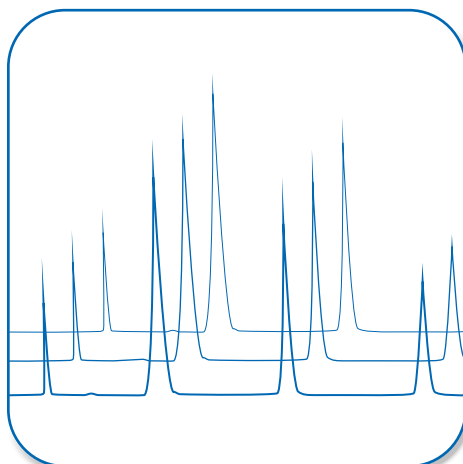




Speciality Columns



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Speciality Columns

Introduction

Unique bonded phases

The YMC's Speciality Columns represents major advances in modern chromatography. In order to obtain maximum separation and resolution, selectivity has to be optimised. YMC is dedicated to produce speciality phases, which are designed to provide robust, reliable and easy transferable methods for specific applications. For this reason, YMC introduce YMC Carotenoid and YMC PAH phases, which

are designed to show high recognition for structurally similar polar and nonpolar carotenoids and polyaromatic hydrocarbons, respectively.

In addition, YMC's J'sphere columns are a series of packings, which offer a range of different hydrophobicity controlled by the alternative process of C18 chain density.

YMC Carotenoid

- **C30 chains**
- **very lipophilic**
- **exceptional selectivity pattern**
- **isomer recognition**
- **LC-MS applications**
- **polar carotenes**
- **polar and nonpolar xanthophylls**
- **steroids**
- **retinols**
- **fat-soluble vitamins**

Specifications	YMC Carotenoid
Particle size / μm	3; 5
Pore size / nm	proprietary
Surface area / m^2g^{-1}	proprietary
Carbon content / %	proprietary
Recommended pH range	2.0 – 7.5

General

The separation of geometric and positional isomers is a challenging task in reversed phase chromatography. Subtle molecular differences have to be recognized and resolved by this particular stationary phase. Sander et al. have con-

clusively shown that polymeric C30 HPLC stationary phases are able to discriminate isomeric structures of long chain molecules [1,2].

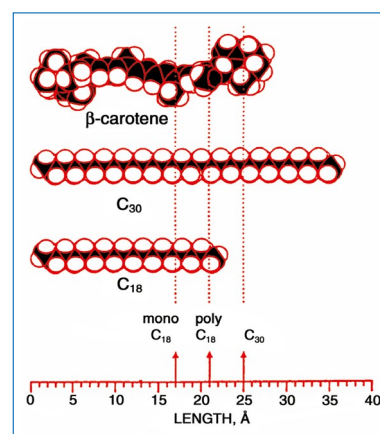
Properties

Compared to classical C18 stationary phases, YMC Carotenoid is much more hydrophobic. Even when pure organic eluents are applied, many sample solutes are retained. The use of non-aqueous reversed phase mobile phases facilitates 100% solvent recycling and LC-MS applications. The YMC Carotenoid stationary phase provides sufficient phase thickness to enhance interaction with long chained molecules (see figure on right). Therefore, geometric and positional isomers of conjugated double bonding systems are recognised and resolved by the YMC Carotenoid phase.

The resolving power of YMC Carotenoid for isomers can be verified by the separation of carotenoids, which has been subject of considerable research efforts in the past. Carotenoids are found in a variety of natural sources including fruits and vegetables. In addition, carotenoids are

considered as potential drugs for cancer intervention or prevention.

Despite the complexity of carotenoid extracts and the minor shape differences between carotenoid isomers, the separation, identification and quantification of these compounds can be achieved by using YMC Carotenoid columns.



Comparison of the film thickness of C18 and C30 stationary phases with the molecular length of β -carotene (determined with Small Angle Neutron Scattering (SANS)).

Application

YMC Carotenoid columns are successfully used in the food industry, for the analysis of vitamin formulations, in environmental analysis, and for the control of algal growth.

