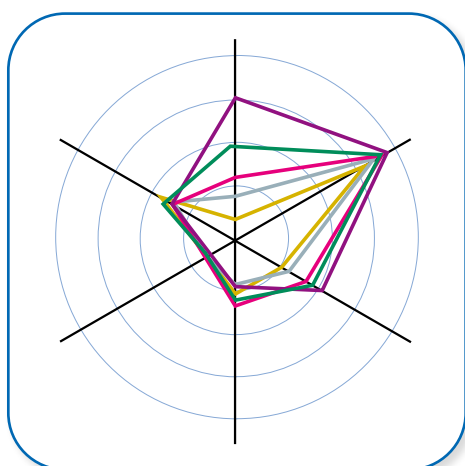
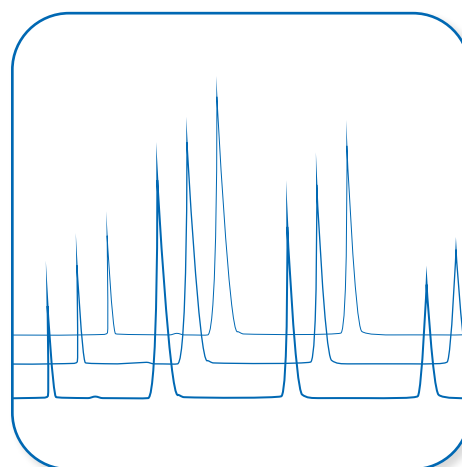




YMC  
ProFamily



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# YMC ProFamily

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

| Specifications                           | Pro C18                  | Pro C8    | Pro C4    | Pro C18 RS | Hydrosphere C18 |
|------------------------------------------|--------------------------|-----------|-----------|------------|-----------------|
| Particle size / $\mu\text{m}$            | 2; 3; 5                  | 3; 5      | 3; 5      | 3; 5       | 2; 3; 5         |
| Pore size / nm                           | 12                       | 12        | 12        | 8          | 12              |
| Surface area / $\text{m}^2\text{g}^{-1}$ | 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             |

# YMC ProFamily

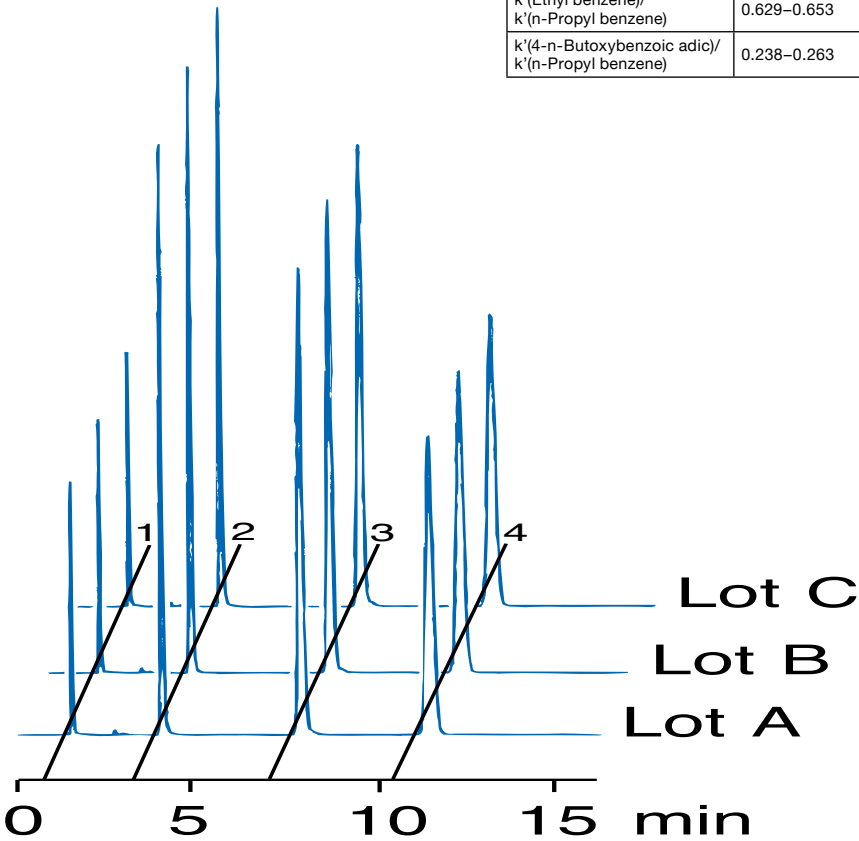
## Properties

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)/<br>k'(n-Propyl benzene)          | 0.629–0.653   |
| k'(4-n-Butoxybenzoic acid)/<br>k'(n-Propyl benzene) | 0.238–0.263   |



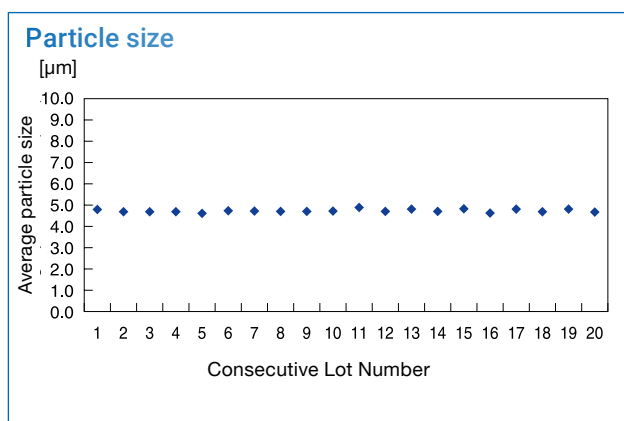
**HPLC Test A**  
Column: 150 x 4.6 mm ID  
Eluent: 20 mM KH<sub>2</sub>PO<sub>4</sub>-H<sub>3</sub>PO<sub>4</sub> (pH 3.5) / acetonitrile (40/60, v/v)  
Flow rate: 1.0 mL/min  
Detection: UV at 254nm  
Temperature: 37 °C

# YMC ProFamily

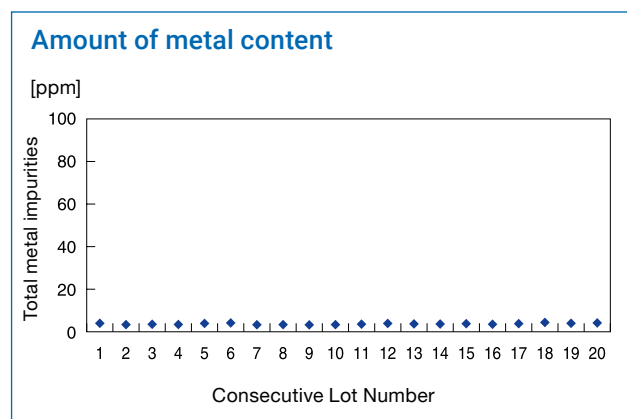
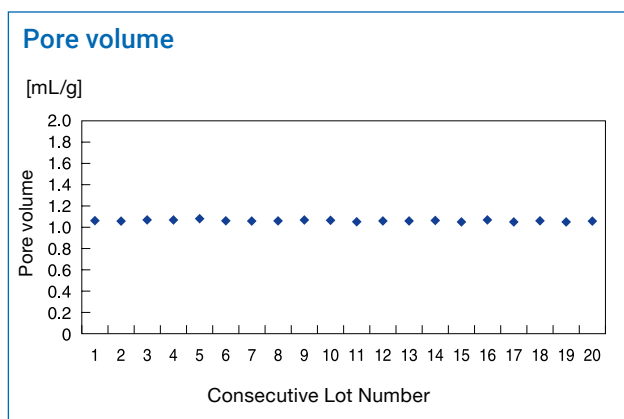
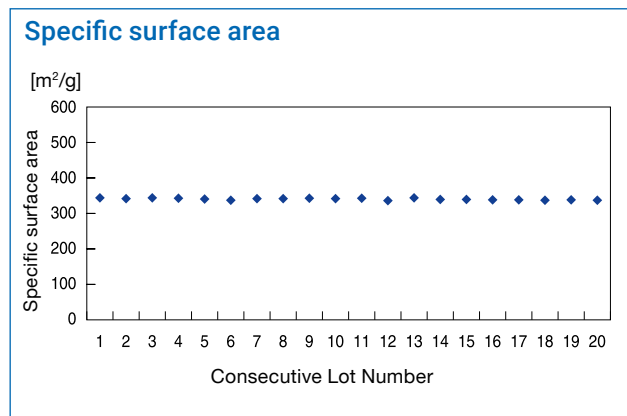
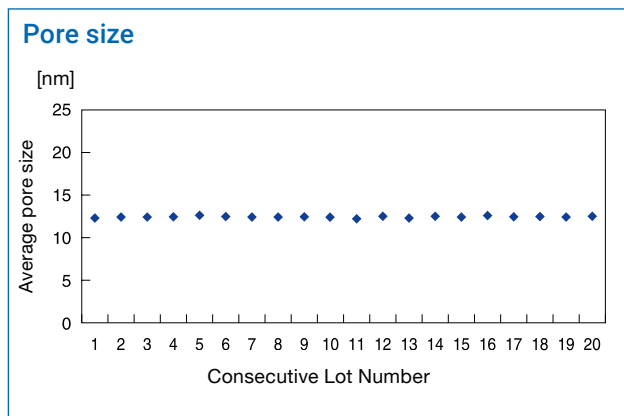
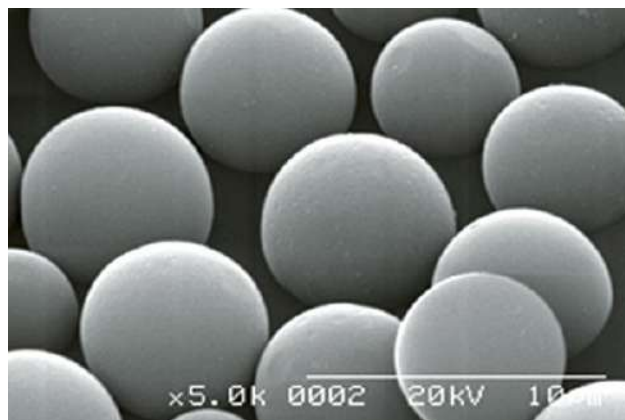
## Underlying silica gel support

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 $\mu\text{m}$ , 12 nm)



### Silica Support Material (5 $\mu\text{m}$ , 12 nm)

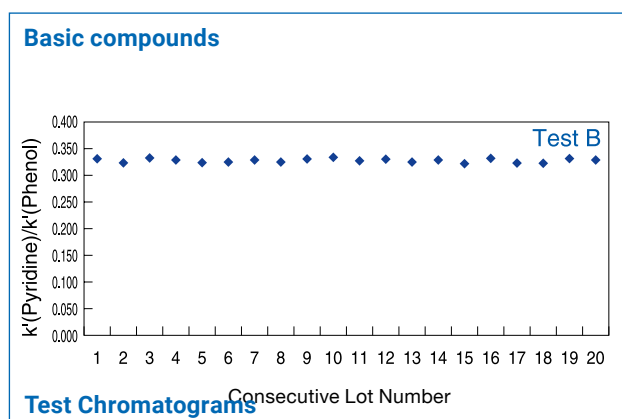
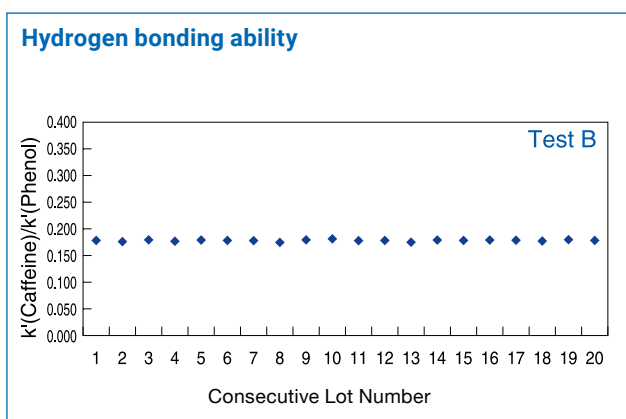
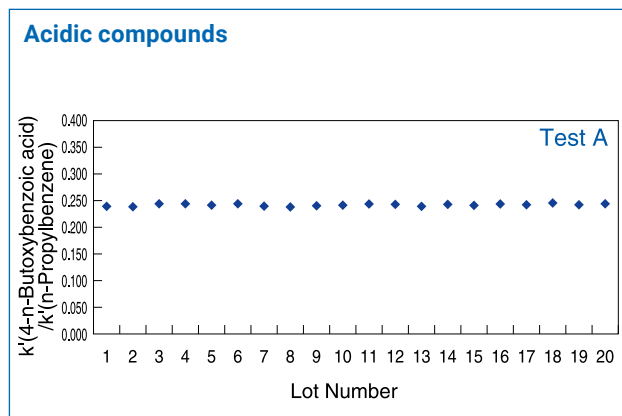
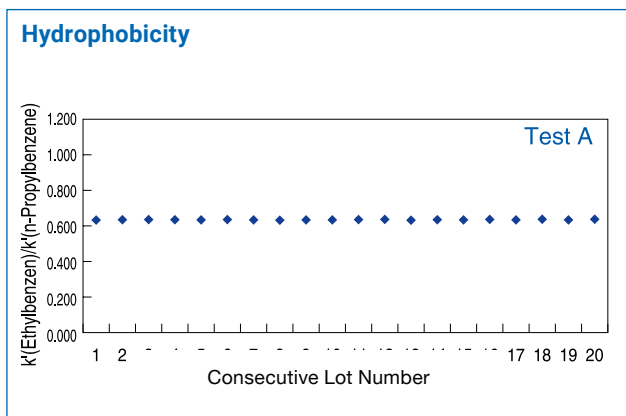
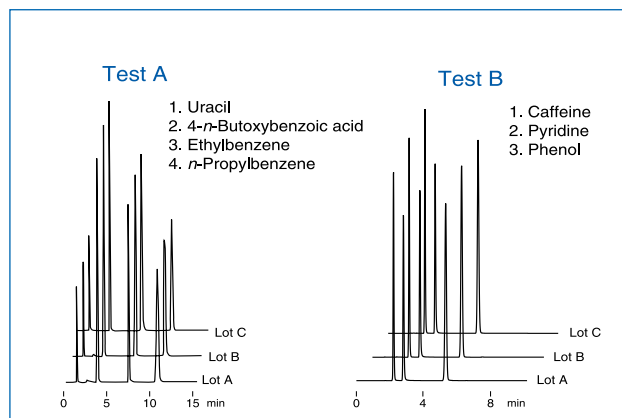
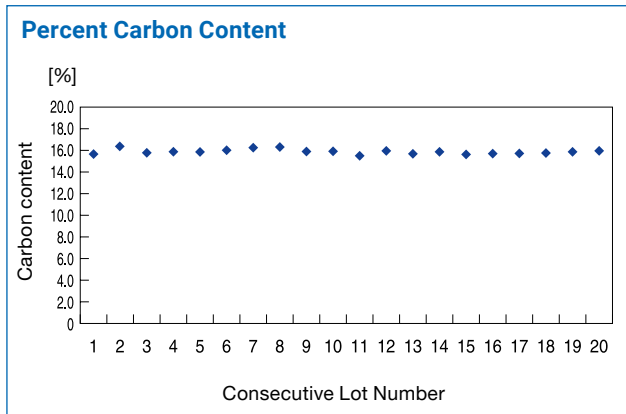


