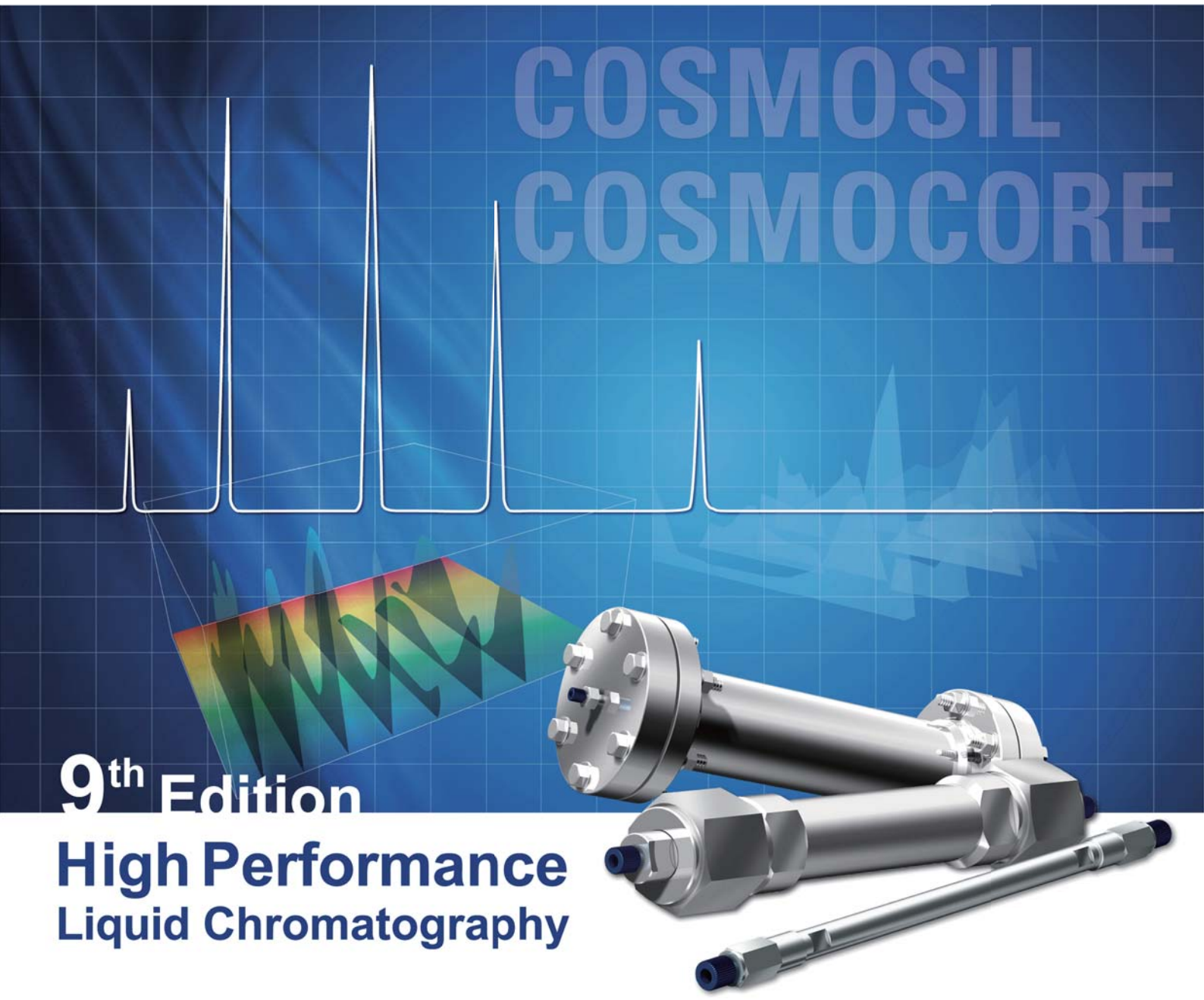
COSMOSIL



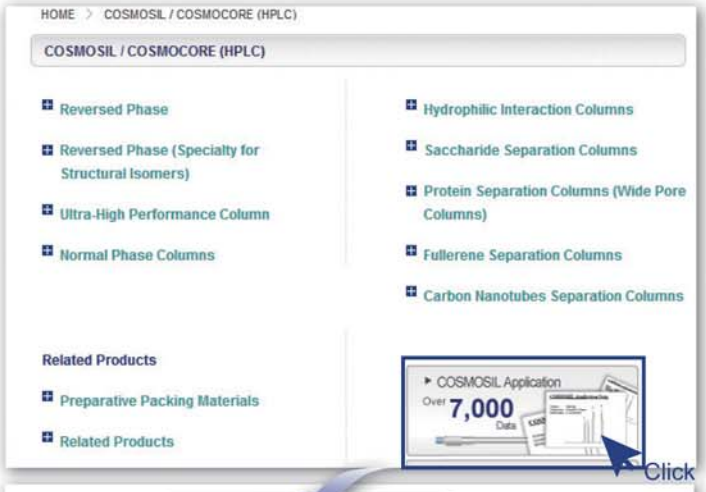
9th Edition

High Performance Liquid Chromatography

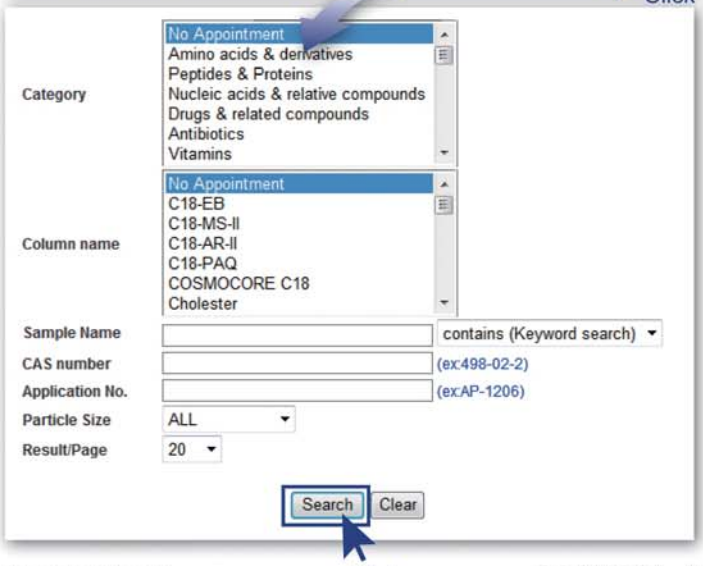
COSMOSIL Applications

COSMOSIL Application has more than 7,000 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 7,000 applications
- Easy to search



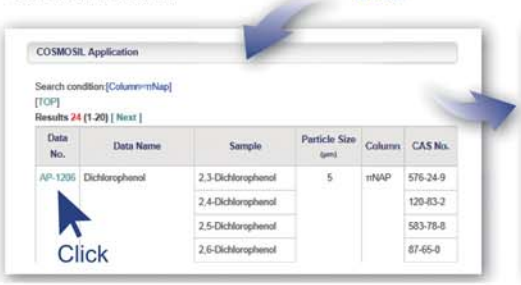
Visit COSMOSIL top page at
http://www.nacalai.co.jp/global/cosmosil/



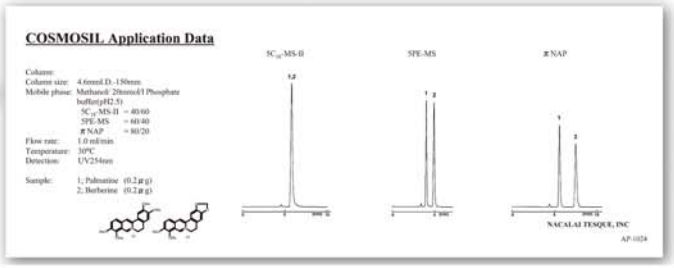
Applications are searched by

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

Search Result



COSMOSIL Application



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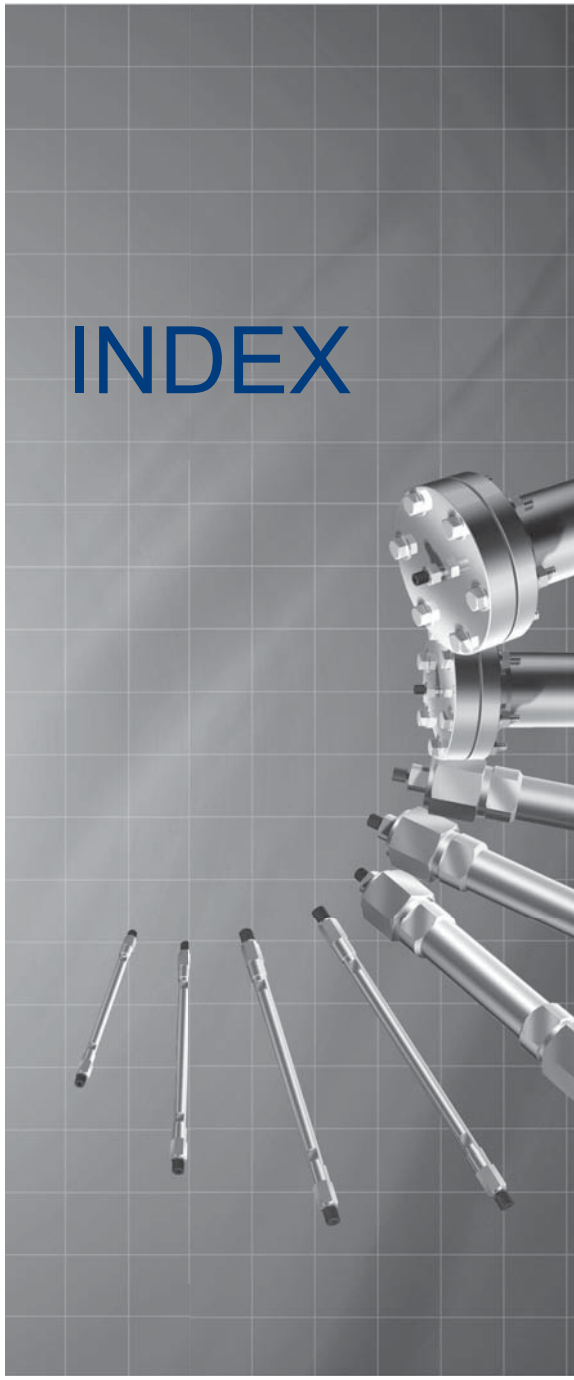


COSMOSIL

Core-Shell Columns Packing Material List

Sample	Separation Mode	Packing Material	Stationary Phase	Bonding Type	Average Particle Size (μm)	Average Pore Size (Å)	Carbon Content (%)	Special Features and Applications	USP Category	Page
Organic compunds (low M.W.)	Reversed phase	C_{18}	Octadecyl group	Polymeric	2.6	90	7	Multi-purpose C_{18} column	L1	5
		Cholester	Cholesteryl group	Monomeric			–	Usable under the same condition as C_{18} . Unique rigid cholesteryl structure improves separation.	Coming soon	8

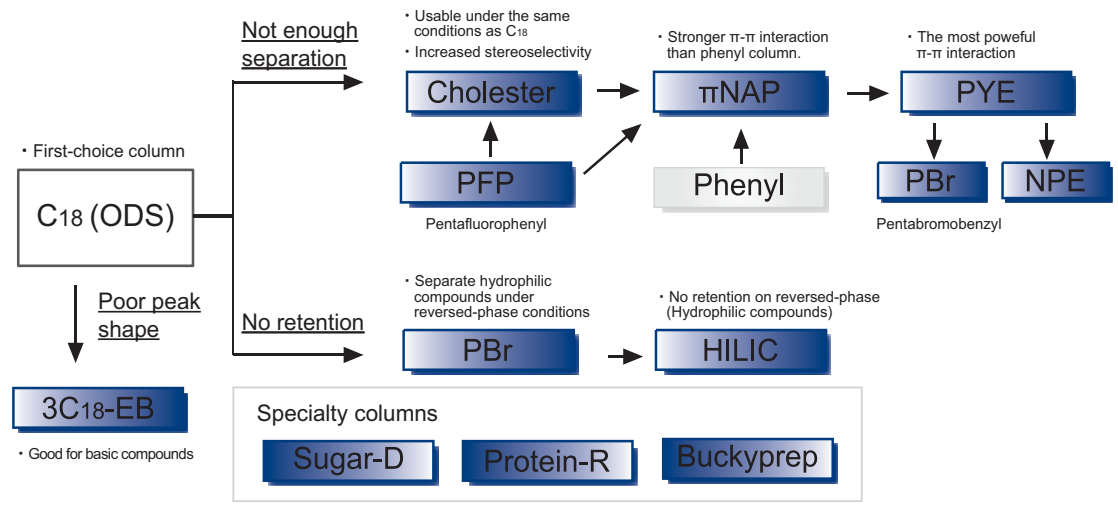
HPLC Columns Packing Material List

Sample	Separation Mode	Packing Material	Stationary Phase	Bonding Type	Average Particle Size (μm)	Average Pore Size (Å)	Carbon Content (%)	Special Features and Applications	USP Category	Page
Organic compunds (low M.W.)	Reversed phase	C_{18}-MS-II	Octadecyl group	Monomeric	2.5	130	18	Multi-purpose C_{18} column	L1	12
						120	16			17
		C_{18}-AR-II		Polymeric	3,5,15	120	17	Features strong acid resistance, good for acidic compounds and peptides.		19
		C_{18}-PAQ			5,15		11	Good for hydrophilic compounds, and stable performance under 100% aqueous conditions.		21
		C_{18}-EB		Monomeric	3	120	14.5	Good for basic compounds		23
		Cholester	Cholesteryl group		2.5	130	21	Usable under the same conditions as C_{18} . Unique rigid cholesteryl structure improves separation.	Coming soon	13
					5	120	20			25
		PBr NEW	Pentabromo-benzyl group				8	Separate hydrophilic compounds under reversed-phase conditions.		26
		πNAP	Naphthylethyl group		2.5	130	14	Stronger π-π interaction than phenyl column.		14
					5	120	11			27
		PYE	Pyrenylethyl group				18	The most powerful π-π interaction	Coming soon	28, 51
		NPE	Nitrophenyl-ethyl group				9	Separation utilizing dipole-dipole interaction.		29, 50
		PFP NEW	Pentafluoro-phenyl group				10	Separation utilizing weak dipole-dipole interaction.	L43	31
		CN-MS	Cyanopropyl group				7	Enables separation of different hydrophobic samples without using gradients.	L10	32
		C_{22}-AR-II	Docosyl group	Polymeric			19	Alkyl chain columns excluding C_{18} column		33
		C_8-MS	Octyl group	Monomeric			10		L7	
		C_4-MS	Butyl group				7		L26	
		TMS-MS	Trimethyl group				5		L13	
		PE-MS	Phenylethyl group				10	π-π interaction	L11	
	Normal phase	SL-II	--	–	3,5,15		–	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.	Coming soon	15
					5	120				35
Mono- and Oligosaccharides	Hydrophilic interaction	Sugar-D	Secondary/ Tertiary amine	–	5	–	–	A novel stationary phase for mono- and oligosaccharides.		37
		NH_2-MS	Aminopropyl group	Polymeric	5	120	4	Primary amino bonded column	L8	38
Proteins	Reversed phase	Protein-R	Octadecyl group	Polymeric	5	300	–	Wide-pore column with the advantages of both C_{18} and C_4	L1	39
		C_{18}-AR-300					12	Wide pore type	L1	40
		C_8-AR-300	Octyl group				7		L7	
		C_4-AR-300	Butyl group				6		L26	
		Ph-AR-300	Pyrenyl group				7		L11	
	Gel permeation	Diol-120-II	Diol group	–	5	120	–	Aqueous GFC column with a silica base, Selection of Pore Size: 5,000-100,000 Da	L20	42
		Diol-300-II				300		Aqueous GFC column with a silica base, Selection of Pore Size: 10,000-700,000 Da		

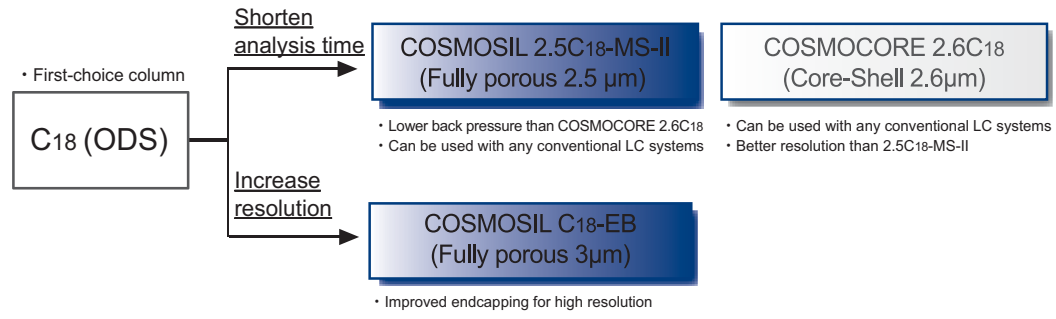
Sample	Separation Mode	Packing Material	Stationary Phase	Bonding Type	Average Particle Size (μm)	Average Pore Size (Å)	Carbon Content (%)	Special Features and Applications	USP Category	Page
Proteins	Ion-exchange	IEX Type Q	Trimethylaminopropyl type	-	5	1000	-	Anion-exchange type (purification)		43
		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		45
Fullerenes	--	Buckyprep	Pyrenylpropyl group	Monomeric	5	120	17	Standard column for fullerene separation.		47
		Buckyprep-D	Nitro-carbazoyl group				-	Good for derivatized fullerenes		48
		Buckyprep-M	Phenothiazinyl group				13	Good for metallofullerenes		49
		PBB	Pentabromobenzyl group				8	Good for preparative separation of C_{60} or C_{70}.		50
Carbon nanotubes	Gel permeation	CNT-300	Hydrophilic group (neutral)	-	5	300	-	Separation of soluble carbon nanotubes.		52
		CNT-1000				1000				
		CNT-2000				2000				

Column Selection Guide

Selection by Stationary Phase Type

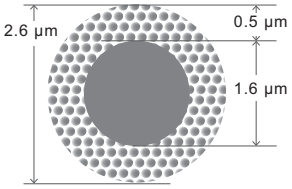


Selection by Particle Size



I. Core-Shell Columns

1. COSMOCORE Series



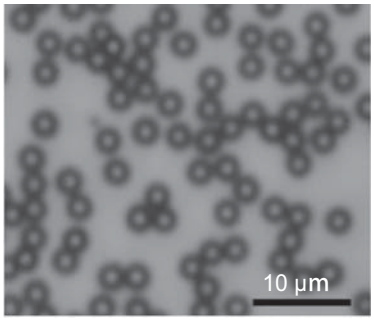
Schematic diagram of a silica particle

About Core-Shell Particles

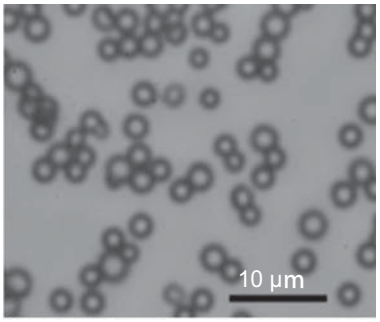
Core-shell particles consist of a nonporous core inside a porous shell. By using these core-shell particles, one can achieve sharper peaks compared to fully porous silica gel particles of the same diameter.

Uniform Particle Size Distribution Compared to 1.7 µm Particles

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



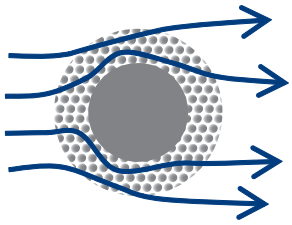
COSMOCORE 2.6C18 (200x)

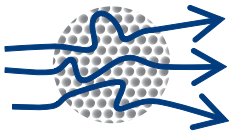


Fully porous 1.7 µm particles (200x)

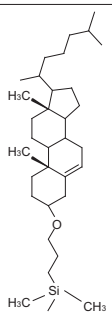
Mass Transfer Equivalent to Fully Porous Sub-2 µm Particles

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


COSMOCORE 2.6C18


Fully porous sub-2 µm particle

Specifications

Packing Material	COSMOCORE 2.6C18	COSMOCORE 2.6Cholester
Silica Gel	Core-shell type silica gel	
Average Particle Size	2.6 µm	
Average Pore Size	approx. 90 Å	
Specific Surface Area	approx. 150 m^2/g	
Bonded Phase Stracture		
Bonded Phase	Octadecyl group	Cholesteryl group
End Capping Treatment	Near-perfect treatment	
Usable pH Range	1.5 – 10	2 – 7.5
Maximum Puressure	60 MPa	

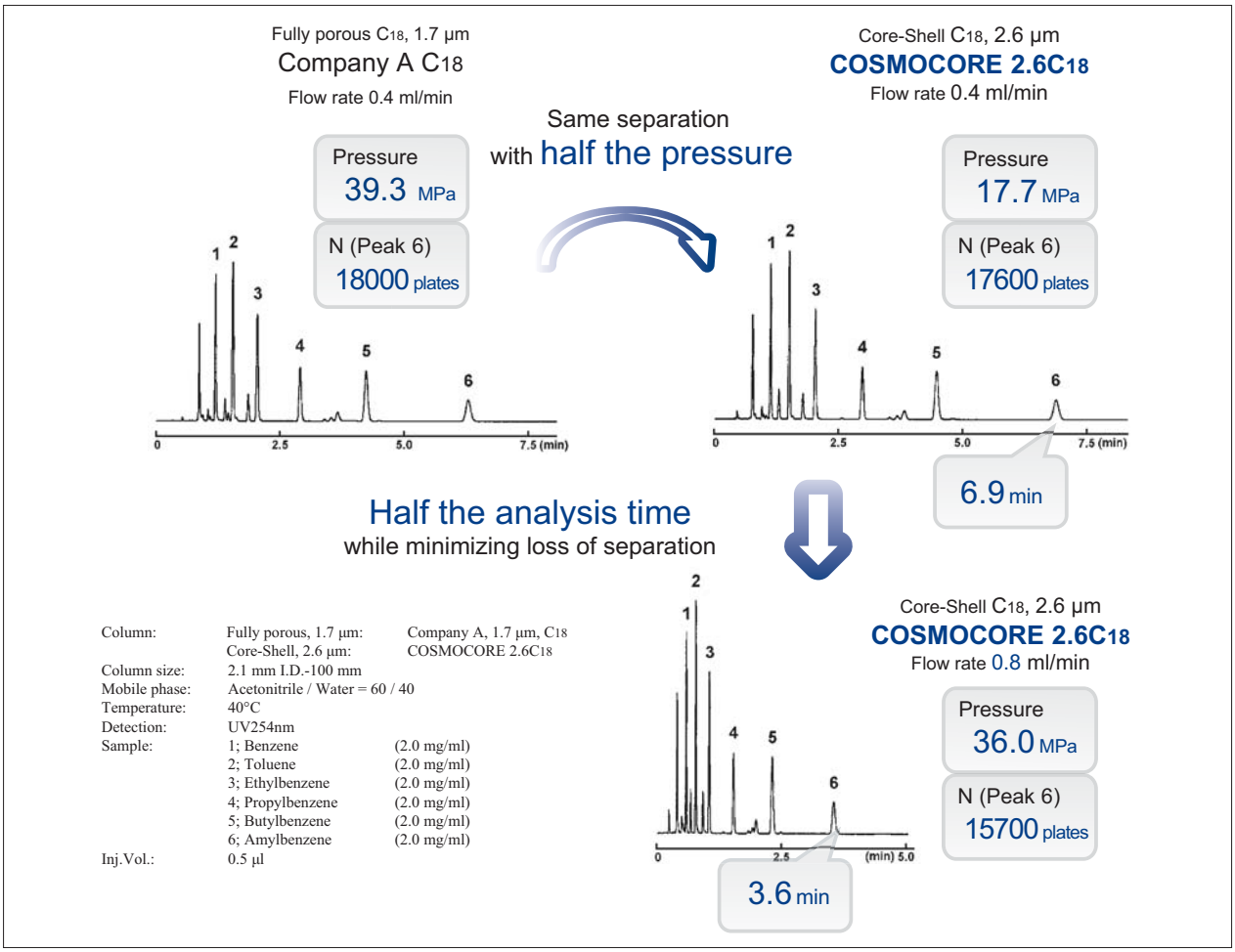
COSMOCORE 2.6C18

- 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)

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

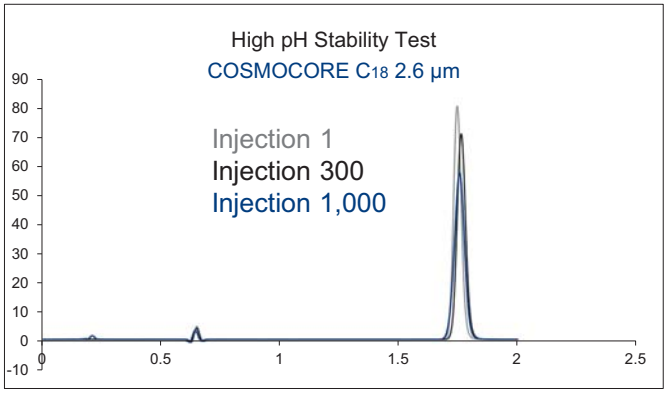
- Reduced Back Pressure

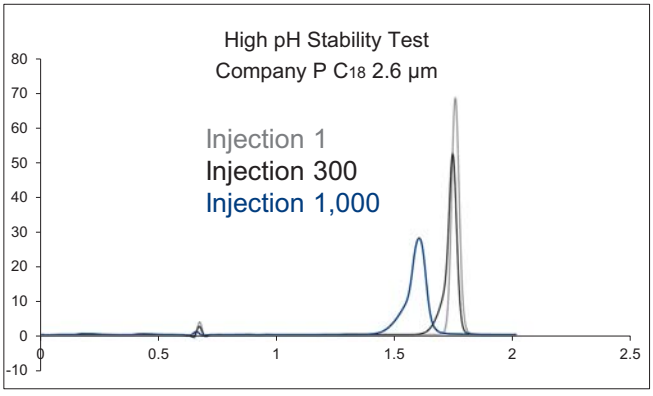
COSMOCORE 2.6C18 maintains the same performance as sub-2 µm particles with half the back pressure.



