

Polar Analytes

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Introduction

HPLC Columns for Polar Analytes

Today, HPLC is a widely used method of analysis for a vast number of compounds, due to its simplicity and reproducibility of the method.

However, a fundamental difficulty exists: the low retention of polar analytes makes HPLC method development more demanding. Nevertheless, modern HPLC offers a range of options to the chromatographer to overcome this problem.

This chapter describes some of the possibilities available for the separation of polar compounds. In the following section both reversed phase and hydrophilic interactions chromatography techniques are discussed.

Reversed Phase Techniques

- RP techniques for the separation of polar compounds
- Hydrosphere C18 and YMC-Pack ODS-AQ: hydrophilic C18 surface for enhanced polar recognition
- HILIC techniques: Hydrophilic Interaction Chromatography provides an ideal retention mechanism for extreme polar analytes



General

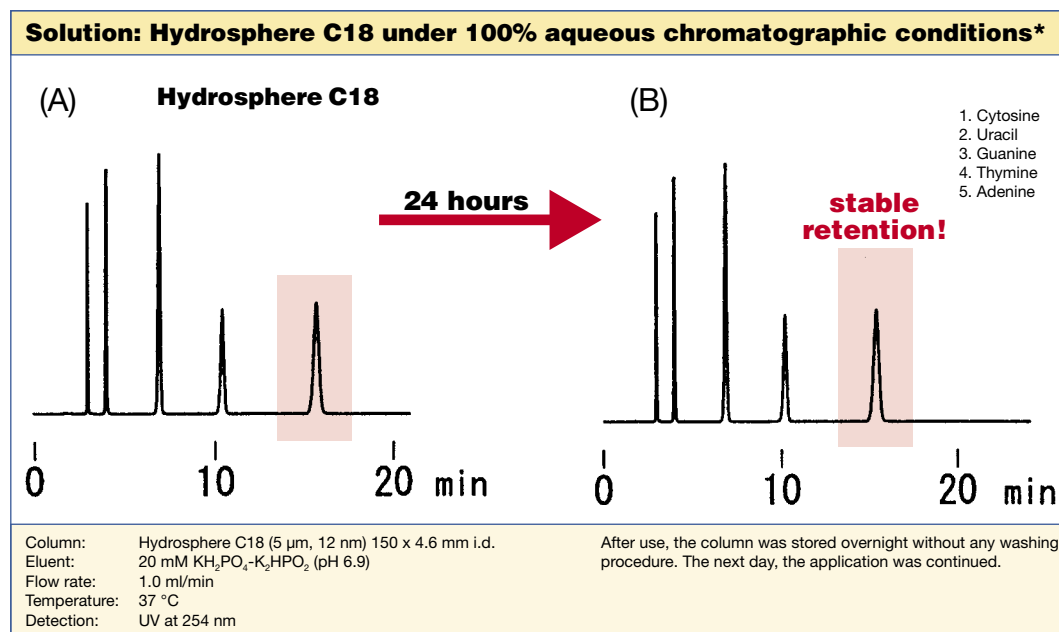
The separation of polar compounds in many cases requires highly aqueous mobile phase conditions to achieve sufficient retention on the stationary phase. Conventional reversed phase selectivities do not give reproducible results under these conditions due to mainly collapse of the C18 chains.

YMC developed Hydrosphere C18 and YMC-Pack ODS-AQ in order to overcome the loss in retention.

Properties

A proprietary derivatisation procedure enables Hydrosphere C18 and YMC-Pack ODS-AQ to be penetrated by water without losing the brush-like chain structure. This model of the so-called phase collapse is one explanation for a phenomenon, where the retention times decrease after a very short time under 100% aqueous eluent on a conventional C18 phase.

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

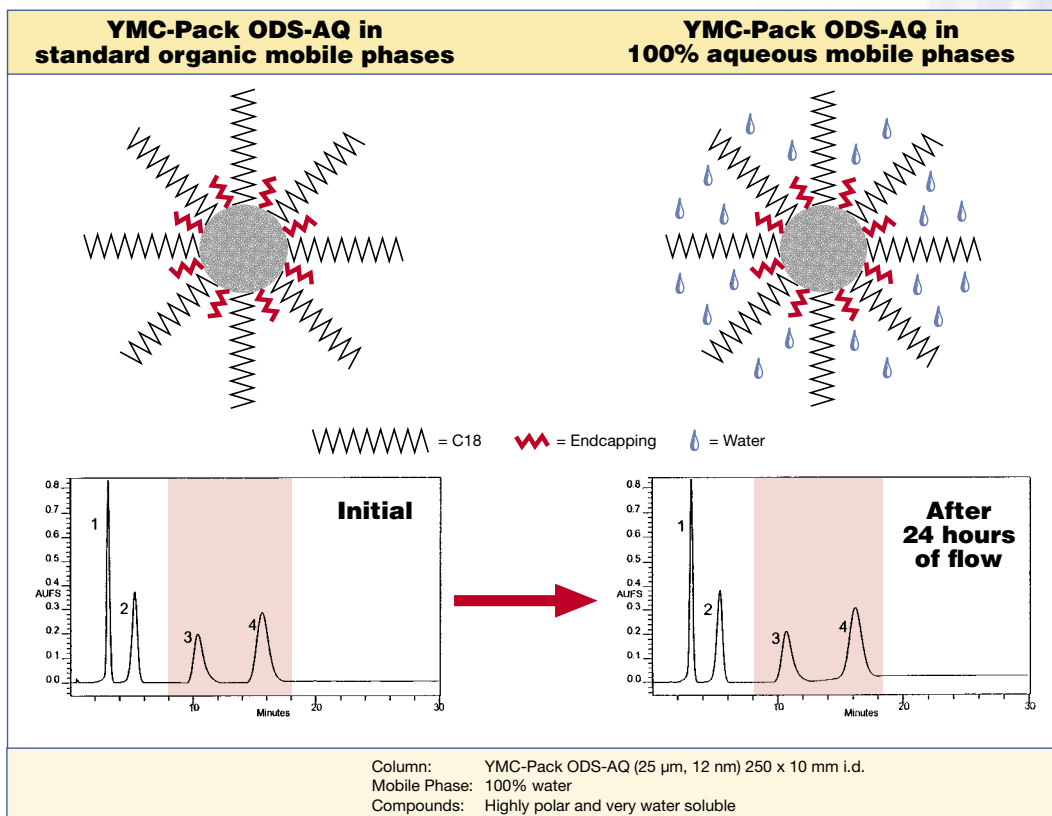
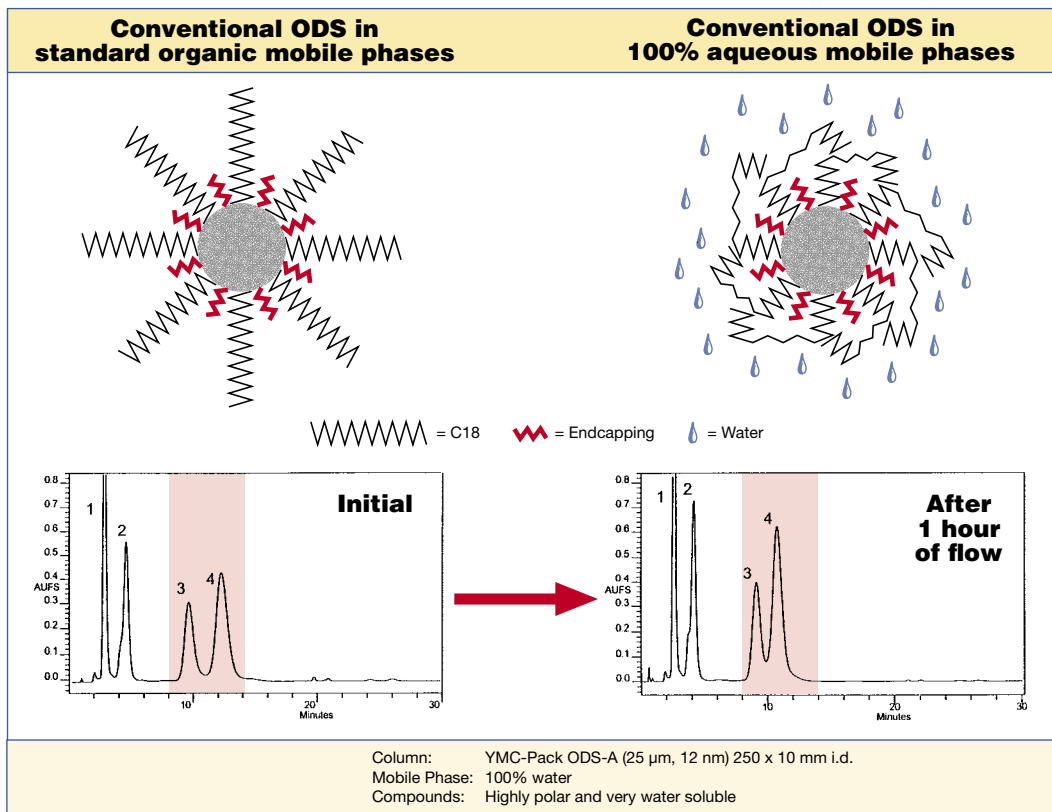


* By courtesy YMC Co., Ltd.



Reversed Phase Techniques

Comparison of ODS-AQ vs. Conventional ODS



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



Hydrosphere C18	Specification
Particle size / μm	2*; 3*; 5
Pore size / nm	12
Surface area / m^2g^{-1}	340
Carbon content / %	12
Recommended pH range	2.0 - 8.0

* please be referred to page 35 ff for Ultra Fast LC and Fast LC Columns

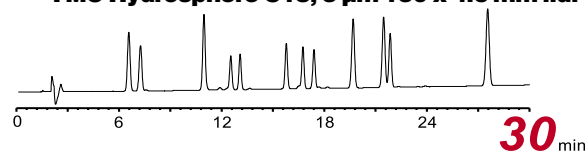
General

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.