# YMC ProFamily

## Packing material

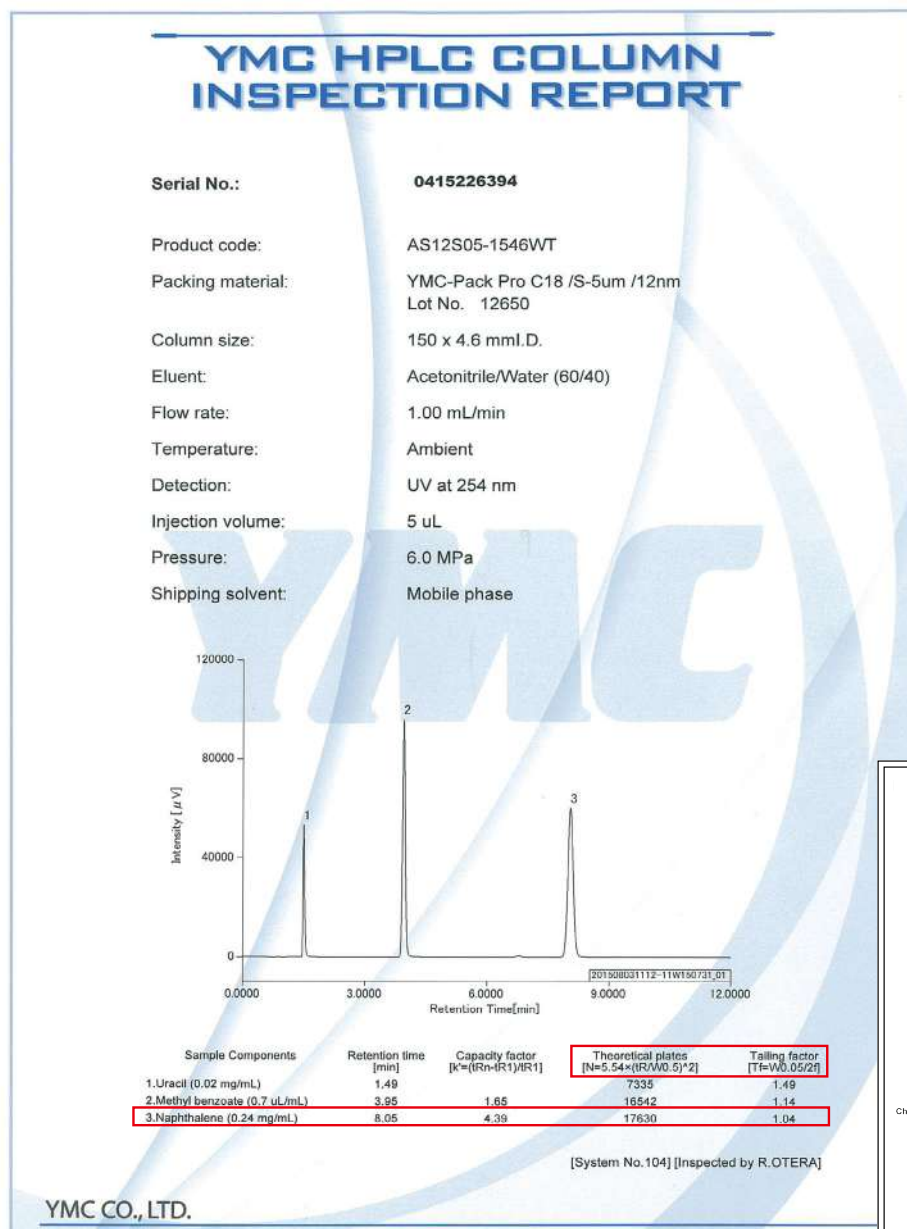
Excellent reproducibility of the Pro C18 is shown not only in the separation of hydrophobic compounds but also in that of hydrophilic, basic, and acidic compounds.

### Pro C18 5 $\mu$ m, Reproducibility between batches

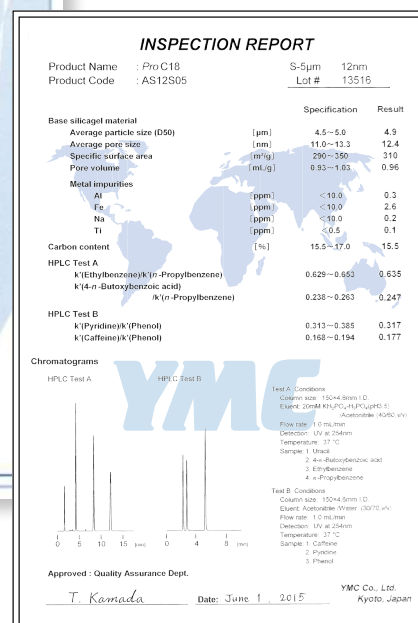


## YMC ProFamily

## Individual Column Test



## Individual Lot Test



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

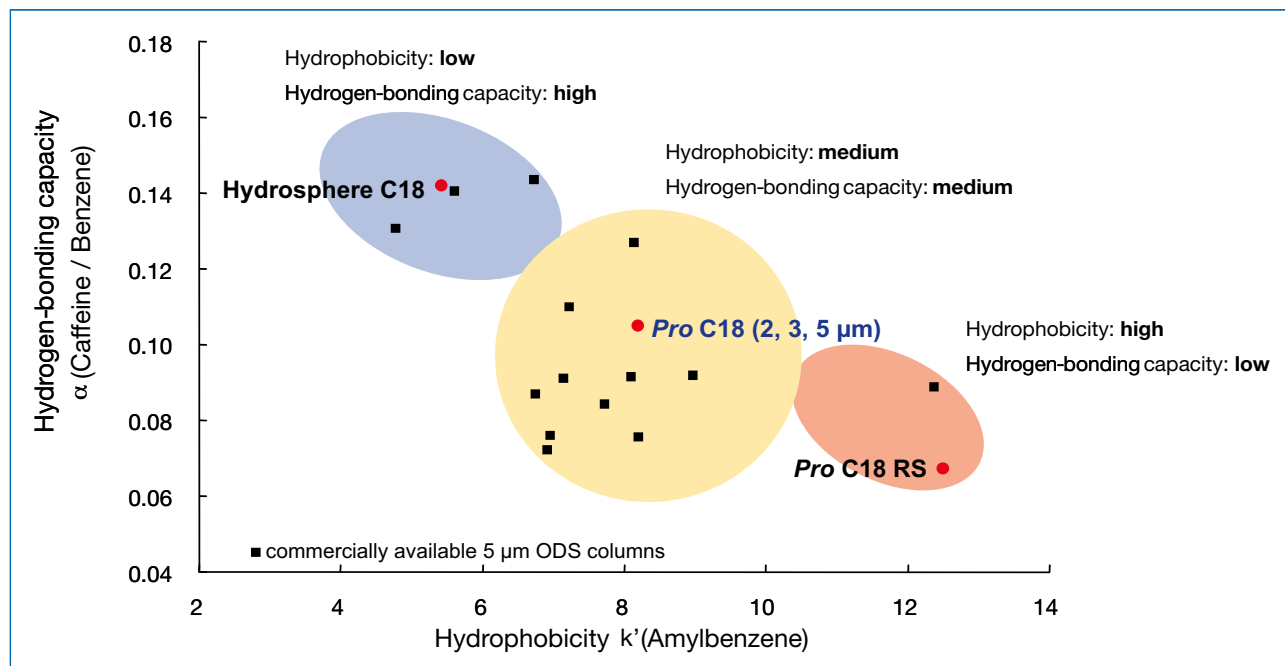
To give our customers an insight into the strict criteria with regard to the silica base, the bonded final product and the reproducible chromatographic behaviour, each column of the ProFamily is supplied with a lot inspection report and an individual column test chromatogram. The first report illustrates 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 a tailing factor of 0.90 to 1.15 (at 5% peak height for 5 μm particle size).

# YMC ProFamily

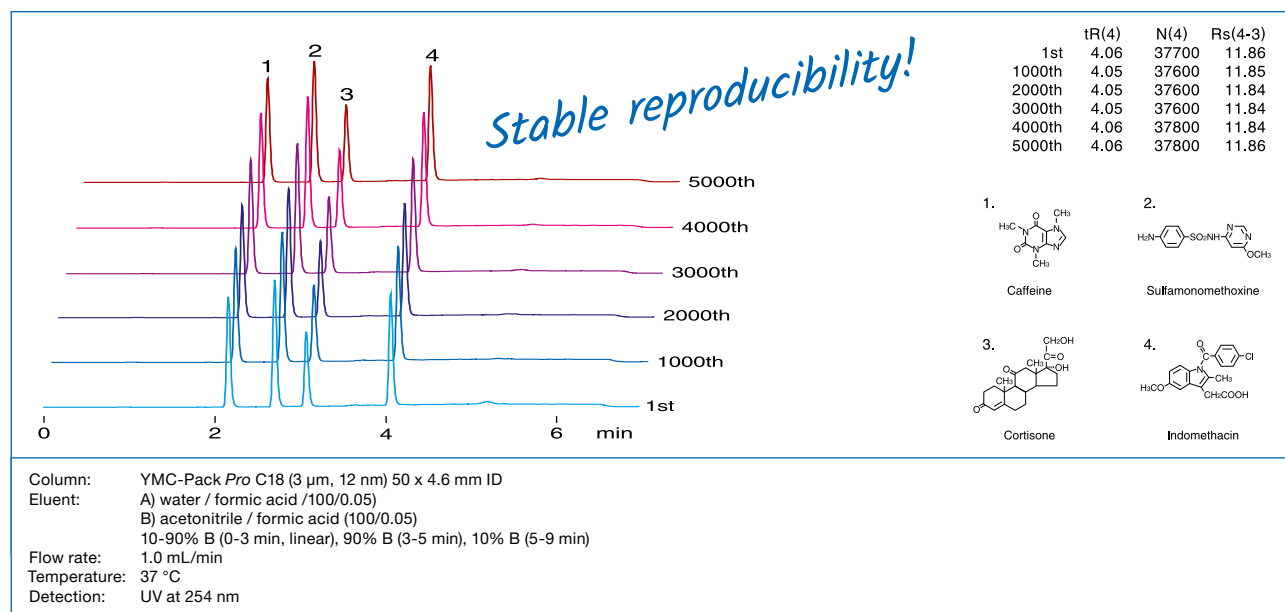
## Comparison of separative selectivity

The selectivity characteristics of each column are shown using hydrophobicity and hydrogen-bonding ability as indicators. The ProFamily series of ODS phases is designed to make Hydrosphere C18 and YMC-Pack Pro C18 RS have contrasting separation characteristics, with standard YMC-Pack 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.



## Stability for repetitive analysis

The long-term stability of a YMC-Pack 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 months) during gradient analysis.

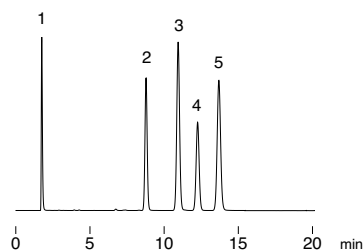


# YMC ProFamily

## Hydrophobicity and steric selectivity

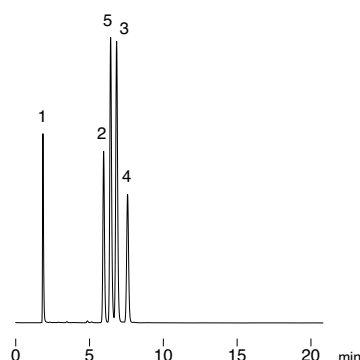
This comparison shows the different properties of the ProFamily members giving a good indication on their potential for method development. The compounds 1. uracil (dead volume marker) 2. n-butylbenzene 3. o-terphenyl 4. n-amylobenzene and 5. triphenylene are used to determine the hydrophobicity (2. and 4.) and the steric selectivity (3. and 5.) of each ProFamily member under unbuffered chromatographic conditions.

YMC-Pack Pro C18



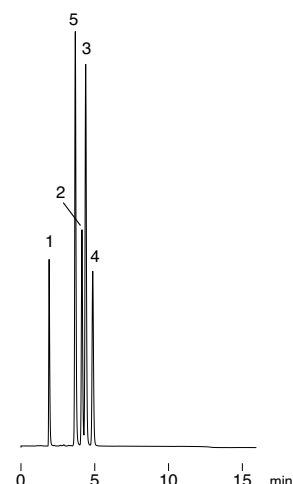
*balanced hydrogen bonding, capacity and hydrophobicity*

YMC-Pack Pro C8



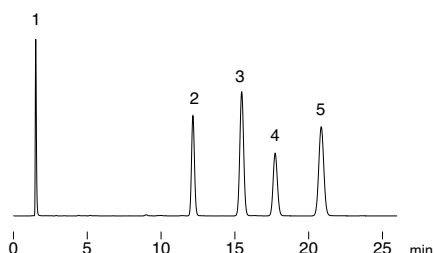
*lower hydrophobicity*

YMC-Pack Pro C4



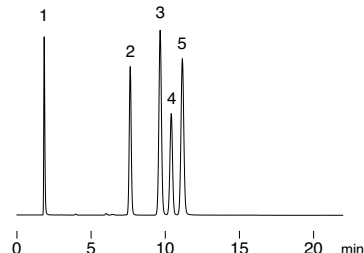
*lowest hydrophobicity*

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-Amylobenzene  
5. Triphenylene

The whole ProFamily 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.

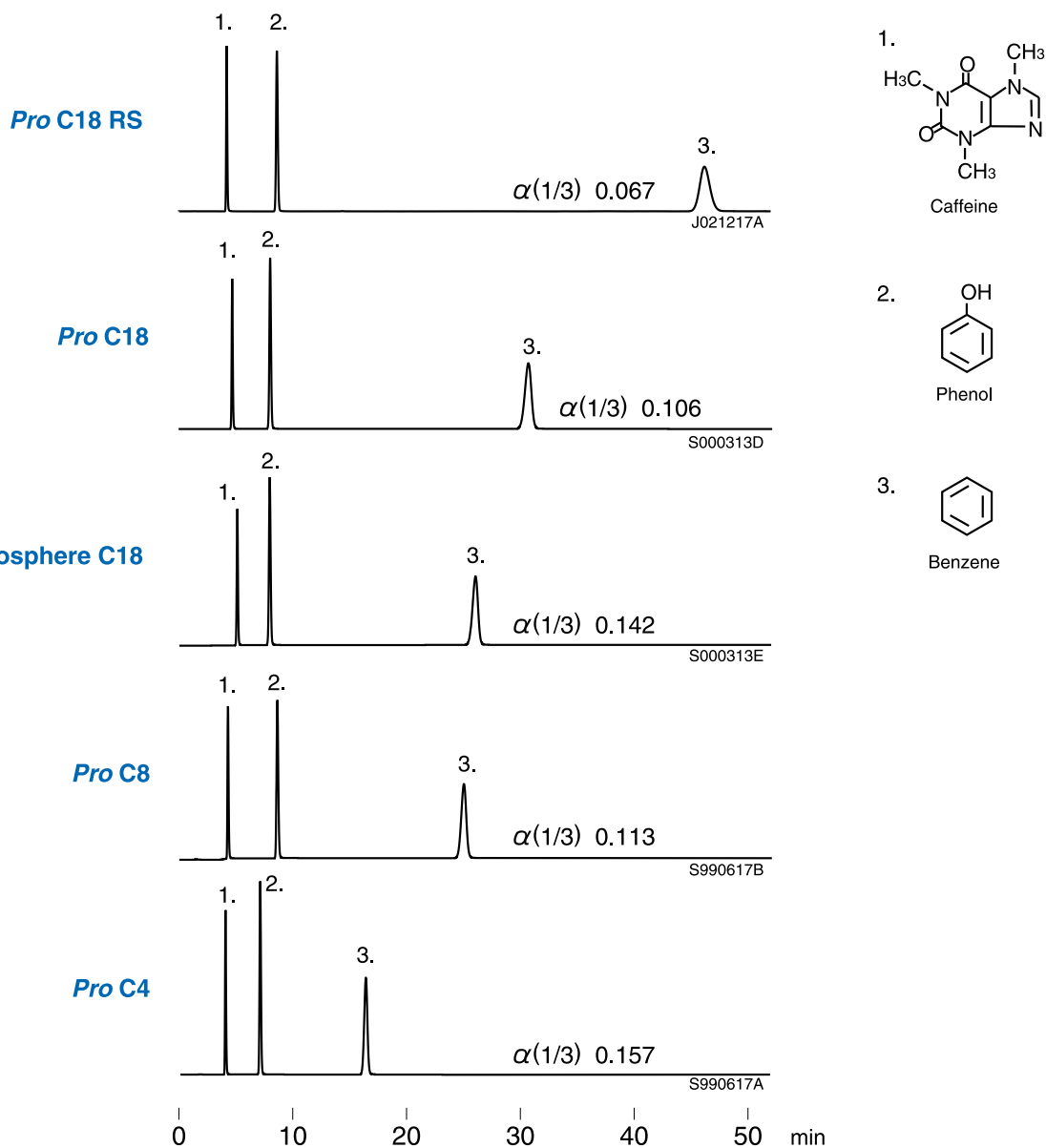
# YMC ProFamily

## Hydrogen bonding capacity

Hydrogen bonding capacity is evaluated by examining the relative retention coefficient as a (caffeine/benzene). Among the *ProFamily* series both Hydrosphere C18, with low density of C18, and YMC-Pack *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 packings have similar retention time, but show different selectivity.