Excellent pH Stability

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





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

Higher retention and loading capacity than competitors' core-shell columns

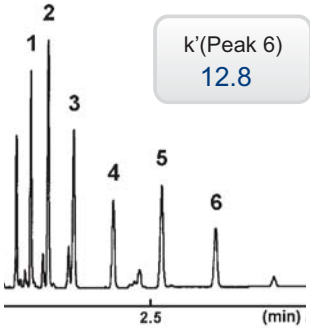
- Retention

COSMOCORE 2.6C18 features high retention and better separation compared to other core-shell columns.

COSMOCORE Application Data

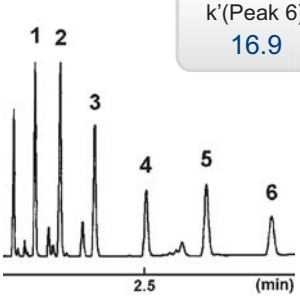
Column size:	2.1 mm I.D.-50 mm
Mobile phase:	A: Acetonitrile / Water = 50 / 50
	B: Acetonitrile / Water = 70 / 30
	B conc. 0→100% (0-4 min), 100% (4-5 min)
Flow rate:	0.4 ml/min
Temperature:	40°C
Detection:	UV254nm
Sample:	1; Benzene (2.0 mg/ml)
	2; Toluene (2.0 mg/ml)
	3; Ethylbenzene (2.0 mg/ml)
	4; Propylbenzene (2.0 mg/ml)
	5; Butylbenzene (2.0 mg/ml)
	6; Amylbenzene (2.0 mg/ml)
Inj.Vol.:	0.5 µl

Core-Shell C18, 2.6 µm
Company B C18



k'(Peak 6) 12.8

Core-Shell C18, 2.6 µm
COSMOCORE 2.6C18



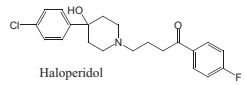
k'(Peak 6) 16.9

Applications

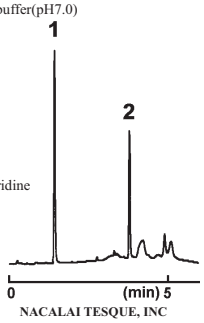
- Haloperidol

COSMOCORE Application Data

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:	40ºC
Detection:	UV220nm
Sample:	1; 4-(4-Chlorophenyl)-4-hydroxypiperidine (0.1 mg/ml)
	2; Haloperidol (0.1 mg/ml)
Inj. Vol:	0.5 µl



Haloperidol

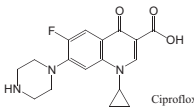


NACALAI TESQUE, INC

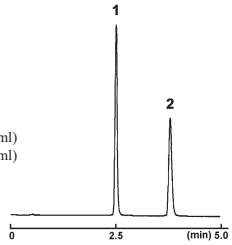
- Ciprofloxacin

COSMOCORE Application Data

Column:	2.6C18
Column size:	2.1mmI.D.-100mm
Mobile phase:	Acetonitrile/ 20mmol/l Phosphate buffer(pH2.5) = 10/90
Flow rate:	0.4 ml/min
Temperature:	40°C
Detection:	UV278nm
Sample:	1; Ciprofloxacin Ethylenediamine Analog (0.05mg/ml)
	2; Ciprofloxacin (0.05mg/ml)
Inj. Vol:	0.5µl



Ciprofloxacin



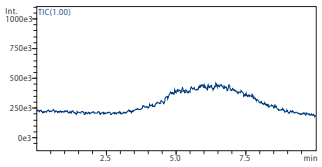
NACALAI TESQUE, INC

Low Bleed-Suitable for LC-MS

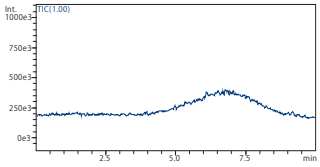
COSMOCORE 2.6C18 has low column bleed and consequently low MS noise level.

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

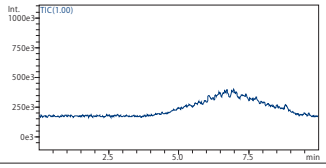
without Column



Core-Shell C18, 2.6 µm
COSMOCORE 2.6C18



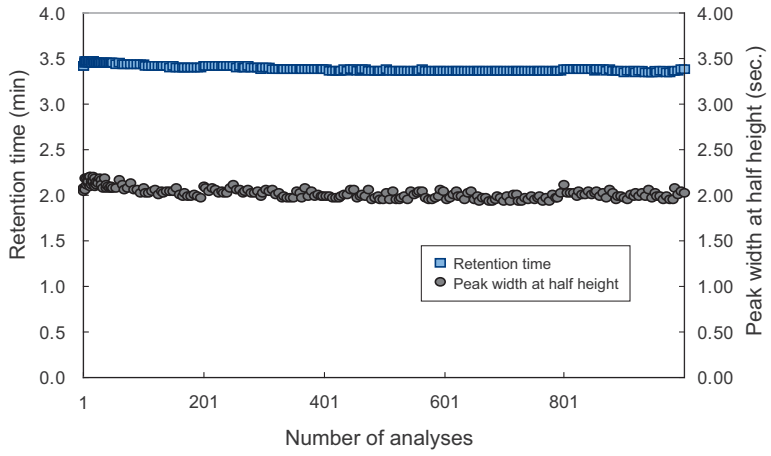
Core-Shell C18, 2.6 µm
Company B C18



Durability Test

COSMOCORE 2.6C$_{18}$ exhibits high durability. Even after analyzing amitriptyline 1000 times, there is no significant deterioration in retention or peak shape.

<Durability test: 1000 consecutive analyses>



Test conditions

Column:	COSMOCORE 2.6C$_{18}$
Column size:	2.1 mm I.D. - 50 mm
Mobile phase:	A: 0.1% TFA/Water B: 0.1% TFA/Acetonitrile B conc. 5→90%(0-3 min), 90→3%(3-3.01 min), 5%(3.01-6 min)
Flow rate:	0.4 ml/min
Temperature:	40°C
Detection:	UV236nm
Sample:	Amitriptyline (0.2 mg/ml)
Inj. Vol:	1.0 µl

Ordering Information

● Analytical Columns (Particle Size: 2.6 µm)

COSMOCORE 2.6C$_{18}$ 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	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.
Other sizes may be available.

UHPLC–compatible prefilter

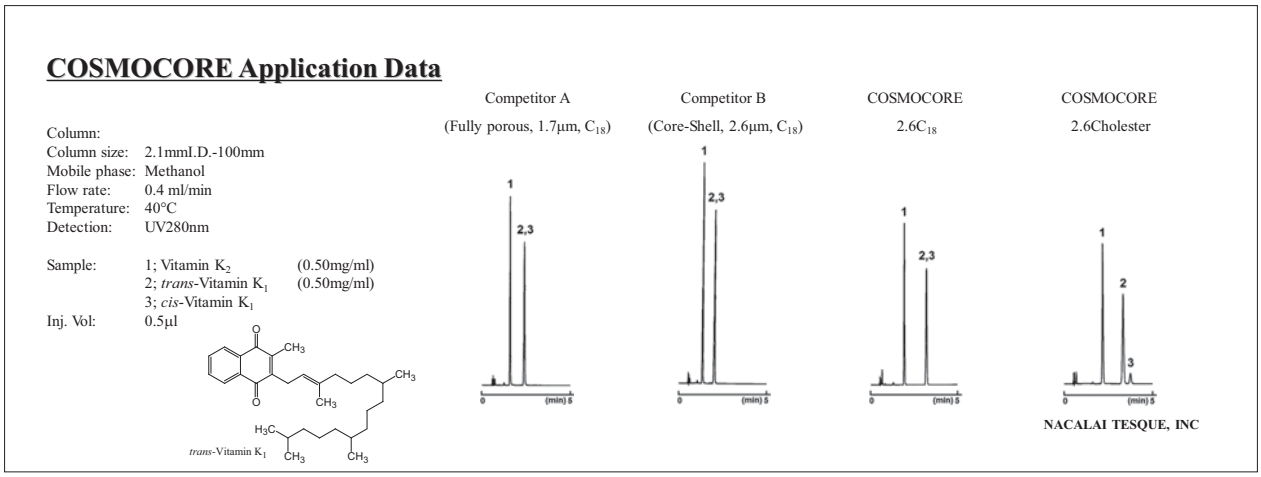
Product Name	Product Number	In	Out	Contents	PKG Size
U-Fil UHPLC-compatible prefilter	12571-31	UHPLC	UHPLC	Filter: 0.5 µm	1 SET
	12572-21	HPLC	UHPLC	Tubing connecting diameter: 1/16	1 SET
U-Fil replacement filter	28150	-	-	Filter: 0.5 µm, Material: SUS316L	5 units / PKG

COSMOCORE 2.6Cholester

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

Comparison with C_{18}

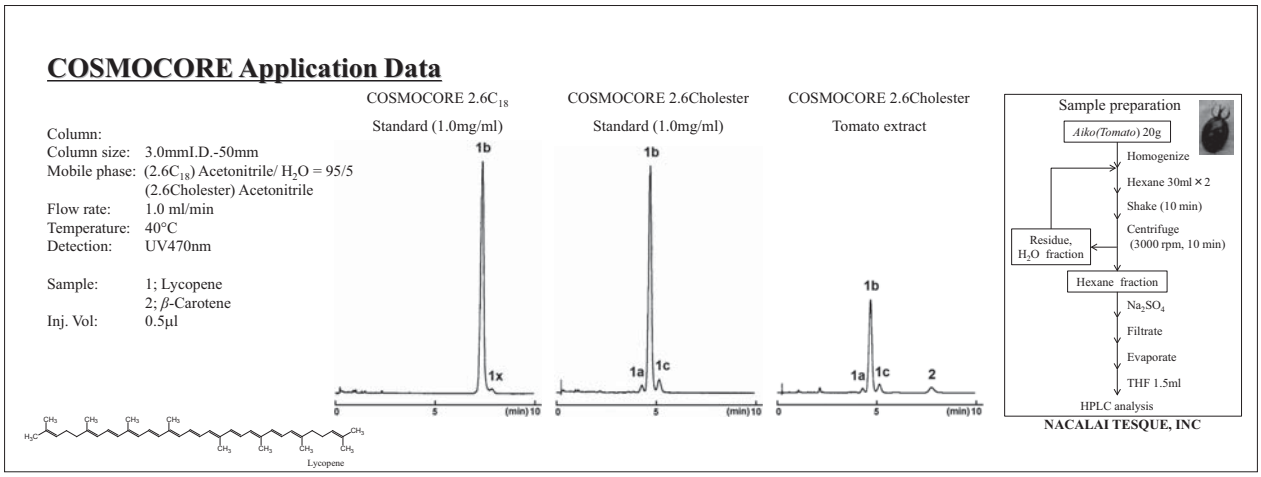
COSMOCORE 2.6Cholester offers improved separation for cis-trans isomers than C_{18} under typical reversed-phase mobile phase.



Applications

- Separation of Natural Compounds (Tomato components)

  Lycopene exists in many cis-trans isomers. COSMOCORE 2.6Cholester separates these compounds better than C_{18}.



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.
Other sizes may be available.
For UHPLC–compatible prefilter, refer to page 7.

Instrument Settings and Compatibility

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

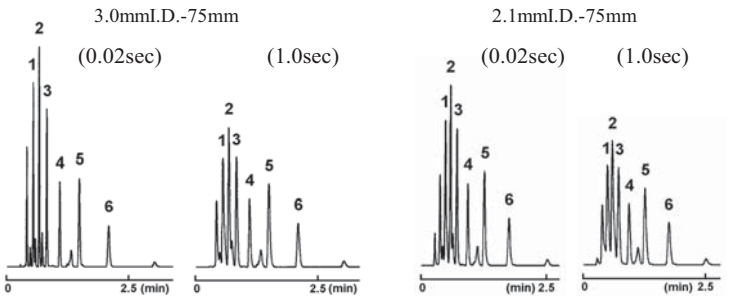
COSMOCORE 2.6C_{18} is designed for use with UHPLC instruments. In addition, due to its low backpressure, it can be used with conventional instruments. However, it is necessary to change the following settings.

1. Detector response time

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

COSMOCORE Application Data

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

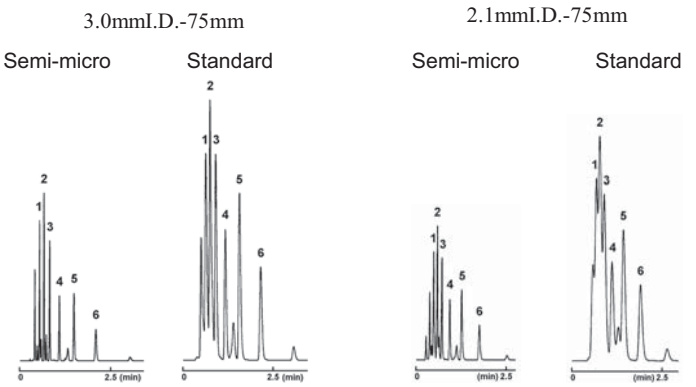


2. Other instrument parameters

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

COSMOCORE Application Data

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



- Fittings and adapters

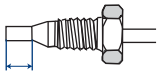
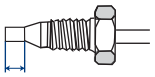
COSMOCORE columns use the same connectors as Waters UPLC® (UHPLC) columns. This is different from our conventional COSMOSIL columns, which use the conventional Waters HPLC-compatible connectors. (UPLC® is a registered trademark of Waters Corporation.)

1. Differences between end fitting

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

HPLC: Conventional Waters–compatible connector

UHPLC: Waters UPLC®–compatible connector

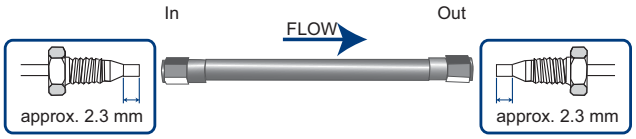
	HPLC	UHPLC
Connector Shape	 approx. 3.3 mm	 approx. 2.3 mm

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

2. COSMOCORE-compatible fittings

1) UHPLC instrument fittings

No adapter needed; just connect as-is.

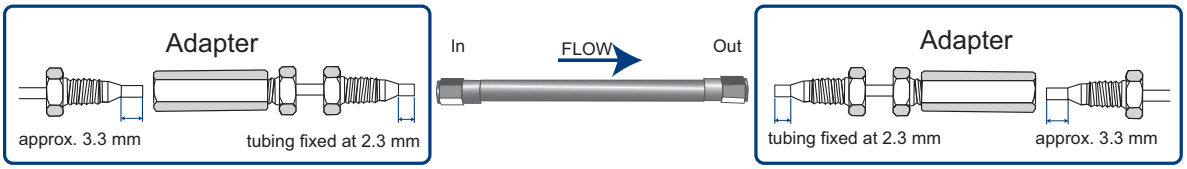


2) HPLC instrument fittings

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

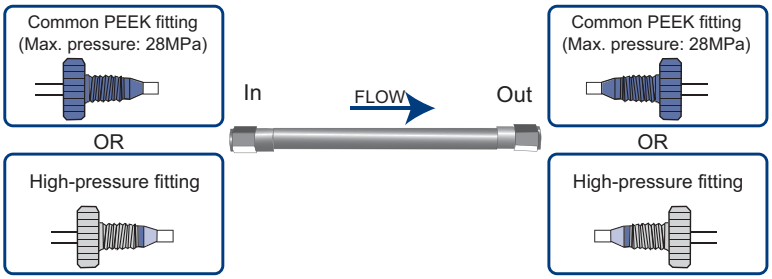
- SUS ferrules (HPLC) fixed on the tubing

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



- PEEK fittings

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



- **Adapter list**

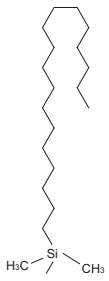
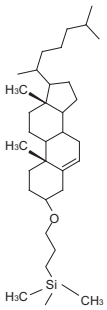
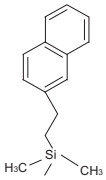
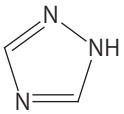
Name	Product Number	Description	PKG Size
Low & Zero Dead Volume Union	P0402	Material: SUS Bore diameter: 0.35 mm	1 PKG
COSMOSIL Column Connecting Tube (0.1 mm I.D.)	12570-41	I.D.: 0.1 mm	1 PKG
COSMOSIL Column Connecting Tube (0.25 mm I.D.)	37843-69	I.D.: 0.25 mm	1 PKG

II. Ultra-High Performance Columns

1. COSMOSIL 2.5 μm Series

- Low back pressure (2.5 μm silica gel)
- Can be used with conventional LC systems

Specifications

Packing Material	2.5C_{18}-MS-II	2.5Cholester	2.5πNAP	2.5HILIC
				
Bonded Phase	Octadecyl group	Cholesteryl group	Naphtylethyl group	Triazole
Main Interaction	Hydrophobic interaction	Hydrophobic interaction Molecular shape selectivity	Hydrophobic interaction π−π interaction	Hydrophilic interaction Anion exchange
End−Capping Treatment	Near−perfect treatment			−
pH Range	2−7.5			
Feature	•First−choice column of our ODS series •Good for basic compounds	•Usable under the same condition as C18 . •Unique rigid cholesteryl structure improves separation.	•Stronger π−π interaction than phenyl column. •π−π interaction	•Retains highly polar compounds that would not be retained in C18 column.
Packing Material Information	P17	P25	P27	P35

Silica gel: high purity porous spherical silica, average particle size: 2.5 μm, average pore size: approx. 130 Å, specific surface area: approx. 330 m^2/g

Ultra-High Performance Liquid Chromatography

Very fast and efficient separation can be achieved using 2.5 μm particles.

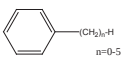
Note: An ultra high performance liquid chromatography system or a modified HPLC system is required for UHPLC analysis. The following application was acquired by an HPLC system for semi−micro columns with a detector response of 0.02 sec.

To Ultra Fast Liquid Chromatography

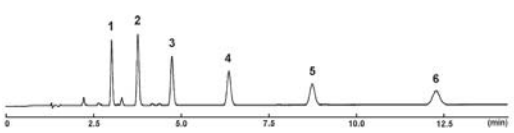
Column: COSMOSIL C_{18}-MS-II
Column size:
Mobile phase: Acetonitrile/ H_2O = 70/30
Flow rate: 1.0 ml/min
Temperature: 40°C
Detection: UV254nm

Sample:
1; Benzene (1.67mg/ml)
2; Toluene (1.67mg/ml)
3; Ethylbenzene (1.67mg/ml)
4; *n*-Propylbenzene (1.67mg/ml)
5; *n*-Butylbenzene (1.67mg/ml)
6; Amylbenzene (1.67mg/ml)

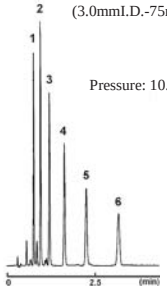
Injection Vol. 1.0 μl



5C_{18}-MS-II
(4.6mmI.D.-150mm)
Pressure: 3.7MPa



2.5C_{18}-MS-II
(3.0mmI.D.-75mm)
Pressure: 10.9MPa



NACALAI TESQUE, INC

COSMOSIL 2.5C18-MS-II

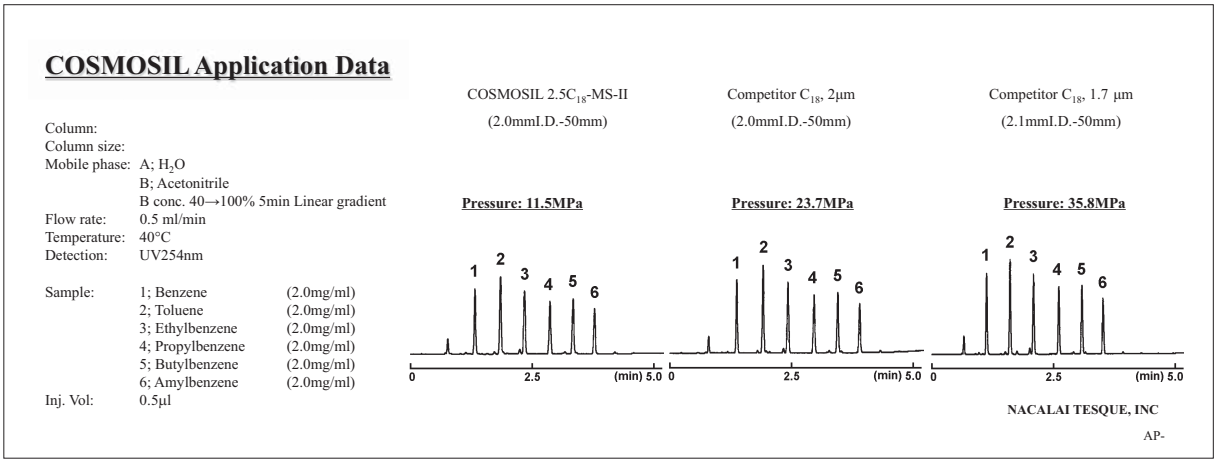
- Multi-purpose C_{18} Column

Suitable Samples

- Low M.W. Compounds

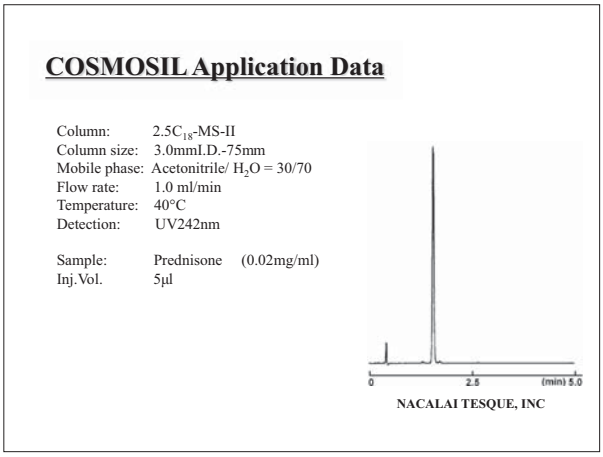
Comparison with sub-2μm

COSMOSIL 2.5C_{18}-MS-II can be used under lower pressure than competitors' 2 μm columns.

