

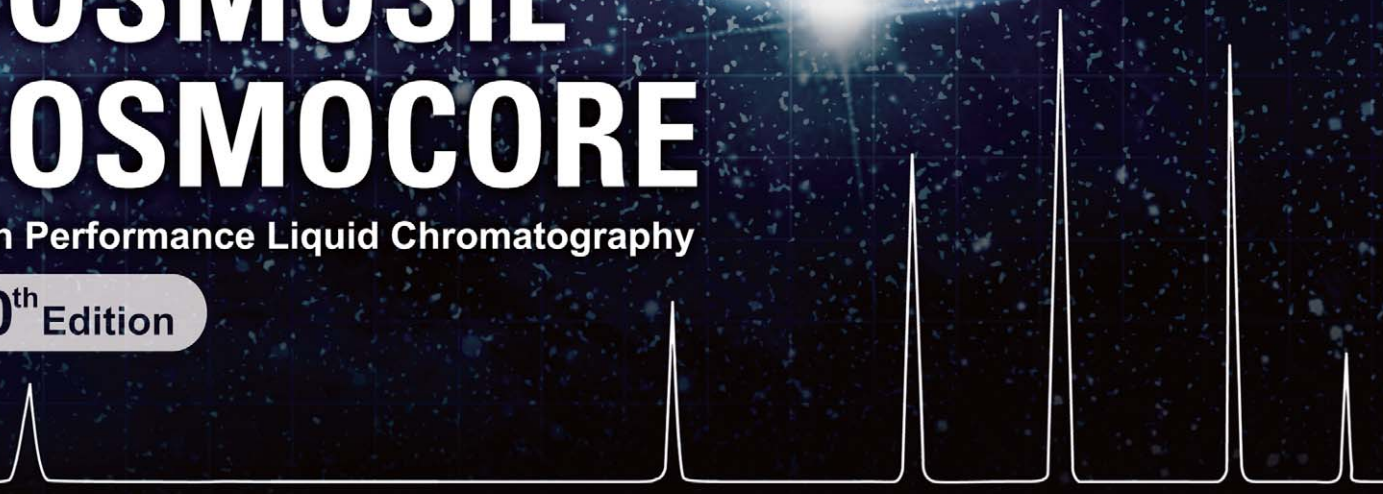
COSMOSIL

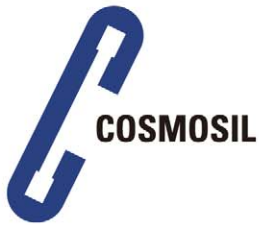


COSMOSIL COSMOCORE

High Performance Liquid Chromatography

10th Edition





COSMOSIL Applications

COSMOSIL Application has more than 7,600 applications using COSMOSIL columns. Setting optimal HPLC experimental parameters is an important process that requires experience and time. COSMOSIL Applications provide you with sample analysis conditions for widely used ODS columns and our specialty columns.

- Over 7,600 applications
- Easy to search

Visit COSMOSIL top page at <http://www.nacalai.co.jp/global/cosmosil/>

COSMOSIL HPLC Columns

General info. of COSMOSIL/COSMOGEL
COSMOSIL Columns List by Phase

- Standard Reversed Phase Columns
- Specialty Reversed Phase Columns
- Ultra-High Performance Columns
- Normal Phase Columns

Related Products

- Preparative Packing Materials
- Related Products

- Hydrophilic Interaction Columns
- Saccharide Separation Columns
- Protein Separation Columns (Wide Pore Columns)
- Fullerene Separation Columns
- Carbon Nanotubes Separation Columns

▶ COSMOSIL Applications
Application Search
Over 7,000 Data

▶ Reference Lists

Click

Sample Name contains (Keyword search) ▼

CAS number (ex: 498-D2-2)

Category (If no checkbox is clicked, the search will be performed in all categories.)

Amino acids & derivatives Peptides & Proteins Nucleic acids & relative compounds

Drugs & related compounds Antibiotics Vitamins

Steroids Indoles Natural products

Carbohydrates & derivatives Glyceride Oil

Column name (If no checkbox is clicked, the search will be performed in all columns.)

C18-EB C18-MS-II C18-AR-II C18-PAQ

COSMOCORE C18 Cholester PFP mNAP

PYE NPE PBr CN-MS

C8-MS C4-MS TMS-MS PE-MS

SL-II HILIC Sugar-D NH2-MS

Particle Size ALL ▼

Application No. (ex: AP-1206)

Result/Page 20 ▼

Click

- Applications are searched by
1. Sample Category
 2. Sample Name
 3. CAS No.
 4. Column Name
 5. Particle Size

Search Result

COSMOSIL Application

COSMOSIL Application

Search condition [Application No=AP-1206]

[TOP]

Results 1 (1-1)

| Data No. | Data Name | Particle Size | Column |
|----------|----------------|---------------|----------|
| Sample | | CAS No. | |
| AP-1206 | Dichlorophenol | 5 | mNAP |
| 2 | chlorophenol | | 576-24-9 |
| 2 | chlorophenol | | 120-83-2 |
| 2 | chlorophenol | | 583-78-8 |
| 2,6 | Dichlorophenol | | 87-65-0 |
| 3,4 | Dichlorophenol | | 95-77-2 |
| 3,5 | Dichlorophenol | | 591-35-5 |

Click

COSMOSIL Application

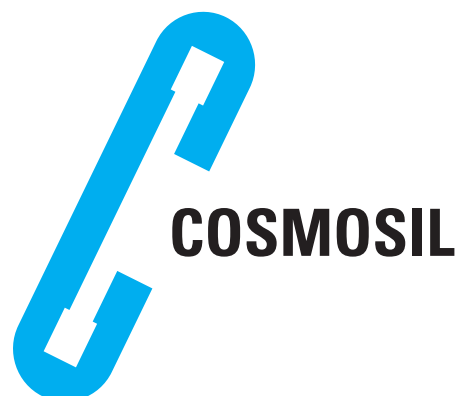
COSMOSIL Application Data

click to enlarge

| | |
|-----------|-----------|
| Data No. | AP-1024 |
| Data Name | Berberine |

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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 | C18 | 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

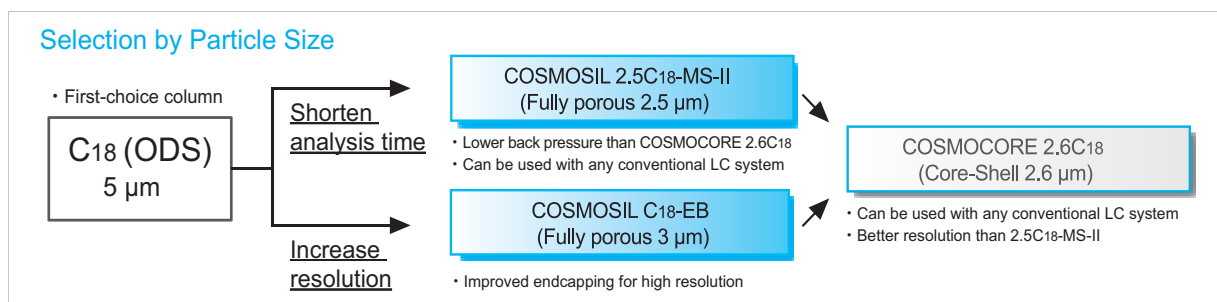
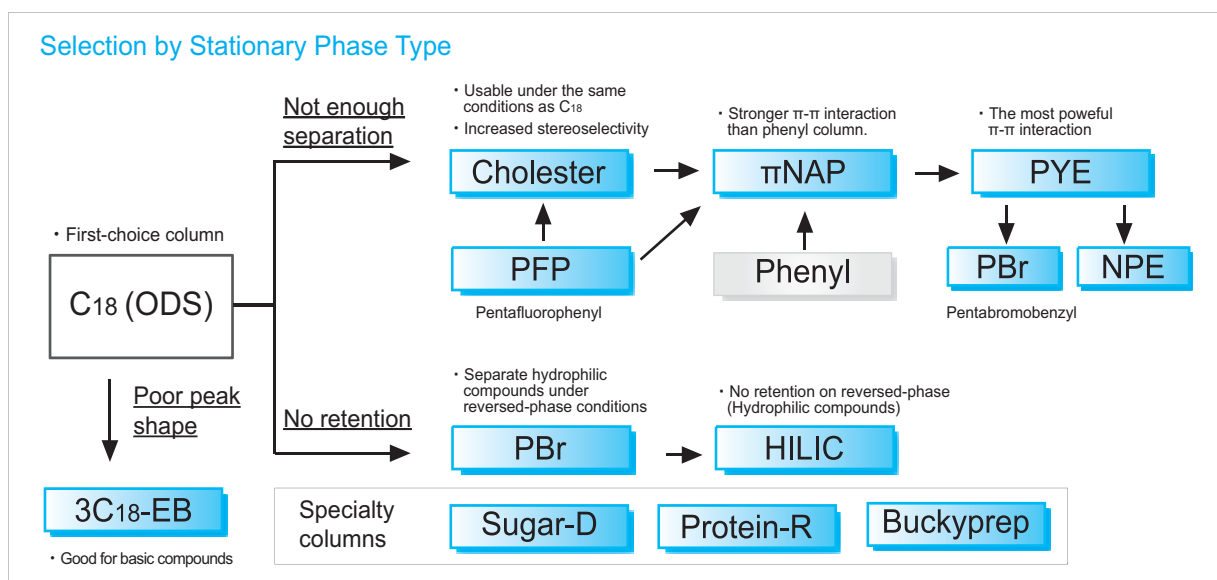
| Sample | Separation Mode | Packing Material | Bonded Phase | Bonding Type | Average Particle Size (µm) | Average Pore Size (Å) | Carbon Content (%) | Special Features and Applications | USP Category | Page |
|------------------------------|-------------------------|-----------------------------|---|-----------------|----------------------------|---|---|---|--------------|--------|
| Organic compounds (low M.W.) | Reversed phase | C18-MS-II | Octadecyl group | Mono-meric | 2.5 | 130 | 18 | Multi-purpose C ₁₈ column | L1 | 14, 15 |
| | | 3, 5,15 | | | 120 | 16 | | | | |
| | | C18-AR-II | | Polymeric | 3, 5,15 | 120 | 17 | Features strong acid resistance, good for acidic compounds and peptides. | | 14, 17 |
| | | C18-PAQ | | | 5,15 | | 11 | Good for hydrophilic compounds, and stable performance under 100% aqueous conditions. | | |
| | | C18-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 | Mono-meric | 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 | The most powerful π-π interaction | 22, 28 | | | |
| | | PYE | Pyrenylethyl group | | 18 | | | | | |
| | | 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 | | 5 | 120 | 7 | Enables separation of different hydrophobic samples without using gradients. | | L10 |
| | C22-AR-II | Docosyl group | Polymeric | | 19 | Alkyl chain columns, excluding C ₁₈ column | - | 30, 33 | | |
| | C8-MS | Octyl group | Mono-meric | 10 | L7 | | | | | |
| | C4-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 column. | 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 |
| | | C18-AR-300 | | | | | 12 | | | |
| | | C8-AR-300 | 7 | | | | Wide pore type | | L1 | |
| | | C4-AR-300 | 6 | | | | | | L7 | |
| | | Ph-AR-300 | 7 | | | | | | L26 | |
| | 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 | | | | |
| | 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. | | |
| | | Quinoline NEW | Quinoline group | | | | | Alternate selectivity to HP and PY. | | |
| | | Cholester | Cholesteryl group | Mono-meric | 2.5, 5 | 130 | 21 | Usable under the same conditions as C ₁₈ . Unique rigid cholesteryl structure improves separation. | L101 | 55, 59 |
| | | PBr | Pentabromobenzyl group | | 5 | 120 | 8 | Separate hydrophilic compounds under reversed-phase conditions. | | |

Column Selection Guide



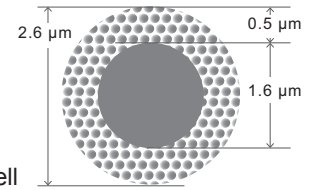
I. HPLC Columns

1. Core-Shell Columns

(1) COSMOCORE Series

About Core-Shell Particles

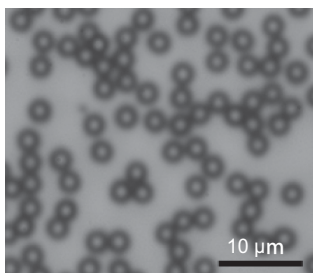
Core-shell particles consist of a nonporous core inside a porous shell. By using these core-shell particles, one can achieve sharper peaks compared to fully porous silica gel particles of the same diameter.



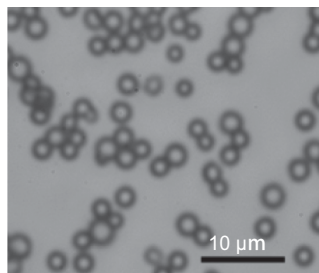
Schematic diagram of a silica particle

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.



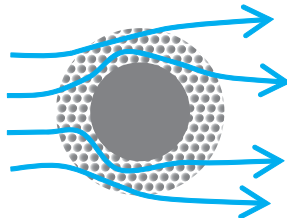
COSMOCORE 2.6C18 (200x)



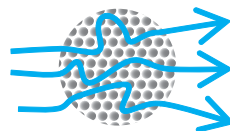
Fully porous 1.7 μm particles (200x)

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.



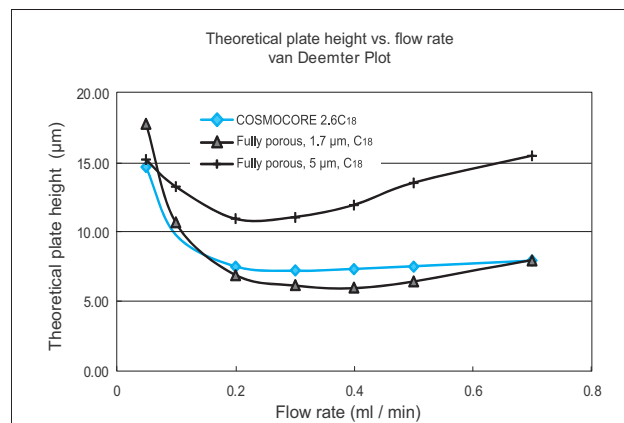
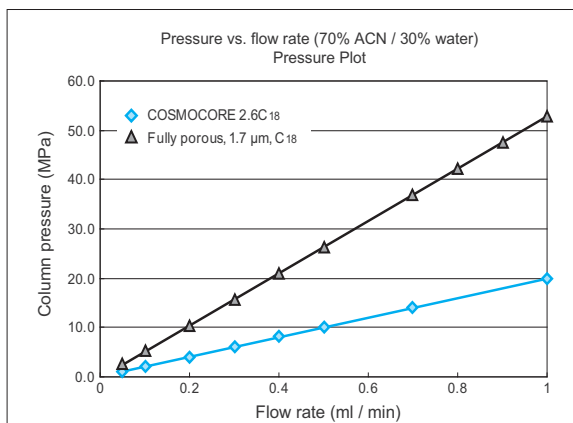
COSMOCORE 2.6C18



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.



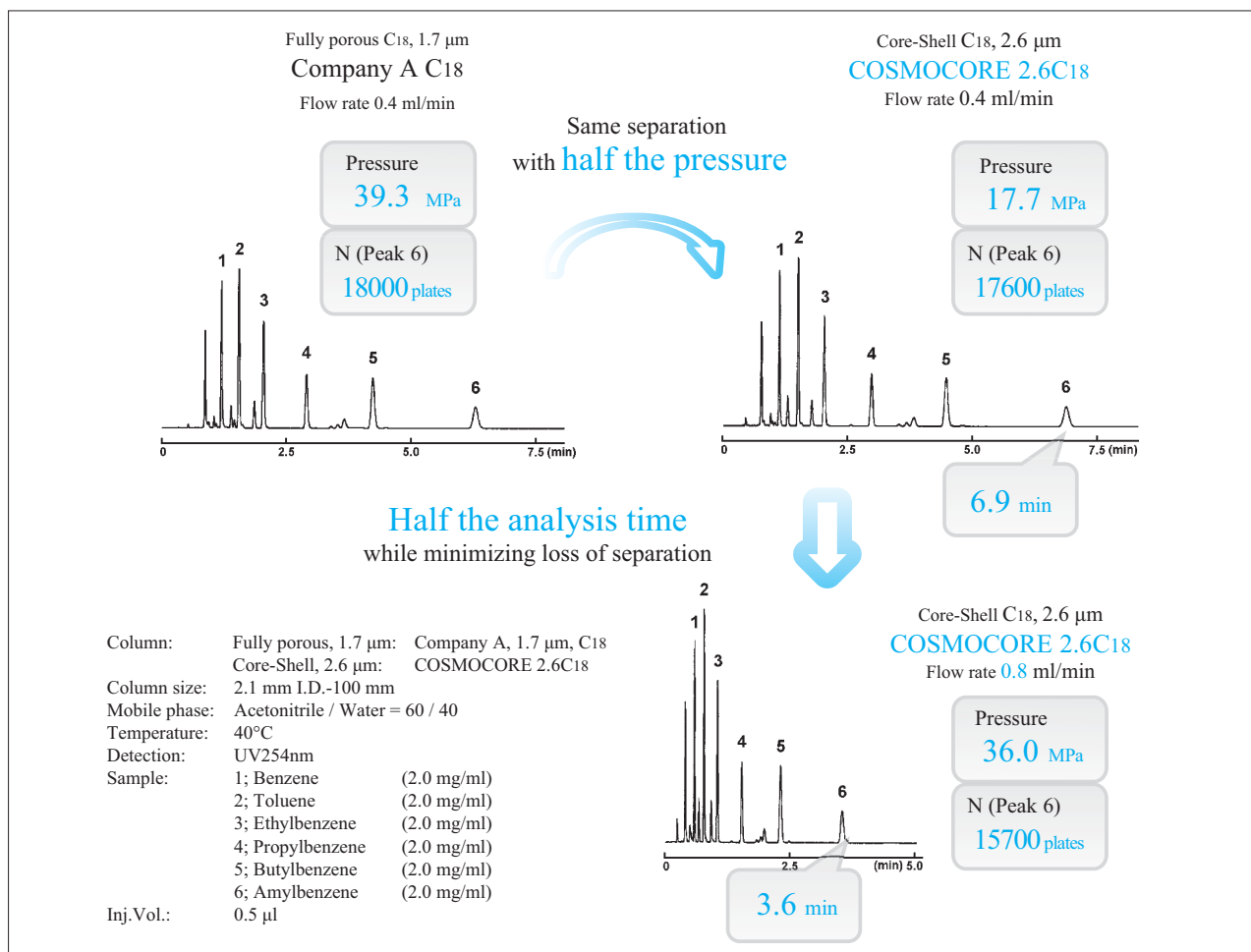
Column size: 2.1 mm I.D. x 50 mm
Mobile phase: Acetonitrile / Water = 70 / 30

Temperature: 40°C
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

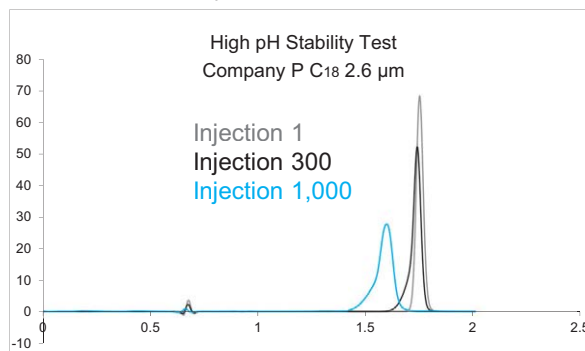
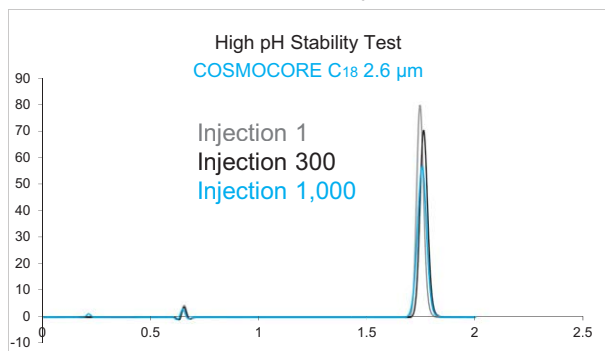
| Packing Material | 2.6C18 | 2.6Cholester | 2.6PBr |
|------------------------|-------------------------------|--|---|
| Silica Gel | Core-shell type silica gel | | |
| Average Particle Size | 2.6 μm | | |
| Average Core Diameter | 1.6 μm | | |
| Average Pore Size | approx. 90 Å | | |
| Specific Surface Area | approx. 150 m ² /g | | |
| Bonded Phase Structure | | | |
| Bonded Phase | Octadecyl group | Cholesteryl group | Pentabromobenzyl Group |
| Main interaction | Hydrophobic interaction | Hydrophobic interaction Molecular shape selectivity | Hydrophobic interaction 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
Sample: Caffeine (0.05 mg/ml)
Flow rate: 0.4 ml/min.
Mobile phase: 0.35% Ammonium hydroxide/ acetonitrile = 90/10 (pH 10.4)
Injection volume: 1 μl
Temperature: 40 °C

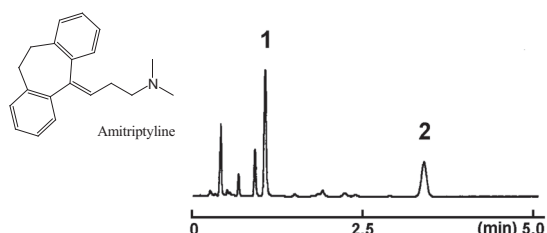
Sharp Peaks with Many Types of Compounds

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

Column size: 2.1 mm I.D. - 50 mm
Mobile phase: Acetonitrile / 20mmol/l Phosphoric Buffer(pH7.0) = 60 / 40
Temperature: 40°C
Flow rate: 0.4 ml/min
Detection: UV254nm
Sample: 1; Amitriptyline (0.2 mg/ml)
2; Amylbenzene I.S. (2.0 mg/ml)
Inj. Vol.: 0.5 μl



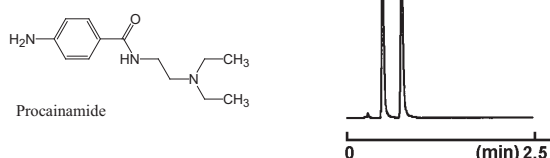
• Haloperidol

Column size: 2.1 mm I.D. - 50 mm
Mobile phase: A; Acetonitrile/ 20mmol/l Phosphate buffer(pH7.0) = 10/90
B; Acetonitrile/ 20mmol/l Phosphate buffer(pH7.0) = 50/50
B conc. 0→100%(0→3min), 100%(3-5min)
Flow rate: 0.4 ml/min
Temperature: 40°C
Detection: UV220nm
Sample: 1; 4-(4-Chlorophenyl)-4-hydroxypiperidine (0.1 mg/ml)
2; Haloperidol (0.1 mg/ml)
Inj. Vol.: 0.5 μl



• Procainamide

Column size: 2.1 mm I.D. - 50 mm
Mobile phase: Acetonitrile/ 20mmol/l Phosphate buffer(pH7.0) = 10/90
Flow rate: 0.4 ml/min
Temperature: 40°C
Detection: UV270nm
Sample: 1; Procainamide (0.05 mg/ml)
2; N-Acetylprocainamide (0.05 mg/ml)
Inj. Vol.: 0.5 μl



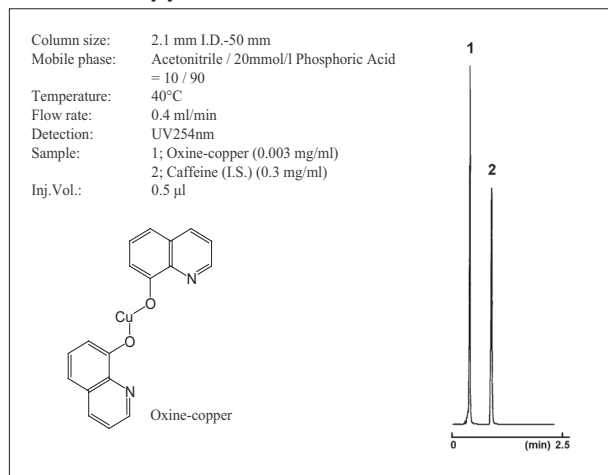
• Caffeine

Column size: 2.1 mm I.D. - 100 mm
Mobile phase: Acetonitrile/ H₂O = 10/90
Flow rate: 0.4 ml/min
Temperature: 40°C
Detection: UV275nm
Sample: 1; Theobromine (0.05 mg/ml)
2; Theophylline (0.05 mg/ml)
3; Caffeine (0.05 mg/ml)
Inj. Vol.: 1.0 μl



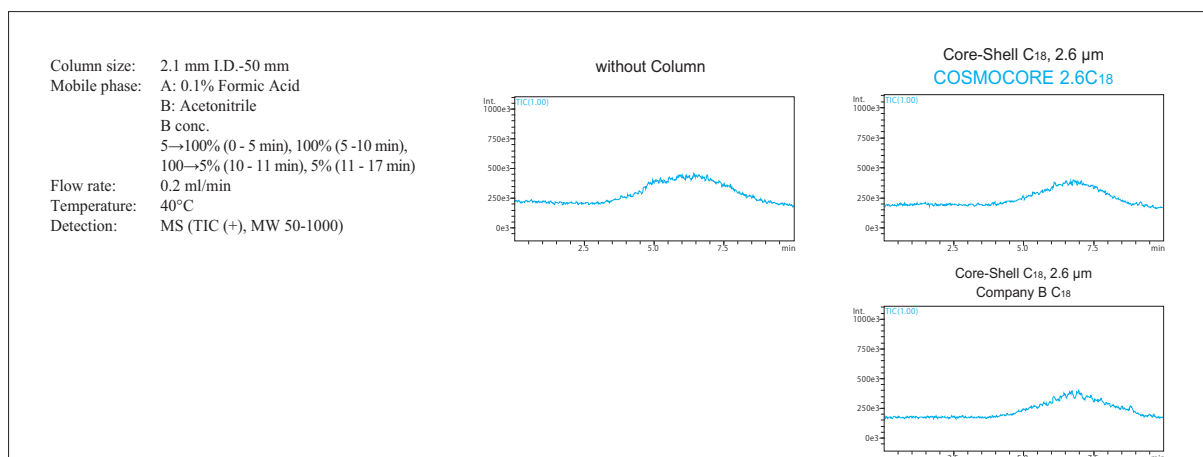
Metal Coordination Complexes

• Oxine-Copper



Low Bleed-Suitable for LC-MS

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



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.

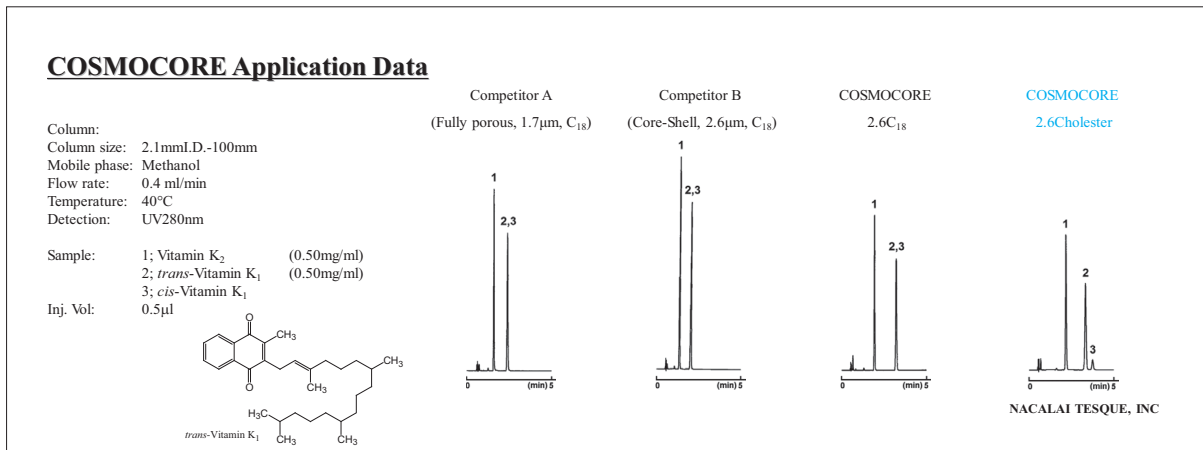
For UHPLC-compatible prefilters, refer to page 13.

COSMOCORE 2.6Cholester

- Cholesterol-bonded reversed-phase core-shell column
- Usable under the same conditions as C₁₈ columns
- Better selectivity for cis-trans isomers, and natural products

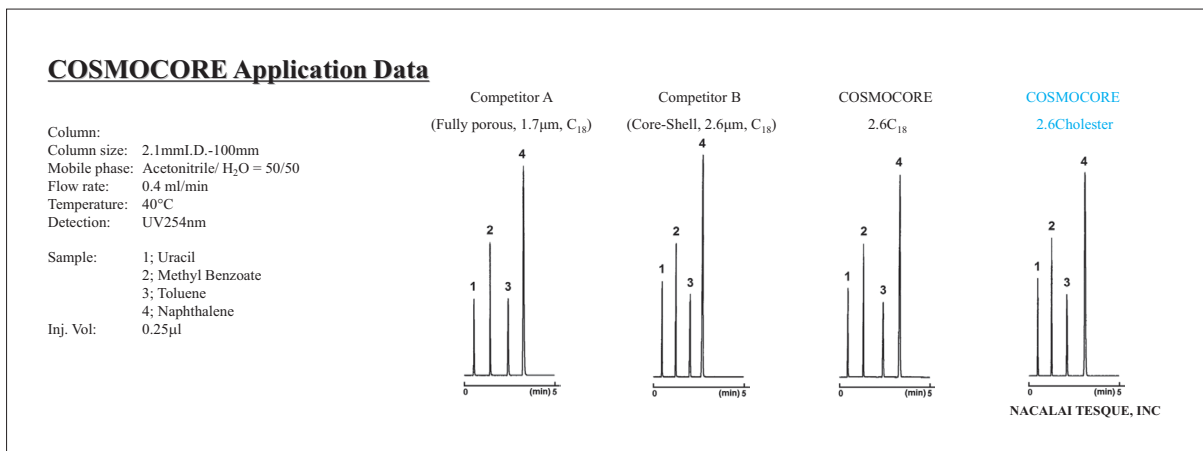
Comparison with C₁₈

COSMOCORE 2.6Cholester offers improved separation for cis-trans isomers than C₁₈ under typical reversed-phase mobile phase.