### Hydrogen bonding capacity



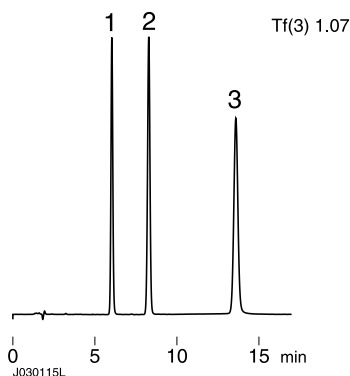
Column: 150 x 4.6 mm ID  
 Eluent: methanol / water (30/70)  
 Flow rate: 1.0 mL/min  
 Temperature: 37° C  
 Detection: UV at 254 nm

## YMC ProFamily

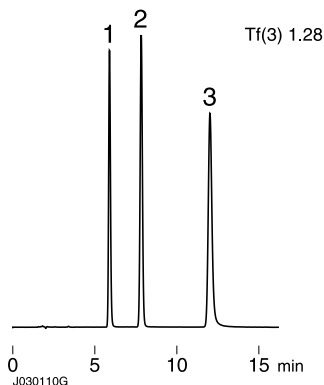
## Acidic and basic compounds

## Acidic compounds

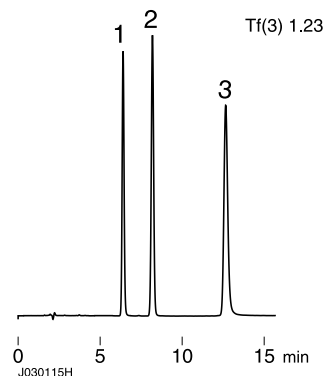
## Pro C18 RS



## Pro C18



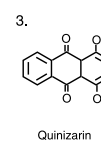
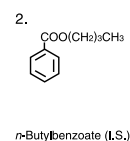
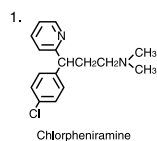
## Hydrosphere C18



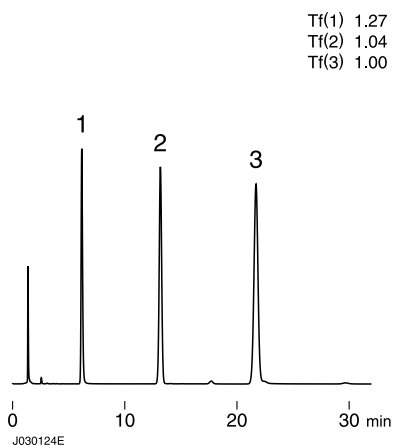
Column: 150 x 4.6 mm ID  
 Eluent: 20 mM CH<sub>3</sub>COONa-CH<sub>3</sub>COOH (pH 4.4) / acetonitrile (80/20)  
 Flow rate: 1.0 mL/min  
 Temperature: 37° C  
 Detection: UV at 230 nm

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

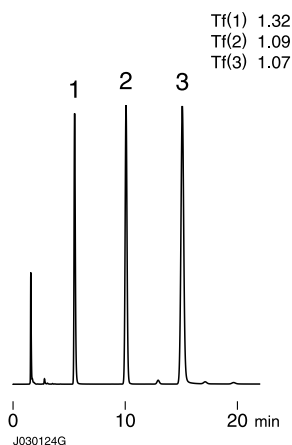
## Basic compounds



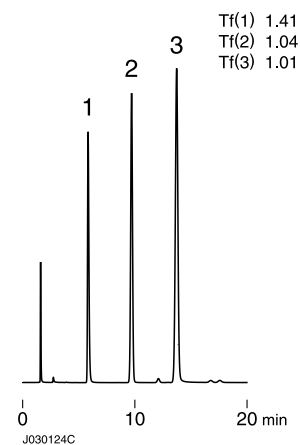
## Pro C18 RS



## Pro C18



## Hydrosphere C18



Column: 150 x 4.6 mm ID  
 Eluent: 20 mM KH<sub>2</sub>PO<sub>4</sub>-K<sub>2</sub>HPO<sub>4</sub> (pH 6.9) / methanol (30/70)  
 Flow rate: 1.0 mL/min  
 Temperature: 37° C  
 Detection: UV at 254 nm

# 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*

| Specifications                           | YMC-Pack Pro C18 |
|------------------------------------------|------------------|
| Particle size / $\mu\text{m}$            | 2; 3; 5          |
| Pore size / nm                           | 12               |
| Surface area / $\text{m}^2\text{g}^{-1}$ | 330              |
| Carbon content / %                       | 16               |
| Recommended pH range                     | 2.0 – 8.0        |

## Properties

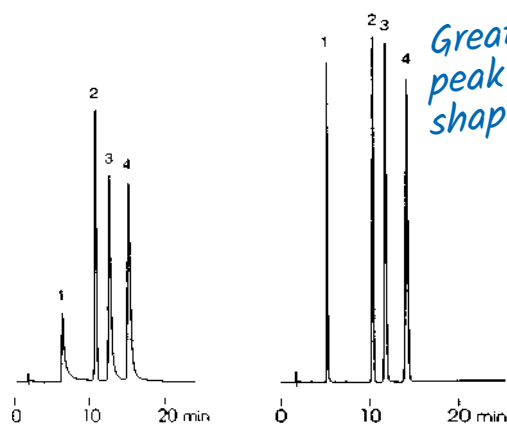
YMC-Pack *Pro* C18 is based on an ultra pure silica support, which is used for the whole *Pro*Family. Due to a proprietary endcapping process especially designed for this type of silica, YMC-Pack *Pro* C18 is perfectly suitable for the separation of acidic and basic molecules. The inertness of the silica 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

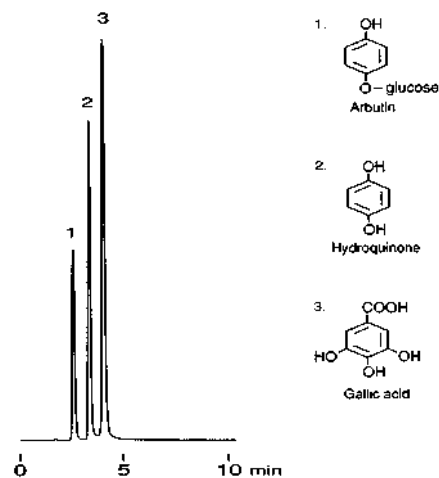
## YMC-Pack ODS-A

## YMC-Pack Pro C18



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 compatible separations



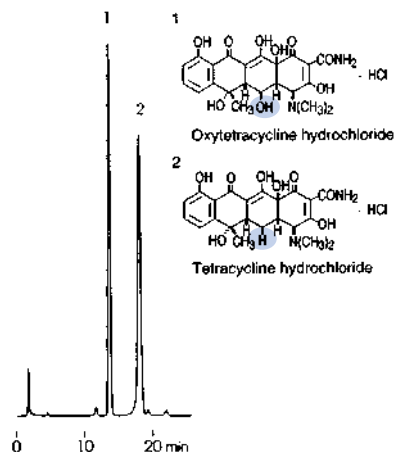
Column: YMC-Pack Pro C18 (3  $\mu$ m, 12 nm) 50 x 2.0 mm ID  
Eluent: 10 mM CH<sub>3</sub>COONH<sub>4</sub> / methanol (45/55)  
Flow rate: 0.2 mL/min  
Temperature: 37° C  
Detection: UV at 254 nm

# YMC-Pack Pro C18

## Applications

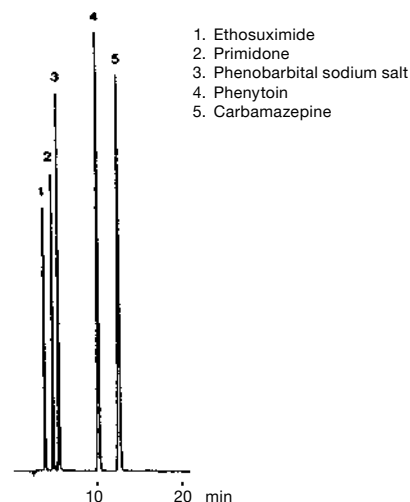
This small collection of applications can only give a brief insight into the multiple applications for Pro C18.

### Tetracycline antibiotics



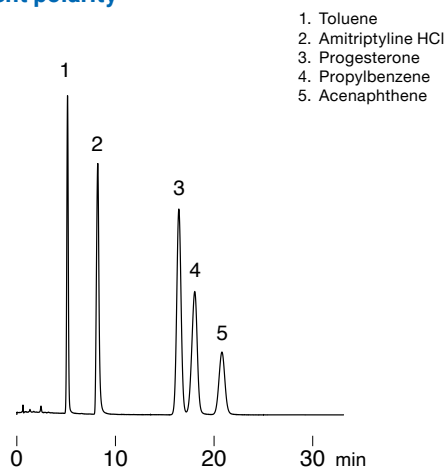
Column: YMC-Pack Pro C18 (5  $\mu$ m, 12 nm) 150 x 4.6 mm ID  
 Part No.: AS12S05-1546WT  
 Eluent: acetonitrile / 10 mM oxalic acid (10/90)  
 Flow: 1.0 mL/min  
 Detection: UV at 280 nm, 0.13 AUFS  
 Temperature: 37 °C  
 Injection: 6  $\mu$ L (0.2 mg/mL)

### Antiepileptics



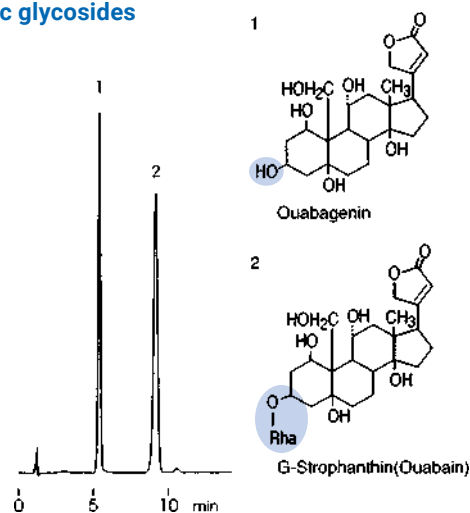
Column: YMC-Pack Pro C18 (5  $\mu$ m, 12 nm) 150 x 4.6 mm ID  
 Part No.: AS12S05-1546WT  
 Eluent: 50 mM  $\text{NH}_4\text{H}_2\text{PO}_4$ - $(\text{NH}_4)_2\text{HPO}_4$  (pH 6.7) / methanol (50/50)  
 Flow: 0.7 mL/min  
 Detection: UV at 215 nm, 0.32 AUFS  
 Temperature: 37 °C  
 Injection: 8  $\mu$ L (0.035 p 0.7 mg/mL)

### Baseline separation of compounds with different polarity



Column: YMC-Pack Pro C18 (3  $\mu$ m, 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  $\mu$ L (0.2 – 0.5 mg/mL)

### Cardiac glycosides



Column: YMC-Pack Pro C18 (5  $\mu$ m, 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  $\mu$ L (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 can be downloaded from [www.ymc.eu/download-library.html](http://www.ymc.eu/download-library.html).

# YMC-Pack Pro C8

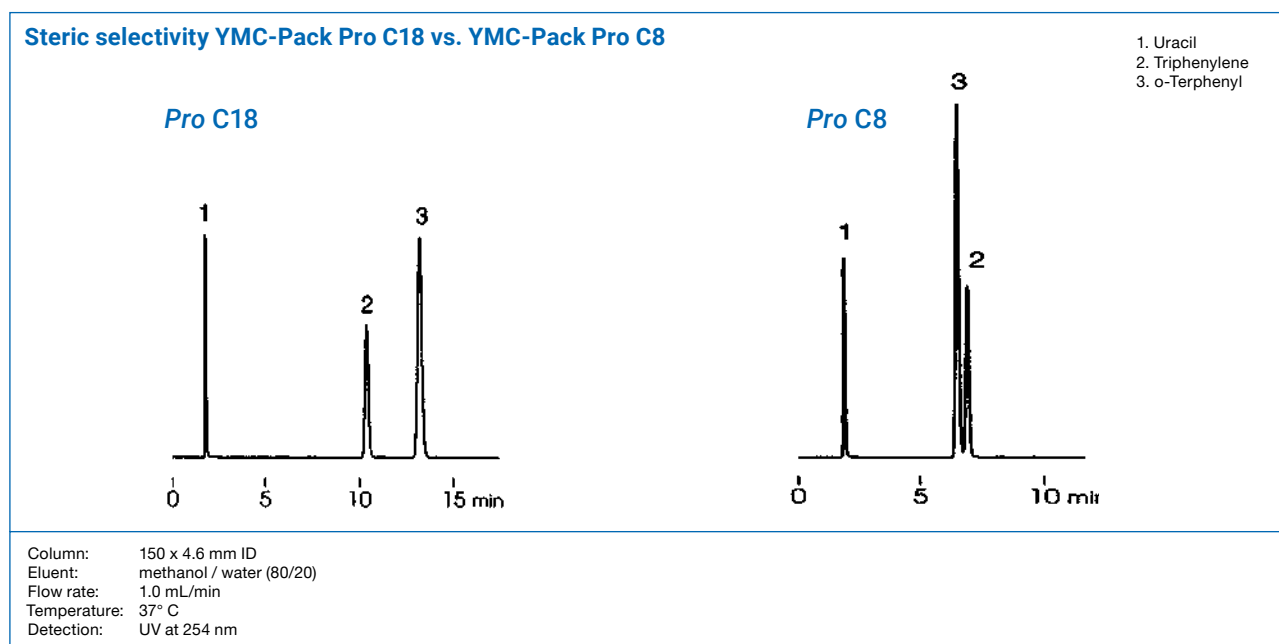
- *extremely broad selectivity pattern*
- *good alternative to C18 phases*
- *suitable for all types of organic molecules, especially basic pharmaceuticals*

| Specifications                           | YMC-Pack Pro C8 |
|------------------------------------------|-----------------|
| Particle size / $\mu\text{m}$            | 3; 5            |
| Pore size / nm                           | 12              |
| Surface area / $\text{m}^2\text{g}^{-1}$ | 330             |
| Carbon content / %                       | 10              |
| Recommended pH range                     | 2.0 – 7.5       |