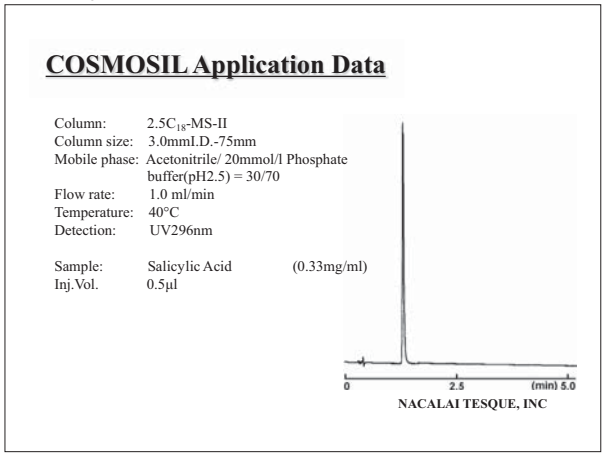


Applications

- Prednisone



- Salicylic Acid



Ordering Information

- Analytical Columns (Particle Size: 2.5 μm)

COSMOSIL 2.5C_{18}-MS-II

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 x100	08996-11	3.0 x100	08999-81

COSMOSIL 2.5Cholester

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

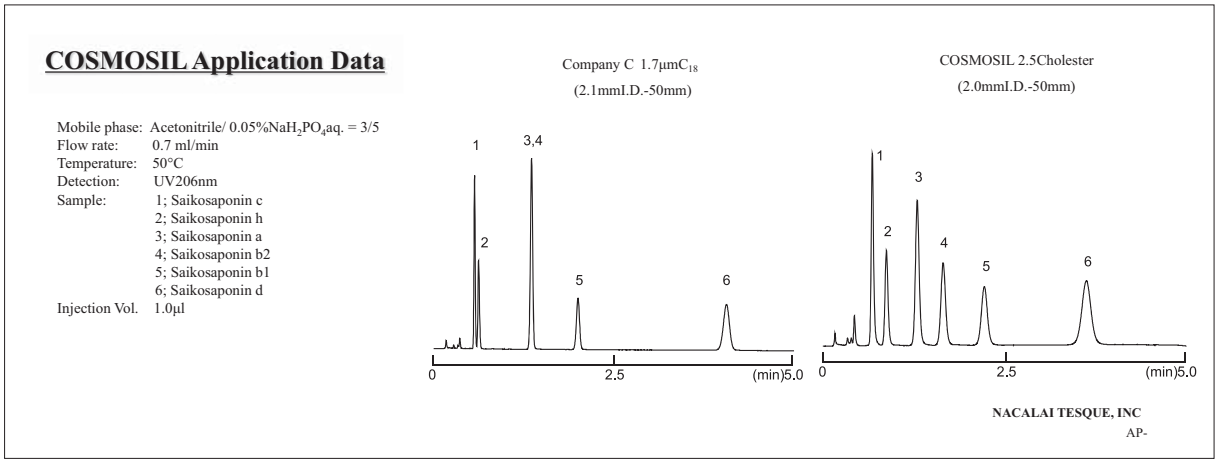
Suitable Samples

- Natural Compouds
- Polyphenols, catechins, fat-soluble vitamins and flavones

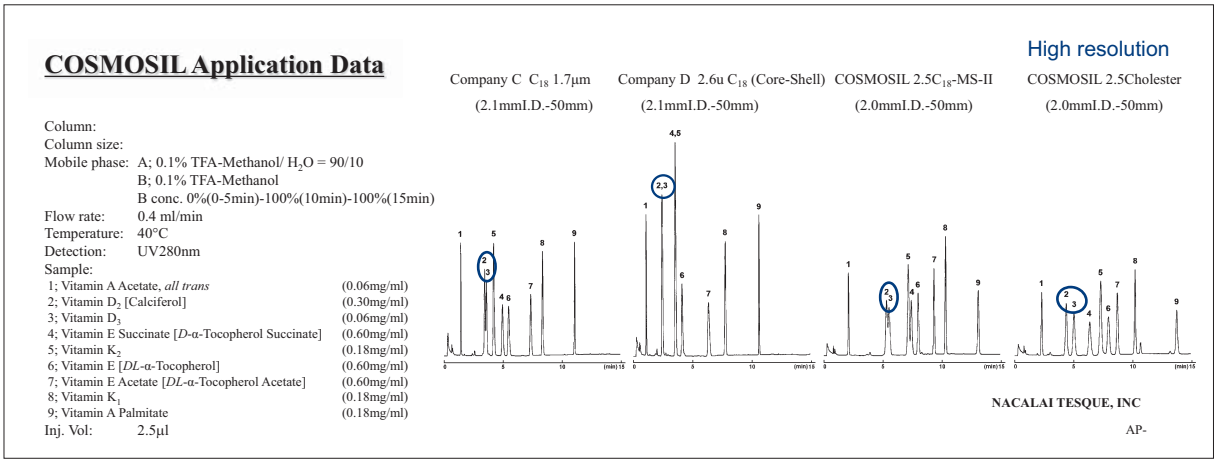
Applications

COSMOSIL 2.5Cholester offers improved resolution for compounds difficult to analyze with C_{18} without changing analytical conditions.

- Saikosaponins



- Water Soluble Vitamins



For more information on Cholester packing material, refer to page 25.

Ordering Information

● Analytical Columns (Particle Size: 2.5 µm)

COSMOSIL 2.5Cholester

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 2.5πNAP

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

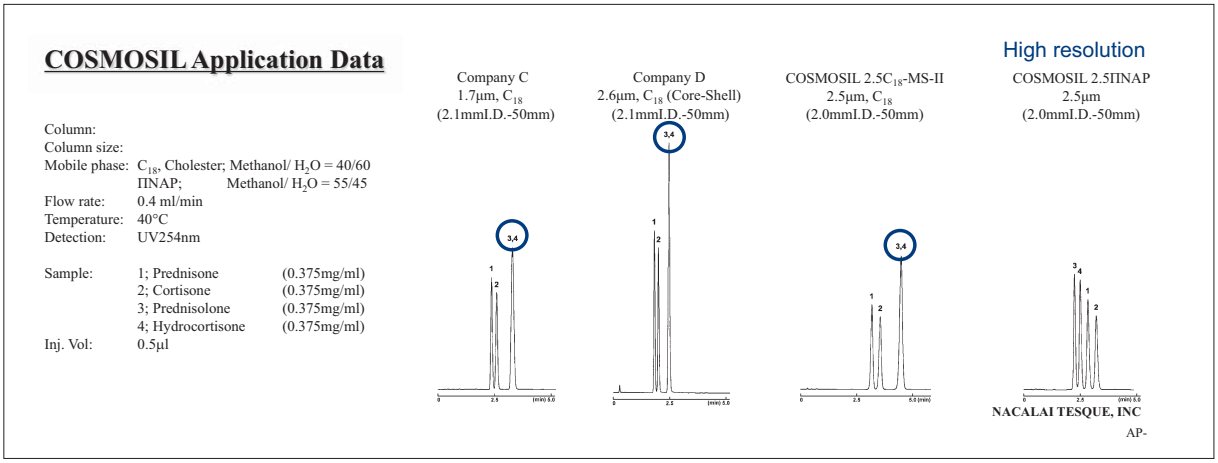
Suitable Samples

- Aromatic compounds and positional isomers

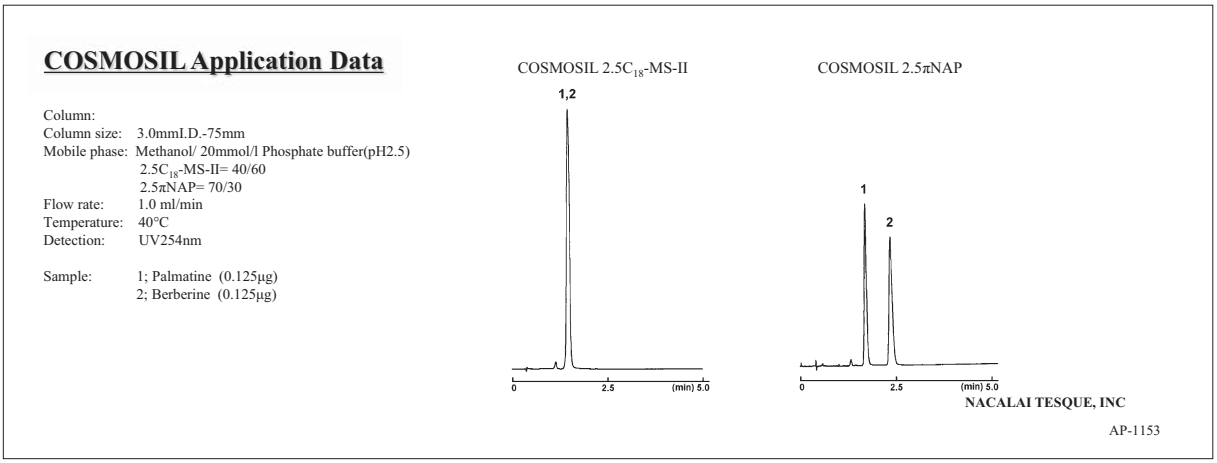
Applications

COSMOSIL 2.5πNAP provides greater performance in separating positional isomers and other closely related compounds which are difficult to analyze with C18.

- Adrenocortical Hormone



- Berberine



For more information on πNAP packing material, refer to page 27.

Ordering Information

- Analytical Columns (Particle Size: 2.5 µm)

COSMOSIL 2.5πNAP

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 2.5HILIC

- 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

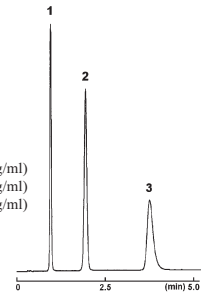
Applications

● Nucleotides

COSMOSIL Application Data

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

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



NACALAI TESQUE, INC

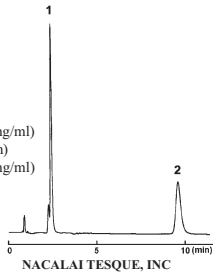
AP-1275

● Phosphorylated Peptide

COSMOSIL Application Data

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

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



NACALAI TESQUE, INC

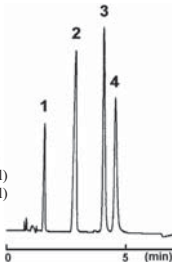
AP-1280

● Umami Components

COSMOSIL Application Data

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

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



NACALAI TESQUE, INC

AP-1276

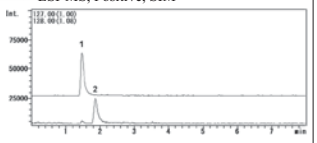
● Melamine

COSMOSIL Application Data

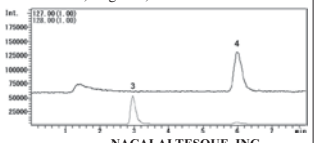
Column: 2.5HILIC
Column size: 2.0mmI.D.-50mm
Mobile phase: Acetonitrile/ 10mmol/l Ammonium Acetate = 80/20
Flow rate: 0.2 ml/min
Temperature: 40°C
Detection: ESI-MS

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

ESI-MS, Positive, SIM



ESI-MS, Negative, SIM



NACALAI TESQUE, INC

AP-1286

For more information on HILIC packing material, refer to page 35.

Ordering Information

● Analytical Columns (Particle Size: 2.5 µm)

COSMOSIL 2.5HILIC

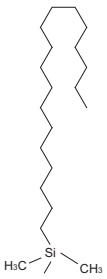
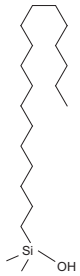
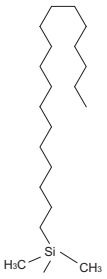
Column Size I.D. x Length (mm)	Product Number	Column Size I.D. x Length (mm)	Product Number
2.0 x 50	11766-21	3.0 x 50	11771-41
2.0 x 75	11768-01	3.0 x 75	11772-31
2.0 x 100	11769-91	3.0 x 100	11773-21
2.0 x 150	11770-51	3.0 x 150	11773-21

III. HPLC Columns

1. Reversed Phase HPLC Columns

(1) C_{18}(ODS) Series

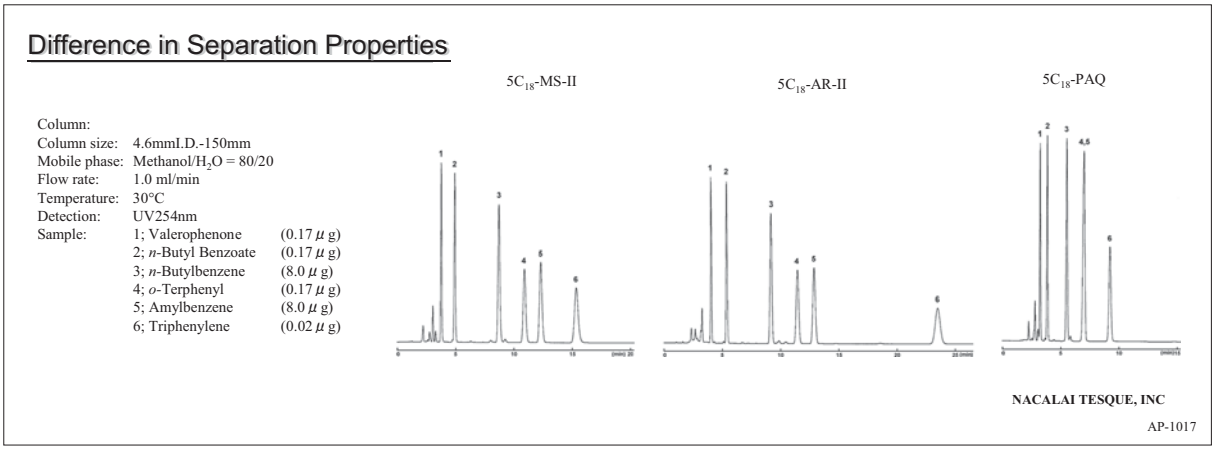
Specifications

Packing Material	C_{18}-MS-II	C_{18}-AR-II	C_{18}-PAQ	C_{18}-EB
Silica Gel	High purity porous spherical silica			
Average Particle Size	3 , 5, 15 µm*	3, 5, 15 µm	5, 15 µm	3 µm
Average Pore Size	approx. 120 Å			
Specific Surface Area	approx. 300 m²/g			
Bonded Phase Structure				
Bonded Phase	Octadecyl group			
Bonding Type	Monomeric	Polymeric		Monomeric
Main Interaction	Hydrophobic interaction			
End-capping Treatment	Near-perfect treatment			
Carbon Load	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

* For 2.5C_{18}-MS-II (2.5 µm), refer to page 12.
**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)

Comparing to COSMOSIL 5C_{18}-MS-II;
COSMOSIL 5C_{18}-AR-II retains planar compouds (sample 6.Triphenylene) longer. COSMOSIL 5C_{18}-PAQ has shorter retention time, and retains polar compounds (samples 1.Valerophenone, 2.*n*-Butyl Benzoate) longer.

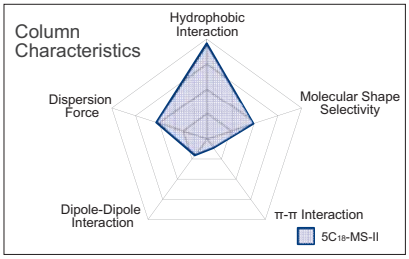


COSMOSIL C_{18}-MS-II

- First-choice column of our ODS series
- Multi-purpose C_{18} column
- High reproducibility
- A wide range of applications

Suitable Samples

- Low-M.W. Compounds



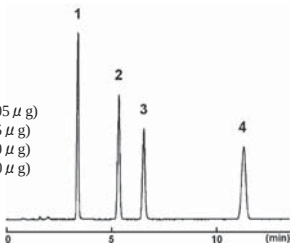
Separation Property

The COSMOSIL 5C_{18}-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 5C_{18}-MS-II is the first-choice column for reversed-phase chromatography.

Separation Property

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

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



NACALAI TESQUE, INC

AP-0421

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

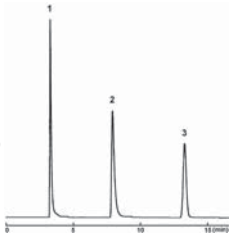
Column	Hydrophobic Interaction α (Toluene/Benzene)	Pressure (MPa)	Theoretical Plate Number (Toluene)
COSMOSIL 5C18-MS-II	1.96	8.3	14300
Company A C18	1.99	13.0	16800
Company B C18	1.94	8.0	14000
Company C C18	1.69	11.2	5600
Company D C18	1.84	10.5	14200

Analysis of Basic Compounds and Metal Coordination Compounds

The COSMOSIL 5C_{18}-MS-II column, taking advantage of a new end-capping treatment, can replace the original COSMOSIL C_{18} (ODS) column. A new end-capping treatment with polar groups for shielding effect has significantly improved peak shape for basic compounds. Ultra pure silica gel with low trace-metal content is used for COSMOSIL columns; thus the columns provide excellent peak shapes for chelating compounds.

Basic Compounds

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



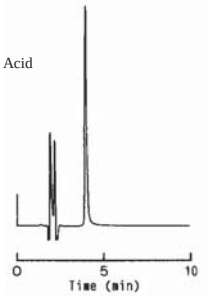
NACALAI TESQUE, INC

AP-1010

Metal Coordination Compounds

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

Sample: Oxine-copper



NACALAI TESQUE, INC

AP-0143

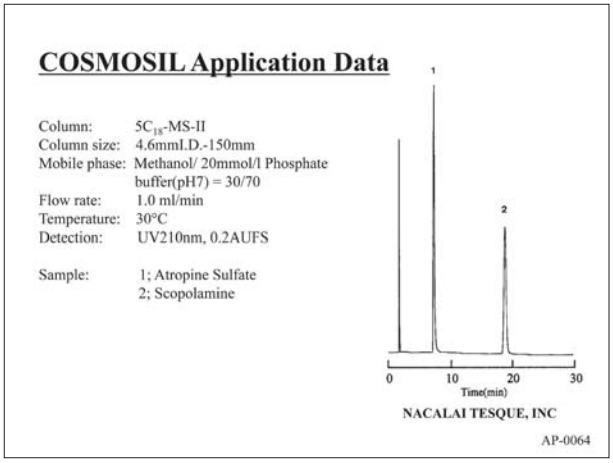
High Reproducibility

The strict quality control system of Nacalai Tesque ensures the quality of the silica gel and bonding and end capping process, reducing variation between lots. We support customers with an individual Inspection Report which accompanies each and every COSMOSIL, COSMOCORE and COSMOGEL packed column (except guard columns) and an additional Certificate of Analysis for the COSMOSIL 5C$_{18}$-MS-II (4.6 mm I.D. x 150 mm and 4.6 mm I.D. x 250 mm).

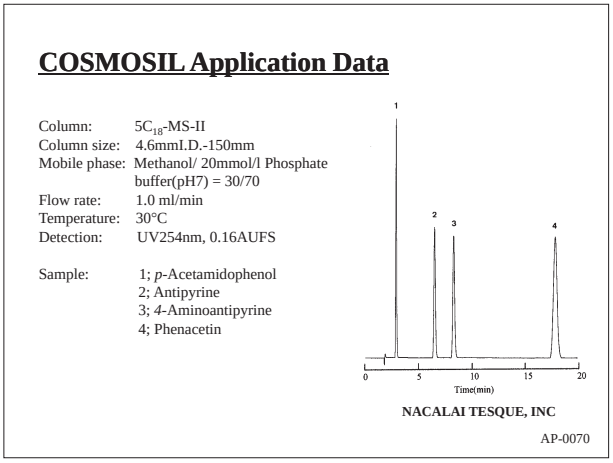
A Wide Range of Applications

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 5C$_{18}$-MS-II Packed Column

Column Size I.D. x Length (mm)	Product Number
1.0 x 50	02824-31
1.0 x 150	02896-01
2.0 x 30	05876-71
2.0 x 50	04355-21
2.0 x 100	05597-31
2.0 x 150	38025-91
2.0 x 250	05761-61
3.0 x 100	05458-51
3.0 x 150	34245-31
3.0 x 250	34254-11
4.6 x 30	34341-61
4.6 x 50	38017-01
4.6 x 100	38018-91
4.6 x 150*	38019-81
4.6 x 150 3 lots set	09397-73
4.6 x 250*	38020-41
6.0 x 150	38021-31
6.0 x 250	38022-21
10 x 50	05789-21
10 x 150	34355-91
10 x 250	38023-11
20 x 150	05091-41
20 x 250	38024-01
28 x 250	05760-71

COSMOSIL 5C$_{18}$-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, needs a holder, refer to page 64.

● Preparative Columns (Particle Size: 15 µm)

COSMOSIL 15C$_{18}$-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 15C$_{18}$-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 3C$_{18}$-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

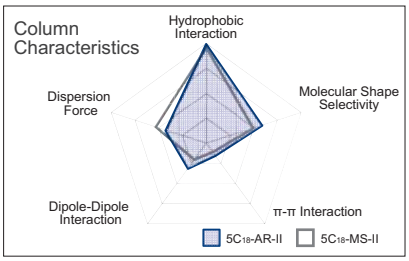
For more information, refer to page 12 for 2.5C$_{18}$-MS-II (2.5 µm).

COSMOSIL C_{18}-AR-II

- Features strong acid resistance

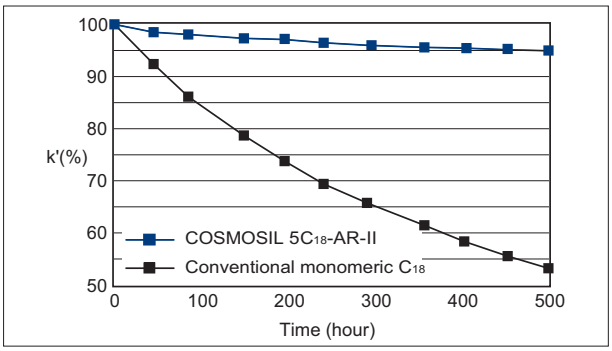
Suitable Samples

- Peptides, acidic compounds, etc.