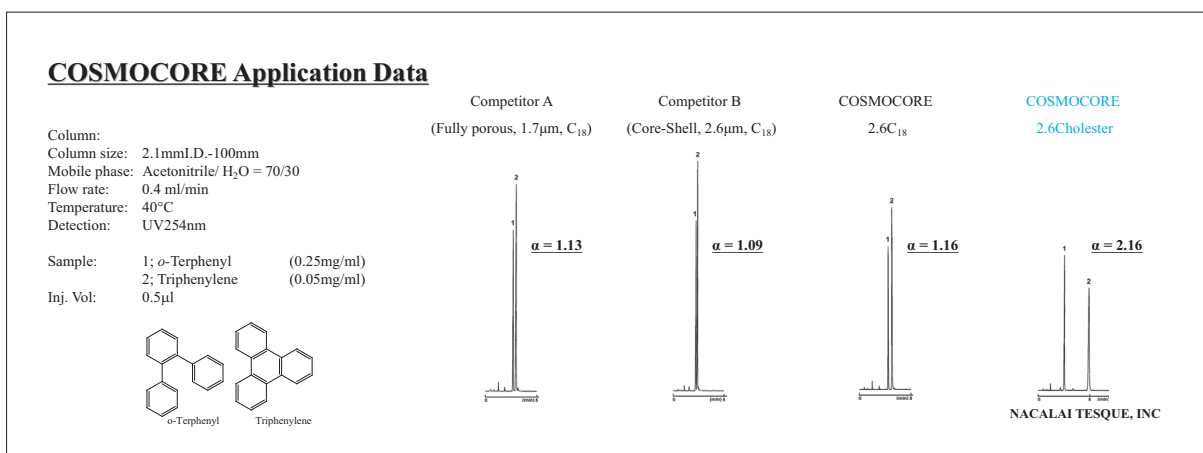
Separation Properties

COSMOCORE 2.6Cholester has about the same hydrophobicity as C₁₈. It is not necessary to change the analytical conditions when replacing C₁₈ Columns with COSMOCORE 2.6Cholester.



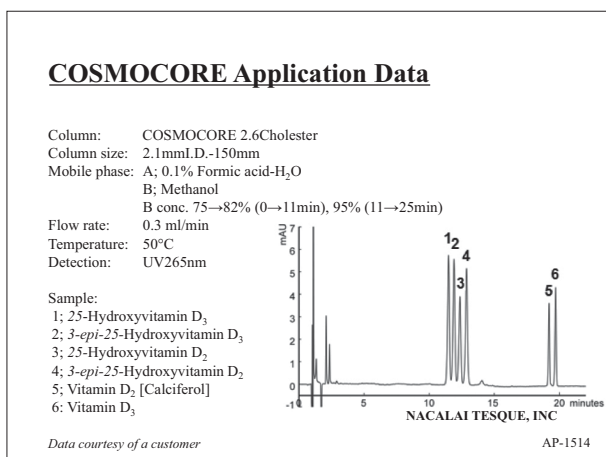
Molecular Shape Selectivity

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

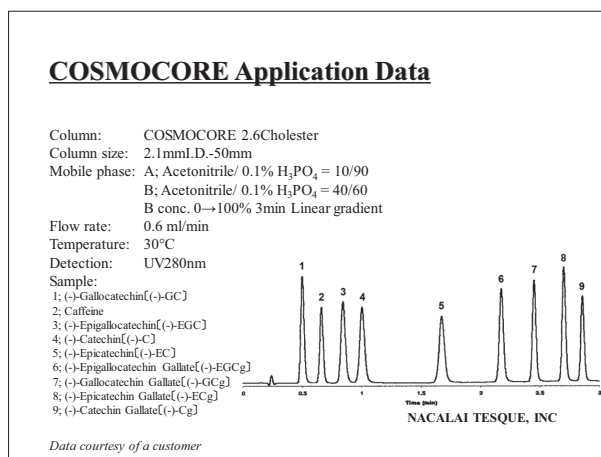


Applications

• Vitamin D metabolites



• Catechins



Ordering Information

• Analytical Columns (Particle Size: 2.6 µm)

COSMOCORE 2.6Cholester 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 | 12858-91 | 3.0 x 30 | 12863-11 | 4.6 x 30 | 12869-51 |
| 2.1 x 50 | 12859-81 | 3.0 x 50 | 12864-01 | 4.6 x 50 | 12870-11 |
| 2.1 x 75 | 12860-41 | 3.0 x 75 | 12866-81 | 4.6 x 75 | 12871-01 |
| 2.1 x 100 | 12861-31 | 3.0 x 100 | 12867-71 | 4.6 x 100 | 12872-91 |
| 2.1 x 150 | 12862-21 | 3.0 x 150 | 12868-61 | 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 C₁₈
- Greater sample loading capacity than HILIC
- High performance similar to sub-2 μm particles with lower back pressure

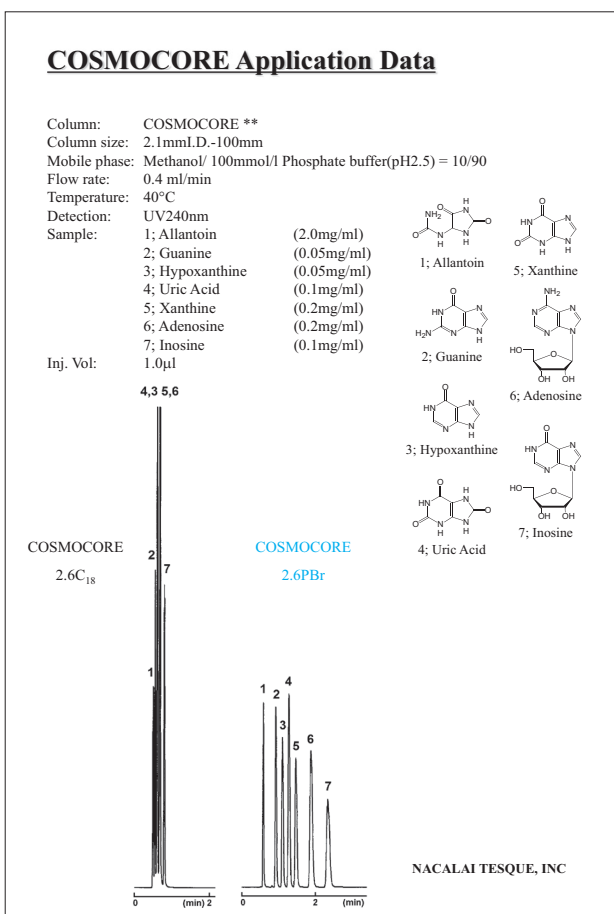
< Suitable Samples >

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

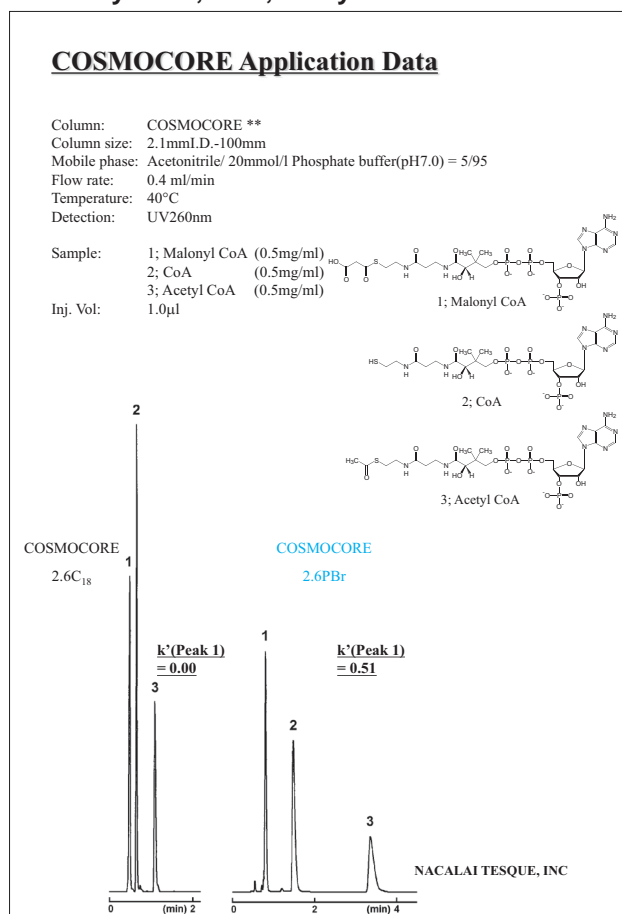
Separation of Hydrophilic Compounds (low retention on C₁₈)

COSMOCORE 2.6PBr retains hydrophilic compounds stronger than C₁₈ columns under the same reversed-phase conditions.

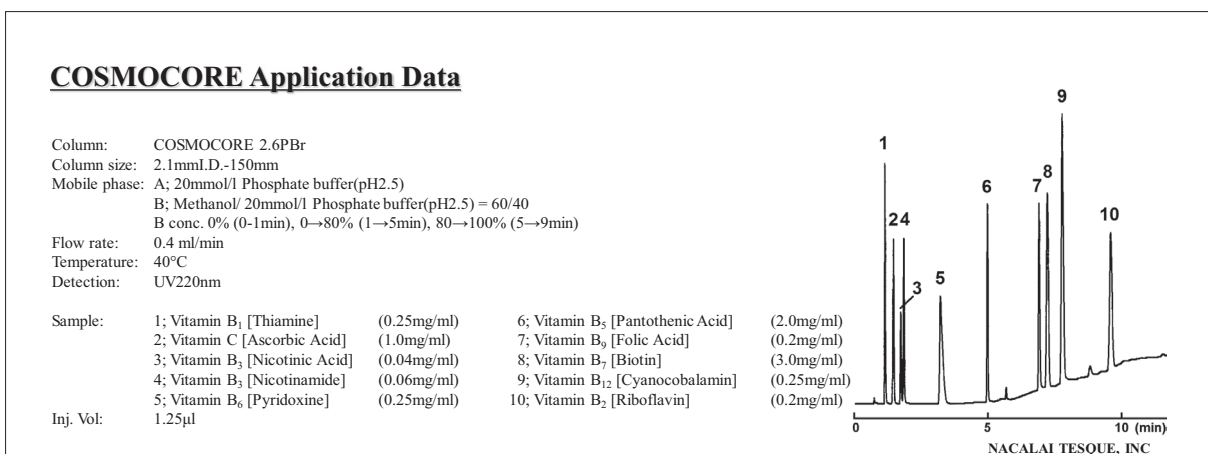
• Nucleic Acid Metabolites



• Malonyl CoA, CoA, Acetyl CoA



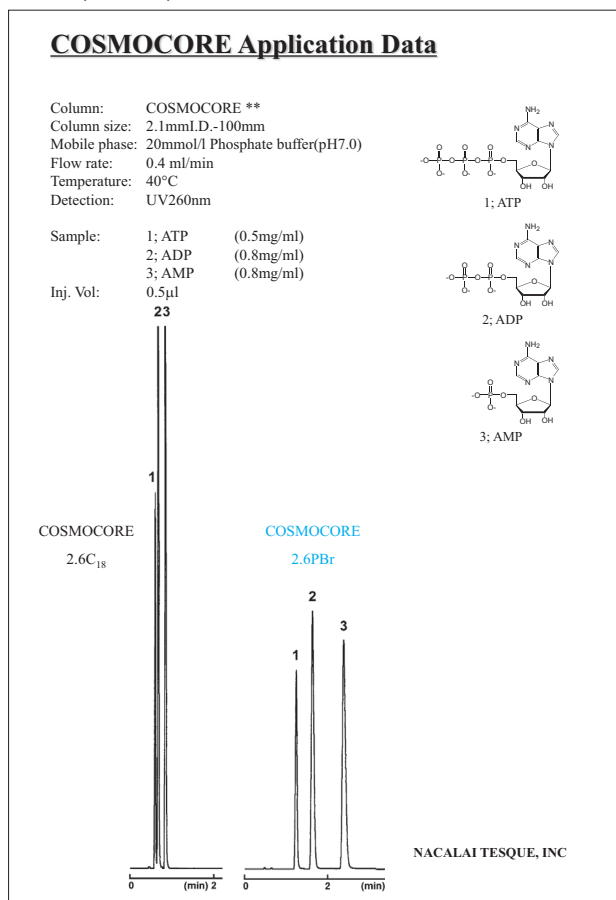
• Water-Soluble Vitamins



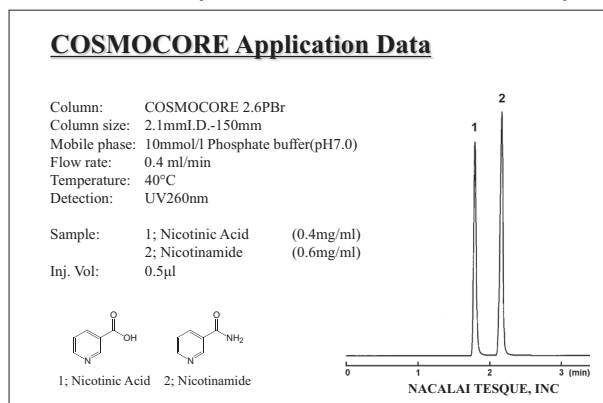
Separation of Hydrophilic Compounds (compounds with similar hydrophobicity)

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

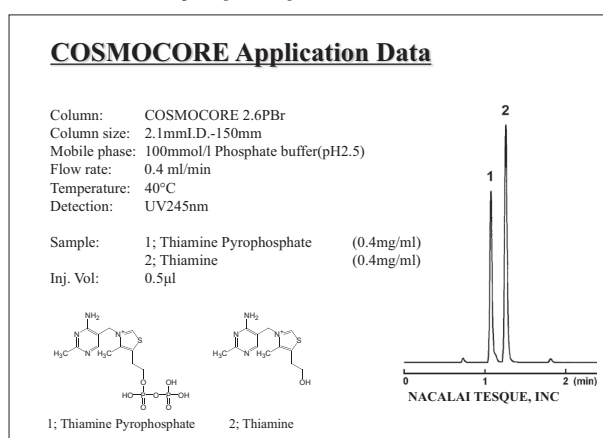
• ATP, ADP, AMP



• Vitamin B3 (Nicotinic Acid, Nicotinamide)



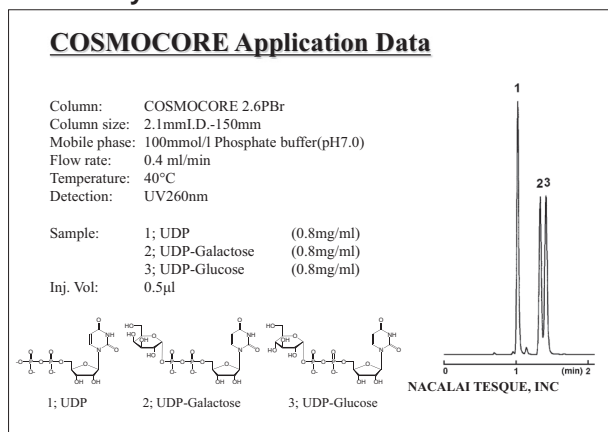
• Thiamine Pyrophosphate, Thiamine



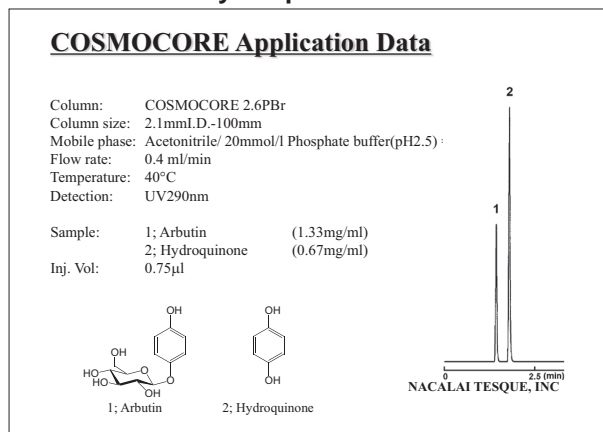
Separation of Hydrophilic Compounds (Glycosides)

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.

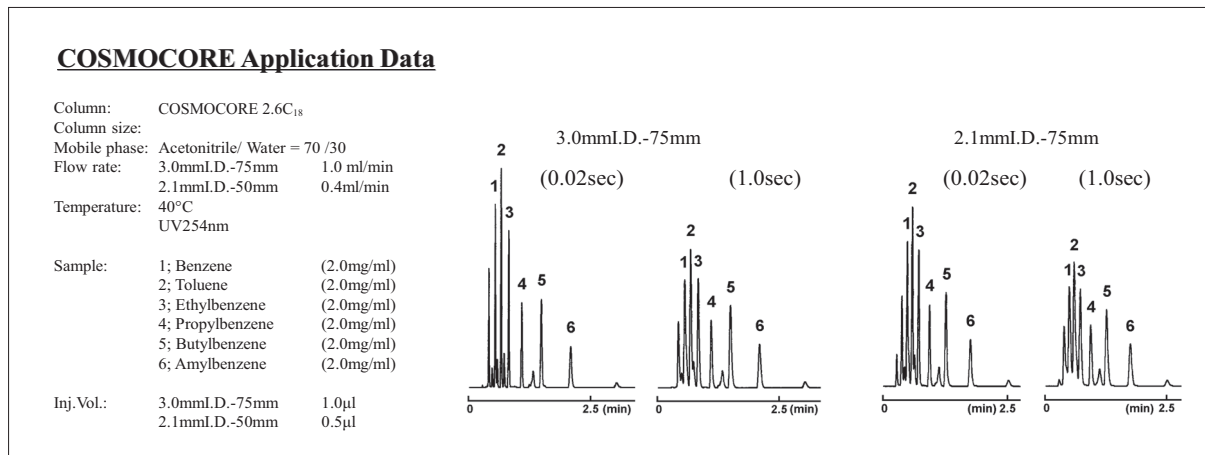
(2) Instrument Settings and Compatibility

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.

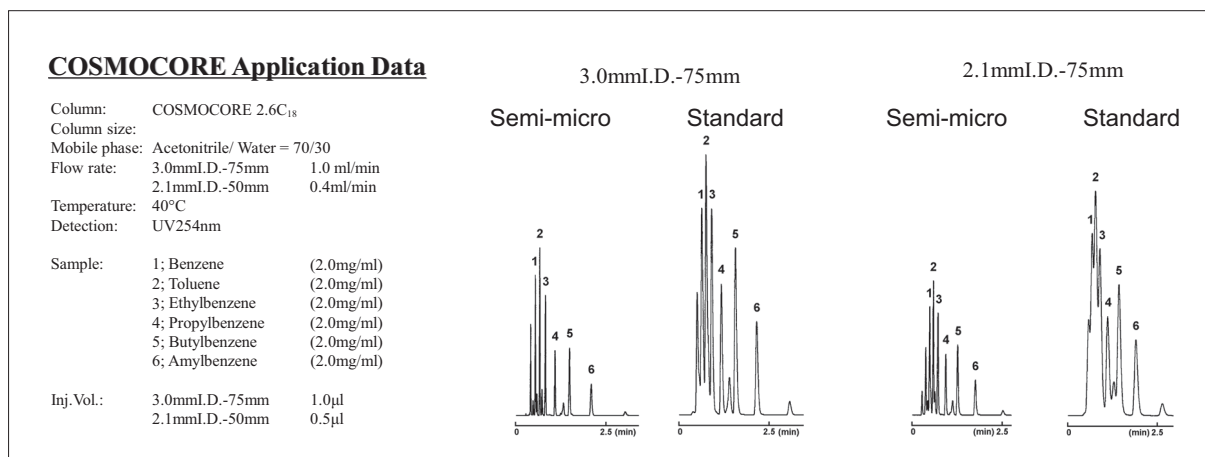
Detector Response Time

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.



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).



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

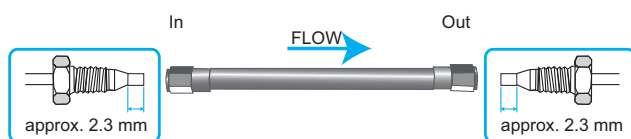
| | HPLC | UHPLC |
|-----------------|--------------------|--------------------|
| Connector Shape | approx. 3.3 mm | approx. 2.3 mm |

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.

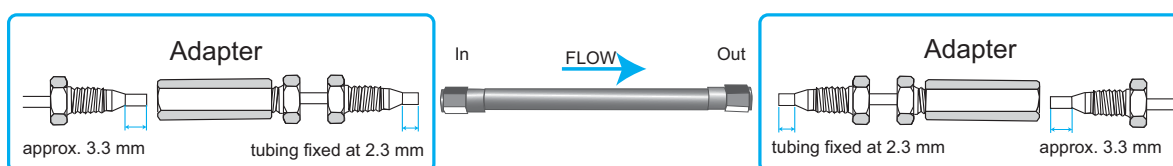


2) HPLC instrument fittings

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

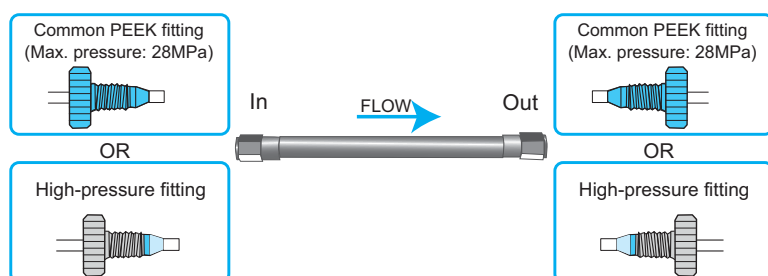
SUS ferrules (HPLC) fixed on the tubing

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 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

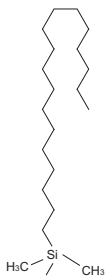
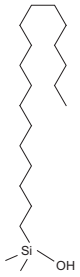
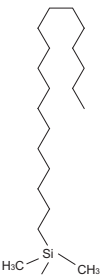
| Product Name | In | Out | Contents | Product Number | PKG Size |
|----------------------------------|-------|-------|--|----------------|---------------|
| U-Fil UHPLC-compatible prefilter | UHPLC | UHPLC | Filter: 0.5 μ m | 12571-31 | 1 SET |
| | HPLC | UHPLC | Tubing connecting diameter: 1/16 | 12572-21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

2. HPLC Columns

(1) Reversed Phase Columns

C₁₈ (ODS) Series

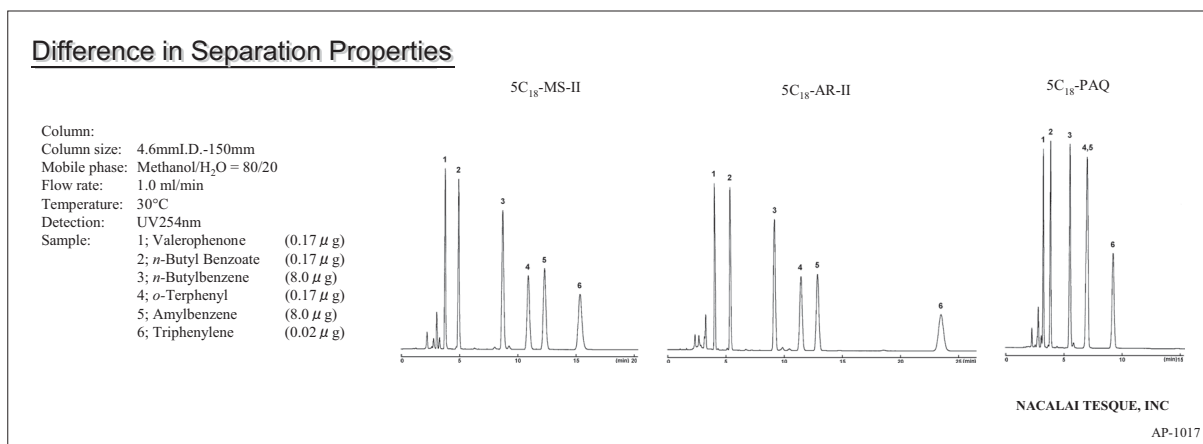
Specifications

| 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. •Good for acidic compounds and peptides. | •Good for hydrophilic compounds. •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 5C₁₈-AR-II retains planar compounds (such as triphenylene) longer compared to COSMOSIL 5C₁₈-MS-II. COSMOSIL 5C₁₈-PAQ has shorter retention time, and retains polar compounds (Such as valerophenone, *n*-butyl benzoate) longer.

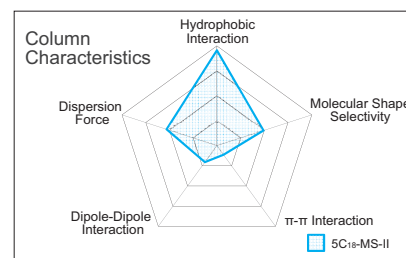


COSMOSIL C₁₈-MS-II

- 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.

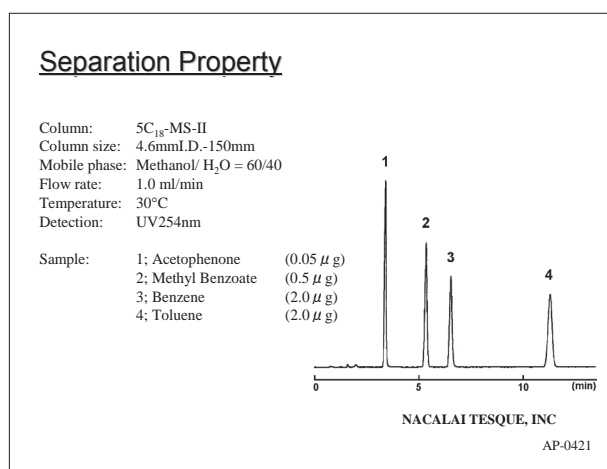
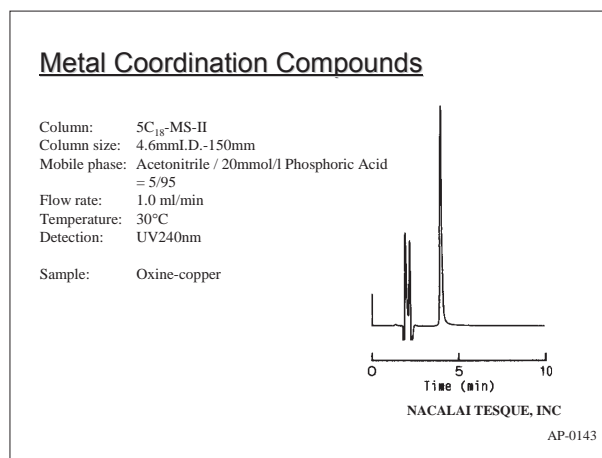
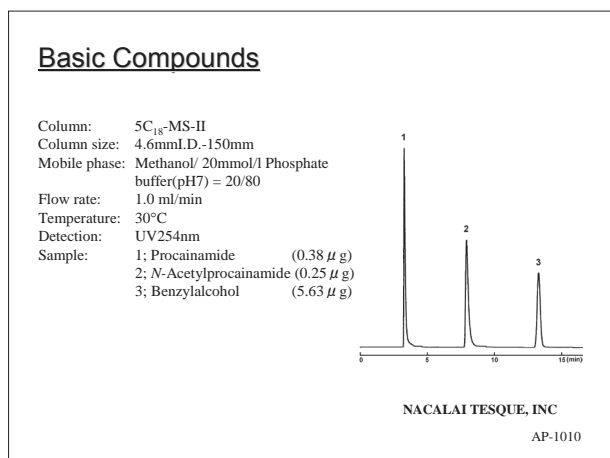


Table. Comparison of hydrophobic interaction, analytical pressure, and theoretical plate number

| Column | Hydrophobic Interaction α (Toluene/Benzene) | Pressure (MPa) | Theoretical Plate Number (Toluene) |
|----------------------------------|---|----------------|------------------------------------|
| COSMOSIL 5C ₁₈ -MS-II | 1.96 | 8.3 | 14300 |
| Company A C ₁₈ | 1.99 | 13.0 | 16800 |
| Company B C ₁₈ | 1.94 | 8.0 | 14000 |
| Company C C ₁₈ | 1.69 | 11.2 | 5600 |
| Company D C ₁₈ | 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.



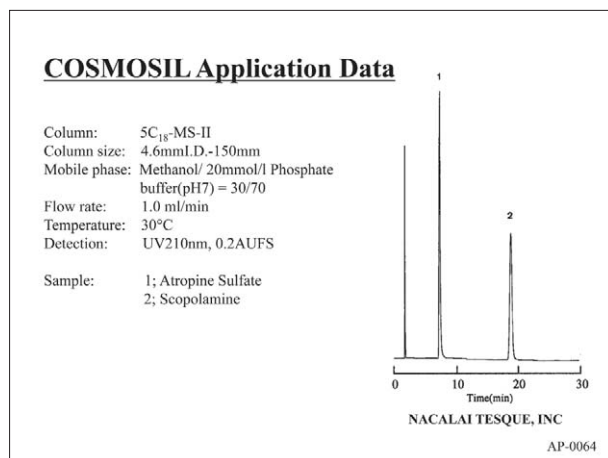
High Reproducibility

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).