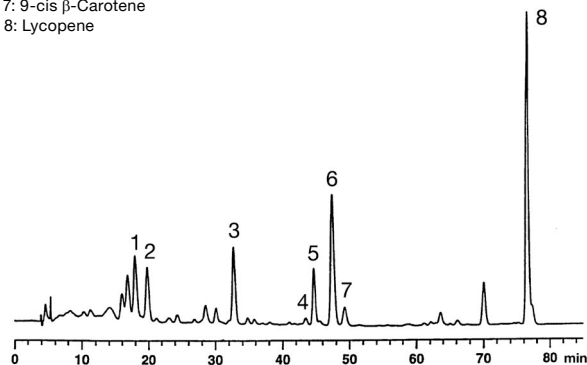
Other potential applications include the separation of prostaglandins and leucotrienes.

YMC Carotenoid

Separation of natural compounds

Extract of SRM 2383, NIST food standard^a

- 1: Lutein
- 2: Zeaxanthin
- 3: β -Cryptoxanthin
- 4: 13-cis β -Carotene
- 5: α -Carotene
- 6: trans β -Carotene
- 7: 9-cis β -Carotene
- 8: Lycopene

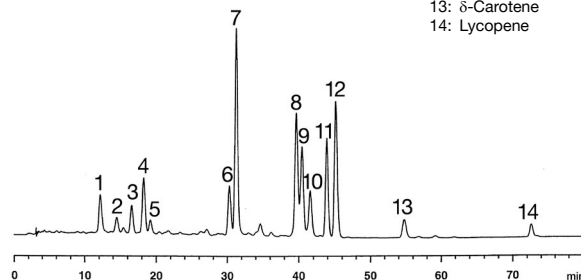


Column: YMC Carotenoid (5 μ m) 250 x 4.6 mm ID
 Part No.: CT99S05-2546WT
 Eluent: A: MeOH / MTBE / H₂O = 81/15/4 / B: MeOH / MTBE / H₂O = 6/90/4
 Gradient: 0-100% B (90 min)
 Flow: 1.0 mL/min
 Detection: UV at 450 nm
 Temperature: ambient

Carotene and Xanthophyll standard^a

Gradient elution was performed by ternary gradient elution. Mobile phase B) is not miscible in this proportion. For binary gradient elution, MeOH/MTBE/water(7/90/3) is suitable as mobile phase B).

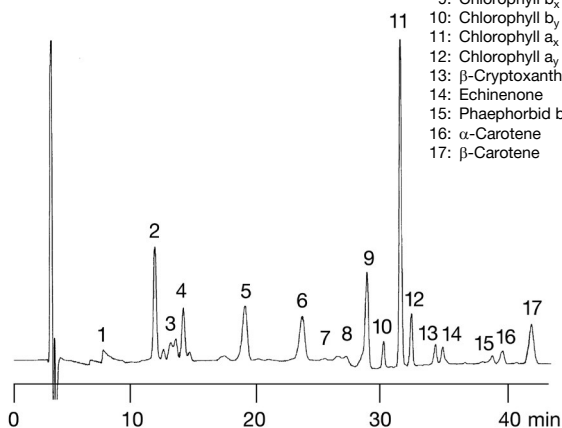
- 1: Astaxanthin
- 2: Capsanthin
- 3: Lutein
- 4: Zeaxanthin
- 5: Canthaxanthin
- 6: β -Cryptoxanthin
- 7: Echinenone
- 8: 15-cis β -Carotene
- 9: 13-cis β -Carotene
- 10: α -Carotene
- 11: trans β -Carotene
- 12: 9-cis β -Carotene
- 13: δ -Carotene
- 14: Lycopene



Column: YMC Carotenoid (5 μ m) 250 x 4.6 mm ID
 Part No.: CT99S05-2546WT
 Eluent: A: MeOH / MTBE / H₂O = 81/15/4 / B: MeOH / MTBE / H₂O = 6/90/4
 Gradient: 1-100% B (90 min)
 Flow: 1.0 mL/min
 Detection: UV at 450 nm
 Temperature: ambient