Acid Resistance

The COSMOSIL 5C_{18}-AR-II packed column features a polymeric type of C_{18} reversed phase material. The acidic resistance of COSMOSIL 5C_{18}-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 / H_2O=70/30

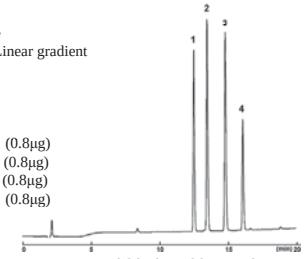
Applications

- Peptides

COSMOSIL Application Data

Column: 5C_{18}-AR-II
Column size: 4.6mmI.D.-150mm
Mobile phase: A; 0.05%TFA-H_2O
B; 0.05%TFA-Acetonitrile
B conc. 10→40% 20min Linear gradient
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV220nm

Sample: 1; Oxytocin (0.8μg)
2; Angiotensin II(Human) (0.8μg)
3; Angiotensin I(Human) (0.8μg)
4; Substance P (0.8μg)



NACALAI TESQUE, INC

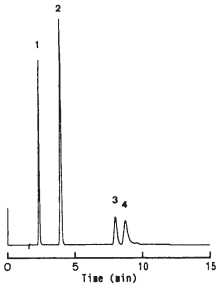
AP-0351

- Organic Acids

COSMOSIL Application Data

Column: 5C_{18}-AR-II
Column size: 4.6mmI.D.-150mm
Mobile phase: Methanol/ 20mmol/l Phosphoric Acid = 20/80
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV254nm, 0.5AUFS

Sample: 1; Gallic Acid (0.63μg)
2; Protocatechuic Acid (0.63μg)
3; Gentisic Acid (0.63μg)
4; Phthalic Acid (0.63μg)



NACALAI TESQUE, INC

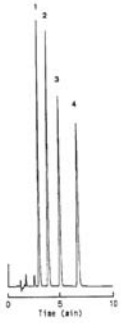
AP-0159

- Salicylic Acid Esters

COSMOSIL Application Data

Column: 5C_{18}-AR-II
Column size: 4.6mmI.D.-150mm
Mobile phase: Acetonitrile/ H_2O = 70/30
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV254nm, 0.2AUFS

Sample: 1; Methyl Salicylate (2.3μg)
2; Ethyl Salicylate (2.6μg)
3; *n*-Propyl Salicylate (2.3μg)
4; *n*-Butyl Salicylate (2.6μg)



NACALAI TESQUE, INC

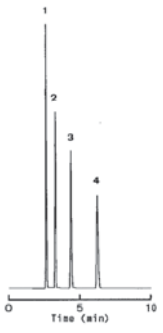
AP-0165

- Parabens

COSMOSIL Application Data

Column: 5C_{18}-AR-II
Column size: 4.6mmI.D.-150mm
Mobile phase: Acetonitrile/ H_2O = 50/50
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV254nm, 0.12AUFS

Sample: 1; Methyl *p*-Hydroxybenzoate (0.125μg)
2; Ethyl *p*-Hydroxybenzoate (0.125μg)
3; *n*-Propyl *p*-Hydroxybenzoate (0.125μg)
4; Butyl *p*-Hydroxybenzoate (0.125μg)

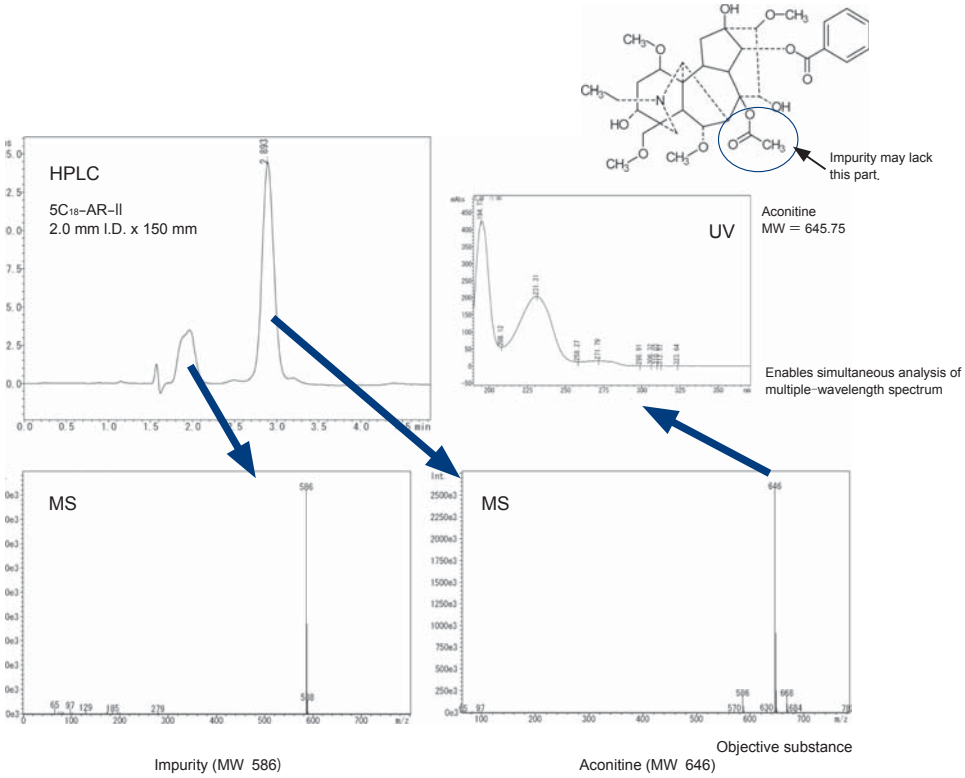


NACALAI TESQUE, INC

AP-0099

LC/MS Applications

● Identification of herbal medicine constituents by LC/MS



Ordering Information

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

COSMOSIL 5C18-AR-II Packed Column

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

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

COSMOSIL 5C18-AR-II Guard Column

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

* Validated columns

** 2 cartridges included, needs a holder, refer to page 64.

● 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

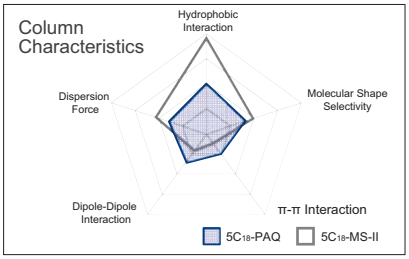
Column Size I.D. x Length (mm)	Product Number
2.0 x 50	05478-91
4.6 x 10	38068-41
4.6 x 50	38069-31
4.6 x 100	38070-91

COSMOSIL C_{18}-PAQ

- Compatible with 100% water based mobile phase

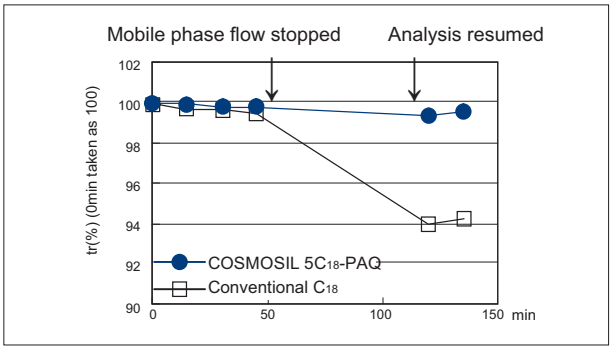
Suitable Samples

- 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 C_{18} column showed change of retention time, but COSMOSIL 5C18-PAQ maintained stable retention time.

Applications

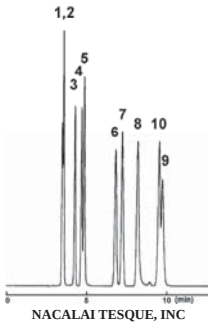
- Organic Acids

COSMOSIL Application Data

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

Sample:

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



NACALAI TESQUE, INC

AP-1058

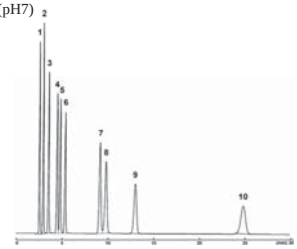
- Nucleobases and Nucleosides

COSMOSIL Application Data

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

Sample:

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



NACALAI TESQUE, INC

AP-0375

- dNTPs

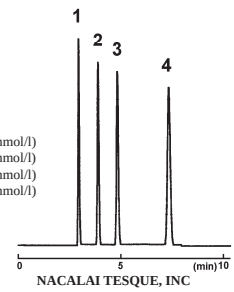
COSMOSIL Application Data

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

Sample:

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

Injection 0.5µl



NACALAI TESQUE, INC

AP-0371

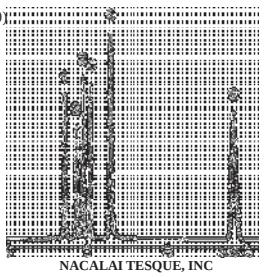
- Catecholamines

COSMOSIL Application Data

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

Sample:

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



NACALAI TESQUE, INC

AP-1056

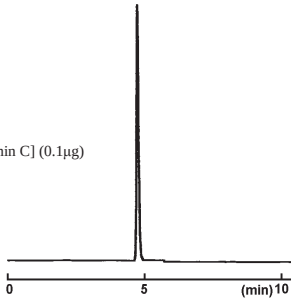
Applications

● Ascorbic Acid

COSMOSIL Application Data

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

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



NACALAI TESQUE, INC

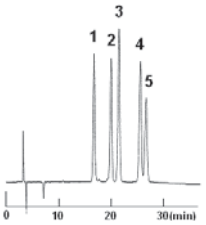
AP-0372

● *2*-Phenylethyl Glycosides

COSMOSIL Application Data

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

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



NACALAI TESQUE, INC

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

Ordering Information

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

COSMOSIL $5C_{18}$-PAQ Packed Column

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

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

COSMOSIL $5C_{18}$-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 $15C_{18}$-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 $15C_{18}$-PAQ Guard Column

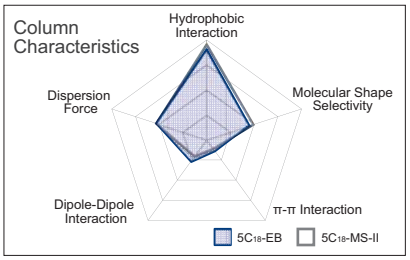
Column Size I.D. x Length (mm)	Product Number
28 x 50	05887-31
50 x 50	05889-11

COSMOSIL 3C$_{18}$-EB

- 3 µm C$_{18}$ 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



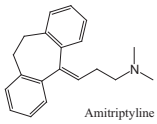
Analysis of Basic Compounds

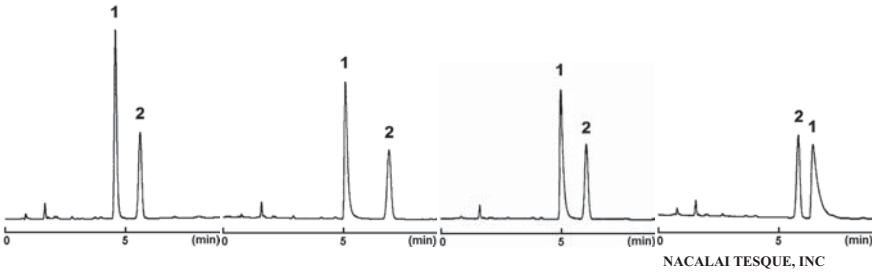
COSMOSIL 3C$_{18}$-EB uses a new end-capping method to reduce the number of residual silanol groups, which can cause peak tailing with basic compounds.

COSMOSIL Application Data

Column:
Column size: 4.6mmI.D.-75mm
Mobile phase: Acetonitrile/ 20mmol/l Phosphate buffer(pH7.0) = 60/40
Flow rate: 1.0 ml/min
Temperature: 40°C
Detection: UV254nm

Sample: 1; Amitriptyline (0.2mg/ml)
2; Propylbenzene (I.S.) (2.0mg/ml)
Inj. Vol: 1.0µl


Amitriptyline



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Analysis of Acidic Compounds or Metal Coordination Compouds

COSMOSIL 3C$_{18}$-EB utilizes a new end-capping method and high-purity silica gel to reduce tailing with metal coordination compounds.

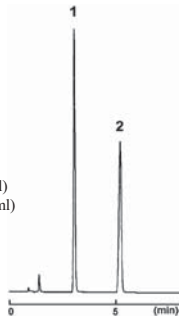
- Acidic Compounds

COSMOSIL Application Data

Column: 3C$_{18}$-EB
Column size: 4.6mmI.D.-75mm
Mobile phase: Acetonitrile/ 20mmol/l Phosphate buffer(pH2.5) = 30/70
Flow rate: 1.0 ml/min
Temperature: 40°C
Detection: UV254nm

Sample: 1; Salicylic Acid (1.0mg/ml)
2; Ethyl *p*-Hydroxybenzoate (I.S.)(0.05mg/ml)
Inj. Vol: 1.0µl


Salicylic Acid



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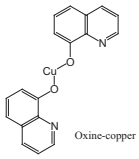
- Metal Coordination Compounds

COSMOSIL Application Data

Column: 3C$_{18}$-EB
Column size: 4.6mmI.D.-75mm
Mobile phase: Acetonitrile/ 20mmol/l Phosphoric Acid = 10/90
Flow rate: 1.0 ml/min
Temperature: 40°C
Detection: UV254nm

Sample: 1; Oxine-copper (0.03mg/ml)
2; Caffeine (I.S.) (0.3mg/ml)
Inj. Vol: 2.0µl


Oxine-copper

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Ordering Information

- Analytical Columns (Particle Size: 3 µm)

COSMOSIL 3C$_{18}$-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 3C$_{18}$-EB Guard Column

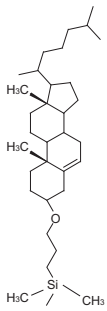
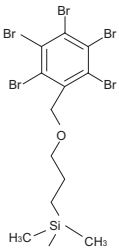
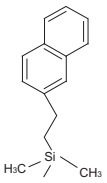
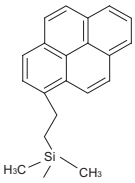
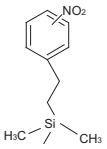
Column Size I.D. x Length (mm)	Product Number
2.0 x 10 Cartrige**	11892-74
4.6 x 10	09839-41
4.6 x 10 Cartrige**	11890-94

* Validated columns

** 2 cartridges included, needs a holder, refer to page 64.

(2) Reversed Phase Specialty Columns

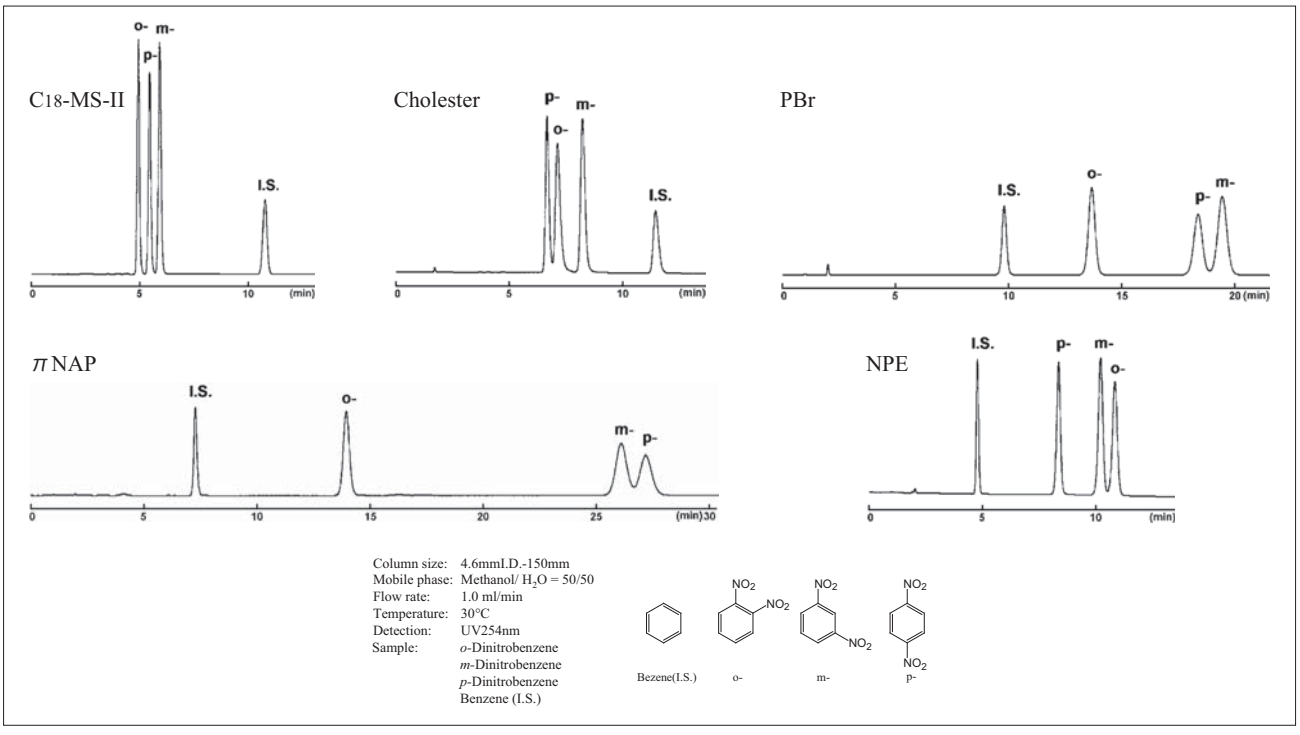
Specifications

Packing Material	Cholester	PBr	πNAP	PYE	NPE
Silica Gel	High purity porous spherical silica				
Average Particle Size	5 μm*				
Average Pore Size	approx. 120 Å				
Specific Surface Area	approx. 300 m^2/g				
Bonded Phase Stracture					
Bonded Phase	Cholesteryl group	Pentabromobenzyl group	Naphtylethyl group	Pyrenylethyl group	Nitrophenylethyl group
Bonding Type	Monomeric				
Main Interaction	•Hydrophobic interaction •Molecular shap selectivity	•Hydrophobic interaction •Dispersion force	•Hydrophobic interaction •π–π interaction	•Hydrophobic interaction •π–π interaction •Dispersion force •Charge–tansfer interaction	•Hydrophobic interaction •π–π interaction •Dipole–dipole interaction
End–capping Treatment	Near–perfect treatment				
Carbon Load	approx. 20%	approx. 8%	approx. 11%	approx. 18%	approx. 9%
pH Range	2–7.5				
Features	•Usable under condition the same as C_{18} •High molecular sharp selectivity	•Separe hydrophilic compounds in reversed–phase conditions	•Stronger π–π interaction than phenyl column	•Strongest π–π interaction	•Dipole–dipole interaction

*For 2.5Cholester, 2.5πNAP (2.5 μm), refer to page 11.

Selectivity for positional isomers of dinitrobenzene

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

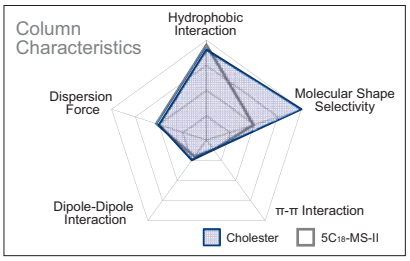


COSMOSIL Cholester

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

Suitable Samples

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

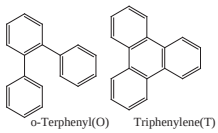


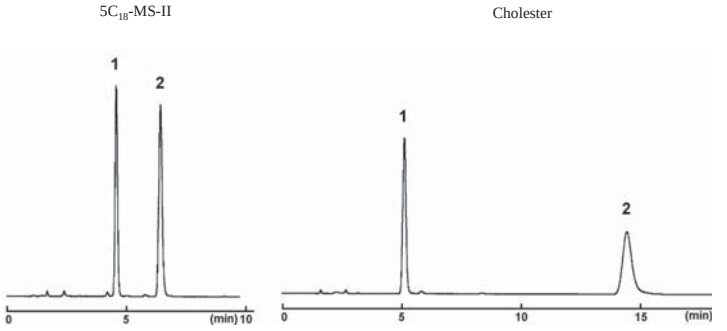
Molecular Shape Selectivity

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.

Comparison of Molecular Shape Selectivity

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





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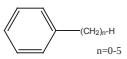
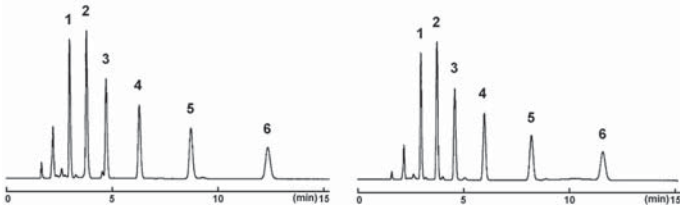
Hydrophobic Interaction

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

Comparison of Hydrophobic Interaction

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





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Ordering Information

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

COSMOSIL Cholester Packed Column

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

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

* Validated Columns

COSMOSIL Cholester Guard Column

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

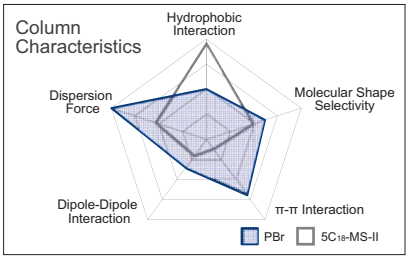
For more information on 2.5Cholester (2.5 μm), refer to page 13.