## General

Within the *ProFamily*, 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

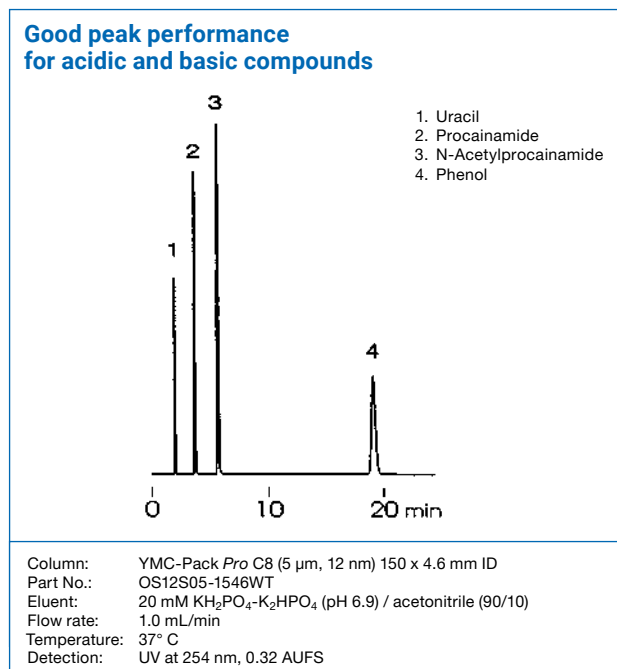
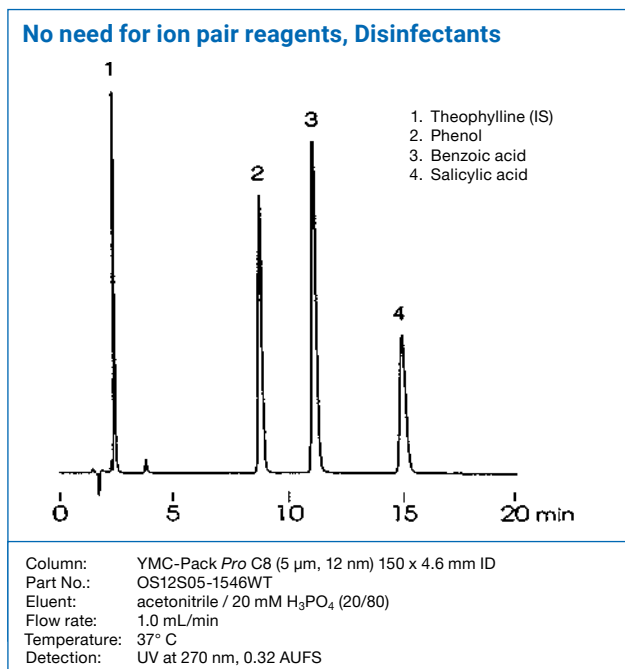
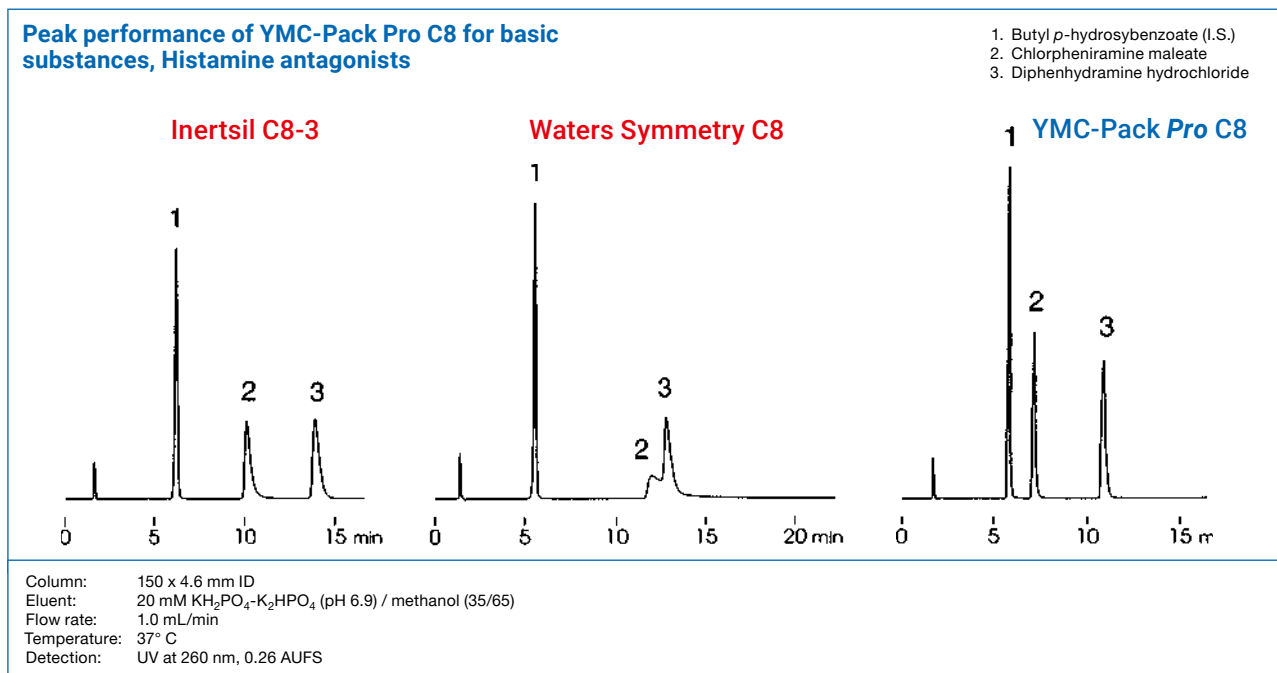
obtain satisfactory separation and low detection limits. In contrast, *Pro C8* with its ultra pure silica allows the analysis without these modifiers but still generates excellent chromatograms. In addition to the reduced hydrophobicity of YMC-Pack *Pro C8* compared with YMC-Pack *Pro C18*, the different steric selectivity offers new possibilities in method optimisation as demonstrated in the figure below:



The reversed elution order of triphenylene and o-terphenyl for the shorter C8 chains of YMC-Pack *Pro C8* illustrates the different steric recognition for steric-demanding substances.

# YMC-Pack Pro C8

YMC-Pack Pro C8 is a member of the ProFamily 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.



## 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 can be downloaded from [www.ymc.eu/download-library.html](http://www.ymc.eu/download-library.html).

# YMC-Pack Pro C4

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

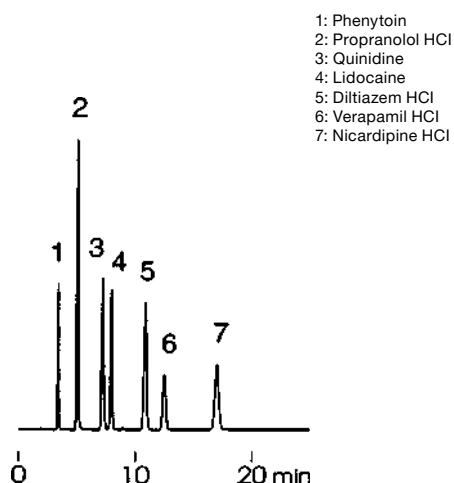
| Specifications                           | YMC-Pack Pro C4 |
|------------------------------------------|-----------------|
| Particle size / $\mu\text{m}$            | 3; 5            |
| Pore size / nm                           | 12              |
| Surface area / $\text{m}^2\text{g}^{-1}$ | 330             |
| Carbon content / %                       | 7               |
| Recommended pH range                     | 2.0 – 7.5       |

## General

More than 80% of the reversed phase 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 *ProFamily*. 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.

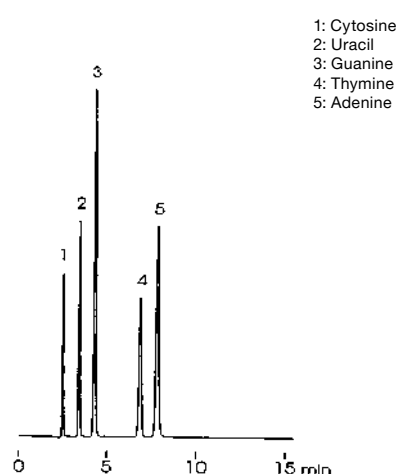
This makes the *Pro C4* an interesting alternative especially when short analysis times are required. For this reason, mixtures with a wide range of component polarity are best analysed by short chains, such as YMC-Pack *Pro C4*. Within the *ProFamily*, YMC-Pack *Pro C4* is the selectivity of choice to reduce time of analysis in combination with the given advantages of the *ProFamily*, 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  $\mu\text{m}$ , 12 nm) 150 x 4.6 mm ID  
Part No.: BS12S05-1546WT  
Eluent: 20 mM  $\text{KH}_2\text{PO}_4$ - $\text{K}_2\text{HPO}_4$  (pH 6.9) / methanol (40/60)  
Flow rate: 1.0 mL/min  
Temperature: 37° C  
Detection: UV at 220 nm

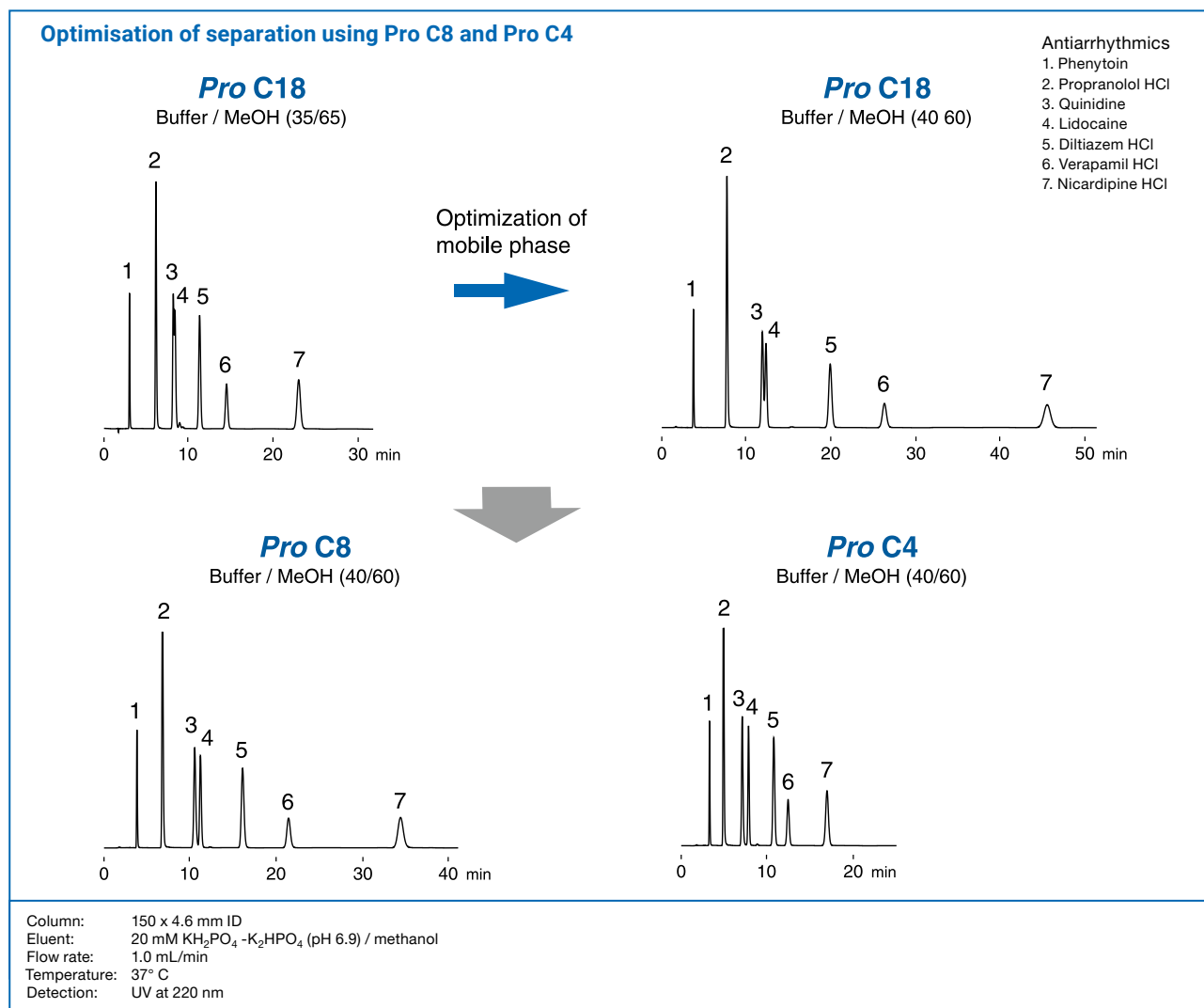
### Fast separation of nucleic acid bases, Nucleic acid bases



Column: YMC-Pack Pro C4 (5  $\mu\text{m}$ , 12 nm) 150 x 4.6 mm ID  
Part No.: BS12S05-1546WT  
Eluent: 20 mM  $\text{KH}_2\text{PO}_4$   
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.



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 replace-

ment. For detailed information please refer to the "Column Care and Use Instructions" which can be downloaded from [www.ymc.eu/download-library.html](http://www.ymc.eu/download-library.html).

# YMC-Pack Pro C18 RS

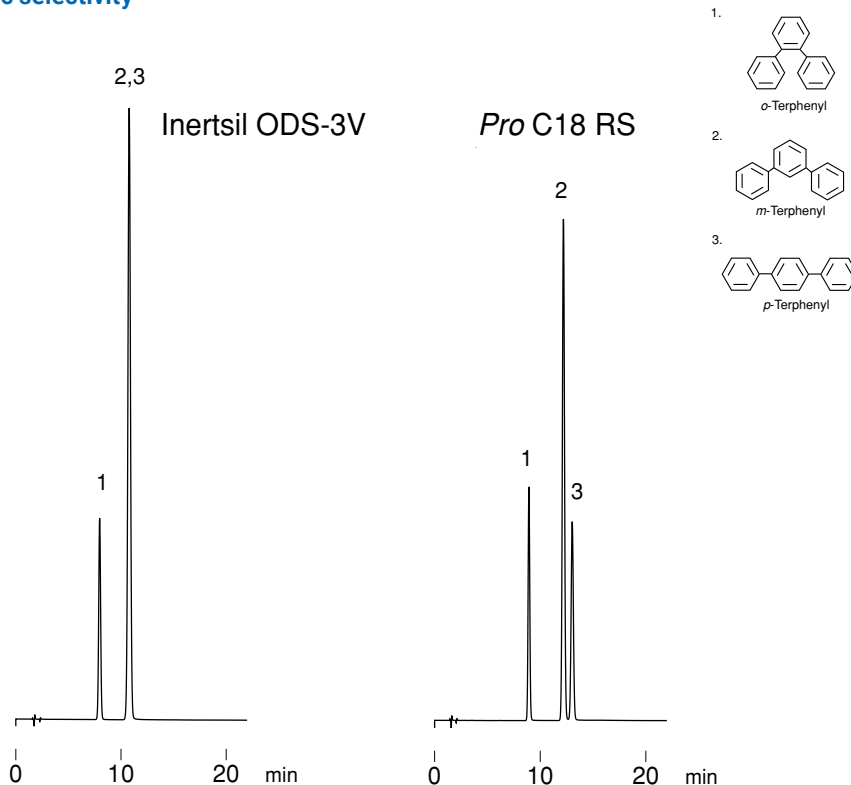
- *strongly hydrophobic due to carbon content of 22%*
- *exhibits extraordinary steric selectivity*
- *extended pH and temperature stability*
- *for the separation of hydrophobic, acidic and basic molecules*

| Specifications                           | YMC-Pack Pro C18 RS |
|------------------------------------------|---------------------|
| Particle size / $\mu\text{m}$            | 3; 5                |
| Pore size / nm                           | 8                   |
| Surface area / $\text{m}^2\text{g}^{-1}$ | 510                 |
| Carbon content / %                       | 22                  |
| Recommended pH range                     | 1.0 – 10.0*         |

## 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



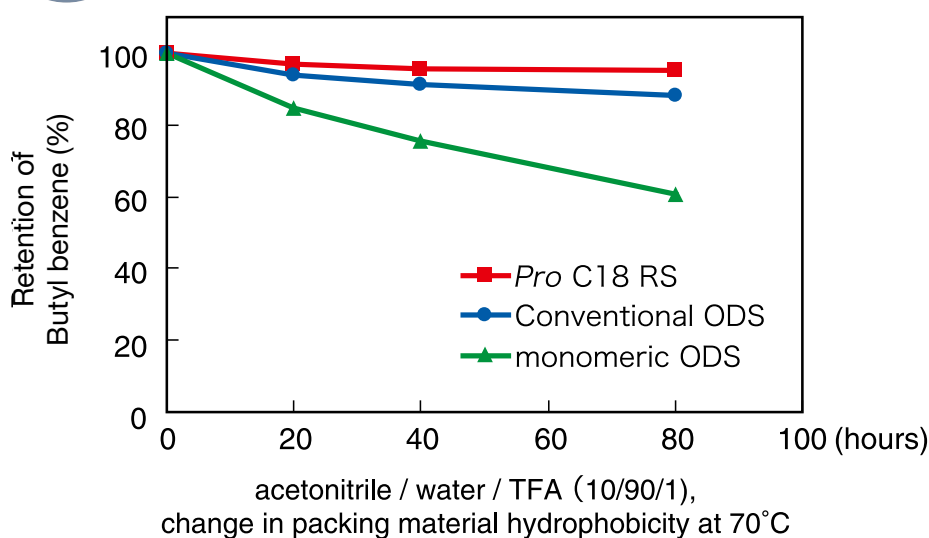
Column: 150 x 4.6 mm ID  
 Eluent: methanol / water (85/15)  
 Flow rate: 1.0 mL/min  
 Temperature: 37° C  
 Detection: UV at 254 nm

