

SHISEIDO HPLC COLUMNS

CAPCELL PAK

SHISEIDO

Polymer-coating type core-shell technology



CAPCELL CORE

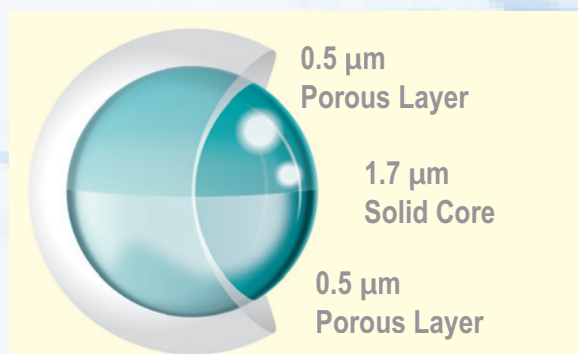
Core-shell, the new particle geometry of HPLC

Since 1987 Shiseido has been pursuing the best LC separation by creating new chemistry on the surface of powdery materials.

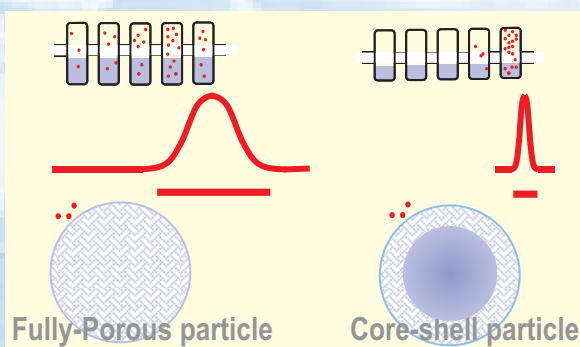
Fusing Shiseido's chemistry and a new particle geometry together, the beginning of new LC separation is ready to present!
Polymer-coating type Core-shell technology



Polymer-coated core-shell particle



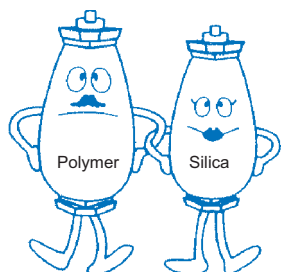
High efficiency at fast analysis



Shiseido's challenge,
Begin the Beginning !

CAPCELL PAK

The revolutionary polymer-coated "capsule type" HPLC column with combined advantages of silica-based and polymer-based columns



CAPCELL PAK columns show tremendous durability and reproducibility, being free from undesirable secondary effects typical of other silica-based columns. Their unique synthetic process consists of two steps.

- 1) Surface coating of the silica using a silicone monomer by vapor deposition, resulting in a homogenous polymeric mono-layer.
- 2) Attaching alkyl groups to the coated surface that shields acidic silanols (Fig.1).

This imparts superior mechanical strength as well as extended pH stability, and provides excellent peak profiles for acidic, basic and chelating compounds. CAPCELL PAK exhibits excellent separation and chemical stability, hence the combined benefits of silica supports.

Table 1

	silica type	capsule type	polymer type
pressur durability	○ (20MPa)	○ (20MPa)	× (3.5-7MPa)
basic resistance	△ (pH2-7)	○ (pH1-10)	△ (pH1-12)
separation	○	◎	△
validation	○		×

◎: excellent ○: good △: marginal ×: bad

FEATURES

- Polymer coating deactivates residual silanols which cause peak tailing
- Extended pH range (1-10) provides longer lifetime
- Durable and reproducible
- Low column pressure
- Excellent selectivity
- Available in many popular phases
- GLP/GMP validation supported (UG, MG series)

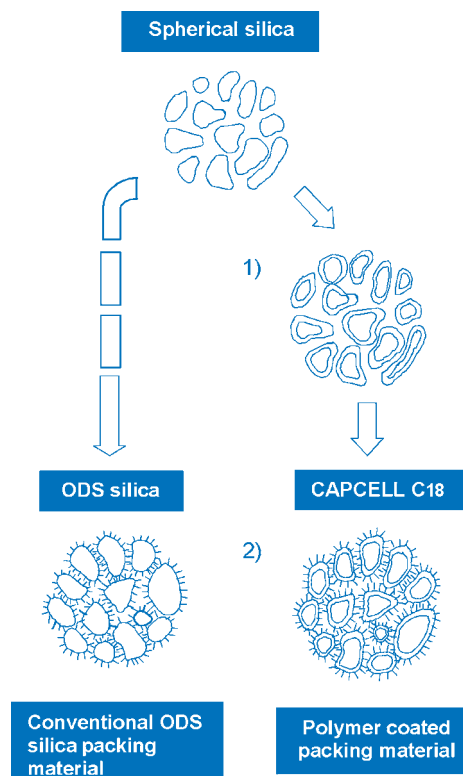


Fig.1

Advantages of CAPCELL PAK

Through its precisely-controlled manufacturing process, **CAPCELL PAK** is a perfectly inert column that neither contains nor releases impurities.

High-quality raw materials

- High-purity silica
Metal impurities in silica, the starting material, used for SG, UG, MG Series, ACR, and IF AQ type are less than 5ppm.
- Precisely controlled pore size and distribution
- Spherical silica with an extremely narrow distribution of diameter, which leads to low column pressure.

Low pressure, easy-to-use

CAPCELL PAK analytical columns (4.6 mm i.d. x 250mm) typically show lower pressures, compared to conventional ODS columns (Fig. 2).

Mobile phase : 70vol% CH₃OH,
1.0mL/min, 25°C

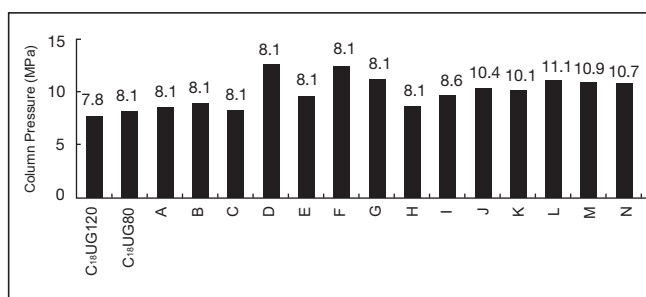
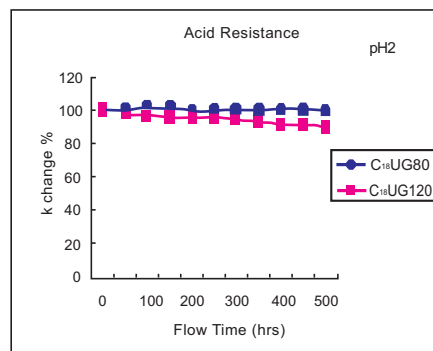
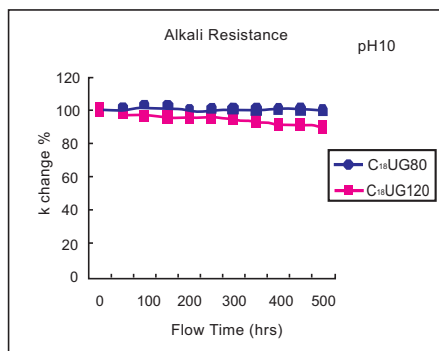


Fig.2

Durable over a wide pH range (pH 2-10) (ACR, pH 1-10)

Stability of Retention Factor K'

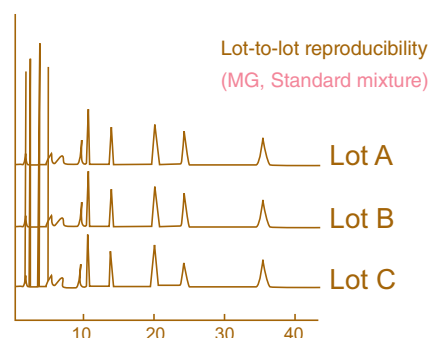


Column : CAPCELL PAK C₁₈ UG80/120 S5 4.6 mm i.d. x 150mm
Mobile phase : CH₃OH/10mmol/L Phosphate buffer=70/30,

Column : CAPCELL PAK C₁₈ UG80/120 S5 4.6 mm i.d. x150mm
Mobile phase : CH₃OH/H₂O (pH1.0, H₃PO₄)=70/30, pH2.0

Excellent Peak profile and Lot-to-Lot reproducibility

- Symmetrical peaks are obtained even for basic compounds since the undesired effects of residual silanols and metal impurities are kept minimal.
- Excellent lot-to-lot reproducibility.



Most CAPCELL PAK are categorized as L1 in USP

Evolution of Capcell Pak Technology

Ever since the first CAPCELL PAK was introduced in 1987 (AG type), the product line has evolved in terms of the quality of the silica support as well as the polymer coating technology (Table 2). To meet the increased demands in high-throughput analysis, low background analysis, and analysis using harsh mobile phases (e.g., pH<2), CAPCELL PAK with acid resistance (ACR) and different geometries (Mini and capillary) were released to the market. In 2004, Capcell Pak MGII, was launched as a new milestone of CAPCELL PAK, which was developed for generic HPLC method of basic compounds even under neutral condition. In response to the increasing needs of LC-MS and UHPLC analysis, novel modification in particle size and surface bonding with keeping the conventional performance of CAPCELL PAK, gave birth of MGIII, MGIII-H, and IF2 (sub2 μ m) Now, upon the new challenge in core-shell technology, CAPCELL CORE columns have been launched to extend the CAPCELL PAK product line.

Table 2

Polymer-coating Type	Base silica	Polymer coating	pH range	Separation	retention of polar compounds
AG	conventional grade	Mono-layer	2-10	Good	Fair
SG	High purity (metal content: <5ppm)	Mono-layer	2-9	Good	Fair
UG	High purity (metal content: <5ppm)	Homogeneous mono-layer	2-10	Excellent	Fair
MG, MGII, MGIII, IF2	High purity (metal content: <5ppm)	Controlled homogeneous mono-layer	2-10	Excellent	Strong
ACR	High purity (metal content: <5ppm)	Reinforced homogeneous mono-layer	1-10	Excellent	Fair
AQ	High purity (metal content: <5ppm)	Controlled homogeneous mono-layer	2-9	Excellent	Excellent (100% water)

Column List

Core-shell Type Columns

- CAPCELL CORE (C₁₈, AQ, PC, PEP) **NEW!**.....5-6
Core-shell type columns for improved LC, LC-MS and UHPLC

General Columns

- CAPCELL PAK C₁₈ IF2 **NEW!**.....7-8
A Sub2- μ m column in response to ultrahigh-pressure analysis
- CAPCELL PAK C₁₈ MG Series (Capillary, MGII, MGIII, Minimimi)..... 9-18
For improved retention of polar compounds with reduced peak tailing
- CAPCELL PAK UG Series (C₁₈, C₈, Ph, CN, NH₂, SCX) 19-22
For fast separation of basic and polar compounds
- CAPCELL PAK ACR (C₁₈, Capillary, cartridge)23-25
C₁₈ column with unprecedented acid resistance
- CAPCELL PAK AQ (C₁₈, Capillary, cartridge)26-27
C₁₈ column operable in 100% water
- CAPCELL PAK CR (1:50, 1:20, 1:4) **NEW!**.....28-29
A mixing mode of strong cation - exchange and reversed phase.
- CAPCELL PAK C₈ DD.....30-31
C₈, yet resistant to acid and alkali
- PC HILIC **NEW!**
A silica based HILIC column bound with Phosphorycholine (PC) group.....32-33

Wide-Pore Columns

- PROTEONAVI **NEW!**
For analytical and preparative separation of protein.....34-35

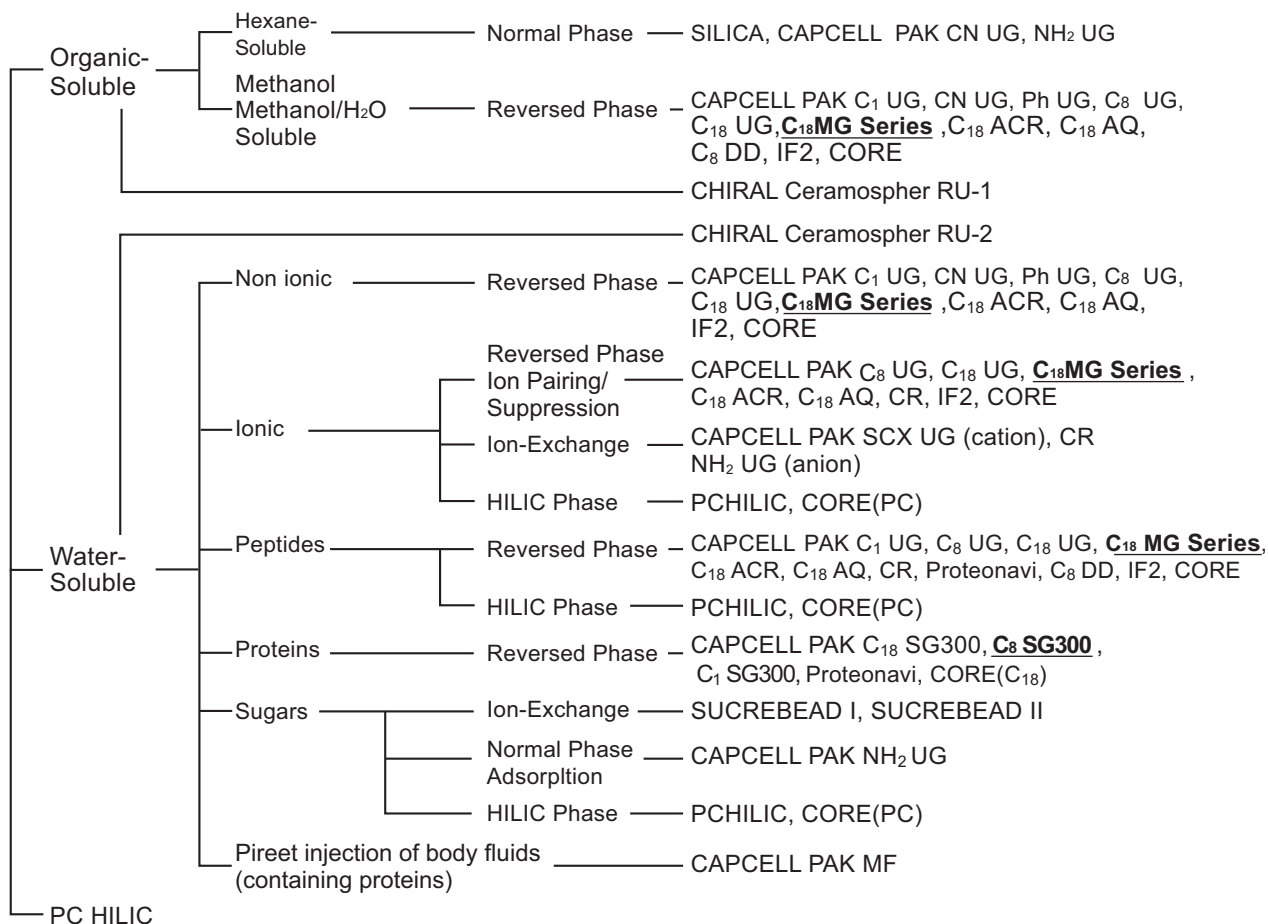
Specialty Columns

- CAPCELL PAK MF (SCX, C₈, Ph).....38-40
For direct injection of serum or plasma without pretreatment
- CHIRAL columns (Ceramospher Ru-1/Ru-2, CD-Ph).....41-42
- SUCREBEAD I, SUCREBEAD II43
For separation of sugars
- REDUCTION Column.....44

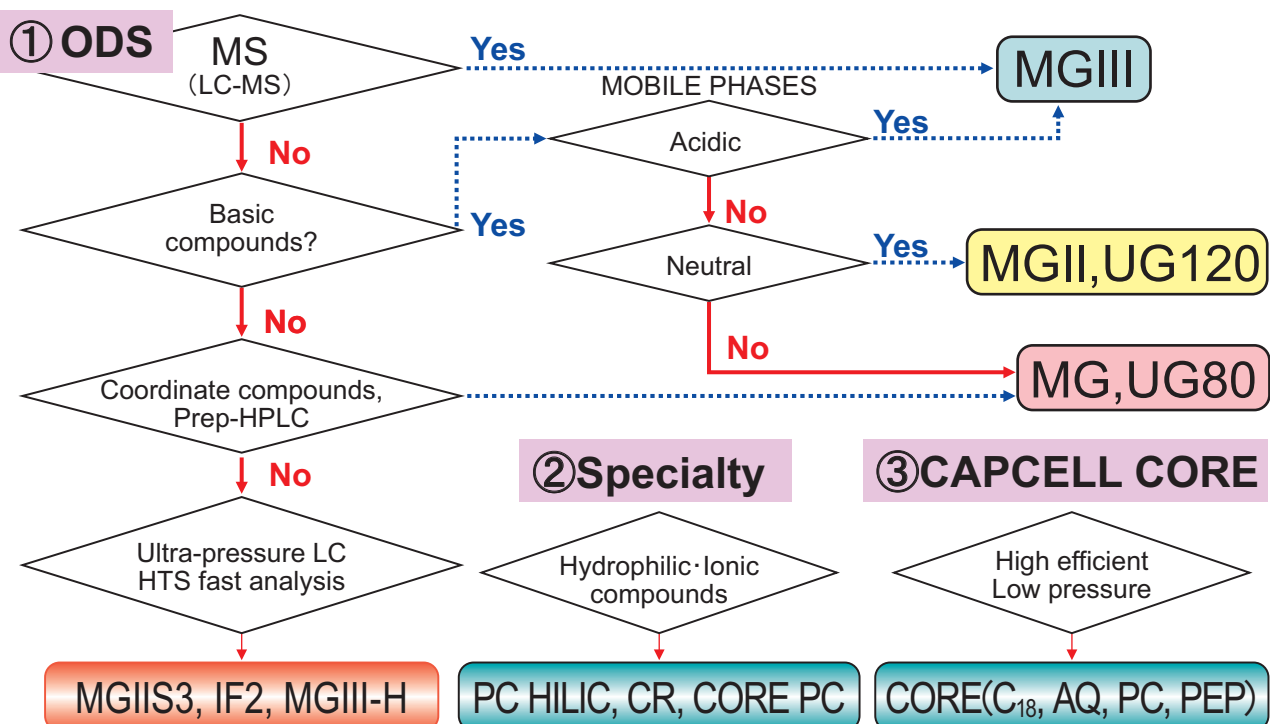


CAPCELL PAK SELECTION

Capcell Pak columns provide reversed-phase, normal-phase and HILIC (Reverse of reversed-phase) modes ion-exchange separation modes. The following guide will help chromatographers to choose a suitable column that best fits their applications.



Column selection guide



CAPCELL CORE C₁₈

5

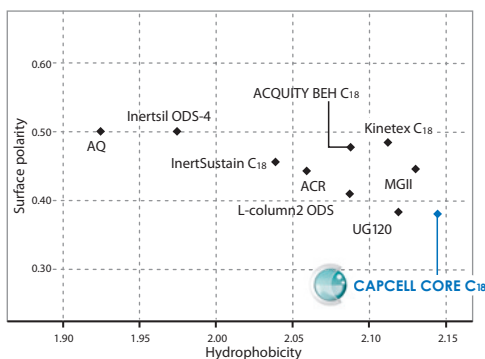


Polymer-coating type core-shell column

CAPCELL CORE is a polymer-coating type core-shell column of 2.7- μ m particle with 1.7- μ m solid core and 0.5- μ m porous layer. CAPCELL CORE provides high-speed and improved separation in UHPLC as well as conventional HPLC.

Characteristics

Function group	Micro pore diameter (nm)	Particle size (μ m)	Specific surface area (m ² /g)	C%	Operational pH range	Pressure resistance (MPa)
C ₁₈	9	2.7	150	7	1.5 - 10	60

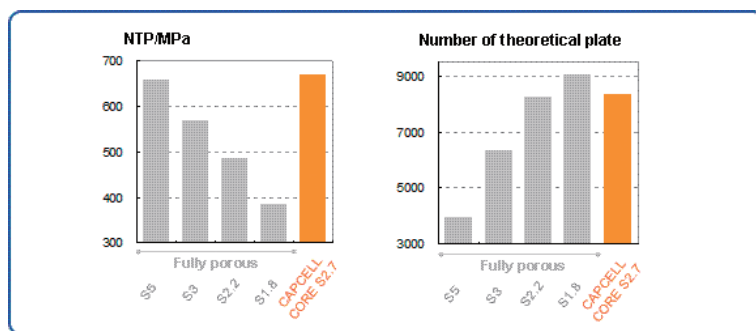


Evolution of polymer coating technology in core-shell!

CAPCELL CORE is a column with minimized undesirable second effect of the silanols by applying polymer coating on the surface of core-shell base material. CAPCELL CORE phase is developed by aiming at full play to high performance of separation derived from the unique structure of core-shell.

High efficient separation with lower back pressure

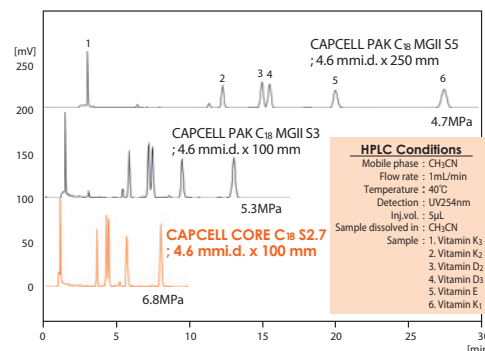
core-shell type CAPCELL CORE overcome the separation impedance of sub 2- μ m porous particles with similar high efficiency under a lower back pressure.



Number of theoretical plate Vs pressure drop in response to particle sizes

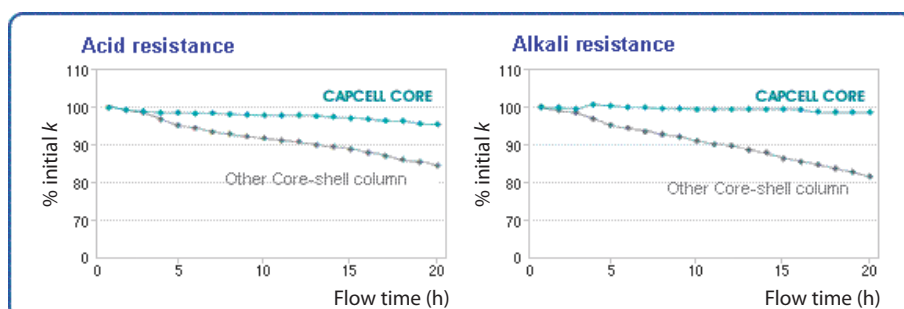
High-speed high-efficient analysis

CAPCELL CORE C₁₈ is suggested the improved way to gain the highest separation efficiency at fast analysis even in conventional HPLC.



Excellent stability under acidic and basic conditions (pH1.5-10)

Polymer coating technology applied on Capcell Core leads to an excellent stability under acid and basic conditions. Clear differences from other core-shell products can be observed



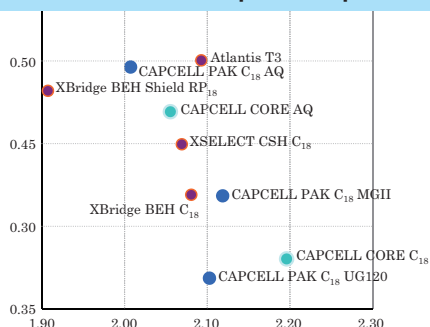
Stability tests under acidic and basic conditions

CAPCELL CORE AQ

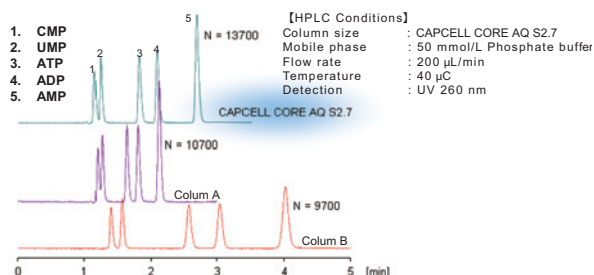
CAPCELL CORE AQ is C₂₇ column developed for improved retention of high hydrophilic compounds under 100% aqueous mobile phase at fast analysis.