COSMOSIL PBr

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

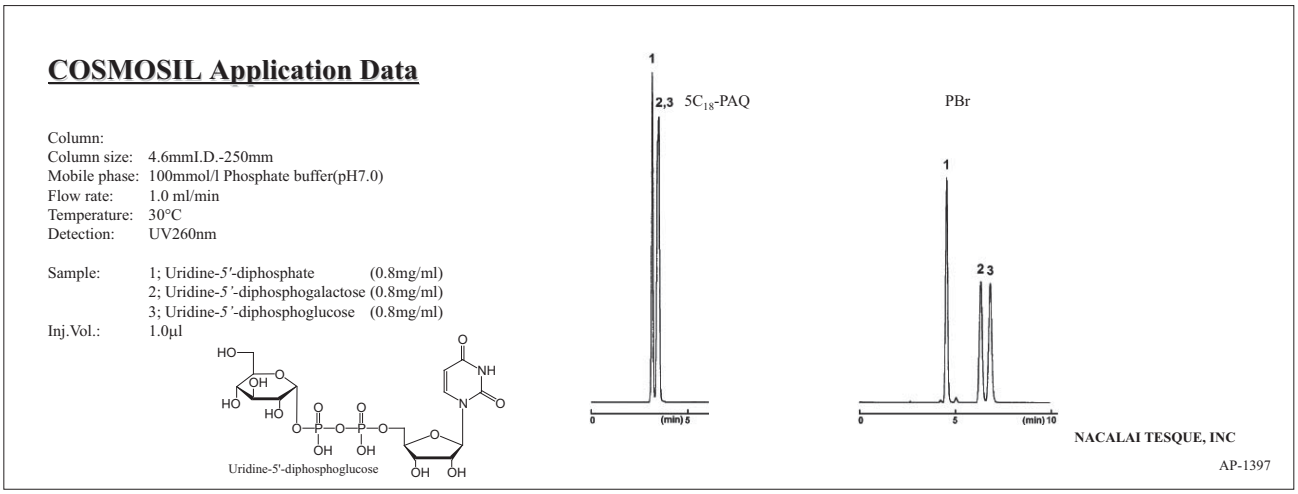
Suitable Samples

- Hydrophilic compounds
- Nucleotides, peptides, catecholamines and oligosaccharides



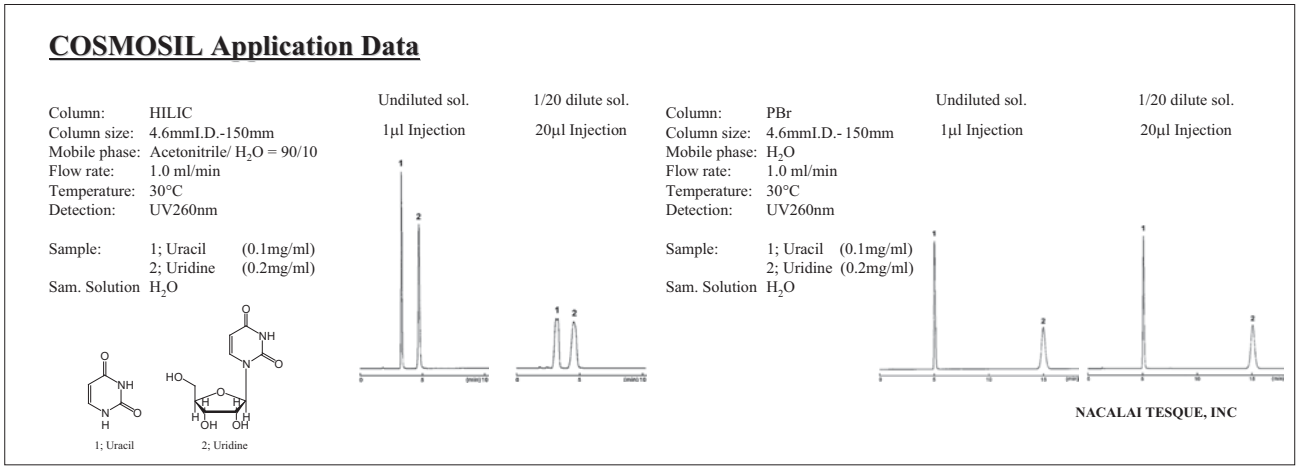
Comparison with C_{18}

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



Comparison with HILIC

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



Ordering Information

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

COSMOSIL PBr Packed Column

Column Size I.D. x Length (mm)	Product Number	Column Size I.D. x Length (mm)	Product Number
2.0 x 50	13244-91	10 x 50	13253-71
2.0 x 100	13245-81	10 x 100	13254-61
2.0 x 150	12392-81	10 x 150	13255-51
2.0 x 250	13247-61	10 x 250	12397-31
3.0 x 50	12592-61	20 x 50	13257-31
3.0 x 100	13249-41	20 x 100	13258-21
3.0 x 150	13250-01	20 x 150	13259-11
3.0 x 250	13251-91	20 x 250	12398-21
4.6 x 50	13252-81	28 x 100	13260-71
4.6 x 150	12394-61	28 x 150	13261-61
4.6 x 250	12395-51	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

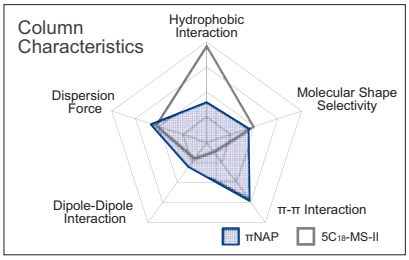
* 2 cartridges included, needs a holder, refer to page 64.

COSMOSIL πNAP

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

Suitable Samples

- Aromatic compounds and positional isomers



Comparison of π-π Interactions

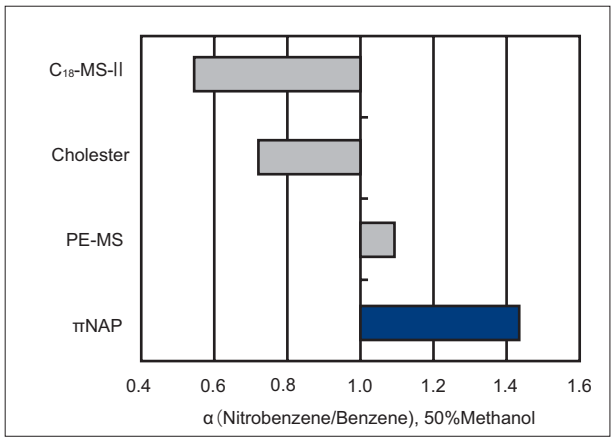
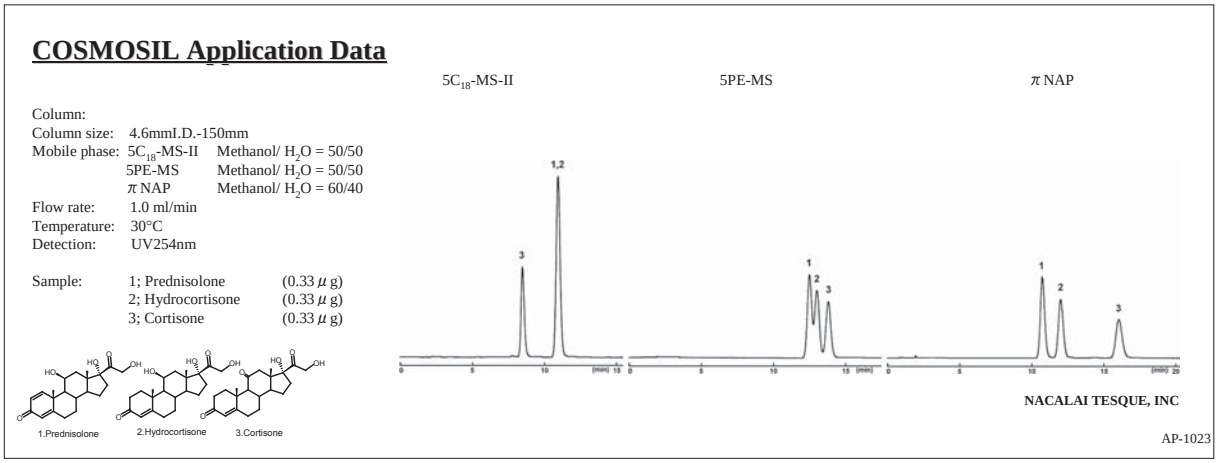


Figure. Comparison of π−π interaction

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

Applications

- Adrenal Cortical Hormones



Ordering Information

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

COSMOSIL πNAP Packed Column

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

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

COSMOSIL πNAP Guard Column

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

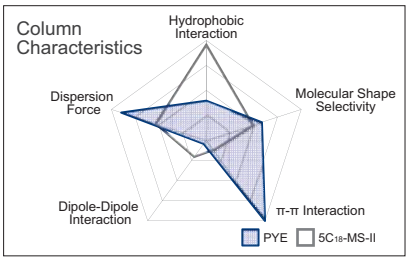
For more information on 2.5πNAP (2.5 μm), refer to page 14.

COSMOSIL PYE

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

Suitable Samples

- Aromatic compounds, positional isomers, dioxins, and PCBs



Comparison of π-π Interaction

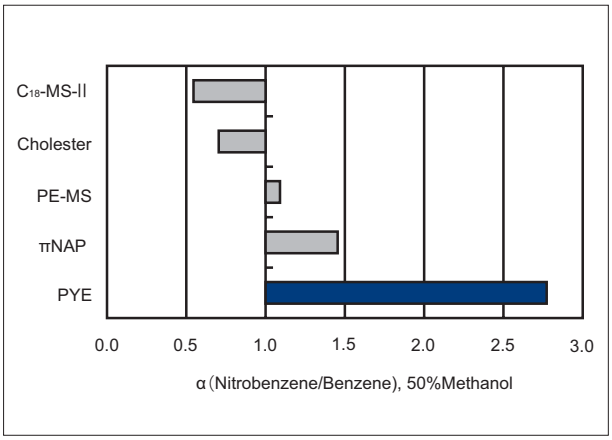
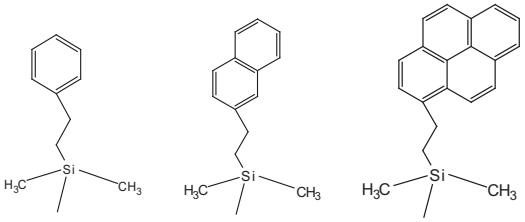


Figure. Comparison of π–π interactions

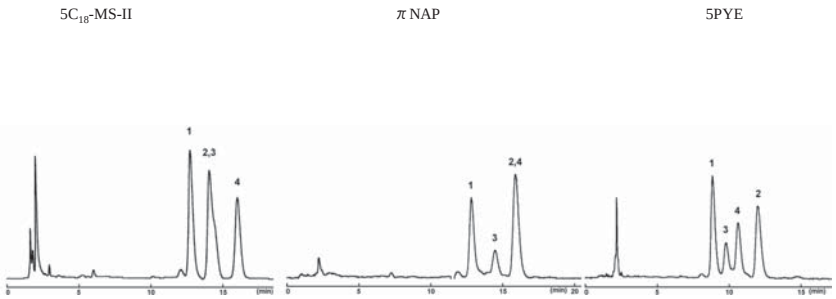
COSMOSIL PYE provides much stronger π–π interactions than πNAP page 27.



Applications

- Sterols

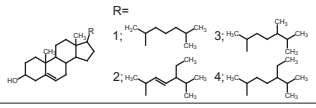
COSMOSIL Application Data



Column:
Column size: 4.6mmI.D.-150mm
Mobile phase: $5C_{18}$-MS-II Methanol/ H_2O = 98/2
π NAP Methanol/ H_2O = 90/10
5PYE Methanol/ H_2O = 95/5
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV210nm

Sample: 1; Cholesterol (5.6 μg)
2; Stigmasterol (5.9 μg)
3; Campesterol
4; Sitosterol

R=



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Caution

1. Methanol is recommended as a mobile phase for COSMOSIL PYE column. 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 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 PYE column is not suitable for gradient analysis.

Ordering Information

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

COSMOSIL 5PYE Packed Column

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

COSMOSIL 5PYE Guard Column

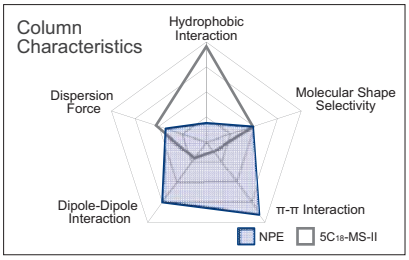
Column Size I.D. x Length (mm)	Product Number
4.6 x 10	37903–11
10 x 20	38041–71
20 x 20	05867–91
20 x 50	34475–21

COSMOSIL NPE

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

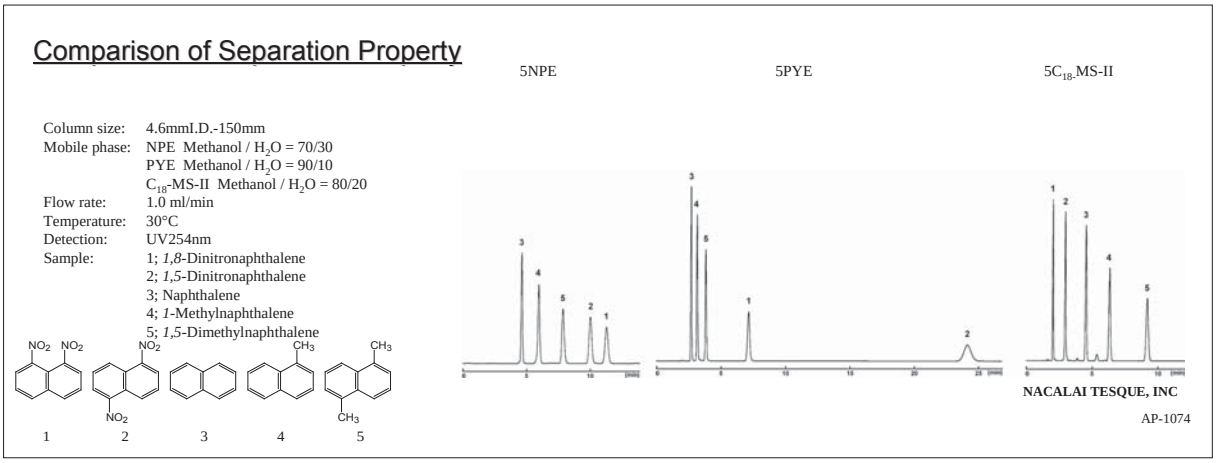
Suitable Samples

- Isomers and nitro compounds



Selectivity for Dipole-Dipole Interactions

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



Caution

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

Ordering Information

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

COSMOSIL 5NPE Packed Column

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

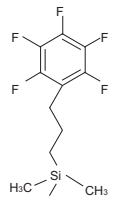
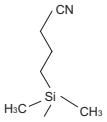
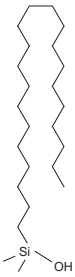
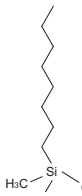
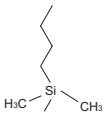
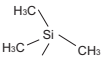
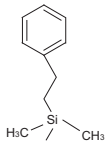
Column Size I.D. x Length (mm)	Product Number
4.6 x 150	37902-21
4.6 x 250	37990-71
10 x 250	05469-11
20 x 250	38046-21

COSMOSIL 5NPE Guard Column

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

(3) Other Reversed Phase HPLC Columns

Specifications

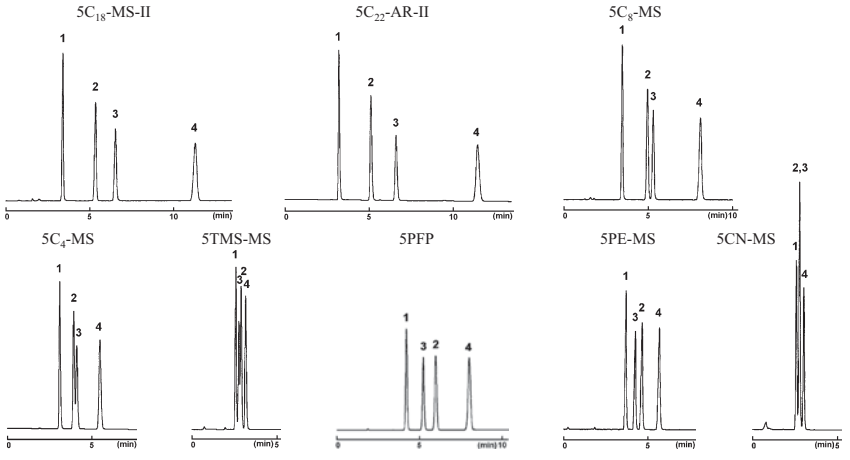
Packing Material	PFP	CN-MS	C_{22}-AR-II	C_8-MS	C_4-MS	TMS-MS	PE-MS
Silica Gel	High purity porous spherical silica						
Average Particle Size	5 µm						
Average Pore Size	approx. 120 Å						
Specific Surface Area	approx. 300 m^2/g						
Bonded Phase Stracture							
Bonded Phase	Pentafluorophenyl group	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 Load	approx. 10%	approx. 7%	approx. 19%	approx. 10%	approx. 7%	approx. 5%	approx. 10%
pH Range	2–7.5						

Difference in Separation Characteristics

COSMOSIL Application Data

Column:
Column size: 4.6mmI.D.-150mm
Mobile phase: Methanol/ H_2O = 60/40
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV254nm

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

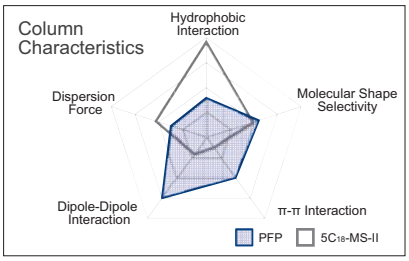


COSMOSIL PFP

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

Suitable Samples

- Vitamin E, Structural isomers and fluorides



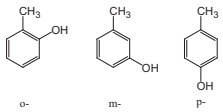
Alternative Selectivity to C_{18} Columns

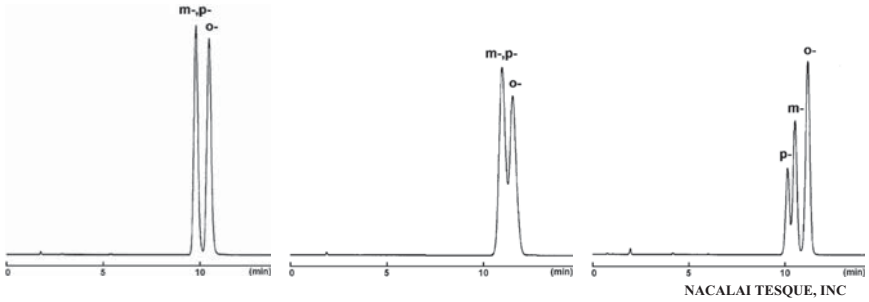
COSMOSIL PFP provides different selectivity from C_{18} Columns. Furthermore, it offers improved separation compared to other PFP columns.

COSMOSIL Application Data

Column:
Column size: 4.6mmI.D.-150mm
Mobile phase: Methanol/ H_2O = 40/60
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV254nm

Sample: *o*-Cresol (3.0mg/ml)
m-Cresol (3.0mg/ml)
p-Cresol (3.0mg/ml)
Inj.Vol.: 1.0µl





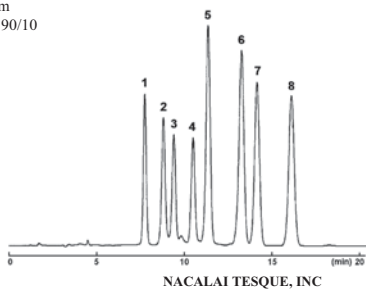
Applications

- Vitamin E

COSMOSIL Application Data

Column: 5PFP
Column size: 4.6mmI.D.-250mm
Mobile phase: Methanol/ H_2O = 90/10
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV295nm

Sample: 1; δ-Tocotrienol
2; β-Tocotrienol
3; γ-Tocotrienol
4; α-Tocotrienol
5; δ-Tocopherol
6; β-Tocopherol
7; γ-Tocopherol
8; α-Tocopherol

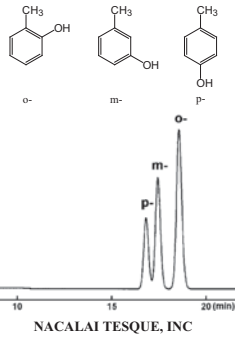


- Cresol Isomers

COSMOSIL Application Data

Column: 5PFP
Column size: 4.6mmI.D.-250mm
Mobile phase: Methanol/ H_2O = 40/60
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV254nm

Sample: *o*-Cresol (3.0mg/ml)
m-Cresol (3.0mg/ml)
p-Cresol (3.0mg/ml)
Inj.Vol.: 1.0µl



Ordering Information

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

COSMOSIL 5PFP Packed Column

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

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

COSMOSIL 5PFP Guard Column

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

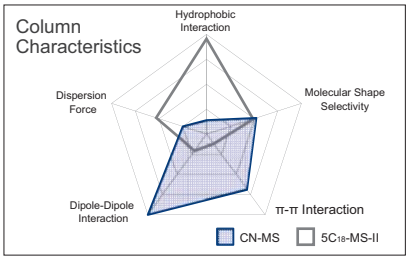
* 2 cartridges included, needs a holder, refer to page 64.

COSMOSIL CN-MS

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

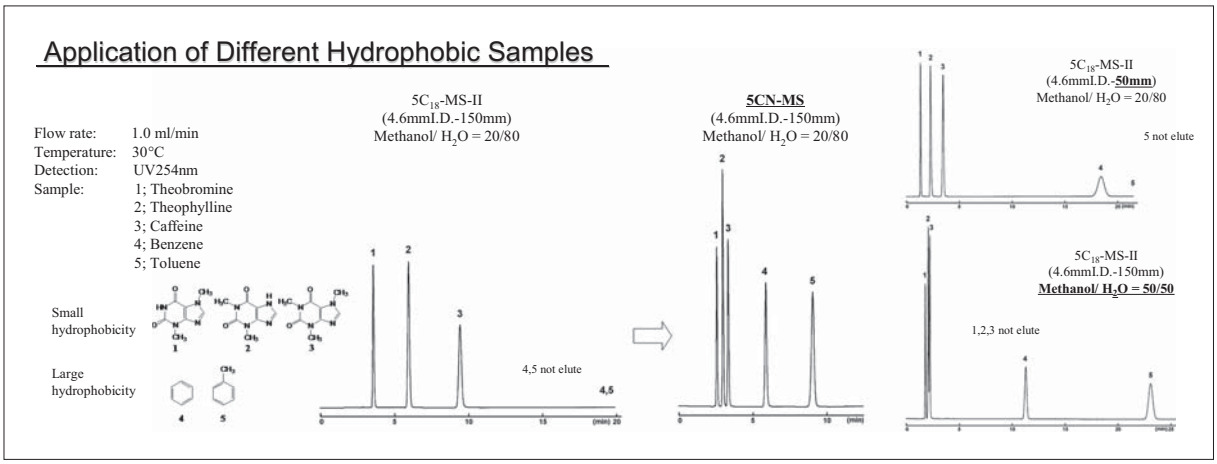
Suitable Samples

- Mixtures of natural compounds



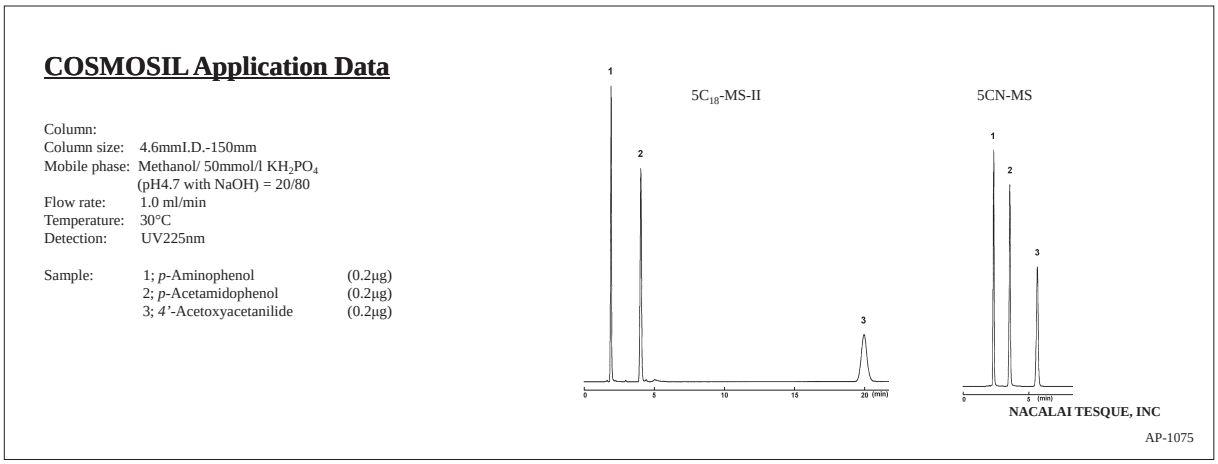
Rapid Analysis

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



Applications

- Acetoaminophen



Ordering Information

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

COSMOSIL 5CN-MS Packed Column

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

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

COSMOSIL 5CN-MS Guard Column

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

COSMOSIL C_{22}-AR-II, C_8-MS, C_4-MS, TMS-MS, PE-MS

Ordering Information

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

COSMOSIL 5C_{22}-AR-II Packed Column

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

COSMOSIL 5C_{22}-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 5C_8-MS Packed Column

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

COSMOSIL 5C_8-MS Guard Column

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

COSMOSIL 5C_4-MS Packed Column

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

COSMOSIL 5C_4-MS Guard Column

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

COSMOSIL 5TMS-MS Packed Column

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

COSMOSIL 5TMS-MS Guard Column

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

COSMOSIL 5PE-MS Packed Column

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

COSMOSIL 5PE-MS Guard Column

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

2. Normal Phase Chromatography Column

COSMOSIL SL-II

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

Specifications

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

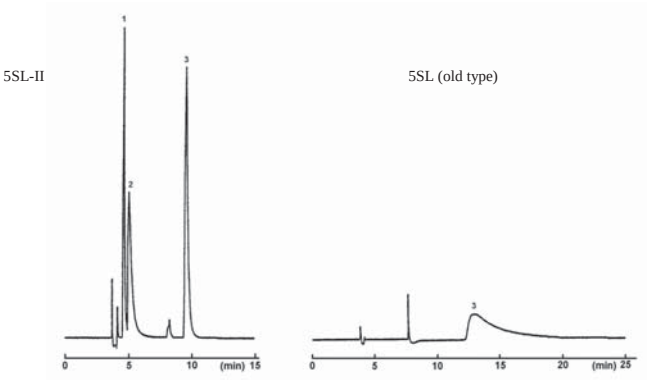
Comparison with Old Type

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

Comparison with Old Type

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

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



NACALAI TESQUE, INC

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

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

COSMOSIL15SL–II Guard Column

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

● Fast LC column (Particle Size: 3 µm)

COSMOSIL 3SL–II Packed Column

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

3. Hydrophilic Interaction Chromatography Column

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 viatamines

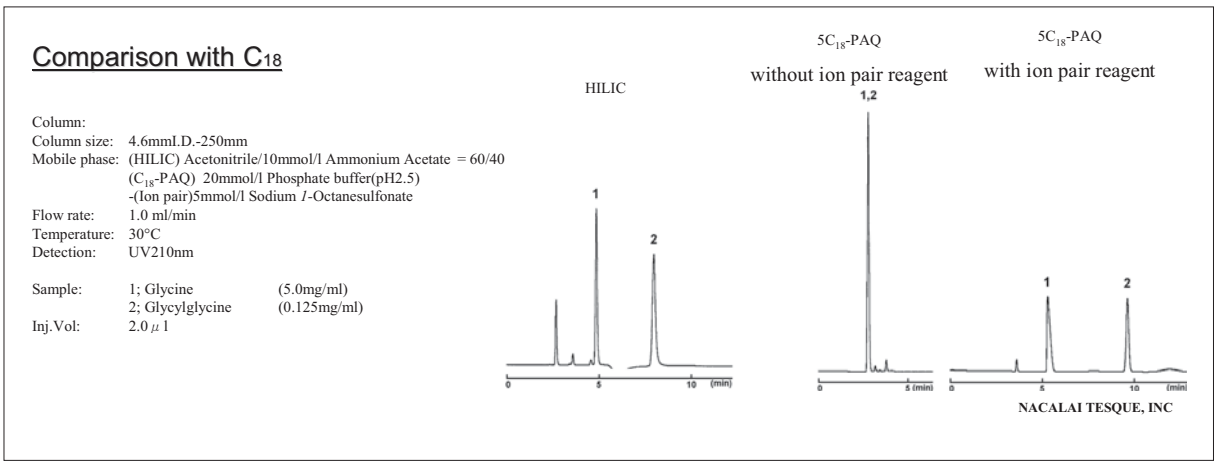
Specifications

Packing Material	HILIC
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	Triazole
Interaction	Hydrophilic interaction, anion exchange
Target Substance	Hydrophilic compounds, acidic compounds
Features	Suitable for compounds not retained by C_{18}

* For more information on 2.5HILIC (2.5 µm), refer to page 15.