# YMC-Pack Pro C18 RS

## Stability under acidic conditions

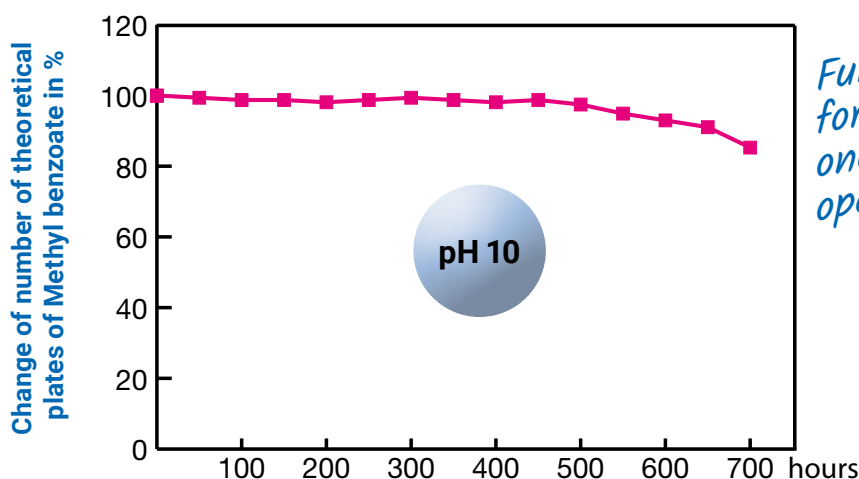
pH 1

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  $\text{H}_3\text{BO}_3$ -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

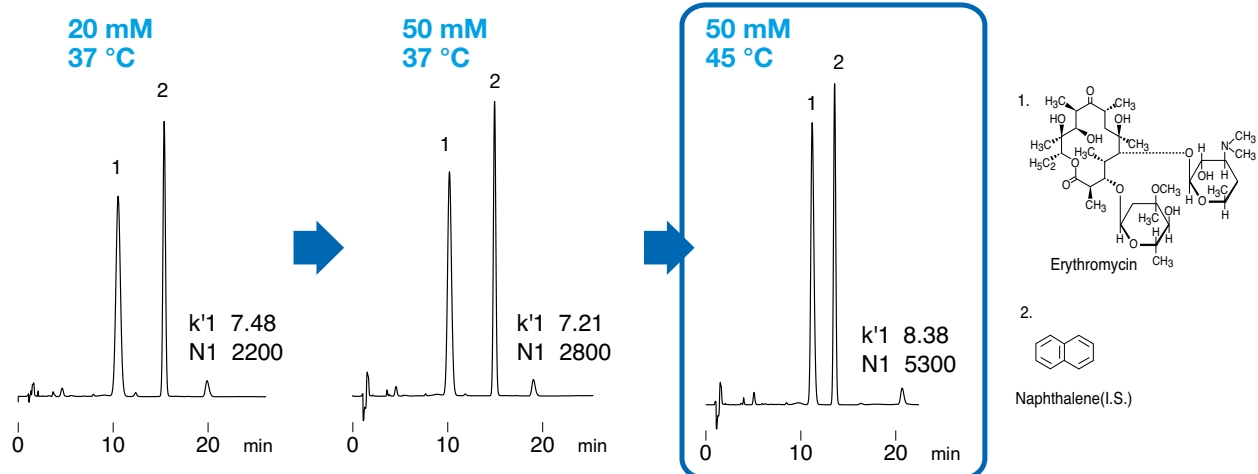
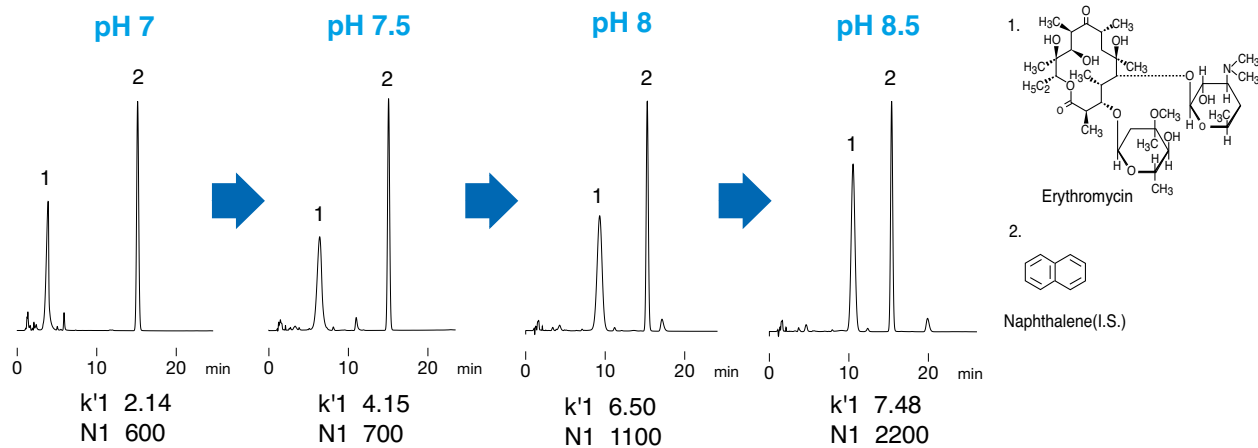
recycled, since the "active" basic sites may equilibrate to a saturation level with time, resulting in no further interactions taking place. Consequently, only continuous flow of "fresh" and thoroughly buffered eluent will provide accurate and meaningful performance data.

# 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



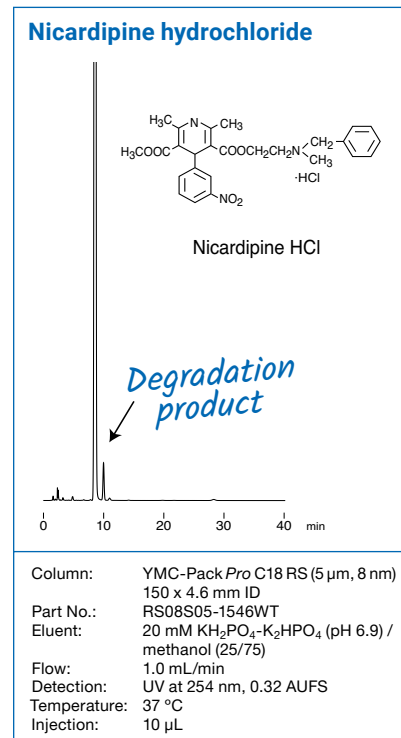
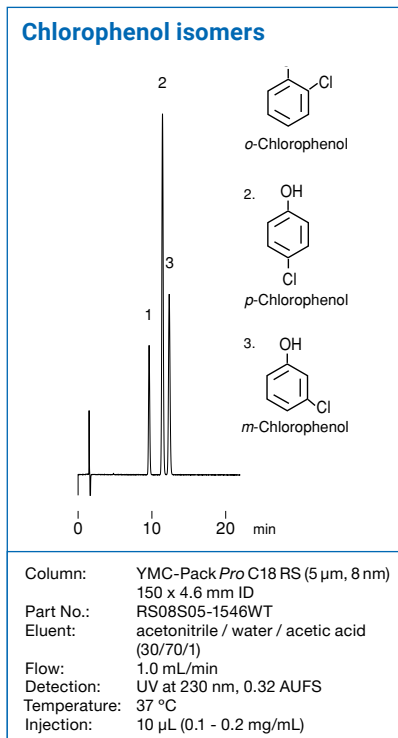
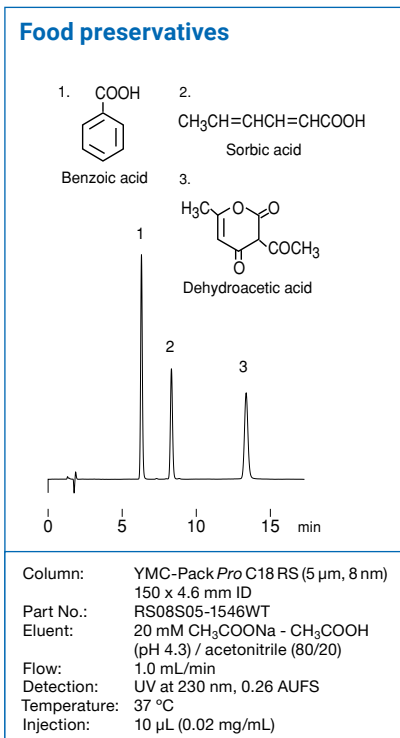
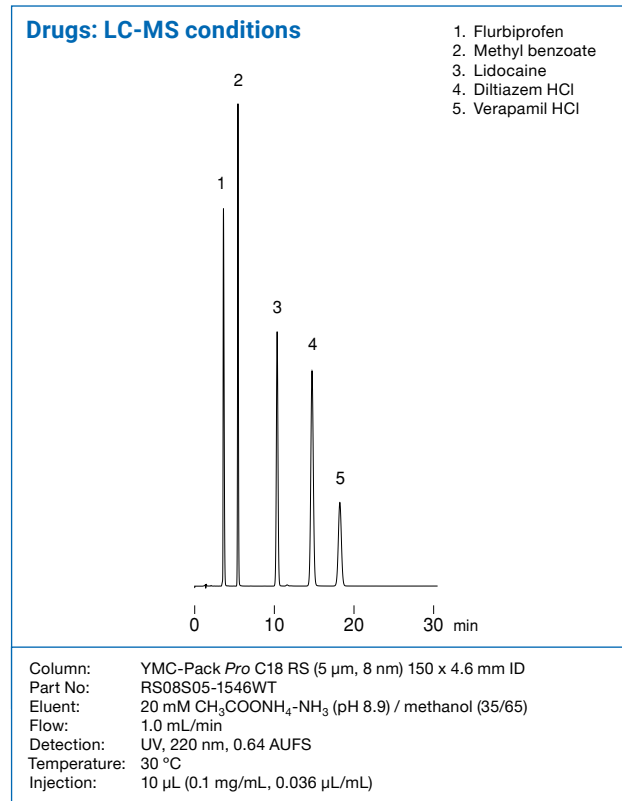
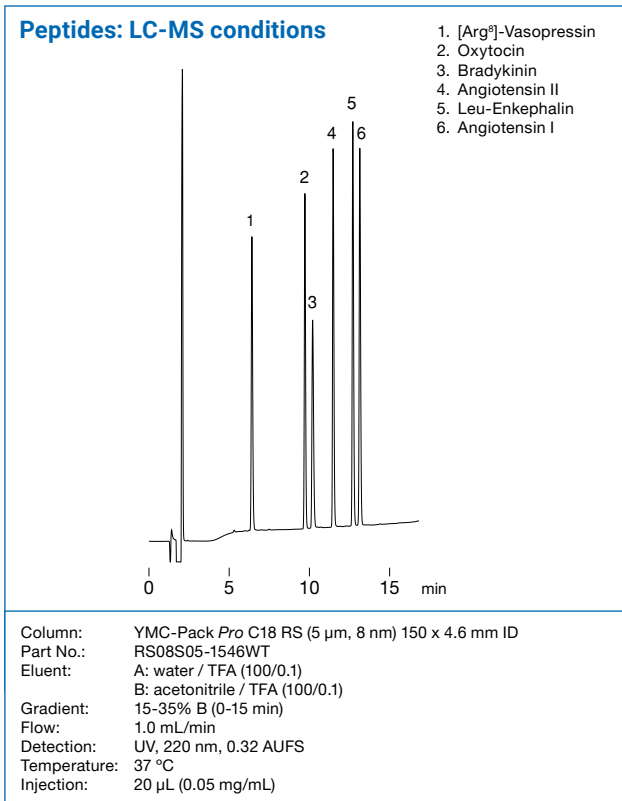
Column: YMC-Pack Pro C18 RS (5  $\mu$ m, 8 nm) 150 x 4.6 mm ID  
 Part No.: RS08S05-1546WT  
 Eluent: potassium phosphate buffer (pH 8.5) / acetonitrile (50/50)  
 Flow rate: 1.0 mL/min  
 Temperature: 37 °C  
 Detection: UV at 210 nm

# 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.**

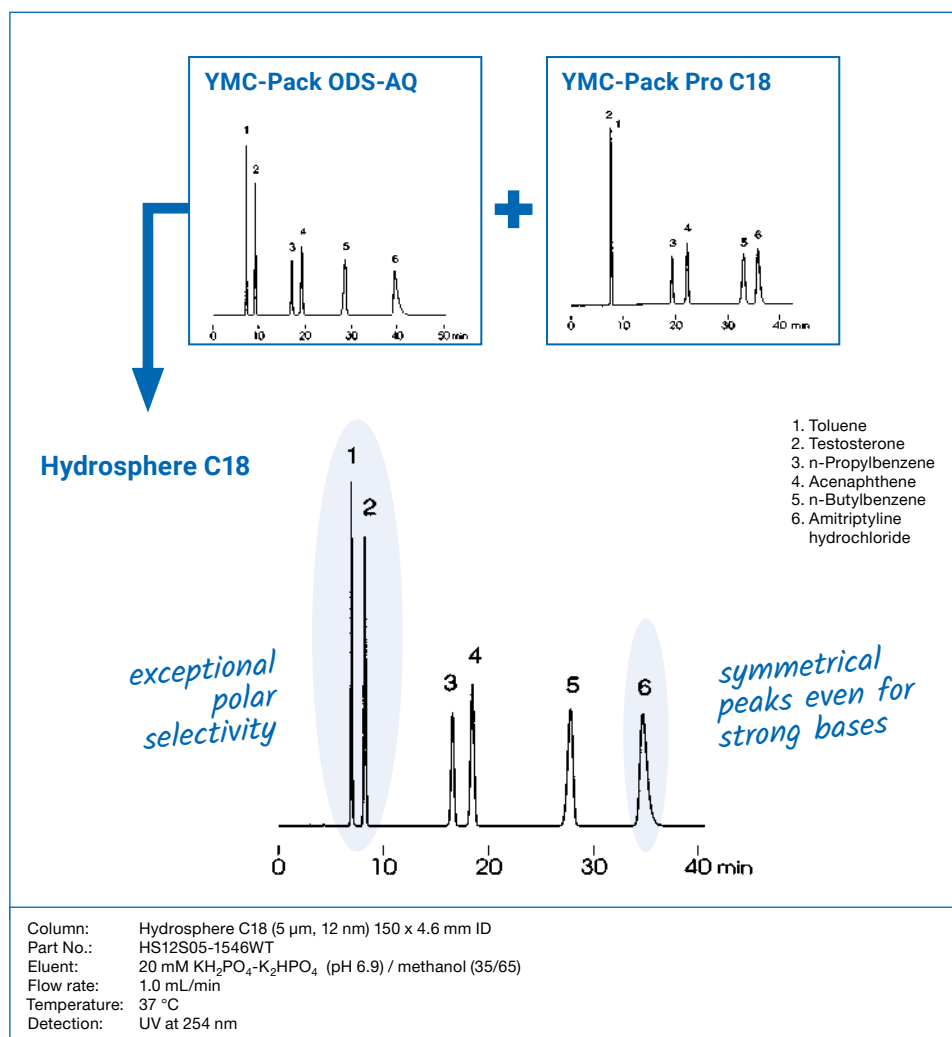


For more applications please refer to our "Application Data Collections" or contact us directly.

