PB-0048E

HPLC Columns

- YMC-UltraHT *Pro* C18
- YMC-UltraHT Hydrosphere C18
- YMC-Pack *Pro* C18
- Hydrosphere C18
- YMC-Pack *Pro* C18 RS
- YMC-Pack *Pro* C8
- YMC-Pack *Pro* C4
- YMC-Actus

Pro series

High Performance Reversed Phase Columns

YMC Co., Ltd.

High Performance Reversed Phase Columns

Pro series

Pro series products of guaranteed quality are available on a world-wide basis

Pro series products begin with a base material in which pore size and pore volume are strictly controlled, and the level of metal contamination is carefully minimized. The processes used for stationary phase synthesis and end-capping are standardized and meticulously controlled – delivering separation reproducibility not only batch-to-batch, but year-to-year as well. The *Pro* series quality guarantee spans 5 types of columns: 3 types of ODS (C18) with different characteristics in separation, C8, and C4. *Pro* series products can be used in production, R&D, and quality control because the same supply of guaranteed performance and quality are available world-wide.

Characteristics

- Five reversed phase chemistries : C18 (three types), C8, and C4
- Very low metal impurities
- Thorough and complete end-capping
- Excellent separation of basic compounds
- Useful for LC/MS
- Excellent durability and reproducibility
- Batch and column reports enclosed with each column
- Suitable for use in production, research and development, and quality control

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Types of *Pro* series

Ultra Fast LC
YMC-UltraHT *Pro* C18

YMC-UltraHT Pro C18 is an ODS bonded-phase based on highly efficient 2 μm spherical silica particles. This column is specifically designed for high-speed and high-throughput analysis in various fields such as pharmaceuticals, foods and environmental. Easy method transfer from conventional HPLC to Ultra Fast LC is available without changing elution conditions.

Ultra Fast LC
YMC-UltraHT Hydrosphere C18

YMC-UltraHT Hydrosphere C18 is an ODS bonded-phase based on highly efficient 2 μm spherical silica particles. It is designed to maintain hydrophilicity of the gel and deactivate the silica surface. This column is suitable for high-throughput separation of food components or drug metabolites which are difficult to separate with standard-type ODS.

Standard ODS
YMC-Pack *Pro* C18

YMC-Pack Pro C18 is a monomeric, high performance ODS column with standard hydrophobicity as well as high resolution, durability and reproducibility. This column can be used universally, and applied as the first choice column in almost all fields such as pharmaceuticals, agricultural chemicals, foods and natural products.

Low carbon type ODS
Hydrosphere C18

Hydrosphere C18 is an ODS column designed to have the highest hydrophilicity and deactivated silica surface. This column can be used even in conditions with 100% water, where a universal ODS performs suboptimally. Hydrosphere C18 can be applied to separate hydrophilic compounds.

High carbon type ODS
YMC-Pack *Pro* C18 RS

YMC-Pack Pro C18 RS is a polymeric, high carbon ODS column with high separation capacity and high durability. This column can be applied especially to separate various compounds with small differences in hydrophobicity. Pro C18 RS columns may be used across a broad pH range (1-10) adding to the column's ability to provide unique selectivity by varying conditions of pH.

C8, C4
YMC-Pack *Pro* C8 & YMC-Pack *Pro* C4

YMC-Pack Pro C8 and C4 are columns of lower hydrophobicity than ODS, and have different separation characteristics such as hydrogen bonding capacity and planar cognitive ability. These columns can be used to shorten analysis time and separate compounds with large differences in hydrophobicity where ODS would give excessive analysis time.

High durability preparative columns
YMC-Actus series

YMC-Actus series columns are semi-preparative HPLC columns that have excellent column durability and efficiency resulting from the use of axial compression technology. YMC-Actus series columns show high durability under high flow rate or steep gradient conditions and are ideal for milligram scale preparative HPLC of various compounds.

Specifications

	UltraHT *Pro* C18	UltraHT Hydrosphere C18	*Pro* C18	Hydrosphere C18	*Pro* C18 RS	*Pro* C8	*Pro* C4
Particle size (μm)	2	2	3 , 5 , 10	3 , 5	3 , 5	3 , 5	3 , 5
Pore size (nm)	12	12	12	12	8	12	12
Specific surface area(m^2/g)	330	330	330	330	510	330	330
Carbon content	16%	12%	16%	12%	22%	10%	7%
Bonding type	Monomeric	Monomeric	Monomeric	Monomeric	Polymeric	Monomeric	Monomeric
pH range	2 - 8	2 - 8	2 - 8	2 - 8	1 - 10	2 - 7.5	2 - 7.5
Characteristics	Ultra Fast LC Standard	Ultra Fast LC for Hydrophilic compounds	Standard	for Hydrophilic compounds	High durability	Different separation characteristics from ODS	

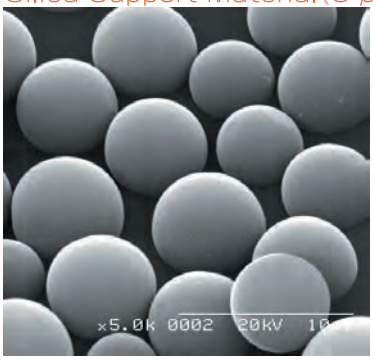
Quality control system

Strict quality control is conducted in the manufacturing of the silica support material, bonding of the stationary phase, end-capping, and column packing operations to supply high performance columns of stable quality over a long period of time

Silica support material

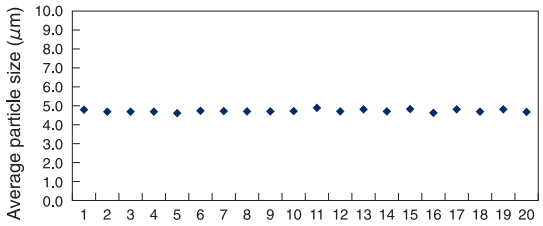
The physical properties of silica gel have a great effect on the separation behavior and performance of the bonded packing. To ensure the highest quality, physical properties such as particle size, particle surface area, pore size distribution, pore volume, and level of metals contamination must be strictly controlled.

Silica Support Material(5 μm、12 nm)

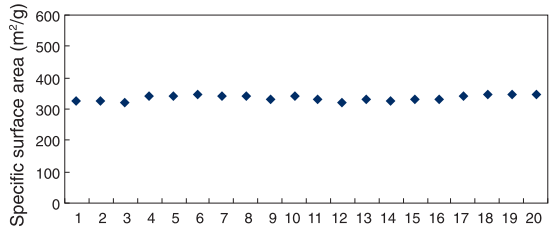


<Physical properties (*Pro* C18, 5 μm) >

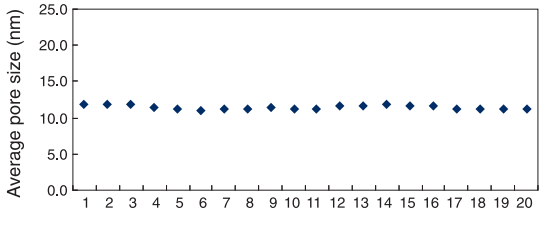
Particle size



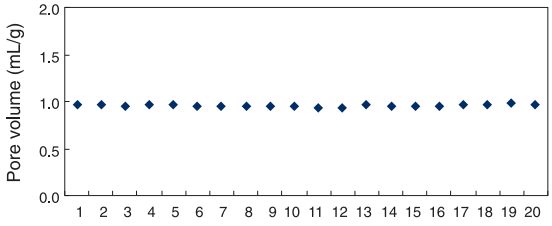
Specific surface area

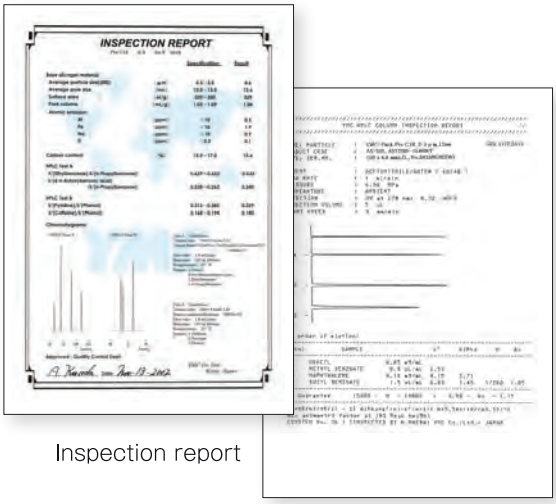


Pore size



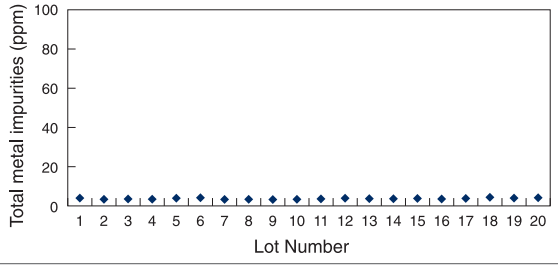
Pore volume





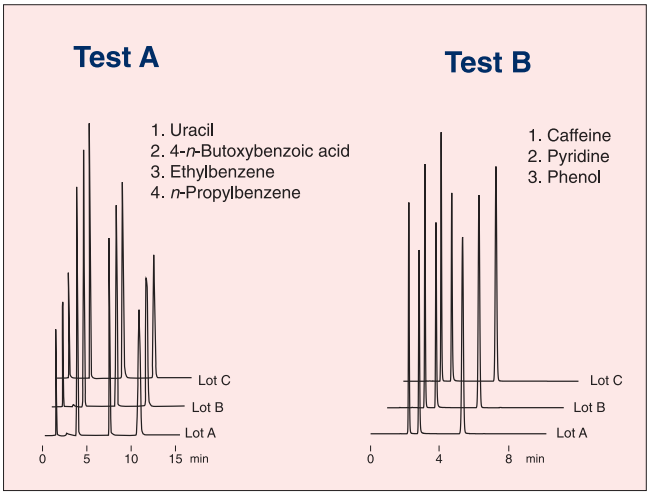
Inspection report

Level of metals contamination

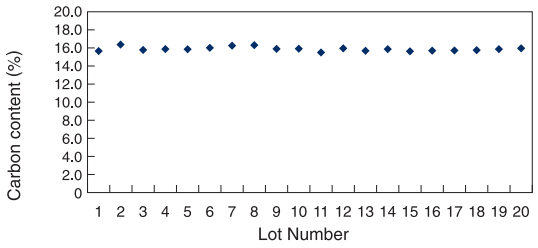


Packing material

Excellent reproducibility of Pro C18 is shown not only in the separation of hydrophobic compounds but also in that of hydrophilic, basic, and acidic compounds.

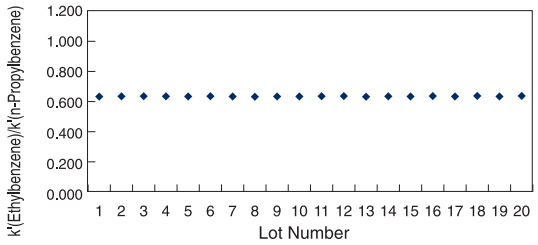


Carbon content



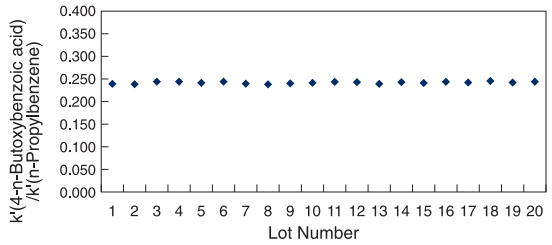
Hydrophobicity

Test A



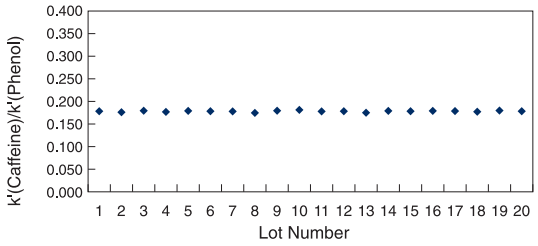
Acidic compounds

Test A



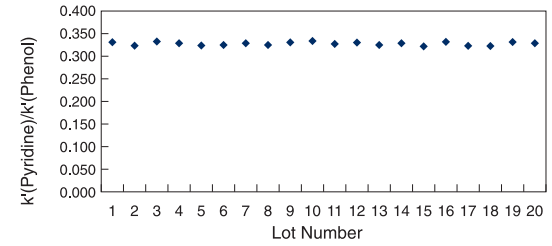
Hydrogen bonding capacity

Test B



Basic compounds

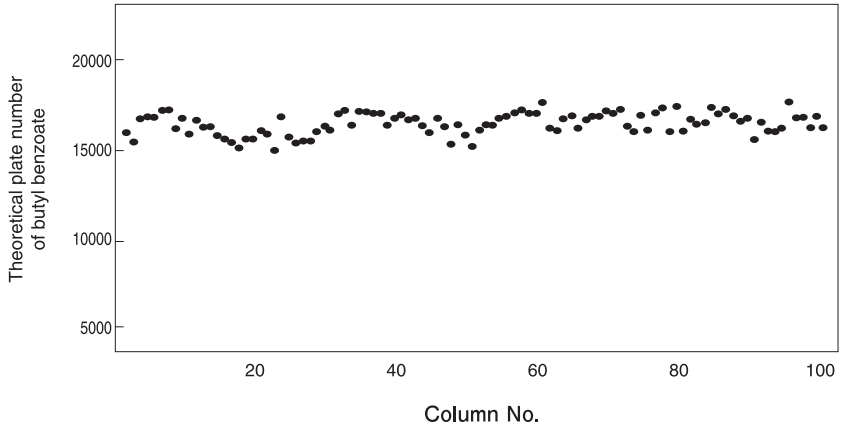
Test B



Packed column

Theoretical plate number of Pro series ODS packed columns is maintained in a very narrow range.

Actual results of theoretical plate number of *Pro* C18 5 μm, 150×4.6 mmI.D.

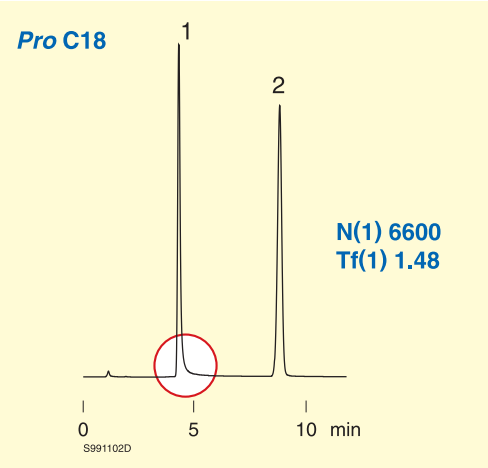


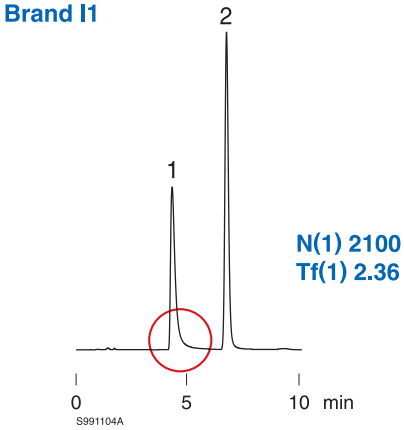
Excellent peak shape

Residual silanols on reversed phase columns cause adsorption and peak tailing of basic compounds. Therefore, reversed phase columns are end-capped in order to minimize these undesirable secondary interactions.
Pro series columns are thoroughly end-capped and basic compounds show excellent peak shapes.
Coordination and acidic compounds, often subject to interactions with metals on competitive columns, show excellent peak shapes with no secondary interactions on *Pro* series columns. *Pro* series columns produce stable separations on all types of compounds.

Advanced end-capping technology

Pro series columns are end-capped by our proprietary technique using Lewis acid/base chemistry. The chromatogram below shows pyridine, a compound used to demonstrate silanol activity. Pyridine tails on the competitive columns due to the presence of accessible silanols while the Pro C18 column shows improved peak shape.