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.



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

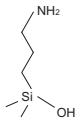
Column Size I.D. x Length (mm)	Product Number
4.6 x 10	07055-61
10 x 20	07058-31
20 x 20	07854-91
20 x 50	07873-41
28 x 50	07874-31

4. Mono-and Oligosaccharide Analysis Columns

Introduction

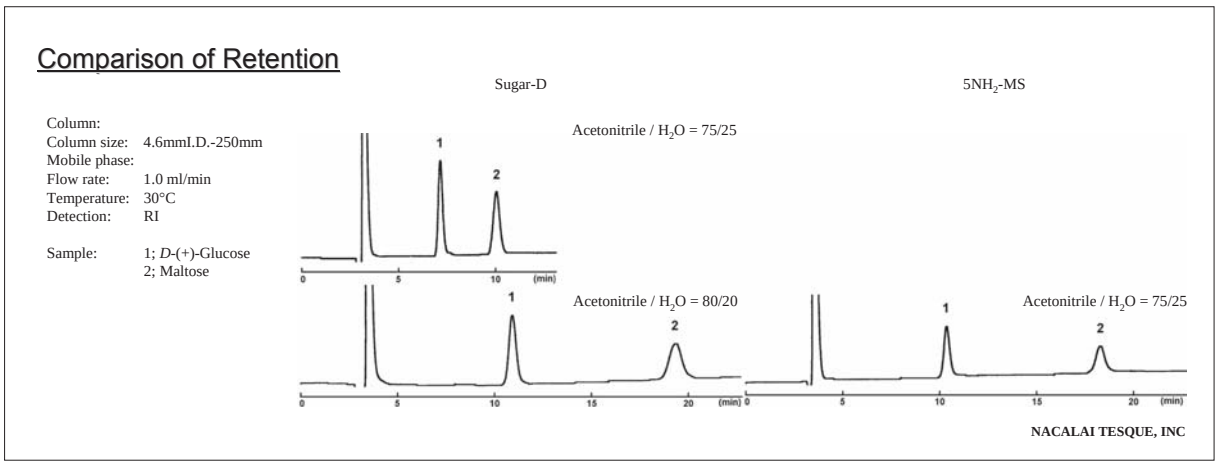
Saccharides are not retained on standard C_{18} columns because of their low hydrophobicity. COSMOSIL Sugar-D and NH_2-MS are specifically designed for separation of saccharides. COSMOSIL C_{18}-PAQ is recommended for hydrophobic glycosides or saccharide derivatives.

Specifications

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

Comparison of Retention

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

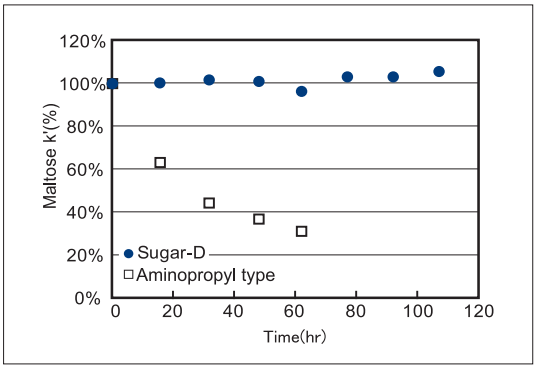


COSMOSIL Sugar-D

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

Comparison of Durability

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



Decomposition Condition

Solution	Water
Flow Rate	1.0 ml/min
Temperature	Room Temperature

Column	4.6 mm I.D. x 250 mm
Mobile Phase	Acetonitrile : Water = 70 : 30
Flow Rate	1.0 ml/min
Temperature	30°C
Detection	RI
Sample	Maltose

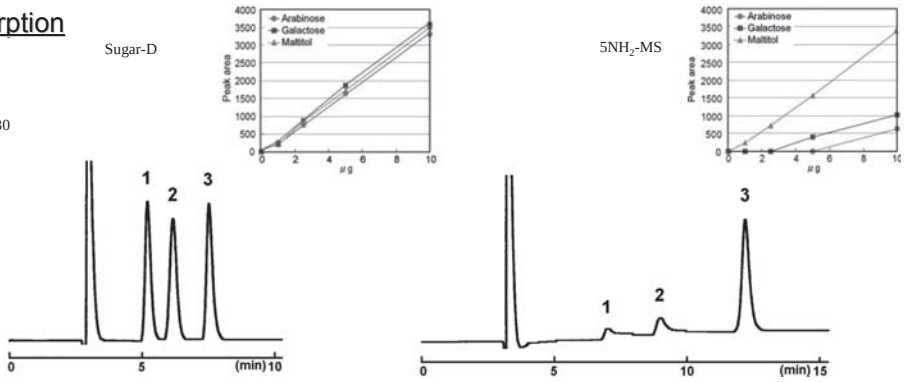
Comparison of Adsorption

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.

Comparison of Adsorption

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

Sample: 1; *D*-(-)-Arabinose
2; *D*-(+)-Galactose
3; Maltitol



Applications

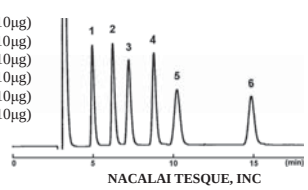
- Mono- and Oligosaccharides
- Polyols

COSMOSIL Application Data

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

Sample:

1; *L*-(+)-Rhamnose	(10μg)	
2; *D*-(-)-Fructose	(10μg)	
3; *D*-(+)-Glucose	(10μg)	
4; Sucrose	(10μg)	
5; Maltose	(10μg)	
6; *D*-(+)- Raffinose	(10μg)	



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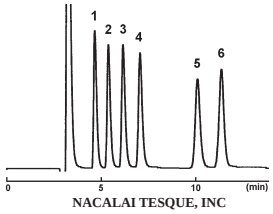
AP-0329

COSMOSIL Application Data

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

Sample:

1; Glycerol	(10μg)	
2; *meso*-Erythritol 〔*meso* - Erythrite〕	(10μg)	
3; Xylitol	(10μg)	
4; *D*-Glucitol	(10μg)	
5; Maltitol	(10μg)	
6; *myo*-Inositol	(10μg)	



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AP-0330

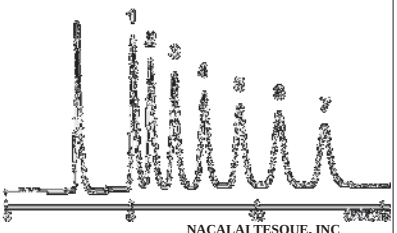
Applications

● Oligomaltoses

COSMOSIL Application Data

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

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



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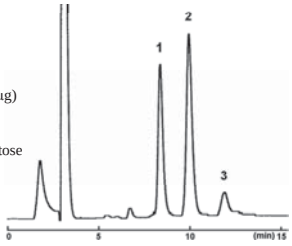
AP-0331

● Oligofructoses

COSMOSIL Application Data

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

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



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AP-0320

Ordering Information

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

COSMOSIL Sugar–D Packed Column

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

COSMOSIL Sugar–D Guard Column

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

NH_2-MS

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

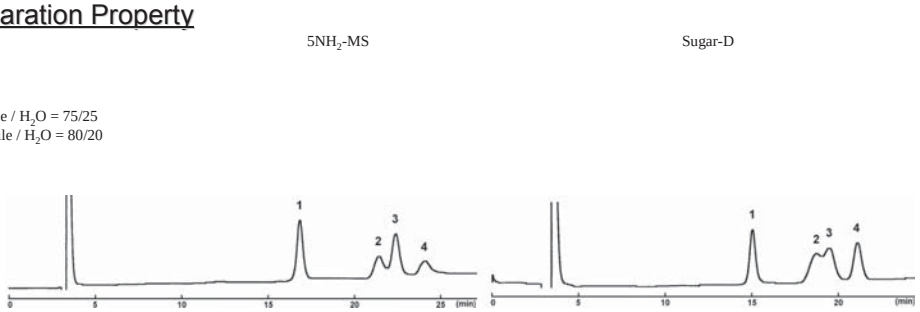
Comparison of Adsorption

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

Comparison of Separation Property

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

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



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Ordering Information

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

COSMOSIL 5NH_2–MS Packed Column

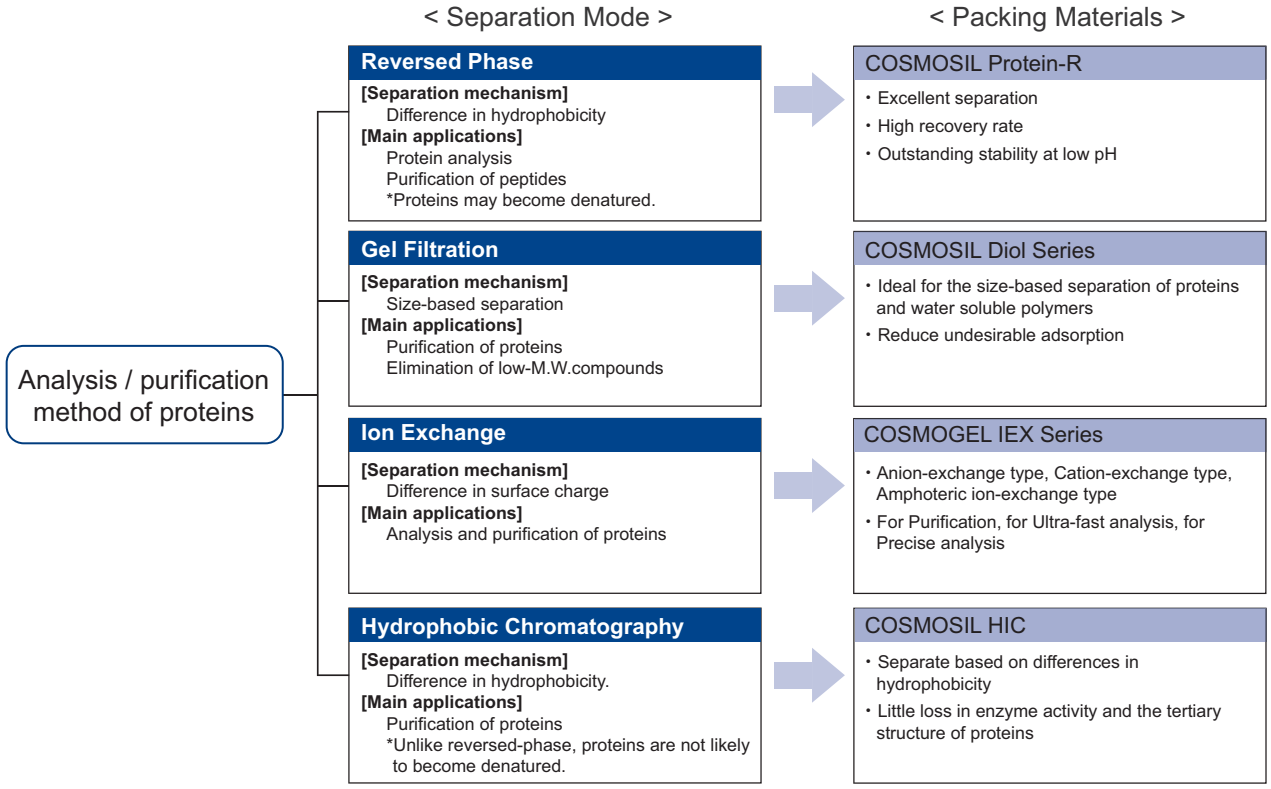
Column Size I.D. x Length (mm)	Product Number
4.6 x 150	38245–11
4.6 x 250	38246–01
10 x 250	38249–71
20 x 250	38250–31

COSMOSIL 5NH_2–MS Guard Column

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

5. Protein Separation Columns

Protein separation with HPLC



(1) Reversed Phase Chromatography

COSMOSIL Protein-R

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

Specifications

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

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

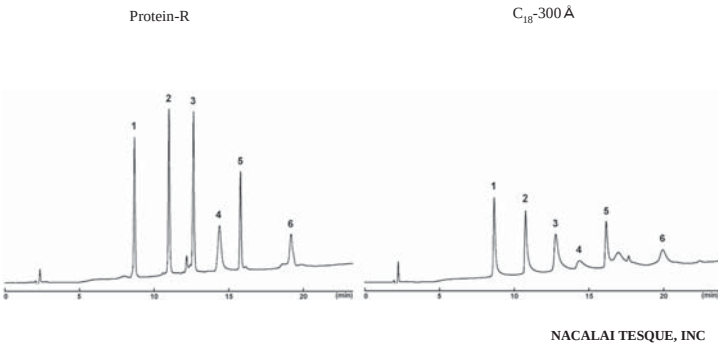
Comparison of Separation

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

Comparison of Separation Property

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

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



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Ordering Information

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

COSMOSIL Protein-R Packed Column

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

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

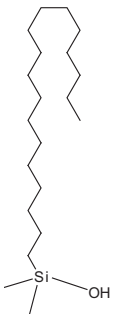
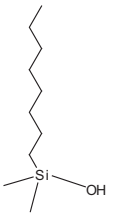
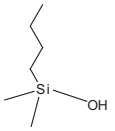
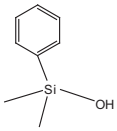
COSMOSIL Protein-R Guard Column

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

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

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

Specifications

Packing Material	5C_{18}-AR-300	5C_8-AR-300	5C_4-AR-300	5Ph-AR-300
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 Load	approx. 12%	approx. 7%	approx. 6%	approx. 7%

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

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

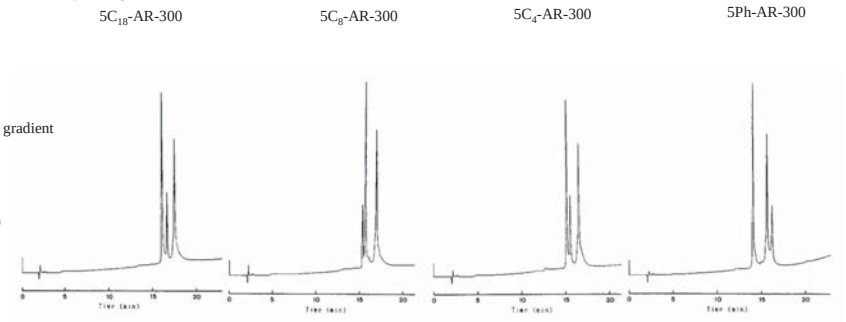
Comparison of Separation

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

Comparison of Separation Property

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

Sample: Hemoglobin, Bovine (10 μg)



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Ordering Information

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

COSMOSIL 5C18-AR-300 Packed Column

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

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

COSMOSIL 5C18-AR-300 Guard Column

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

COSMOSIL 5C8-AR-300 Packed Column

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

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

COSMOSIL 5C8-AR-300 Guard Column

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

COSMOSIL 5C4-AR-300 Packed Column

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

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

COSMOSIL 5C4-AR-300 Guard Column

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

COSMOSIL 5Ph-AR-300 Packed Column

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

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

COSMOSIL 5Ph-AR-300 Guard Column

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

(2) Gel Filtration Chromatography Column (aqueous)

COSMOSIL Diol-120-II,Diol-300-II

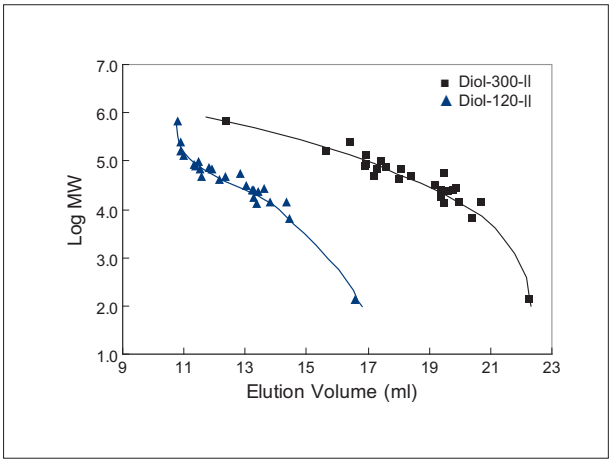
- Ideal for the size-based separation of proteins and water-soluble polymers
- Reduce undesirable adsorption

Specifications

Packing Material	5Diol-120-II	5Diol-300-II
Silica Gel	High purity porous spherical silica	
Average Particle Size	5 µm	
Average Pore Size	approx. 120 Å	approx. 300 Å
Bonded Phase	Diol group	
Object Substance	Proteins, water soluble polymers	
Flow Rate	0.5-1.0 (ml/min)	
Selection of Pore Size (protein)	5,000-100,000	10,000-700,000
Selection of Pore Size (water soluble polymers)	300-30,000	500-300,000

Calibration Curve

- Calibration Curve of Proteins



Column COSMOSIL 5Diol-II 7.5mmI.D.x 600 mm
Mobile Phase 20mmol/l Phosphate Buffer (pH7.0)+100mmol/l Na_2S0_4
Flow Rate 1.0ml/min
Temperature 30°C

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

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

(3) Ion Exchange Chromatography Column

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/Average Particle Size	Hydrophilic polymer / 5 µm					
Average Pore Size	1000 Å	Non-porous	1000 Å	Non-porous	1000 Å	Non-porous
Functional Group	$-CH_3N^+(CH_3)_3$		$-(CH_2)_3SO_3^-$		$-CH_3N^+(CH_3)_3$ + $-(CH_2)_3SO_3^-$	
Protein Binding Capacity	110-150 mg	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 Lengh (mm)	4.6-50	4.6-30 / 4.6-100	4.6-50	4.6-30 / 4.6-100	4.6-50	4.6-100
Column Material	PEEK					
Connection	Waters Type					

Type of Packing Material

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

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

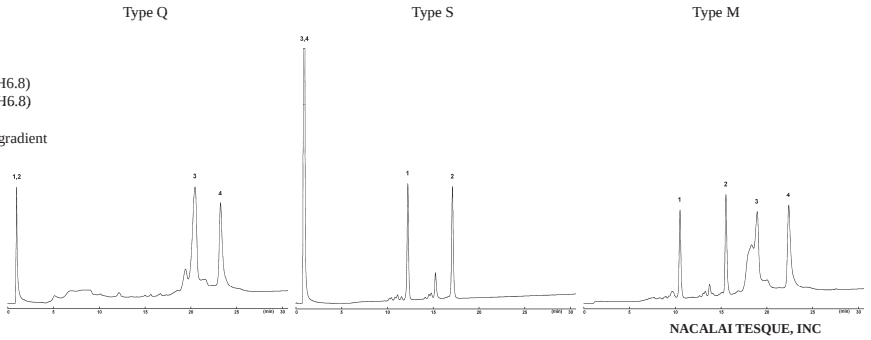
- Comprehensive isolation of proteins by amphoteric ion-exchange type (Type M)

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

COSMOSIL Application Data

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

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



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Type of Column

COSMOGEL IEX columns are available for 3 types of applications:

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

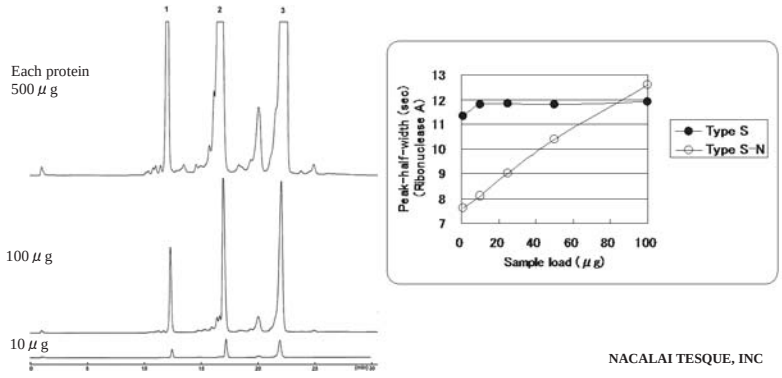
- For Purification: Type Q, Type S, Type M