Function group	Micro pore diameter (nm)	Particle size (μm)	Specific surface area (m ² /g)	C%	Operational pH range	Pressure resistance (MPa)
C ₂₇	16	2.7	90	4	2-10	60

Characterization ~Optimized parameter~



Well-balanced and efficient separation under 100% buffer



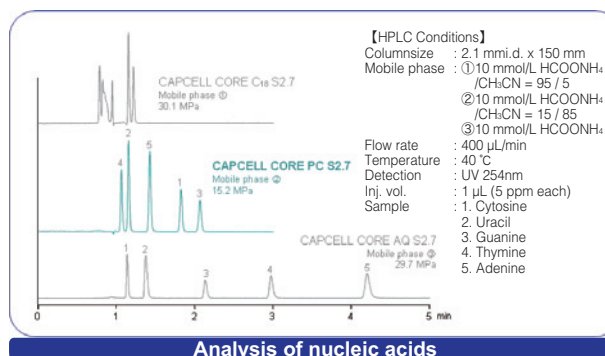
CAPCELL CORE PC

CAPCELL CORE PC is developed by sophisticated bonding of phosphorylcholine group (PC). The PC column provides HILIC-mode retention of very polar compounds.

Function group	Micro pore diameter (nm)	Particle size (μm)	Specific surface area (m ² /g)	C%	Operational pH range	Pressure resistance (MPa)
PC	9	2.7	150	—	2-7.5	60

Synergy of PC technology and CAPCELL CORE

CAPCELL CORE PC retains high hydrophilic compounds under organic solvent-rich mobile phase where C₁₈ has no retention. Core-shell type PC is a good alternative for UHPLC (sub 2-μm) HILIC mode and provides improved LC-MS for high hydrophilic compounds.



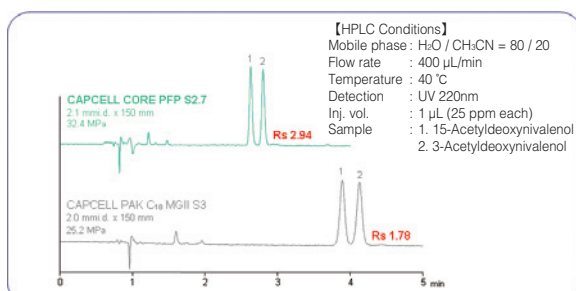
Analysis of nucleic acids

CAPCELL CORE PFP

CAPCELL CORE PFP is a novel phase with function group of pentafluorophenyl group. It provides improved separation capacity by specific retention of fluorine compounds and position isomers.

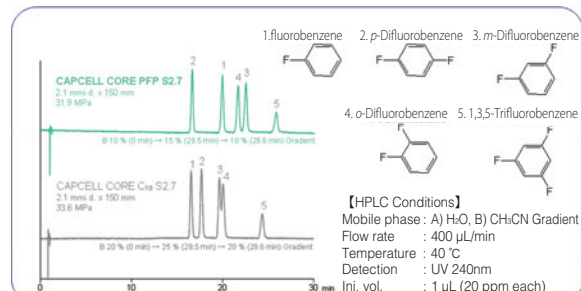
Function group	Micro pore diameter (nm)	Particle size (μm)	Specific surface area (m ² /g)	C%	Operational pH range	Pressure resistance (MPa)
PFP	9	2.7	150	5	2-9	60

Specific selectivity of position isomer in UHPLC



Separation of position isomer

Best choice for analysis of fluorine compounds



Analysis of fluorine compounds

UHPLC column for Ultra-High-Speed High-Pressure Separation

7

CAPCELL PAK
IF2

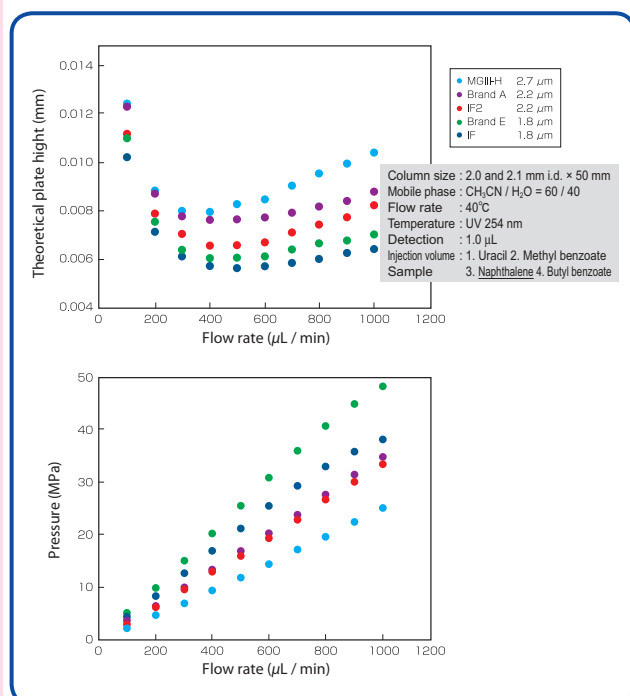
Durability is an indispensable quality to columns for ultra-high-speed high-pressure separation. A short lifetime under high pressure, and therefore, a high column cost would make high-pressure separation less attractive to chromatographers.

CAPCELL PAK C₁₈ IF2

In response to such customer's needs, CAPCELL PAK C₁₈ IF2 has been developed. IF2 enables excellent peak shape of basic compounds as well as the separation efficiency, while showing unsurpassed durability, hence offers the best choice for real ultra-high-speed, high-pressure separation

Properties

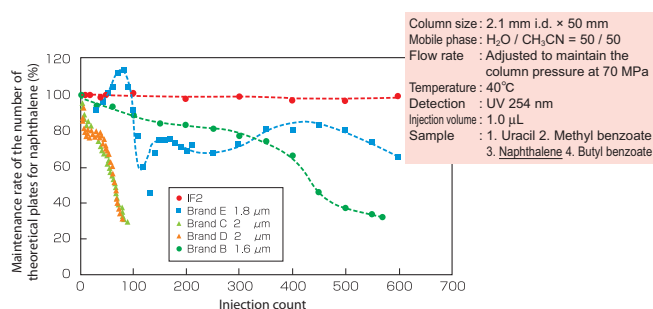
Function group	Pore size (nm)	Average Particle size (μm)	Specific surface area (m ² /g)	C%	Density (μmol/m ²)	Applicable pH range
C ₁₈	8	2.2	480	15.5	1.5	2-9



Unsurpassed Durability against Pressure up to 100 MPa

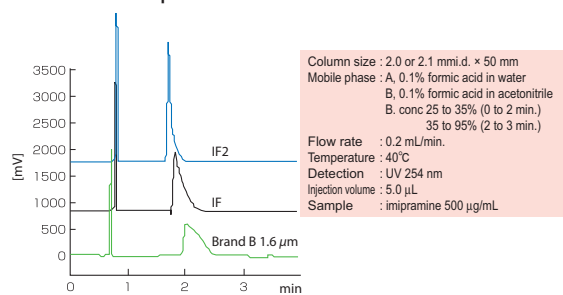
The graph below shows the durability comparison measured under a pressure of 70 MPa by adjusting the flow rate of each column. Among the columns whose specifications of withstand pressure are known as more than 70 MPa, CAPCELL PAK IF2 with pressure resistance up to 100 MPa, shows outstanding durability as a UHPLC column truly ideal for ultra-high-speed high-pressure separation.

Packing technology is an important process that determines the quality of the column. To achieve such excellent durability, we used considerable ingenuity in the packing of the CAPCELL PAK IF2.



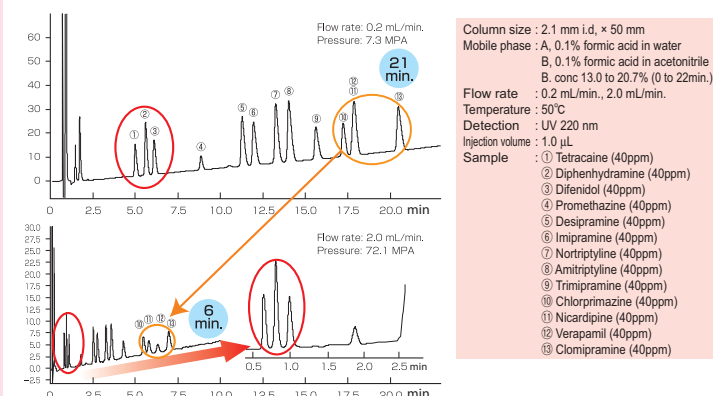
Higher Loadability than Existing Products

We injected 50-time more concentrated imipramine to compare the peak shape. The CAPCELL PAK IF2, which is suitable for the separation of basic compounds, sharply elutes even high concentrations of basic compounds.



Quick and Sharp Elution of Basic Compounds

The CAPCELL PAK IF2 showing sharp peaks for basic analytes, provides excellent peak shape and separation efficiency even at ten-time greater flow rate, while enables the analytes to elute quickly.



CAPCELL PAK C₁₈ IF2 S2

Catalog No	Inner Diameter (mm)	Length (mm)
92883	2.1	20
92885	2.1	50
92887	2.1	100

UHPLC column for Ultra-High-Speed LC-MS analysis

8

With the improved performance of mass spectrometers, the requirements for columns are divided into two properties: capability of fast crude separation and a superior separation efficiency that enables highly-sensitive analysis of a smaller amount of samples. Both of them require high pressure resistance.

CAPCELL PAK C₁₈ MGIII-H

CAPCELL PAK MGIII-H is an evolution of MGIII in response to such needs. MGIII-H enables operation pressure up to 50 MPa, showing outstanding durability, hence offers improved high-speed LC-MS of basic compounds with flexible pressure resistance.

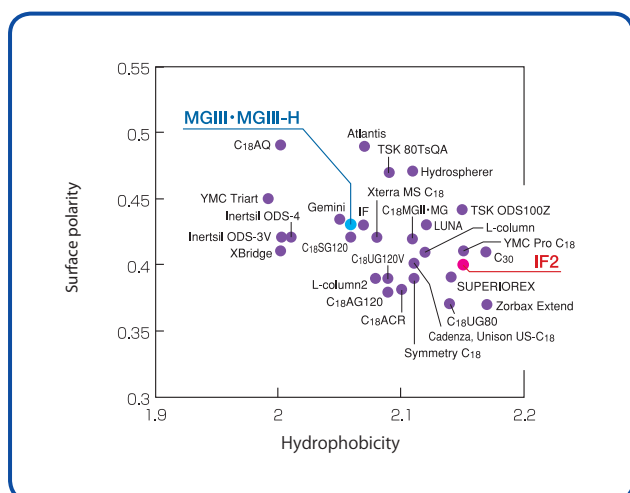


Properties

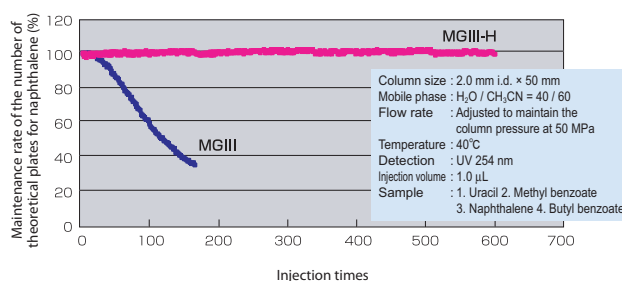
Function group	Pore size (nm)	Average Particle size (μm)	Specific surface area (m ² /g)	C%	Density (μmol/m ²)	Applicable pH range
C ₁₈	10	2.7	300	15	2.3	2-9

Unsurpassed Durability against Pressure up to 100 MPa

The durability is determined under 50 MPa by adjusting the flow rate of each column. The CAPCELL PAK MGIII-H maintains the number of theoretical plates even after 600 times of injection, so can be used with confidence.

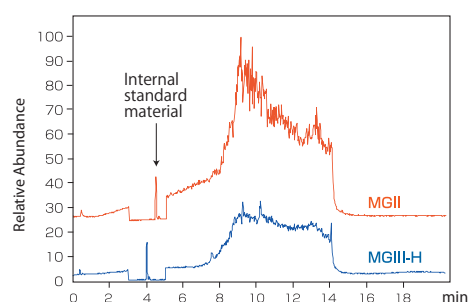


Parameter map



Minimized Bleeding

As another effect of the special preconditioning, the background (bleeding) most affecting the high sensitivity range has been drastically reduced.



Specifications for MG Series Columns

We conduct strict control by adding the symmetry of the peak shape and the retention coefficient for amitriptyline, which is sensitive to silanol, to the specifications.

Test item	Column	MGIII	MGII	MG
Pyridine/Pheno	As (Py): 0.90-1.50 As (Ph): 0.90-1.20	As (Py): 0.90-1.50 As (Ph): 0.90-1.20	Shipment standard specified	Shipment standard specified
Quinizarin	As: 0.90-1.40	As: 0.90-1.40	—	—
Amitriptyline (neutral condition)	—	As: 0.90-1.30	—	—
Amitriptyline (acidic condition)	As: 0.90-1.30 k: 1.3-1.6	As: 0.90-1.30 k: 1.3-1.6	—	—

Excellent Reproducibility for Basic Compounds under Acidic Conditions

The lot-to-lot reproducibility is an issue for isocratic analysis under acidic conditions, which is often conducted as the LC-MS analysis of basic compounds. The MGIII-H is developed with special conditioning similarly to that of the MGIII during the manufacturing processes, therefore can provide promised performance with confidence.

CAPCELL PAK C₁₈ MGIII-H S3

Catalog No	Inner Diameter (mm)	Length (mm)
92782	2.0	20
92784	2.0	50
92786	2.0	100

CAPCELL PAK C₁₈ MGIII

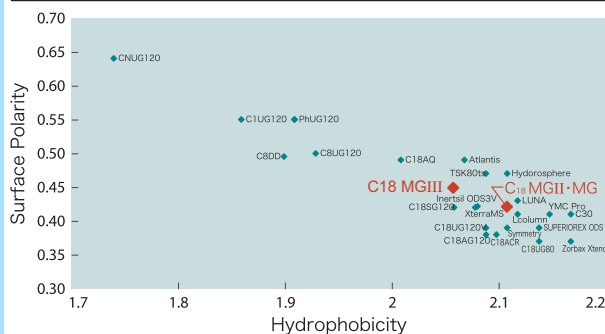
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The CAPCELL PAK C₁₈ MGIII, the third generation of the MG series, is developed to overcome the column-to-column variation in retention of basic compounds under an acidic condition. The quality of MGIII will help develop improved methods in various LC-MS applications.

Characteristics and parameter mapping

Function group	Pore size (nm)	Particle size (μm)	Specific surface (m ² /g)	C%	Density (μmol/m ²)	pH	USP
C ₁₈	10	5	260	15	2.7	2-10	L1
C ₁₈	10	3	300	15	2.3	2-10	L1



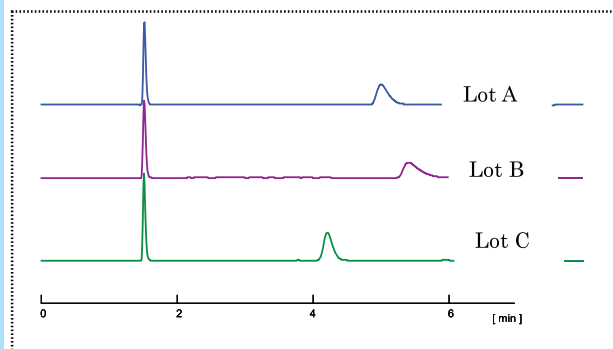
Comparison of Shiseido HPLC columns

Feature	MGIII	MGII	MG	UG120	ACR	AQ
High-purity silica		✓✓			✓✓	
Highly basic compounds (under acidic mobile phases)	✓✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
Highly basic compounds (under neutral mobile phases)	✓✓	✓✓✓	n/a	n/a	n/a	n/a
LC-MS/MS	✓✓✓	✓✓	✓	✓	✓	✓
Multi-component analysis	✓✓	✓✓	✓✓	✓	✓✓	✓✓
High-polarity compounds	✓✓	✓✓	✓✓	✓	✓	✓✓✓
Pyridine/phenol test	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
Quinizarin	✓✓	—	—	—	—	—
Acidic durability	✓✓	✓✓	✓✓	✓✓	✓✓✓	✓✓
Basic durability	✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓
Semi-preparative scale	—	✓✓	✓✓	✓✓	✓✓	✓✓
3-μm particle type	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓

✓✓✓: excellent ✓✓: good(applicable) n/a: not applicable

The problem in the analysis of basic compounds under an acidic condition

The following figure is an example of column-to-column variation under an acidic condition. The compound used here was amitriptyline, a highly basic compound used for the USP evaluation method. The results were obtained under an isocratic condition (0.1% formic acid/methanol). Retention times of the three columns (Column A, anonymous) were found very different under the mobile phase that was one of the most common in LC-MS. The similar tendency was observed in many other columns.

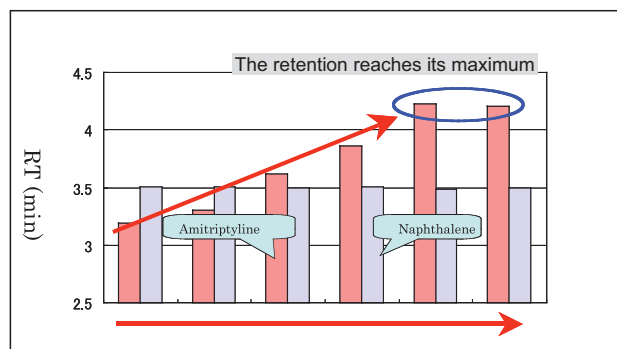


Lot variation under an acidic condition

HPLC Conditions

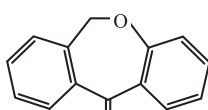
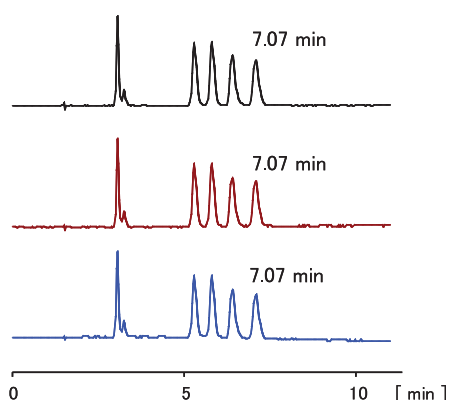
Column	: Column A 4.6 mm i.d. x 150 mm
Mobile phase	: CH ₃ OH / H ₂ O / HCOOH = 500 / 500 / 1
Flow rate	: 1 mL/min
Temperature	: 40 °C
Detection	: UV, 254 nm
Inj.vol.	: 5 μL
Sample dissolved in	: H ₂ O (50 μg/mL)

Based on our previous studies, we found the responsible factor was related to the synthetic byproducts and the residues of impurities from reagents used for the synthetic process. We accordingly applied a special pre-conditioning process to the column production, which provided the stable retention to both amitriptyline and naphthalene.

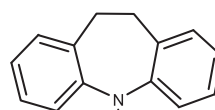


Optimization of pre-conditioning (PC) time

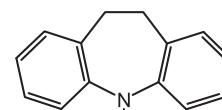
MGIII...excellent reproducibility under an acidic condition



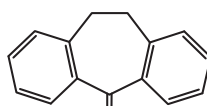
1. Doxepine (M.W. 279.4)



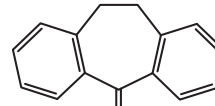
2. Imipramine (M.W.280.4)



3. Desipramine (M.W. 266.4)



4. Amitriptyline (M.W. 277.4)

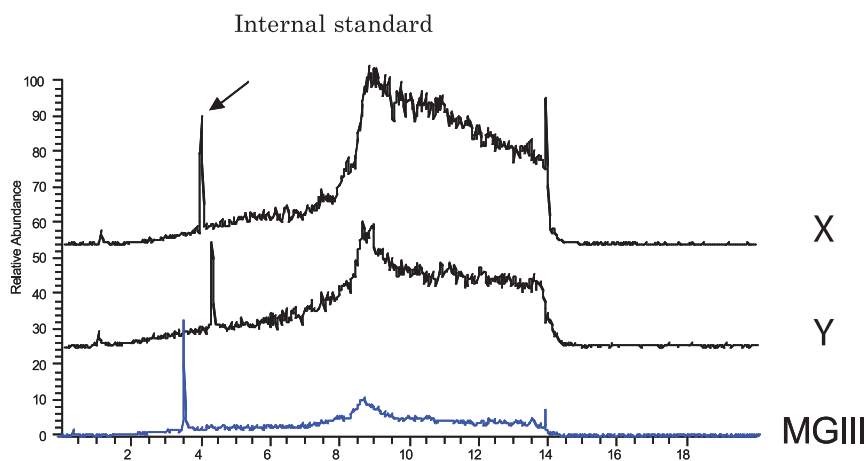


5. Nortriptyline (M.W. 184.2)

Column	: CAPCELL PAK C ₁₈ MGIII S5 4.6 mm i.d. x 150 mm
Mobile phase	: CH ₃ OH / H ₂ O / HCOOH=450 / 550 / 1
Flow rate	: 1 mL/min
Temperature	: 40 °C
Detection	: UV, 254 nm
Inj.vol.	: 1 μL
Sample dissolved in	: H ₂ O (50 μg/mL)

MGIII...low-bleeding column

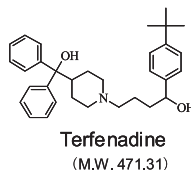
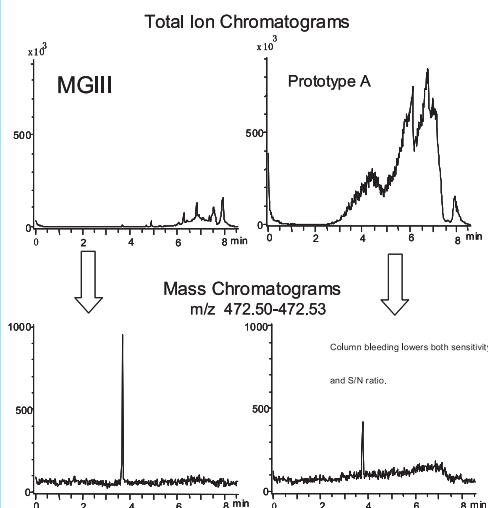
Total ion chromatograms (TICs) were compared among different Shiseido columns under a validated gradient condition. The PC process was found to reduce the amount of column bleeding to a large extent, especially in the region for highly hydrophobic compounds.



Comparison of column bleeding

“Column bleeding” influences LC-MS sensitivity (Ion suppression)

Column bleeding not only interferes an analyte signal by its components with close m/z values, but may lower an intensity of the analyte peak itself. The effect of column bleeding has been extensively studied throughout the development of the MGIII series.

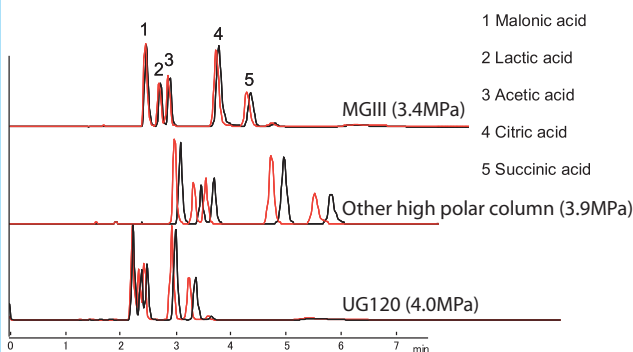


Column size : 2.0 mm i.d. x 50 mm
 Mobile phase : A) 0.1 vol % HCOOH
 B) CH₃CN
 B 10% (0min) -> 100% (5.0 min) -> 100%
 (6.0 min) -> 10% (6.1 min) Gradient
 Flow rate : 200 μ L/min
 Temperature : 40 °C
 Detection : MS ESI Positive
 Inj. vol. : 2 μ L
 Sample dissolved in: Methanol (10 ng/mL)

Influence of column bleeding on ion intensity of analyte (Ion suppression)

MGIII...wide usage from high-polarity compounds to low-polarity ones

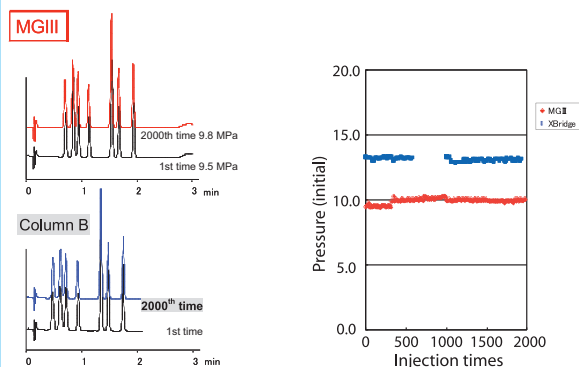
MG Series columns used to be categorized as “medium polar”. MGIII, being treated with the PC process, has a higher polarity than previous MG columns. Separation of small organic acids was attempted to evaluate the polarity of MGIII, in comparison with another Shiseido column and one of the competitor’s high-polarity columns.