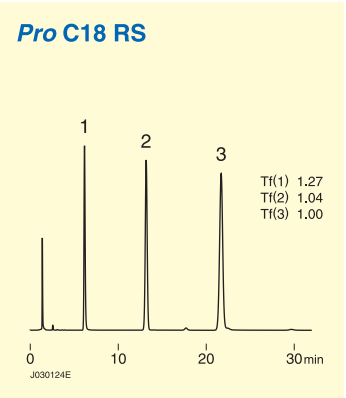


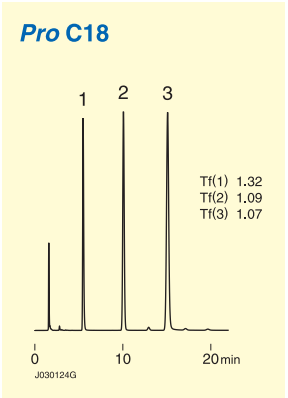
1. Pyridine
2. Phenol

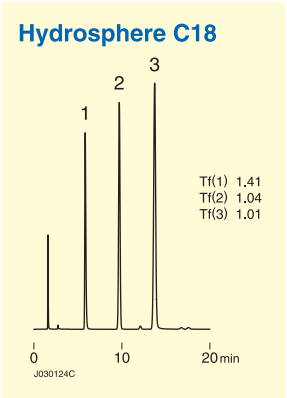
Column	: 150 X 4.6 mm I.D.
Eluent	: methanol/water (30/70)
Flow rate	: 1.0 mL/min
Temperature	: 37˚C
Detection	: UV at 254 nm

Basic compounds/Coordination compounds

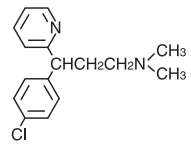
Chlorpheniramine (peak1) is a basic compound often exhibiting tailing on competitive columns. Quinizarin (peak 3) is a coordination compound commonly used to evaluate column characteristics. Note the excellent peak shape exhibited by these compounds on Pro series columns.





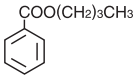


1.

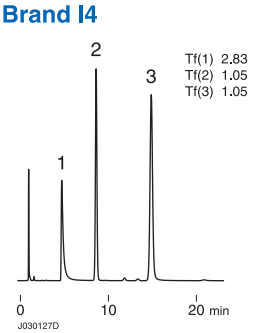


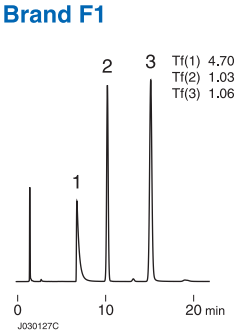
Chlorpheniramine

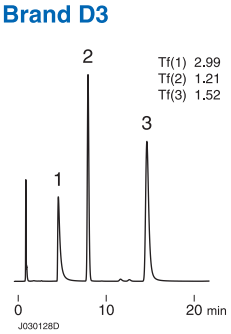
2.



n-Butylbenzoate (I.S.)







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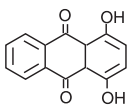


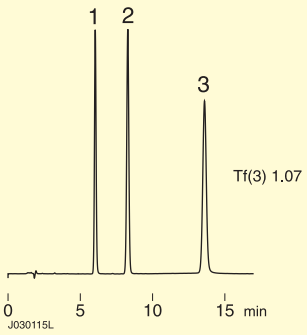
Quinizarin

Column	: 150 X 4.6 mmI.D.
Eluent	: 20 mM KH_2PO_4-K_2HPO_4 (pH 6.9)/methanol (30/70)
Flow rate	: 1.0 mL/min
Temperature	: 37˚C
Detection	: UV at 254 nm

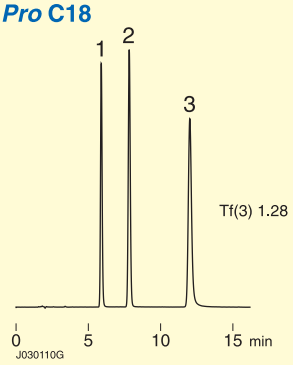
Acidic compounds

These chromatograms show the separation of food additives. Dehydroacetic acid, a compound that can exhibit peak tailing on competitive columns, shows excellent peak shape on Pro series columns.

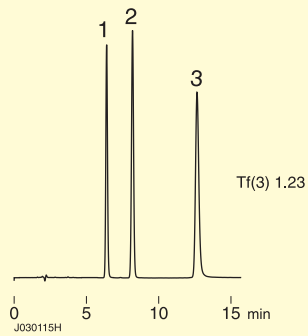
Pro C18 RS



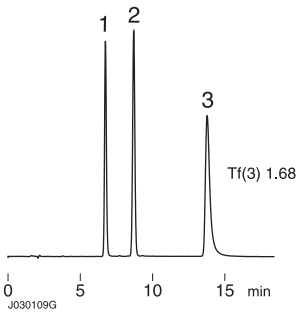
Pro C18

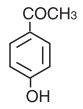


Hydrosphere C18



Brand F1

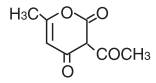


1. 

p-Hydroxyacetophenone (I.S.)

2.

Sorbic acid

3. 

Dehydroacetic acid

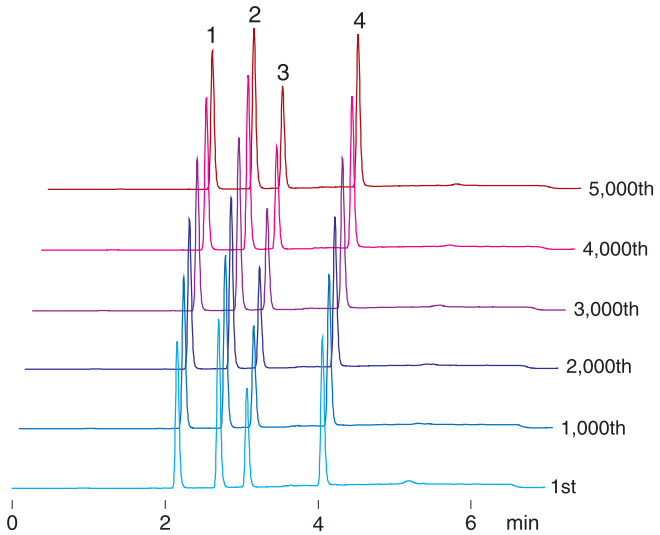
Column	: 150 X 4.6 mmI.D.
Eluent	: 20 mM CH_3COONa-CH_3COOH (pH 4.4)/acetonitrile (80/20)
Flow rate	: 1.0 mL/min
Temperature	: 37°C
Detection	: UV at 230 nm

Superior durability

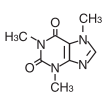
Pro series columns show great durability for repetitive analysis due to the thoroughly end-capped packing material, ultra pure silica gel, and a unique high-density packing method.

Durability for repetitive analysis

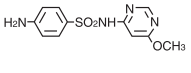
The durability of a Pro C18 (3 μm) short column used in repeated analysis is shown below. There is no change found in the separation even after 5,000 injections (8 hours/day for 5 months) using gradient analysis.



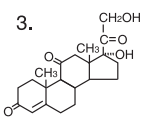
	tR(4)	N(4)	Rs(4-3)
1st	4.06	37,700	11.86
1,000th	4.05	37,600	11.85
2,000th	4.05	37,600	11.84
3,000th	4.05	37,600	11.84
4,000th	4.06	37,800	11.84
5,000th	4.06	37,800	11.86

1. 

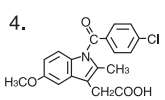
Caffeine

2. 

Sulfamonomethoxine

3. 

Cortisone

4. 

Indomethacin

Column	: YMC-Pack Pro C18 (3 μm,12 nm) 50 X 4.6 mmI.D.
Eluent	: A) water/formic acid (100/0.05) B) acetonitrile/formic acid (100/0.05) 10-90%B (0-3 min), 90%B (3-5 min),10%B (5-9 min)
Flow rate	: 1.0 mL/min
Temperature	: 37°C
Detection	: UV at 254 nm

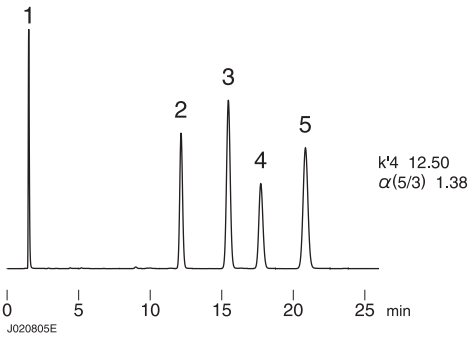
3 types of ODS with different separation characteristics, C8, C4

Pro series reversed phase columns come in 5 types, each showing different carbon content and separation characteristics such as hydrophobicity and planar cognitive ability. This makes method development easier, allowing the analyst to choose the most appropriate column depending on the compound characteristics and eluent conditions. Degree of hydrophobicity and planar cognitive ability for each *Pro* series phase are shown below.

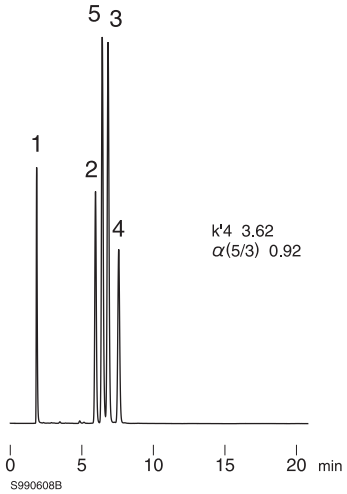
Hydrophobicity and planar cognitive ability

Hydrophobicity is evaluated by retention coefficient (k') of *n*-amylbenzene. Pro C18 RS shows the greatest hydrophobicity followed by Pro C18, Hydrosphere C18, Pro C8 and Pro C4. Pro C18 RS has the highest planar cognitive ability and Pro C4 the lowest. Pro C8 and Pro C4 have a different eluting order for triphenylene when compared to ODS materials.

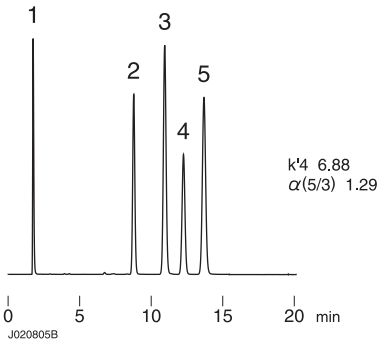
Pro C18 RS



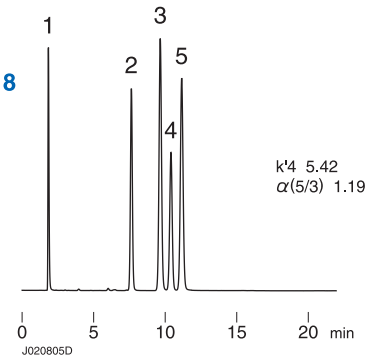
Pro C8



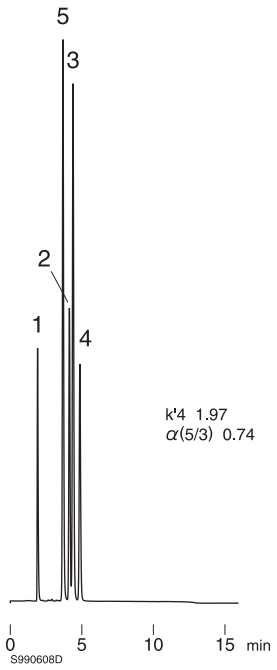
Pro C18



Hydrosphere C18



Pro C4

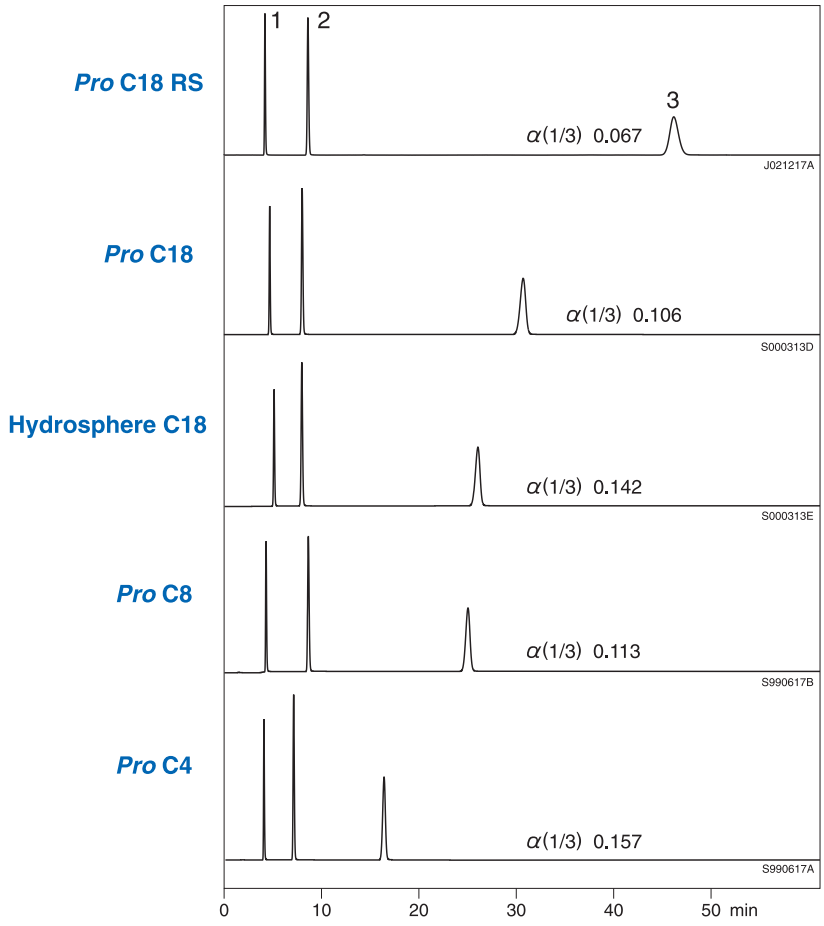


1. Uracil
2. *n*-Butylbenzene
3. *o*-Terphenyl
4. *n*-Amylbenzene
5. Triphenylene

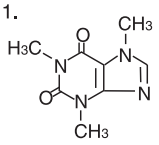
Column	: 150 X 4.6 mmI.D.
Eluent	: methanol/water (80/20)
Flow rate	: 1.0 mL/min
Temperature	: 37°C
Detection	: UV at 254 nm

Hydrogen bonding capacity

Hydrogen bonding capacity is evaluated by examining the relative retention coefficient as α(caffeine / benzene). Among the Pro series, both Hydrosphere C18 with low density of C18, and Pro C4 with short alkyl chain, have high hydrogen bonding capacity. Benzene with no polar groups is retained according to hydrophobicity of the packing. Retention of caffeine and phenol (hydrophilic compounds) is greatly affected by hydrogen bonding capacity, and these packing have similar retention times, but the packings show different selectivity.



1.



Caffeine

2.

Phenol

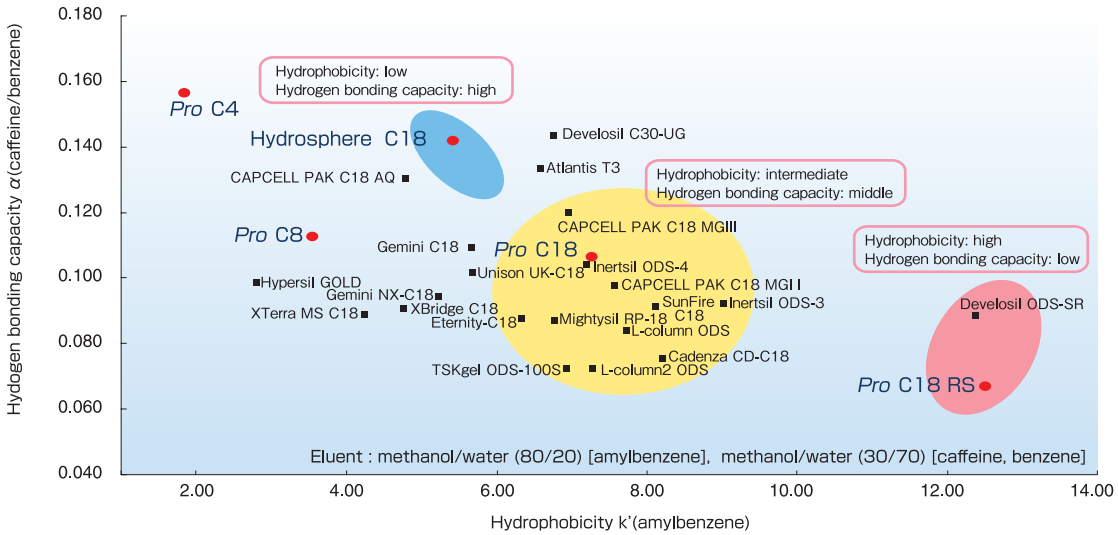
3.

Benzene

Column	: 150 X 4.6 mm I.D.
Eluent	: methanol/water (30/70)
Flow rate	: 1.0 mL/min
Temperature	: 37°C
Detection	: UV at 254 nm

Comparison of separation selectivity

The separation characteristics of each column are shown by hydrophobicity and hydrogen bonding capacity as indicators. Among the Pro series ODS packings, Hydrosphere C18 and Pro C18 RS have contrasting separation characteristics with standard Pro C18 in between. Pro C8 and C4 have different selectivity from ODS. By choosing one from these 5 types of columns, one can easily optimize the separation of polar and non polar compounds.



