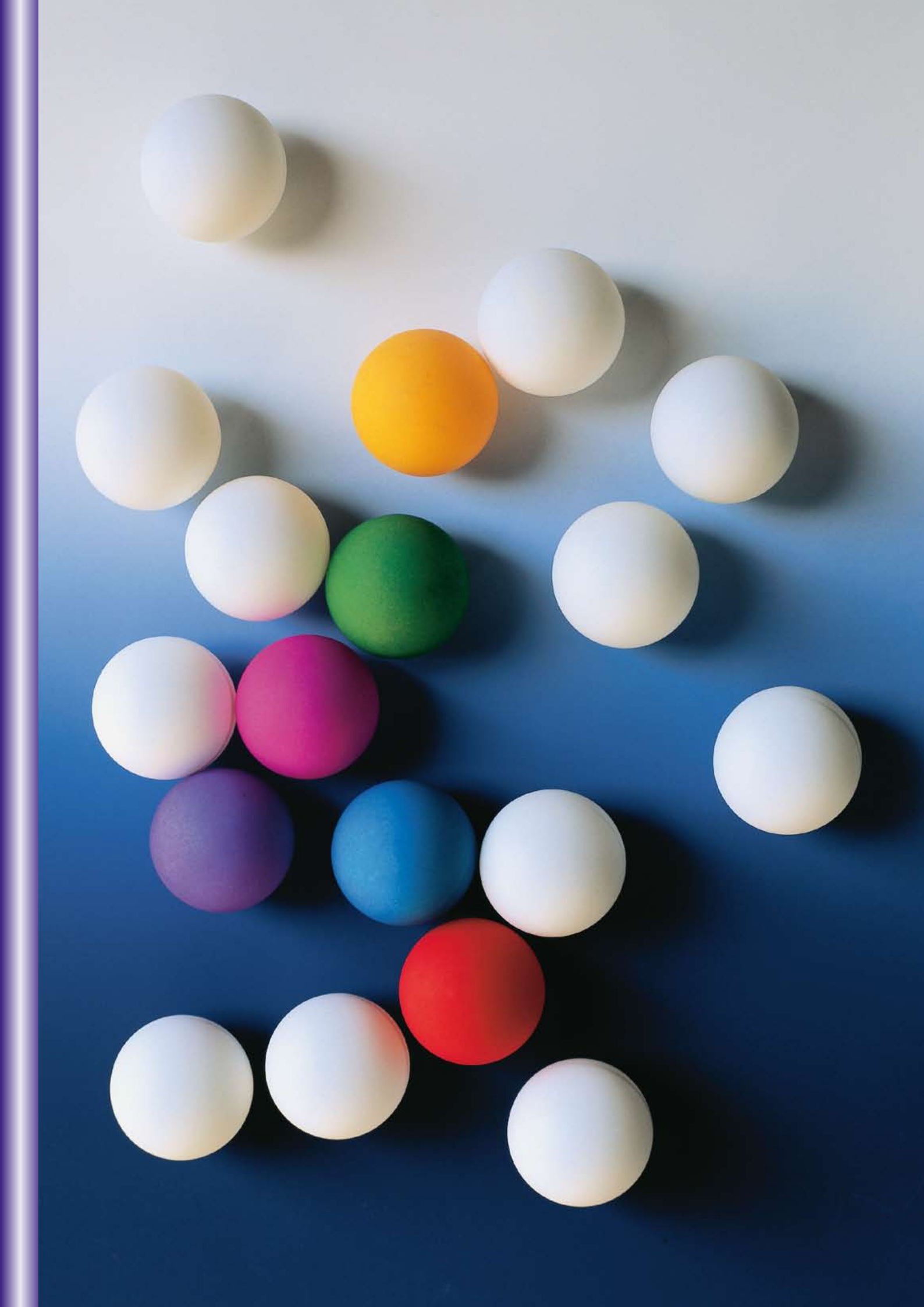


YMC *Pro*Family

Contents

Introduction

HPLC Columns for Ultra Fast LC

Nowadays, especially in the pharmaceutical industry, the need for Ultra Fast LC and Rapid Resolution is still growing due to the continuous demand for high throughput analysis in research & development and quality control.

To satisfy the demand for these Ultra Fast LC methods, YMC introduced YMC-UltraHT columns, which ideally match the latest instrumentation technology for “extra” high pressure application e.g. with Agilent 1200™ series or Waters Acquity UPLC™.

As a column and bulk media supplier with many years of practical chromatographic experience, YMC found unacceptable that the use of novel separation media is often restricted to dedicated equipment and not applicable to the large installed base of “conventional” HPLC systems with a standard pressure rating of 5800 psi (400 bar, 40 MPa). For this reason, specifications for YMC-UltraHT columns have been designed to provide powerful chromatographic improvements, in terms of velocity and resolution, even with conventional operating conditions. Since YMC-UltraHT columns provides a substantially lower pressure drop than most competitive 2 µm or sub-2 µm media, high flow rates can be achieved without generating excessive back pressure and without the need for specialised equipment (see page 54 for details).

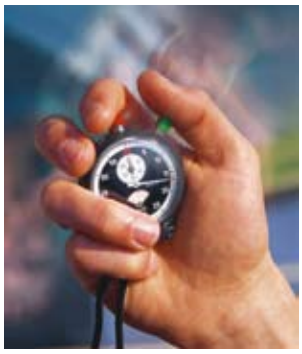
For effective high throughput separations, YMC offer a wide range of high performance HPLC columns which allow Ultra Fast analytical HPLC with conventional equipment. Due to the down-scalability of the majority of YMC’s stationary phases, the time needed for a single analysis can be reduced to less than 60 seconds, depending on the sample conditions.

YMC *Pro*Family

One of the main challenges in RP-HPLC is the quantitation of ionisable compounds including drugs, degradation products, etc. For this purpose symmetrical, sharp peaks are required to provide highest resolution and reliable integration. The stationary phases of the YMC *Pro*Family fullfil these demands making them an excellent choice for the pharmaceutical and biotechnology industries. This product line consists of the three C18-phases: YMC-Pack *Pro* C18 RS (with high carbon load [22%]), YMC-Pack *Pro* C18 and Hydrosphere C18 (“AQ-type”) together with the C8- and C4-phase: YMC-Pack *Pro* C8 and YMC-Pack *Pro* C4.

Ultra Fast LC Columns

- **YMC Pack *Pro*Family chemistries, based on ultra high purity silica, provide excellent resolution for a wide range of analytes**
- **YMC-UltraHT LC Columns provide considerable time saving without resort to ultra high pressures**
- **YMC-UltraHT LC Columns achieve ultra fast separations even with conventional HPLC equipment**
- **fully up- and down-scalable selectivity**



Specifications	YMC-UltraHT *Pro* C18	YMC-UltraHT Hydrosphere C18
Particle size / µm	2	2
Pore size / nm	12	12
Surface area / m^2g^{-1}	330	330
Carbon content / %	16	12
Recommended pH range	2.0 - 8.0	2.0 - 8.0

General

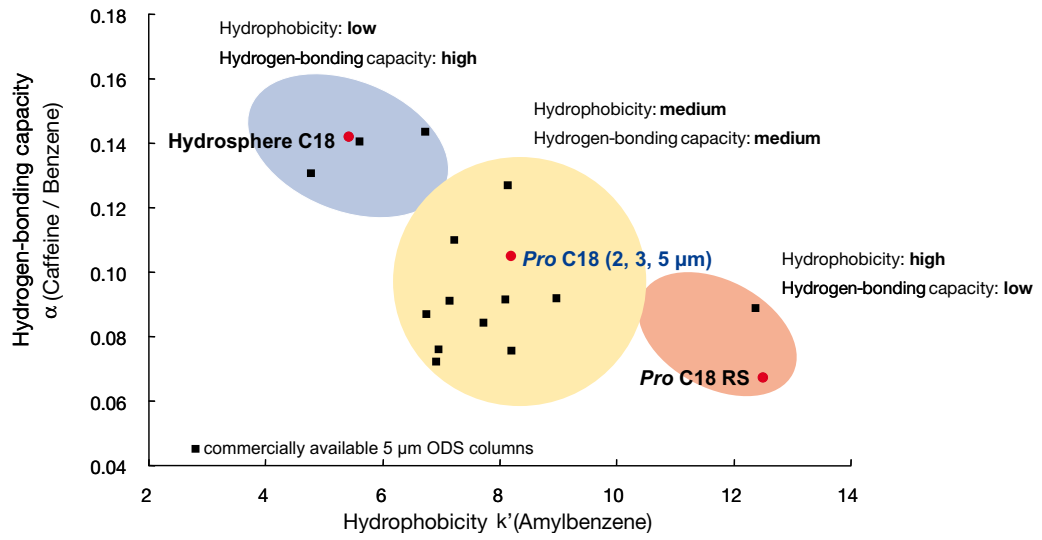
Since the introduction of the *Pro*Family series of phases, YMC-Pack *Pro* C18 has proved to be one of the first choices for a wide range of HPLC applications in pharmaceutical and biotechnological research and production, where efficiency and reliability are a major demand.

In many cases, the separation of highly polar compounds requires highly aqueous mobile phase conditions to achieve sufficient retention on the stationary phase. Conventional reversed phase selectivities do not give reproducible results under these conditions due to mainly collapse of the C18 chains. Therefore, YMC did developed Hydrosphere C18 in order of to overcome the loss in retention. Now, this outstanding chromatographic behaviour has been transferred to YMC-UltraHT Hydrosphere C18.

YMC-Pack *Pro* C18 is a well-established C18 silica-based column, which provides a medium balance of hydrogen-bonding capacity and hydrophobicity, as shown below. Conversely, Hydrosphere C18 is optimal selectivity for the separation of highly polar compounds.

Ultra Fast LC Columns

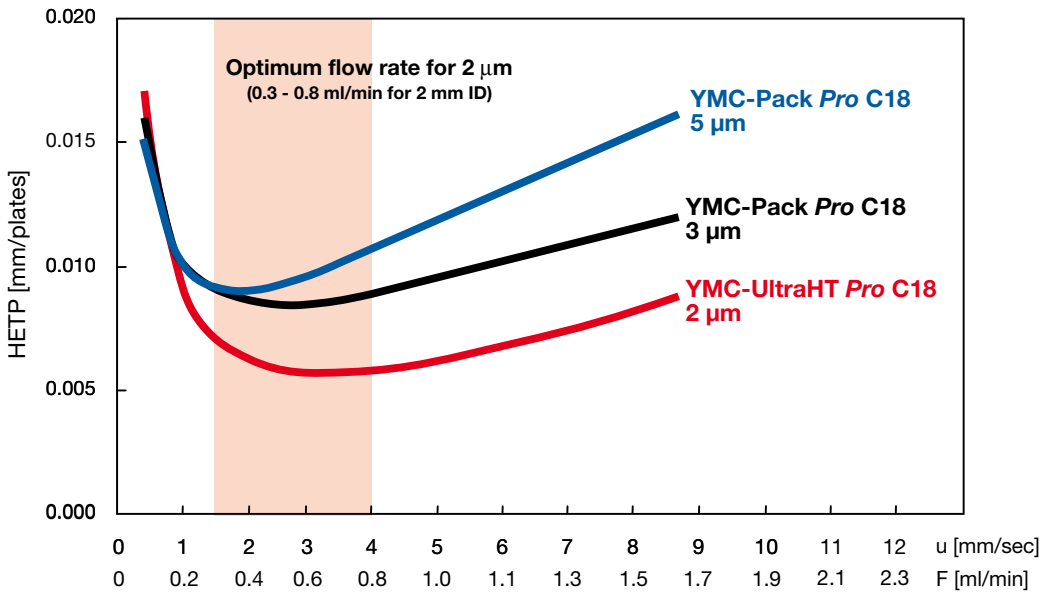
Selectivity-Chart*



Why smaller Particles?

Ever since in the beginning of HPLC, more-demanding analytical problems have required a progressive improvement in separation efficiency. The challenges include ever more complex analytes and the reduction in analysis times to keep up with the increasing numbers of samples. In addition to reducing the column dimensions and increasing flow rates, the implementation of small particles is a powerful tool to increase efficiency.

Van Deemter Plot*



The van Deemter equation describes the "Height Equivalent of the Theoretical Plate" (HETP) as a function of the linear velocity (u) by

$$H = A+B/u+C*u$$

where A, B and C are constants and u is the mobile phase linear velocity measured in mm/sec.

The resulting van Deemter plots show the reduction of HETP when using smaller particle sizes of YMC-Pack *Pro* C18 with an additional shift of the minimum value to higher flow rates.

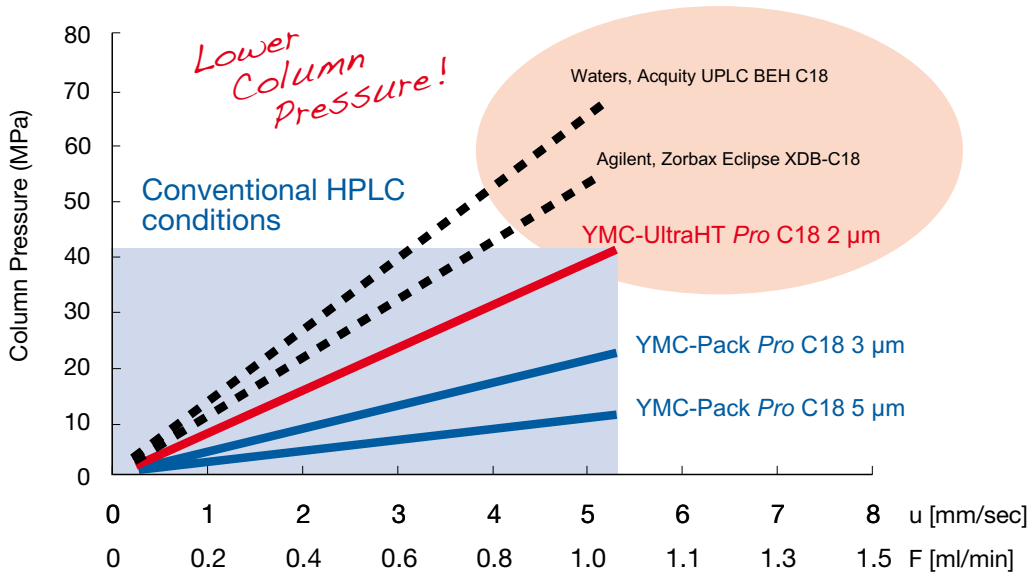
* Application data by courtesy YMC Co., Ltd.

Features of Packing Material

When starting to focus on Ultra Fast LC through the use of small particles, very high back pressures have to be considered and a balance sought. The extensive experience in silica production enables YMC to provide small particles with an extremely narrow particle size distribution which results in low back pressures.

YMC's UltraHT *Pro* C18 columns offer outstanding efficiency for Fast LC without exhibiting extremely high back pressure values which can be obtained with sub-2 µm particles from other manufacturers. Therefore YMC's UltraHT *Pro* C18 may not require dedicated HPLC equipment for providing outstanding column performances.