Column size : 2.0&2.1 mm i.d. x 150 mm
 Mobile phase : 0.1 vol% H₃PO₄ / CH₃CN = 99.5 / 0.5
 Flow rate : 200 μ L/min
 Temp. : 40 °C
 Detection : UV 210 nm
 Inj. vol. : 2.0 μ L
 Sample dissolved in : Mobile phase (500 μ g/mL)

Separation of organic acids

MGIII...low pressure and high durability



Pressure change in continuous operations

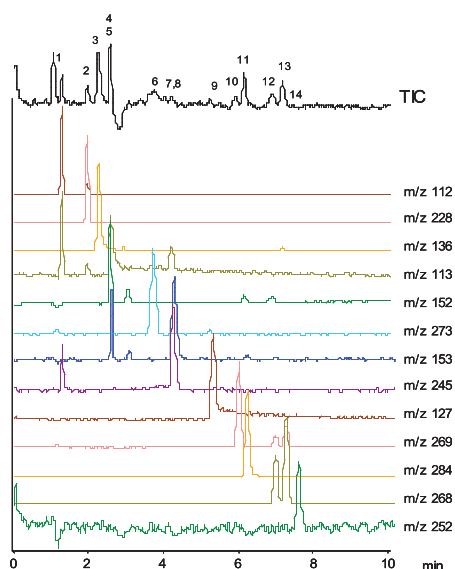
- Low pressure and high durability. A similar separation efficiency to be obtained with 25% less pressure.
- A new end fitting design (filter pore size, shape of through pore) to meet the new column specifications.
- A new process to finish the inner wall of the empty column.

LC-MS analysis of fourteen nucleic acid-related compounds

MGIII is suitable for separations of polar compounds. Nucleic acid-related compounds, which are generally considered hard to retain in C₁₈ columns, were also well separated with MGIII.

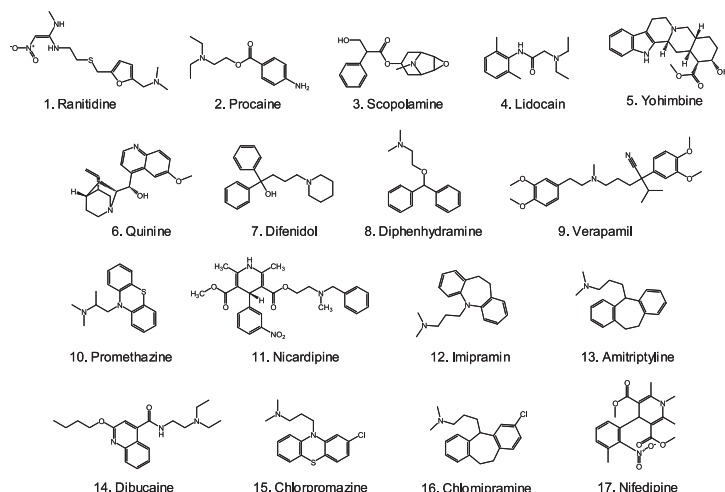
LC-MS Conditions

Column : CAPCELL PAK C18 MGIII S5 ; 2.0 mm i.d. x 150 mm
 Mobile phase : A) 0.1 vol% CH₃COOH B) CH₃OH
 B 2% (0 min) -> 20% (10 min) -> 2% (10 min) Gradient
 Flow rate : 200 µL/min
 Temperature : 40 °C
 Detection : MS ESI Positive
 Inj.vol. : 2 µL
 Sample : guanine (1000 µg/mL in 0.1 mol/L KOH), xanthin (1000 µg/mL in 0.1 mol/L NaOH), uridine (500 µg/mL in 1% HCOOH), deoxyadenosine (1000 µg/mL in 1% HCOOH) and other solutions (1000 µg/mL in 1% HCOOH) were mixed together, and diluted to 1 mL with water.
 Sonication (30 min) is necessary to dissolve some of the compounds.

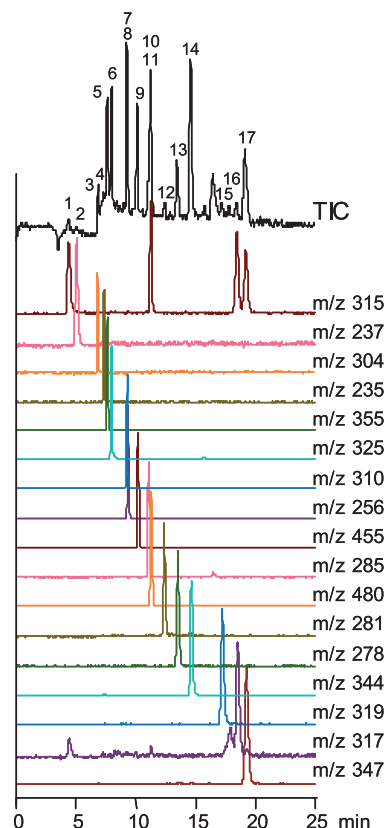


1. Cytosine (MW. 111.1)
2. Deoxycytidine (MW. 227.2)
3. Adenine (MW. 135.1)
4. Uracil (MW. 112.1)
5. Guanine (MW. 151.1)
6. Hypoxanthine (MW. 136.1)
7. Xanthine (MW. 152.1)
8. Uridine (MW. 244.2)
9. Thymine (MW. 126.1)
10. Inosine (MW. 268.2)
11. Guanosine (MW. 283.2)
12. Adenosine (MW. 267.2)
13. Deoxyguanosine (MW. 267.2)
14. Deoxyadenosine (MW. 251.2)

Simultaneous separation of seventeen basic compounds with MGIII column



Column : CAPCELL PAK C₁₈ MGIII S5 ; 2.0 mm i.d. x 250 mm
 Mobile phase : A) 10 mmol/L HCOONH₄ contained 0.1 vol% HCOOH B) CH₃OH
 B 20% (0 min) -> 20% (3 min) -> 55% (3 min) -> 55% (25 min) -> 20% (25 min) Gradient
 Flow rate : 200 µL/min
 Temperature : 40 °C
 Detect : MS ESI Positive
 Inj.vol. : 2 µL
 Sample : Methanol (Diphenhydramine: 10 µg/mL, Other sixteen compounds: 2 µg/mL)



CAPCELL PAK C₁₈ MGII

13

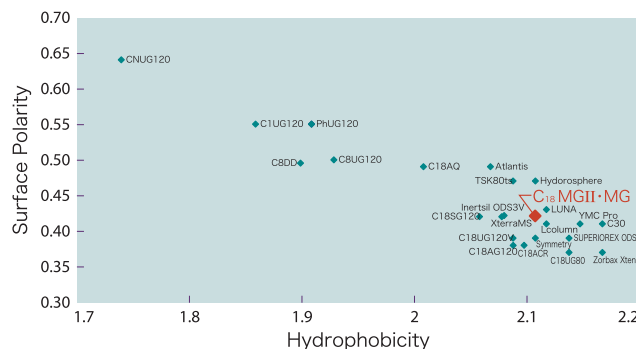


CAPCELL PAK MG II is based on high-purity silica support, being one of the MG series columns. MG II is designed to provide excellent peak shapes for basic compounds under neutral mobile phase conditions. Its outstanding “silanol-shielding” material was generated by the original polymer-coating technology.

Characteristics and parameter mapping

The general characteristics of CAPCELL PAK C₁₈ MG II are same as that of MG. MG II is an easy-to-use column with moderate hydrophobicity and moderate surface polarity.

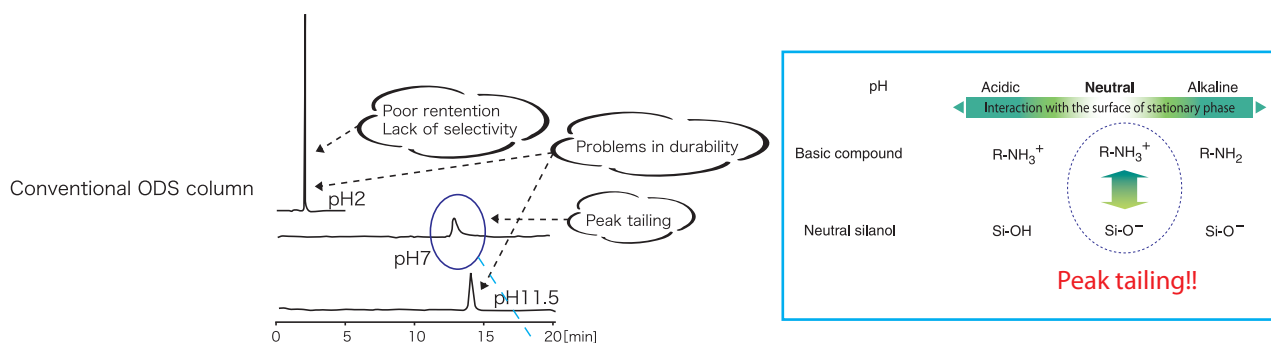
Function group	Pore size (nm)	Particle size (μm)	Specific surface area (m ² /g)	Carbon%	Alky group density (μmol/m ²)	pH	USP
C ₁₈	10	5	260	15	2.7	2-10	L1
C ₁₈	10	3	300	15	2.3	2-10	L1



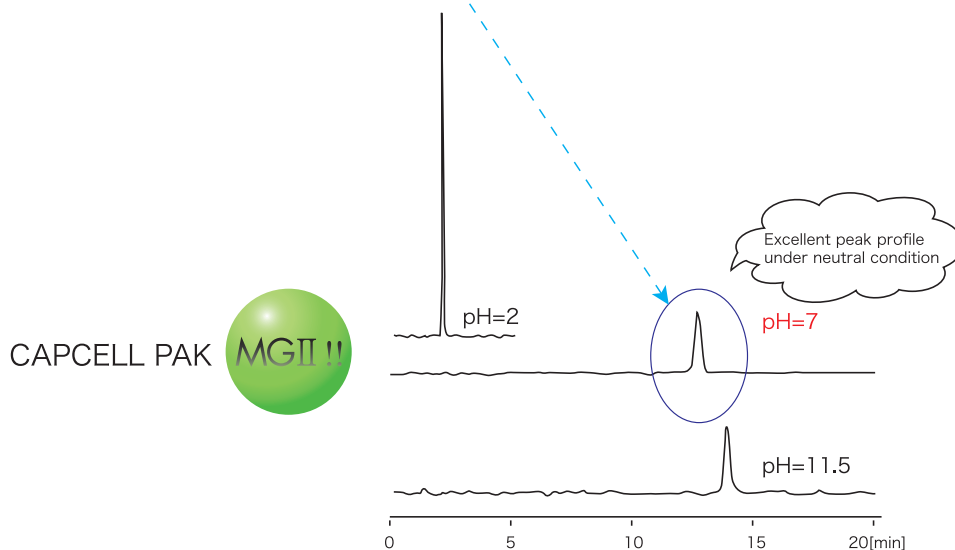
Why do we need a good column to be used under neutral mobile phase conditions?

Many physiologically active compounds and their metabolites possess a basic nature. Chromatographers keep on seeking a good column for such compounds, free from peak shape deterioration caused by silica’s acidity, the inherent nature of silica-based columns.

<Problems in analysis of basic compounds under acidic, basic, and neutral condition>



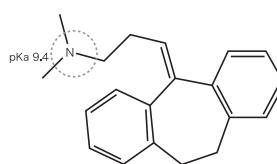
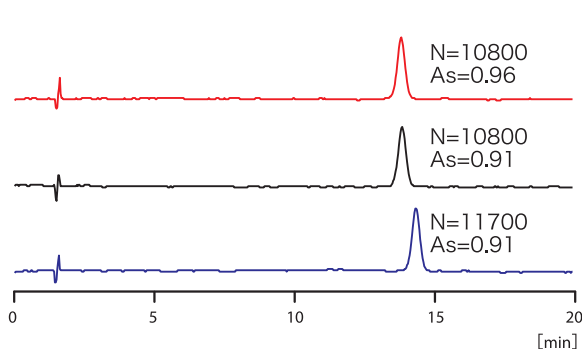
“CAPCELL PAK C₁₈ MG II” is the solution for analysis of basic compounds under neutral condition



- Advantage 1** → Possible to avoid lowering pH for compounds unstable at acidic conditions.
- Advantage 2** → Beginning a mobile phase optimization at neutral pH makes the process simple, especially in LC-MS.
- Advantage 3** → Good for compounds that show the highest ion intensity at neutral pH in LC-MS.

Excellent reproducibility

In addition to "Standard of Silica" and "Standards for Parameters of Packing Materials" (both documented by Shiseido), a test with amitriptyline is used to quality-control the production of MG II.



Amitriptyline

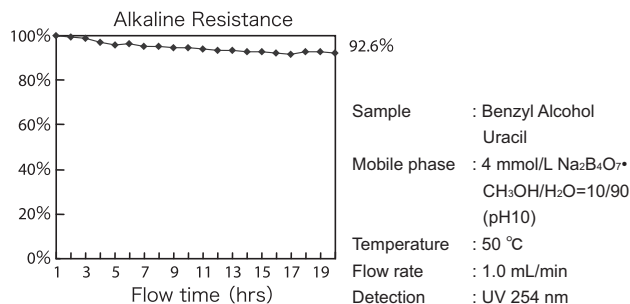
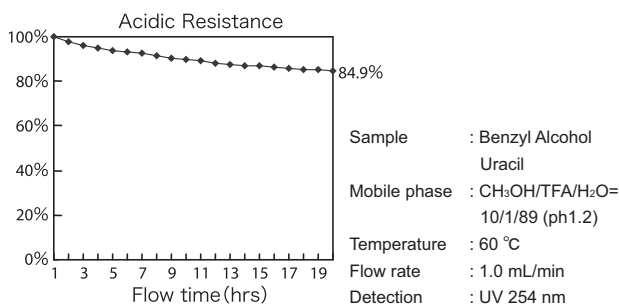
Sample	: Amitriptyline 50 ppm
Injection Vol.	: 5 μ L
Mobile Phase	: CH ₃ OH/20 mmol/L phosphate buffer=75/25
Temperature	: 40 °C
Flow rate	: 1.0 mL/min
Detection	: UV 254 nm

GLP/GMP Support Column

CAPCELL PAK C₁₈ MG II, a GLP/GMP support column, is attached with a test chromatogram and a certificate of performance for packing materials used for it. In addition, it is possible to request three columns from three different production lots for a validation purpose.

Wide pH range from 2 to 10

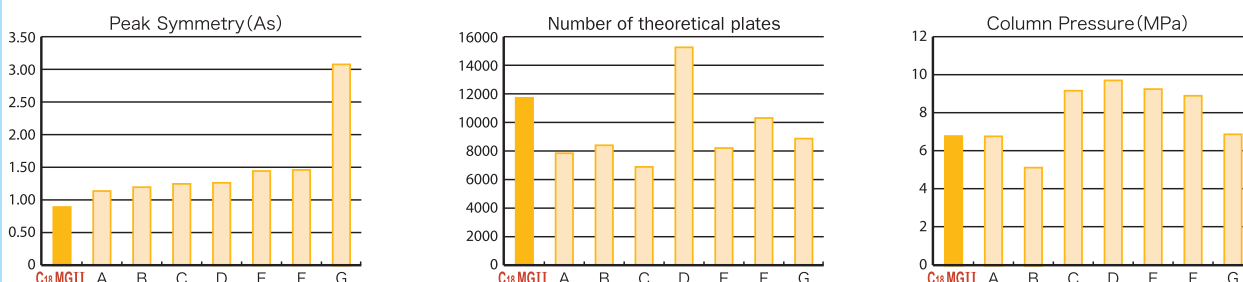
CAPCELL PAK C₁₈ MG II is a column having excellent performance and durability. The graphs below show the results of the durability test under acidic and basic conditions, indicating that CAPCELL PAK C₁₈ MG II can be used in a wide pH range.





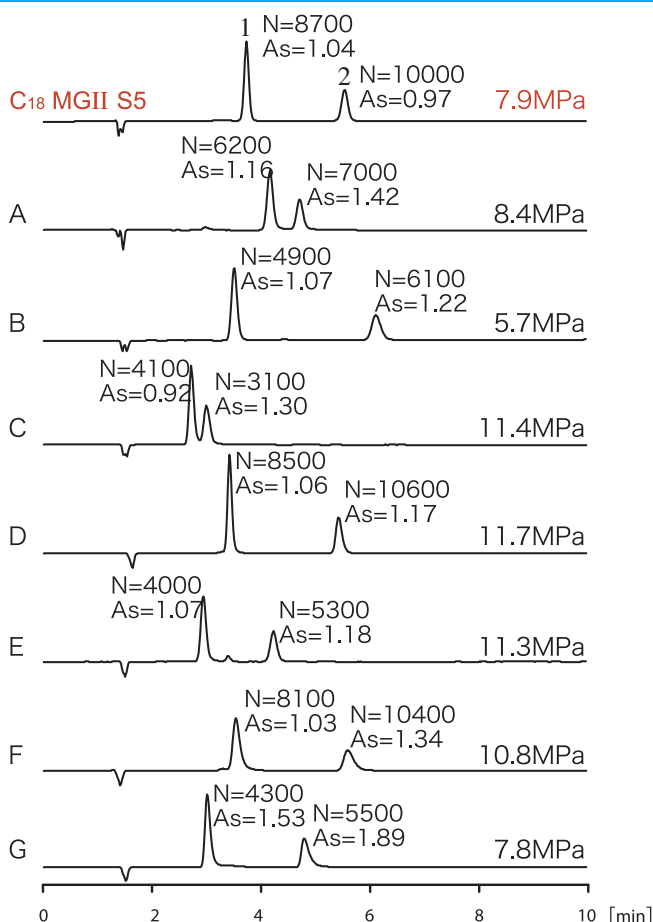
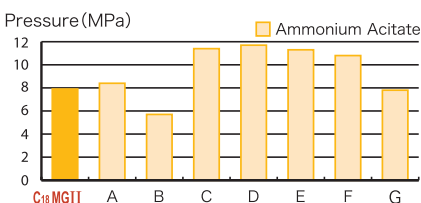
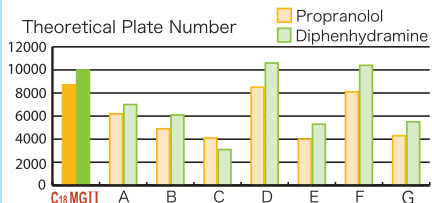
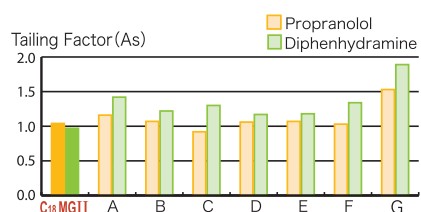
Shielding silanol groups at the highest level

The graphs below show the comparisons among columns of other suppliers in terms of tailing factor (As), Number of theoretical plates, and pressure (MPa) of amitriptyline, which are the indicators of the influences of residual silanol. As for MG II, good values were obtained in the three comparative factors. The results indicate that MG II is the best choice for analysis of basic compounds, and has achieved the highest level in shielding silanol groups.



Analysis using volatile salts

Basic compounds were analyzed with different columns using ammonium acetate, which is a neutral salt often used in LC-MS. Compared with other columns, CAPCELL PAK C₁₈ MG II showed the top level on peak symmetry and number of theoretical plates. In addition, MG II also showed low column pressure, which is one of the features common to all the CAPCELL PAK columns.

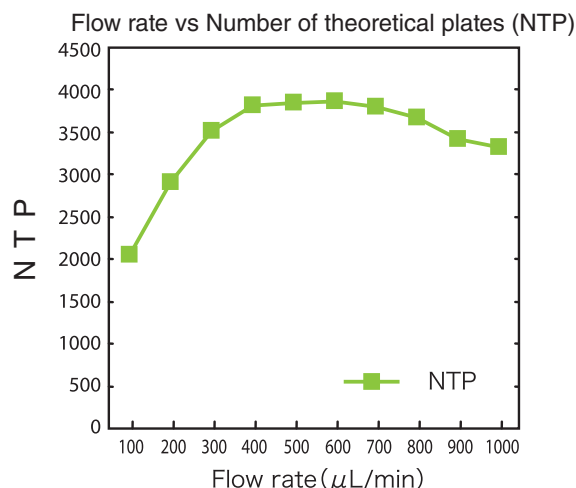


Column size : 4.6 mm i.d. x 150 mm
 Mobile phase : 10 mmol/L NH₄AcO, MeOH/H₂O=60/40, pH 7.35
 Flow rate : 1.0 mL/min
 Detection : UV 254 nm
 Injection Vol. : 5μL
 Temperature : 40 °C
 Sample : 1. Propranolol (100 ppm)
 2. Diphenhydramine (200 ppm)

3- μm particles for high-throughput analysis

CAPCELL PAK C₁₈ MGII S3 Provides the solution to meet the high-throughput demand.

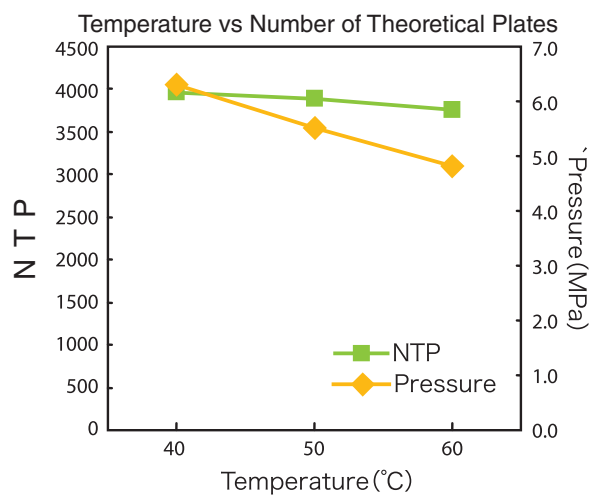
The largest number of theoretical plates is obtained around twice the normal flow rate (200 $\mu\text{L}/\text{min}$ for 2-mm column) and is nearly maintained in the zone of higher flow rates. (Recommended column pressure: 15 MPa or less, Maximum operating pressure: 20 MPa)



Run at more than twice the normal flow rate

- The run time is shortened in inverse proportion to the flow rate!
- Number of theoretical plates increases too!

Sample : Naphthalene
 Injection Vol. : 5 μL
 Column : C₁₈ MGII S-3
 2.0 mm i.d. \times 35 mm
 Mobile phase : CH₃CN/H₂O=50/50
 Temperature : 40 $^{\circ}\text{C}$
 Detection : UV 254 nm



Raise the temperature.

- Lowering pressure and increasing number of theoretical plates!