YMC-UltraHT *Pro* C18 & Hydrosphere C18

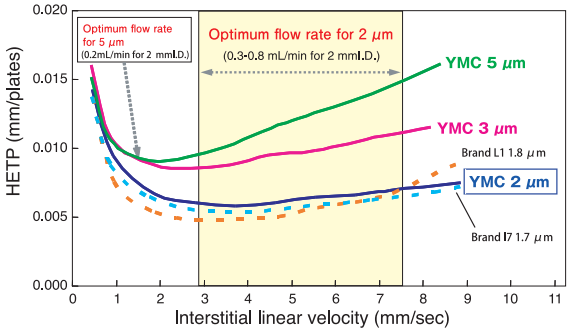
Ultra Fast Separation

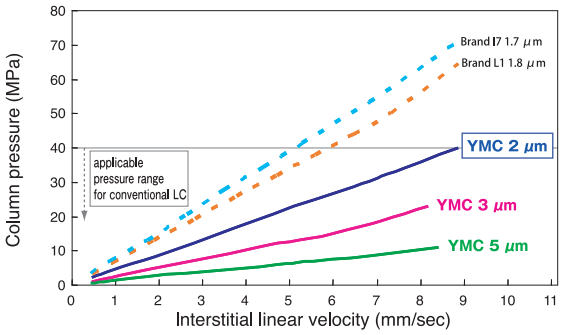
- Superior column performance at higher flow rate and higher pressure
- Useful for reducing analysis time and cost
- Applicable on both conventional HPLC and UHPLC
- Same selectivity and superior peak shape as 3 μm or 5 μm columns
- Simple method transfer from conventional HPLC ; no need to change elution conditions
- Useful in high sensitivity analysis with because of sharp peak shape

Characteristics of 2 μm packing material

YMC-UltraHT series columns show the same efficiency as sub-2 μm columns for ultra fast LC system and reduce the system pressure significantly.

Van Deemter curves



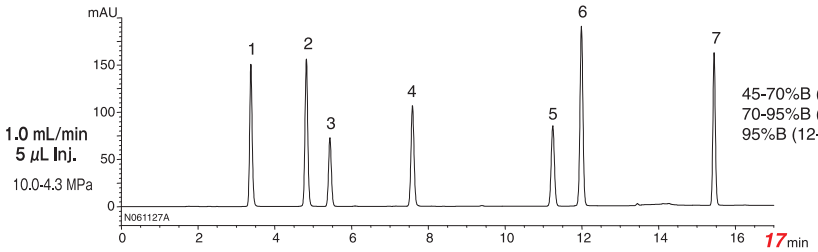


Column	: 50 X 2.0 or 2.1 mmI.D.
Eluent	: acetonitrile/water (60/40)
Temperature	: 25˚C
Sample	: Butyl benzoate

Method transfer from conventional LC to Ultra fast LC

This example shows the method transfer from conventional HPLC method to Ultra fast LC method using a YMC-UltraHT column. Since the column efficiency of YMC-UltraHT is maintained even when the flow rate is 4 times as fast as the conventional condition, it can shorten analysis time by about 91% while decreasing about 93% of solvent consumption without losing the separation characteristics.

Conventional LC method : **YMC-Pack *Pro* C18**
150 X 4.6 mmI.D. 5 μm

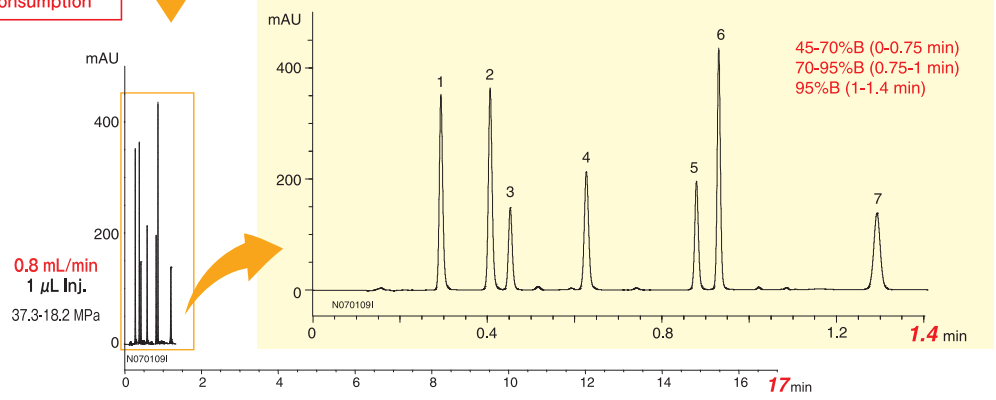


91% decrease in analysis time

93% decrease in solvent consumption

Linear velocity X4

Ultra fast LC method : **YMC-UltraHT *Pro* C18**
50 X 2.0 mmI.D. 2 μm



Antioxidants

1. *n*-Propyl gallate (PG)
2. 2,4,5-Trihydroxybutyrophenone (THBP)
3. *tert*-Butylhydroquinone (TBHQ)
4. Nordihydroguaiaretic acid (NDGA)
5. 4-Hydroxymethyl-2,6-di-*tert*-butylphenol (HMBP)
6. *n*-Octyl gallate (OG)
7. *n*-Dodecyl gallate (DG)

Eluent	: A) water/TFA (100/0.1) B) acetonitrile/methanol/TFA (75/25/0.1)
Temperature	: 30˚C
Detection	: UV at 280 nm

Selecting the desired column dimensions

YMC-UltraHT columns can be chosen from various sizes depending upon the application.

Speed and resolution	For decreasing solvent consumption or LC/MS (2.0 mmI.D.)	For conventional LC (3.0 mmI.D.)
Emphasize reduction of analysis time (30 mm length)	30 X 2.0	–
Ultra-fast analysis with similar efficiency to 5 μm, 150 mm length column (50 mm, 75 mm length)	Standard for ultra fast LC 50 X 2.0	50 X 3.0
	75 X 2.0	75 X 3.0
High-resolution column for multi-component sample and separation of closely eluting peaks (100 mm length)	100 X 2.0	100 X 3.0

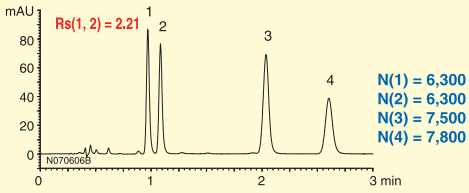
3.0 mmI.D. column: easily applicable with conventional LC systems

YMC-UltraHT series columns can be used for fast analysis with conventional LC systems, because the pressure is lower than commercial sub-2 μm columns. Considering extra-column band spreading, 3.0 mmI.D. columns are more applicable for conventional LC systems than 2.0 mmI.D.

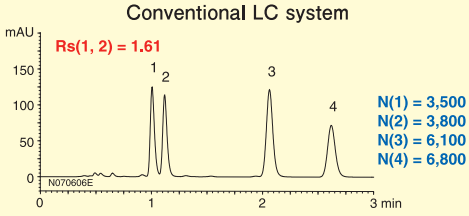
50 X 3.0 mmI.D.

Flow rate : 0.8 mL/min
Injection : 2 μL
Pressure : 18.6 MPa

Conventional semi-micro LC system



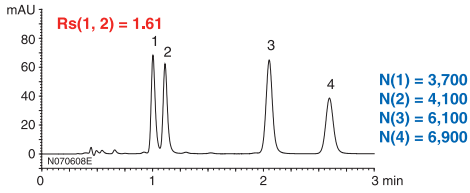
Conventional LC system



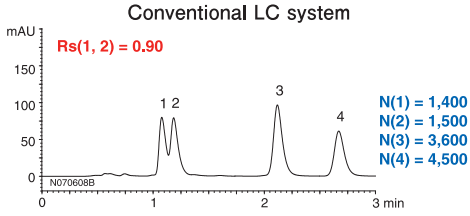
50 X 2.0 mmI.D.

Flow rate : 0.36 mL/min
Injection : 1 μL
Pressure : 16.2 MPa

Conventional semi-micro LC system



Conventional LC system



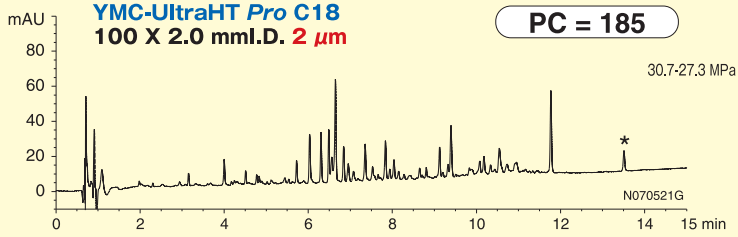
Cephalosporin antibiotics

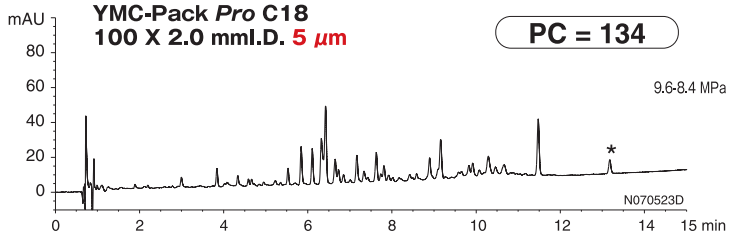
1. Cephalexin
2. Cefaclor
3. Cephaloglycin
4. Cephaloridine

Column	: YMC-UltraHT Pro C18
Eluent	: acetonitrile/20 mM KH_2PO_4 (10/90)
Temperature	: 37˚C
Detection	: UV at 260 nm

100 mm length column: suitable for multi-component analysis

Analysis of a tryptic digest of β-lactoglobulin B is shown in below. A YMC-UltraHT column can resolve 38% more peaks than a conventional 5 μm column with increased sensitivity. A 100 mm length column is useful for high resolution analysis of multi-component samples such as peptide mapping.





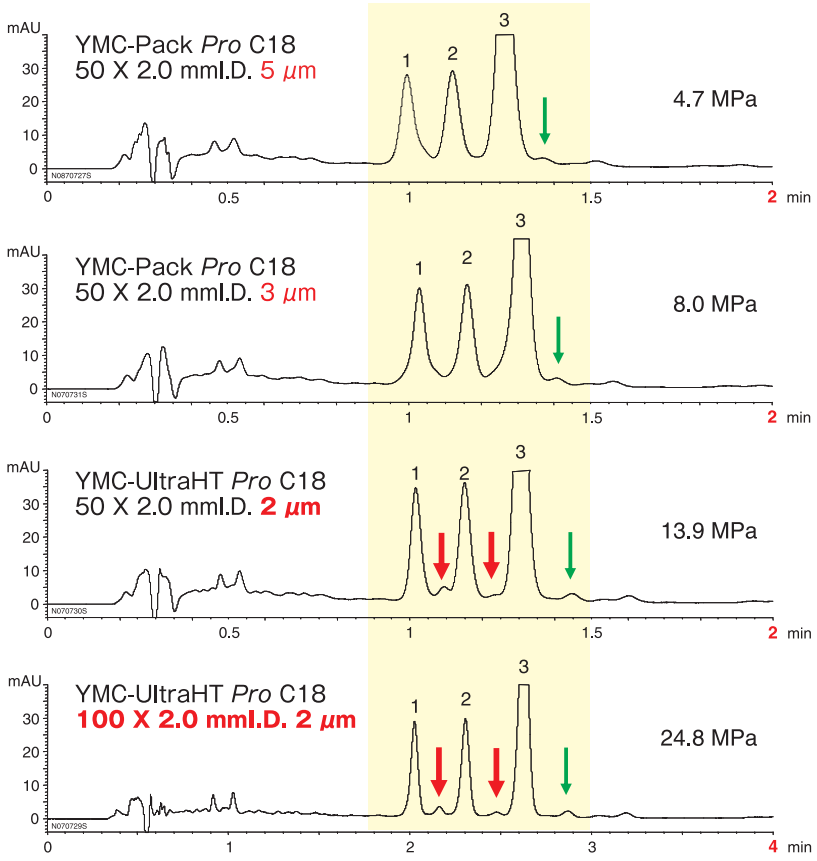
PC: Peak capacity
PC = 1 + (gradient time / peak width)

* undigested β-Lactoglobulin B

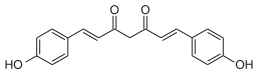
Eluent	: A) water/TFA (100/0.1) B) acetonitrile/TFA (100/0.1) 5-50%B (0-15 min)
Flow rate	: 0.4 mL/min
Temperature	: 37 ˚C
Detection	: UV at 220 nm
Injection	: 1 μL
Sample	: Tryptic digest of β-Lactoglobulin B (5 mg/mL; 37 ˚C, 24 h)

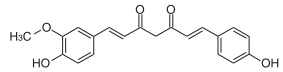
Curcuminoids in a commercial turmeric supplement

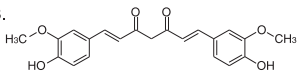
Some impurities between each main component are detected by using 50 mm length of YMC-UltraHT Pro C18. Furthermore, baseline separations of impurities are achieved by using 100 mm length column.



Commercial turmeric supplement

1. 
Curcumin 3 (Bisdemethoxycurcumin)

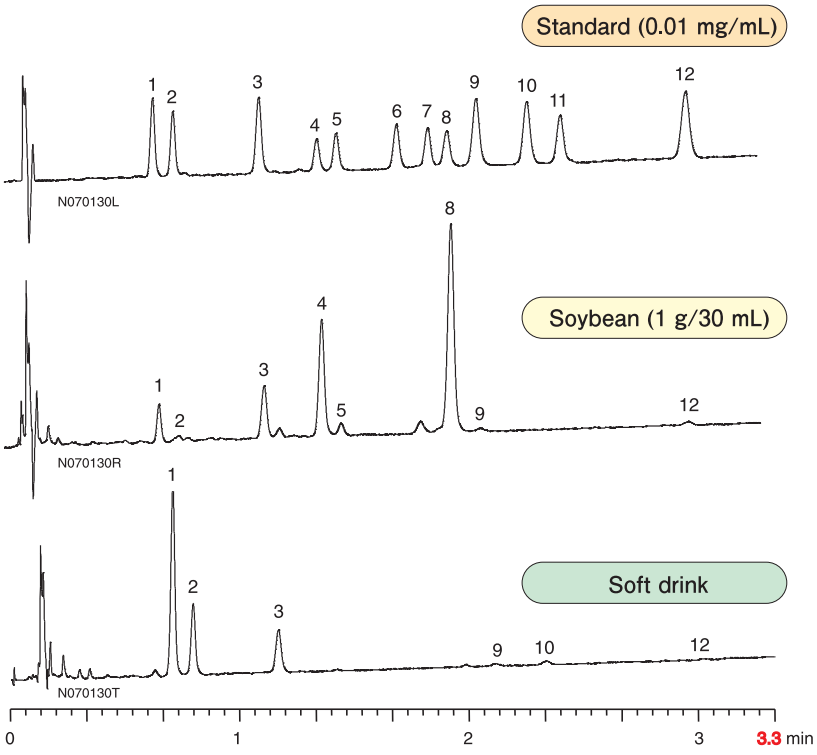
2. 
Curcumin 2 (Demethoxycurcumin)

3. 
Curcumin 1 (Curcumin)

Eluent	: acetonitrile/water/formic acid (50/50/0.1)
Flow rate	: 0.4 mL/min
Temperature	: 40˚C
Detection	: UV at 250 nm
Injection	: 1 μL
Sample	: Tablets (6.9 mg/mL)

Isoflavones in food

Soy isoflavones are relatively hydrophilic and have similar structures to each other. YMC-UltraHT Hydrosphere C18 provides excellent separation of all 12 isoflavones with a short analysis time.



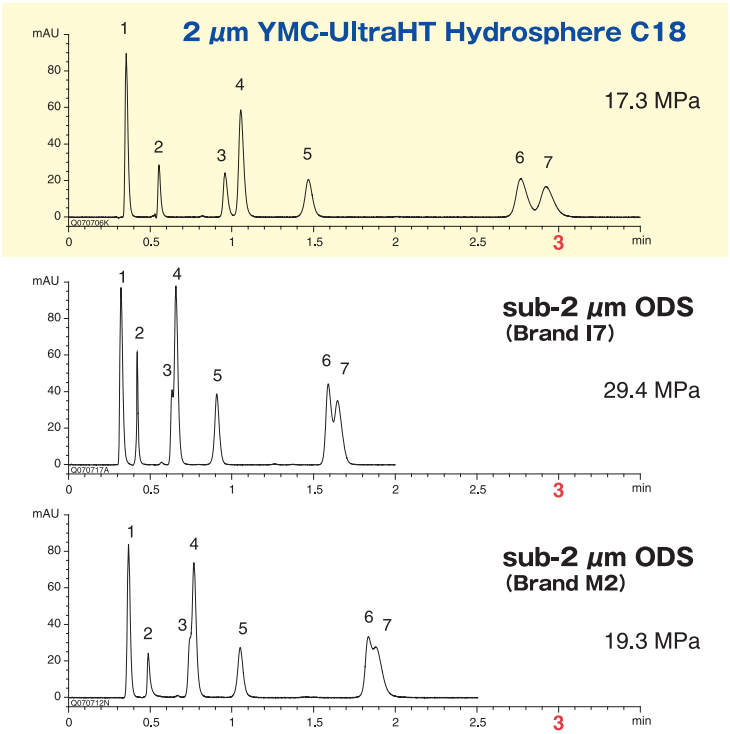
Soy isoflavones

1. Daidzin
2. Glycitin
3. Genistin
4. 6"-*O*-Malonyldaidzin
5. 6"-*O*-Malonylglycitin
6. 6"-*O*-Acetyldaidzin
7. 6"-*O*-Acetylglycitin
8. 6"-*O*-Malonylgenistin
9. Daidzein
10. Glycitein
11. 6"-*O*-Acetylgenistin
12. Genistein

Column	: YMC-UltraHT Hydrosphere C18 50 X 2.0 mmI.D. 2 μm
Eluent	: A) water/acetic acid (100/3) B) acetonitrile/acetic acid (100/3) 12.5-30% B (0-3.3 min)
Flow rate	: 0.9 mL/min
Temperature	: 35˚C
Detection	: UV at 254 nm
Injection	: 0.6 μL
Pressure	: 50.3 - 49.6 MPa

Metabolites of organic solvents

YMC-UltraHT Hydrosphere C18 shows favorable retention and superior resolution of polar metabolites of organic solvents, which are difficult to retain on a standard ODS column. In this application, the eluent contains only 3% of organic solvent. YMC-UltraHT Hydrosphere C18 can be used under a highly aqueous mobile phase or even under a 100% aqueous mobile phase with excellent reproducibility.