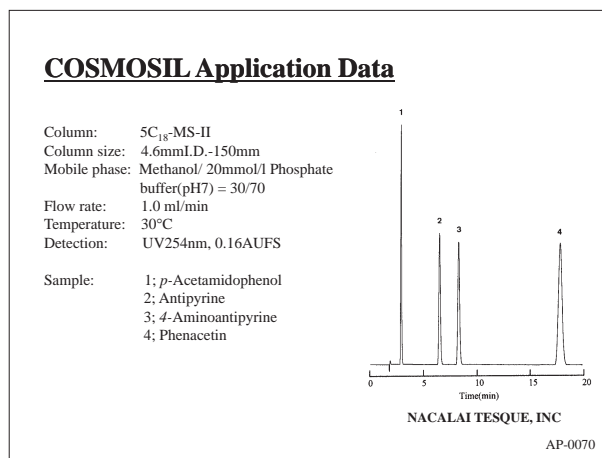
A Wide Range of Applications

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 | Column Size I.D. x Length (mm) | Product Number |
|-----------------------------------|----------------|-----------------------------------|----------------|
| 1.0 x 50 | 02824-31 | 4.6 x 100 | 38018-91 |
| 1.0 x 150 | 02896-01 | 4.6 x 150* | 38019-81 |
| 2.0 x 30 | 05876-71 | 4.6 x 150 3 lots set | 09397-73 |
| 2.0 x 50 | 04355-21 | 4.6 x 250* | 38020-41 |
| 2.0 x 100 | 05597-31 | 6.0 x 150 | 38021-31 |
| 2.0 x 150 | 38025-91 | 6.0 x 250 | 38022-21 |
| 2.0 x 250 | 05761-61 | 10 x 50 | 05789-21 |
| 3.0 x 100 | 05458-51 | 10 x 150 | 34355-91 |
| 3.0 x 150 | 34245-31 | 10 x 250 | 38023-11 |
| 3.0 x 250 | 34254-11 | 20 x 150 | 05091-41 |
| 4.6 x 30 | 34341-61 | 20 x 250 | 38024-01 |
| 4.6 x 50 | 38017-01 | 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 |

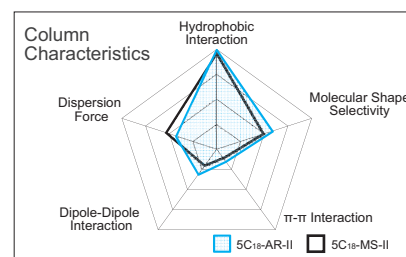
• Analytical Columns (Particle Size: 2.5 µm)

COSMOSIL 2.5C₁₈-MS-II Packed Column

| Column Size I.D. x Length (mm) | Product Number | Column Size I.D. x Length (mm) | Product Number |
|-----------------------------------|----------------|-----------------------------------|----------------|
| 2.0 x 50 | 08994-31 | 3.0 x 50 | 08997-01 |
| 2.0 x 75 | 08995-21 | 3.0 x 75 | 08998-91 |
| 2.0 x 100 | 08996-11 | 3.0 x 100 | 08999-81 |

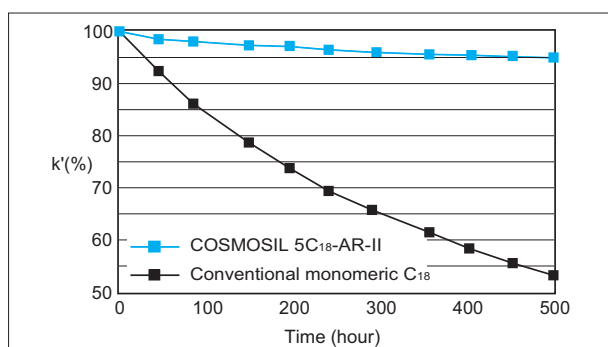
COSMOSIL C₁₈-AR-II

- Features strong acid resistance
- < Suitable Samples >
- Peptides, acidic compounds, etc.



Acid Resistance

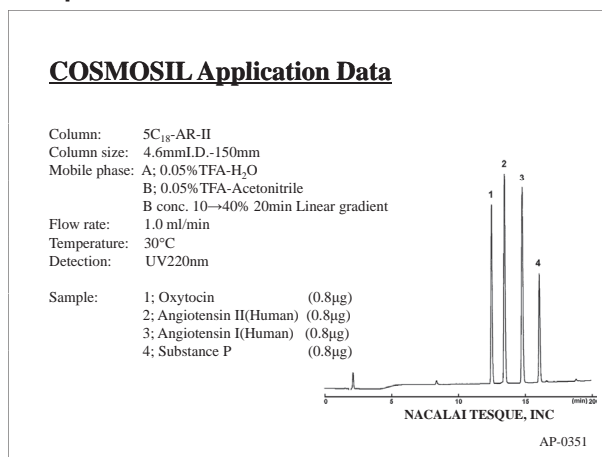
The COSMOSIL 5C₁₈-AR-II packed column features a polymeric type of C₁₈ reversed phase material. The acidic resistance of COSMOSIL 5C₁₈-AR-II is much improved compared with commercially available monomeric type octadecyl stationary phases. It retains high performance even with acidic mobile phases commonly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



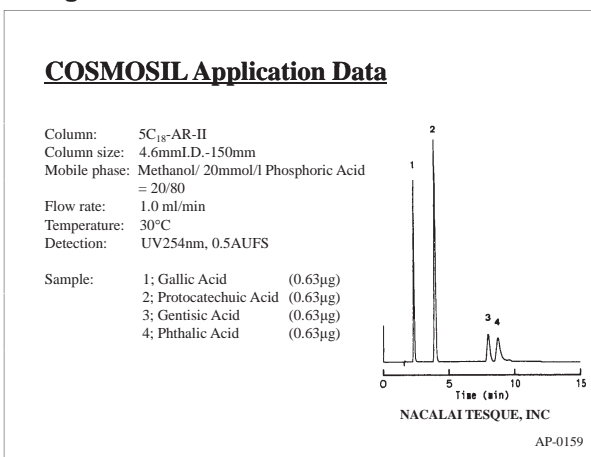
Decomposition test in 0.1% Trifluoroacetic acid solution at 60°C.
Capacity factor (k') = Naphthalene,
Mobile phase: Methanol / H₂O=70/30

Applications

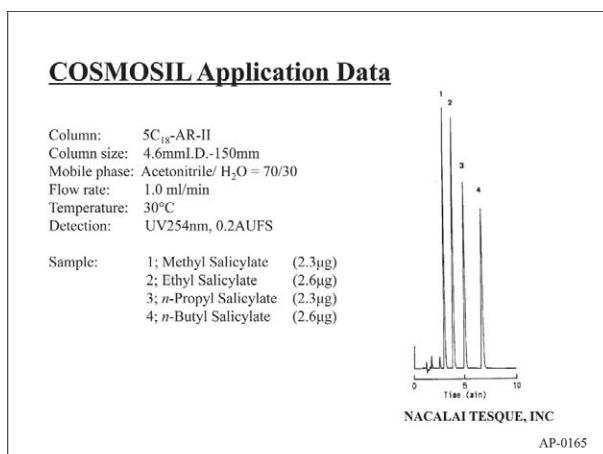
• Peptides



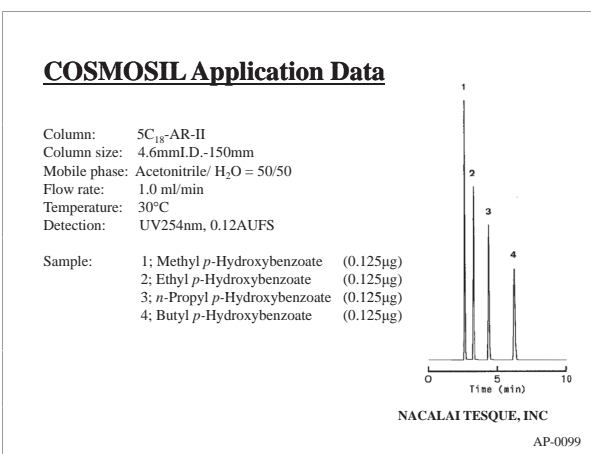
• Organic Acids



• Salicylic Acid Esters

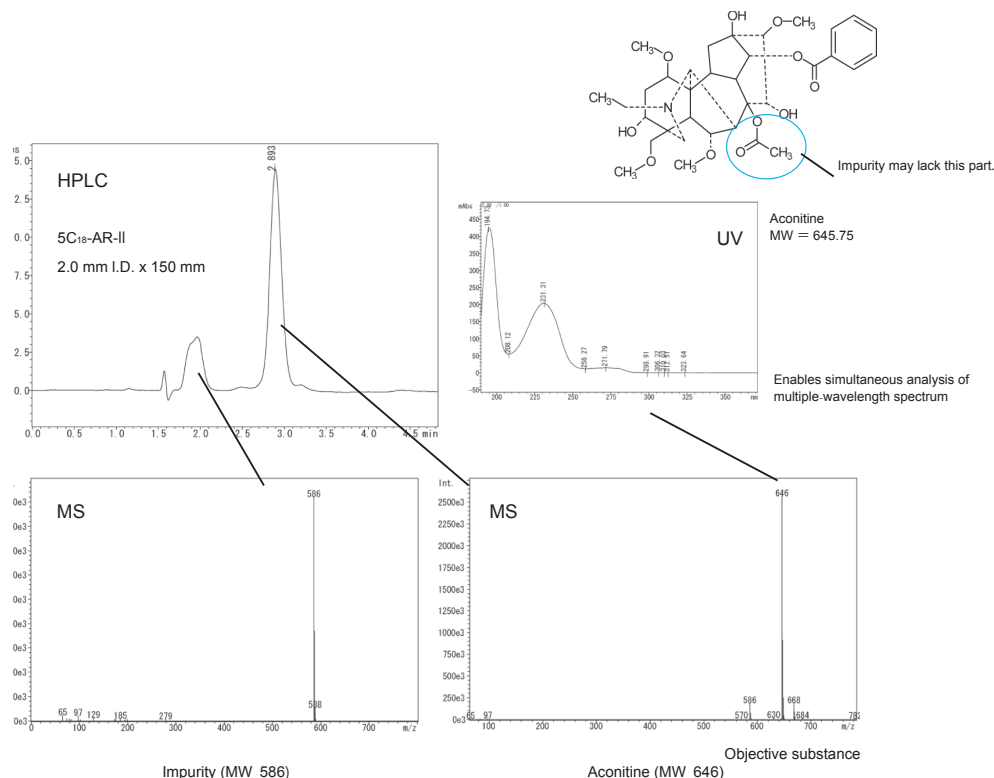


• Parabens



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 |

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

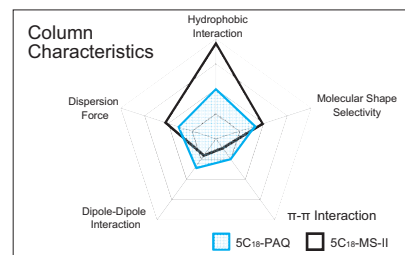
| Column Size I.D. x Length (mm) | Product Number |
|-----------------------------------|----------------|
| 2.0 x 50 | 05478-91 |
| 4.6 x 10 | 38068-41 |
| 4.6 x 50 | 38069-31 |
| 4.6 x 100 | 38070-91 |

COSMOSIL C₁₈-PAQ

- Compatible with 100% water based mobile phase

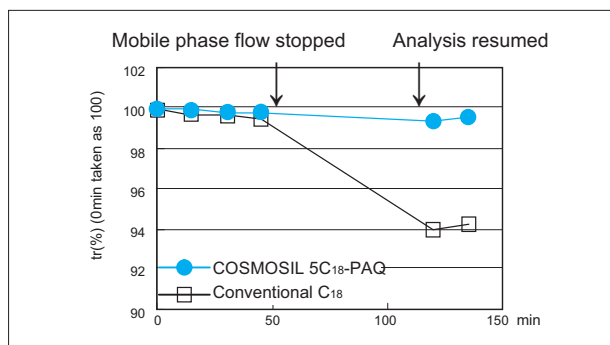
< Suitable Samples >

- Hydrophilic compounds
- Organic acids, nucleic acid bases, etc.



Stable Performance

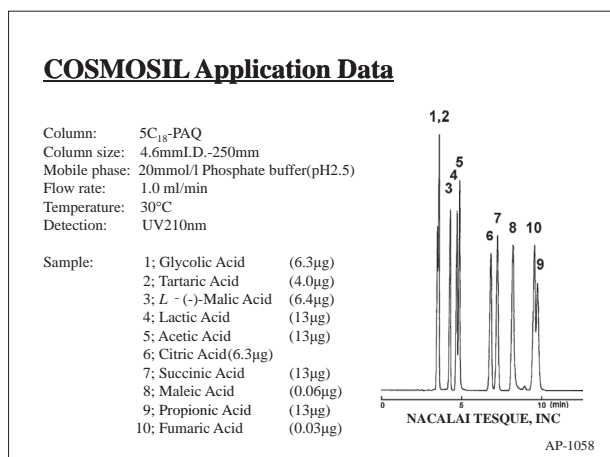
Stable performance under 100% aqueous conditions



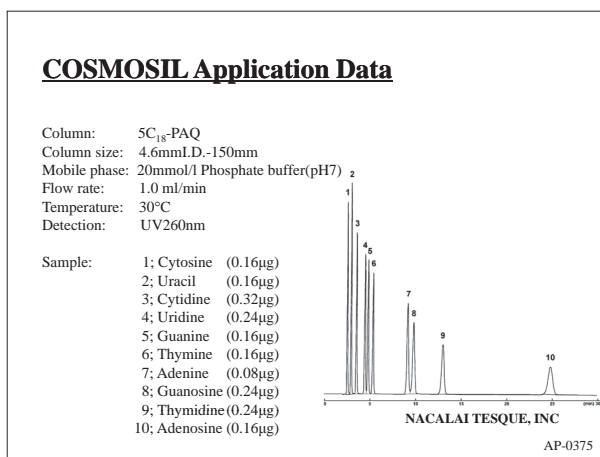
The figure shows the change of retention time for thymine with 100% aqueous mobile phase (20 mmol/l phosphate buffer, pH 7). The sample was analyzed 4 times (1 hour). Flow of mobile phase was then stopped for 1 hour. The sample was analyzed under the same conditions again after 1 hour. The conventional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

Applications

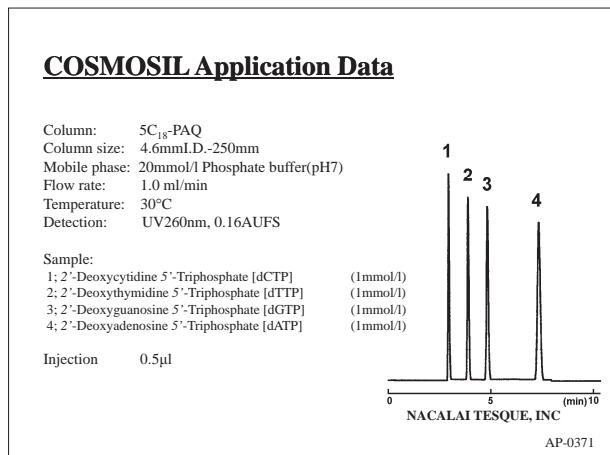
- Organic Acids



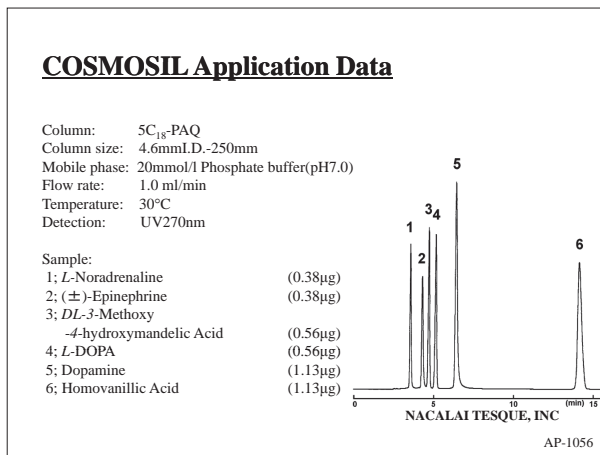
- Nucleobases and Nucleosides



- dNTPs



- Catecholamines



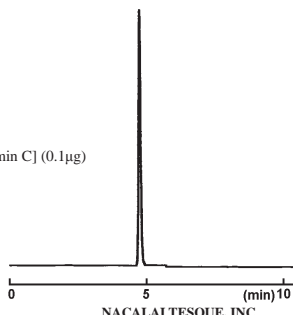
Applications

• Ascorbic Acid

COSMOSIL Application Data

Column: 5C₁₈-PAQ
 Column size: 4.6mm I.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

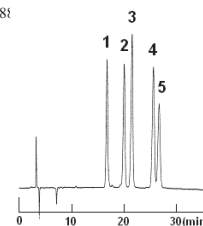
AP-0372

• 2-Phenylethyl Glycosides

COSMOSIL Application Data

Column: 5C₁₈-PAQ
 Column size: 4.6mm I.D.-150mm
 Mobile phase: Acetonitrile/ Methanol/ H₂O = 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 | Column Size I.D. x Length (mm) | Product Number |
|-----------------------------------|----------------|-----------------------------------|----------------|
| 1.0 x 50 | 05792-61 | 4.6 x 100 | 05799-91 |
| 1.0 x 150 | 05793-51 | 4.6 x 150 | 02486-71 |
| 2.0 x 30 | 05878-51 | 4.6 x 250 | 02485-81 |
| 2.0 x 50 | 05794-41 | 6.0 x 150 | 34419-61 |
| 2.0 x 100 | 05470-71 | 6.0 x 250 | 05800-41 |
| 2.0 x 150 | 34449-71 | 10 x 50 | 05801-31 |
| 2.0 x 250 | 05795-31 | 10 x 150 | 34466-41 |
| 3.0 x 100 | 05796-21 | 10 x 250 | 34376-21 |
| 3.0 x 150 | 05797-11 | 20 x 150 | 34476-11 |
| 3.0 x 250 | 05798-01 | 20 x 250 | 34373-51 |
| 4.6 x 30 | 05879-41 | 28 x 250 | 34456-71 |
| 4.6 x 50 | 34451-21 | | |

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

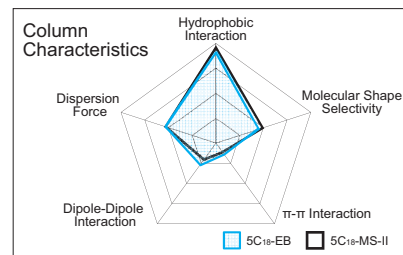
| Column Size I.D. x Length (mm) | Product Number |
|-----------------------------------|----------------|
| 28 x 250 | 05888-21 |
| 50 x 250 | 05890-71 |
| 50 x 500 | 05891-61 |

COSMOSIL 15C₁₈-PAQ Guard Column

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

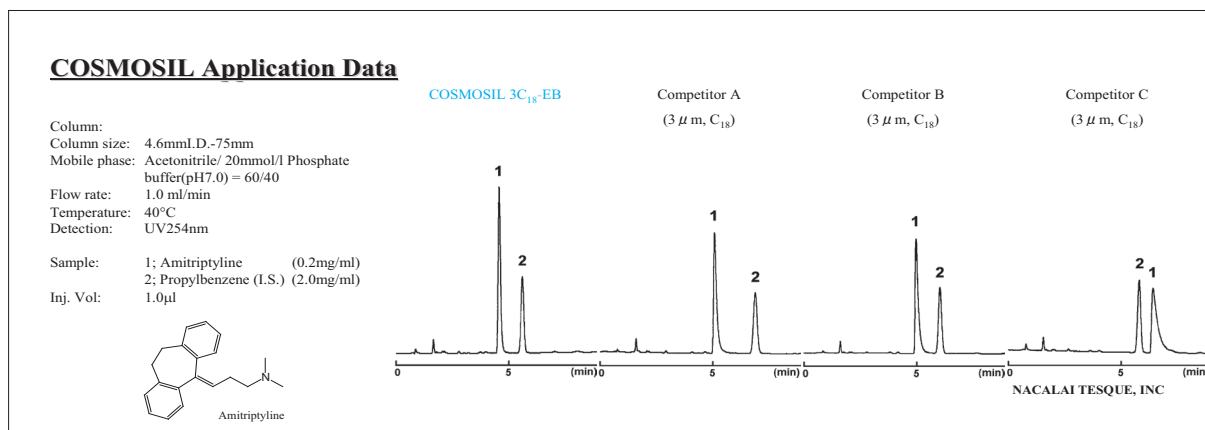
COSMOSIL C₁₈-EB

- 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

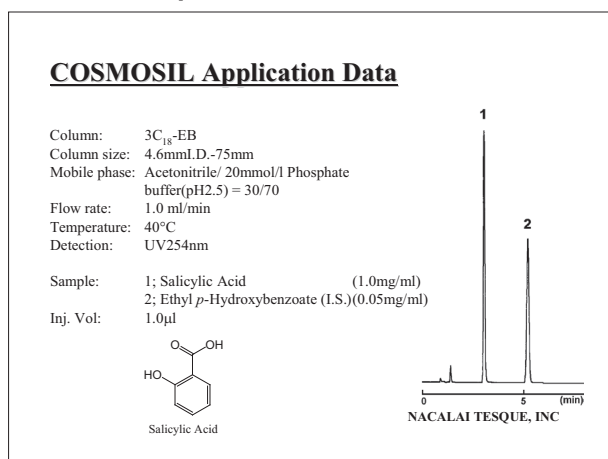
COSMOSIL 3C₁₈-EB uses a new end-capping method to reduce the number of residual silanol groups, which can cause peak tailing with basic compounds.



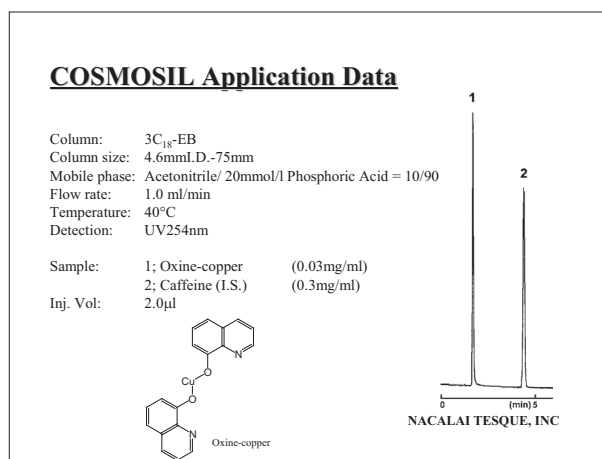
Analysis of Acidic Compounds and Metal Coordination Compounds

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 |

| Column Size I.D. x Length (mm) | Product Number |
|--------------------------------|----------------|
| 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

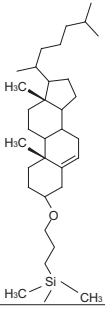
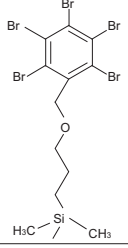
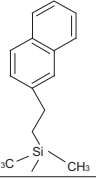
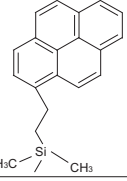
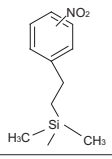
| Column Size I.D. x Length (mm) | Product Number |
|--------------------------------|----------------|
| 2.0 x 10 Cartridge** | 11892-74 |
| 4.6 x 10 | 09839-41 |
| 4.6 x 10 Cartridge** | 11890-94 |

* Validated columns

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

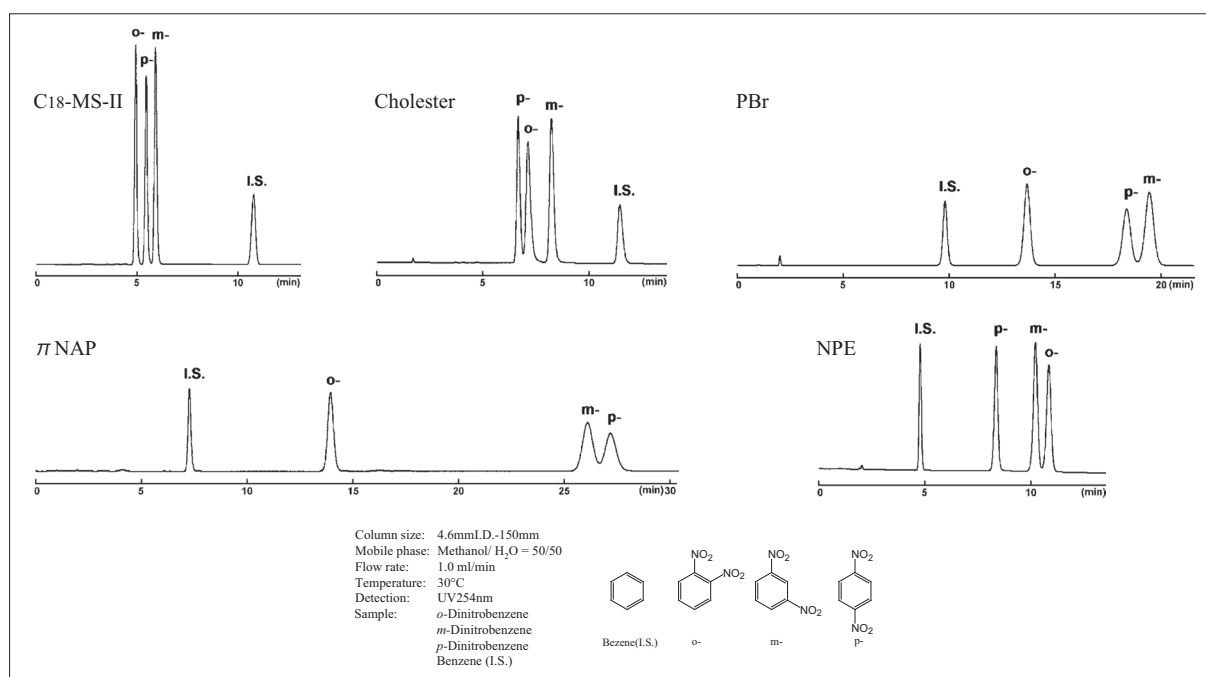
Reversed Phase Specialty Columns

Specifications

| Packing Material | Cholester | PBr | π NAP | PYE | NPE |
|------------------------|--|--|--|---|--|
| Silica Gel | High purity porous spherical silica | | | | |
| Average Particle Size | 2.5, 5 μ m | 5 μ m | 2.5, 5 μ m | 5 μ m | |
| 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 Molecular shape selectivity | Hydrophobic interaction Dispersion force | Hydrophobic interaction π - π interaction | Hydrophobic interaction π - π interaction Dispersion force Molecular shape selectivity | Hydrophobic interaction π - π interaction 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 | <ul style="list-style-type: none"> • Usable under the same conditions as C₁₈ • High molecular shape selectivity | <ul style="list-style-type: none"> • Separate hydrophilic compounds under reversed-phase conditions | <ul style="list-style-type: none"> • Stronger π-π interaction than phenyl columns | <ul style="list-style-type: none"> • Very strong π-π interaction | <ul style="list-style-type: none"> • Strong dipole-dipole interaction |

Selectivity for positional isomers of dinitrobenzene

Different stationary phase exhibits different selectivity due to the use of forces that C₁₈ (hydrophobic interaction) does not have. By using these columns, you can achieve separation that cannot be done using only C₁₈.

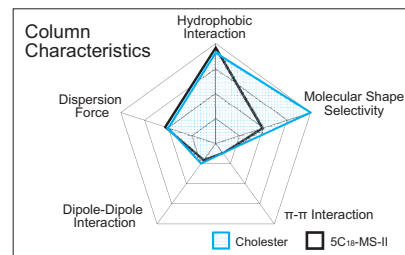


COSMOSIL Cholester

- Cholesterol-bonded stationary phase
- Increased stereoselectivity and improved resolution for geometric isomers
- Usable under the same conditions as C₁₈

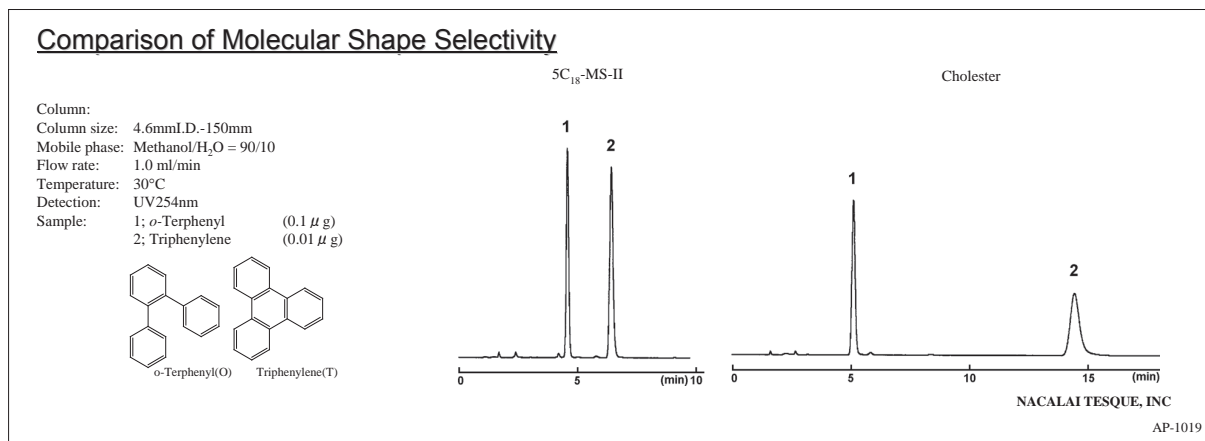
< Suitable Samples >

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



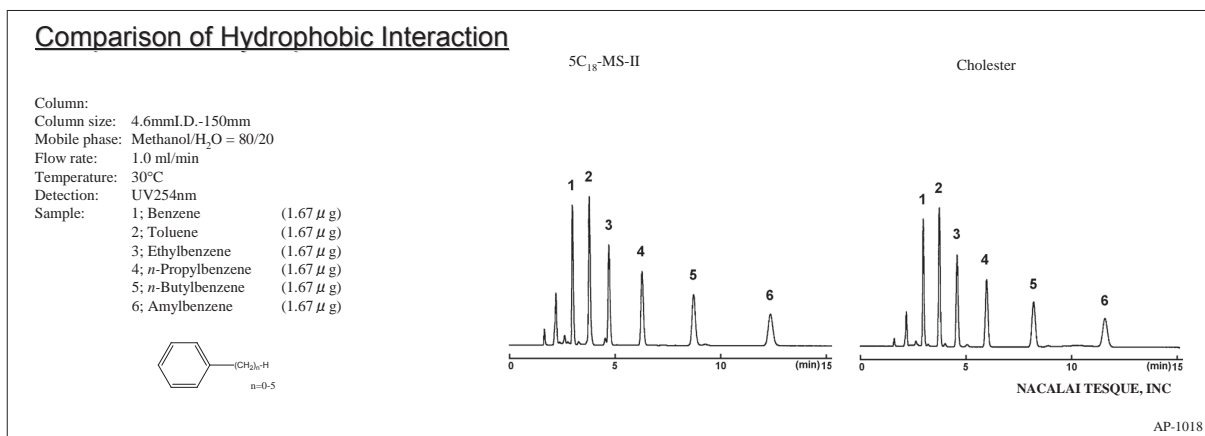
Molecular Shape Selectivity

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.