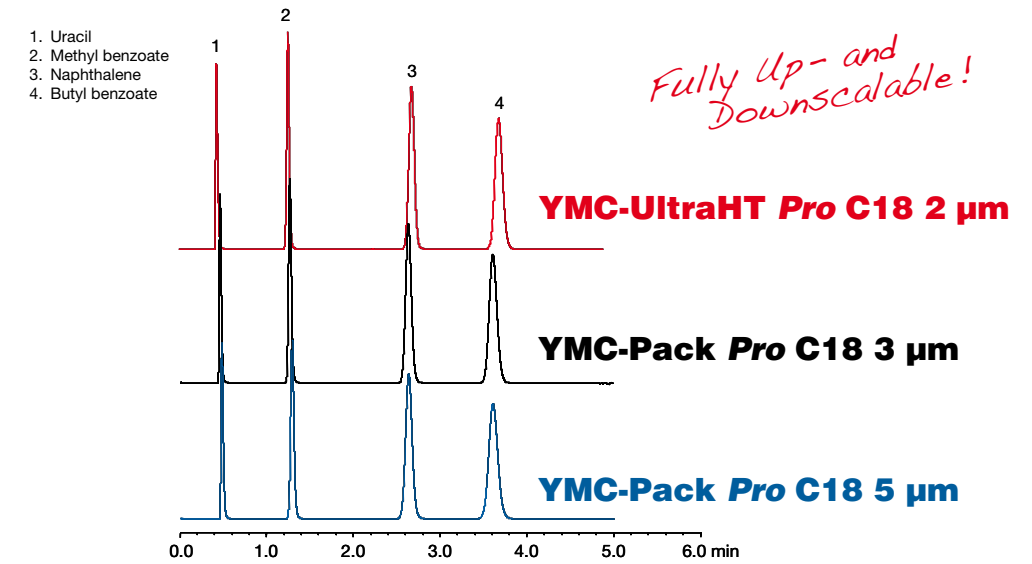
Column Pressure*



Columns: 50 x 2.0 or 2.1 mm ID
Eluent: acetonitrile / water (60/40)
Temperature: 25 °C
Sample: Butyl benzoate

The introduction of YMC-Pack *Pro* C18 2 µm allows easy downscaling of existing methods which use YMC-Pack *Pro* C18 3 µm and 5 µm.

Reproducibility Comparison*



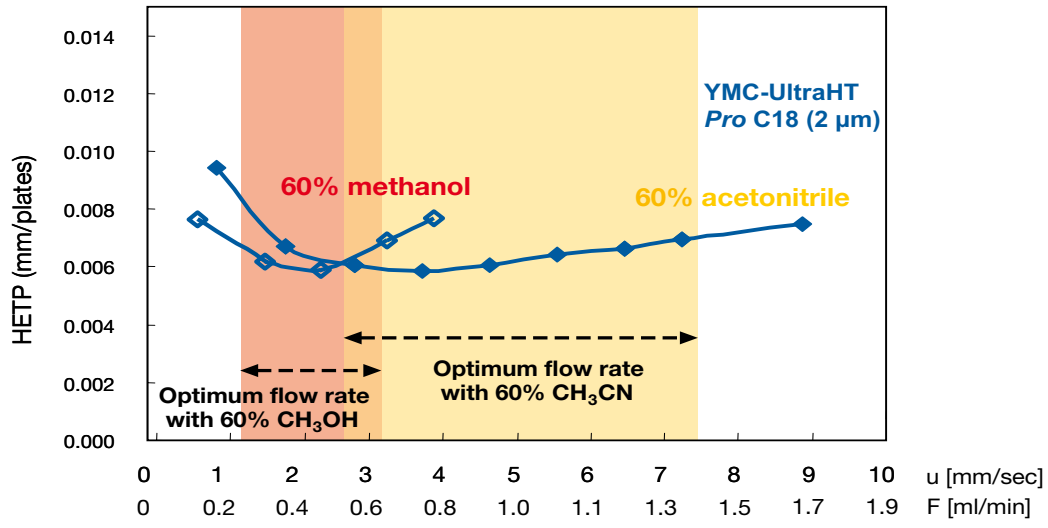
Column: 50 x 2.0 or 2.1 mm ID
Eluent: acetonitrile / water (60/40)
Temperature: 25 °C
Detection: UV at 270 nm

Features of Packing Material

The graph below shows the dependency of “Height Equivalent of the Theoretical Plate” (HETP) and the linear velocity in the presence of different organic solvents. When methanol is used, the optimum HETP is achieved within a different range of velocity compared to when acetonitrile is used due to their different viscosities. Therefore the optimum range of flow rate changes with the organic solvent.

The maximum resolution is obtained by optimising flow rate, temperature, and organic solvent in order to achieve the optimum back pressure.

Linear velocity versus HETP*



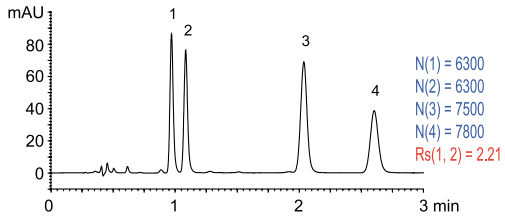
Column: YMC-UltraHT *Pro* C18, 2 µm, 50 x 2.0 mm ID
Temperature: 25 °C
Sample: Butyl benzoate

Since YMC-UltraHT columns provide substantially lower pressure drop than most competitive 2 µm or sub-2 µm media, high flow rates can be achieved without generating excessive back pressure and without the need for specialised equipment. Nevertheless, 3 mm ID columns are less affected by the diffusion volume than 2 mm ID columns. Therefore, it is necessary to reduce the system “dead” volume in order to obtain outstanding chromatographic performances with 2 mm ID columns.

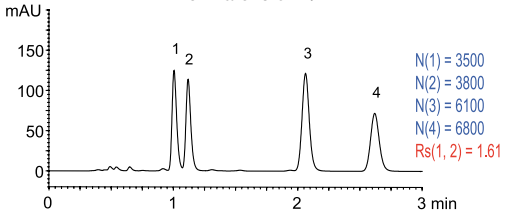
Fast LC analysis with conventional LC equipment*

50 x 3 mm ID

Semi-micro Cell (2.5 µl, Cell length 5 mm)
Flow rate: 0.8 ml/min

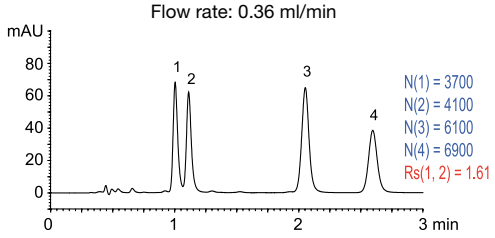


Standard Cell (8 µl, Cell length 10 mm)
Flow rate: 0.8 ml/min

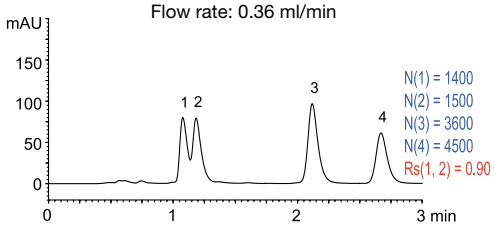


50 x 2 mm ID

Semi-micro Cell (2.5 µl, Cell length 5 mm)
Flow rate: 0.36 ml/min



Standard Cell (8 µl, Cell length 10 mm)
Flow rate: 0.36 ml/min



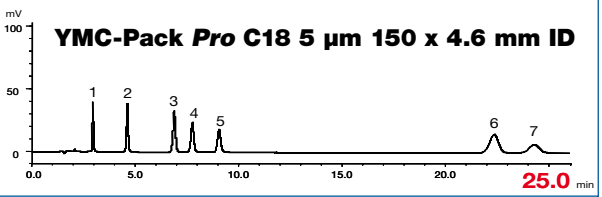
Column: YMC-UltraHT *Pro* C18
Eluent: acetonitrile / 20 mM KH_2PO_4 (10/90)
Temperature: 37 °C
Detection: UV at 260 nm

1. Uracil
2. Methyl benzoate
3. Naphthalene
4. Butyl benzoate

* Application data by courtesy YMC Co., Ltd.

Downscale of Methods

Conventional LC Method*

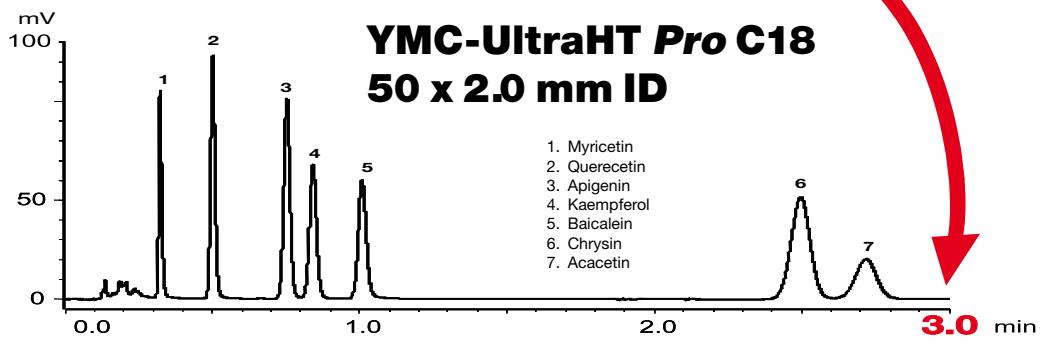


Eluent: acetonitrile / water / formic acid (35/65/0.1)
Flow rate: 1.0 ml/min (1.00 mm/sec)
Temperature: 40 °C
Detection: UV at 260 nm
Pressure: 1230 psi (83 bar, 8.3 MPa)

Due to the production processes used to manufacture YMC-Pack *Pro*Family, methods can be easily downscaled with unchanged selectivity.

As the examples shown demonstrate, conventional HPLC methods can be transferred easily to Ultra Fast LC methods by choosing YMC-UltraHT columns to gain efficiency and significantly reduce analysis time.

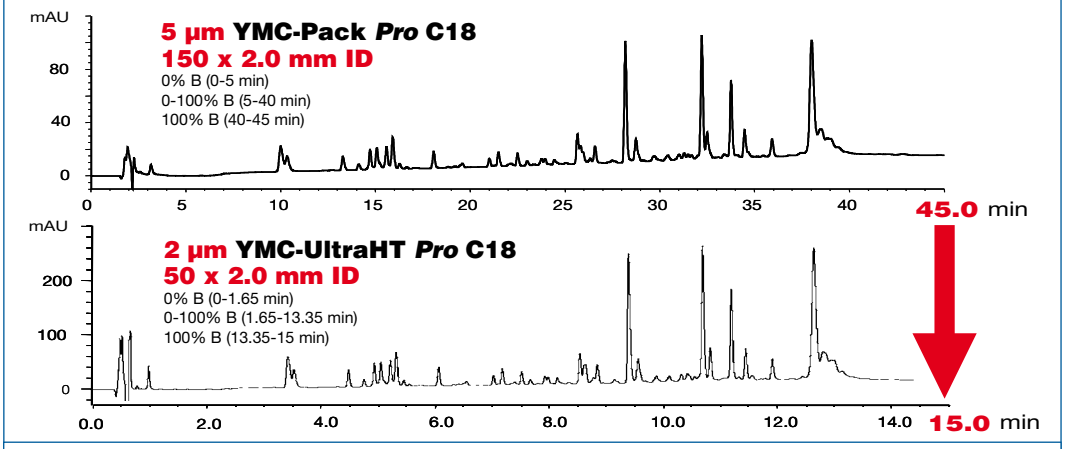
Ultra Fast LC Method*



Eluent: acetonitrile / water / formic acid (35/65/0.1)
Flow rate: 0.6 ml/min (3.18 mm/sec)
Temperature: 40 °C
Detection: UV at 260 nm
Pressure: 4350 psi (292 bar, 29.2 MPa)

The application of HPLC to biologically relevant separations is an existing and rapidly growing field. YMC-UltraHT *Pro* C18 provides outstanding chromatographic performance, which is more than capable of meeting the challenge of peptide mapping, where a large number of peptide fragments are generated from enzymatic digestion.

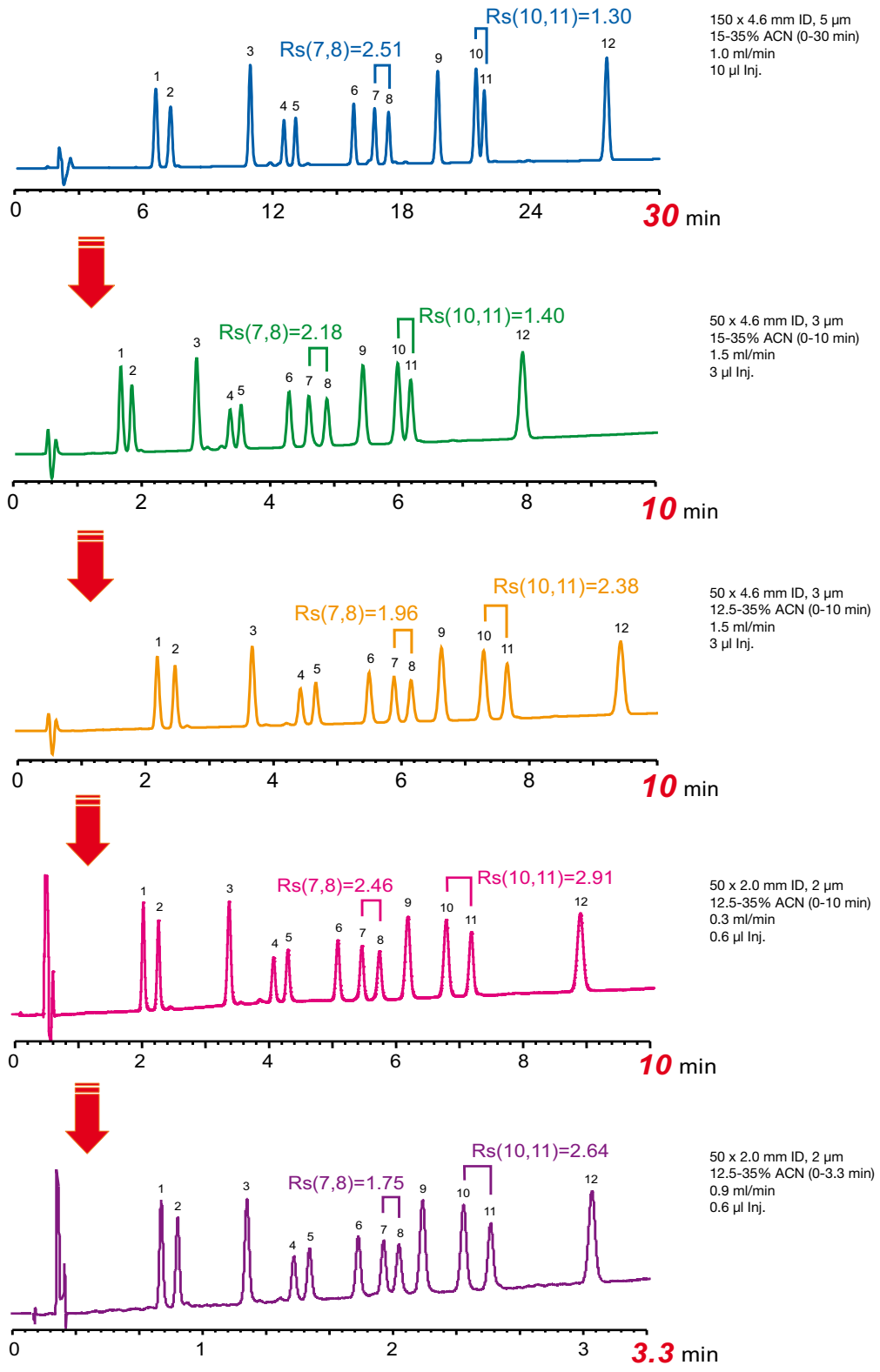
Peptide mapping*



Eluent: A) acetonitrile / water / TFA (10/90/0.1)
B) acetonitrile / water / TFA (35/65/0.1)
Flow rate: 0.2 ml/min
Temperature: 37 °C
Detection: UV at 220 nm
Sample: Tryptic digest of Cytochrome *c* (5 mg/ml; 37 °C; 24h)

Downscale of Methods

Method transfer from conventional LC to Ultra Fast LC*



Columns: Hydrosphere C18
Eluent: A: water / acetic acid (100/3)
B: acetonitrile / acetic acid (100/3)
Temperature: 35 °C
Detection: UV at 254 nm

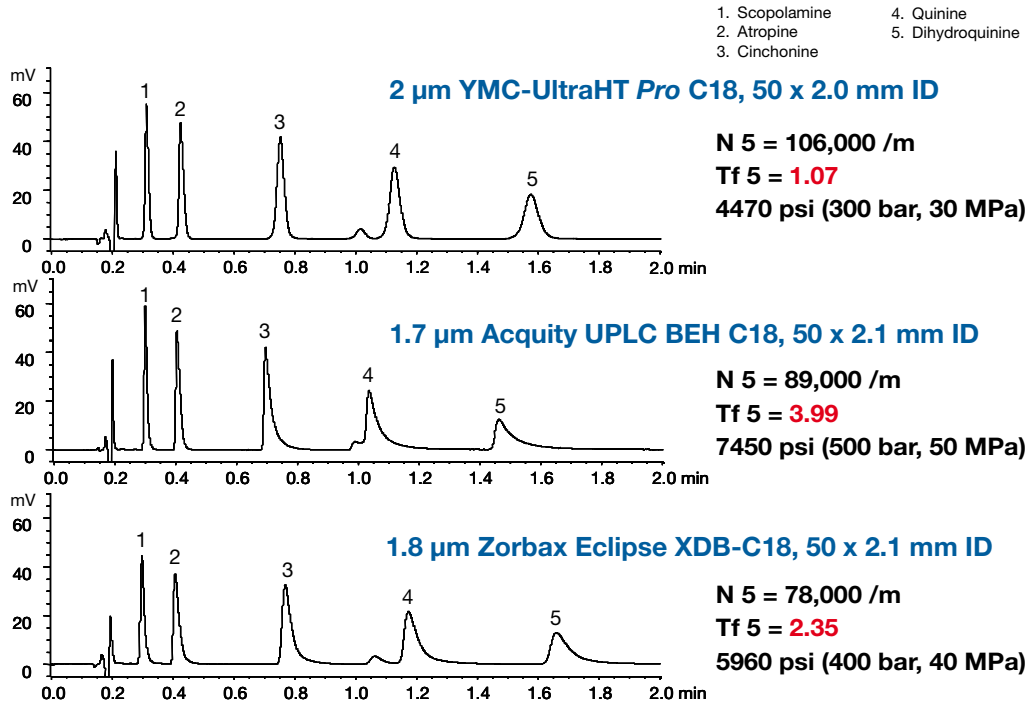
1. Daidzin
2. Glycitin
3. Genistin
4. 6'-O-Malonyldaidzin
5. 6'-O-Malonylglycitin
6. 6'-O-Acetyldaidzin
7. 6'-O-Acetylglycitin
8. 6'-O-Malonylgenistin
9. Daidzein
10. Glycitein
11. 6'-O-Acetylgenistin
12. Genistein

* Application data by courtesy YMC Co., Ltd.