Now, with the introduction of Hydrosphere C18 2 μm chromatographers are enabled to transfer the outstanding abilities of Hydrosphere C18 to rapid resolution chromatography.

Conventional LC Method

YMC Hydrosphere C18, 5 μm 150 x 4.6 mm i.d.

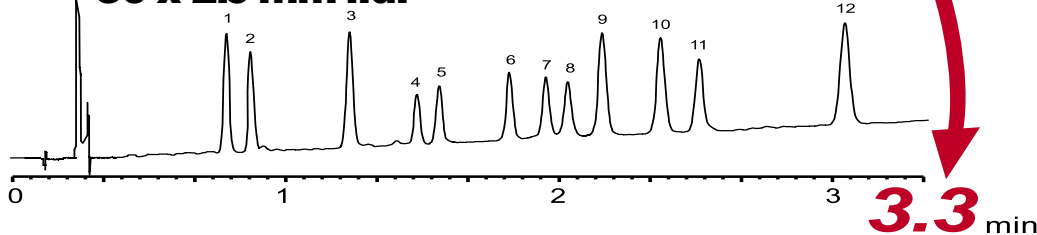


Eluent: A: water / acetic acid (100/3) 15-35% acetonitrile
 B: acetonitrile / acetic acid (100/3) (0-30 min)
 Flow rate: 1.0 ml/min
 Temperature: 35 °C
 Detection: UV at 254 nm

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

Ultra Fast LC Method

YMC-UltraHT Hydrosphere C18, 2 μm 50 x 2.0 mm i.d.



Eluent: A: water / acetic acid (100/3) 12.5-30% acetonitrile
 B: acetonitrile / acetic acid (100/3) (0-3.3 min)
 Flow rate: 0.9 ml/min
 Temperature: 35 °C
 Detection: UV at 254 nm

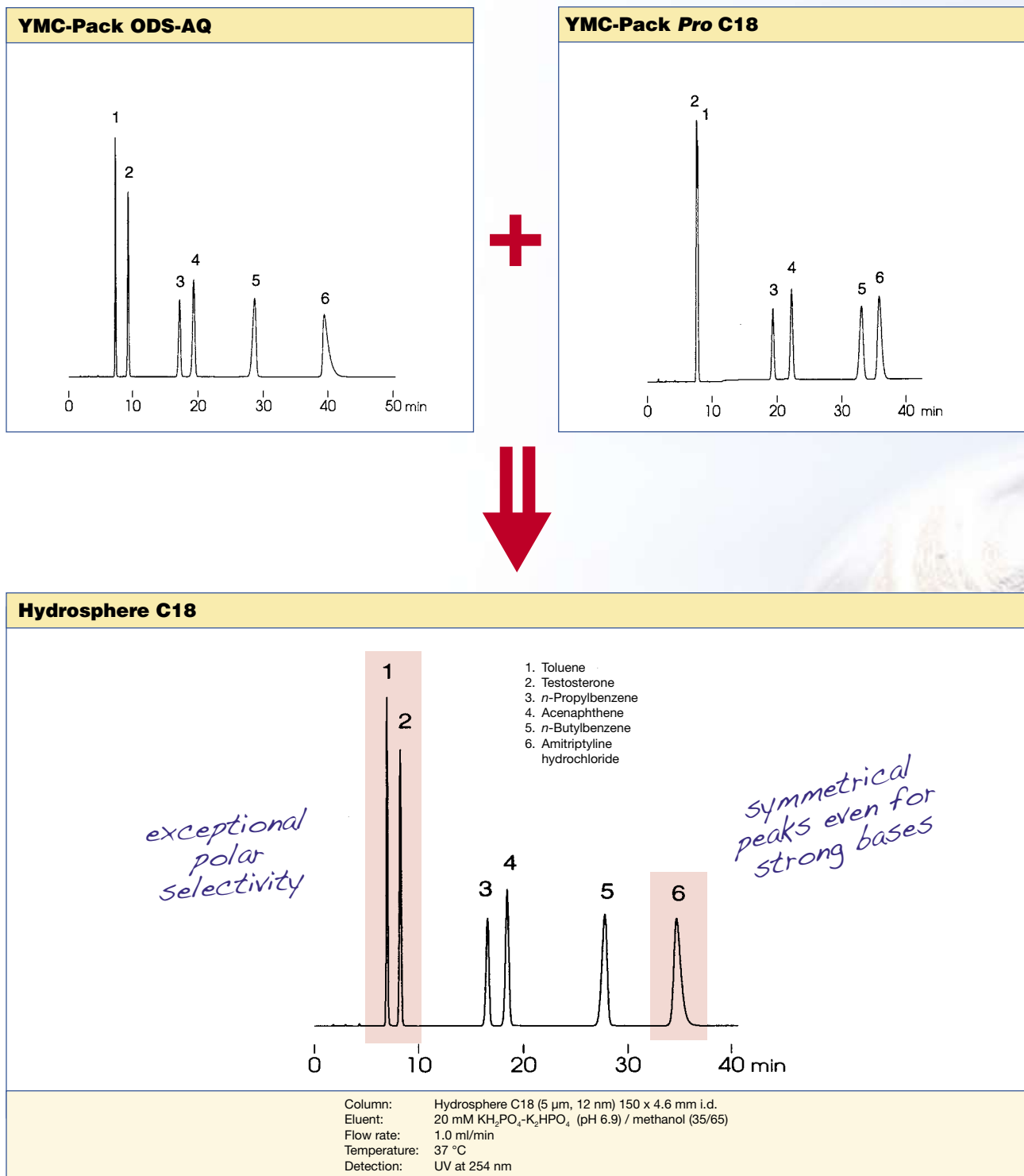


Hydrosphere C18

Here, the properties of YMC-Pack ODS-AQ are compared with YMC-Pack *Pro* C18 and Hydrosphere C18 to show similarities and differences of these three phases and to give assistance when choosing the most appropriate for specific chromatographic purposes.

Traditionally, YMC-Pack ODS-AQ was designed for the separation of polar compounds using 100% aqueous conditions and YMC-Pack *Pro* C18 for the separation of acidic and basic substances.

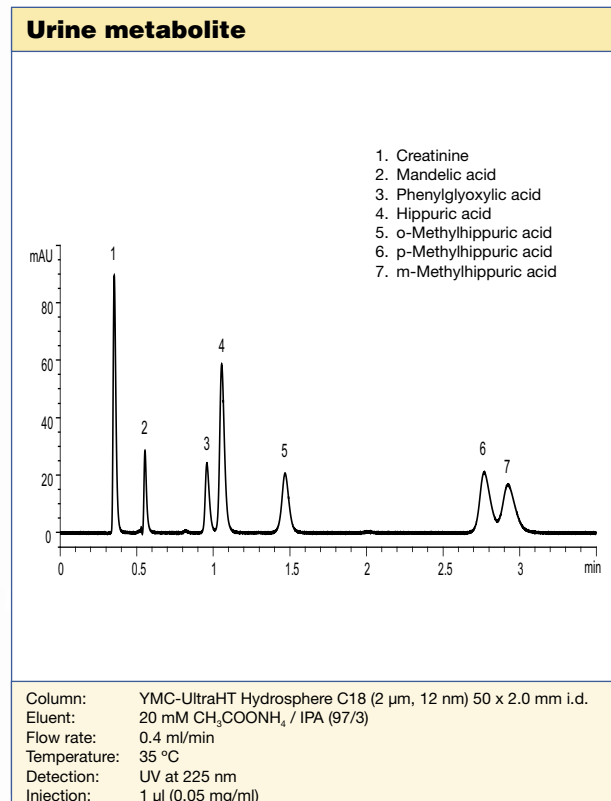
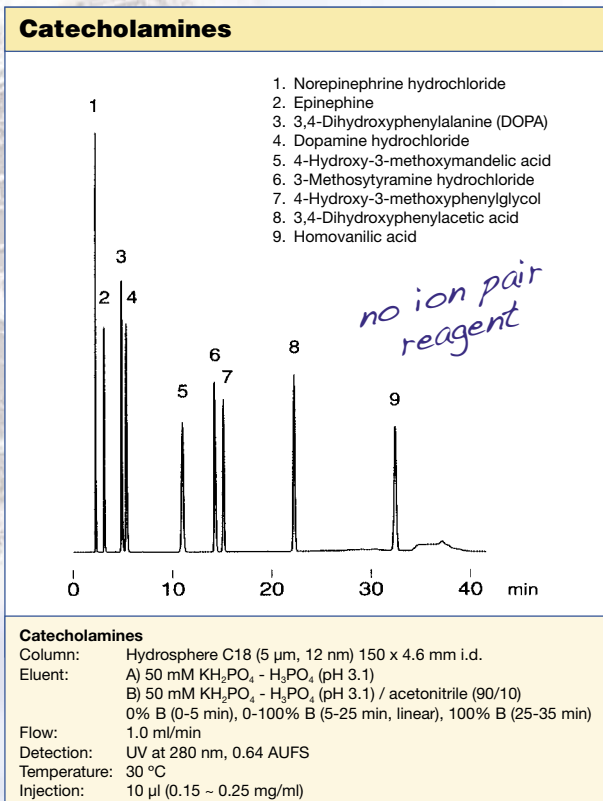
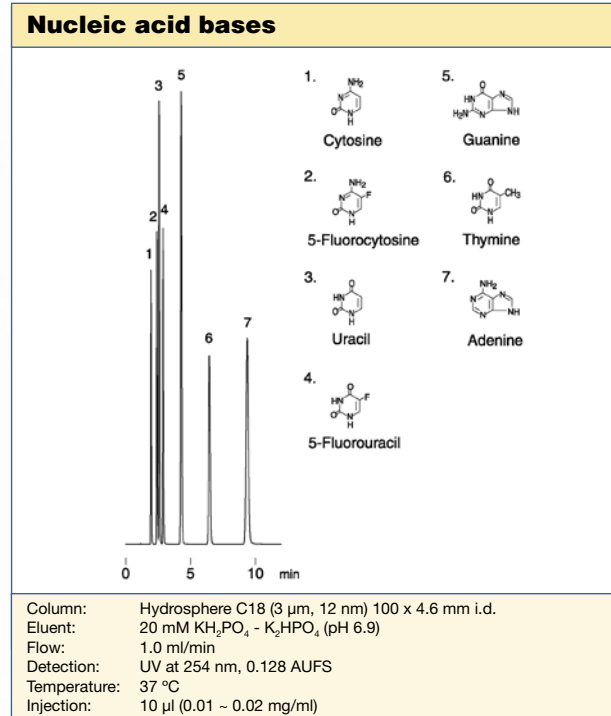
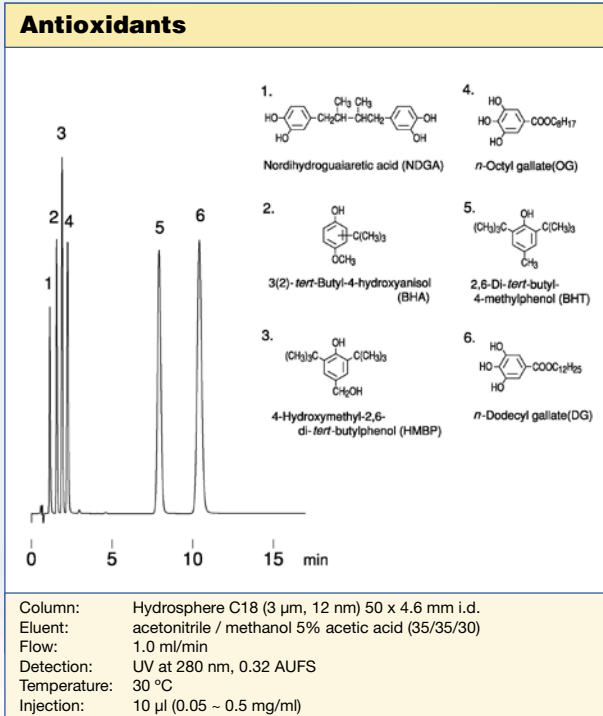
As a consequence, Hydrosphere C18 should be understood to provide a combination of the advantages of YMC-Pack ODS-AQ and YMC-Pack *Pro* C18.