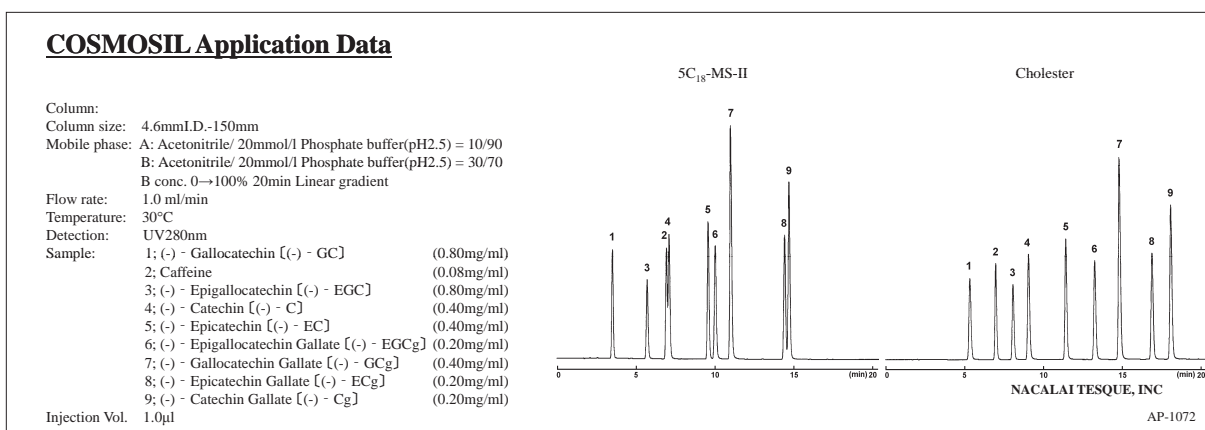
Hydrophobic Interaction

The below figure shows the comparison of hydrophobic interactions with competitor's C₁₈ columns. Cholester provides about the same hydrophobicity as alkyl group bonded types (C₁₈, C₃₀). It is not necessary to change the analytical conditions when replacing C₁₈ or C₃₀ columns with Cholester.



Applications

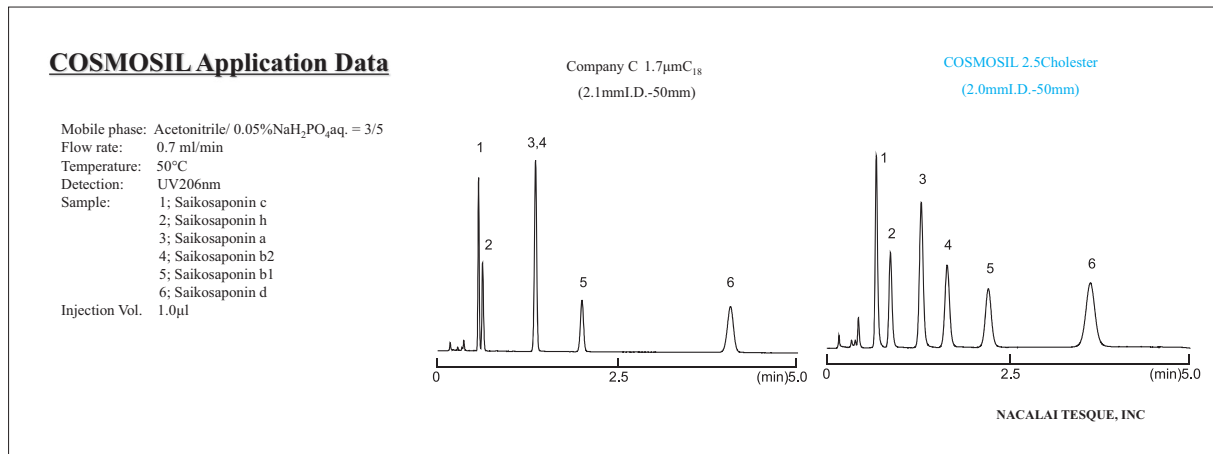
- Catechins



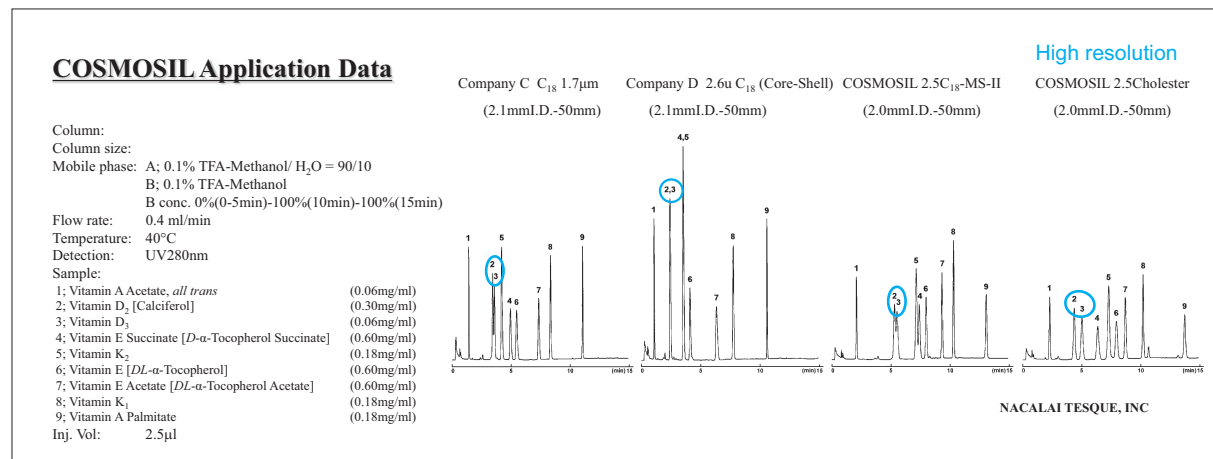
Applications (Continued)

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

• Saikosaponins



• Fat-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 |

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 |

| 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

• Analytical (Particle Size: 2.5 μm)

COSMOSIL 2.5Cholester Packed Column

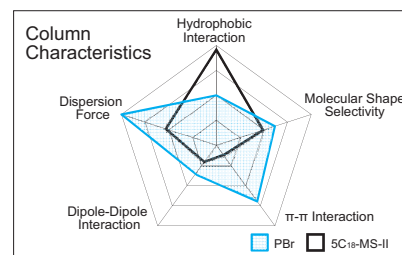
| Column Size I.D. x Length (mm) | Product Number | Column Size I.D. x Length (mm) | Product Number |
|-----------------------------------|----------------|-----------------------------------|----------------|
| 2.0 x 50 | 09000-01 | 3.0 x 50 | 09049-91 |
| 2.0 x 75 | 09047-11 | 3.0 x 75 | 09050-51 |
| 2.0 x 100 | 09048-01 | 3.0 x 100 | 09051-41 |

COSMOSIL PBr

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

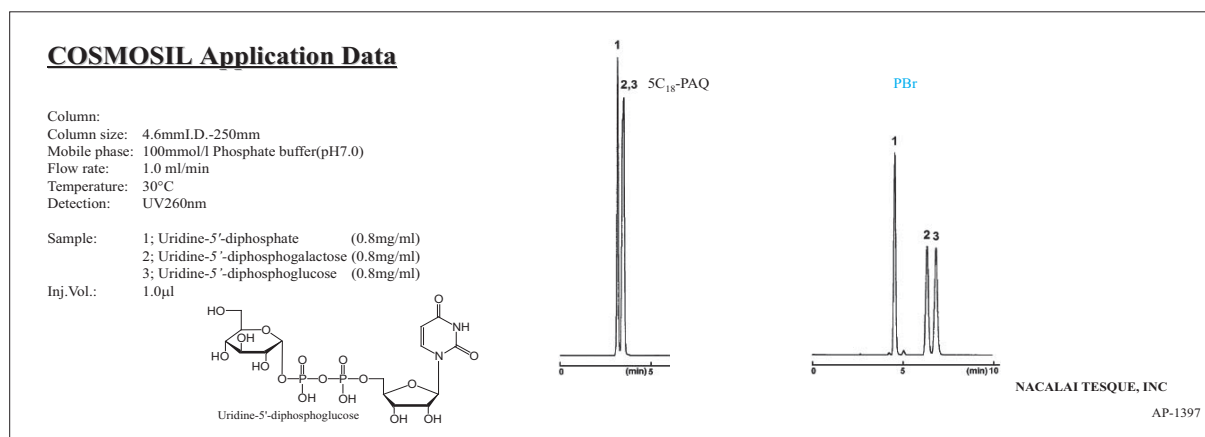
< Suitable Samples >

- Hydrophilic compounds
- Nucleotides, peptides, catecholamines and oligosaccharides



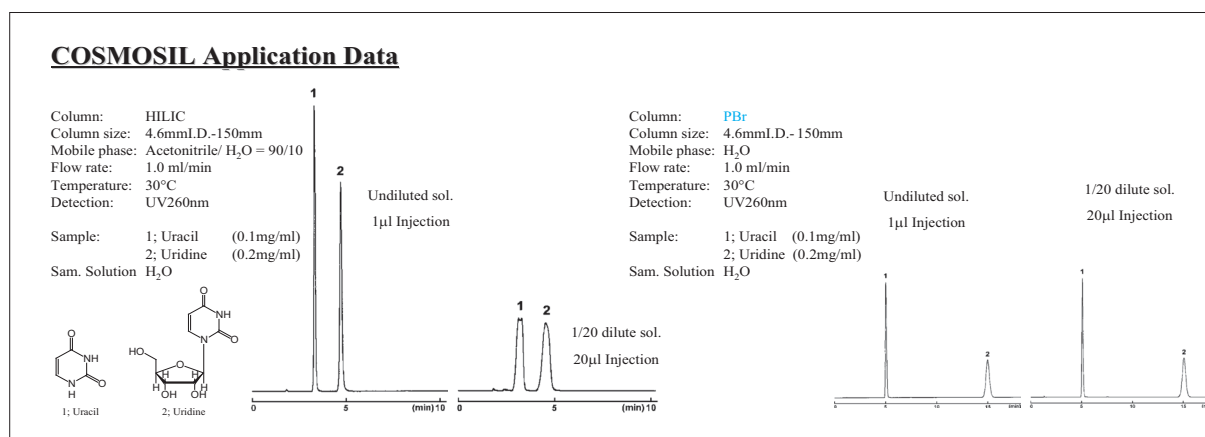
Comparison with C₁₈

COSMOSIL PBr retains hydrophilic compounds stronger than C₁₈ 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 | Column Size I.D. x Length (mm) | Product Number |
|--------------------------------|----------------|--------------------------------|----------------|
| 2.0 x 100 | 13245-81 | 10 x 50 | 13253-71 |
| 2.0 x 150 | 12392-81 | 10 x 100 | 13254-61 |
| 2.0 x 250 | 13247-61 | 10 x 150 | 13255-51 |
| 3.0 x 50 | 12592-61 | 10 x 250 | 12397-31 |
| 3.0 x 100 | 13249-41 | 20 x 50 | 13257-31 |
| 3.0 x 150 | 13250-01 | 20 x 100 | 13258-21 |
| 3.0 x 250 | 13251-91 | 20 x 150 | 13259-11 |
| 4.6 x 50 | 13252-81 | 20 x 250 | 12398-21 |
| 4.6 x 150 | 12394-61 | 28 x 100 | 13260-71 |
| 4.6 x 250 | 12395-51 | 28 x 150 | 13261-61 |
| | | 28 x 250 | 13262-51 |

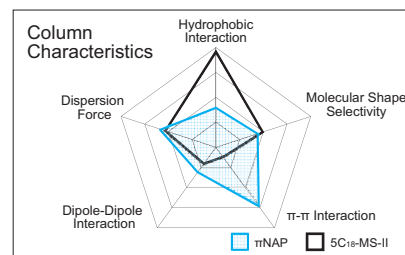
COSMOSIL PBr Guard Column

| 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 π NAP

- Naphthalene-bonded stationary phase
 - Enhanced π - π interactions
- < Suitable Samples >
- Aromatic compounds and positional isomers



Comparison of π - π Interactions

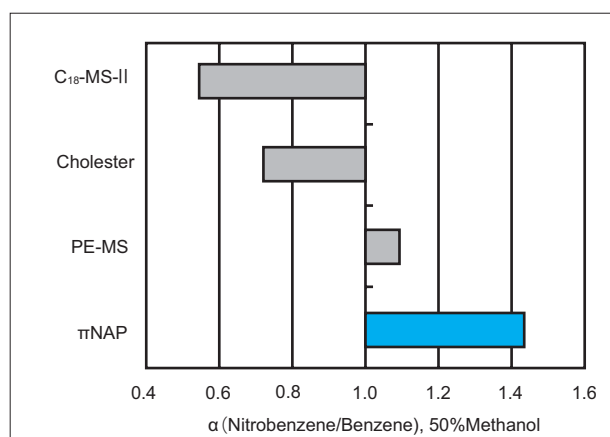
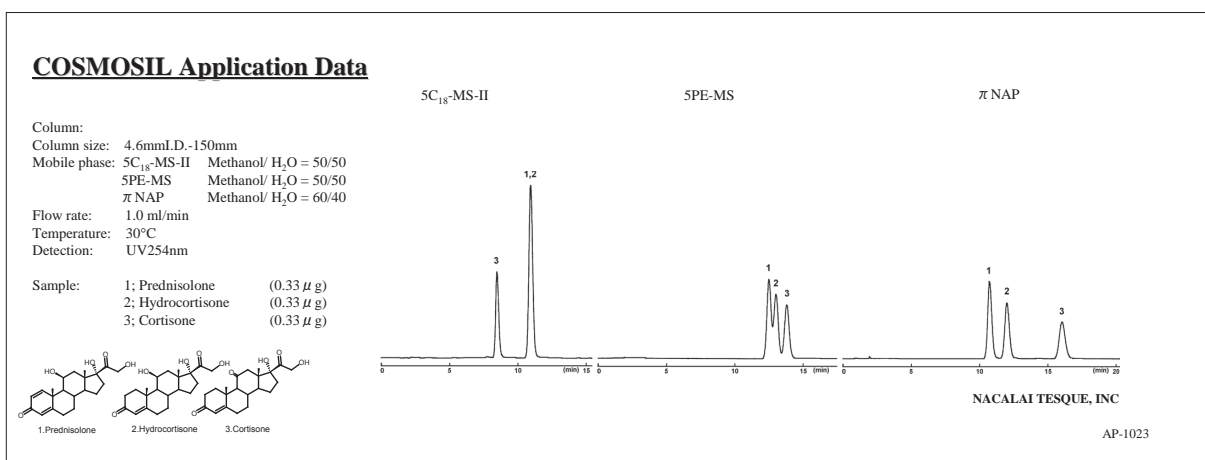


Figure. Comparison of π - π interaction

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

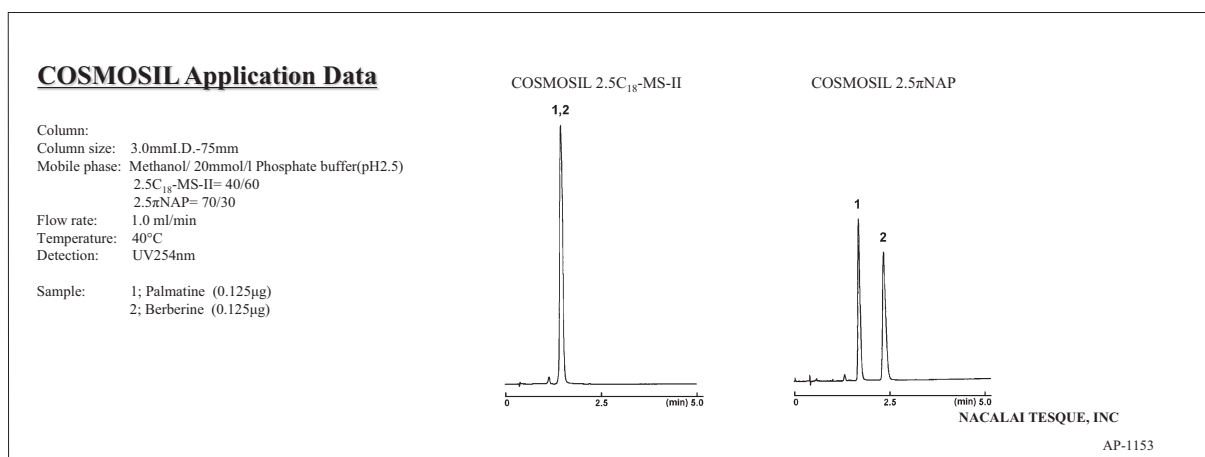
Applications

- Adrenal Cortical Hormones



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

- Berberine



Ordering Information

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

COSMOSIL π NAP Packed Column

| Column Size I.D. x Length (mm) | Product Number | Column Size I.D. x Length (mm) | Product Number |
|-----------------------------------|----------------|-----------------------------------|----------------|
| 1.0 x 150 | 08076-61 | 3.0 x 250 | 08081-81 |
| 1.0 x 250 | 08077-51 | 4.6 x 150 | 08085-41 |
| 2.0 x 30 | 08566-41 | 4.6 x 250 | 08086-31 |
| 2.0 x 50 | 08567-31 | 10 x 150 | 08088-11 |
| 2.0 x 100 | 08299-51 | 10 x 250 | 08089-01 |
| 2.0 x 150 | 08078-41 | 20 x 150 | 08092-41 |
| 2.0 x 250 | 08079-31 | 20 x 250 | 08093-31 |
| 3.0 x 150 | 08080-91 | 28 x 250 | 08095-11 |

COSMOSIL π NAP 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 |

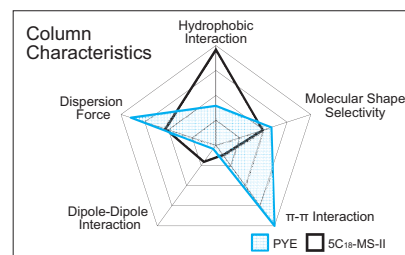
- Analytical Columns (Particle Size: 2.5 μm)

COSMOSIL π NAP Packed Column

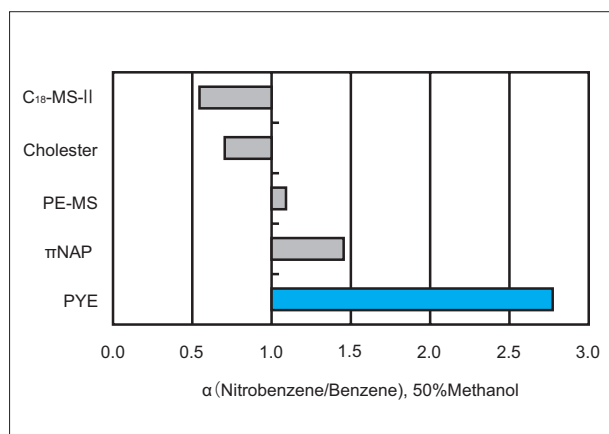
| Column Size I.D. x Length (mm) | Product Number | Column Size I.D. x Length (mm) | Product Number |
|-----------------------------------|----------------|-----------------------------------|----------------|
| 2.0 x 50 | 06062-91 | 3.0 x 50 | 06054-01 |
| 2.0 x 75 | 06051-31 | 3.0 x 75 | 06055-91 |
| 2.0 x 100 | 06052-21 | 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



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

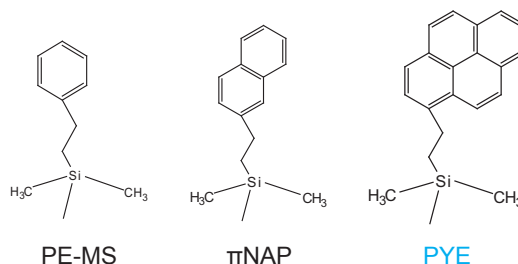
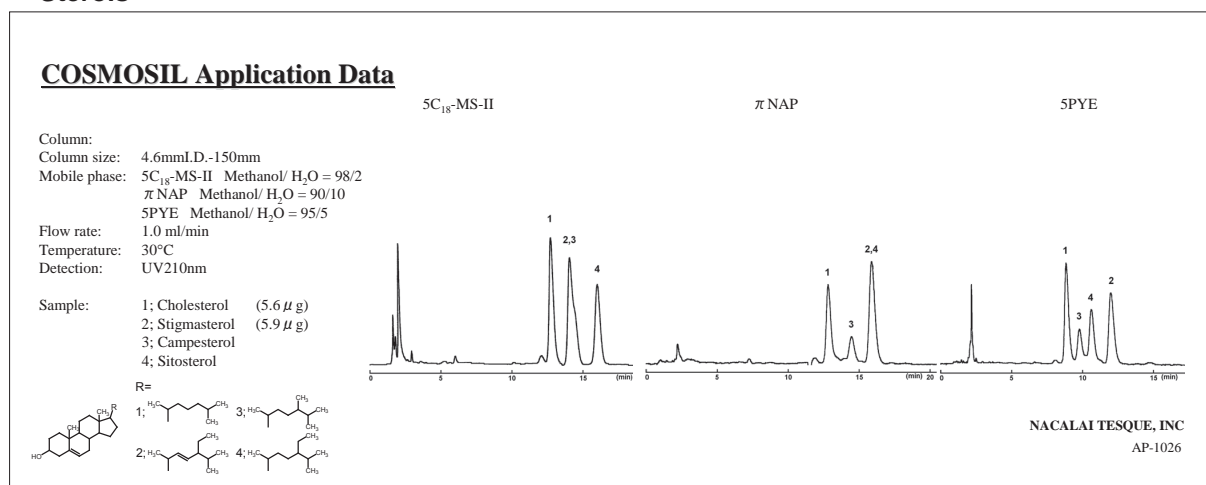


Figure. Comparison of π - π interactions

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 μ m)

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 |

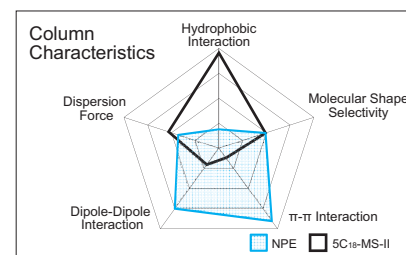
COSMOSIL 5PYE Guard Column

| Column Size I.D. x Length (mm) | Product Number |
|-----------------------------------|----------------|
| 4.6 x 150 | 37837-91 |
| 4.6 x 250 | 37989-11 |
| 10 x 250 | 37996-11 |
| 20 x 250 | 38044-41 |

| 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 |

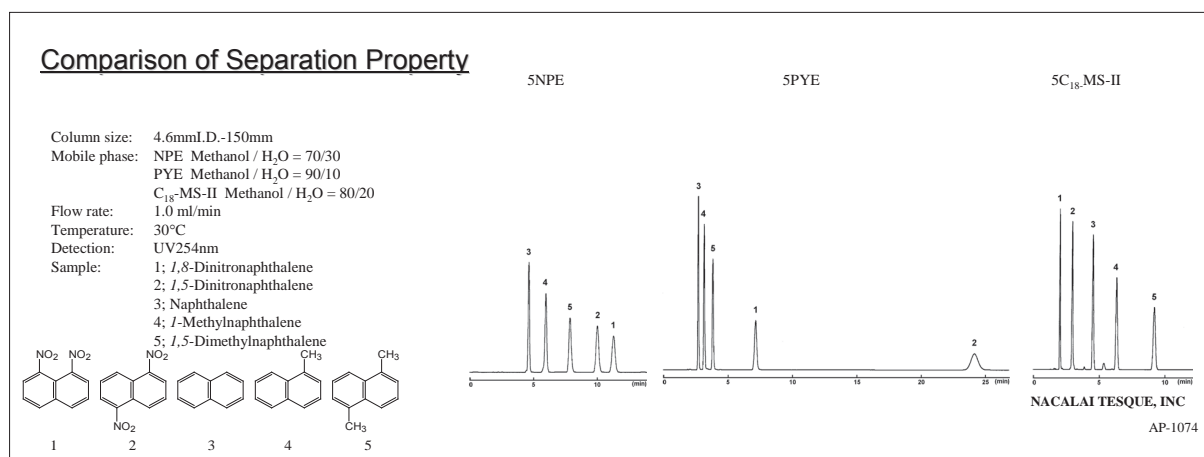
COSMOSIL NPE

- 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 μ m)

COSMOSIL 5NPE Packed Column

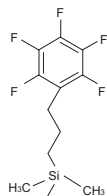
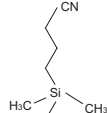
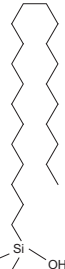
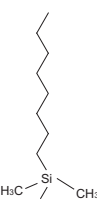
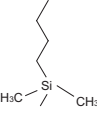

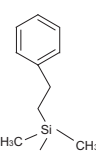
| Column Size I.D. x Length (mm) | Product Number |
|--------------------------------|----------------|
| 1.0 x 150 | 05897-01 |
| 2.0 x 150 | 34328-51 |
| 2.0 x 250 | 34379-91 |

COSMOSIL 5NPE Guard Column

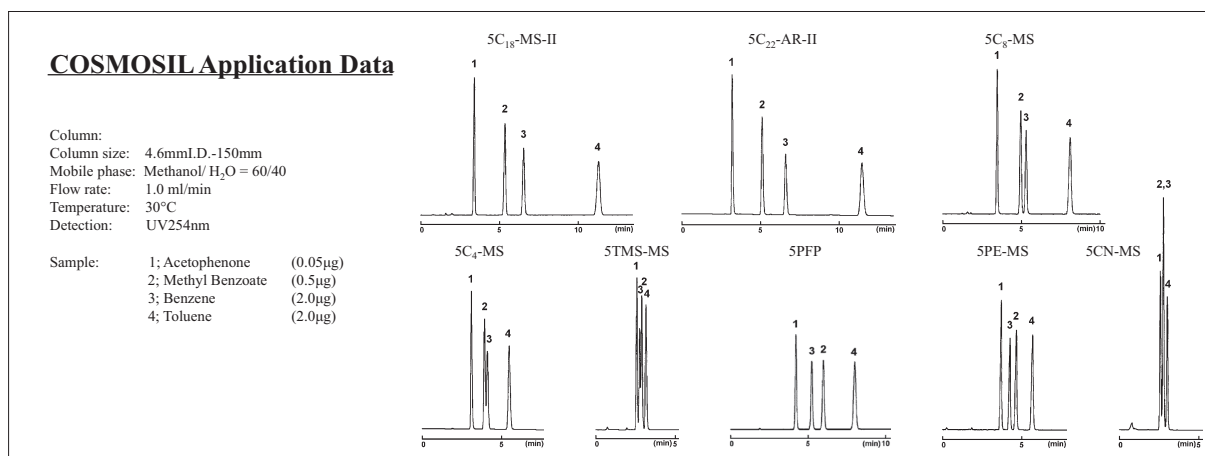
| Column Size I.D. x Length (mm) | Product Number | Column Size I.D. x Length (mm) | Product Number | Column Size I.D. x Length (mm) | Product Number |
|--------------------------------|----------------|--------------------------------|----------------|--------------------------------|----------------|
| 4.6 x 150 | 37902-21 | 4.6 x 10 | 37904-01 | 10 x 20 | 38045-31 |
| 4.6 x 250 | 37990-71 | 10 x 20 | 38045-31 | 20 x 20 | 05868-81 |
| 10 x 250 | 05469-11 | 20 x 20 | 05868-81 | 20 x 50 | 05869-71 |
| 20 x 250 | 38046-21 | 20 x 50 | 05869-71 | | |

Other Reversed Phase Columns

Specifications

| Packing Material | PFP | CN-MS | C ₂₂ -AR-II | C ₈ -MS | C ₄ -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 π-π interaction Dipole-dipole | Hydrophobic interaction π-π interaction | Hydrophobic interaction | | | | Hydrophobic interaction 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

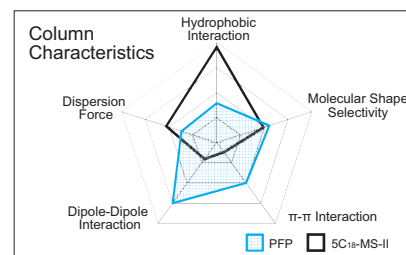


COSMOSIL PFP

- Pentafluorophenyl-bonded stationary phase
- Alternative selectivity to C₁₈ columns

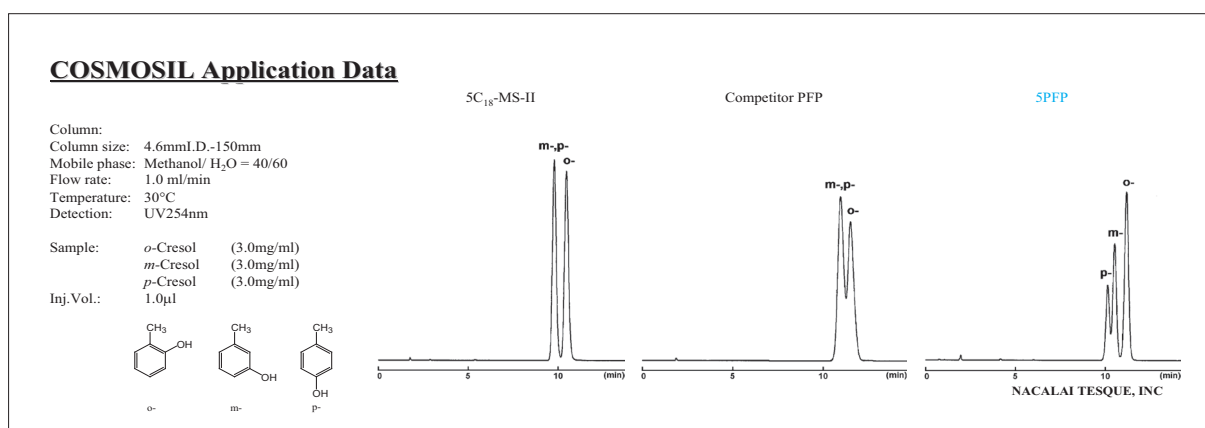
< Suitable Samples >

- Vitamin E, structural isomers and fluorides



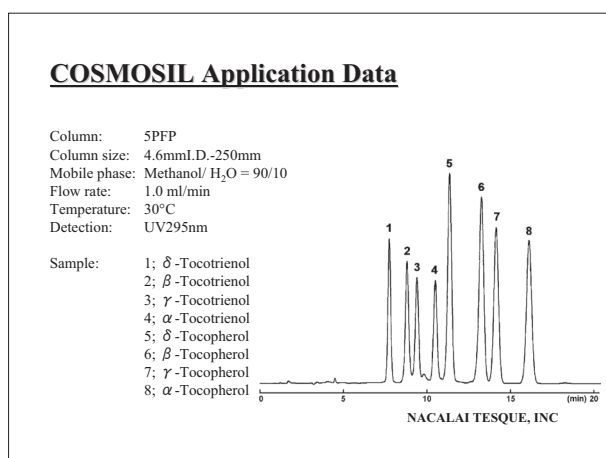
Alternative Selectivity to C₁₈ Columns

COSMOSIL PFP provides different selectivity from C₁₈ Columns. Furthermore, it offers improved separation compared to other PFP columns.