Carotenoid pigments in algae^b

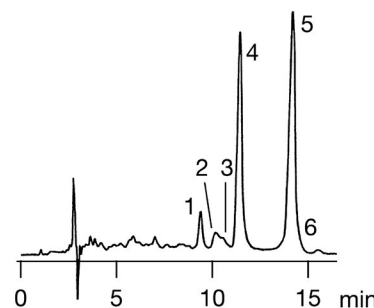
- 1: Chlorophyll c₁+c₂
- 2: Fucoxanthin
- 3: Neoxanthin
- 4: Violaxanthin
- 5: Diadinoxanthin
- 6: Lutein
- 7: Zeaxanthin
- 8: Diatoxanthin
- 9: Chlorophyll b_x
- 10: Chlorophyll b_y
- 11: Chlorophyll a_x
- 12: Chlorophyll a_y
- 13: β -Cryptoxanthin
- 14: Echinenone
- 15: Phaephorboid b
- 16: α -Carotene
- 17: β -Carotene



Column: YMC Carotenoid (5 μ m) 250 x 4.6 mm ID
 Part No.: CT99S05-2546WT
 Eluent: A: methanol / acetone = 60/40
 B: acetone / H₂O = 60/40
 Gradient: 60-30% B (0-3 min), 30% B (3-22 min), 30-10% B (22-26 min), 10% B (26-41.5 min), 10-60% B (41.5-45 min)
 Flow: 0.5 mL/min
 Detection: UV at 450 nm
 Temperature: 35 °C

Carotene isomers from commercially available capsules^a

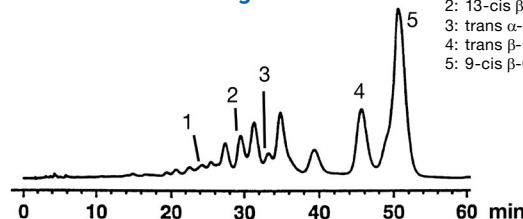
- 1: 15-cis β -Carotene
- 2: 13-cis β -Carotene
- 3: 13'-cis β -Carotene
- 4: α -Carotene
- 5: β -Carotene
- 6: α -Carotene



Column: YMC Carotenoid (5 μ m) 250 x 4.6 mm ID
 Part No.: CT99S05-2546WT
 Eluent: EtOH / MeOH / THF = 75/20/5
 Flow: 1.0 mL/min
 Detection: UV at 450 nm
 Temperature: ambient

Carotenes found in algae^a

- 1: 15-cis β -Carotene
- 2: 13-cis β -Carotene
- 3: trans α -Carotene
- 4: trans β -Carotene
- 5: 9-cis β -Carotene



Column: YMC Carotenoid (5 μ m) 250 x 4.6 mm ID
 Part No.: CT99S05-2546WT
 Eluent: MeOH / MTBE = 80/20
 Flow: 2.0 mL/min
 Detection: UV at 450 nm
 Temperature: 35 °C

References

- [1] Sander, L.C. and S.A. Wise; J. Chromatogr. 1993, 656, 335-351
- [2] Sander, L.C. et al.; Anal. Chem. 1994, 66, 1667-1674
- [3] Block, G. and L. Langseth, "Antioxidant Vitamins and Disease Prevention", Food Technology July 1994

^a Courtesy of L.C. Sander, NIST, Gaithersburg, NC, USA

^b Courtesy of J. Schmid, Institut für Seenforschung, Langenargen, Germany

YMC PAH

- specifically designed for the analysis of Polynuclear Aromatic Hydrocarbons
- provides the resolution necessary for a fast identification and quantification for PAHs

Specifications	YMC PAH
Particle size / μm	3; 5
Pore size / nm	proprietary
Surface area / m^2g^{-1}	proprietary
Carbon content / %	proprietary
Recommended pH range	2.0 – 6.5

General

Polynuclear Aromatic Hydrocarbons (PAHs) are among the most frequently monitored environmental contaminants. YMC PAH columns have been specifically developed for the highly demanding analysis of Polynuclear Aromatic Hydrocarbons.

