-250mm
Mobile phase: ($NH_2$-MS) Acetonitrile / $H_2O$ = 75/25
(Sugar-D) Acetonitrile / $H_2O$ = 80/20
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: RI

Sample:
1; Sucrose (10 µg)
2; Maltose (10 µg)
3; Lactose (10 µg)
4; *D*-(+)-Trehalose (10 µg)

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## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 µm)

**COSMOSIL 5$NH_2$-MS Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 150 | 38245-11 |
| 4.6 x 250 | 38246-01 |

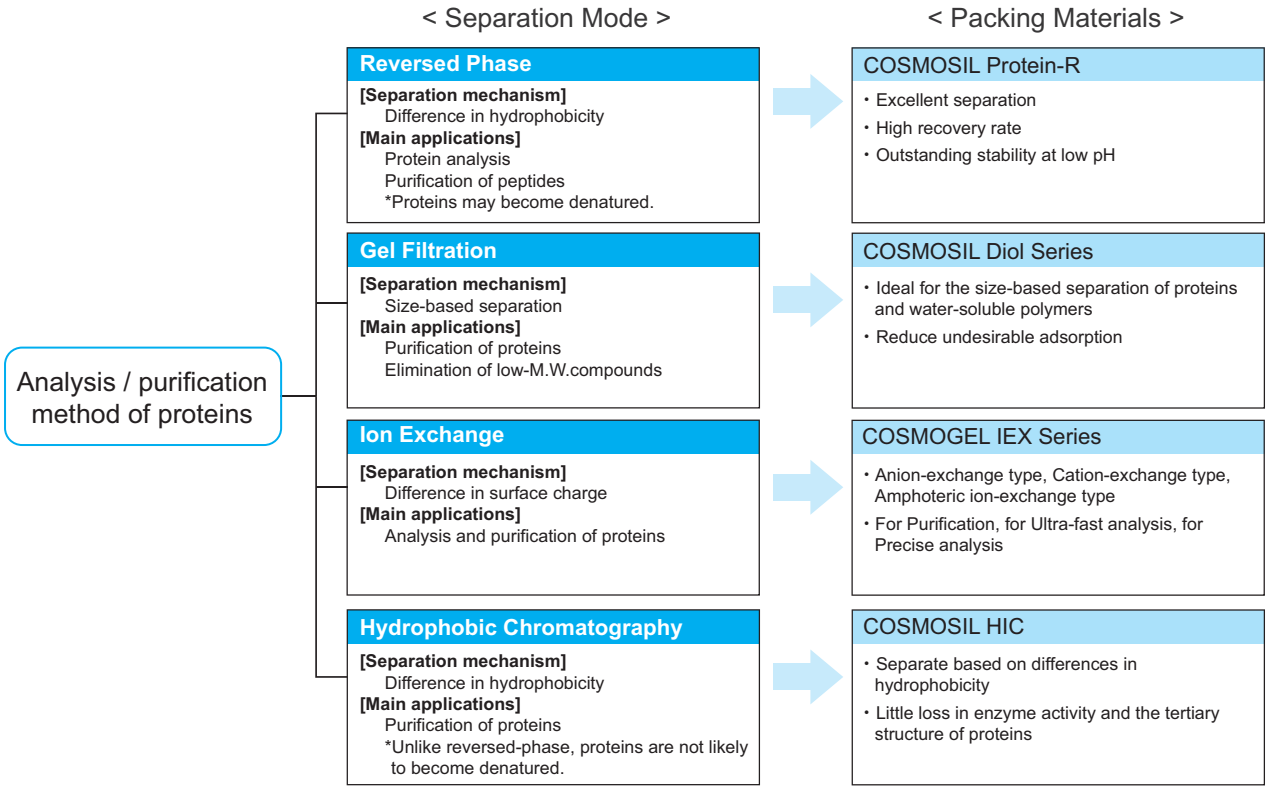
| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 10 x 250 | 38249-71 |
| 20 x 250 | 38250-31 |

**COSMOSIL 5$NH_2$-MS Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 38241-51 |
| 10 x 20 | 38242-41 |
| 20 x 50 | 06093-91 |

# (5) Protein Separation Columns

**Protein separation with HPLC**




## Reversed Phase Columns

# COSMOSIL Protein-R

- Excellent separation
- High recovery rate
- Outstanding stability at low pH

## Specifications

| Packing Material | Protein-R |
|---|---|
| Silica Gel | High purity porous spherical silica |
| Average Particle Size | 5 µm |
| Average Pore Size | approx. 300 Å |
| Specific Surface Area | approx. 150 $m^2/g$ |
| Bonded Phase | Octadecyl group |
| Bonding Type | Polymeric |
| Main Interaction | Hydrophobic interaction |
| End-Capping Treatment | Near-perfect treatment |
| pH Range | 1.5-7.5* |
| Features | • High recovery rate • Acid-resistant |

*Optimal pH range of silica-based columns is between 2 and 7.5. Extreme pH may significantly decrease column lifetime.

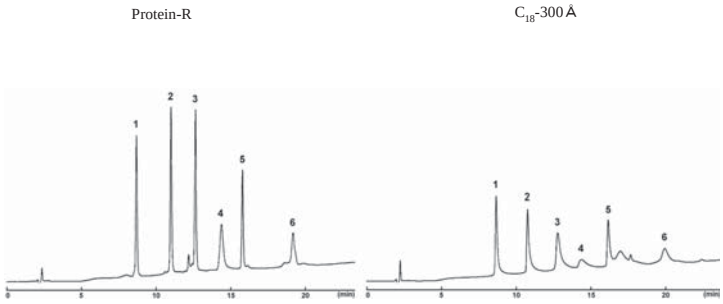
## Comparison of Separation

Protein-R shows sharper peaks for proteins than conventional $C_{18}$ wide-pore columns.

### Comparison of Separation Property

Column:
Column size: 4.6mmI.D.-150mm
Mobile phase: A; 0.05%TFA-20%Acetonitrile
B; 0.05%TFA-60%Acetonitrile
B conc. 0→100% 20min Linear gradient
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV220nm

Sample:
1; Ribonuclease A (1.0 μg)
2; Cytochrome C (1.0 μg)
3; Lysozyme (1.0 μg)
4; Albumin, Bovine [BSA] (1.0 μg)
5; Myoglobin (1.0 μg)
6; Albumin, Egg [Ovalbumin] (1.0 μg)

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## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 μm)

**COSMOSIL Protein-R Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 2.0 x 150 | 06514-71 |
| 4.6 x 50 | 06525-31 |
| 4.6 x 150 | 06526-21 |
| 4.6 x 250 | 06527-11 |

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 10 x 150 | 06529-91 |
| 10 x 250 | 06530-51 |
| 20 x 150 | 06531-41 |
| 20 x 250 | 06532-31 |

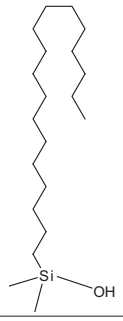
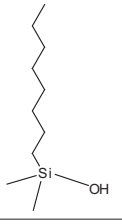
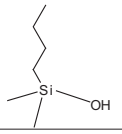
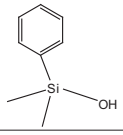
**COSMOSIL Protein-R Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 06518-31 |
| 10 x 20 | 06528-01 |
| 20 x 20 | 08692-81 |

# COSMOSIL $C_{18}$-AR-300, $C_8$-AR-300, $C_4$-AR-300, Ph-AR-300

- Wide-pore reversed-phase column
- 4 types of phases (octadecyl, octyl, butyl and phenyl)

## Specifications

| Packing Material | 5$C_{18}$-AR-300 | 5$C_8$-AR-300 | 5$C_4$-AR-300 | 5Ph-AR-300 |
|---|---|---|---|---|
| Silica Gel | High purity porous spherical silica | | | |
| Aerage Particle Size | 5 μm | | | |
| Average Pore Size | 300 Å | | | |
| Specific Surface Area | 150 $m^2/g$ | | | |
| Bonded Phase Structure |  |  |  |  |
| Bonded Phase | Octadecyl group | Octyl group | Butyl group | Phenyl group |
| Bonding Type | Polymeric | | | |
| Main Interaction | Hydrophobic interaction | | | Hydrophobic interaction π-π interaction |
| End-Capping Treatment | Near-perfect treatment | | | |
| pH Range | 1.5-7.5* | | | |
| Carbon Content | approx. 12% | approx. 7% | approx. 6% | approx. 7% |

*Optimal pH range of silica-based columns is between 2 and 7.5. Extreme pH may significantly decrease column lifetime.

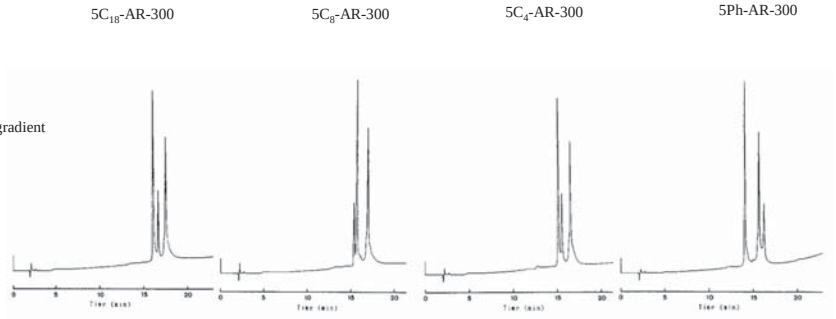
## Comparison of Separation

COSMOSIL AR-300 packed column series offers 3 types of alkyl phases and a phenyl phase.

### Comparison of Separation Property

Column:
Column size: 4.6mmI.D.-150mm
Mobile phase: A; 0.05%TFA-20%Acetonitrile
B; 0.05%TFA-60%Acetonitrile
B conc. 0→100% 20min Linear gradient
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV220nm

Sample: Hemoglobin, Bovine (10 μg)

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## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 μm)

**COSMOSIL 5C18-AR-300 Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 50 | 37911-01 |
| 4.6 x 150 | 37913-81 |
| 4.6 x 250 | 37914-71 |

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 10 x 150 | 37917-41 |
| 10 x 250 | 37918-31 |
| 20 x 150 | 37919-21 |
| 20 x 250 | 37920-81 |

**COSMOSIL 5C18-AR-300 Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 37910-11 |
| 10 x 20 | 37965-11 |

**COSMOSIL 5C8-AR-300 Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 50 | 37951-81 |
| 4.6 x 150 | 37953-61 |
| 4.6 x 250 | 37954-51 |

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 10 x 150 | 34345-21 |
| 10 x 250 | 34247-11 |
| 20 x 150 | 05861-51 |
| 20 x 250 | 34364-71 |

**COSMOSIL 5C8-AR-300 Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 37950-91 |
| 10 x 20 | 34464-61 |

**COSMOSIL 5C4-AR-300 Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 50 | 37956-31 |
| 4.6 x 150 | 37958-11 |
| 4.6 x 250 | 37959-01 |

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 10 x 150 | 34249-91 |
| 10 x 250 | 38047-11 |
| 20 x 150 | 34477-01 |
| 20 x 250 | 38048-01 |

**COSMOSIL 5C4-AR-300 Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 37955-41 |
| 10 x 20 | 05862-41 |

**COSMOSIL 5Ph-AR-300 Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 50 | 37961-51 |
| 4.6 x 150 | 37963-31 |
| 4.6 x 250 | 37964-21 |

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 10 x 150 | 05865-11 |
| 10 x 250 | 34267-51 |
| 20 x 150 | 05866-01 |
| 20 x 250 | 34468-21 |

**COSMOSIL 5Ph-AR-300 Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 37960-61 |
| 10 x 20 | 34268-41 |

# COSMOSIL Diol-120-II, Diol-300-II, Diol-1000-II

- Ideal for the size-based separation of proteins and water-soluble polymers
- Reduce undesirable adsorption

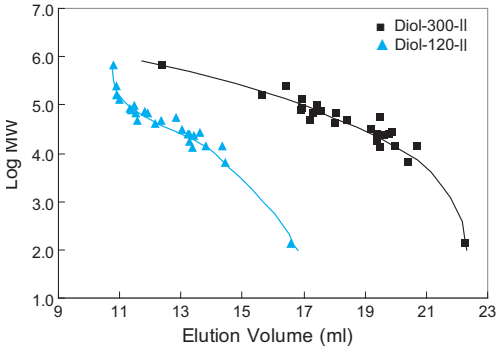
## Specifications

| Packing Material | 5Diol-120-II | 5Diol-300-II | 5Diol-1000-II |
|---|---|---|---|
| Silica Gel | High purity porous spherical silica(1) | | |
| Average Particle Size | 5 µm | | |
| Average Pore Size | approx. 120 Å | approx. 300 Å | approx. 1000 Å(2) |
| Bonded Phase | Diol group | | |
| Target Substances | Proteins, water soluble polymers | | |
| Flow Rate | 0.5-1.0 (ml/min) | | |
| Selection of Pore Size (protein) | MW 5,000-100,000 | MW 10,000-700,000 | - |
| Selection of Pore Size (water-soluble polymers) | MW 1,000-20,000 | MW 5,000-100,000 | MW 50,000-500,000 |

(1) With the silica-based gel, organic solvents, including methanol and acetonitrile, can be used.
(2) If you require pore sizes greater than 1000 Å, please contact us.