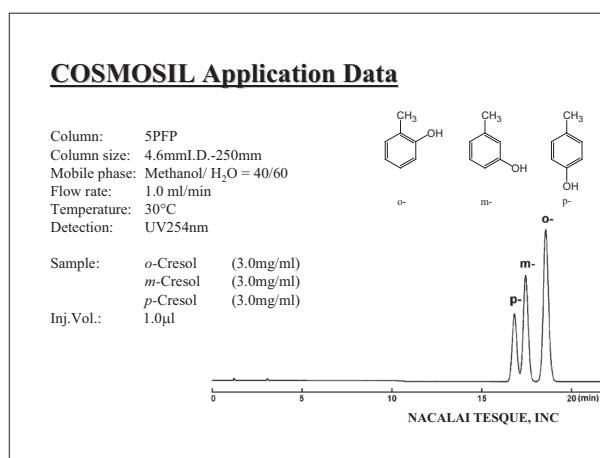


Applications

• 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 | Column Size I.D. x Length (mm) | Product Number |
|--------------------------------|----------------|--------------------------------|----------------|
| 2.0 x 50 | 13263-41 | 10 x 50 | 13272-21 |
| 2.0 x 100 | 13264-31 | 10 x 100 | 13273-11 |
| 2.0 x 150 | 12381-21 | 10 x 150 | 13274-01 |
| 2.0 x 250 | 13265-21 | 10 x 250 | 12386-71 |
| 3.0 x 50 | 13266-11 | 20 x 50 | 13276-81 |
| 3.0 x 100 | 13267-01 | 20 x 100 | 13277-71 |
| 3.0 x 150 | 13268-91 | 20 x 150 | 13278-61 |
| 3.0 x 250 | 13269-81 | 20 x 250 | 12387-61 |
| 4.6 x 50 | 13270-41 | 28 x 100 | 13280-11 |
| 4.6 x 100 | 13271-31 | 28 x 150 | 13281-01 |
| 4.6 x 150 | 12383-01 | 28 x 250 | 13282-91 |
| 4.6 x 250 | 12384-91 | | |

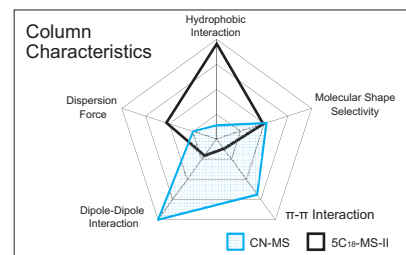
COSMOSIL 5PFP Guard Column

| Column Size I.D. x Length (mm) | Product Number |
|--------------------------------|----------------|
| 4.6 x 10 Cartridge* | 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.

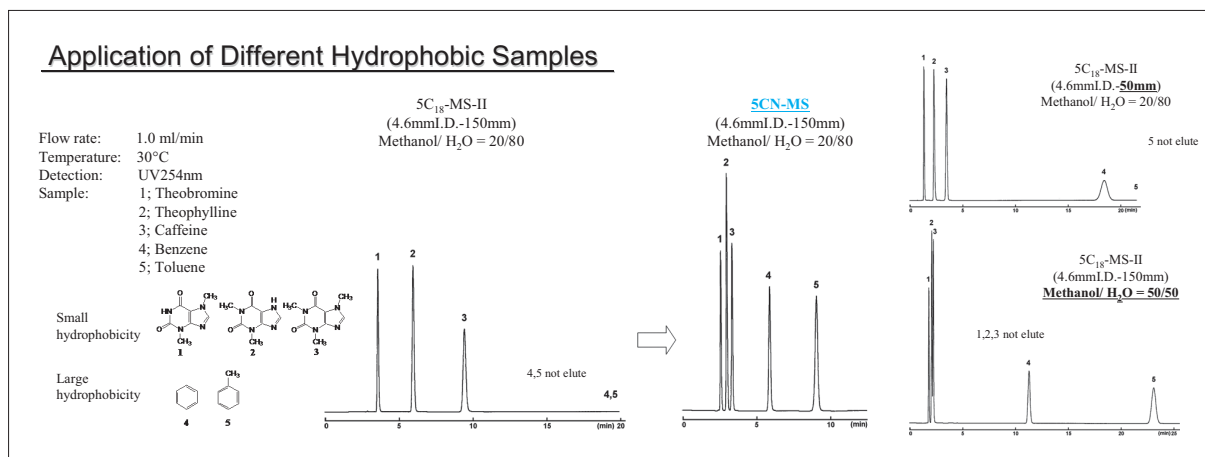
COSMOSIL CN-MS

- Cyanopropyl-bonded stationary phase
 - Enables separation of different hydrophobic samples without using gradient
- < Suitable Samples >
- Mixtures of natural compounds



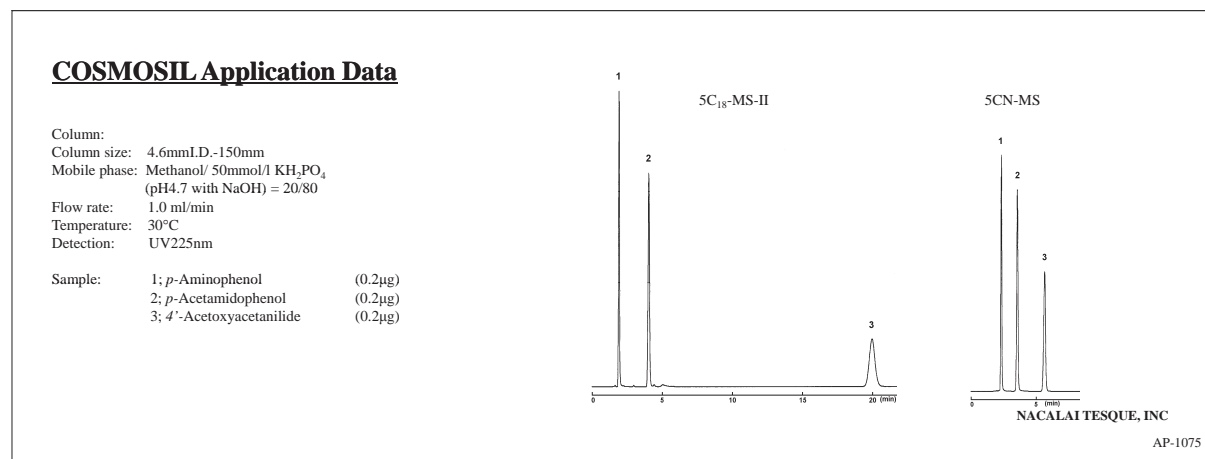
Rapid Analysis

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 | Column Size I.D. x Length (mm) | Product Number |
|--------------------------------|----------------|--------------------------------|----------------|
| 4.6 x 50 | 38233-61 | 6.0 x 150 | 38237-21 |
| 4.6 x 100 | 38234-51 | 6.0 x 250 | 38238-11 |
| 4.6 x 150 | 38235-41 | 10 x 250 | 38239-01 |
| 4.6 x 250 | 38236-31 | 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 | Column Size I.D. x Length (mm) | Product Number |
|-----------------------------------|----------------|-----------------------------------|----------------|
| 4.6 x 50 | 05848-41 | 6.0 x 150 | 05850-91 |
| 4.6 x 100 | 05849-31 | 6.0 x 250 | 05851-81 |
| 4.6 x 150 | 04598-51 | 10 x 250 | 04969-91 |
| 4.6 x 250 | 04599-41 | 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 | Column Size I.D. x Length (mm) | Product Number |
|-----------------------------------|----------------|-----------------------------------|----------------|
| 4.6 x 50 | 38153-11 | 6.0 x 150 | 38157-71 |
| 4.6 x 100 | 38154-01 | 6.0 x 250 | 38158-61 |
| 4.6 x 150 | 38155-91 | 10 x 250 | 38159-51 |
| 4.6 x 250 | 38156-81 | 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 | Column Size I.D. x Length (mm) | Product Number |
|-----------------------------------|----------------|-----------------------------------|----------------|
| 4.6 x 50 | 38163-81 | 6.0 x 150 | 38167-41 |
| 4.6 x 100 | 38164-71 | 6.0 x 250 | 38168-31 |
| 4.6 x 150 | 38165-61 | 10 x 250 | 38169-21 |
| 4.6 x 250 | 38166-51 | 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 | Column Size I.D. x Length (mm) | Product Number |
|-----------------------------------|----------------|-----------------------------------|----------------|
| 4.6 x 50 | 38173-51 | 6.0 x 150 | 38177-11 |
| 4.6 x 100 | 38174-41 | 6.0 x 250 | 38178-01 |
| 4.6 x 150 | 38175-31 | 10 x 250 | 38179-91 |
| 4.6 x 250 | 38176-21 | 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 | Column Size I.D. x Length (mm) | Product Number |
|-----------------------------------|----------------|-----------------------------------|----------------|
| 4.6 x 50 | 38183-21 | 6.0 x 150 | 38187-81 |
| 4.6 x 100 | 38184-11 | 6.0 x 250 | 38188-71 |
| 4.6 x 150 | 38185-01 | 10 x 250 | 38189-61 |
| 4.6 x 250 | 38186-91 | 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

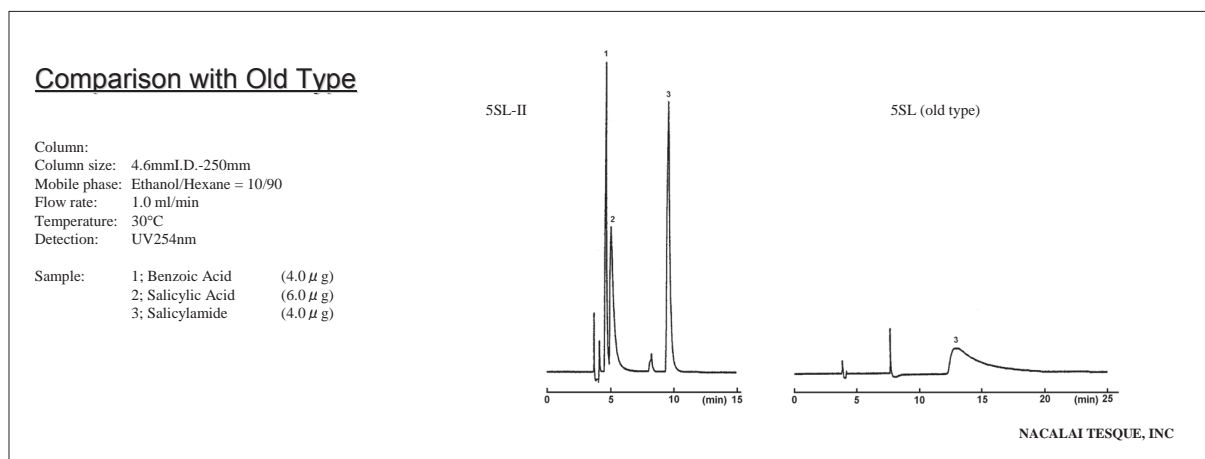
- High purity silica gel (>99.99%) with special treatment
- Suitable for preparative separation

Specifications

| Packing Material | SL-II |
|-----------------------|---|
| Silica Gel | High purity porous spherical silica |
| Average Particle Size | 3, 5, 15 μm |
| Average Pore Size | approx. 120 \AA |
| Specific Surface Area | approx. 300 m^2/g |
| Features | <ul style="list-style-type: none"> • High purity silica gel (>99.99%) with special treatment • 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.



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 |

COSMOSIL 5SL-II Guard Column

| Column Size I.D. x Length (mm) | Product Number |
|-----------------------------------|----------------|
| 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 |

COSMOSIL 15SL-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 >

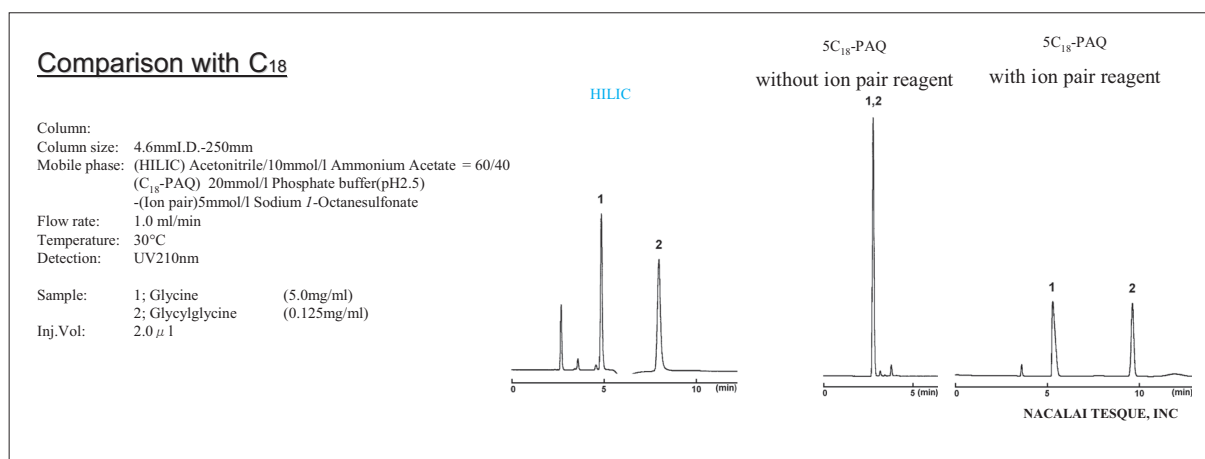
- Hydrophilic compounds that would not be retained in reversed phase chromatography
- Melamine and water-soluble vitamins

Specifications

| Packing Material | HILIC |
|-----------------------|--|
| Silica Gel | High purity porous spherical silica |
| Average Particle Size | 2.5, 5 μm |
| Average Pore Size | approx. 120 \AA |
| 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}

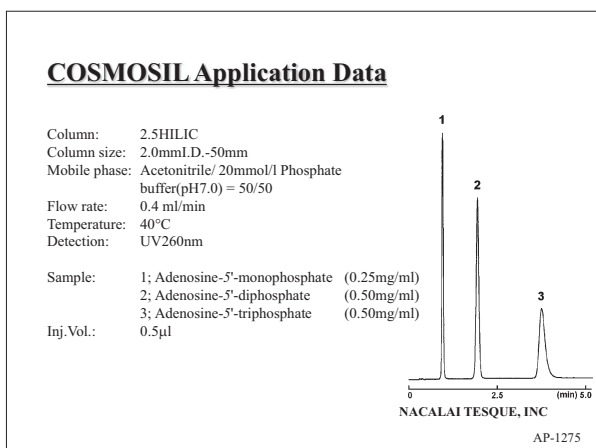
The hydrophilic interaction chromatography is a variation of normal phase chromatography where a polar stationary phase is used with a mobile phase which contains a high concentration of water-miscible organic solvent and a low concentration of aqueous eluent. The main retention mechanism is the partitioning 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.



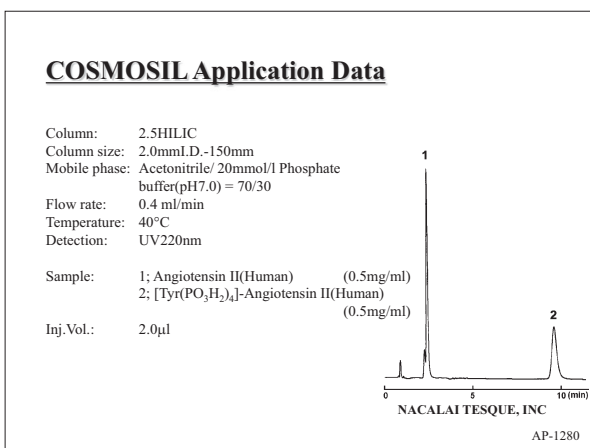
Applications

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

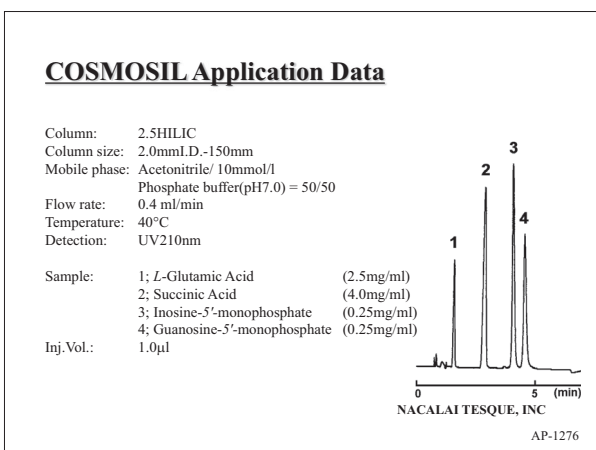
• Nucleotides



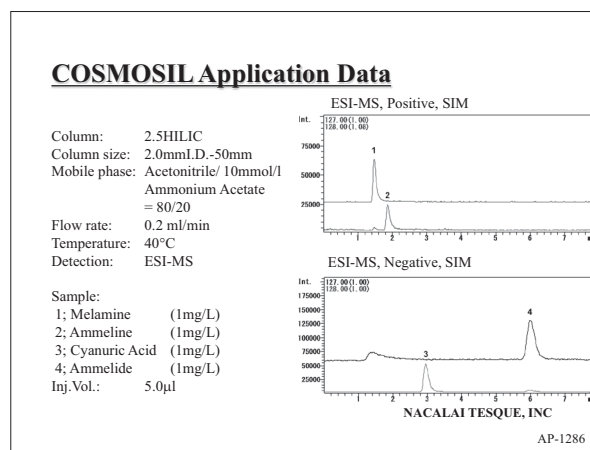
• Phosphorylated Peptide



• Umami Components



• Melamine



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 |

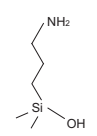
| Column Size I.D. x Length (mm) | Product Number |
|--------------------------------|----------------|
| 3.0 x 50 | 11771-41 |
| 3.0 x 75 | 11772-31 |
| 3.0 x 100 | 11773-21 |
| 3.0 x 150 | 11774-11 |

(4) Mono- and Oligosaccharide Analysis Columns

Introduction

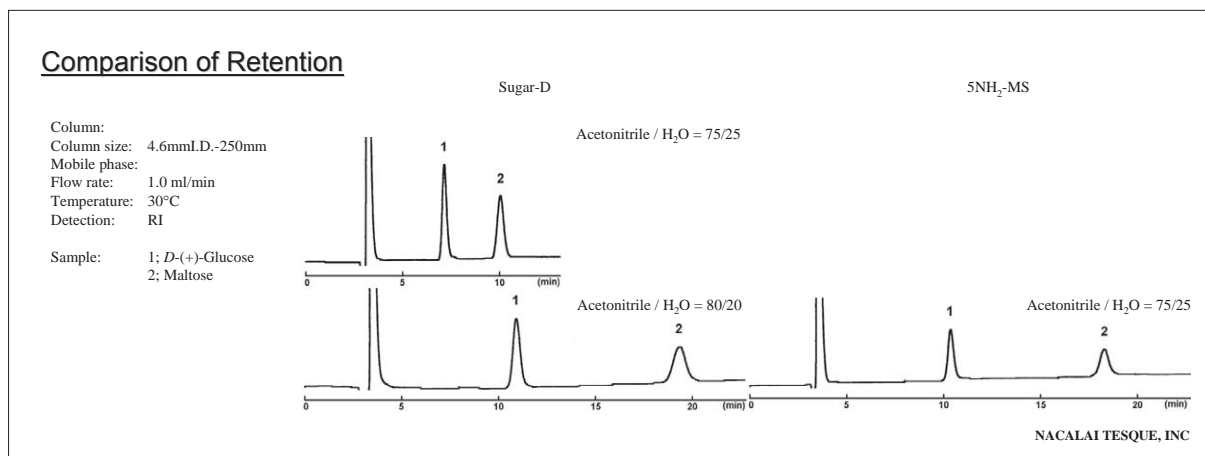
Saccharides are not retained on standard C₁₈ columns because of their low hydrophobicity. COSMOSIL Sugar-D and NH₂-MS are specifically designed for separation of saccharides. COSMOSIL C₁₈-PAQ is recommended for hydrophobic glycosides or saccharide derivatives.

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 | <ul style="list-style-type: none"> •First choice for saccharide analysis •High durability •Good quantitative analysis | <ul style="list-style-type: none"> •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.

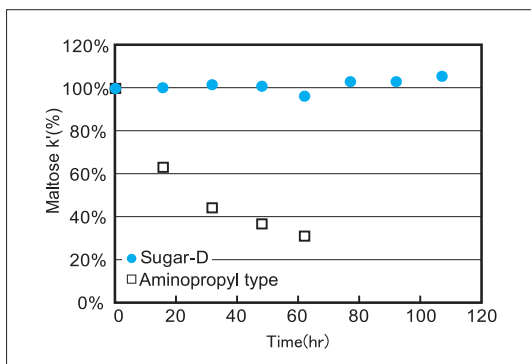


COSMOSIL Sugar-D

- 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.

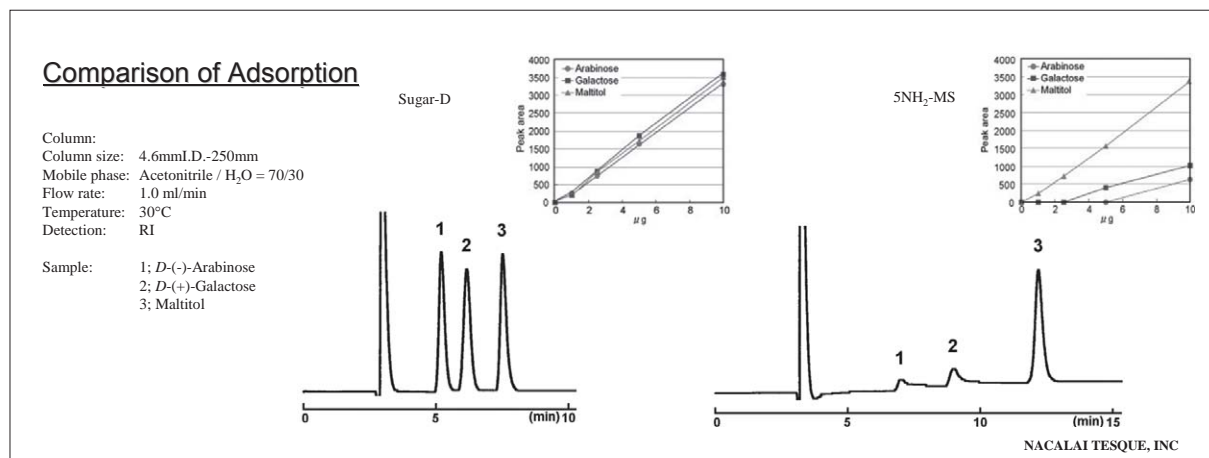


Decomposition Condition

| | |
|--------------|--------------------------------|
| 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 | 30°C |
| Detection | RI |
| Sample | Maltose |

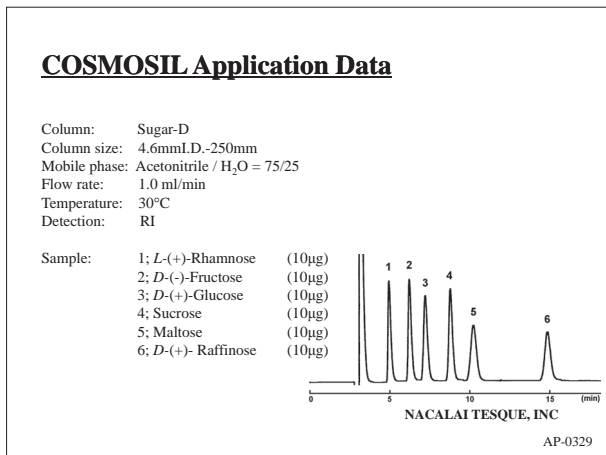
Comparison of Adsorption

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.

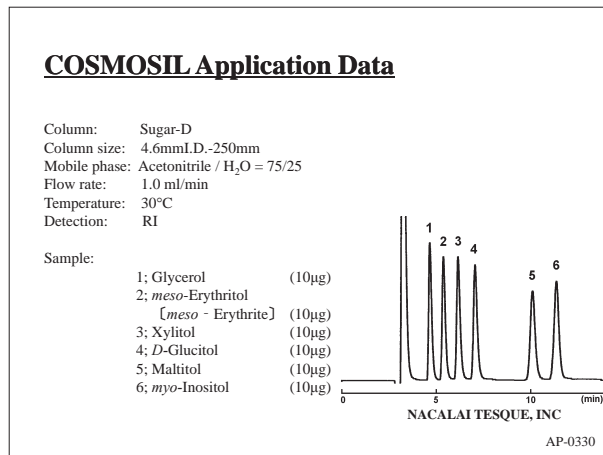


Applications

• Mono- and Oligosaccharides

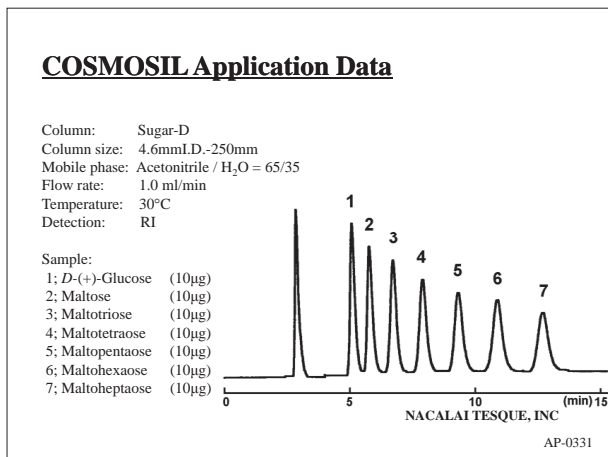


• Polyols

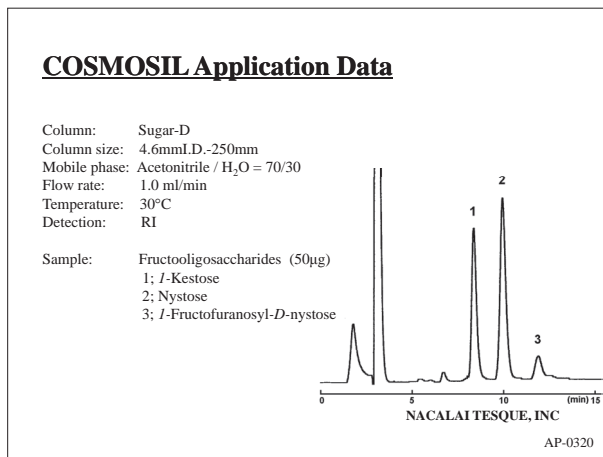


Applications

• Oligomaltoses



• Oligofructoses



Ordering Information

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

COSMOSIL Sugar-D Packed Column

| Column Size I.D. x Length (mm) | Product Number | Column Size I.D. x Length (mm) | Product Number |
|--------------------------------|----------------|--------------------------------|----------------|
| 2.0 x 250 | 05689-31 | 4.6 x 150 | 05395-71 |
| 3.0 x 150 | 05690-91 | 4.6 x 250 | 05397-51 |
| 3.0 x 250 | 05691-81 | 10 x 250 | 05692-71 |
| | | 20 x 250 | 05693-61 |

COSMOSIL Sugar-D Guard Column

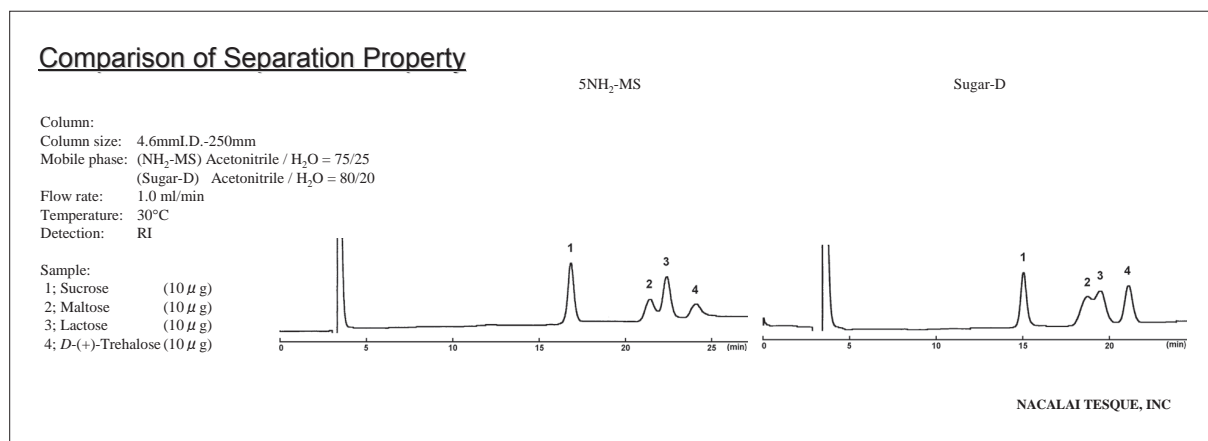
| Column Size I.D. x Length (mm) | Product Number |
|--------------------------------|----------------|
| 4.6 x 10 | 05394-81 |
| 10 x 20 | 05696-31 |
| 20 x 50 | 05694-51 |

COSMOSIL NH₂-MS

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

Comparison of Adsorption

NH₂-MS offers better separation than Sugar-D for some samples.