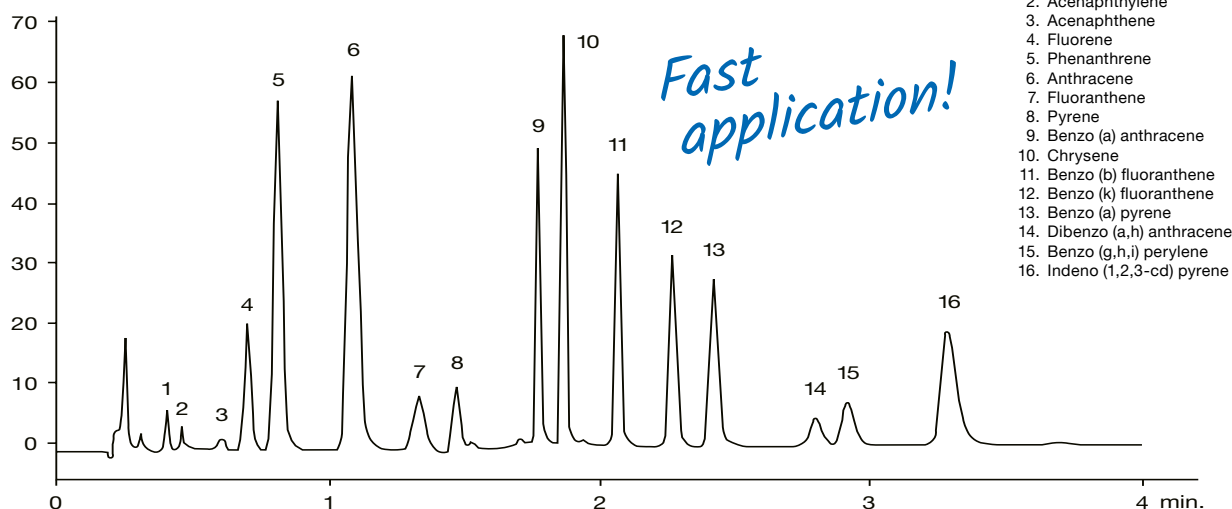
Standard and official methods for the analysis of PAHs are found in compendia for air, drinking water, waste water, solid waste, and food analysis. Many of these methods specify HPLC, usually with UV or fluorescence detection, as recommended analytical procedure.

Properties

The YMC PAH columns provide narrow symmetrical peak shapes and its resolving ability leads to an easy identification and quantification for PAHs. The optimised selectivity

of YMC PAH columns results in a separation with enough space for wavelength changes by the use of fluorescence detectors.

16 PAH according to EPA 610

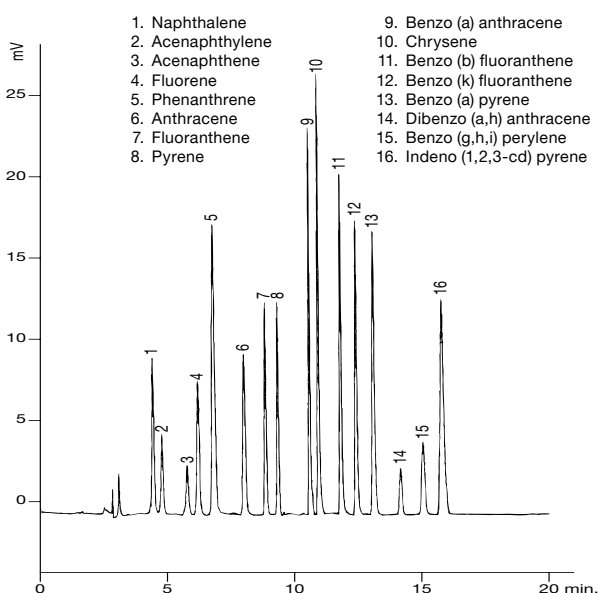


Column: YMC PAH (3 μm) 50 x 4.0 mm ID
 Part No.: YP99S03-0504WT
 Eluent: A) methanol / water (80/20) B) acetonitrile
 Flow rate: 2.0 mL/min
 Temperature: 24 °C
 Detection: UV at 254 nm Gradient