Hydrosphere C18

Applications

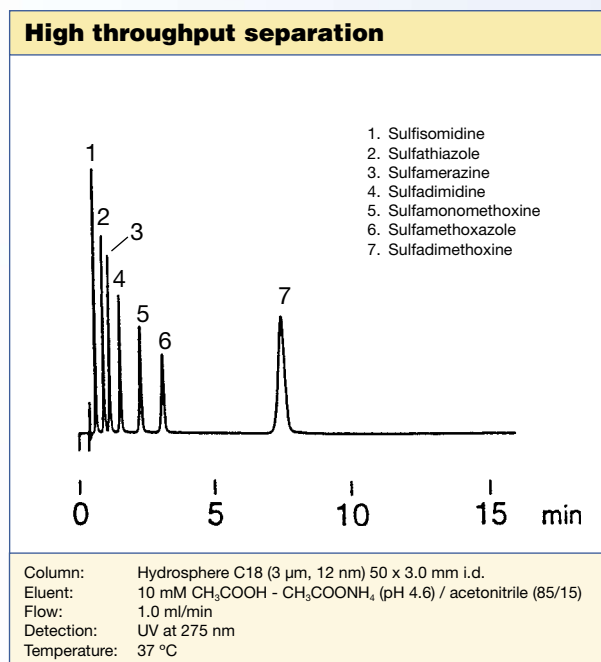
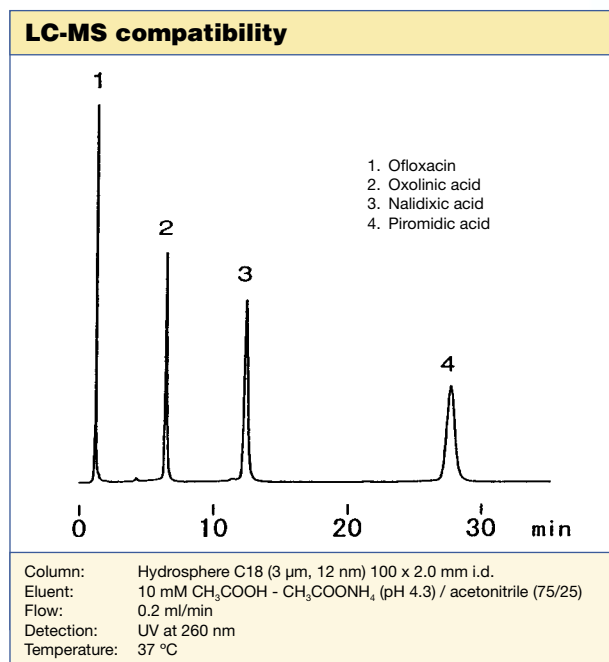
Hydrosphere C18 is the column of choice within the YMC portfolio for a wide range of different substances. As an almost "universal" selectivity it can be used under standard reversed phase conditions as well as pure aqueous eluents as demonstrated by this collection of applications.



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

Hydrosphere C18

Finally, Hydrosphere C18 is, in common with all *ProFamily* members, applicable to LC-MS methods as shown below. High throughput LC-MS separations with enhanced flow rates are easily achievable with the 3 μm version of Hydrosphere C18.



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 $^\circ\text{C}$. 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.

YMC-Pack ODS-AQ



- "hydrophilic" C18
- balanced surface chemistry
- polar recognition
- metabolite recognition

balanced polarity for

- pharmaceuticals
- antibiotics
- peptides and proteins
- nucleic acids
- oligosaccharides
- water-soluble vitamins
- carboxylic acids



YMC-Pack ODS-AQ	Specification	Specification
Particle size / μm	3; 5	3; 5
Pore size / nm	12	20
Surface area / m^2g^{-1}	300	200
Carbon content / %	14	11
Recommended pH range	2.0 - 7.5	2.0 - 7.5

General

YMC-Pack ODS-AQ is a C18 reversed phase silica based HPLC packing material specifically designed for use in 100% aqueous eluents. As a result of the proprietary derivatisation process, YMC-Pack ODS-AQ exhibits a different selectivity to that of traditional C18 stationary phases. This difference in selectivity of YMC-Pack ODS-AQ can be used to advantage for HPLC separations, which are difficult to achieve with conventional C18 columns.

Selectivity Data

The proprietary YMC derivatisation process creates the different selectivity of YMC-Pack ODS-AQ, where:

1. The activity of acidic unreacted silanols is reduced, allowing moderately basic compounds to be eluted with little or no peak tailing.
2. The balanced hydrophilic/lipophilic nature of the YMC-Pack ODS-AQ stationary phase leads to strong retentions of polar sample solutes even in aqueous eluents.

These properties of YMC-Pack ODS-AQ are beneficial for separations of polar organic compounds, which tend not to be retained or are unresolved when conventional C18 columns are used.

Many conventional ODS packings lose their ability to retain polar compounds in these high aqueous content mobile phases as shown opposite. They appear less lipophilic with densely folded C18 chains. However, in similar mobile phases, YMC-Pack ODS-AQ maintains its brush-like C18 chain structure and its lipophilic properties and provides excellent retention of polar compounds.

Applications

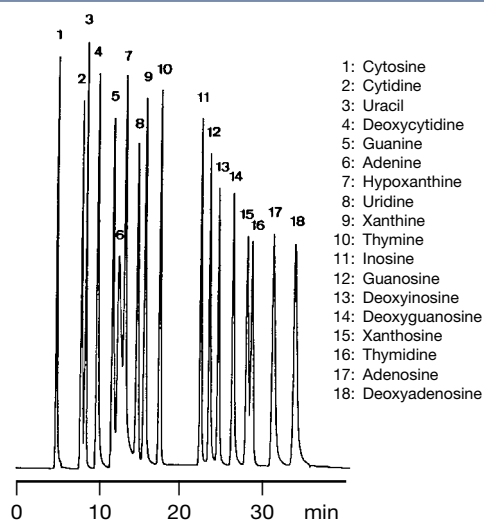
YMC-Pack ODS-AQ is able to resolve compounds with minor differences in polarity from closely related chemical structures. As a result, YMC-Pack ODS-AQ is an excellent tool for the separation of drugs and corresponding metabolites, pesticides and degradation products, or peptides and protein digests etc. This capability of "polar recognition" opens up a broad application range for YMC-Pack ODS-AQ in life sciences and pharmacology.

Genuine linear scale-up from analytical to large scale separations is easily achievable with YMC products such as YMC-Pack ODS-AQ, where particle sizes from 3 to 150 μm are available in large lot sizes up to several hundred kilograms, if needed. This, together with the outstanding selectivity of YMC-Pack ODS-AQ, make it an essential tool to enhance the productivity of large scale chromatographic processes.