Ordering Information

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

COSMOSIL 5NH₂-MS Packed Column

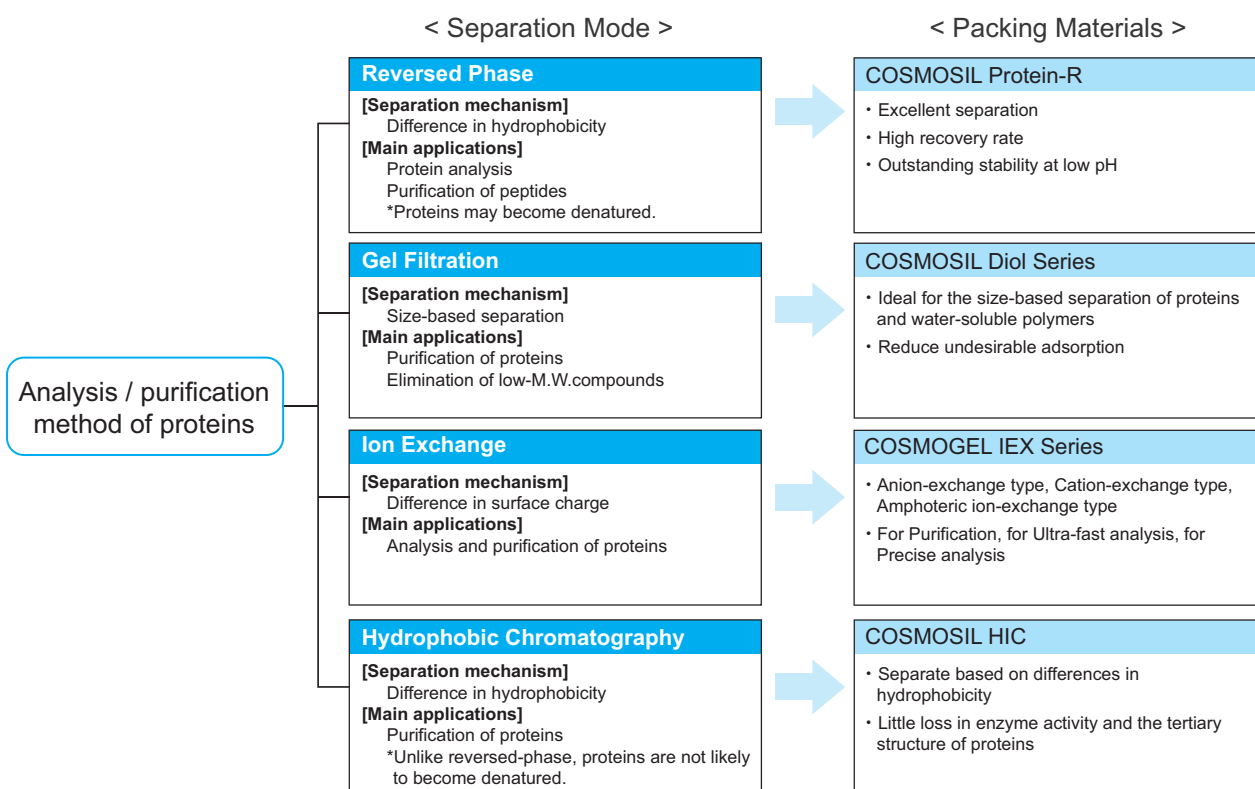
| Column Size I.D. x Length (mm) | Product Number | Column Size I.D. x Length (mm) | Product Number |
|--------------------------------|----------------|--------------------------------|----------------|
| 4.6 x 150 | 38245-11 | 10 x 250 | 38249-71 |
| 4.6 x 250 | 38246-01 | 20 x 250 | 38250-31 |

COSMOSIL 5NH₂-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

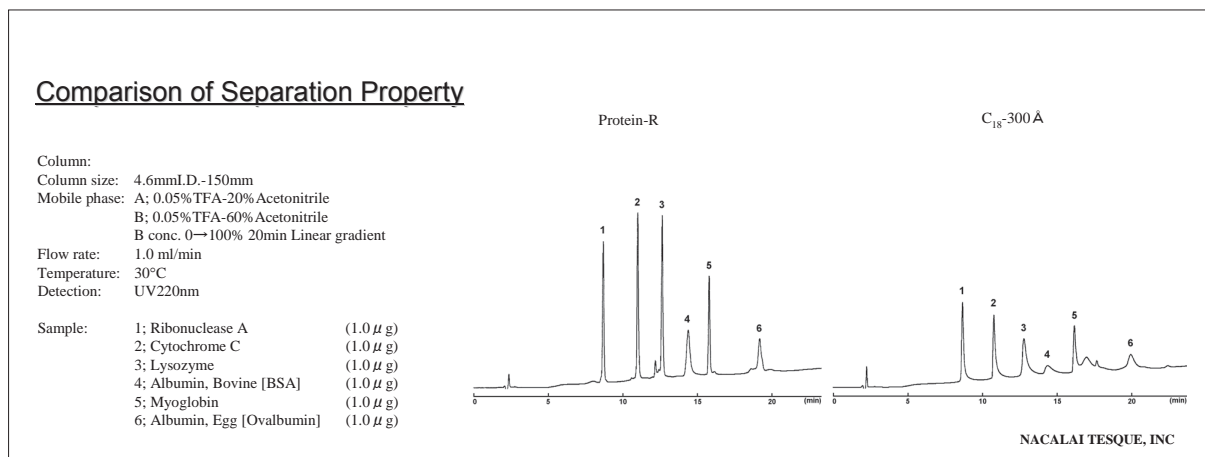
Specifications

| Packing Material | Protein-R |
|-----------------------|---------------------------------------|
| Silica Gel | High purity porous spherical silica |
| Average Particle Size | 5 μm |
| Average Pore Size | approx. 300 \AA |
| 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 C₁₈ wide-pore columns.



Ordering Information

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

COSMOSIL Protein-R Packed Column

| Column Size I.D. x Length (mm) | Product Number | Column Size I.D. x Length (mm) | Product Number |
|--------------------------------|----------------|--------------------------------|----------------|
| 2.0 x 150 | 06514-71 | 10 x 150 | 06529-91 |
| 4.6 x 50 | 06525-31 | 10 x 250 | 06530-51 |
| 4.6 x 150 | 06526-21 | 20 x 150 | 06531-41 |
| 4.6 x 250 | 06527-11 | 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 C₁₈-AR-300, C₈-AR-300, C₄-AR-300, Ph-AR-300

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

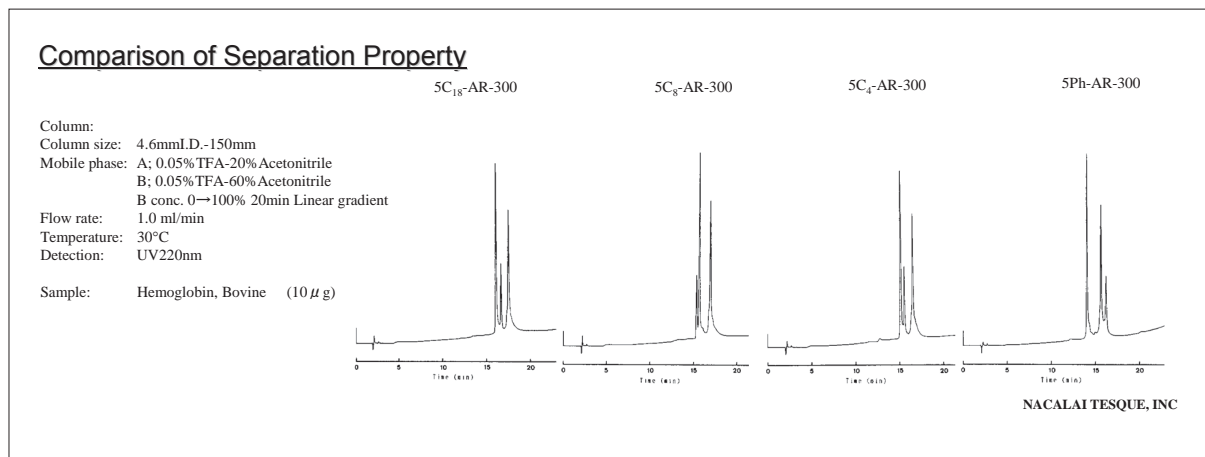
Specifications

| Packing Material | 5C ₁₈ -AR-300 | 5C ₈ -AR-300 | 5C ₄ -AR-300 | 5Ph-AR-300 |
|------------------------|-------------------------------------|-------------------------|-------------------------|--|
| Silica Gel | High purity porous spherical silica | | | |
| Average 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.



Ordering Information

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

COSMOSIL 5C₁₈-AR-300 Packed Column

| Column Size I.D. x Length (mm) | Product Number | Column Size I.D. x Length (mm) | Product Number |
|-----------------------------------|----------------|-----------------------------------|----------------|
| 4.6 x 50 | 37911-01 | 10 x 150 | 37917-41 |
| 4.6 x 150 | 37913-81 | 10 x 250 | 37918-31 |
| 4.6 x 250 | 37914-71 | 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 | Column Size I.D. x Length (mm) | Product Number |
|-----------------------------------|----------------|-----------------------------------|----------------|
| 4.6 x 50 | 37951-81 | 10 x 150 | 34345-21 |
| 4.6 x 150 | 37953-61 | 10 x 250 | 34247-11 |
| 4.6 x 250 | 37954-51 | 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 | Column Size I.D. x Length (mm) | Product Number |
|-----------------------------------|----------------|-----------------------------------|----------------|
| 4.6 x 50 | 37956-31 | 10 x 150 | 34249-91 |
| 4.6 x 150 | 37958-11 | 10 x 250 | 38047-11 |
| 4.6 x 250 | 37959-01 | 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 | Column Size I.D. x Length (mm) | Product Number |
|-----------------------------------|----------------|-----------------------------------|----------------|
| 4.6 x 50 | 37961-51 | 10 x 150 | 05865-11 |
| 4.6 x 150 | 37963-31 | 10 x 250 | 34267-51 |
| 4.6 x 250 | 37964-21 | 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

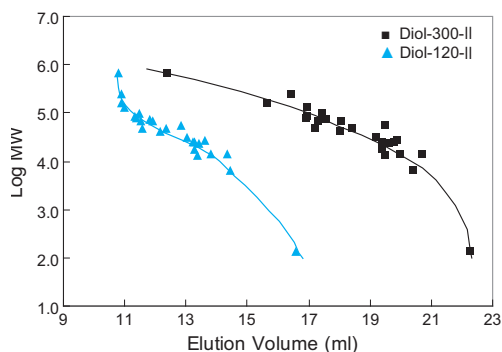
| Packing Material | 5Diol-120-II | 5Diol-300-II | 5Diol-1000-II |
|---|--|-------------------|-------------------------------|
| Silica Gel | High purity porous spherical silica ⁽¹⁾ | | |
| Average Particle Size | 5 µm | | |
| Average Pore Size | approx. 120 Å | approx. 300 Å | approx. 1000 Å ⁽²⁾ |
| 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

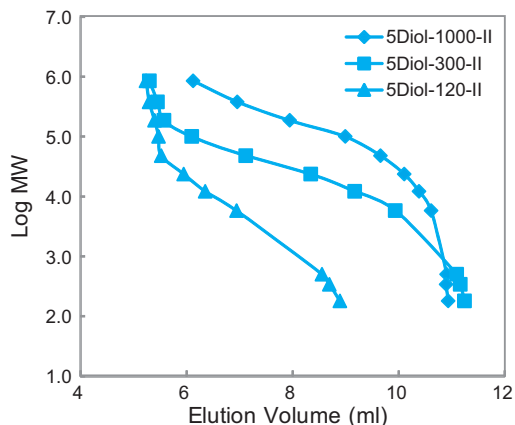
• Calibration Curve of Proteins



Column COSMOSIL 5Diol-II (7.5 mm I.D. x 600 mm)
 Mobile Phase 20mmol/l Phosphate Buffer (pH7.0)+100mmol/l Na₂SO₄
 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

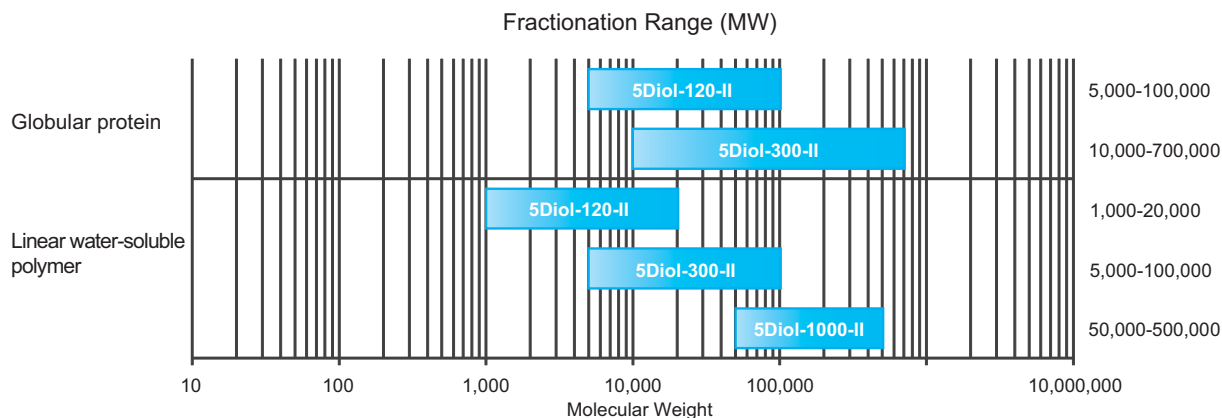


Column COSMOSIL 5Diol-II (7.5 mm I.D. x 300 mm)
 Mobile Phase Water
 Flow Rate 1.0ml/min
 Temperature 30°C
 Detection RI
 Sample Linear pullulan

| 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 |

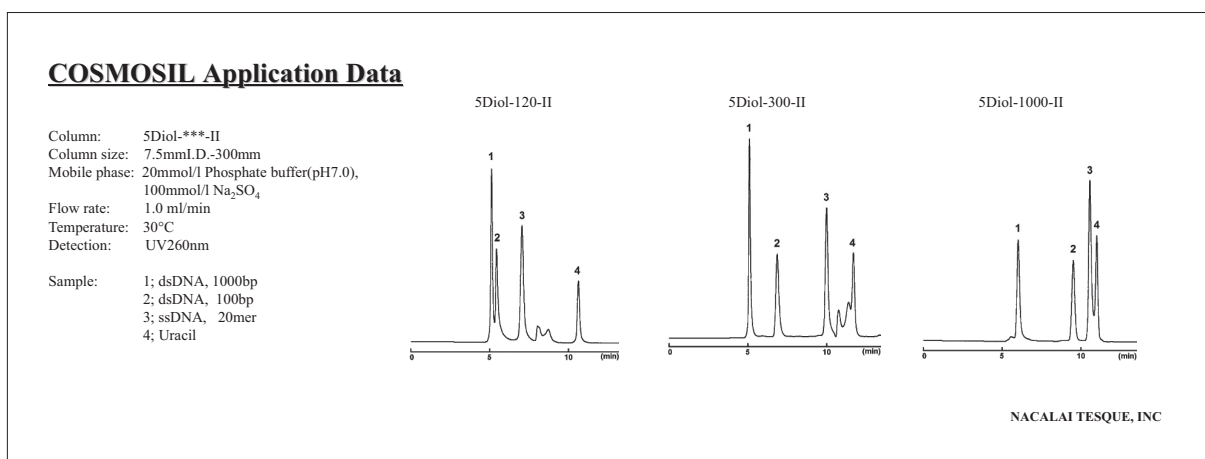
Molecular Weight Range

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 ₃ N ⁺ (CH ₃) ₃ | | -(CH ₂) ₃ SO ₃ ⁻ | | -CH ₃ N ⁺ (CH ₃) ₃ + -(CH ₂) ₃ SO ₃ ⁻ | |
| Protein Binding Capacity | 110-150 mg | 12-20 mg | 70-100 mg | 10-18 mg | 55-75 mg(BSA)/ml 35-50 mg(IgG)/ml | 6-10 mg(BSA)/ml 5-9 mg(IgG)/ml |
| | BSA/ml-resin | | Human IgG/ml-resin | | | |
| Column Size I.D. x Length (mm) | 4.6 x 50 | 4.6 x 30 4.6 x 100 | 4.6 x 50 | 4.6 x 30 4.6 x 100 | 4.6 x 50 | 4.6 x 100 |
| Column Material | PEEK | | | | | |
| Connection | Waters Type | | | | | |

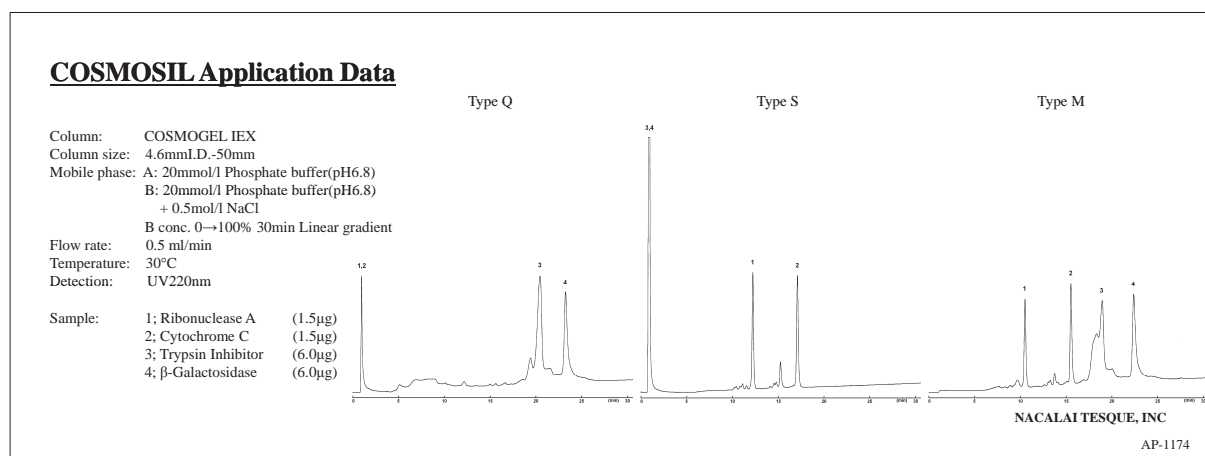
Type of Packing Material

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.



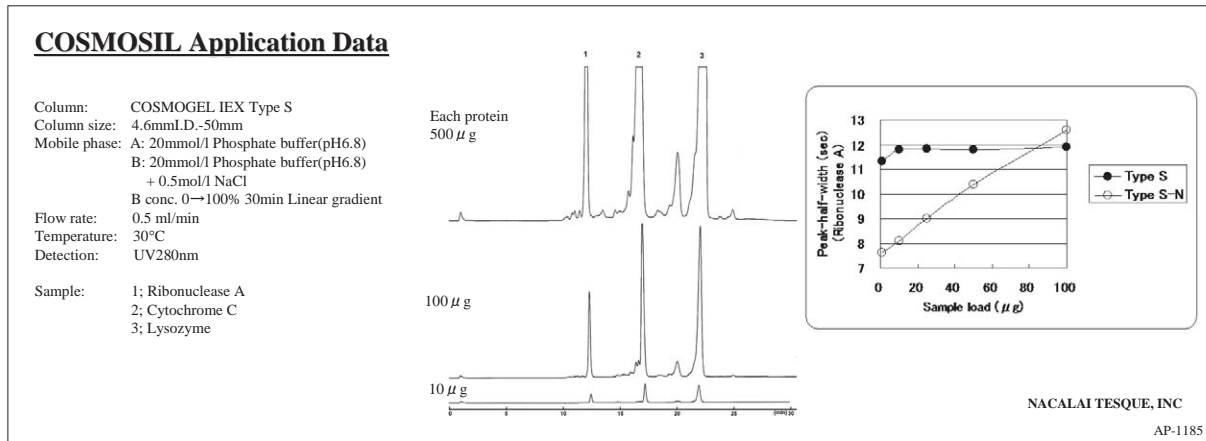
Type of Column

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 | — |

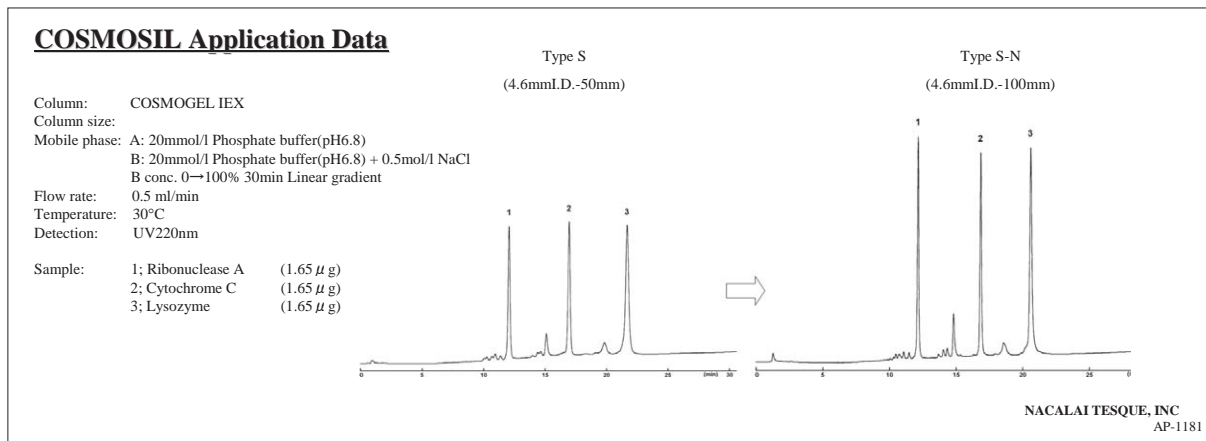
For Purification: Type Q, Type S, Type M

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.



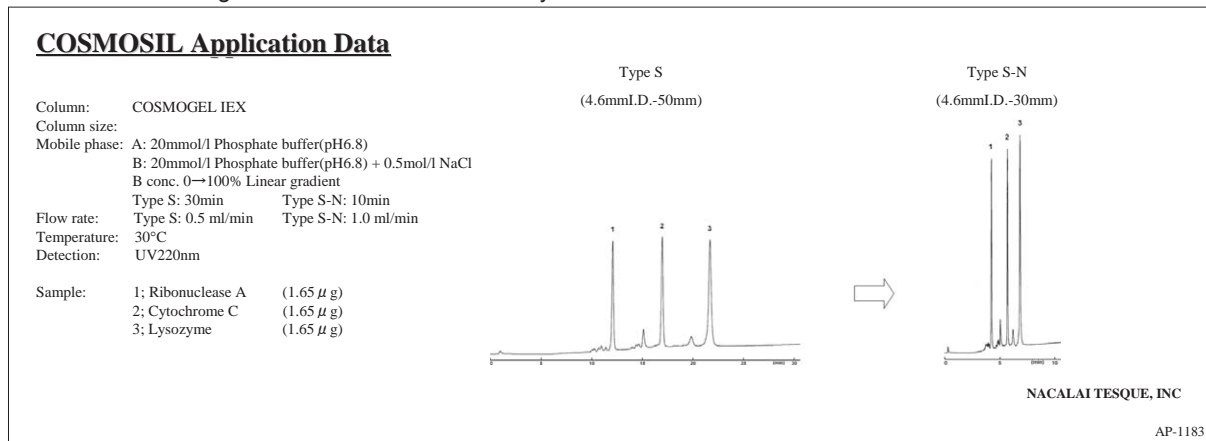
For Precise Analysis: Type Q-N, Type S-N, Type M-N

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.



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.



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

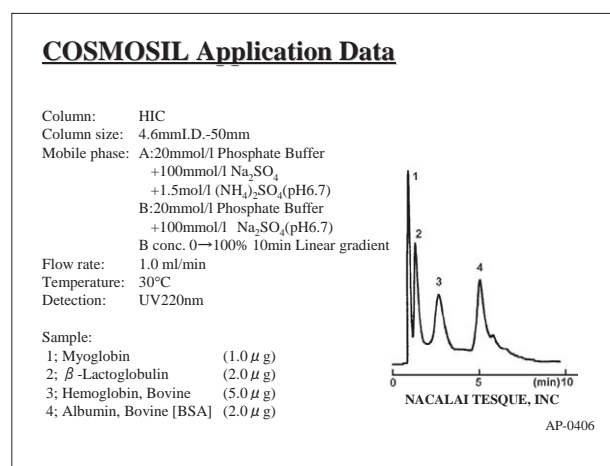
Specifications

| 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 |

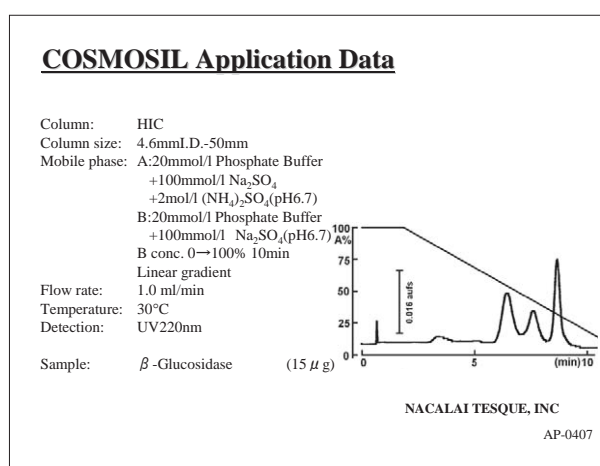
Applications

A buffer with high salt concentration, usually 1-2 mol/l of (NH₄)₂SO₄, 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

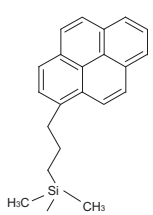
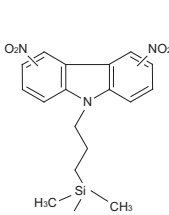
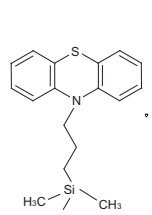
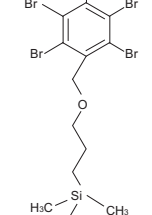
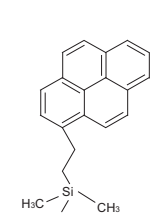
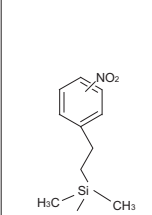
| Column Size I.D. x Length (mm) | Product Number |
|-----------------------------------|----------------|
| 4.6 x 50 | 04263-21 |

(6) Columns for Fullerene Separation

Introduction

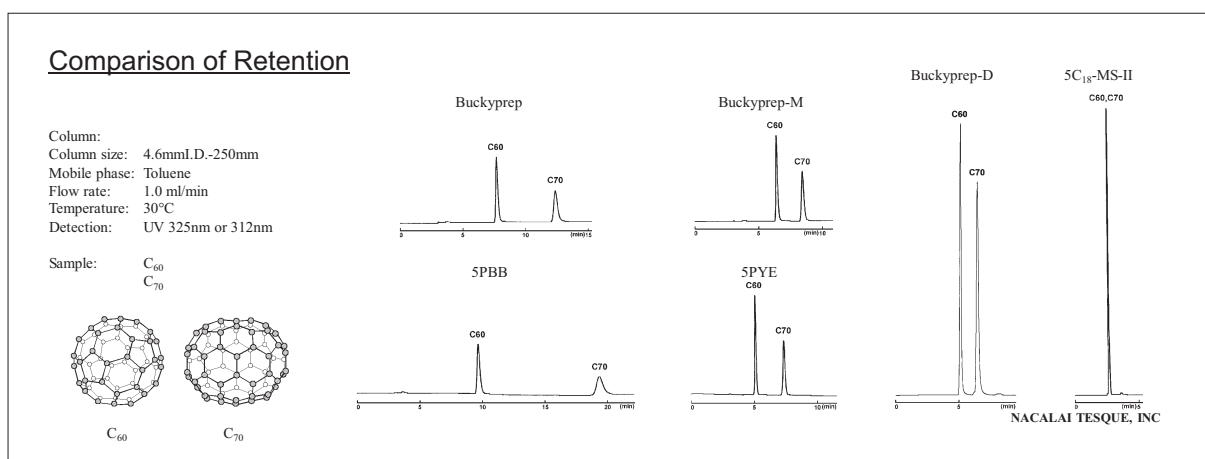
Separation of fullerenes, especially preparative scale separation, on conventional HPLC columns is always problematic due to the low solubility and low recovery rate of fullerenes. COSMOSIL offers a variety of columns designed for preparative scale separation of fullerenes, including higher fullerenes, 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 \AA | | | | | |
| 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 | • Designed 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 C₆₀ and C₇₀ 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 C₆₀ and C₇₀.