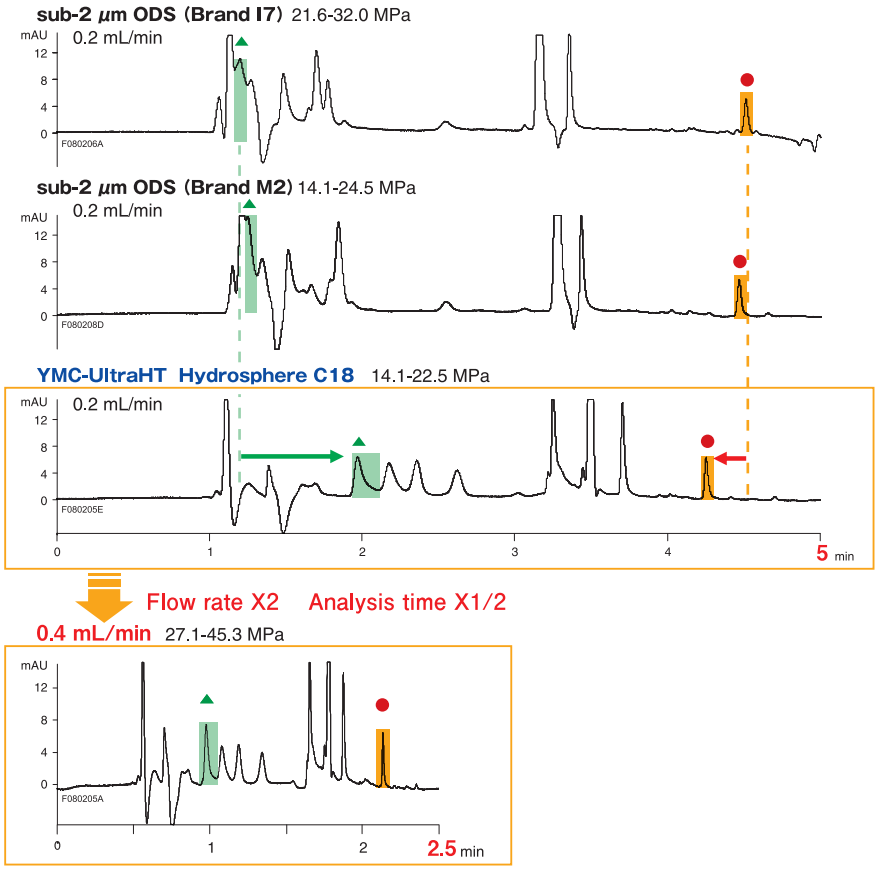
Metabolites of organic solvents

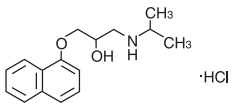
1. Creatinine
2. Mandelic acid
3. Phenylglyoxylic acid
4. Hippuric acid
5. *o*-Methylhippuric acid
6. *p*-Methylhippuric acid
7. *m*-Methylhippuric acid

Column	: 50 X 2.0 or 2.1 mmI.D.
Eluent	: 20 mM CH_3COONH_4/IPA (97/3)
Flow rate	: 0.4 mL/min
Temperature	: 35°C
Detection	: UV at 225 nm
Injection	: 1 μL
Sample	: 0.05 mg/mL

Fast analysis of *in-vitro* metabolites of propranolol

Simultaneous analysis of metabolites of propranolol is shown below. Propranolol was metabolized by human liver microsome *in-vitro*. Hydrosphere C18 maintains hydrophilicity by decreasing ODS density while fully deactivating the residual silanol group. Therefore Hydrosphere C18 provides long retention time for highly hydrophilic metabolites(▲) and short retention time for the relatively hydrophobic drug itself (propranolol●). YMC-UltraHT Hydrosphere C18 shows superior separation within a shorter analysis time compared to competitor's UHPLC columns. YMC-UltraHT Hydrosphere C18 is suitable for ultra-fast separation of samples containing compounds with various polarities such as a drug and its metabolites.





● Unchanged drug

▲ Metabolite

Column	: 100 X 2.0 mmI.D. or 100 X 2.1 mmI.D.
Eluent	: A) 20 mM HCOOH-$HCOONH_4$ (pH 4.6) B) methanol 5%B (0-1 min), 5-100%B (1-3 min), 100%B (3-5 min) at 0.2 mL/min 5%B (0-0.5 min), 5-100%B (0.5-1.5 min), 100%B (1.5-2.5 min) at 0.4 mL/min
Detection	: UV at 220 nm
Temperature	: 37°C
Injection	: 1 μL

Pro C18 Standard ODS with High Versatility

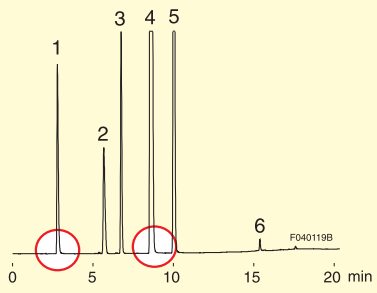
- Superior separation of basic compounds
- Processed with advanced end-capping technology
- Excellent reproducibility

Pro C18 with standard hydrophobicity can be widely applied to separate hydrophilic compounds and hydrophobic compounds.

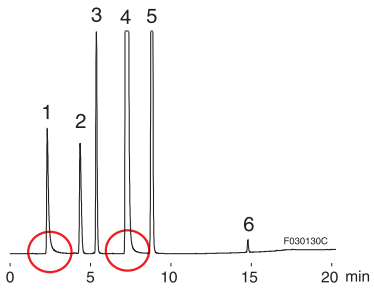
First choice ODS column in almost all fields

YMC-Pack Pro C18 is a high performance ODS column providing standard hydrophobicity, high resolution, high durability and excellent reproducibility. This column is highly appropriate for basic compounds that often elute with poor peak shapes on competitive columns.

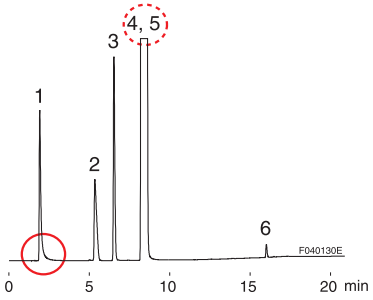
***Pro* C18**



Brand I4



Brand L1



Nose drops (OTC)

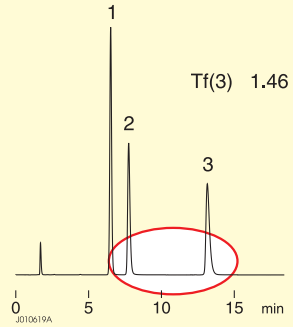
1. Maleic acid
2. Lidocaine
3. Naphazoline
4. Chlorpheniramine
5. Methyl *p*-hydroxybenzoate
6. Benzethonium chloride

Column	: 150 X 4.6 mmI.D. 5 μm
Eluent	: A) 20 mM KH_2PO_4-H_3PO_4 (pH 2.5) B) methanol 20-90%B (0-15 min), 90%B (15-20 min)
Flow rate	: 1.0 mL/min
Temperature	: 37°C
Detection	: UV at 260 nm

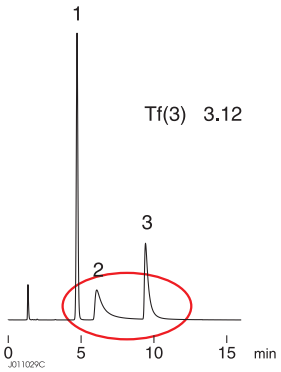
Antihistamine drugs

YMC-Pack Pro C18 shows excellent peak shape in an analysis of basic antihistamine drugs that often exhibit tailing peak shapes on conventional ODS columns.

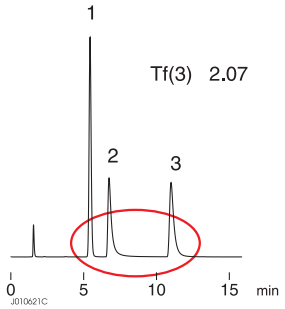
***Pro* C18**



Brand L3



Brand F2



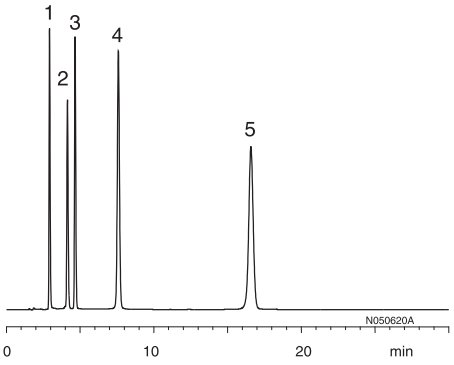
Antihistamine drugs

1. Butyl *p*-hydroxybenzoate (I.S.)
2. Diphenhydramine hydrochloride
3. Chlorpheniramine maleate

Column	: 150 X 4.6 mm I.D. 5 μm
Eluent	: 20 mM KH_2PO_4-K_2HPO_4 (pH 6.9) /methanol (35/65)
Flow rate	: 1.0 mL/min
Temperature	: 37°C
Detection	: UV at 260 nm

Separation of tea catechins

The tea catechins which have various bioactive factors are analyzed with the versatile Pro C18 column.



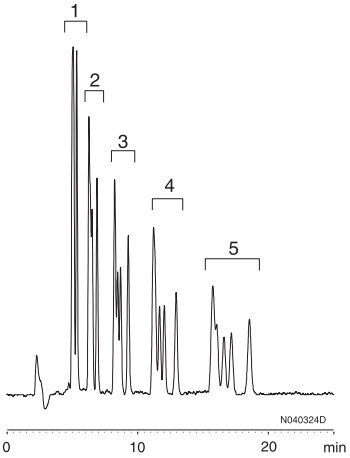
Catechins

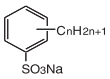
1. (-)-Epigallocatechin
2. (+)-Catechin
3. (-)-Epicatechin
4. (-)-Epigallocatechin gallate
5. (-)-Epicatechin gallate

Column	: YMC-Pack Pro C18 5 μm 150 X 4.6 mmI.D.
Eluent	: acetonitrile/ethyl acetate/water/TFA (9/3/88/0.1)
Flow rate	: 1.0 mL/min
Temperature	: 37°C
Detection	: UV at 280 nm

Anionic surfactants

A separation of anionic surfactants is shown below.





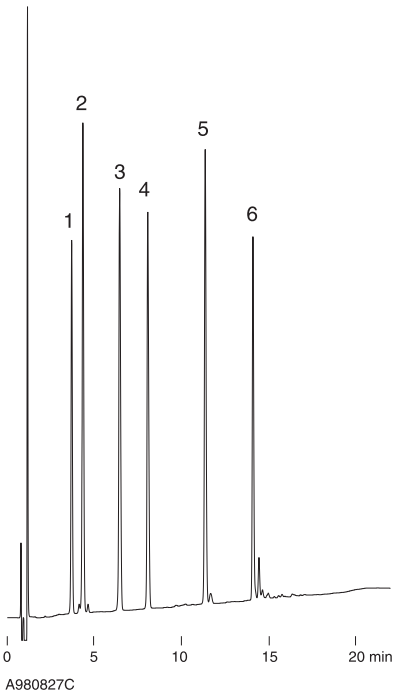
Anionic surfactants

1. Sodium decylbenzenesulfonate (n=10)
2. Sodium undecylbenzenesulfonate (n=11)
3. Sodium dodecylbenzenesulfonate (n=12)
4. Sodium tridecylbenzenesulfonate (n=13)
5. Sodium tetradecylbenzenesulfonate (n=14)

Column	: YMC-Pack Pro C18 5 μm 250 X 4.6 mmI.D.
Eluent	: acetonitrile/water (65/35) containing 0.1 M $NaClO_4$
Flow rate	: 1.0 mL/min
Temperature	: 40°C
Detection	: FLS at Ex 221 nm, Em 284 nm
Injection	: 20 μL (2.0 μg/mL)

Peptides

Peptides with molecular weight of about 500 to 6,000 are separated by using short column of Pro C18 3 μm.



Peptides

1. Oxytocin (MW 1,007)
2. Met-Enkephalin (MW 574)
3. Leu-Enkephalin (MW 556)
4. Angiotensin I (MW 1,296)
5. α-Mating factor (MW 1,684)
6. Insulin (MW 5,733)

Column	: YMC-Pack Pro C18 3 μm 75 X 4.6 mmI.D.
Eluent	: A) water/TFA (100/0.1) B) acetonitrile/TFA (100/0.1) 20-40%B (0-20 min)
Flow rate	: 1.0 mL/min
Temperature	: 37°C
Detection	: UV at 220 nm

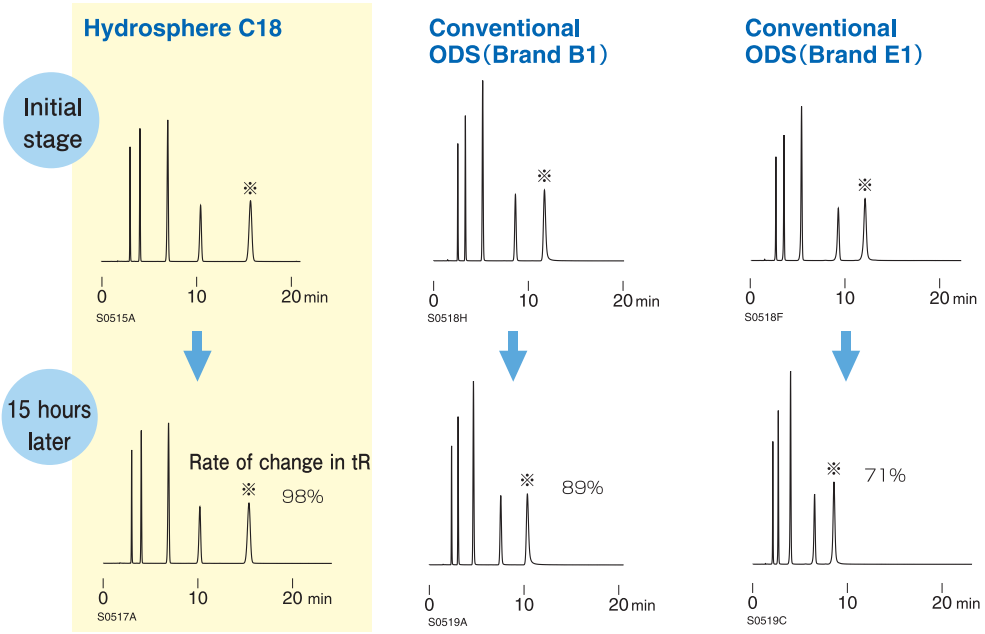
Hydrosphere C18
ODS for Hydrophilic Compounds

- Strong retention of hydrophilic compounds
- Can be used with 100% aqueous mobile phase
- Superior separation of basic compounds

Hydrosphere C18 is designed to maintain adequate hydrophilicity on the packing surface for superior separation of hydrophilic compounds even under conditions of 100% water.

Reproducibility of retention time when used with 100% aqueous mobile phase

When conventional ODS columns are used with 100% aqueous mobile phase, the apparent hydrophobicity decreases due to repulsive interactions between water and hydrophobic groups on the surface of the packing materials, resulting in reduced retention of compounds. The rates of change in retention time of adenine show that there is very little change (98% of initial value) on Hydrosphere C18, compared to 89% on Brand B1 and 71% on Brand E1. Hydrosphere C18 is designed to maintain adequate hydrophilicity on the packing surface so that hydration can be achieved. When Hydrosphere C18 is used with mobile phases containing no organic solvent, the retention time is not significantly shortened and highly reproducible chromatograms can be obtained.