Sample : Naphthalene
 Injection Vol. : 5 μL
 Column : C₁₈ MGII S-3
 2.0 mm i.d. \times 35 mm
 Mobile phase : CH₃CN/H₂O=50/50
 Flow rate : 400 $\mu\text{L}/\text{min}$
 Detection : UV 254 nm
 Temperature : 40 $^{\circ}\text{C}$, 50 $^{\circ}\text{C}$, 60 $^{\circ}\text{C}$

Popular Column Dimension

Partial Number	Function Group	Grade	Pore Size (\AA)	Particle Size (μm)	Length (mm)	I.D. (mm)
92469	C ₁₈	MGII	100	3	100	2.0
92470	C ₁₈	MGII	100	3	150	2.0
92479	C ₁₈	MGII	100	3	50	4.6
92480	C ₁₈	MGII	100	3	75	4.6
92481	C ₁₈	MGII	100	3	100	4.6
92482	C ₁₈	MGII	100	3	150	4.6

Partial Number	Group	Grade	Pore Size (\AA)	Particle Size (μm)	Length (mm)	I.D. (mm)
92519	C ₁₈	MGII	100	5	100	2.0
92520	C ₁₈	MGII	100	5	150	2.0
92521	C ₁₈	MGII	100	5	250	2.0
92531	C ₁₈	MGII	100	5	100	4.6
92532	C ₁₈	MGII	100	5	150	4.6
92533	C ₁₈	MGII	100	5	250	4.6

CAPCELL PAK C₁₈ MG

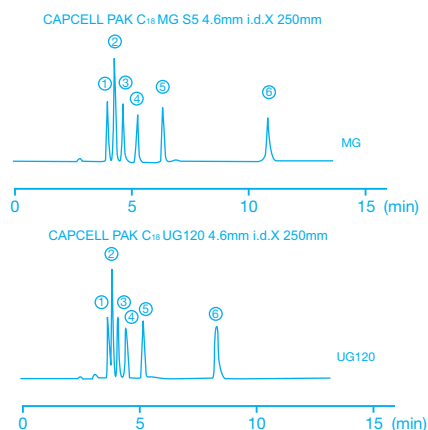
17



MG stands for Miracle Grade. The enhancement of hydrophobicity had previously been considered to conflict with the enhancement of surface polarity. This miraculous packing material, however, achieved an exquisite balance through the fine control of polymer coating and alkyl group introduction.

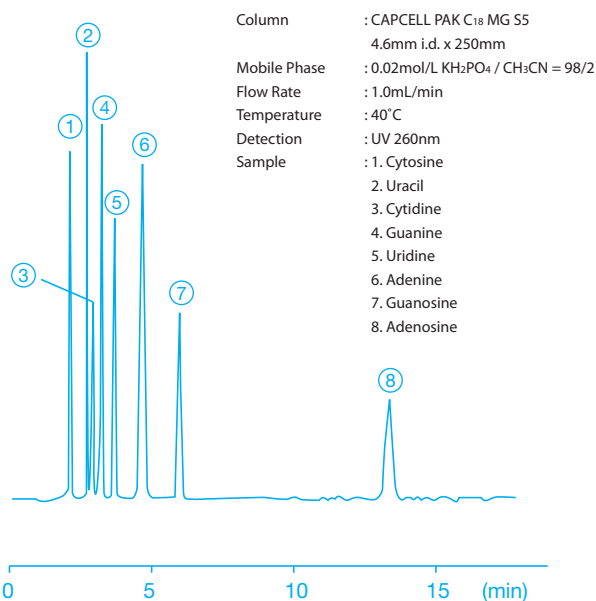
A wide range of compounds (acidic, neutral, and basic compounds, low-polarity to high-polarity compounds, and others) can be efficiently separated. This column is the optimum "first choice", being free of specific selectivity, easy-to-use, available in the pH range 2-10, and extremely durable.

Organic acids

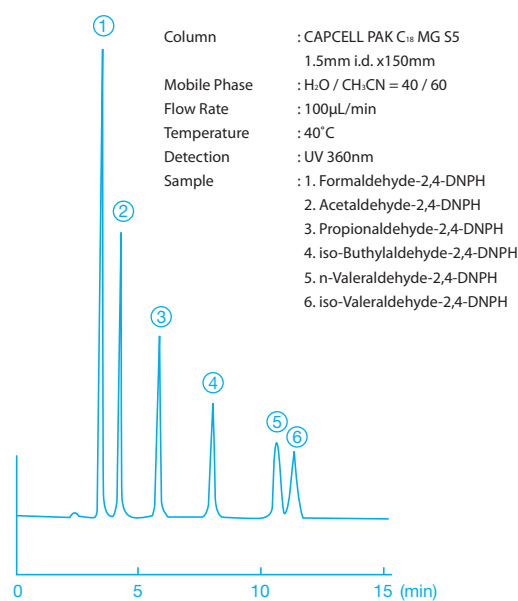


Column	: 4.6mm i.d. x 250mm
Mobile Phase	: 0.1vol% H ₃ PO ₄ / CH ₃ CN = 97.5 / 2.5
Flow Rate	: 1.0mL/min
Temperature	: 40°C
Detection	: UV 210nm
Sample	: 1. Malonic acid 2. Lactic acid 3. Acetic acid 4. Citric acid 5. Succinic acid 6. Propionic acid

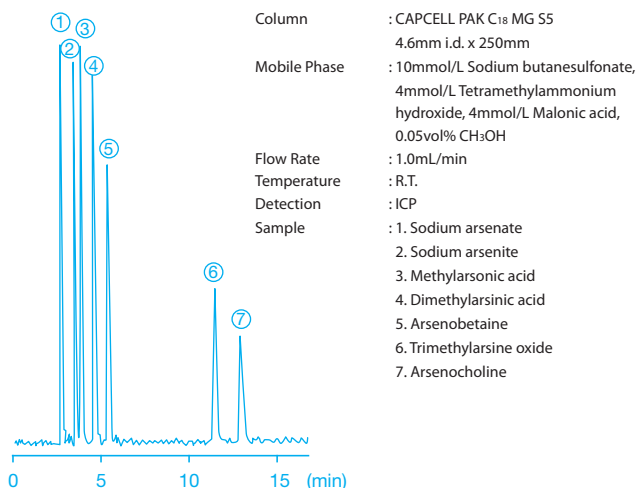
Nucleic acid bases, Nucleosides



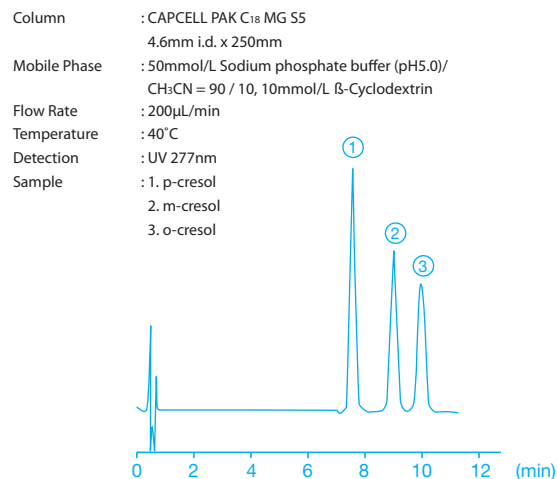
DNPH-aldehydes



Analysis of Arsenic Compounds by LC/ICP



Cresols



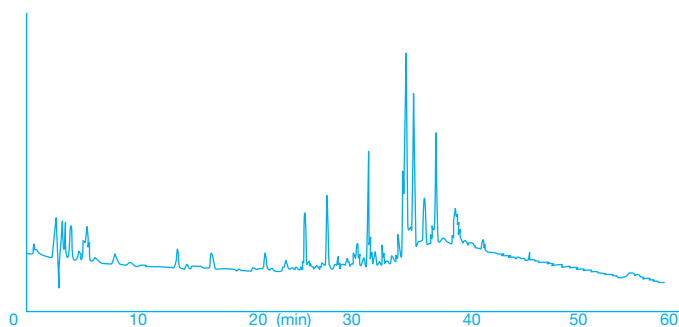
Capillary Columns

The MG S5 and S3 are now available in 0.5mm and 0.3mm i.d. !!

The MG phase is now available in capillary columns to meet the highest sensitivity and resolution, demanded typically in the field of proteomics.

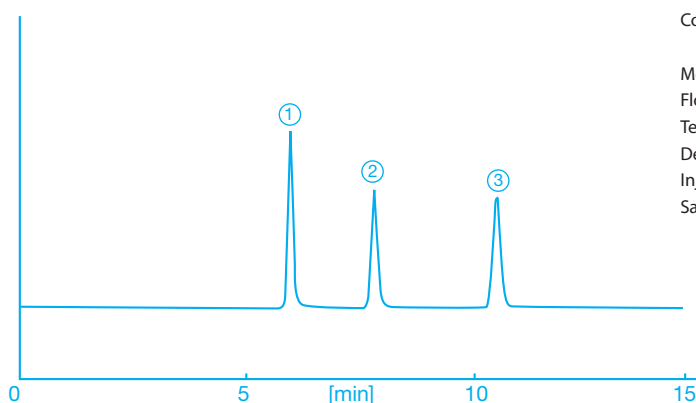
At 150mm length, S5 (5 μ m) and S3 (3 μ m) offer NTP (number of theoretical plates) of over 10,000 and 14,000 respectively.

Peptide Mapping with high Resolution



HPLC Conditions
 Column : CAPCELL PAK C₁₈ MG S3 0.3mm i.d. x 150mm
 Mobile phase : A: 0.05vol% TFA, H₂O
 B: 0.05vol% TFA, CH₃CN
 B: 10%(0min) → 50%(45min) → 50%(60min)
 Flow rate : 5 μ L/min
 Temperature : RT
 Detection : UV 210 nm
 Injection : 60nL
 Sample : Tryptic digest of casein

High NTP and Excellent Peak Symmetry



Column : CAPCELL PAK C₁₈ MGS3
 0.3mm i.d. x 150mm
Mobile phase : H₂O / CH₃CN= 25 / 75(v/v)
Flow rate : 5 μ L/min
Temperature : RT
Detection : UV 254nm
Injection : 60nL
Sample : 1. Ethyl benzene
 2. n-Propyl benzene
 3. n-Butyl benzene

Column Dimension

phase	type	size	i.d.(mm)	length (mm)
C ₁₈	MG	5 μ m	0.3	150
			0.5	
		3 μ m	0.3	
			0.5	

CAPCELL PAK UG (C₁₈, C₈, Ph, CN, NH₂, SCX)

19

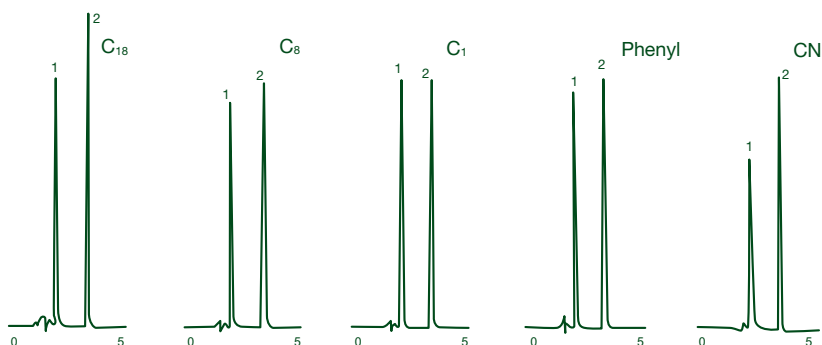


The CAPCELL PAK UG type utilizes a high-purity silica with low metal impurity (<5ppm), that gives a fast separation of basic and polar compounds with sharp symmetrical peaks.

Excellent surface inertness

PYRIDINE/PHENOL TEST

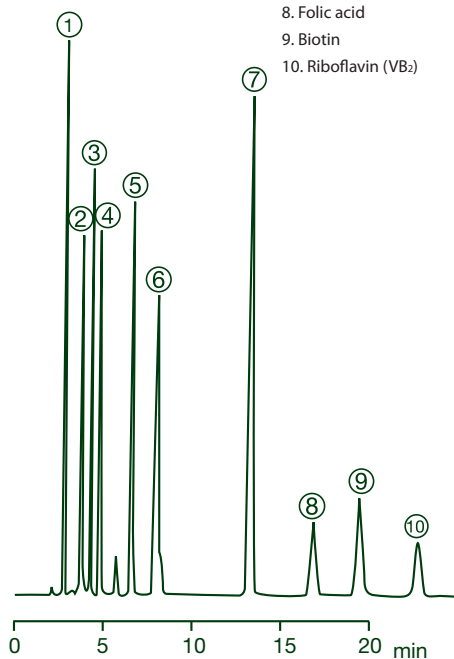
Column : CAPCELL PAK UG120 4.6mm i.d. x 150mm
 Mobile Phase : CH₃CN/H₂O = 30/70
 Flow Rate : 1.0mL/min
 Temperature : 40°C
 Detection : UV 254nm
 Sample : 1. Pyridine
 2. Phenol



C₁₈ UG

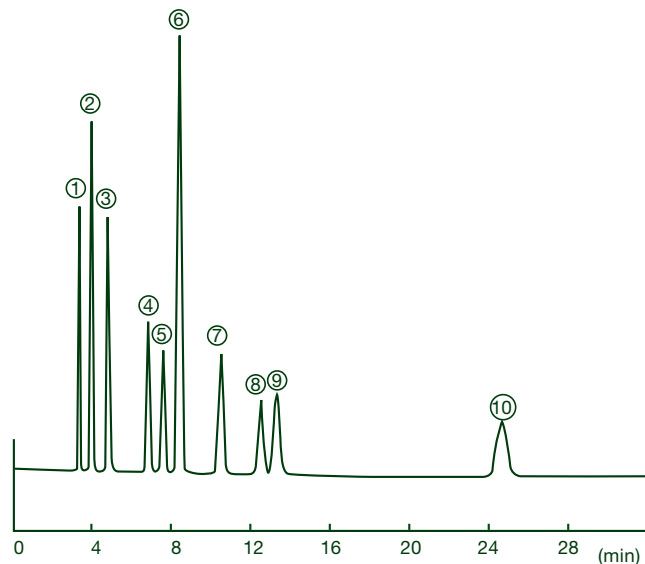
Water soluble vitamins

Column : CAPCELL PAK C₁₈ UG120 S5
 4.6mm i.d. x 150mm
 Mobile Phase : (5mmol/L Sodium hexanesulfonate
 + 20mmol/L H₃PO₄, pH2.3) /
 CH₃CN = 91 / 9
 Flow Rate : 1.0mL/min
 Temperature : 40°C
 Detection : UV 210nm
 Sample : 1. L-Ascorbic acid
 2. Nicotinic acid
 3. Nicotinamide
 4. Sodium pantothenate
 5. Pyridoxine hydrochloride
 6. Riboflavin phosphate
 7. Thiamine
 8. Folic acid
 9. Biotin
 10. Riboflavin (VB₂)



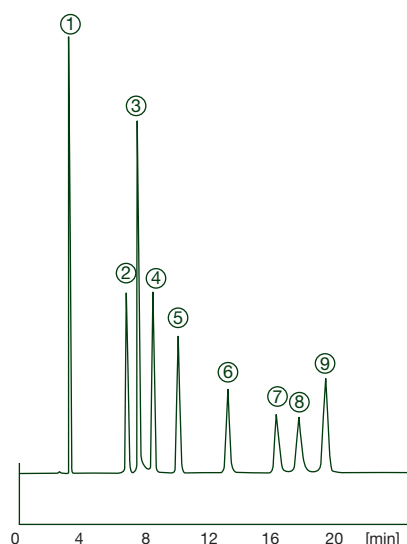
Antiseptics

Column : CAPCELL PAK C₁₈ UG120 S5
 4.6mm i.d. x 150mm
 Mobile Phase : 0.05mol/L NaH₂PO₄, pH4.5 / MeOH /
 CH₃CN = 50 / 35 / 15, 4mmol/L
 Cetyltrimethyl ammonium chloride
 Flow Rate : 1.0mL/min
 Temperature : 40°C
 Detection : UV 235nm
 Sample : 1. Methylparaben
 2. p-Hydroxy benzoic acid
 3. Ethylparaben
 4. Dehydroacetic acid
 5. n-Propylparaben
 6. Sorbic acid
 7. Benzoic acid
 8. Iso-Butylparaben
 9. n-Butylparaben
 10. Salicylic acid



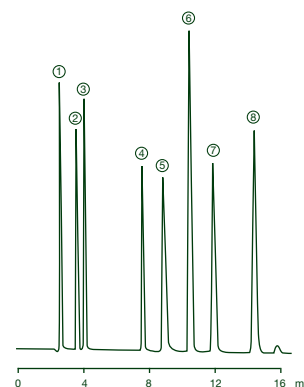
Acidic hair dyes

Column	: CAPCELL PAK C ₁₈ UG120 S5 4.6mm i.d. x 150mm
Mobile Phase	: 50mmol/L Sodium 1-octanesulfonate / CH ₃ OH = 60 / 40 (pH2.5, H ₃ PO ₄)
Flow Rate	: 1.0mL/min
Temperature	: 40°C
Detection	: UV 280nm
Sample	: 1. Resorcin 2. p-Aminophenol 3. p-Nitro-o-phenylenediamine 4. m-Aminophenol 5. o-Aminophenol 6. m-Phenylenediamine 7. p-Phenylenediamine 8. p-Toluenediaminosulfonate 9. p-Amino-o-cresol



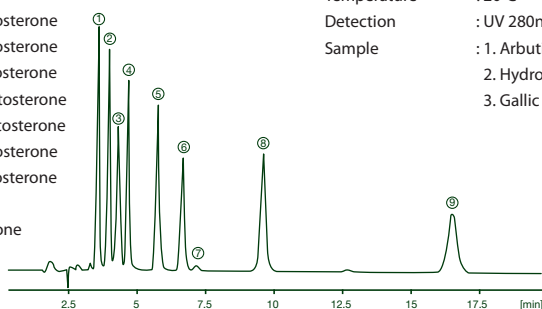
Ingredients of cold medicines

Column	: CAPCELL PAK C ₁₈ UG120 S5 4.6mm i.d. x 150mm
Mobile Phase	: 0.05mol/L NaH ₂ PO ₄ / CH ₃ CN = 20 / 80 (pH2.5, H ₃ PO ₄)
Flow Rate	: 1.0mL/min
Temperature	: 40°C
Detection	: UV 280nm
Sample	: 1. Potassium guaiacolsulfonate 2. Acetaminophen 3. Caffeine 4. Salicylamide 5. Chlorpheniramine maleate 6. Phenol(I.S.) 7. Aspirin 8. Ethenzamide



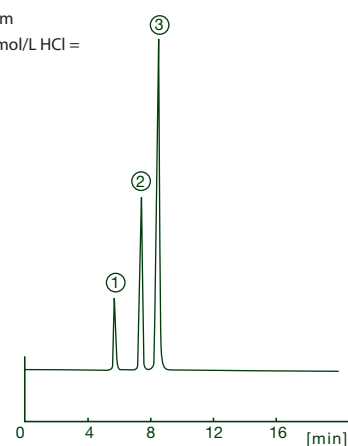
Metabolites of testosterone

Column	: CAPCELL PAK C ₁₈ UG120 S3 4.6mm i.d. x 150mm
Mobile Phase	: H ₂ O / CH ₃ OH / THF = 55 / 38 / 7
Flow Rate	: 1.0mL/min
Temperature	: 40°C
Detection	: UV 254nm
Sample	: 1. 6 α -Hydroxytestosterone 2. 7 α -Hydroxytestosterone 3. 6 β -Hydroxytestosterone 4. 16 α -Hydroxytestosterone 5. 16 β -Hydroxytestosterone 6. 2 α -Hydroxytestosterone 7. 2 β -Hydroxytestosterone 8. Androsterone 9. Methyltestosterone



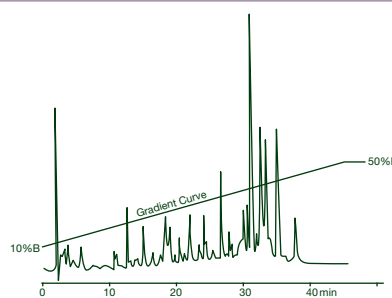
Active ingredients of bearberry leaf

Column	: CAPCELL PAK C ₁₈ UG120 S5 4.6mm i.d. x 150mm
Mobile Phase	: H ₂ O / CH ₃ OH / 0.1mol/L HCl = 94 / 5 / 1
Flow Rate	: 0.6mL/min
Temperature	: 20°C
Detection	: UV 280nm
Sample	: 1. Arbutin 2. Hydroquinone 3. Gallic acid



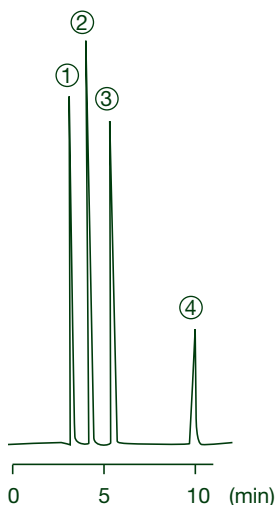
Tryptic digest of casein (peptide mapping)

Column	: CAPCELL PAK C ₁₈ UG120 S5 1.0 mm i.d. x 250 mm
Mobile Phase	: A : 0.1vol% TFA, H ₂ O B : 0.1vol% TFA, CH ₃ CN B 10% - 50% (45min) Gradient
Flow Rate	: 70 μ L/min
Temperature	: 35°C
Detection	: UV 210nm
Sample	: 1. Tryptic digest of casein



C₈ UG120

Suitable for quick separation of polar compounds, which used to be retained too long in other C₁₈ phases.



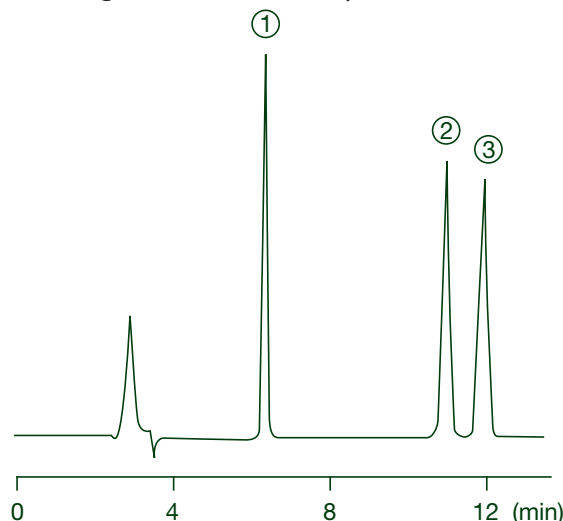
Column	: CAPCELL PAK C ₈ UG120 S5 4.6mm i.d. x 150mm
Mobile Phase	: 0.1vol% H ₃ PO ₄ / CH ₃ OH = 70 / 30
Flow Rate	: 1.0mL/min
Temperature	: 40°C
Detection	: UV 254nm
Sample	: 1. Hydroquinone 2. Resorcin 3. Catechol 4. Phenol

Ph UG120

Used for obtaining a different selectivity for analytes possessing an aromatic moiety.

Antiepileptics

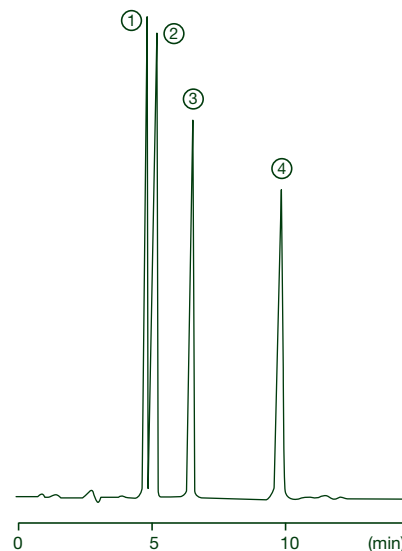
Column	: CAPCELL PAK Ph UG120 S5 4.6mm i.d. x 150mm
Mobile Phase	: { 50mmol/L Na ₂ HPO ₄ + 50mmol/L KH ₂ PO ₄ (pH6.8) } / CH ₃ CN = 70 / 30
Flow Rate	: 1.0mL/min
Temperature	: 40°C
Detection	: UV 254nm
Sample	: 1. Phenobarbital 2. Carbamazepine 3. Phenytoin

**CN UG120**

A phase having the least retentive nature of all reversed phases and a different selectivity brought by cyano groups.