## Calibration Curve

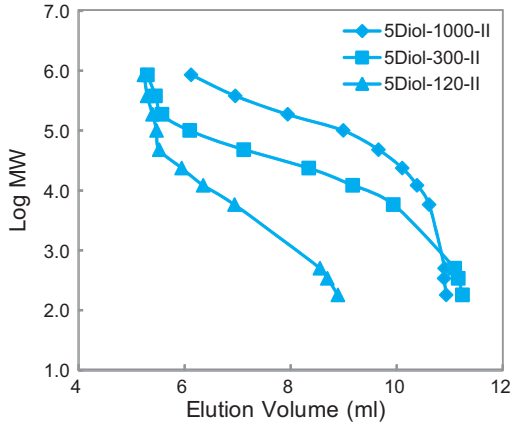
### • Calibration Curve of Proteins




| | |
|---|---|
| Column | COSMOSIL 5Diol-II (7.5 mm I.D. x 600 mm) |
| Mobile Phase | 20mmol/l Phosphate Buffer (pH7.0)+100mmol/l $Na_2SO_4$ |
| Flow Rate | 1.0ml/min |
| Temperature | 30°C |

| Sample | M.W. | Sample | M.W. |
|---|---|---|---|
| Thyroglobulin | 660,000 | Peroxidase | 40,000 |
| Catalase | 250,000 | Carbonic Anhydrase | 30,000 |
| Glucose Oxidase | 160,000 | α-Chymotrypsinogen A | 25,700 |
| Uricase | 128,000 | α-Chymotrypsin | 25,200 |
| Choline Oxidase | 95,000 | Trypsinogen | 24,000 |
| Transferrin | 85,000 | Trypsin (bovine) | 23,300 |
| Conalbumin | 77,500 | Myoglobin | 17,000 |
| Malate Dehydrogenase | 70,000 | Lysozyme | 14,300 |
| α-Glucosidase | 68,500 | Ribonuclease A | 13,700 |
| Albumin (BSA) | 66,000 | Cytochrome C | 12,400 |
| α-Amylase | 52,500 | Aprotinin | 6,500 |
| Fetuin | 48,000 | Gly-Gly | 132 |
| Albumin (Ovalbumin) | 45,000 | | |

### • Linear pullulan calibration curve

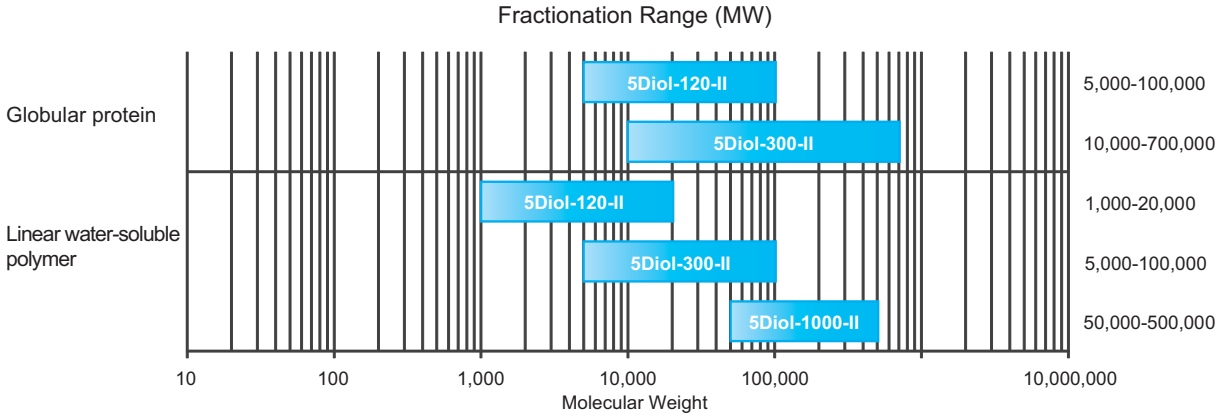



| | |
|---|---|
| Column | COSMOSIL 5Diol-II (7.5 mm I.D. x 300 mm) |
| Mobile Phase | Water |
| Flow Rate | 1.0ml/min |
| Temperature | 30°C |
| Detection | RI |
| Sample | Linear pullulan |

| Sample | M.W. |
|---|---|
| 1; P-800 | 853,000 |
| 2; P-400 | 380,000 |
| 3; P-200 | 186,000 |
| 4; P-100 | 100,000 |
| 5; P-50 | 48,000 |
| 6; P-20 | 23,700 |
| 7; P-10 | 12,200 |
| 8; P-5 | 5,800 |
| 9; Maltotriose | 504 |
| 10; Maltose | 342 |
| 11; Glucose | 180 |

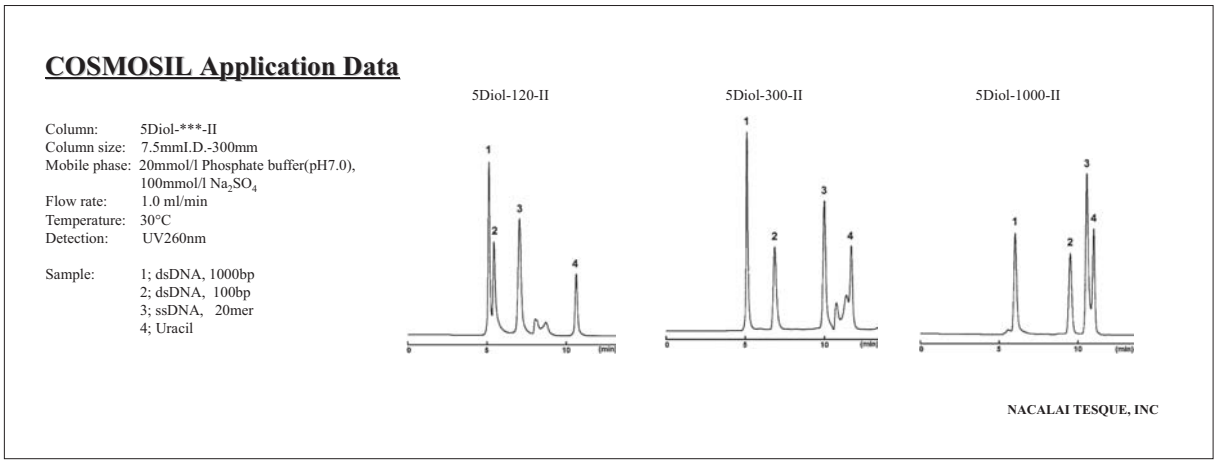
## Molecular Weight Range

Globular molecules have smaller apparent size compared to linear molecules of the same weight. Therefore, globular molecules can be separated with smaller pores compared to linear molecules.




## Application

- **DNA**




## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 µm)

**COSMOSIL 5Diol-120-II Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 7.5 x 300 | 38050-51 |
| 7.5 x 600 | 38051-41 |

**COSMOSIL 5Diol-120-II Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 7.5 x 50 | 38049-91 |

**COSMOSIL 5Diol-300-II Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 7.5 x 300 | 38053-21 |
| 7.5 x 600 | 38054-11 |

**COSMOSIL 5Diol-300-II Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 7.5 x 50 | 38052-31 |

**COSMOSIL 5Diol-1000-II Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 7.5 x 300 | 13338-71 |

**COSMOSIL 5Diol-1000-II Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 7.5 x 50 | 13337-81 |

# COSMOGEL IEX Series

- Available in 3 different ion-exchange modes
  (Anion-exchange type, Cation-exchange type, Amphoteric ion-exchange type)
- Available for 3 different application areas
  (for Purification, for Ultra-fast analysis, for Precise analysis)
- For separation of biopolymers such as proteins or nucleic acids

## Specifications

| Packing Material | Type Q | Type Q-N | Type S | Type S-N | Type M | Type M-N |
|---|---|---|---|---|---|---|
| Gel | Hydrophilic polymer | | | | | |
| Average Particle Size | 5 µm | | | | | |
| Average Pore Size | 1000 Å | Non-porous | 1000 Å | Non-porous | 1000 Å | Non-porous |
| Functional Group | $-CH_3N^+(CH_3)_3$ | | $-(CH_2)_3SO_3^-$ | | $-CH_3N^+(CH_3)_3$ + $-(CH_2)_3SO_3^-$ | |
| Protein Binding Capacity | 110-150 mg BSA/ml-resin | 12-20 mg BSA/ml-resin | 70-100 mg Human IgG/ml-resin | 10-18 mg Human IgG/ml-resin | 55-75 mg(BSA)/ml 35-50 mg(IgG)/ml | 6-10 mg(BSA)/ml 5-9 mg(IgG)/ml |
| Column Size I.D. x Lengh (mm) | 4.6 x 50 | 4.6 x 30<br>4.6 x 100 | 4.6 x 50 | 4.6 x 30<br>4.6 x 100 | 4.6 x 50 | 4.6 x 100 |
| Column Material | PEEK | | | | | |
| Connection | Waters Type | | | | | |

## Type of Packing Material

COSMOGEL IEX Series are available in amphoteric ion-exchange type in which two kinds of packing materials are mixed, as well as in widely used anion-exchange type and cation-exchange type.

| Type of Packing Material | Target Sample | Average Pore Size | |
|---|---|---|---|
| | | Porous (1000 Å ) | Non-porous |
| Anion-Exchange Type | Acidic proteins / DNA | Type Q | Type Q-N |
| Cation-Exchange Type | Basic proteins | Type S | Type S-N |
| Amphoteric Ion-Exchange Type | All proteins | Type M | Type M-N |

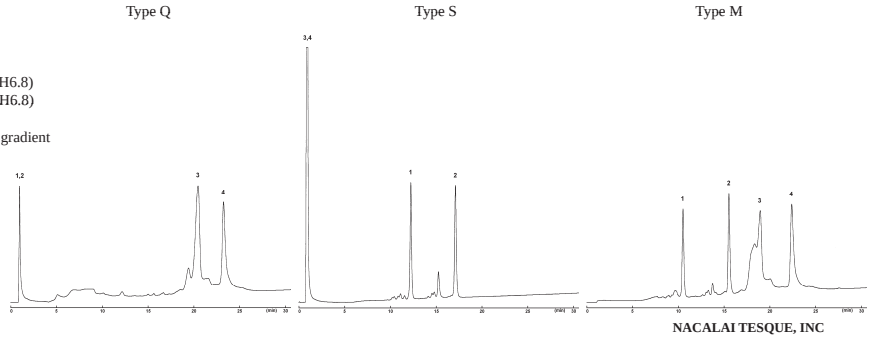
### Comprehensive isolation of proteins by amphoteric ion-exchange type (Type M)

The amphoteric ion-exchange type enables the simultaneous separation of both acidic and basic proteins in one application.

**COSMOSIL Application Data**

Column: COSMOGEL IEX
Column size: 4.6mmI.D.-50mm
Mobile phase: A: 20mmol/l Phosphate buffer(pH6.8)
B: 20mmol/l Phosphate buffer(pH6.8) + 0.5mol/l NaCl
B conc. 0→100% 30min Linear gradient
Flow rate: 0.5 ml/min
Temperature: 30°C
Detection: UV220nm

Sample: 1; Ribonuclease A (1.5µg)
2; Cytochrome C (1.5µg)
3; Trypsin Inhibitor (6.0µg)
4; β-Galactosidase (6.0µg)

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## Type of Column

COSMOGEL IEX columns are available for 3 types of applications:

| Application | Pore Size | Column Size I.D. x Length (mm) | Column | | |
|---|---|---|---|---|---|
| For Purification | Porous (1000 Å ) | 4.6 × 50 | Type Q | Type S | Type M |
| For Precise Analysis | Non-porous | 4.6 × 100 | Type Q-N | Type S-N | Type M-N |
| For Ultra-Fast Analysis | Non-porous | 4.6 × 30 | Type Q-N | Type S-N | — |

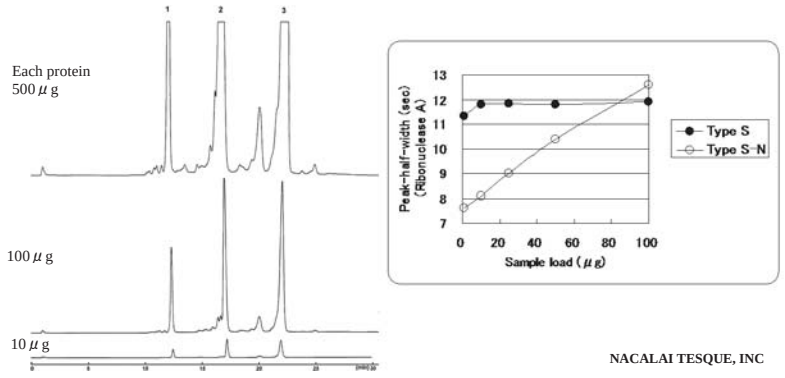
## For Purification: Type Q, Type S, Type M

Porous packing materials have higher binding capacity for proteins than the non-porous type, which means that peak shape does not spread even with injection of a large volume of sample. Therefore they are highly suitable for purification of large samples.

**COSMOSIL Application Data**

Column: COSMOGEL IEX Type S
Column size: 4.6mmI.D.-50mm
Mobile phase: A: 20mmol/l Phosphate buffer(pH6.8)
B: 20mmol/l Phosphate buffer(pH6.8) + 0.5mol/l NaCl
B conc. 0→100% 30min Linear gradient
Flow rate: 0.5 ml/min
Temperature: 30°C
Detection: UV280nm

Sample: 1; Ribonuclease A
2; Cytochrome C
3; Lysozyme

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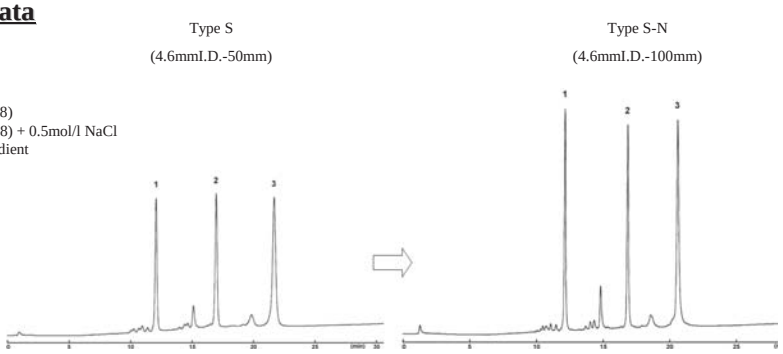
## For Precise Analysis: Type Q-N, Type S-N, Type M-N

Non-porous packing materials reduce spreading of samples in packing materials, resulting in high resolution separation for precise analysis, such as quality control of antibody preparations. The longer column length also contributes to the sharper peaks.

**COSMOSIL Application Data**

Column: COSMOGEL IEX
Column size:
Mobile phase: A: 20mmol/l Phosphate buffer(pH6.8)
B: 20mmol/l Phosphate buffer(pH6.8) + 0.5mol/l NaCl
B conc. 0→100% 30min Linear gradient
Flow rate: 0.5 ml/min
Temperature: 30°C
Detection: UV220nm

Sample: 1; Ribonuclease A (1.65 μg)
2; Cytochrome C (1.65 μg)
3; Lysozyme (1.65 μg)

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AP-1181

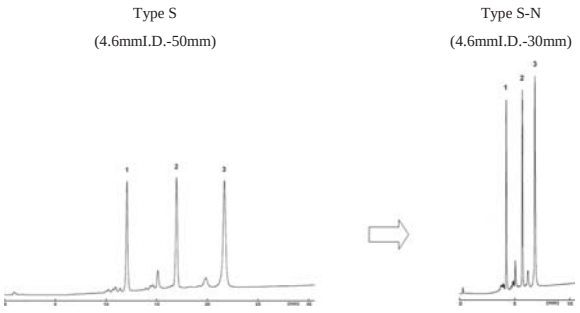
## For Ultra-fast Analysis: Type Q-N, Type S-N

Non-porous packing materials are not much affected by high flow rate and thus the materials are suitable for fast analysis. The shorter column length contributes to the fast analysis.