After completion of analysis, the flow was stopped and the columns were left to stand overnight (approx. 15 hours).

Nucleic acid bases

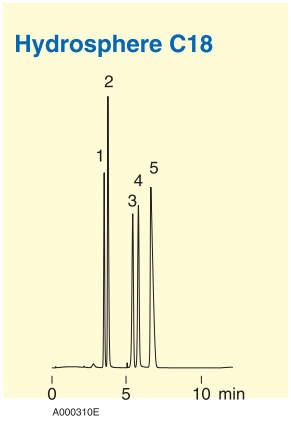
1. Cytosine
2. Uracil
3. Guanine
4. Thymine
5. Adenine

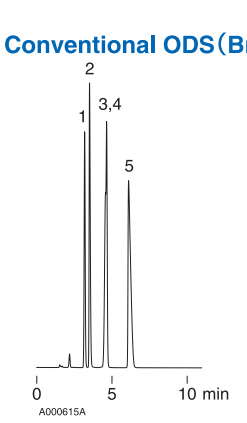
Column	: 150 X 4.6 mm I.D. 5 μm
Eluent	: 20 mM KH_2PO_4-K_2HPO_4 (pH 6.9)
Flow rate	: 1.0 mL/min
Temperature	: 37°C
Detection	: UV at 254 nm

Separation of hydrophilic compounds

Because of high hydrophilicity on the surface of Hydrosphere C18 packing material, when compared with the separation by a conventinal ODS, Hydrosphere C18 shows longer retention and better separation of citric acid and fumaric acid.

Hydrosphere C18 can separate hydrophilic compounds such as amino acids without the need for ion pair reagents.

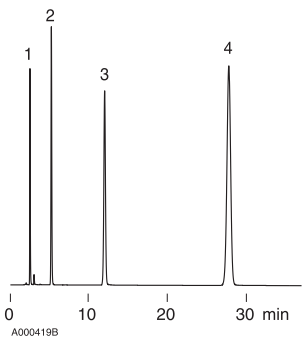




Organic acids

1. Lactic acid
2. Acetic acid
3. Citric acid
4. Fumaric acid
5. Succinic acid

Column	: 150 X 4.6 mmI.D. 5 μm
Eluent	: 20 mM NaH_2PO_4-H_3PO_4 (pH 2.8)
Flow rate	: 1.0 mL/min
Temperature	: 30°C
Detection	: UV at 210 nm



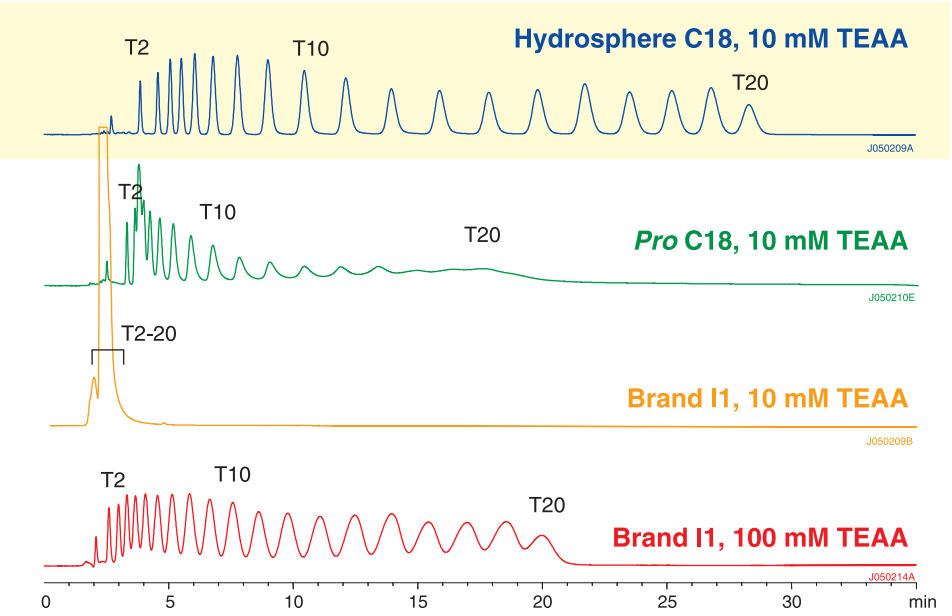
Amino acids

1. L-Valine
2. L-Tyrosine
3. L-Phenylalanine
4. L-Tryptophan

Column	: Hydrosphere C18 5 μm 150 X 4.6 mm I.D.
Eluent	: 20 mM KH_2PO_4
Flow rate	: 1.0 mL/min
Temperature	: 37°C
Detection	: UV at 210 nm

Oligonucleotides d(pT)2-20

Hydrosphere C18 shows strong retention and good resolution of oligonucleotides at a relatively low concentration of triethylamine compared to ordinary C18 phases.

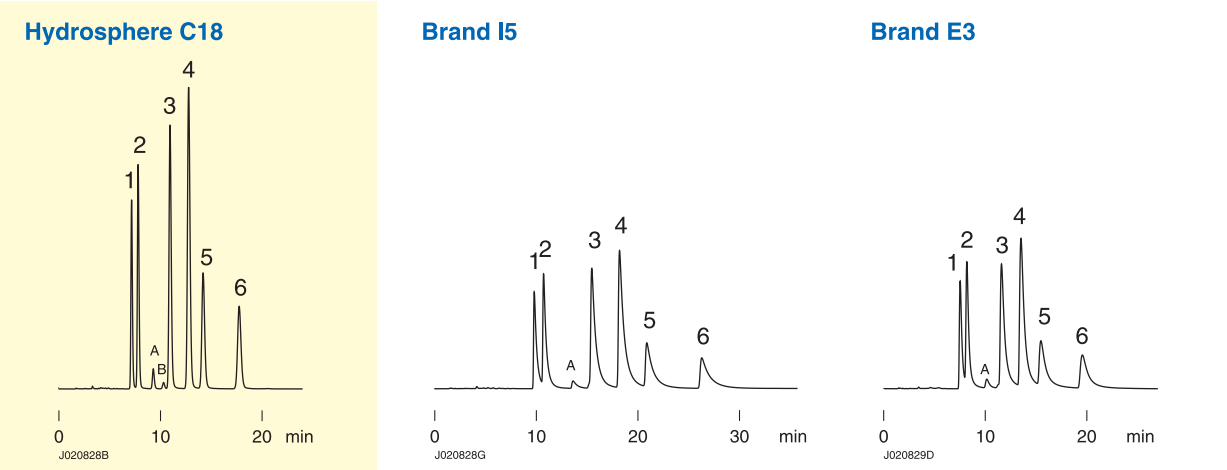


Column	: 150 X 4.6 mmI.D.
Eluent	: A) 10 mM or 100 mM TEAA* (pH 6.0) B) 10 mM or 100 mM TEAA* (pH 6.0)/acetonitrile (80/20) 55-61%B (0-30 min)
Flow rate	: 1.0 mL/min
Temperature	: 35˚C
Detection	: UV at 269 nm

*TEAA : triethylamine-acetic acid

Alkaloids

In the separation of alkaloids below, unacceptable peak tailing is found when competitive columns are used, while there is none when Hydrosphere C18 is used. Peak 3 and Peak B co-elute on competitive columns, but are separated on Hydrosphere C18.



Alkaloids

1. Cinchonine
2. Cinchonidine
3. Quinidine
4. Quinine
5. Dihydroquinidine
6. Dihydroquinine

A : Impurity derived from cinchonine
B : Impurity derived from cinchonidine

Column	: 150 X 4.6 mmI.D. 5 μm
Eluent	: methanol/20 mM KH_2PO_4 (35/65)
Flow rate	: 1.0 mL/min
Temperature	: 37˚C
Detection	: UV at 235 nm

Pro C18 RS
Highly Durable ODS

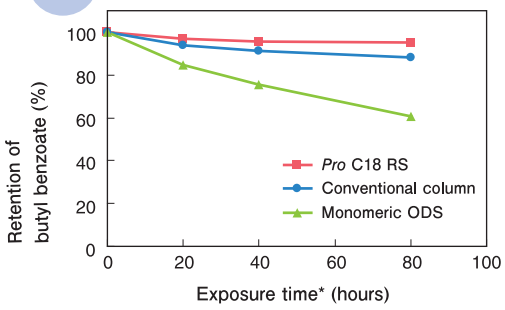
- Excellent acid and alkaline resistance (pH 1-10)
- Superior separation of structural isomers
- Superior separation of basic compounds

Pro C18 RS is a multifunctionally bonded high carbon ODS column characterized by high resolution and durability. It is applicable to a wide range of compounds, providing good separation of compounds with small differences in hydrophobicity.

Excellent durability

The hydrophobicity of Pro C18 RS is hardly changed under the harsh condition (pH 1, temp. 70℃).

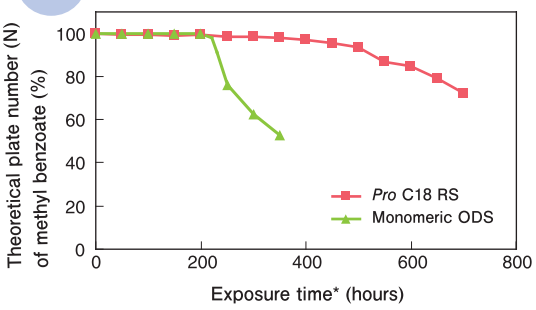
pH 1



*Purged the column with acetonitrile/water/TFA(10/90/1) at 70℃

Unlike conventional ODS columns, Pro C18 RS can be used with an alkaline mobile phase.

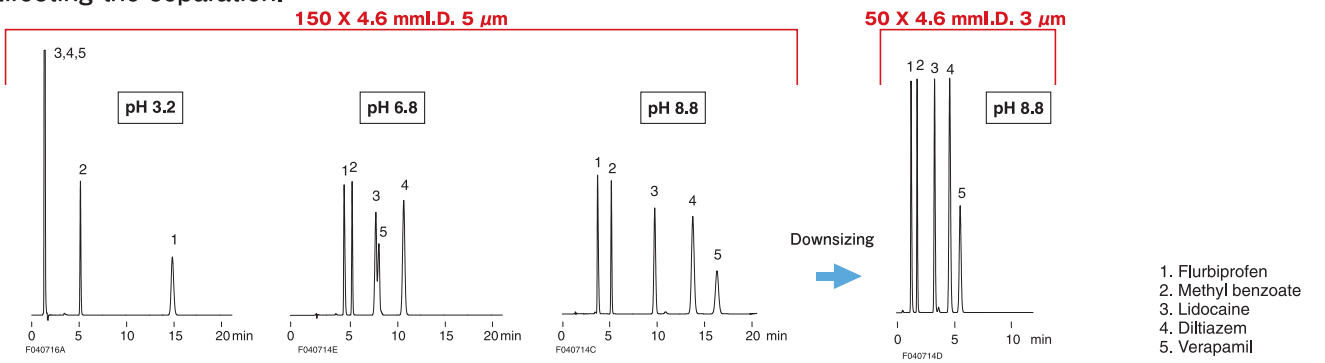
pH 10



*Sequential analysis with 20 mM H_3BO_3-NaOH (pH9.8)/methanol(50/50) at 30℃

A wide choice of mobile phases facilitates method development

Pro C18 RS with excellent acid and alkali resistance can be used over a wide pH range, and it is easy to optimize the separation conditions. In addition, by downsizing the column (5 μm, length 150 mm) to a shorter one (3 μm, length 50 mm), it becomes possible to shorten the analysis time by one third without affecting the separation.

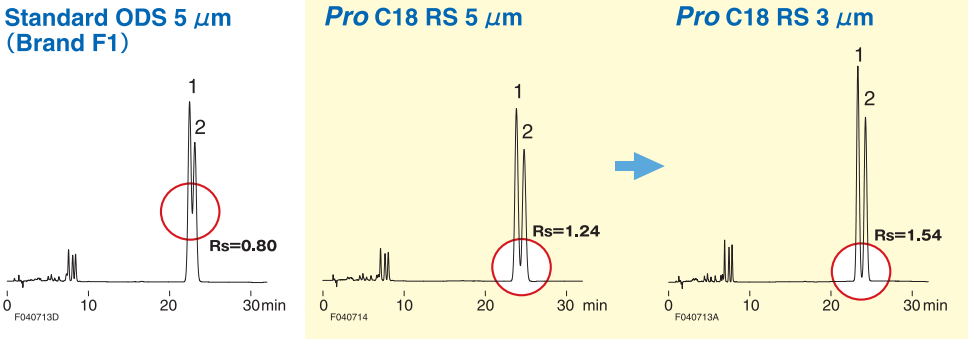


1. Flurbiprofen
2. Methyl benzoate
3. Lidocaine
4. Diltiazem
5. Verapamil

Column	: YMC-Pack Pro C18 RS
Eluent	: 20 mM acetate buffer/methanol (35/65)
Flow rate	: 1.0 mL/min
Temperature	: 30˚C
Detection	: UV at 220 nm

Separation of structural isomers

Pro C18 RS with a high C18 density has high hydrophobicity and planar cognitive ability, and can be applied to separate structural isomers which are difficult to separate with other ODS. In addition, by using 3 μm material, resolution can be increased, and it becomes possible to achive a baseline separation of linolenate isomers.



Methyl linolenate isomers

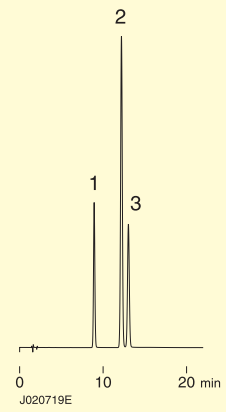
1. Methyl linolenate
2. Methyl γ-linolenate

Column	: 150 X 4.6 mmI.D.
Eluent	: acetonitrile/THF/water (35/30/35)
Flow rate	: 1.0 mL/min
Temperature	: 30˚C
Detection	: UV at 210 nm

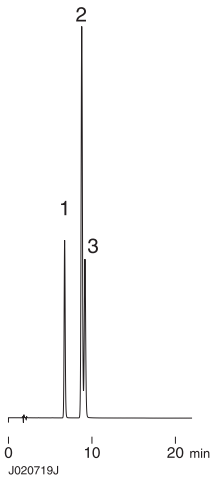
Terphenyl isomers

Because Pro C18 RS has high hydrophobicity and planar cognitive ability, Pro C18 RS works well in the separation of structural isomers that are difficult to separate on conventional ODS columns.

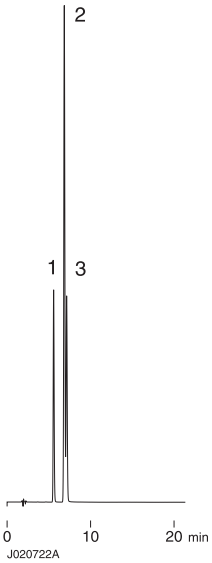
Pro C18 RS



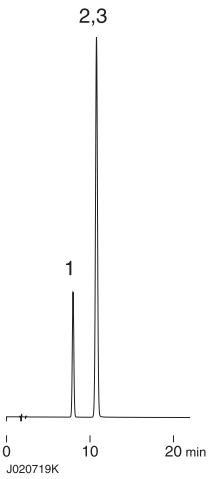
Pro C18



Hydrosphere C18



Brand C1



Terphenyl isomers

1. *o*-Terphenyl

2. *m*-Terphenyl

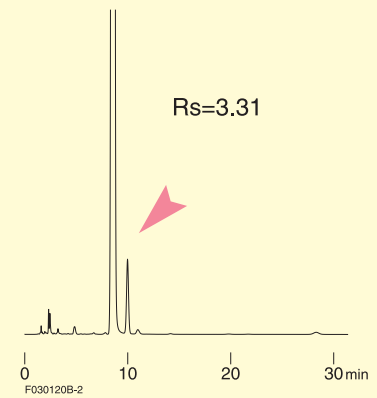
3. *p*-Terphenyl

Column	:150 X 4.6 mmI.D. 5 μm
Eluent	: methanol/water (85/15)
Flow rate	: 1.0 mL/min
Temperature	: 37°C
Detection	: UV at 254 nm

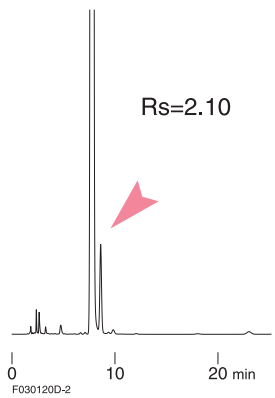
Nicardipine hydrochloride

The separation of degradation products of nicardipine hydrochloride, a compound with relatively high hydrophobicity, is shown below. The main peak and the degradation products are separated poorly on competitive columns.
Even if Pro C18 or Hydrosphere C18 is used, baseline resolution is difficult. On the other hand, Pro C18 RS, superior in hydrophobicity and the ability to discern structural differences, can separate the main peak and degradation products completely. As seen here, Pro C18 RS shows excellent selectivity when components can elute very close together in the separation of compounds with high hydrophobicity.