Steroids

Column	: CAPCELL PAK CN UG120 S5 4.6mm i.d. x 150mm
Mobile Phase	: CH ₃ CN / H ₂ O = 35 / 65
Flow Rate	: 1.0mL/min
Temperature	: 35°C
Detection	: UV 242nm
Sample	: 1. Cortisol 2. Cortisone 3. Corticosterone 4. Testosterone

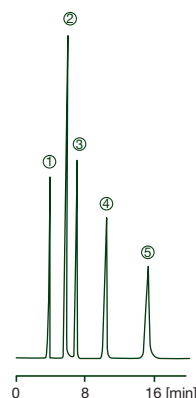


NH₂ UG80

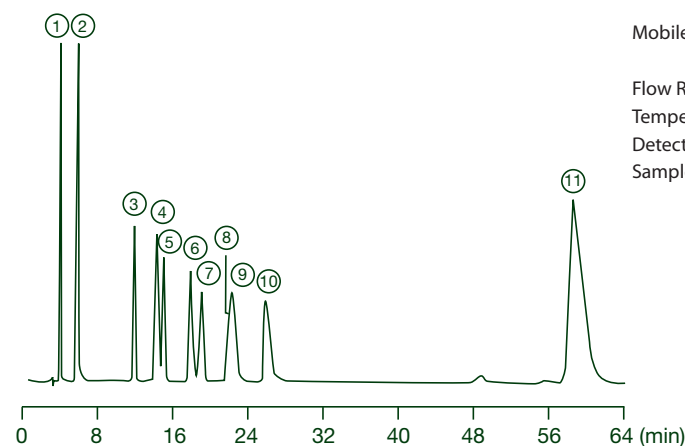
To be used as a normal phase under a water/organic mobile phase, or a weak anion exchanger under an acidic buffer.

Nucleotides

Column	: CAPCELL PAK NH ₂ UG80 S5 4.6mm i.d. x 250mm
Mobile Phase	: 0.05mol/L (NH ₄) ₂ HPO ₄ (pH3.0)
Flow Rate	: 1.0mL/min
Temperature	: 40°C
Detection	: UV 254nm
Sample	: 1. 5'-CMP 2. 5'-AMP 3. 5'-UMP 4. 5'-IMP 5. 5'-GMP

**SCX UG80**

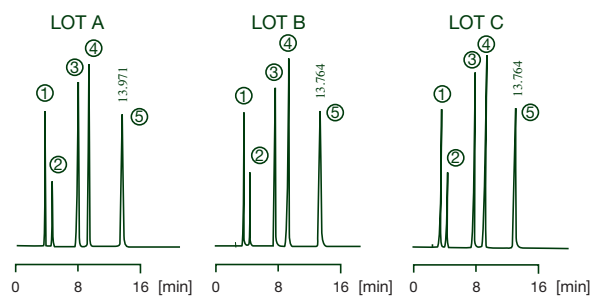
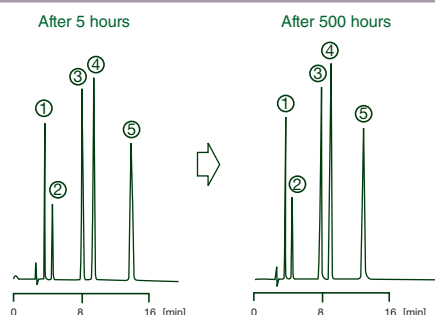
A strong cation exchanger used for basic compounds.

Determination of biogenic amines

Column	: CAPCELL PAK SCX UG80 4.6mm i.d. x 150mm
Mobile Phase	: 0.2mol/L CH ₃ COONa + 0.02mol/L CH ₃ COOH (pH5.6)
Flow Rate	: 1.0mL/min
Temperature	: 40°C
Detection	: UV 254nm
Sample	: 1. Dopa 2. Creatinine 3. Norepinephrine 4. Epinephrine 5. Octopamine 6. Normetanephrine 7. Dopamine 8. Isoproterenol 9. Metanephrine 10. Tyramine 11. Serotonin

Excellent lot-to-lot reproducibility

Column	: CAPCELL PAK SCX UG80 4.6mm i.d. x 150mm
Mobile Phase	: 0.2mol/L NH ₄ H ₂ PO ₄ (pH3.5)
Flow Rate	: 1.0mL/min
Temperature	: 40°C
Detection	: UV 254nm
Sample	: 1. Uracil 2. Thymine 3. Guanine 4. Cytosine 5. Adenine

**Highly durable**

Column	: CAPCELL PAK SCX UG80 4.6mm i.d. x 150mm
Mobile Phase	: 0.2mol/L NH ₄ H ₂ PO ₄ (pH3.5)
Flow Rate	: 1.0mL/min
Temperature	: 40°C
Detection	: UV 254nm
Sample	: 1. Uracil 2. Thymine 3. Guanine 4. Cytosine 5. Adenine

CAPCELL PAK C₁₈ ACR

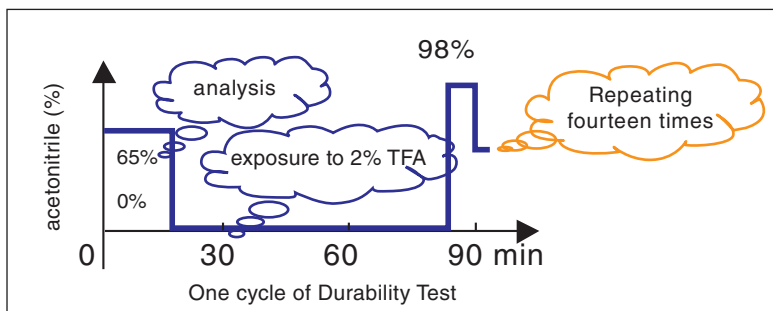
23



CAPCELL PAK C₁₈ ACR was synthesized through a modified polymer-coating technique, and intended to show an outstanding durability under an acidic mobile phase. Its performance was proven in the evaluation method originally designed for acidic resistance.

* ACR Capillary Columns are also available

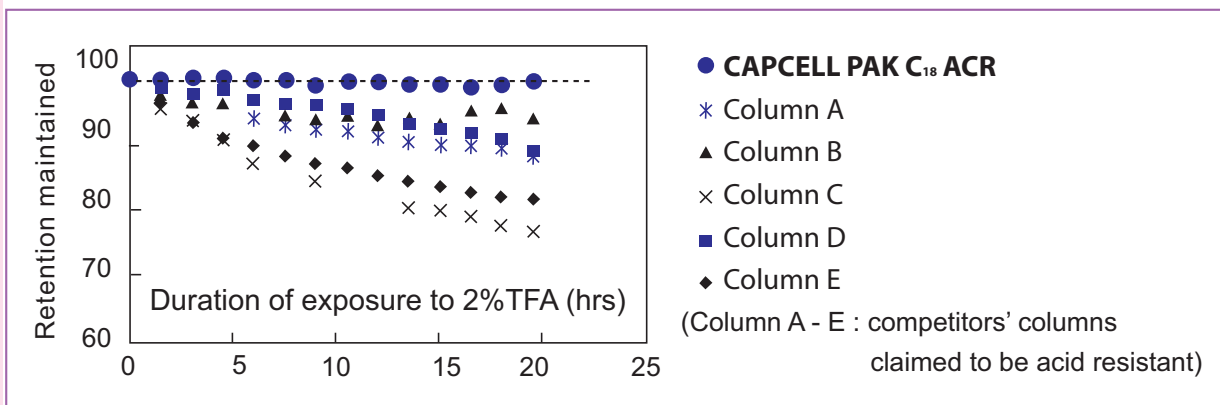
Acidic resistance test



HPLC conditions
 Column : C₁₈ ACR 4.6mm i.d.x150mm
 Mobile phase : A: 2vol% TFA in H₂O (pH1)
 B: 2vol% TFA in CH₃CN
 B: 65%(20min) - 0%(60min) - 98%(5min) - 65%(5min)
 Flow rate : 1.0mL/min
 Temperature : 60°C
 Detection : UV 254 nm
 Injection : 7µL
 Sample : uracil, amylbenzene



Comparison of Acidic Resistance



<http://hplc.shiseido.co.jp/e/>

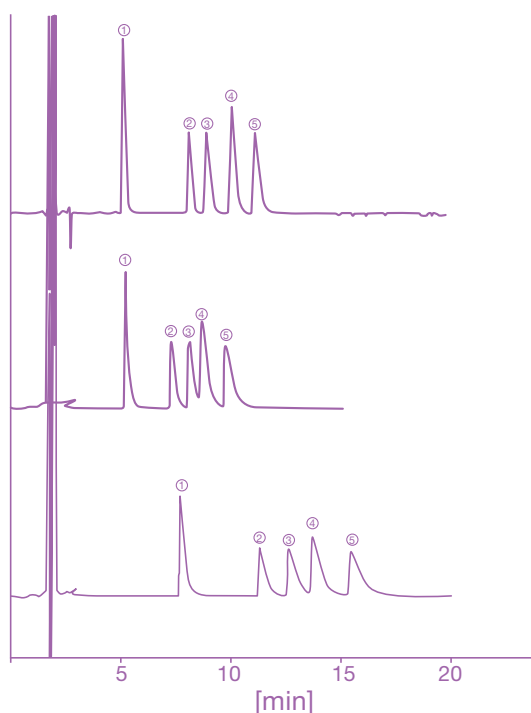
CAPCELL PAK C₁₈ ACR compared to other CAPCELL PAK C₁₈ phases

Type	Surface Area m ² /g	Pore Volume mL/g	Pore Size nm	Particle Diameter µm	Carbon Content %
ACR	340	0.8	8	5	18
MG	260	0.9	10	5	15
UG120	300	1.0	12	5	15
UG80	340	0.8	8	5	18

ACR Applications

Basic Compounds...Tricyclic antidepressants

Peaks of tricyclic antidepressants, highly basic compounds, are known to be easily affected by residual silanols of a stationary phase. The tendency is pronouncing under acidic mobile phases commonly used in LC-MS. The following comparison is performed between CAPCELL PAK C₁₈ ACR and Column F, one of the major commercial columns, using five typical antidepressants. The ACR column shows a good baseline separation for these compounds, while Column F shows a very unstable retention behavior, influenced by a slight change in organic content in a mobile phase. The inertness of the ACR column was explained by its completely polymer-coated surface structure.



CAPCELL PAK C₁₈ ACR
Mobile Phase
0.1vol% HCOOH, CH₃CN / H₂O = 25 / 75

Column F
Mobile Phase
0.1vol% HCOOH, CH₃CN / H₂O = 33 / 67

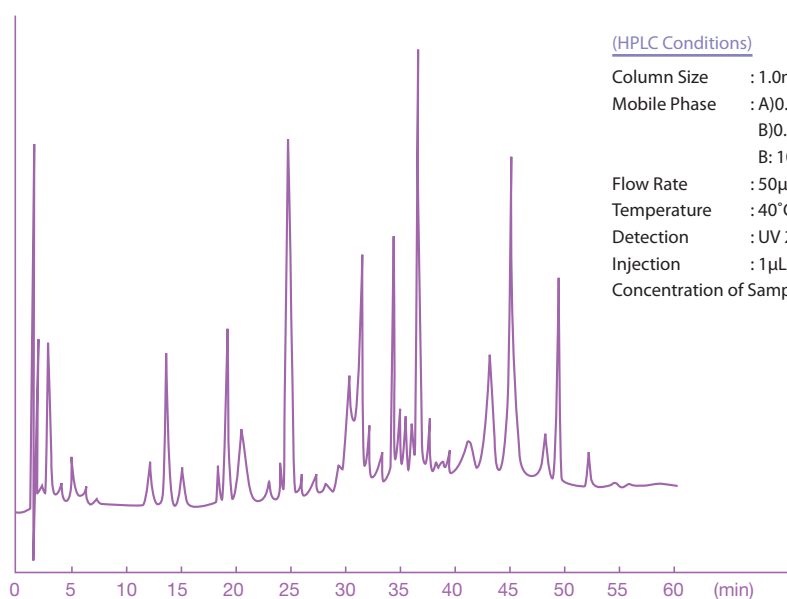
Column F
Mobile Phase
0.1vol% HCOOH, CH₃CN / H₂O = 32 / 68

(HPLC Conditions)

Column Size : 4.6mm i.d.x150mm
Flow Rate : 1.0mL/min
Temperature : 40°C
Detection : UV 210nm
Samples : ① Doxepine
 ② Desipramine
 ③ Imipramine
 ④ Nortriptyline
 ⑤ Amitriptyline

Peptide Mapping

Tryptic digest of fetuin



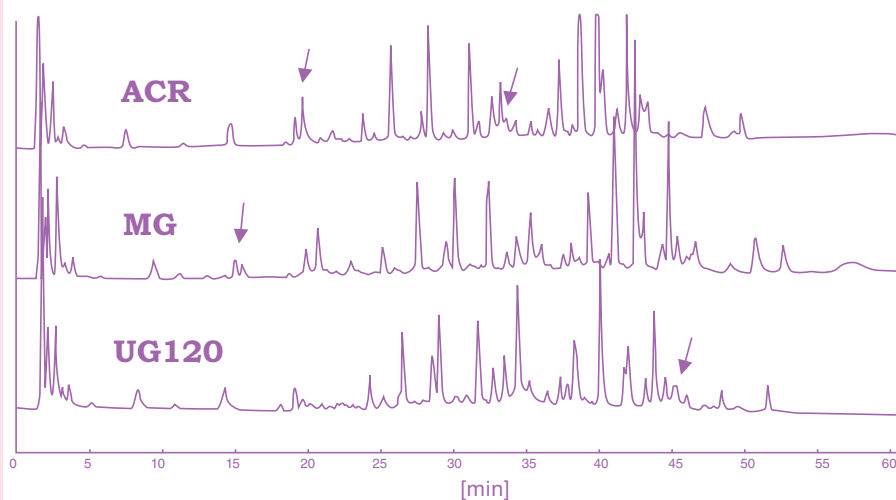
(HPLC Conditions)

Column Size : 1.0mm i.d. x 150mm
Mobile Phase : A) 0.05%vol TFA, H₂O
 B) 0.05%vol TFA, CH₃CN
 B: 10%(0min) → 50%(60min)
Flow Rate : 50μL/min
Temperature : 40°C
Detection : UV 210nm
Injection : 1μL
Concentration of Sample : 7.5mg/mL (before digestion)



Tryptic digest of casein

Profiles of tryptic digest of casein obtained with **CAPCELL PAK ACR, MG, and UG120** are compared as shown below. Acidic mobile phases are commonly used in peptide mapping based on reversed-phase chromatography.

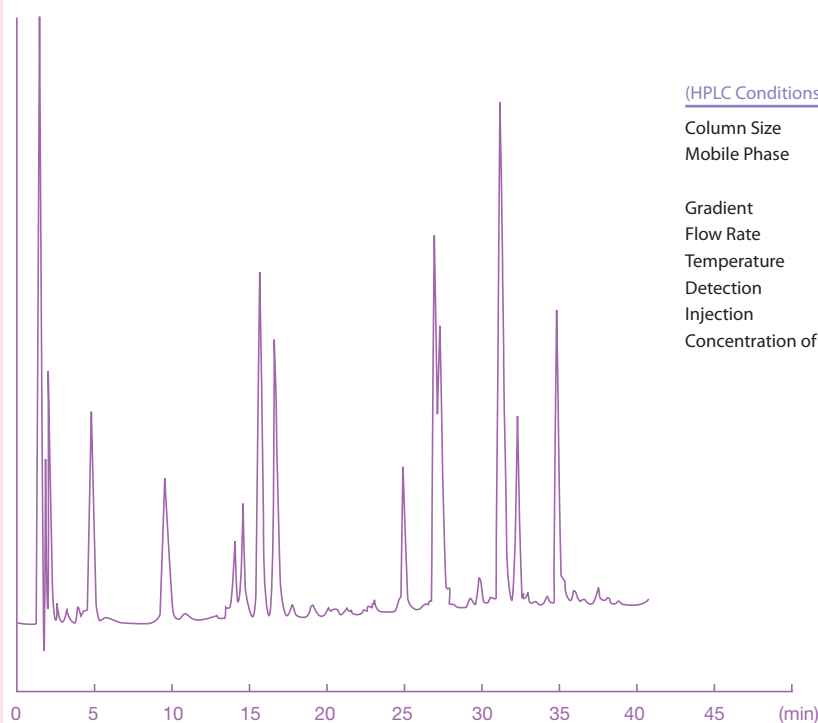


(HPLC Conditions)

Column Size : 1.0mm i.d. x 150mm
 Mobile Phase : A)0.05vol% TFA, H₂O
 B)0.05vol% TFA, CH₃CN
 Gradient : B: 10%(0min) → 50%(60min)
 Flow Rate : 50 μL/min
 Temperature : 40°C
 Detection : UV 210nm
 Injection : 1μL
 Concentration of Sample : 5mg/mL (before digestion)

Some selectivity differences (indicated with arrows) were observed among these columns.

Tryptic digest of cytochrome C



(HPLC Conditions)

Column Size : 1.0mm i.d. x 150mm
 Mobile Phase : A)0.05%vol TFA, H₂O
 B)0.05%vol TFA, CH₃CN
 Gradient : B: 10%(0min) → 50%(60min)
 Flow Rate : 50μL/min
 Temperature : 40°C
 Detection : UV 210nm
 Injection : 1μL
 Concentration of Sample : 7.5mg/mL (before digestion)

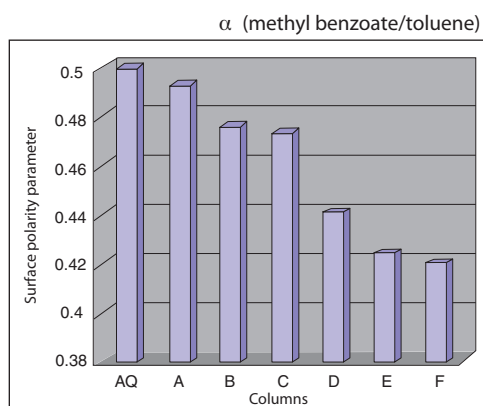
CAPCELL PAK C₁₈ AQ

26



CAPCELL PAK C₁₈ AQ was intended for separating highly polar compounds under water (buffer) rich mobile phase. Its C₁₈ group density was designed to be small, and shows a relatively small carbon content. The surface excess of organic solvent molecules on the stationary phase is adequately limited, and a stable retention of analytes can be obtained even under an aqueous mobile phase.

Surface polarity parameter of typical reversed-phase C₁₈ columns



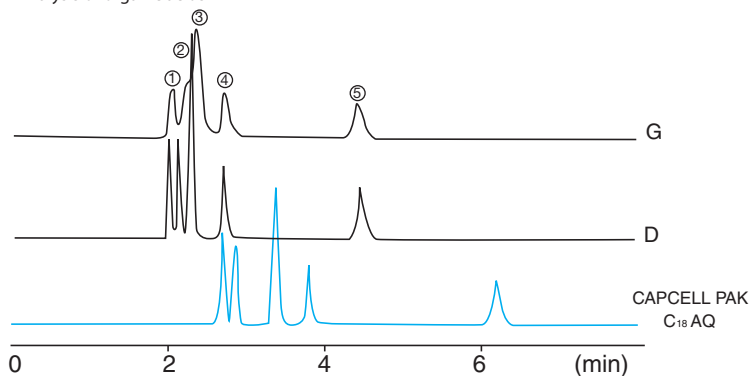
characteristics

Column	Specific surface area of silica support (m ² /g)	Carbon content (C%)
CAPCELL PAK C ₁₈ AQ	300	11
CAPCELL PAK C ₁₈ MG	260	15
CAPCELL PAK C ₁₈ UG	300	15

Excellent retention of polar compounds

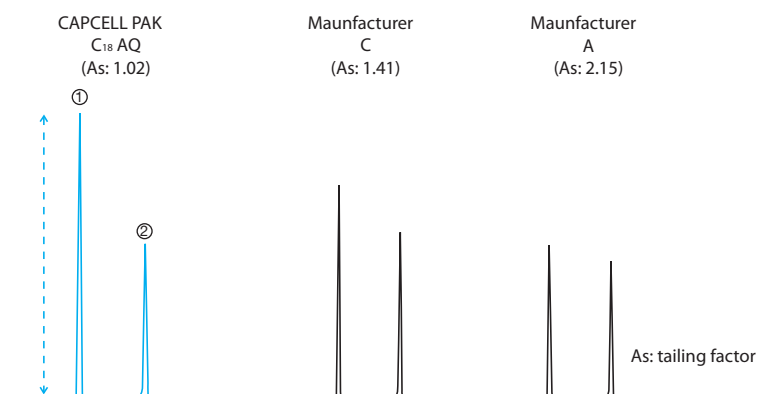
Column : 4.6mm i.d. x 150 mm
 Mobile Phase : 0.1vol% H₃PO₄
 CH₃CN / H₂O = 2/ 98
 Flow Rate : 1.0 mL/min
 Temperature : 40°C
 Detection : UV 210 nm
 Samples : 1) Lactic acid 2) Acetic acid
 3) Citric acid 4) Succinic acid
 5) Propionic acid

Analysis of organic acids



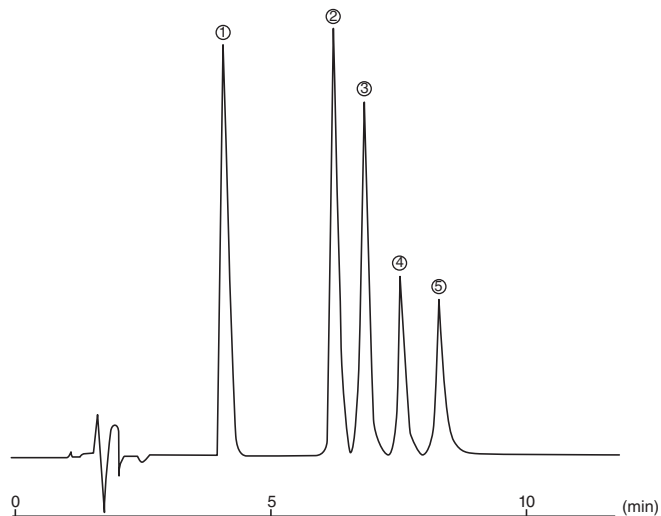
The peak shape of basic compounds represented by pyridine is almost symmetrical without tailing.

Column : 4.6mm i.d. x 150 mm
 Mobile Phase : CH₃CN / H₂O = 30 / 70
 Flow Rate : 1.0 mL/min
 Temperature : 40°C
 Detection : UV 254 nm
 Samples : 1) Pyridine
 2) Phenol



Good peak shape of basic compounds under slightly acidic conditions.