Downscale of Methods

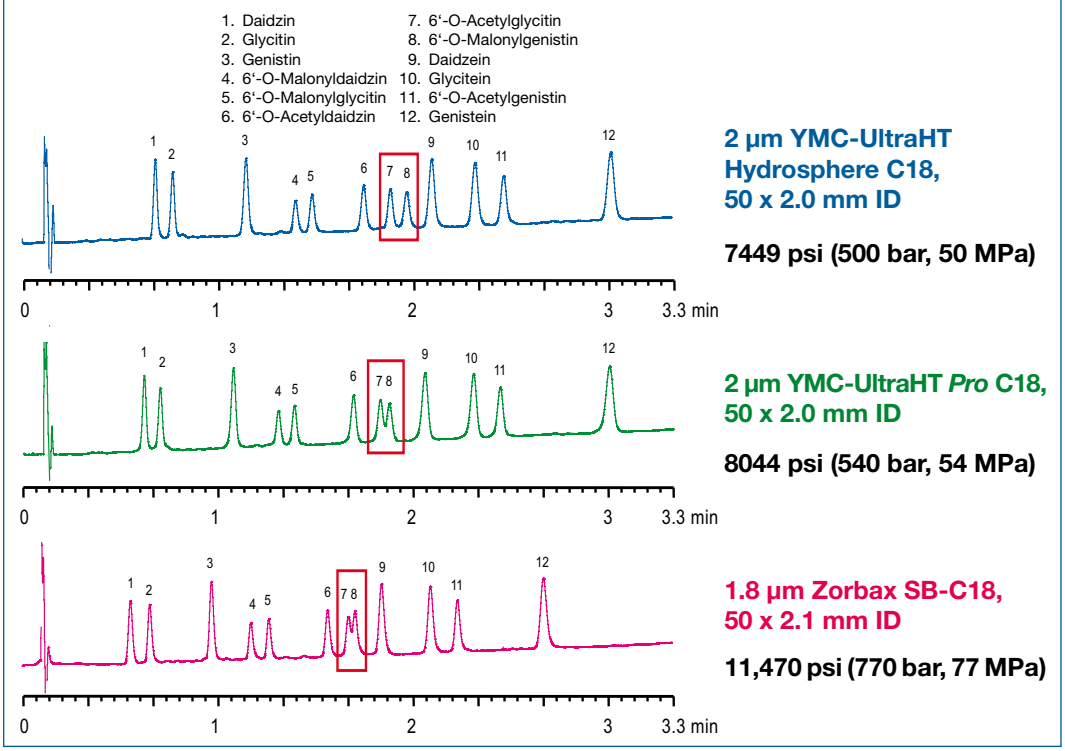
Why not take the pressure out of Fast LC!

Peak performance*



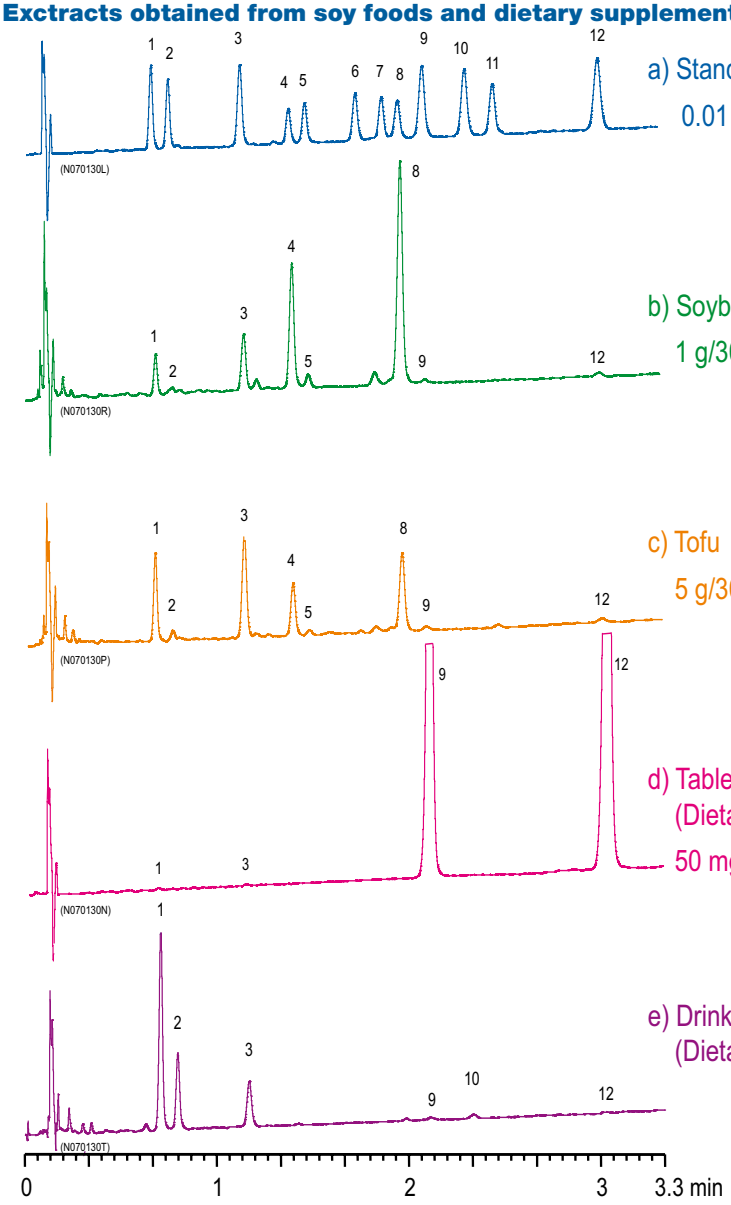
With YMC-UltraHT *Pro* C18 you have all the efficiency you need to develop your Fast LC methods with none of the pressure or heat some would have you believe is essential!

Peak performance*



Downscale of Methods

Exctracts obtained from soy foods and dietary supplements*



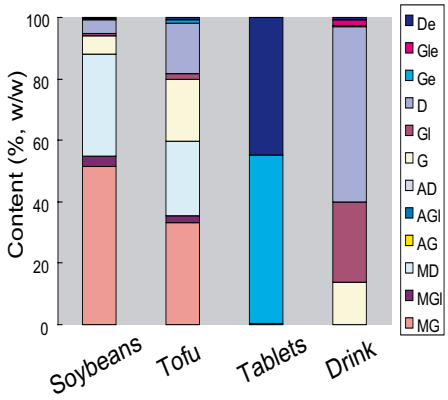
1. Daidzin (D)
2. Glycitin (Gl)
3. Genistin (G)
4. 6'-O-Malonyldaidzin (MD)
5. 6'-O-Malonylglycitin (MGl)
6. 6'-O-Acetyldaidzin (AD)
7. 6'-O-Acetylglycitin (AGl)
8. 6'-O-Malonylgenistin (MG)
9. Daidzein (De)
10. Glycitein (Gle)
11. 6'-O-Acetylgenistin (AG)
12. Genistein (Ge)

Sample preparation method

Sample b-d
← 50% aqueous ethanol
Stirred at r.t. for 1 hr.
Filtration (Filter paper No. 5A)
Filtration (0.2 µm YMC Duo-Filter)
Injection (0.6 µl)
Sample e

Column	: YMC-UltraHT Hydrosphere C18 (2 µm) 50 x 2.0 mm ID
Flow rate	: 0.9 ml/min
Temperature	: 35°C
Detection	: UV at 254 nm
Injection	: 0.6 µl
Eluent	: A) water / acetic acid (100/3) B) acetonitrile / acetic acid (100/3)
Gradient	: 12.5-30% acetonitrile (0-3.3 min)

Content of isoflavones in soy foods and dietary supplements



* Application data by courtesy YMC Co., Ltd.

YMC *Pro*Family

- **YMC-Pack *Pro*Family based on ultra high purity silica**
- **Hydrosphere C18 for stability in aqueous mobile phases**
- **every packed column supplied with:**
  - **lot certificate**
  - **test chromatogram**

	Pro C18	*Pro* C8	*Pro* C4	*Pro* C18 RS	Hydrosphere C18
Particle size / µm	2; 3; 5	3; 5	3; 5	3; 5	2; 3; 5
Pore size / nm	12	12	12	8	12
Surface area / m^2g^{-1}	330	330	330	510	330
Carbon content / %	16	10	7	22	12
pH range	2.0 - 8.0	2.0 - 7.5	2.0 - 7.5	1.0 - 10.0	2.0 - 8.0
Metal content	(Randomly selected lots)				
Al / ppm	0.3	0.2	0.6	0.3	0.7
Fe / ppm	2.8	2.5	2.9	0.1	1.2
Na / ppm	0.3	1.4	1.0	1.3	0.7
Ti / ppm	0.1	0.1	0.1	0.1	0.1
	see pages 68-69	see pages 70-71	see pages 72-73	see pages 74-77	see pages 78-79

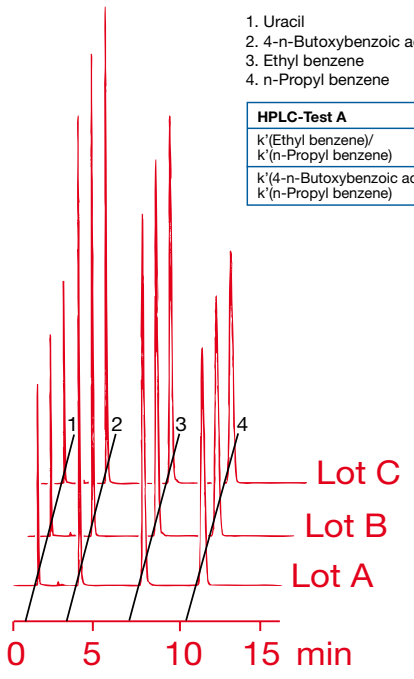
Properties

Strict quality control is enforced during the manufacturing of the underlying silica, bonding of the stationary phase, endcapping and column packing operations to supply high performance columns of high reproducible quality over a long period of time.

Lot-to-lot reproducibility of YMC-Pack *Pro* C18

1. Uracil
2. 4-n-Butoxybenzoic acid
3. Ethyl benzene
4. n-Propyl benzene

HPLC-Test A	Specification
k'(Ethyl benzene)/ k'(n-Propyl benzene)	0.629-0.653
k'(4-n-Butoxybenzoic adic)/ k'(n-Propyl benzene)	0.238-0.263



HPLC Test A
Column: 150 x 4.6 mm ID
Eluent: 20 mM KH_2PO_4-H_3PO_4 (pH3.5) / acetonitrile (40/60,v/v)
Flow rate: 1.0 ml/min
Detection: UV at 254nm
Temperature: 37 °C

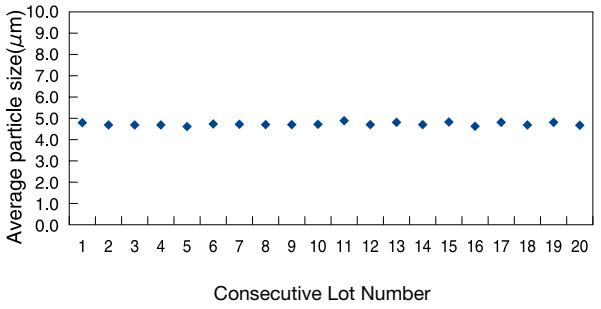
YMC *Pro*Family

Underlying silica gel support

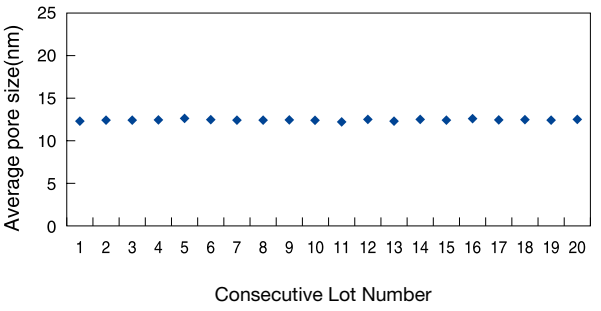
The physical properties of silica gel have a great effect on the selectivity and performance of the bonded packing. For the purpose of supplying columns of stable quality, the physical properties of silica gel used for packing such as particle size, pore size, specific surface area, pore volume and amount of metal contamination have to be strictly controlled.

Physical properties (*Pro* C18, 5 µm, 12 nm)

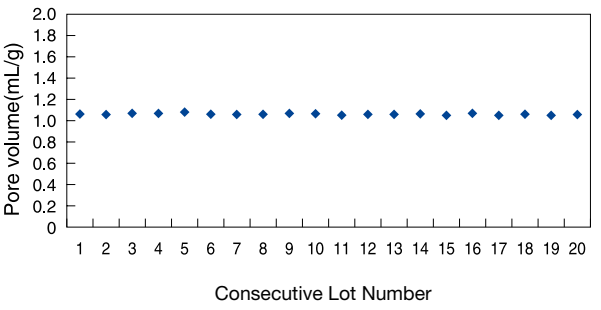
Particle size*



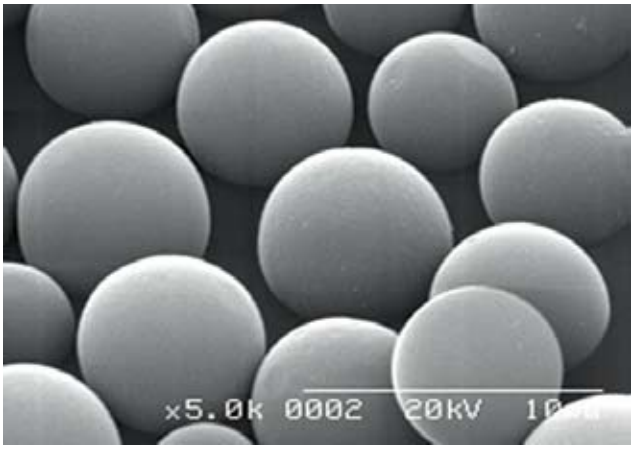
Pore size*



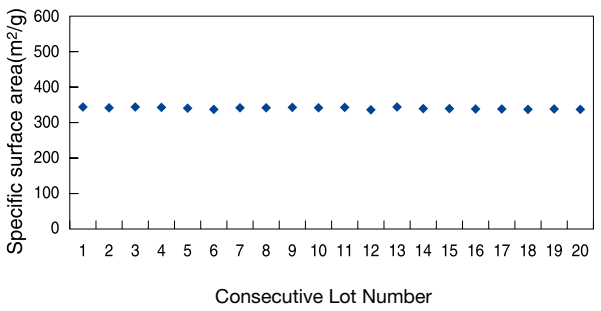
Pore volume*



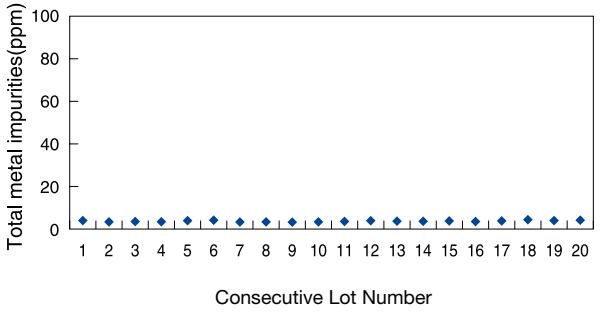
Silica Support Material (5 µm, 12 nm)



Specific surface area*



Amount of metal content*



* Application data by courtesy YMC Co., Ltd.