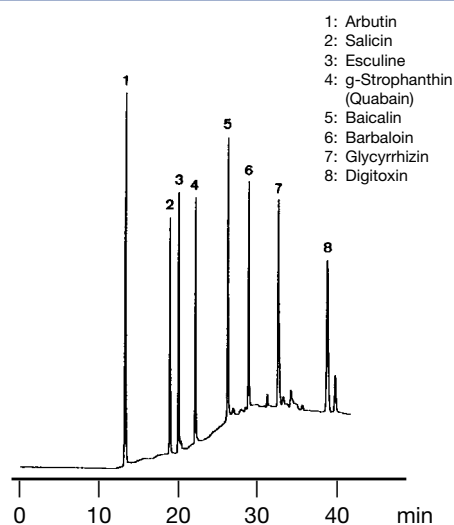
YMC-Pack ODS-AQ

Separation of biomolecules



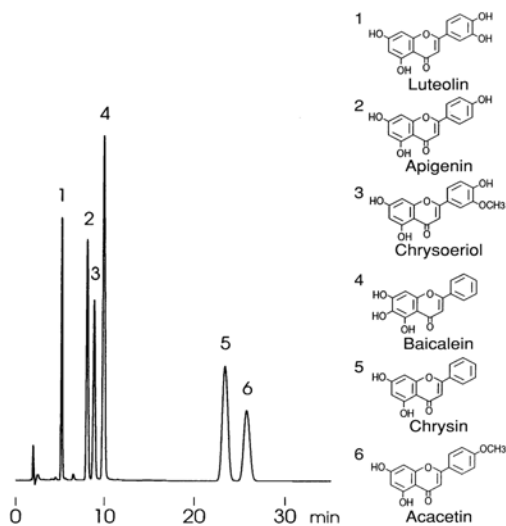
Column: YMC-Pack ODS-AQ (12 nm, 5 μ m) 250 x 4.6 mm i.d.
 Eluent: A = $\text{CH}_3\text{COOH}-\text{CH}_3\text{COONH}_4$ (pH 3.5)
 B = $\text{CH}_3\text{COOH}-\text{CH}_3\text{COONH}_4$ (pH 3.5) / methanol = 90/10 (v/v)
 Gradient: 30% B (0-5 min), 30-100% B (5-13 min, linear), 100% B (13-40 min)
 Flow: 0.7 ml/min
 Detection: UV at 260 nm
 Temperature: 30 $^\circ\text{C}$

Crude Drugs



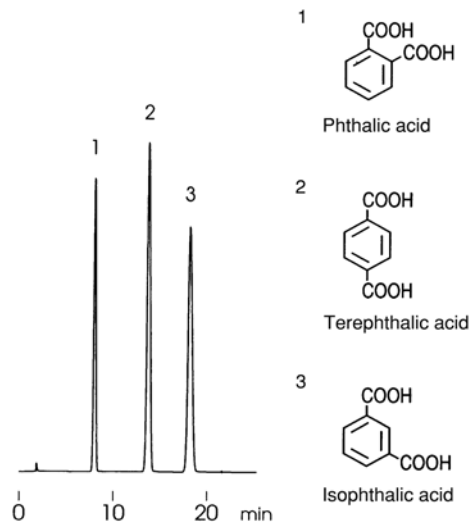
Column: YMC-Pack ODS-AQ (12 nm, 5 μ m) 250 x 4.6 mm i.d.
 Eluent: A: methanol / $\text{NH}_4\text{H}_2\text{PO}_4$ (20 mM) = 5/95
 B: methanol / $\text{NH}_4\text{H}_2\text{PO}_4$ (20 mM) = 80/20
 Gradient: 0-100% B (0-20 min, linear), 100% B (20-40 min)
 Flow: 0.6 ml/min
 Detection: UV at 250 nm
 Temperature: 30 $^\circ\text{C}$

Flavonoids



Column: YMC-Pack ODS-AQ (12 nm, 5 μ m) 150 x 4.6 mm i.d.
 Eluent: acetonitrile / 10 mM H_3PO_4 (35/65)
 Flow: 1.0 ml/min
 Detection: UV at 280 nm, 0.13 AUFS
 Temperature: 37 $^\circ\text{C}$
 Injection: 5 μ l (0.05 mg/ml)

Phthalic acid isomers



Column: YMC-Pack ODS-AQ (12 nm, 5 μ m) 150 x 4.6 mm i.d.
 Eluent: methanol / 10 mM H_3PO_4 (25/75)
 Flow: 0.4 ml/min
 Detection: UV at 254 nm, 0.16 AUFS
 Temperature: 37 $^\circ\text{C}$
 Injection: 10 μ l (0.05 ~ 0.5 mg/ml)

Column care

The recommended pH range for YMC-Pack ODS-AQ is 2.0 - 7.5 in up to 100% aqueous systems and a maximum of 50 $^\circ\text{C}$. 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.

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

J'sphere ODS-M80



- high quality RP columns
- high surface silica, 8 nm, 4 μm
- metabolite recognition
- high siloxane content
- additional selectivity through H-bonding



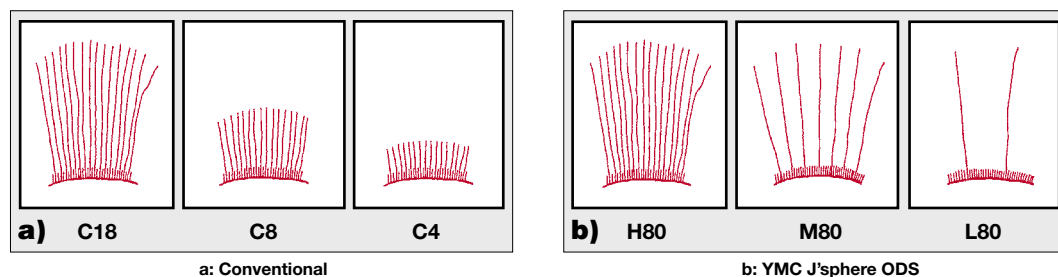
J'sphere ODS-M80	Specification
Particle size / μm	4
Pore size / nm	8
Surface area / m ² g ⁻¹	510
Carbon content / %	14
Recommended pH range	2.0 - 7.5

General

The demand for higher resolution and enhanced selectivity in modern HPLC analysis has a strong impact on the development of novel HPLC packings and stationary phases. For this purpose, YMC created a series of novel packing materials, namely the J'sphere ODS series, with graduated properties in terms of hydrophobicity and hydrogen bonding (H-bonding) capacity to meet the needs for sophisticated HPLC methods.

Graduated Properties

Alkyl chains of different lengths, including C18, C8 and C4, are commonly used for bonding during the synthesis of conventional reversed stationary phases of different polarity. YMC however, have applied another approach for creating divergent polarities and improving the consistency in the synthesis of reversed phase packings. With the J'sphere ODS series, the alkyl chain length is kept constant (as C18), but the density of coverage of C18 groups on the silica surface is varied to produce the three different J'sphere ODS packings with graduated hydrophobicity (see figure).



Schematic comparison of reversed phases of different polarity.

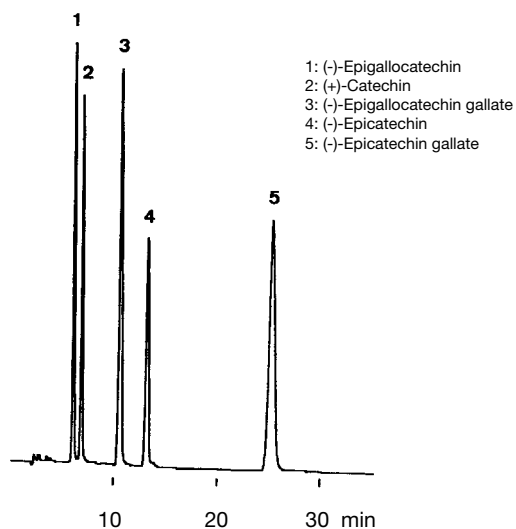


J'sphere ODS-M80

The lower coverage of C18 monomeric bonded groups in J'sphere ODS-M80 provides moderate hydrophobicity. As the lipophilic character is decreased, the H-bonding capacity becomes more and more important. J'sphere ODS-M80 has a pronounced balanced polarity which is extraordinary flexible and allows application to a wide variety of separation problems. Depending on the separation, J'sphere ODS-M80 columns can be operated over a very broad range of eluent polarity. J'sphere ODS-M80 columns are a very adaptable tool in various fields in analytical HPLC including drug analysis and QC.

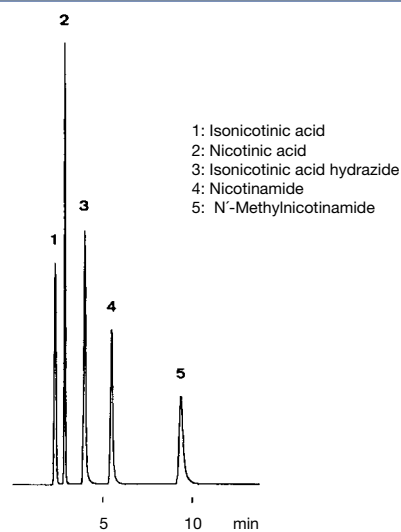
J'sphere ODS-M80

Food preservatives



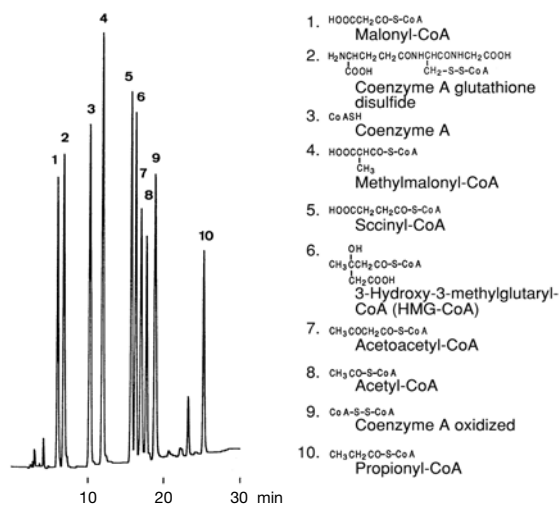
Column: J'sphere ODS-M80 (4 μ m, 8 nm) 150 x 4.6 mm i.d.
Eluent: KH_2PO_4 - H_3PO_4 (pH 2.4) / methanol = 75/25
Flow: 0.8 ml/min
Detection: UV at 280 nm
Temperature: 37 $^\circ\text{C}$

Nicotinic acid analogues



Column: J'sphere ODS-M80 (4 μ m, 8 nm) 150 x 4.6 mm i.d.
Eluent: acetonitrile / KH_2PO_4 (20 mM) = 5/95
Flow: 1.0 ml/min
Detection: UV at 260 nm
Temperature: 30 $^\circ\text{C}$