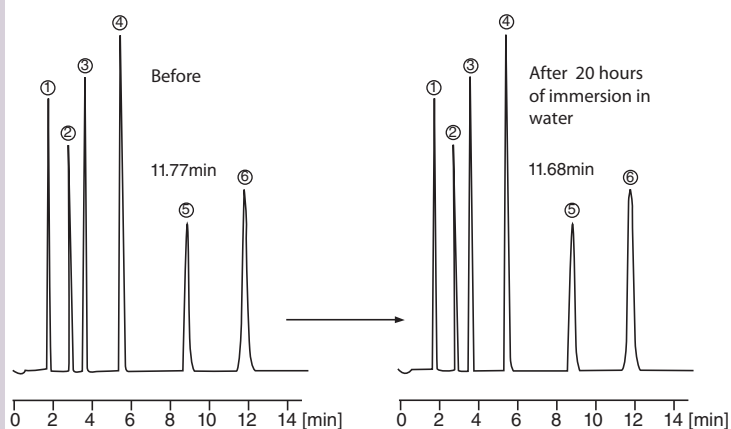
Analysis of tricyclic antidepressants



Column	: 4.6mm i.d. x 150 mm	
Mobile phase	: 0.1vol% HCOOH, CH ₃ CN /H ₂ O = 25 / 75	
Flow Rate	: 1.0 mL/min	
Temperature	: 40°C	
Detection	: UV 210 nm	
Samples	1) Doxepine	4) Nortriptyline
	2) Desipramine	5) Amitriptyline
	3) Imipramine	

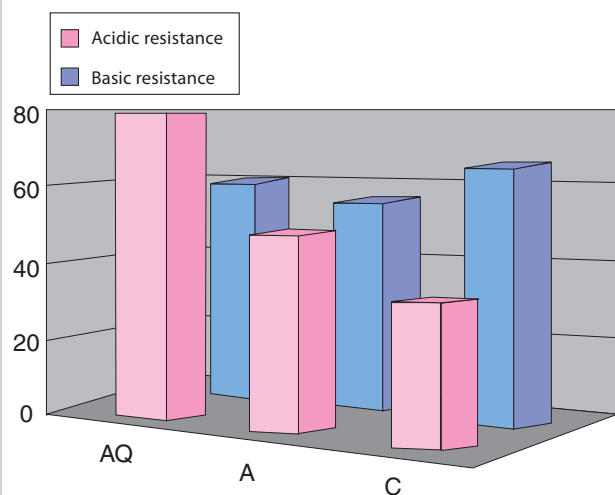
Compatible with a mobile phase of 100% water

Analysis of nucleic acid base

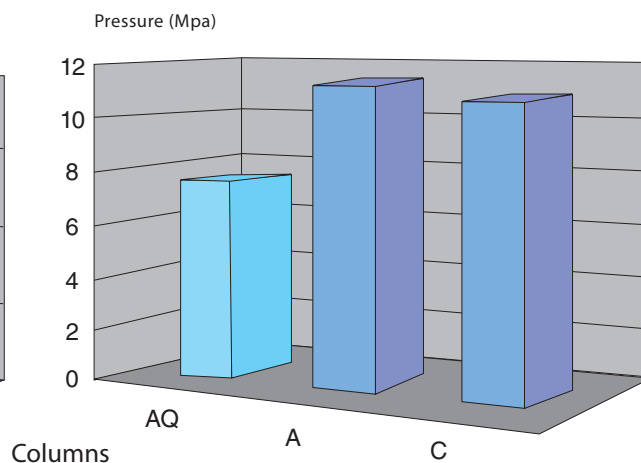


Column	: 4.6 mm i.d. x 150 mm	
Mobile phase	: 20 mmol/L KH ₂ PO ₄ , 20 mmol/L K ₂ HPO ₄	
Flow rate	: 1.0 mL/min	
Temperature	: 40°C	
Detection	: UV 254 nm	
Samples	1) Sodium nitrite	4) Guanine
	2) Cytosine	5) Thymine
	3) Uracil	6) Adenine

Superior resistance to acidic and Basic conditions



Excellent durability due to low column pressure



CAPCELL PAK CR



CR...Strong Cation Exchange & Reversed Phase

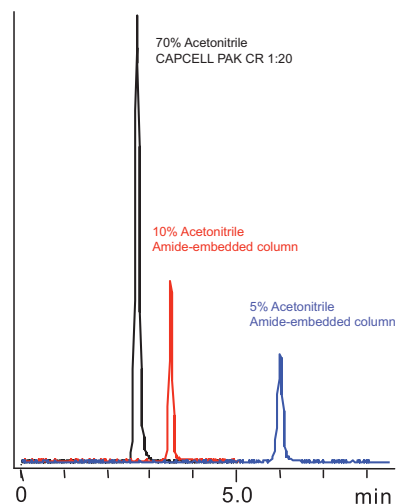
As a method to improve the sensitivity of basic drugs and their metabolites in LC-MS, Shiseido has developed a unique stationary phase.

The new product, "CAPCELL PAK CR," is a single column in which SCX and C₁₈ are mixed inside. The CR column is available with different mixing ratios that were not possible to obtain by connecting two columns; SCX:C₁₈ = 1:50, 1:20 and 1:4. Simply choose the optimum column that best suits your separation.

They are intended to elute basic compounds possessing a certain level of hydrophobicity under a mobile phase with a higher organic content than that for C₁₈ phases, for obtaining a higher sensitivity in LC-MS, or simply to obtain an altered separation selectivity.

Sensitivity increase in LC-MS

When a very hydrophilic and basic compound is to be analyzed in LC-MS, the choice of mobile phase may not be straightforward. An acidity and a large organic content are preferred to obtain a good ionization efficiency (sensitivity), while an organic content is limited in order to keep an adequate retention on reversed phase. CAPCELL PAK CR makes it possible to use a large organic content in a mobile phase for hydrophilic compounds, such as procaine, while only a very small organic content is allowed even for an amide-embedded column, a column considered suitable for such polar compounds.

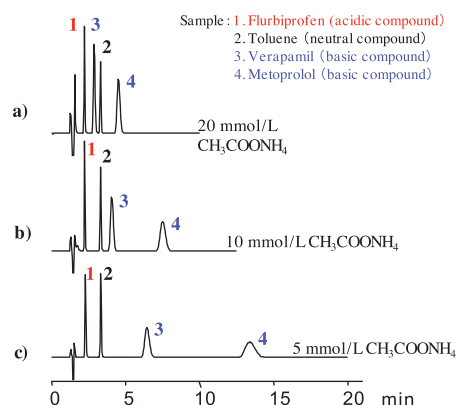


Conditions

Column	: Black : CAPCELL PAK CR 1 : 20 2.0 mm i.d. x 150 mm Red and blue : Amide-embedded column 2.1 mm i.d. x 150 mm
Mobile phase	: A) 10 mmol/L HCOONH ₄ (adjusted at pH3 with HCOOH) B) CH ₃ CN A / B : Black 30 / 70, Red 90 / 10, Blue 95 / 5
Flow rate	: 200 µL/min
Temp.	: 40 °C
Detection	: MS, ESI, Positive mode
Inj. vol.	: 2 µL
Sample	: Procaine

Simultaneous analysis of acidic/neutral/basic materials

CAPCELL PAK CR allows the analysis of not only basic compounds but the simultaneous analysis of neutral and acidic compounds. By varying the salt concentration in the mobile phase, it is also possible to independently adjust the retention of the basic compound.

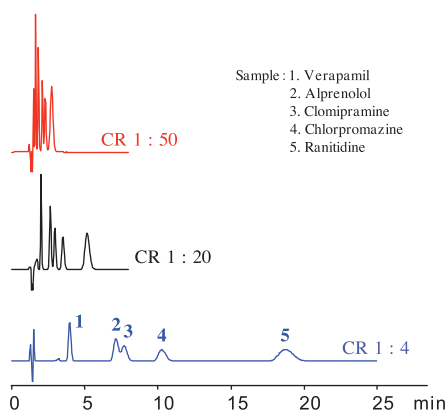


Conditions

Column	: CAPCELL PAK CR 1 : 4
Column size	: 2.0 mm i.d. x 150 mm
Mobile phase	: a) 20 mmol/L CH ₃ COONH ₄ (adjusted at pH4.0 with CH ₃ COOH) / CH ₃ CN = 30 / 70 b) 10 mmol/L CH ₃ COONH ₄ (adjusted at pH4.0 with CH ₃ COOH) / CH ₃ CN = 30 / 70 c) 5 mmol/L CH ₃ COONH ₄ (adjusted at pH4.0 with CH ₃ COOH) / CH ₃ CN = 30 / 70
Flow rate	: 200 µL/min
Temp.	: 40 °C
Detection	: UV 220 nm
Inj. vol.	: 1 µL

Choice of three different ratios

Reducing run time and improving the separation profile are possible with the same mobile phase condition by choosing a different mixing ratios available in CAPCELL PAK CR.



Conditions

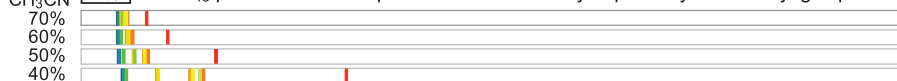
Column	: Red : CAPCELL PAK CR 1 : 50 Black : CAPCELL PAK CR 1 : 20 Blue : CAPCELL PAK CR 1 : 4
Column size	: 2.0 mm i.d. x 150 mm
Mobile phase	: 10 mmol/L HCOONH ₄ (adjusted at pH 3.0 with HCOOH) / CH ₃ CN = 30 / 70
Flow rate	: 200 μL/min
Temp.	: 40 °C
Detection	: UV 220 nm
Inj. vol.	: 2 μL
Sample	: Basic compounds 5 types

CAPCELL PAK CR -Atlas-

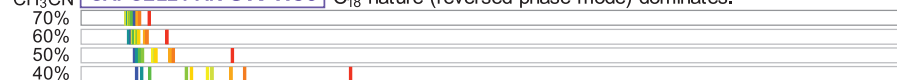
CAPCELL PAK C₁₈, CAPCELL PAK SCX, and three types of CAPCELL PAK CR columns were compared in the separations of ten typical basic compounds. The figures below show structure, pKa value, and change in retention time and selectivity under different mobile phases, for each compound. While CR 1:50 and CR 1:20 generally show selectivity close to those of C₁₈, CR 1:4 has selectivity totally different from those of C₁₈ and SCX. It is advised to utilize the results for method developments of other basic compounds.

A. Ohkubo et al. *J.Chromatogr. A* 779 (1997) 113-122.

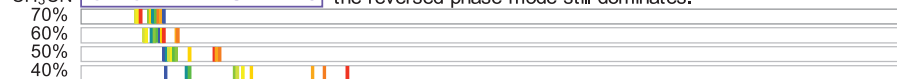
CH₃CN **C₁₈** The C₁₈ phase retains compounds based on the hydrophobicity of the alkyl groups.



CH₃CN **CAPCELL PAK CR 1:50** Slight cation-exchange effect is added, but the C₁₈ nature (reversed-phase mode) dominates.



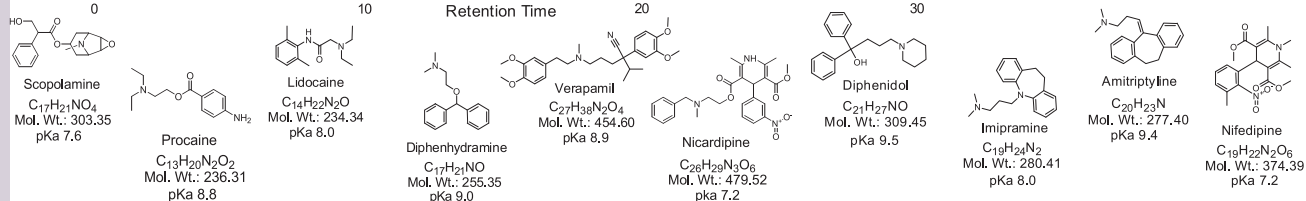
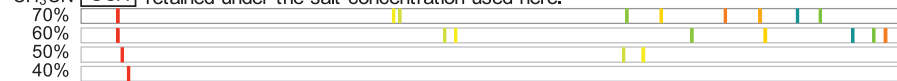
CH₃CN **CAPCELL PAK CR 1:20** Cation-exchange effect is further added, but the reversed-phase mode still dominates.



CH₃CN **CAPCELL PAK CR 1:4** The phase has a selectivity totally different from those of C₁₈ and SCX.

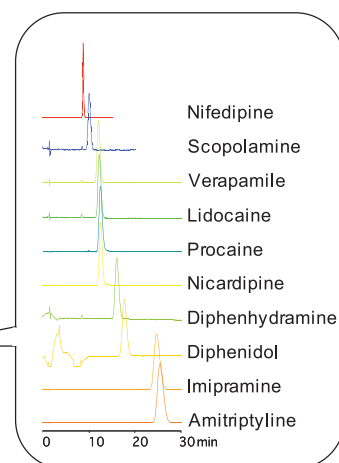


CH₃CN **SCX** Cation-exchange effect dominates. Cationic compounds are strongly retained under the salt concentration used here.



HPLC Conditions

Column size	: 2.0 mm i.d. x 150 mm
Mobile phase	: 10 mmol/L HCOONH ₄ (pH3, HCOOH) / CH ₃ CN
Flow rate	: 200 ml/min
Temp.	: 40 °C
Inj. vol.	: 2mL
Sample dissolved in	: CH ₃ OH



CAPCELL PAK C₈ DD (Double Durability)

CAPCELL PAK C₈ DD, Different performances from those of conventional C₈ phases

Alkyl groups attached to silica-based packing material are cleaved when used in an acidic mobile phase for a long period of time. When used in a basic mobile phase, the silica support dissolves thus destroying the column. Durability of reversed phases has a tendency to decrease as the length of the alkyl group decreases. CAPCELL PAK C₈ DD (Double Durability) is a column with unparalleled acidic and basic resistance. The high surface polarity and smaller hydrophobicity, compared to C₁₈ columns, make this product the best choice for short-time analysis of mixtures with diverse hydrophobicities.

Excellent durability (pH range : 1.5 – 10)

Excellent Acidic resistance

Acidic resistance depends on the concentration of the organic content in a mobile phase. It is known that the higher the concentration of the organic content is, the more difficult it is to cleave the Si-C bond. The test method here uses a mobile phase of pH 1 with no organic solvent, thus representing an extremely harsh acidic condition.

*Acidic resistance test conditions

Mobile phase	: (A) 2 vol% TFA, H ₂ O, pH1 (B) 2 vol% TFA, CH ₃ CN B 65% (20min)>0% (60min) >98% (5min)>65% (5min)
Flow rate	: 1.0 mL/min
Temperature	: 60 °C
Detection	: UV 254 nm
Sample	: Uracil, amylbenzene

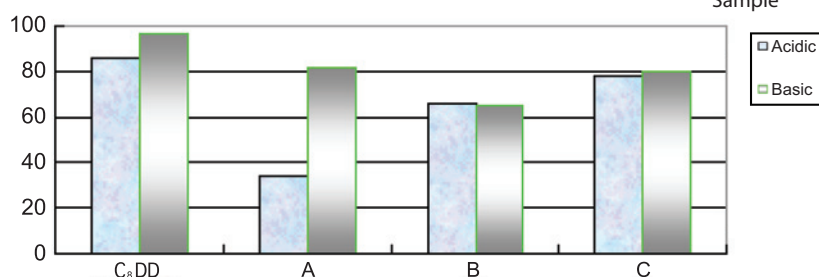
Excellent Basic resistance

Silica is not hydrolysed under acidic conditions, but unstable under neutral to basic conditions. The test method uses a mobile phase of pH 10 which represents an extremely harsh basic condition.

*Basic resistance test conditions

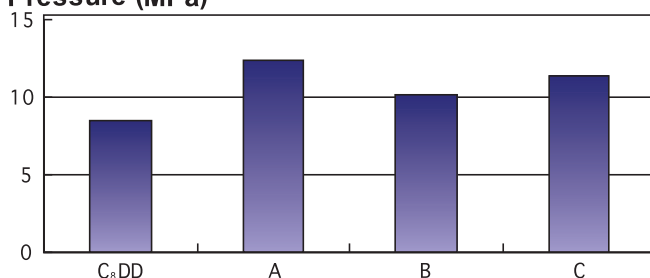
Column	: 4.6mm i.d. x150mm
Mobile phase	: 4 mmol/L Na ₂ B ₄ O ₇ /CH ₃ CN=90/10, pH 10.0
Flow rate	: 1.0 mL/min
Temperature	: 50 °C
Detection	: UV 254 nm
Sample	: Uracil, amylbenzene

Durability (%)



Low back pressure

Pressure (MPa)



Conditions

Column	: 4.6mm i.d. x150mm
Mobile phase	: H ₂ O/CH ₃ CN=50/50
Flow rate	: 1.0 mL/min
Temperature	: 40°C



Excellent peak shape of basic compounds

The polymer coating technology used for CAPCELL PAK C₈ DD resulted in showing excellent peak shapes for basic compounds. The figure down on the left is the comparison with other columns in "pyridine/phenol test", an evaluation method commonly used for silanol effects. A good separation was also obtained for five tricyclic antidepressants, highly basic compounds (down, left).

Pyridine/phenol test

As: 1.02



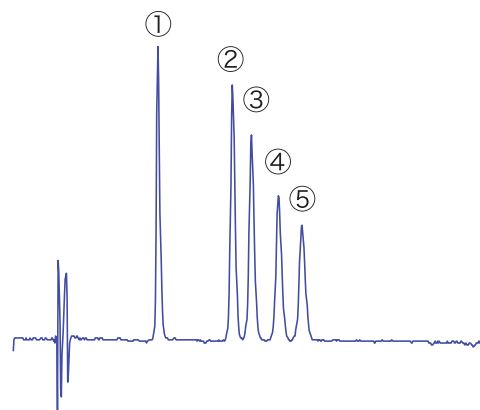
As: 1.57
Column A

As: 1.36
Column B

As: 2.61
Column C

Condition
 Column : Capcell Pak C₈ DD S5
 4.6 mm i.d. x150mm
 Mobile phase : H₂O/CH₃CN=30/70
 Flow rate : 1.0 mL/min
 Temperature : 40 °C
 Samples : 1) Pyridine 2) Phenol

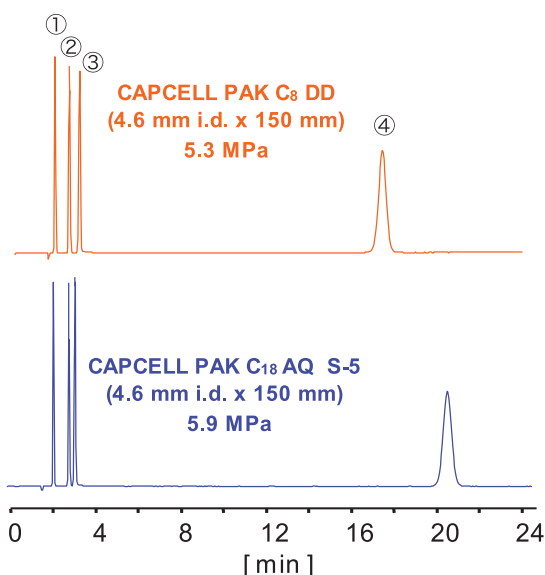
Analysis of tricyclic antidepressants



Column : Capcell Pak C₈ DD S5
 4.6 mm i.d. x150mm
 Mobile phase : 0.1 vol% HCOOH,
 CH₃CN/H₂O=25/75
 Flow rate : 1.0 mL/min
 Temperature : 40 °C
 Detection : UV 254 nm
 Samples : 1) Doxepine 2) Desipramine
 3) Imipramine 4) Nortriptyline
 5) Amitriptyline

Suitable for quickly separating mixtures with diverse hydrophobicity

This is a comparison between CAPCELL PAK C₁₈ AQ, and CAPCELL PAK C₈ DD column. Due to large hydrophobicity corresponding to the long functional group, CAPCELL PAK C₁₈ AQ requires more time to elute ibuprofen that has a relatively high hydrophobicity. On the other hand, C₈ DD column, with its low hydrophobicity, is capable of separating the sample in a much shorter time. In addition, because of the high surface polarity that is equivalent to that of the C₁₈ AQ, highly polar samples are effectively retained.



1, Caffeine
 2, Ethenzamide
 3, Bromovalerylurea
 4, Ibuprofen

Mobile phase : CH₃OH/H₂O = 60/40, 0.1 H₃PO₄
 Flow rate : 1.0mL/min
 Detection : UV 220 nm
 Teperature : 40 °C

PC HILIC ~Phosphorylcholine - bound HILIC Column~

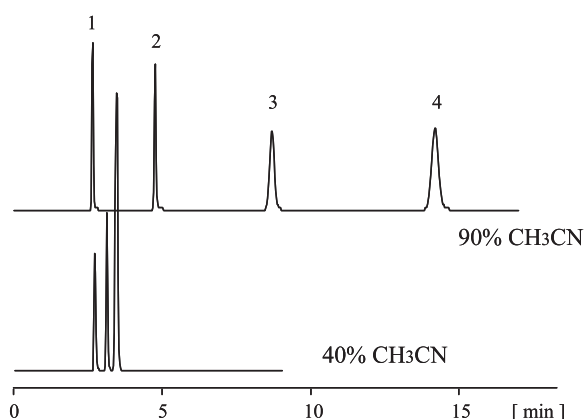
Features

- A silica-based HILIC column with phosphorylcholine (PC) group
- Excellent retention and separation of very polar and hydrophilic compounds
- Large number of theoretical plates and outstanding peak profiles

PC HILIC is a silica-based HILIC column with phosphorylcholine (PC) group. The superhydrophilic character of PC was taken advantage of in preparing an optimum stationary phase for HILIC mode separation. Polar, hydrophilic, and charged compounds, which are hard to handle in reversed-phase mode, are expected to show adequate retention with PC HILIC.

What is HILIC?

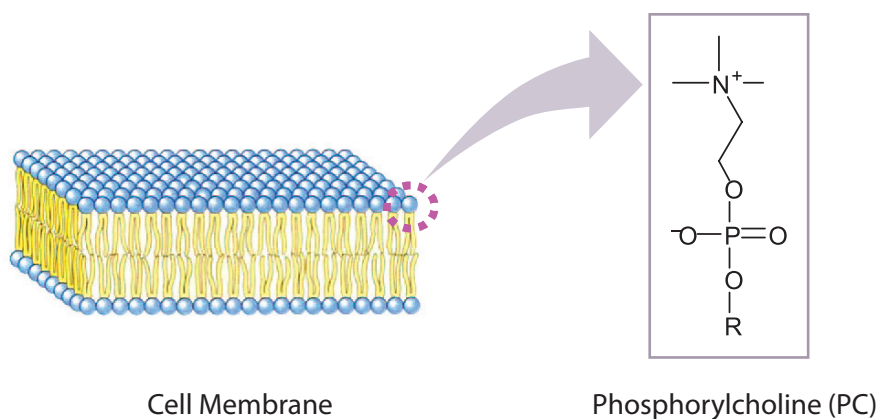
Hydrophilic interaction liquid chromatography (HILIC) is a relatively new LC technique that uses a hydrophilic stationary phase, in most cases, with organic-dominant mobile phase. The elution order of substances in HILIC mode is roughly the reverse of that in reversed-phase mode.



Column	: PC HILIC 4.6 x 250 mm, 5 μ m
M. phase	: 10mmol/L HCOONH ₄ , x% CH ₃ CN
Flow rate	: 1 mL/min
Temp.	: 40 °C
Detection	: UV 254 nm
Sample	: 1. Naphthalene, 2. Thymine, 3. Adenine, 4. Cytosine

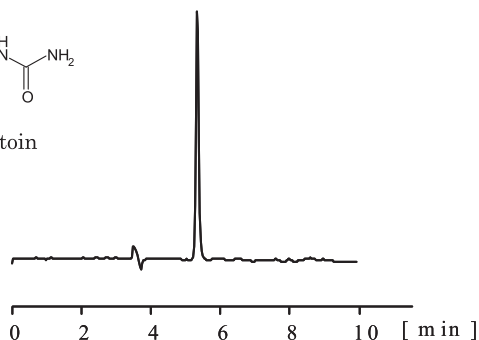
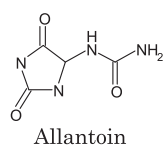
What is PC?

Phosphorylcholine (PC) is a partial structure of phosphatidylcholine (lecitin), one of the phospholipids forming cell membranes. PC has a betaine structure and shows high hydrophilicity, biocompatibility, and inhibitory effect of protein adhesion. Its superhydrophilic character is suitable to the application as a HILIC phase.

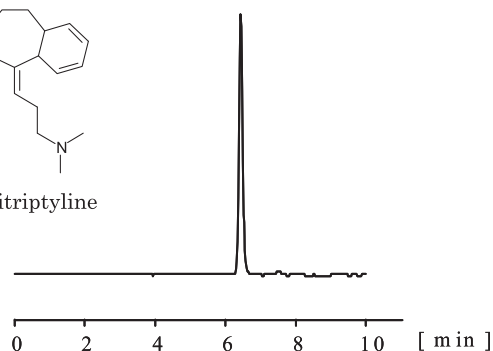
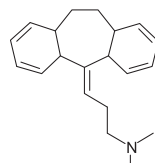


Strong retention of polar compounds

HILIC mode provides another alternative to handle extremely polar and hydrophilic compounds, which are unretainable in reversed-phase (e.g. a chromatogram of allantoin, shown below)



Column : PC HILIC 4.6 x 250 mm, 5 μ m
 M. phase : 80% CH₃CN
 Flow rate : 1 mL/min
 Temp. : 40 °C
 Detection : UV 210 nm
 Sample : Allantoin

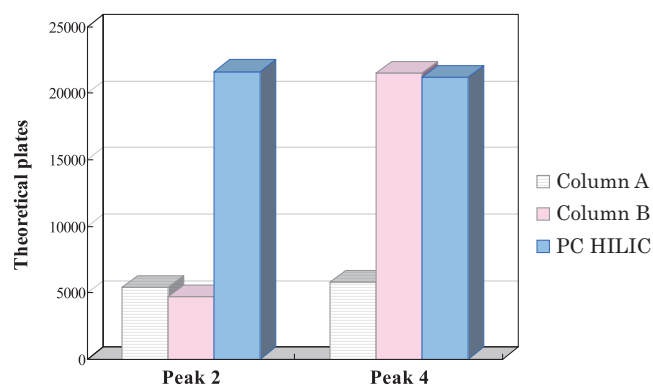
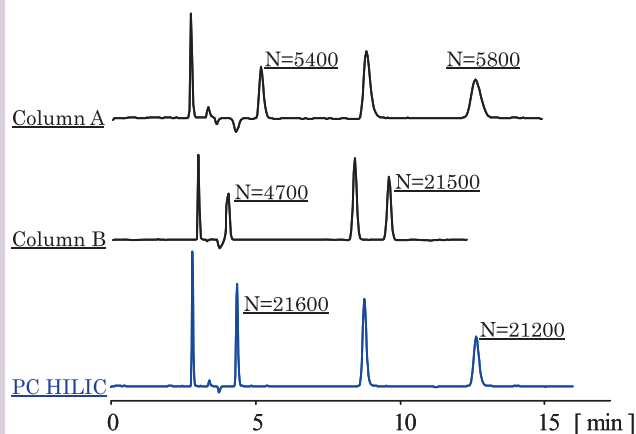


Column : PC HILIC 4.6 x 250 mm, 5 μ m
 M. phase : 10 mmol/L HCOONH₄ in 90% CH₃CN
 Flow rate : 1 mL/min
 Temp. : 30 °C
 Detection : UV 254 nm
 Sample : Amitriptyline

Amitriptyline, a compound with a strong basicity, is often used for discussing the quality of columns. PC HILIC provides excellent peak shapes for basic compounds, too.