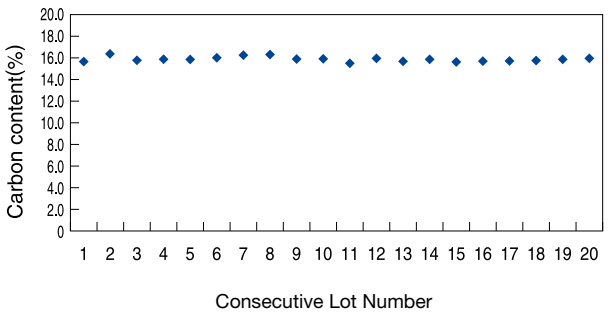
YMC *Pro*Family

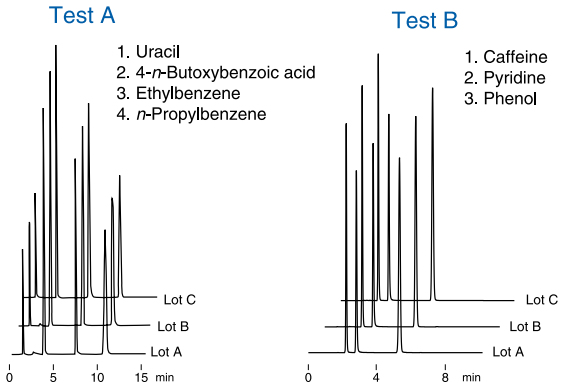
Packing material

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

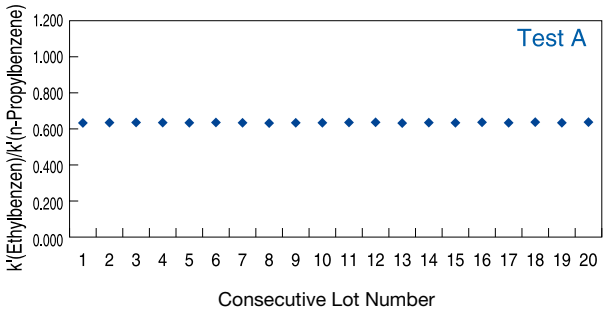
Pro C18 5 µm, Reproducibility between batches