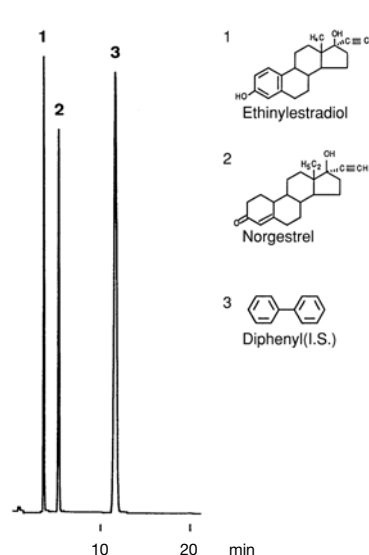
Coenzyme A and derivatives



Courtesy of Dr. Takamura, Ibaraki University

Column: J'sphere ODS-M80 (4 μ m, 8 nm) 150 x 4.6 mm i.d.
Eluent: A) methanol / 50 mM KH_2PO_4 (10/90)
B) methanol / 50 mM KH_2PO_4 (30/70)
10% B (0-5 min), 10-100% B (5-30 min)
Flow: 0.7 ml/min
Detection: UV at 260 nm, 0.016 AUFS
Temperature: 37 $^\circ\text{C}$
Injection: 10 μ l (16.7 nmol/ml)

Norgestrel and ethinylestradiol



Column: J'sphere ODS-M80 (4 μ m, 8 nm) 75 x 4.6 mm i.d.
Eluent: acetonitrile / water (50/50)
Flow: 1.0 ml/min
Detection: UV at 230 nm, 0.13 AUFS
Temperature: 37 $^\circ\text{C}$
Injection: 6 μ l (0.05 - 0.1 mg/ml)

Column care

The recommended pH range for J'sphere ODS-M80 is 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.

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

HILIC Techniques for Polar Compounds



- YMC HILIC provides an ideal mechanism for the analysis of extremely polar analytes
- YMC offers a wide variety of HILIC phases to cover a broad range of polar selectivities
- HILIC eluents are compatible with LC-MS systems



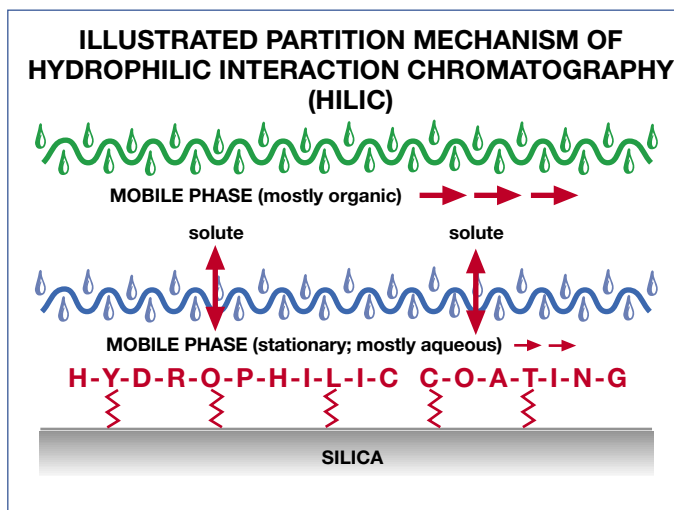
Specifications	SIL	PVA-Sil	Polyamine II	NH ₂
Particle size / μm	3; 5	5	5	3; 5
Pore size / nm	6; 12; 20; 30	12	12	12
Carbon content / %	n/a	4; 3	n/a	3
pH range	2.0 - 7.5	2.0 - 9.5	2.0 - 9.0	2.0 - 7.5

General

Hydrophilic Interaction Chromatography is a technique which has attracted more and more attention since it offers an alternative approach for the separation of highly polar compounds. The method itself, although it has been known for more than 25 years, has become more popular recently due to the introduction of several specialised HILIC selectivities onto the market. However it is not well known that HILIC can be accomplished with any highly polar stationary phase.

This opens up a large range of materials which are suitable for HILIC separations. In order to understand the mechanism and the separation principle it is helpful to use a schematic drawing:

As shown above, HILIC uses a highly polar stationary phase and a non polar mobile phase e.g. functionalised silica with a hydrophilic coating and an acetonitrile/water mixture (80:20). The polar or hydrophilic sample experiences more attraction towards the stationary phase or the more polar and more stationary part of the mobile phase. Polar samples can be eluted by using isocratic or gradient methods, giving the mobile phase a more hydrophilic character or even a higher ionic strength.



Separation principle of Hydrophilic Interaction Chromatography

Advantages

In general, reliable applications in HPLC require a minimum retention factor (k') of 2. In the widely used reversed phase methods polar compounds such as peptides, organic acids or pyrimidines often exhibit little or no retention and therefore low resolution on a conventional C18 phase. The use of additives such as ion-pair reagents is not an alternative since it is not applicable to LC-MS. Also normal phase chromatography fails due to poor solubility of the polar compounds in organic solvents. HILIC fills the gap between reversed phase and normal phase chromatography, because polar compounds can be retained while using e.g. acetonitrile/water eluents and buffers suitable for LC-MS.



HILIC Techniques for Polar Compounds

Conclusion

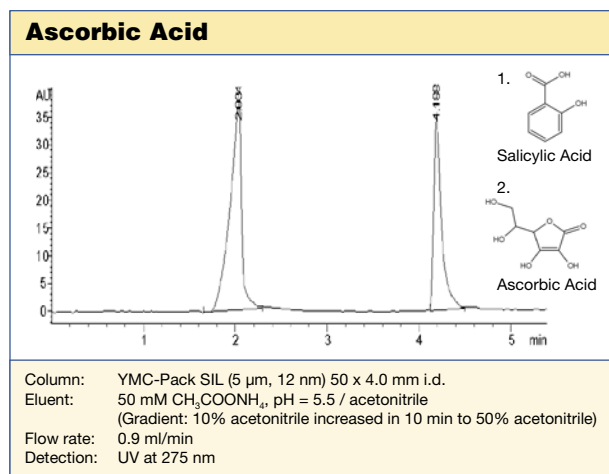
HILIC is a very interesting tool since a single reversed phase material hardly can retain polar, water-soluble compounds. An alternate mode of retention and separation needs to be considered for very polar compounds such as actives, metabolites and peptides. Hydrophilic Interaction Chromatography has also been referred to as "aqueous normal phase" or "reverse reversed phase" since elution is in the order of increasing hydrophilicity and the organic portion of the mobile phase (typically acetonitrile) is the weak solvent and the aqueous portion is the strong eluting solvent.

HILIC columns from YMC are rugged stationary phases which provide improved LC/ESI-MS response, direct SPE solvent compatibility and complementary selectivity to reversed phase. This is important to R&D and drug metabolism scientists since the impurity or metabolite is frequently more polar and present at much lower concentrations than the parent compound. With YMC HILIC columns, these very polar compounds elute later than the higher hydrophobic parent compound, thereby minimizing the MS ion suppression that can occur at the beginning of the chromatogram.

Another very important field of application is the separation and purification of polar compounds on a preparative to industrial scale. For this purpose YMC's well known phases are fully scaleable from kg to multi-ton supply and of course are available with particle sizes up to 150 μm . Please feel free to ask our technical staff for advice and support for scale-up applications!

YMC-Pack SIL

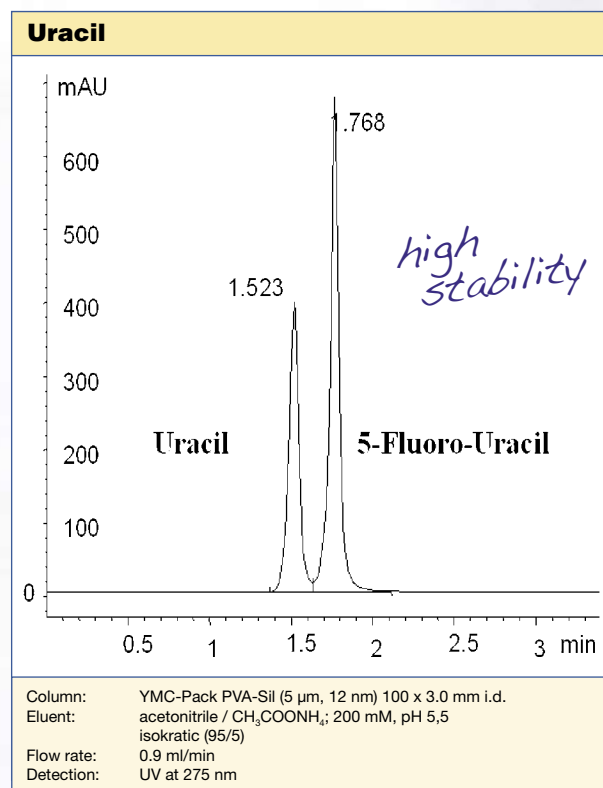
YMC-Pack Silica columns are prepared from highly purified silica gel and provide high sample recoveries in both normal and HILIC mode. YMC-Pack Silica is also available as wide pore column material.