**COSMOSIL Application Data**

Column: COSMOGEL IEX
Column size:
Mobile phase: A: 20mmol/l Phosphate buffer(pH6.8)
B: 20mmol/l Phosphate buffer(pH6.8) + 0.5mol/l NaCl
B conc. 0→100% Linear gradient
Type S: 30min Type S-N: 10min
Flow rate: Type S: 0.5 ml/min Type S-N: 1.0 ml/min
Temperature: 30°C
Detection: UV220nm

Sample: 1; Ribonuclease A (1.65 μg)
2; Cytochrome C (1.65 μg)
3; Lysozyme (1.65 μg)

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## Ordering Information

| Ion Exchange Mode | Product Name | Application | Column Size I.D. x Length (mm) | Product Number |
|---|---|---|---|---|
| Anion-exchange Type | COSMOGEL IEX Type Q | For Purification | 4.6 x 50 | 06266-31 |
| | COSMOGEL IEX Type Q-N | For Ultra-fast Analysis | 4.6 x 30 | 06264-51 |
| | COSMOGEL IEX Type Q-N | For Precise Analysis | 4.6 x 100 | 06258-41 |
| Cation-exchange Type | COSMOGEL IEX Type S | For Purification | 4.6 x 50 | 06252-01 |
| | COSMOGEL IEX Type S-N | For Ultra-fast Analysis | 4.6 x 30 | 06251-11 |
| | COSMOGEL IEX Type S-N | For Precise Analysis | 4.6 x 100 | 06250-21 |
| Amphoteric Ion-exchange Type | COSMOGEL IEX Type M | For Purification | 4.6 x 50 | 06248-71 |
| | COSMOGEL IEX Type M-Nz | For Precise Analysis | 4.6 x 100 | 06244-11 |

# COSMOSIL HIC

- Separate based on differences in hydrophobicity
- Little loss in enzyme activity and the tertiary structure of proteins

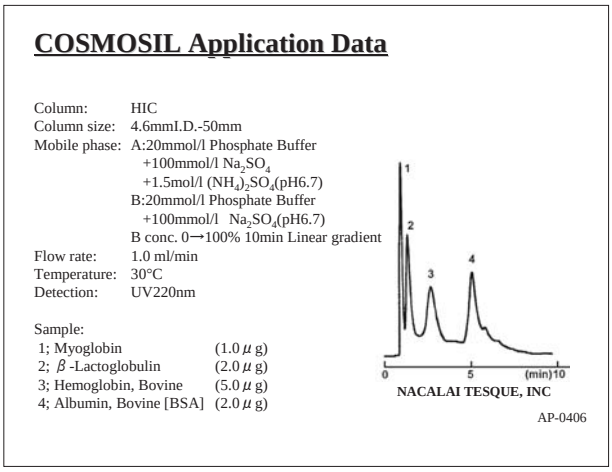
## Specifications

| Packing Material | HIC |
|---|---|
| Silica Gel | High purity porous spherical silica |
| Average Particle Size | 5 µm |
| Average Pore Size | approx. 300 Å |
| Specific Surface Area | approx. 150 $m^2/g$ |
| Main Interaction | Hydrophobic interaction |

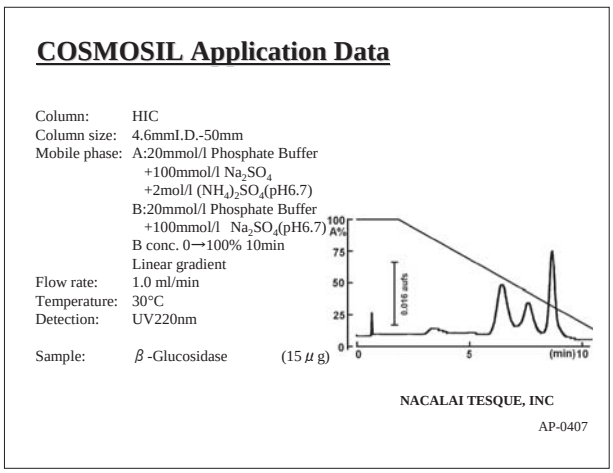
## Applications

A buffer with high salt concentration, usually 1-2 mol/l of $(NH_4)_2SO_4$, is used as an initial mobile phase for adsorption of samples to a weakly hydrophobic stationary phase. The elution is done with a decreasing salt gradient. The application in the lower left shows that myoglobin elutes earlier than BSA under the buffer with high salt concentration, suggesting that myoglobin is less hydrophobic than BSA.

- **Separation of Protein Standards**




- **Separation of β-Glucosidase**




## Ordering Information

- Analytical Columns (Particle Size: 5 µm)

**COSMOSIL 5HIC Packed Column**

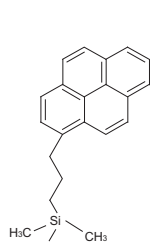
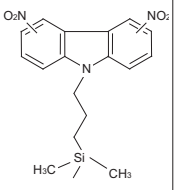
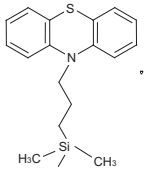
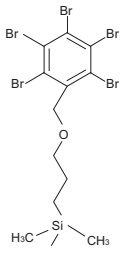
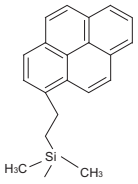
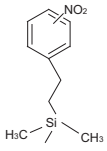
| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 50 | 04263-21 |

# (6) Columns for Fullerene Separation

## Introduction

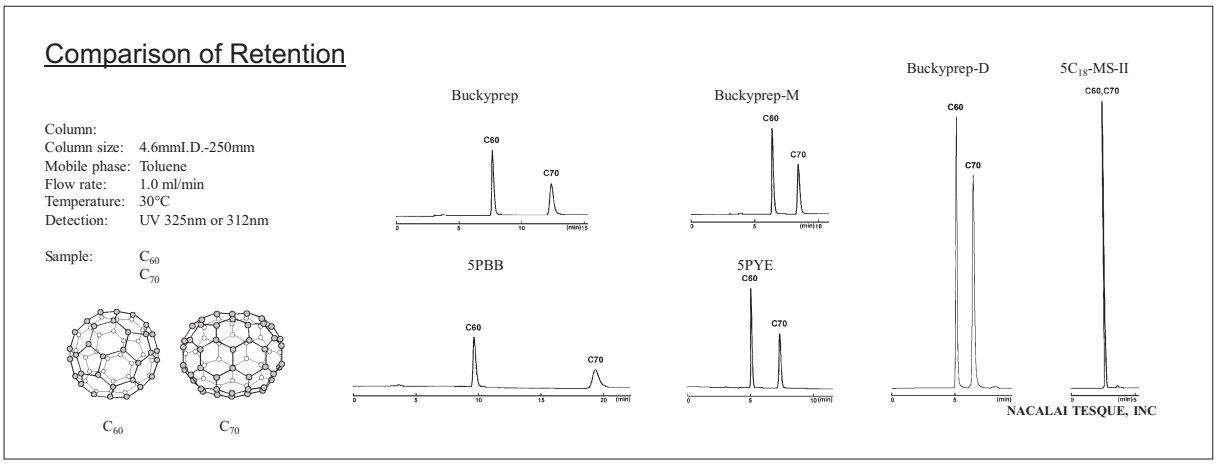
Separation of fullerenes, especially preparative scale separation, on conventional HPLC columns is always problematic due to the low solubility and low recovery rate of fullerenes. COSMOSIL offers a variety of columns designed for preparative scale separation of fullerenes, including higher fullerenes, metallofullerenes and fullerene derivatives.

## Specifications

| Packing Material | Buckyprep | Buckyprep-D | Buckyprep-M | PBB | PYE | NPE |
|---|---|---|---|---|---|---|
| Silica Gel | High purity porous spherical silica | | | | | |
| Average Particle Size | 5 µm | | | | | |
| Average Pore Size | approx. 120 Å | | | | | |
| Specific Surface Area | approx. 300 $m^2/g$ | | | | | |
| Bonded Phase Structure |  |  |  |  |  |  |
| Bonded Phase | Pyrenylpropyl group | Nitro-carbazoyl group | Phenothiazinyl group | Pentabromobenzyl group | Pyrenylethyl group | Nitrophenylethyl group |
| Bonding Type | Monomeric | | | | | |
| End-Capping Treatment | Near-perfect treatment | | None | Near-perfect treatment | | |
| Carbon Content | approx. 17% | - | approx. 13% | approx. 8% | approx. 18% | approx. 9% |
| Features | • Standard column for fullerene separation. | • For separation of derivatized fullerenes | • Designed to separate metallofullerenes | • Designded for preparative separation of $C_{60}$, $C_{70}$ | • Separation of fullerene and structural isomers | • Separation of fullerene derivatives |

## Comparison of Retention

The figure below shows the retention time of $C_{60}$ and $C_{70}$ in toluene. COSMOSIL fullerene separation columns (Buckyprep, Buckyprep-D, Buckyprep-M, PBB and PYE) exhibit high fullerene retention with toluene, so they can easily separate $C_{60}$ and $C_{70}$.




## Suggested Solvents for Fullerene Separation

| Solvent | Solubility of $C_{60}$ (mg/ml) | Features |
|---|---|---|
| Toluene | 3.2 | The most commonly used solvent. |
| *n*-Hexane | 0.046 | Weaker eluent than toluene |
| *n*-Heptane | -- | |
| Methanol | 0.001 | |
| *2*-Propanol | -- | |
| Acetonitrile | 0.018 | Weaker eluent than toluene. Recommended as a washing solvent for Buckyprep-D. |

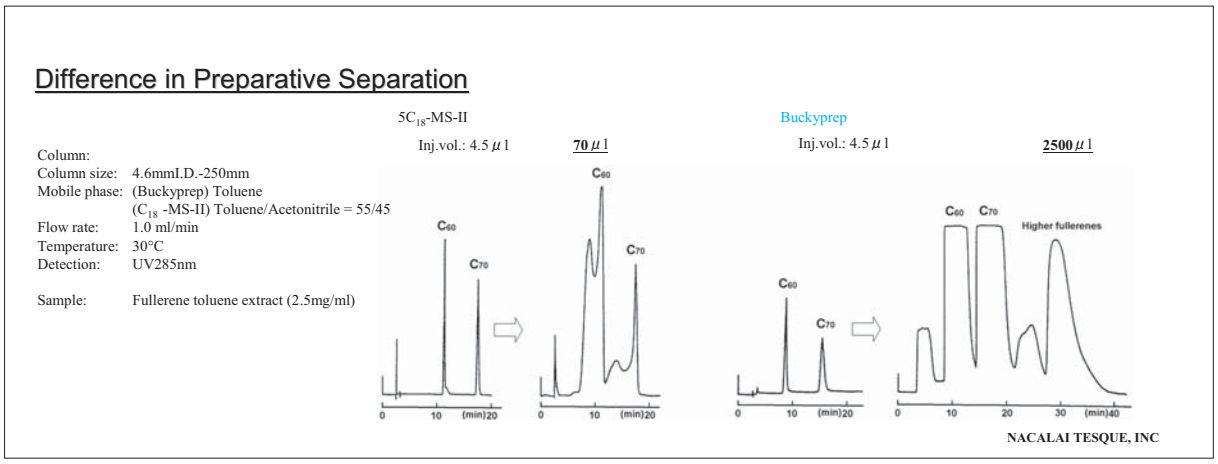
| Solvent | Solubility of $C_{60}$ (mg/ml) | Features |
|---|---|---|
| Chlorobenzene | 7.0 | Stronger eluent than toluene. Recommended for higher fullerenes. |
| *o*-Dichlorobenzene | 27.0 | Stronger eluent than chlorobenzene. |
| *1,2,4*-Trichlorobenzene | 21.3 | Strongest eluent. Recommended as a washing solvent. |

# COSMOSIL Buckyprep

- Standard column for fullerene separation
- Excellent separation for higher and derivatized fullerenes

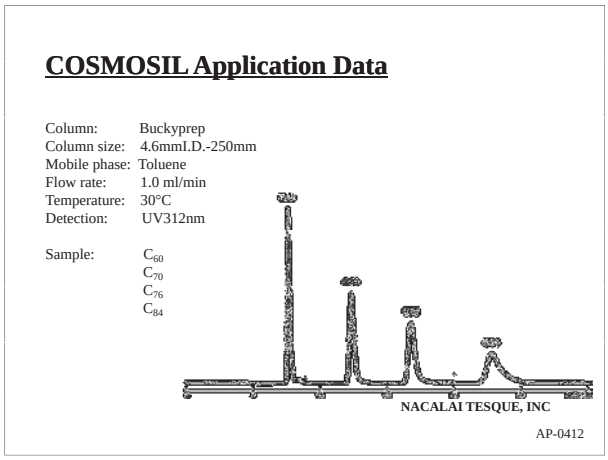
## Difference in Preparative Separation

Buckyprep can be used with toluene, the most commonly-used solvent in fullerene separation. Because tailing does not occur, you can inject about 35 times more sample than with a $C_{18}$ column.

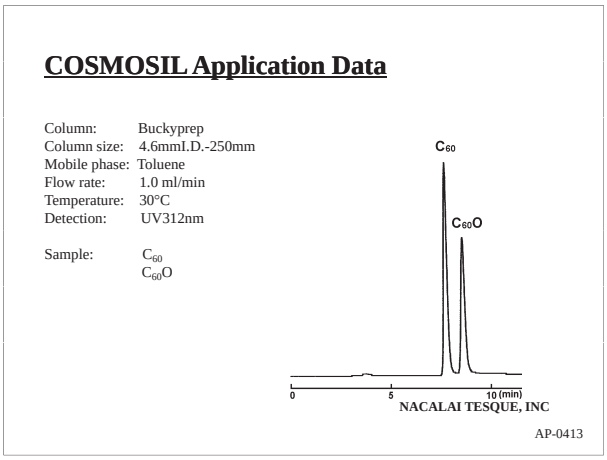



## Applications

- **Higher Fullerenes**




- **Oxidized Fullerenes**




## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 μm)

**COSMOSIL Buckyprep Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 250 | 37977-61 |
| 10 x 250 | 37981-91 |
| 20 x 250 | 37982-81 |
| 28 x 250 | 34346-11 |

**COSMOSIL Buckyprep Guard Column**

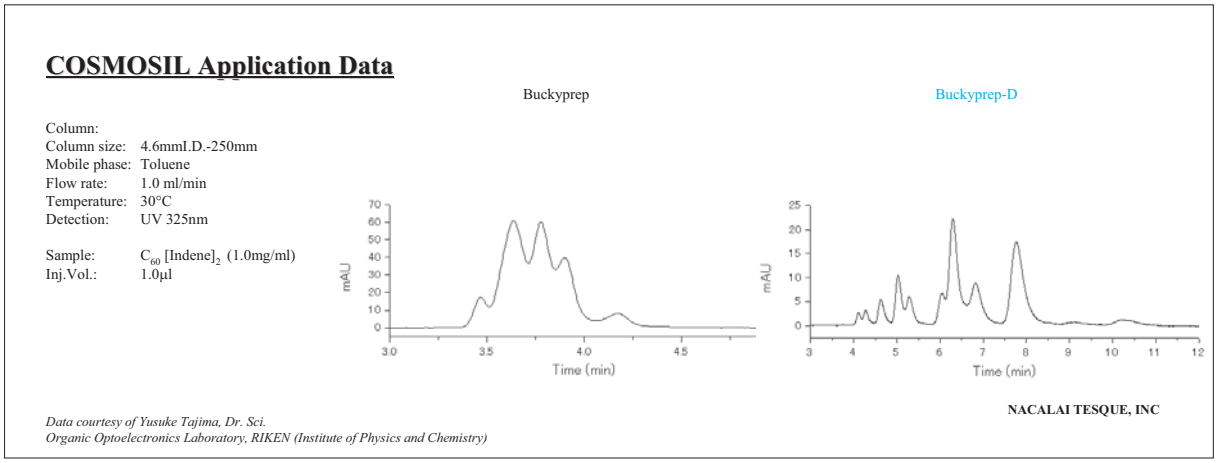
| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 37983-71 |
| 10 x 20 | 37984-61 |
| 20 x 50 | 34374-41 |
| 28 x 50 | 05871-21 |