Percent Carbon Content*

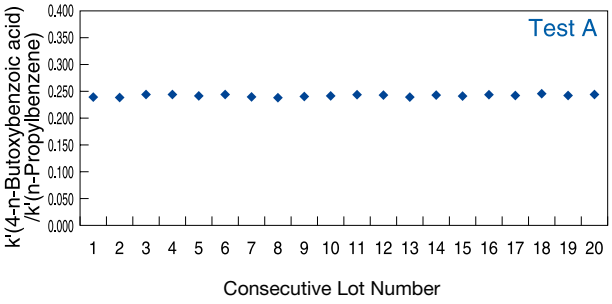




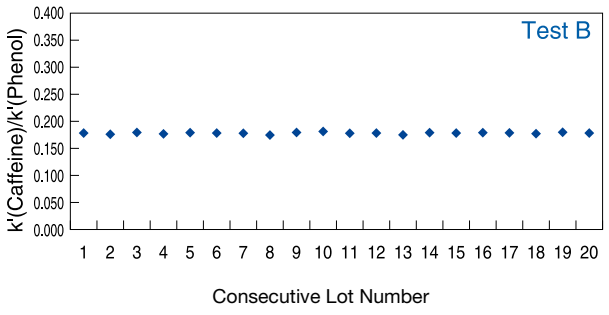
Hydrophobicity*



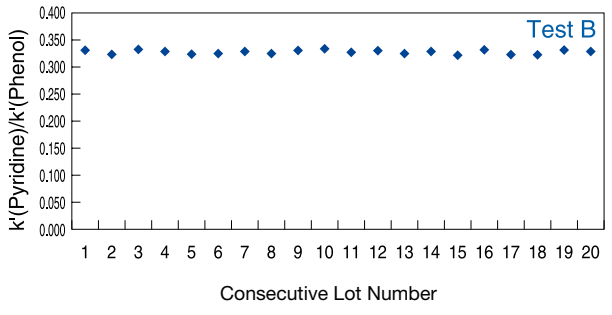
Acidic compounds*



Hydrogen bonding ability*



Basic compounds*



Individual Column Test

To give our customers an insight into the strict criteria with regard to the silica base, the bonded final product and the reproducible chromatographic behaviour, each column of the *Pro*Family is supplied with a lot inspection report and an individual column test chromatogram. The first report illustrates the narrow window for physical parameters such as particle size distribution or surface area and the reproducibility of chemical properties. The test chromatogram illustrates the efficiency of the column with a guaranteed minimum performance of 100,000 theoretical plates for 150 and 250 x 4.6 mm ID and an asymmetry of 0.90 to 1.15 (at 10% peak height for 5 µm particle size).

```
////////////////////////////////////////////////////////////////////////
//              YMC HPLC COLUMN INSPECTION REPORT                     //
////////////////////////////////////////////////////////////////////////

NAME, PARTICLE      :  YMC-Pack Pro C18, S-5 µm,12nm          GEL LOT,7602
PRODUCT CODE        :  AS12S05-1546WT, AS-302
SIZE, SER.NO.       :  150 x 4.6 mmI.D., No.0415125458(W)

ELUENT              :  ACETONITRILE/WATER ( 60/40 )
FLOW RATE           :  1  mL/min
PRESSURE            :  6.86  MPa
TEMPERATURE         :  AMBIENT
DETECTION           :  UV at 270 nm,  0.32  AUFS
INJECTION VOLUME    :  5  uL
CHART SPEED         :  5  mm/min
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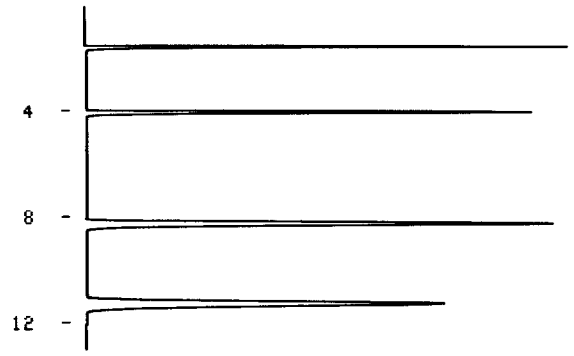


in order of elution;

No(n)	SAMPLE		k'	AlPha	N	As
1	URACIL	0.05 mg/mL				
2	METHYL BENZOATE	0.5 uL/mL	1.6			
3	NAPHTHALENE	0.18 mg/mL	4.34	2.71		
4	BUTYL BENZOATE	1.5 uL/mL	6.31	1.45	17000	1.11

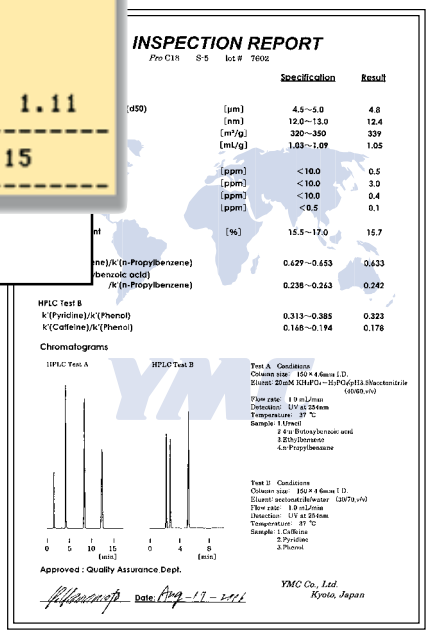
Guarantee 15000 - N - 19000 , 0.90 - As - 1.15

As, asymmetry factor at 10% Peak height

[SYSTEM No. 102] [INSPECTED BY M.BANDO] YMC Co.,Ltd., JAPAN

Indicates the efficiency of the column retention characteristics and symmetry of the test peaks

Individual Lot Test


INSPECTION REPORT

Pro C18 S-5 lot # 7602

		Specification	Result
(d50)	[µm]	4.5~5.0	4.8
	[nm]	12.0~13.0	12.4
	[m²/g]	320~350	339
	[mL/g]	1.03~1.09	1.05
	[ppm]	<10.0	0.5
	[ppm]	<10.0	3.0
	[ppm]	<10.0	0.4
	[ppm]	<0.5	0.1
	[%]	15.5~17.0	15.7
ne)/k'(n-Propylbenzene)		0.629~0.653	0.633
benzoic acid) /k'(n-Propylbenzene)		0.238~0.263	0.242
HPLC Test B			
k'(Pyridine)/k'(Phenol)		0.313~0.385	0.323
k'(Caffeine)/k'(Phenol)		0.168~0.194	0.178

Chromatograms

HPLC Test A HPLC Test B

Approved : Quality Assurance Dept.

Date: Aug-17-2004

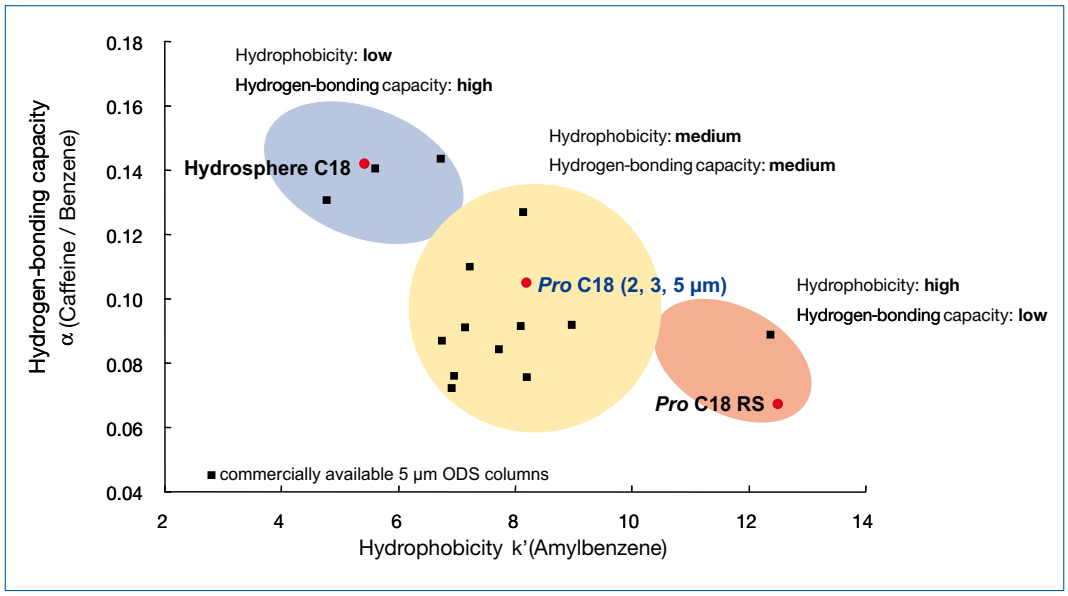
YMC Co., Ltd. Kyoto, Japan

* Application data by courtesy YMC Co., Ltd.

YMC *Pro*Family

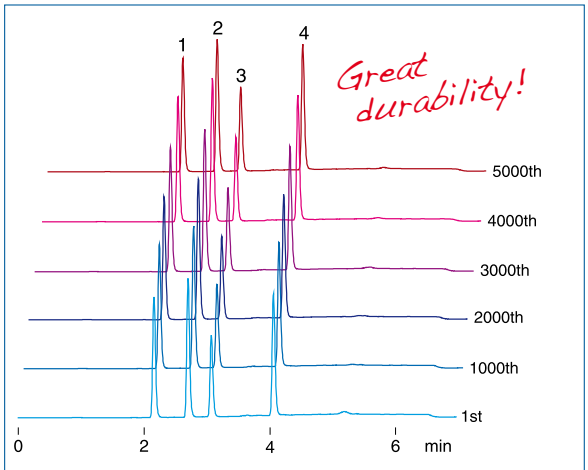
Comparison of separative selectivity

The selectivity characteristics of each column are shown using hydrophobicity and hydrogen-bonding ability as indicators. The *Pro*Family series of ODS phases is designed to make Hydrosphere C18 and *Pro* C18 RS have contrasting separation characteristics, with standard *Pro* C18 in between. Also, *Pro* C8 and C4 have different selectivity from the ODS phases. By choosing one from these 5 types of columns, one can easily optimise the separation of polar and non-polar compounds.



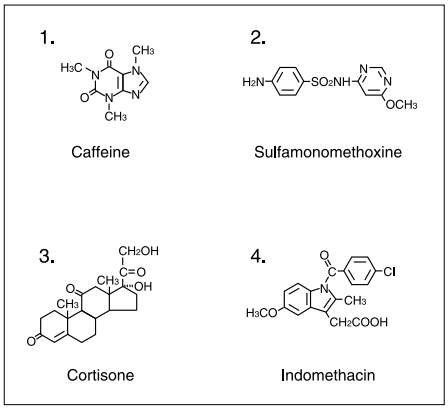
Durability for repetitive analysis

The long-term stability of a *Pro* C18 (3 µm) short column used in repeated analysis is shown below. There is no change found in the separation of all compounds after 5000 injections (8 hours/day for 5 month) during gradient analysis.



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

	tR(4)	N(4)	Rs(4-3)
1st	4.06	37700	11.86
1000th	4.05	37600	11.85
2000th	4.05	37600	11.84
3000th	4.05	37600	11.84
4000th	4.06	37800	11.84
5000th	4.06	37800	11.86



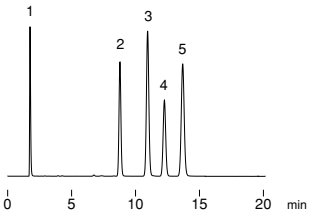
YMC *Pro*Family

Hydrophobicity and steric selectivity

This comparison shows the different properties of the *Pro*Family members giving a good indication on their potential for method development.

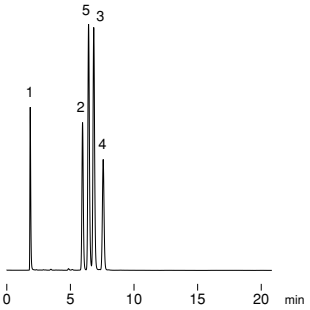
The compounds 1. uracil (dead volume marker) 2. n-butylbenzene 3. o-terphenyl 4. n-amylbenzene and 5. triphenylene are used to determine the hydrophobicity (2. and 4.) and the steric selectivity (3. and. 5.) of each *Pro*Family member under unbuffered chromatographic conditions.

YMC-Pack *Pro* C18



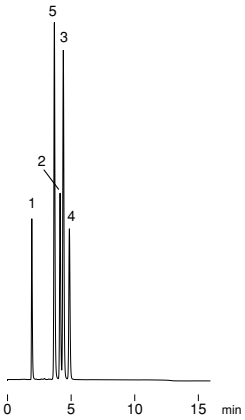
balanced hydrogen bonding, capacity and hydrophobicity

YMC-Pack *Pro* C8



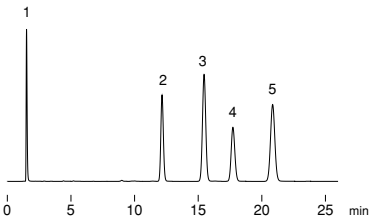
lower hydrophobicity

YMC-Pack *Pro* C4



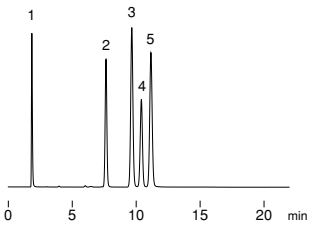
lowest hydrophobicity

YMC-Pack *Pro* C18 RS



highest carbon load

Hydrosphere C18



high polar recognition

Column:	150 x 4.6 mm ID
Eluent:	methanol / water (80/20)
Flow rate:	1.0 ml/min
Temperature:	37° C
Detection:	UV at 254 nm

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

The whole *Pro*Family covers a large area of hydrophobicity and steric selectivity, as presented in this comparison, which offers the opportunity to accomplish optimisation of chromatographic methods even for complicated separation problems.

For more applications please refer to our “Application Data Collections” or contact us directly.

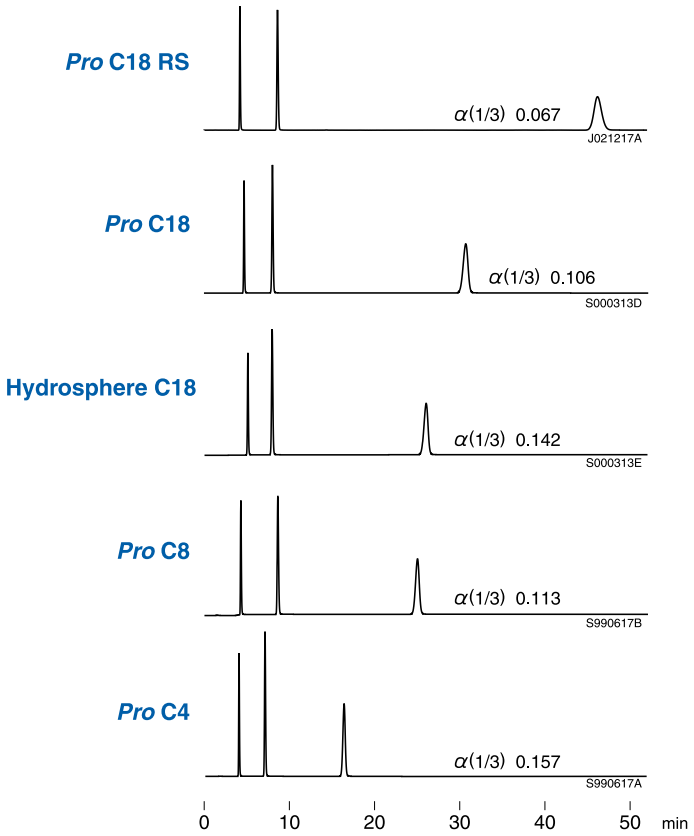
* Application data by courtesy YMC Co., Ltd.

YMC *Pro*Family

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 non-polar groups is retained according to hydrophobicity of the packing, while retention of caffeine and phenol (hydrophilic compounds), is greatly affected by hydrogen-bonding capacity, and these packing have similar retention time, but show different selectivity.

Hydrogen bonding capacity*



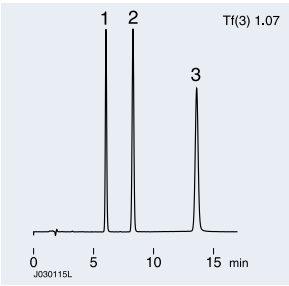
Column: 150 x 4.6 mm ID
Eluent: methanol / water (30/70)
Flow rate: 1.0 ml/min
Temperature: 37° C
Detection: UV at 254 nm

YMC *Pro*Family

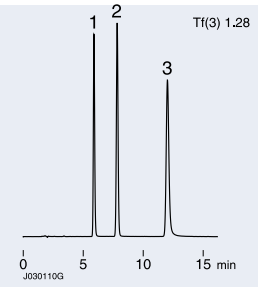
Acidic and basic compounds

Acidic compounds*

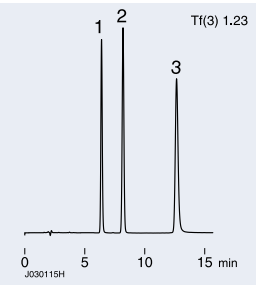
***Pro* C18 RS**



***Pro* C18**



Hydrosphere C18

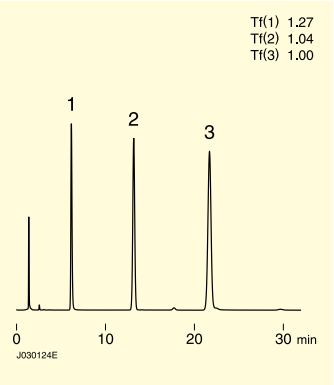


Column: 150 x 4.6 mm ID
Eluent: 20 mM CH_3COONa-CH_3COOH (pH 4.4) / acetonitrile (80/20)
Flow rate: 1.0 ml/min
Temperature: 37° C
Detection: UV at 230 nm

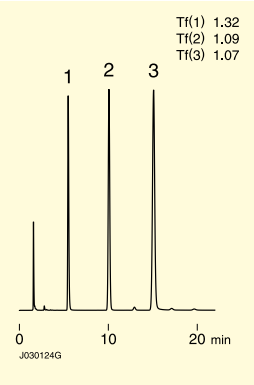
1. *p*-Hydroxyacetophenone (I.S.)
2. Sorbic acid
3. Dehydroacetic acid

Basic compounds*

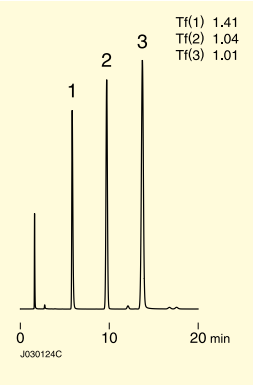
***Pro* C18 RS**

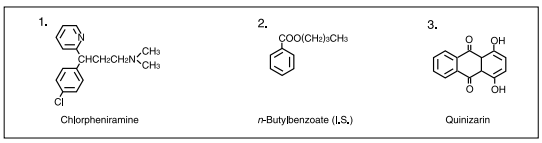


***Pro* C18**



Hydrosphere C18





Column: 150 x 4.6 mm ID
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

* Application data by courtesy YMC Co., Ltd.

YMC-Pack *Pro* C18

- **specifically designed for pharmaceutical and biotechnical R&D**
- **extreme narrow specifications**
- **high lot-to-lot reproducibility**
- **high column-to-column reproducibility**
- **ideal for basic, acidic and polar compounds**

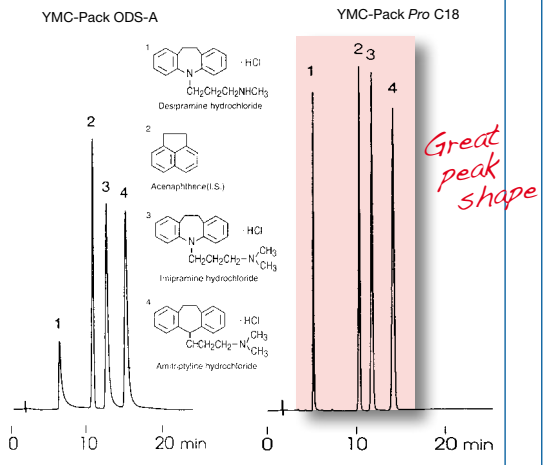
YMC-Pack *Pro* C18	Specification
Particle size / µm	2*; 3*; 5
Pore size / nm	12
Surface area / m^2g^{-1}	330
Carbon content / %	16
Recommended pH range	2.0 - 8.0

*** please be referred to page 52 ff for YMC-UltraHT columns**

Properties

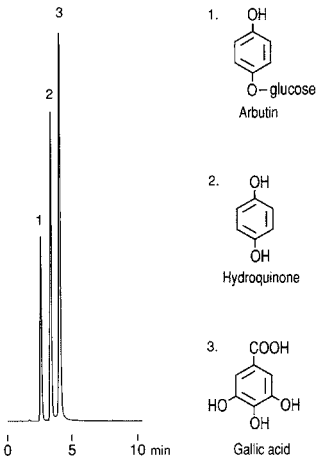