High Column Efficiency

PC HILIC shows large numbers of theoretical plates, compared to conventional HILIC columns.



Column : PC HILIC 4.6 x 250 mm, 5 μ m
 M. phase : 10 mmol/L HCOONH₄, CH₃CN/H₂O=90/10, pH=3.5
 Flow rate : 1 mL/min
 Temp. : 40 °C
 Detection : UV 254 nm
 Sample : 1. Naphthalene, 2. Thymine,
 3. Adenine, 4. Cytosine

PROTEONAVI ~For analytical and preparative separation of protein~

34

Features

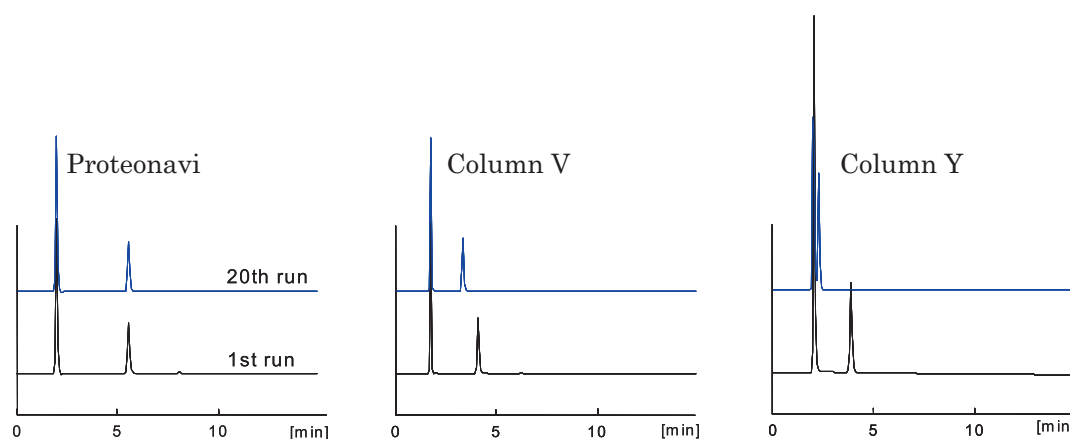
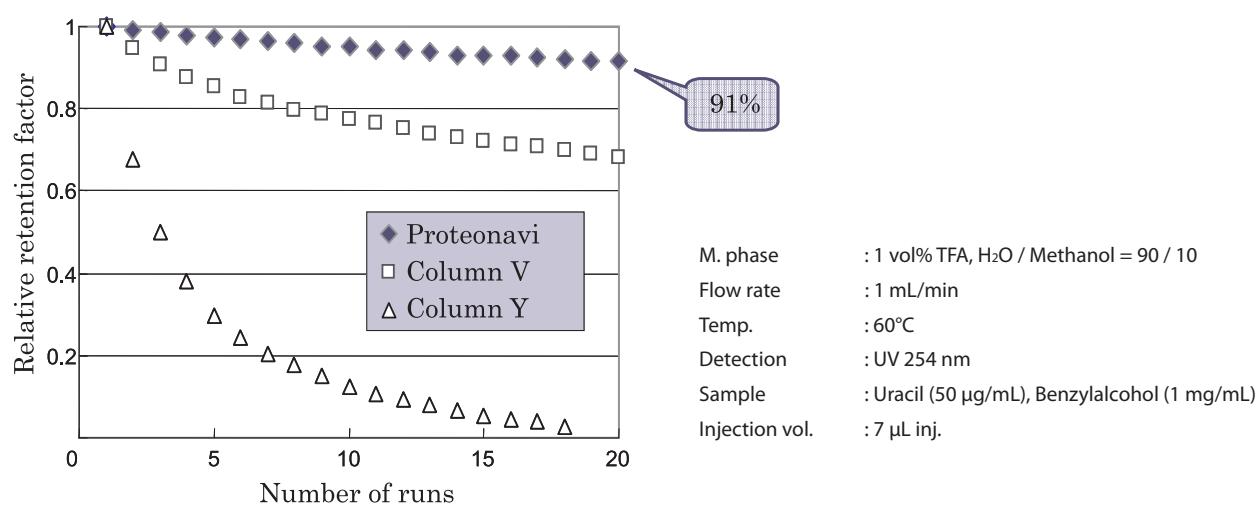
- Excellent acidic durability!
- Minimal protein adsorption! Minimum sample loss!
- Easy to shift from analytical to preparative size!

Adsorption to a stationary phase is one of the most common limiting factors in protein separation in reversed-phase mode. It is generally understood that the irreversible adsorption is caused by denaturing of protein in the hydrophobic phase or a coulombic interaction with silica, a chromatographic support. Proteonavi has overcome the problem by introducing the short four- carbon structure on the silica surface with a unique chemistry. Its synthetic process has already been established for even a large industrial-scale purification.

Outstanding Acid Durability

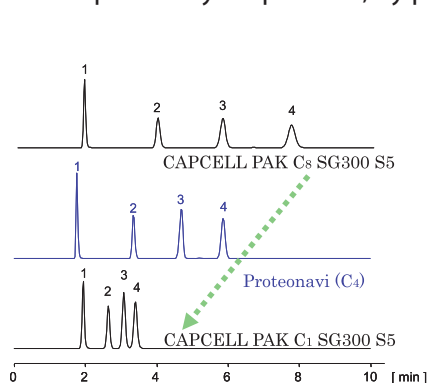
Acidic hydrolysis is the major cause of loss in performance in reversed phase. Proteonavi's durability under acidic conditions was proven by the accelerated test using 1vol% of trifluoroacetic acid (TFA), a concentration one order of magnitude higher than those used for mobile phases for common protein separations.

Sequence of process: After thermal equilibration of column, start the pump. Sixty minutes later, run the sample and record its retention time. Repeat the sequence in every 60 minutes and observe the loss of retention. (For HPLC condition, see below.)

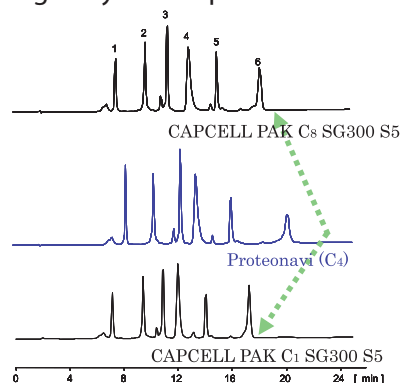


Specific Retention for Proteins

While their retention times of small neutral compounds are supposed to be correlated to amount or length of alkyl chains of stationary phase, that of protein is, in general, governed not only by hydrophobic interaction, but by hydrophilic or ionic interactions. Proteonavi is designed to show large retention specifically for proteins, by precisely controlling its synthetic process.



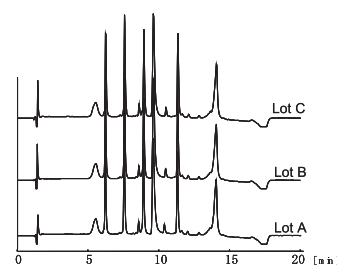
Column size : 2.0 mm i.d. x 150 mm
 Mobile phase : CH₃CN / H₂O = 40 / 60
 Flow rate : 200 μL/min
 Temp. : 40 °C
 Detection : UV 254 nm
 Sample : 1. Uracil, 2. Methyl benzoate,
 3. Toluene, 4. Naphthalene



Column size : 2.0 mm i.d. x 150 mm
 Mobile phase : A) 0.1vol% TFA / H₂O
 B) 0.1vol% TFA / CH₃CN
 B 20% (0 min) → 70% (25 min) Gradient
 Flow rate : 200 μL/min
 Temp. : 40 °C
 Detection : UV 220 nm
 Sample : 1. Ribonuclease A, 2. Cytochrome C,
 3. Lysozyme, 4. B.S. albumin,
 5. Myoglobin, 6. Ovalbumin

Minimal Lot Variation

Lot-to-lot variation in separation is often discussed in protein analysis. Proteonavi's silica support and its synthetic procedure are precisely controlled to minimize it.

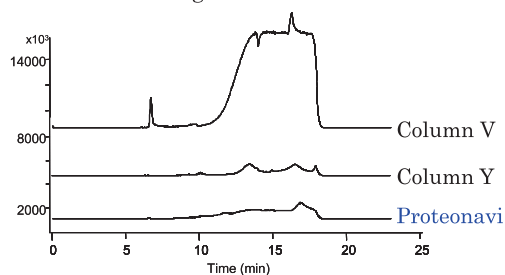


【HPLC Condition】
 same as the above

Reduced Column Bleed

Total ion chromatograms in LC-MS were compared among competitor's columns under validated gradient conditions. Proteonavi showed the least column bleed, and is expected to provide high purification efficiency in preparative applications, as well as a high sensitivity in LC-MS.

Total ion chromatogram



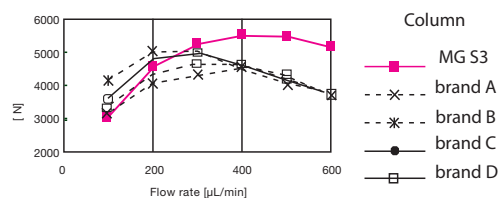
Column size : 2.0 mm i.d. x 150 mm
 Mobile phase : A) 0.1vol% TFA / H₂O, B) 0.1vol% TFA / CH₃CN,
 B: 5% → 95% (10min) → 95% (12min) →
 5% (12.1min) Gradient
 Flow rate : 200 μL/min
 Detection : LC-MS (AccuTOF)

A column for LC-MS and HTS should be inert, and background-free. Polymer-coated Capcell Pak was designed to correspond to such a need. In response to different analytes and conditions, Shiseido proudly provides the chromatographers with improved separation tools.

Column	Phases	Characteristics
MGIII	C ₁₈	Excellent reproducibility of basic compounds under acidic conditions, Low bleeding
MGII	C ₁₈	Minimized residual silanol, ideal for basic compounds under neutral conditions
MG	C ₁₈	High-efficiency separation and well-balanced retention for diverse compounds
UG	C ₁₈ , C ₈ , Ph, CN	Good retention for hydrophobic compounds, fast separation of basic and polar compounds
ACR	C ₁₈	Excellent acidic durability (pH 1~10)
AQ	C ₁₈	Suitable for aqueous mobile phases to be used for polar compounds
DD	C ₈	Superb acidic and basic durability
CR	C ₁₈ +SCX	Provides a large retention for basic compounds
PC HILIC	PC	Excellent retention and separation of very polar and hydrophilic compounds
Protonavi	C ₄	Specific retention for proteins and excellent acidic durability

High efficiency at higher flow rate, Capcell Pak C₁₈ MG, MGII, MGIII S3

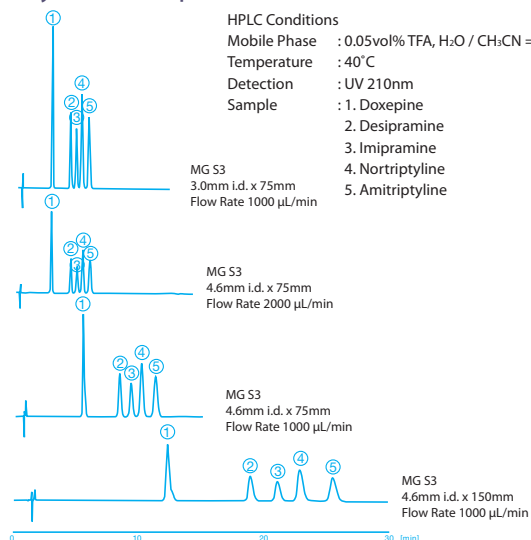
3- μ m CAPCELL PAK shows a large number of theoretical plates at high flow rates



HPLC Conditions
 Column : 2.0mm i.d. x 50mm
 Mobile Phase : H₂O/CH₃CN = 50/50
 Temperature : 40°C
 Detection : UV 254nm
 Sample : Naphthalene

Tricyclic antidepressants

HPLC Conditions
 Mobile Phase : 0.05vol% TFA, H₂O / CH₃CN = 70 / 30
 Temperature : 40°C
 Detection : UV 210nm
 Sample : 1. Doxepine
 2. Desipramine
 3. Imipramine
 4. Nortriptyline
 5. Amitriptyline



Semi-microcolumn of 1.0-2.0mm i.d.

Semi-microcolumn of 1.0-2.0mm i.d. is extremely effective in the high sensitivity analysis. The benefits of reducing the inner diameter of the column are:

- Improvement in absolute sensitivity of a concentration-sensitive detector
- Reduction of mobile phase consumption
- Reduction of baseline noise in LC-MS
- Small Amounts of packing material result in a good dynamic range for substances causing an irreversible adsorption on a stationary phase

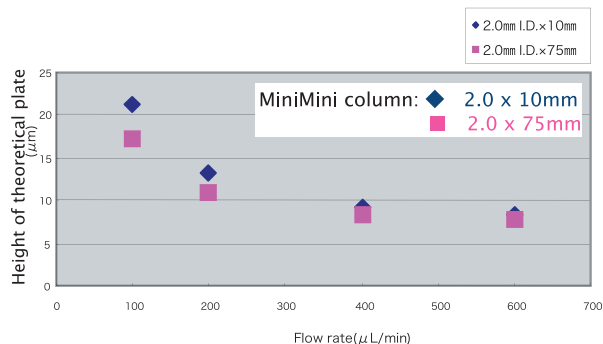
MiniMini columns

Low pressure•Fast separation•Long lifetime

2.0 mm i.d. x **10 mm** 

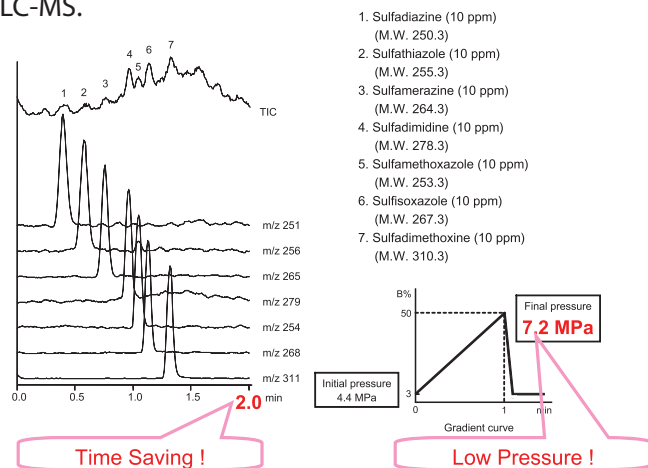
1.5 mm i.d. x **10 mm** 

Designed for fast separation



Low-pressure and Rapid LC-MS of seven sulfa drugs

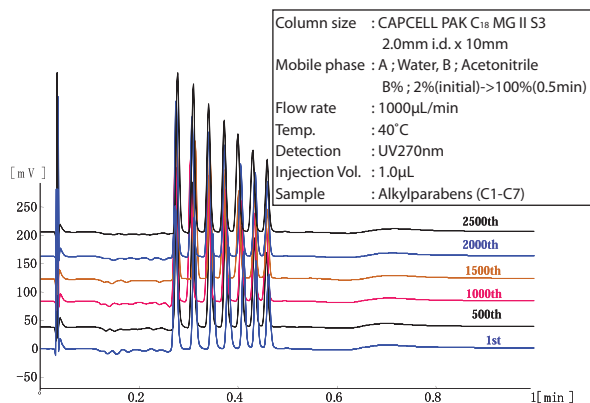
Simultaneous analysis of seven sulfa drugs was attempted with a MiniMini column (1.5mm i.d. x 10mm), which provided high-resolution separation with a low pressure at a high flow rate in LC-MS.



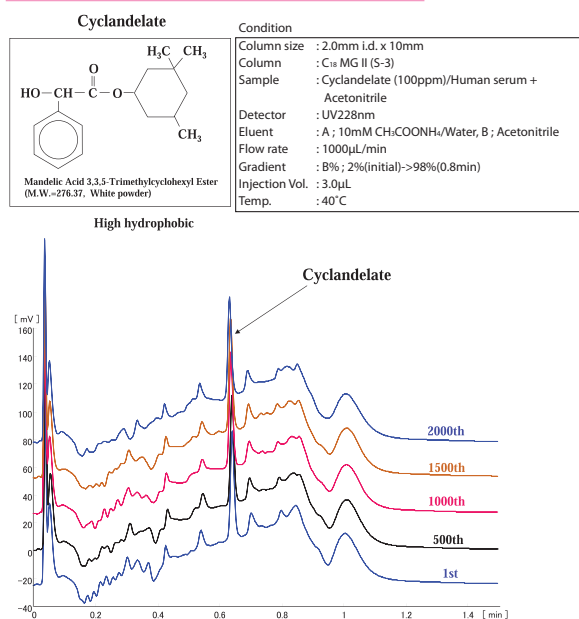
Long lifetime--Durability Test

The original polymer coating and column packing technology bring the excellent durability and lifetime.

Durability test by continuous operations of Alkylparabens

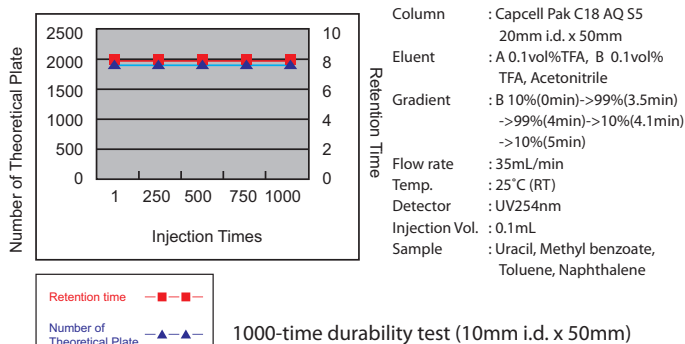


Durability test by continuous operations of a serum-derived sample



Columns for combinatorial chemistry

The unique performance of high efficiency and low pressure is attributed to a narrow distribution of particle diameter. Capcell Pak is suitable to preparative separation in combinatorial chemistry.



CAPCELL PAK MF

CAPCELL PAK MF is a mixed-function phase for direct analysis of drugs contained in serum, plasma or other body fluids.

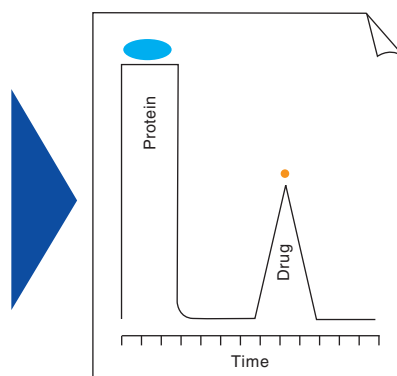
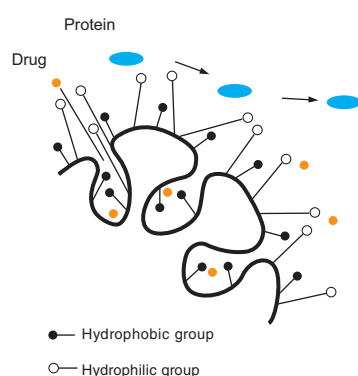
- Direct injection of body fluids
- High recovery of drugs
- Very reproducible
- Higher sensitivity using column switching method
- Available as analytical columns and guard cartridges
- Available in four different functional groups

Using the same polymer coating technology, CAPCELL PAK MF is designed to allow the direct injection of serum or other biological fluids, without tedious and time-consuming pretreatment procedures. This is done by bonding hydrophilic polyoxyethylene groups and hydrophobic groups (phenyl, C₈, C₁₈, SCX) to the polymer coated silica. This allows proteins to pass through the column and elute in the void volume due to restricted access to the surface of the packing, while retaining a drug of interest on the small hydrophobic phase. CAPCELL PAK MF columns have three main functions.