# 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*

| Specifications                           | Hydrosphere C18 |
|------------------------------------------|-----------------|
| Particle size / $\mu\text{m}$            | 2; 3; 5         |
| Pore size / nm                           | 12              |
| Surface area / $\text{m}^2\text{g}^{-1}$ | 330             |
| Carbon content / %                       | 12              |
| Recommended pH range                     | 2.0 – 8.0       |

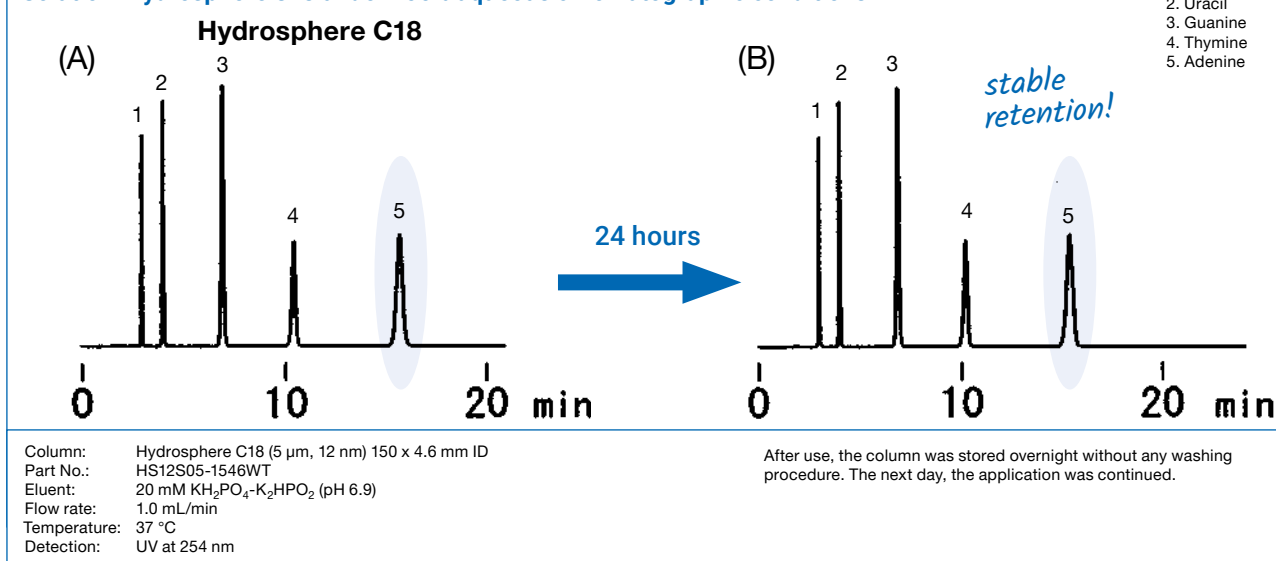


## General

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 ProFamily, 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.

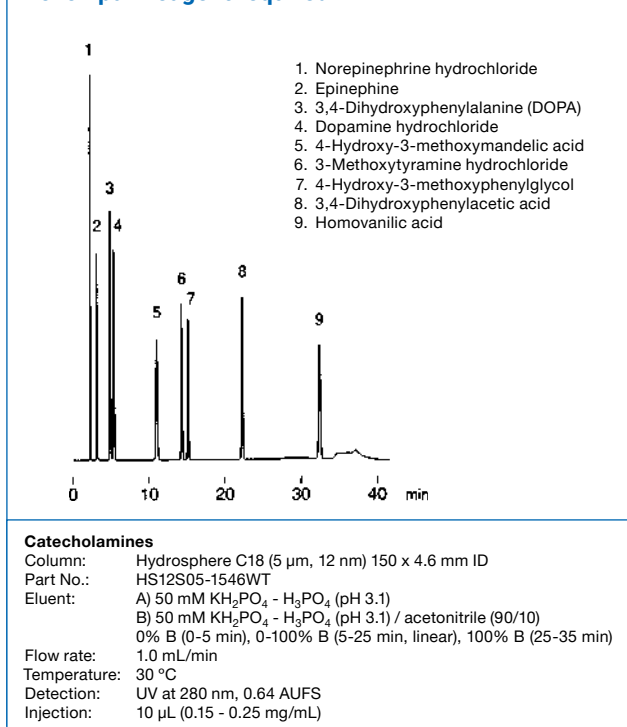
# Hydrosphere C18

## Solution: Hydrosphere C18 under 100% aqueous chromatographic conditions

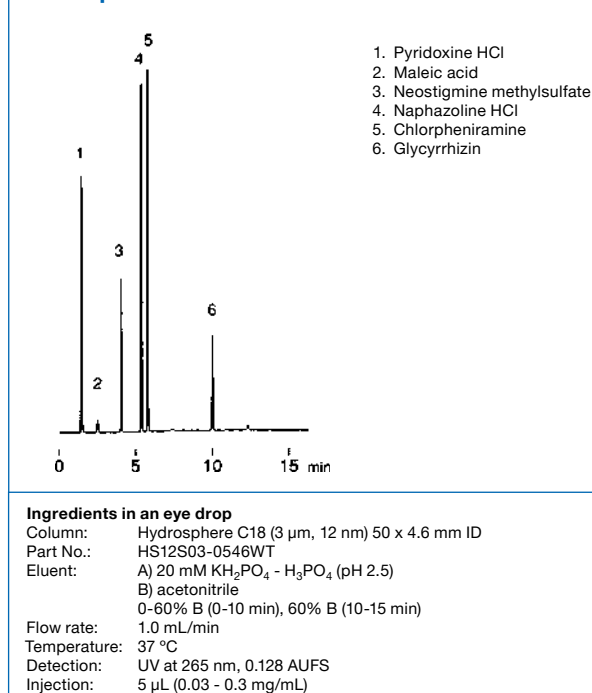


Its "hydrophilic" C18 surface gives Hydrosphere C18 the capability to show stable retention times even after 24 hours under these chromatographic conditions.

### No ion pair reagent required



### Efficient separation of complex substance mixtures



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 can be downloaded from [www.ymc.eu/download-library.html](http://www.ymc.eu/download-library.html).

## Ultra Fast LC Columns

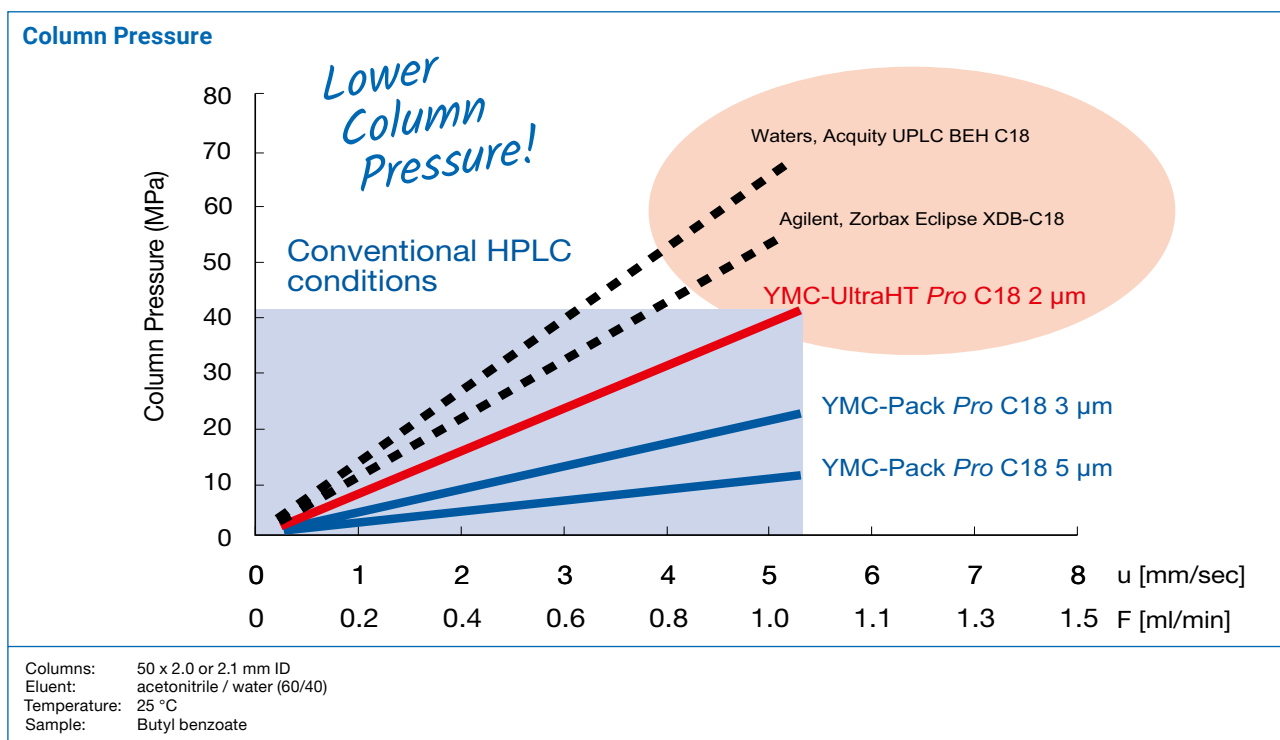
- *YMC Pack ProFamily chemistries, based on ultra high purity silica, provide excellent resolution for a wide range of analytes*
- *YMC-UltraHT LC columns provide considerable time saving without resort to ultra high pressures*
- *YMC-UltraHT LC columns achieve ultra fast separations even with conventional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

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

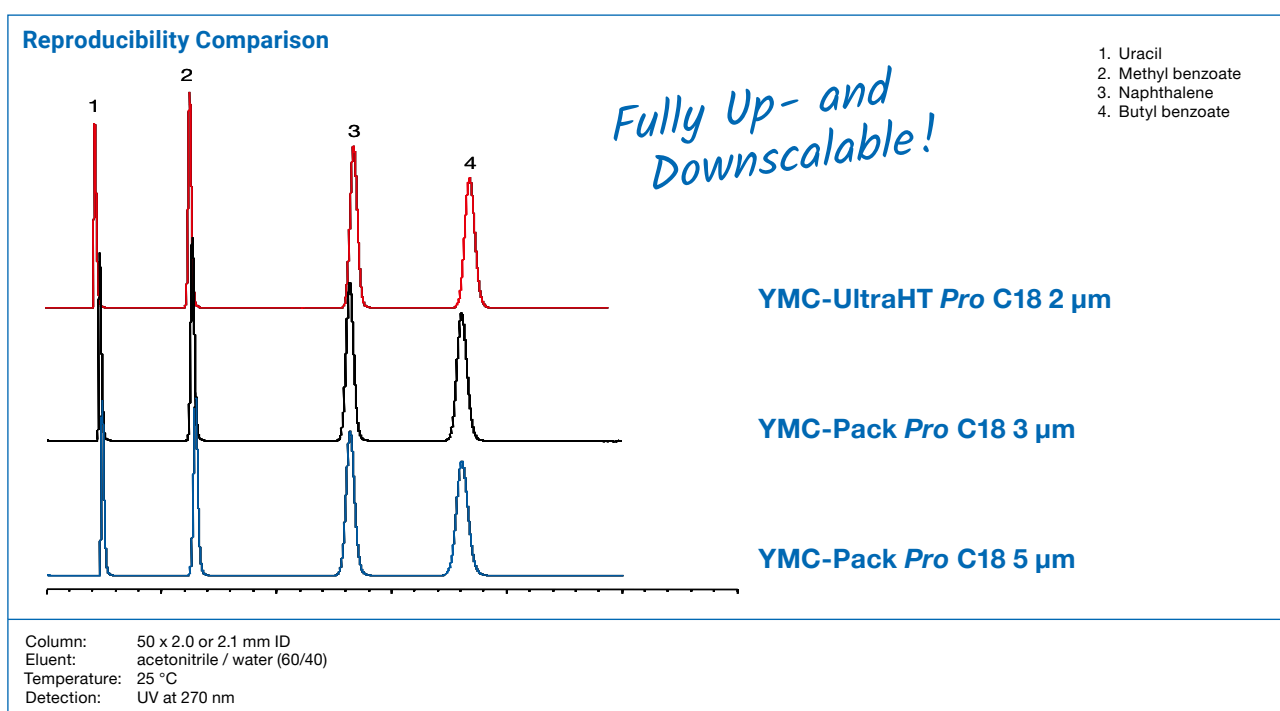
# Features of Packing Material

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  $\mu\text{m}$  particles from other manufacturers. Therefore YMC's UltraHT Pro C18 may not require dedicated HPLC equipment for providing outstanding column performances.



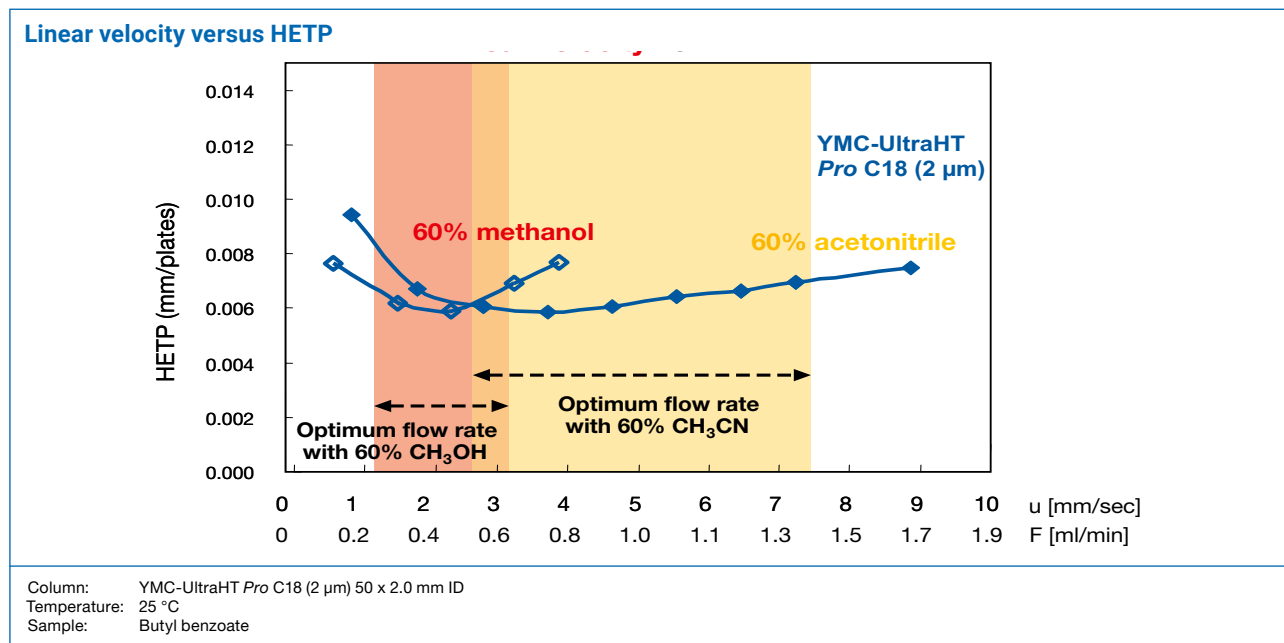
The introduction of YMC-UltraHT Pro C18 2  $\mu\text{m}$  allows easy downscaling of existing methods which use YMC-Pack Pro C18 3  $\mu\text{m}$  and 5  $\mu\text{m}$ .