Suitability of YMC-Pack Silica in HILIC mode

YMC-Pack PVA-Sil

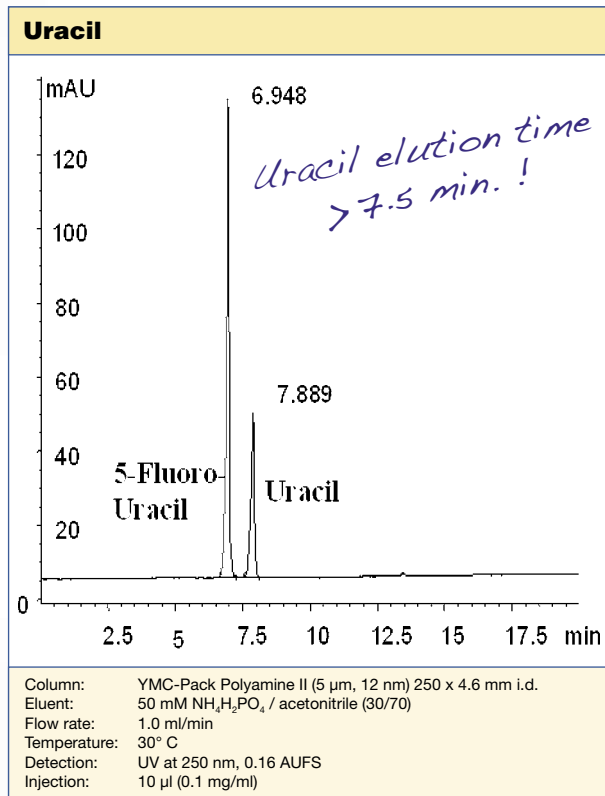
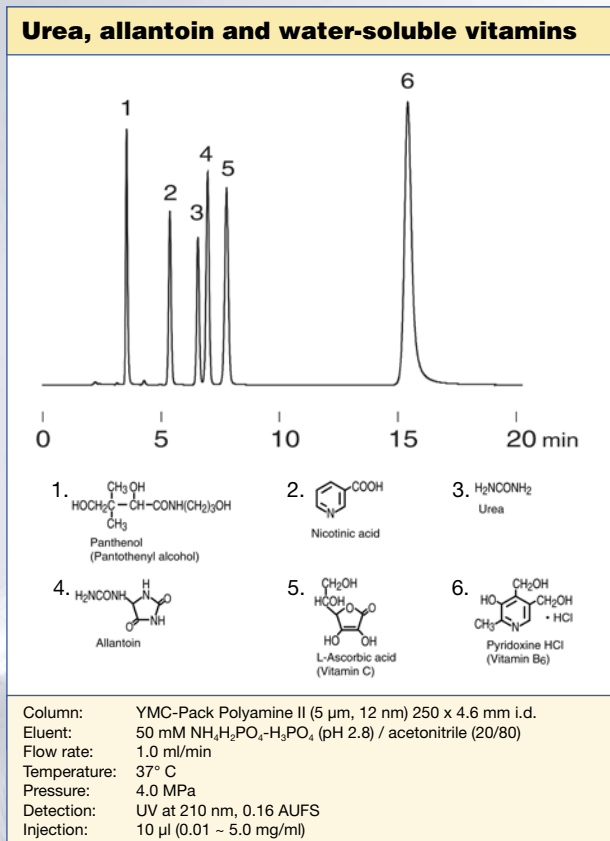
YMC-Pack PVA-Sil is prepared from a 5 μm , 12 nm silica support which is bonded with a monomolecular polymer coating of vinyl alcohol. The polymerised PVA completely covers both external and internal surfaces of the silica support, protecting it against aggressive, high pH buffers and solvents.



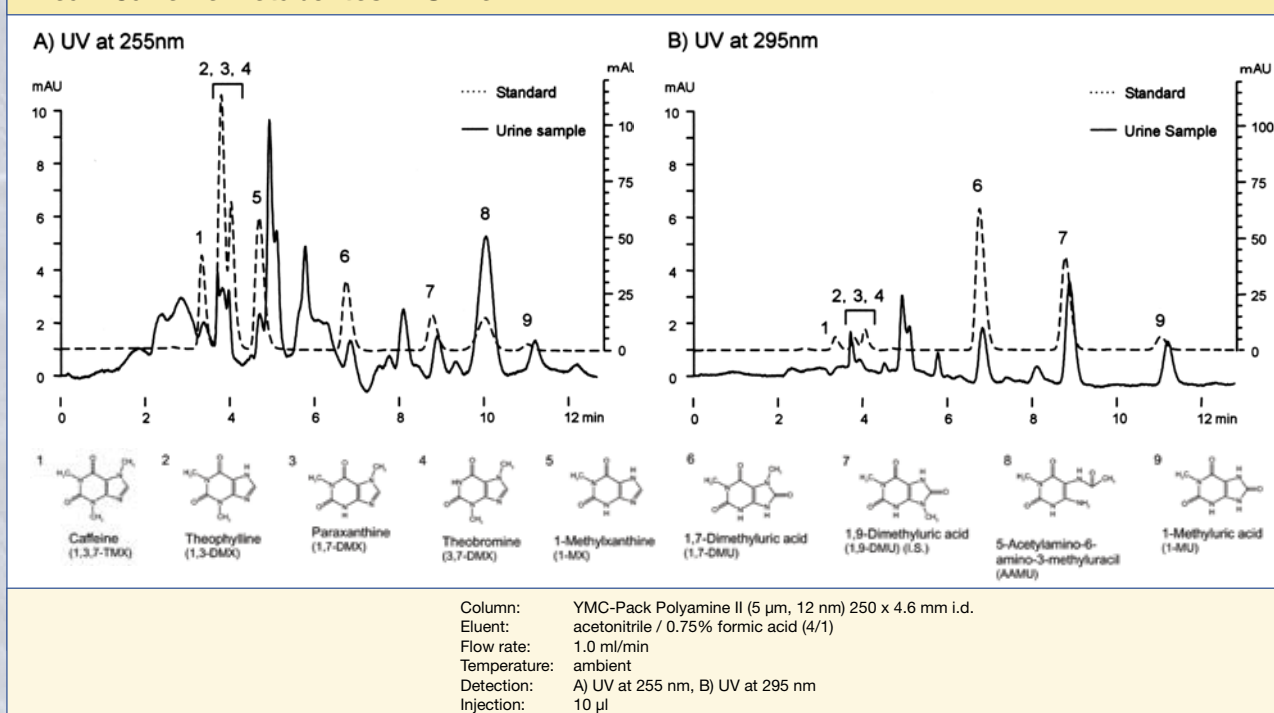
HILIC Techniques for Polar Compounds

YMC-Pack Polyamine II

YMC-Pack Polyamine II columns consist of a bonded phase with a polymer resin containing secondary and tertiary amine groups. This has advantages concerning the column life time over a conventional amino bonded phase due to the inability of secondary and tertiary amine groups to form Schiff's bases. YMC Polyamine phases are based on 5 µm, 12 nm spherical silica.



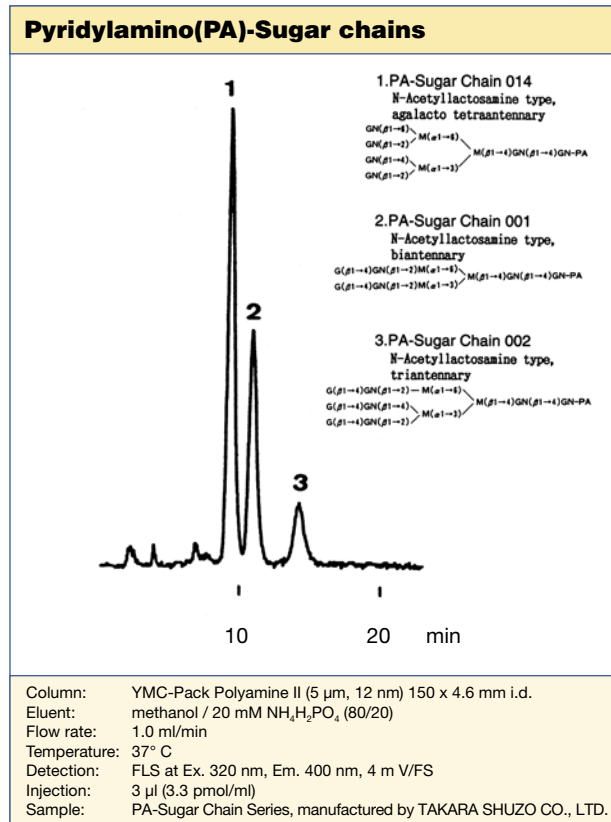
"Real" Caffeine Metabolites in Urine*



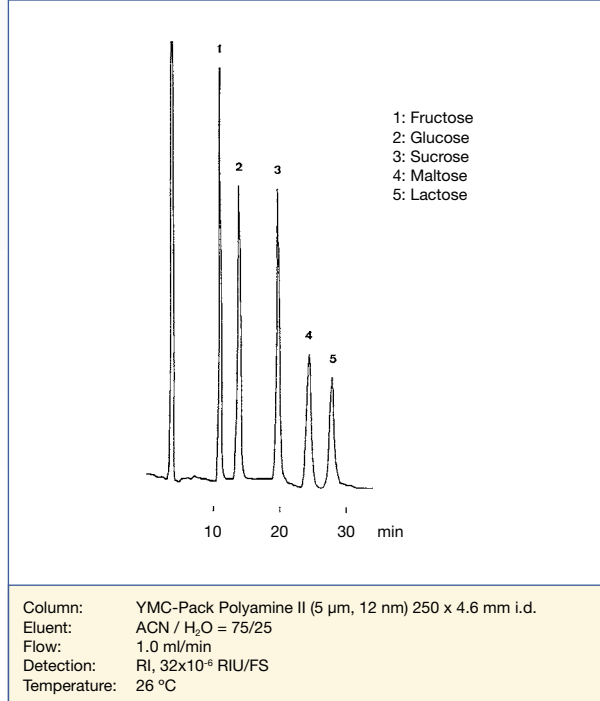
* Source: Courtesy of Takashi FURUTA, Ph.D., Tokyo University of Pharmacy and Life science