# COSMOSIL Buckyprep-D

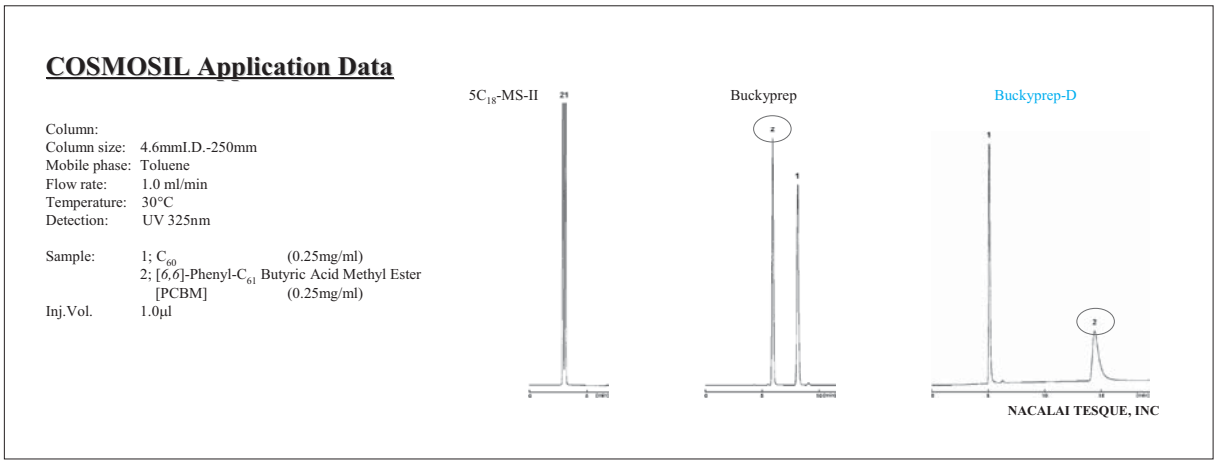
- For preparative separation of derivatized fullerenes
- For separation of derivatized fullerenes such as $C_{60}$-indene (used for organic thin-film solar cell)

## Applications

Buckyprep-D offers improved separation for $C_{60}$-indene, a derivatized fullerene that has received much attention as an n-type semiconductor material for organic thin-film solar cells.




Buckyprep-D retains derivatized fullerenes longer than $C_{60}$. Therefore it is more suitable for preparative separation of derivatized fullerenes than our conventional Buckyprep column.




## Note

The baseline of Bukyprep-D is less stable relative to other fullerene columns. To stabilize baseline, let acetonitrile run through for 10 minutes before analysis.

## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 µm)

**COSMOSIL Buckyprep-D Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 50 | 09646-61 |
| 4.6 x 250 | 09647-51 |
| 10 x 250 | 09650-91 |
| 20 x 250 | 09651-81 |

**COSMOSIL Buckyprep-D Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 09611-01 |
| 10 x 20 | 09613-81 |
| 20 x 50 | 09614-71 |

# COSMOSIL Buckyprep-M

- Different selectivity from Buckyprep
- Excellent separation for metallofullerenes

## Applications

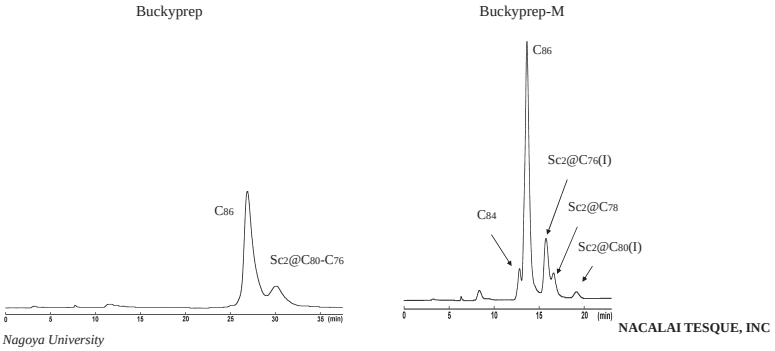
### Metallofullerenes

COSMOSIL Buckyprep-M is a phenothiazinyl-bonded silica-based column specifically designed for metallofullerene separation. Metallofullerenes are retained more strongly than other fullerenes on this column. COSMOSIL Buckyprep-M is also effective for the separation of higher fullerenes and fullerene derivatives.

**COSMOSIL Application Data**

Column:
Column size: 4.6mmI.D.-250mm
Mobile phase: Toluene
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV312nm

Sample: $Sc_2@C_{76}(I)$
$Sc_2@C_{78}$
$Sc_2@C_{80}(I)$
$C_{86}$



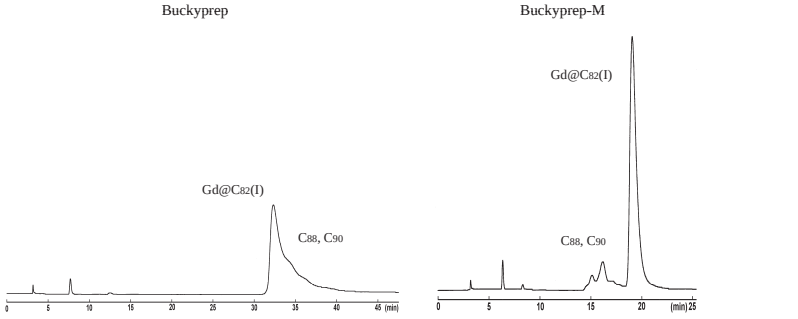

NACALAI TESQUE, INC

*Sample courtesy of Prof. H.Shinohara,Department of chemistry, Nagoya University*

**COSMOSIL Application Data**

Column:
Column size: 4.6mmI.D.-250mm
Mobile phase: Toluene
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV312nm

Sample: $Gd@C_{82}(I)$




NACALAI TESQUE, INC

*Sample courtesy of Prof. H.Shinohara,Department of chemistry, Nagoya University*

## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 µm)

**COSMOSIL Buckyprep-M Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 250 | 04138-71 |
| 10 x 250 | 04141-11 |
| 20 x 250 | 04142-01 |
| 28 x 250 | 05873-01 |

**COSMOSIL Buckyprep-M Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 04139-61 |
| 10 x 20 | 04140-21 |
| 20 x 50 | 34474-31 |
| 28 x 50 | 05872-11 |

# COSMOSIL PBB

- Can be used with *o*-dichlorobenzene or carbon disulfide
- Suitable for preparative scale separation

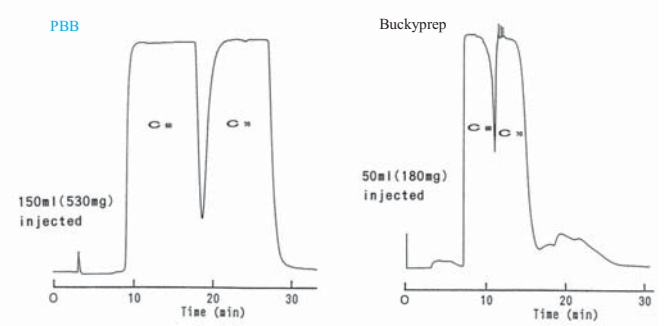
## Applications

The loading capacity of COSMOSIL PBB for $C_{60}$ and $C_{70}$ can be three times greater than COSMOSIL Buckyprep.

### Preparative Separation of Fullerenes

Column:
Column size: 20mmI.D.-250mm
Mobile phase: Toluene
Flow rate: 18 ml/min
Temperature: Room temperature
Detection: UV285nm

Sample: Crude fullerenes (3.5mg/ml)




## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 µm)

**COSMOSIL 5PBB Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 250 | 37980-01 |
| 10 x 250 | 37985-51 |
| 20 x 250 | 37986-41 |

**COSMOSIL 5PBB Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 37987-31 |
| 10 x 20 | 37988-21 |
| 20 x 50 | 34375-31 |

# COSMOSIL NPE

- Different selectivity from Buckyprep or PBB
- Excellent separation for derivatized fullerenes

## Applications

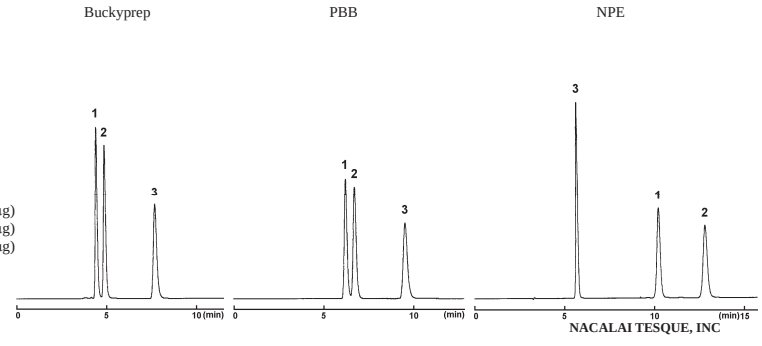
- **PCBM, PCBB**

COSMOSIL NPE retains derivatized $C_{60}$ stronger than $C_{60}$.

### COSMOSIL Application Data

Column:
Column size: 4.6mmI.D.-250mm
Mobile phase: (Buckyprep, PBB) Toluene
(NPE) Toluene/ Hexane = 25/75
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV325nm

Sample:
1; [6,6]-Phenyl-$C_{61}$ Butyric Acid Methyl Ester [PCBM] (1.5µg)
2; [6,6]-Phenyl-$C_{61}$ Butyric Acid Butyl Ester [PCBB] (1.5µg)
3; $C_{60}$ (1.5µg)




Hexane added to mobile phase due to NPE's weak retention.

## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 µm)

**COSMOSIL 5NPE Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 150 | 37902-21 |
| 4.6 x 250 | 37990-71 |
| 10 x 250 | 05469-11 |
| 20 x 250 | 38046-21 |

**COSMOSIL 5NPE Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 37904-01 |
| 10 x 20 | 38045-31 |
| 20 x 50 | 05869-71 |

# COSMOSIL PYE

## Ordering Information

- Analytical / Preparative Columns (Particle Size: 5 µm)

**COSMOSIL 5PYE Packed Column**

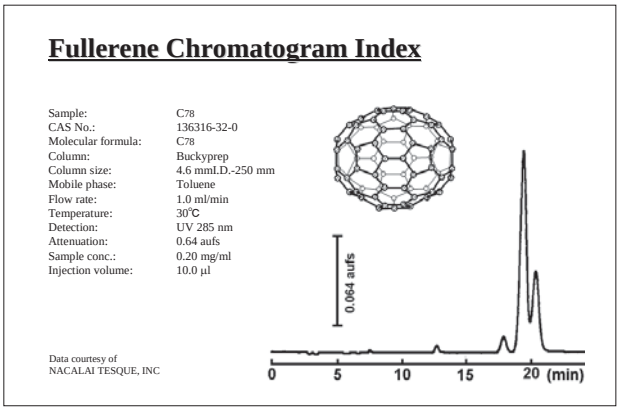
| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 250 | 37989-11 |
| 10 x 250 | 37996-11 |
| 20 x 250 | 38044-41 |
| 28 x 250 | 34300-91 |

**COSMOSIL 5PYE Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 4.6 x 10 | 37903-11 |
| 10 x 20 | 38041-71 |
| 20 x 50 | 34475-21 |

## Fullerene Chromatogram Index

Fullerene Chromatogram Index includes more than 100 chromatograms. If you are interested in this index, please feel free to e-mail us at info.intl@nacalai.com. The online version is available at the website of The Fullerenes, Nanotubes and Graphene Research Society below.




The Fullerenes, Nanotubes and Graphene Research Society

Website: http://fullerene-jp.org/en/chromato_index_3.pdf

## (7) Columns for Soluble Carbon Nanotube Separation

# COSMOSIL CNT-300, CNT-1000, CNT-2000

- Size-based separation of soluble carbon nanotubes
- Three pore sizes (300 Å , 1000 Å , 2000 Å )
- High durability

## Specifications

| Packing Material | CNT-300 | CNT-1000 | CNT-2000 |
|---|---|---|---|
| Silica Gel | High purity porous spherical silica | | |
| Average Particle Size | 5 µm | | |
| Average Pore Size | approx. 300 Å | approx. 1000 Å | approx. 2000 Å |
| Bonded Phase | Hydrophilic group (neutral) | | |
| pH Range | 2-7.5 | | |
| Pressure | 15 MPa and below | | |

## Applications

- **Carbon Nanotubes**

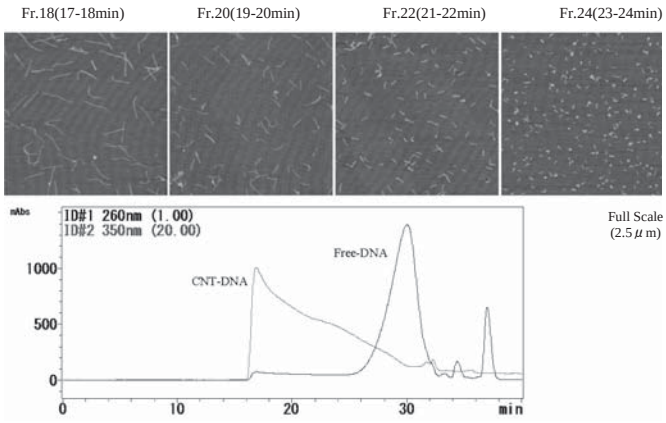
COSMOSIL CNT columns offer improved separation for DNA-wrapped carbon nanotubes by connecting three columns with different pore sizes.