# Features of Packing Material

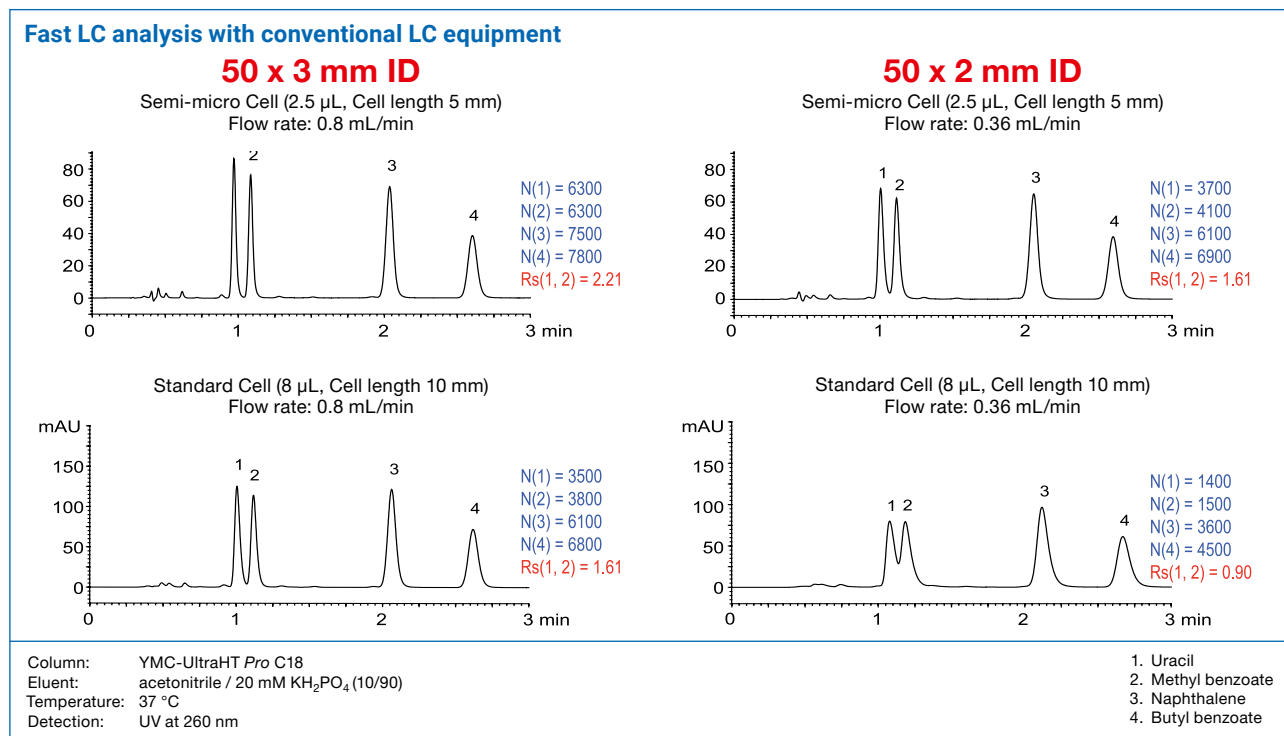
The graph below shows the dependency of "Height Equivalent of the Theoretical Plate" (HETP) and the linear velocity in the presence of different organic solvents. When methanol is used, the optimum HETP is achieved within a different range of velocity compared to when acetonitrile

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.

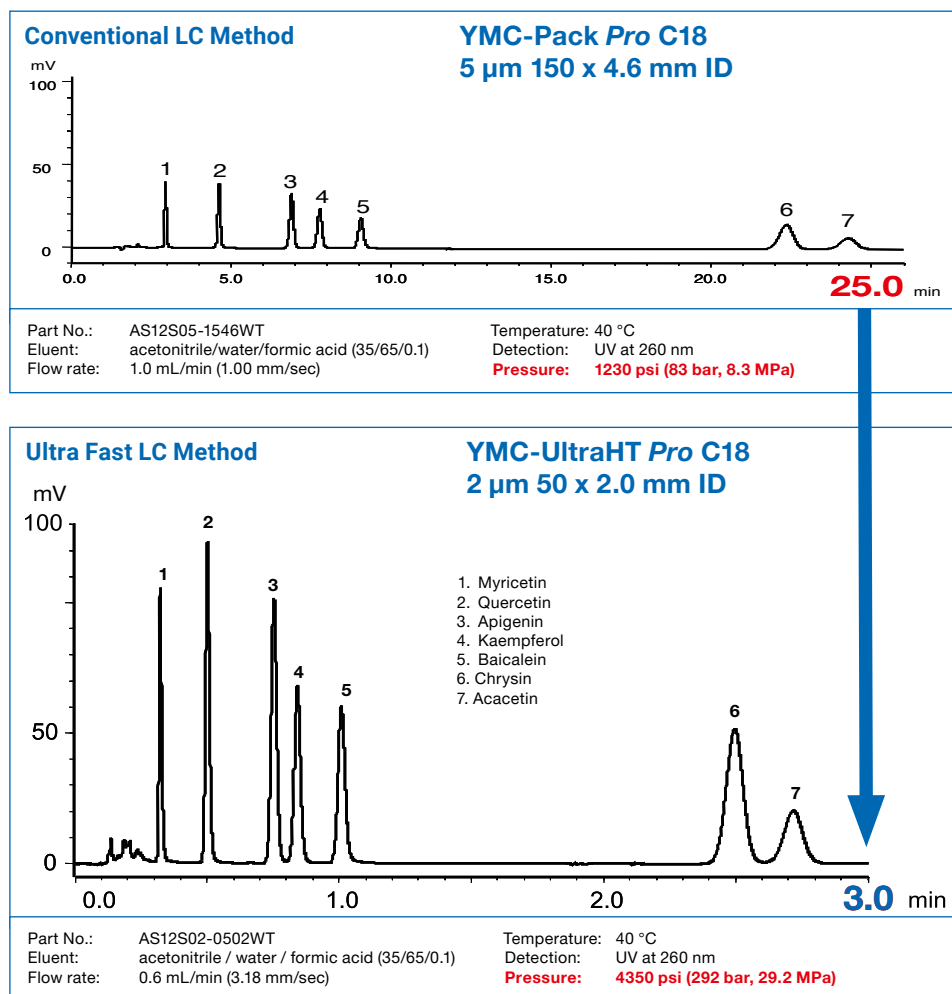


Since YMC-UltraHT columns provide substantially lower pressure drop than most competitive 2 µm or sub-2 µm media, high flow rates can be achieved without generating excessive back pressure and without the need for specialised equipment. Nevertheless, 3 mm ID columns are less

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.



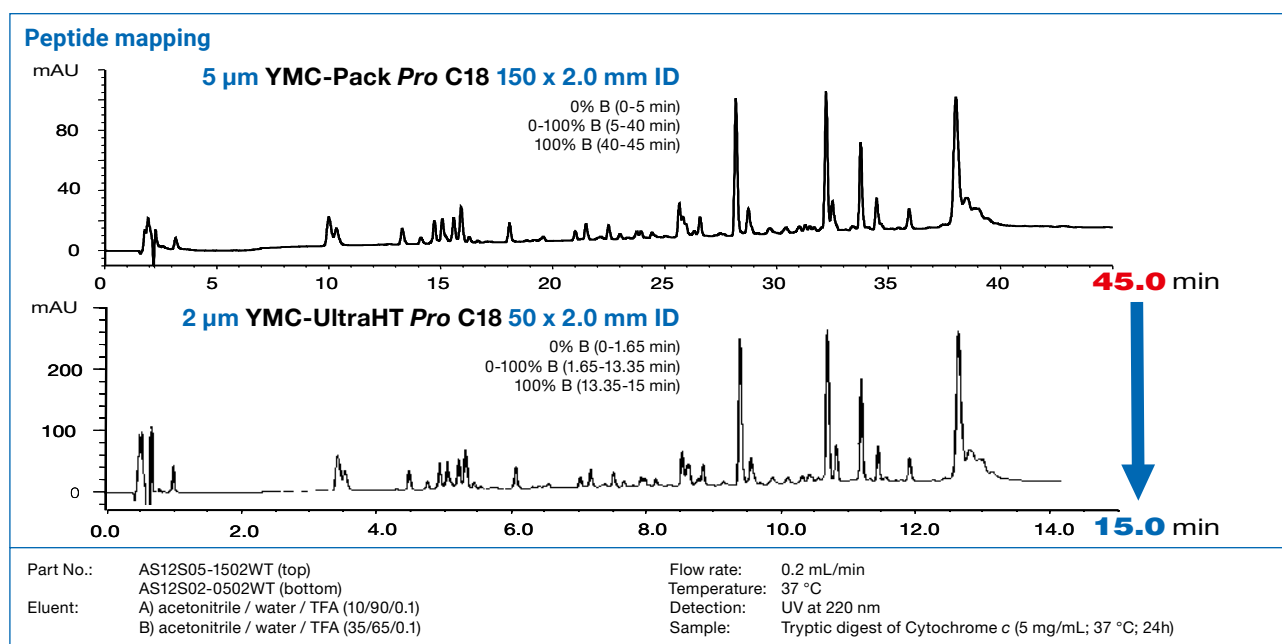
# Downscale of Methods



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

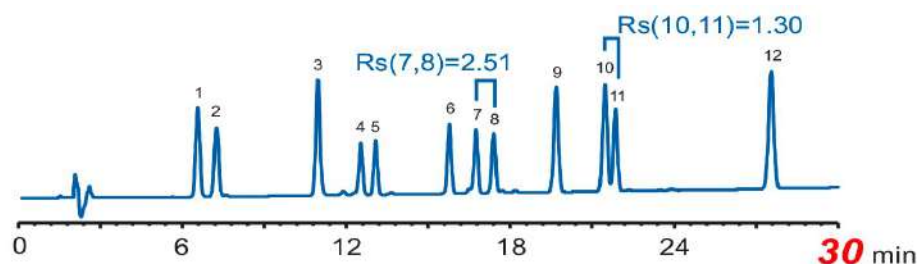
As the examples shown demonstrate, conventional HPLC methods can be transferred easily to Ultra Fast LC methods by choosing YMC-UltraHT columns to gain efficiency and significantly reduce analysis time.

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.

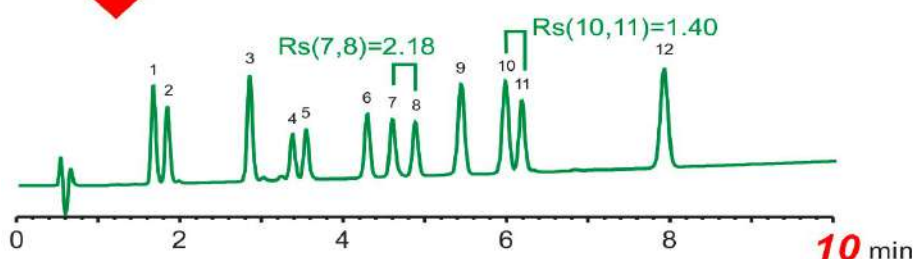


# Downscale of Methods

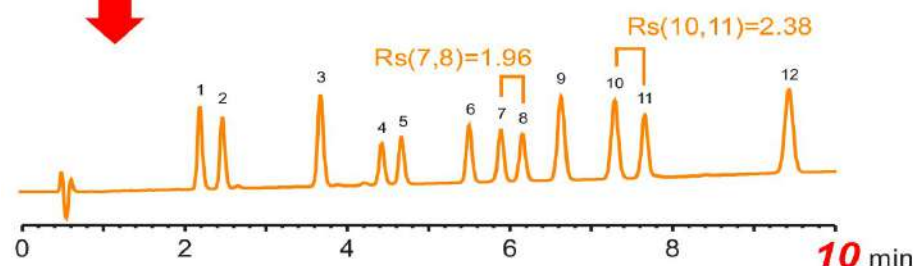
## Method transfer from conventional LC to Ultra Fast LC



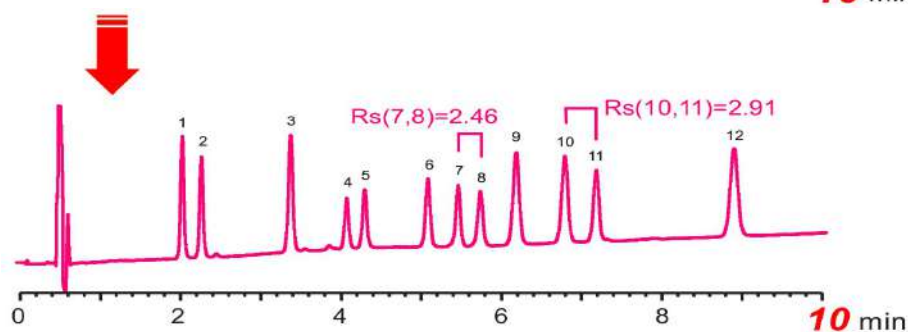
150 x 4.6 mm ID, 5  $\mu$ m  
15-35% ACN (0-30 min)  
1.0 mL/min  
10  $\mu$ L Inj.



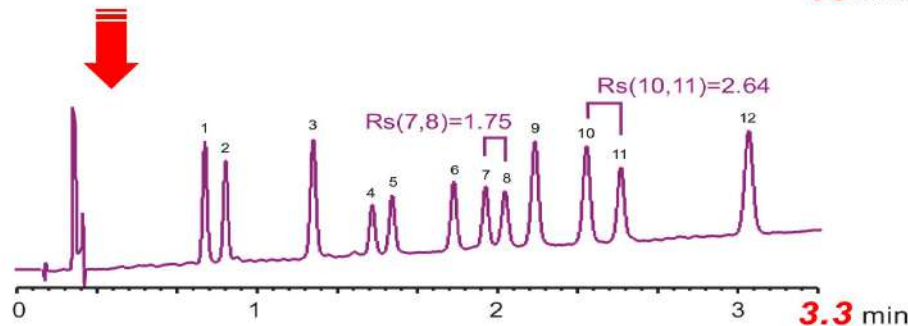
50 x 4.6 mm ID, 3  $\mu$ m  
15-35% ACN (0-10 min)  
1.5 mL/min  
3  $\mu$ L Inj.



50 x 4.6 mm ID, 3  $\mu$ m  
12.5-35% ACN (0-10 min)  
1.5 mL/min  
3  $\mu$ L Inj.



50 x 2.0 mm ID, 2  $\mu$ m  
12.5-35% ACN (0-10 min)  
0.3 mL/min  
0.6  $\mu$ L Inj.



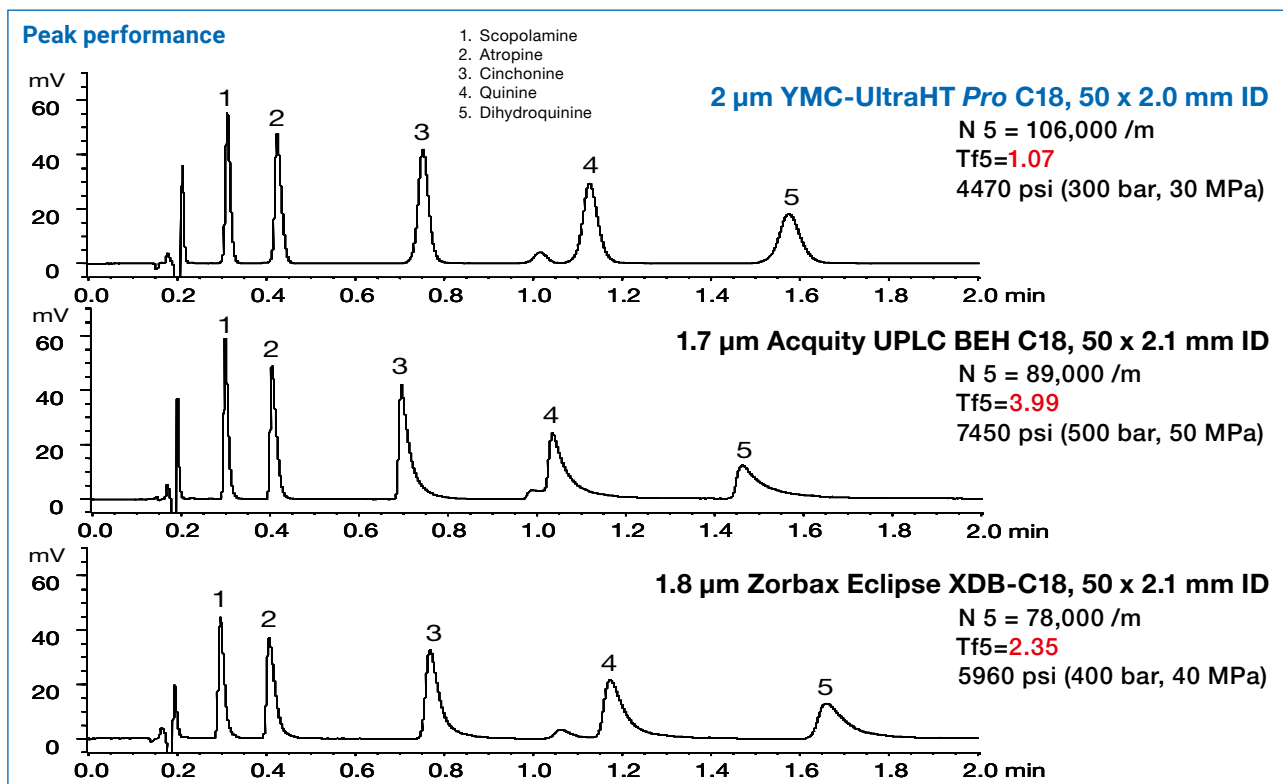
50 x 2.0 mm ID, 2  $\mu$ m  
12.5-35% ACN (0-3.3 min)  
0.9 mL/min  
0.6  $\mu$ L Inj.