YMC-Pack *Pro* C18 is based on an ultra pure silica support, which is used for the whole *Pro*Family. Due to a proprietary endcapping process especially designed for this type of silica, YMC-Pack *Pro* C18 is perfectly suitable for the separation of acidic and basic molecules. The inertness of the silica makes it an excellent choice for the analysis of drugs or metabolites, compounds that are susceptible to polar interactions with residual silanol groups and metal impurities as demonstrated in the following comparison. The extreme basic substances are selected to prove the very good performance of YMC-Pack *Pro* C18 in regard to their separation and the peak performance that cannot be achieved with classical materials.

Basic compounds*



Tricyclic antidepressants
Column: YMC-Pack *Pro* C18 (5 µm, 12 nm) 150 x 4.6 mm ID
Eluent: 20 mM potassium phosphate buffer (pH 6.9) / methanol (25/75)
Flow rate: 1.0 ml/min
Temperature: 37°C
Detection: UV at 254 nm

LC-MS separations*



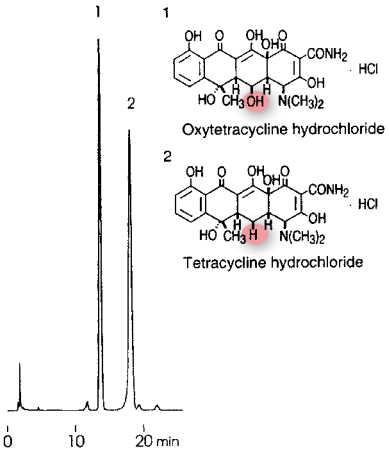
Column: YMC-Pack *Pro* C18 (3 µm, 12 nm) 50 x 2.0 mm ID
Eluent: 10 mM CH_3COONH_4 / methanol (45/55)
Flow rate: 0.2 ml/min
Temperature: 37° C
Detection: UV at 254 nm

YMC-Pack *Pro* C18

Application

This small collection of applications can only give a brief insight into the multiple applications for *Pro* C18.

Tetracycline antibiotics*



1

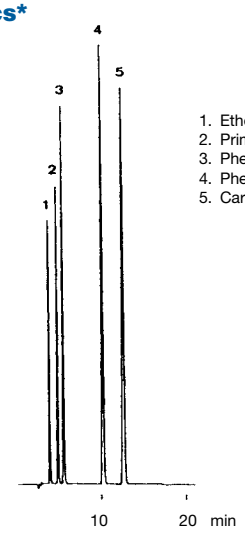
Oxytetracycline hydrochloride

2

Tetracycline hydrochloride

Column:	YMC-Pack *Pro* C18 (5 µm, 12 nm) 150 x 4.6 mm ID
Part No.:	AS12S05-1546WT
Eluent:	acetonitrile / 10 mM oxalic acid (10/90)
Flow:	1.0 ml/min
Detection:	UV at 280 nm, 0.13 AUFS
Temperature:	37 °C
Injection:	6 µl (0.2 mg/ml)

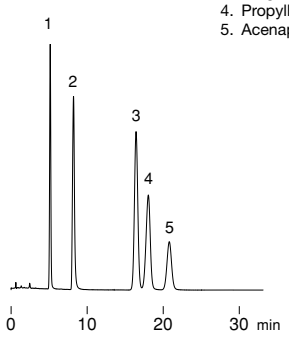
Antiepileptics*



1. Ethosuximide
2. Primidone
3. Phenobarbital sodium salt
4. Phenytoin
5. Carbamazepine

Column:	YMC-Pack *Pro* C18 (5 µm, 12 nm) 150 x 4.6 mm ID
Part No.:	AS12S05-1546WT
Eluent:	50 mM $NH_4H_2PO_4$-$(NH_4)_2HPO_4$ (pH 6.7) / methanol (50/50)
Flow:	0.7 ml/min
Detection:	UV at 215 nm, 0.32 AUFS
Temperature:	37 °C
Injection:	8 µl (0.035 p 0.7 mg/ml)

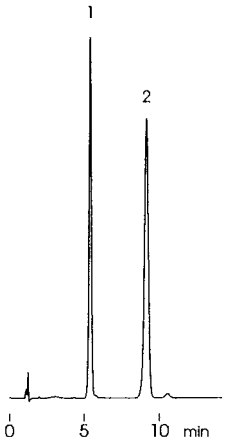
Baseline separation of compounds with different polarity*

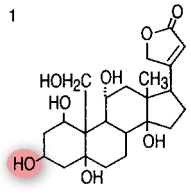


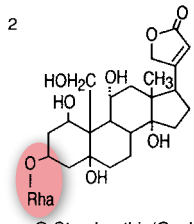
1. Toluene
2. Amitriptyline HCl
3. Progesterone
4. Propylbenzene
5. Acenaphthene

Column:	YMC-Pack *Pro* C18 (3 µm, 12 nm) 75 x 2.0 mm ID
Part No.:	AS12S03-L502WT
Eluent:	methanol / water / TFA (5/95/0.5)
Flow:	0.2 ml/min
Detection:	UV at 280 nm, 0.16 AUFS
Temperature:	30 °C
Injection:	1 µl (0.2 – 0.5 mg/ml)

Cardiac glycosides*



1

Ouabagenin

2


G-Strophanthin(Ouabain)

Column:	YMC-Pack *Pro* C18 (5 µm, 12 nm) 75 x 4.6 mm ID
Part No.:	AS12S05-L546WT
Eluent:	acetonitrile / water (10/90)
Flow:	1.0 ml/min
Detection:	UV at 220 nm, 0.26 AUFS
Temperature:	37 °C
Injection:	5 µl (0.2, 0.4 mg/ml)

For more applications please refer to our “Application Data Collections” or contact us directly.

Column care

YMC Pack *Pro* C18 is stable towards hydrolysis between pH 2.0-8.0. Remove acid and buffer salts before storage. Store the column in methanol / water = 70/30.

For detailed information please refer to the “Column Care and Use Instructions” which are shipped with each analytical column.

* Application data by courtesy YMC Co., Ltd.

YMC-Pack *Pro* C8

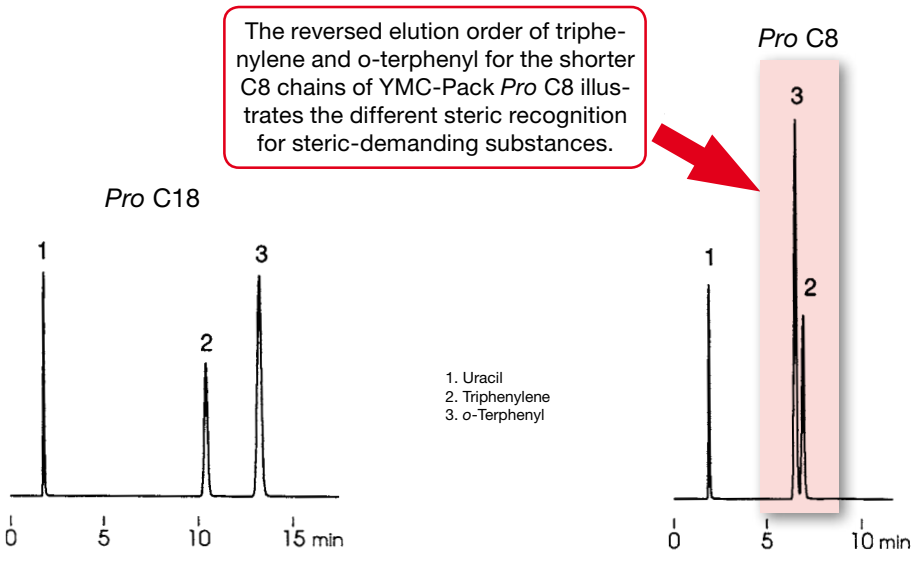
- **extremely broad selectivity pattern**
- **good alternative to C18-phases**
- **suitable for all types of organic molecules, especially basic pharmaceuticals**

YMC-Pack *Pro* C8	Specification
Particle size / µm	3; 5
Pore size / nm	12
Surface area / m^2g^{-1}	330
Carbon content / %	10
Recommended pH range	2.0 - 7.5

General

Within the *Pro*Family, the YMC-Pack *Pro* C8 provides an additional, less hydrophobic stationary phase for all types of compounds, but especially for basic and metal chelating substances. For many applications regarding the separation of peptides, nucleic acids and similar compounds with LC-MS detection, conventional C8-stationary phases require ion pair reagents and ion-suppression to obtain satisfactory separation and low detection limits. In contrast, *Pro* C8 with its ultra pure silica allows the analysis without these modifiers but still generates excellent chromatograms. In addition to the reduced hydrophobicity of YMC-Pack *Pro* C8 compared with YMC-Pack *Pro* C18, the different steric selectivity offers new possibilities in method optimisation as demonstrated in the figure below:

Steric selectivity YMC-Pack *Pro* C18 vs. YMC-Pack *Pro* C8*



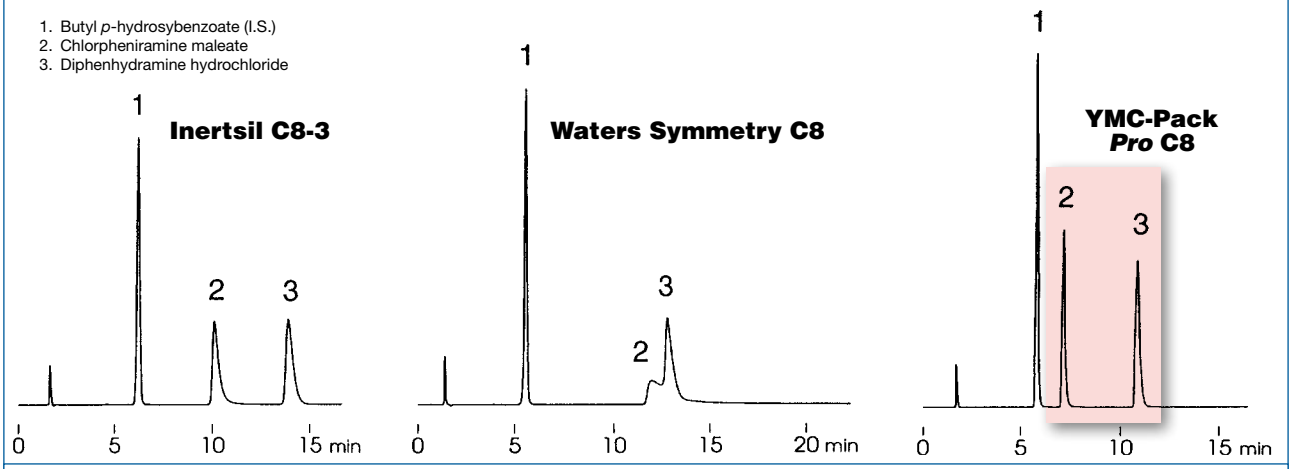
Column: 150 x 4.6 mm ID
Eluent: methanol / water (80/20)
Flow rate: 1.0 ml/min
Temperature: 37° C
Detection: UV at 254 nm

YMC-Pack *Pro* C8

YMC-Pack *Pro* C8 is a member of the *Pro*Family and as a result gives excellent peak shapes even for basic substances, due to its low metal content and the endcapping procedure, which is identical to that used for YMC-Pack *Pro* C18. This shall be demonstrated in the comparison below where YMC-Pack *Pro* C8 outperforms competitive state of the art products.

Peak performance of YMC-Pack *Pro* C8 for basic substances*

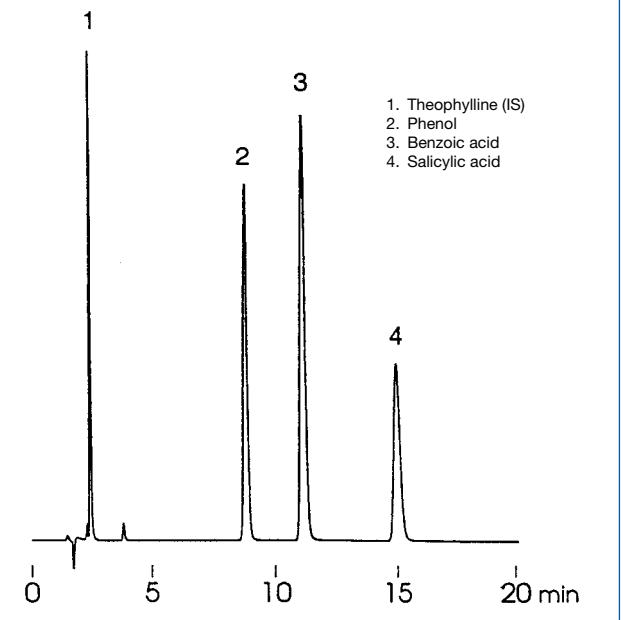
1. Butyl *p*-hydrosybenzoate (I.S.)
2. Chlorpheniramine maleate
3. Diphenhydramine hydrochloride



Histamine antagonists

Column:	150 x 4.6 mm ID
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, 0.26 AUFS

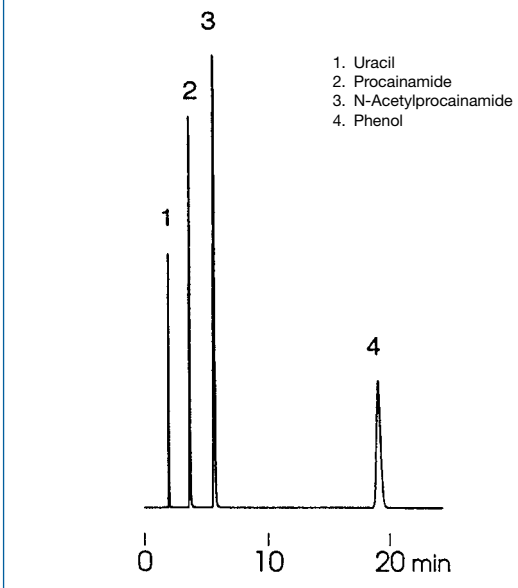
No need for ion pair reagents*



Disinfectants

Column:	YMC-Pack *Pro* C8 (5 µm, 12 nm) 150 x 4.6 mm ID
Part No.:	OS12S05-1546WT
Eluent:	acetonitrile / 20 mM H_3PO_4 (20/80)
Flow rate:	1.0 ml/min
Temperature:	37° C
Detection:	UV at 270 nm, 0.32 AUFS

Good peak performance for acidic and basic compounds*



Basic compounds

Column:	YMC-Pack *Pro* C8 (5 µm, 12 nm) 150 x 4.6 mm ID
Part No.:	OS12S05-1546WT
Eluent:	20 mM KH_2PO_4-K_2HPO_4 (pH 6.9) / acetonitrile (90/10)
Flow rate:	1.0 ml/min
Temperature:	37° C
Detection:	UV at 254 nm, 0.32 AUFS

For more applications please refer to our "Application Data Collections" or contact us directly.

Column care

YMC-Pack *Pro* C8 is stable towards hydrolysis between pH 2.0-7.5. Remove acid and buffer salts before storage. Store the column in methanol / water = 70/30.

For detailed information please refer to the "Column Care and Use Instructions" which are shipped with each analytical column.

* Application data by courtesy YMC Co., Ltd.

YMC-Pack *Pro* C4

L26

- **proprietary endcapping in order to minimize the effect of residual silanols**
- **for polar organic molecules, especially basic pharmaceuticals and peptides**
- **ideal for fast chromatography**

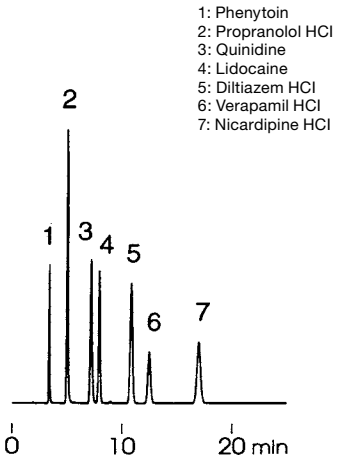
YMC-Pack *Pro* C4	Specification
Particle size / µm	3; 5
Pore size / nm	12
Surface area / m^2g^{-1}	330
Carbon content / %	7
Recommended pH range	2.0 - 7.5

General

More than 80% of the RP-HPLC analyses are accomplished on octyl- or octadecyl-phases. Because of this overwhelming majority, many chromatographers neglect other selectivities that might be better suited to their separation, such as butyl phases. With *Pro* C4, YMC offers a stationary phase based on the well-known ultra pure silica of the *Pro*Family. Compared to a C18-phase with the same eluent, this less hydrophobic material gives shorter retention times for non-polar compounds while the retention time of polar analytes are virtually unaffected. This makes the *Pro* C4 an interesting alternative especially when short analysis times are required. For this reason, mixtures with a wide range of component polarity are best analysed by short chains, such as YMC-Pack *Pro* C4.

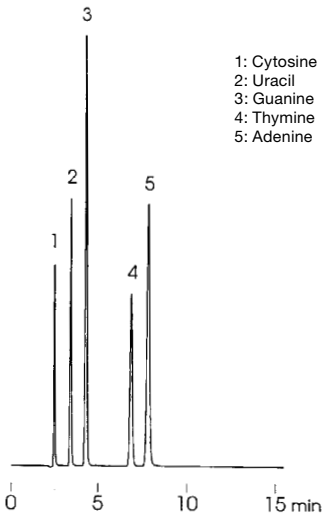