**COSMOSIL Application Data**

Column: CNT-300 + CNT-1000 + CNT-2000
Column size: 7.5mmI.D.-300mm × 3
Mobile phase: 0.5mmol/l EDTA, 200mmol/l NaCl, 40mmol/l Tris-Tris HCl(pH7.0)
Flow rate: 1.0 ml/min
Temperature: 40°C
Detection: UV260nm( × 1), 350nm( × 20)

Sample: DNA-wrapped CNT(CNT-DNA)
Inj. Vol. 500 µl

*Data courtesy of Prof. H.Shinohara, Dr. Y.Asada, Department of chemistry, Nagoya University*




AP-1147

## Ordering Information

- Analytical Columns (Particle Size: 5µm)

**COSMOSIL CNT-300 Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 7.5 x 300 | 09195-71 |

**COSMOSIL CNT-300 Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 7.5 x 50 | 09194-81 |

**COSMOSIL CNT-1000 Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 7.5 x 300 | 09197-51 |

**COSMOSIL CNT-1000 Guard Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 7.5 x 50 | 09196-61 |

**COSMOSIL CNT-2000 Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 7.5 x 300 | 09199-31 |

**COSMOSIL CNT-2000 Guard Column**

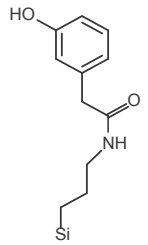
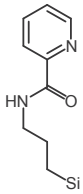
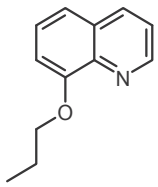
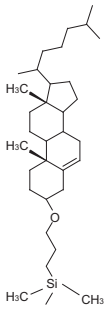
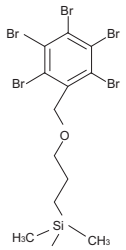
| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 7.5 x 50 | 09198-41 |

# II. SFC Columns

Supercritical Fluid Chromatography (SFC) has become more attractive because it offers some advantages over HPLC, such as high speed, unique selectivity and environmentally friendly separations. Many conventional normal-phase stationary phases, such as diol, amino and cyano, have been used for SFC applications. However, these phases present limitations for separations. COSMOSIL SFC Columns have been developed to enhance the capability of SFC separations.

## COSMOSIL SFC Columns

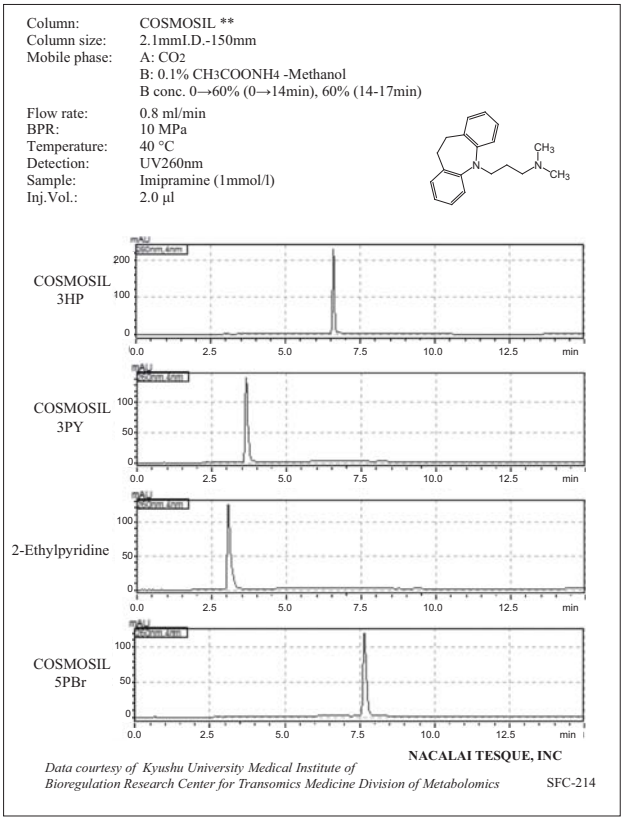
Nacalai Tesque has developed columns specially designed for SFC in collaboration with Nacalai USA and Pfizer, Inc. Global R&D: COSMOSIL HP, PY (equivalent to *2*-ethylpyridine) and Quinoline. In addition to these, our HPLC columns Cholester and PBr have been tested for use with SFC.

| Packing Material | HP | PY | Quinoline | | Cholester | | PBr |
|---|---|---|---|---|---|---|---|
| Average Particle Sizes | 3, 5 µm | | 2.5 µm | 5 µm | 2.5 µm | 5 µm | 5 µm |
| Average Pore Sizes | 120 Å | | 130 Å | 120 Å | 130 Å | 120 Å | 120 Å |
| Specific Surface Area | 300 $m^2/g$ | | 330 $m^2/g$ | 300 $m^2/g$ | 330 $m^2/g$ | 300 $m^2/g$ | 300 $m^2/g$ |
| Bonded Phase Structure |  |  |  | |  | |  |
| Bonded Phase | 3-Hydroxyphenyl group | Pyridinyl group | Quinoline group | | Cholesteryl group | | Pentabromobenzyl group |

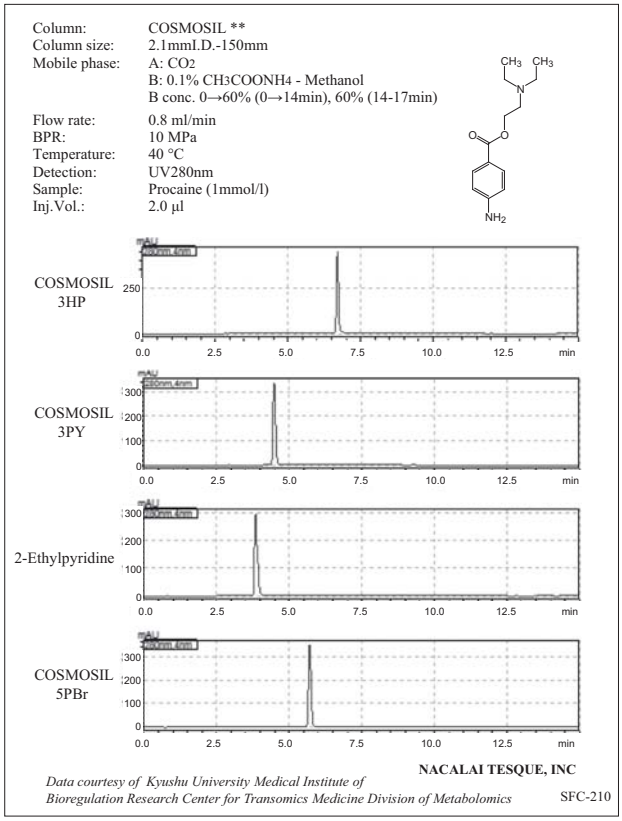
## Pharmaceutical Analysis

Each phase has different retention properties.

- **Imipramine**




- **Procaine**

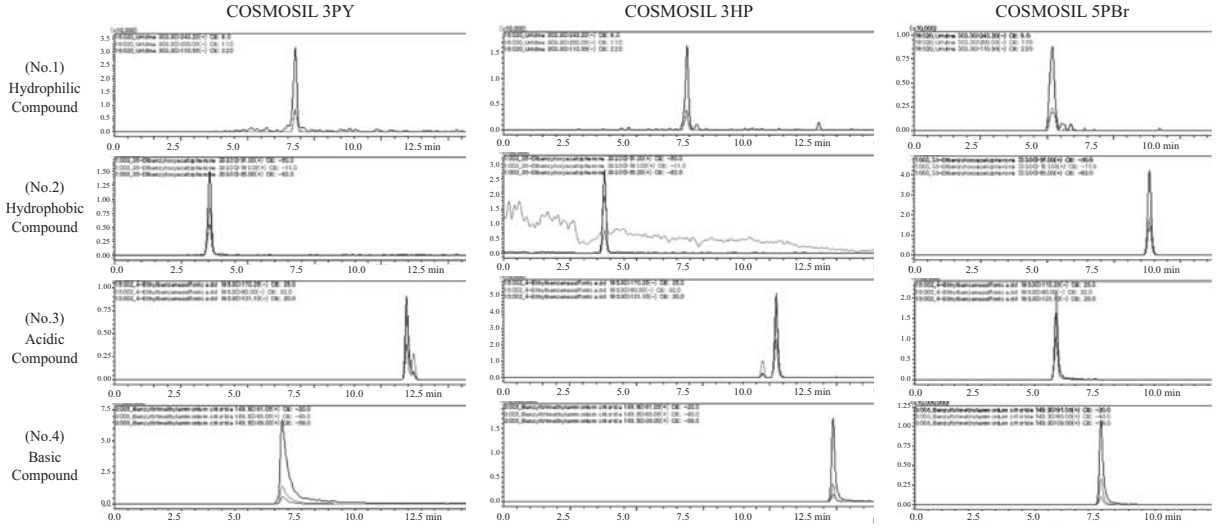


## Comparison of Retention Behavior

The following three stationary phases were evaluated for their retention of hydrophilic, hydrophobic, acidic and basic compounds. COSMOSIL HP and PY elute hydrophobic compounds first and retain hydrophilic compounds longer, whereas PBr elutes in the reverse order, exhibiting high retention for hydrophobic compounds. HP had the longest retention for basic compounds.

Column: COSMOSIL **
Column size: 2.1mmI.D.-150mm
Mobile phase: A: $CO_2$
B: 0.1% $CH_3COONH_4$-Methanol
B conc. 0→50% (0→14min), 50% (14-17min)
Flow rate: 0.8 ml/min
BPR: 10 MPa
Temperature: 40 °C
Detection: ESI-MS/MS, MRM
Sample conc. 8 µmol/l
Inj.Vol.: 2.0 µl

Sample: No.1 Uridine; No.2 2; 3' ,5' - Dibenzyloxyacetophenone; No.3 3; 4-Ethylbenzenesulfonic Acid; No.4 Benzyltrimethyl ammonium




*Data courtesy of Kyushu University Medical Institute of Bioregulation Research Center for Transomics Medicine Division of Metabolomics*

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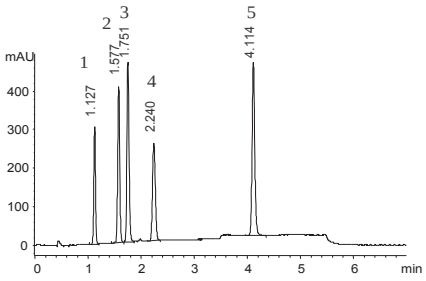
# COSMOSIL HP (3-Hydroxyphenyl)

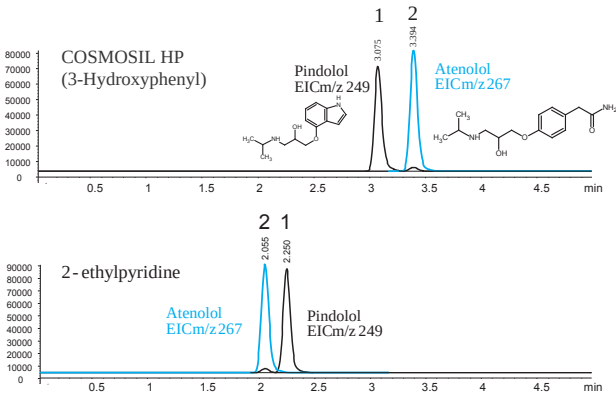
## Applications

- **Non-steroidal anti-inflammatory drugs**




Column size: 4.6 mm I.D. x 150 mm
Mobile phase: Carbon Dioxide : Methanol
Gradient: 95:5 to 65:35 over 6 minutes
Flow rate: 5.0 ml/min
Temperature: 30°C
Detection: UV 230 nm
Sample: 1. Ibuprofen
2. Fenoprofen
3. Flurbiprofen
4. Ketoprofen
5. Indoprofen

- **Beta Blockers (Peak elution order reversal under identical conditions)**




Column size: 4.6 mm I.D. x 150 mm
Mobile phase : Carbon Dioxide : Methanol
w/20mM ammonium formate
Gradient: 95:5 to 50:50 over 4 minutes
Flow rate: 5.0 ml/min
Temperature: 30°C
Detection: APCI(+)
Sample: 1. Pindolol
2. Atenolol

## Ordering Information

- Analytical / Preparative Columns

(Particle Size: 5 µm)

**COSMOSIL 5HP (3-Hydroxyphenyl) Packed Columns**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 2.0 x 150 | 13787-91 |
| 4.6 x 250 | 13788-81 |
| 10 x 250 | 13789-71 |
| 20 x 250 | 13790-31 |

**COSMOSIL 5HP (3-Hydroxyphenyl) Guard Columns**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 10.0 x 20 | 13791-21 |

(Particle Size: 3 µm)

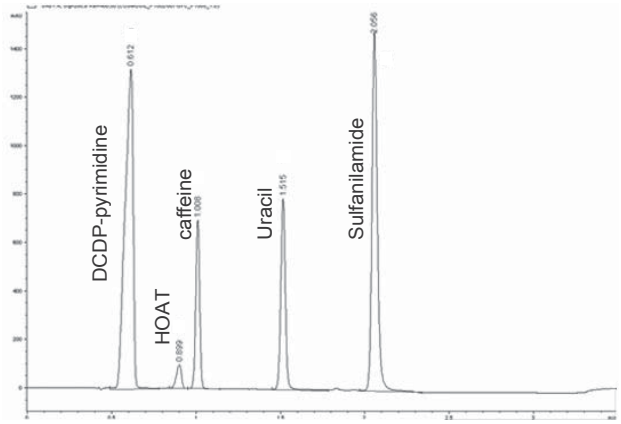
**COSMOSIL 3HP (3-Hydroxyphenyl) Packed Columns**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 2.0 x 150 | 13792-11 |
| 4.6 x 250 | 13793-01 |

# COSMOSIL PY (Pyridinyl)

## Applications

- **Hydrophilic organics**




Phase: Pyridinyl
Column size: 4.6 mm I.D. x 150 mm
Flow rate: 5.6 mL/min
Pressure 140 bar
Temperature: Ambient
Mobile phase : Methanol gradient 5-50% @18%/minute; hold @ 50% 0.1 min; return to 5% @99%/min

## Ordering Information

- Analytical / Preparative Columns

(Particle Size: 5 µm)

**COSMOSIL 5PY (Pyridinyl) Packed Columns**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 2.0 x 150 | 13818-81 |
| 4.6 x 250 | 13827-61 |
| 10 x 250 | 13828-51 |
| 20 x 250 | 13829-41 |

**COSMOSIL 5PY (Pyridinyl) Guard Columns**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 10.0 x 20 | 13830-01 |

(Particle Size: 3 µm)