Columns: Hydrosphere C18  
Eluent: A: water / acetic acid (100/3)  
B: acetonitrile / acetic acid (100/3)  
Temperature: 35  $^{\circ}$ C  
Detection: UV at 254 nm

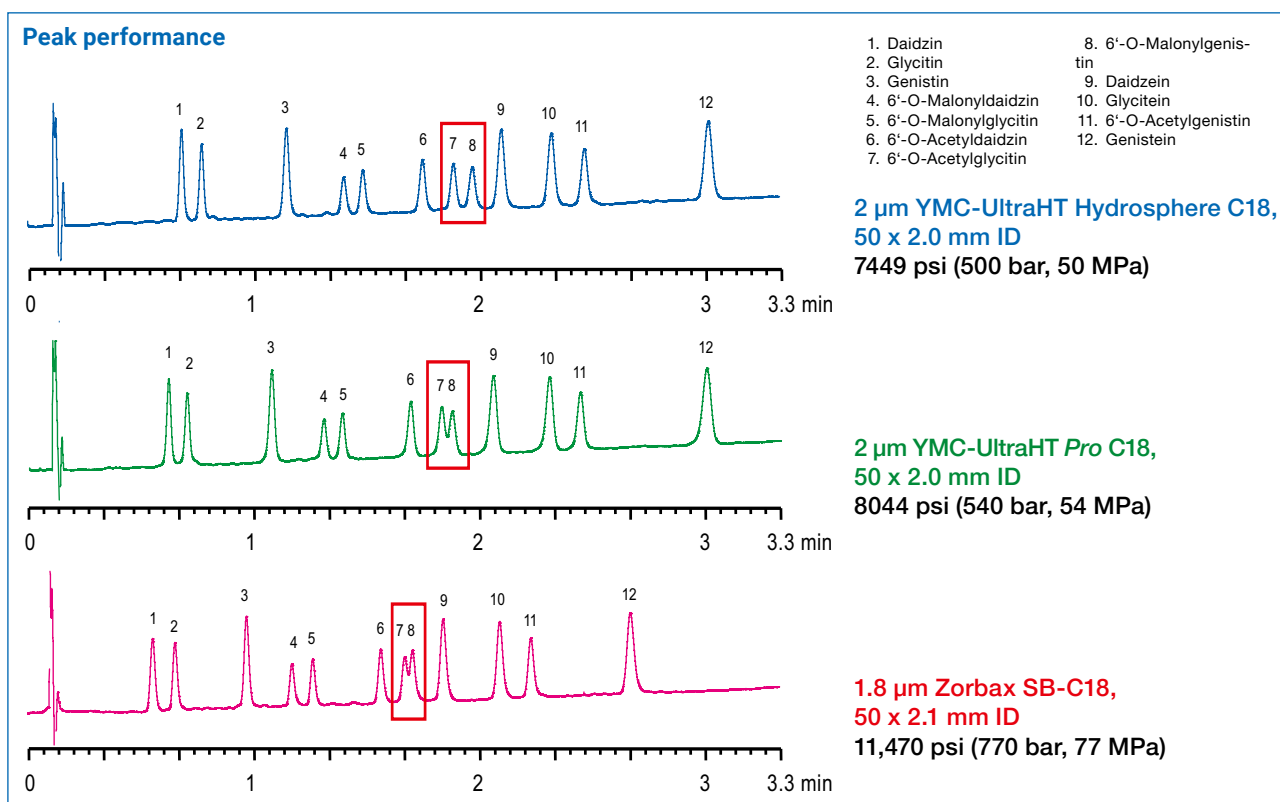
1. Daidzin  
2. Glycitin  
3. Genistin  
4. 6'-O-Malonyldaidzin  
5. 6'-O-Malonylglycitin  
6. 6'-O-Acetyldaidzin  
7. 6'-O-Acetylglycitin  
8. 6'-O-Malonylgenistin  
9. Daidzein  
10. Glycitein  
11. 6'-O-Acetylgenistin  
12. Genistein

# Downscale of Methods

## Why not take the pressure out of Fast LC!



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!



# Ordering Information

## 2 µm UltraHT Fast LC columns

| Phase            | Column ID [mm] | Column length [mm] |                |                |                | Guard cartridges* with 10 mm length |
|------------------|----------------|--------------------|----------------|----------------|----------------|-------------------------------------|
|                  |                | 50                 | 100            | 150            | 250            |                                     |
|                  |                |                    |                |                |                | (pack of 5)                         |
| YMC-Pack Pro C18 | 2.0            | AS12S02-0302WT     | AS12S02-0502WT | AS12S02-1002WT | AS12S02-1502WT | AS12S02-01Q1GC                      |
|                  | 3.0            | –                  | AS12S02-0503WT | AS12S02-1003WT | AS12S02-1503WT | AS12S02-0103GC                      |
| Hydrosphere C18  | 2.1            | HS12S02-0302WT     | HS12S02-0502WT | HS12S02-1002WT | HS12S02-1502WT | HS12S02-01Q1GC                      |
|                  | 3.0            | –                  | HS12S02-0503WT | HS12S02-1003WT | HS12S02-1503WT | HS12S02-0103GC                      |

## 3 µm HPLC columns (Waters type hardware, WT)

| Phase               | Column ID [mm] | Column length [mm] |                |                |                | Guard cartridges* with 10 mm length |
|---------------------|----------------|--------------------|----------------|----------------|----------------|-------------------------------------|
|                     |                | 50                 | 100            | 150            | 250            |                                     |
|                     |                |                    |                |                |                | (pack of 5)                         |
| YMC-Pack Pro C18    | 2.0            | AS12S03-0502WT     | AS12S03-1002WT | AS12S03-1502WT | AS12S03-2502WT | AS12S03-01Q1GC                      |
|                     | 2.1            | AS12S03-05Q1WT     | AS12S03-10Q1WT | AS12S03-15Q1WT | AS12S03-25Q1WT | AS12S03-01Q1GC                      |
|                     | 3.0            | AS12S03-0503WT     | AS12S03-1003WT | AS12S03-1503WT | AS12S03-2503WT | AS12S03-0103GC                      |
|                     | 4.0            | AS12S03-0504WT     | AS12S03-1004WT | AS12S03-1504WT | AS12S03-2504WT | AS12S03-0104GC                      |
|                     | 4.6            | AS12S03-0546WT     | AS12S03-1046WT | AS12S03-1546WT | AS12S03-2546WT | AS12S03-0104GC                      |
| YMC-Pack Pro C18 RS | 2.0            | RS08S03-0502WT     | RS08S03-1002WT | RS08S03-1502WT | RS08S03-2502WT | RS08S03-01Q1GC                      |
|                     | 2.1            | RS08S03-05Q1WT     | RS08S03-10Q1WT | RS08S03-15Q1WT | RS08S03-25Q1WT | RS08S03-01Q1GC                      |
|                     | 3.0            | RS08S03-0503WT     | RS08S03-1003WT | RS08S03-1503WT | RS08S03-2503WT | RS08S03-0103GC                      |
|                     | 4.0            | RS08S03-0504WT     | RS08S03-1004WT | RS08S03-1504WT | RS08S03-2504WT | RS08S03-0104GC                      |
|                     | 4.6            | RS08S03-0546WT     | RS08S03-1046WT | RS08S03-1546WT | RS08S03-2546WT | RS08S03-0104GC                      |
| Hydrosphere C18     | 2.0            | HS12S03-0502WT     | HS12S03-1002WT | HS12S03-1502WT | HS12S03-2502WT | HS12S03-01Q1GC                      |
|                     | 2.1            | HS12S03-05Q1WT     | HS12S03-10Q1WT | HS12S03-15Q1WT | HS12S03-25Q1WT | HS12S03-01Q1GC                      |
|                     | 3.0            | HS12S03-0503WT     | HS12S03-1003WT | HS12S03-1503WT | HS12S03-2503WT | HS12S03-0103GC                      |
|                     | 4.0            | HS12S03-0504WT     | HS12S03-1004WT | HS12S03-1504WT | HS12S03-2504WT | HS12S03-0104GC                      |
|                     | 4.6            | HS12S03-0546WT     | HS12S03-1046WT | HS12S03-1546WT | HS12S03-2546WT | HS12S03-0104GC                      |
| YMC-Pack Pro C8     | 2.0            | OS12S03-0502WT     | OS12S03-1002WT | OS12S03-1502WT | OS12S03-2502WT | OS12S03-01Q1GC                      |
|                     | 2.1            | OS12S03-05Q1WT     | OS12S03-10Q1WT | OS12S03-15Q1WT | OS12S03-25Q1WT | OS12S03-01Q1GC                      |
|                     | 3.0            | OS12S03-0503WT     | OS12S03-1003WT | OS12S03-1503WT | OS12S03-2503WT | OS12S03-0103GC                      |
|                     | 4.0            | OS12S03-0504WT     | OS12S03-1004WT | OS12S03-1504WT | OS12S03-2504WT | OS12S03-0104GC                      |
|                     | 4.6            | OS12S03-0546WT     | OS12S03-1046WT | OS12S03-1546WT | OS12S03-2546WT | OS12S03-0104GC                      |
| YMC-Pack Pro C4     | 2.0            | BS12S03-0502WT     | BS12S03-1002WT | BS12S03-1502WT | BS12S03-2502WT | BS12S03-01Q1GC                      |
|                     | 2.1            | BS12S03-05Q1WT     | BS12S03-10Q1WT | BS12S03-15Q1WT | BS12S03-25Q1WT | BS12S03-01Q1GC                      |
|                     | 3.0            | BS12S03-0503WT     | BS12S03-1003WT | BS12S03-1503WT | BS12S03-2503WT | BS12S03-0103GC                      |
|                     | 4.0            | BS12S03-0504WT     | BS12S03-1004WT | BS12S03-1504WT | BS12S03-2504WT | BS12S03-0104GC                      |
|                     | 4.6            | BS12S03-0546WT     | BS12S03-1046WT | BS12S03-1546WT | BS12S03-2546WT | BS12S03-0104GC                      |

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

# Ordering Information

## 5 µm HPLC columns (Waters type hardware, WT)

| Phase               | Column ID [mm] | Column length [mm] |                |                |                | Guard cartridges* with 10 mm length |
|---------------------|----------------|--------------------|----------------|----------------|----------------|-------------------------------------|
|                     |                | 50                 | 100            | 150            | 250            | (pack of 5)                         |
| YMC-Pack Pro C18    | 2.0            | AS12S05-0502WT     | AS12S05-1002WT | AS12S05-1502WT | AS12S05-2502WT | AS12S05-01Q1GC                      |
|                     | 2.1            | AS12S05-05Q1WT     | AS12S05-10Q1WT | AS12S05-15Q1WT | AS12S05-25Q1WT | AS12S05-01Q1GC                      |
|                     | 3.0            | AS12S05-0503WT     | AS12S05-1003WT | AS12S05-1503WT | AS12S05-2503WT | AS12S05-01Q3GC                      |
|                     | 4.0            | AS12S05-0504WT     | AS12S05-1004WT | AS12S05-1504WT | AS12S05-2504WT | AS12S05-01Q4GC                      |
|                     | 4.6            | AS12S05-0546WT     | AS12S05-1046WT | AS12S05-1546WT | AS12S05-2546WT | AS12S05-01Q4GC                      |
| YMC-Pack Pro C18 RS | 2.0            | RS08S05-0502WT     | RS08S05-1002WT | RS08S05-1502WT | RS08S05-2502WT | RS08S05-01Q1GC                      |
|                     | 2.1            | RS08S05-05Q1WT     | RS08S05-10Q1WT | RS08S05-15Q1WT | RS08S05-25Q1WT | RS08S05-01Q1GC                      |
|                     | 3.0            | RS08S05-0503WT     | RS08S05-1003WT | RS08S05-1503WT | RS08S05-2503WT | RS08S05-01Q3GC                      |
|                     | 4.0            | RS08S05-0504WT     | RS08S05-1004WT | RS08S05-1504WT | RS08S05-2504WT | RS08S05-01Q4GC                      |
|                     | 4.6            | RS08S05-0546WT     | RS08S05-1046WT | RS08S05-1546WT | RS08S05-2546WT | RS08S05-01Q4GC                      |
| Hydrosphere C18     | 2.0            | HS12S05-0502WT     | HS12S05-1002WT | HS12S05-1502WT | HS12S05-2502WT | HS12S05-01Q1GC                      |
|                     | 2.1            | HS12S05-05Q1WT     | HS12S05-10Q1WT | HS12S05-15Q1WT | HS12S05-25Q1WT | HS12S05-01Q1GC                      |
|                     | 3.0            | HS12S05-0503WT     | HS12S05-1003WT | HS12S05-1503WT | HS12S05-2503WT | HS12S05-01Q3GC                      |
|                     | 4.0            | HS12S05-0504WT     | HS12S05-1004WT | HS12S05-1504WT | HS12S05-2504WT | HS12S05-01Q4GC                      |
|                     | 4.6            | HS12S05-0546WT     | HS12S05-1046WT | HS12S05-1546WT | HS12S05-2546WT | HS12S05-01Q4GC                      |
| YMC-Pack Pro C8     | 2.0            | OS12S05-0502WT     | OS12S05-1002WT | OS12S05-1502WT | OS12S05-2502WT | OS12S05-01Q1GC                      |
|                     | 2.1            | OS12S05-05Q1WT     | OS12S05-10Q1WT | OS12S05-15Q1WT | OS12S05-25Q1WT | OS12S05-01Q1GC                      |
|                     | 3.0            | OS12S05-0503WT     | OS12S05-1003WT | OS12S05-1503WT | OS12S05-2503WT | OS12S05-01Q3GC                      |
|                     | 4.0            | OS12S05-0504WT     | OS12S05-1004WT | OS12S05-1504WT | OS12S05-2504WT | OS12S05-01Q4GC                      |
|                     | 4.6            | OS12S05-0546WT     | OS12S05-1046WT | OS12S05-1546WT | OS12S05-2546WT | OS12S05-01Q4GC                      |
| YMC-Pack Pro C4     | 2.0            | BS12S05-0502WT     | BS12S05-1002WT | BS12S05-1502WT | BS12S05-2502WT | BS12S05-01Q1GC                      |
|                     | 2.1            | BS12S05-05Q1WT     | BS12S05-10Q1WT | BS12S05-15Q1WT | BS12S05-25Q1WT | BS12S05-01Q1GC                      |
|                     | 3.0            | BS12S05-0503WT     | BS12S05-1003WT | BS12S05-1503WT | BS12S05-2503WT | BS12S05-01Q3GC                      |
|                     | 4.0            | BS12S05-0504WT     | BS12S05-1004WT | BS12S05-1504WT | BS12S05-2504WT | BS12S05-01Q4GC                      |
|                     | 4.6            | BS12S05-0546WT     | BS12S05-1046WT | BS12S05-1546WT | BS12S05-2546WT | BS12S05-01Q4GC                      |

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

For other dimensions, please contact your YMC representative or YMC directly by phone (+49 (0)2064 427-0), by mail ([info@ymc.eu](mailto:info@ymc.eu)) or use our online chat on our homepage ([www.ymc.eu](http://www.ymc.eu)).