Suggested Solvents for Fullerene Separation

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

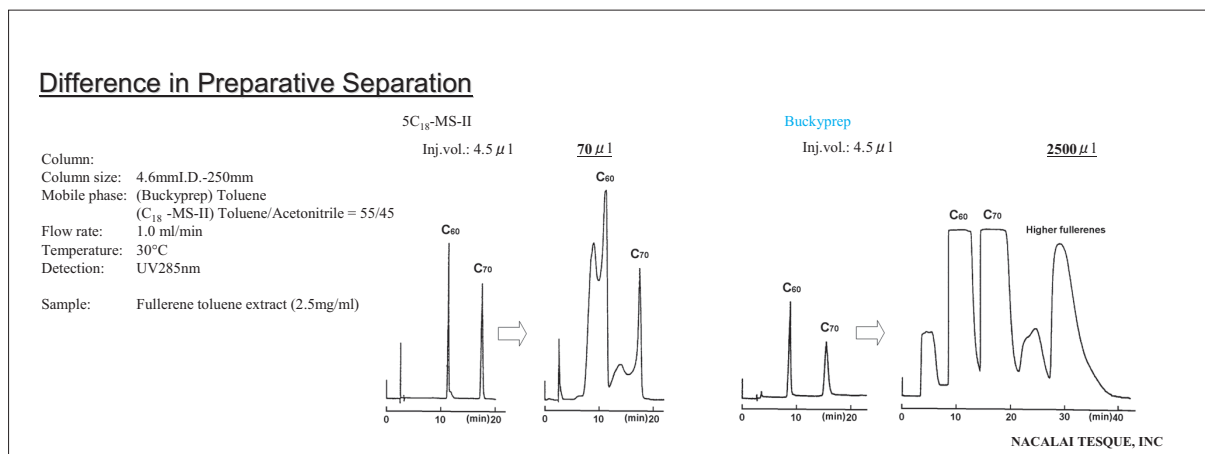
| Solvent | Solubility of C ₆₀ (mg/ml) | Features |
|---------------------------|---------------------------------------|--|
| Chlorobenzene | 7.0 | Stronger eluent than toluene. Recommended for higher fullerenes. |
| <i>o</i> -Dichlorobenzene | 27.0 | Stronger eluent than chlorobenzene. |
| 1,2,4-Trichlorobenzene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

COSMOSIL Buckyprep

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

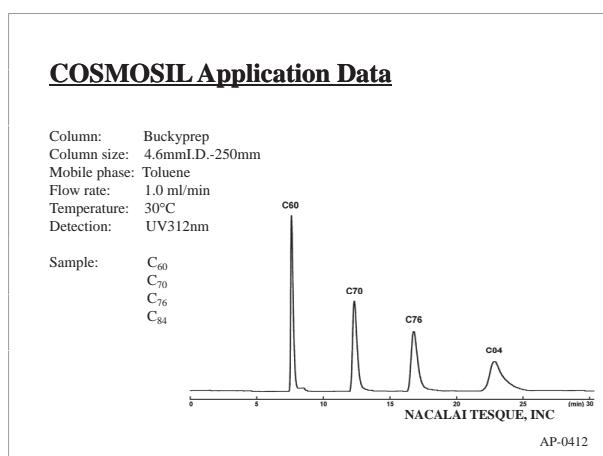
Difference in Preparative Separation

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 C₁₈ column.

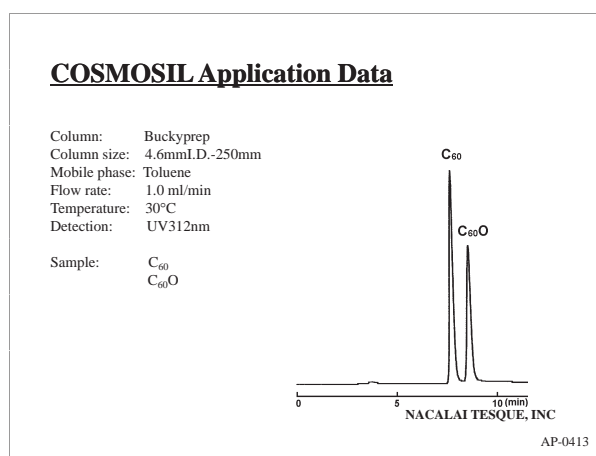


Applications

• Higher Fullerenes



• Oxidized Fullerenes



Ordering Information

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

COSMOSIL Buckyprep Packed Column

COSMOSIL Buckyprep Guard Column

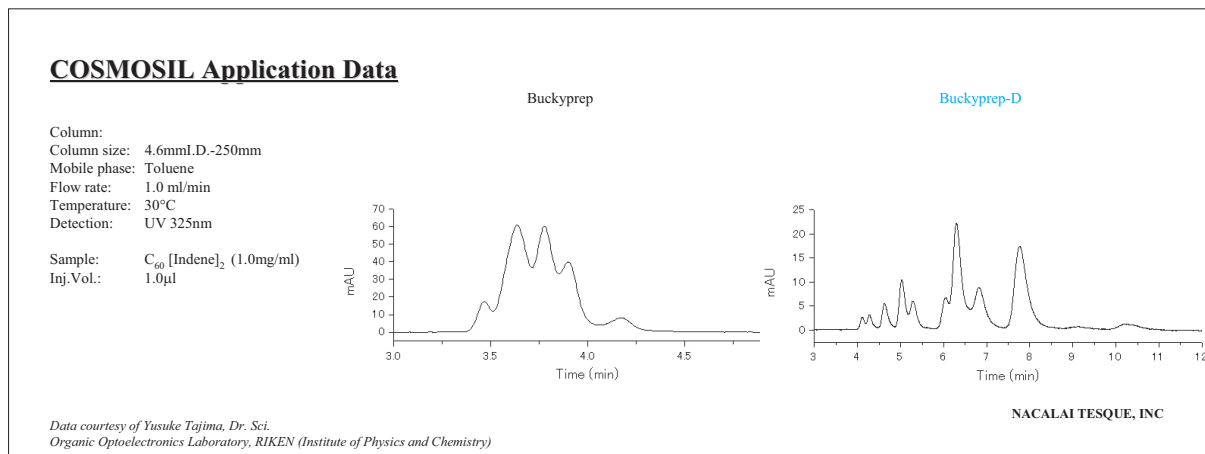
| Column Size I.D. x Length (mm) | Product Number | Column Size I.D. x Length (mm) | Product Number |
|-----------------------------------|----------------|-----------------------------------|----------------|
| 4.6 x 250 | 37977-61 | 4.6 x 10 | 37983-71 |
| 10 x 250 | 37981-91 | 10 x 20 | 37984-61 |
| 20 x 250 | 37982-81 | 20 x 50 | 34374-41 |
| 28 x 250 | 34346-11 | 28 x 50 | 05871-21 |

COSMOSIL Buckyprep-D

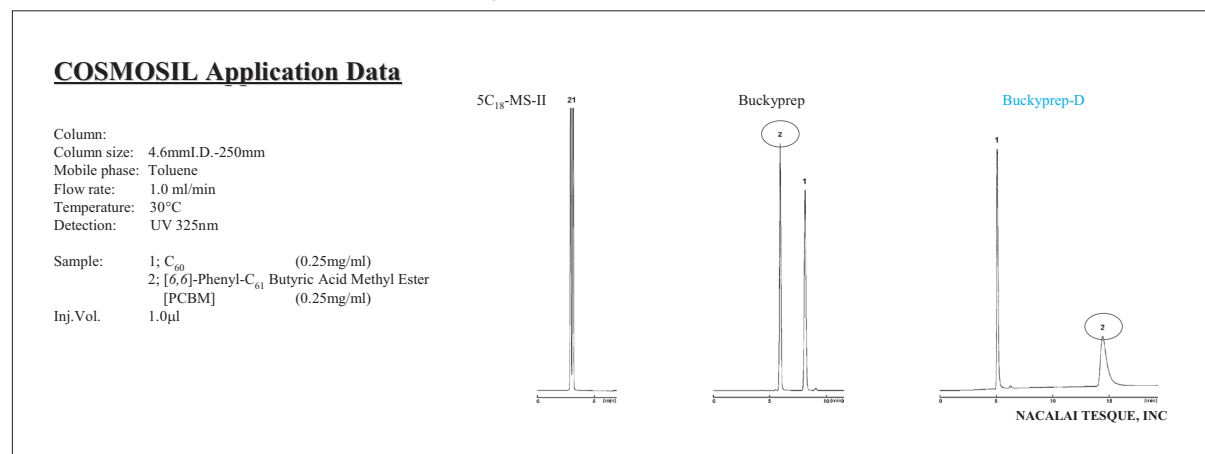
- For preparative separation of derivatized fullerenes
- For separation of derivatized fullerenes such as C₆₀-indene (used for organic thin-film solar cell)

Applications

Buckyprep-D offers improved separation for C₆₀-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 C₆₀. Therefore it is more suitable for preparative separation of derivatized fullerenes than our conventional Buckyprep column.



Note

The baseline of Buckyprep-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 |

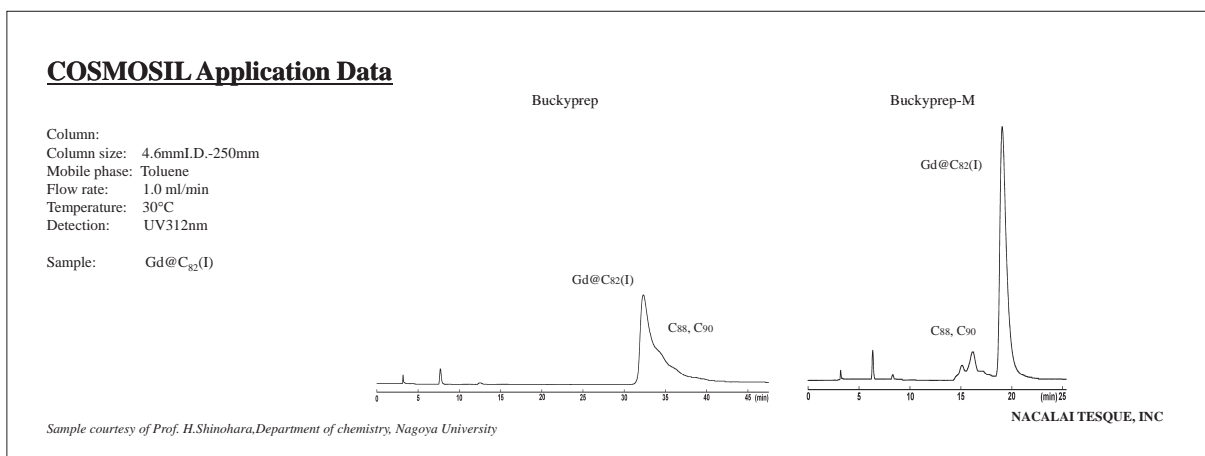
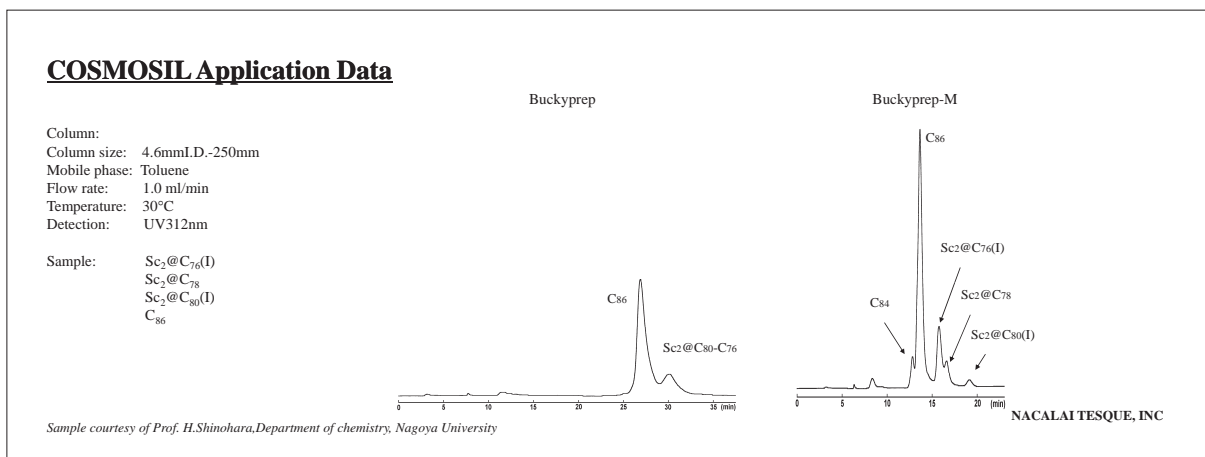
COSMOSIL Buckyprep-M

- 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.



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

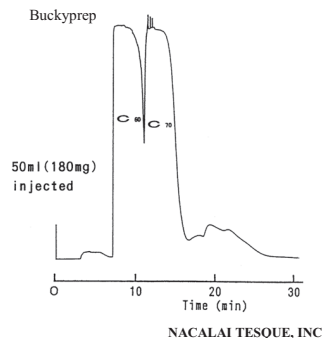
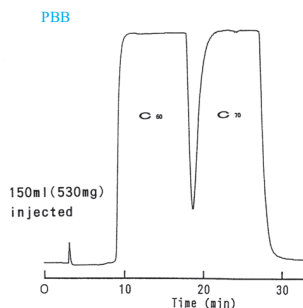
Applications

The loading capacity of COSMOSIL PBB for C₆₀ and C₇₀ can be three times greater than COSMOSIL Buckyrep.

Preparative Separation of Fullerenes

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

Sample: Crude fullerenes (3.5mg/ml)



NACALAI TESQUE, INC

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 Buckyrep or PBB
- Excellent separation for derivatized fullerenes

Applications

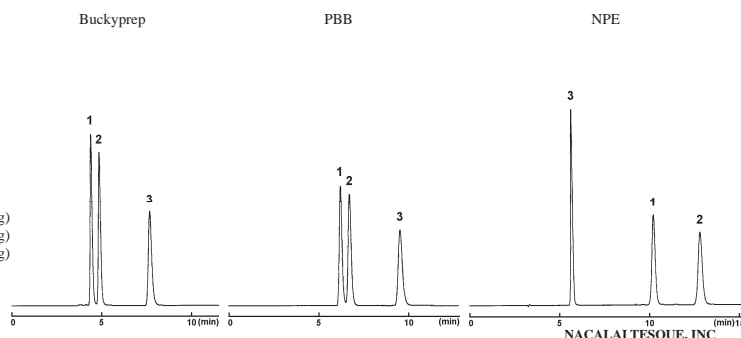
- PCBM, PCBB

COSMOSIL NPE retains derivatized C₆₀ stronger than C₆₀.

COSMOSIL Application Data

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

Sample:
 1; [6,6]-Phenyl-C₆₁ Butyric Acid Methyl Ester [PCBM] (1.5µg)
 2; [6,6]-Phenyl-C₆₁ Butyric Acid Butyl Ester [PCBB] (1.5µg)
 3; C₆₀ (1.5µg)



NACALAI TESQUE, INC

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

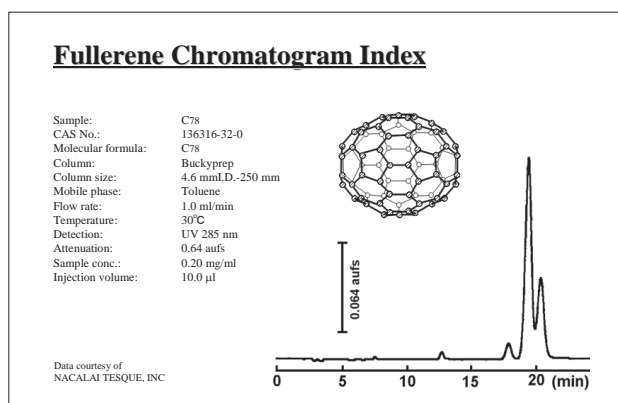
| Column Size I.D. x Length (mm) | Product Number |
|-----------------------------------|----------------|
| 4.6 x 250 | 37989-11 |
| 10 x 250 | 37996-11 |
| 20 x 250 | 38044-41 |
| 28 x 250 | 34300-91 |

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

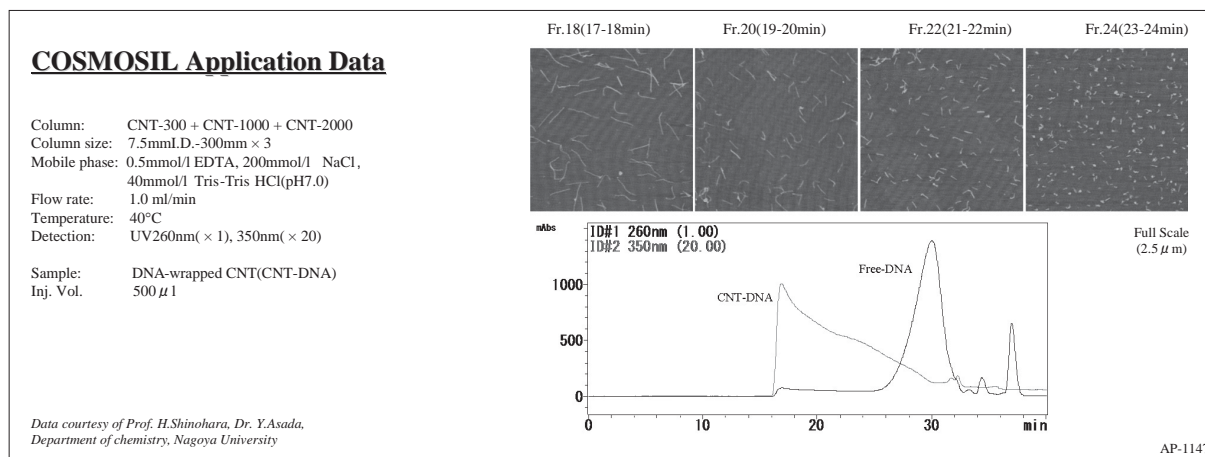
Specifications

| 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.



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

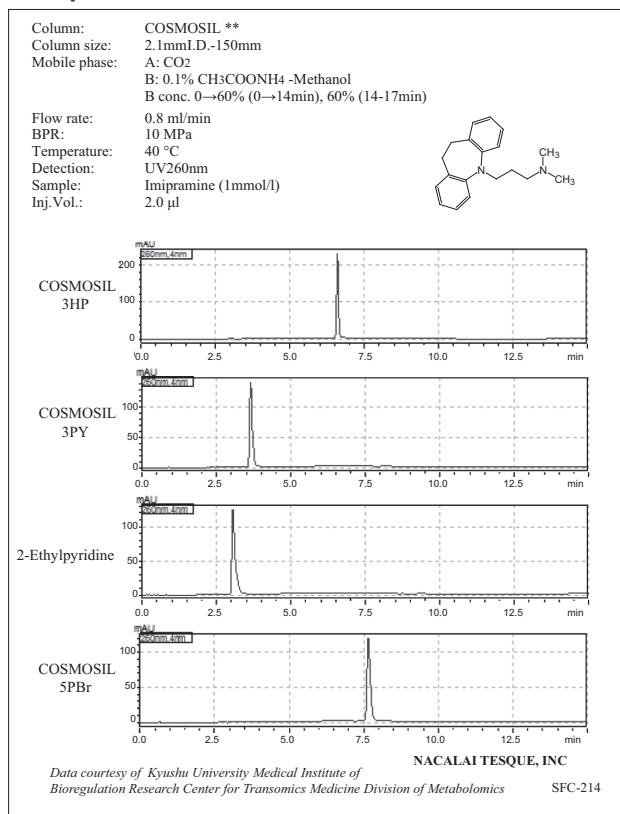
Nacalai Tesque has developed columns specially designed for SFC in collaboration with Nacalai USA and Pfizer, Inc. Global R&D: COSMOSIL HP, PY (equivalent to 2-ethylpyridine) and Quinoline. In addition to these, our HPLC columns Cholester and PBr have been tested for use with SFC.

| 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 \AA | | 130 \AA | 120 \AA | 130 \AA | 120 \AA | 120 \AA |
| 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 |

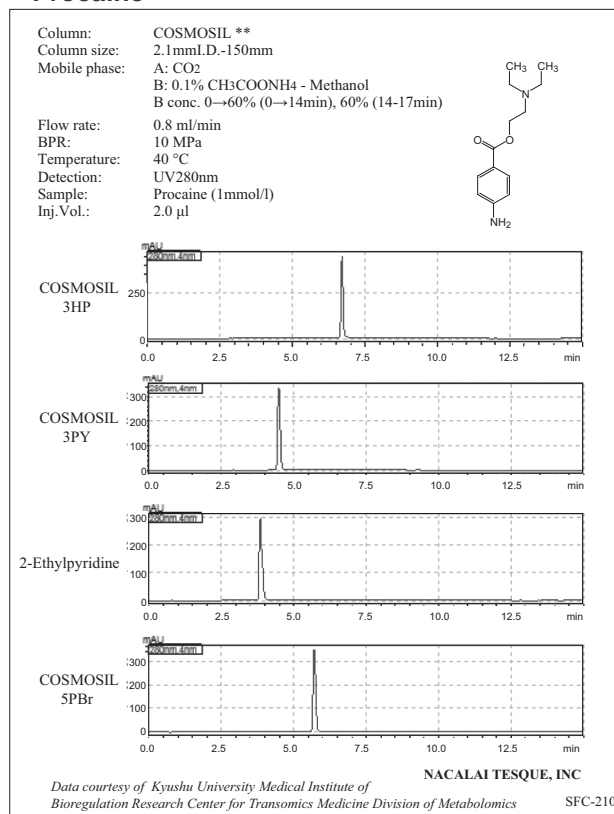
Pharmaceutical Analysis

Each phase has different retention properties.

• Imipramine

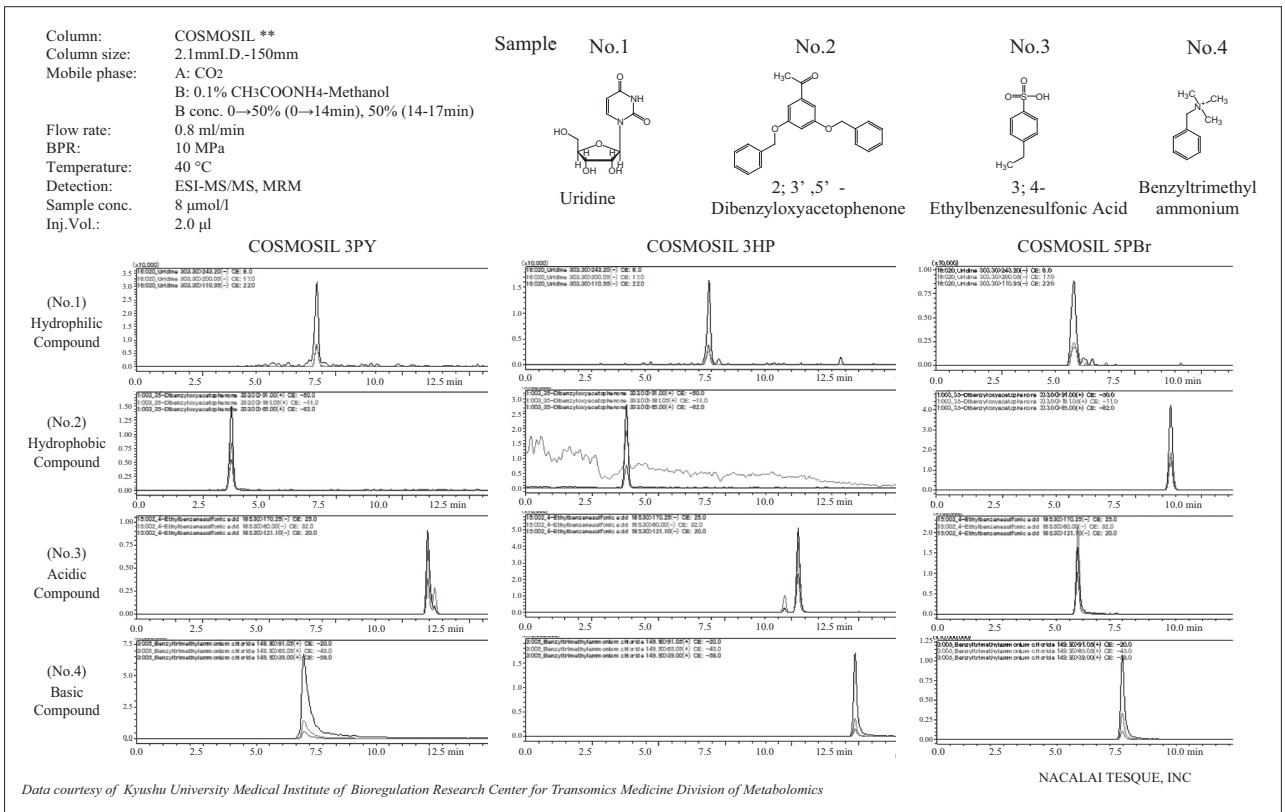


• Procaine



Comparison of Retention Behavior

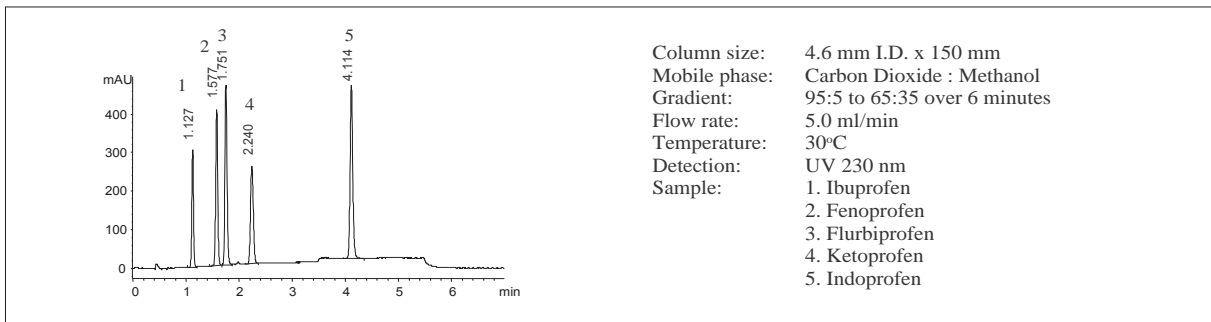
The following three stationary phases were evaluated for their retention of hydrophilic, hydrophobic, acidic and basic compounds. COSMOSIL HP and PY elute hydrophobic compounds first and retain hydrophilic compounds longer, whereas PBr elutes in the reverse order, exhibiting high retention for hydrophobic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



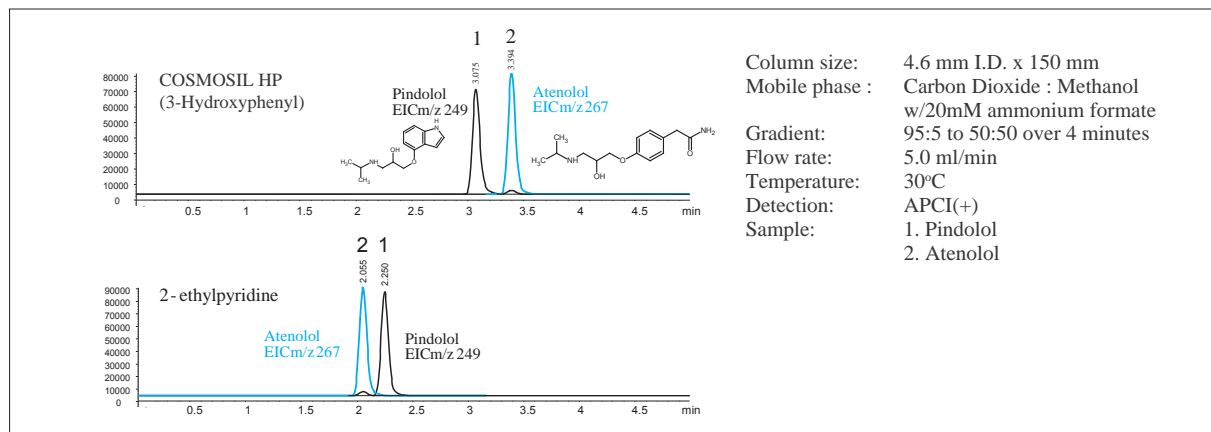
COSMOSIL HP (3-Hydroxyphenyl)

Applications

• Non-steroidal anti-inflammatory drugs



• Beta Blockers (Peak elution order reversal under identical conditions)



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)

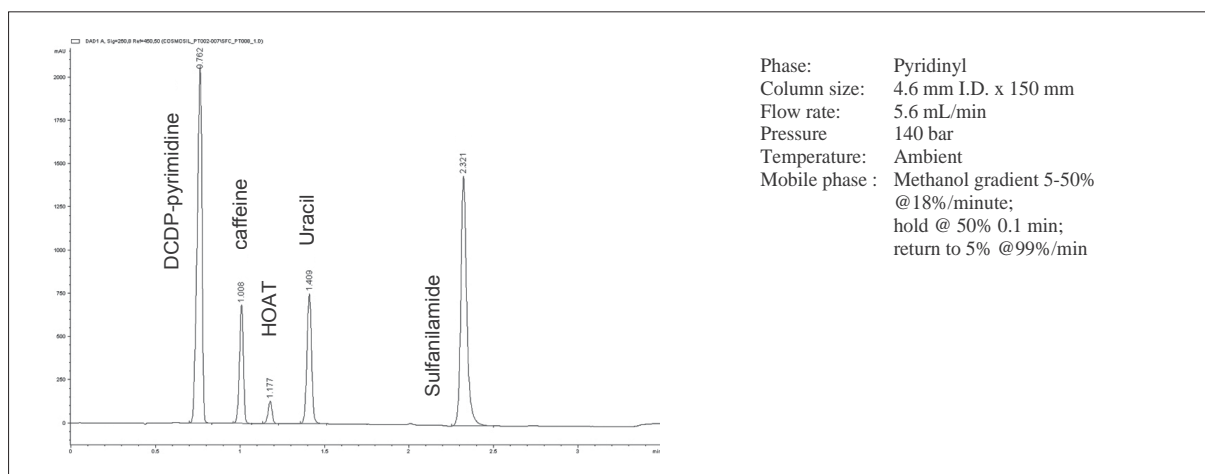
COSMOSIL 3HP (3-Hydroxyphenyl) Packed Columns

| 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



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

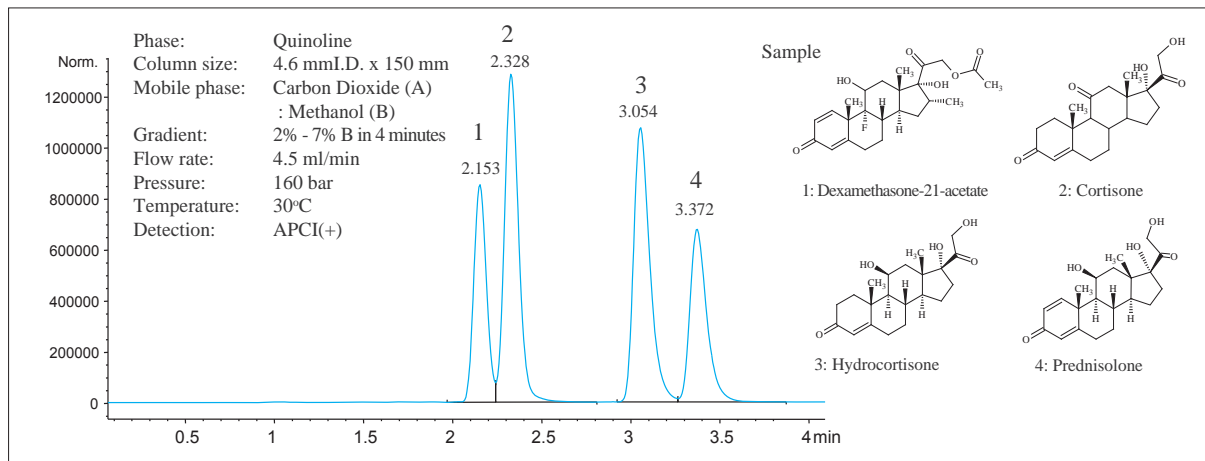
| Column Size I.D. x Length (mm) | Product Number |
|--------------------------------|----------------|
| 2.0 x 150 | 13831-91 |
| 4.6 x 250 | 13832-81 |