**COSMOSIL 3PY (Pyridinyl) Packed Columns**

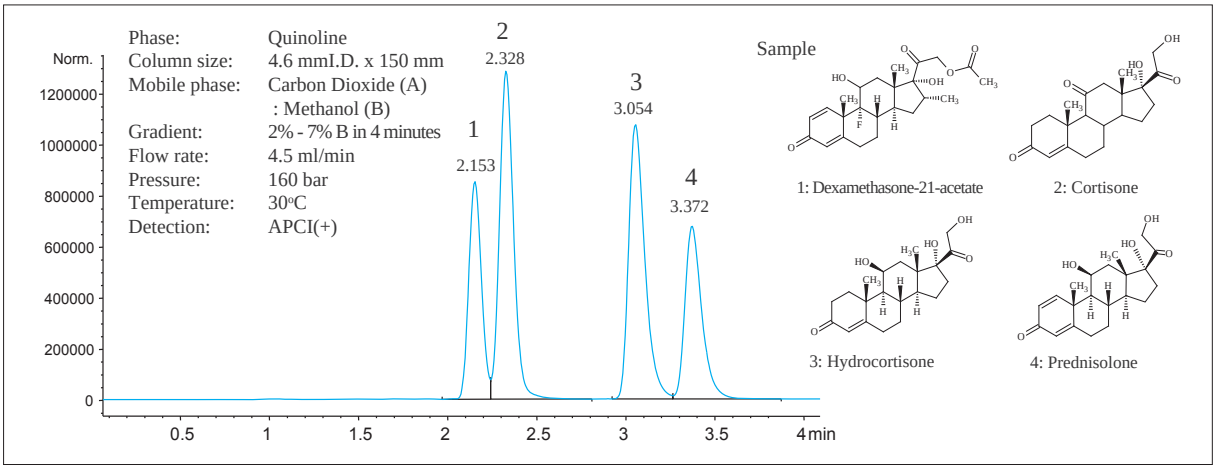
| Colu mn Size I.D. x Le ngth (mm) | Product Number |
|---|---|
| 2.0 x 150 | 13831-91 |
| 4.6 x 250 | 13832-81 |

# COSMOSIL Quinoline

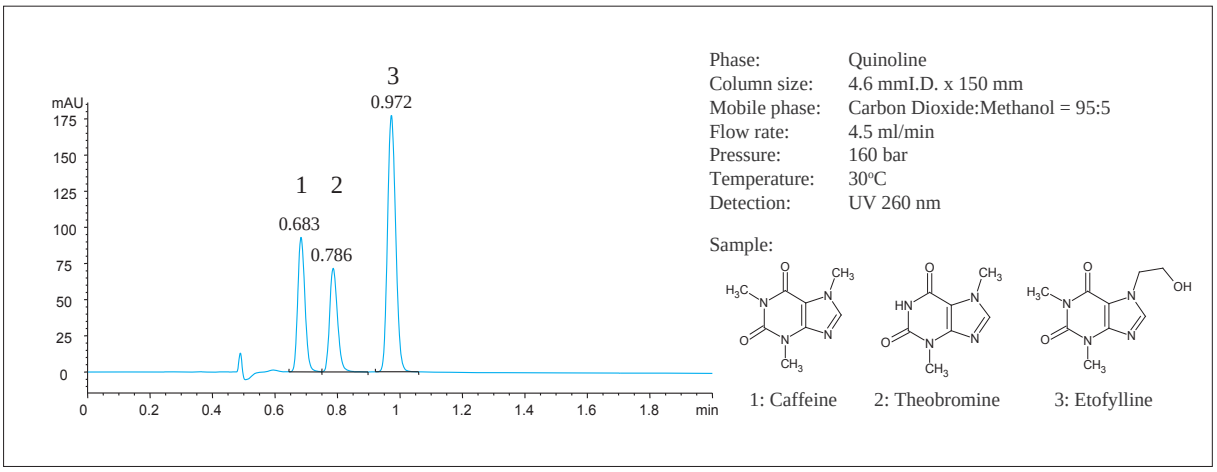
The structural similarities between polar lipids, such as cholesterol and related analogs, have posed chromatographic and spectrometric challenges to analysts interested in quantifying these potential biomarkers. COSMOSIL Quinoline has been developed to improve the separation of these structural isomers utilizing the π-π interactions and structural rigidity of the naphthylethyl phase and the hydrogen bonding of the pyridine phase.

## Applications

- **Steroids**




- **Caffeine analogs**




## Ordering Information

- Analytical / Preparative Columns

(Particle Size: 5 µm)

**COSMOSIL Quinoline Packed Column**

| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 2.0 x 150 | Inquire |
| 4.6 x 100 | Inquire |
| 4.6 x 150 | Inquire |
| 10.0 x 150 | Inquire |
| 20.0 x 150 | Inquire |

(Particle Size: 2.5 µm)

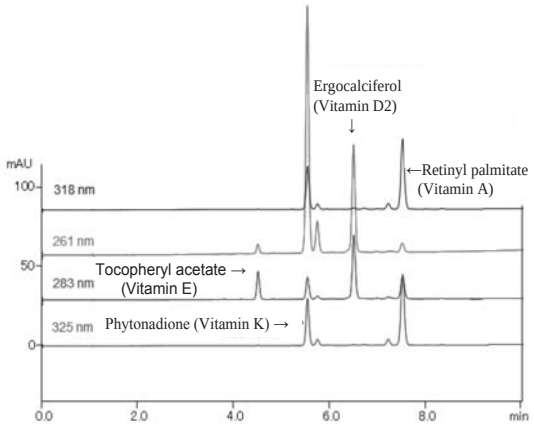
**COSMOSIL Quinoline Packed Column**

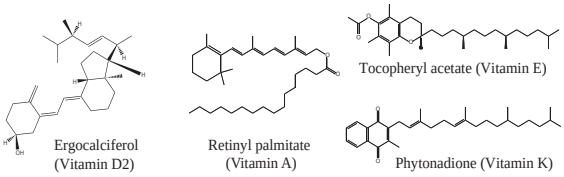
| Column Size I.D. x Length (mm) | Product Number |
|---|---|
| 3.0 x 50 | Inquire |
| 3.0 x 100 | Inquire |
| 3.0 x 150 | Inquire |

# COSMOSIL Cholester

## Fat-Soluble Vitamin Analysis

When used with SFC, COSMOSIL Cholester can separate fat-soluble vitamins and their impurities.




| | |
|---|---|
| Column: | COSMOSIL 5Cholester |
| Column size: | 4.6 mm I.D. x 250 mm |
| Mobile phase: | IPA in $CO_2$ |
| | IPA conc. 0→10%(0→10min),10%(10→12min) |
| Flow rate: | 3.0 ml/min |
| BPR: | 15 MPa |
| Temperature: | 40ºC |
| Detection: | UV-VIS |
| Sample conc: | 2.0 mg/ml |
| Inj. Vol: | 1.0 µl |

*Data courtesy of Shimadzu Corporation*

COSMOSIL Cholester exhibits strong retention for fat-soluble vitamins and is suitable for on-line SFE-SFC using Shimadzu's Nexera UC. The online extraction from food also produced triglyceride impurities, which were successfully separated from the vitamins.

## Ordering Information

For ordering information for COSMOSIL Cholester, refer to page 24.

# COSMOSIL PBr

## Ordering Information

For ordering information for COSMOSIL PBr, refer to page 25.

# III. Preparative Packing Materials

## Normal and Reversed Phase Packing Materials

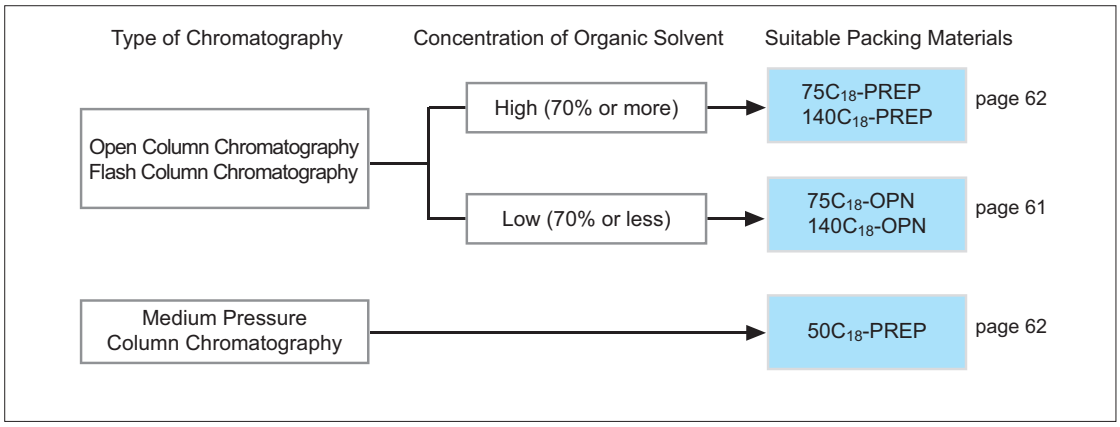
### Introduction

Open column chromatography is an excellent and easy technique for large-scale preparation and purification at low cost. COSMOSIL offers both normal and reversed phase packing materials based on totally porous spherical silica, which provides higher separation, less pressure and higher reproducibility than irregular silica.

### Specifications

| Packing Material | $C_{18}$-OPN | $C_{18}$-PREP | Silica Gel 60 (Neutral) |
|---|---|---|---|
| Silica Gel | High purity porous spherical silica | | |
| Average Particle Size | 75, 140 µm | 50, 75, 140 µm | 75, 140 µm |
| Average Pore Size | approx.120 Å | | approx. 60 Å |
| Specific Surface Area | approx. 300 $m^2/g$ | | approx. 500 $m^2/g$ |
| Bonded Phase | Octadecyl group | | None |
| Carbon Content | — | approx. 19% | 0% |
| Residual Silanol Group | Yes | None | — |
| Application | Open column chromatography / Flash column chromatography | | |
| | Reversed phase chromatography | | Normal phase chromatography |

### Selection Guide (Reversed Phase)



# COSMOSIL C18-OPN

- A new “Water-Wet” C18 packing material for reversed phase open column chromatography
- Usable under 100% aqueous eluents

## Characteristic

The external surface of the C18-OPN gel is coated with hydrophilic group to increase wettability of the gel, and the octadecyl group is bonded within the pore of the gel. Conventional reversed phase C18 packing materials are restricted to about 30-50% water in the mobile phase. The COSMOSIL C18-OPN is a new “Water-Wet” C18 packing material developed for reversed phase open column chromatography. The C18-OPN material can be used in 100% aqueous eluents.

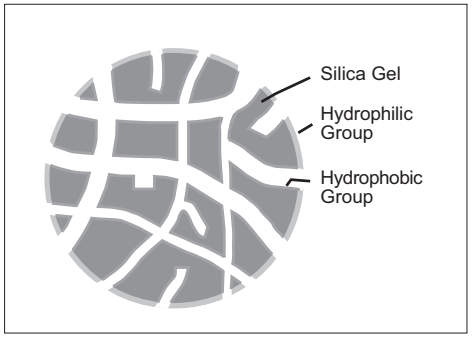



Figure 1. Structure of C18-OPN

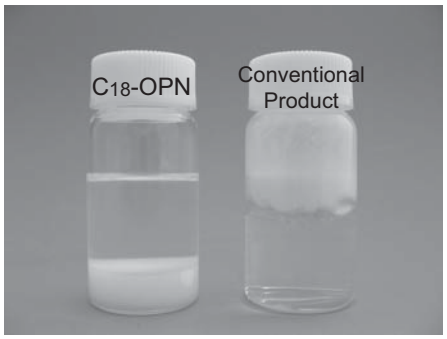


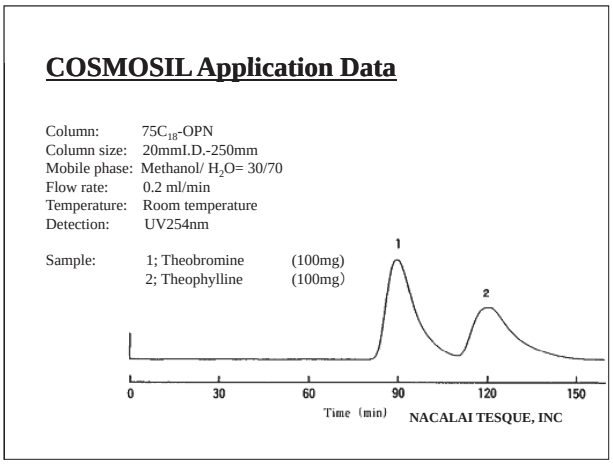

Figure 2. Packing material in water

Left: C18-OPN provides good resolution
Can be used with low concentration of organic solvent on open, flash column chromatography.

Right: C18-PREP float up
Use with 70% or more organic solvent on open, flash column chromatography.

## Applications

- **Separation of hydrophilic compounds in aqueous solution**




In reversed phase chromatography, hydrophilic compounds such as theobromine and theophylline could be separated under low concentration of organic solvent. The figure shows they are clearly separated by reversed open column chromatography with 70% water.

## Ordering Information

**COSMOSIL C18-OPN**

| Product Name | Average Particle Size | Product Number | PKG Size |
|---|---|---|---|
| COSMOSIL 75C18-OPN | 75µm | 37842-66 | 100 g |
| | | 37842-95 | 500 g |
| | | 37842-11 | 1 kg |
| COSMOSIL 140C18-OPN | 140µm | 37878-16 | 100 g |
| | | 37878-45 | 500 g |
| | | 37878-61 | 1 kg |

# COSMOSIL $C_{18}$-PREP

- Standard reversed phase packing material for open chromatography
- Endcapped
- 3 particle sizes (50, 75, 140 µm)

## Particle Size, Flow Rate and Theoretical Plate Number

Because reversed phase chromatography employs a mobile phase of high viscosity such as methanol and water, the flow rate is lower than that of normal phase chromatography, which uses mobile phase of low viscosity such as hexane and ethyl acetate.