Within the *Pro*Family, YMC-Pack *Pro* C4 is the selectivity of choice to reduce time of analysis in combination with the given advantages of the *Pro*Family, namely the high purity silica support and the low metal content, which result in excellent peak performance as below.

Efficient separation of pharmaceutical drugs*



Antiarrhythmic drugs
Column: YMC-Pack *Pro* C4 (5 µm, 12 nm) 150 x 4.6 mm ID
Part No.: BS12S05-1546WT
Eluent: 20 mM KH_2PO_4-K_2HPO_4 (pH 6.9) / methanol (40/60)
Flow rate: 1.0 ml/min
Temperature: 37° C
Detection: UV at 220 nm

Fast separation of nucleic acid bases*

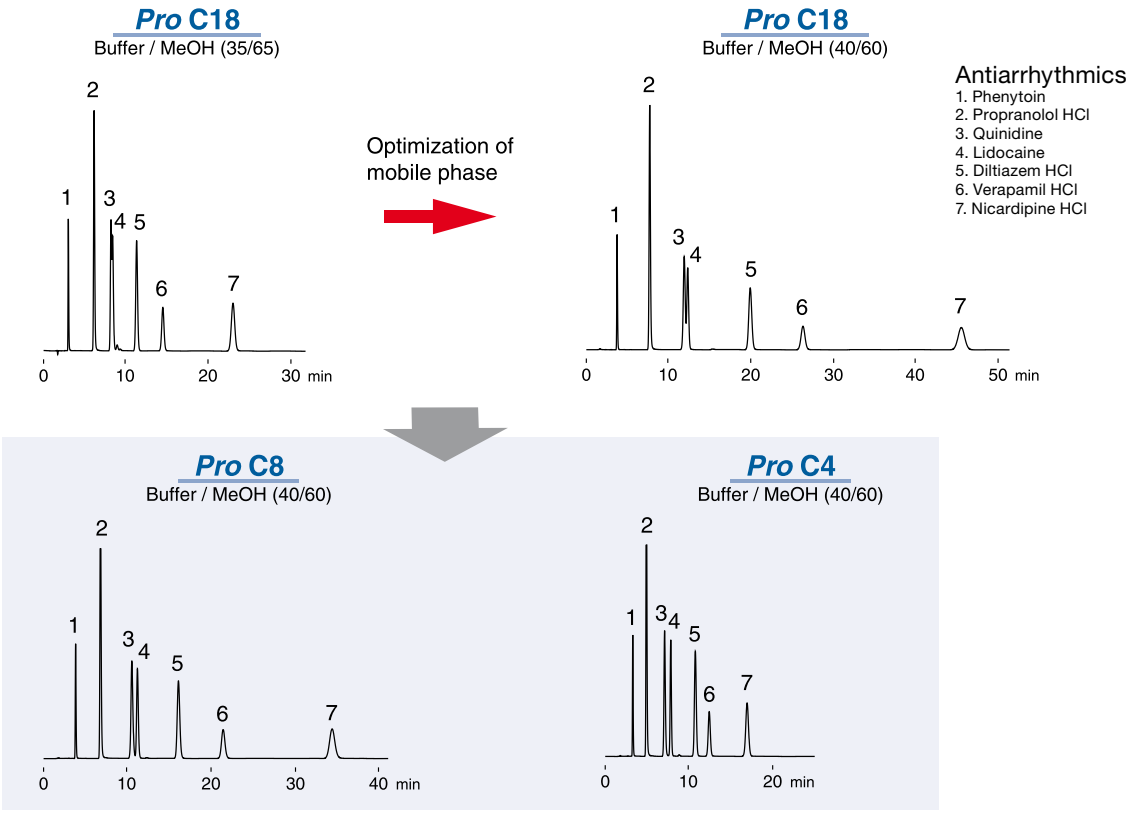


Nucleic acid bases
Column: YMC-Pack *Pro* C4 (5 µm, 12 nm) 150 x 4.6 mm ID
Part No.: BS12S05-1546WT
Eluent: 20 mM KH_2PO_4
Flow rate: 1.0 ml/min
Temperature: 37° C
Detection: UV at 254 nm

YMC-Pack *Pro* C4

The comparison shown below demonstrates that YMC-Pack *Pro* C4 is the column of choice when fast HPLC is required. There is almost no difference in retention times for the first three compounds whilst Nicardipine HCl elutes faster on YMC-Pack *Pro* C4 due to its lower polarity.

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



Column:	150 x 4.6 mm ID
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

For more applications please refer to our “Application Data Collections” or contact us directly.

Column care

YMC-Pack *Pro* C4 is stable towards hydrolysis between pH 2.0-7.5. Remove acid and buffer salts before storage. Store the column in methanol / water = 70/30. Clogged inlet frits often can be cleaned by changing the flow direction or replacement.

For detailed information please refer to the “Column Care and Use Instructions”, which are shipped with each analytical column.

* Application data by courtesy YMC Co., Ltd.

YMC-Pack *Pro* C18 RS

L1 LC MS C 22 1-10

- **strongly hydrophobic due to carbon content of 22%**
- **exhibits extraordinary steric selectivity**
- **extended pH and temperature stability**
- **for the separation of hydrophobic, acidic and basic molecules**

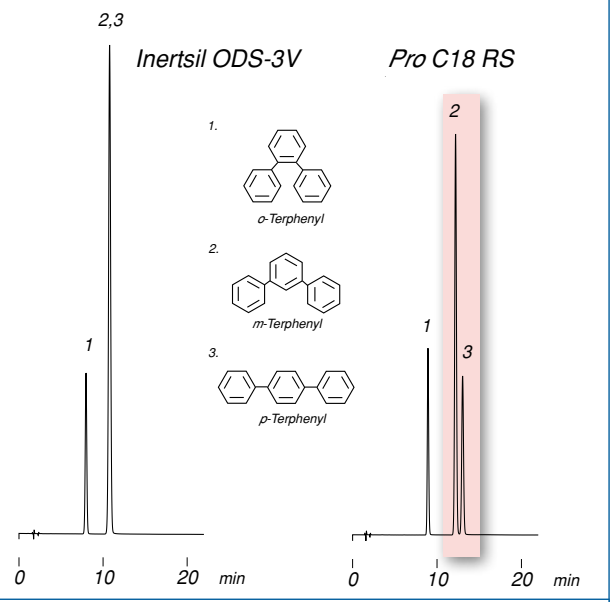
YMC-Pack *Pro* C18 RS	Specification
Particle size / µm	3; 5
Pore size / nm	8
Surface area / m^2g^{-1}	510
Carbon content / %	22
Recommended pH range	1.0 - 10.0*

* it is recommended to use at least 10% organic solvent composition near the pH limits and over 50% at pH values above pH 9.0 to preserve column lifetimes

General

The relatively high carbon load of YMC-Pack *Pro* C18 RS with 22% amplifies the selectivity's ability to discriminate between closely related compounds such as positional or steric isomers. A good system to test this steric selectivity is a mixture of o-, m- and p-terphenyl separated under methanol/water conditions. These three compounds differ only in their three-dimensional structure and not in their hydrophobicity or polarity. YMC-Pack *Pro* C18 RS recognizes even slight steric differences as shown in the chromatogram on the right, whilst a more conventional carbon load (15%) C18 chemistry does not.

Steric selectivity*



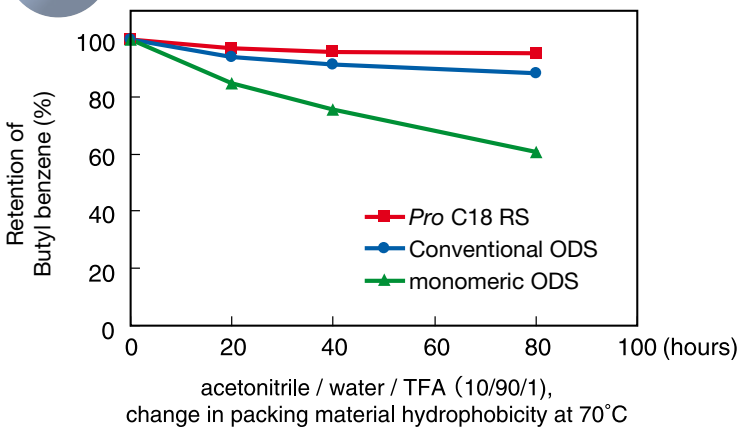
Column: 150 x 4.6 mm ID
Eluent: methanol / water (85/15)
Flow rate: 1.0 ml/min
Temperature: 37° C
Detection: UV at 254 nm

YMC-Pack *Pro* C18 RS

Stability under acidic conditions*

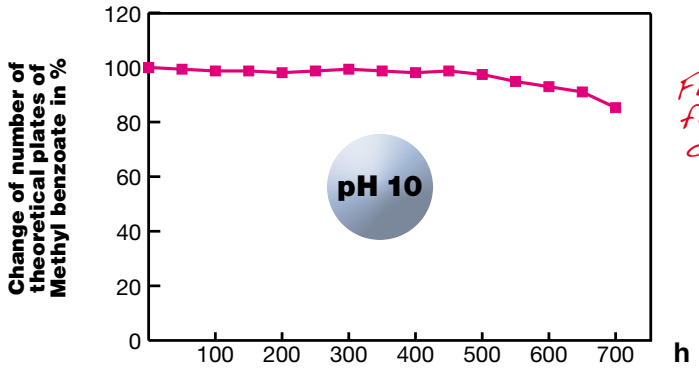
pH 1

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



Note: When assessing pH stability data, please take care to certify that complete chromatographic conditions are presented.

Stability under basic conditions*



Full stability for 3 month one shift operation!

For pH 10, a borate buffer system (20 mM H_3BO_3-NaOH (pH 9.8) / methanol 50/50 at 30°C) was selected to be continuously pumped through the column, while checking the number of theoretical plates for methyl benzoate every 50 hours.

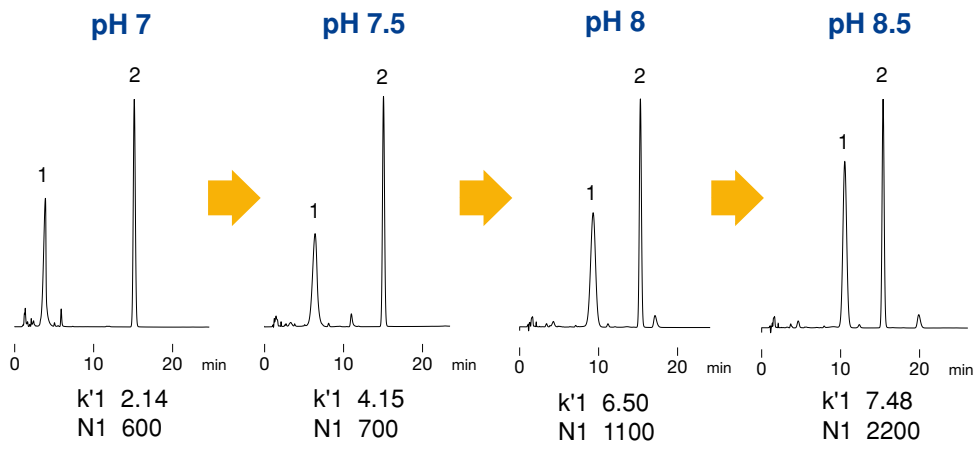
Basic eluents may significantly affect silicas and traditional bonding chemistries. Therefore, stability data should be considered only after verifying that the buffer system used maintains the selected pH during preparation and use. Furthermore, it must be verified that the eluent is not recycled, since the “active” basic sites may equilibrate to a saturation level with time, resulting in no further interactions taking place. Consequently, only continuous flow of “fresh” and thoroughly buffered eluent will provide accurate and meaningful performance data.

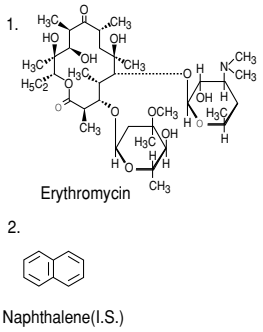
* Application data by courtesy YMC Co., Ltd.

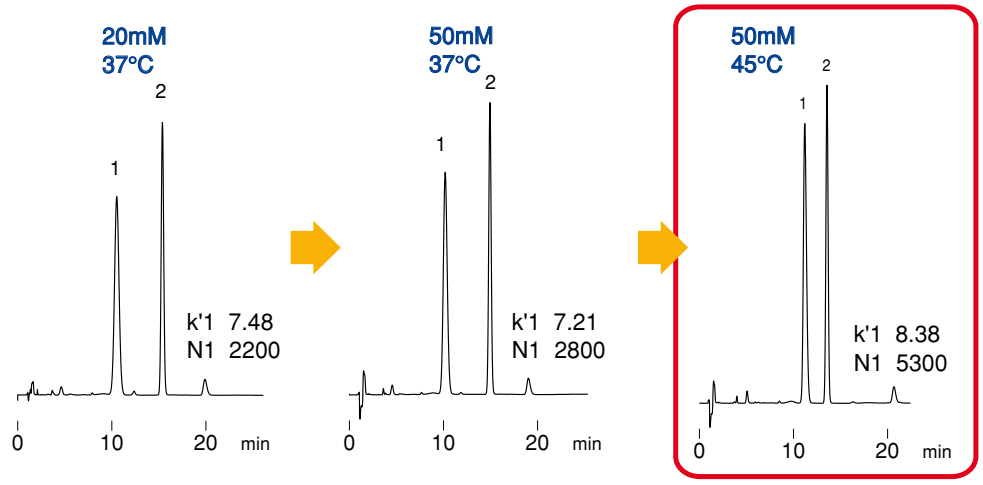
YMC-Pack *Pro* C18 RS

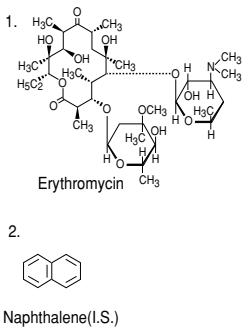
YMC-Pack *Pro* C18 RS: Ideal for the separation of steric demanding compounds and/or for use under broader pH conditions!

Method optimization*









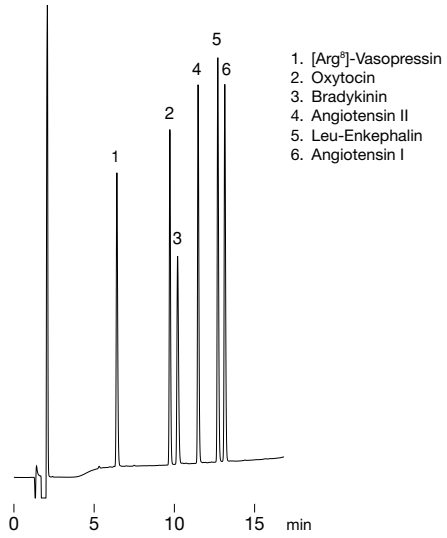
Column:	YMC-Pack *Pro* C18 RS (5 µm, 8 nm) 150 x 4.6 mm ID
Eluent:	potassium phosphate buffer (pH 8.5) / acetronitrile (50/50)
Flow rate:	1.0 ml/min
Temperature:	37° C
Detection:	UV at 210 nm

YMC-Pack *Pro* C18 RS

Applications

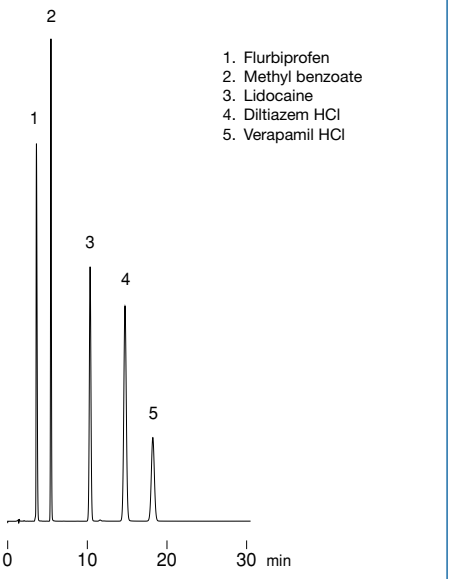
The specific properties of YMC-Pack *Pro* C18 RS make it an excellent choice for the separation of non-polar structurally related analytes. The extended resistance towards acidic and basic conditions not only widens the possibilities in method development but also provides further selectivities for demanding separations such as LC-MS or combinatorial chemistry of: positional isomers, large hydrophobic molecules, basic and acidic compounds, peptides

Peptides: LC-MS conditions*



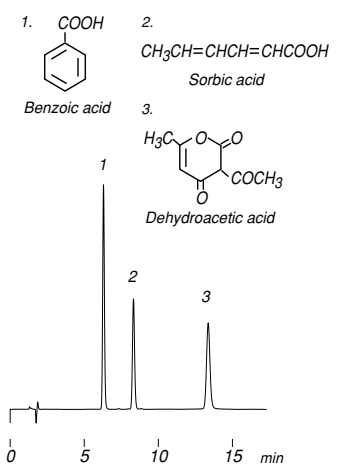
Column:	YMC-Pack *Pro* C18 RS (5 µm, 8 nm) 150 x 4.6 mm ID
Part No.:	RS08S05-1546WT
Eluent:	A: water / TFA (100/0.1) B: acetonitrile / TFA (100/0.1)
Gradient:	15-35% B (0-15 min)
Flow:	1.0 ml/min
Detection:	UV, 220 nm, 0.32 AUFS
Temperature:	37 °C
Injection:	20 µl (0.05 mg/ml)

Drugs: LC-MS conditions*



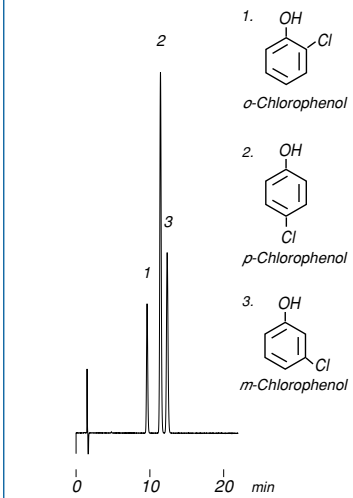
Column:	YMC-Pack *Pro* C18 RS (5 µm, 8 nm) 150 x 4.6 mm ID
Part No:	RS08S05-1546WT
Eluent:	20 mM CH_3COONH_4-NH_3 (pH 8.9) / methanol (35/65)
Flow:	1.0 ml/min
Detection:	UV, 220 nm, 0.64 AUFS
Temperature:	30 °C
Injection:	10 µl (0.1 mg/ml, 0.036 µl/ml)

Food preservatives*



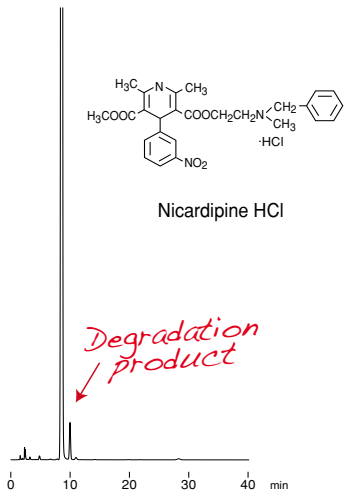
Column:	YMC-Pack *Pro* C18 RS (5 µm, 8 nm) 150 x 4.6 mm ID
Part No.:	RS08S05-1546WT
Eluent:	20 mM CH_3COONa - CH_3COOH (pH 4.3) / acetonitrile (80/20)
Flow:	1.0 ml/min
Detection:	UV at 230 nm, 0.26 AUFS
Temperature:	37 °C
Injection:	10 µl (0.02 mg/ml)

Chlorophenol isomers*



Column:	YMC-Pack *Pro* C18 RS (5 µm, 8 nm) 150 x 4.6 mm ID
Part No.:	RS08S05-1546WT
Eluent:	acetonitrile / water / acetic acid (30/70/1)
Flow:	1.0 ml/min
Detection:	UV at 230 nm, 0.32 AUFS
Temperature:	37 °C
Injection:	10 µl (0.1 - 0.2 mg/ml)

Nicardipine hydrochloride*



Column:	YMC-Pack *Pro* C18 RS (5 µm, 8 nm) 150 x 4.6 mm ID
Part No.:	RS08S05-1546WT
Eluent:	20 mM KH_2PO_4-K_2HPO_4 (pH 6.9) / methanol (25/75)
Flow:	1.0 ml/min
Detection:	UV at 254 nm, 0.32 AUFS
Temperature:	37 °C
Injection:	10 µl

For more applications please refer to our “Application Data Collections” or contact us directly.

* Application data by courtesy YMC Co., Ltd.

Hydrosphere C18

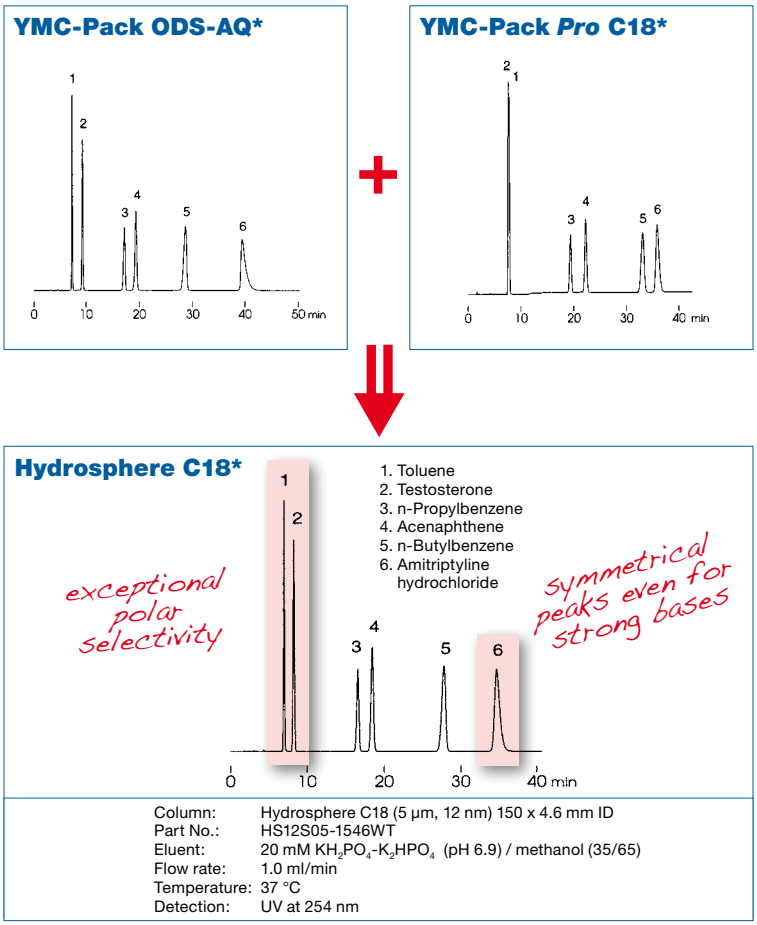
- **stable under the use of 100% aqueous eluent**
- **"hydrophilic" C18 surface for enhanced polar recognition**
- **no need for ion pair reagents**
- **based on highly inert, ultrapure, pH neutral silica**
- **specifically designed for pharmaceutical and biotechnology R&D**

Hydrosphere C18	Specification
Particle size / µm	2*; 3*; 5
Pore size / nm	12
Surface area / m^2g^{-1}	330
Carbon content / %	12
Recommended pH range	2.0 - 8.0