HILIC Techniques for Polar Compounds

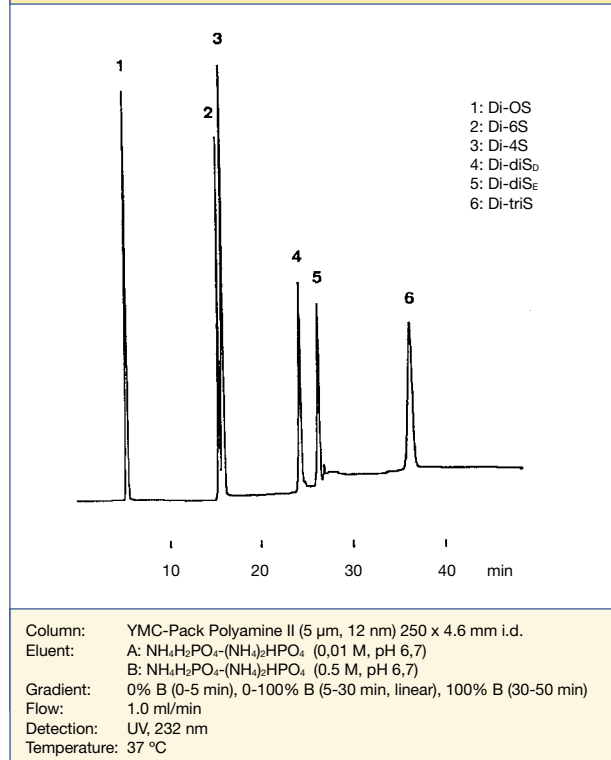
YMC-Pack Polyamine II



Mono- and Di-saccharides



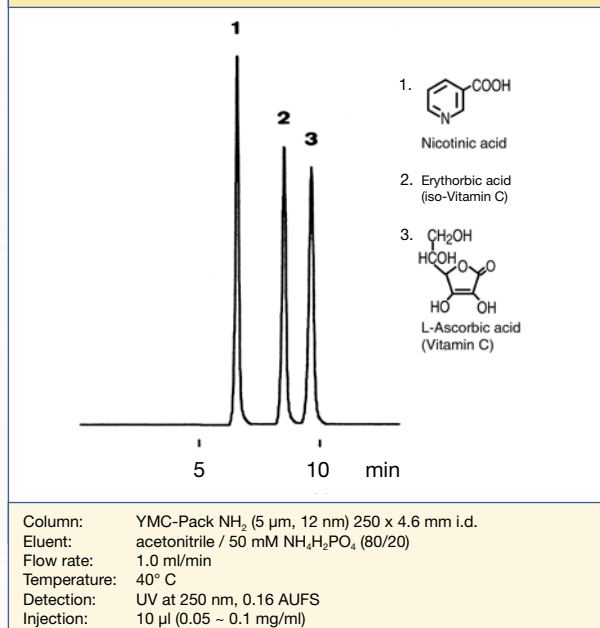
Unsaturated Chondrodisaccharides



YMC-Pack NH_2

YMC-Pack NH_2 (Amino) columns are prepared from a monomeric bonding of a primary propyl amine with a 12 nm or 30 nm spherical pore size. The YMC-Pack Amino columns can be used in normal phase, reversed phase and HILIC mode.

Water-soluble vitamins



Ordering Information

YMC-UltraHT Hydrosphere C18, 12 nm, 2 µm



Column i.d. (mm)	Column length (mm)				
	30	50	75	100	150
2.0	HS12S020302	HS12S020502	HS12S02L502	HS12S021002	HS12S021502
3.0		HS12S020503	HS12S02L503	HS12S021003	HS12S021503



YMC-Pack Hydrosphere C18, 12 nm, 3 µm



Column i.d. (mm)	Column length (mm)					Guard cartridges with 10 mm length (pack of 5)
	33	50	100	150	250	
2.1	HS12S030302QT	HS12S030502QT	HS12S031002QT	HS12S031502QT	HS12S032502QT	HS12S030102
3.0	HS12S030303QT	HS12S030503QT	HS12S031003QT	HS12S031503QT	HS12S032503QT	HS12S030103
4.0	HS12S030304QT	HS12S030504QT	HS12S031004QT	HS12S031504QT	HS12S032504QT	HS12S030104
4.6	HS12S030346WT	HS12S030546WT	HS12S031046WT	HS12S031546WT	HS12S032546WT	HS12S030104



For other dimensions please refer to page 161

YMC-Pack Hydrosphere C18, 12 nm, 5 µm



Column i.d. (mm)	Column length (mm)					Guard cartridges with 10 mm length (pack of 5)
	33	50	100	150	250	
2.1	HS12S050302QT	HS12S050502QT	HS12S051002QT	HS12S051502QT	HS12S052502QT	HS12S050102
3.0	HS12S050303QT	HS12S050503QT	HS12S051003QT	HS12S051503QT	HS12S052503QT	HS12S050103
4.0	HS12S050304QT	HS12S050504QT	HS12S051004QT	HS12S051504QT	HS12S052504QT	HS12S050104
4.6	HS12S050346WT	HS12S050546WT	HS12S051046WT	HS12S051546WT	HS12S052546WT	HS12S050104



For other dimensions please refer to page 161

Note: For your first order on guard cartridges, please add one guard cartridge holder per system to your order list: integral guard cartridge holder for columns with 2.1-4.0 mm i.d. **XPGCS-Q1** or universal guard cartridge holder for columns with 4.6 mm i.d. **XPGCH-Q1**. The holder can continuously be re-used and, thus it is not required for repeat orders.

Ordering Information

YMC-Pack ODS-AQ, 12 nm, 3 µm

Column i.d. (mm)	Column length (mm)					Guard cartridges with 10 mm length (pack of 5)
	33	50	100	150	250	
2.1	AQ12S030302QT	AQ12S030502QT	AQ12S031002QT	AQ12S031502QT	AQ12S032502QT	AQ12S030102
3.0	AQ12S030303QT	AQ12S030503QT	AQ12S031003QT	AQ12S031503QT	AQ12S032503QT	AQ12S030103
4.0	AQ12S030304QT	AQ12S030504QT	AQ12S031004QT	AQ12S031504QT	AQ12S032504QT	AQ12S030104
4.6	AQ12S030346WT	AQ12S030546WT	AQ12S031046WT	AQ12S031546WT	AQ12S032546WT	AQ12S030104

For other dimensions please refer to page 161



YMC-Pack ODS-AQ, 20 nm, 3 µm

Column i.d. (mm)	Column length (mm)					Guard cartridges with 10 mm length (pack of 5)
	33	50	100	150	250	
2.1	AQ20S030302QT	AQ20S030502QT	AQ20S031002QT	AQ20S031502QT	AQ20S032502QT	AQ20S030102
3.0	AQ20S030303QT	AQ20S030503QT	AQ20S031003QT	AQ20S031503QT	AQ20S032503QT	AQ20S030103
4.0	AQ20S030304QT	AQ20S030504QT	AQ20S031004QT	AQ20S031504QT	AQ20S032504QT	AQ20S030104
4.6	AQ20S030346WT	AQ20S030546WT	AQ20S031046WT	AQ20S031546WT	AQ20S032546WT	AQ20S030104

For other dimensions please refer to page 161



YMC-Pack ODS-AQ, 12 nm, 5 µm

Column i.d. (mm)	Column length (mm)					Guard cartridges with 10 mm length (pack of 5)
	33	50	100	150	250	
2.1	AQ12S050302QT	AQ12S050502QT	AQ12S051002QT	AQ12S051502QT	AQ12S052502QT	AQ12S050102
3.0	AQ12S050303QT	AQ12S050503QT	AQ12S051003QT	AQ12S051503QT	AQ12S052503QT	AQ12S050103
4.0	AQ12S050304QT	AQ12S050504QT	AQ12S051004QT	AQ12S051504QT	AQ12S052504QT	AQ12S050104
4.6	AQ12S050346WT	AQ12S050546WT	AQ12S051046WT	AQ12S051546WT	AQ12S052546WT	AQ12S050104

For other dimensions please refer to page 161



YMC-Pack ODS-AQ, 20 nm, 5 µm

Column i.d. (mm)	Column length (mm)					Guard cartridges with 10 mm length (pack of 5)
	33	50	100	150	250	
2.1	AQ20S050302QT	AQ20S050502QT	AQ20S051002QT	AQ20S051502QT	AQ20S052502QT	AQ20S050102
3.0	AQ20S050303QT	AQ20S050503QT	AQ20S051003QT	AQ20S051503QT	AQ20S052503QT	AQ20S050103
4.0	AQ20S050304QT	AQ20S050504QT	AQ20S051004QT	AQ20S051504QT	AQ20S052504QT	AQ20S050104
4.6	AQ20S050346WT	AQ20S050546WT	AQ20S051046WT	AQ20S051546WT	AQ20S052546WT	AQ20S050104

For other dimensions please refer to page 161



J'sphere ODS-M80, 8 nm, 4 µm

Column i.d. (mm)	Column length (mm)					Guard cartridges with 10 mm length (pack of 5)
	33	50	100	150	250	
2.1	JM08S040302QT	JM08S040502QT	JM08S041002QT	JM08S041502QT	JM08S042502QT	JM08S040102
3.0	JM08S040303QT	JM08S040503QT	JM08S041003QT	JM08S041503QT	JM08S042503QT	JM08S040103
4.0	JM08S040304QT	JM08S040504QT	JM08S041004QT	JM08S041504QT	JM08S042504QT	JM08S040104
4.6	JM08S040346WT	JM08S040546WT	JM08S041046WT	JM08S041546WT	JM08S042546WT	JM08S040104

For other dimensions please refer to page 161



Ordering Information



YMC-Pack SIL, 12 nm, 3 μm



Column i.d. (mm)	Column length (mm)					Guard cartridges with 10 mm length (pack of 5)
	33	50	100	150	250	
2.1	SL12S030302QT	SL12S030502QT	SL12S031002QT	SL12S031502QT	SL12S032502QT	SL12S030102
3.0	SL12S030303QT	SL12S030503QT	SL12S031003QT	SL12S031503QT	SL12S032503QT	SL12S030103
4.0	SL12S030304QT	SL12S030504QT	SL12S031004QT	SL12S031504QT	SL12S032504QT	SL12S030104
4.6	SL12S030346WT	SL12S030546WT	SL12S031046WT	SL12S031546WT	SL12S032546WT	SL12S030104