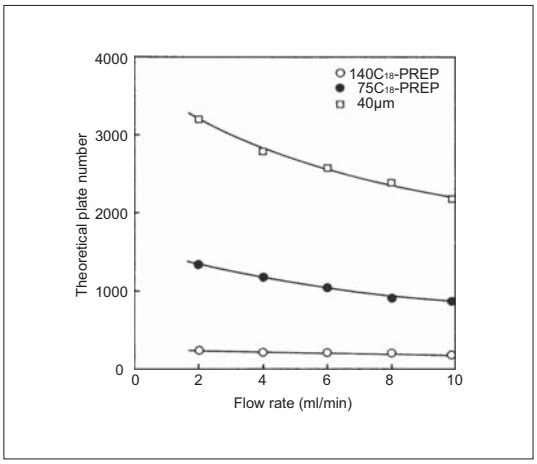



Figure 1. Flow rate against theoretical plate number
Column size: 20 mm I.D. x 300 mm

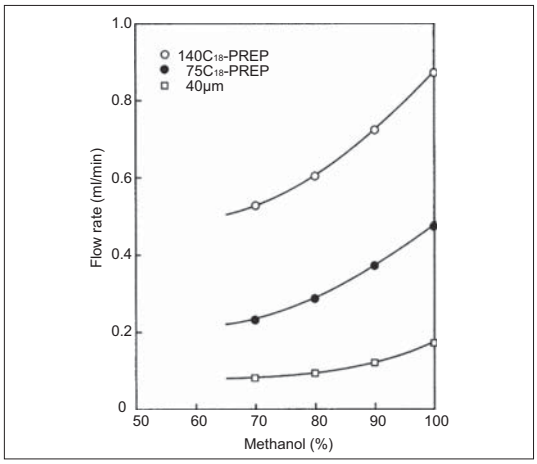
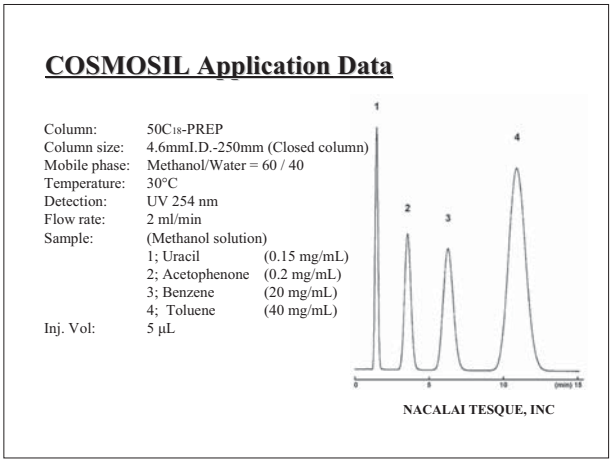
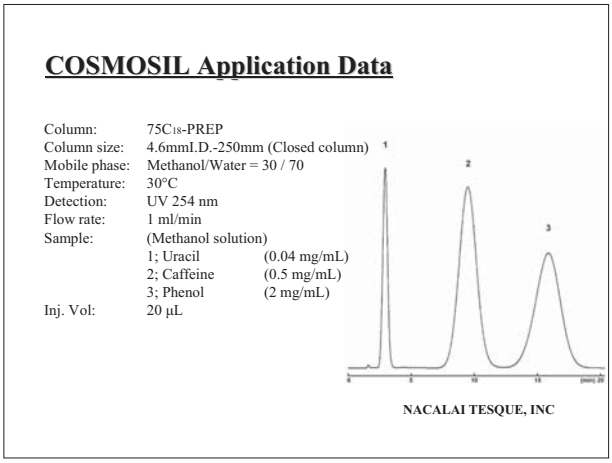



Figure 2. Concentration of methanol against flow rate
Column size: 10 mm I.D. x 180 mm bed height
(gravitational liquid flow)

## Performance Evaluation




## Ordering Information

**COSMOSIL $C_{18}$-PREP**

| Product Name | Average Particle Size | Product Number | PKG Size |
|---|---|---|---|
| COSMOSIL 50$C_{18}$-PREP | 50 µm | 12065-84 | 100 g |
| | | 12065-55 | 500 g |
| | | 12065-71 | 1 kg |
| COSMOSIL 75$C_{18}$-PREP | 75 µm | 12061-24 | 100 g |
| | | 12061-95 | 500 g |
| | | 12061-11 | 1 kg |
| COSMOSIL 140$C_{18}$-PREP | 140 µm | 12063-04 | 100 g |
| | | 12063-75 | 500 g |
| | | 12063-91 | 1 kg |

# Silica Gel (Spherical, Neutral)

- The pH of silica gel is adjusted to neutral
- Suitable for the separation of pH-sensitive compounds

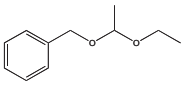
## Comparison with Conventional Silica Gel

- **Purification of Acetals -1**

**COSMOSIL Application Data**

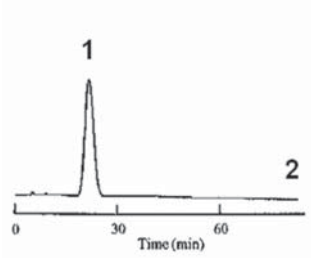
Column:
Column size: 4.6mmI.D.-250mm
Mobile phase: Hexane/Ethyl Acetate = 99/1
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV254nm

Sample: 1; Methyl Benzoate(Standard) (10mg/ml)
2; Sample A (100mg/ml)
Inj.Vol. 3 μl

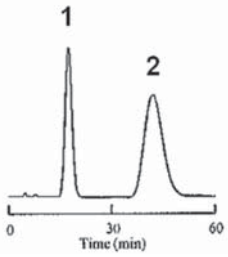


Sample A

Our conventional product




Silica Gel 60 (spherical, neutral)

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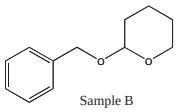
- **Purification of Acetals -2**

**COSMOSIL Application Data**

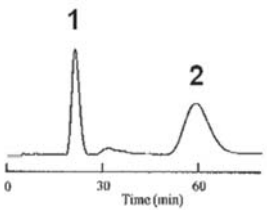
Column:
Column size: 4.6mmI.D.-250mm
Mobile phase: Hexane/Ethyl Acetate = 99/1
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV254nm

Sample: 1; Methyl Benzoate(Standard) (10mg/ml)
2; Sample B (200mg/ml)
Inj.Vol. 3 μl

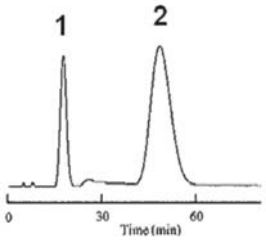


Sample B

Our conventional product




Silica Gel 60 (spherical, neutral)

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## Ordering Information

**Silica gel 60 (Spherical, Neutral)**

| Product Name | Average Particle Size | Product Number | PKG Size |
|---|---|---|---|
| Silica Gel 60 (Spherical, Neutral) for Column Chromatograph | 75 μm | 30511-64 | 100 g |
| | | 30511-35 | 500 g |
| | | 30511-51 | 1 kg |
| | | 30511-06 | 5 kg |
| | | 30511-22 | 25 kg |
| | 140 μm | 30518-94 | 100 g |
| | | 30518-65 | 500 g |
| | | 30518-81 | 1 kg |

# Silica Gel (for Column Chromatography)

## Ordering Information

**Silica Gel (Spherical)**

| Product Name | Average Particle Size | Average Pore Size | Grade | Product Number | PKG Size |
|---|---|---|---|---|---|
| Silica Gel 60, Spherical | approx. 70 ~ 230 mesh | 60 Å | SP | 30731-71 | 1 kg |
| | | | | 30731-42 | 25 kg |
| Silica Gel 120, Spherical | approx. 70 ~ 230 mesh | 120 Å | SP | 30734-41 | 1 kg |

**Silica Gel (Irregular)**

| Product Name | Average Particle Size | Average Pore Size | Grade | Product Number | PKG Size |
|---|---|---|---|---|---|
| Silica Gel 60 | approx. 70 ~ 230 mesh | 60 Å | SP | 30724-55 | 500 g |
| | | | | 30724-71 | 1 kg |
| | | | | 30724-84 | 5 kg |
| | | | | 30724-42 | 25 kg |
| | approx. 230 ~ 400 mesh | | SP | 30721-85 | 500 g |
| | | | | 30721-01 | 1 kg |
| | | | | 30721-14 | 5 kg |

# IV. Related Products

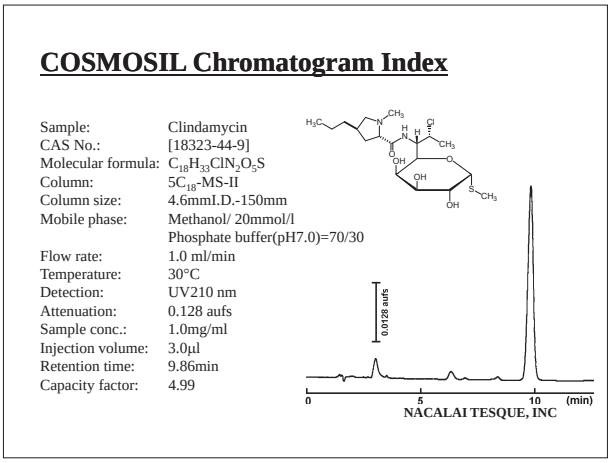
## 1. Reagents for Mobile Phase Preparation

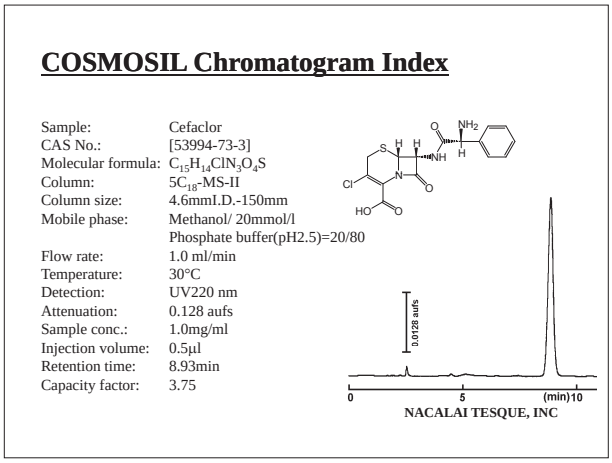
## Phosphate Buffer Solution (pH 2.5) (5X)

- pH-adjusted
- Filtered (0.2 µm)
- UV, fluorescence tested
- Easily prepare the mobile phases used in COSMOSIL applications

### How to Prepare

Dilute this product with HPLC grade distilled water (1 part buffer solution : 4 parts water) to make the 20 mmol/l phosphate buffer used in the following COSMOSIL applications.




### Ordering Information

**Phosphate Buffer Solution (5X)**

| Product Name | Grade | Product Number | PKG Size |
|---|---|---|---|
| Phosphate Buffer Solution (pH 2.5) (5X) | SP | 08969-71 | 1 L |
| Phosphate Buffer Solution (pH 7.0) (5X) | SP | 08968-81 | 1 L |

## Stock Solutions for HPLC

### Ordering Information

| Product Name | Grade | Product Number | PKG Size |
|---|---|---|---|
| 1mol/l-Ammonium Formate Solution | SP | 12235-54 | 100 ml |
| 1mol/l-Ammonium Acetate Solution | SP | 12236-44 | 100 ml |

## Premixed Eluents for HPLC

### Ordering Information

| Product Name | Grade | Product Number | PKG Size |
|---|---|---|---|
| 0.1vol% Formic Acid-Acetonitrile | SP | 12578-61 | 1 L |
| | | 12578-03 | 3 L |
| 0.1vol% Formic Acid-Distilled Water | SP | 12582-91 | 1 L |
| | | 12582-33 | 3 L |
| 0.1vol% Trifluoroacetic Acid-Acetonitrile | SP | 12583-81 | 1 L |
| | | 12583-23 | 3 L |
| 0.1vol% Trifluoroacetic Acid-Distilled Water | SP | 12584-13 | 3 L |

# Additives

## Ordering Information

| Product Name | Grade | Product Number | PKG Size |
|---|---|---|---|
| Acetic Acid | SP | 08963-02 | 25 ml |
| Formic Acid | SP | 08965-82 | 25 ml |
| Phosphoric Acid, Ortho | SP | 08964-92 | 25 ml |
| Trifluoroacetic Acid | SP | 34840-21 | 5 x 1 ml |
| | | 34840-76 | 5 x 1.5 ml |
| | | 34840-63 | 5 x 3 ml |
| | | 34840-34 | 10 ml |

# Ion-pair Reagents

## Ordering Information

**For Basic Samples** **($R\text{-}SO_3^-Na^+$)**

| Product Name | R: | Grade | Product Number | PKG Size |
|---|---|---|---|---|
| Sodium *1*-Butanesulfonate | $C_4H_9$- | SP | 31331-94 | 5 g |
| Sodium *1*-Pentanesulfonate | $C_5H_{11}$- | SP | 31730-64 | 5 g |
| | | | 31730-22 | 25 g |
| Sodium *1*-Hexanesulfonate | $C_6H_{13}$- | SP | 31529-24 | 5 g |
| | | | 31529-82 | 25 g |
| Sodium *1*-Heptanesulfonate | $C_7H_{15}$- | SP | 31528-34 | 5 g |
| | | | 31528-92 | 25 g |
| Sodium *1*-Octanesulfonate | $C_8H_{17}$- | SP | 31729-04 | 5 g |
| | | | 31729-62 | 25 g |
| Sodium *1*-Nonanesulfonate | $C_9H_{19}$- | SP | 31626-44 | 5 g |
| Sodium *1*-Decanesulfonate | $C_{10}H_{21}$- | SP | 31429-34 | 5 g |
| Sodium *1*-Dodecanesulfonate | $C_{12}H_{25}$- | SP | 31426-64 | 5 g |
| Sodium Lauryl Sulfate | ** | SP | 31623-32 | 25 g |
| 0.5M Solution | | | | |
| Sodium *1*-Butanesulfonate | $C_4H_9$- | SP | 31332-84 | 5 x 10 ml |
| Sodium *1*-Hexanesulfonate | $C_6H_{13}$- | SP | 31532-64 | 10 ml |
| | | | 31532-06 | 5 x 10 ml |
| Sodium *1*-Octanesulfonate | $C_8H_{17}$- | SP | 31733-34 | 10 ml |
| | | | 31733-76 | 5 x 10 ml |

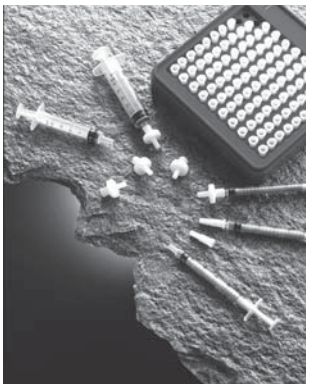
**For Acidic Samples** **$(C_4H_9)_4N^+X^-$**

| Product Name | $X^-$: | Grade | Product Number | PKG Size |
|---|---|---|---|---|
| Tetra-*n*-butylammonium Bromide | -Br | SP | 32824-72 | 25 g |
| Tetra-*n*-butylammonium Chloride | -Cl | EP | 32935-64 | 5 g |
| | | | 32935-22 | 25 g |
| Tetra-*n*-butylammonium Hydrogensulfate | $-HSO_4$ | GR | 32924-62 | 25 g |
| Tetra-*n*-butylammonium Iodide | -I | SP | 32905-54 | 5 g |
| | | | 32905-12 | 25 g |
| Tetra-*n*-butylammonium Perchlorate | $-ClO_4$ | SP | 32906-44 | 5 g |
| | | | 32906-02 | 25 g |
| Tetra-*n*-butylammonium Phosphate | $-H_2PO_4$ | SP | 32929-54 | 5 g |
| 0.5M Solution | | | | |
| Tetra-*n*-butylammonium Phosphate | $-H_2PO_4$ | SP | 32926-26 | 10 ml |
| | | | 32926-84 | 5 x 10 ml |

# 2. Products for Sample Preparation

## Cosmonice Filter

- For sample filtration
- Just attach a filter on top of a syringe



### W Series (aqueous solution)

The W series uses a new material of low-adsorptive and low-extractive PVDF (poly vinylidenedifluoride) filter, which can be used with various solvents. They are able to minimize the loss of proteins in the small amount of sample, and prevent secondary contamination during prefiltration.