*** please be referred to page 52 ff for YMC-UltraHT columns**

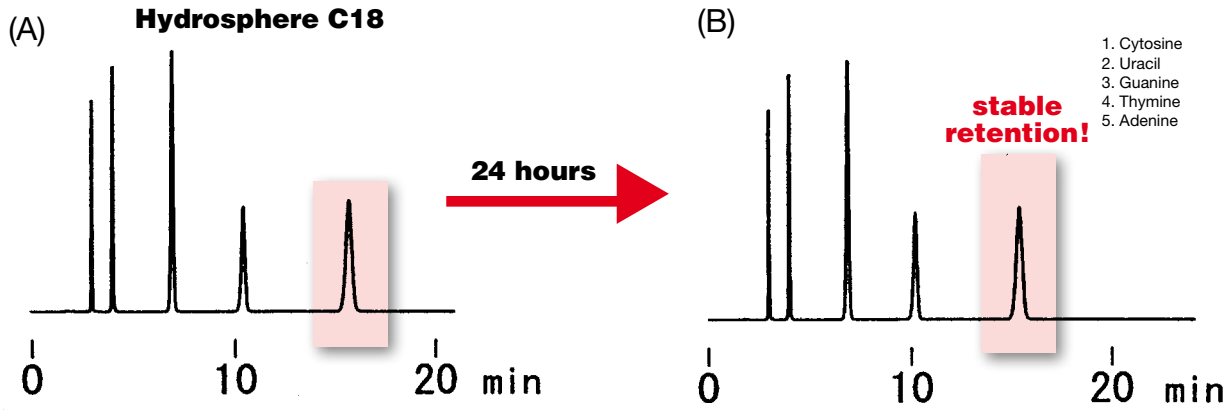
General

The separation of polar compounds in many cases requires highly aqueous mobile phase conditions to achieve sufficient retention on the stationary phase. Conventional reversed phase selectivities do not give reproducible results under these conditions due mainly to the collapse of the C18 chains, Hydrosphere C18 has been developed, on the ultra pure silica support of the *Pro*Family, as the next generation of speciality phases following the well known YMC-Pack ODS-AQ, which was developed in 1987 and is still a very interesting selectivity option for these purposes.



Hydrosphere C18

Solution: Hydrosphere C18 under 100% aqueous chromatographic conditions*

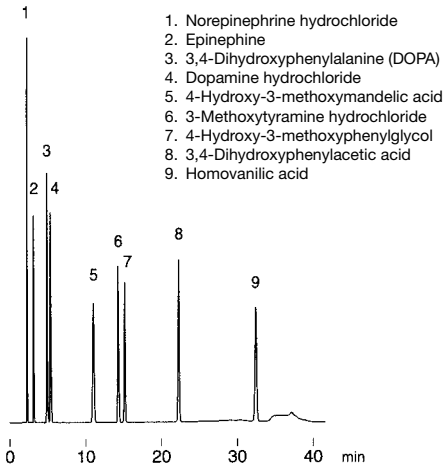


Column:	Hydrosphere C18 (5 µm, 12 nm) 150 x 4.6 mm ID
Part No.:	HS12S05-1546WT
Eluent:	20 mM KH_2PO_4-K_2HPO_2 (pH 6.9)
Flow rate:	1.0 ml/min
Temperature:	37 °C
Detection:	UV at 254 nm

After use, the column was stored overnight without any washing procedure. The next day, the application was continued.

Its "hydrophilic" C18 surface gives Hydrosphere C18 the capability to show stable retention times even after 24 hours under these chromatographic conditions.

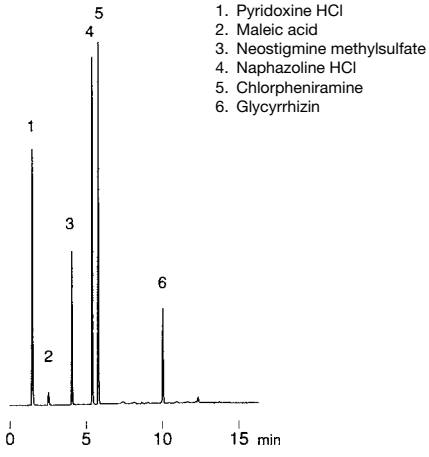
No ion pair reagent required*



Catecholamines

Column:	Hydrosphere C18 (5 µm, 12 nm) 150 x 4.6 mm ID
Part No.:	HS12S05-1546WT
Eluent:	A) 50 mM KH_2PO_4 - H_3PO_4 (pH 3.1) B) 50 mM KH_2PO_4 - H_3PO_4 (pH 3.1) / acetonitrile (90/10) 0% B (0-5 min), 0-100% B (5-25 min, linear), 100% B (25-35 min)
Flow:	1.0 ml/min
Detection:	UV at 280 nm, 0.64 AUFS
Temperature:	30 °C
Injection:	10 µl (0.15 - 0.25 mg/ml)

Efficient separation of complex substance mixtures*



Ingredients in an eye drop

Column:	Hydrosphere C18 (3 µm, 12 nm) 50 x 4.6 mm ID
Part No.:	HS12S03-0546WT
Eluent:	A) 20 mM KH_2PO_4 - H_3PO_4 (pH 2.5) B) acetonitrile 0-60% B (0-10 min), 60% B (10-15 min)
Flow rate:	1.0 ml/min
Temperature:	37 °C
Detection:	UV at 265 nm, 0.128 AUFS
Injection:	5 µl (0.03 - 0.3 mg/ml)

For more applications please refer to our "Application Data Collections" or contact us directly.

Column care

Hydrosphere C18 is stable towards hydrolysis between pH 2.0-8.0 in up to 100% aqueous systems and a maximum of 50 °C. Remove acid and buffer salts before storage. Store the column in methanol / water = 70/30.

For detailed information please refer to the "Column Care and Use Instructions" which are shipped with each analytical column.

* Application data by courtesy YMC Co., Ltd.

Ordering Information

YMC-Pack *Pro* C18

Phase dimension	Column ID [mm]	Column length [mm]					Guard cartridges* with 10 mm length [pack of 5]
		30 (WT) / 33 (QT)	50	100	150	250	
12 nm 3 µm	2.1	AS12S03-H3Q1QT	AS12S03-05Q1QT	AS12S03-10Q1QT	AS12S03-15Q1QT	AS12S03-25Q1QT	AS12S03-01Q1GC
	3.0	AS12S03-H303QT	AS12S03-0503QT	AS12S03-1003QT	AS12S03-1503QT	AS12S03-2503QT	AS12S03-0103GC
	4.0	AS12S03-H304QT	AS12S03-0504QT	AS12S03-1004QT	AS12S03-1504QT	AS12S03-2504QT	AS12S03-0104GC
	4.6	AS12S03-0346WT	AS12S03-0546WT	AS12S03-1046WT	AS12S03-1546WT	AS12S03-2546WT	AS12S03-0104GC
12 nm 5 µm	2.1	AS12S05-H3Q1QT	AS12S05-05Q1QT	AS12S05-10Q1QT	AS12S05-15Q1QT	AS12S05-25Q1QT	AS12S05-01Q1GC
	3.0	AS12S05-H303QT	AS12S05-0503QT	AS12S05-1003QT	AS12S05-1503QT	AS12S05-2503QT	AS12S05-0103GC
	4.0	AS12S05-H304QT	AS12S05-0504QT	AS12S05-1004QT	AS12S05-1504QT	AS12S05-2504QT	AS12S05-0104GC
	4.6	AS12S05-0346WT	AS12S05-0546WT	AS12S05-1046WT	AS12S05-1546WT	AS12S05-2546WT	AS12S05-0104GC

*Guard cartridge holder required, part no. XPGCH-Q1

YMC-Pack *Pro* C8

Phase dimension	Column ID [mm]	Column length [mm]					Guard cartridges* with 10 mm length [pack of 5]
		30 (WT) / 33 (QT)	50	100	150	250	
12 nm 3 µm	2.1	OS12S03-H3Q1QT	OS12S03-05Q1QT	OS12S03-10Q1QT	OS12S03-15Q1QT	OS12S03-25Q1QT	OS12S03-01Q1GC
	3.0	OS12S03-H303QT	OS12S03-0503QT	OS12S03-1003QT	OS12S03-1503QT	OS12S03-2503QT	OS12S03-0103GC
	4.0	OS12S03-H304QT	OS12S03-0504QT	OS12S03-1004QT	OS12S03-1504QT	OS12S03-2504QT	OS12S03-0104GC
	4.6	OS12S03-0346WT	OS12S03-0546WT	OS12S03-1046WT	OS12S03-1546WT	OS12S03-2546WT	OS12S03-0104GC
12 nm 5 µm	2.1	OS12S05-H3Q1QT	OS12S05-05Q1QT	OS12S05-10Q1QT	OS12S05-15Q1QT	OS12S05-25Q1QT	OS12S05-01Q1GC
	3.0	OS12S05-H303QT	OS12S05-0503QT	OS12S05-1003QT	OS12S05-1503QT	OS12S05-2503QT	OS12S05-0103GC
	4.0	OS12S05-H304QT	OS12S05-0504QT	OS12S05-1004QT	OS12S05-1504QT	OS12S05-2504QT	OS12S05-0104GC
	4.6	OS12S05-0346WT	OS12S05-0546WT	OS12S05-1046WT	OS12S05-1546WT	OS12S05-2546WT	OS12S05-0104GC

*Guard cartridge holder required, part no. XPGCH-Q1

YMC-Pack *Pro* C4

Phase dimension	Column ID [mm]	Column length [mm]					Guard cartridges* with 10 mm length [pack of 5]
		30 (WT) / 33 (QT)	50	100	150	250	
12 nm 3 µm	2.1	BS12S03-H3Q1QT	BS12S03-05Q1QT	BS12S03-10Q1QT	BS12S03-15Q1QT	BS12S03-25Q1QT	BS12S03-01Q1GC
	3.0	BS12S03-H303QT	BS12S03-0503QT	BS12S03-1003QT	BS12S03-1503QT	BS12S03-2503QT	BS12S03-0103GC
	4.0	BS12S03-H304QT	BS12S03-0504QT	BS12S03-1004QT	BS12S03-1504QT	BS12S03-2504QT	BS12S03-0104GC
	4.6	BS12S03-0346WT	BS12S03-0546WT	BS12S03-1046WT	BS12S03-1546WT	BS12S03-2546WT	BS12S03-0104GC
12 nm 5 µm	2.1	BS12S05-H3Q1QT	BS12S05-05Q1QT	BS12S05-10Q1QT	BS12S05-15Q1QT	BS12S05-25Q1QT	BS12S05-01Q1GC
	3.0	BS12S05-H303QT	BS12S05-0503QT	BS12S05-1003QT	BS12S05-1503QT	BS12S05-2503QT	BS12S05-0103GC
	4.0	BS12S05-H304QT	BS12S05-0504QT	BS12S05-1004QT	BS12S05-1504QT	BS12S05-2504QT	BS12S05-0104GC
	4.6	BS12S05-0346WT	BS12S05-0546WT	BS12S05-1046WT	BS12S05-1546WT	BS12S05-2546WT	BS12S05-0104GC

*Guard cartridge holder required, part no. XPGCH-Q1

YMC-Pack *Pro* C18 RS

Phase dimension	Column ID [mm]	Column length [mm]					Guard cartridges* with 10 mm length [pack of 5]
		30 (WT) / 33 (QT)	50	100	150	250	
8 nm 3 µm	2.1	RS08S03-H3Q1QT	RS08S03-05Q1QT	RS08S03-10Q1QT	RS08S03-15Q1QT	RS08S03-25Q1QT	RS08S03-01Q1GC
	3.0	RS08S03-H303QT	RS08S03-0503QT	RS08S03-1003QT	RS08S03-1503QT	RS08S03-2503QT	RS08S03-0103GC
	4.0	RS08S03-H304QT	RS08S03-0504QT	RS08S03-1004QT	RS08S03-1504QT	RS08S03-2504QT	RS08S03-0104GC
	4.6	RS08S03-0346WT	RS08S03-0546WT	RS08S03-1046WT	RS08S03-1546WT	RS08S03-2546WT	RS08S03-0104GC
8 nm 5 µm	2.1	RS08S05-H3Q1QT	RS08S05-05Q1QT	RS08S05-10Q1QT	RS08S05-15Q1QT	RS08S05-25Q1QT	RS08S05-01Q1GC
	3.0	RS08S05-H303QT	RS08S05-0503QT	RS08S05-1003QT	RS08S05-1503QT	RS08S05-2503QT	RS08S05-0103GC
	4.0	RS08S05-H304QT	RS08S05-0504QT	RS08S05-1004QT	RS08S05-1504QT	RS08S05-2504QT	RS08S05-0104GC
	4.6	RS08S05-0346WT	RS08S05-0546WT	RS08S05-1046WT	RS08S05-1546WT	RS08S05-2546WT	RS08S05-0104GC

*Guard cartridge holder required, part no. XPGCH-Q1

Ordering Information

Hydrosphere C18

Phase dimension	Column ID [mm]	Column length [mm]					Guard cartridges* with 10 mm length [pack of 5]
		30 (WT) / 33 (QT)	50	100	150	250	
12 nm 3 µm	2.1	HS12S03-H3Q1QT	HS12S03-05Q1QT	HS12S03-10Q1QT	HS12S03-15Q1QT	HS12S03-25Q1QT	HS12S03-01Q1GC
	3.0	HS12S03-H303QT	HS12S03-0503QT	HS12S03-1003QT	HS12S03-1503QT	HS12S03-2503QT	HS12S03-0103GC
	4.0	HS12S03-H304QT	HS12S03-0504QT	HS12S03-1004QT	HS12S03-1504QT	HS12S03-2504QT	HS12S03-0104GC
	4.6	HS12S03-0346WT	HS12S03-0546WT	HS12S03-1046WT	HS12S03-1546WT	HS12S03-2546WT	HS12S03-0104GC
12 nm 5 µm	2.1	HS12S05-H3Q1QT	HS12S05-05Q1QT	HS12S05-10Q1QT	HS12S05-15Q1QT	HS12S05-25Q1QT	HS12S05-01Q1GC
	3.0	HS12S05-H303QT	HS12S05-0503QT	HS12S05-1003QT	HS12S05-1503QT	HS12S05-2503QT	HS12S05-0103GC
	4.0	HS12S05-H304QT	HS12S05-0504QT	HS12S05-1004QT	HS12S05-1504QT	HS12S05-2504QT	HS12S05-0104GC
	4.6	HS12S05-0346WT	HS12S05-0546WT	HS12S05-1046WT	HS12S05-1546WT	HS12S05-2546WT	HS12S05-0104GC

*Guard cartridge holder required, part no. XPGCH-Q1

For other dimensions please refer to page 247