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

COSMOSIL Application Data

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

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



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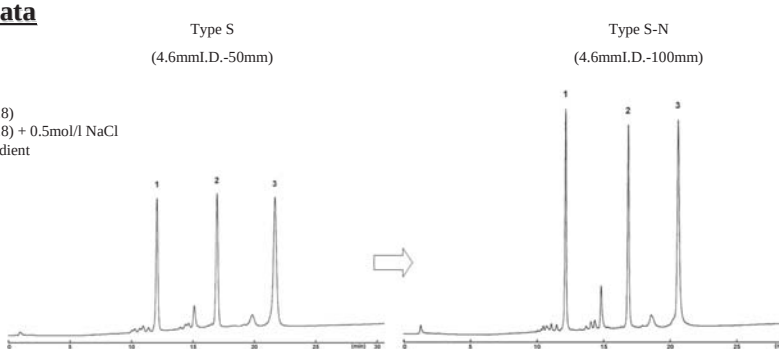
- For Precise Analysis: Type Q-N, Type S-N, Type M-N

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

COSMOSIL Application Data

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

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



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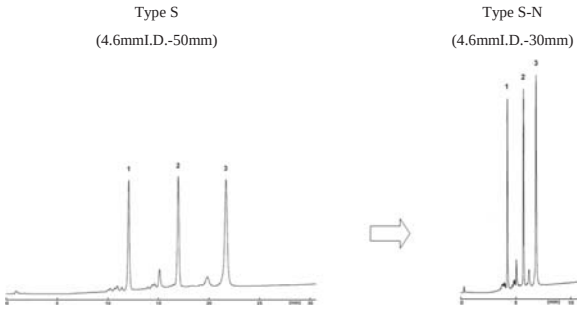
- For Ultra-fast Analysis: Type Q-N, Type S-N

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

COSMOSIL Application Data

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

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



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Ordering Information

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

(4) Hydrophobic Interaction Chromatography Column

COSMOSIL HIC

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

Specifications

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

Applications

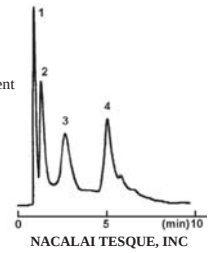
A buffer with high salt concentration, usually 1-2 mol/l of $(NH_4)_2SO_4$, is used as an initial mobile phase for adsorption of samples to a weakly hydrophobic stationary phase. The elution is done with a decreasing salt gradient. The application in the lower left shows that myoglobin elutes earlier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

- Separation of Protein Standards

COSMOSIL Application Data

Column: HIC
Column size: 4.6mmI.D.-50mm
Mobile phase: A:20mmol/l Phosphate Buffer
+100mmol/l Na_2SO_4
+1.5mol/l $(NH_4)_2SO_4$(pH6.7)
B:20mmol/l Phosphate Buffer
+100mmol/l Na_2SO_4(pH6.7)
B conc. 0→100% 10min Linear gradient
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV220nm

Sample:
1; Myoglobin (1.0 µg)
2; β-Lactoglobulin (2.0 µg)
3; Hemoglobin, Bovine (5.0 µg)
4; Albumin, Bovine [BSA] (2.0 µg)



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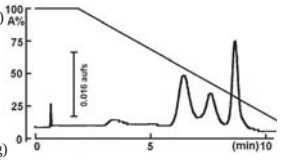
AP-0406

- Separation of β-Glucosidase

COSMOSIL Application Data

Column: HIC
Column size: 4.6mmI.D.-50mm
Mobile phase: A:20mmol/l Phosphate Buffer
+100mmol/l Na_2SO_4
+2mol/l $(NH_4)_2SO_4$(pH6.7)
B:20mmol/l Phosphate Buffer
+100mmol/l Na_2SO_4(pH6.7)
B conc. 0→100% 10min
Linear gradient
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV220nm

Sample: β-Glucosidase (15 µg)



NACALAI TESQUE, INC
AP-0407

Ordering Information

- Analytical Columns (Particle Size: 5 µm)

COSMOSIL 5HIC Packed Column

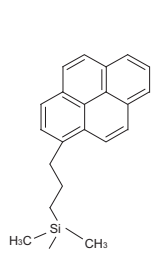
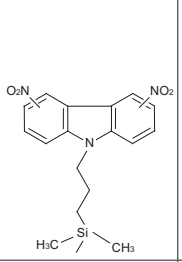
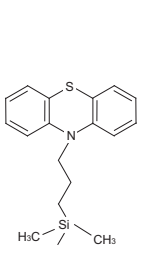
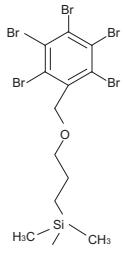
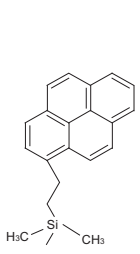
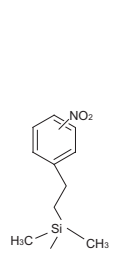
Column Size I.D. x Length (mm)	Product Number
4.6 x 50	04263-21

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.

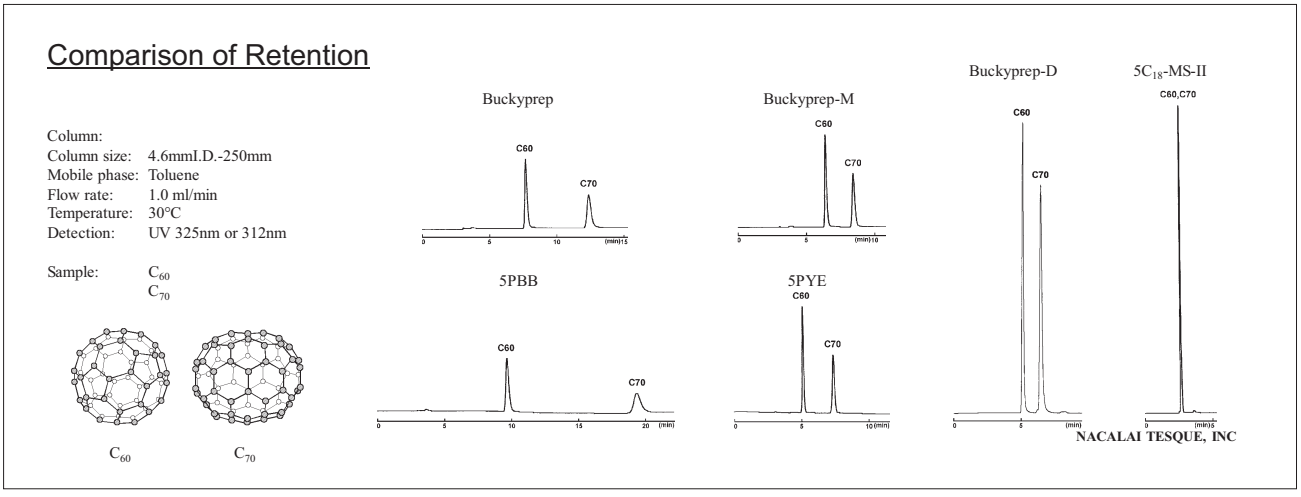
Specifications

Packing Material	Buckyprep	Buckyprep-D	Buckyprep-M	PBB	PYE	NPE
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 Load	approx. 17%	–	approx. 13%	approx. 8%	approx. 18%	approx. 9%
Features	• Standard column for fullerene separation.	• For separation of derivatized fullerenes	• Designed to separate metallofullerenes	• Designded for preparative separation of C_{60}, C_{70}	• Separation of fullerene and structural isomers	• Separation of fullerene derivatives

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

Comparison of Retention

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



Suggested Solvents for Fullerene Separation

Solvent	Solubility of C60 (mg/ml)	Features
Toluene	3.2	The most commonly used solvent.
n-Hexane	0.046	Weaker eluent than toluene
n-Heptane	--	
Methanol	0.001	
2-Propanol	--	
Acetonitrile	0.018	Weaker eluent than toluene. Recommended as a washing solvent for Buckyprep-D.

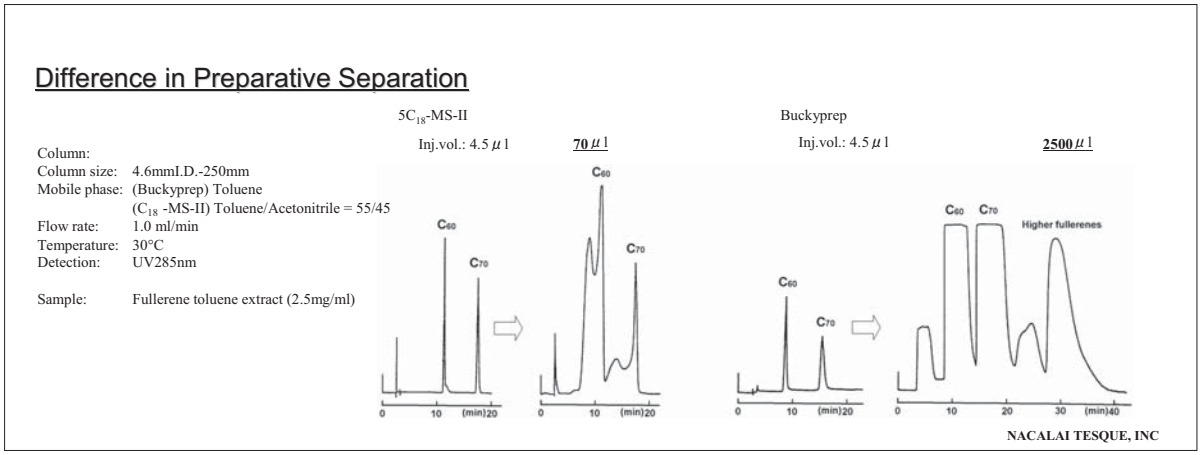
Solvent	Solubility of C60 (mg/ml)	Features
Chlorobenzene	7.0	Stronger eluent than toluene. Recommended for higher fullerenes.
o-Dichlorobenzene	27.0	Stronger eluent than chlorobenzene.
1,2,4-Trichlorobenzene	21.3	Strongest eluent. Recommended as a washing solvent.

COSMOSIL Buckyprep

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

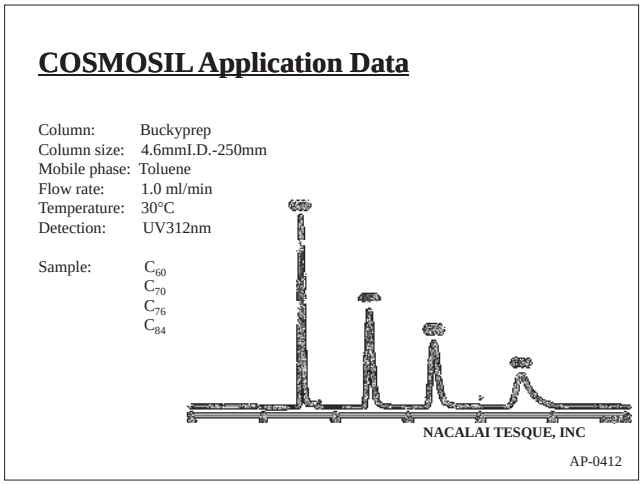
Difference in Preparative Separation

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

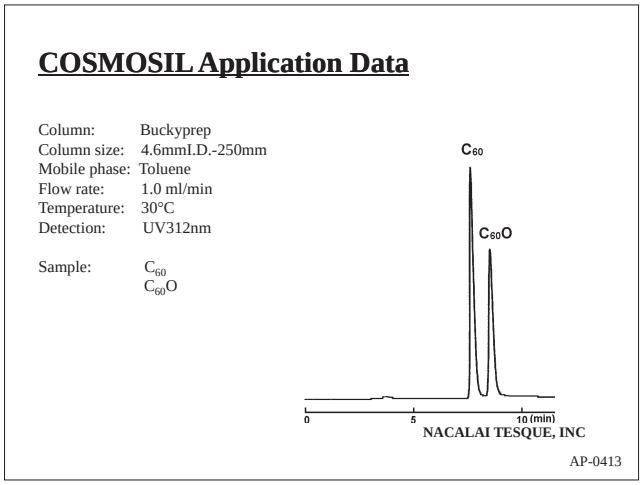


Applications

- Higher Fullerenes



- Oxidized Fullerenes



Ordering Information

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

COSMOSIL Buckyprep Packed Column

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

COSMOSIL Buckyprep Guard Column

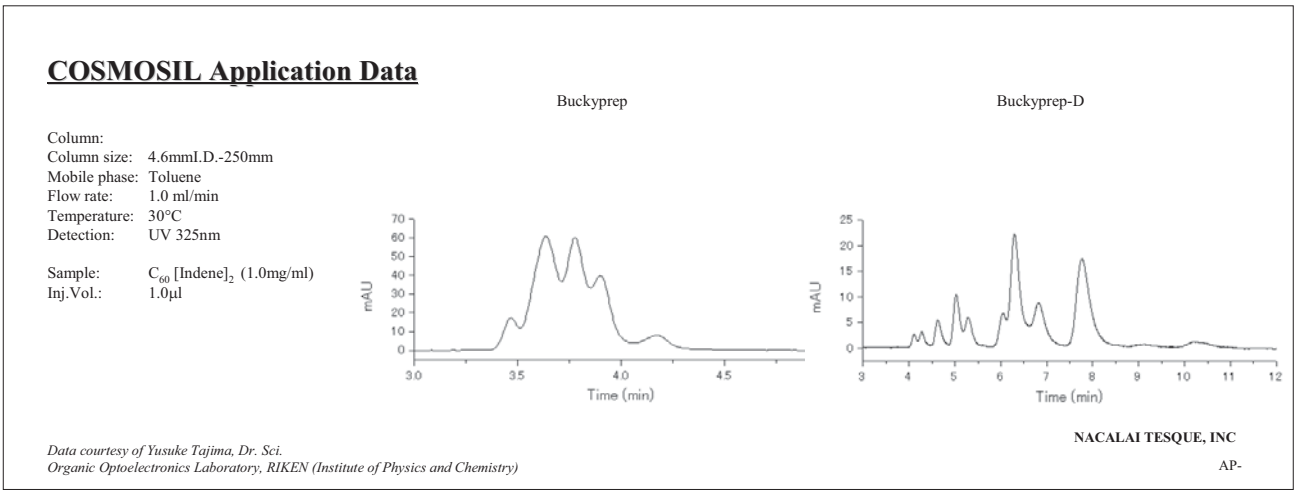
Column Size I.D. x Length (mm)	Product Number
4.6 x 10	37983-71
10 x 20	37984-61
20 x 50	34374-41
28 x 50	05871-21

COSMOSIL Buckyprep-D

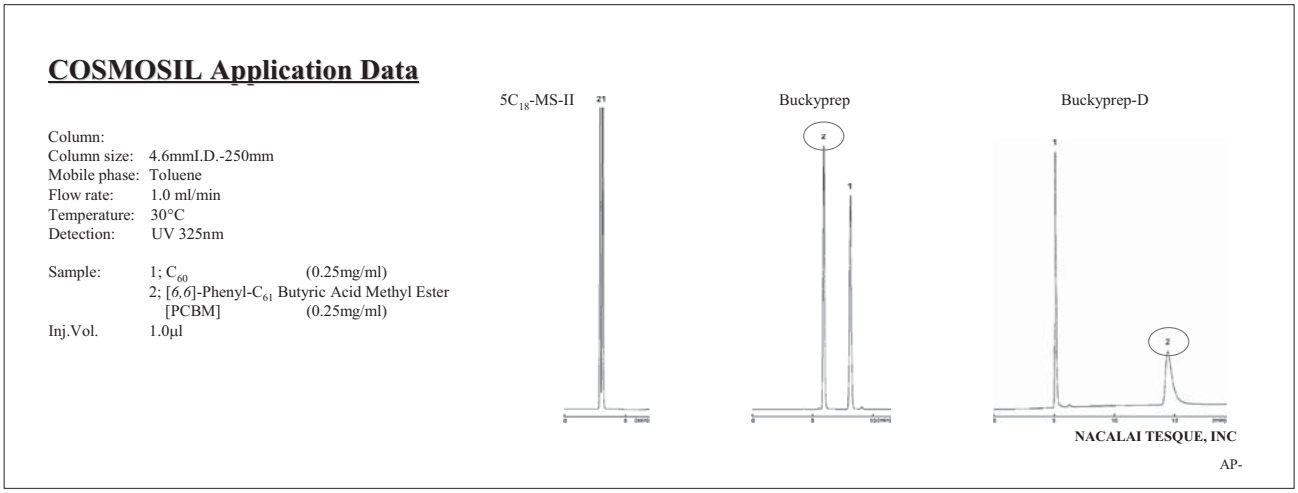
- For preparative separation of derivatized fullerenes
- For separation of derivatized fullerenes such as C_{60}-indene (used for organic thin-film solar cell)

Applications

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



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



Note

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

Ordering Information

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

COSMOSIL Buckyprep-D Packed Column

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

COSMOSIL Buckyprep-D Guard Column

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

COSMOSIL Buckyprep-M

- Different selectivity from Buckyprep
- Excellent separation for metallofullerenes

Applications

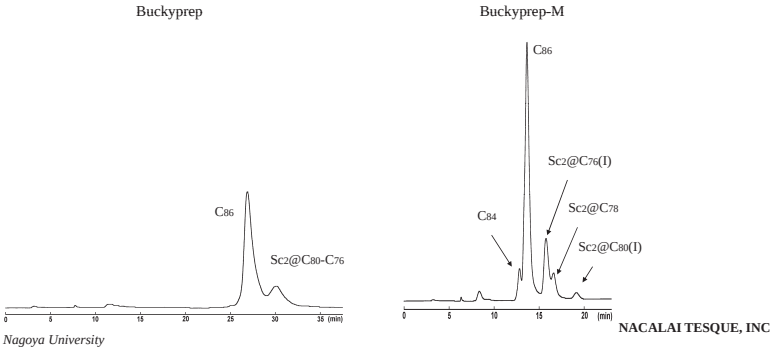
- Metallofullerenes

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

COSMOSIL Application Data

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

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



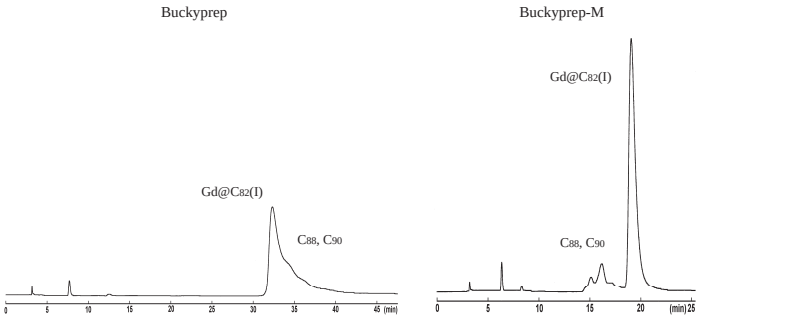
NACALAI TESQUE, INC

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

COSMOSIL Application Data

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

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



NACALAI TESQUE, INC

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

Ordering Information

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

COSMOSIL Buckyprep-M Packed Column

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

COSMOSIL Buckyprep-M Guard Column

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

COSMOSIL PBB

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

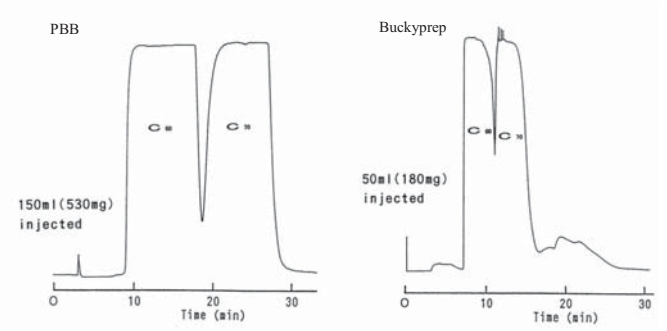
Applications

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

Preparative Separation of Fullerenes

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

Sample: Crude fullerenes (3.5mg/ml)



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 Buckyprep or PBB
- Excellent separation for derivatized fullerenes

Applications

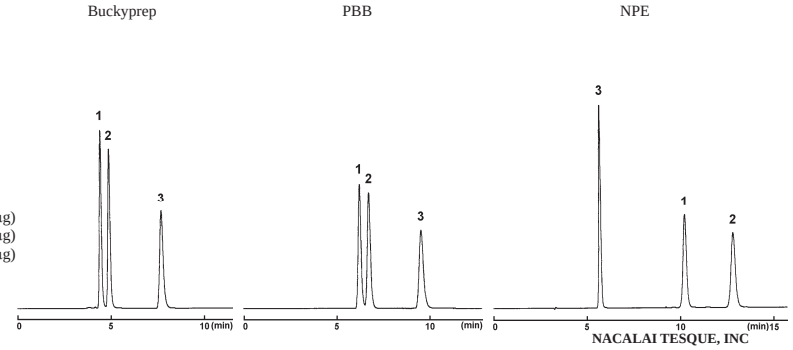
- PCBM, PCBB

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

COSMOSIL Application Data

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

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



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

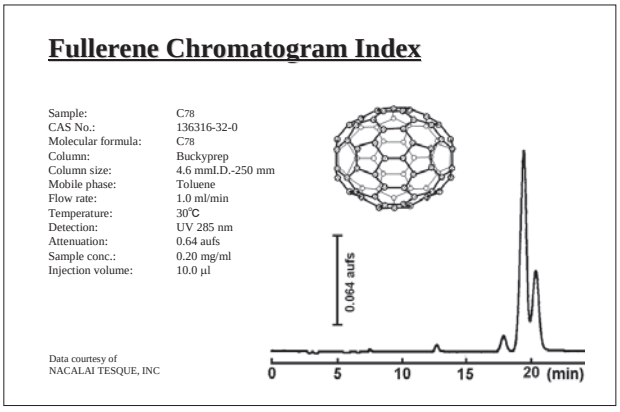
Column Size I.D. x Length (mm)	Product Number
4.6 x 250	37989-11
10 x 250	37996-11
20 x 250	38044-41
28 x 250	34300-91

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

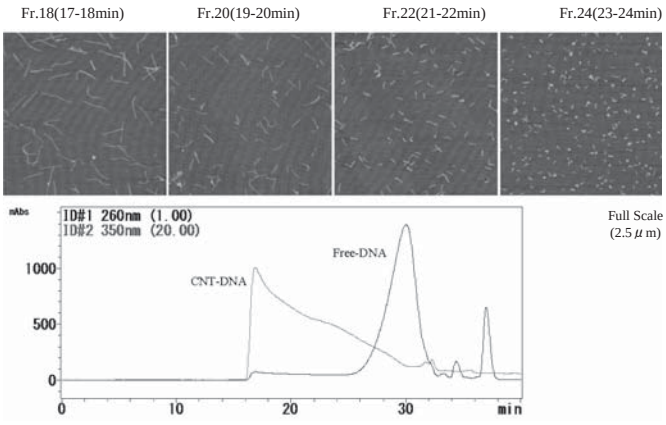
COSMOSIL CNT columns offer improved separation for DNA-wrapped carbon nanotubes by connecting three columns with different pore sizes.