For other dimensions please refer to page 161

YMC-Pack SIL, 20 nm, 3 μm



Column i.d. (mm)	Column length (mm)					Guard cartridges with 10 mm length (pack of 5)
	33	50	100	150	250	
2.1	SL20S030302QT	SL20S030502QT	SL20S031002QT	SL20S031502QT	SL20S032502QT	SL20S030102
3.0	SL20S030303QT	SL20S030503QT	SL20S031003QT	SL20S031503QT	SL20S032503QT	SL20S030103
4.0	SL20S030304QT	SL20S030504QT	SL20S031004QT	SL20S031504QT	SL20S032504QT	SL20S030104
4.6	SL20S030346WT	SL20S030546WT	SL20S031046WT	SL20S031546WT	SL20S032546WT	SL20S030104

For other dimensions please refer to page 161

YMC-Pack SIL, 6 nm, 5 μm



Column i.d. (mm)	Column length (mm)					Guard cartridges with 10 mm length (pack of 5)
	33	50	100	150	250	
2.1	SL06S050302QT	SL06S050502QT	SL06S051002QT	SL06S051502QT	SL06S052502QT	SL06S050102
3.0	SL06S050303QT	SL06S050503QT	SL06S051003QT	SL06S051503QT	SL06S052503QT	SL06S050103
4.0	SL06S050304QT	SL06S050504QT	SL06S051004QT	SL06S051504QT	SL06S052504QT	SL06S050104
4.6	SL06S050346WT	SL06S050546WT	SL06S051046WT	SL06S051546WT	SL06S052546WT	SL06S050104

For other dimensions please refer to page 161

Ordering Information

YMC-Pack SIL, 12 nm, 5 μ m

Column i.d. (mm)	Column length (mm)					Guard cartridges with 10 mm length (pack of 5)
	33	50	100	150	250	
2.1	SL12S050302QT	SL12S050502QT	SL12S051002QT	SL12S051502QT	SL12S052502QT	SL12S050102
3.0	SL12S050303QT	SL12S050503QT	SL12S051003QT	SL12S051503QT	SL12S052503QT	SL12S050103
4.0	SL12S050304QT	SL12S050504QT	SL12S051004QT	SL12S051504QT	SL12S052504QT	SL12S050104
4.6	SL12S050346WT	SL12S050546WT	SL12S051046WT	SL12S051546WT	SL12S052546WT	SL12S050104

For other dimensions please refer to page 161



YMC-Pack SIL, 20 nm, 5 μ m

Column i.d. (mm)	Column length (mm)					Guard cartridges with 10 mm length (pack of 5)
	33	50	100	150	250	
2.1	SL20S050302QT	SL20S050502QT	SL20S051002QT	SL20S051502QT	SL20S052502QT	SL20S050102
3.0	SL20S050303QT	SL20S050503QT	SL20S051003QT	SL20S051503QT	SL20S052503QT	SL20S050103
4.0	SL20S050304QT	SL20S050504QT	SL20S051004QT	SL20S051504QT	SL20S052504QT	SL20S050104
4.6	SL20S050346WT	SL20S050546WT	SL20S051046WT	SL20S051546WT	SL20S052546WT	SL20S050104

For other dimensions please refer to page 161



YMC-Pack SIL, 30 nm, 5 μ m

Column i.d. (mm)	Column length (mm)					Guard cartridges with 10 mm length (pack of 5)
	33	50	100	150	250	
2.1	SL30S050302QT	SL30S050502QT	SL30S051002QT	SL30S051502QT	SL30S052502QT	SL30S050102
3.0	SL30S050303QT	SL30S050503QT	SL30S051003QT	SL30S051503QT	SL30S052503QT	SL30S050103
4.0	SL30S050304QT	SL30S050504QT	SL30S051004QT	SL30S051504QT	SL30S052504QT	SL30S050104
4.6	SL30S050346WT	SL30S050546WT	SL30S051046WT	SL30S051546WT	SL30S052546WT	SL30S050104

For other dimensions please refer to page 161



Ordering Information



YMC-Pack PVA-Sil, 12 nm, 5 μ m



Column i.d. (mm)	Column length (mm)					Guard cartridges with 10 mm length (pack of 5)
	33	50	100	150	250	
2.1	PV12S050302QT	PV12S050502QT	PV12S051002QT	PV12S051502QT	PV12S052502QT	PV12S050102
3.0	PV12S050303QT	PV12S050503QT	PV12S051003QT	PV12S051503QT	PV12S052503QT	PV12S050103
4.0	PV12S050304QT	PV12S050504QT	PV12S051004QT	PV12S051504QT	PV12S052504QT	PV12S050104
4.6	PV12S050346WT	PV12S050546WT	PV12S051046WT	PV12S051546WT	PV12S052546WT	PV12S050104



For other dimensions please refer to page 161

YMC-Pack Polyamine II, 12 nm, 5 μ m



Column i.d. (mm)	Column length (mm)					Guard cartridges with 10 mm length (pack of 5)
	33	50	100	150	250	
2.1	PB12S050302QT	PB12S050502QT	PB12S051002QT	PB12S051502QT	PB12S052502QT	PB12S050102
3.0	PB12S050303QT	PB12S050503QT	PB12S051003QT	PB12S051503QT	PB12S052503QT	PB12S050103
4.0	PB12S050304QT	PB12S050504QT	PB12S051004QT	PB12S051504QT	PB12S052504QT	PB12S050104
4.6	PB12S050346WT	PB12S050546WT	PB12S051046WT	PB12S051546WT	PB12S052546WT	PB12S050104



For other dimensions please refer to page 161

YMC-Pack NH₂, 12 nm, 3 μ m



Column i.d. (mm)	Column length (mm)					Guard cartridges with 10 mm length (pack of 5)
	33	50	100	150	250	
2.1	NH12S030302QT	NH12S030502QT	NH12S031002QT	NH12S031502QT	NH12S032502QT	NH12S030102
3.0	NH12S030303QT	NH12S030503QT	NH12S031003QT	NH12S031503QT	NH12S032503QT	NH12S030103
4.0	NH12S030304QT	NH12S030504QT	NH12S031004QT	NH12S031504QT	NH12S032504QT	NH12S030104
4.6	NH12S030346WT	NH12S030546WT	NH12S031046WT	NH12S031546WT	NH12S032546WT	NH12S030104



For other dimensions please refer to page 161

YMC-Pack NH₂, 12 nm, 5 μ m



Column i.d. (mm)	Column length (mm)					Guard cartridges with 10 mm length (pack of 5)
	33	50	100	150	250	
2.1	NH12S050302QT	NH12S050502QT	NH12S051002QT	NH12S051502QT	NH12S052502QT	NH12S050102
3.0	NH12S050303QT	NH12S050503QT	NH12S051003QT	NH12S051503QT	NH12S052503QT	NH12S050103
4.0	NH12S050304QT	NH12S050504QT	NH12S051004QT	NH12S051504QT	NH12S052504QT	NH12S050104
4.6	NH12S050346WT	NH12S050546WT	NH12S051046WT	NH12S051546WT	NH12S052546WT	NH12S050104



For other dimensions please refer to page 161

Ordering Information

The previous product listing represents commonly used standard column dimension. In order to identify any specific product version and order number, please see the example and the table below.

Full listing of all chemistries and dimensions

Gel Code							Hardware Code						
Chemistry code		Pore size [nm]		Particle shape		Particle size [µm]		Length [mm]		Inner diameter [mm]		Column Type	
YMC30	CT	6	06	spherical	S	3	03	10	01	0.05	E5	Quick Seal	QT
Pro C18	AS	8	08			4	04	20	02	0.075			
Pro C18 RS	RS	12	12			5	05	33	03	0.1	F0	Waters type	WT
Hydrosphere C18	HS	20	20			6	06	50	05	0.2	G0		
ODS-A	AA	30	30					75	L5	0.3	H0		
ODS-AM	AM	100	A0			10	11	100	10	0.5	J0		
ODS-AQ	AQ	proprietary	99			15	16	125	R5	0.8	M0		
J'sphere ODS-H80	JH	non-porous	00			20	21	150	15	1.0	O1		
J'sphere ODS-M80	JM					50	50	250	25	2.1	O2		
J'sphere ODS-L80	JL					75	75			3.0	O3		
ODS-AL	AL							300	30	4.0	O4		
PAH	YP					63/210	A4						
PolymerC18	PC					150	A5	500	50	4.6	46		
Pro C8	OS							1000	A0	6.0	06		
C8 (Octyl)	OC									8.0	08		
YMCbasic	BA									10	10		
Ph (Phenyl)	PH									20	20		
Pro C4	BS									30	30		
C4 (Butyl)	BU												
Protein-RP	PR									50 (2000 psi)	52		
TMS (C1)	TM									70 (2000 psi)	72		
PVA-Sil	PV									100 (2000 psi)	A2		
Polyamine II	PB									150 (2000 psi)	B2		
NH ₂ (Amino)	NH									200 (2000 psi)	C2		
CN (Cyano)	CN												
Diol	DL												
SIL (Silica)	SL												
BioPro-QA	QA												
BioPro-SP	SP												
BioPro-QA-F	QF												
BioPro-SP-F	SF												
Chiral NEA (R)	NR												
Chiral NEA (S)	NS												
Chiral CD BR α	DA												
Chiral CD BR β	DB												
Chiral CD BR γ	DG												
Chiral Prep CD ST	ST												
Chiral Prep CD PM	PM												

Example

Choose your column and fill in the "Gel and Hardware Code" or detailed description (The part number consists of the "Gel Code" and the "Hardware Code").

YMC-Pack ODS-A	12 nm	spherical	3 µm	250 mm	1.0 mm	Quick Seal
AA	12	S	03	25	01	QT

Your column part number: **AA12S032501QT (Example)**

Please note that combinations of features cannot be selected at random, but only from the possible specifications for a chosen stationary phase. These can be determined from the individual product sections in this catalogue or from our homepage www.ymc.de.

For more details



contact your local distributor or

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