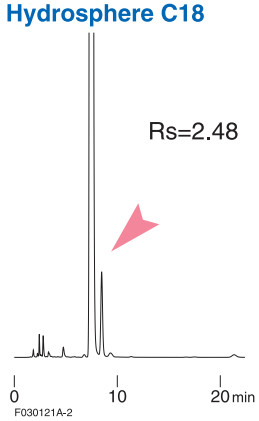
Pro C18 RS



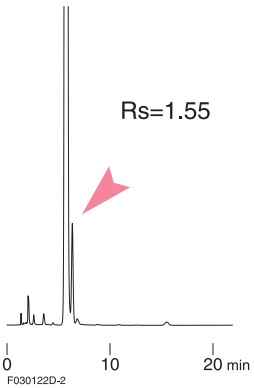
Pro C18



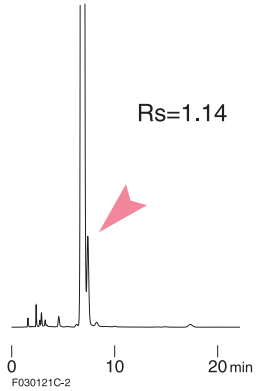
Hydrosphere C18



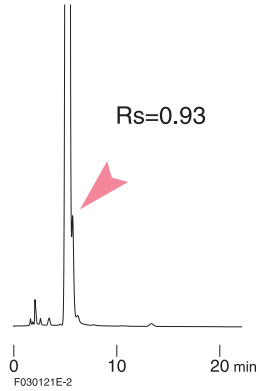
Brand I4

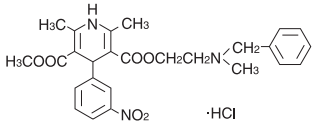


Brand D4



Brand I1





Nicardipine HCl

Column	: 150 X 4.6 mmI.D. 5 μm
Eluent	: 20 mM KH_2PO_4-K_2HPO_4 (pH 6.9)/methanol (25/75)
Flow rate	: 1.0 mL/min
Temperature	: 37°C
Detection	: UV at 254 nm

Pro C8 & *Pro* C4

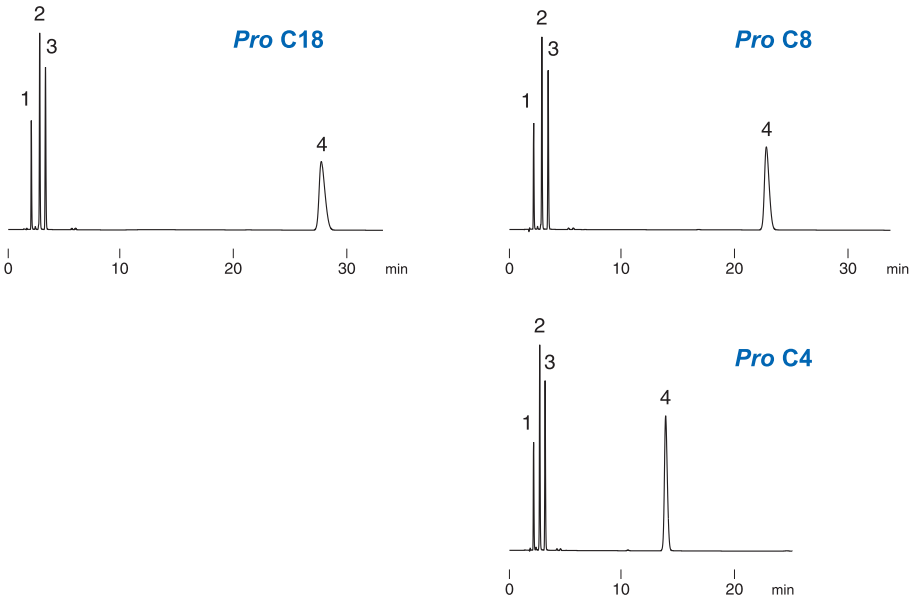
Different Characteristics Compared to ODS

- Different characteristics compared to ODS
- Superior separation of basic compounds
- Processed with advanced end-capping technology

Pro C8 and *Pro* C4 have a tendency to show shorter retention time compared to ODS. Also, as alkyl chains of the functional groups become shorter, hydrogen bonding capacity becomes higher, and then, not only the retention time but also separation selectivity becomes different from that of ODS.

Short time analysis by *Pro* C8 and *Pro* C4

Examples of separation of antipyretic drugs on Pro C8, Pro C4 and Pro C18 are shown below. Since ibuprofen has relatively high hydrophobicity, more time is required to analyze it using the highly hydrophobic packing material Pro C18. When Pro C8 or Pro C4 is used, the lower hydrophobicity of the packing material can shorten the analysis time. In addition, Pro C8 and Pro C4 achieve good separation of hydrophilic compounds, including caffeine, ethenzamide and bromovalerylurea.



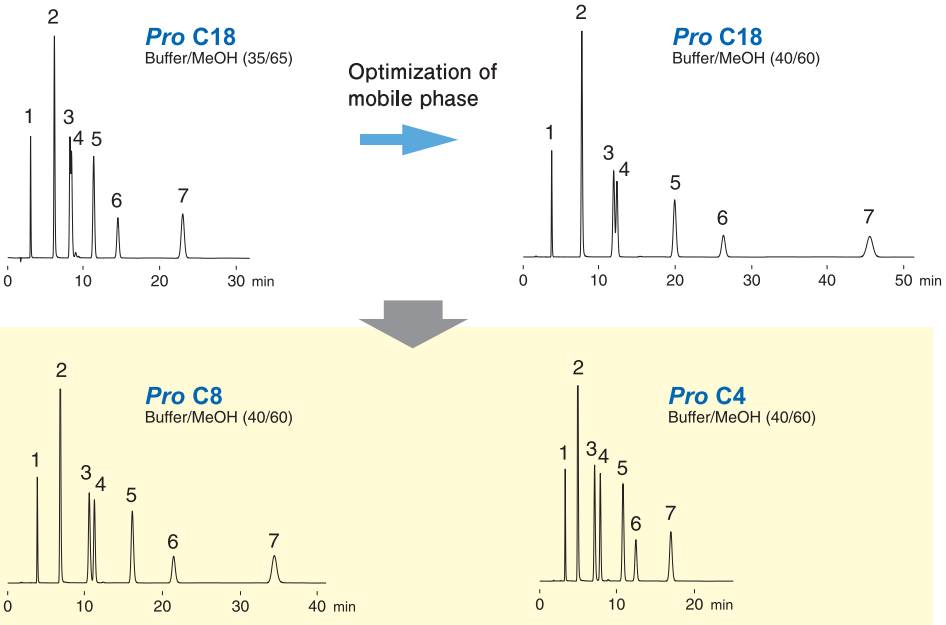
Antipyretic drugs

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

Column	: 150 X 4.6 mmI.D. 5 μm
Eluent	: methanol/20 mM H_3PO_4 (60/40)
Flow rate	: 1.0 mL/min
Temperature	: 37°C
Detection	: UV at 254 nm

Optimization of separation using *Pro* C8 and *Pro* C4

Separation optimization is difficult to achieve for antiarrhythmics using Pro C18, even if the moblie phase is optimized. In contrast, Pro C8 and Pro C4 can completely separate antiarrhythmics in a short time. As shown below, Pro C8 and Pro C4 may be useful in cases where separation optimization is difficult to achieve using Pro C18.



Antiarrhythmics

1. Phenytoin
2. Propranolol HCl
3. Quinidine
4. Lidocaine
5. Diltiazem HCl
6. Verapamil HCl
7. Nicardipine HCl

Column	: 150 X 4.6 mm I.D. 5 μm
Eluent	: 20 mM KH_2PO_4-K_2HPO_4 (pH 6.9)/methanol
Flow rate	: 1.0 mL/min
Temperature	: 37°C
Detection	: UV at 220 nm

Semi-micro columns for LC/MS

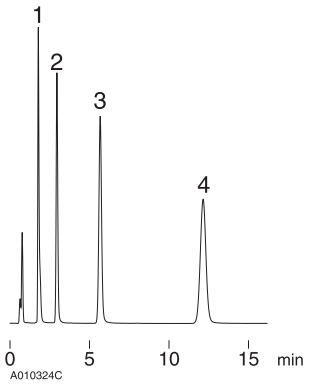
- Most suitable for microanalysis
- Wide selection of packing materials and column sizes

Pro series columns are highly end-capped and are high performance columns, providing good peak shapes even when used with mobile phases suitable for LC/MS.

Excellent peak shape under volatile buffer conditions

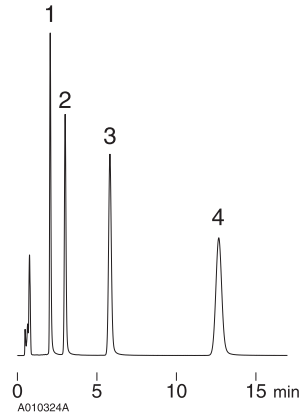
Excellent peak shapes are obtained even when a volatile buffer is used. Pro series can be easily applied to LC/MS.

Non-volatile buffer



Eluent : 50 mM NaH_2PO_4/acetonitrile (75/25)

Volatile buffer



Eluent : 10 mM CH_3COOH-CH_3COONH_4 (pH 4.3) / acetonitrile (75/25)

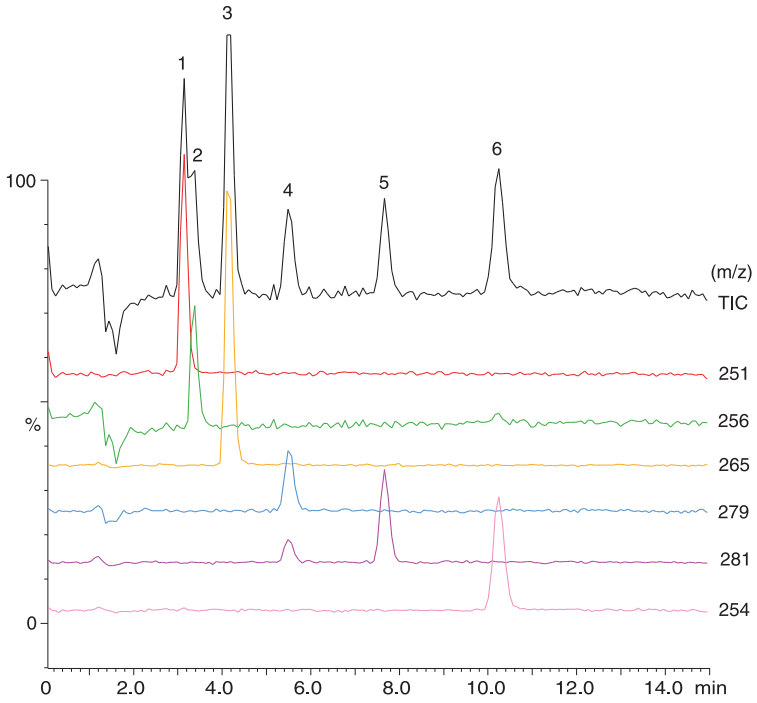
Nalidixic acid antibiotics

1. Cinoxacin
2. Oxolinic acid
3. Nalidixic acid
4. Piromidic acid

Column	: Hydrosphere C18 3 μm 50 X 2.0 mmI.D.
Flow rate	: 0.2 mL/min
Temperature	: 37°C
Detection	: UV at 260 nm

LC/MS analysis of sulfonamides

Superior peak shapes and resolutions of sulfonamides, which are basic compounds, are obtained even under low concentrations of volatile buffer.



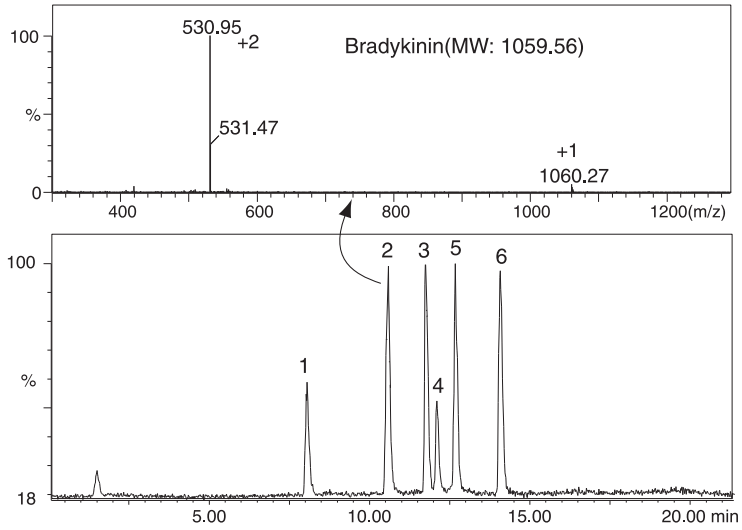
Sulfonamides

1. Sulfadiazine (MW 250)
2. Sulfathiazole (MW 255)
3. Sulfamerazine (MW 264)
4. Sulfadimidine (MW 278)
5. Sulfamonomethoxine (MW 280)
6. Sulfamethoxazole (MW 253)

Column	: Hydrosphere C18 3 μm 75 X 2.0 mmI.D.
Eluent	: 10 mM CH_3COOH-CH_3COONH_4 (pH 4.6) /acetonitrile (85/15)
Flow rate	: 0.18 mL/min
Temperature	: 37°C
Detection	: ESI-positive mode

LC/MS separation of peptides

Superior peak shapes are shown even with very low concentration of TFA.



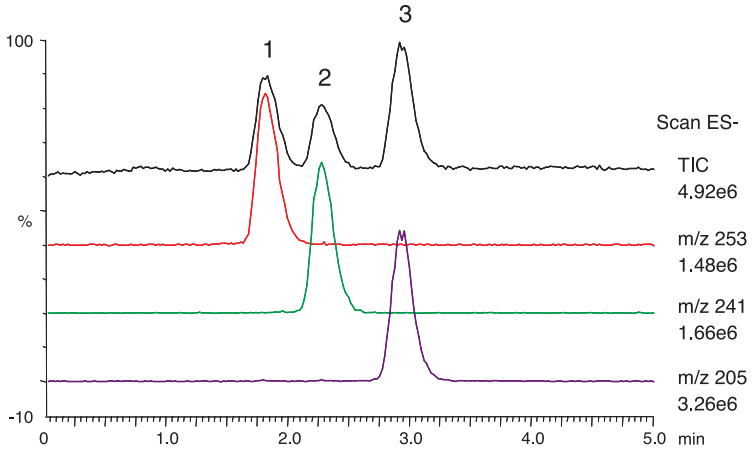
Peptides

1. [Arg^8]-Vasopressin
2. Bradykinin
3. Angiotensin Ⅱ
4. Oxytocin
5. Angiotensin Ⅰ
6. Leu-Enkephalin

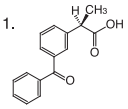
Column	: YMC-Pack Pro C18 RS 5 μm 150 X 2.0 mmI.D.
Eluent	: A) water/TFA (100/0.01) B) acetonitrile/TFA (100/0.01) 10-35%B (0-15 min)
Flow rate	: 0.2 mL/min
Temperature	: 37˚C
Detection	: ESI positive-mode

LC/MS separation of anti-inflammatory drugs

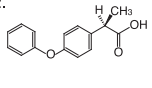
Good resolution, with sharp symmetrical peaks, can be achieved within 4 minutes using 3 μm Pro C18.



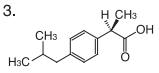
Acidic non-steroidal anti-inflammatory drugs

1. 

Ketoprofen (MW 254.3)

2. 

Fenoprofen (MW 242.3)

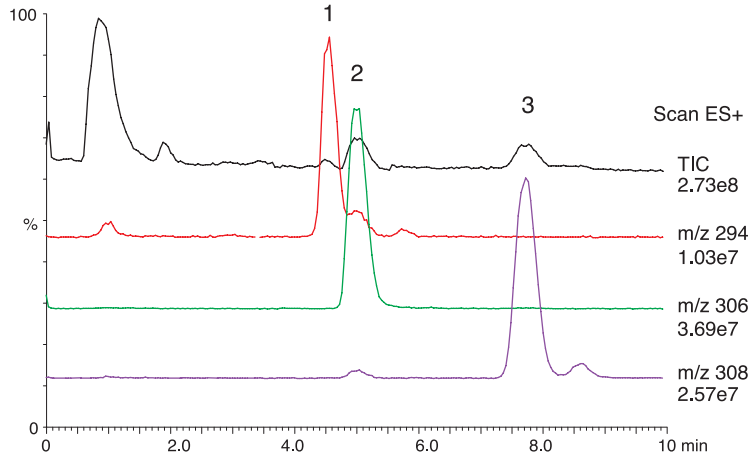
3. 