1) Protein removal

2) Sample concentration

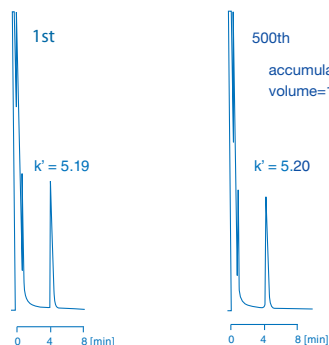
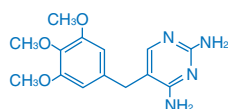
3) Sample analysis



EXCELLENT DURABILITY

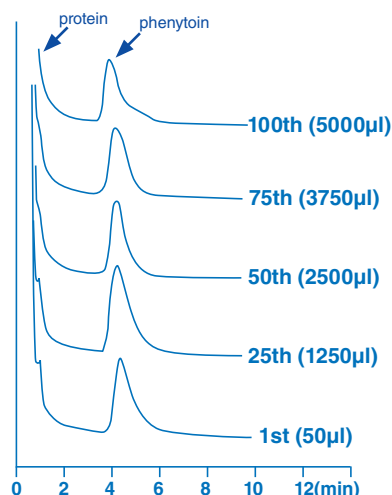
Analytical column

Column	: CAPCELL PAK MF Ph-1 4.6mm i.d. x 100mm
Mobile Phase	: 0.1 mol/L Phosphate buffer / CH ₃ CN = 90 / 10 (pH6.98)
Flow Rate	: 1.0mL/min
Temperature	: 40°C
Detection	: UV 254nm
Sample	: Trimethoprim



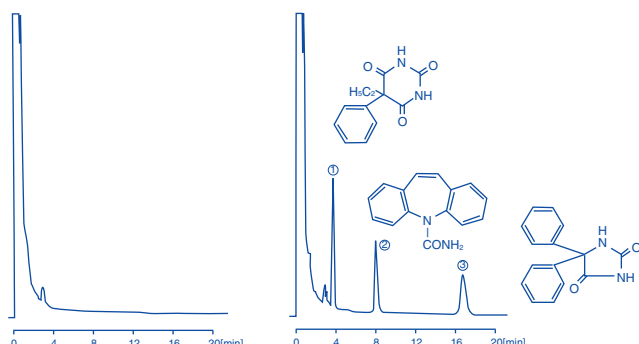
Cartridge column

Column	: CAPCELL PAK MF Ph-1 Guard Cartridge 4.0mm i.d. x 10mm
Mobile Phase	: 100mmol/L Phosphate buffer (pH6.9) / CH ₃ CN = 90 / 10
Flow Rate	: 1.0mL/min
Temperature	: 40°C
Detection	: UV 254nm
Sample	: Phenytoin



Direct Injection of Serum or Plasma / Single Column System

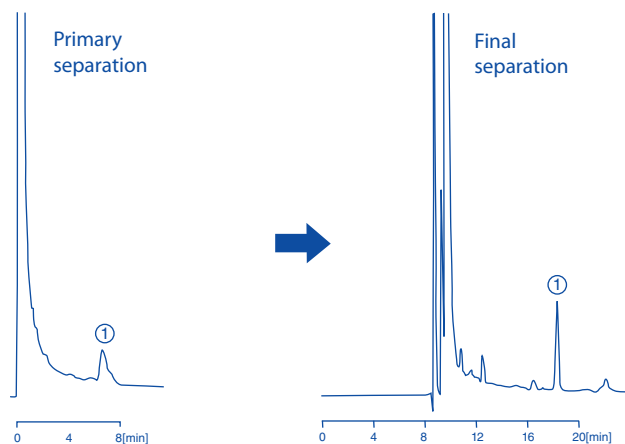
ANTI-EPILEPTIC DRUGS



Column : CAPCELL PAK MF Ph-1
4.6mm i.d. x 100mm
Mobile Phase : 0.1mol/L Phosphate buffer / CH₃CN = 85 / 15 (pH7.09)
Flow Rate : 1.0mL/min
Temperature : 40°C
Detection : UV 254nm
Sample : 1. Phenobarbital (20µg/ml)
2. Carbamazepine (5µg/ml)
3. Phenytoin (40µg/ml)

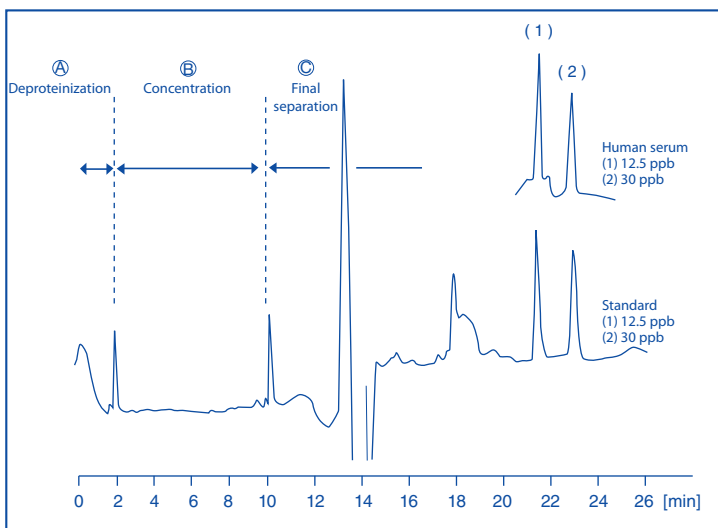
Direct Injection of Serum or Plasma / Dual Column-Switching System

INDOMETHACIN



Column : CAPCELL PAK MF Ph-1
4.6mm i.d. x 50mm
CAPCELL PAK C₁₈ UG120 S5
4.6 mm I.d. x 250 mm
Mobile Phase : A: 100mmol/L Phosphate buffer / CH₃CN = 90 / 10 (pH6.9)
B: 100mmol/L Phosphate buffer / CH₃CN = 50 / 50 (pH2.3, H₃PO₄)
Flow Rate : 1.0mL/min
Temperature : 40°C
Detection : UV 254nm
Sample : 1. Indomethacin

Analysis of Carbamazepine and Phenytoin in Human Serum/Triple Column-Switching System



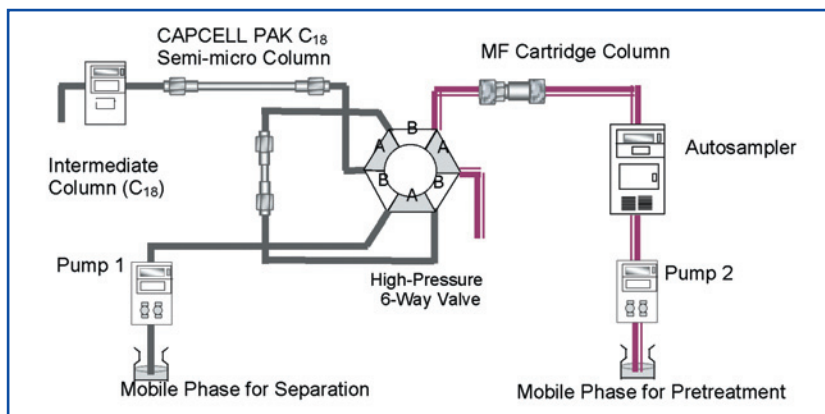
Conditions of Primary separation and Focusing
Column : CAPCELL PAK MF Ph-1 Cartridge
4.0mm i.d. x 10mm
CAPCELL PAK C₁₈ UG120 S5
1.5 mm I.d. x 35 mm
Mobile Phase : 100mmol/L Phosphate buffer (pH7) / CH₃CN = 90 / 10
Flow Rate : 0.5 mL/min - 0.25mL/min
Temperature : 40°C
Detection : UV 254nm

Conditions of Final separation
Column : CAPCELL PAK C₁₈ UG120 S5
1.5 mm i.d. x 250 mm
Mobile Phase : 100mmol/L Phosphate buffer (pH7) / CH₃CN = 70 / 30
Flow Rate : 0.1 mL/min
Temperature : 40°C
Detection : UV 254nm
Sample : 1. Carbamazepine
2. Phenytoin

Trace Analysis of Drugs in Serum and Plasma/ Triple Column-Switching System

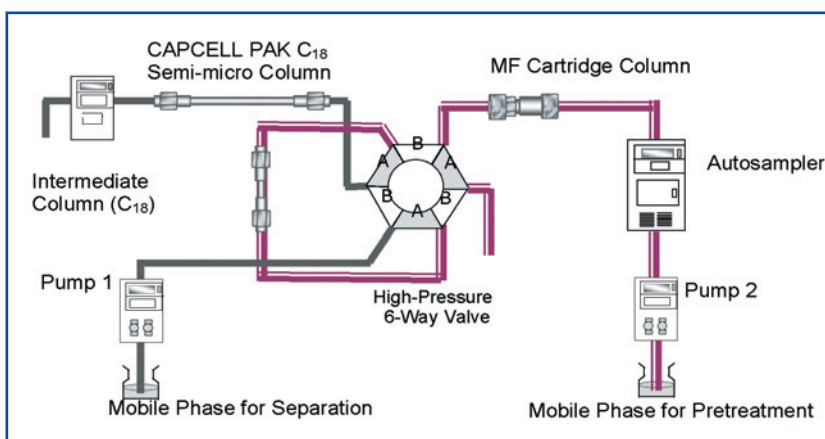
This analytical format consists of a CAPCELL PAK MF cartridge, a small intermediate column and a main analytical column.

DEPROTEINIZATION



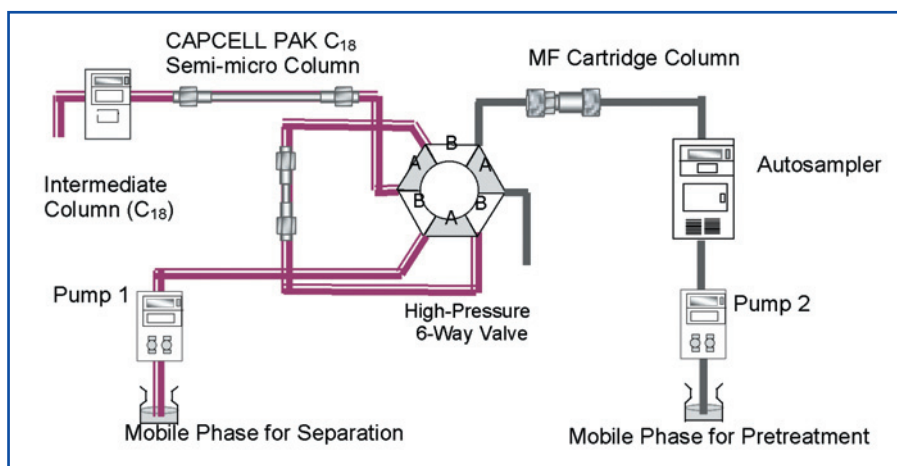
This system using an intermediate column is designed to save run time when a 1.5mm i.d. or smaller column is used. Proteins pass through the MF column, while drugs are retained.

FRACTIONATION AND CONCENTRATING



Drugs are transferred and concentrated in the intermediate column.

FINAL SEPARATION



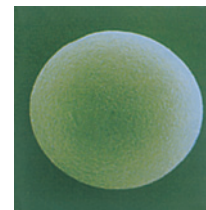
The concentrated drug is separated in a final semi-micro column, An increased sensitivity without any loss in chromatographic efficiency can be obtained.

SHISEIDO CHIRAL COLUMNS

41

CHIRAL
RU

- High efficiency and stability against pressure
- Choice of normal or aqueous mobile phase condition
- Exceptional enantioselectivity for acidic, basic and neutral chiral compounds
- Stable under a wide temperature range
- High loadability combined with long column lifetime

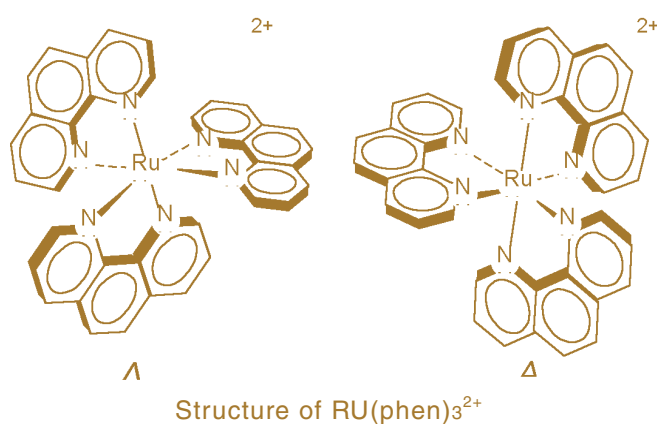
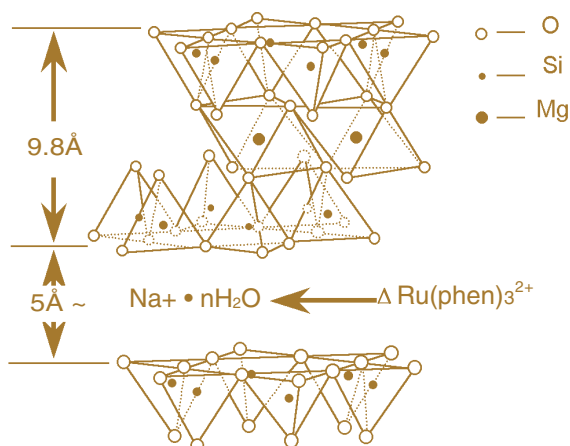


Ceramospher

Chiral RU-1, RU-2

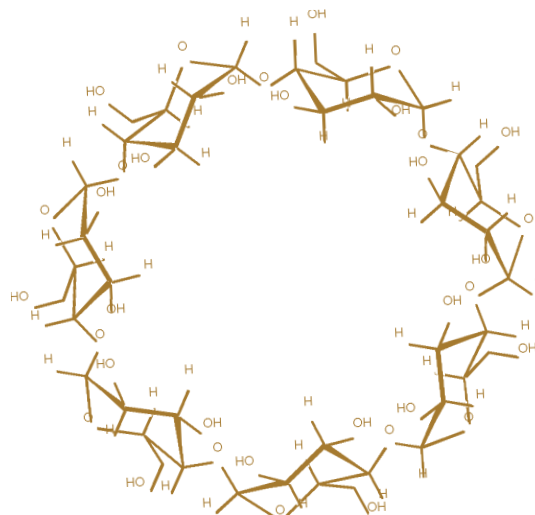
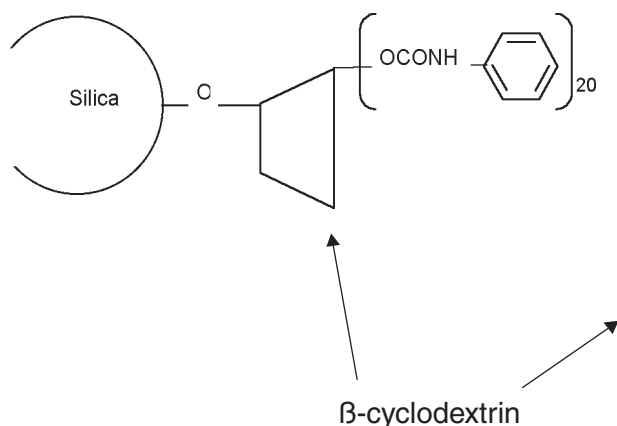
Based on 5- μm spherical sodium magnesium silicate particles, Ceramospher phases RU-1 and RU-2 are novel materials for chiral HPLC separations. Chiral separation is accomplished by an optically-active ruthenium complex that has been ion exchanged with sodium ions in the original clay material. Ceramospher phases show excellent selectivity for a wide variety of chiral samples.

Ceramospher has the remarkable loadability due to its large specific surface area (pore size 4 nm, 300m²/g). The advantage is more pronounced when applied at preparative scales. Both phases utilize simple eluents. RU-1 is used under non-aqueous mobile phases, whereas RU-2 is compatible also with aqueous mobile phases.



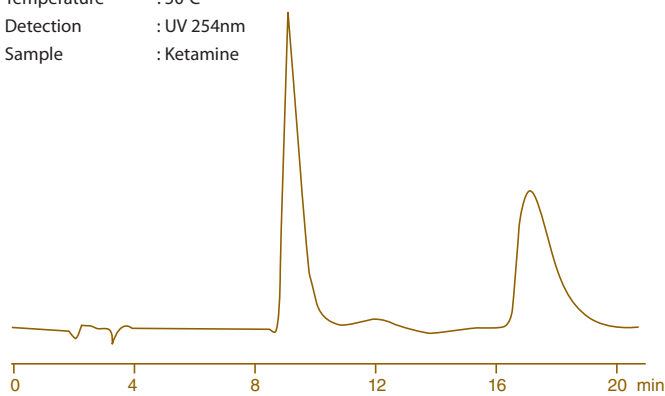
CHIRAL CD-Ph

The Chiral CD-Ph utilizes precisely classified high-purity silica as its support, to which phenylcarbamated β -cyclodextrin is chemically bonded. A large number of theoretical plates is usually achieved. The combined use with the Ceramosphers, covers a wide variety of chiral compounds.



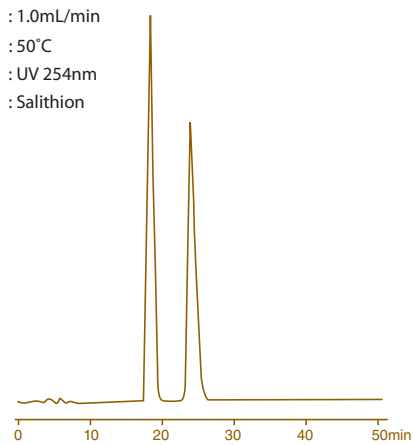
Ketamine

Column : Ceramospher Chiral RU-1
4.6 mm i.d. x 250 mm
Mobile Phase : 1vol% Isopropylamine / CH₃OH
Flow Rate : 1.0mL/min
Temperature : 50°C
Detection : UV 254nm
Sample : Ketamine



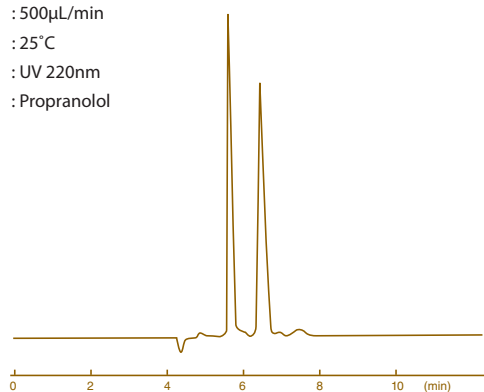
Salithion

Column : Ceramospher Chiral RU-2
4.6 mm i.d. x 250 mm
Mobile Phase : CH₃OH
Flow Rate : 1.0mL/min
Temperature : 50°C
Detection : UV 254nm
Sample : Salithion



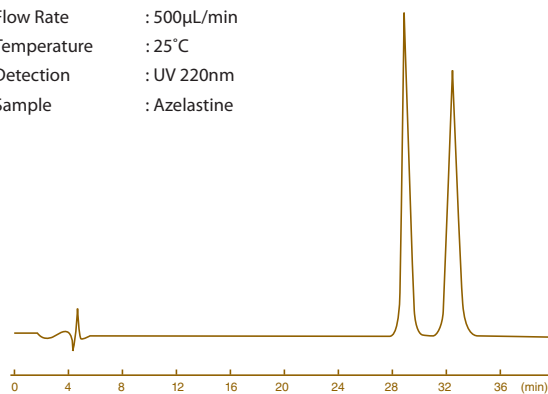
Propranolol

Column : Chiral CD-Ph
4.6 mm i.d. x 250 mm
Mobile Phase : 0.5mol/L NaClO₄ / CH₃CN = 20 / 80
Flow Rate : 500 μ L/min
Temperature : 25°C
Detection : UV 220nm
Sample : Propranolol



Azelastine

Column : Chiral CD-Ph
4.6 mm i.d. x 250 mm
Mobile Phase : 0.5mol/L NaClO₄ / CH₃CN = 50 / 50
Flow Rate : 500 μ L/min
Temperature : 25°C
Detection : UV 220nm
Sample : Azelastine



SUGAR COLUMNS

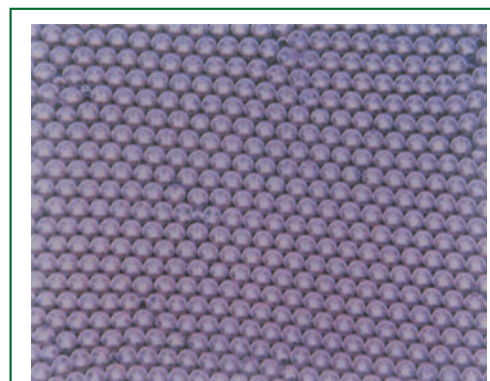
43



SUCREBEAD I

Sucrosebead I is targeted exclusively to carbohydrate analysis. It is based on styrene/divinylbenzene polymer support. Its mono-dispersion character was given by the unique two-step swelling method used for the polymerization, and is advantageous in chromatographic separation.

- Excellent durability
- Efficient peaks at low pressure

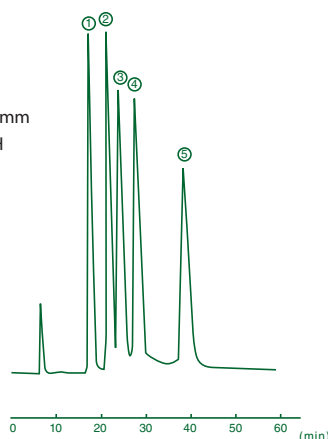


Mono-dispersion particles

Sucrosebead I, in combination with the pulsed amperometric detector (PAD), provides a high-sensitivity carbohydrate analysis.

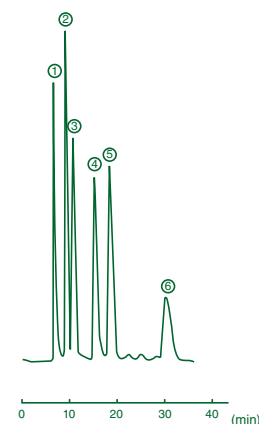
Monosaccharides

Column	: SUCREBEAD I 2.0 mm i.d. x 250 mm
Mobile Phase	: 200mmol/L NaOH
Flow Rate	: 100 μ L/min
Temperature	: 35°C
Detection	: PAD
Sample	: 1. Fucose 2. Mannose 3. Glucose 4. Galactose 5. Ribose



Sugar alcohols

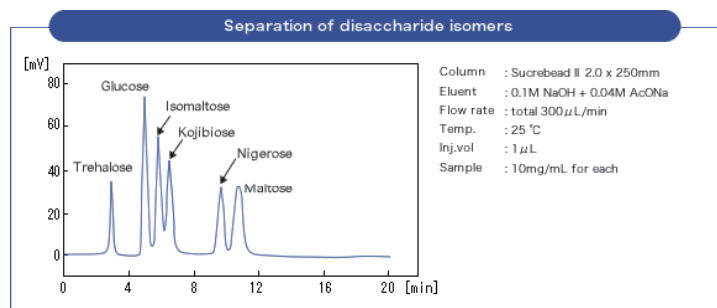
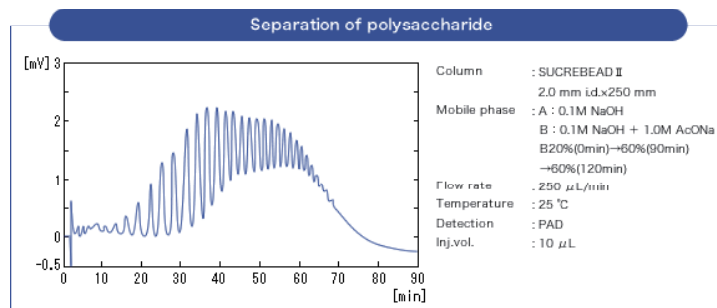
Column	: SUCREBEAD I 2.0 mm i.d. x 250 mm
Mobile Phase	: 200mmol/L NaOH
Flow Rate	: 100 μ L/min
Temperature	: 35°C
Detection	: PAD
Sample	: 1. myo-Inositol 2. meso-Erythritol 3. Xylitol 4. Sorbitol 5. Mannitol 6. Maltitol



SUCREBEAD II

Sucrosebead II is developed to analyze carbohydrates by using anion-exchanging polymer as a stationary phase. Sucrosebead II enables operation under high pH range and high selectivity with carbohydrates.

Optimum for analyzing oligosaccharides and polysaccharides



REDUCTION Column

For analysis of oxidative stress markers

Oxidization stress by active oxygen and free radicals is considered to be closely related to the development of symptoms of various geriatric diseases and the progression of aging. A method of measuring stress accurately and easily is in great demand.

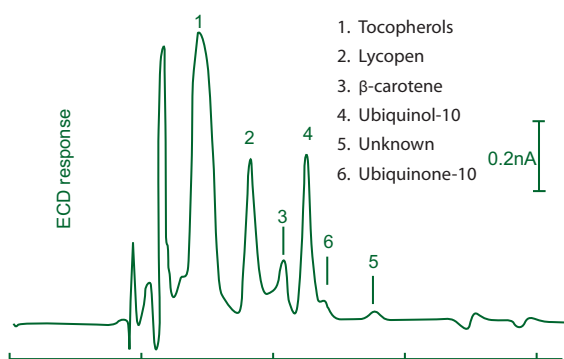
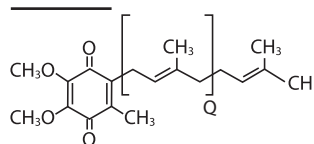
As an index used for diagnosis and treatment, coenzyme Q10, vitamin C, vitamin E, and glutathione that indicate anti-oxidization effect in the human body are receiving great attention.

Among them, reduced coenzyme Q10 is sensitive to oxidization by active oxygen and free radicals, and produces oxidized coenzyme Q10. Therefore, the ratio of oxidized coenzyme Q10 to total coenzyme Q10 may be a sensitive marker for oxidization stress.

Shiseido, with its optimum catalytic column (reduction column) for high-sensitivity analysis of quinone derivatives, developed an analytical system for CoQ10 by combining an electrochemical detector and a reduction column.

1.S.Yamashita,Y.Yamamoto:Simultaneous Detection of Ubiquinol and Ubiquinone in Human Plasma as a Marker of Oxidative Stress,Anal.Biochem.,250,66-73(1997)

CoQ-10



Column size

Product No.	Size
21211	4.0 mm i.d. x 15 mm
21212	4.0 mm i.d. x 30 mm

Analysis of various oxidative stress markers

Welcome to the website of Shiseido HPLC
Fulfilling information of product and useful data-base searching

<http://hplc.shiseido.co.jp/e/>

REDUCTION Column

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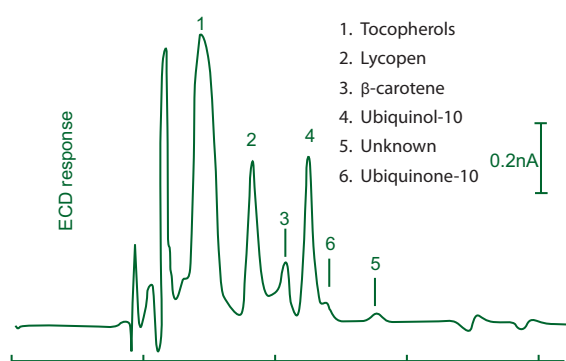
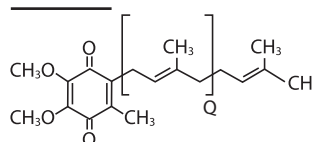
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March, 2013