### S Series (organic solvents)

The S series uses a PTFE (poly tetrafluoroethylene) filter, which shows strong resistance for solvents, acids, and alkalis. It is best for prefiltration of samples extracted with solvents such as chloroform and tetrahydrofuran.

### Ordering Information

**Cosmonice Filter**

| Product Name | Diameter (mm) | Pore Size (µm) | Process Volume | Hold-up Volume | Product Number | PKG Size |
|---|---|---|---|---|---|---|
| Cosmonice Filter W (aqueous) | 4 | 0.45 | 1 ml or less | < 10 µl | 06543-04 | 100 pkg |
| | 13 | 0.45 | 0.5~10 ml | < 30 µl | 06544-94 | 100 pkg |
| Cosmonice Filter S (solvent) | 4 | 0.45 | 1 ml or less | < 10 µl | 06541-24 | 100 pkg |
| | 13 | 0.45 | 0.5~10 ml | < 30 µl | 06542-14 | 100 pkg |

Connection Inlet: luer-lock; Outlet: luer-slip, Connectable to needles
Housing : polyethylene

## Cosmospin Filter

- For sample filtration
- Easy to use by centrifugation
- Omnipore hydrophilic PTFE membrane filter

### Ordering Information

**Cosmospin Filter**

| Product Name | Pore Size (µm) | Maximum Sample Volume | Hold-up Volume | Maximum Centrifugal Force | Rotor Size (fixed-angle) | Filtration Area | Color | Product Number | PKG Size |
|---|---|---|---|---|---|---|---|---|---|
| Cosmospin Filter G | 0.2 | 0.4 ml | 5 µl | 5000 x g | 1.5 ml | 0.2 $cm^2$ | Brown | 06549-44 | 100 pkg |
| Cosmospin Filter H | 0.45 | 0.4 ml | 5 µl | 5000 x g | 1.5 ml | 0.2 $cm^2$ | White | 06540-34 | 100 pkg |

Dimensions: 10.6 mm diameter x 45 mm
Membrane: Omnipore hydrophilic PTFE
Sample reservoir and collection tube: Polypropylene

# Labeling Reagents

## Ordering Information

| Product Name | Grade | Storage | Product Number | PKG Size |
|---|---|---|---|---|
| Dabsyl Chloride | SP | Room temp. | 10427-91 | 1 g |
| *3,5*-Dinitrobenzoyl Chloride (DNBC) | SP | Dark and Cool | 13530-44 | 5 g |
| NBD Chloride | SP | Refrigerator | 24113-61 | 1 g |
| *o*-Phthalaldehyde (OPA) | SP | Refrigerator | 27824-61 | 1 g |
| | | | 27824-74 | 5 g |
| | | | 27824-32 | 25 g |

# 3. Column Care Products

## Introduction

It is important to preserve a column by washing it with suitable cleaning methods before storing it under appropriate conditions to obtain stable data and prolong the column lifetime.

## Applicable Columns

Cleaning Solution Kit and Storage Solution for Reversed Phase HPLC Columns is only applicable to reversed phase HPLC columns, such as COSMOSIL $C_{18}$-MS-II, AR-II, PAQ, EB, Cholester, πNAP, PYE, PBr and COSMOCORE 2.6$C_{18}$, 2.6Cholester and 2.6PBr. Please note that this product is not suitable for Sugar-D, HILIC, normal phase or ion exchange columns.

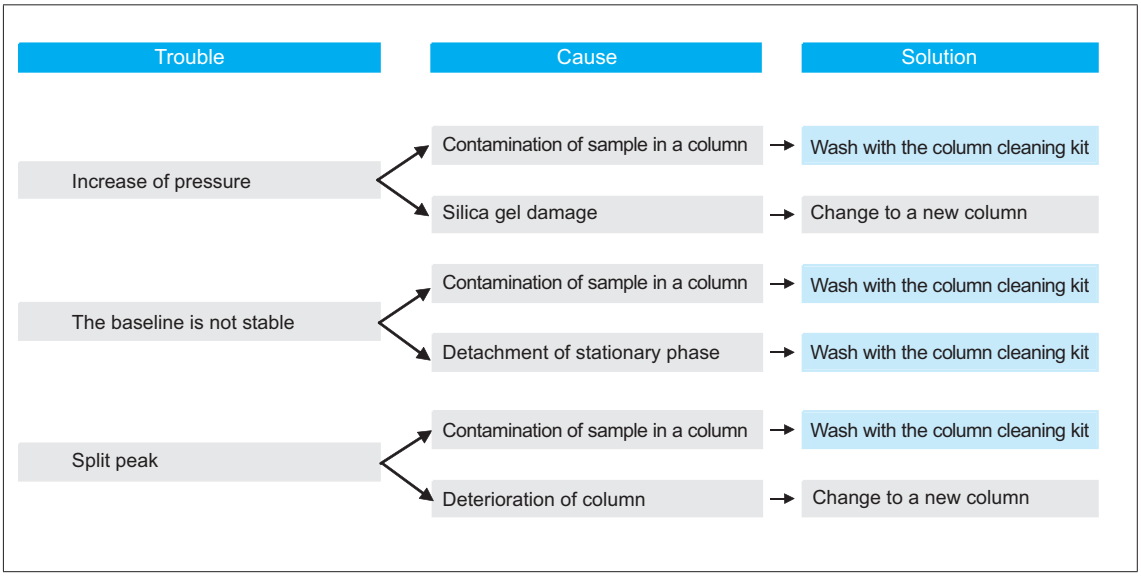
# Cleaning Solution Kit for Reversed Phase HPLC Columns

## Components

| Product Name | Main Components | PKG Size | Quantity | Container |
|---|---|---|---|---|
| Cleaning Solution A | Methanol | 500 ml | 2 | Brown Glass Bottle |
| Cleaning Solution B | Tetrahydrofuran, Methanol | 500 ml | 1 | Brown Glass Bottle |

## Application

Cleaning Solution Kit for Reversed Phase HPLC Columns is designed for washing away contaminant adsorption and stationary phase shedding. If you experience the following symptoms, please try their corresponding solution first.




## Procedure

(For 4.6 mm I.D. x 150 mm)

(1) Replace solvent with HPLC-grade distilled water (1 ml/min, 30 min).
(*This step is for mobile phases containing high concentration buffer. If you are using a salt-free mobile phase, please start from step (2).)

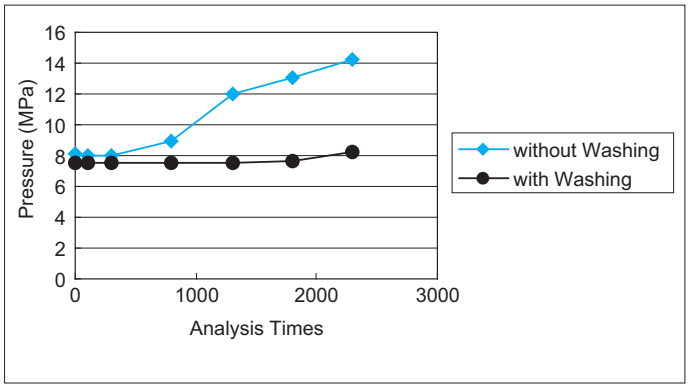
(2) Run the Cleaning Solution A through the column for 15 min at a flow rate of 1ml/min.

(3) Run the Cleaning Solution B through the column at a flow rate of 1ml/min until the baseline becomes stable (approx. 15 min).

(4) Run the Cleaning Solution A through the column for 15 min. The column is ready for storage.

## Example of pressure difference between washed and unwashed columns

The figure shows a pressure comparison between washed and unwashed columns using Cleaning Solution Kit. Repeated analysis of natural products was conducted using COSMOSIL 5C18-MS-II (4.6 mm I.D. x 150 mm).



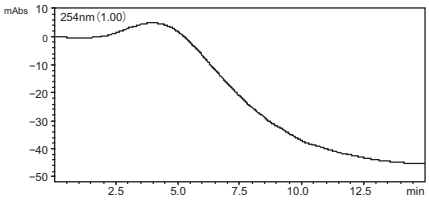

(Condition)
Column: COSMOSIL 5C18-MS-II (4.6 mm I.D. x 150 mm)
Mobile phase: Methanol / $H_2O$ = 70 / 30
Flow rate: 1.0ml/min
Temperature: 40°C

As shown in the figure above, the column pressure increases if you use column continuously without washing. If you wash the column, you can extend the column life time and ease the pressure burden on your HPLC equipment.

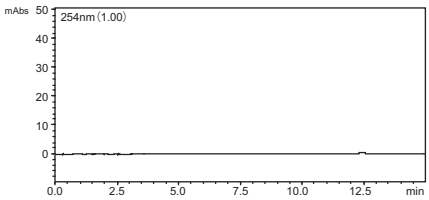
## Example of a Stable Baseline

The baseline may be unstable if sample components with very long retention remain in the column or stationary phase shedding occurs. Especially when analyzing crude samples that have components with a wide range of chemical characteristics, some unwanted components may be strongly retained in the column and slowly elute out in subsequent runs. The resulting unstable baseline can be eliminated by washing the column with the Cleaning Solution Kit.

Before Washing




After Washing




## Ordering Information

| Product Name | Grade | Product Number | PKG Size |
|---|---|---|---|
| Cleaning Solution for Reversed Phase HPLC Columns | SP | 08966-30 | 1 kit |

# Storage Solution for Reversed Phase HPLC Columns

Storage Solution for Reversed Phase HPLC Columns is designed for storing columns under suitable conditions.

## Procedure

(For 4.6 mm I.D. x 150 mm)

(1) Replace solvent with HPLC-grade distilled water. (1 ml/min, 30 min)
(*This step is for mobile phases containing high concentration buffer. If you are using a salt-free mobile phase, please start from step(2).)

(2) Run the Storage Solution through the column for 15 min at a flow rate of 1ml/min, and store.

## Ordering Information

| Product Name | Grade | Product Number | PKG Size |
|---|---|---|---|
| Storage Solution for Reversed Phase HPLC Columns | SP | 08967-20 | 1 kit (500 ml) |

# 4. COSMOSIL HPLC Accessories

## Ordering Information

**COSMOSIL Guard Cartridge Holder**

| I.D. | Product Number | PKG Size |
|---|---|---|
| 2.0 mm | 11884-71 | 1 PKG |
| 4.6 mm | 38009-79 | 1 PKG |

Guard Cartridge Holder is required for Guard Cartridge.

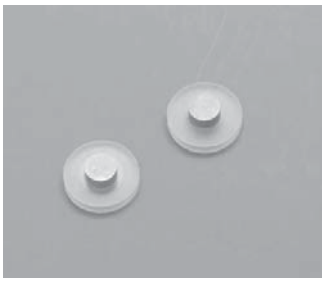
**COSMOSIL Column Prefilter**

| Product Number | PKG Size |
|---|---|
| 39361-19 | 1 PKG |

COSMOSIL Column Prefilter employs filter with smaller pore size (1 µm) than that of column frit (2 µm) .

**COSMOSIL Column Spare Filter for Prefilter**

| Product Number | PKG Size |
|---|---|
| 39539-09 | 2 PKG |



Column spare filter for prefilter

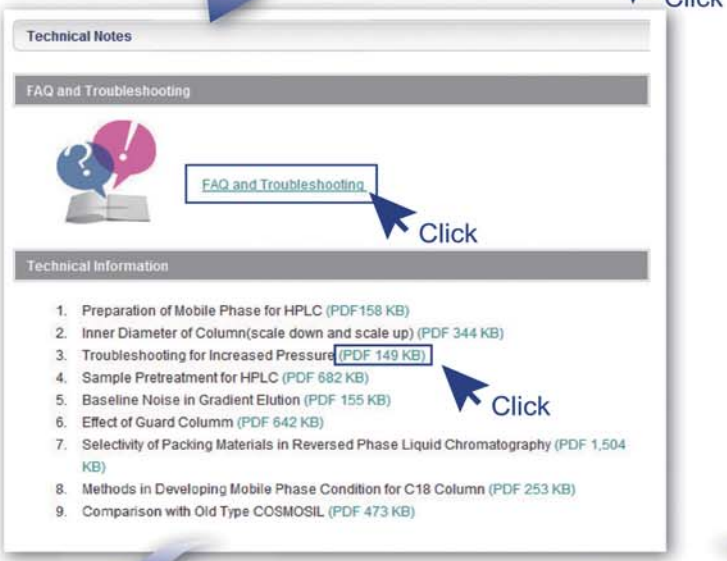
**COSMOSIL Column Connecting Tube**

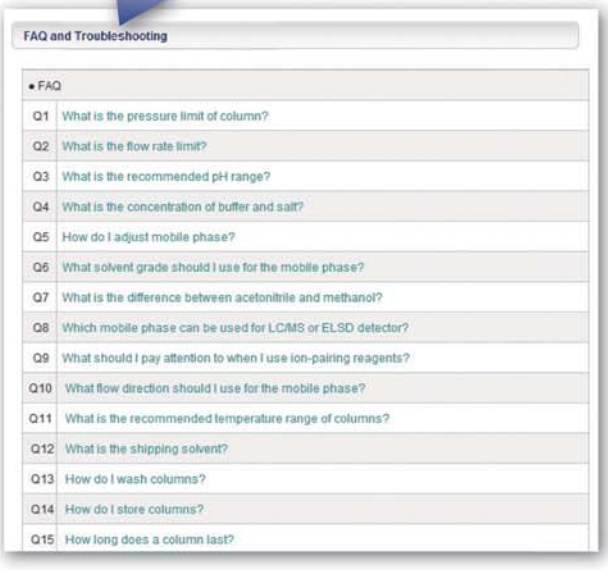
| I.D. | Product Number | PKG Size |
|---|---|---|
| 0.1 mm | 12570-41 | 1 PKG |
| 0.25 mm | 37843-69 | 1 PKG |

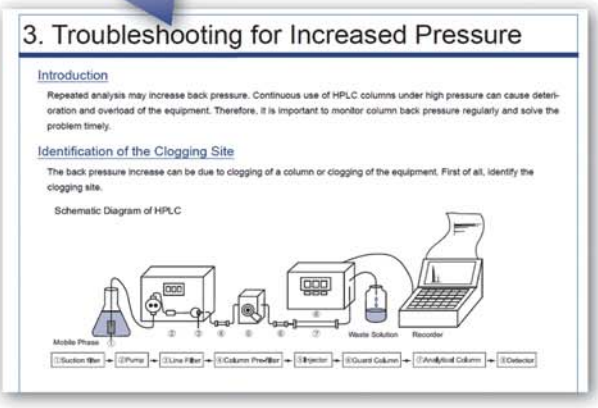
For connecting columns

# COSMOSIL Technical Notes

For our COSMOSIL FAQ, troubleshooting, and technical information, please visit our web site at http://www.nacalai.co.jp/global/cosmosil/.

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