Ibuprofen (MW 206.3)

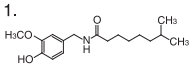
Column	: YMC-Pack Pro C18 3 μm 50 X 2.0 mmI.D.
Eluent	: methanol/water/acetic acid (75/25/0.05)
Flow rate	: 0.2 mL/min
Temperature	: 37˚C
Detection	: ESI negative-mode

LC/MS analysis of capsaicinoids from red pepper

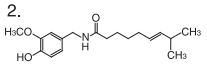
Pro C18 RS has superior selectivity for hydrophobic compounds that differ slightly in structure and hydrophobicity. Pro C18 RS is suitable for fast LC/MS analysis of capsaicinoids.



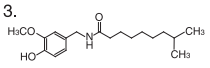
Capsaicinoids

1. 

Nordihydrocapsaicin (MW 293.4)

2. 

Capsaicin (MW 305.4)

3. 

Dihydrocapsaicin (MW 307.4)

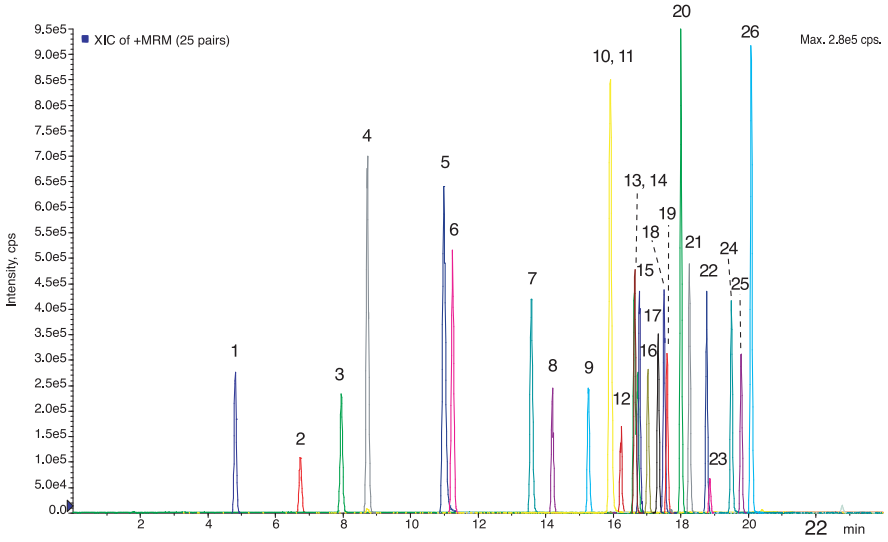
Column	: YMC-Pack Pro C18 RS 3 μm 50 X 2.0 mmI.D.
Eluent	: methanol/water/acetic acid (60/40/0.1)
Flow rate	: 0.2 mL/min
Temperature	: 40˚C
Detection	: ESI positive-mode
Sample	: methanol extract of a commercial cayenne pepper

Simultaneous analysis of agricultural chemicals by LC/MS

As shown in the upper chromatogram, 26 agricultural chemicals were analyzed using a Pro C18 column (3 μm, 150X2.0 mmI.D.). All basic compounds show good peak shapes.
In bottom chromatogram, a YMC-UltraHT Pro C18 (2 μm, 75X2.0 mmI.D.) exhibits almost the same separation pattern as upper chromatogram, with shorter analysis time.

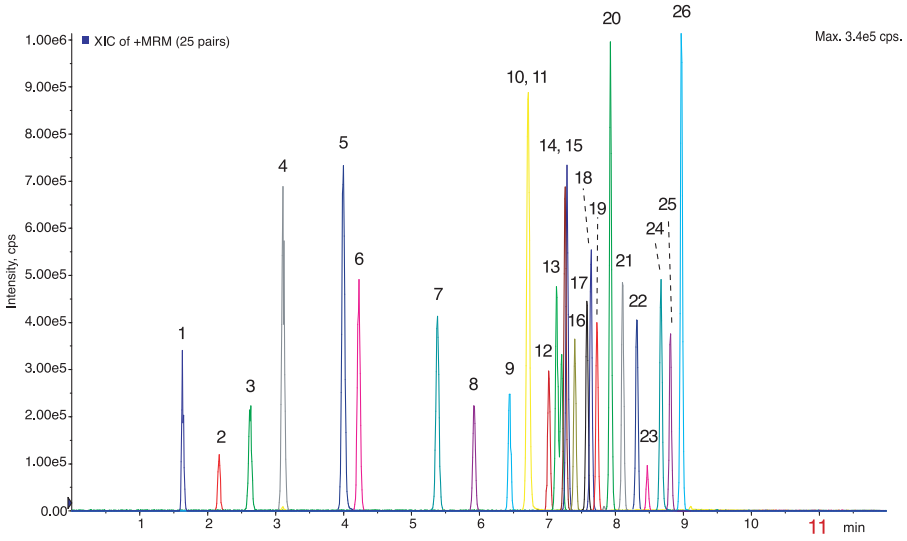
YMC-Pack *Pro* C18 150 X 2.0 mmI.D. 3 μm

Gradient : 15-40%B (0-1 min), 40%B (1-3.5 min),
40-50%B (3.5-6 min), 50-55%B (6-8 min),
55-95%B (8-17.5 min), 95%B (17.5-22 min)
Flow rate : 0.2 mL/min



YMC-UltraHT *Pro* C18 75 X 2.0 mmI.D. 2 μm

Gradient : 15-40%B (0-0.5 min), 40%B (0.5-1.75 min),
40-50%B (1.75-3 min), 50-55%B (3-4 min),
55-95%B (4-8.75 min), 95%B (8.75-11 min)
Flow rate : 0.4 mL/min



1. Thiamethoxam (Q1/Q3 : 292.3/211.3)
2. Clothianidin (Q1/Q3 : 250.3/169.1)
3. Chloridazon (Q1/Q3 : 222.3/77.0)
4. Thiacloprid (Q1/Q3 : 253.3/126.0)
5. Thiabendazole (Q1/Q3 : 202.3/175.2)
6. Azamethiphos (Q1/Q3 : 325.2/183.0)
7. Dimethirimol (Q1/Q3 : 210.4/71.1)
8. Isoxaflutole (Q1/Q3 : 360.2/251.1)
9. Pyriftalid (Q1/Q3 : 319.3/139.1)
10. *(E)*-Ferimzone (Q1/Q3 : 255.4/91.1)
11. *(Z)*-Ferimzone (Q1/Q3 : 255.4/91.1)
12. Methoxyfenozide (Q1/Q3 : 369.4/149.3)
13. Iprovalicarb (Q1/Q3 : 321.4/119.3)
14. Chromafenozide (Q1/Q3 : 395.4/175.1)
15. Butafenacil (Q1/Q3 : 492.1/331.1)
16. Simeconazole (Q1/Q3 : 249.3/70.1)
17. Cyazofamid (Q1/Q3 : 325.2/108.0)
18. Naproanilide (Q1/Q3 : 292.3/171.3)
19. Fenoxycarb (Q1/Q3 : 302.3/88.1)
20. Anilofos (Q1/Q3 : 368.2/199.1)
21. Cyflufenamid (Q1/Q3 : 431.3/295.2)
22. Pyrazolynate (Q1/Q3 : 439.1/91.0)
23. Indoxacarb (Q1/Q3 : 528.1/203.2)
24. Benzofenap (Q1/Q3 : 431.2/105.1)
25. Furathiocarb (Q1/Q3 : 383.3/195.2)
26. Cloquintocet-mexyl (Q1/Q3 : 336.3/238.2)

Eluent : A) 5 mM CH_3COONH_4 in water
B) 5 mM CH_3COONH_4 in methanol
Temperature : ambient
Detection : API5000, ESI, Positive, MRM
Sample : Pesticide Mixture Standard Solution PL-7-2, manufactured by Wako Pure Chemical Industries, Ltd.

Courtesy of J.Watanabe, TAKARA BIO INC.

High durability semi-preparative columns

YMC-Actus series

Axial Compression Technology for Ultimate Separation

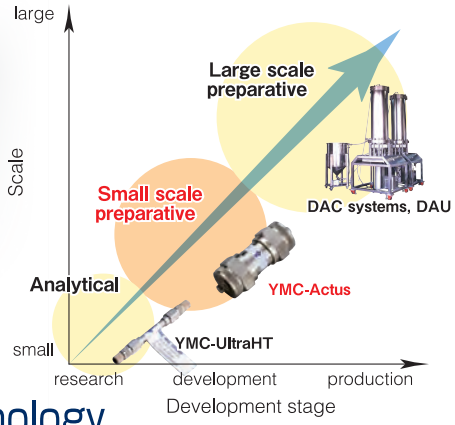
Outstanding Efficiency and Durability

- Outstanding durability through the use of dynamic axial column compression
- Ideal prepacked column for milligram scale preparative HPLC
- Excellent resolution
- High throughput

YMC-Actus series columns are semi-preparative columns with high durability under high flow rate and/or steep gradient conditions.

Scalability

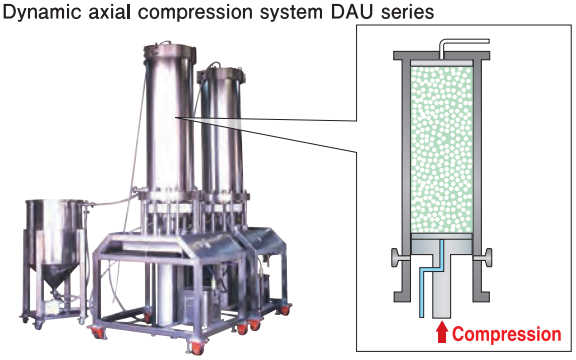
YMC-Actus series is developed for laboratory scale preparative HPLC. As shown in the diagram below, YMC offers various column sizes from analytical scale to production scale. Therefore analytical scale preparative conditions can be directly scaled up to preparative conditions.



Applying axial compression technology

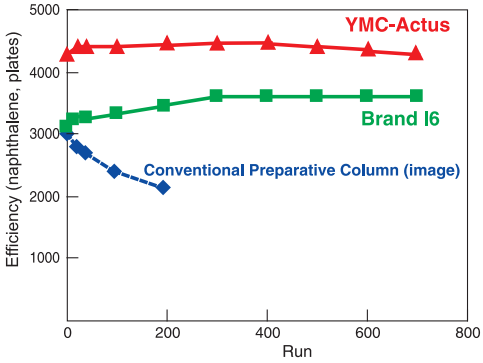
Uniformly high density packing is necessary for high efficiency and high durability of an HPLC column. DAC (Dynamic Axial Compression) system is widely used for preparative separation in pilot or production scale. It allows uniformly high density packing and prevents formation of voids. The YMC-Actus series has been developed by applying this Axial Compression Technology to a semi-preparative column. The column bed is compressed using an end assembly newly designed for YMC-Actus. It provides proper bed density (10% higher than conventional columns) and bed uniformity.

Dynamic axial compression system DAU series



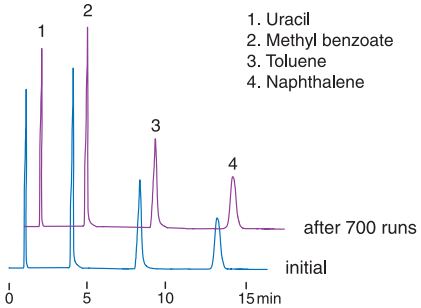
Column durability

Accelerated stability test results are shown below. The column performance test was run after every 100 runs of the sequential gradient test. YMC-Actus offers superior plate counts and resolution compared to other brands. Further, its consistency maintains its excellent performance after a long series of high throughput gradient runs. The excellent resolution and durability of the YMC-Actus is made possible by the combined strength of our experience in the use of DAC columns for isolation and purification, plus our unique packing technology.



Sequential gradient test
Column size : 50 X 20 mmI.D. 5 μm
or 50 X 19 mmI.D. 5 μm
Eluent : A) water B) methanol
5%B (0-0.5 min), 5-95%B (0.5-3.1 min),
95%B (3.1-3.6 min), 5%B (3.6-4.0 min)
Flow rate : 50 mL/min

Chromatograms of YMC-Actus



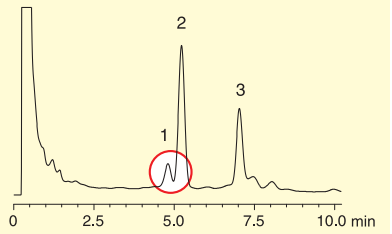
Column performance test
Column size : 50 X 20 mmI.D. 5 μm
Eluent : methanol/water (60/40)
Flow rate : 10 mL/min

Purification of capsaicinoids in red pepper

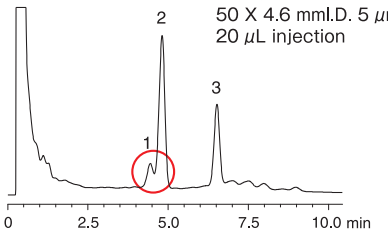
Pro C18 RS, because of its superior selectivity for hydrophobic compounds that differ slightly in structure and hydrophobicity, achieves better resolution between peak 1 and peak 2. Furthermore, analytical separation can be directly scaled up to preparative scale with YMC-Actus Pro C18 RS. YMC-Actus series columns have high resolution equal to analytical columns.

Analysis

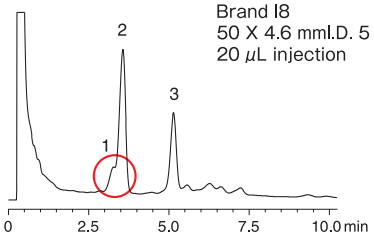
YMC-Pack *Pro* C18 RS 50 X 4.6 mmI.D. 5 μm
20 μL injection



Brand G2
50 X 4.6 mmI.D. 5 μm
20 μL injection

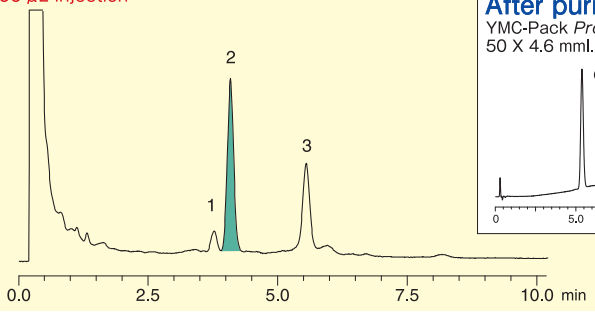


Brand I8
50 X 4.6 mmI.D. 5 μm
20 μL injection

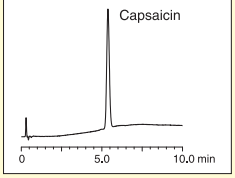


Purification

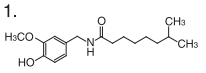
YMC-Actus *Pro* C18 RS 50 X 20 mmI.D. 5 μm
400 μL injection

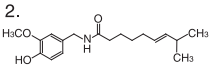


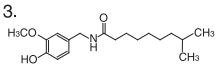
After purification
YMC-Pack *Pro* C18 RS
50 X 4.6 mmI.D. 5 μm



Capsaicinoids

1.

Nordihydrocapsaicin

2.

Capsaicin

3.

Dihydrocapsaicin

Eluent	: A) methanol/water/TFA (50/50/0.1) B) methanol/TFA (100/0.1) 10-35%B (0-5 min), 30%B (5-10 min)
Flow rate	: 2.0 mL/min for 50 X 4.6 mmI.D. 40 mL/min for 50 X 20 mmI.D.
Temperature	: 25˚C for 50 X 4.6 mmI.D. ambient for 50 X 20 mmI.D.
Detection	: UV at 280 nm
Sample	: methanol extract of a commercial cayenne pepper (1 g cayenne pepper / 3 mL)

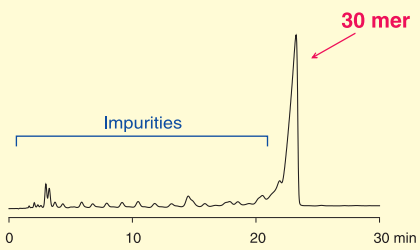
Purification of oligonucleotides

In analytical scale, many impurities can be separated from the target compound by one nucleotide difference on Hydrosphere C18. Even in purification scale, YMC-Actus provides superior separation and recovery. YMC-Actus Hydrosphere C18 is useful for purification of hydrophilic compounds such as oligonucleotides, organic acids, oligosaccharides and glycosides.