COSMOSIL Application Data

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

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

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



AP-1147

Ordering Information

● Analytical Columns (Particle Size: 5µm)

COSMOSIL CNT-300 Packed Column

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

COSMOSIL CNT-300 Guard Column

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

COSMOSIL CNT-1000 Packed Column

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

COSMOSIL CNT-1000 Guard Column

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

IV. Preparative Packing Materials

1. Normal and Reversed Phase Packing Materials

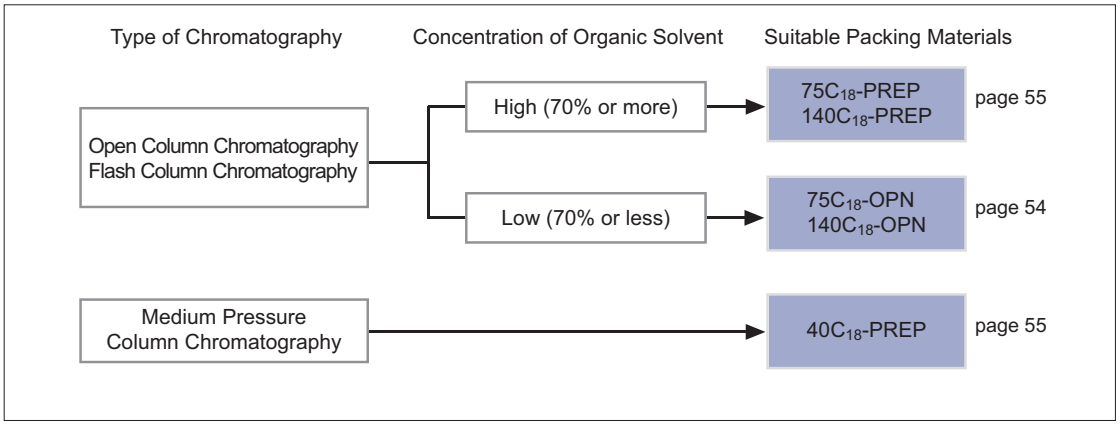
Introduction

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	40, 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 Load	—	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 C_{18}-OPN

- A new "Water-Wet" C_{18} packing material for reversed phase open column chromatography
- Usable under 100% aqueous eluents

Characteristic

The external surface of the C_{18}-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 C_{18} packing materials are restricted to about 30-50% water in the mobile phase. The COSMOSIL C_{18}-OPN is a new "Water-Wet" C_{18} packing material developed for reversed phase open column chromatography. The C_{18}-OPN material can be used in 100% aqueous eluents.

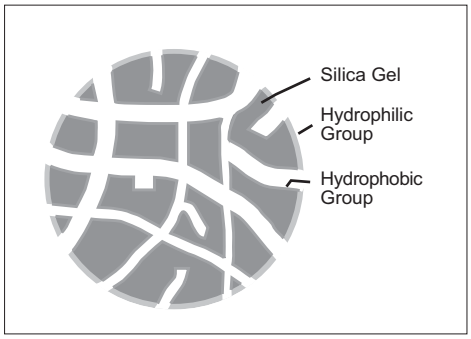


Figure 1. Structure of C_{18}-OPN

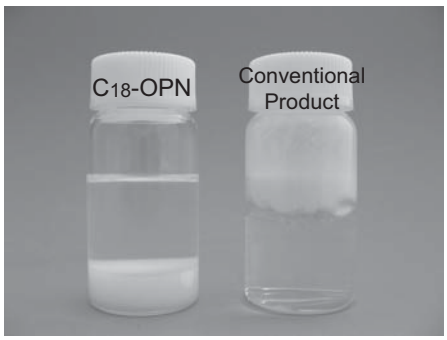


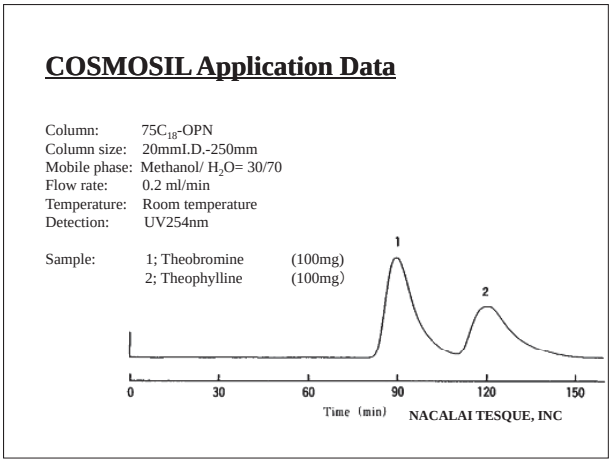
Figure 2. Packing material in water

Left: C_{18}-OPN provides good resolution
Can be used with low concentration of organic solvent on open, flash column chromatography.

Right: C_{18}-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 C_{18}-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 C_{18}-PREP

- Standard reversed phase packing material for open chromatography
- Endcapped
- 3 particle sizes (40, 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.

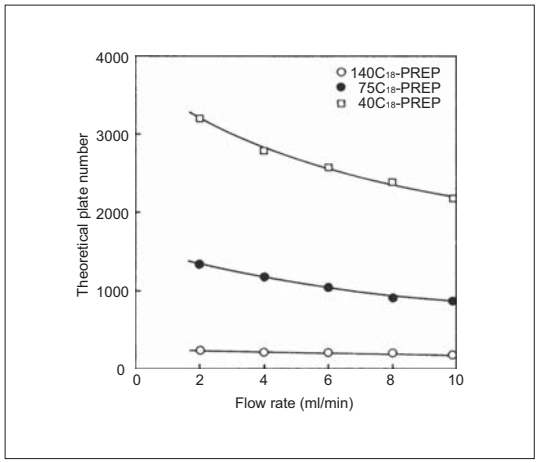


Figure 1. Flow rate against theoretical plate number

Column size: 20 mm I.D. x 300 mm

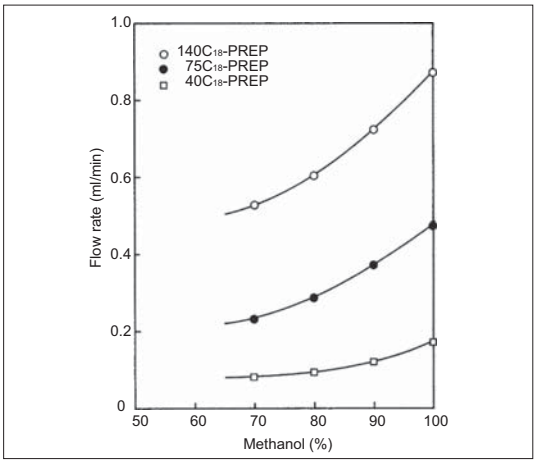
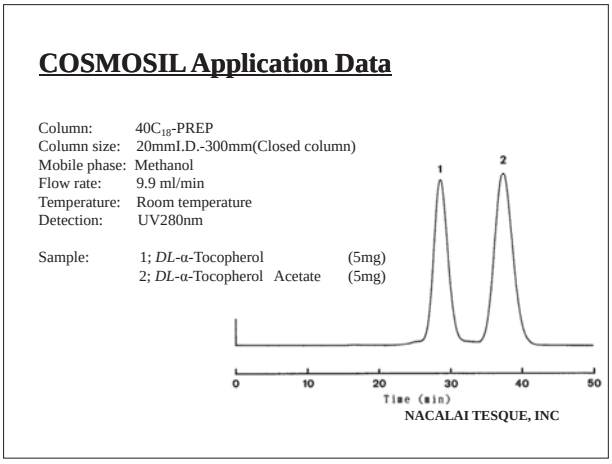


Figure 2. Concentration of methanol against flow rate

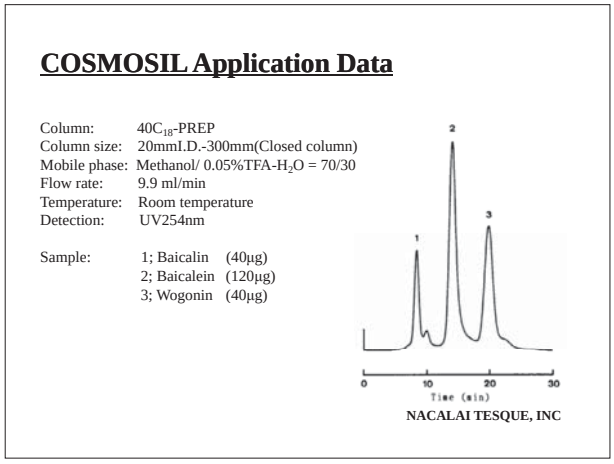
Column size: 10 mm I.D. x 180 mm bed height
(gravitational liquid flow)

Applications

- Vitamin E



- Natural Compounds



Ordering Information

- COSMOSIL C_{18}-PREP

Product Name	Average Particle Size	Product Number	PKG Size
COSMOSIL 40C_{18}-PREP	40 µm	37932-86	100 g
		37932-15	500 g
		37932-31	1 kg
COSMOSIL 75C_{18}-PREP	75 µm	37933-76	100 g
		37933-05	500 g
		37933-21	1 kg
COSMOSIL 140C_{18}-PREP	140 µm	37934-66	100 g
		37934-95	500 g
		37934-11	1 kg

Silica Gel (spherical, neutral)

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

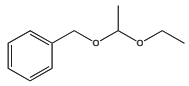
Comparison with Conventional Silica Gel

- Purification of Acetals -1

COSMOSIL Application Data

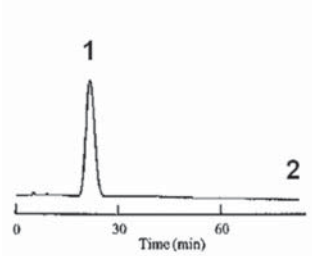
Column:
Column size: 4.6mmI.D.-250mm
Mobile phase: Hexane/Ethyl Acetate = 99/1
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV254nm

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

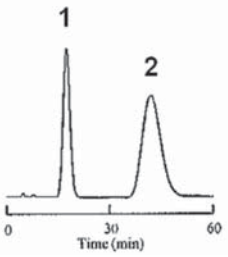


Sample A

Our conventional product



Silica Gel 60 (spherical, neutral)



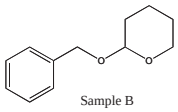
NACALAI TESQUE, INC

- Purification of Acetals -2

COSMOSIL Application Data

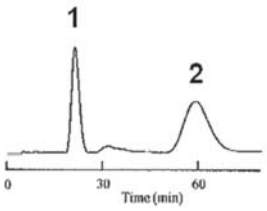
Column:
Column size: 4.6mmI.D.-250mm
Mobile phase: Hexane/Ethyl Acetate = 99/1
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: UV254nm

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

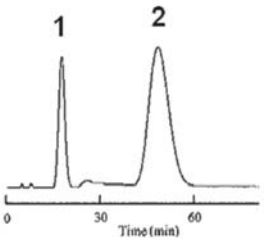


Sample B

Our conventional product



Silica Gel 60 (spherical, neutral)



NACALAI TESQUE, INC

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	Particle Size	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
	approx. 150 ~ 325 mesh		SP	30733-51	1 kg
				30733-22	25 kg
Silica Gel 120, Spherical	approx. 70 ~ 230 mesh	120 Å	SP	30734-41	1 kg

● Silica Gel (irregular)

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

V. Related Products

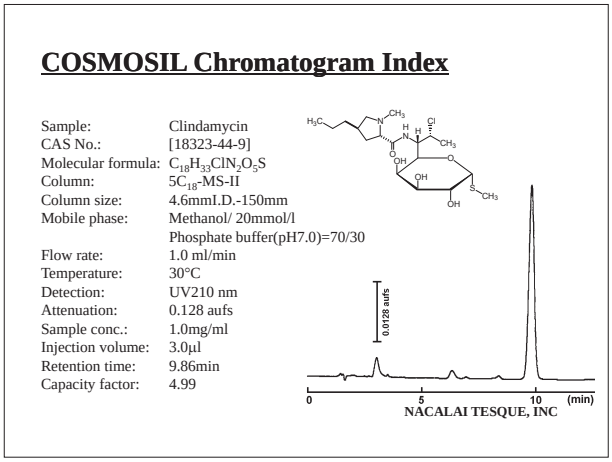
1. Reagents for Mobile Phase Preparation

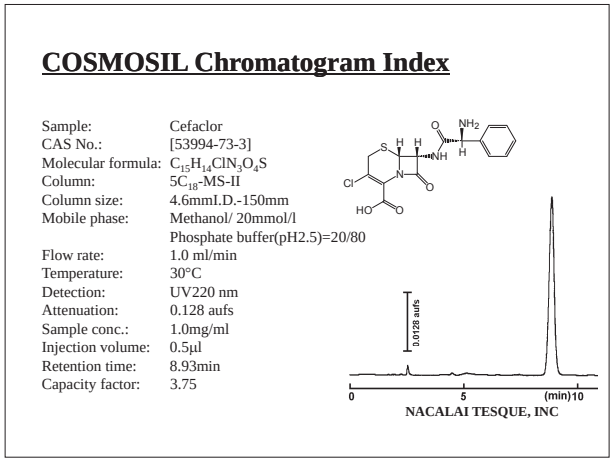
Phosphate Buffer Solution (pH 2.5) (5x)

- 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	5×1 ml
		34840-76	5×1.5 ml
		34840-63	5×3 ml
		34840-34	10 ml

Ion-pair Reagents

Ordering Information

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

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

0.5M Solution

Sodium *1*-Butanesulfonate	C_4H_9-	SP	31332-84	5×10 ml
Sodium *1*-Hexanesulfonate	C_6H_{13}-	SP	31532-64	10 ml
			31532-06	5×10 ml
Sodium *1*-Octanesulfonate	C_8H_{17}-	SP	31733-34	10 ml
			31733-76	5×10 ml

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

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

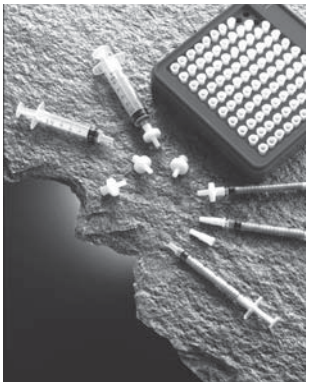
0.5M Solution

Tetra-*n*-butylammonium Phosphate	$-H_2PO_4$	SP	32926-26	10 ml
			32926-84	5x10 ml

2. Prefiltration Tools for Liquid Chromatography

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	1ml 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 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 xg	1.5 ml	0.2 cm^2	Brown	06549-44	100 pkg
Cosmospin Filter H	0.45	0.4 ml	5 μl	5000 xg	1.5 ml	0.2 cm^2	White	06540-34	100 pkg

Dimention: Diameter 10.6 mm x Length 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
p-Bromophenacyl Bromide (PBPB)	GR	Refrigerator	05802-92	25 g
3,5-Dinitrobenzoyl Chloride (DNBC)	SP	Dark and Cool	13530-44	5 g
NBD Chloride	SP	Refrigerator	24113-61	1 g
o-Phthalaldehyde (OPA)	SP	Refrigerator	27824-61	1 g
			27824-74	5 g
			27824-32	25 g

3. Column Care Products

Introduction

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

Applicable Columns

Cleaning Solution Kit and Storage Solution for Reversed Phase HPLC Columns is only applicable to reversed phase HPLC columns, such as COSMOSIL 5C_{18}-MS-II, AR-II, PAQ, EB, Cholester, πNAP, PYE, PBr and COSMOCORE 2.6C_{18} and 2.6Cholester. Please note that this product is not suitable for Sugar-D, HILIC, normal phase or ion exchange columns.

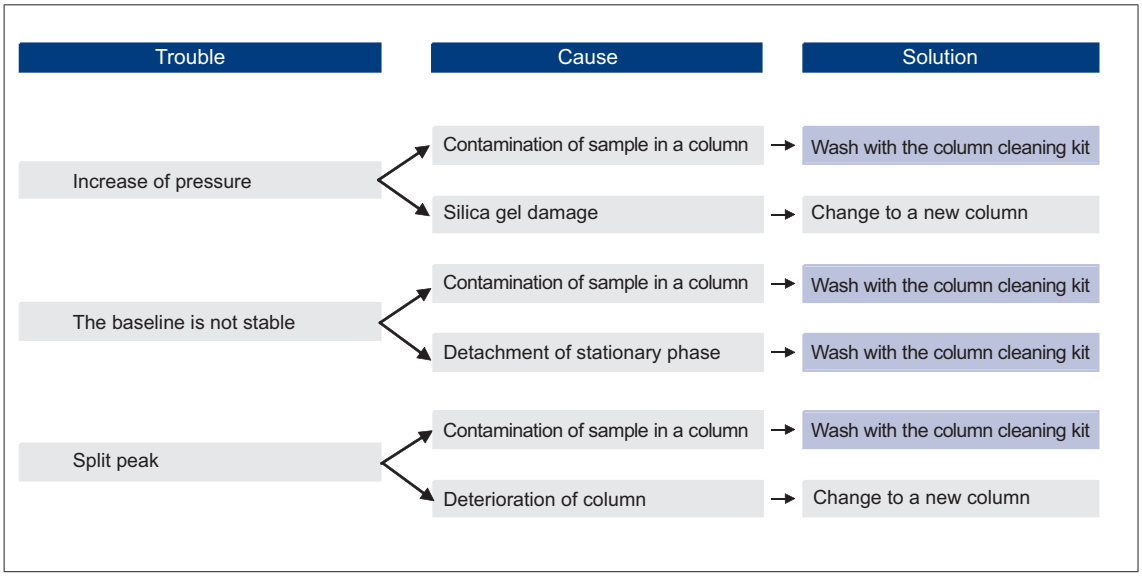
Cleaning Solution Kit for Reversed Phase HPLC Columns

Components

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

Application

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



Procedure

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

(1) Replace solvent with HPLC-grade distilled water (1 ml/min, 30 min).

(*This step is for mobile phases containing high concentration buffer. If you are using a salt-free mobile phase, please start from step (2).)

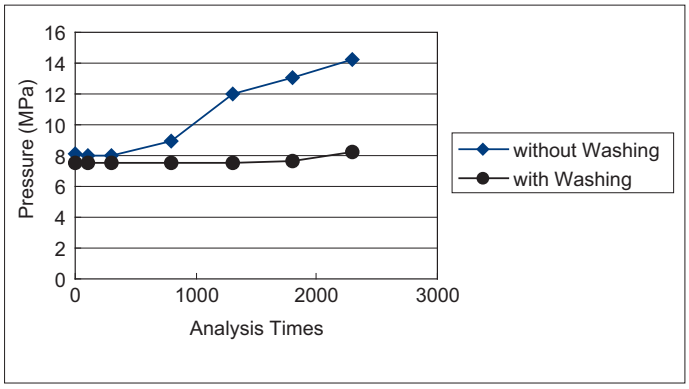
(2) Run the Cleaning Solution A through the column for 15 min at a flow rate of 1ml/min.

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

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

Example of pressure difference between washed and unwashed columns

The figure shows a pressure comparison between washed and unwashed columns using Cleaning Solution Kit. Repeated analysis of natural products was conducted using COSMOSIL 5C$_{18}$-MS-II 4.6 mm I.D. x 150 mm.



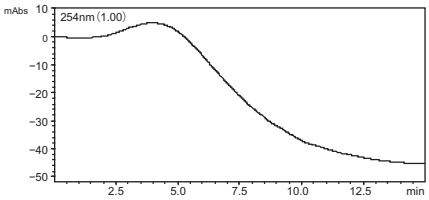
(Condition)
Column: COSMOSIL 5C$_{18}$-MS-II（4.6 mm I.D. × 150 mm
Mobile phase: Methanol / H_2O = 70 / 30, Flow rate: 1.0ml/min
Temp.: 40°C

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.

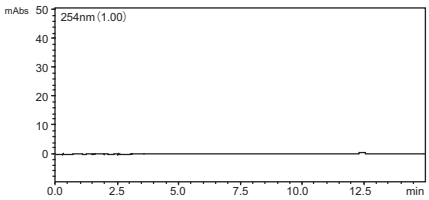
Example of a Stable Baseline

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 chemcal characteristics, some unwanted components may be strongly retained in the column and slowly elute out in subsequent runs. The resulting unstable baseline can be eliminated by washing the column with the Cleaning Solution Kit.

Before Washing



After Washing



Ordering Information

Product Name	Grade	Product No..	PKG Size
Cleaning Solution for Reversed Phase HPLC Columns	SP	08966-30	1 kit

Storage Solution for Reversed Phase HPLC Columns

Application

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 No	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

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

Guard Cartridge Holder is required for Guard Cartridge.

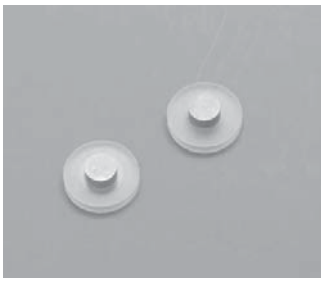
COSMOSIL Column Prefilter

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

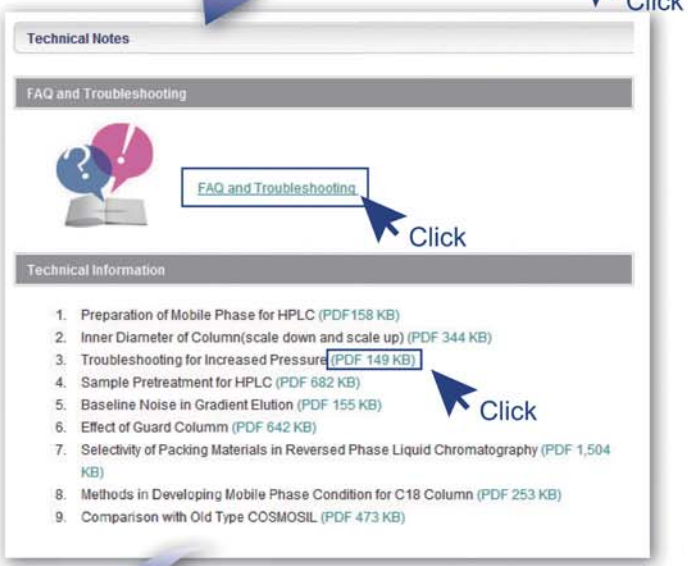
COSMOSIL Column Connecting Tube

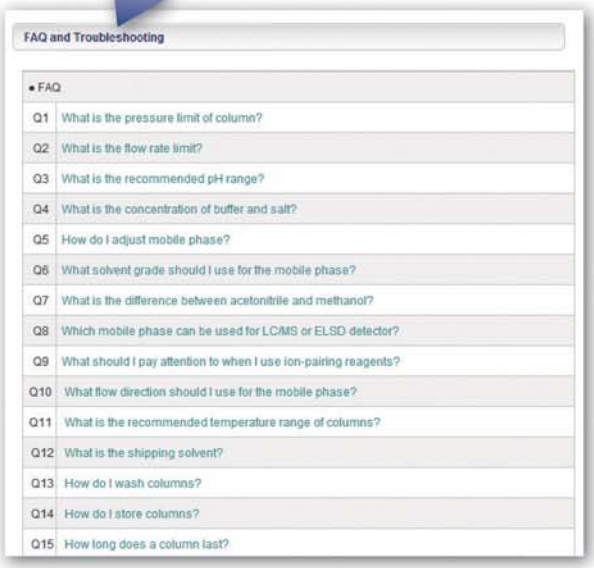
Product number	I.D.	PKG Size
12570-41	0.1 mm	1 PKG
37843-69	0.25 mm	1 PKG

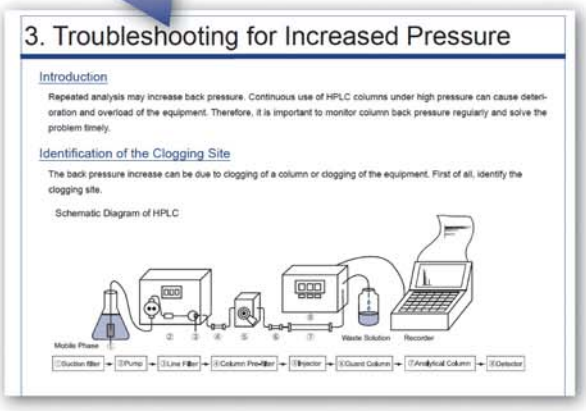
For connecting columns

COSMOSIL Technical Notes

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







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The quality for certainty

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For more information on products and pricing, please contact your local distributor.

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