COSMOSIL Quinoline

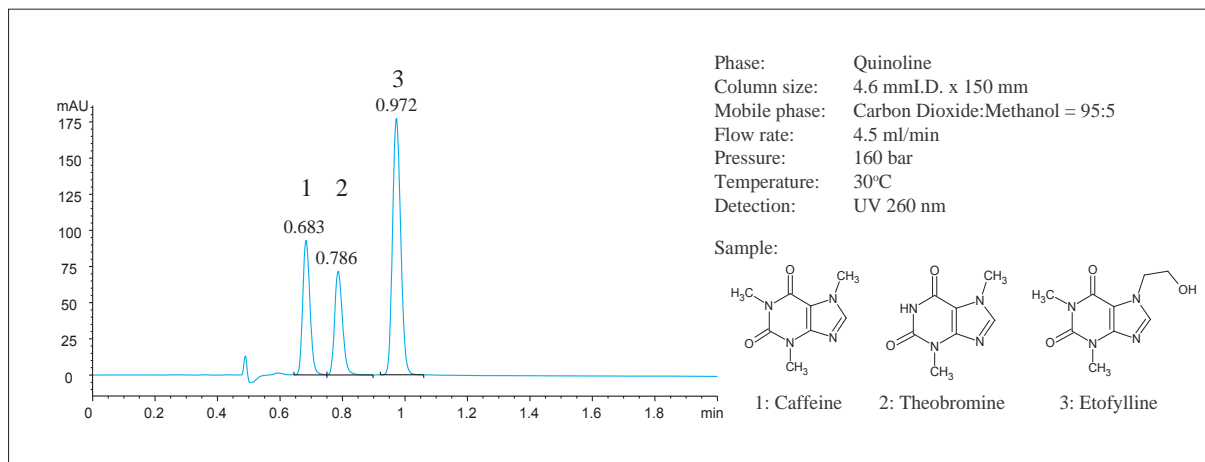
The structural similarities between polar lipids, such as cholesterol and related analogs, have posed chromatographic and spectrometric challenges to analysts interested in quantifying these potential biomarkers. COSMOSIL Quinoline has been developed to improve the separation of these structural isomers 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 μ m)

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 μ m)

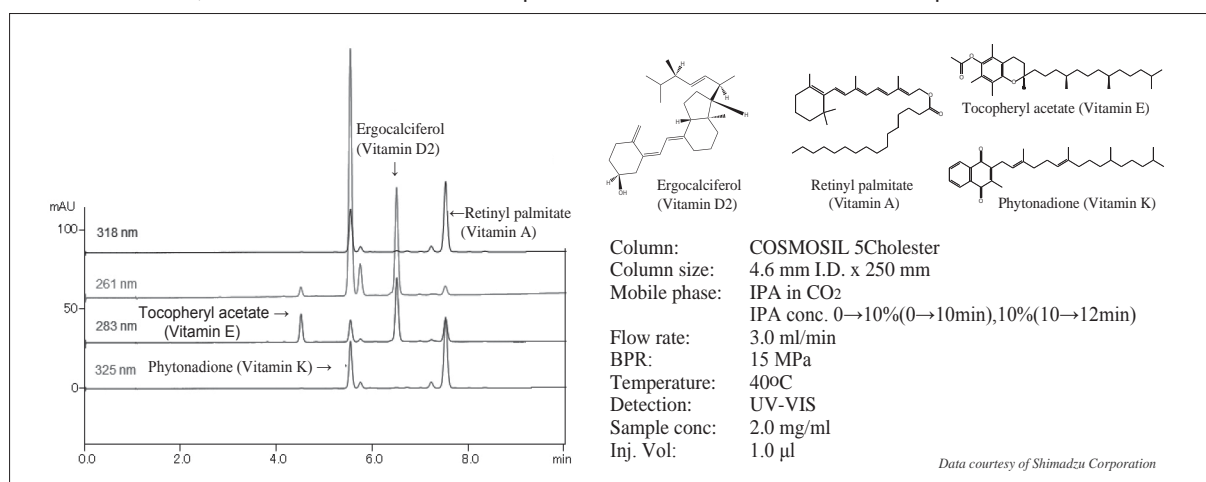
COSMOSIL Quinoline Packed Column

| 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.



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

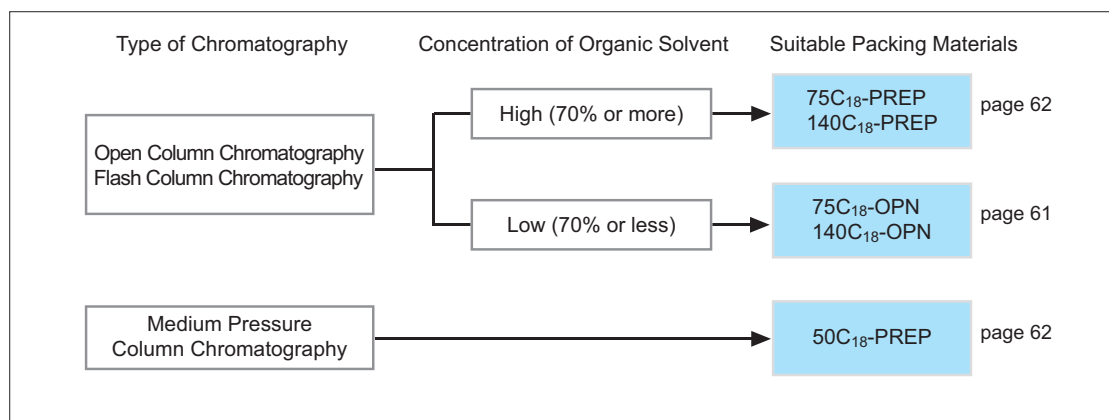
Introduction

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.

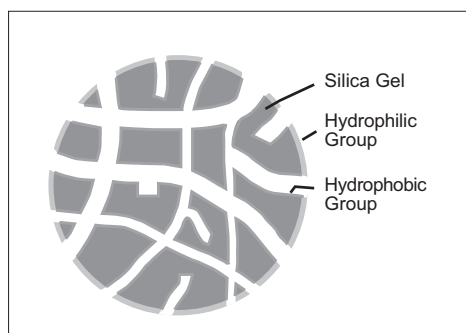


Figure 1. Structure of C₁₈-OPN

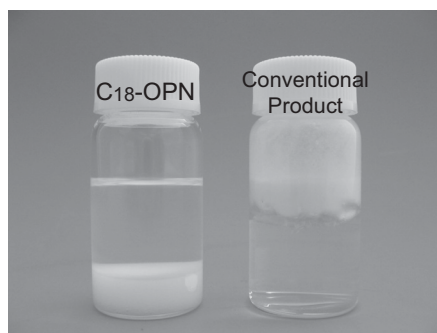


Figure 2. Packing material in water

Left: C₁₈-OPN provides good resolution

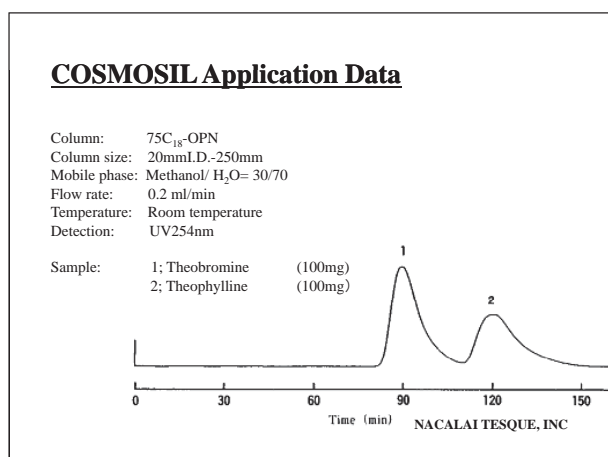
Can be used with low concentration of organic solvent on open, flash column chromatography.

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 75C ₁₈ -OPN | 75μm | 37842-66 | 100 g |
| | | 37842-95 | 500 g |
| | | 37842-11 | 1 kg |
| COSMOSIL 140C ₁₈ -OPN | 140μm | 37878-16 | 100 g |
| | | 37878-45 | 500 g |
| | | 37878-61 | 1 kg |

COSMOSIL C₁₈-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.

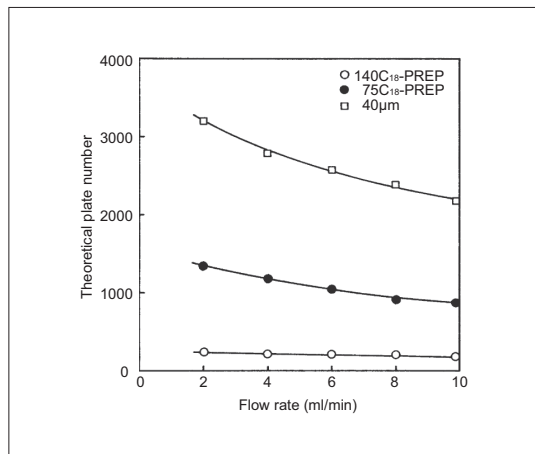


Figure 1. Flow rate against theoretical plate number
Column size: 20 mm I.D. x 300 mm

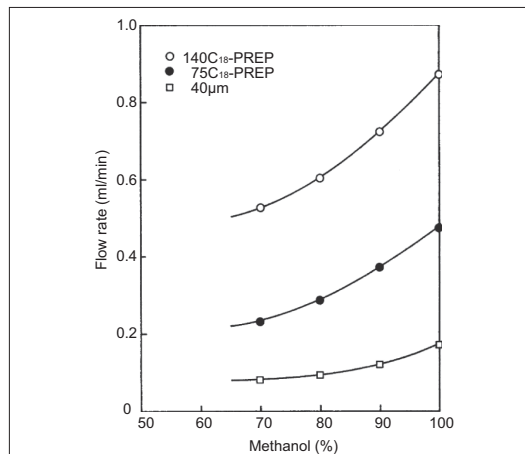
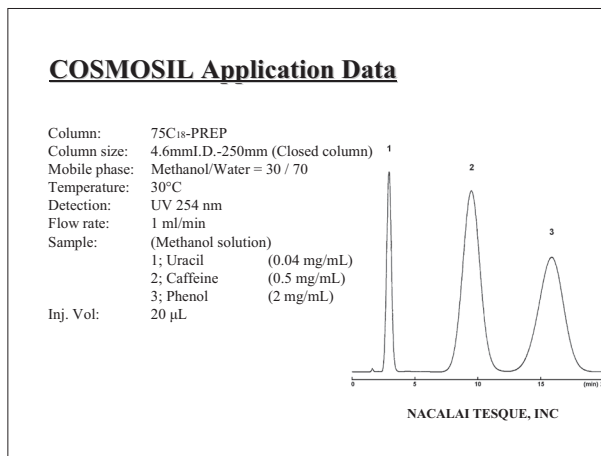
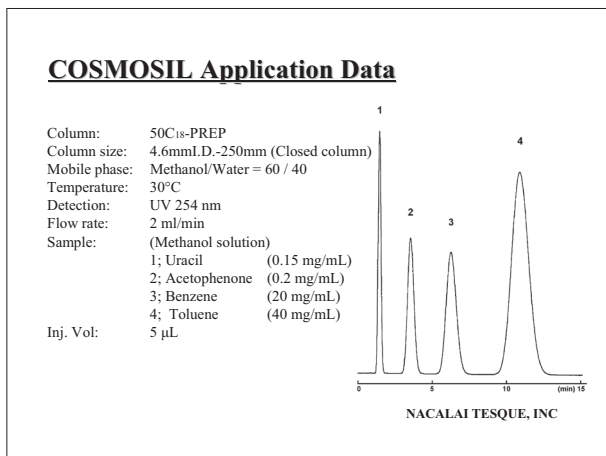


Figure 2. Concentration of methanol against flow rate
Column size: 10 mm I.D. x 180 mm bed height
(gravitational liquid flow)

Performance Evaluation



Ordering Information

COSMOSIL C₁₈-PREP

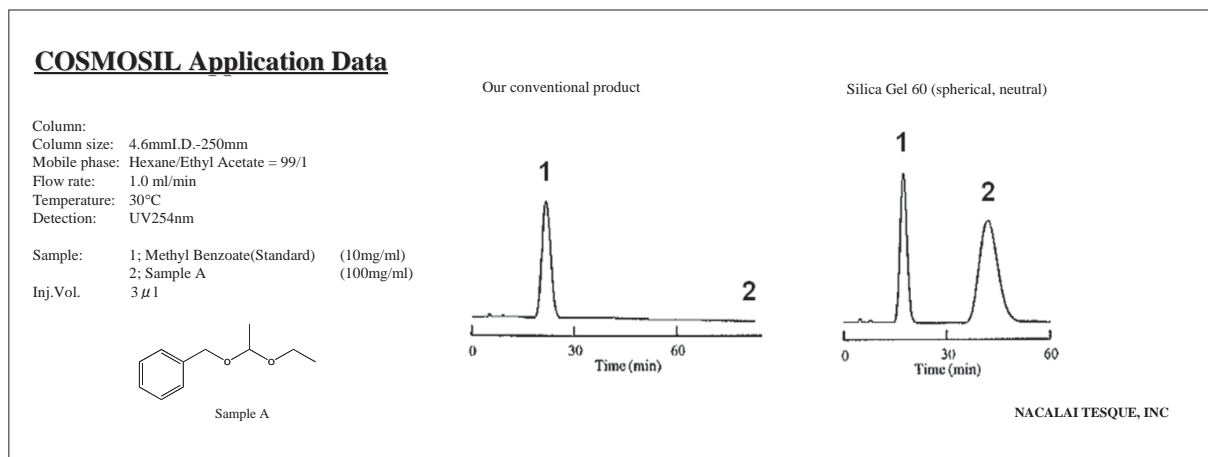
| Product Name | Average Particle Size | Product Number | PKG Size |
|-----------------------------------|-----------------------|----------------|----------|
| COSMOSIL 50C ₁₈ -PREP | 50 μm | 12065-84 | 100 g |
| | | 12065-55 | 500 g |
| | | 12065-71 | 1 kg |
| COSMOSIL 75C ₁₈ -PREP | 75 μm | 12061-24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

Silica Gel (Spherical, Neutral)

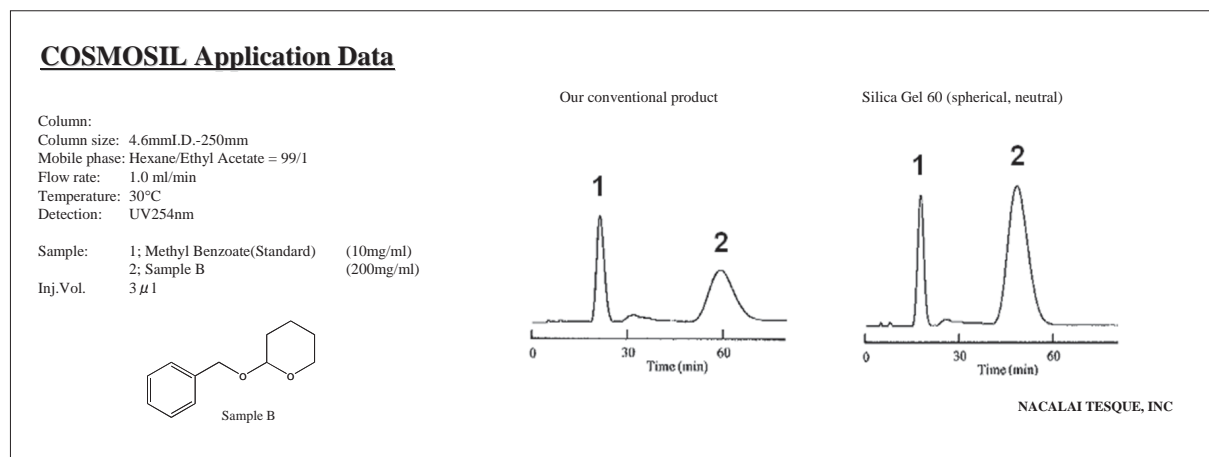
- The pH of silica gel is adjusted to neutral
- Suitable for the separation of pH-sensitive compounds

Comparison with Conventional Silica Gel

• Purification of Acetals -1



• Purification of Acetals -2



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 | 60 Å | SP | 30721-85 | 500 g |
| | | | | 30721-01 | 1 kg |
| | | | | 30721-14 | 5 kg |

IV. Related Products

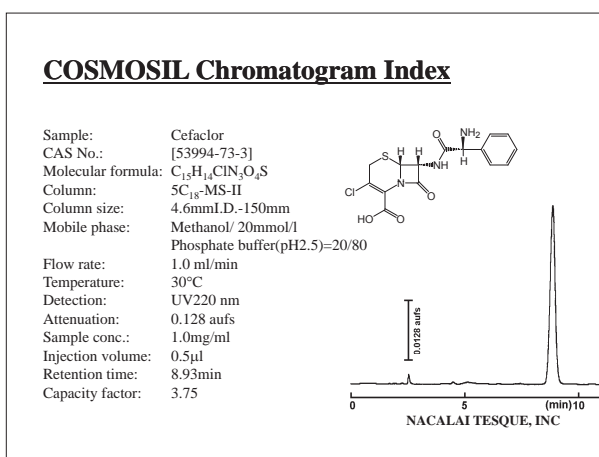
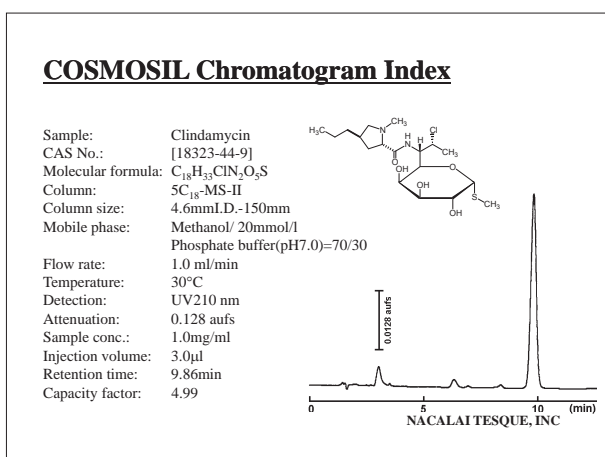
1. Reagents for Mobile Phase Preparation

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-SO₃⁻Na⁺)

| Product Name | R: | Grade | Product Number | PKG Size |
|----------------------------|-----------------------------------|-------|----------------|----------|
| Sodium 1-Butanesulfonate | C ₄ H ₉ - | SP | 31331-94 | 5 g |
| Sodium 1-Pentanesulfonate | C ₅ H ₁₁ - | SP | 31730-64 | 5 g |
| | | | 31730-22 | 25 g |
| Sodium 1-Hexanesulfonate | C ₆ H ₁₃ - | SP | 31529-24 | 5 g |
| | | | 31529-82 | 25 g |
| Sodium 1-Heptanesulfonate | C ₇ H ₁₅ - | SP | 31528-34 | 5 g |
| | | | 31528-92 | 25 g |
| Sodium 1-Octanesulfonate | C ₈ H ₁₇ - | SP | 31729-04 | 5 g |
| | | | 31729-62 | 25 g |
| Sodium 1-Nonanesulfonate | C ₉ H 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 ₄ H ₉ - | SP | 31332-84 | 5 x 10 ml |
| Sodium 1-Hexanesulfonate | C ₆ H ₁₃ - | SP | 31532-64 | 10 ml |
| | | | 31532-06 | 5 x 10 ml |
| Sodium 1-Octanesulfonate | C ₈ H ₁₇ - | SP | 31733-34 | 10 ml |
| | | | 31733-76 | 5 x 10 ml |

For Acidic Samples

(C₄H₉)₄N⁺X⁻

| Product Name | X ⁻ : | Grade | Product Number | PKG Size |
|--|---------------------------------|-------|----------------|----------|
| Tetra- <i>n</i> -butylammonium Bromide | -Br | SP | 32824-72 | 25 g |
| Tetra- <i>n</i> -butylammonium Chloride | -Cl | EP | 32935-64 | 5 g |
| | | | 32935-22 | 25 g |
| Tetra- <i>n</i> -butylammonium Hydrogensulfate | -HSO ₄ | GR | 32924-62 | 25 g |
| Tetra- <i>n</i> -butylammonium Iodide | -I | SP | 32905-54 | 5 g |
| | | | 32905-12 | 25 g |
| Tetra- <i>n</i> -butylammonium Perchlorate | -ClO ₄ | SP | 32906-44 | 5 g |
| | | | 32906-02 | 25 g |
| Tetra- <i>n</i> -butylammonium Phosphate | -H ₂ PO ₄ | SP | 32929-54 | 5 g |

0.5M Solution

| | | | | |
|--|---------------------------------|----|----------|-----------|
| Tetra- <i>n</i> -butylammonium Phosphate | -H ₂ PO 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 |

I. HPLC Columns

II. SFC Columns

III. Preparative Packing Materials

IV. Related Products

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 C₁₈-MS-II, AR-II, PAQ, EB, Cholester, πNAP, PYE, PBr and COSMOCORE 2.6C₁₈, 2.6Cholester and 2.6PBr. Please note that this product is not suitable for Sugar-D, HILIC, normal phase or ion exchange columns.

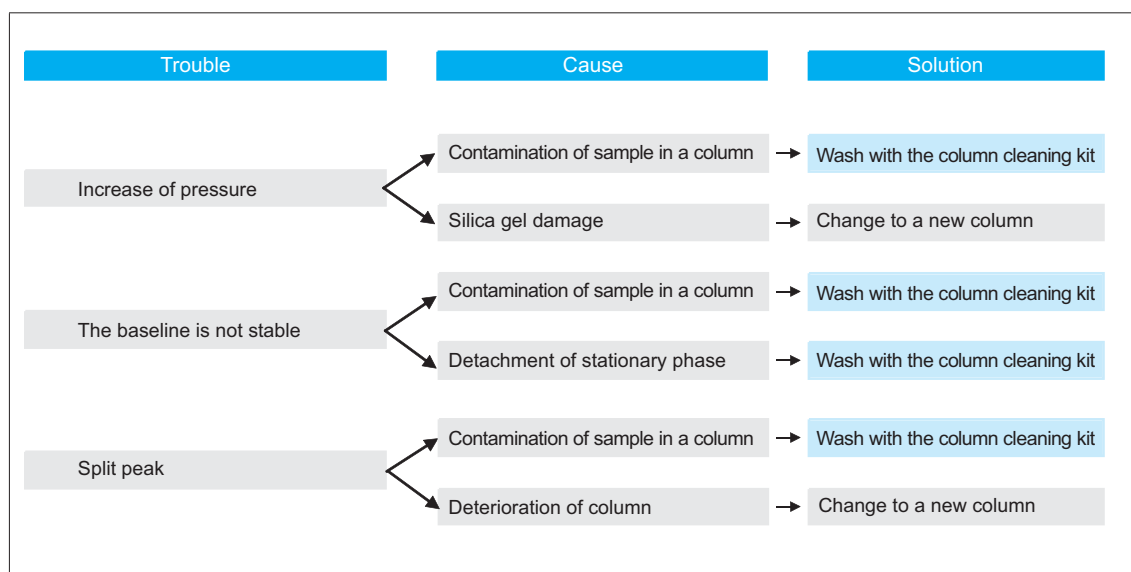
Cleaning Solution Kit for Reversed Phase HPLC Columns

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.



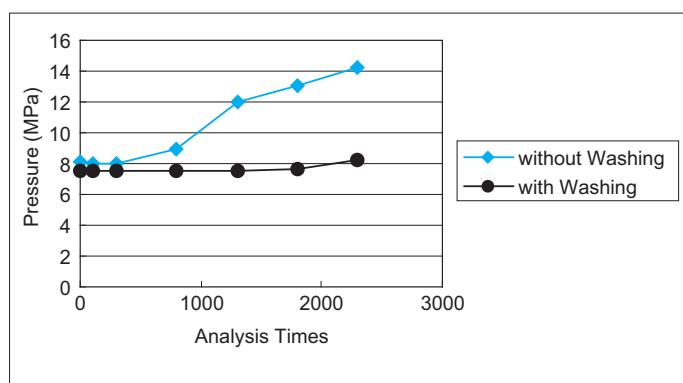
Procedure

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

- 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).)
- Run the Cleaning Solution A through the column for 15 min at a flow rate of 1ml/min.
- Run the Cleaning Solution B through the column at a flow rate of 1ml/min until the baseline becomes stable (approx. 15 min).
- 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 / H₂O = 70 / 30

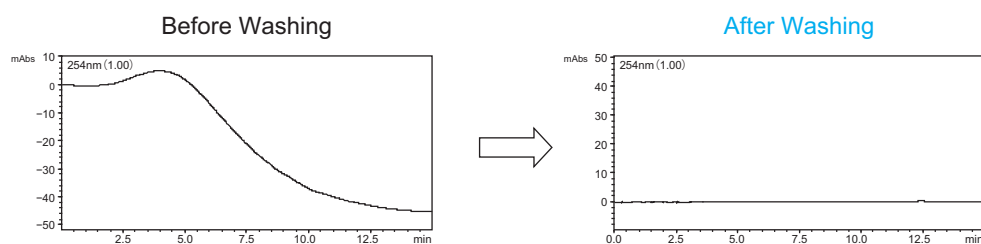
Flow rate: 1.0ml/min

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.



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

COSMOSIL Technical Notes

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

COSMOSIL HPLC Columns

General info. of COSMOSIL/COSMOGEL
COSMOSIL Columns List by Phase

- Standard Reversed Phase Columns
- Specialty Reversed Phase Columns
- Ultra-High Performance Columns
- Normal Phase Columns

Related Products

- Preparative Packing Materials
- Related Products
- Prefiltration Tools
- Fatty Acid Methylation **NEW**

Natural Compounds
Crude Drug Standards
Plant Extract Standards

- Hydrophilic Interaction Columns
- Saccharide Separation Columns
- Protein Separation Columns (Wide Pore Columns)
- Fullerene Separation Columns
- Carbon Nanotubes Separation Columns

COSMOSIL Applications
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Reference Lists

Technical Notes
FAQ
Troubleshooting
Technical Information

Click

Technical Notes

FAQ and Troubleshooting

FAQ and Troubleshooting

Technical Information

- Preparation of Mobile Phase for HPLC (PDF 158 KB)
- Inner Diameter of Column(scale down and scale up) (PDF 344 KB)
- Troubleshooting for Increased Pressure (PDF 149 KB)
- Sample Pretreatment for HPLC (PDF 682 KB)
- Baseline Noise in Gradient Elution (PDF 155 KB)
- Effect of Guard Column (PDF 642 KB)
- Selectivity of Packing Materials in Reversed Phase Liquid Chromatography (PDF 1,504 KB)
- Methods in Developing Mobile Phase Condition for C18 Column (PDF 253 KB)
- Comparison with Old Type COSMOSIL (PDF 473 KB)

Click

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FAQ and Troubleshooting

FAQ

| | |
|-----|---|
| Q1 | What is the pressure limit of column? |
| Q2 | What is the flow rate limit? |
| Q3 | What is the recommended pH range? |
| Q4 | What is the concentration of buffer and salt? |
| Q5 | How do I adjust mobile phase? |
| Q6 | What solvent grade should I use for the mobile phase? |
| Q7 | What is the difference between acetonitrile and methanol? |
| Q8 | Which mobile phase can be used for LC/MS or ELSD detector? |
| Q9 | What should I pay attention to when I use ion-pairing reagents? |
| Q10 | What flow direction should I use for the mobile phase? |
| Q11 | What is the recommended temperature range of columns? |
| Q12 | What is the shipping solvent? |
| Q13 | How do I wash columns? |
| Q14 | How do I store columns? |
| Q15 | How long does a column last? |

3. Troubleshooting for Increased Pressure

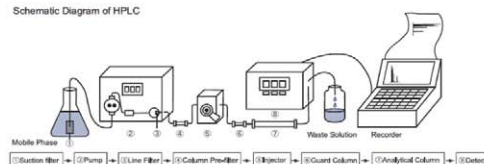
Introduction

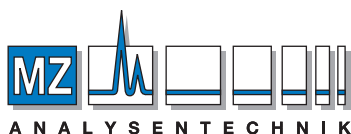
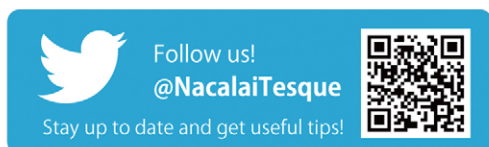
Repeated analysis may increase back pressure. Continuous use of HPLC columns under high pressure can cause deterioration and overload of the equipment. Therefore, it is important to monitor column back pressure regularly and solve the problem timely.

Identification of the Clogging Site

The back pressure increase can be due to clogging of a column or clogging of the equipment. First of all, identify the clogging site.

Schematic Diagram of HPLC





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