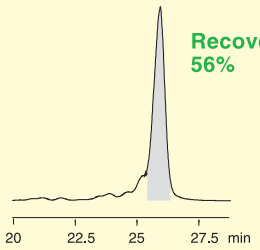
Analysis 1.0 mL/min, 5 μL injection

Purificaton 19 mL/min, 100 μL injection

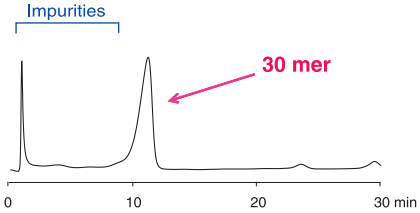
Hydrosphere C18
50 X 4.6 mmI.D. 5 μm



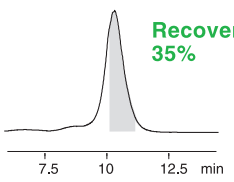
YMC-Actus Hydrosphere C18
50 X 20 mmI.D. 5 μm



Brand I1
50 X 4.6 mmI.D. 5 μm



Brand I1
50 X 19 mmI.D. 5 μm



purity>99%

Eluent	: A) 10 mM DBAA* (pH6.0)/methanol (60/40) B) 10 mM DBAA* (pH6.0)/methanol (20/80) 10-35%B (0-30 min)
Temperature	: ambient
Detection	: UV at 269 nm
Sample	: synthetic oligonucleotide (100 μM)

*DBAA : dibutylamine-acetic acid

Pro C18 10 μm Preparative column

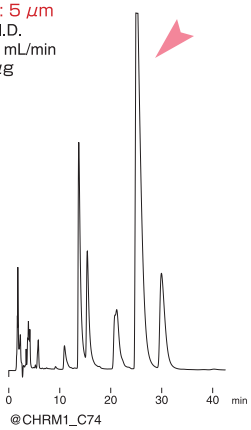
- High performance preparative column
- Superior separation of basic compounds
- Very low metal impurities

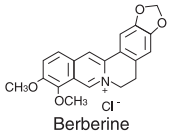
By using *Pro* series with various sizes from analytical to semi-preparative, it is possible to scale up a separation. *Pro* C18 is also available in particle sizes of 10 μm, and can be applied to large scale preparation even when a column over 50 mm in diameter is required.

Isolation of berberin in goldthread

10 μm Pro C18 preparative column is a high performance column with the same separation characteristics as the 5 μm Pro C18 analytical column. By using Pro C18, it becomes easy to scale up from analytical to preparative scale. Even basic compounds that tail on other ODS columns can be purified on a 10 μm Pro C18 column.

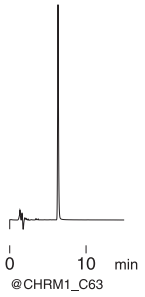
Particle size: 5 μm
150 X 4.6 mmI.D.
Flow rate 1.0 mL/min
Loading 10 μg





Berberine

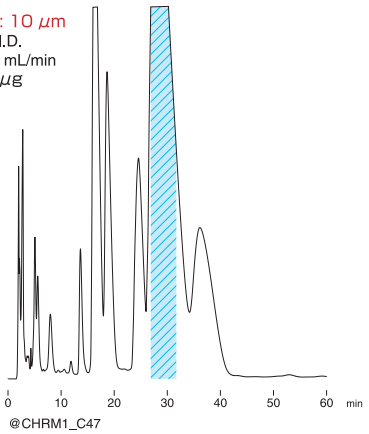
Analysis of fraction



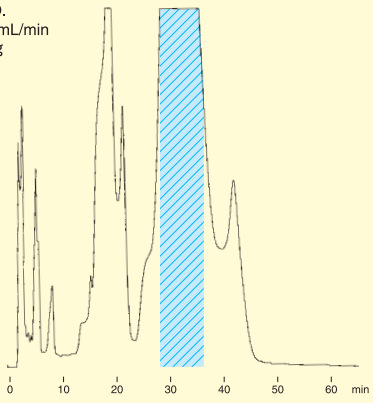
Column	: YMC-Pack Pro C18 (5 μm, 12 nm) 150 X 4.6 mmI.D.
Eluent	: acetonitrile/50 mM KH_2PO_4 (50/50) containing 6 mM SDS
Flow rate	: 1.0 mL/min
Temperature	: 40°C
Detection	: UV at 254 nm

Recovery 88%

Particle size: 10 μm
250 X 6.0 mmI.D.
Flow rate 2.0 mL/min
Loading 500 μg



Particle size: 10 μm
250 X 50 mmI.D.
Flow rate 140 mL/min
Loading 35 mg



Column	: YMC-Pack Pro C18
Eluent	: methanol/THF/10 mM CH_3COONH_4 (15/2/75)
Temperature	: 40°C
Detection	: UV at 254 nm

Ordering Information

Ultra Fast LC column UltraHT *Pro* C18

Particle size (μm)	Column size inner diameter×length(mm)	Product code
S-2	2.0×30	AS12S02-0302WT
	2.0×50	AS12S02-0502WT
	2.0×75	AS12S02-L502WT
	2.0×100	AS12S02-1002WT
	3.0×50	AS12S02-0503WT
	3.0×75	AS12S02-L503WT
	3.0×100	AS12S02-1003WT

Ultra Fast LC column UltraHT Hydrosphere C18

Particle size (μm)	Column size inner diameter×length(mm)	Product code
S-2	2.0×30	HS12S02-0302WT
	2.0×50	HS12S02-0502WT
	2.0×75	HS12S02-L502WT
	2.0×100	HS12S02-1002WT
	3.0×50	HS12S02-0503WT
	3.0×75	HS12S02-L503WT
	3.0×100	HS12S02-1003WT

Analytical column *Pro* C18, Hydrosphere C18

Particle size (μm)	Column size inner diameter×length(mm)	Product code
S-3	1.0×35	(X)S12S03-H501WT
	1.0×50	(X)S12S03-0501WT
	1.0×100	(X)S12S03-1001WT
	1.5×35	(X)S12S03-H5P5WT
	1.5×50	(X)S12S03-05P5WT
	1.5×100	(X)S12S03-10P5WT
	2.0×35	(X)S12S03-H502WT
	2.0×50	(X)S12S03-0502WT
	2.0×75	(X)S12S03-L502WT
	2.0×100	(X)S12S03-1002WT
	2.0×150	(X)S12S03-1502WT
	3.0×50	(X)S12S03-0503WT
	3.0×100	(X)S12S03-1003WT
	3.0×150	(X)S12S03-1503WT
	4.6×35	(X)S12S03-H546WT
	4.6×50	(X)S12S03-0546WT
	4.6×75	(X)S12S03-L546WT
	4.6×100	(X)S12S03-1046WT
	4.6×150	(X)S12S03-1546WT
	6.0×50	(X)S12S03-0506WT
	6.0×75	(X)S12S03-L506WT
	6.0×100	(X)S12S03-1006WT
S-5	1.0×150	(X)S12S05-1501WT
	1.0×250	(X)S12S05-2501WT
	1.5×150	(X)S12S05-15P5WT
	1.5×250	(X)S12S05-25P5WT
	2.0×35	(X)S12S05-H502WT
	2.0×50	(X)S12S05-0502WT
	2.0×75	(X)S12S05-L502WT
	2.0×100	(X)S12S05-1002WT
	2.0×150	(X)S12S05-1502WT
	2.0×250	(X)S12S05-2502WT
	3.0×50	(X)S12S05-0503WT
	3.0×75	(X)S12S05-L503WT
	3.0×100	(X)S12S05-1003WT
	3.0×150	(X)S12S05-1503WT
	3.0×250	(X)S12S05-2503WT
	4.6×50	(X)S12S05-0546WT
	4.6×75	(X)S12S05-L546WT
	4.6×100	(X)S12S05-1046WT
	4.6×150	(X)S12S05-1546WT
	4.6×250	(X)S12S05-2546WT
	6.0×150	(X)S12S05-1506WT
	6.0×250	(X)S12S05-2506WT
S-10	4.6×150	AS12S11-1546WT
	4.6×250	AS12S11-2546WT

(X)=A:Pro C18,H:Hydrosphere C18

Analytical column *Pro* C18 RS

Particle size (μm)	Column size inner diameter×length(mm)	Product code
S-3	1.0×35	RS08S03-H501WT
	1.0×50	RS08S03-0501WT
	1.0×100	RS08S03-1001WT
	1.5×35	RS08S03-H5P5WT
	1.5×50	RS08S03-05P5WT
	1.5×100	RS08S03-10P5WT
	2.0×35	RS08S03-H502WT
	2.0×50	RS08S03-0502WT
	2.0×75	RS08S03-L502WT
	2.0×100	RS08S03-1002WT
	2.0×150	RS08S03-1502WT
	3.0×50	RS08S03-0503WT
	3.0×100	RS08S03-1003WT
	3.0×150	RS08S03-1503WT
	4.6×35	RS08S03-H546WT
	4.6×50	RS08S03-0546WT
	4.6×75	RS08S03-L546WT
	4.6×100	RS08S03-1046WT
	4.6×150	RS08S03-1546WT
	6.0×50	RS08S03-0506WT
	6.0×75	RS08S03-L506WT
	6.0×100	RS08S03-1006WT
S-5	1.0×150	RS08S05-1501WT
	1.0×250	RS08S05-2501WT
	1.5×150	RS08S05-15P5WT
	1.5×250	RS08S05-25P5WT
	2.0×35	RS08S05-H502WT
	2.0×50	RS08S05-0502WT
	2.0×75	RS08S05-L502WT
	2.0×100	RS08S05-1002WT
	2.0×150	RS08S05-1502WT
	2.0×250	RS08S05-2502WT
	3.0×50	RS08S05-0503WT
	3.0×75	RS08S05-L503WT
	3.0×100	RS08S05-1003WT
	3.0×150	RS08S05-1503WT
	3.0×250	RS08S05-2503WT
	4.6×50	RS08S05-0546WT
	4.6×75	RS08S05-L546WT
	4.6×100	RS08S05-1046WT
	4.6×150	RS08S05-1546WT
	4.6×250	RS08S05-2546WT
	6.0×150	RS08S05-1506WT
	6.0×250	RS08S05-2506WT

CombiChrom

Packing material	Particle size (μm)	CombiScreen 4.6×50mm Product code	CombiPrep 20×50mm Product code	CombiPrep 30×50mm Product code
Pro C18	S-5	CCASS05-0546WT	CCASS05-0520WT	CCASS05-0530WT
Hydrosphere C18	S-5	CCHSS05-0546WT	CCHSS05-0520WT	CCHSS05-0530WT
Pro C18 RS	S-5	CCRSS05-0546WT	CCRSS05-0520WT	CCRSS05-0530WT
Pro C8	S-5	CCOSS05-0546WT	CCOSS05-0520WT	CCOSS05-0530WT
Pro C4	S-5	CCBSS05-0546WT	CCBSS05-0520WT	CCBSS05-0530WT

Analytical column **Pro C8, C4**

Particle size (μm)	Column size inner diameter×length(mm)	Product code
S-3	2.0×35	(Y)S12S03-H502WT
	2.0×50	(Y)S12S03-0502WT
	2.0×75	(Y)S12S03-L502WT
	2.0×100	(Y)S12S03-1002WT
	2.0×150	(Y)S12S03-1502WT
	3.0×50	(Y)S12S03-0503WT
	3.0×100	(Y)S12S03-1003WT
	3.0×150	(Y)S12S03-1503WT
	4.6×35	(Y)S12S03-H546WT
	4.6×50	(Y)S12S03-0546WT
	4.6×75	(Y)S12S03-L546WT
	4.6×100	(Y)S12S03-1046WT
	4.6×150	(Y)S12S03-1546WT
S-5	1.0×150	(Y)S12S05-1501WT
	1.0×250	(Y)S12S05-2501WT
	1.5×150	(Y)S12S05-15P5WT
	1.5×250	(Y)S12S05-25P5WT
	2.0×50	(Y)S12S05-0502WT
	2.0×75	(Y)S12S05-L502WT
	2.0×100	(Y)S12S05-1002WT
	2.0×150	(Y)S12S05-1502WT
	3.0×50	(Y)S12S05-0503WT
	3.0×150	(Y)S12S05-1503WT
	3.0×250	(Y)S12S05-2503WT
	4.6×50	(Y)S12S05-0546WT
	4.6×75	(Y)S12S05-L546WT
	4.6×100	(Y)S12S05-1046WT
	4.6×150	(Y)S12S05-1546WT
	4.6×250	(Y)S12S05-2546WT
	6.0×150	(Y)S12S05-1506WT

(Y)=O:Pro C8、B:Pro C4

Preparative Column

Packing material	Particle size (μm)	Column size inner diameter×length(mm)	Product code
Pro C18	S-5	10×150	AS12S05-1510WT
		10×250	AS12S05-2510WT
		20×100	AS12S05-1020WT
		20×150	AS12S05-1520WT
		20×250	AS12S05-2520WT
		30×75	AS12S05-L530WT
		30×100	AS12S05-1030WT
		30×150	AS12S05-1530WT
	S-10	20×100	AS12S11-1020WT
		20×150	AS12S11-1520WT
		20×250	AS12S11-2520WT
		20×500	AS12S11-5020WT
		30×150	AS12S11-1530WT
		30×250	AS12S11-2530WT
		30×500	AS12S11-5030WT
		50×250	AS12S11-2551AR
		50×500	AS12S11-5051AR
Hydrosphere C18	S-5	10×150	HS12S05-1510WT
		10×250	HS12S05-2510WT
		20×100	HS12S05-1020WT
		20×150	HS12S05-1520WT
		20×250	HS12S05-2520WT
Pro C18 RS	S-5	10×150	RS08S05-1510WT
		10×250	RS08S05-2510WT
		20×100	RS08S05-1020WT
		20×150	RS08S05-1520WT
		20×250	RS08S05-2520WT
Pro C8	S-5	20×250	OS12S05-2520WT
Pro C4	S-5	20×250	BS12S05-2520WT

High durability semi-preparative column **YMC-Actus series**

Packing material	Particle size (μm)	Column size inner diameter×length(mm)	Product code
Pro C18	S-5	20×50	(X)S12S05-0520WX
Hydrosphere C18		20×100	(X)S12S05-1020WX
		30×50	(X)S12S05-0530WX
		30×75	(X)S12S05-L530WX
		30×100	(X)S12S05-1030WX
Pro C18 RS	S-5	20×50	RS08S05-0520WX
		20×100	RS08S05-1020WX
		30×75	RS08S05-0530WX
		30×100	RS08S05-L530WX
		30×50	RS08S05-1030WX
Pro C8	S-5	20×100	OS12S05-0520WX
		20×100	OS12S05-1020WX
		30×50	OS12S05-0530WX
		30×75	OS12S05-L530WX
		30×100	OS12S05-1030WX

(X)=A:Pro C18、H:Hydrosphere C18

Guard Cartridge Column

(Inner diameter 1.0, 1.5, 2.0 mm : 2-pack Inner diameter 4.0 mm : 3-pack)

Packing material	Particle size (μm)	Column size inner diameter×length(mm)	Product code
Pro C18	S-3	1.0×10	(X)S12S03-0101CC
Hydrosphere C18		1.5×10	(X)S12S03-01P5CC
		2.0×10	(X)S12S03-0102CC
		4.0×23	(X)S12S03-G304CC
	S-5	1.0×10	(X)S12S05-0101CC
		1.5×10	(X)S12S05-01P5CC
		2.0×10	(X)S12S05-0102CC
		4.0×23	(X)S12S05-G304CC
Pro C18 RS	S-3	1.0×10	RS08S03-0101CC
		1.5×10	RS08S03-01P5CC
		2.0×10	RS08S03-0102CC
		4.0×23	RS08S03-G304CC
	S-5	1.0×10	RS08S05-0101CC
		1.5×10	RS08S05-01P5CC
		2.0×10	RS08S05-0102CC
		4.0×23	RS08S05-G304CC
Pro C8	S-3	2.0×10	(Y)S12S03-0102CC
Pro C4		4.0×23	(Y)S12S03-G304CC
	S-5	1.0×10	(Y)S12S05-0101CC
		1.5×10	(Y)S12S05-01P5CC
		2.0×10	(Y)S12S05-0102CC
		4.0×23	(Y)S12S05-G304CC

Cartridge holder will need to be purchased separately before using this product for the first time

(X)=A:Pro C18、H:Hydrosphere C18
(Y)=O:Pro C8、B:Pro C4

Cartridge Holder

	Product code
Semi-micro Guard Cartridge Holder (for 1.0 , 1.5 , 2.0 mmI.D.)	XPCHSMW
Guard Cartridge Holder (for 4.0 mmI.D.)	XPCHW

Preparative Guard Column

Packing material	Particle size (μm)	Column size inner diameter×length(mm)	Product code
Pro C18	S-5	10×30	AS12S05-0310WTG
		20×50	AS12S05-0520WTG
		30×50	AS12S05-0530WTG
	S-10	20×50	AS12S11-0520WTG
		30×50	AS12S11-0530WTG
		50×50	AS12S11-0551ARG
Hydrosphere C18	S-5	10×30	HS12S05-0310WTG
		20×50	HS12S05-0520WTG
Pro C18 RS	S-5	10×30	RS08S05-0310WTG
		20×50	RS08S05-0520WTG
Pro C8	S-5	20×50	OS12S05-0520WTG
Pro C4	S-5	20×50	BS12S05-0520WTG

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