Time [min]	A	B
0.0	90%	10%
0.5	90%	10%
1.0	0%	100%
4.0	0%	100%

YMC PAH

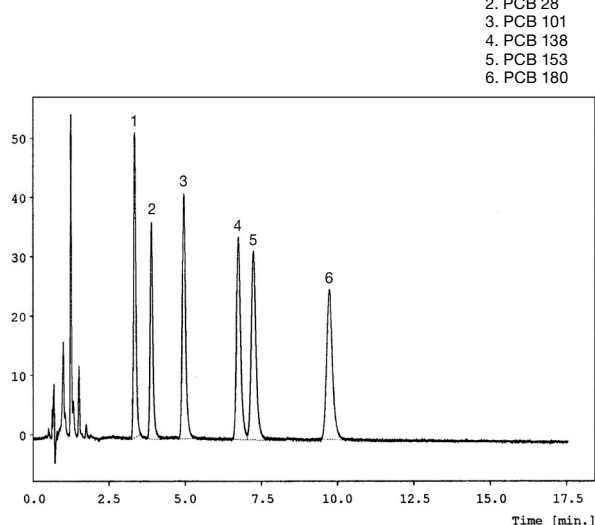
16 PAH according to EPA 610



Column: YMC PAH (5 μ m) 250 x 3.0 mm ID
 Part No.: YP99S05-2503WT
 Eluent: A) MeOH / water (80/20)
 B) acetonitrile
 Flow rate: 0.43 mL/min
 Temperature: 30 °C
 Detection: UV at 254 nm
 Injection: 5 μ L

Gradient Time [min]	A	B
0,0	90%	10%
4	90%	10%
7	0%	100%
25	0%	100%

PCB separation according EPA

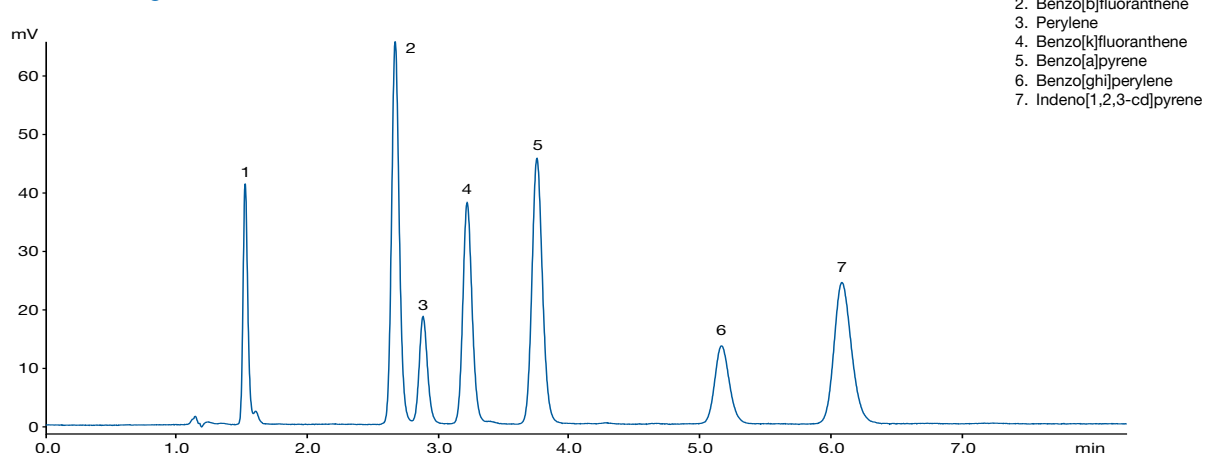


Column: YMC PAH (3 μ m) 100 x 3.0 mm ID
 Part No.: YP99S05-1003WT
 Eluent: acetonitrile / water (75/25)
 Flow rate: 0.6 mL/min
 Temperature: 30 °C
 Detection: UV at 220 nm

Polynuclear Aromatic Hydrocarbons (PAHs) are ubiquitous xenobiotics which are known or suspected carcinogens. According to the German Trinkwasserverordnung (TVO) six PAH have to be quantified. Moreover Perylene, which is often present in the samples under investigation, has to be fully resolved in order to avoid coelutions and therefore questionable results.

The chromatogram below shows the successful separation of all seven substances with a YMC PAH column as stationary and an acetonitrile/methanol mixture as a simple isocratic mobile phase. The elution time has been reduced to approximately six minutes with excellent resolution without the need for gradient elution.

7 PAH according to EPA 610



Column: YMC PAH (5 μ m) 125 x 4.0 mm ID
 Part No.: YP99S05-R504WT
 Eluent: acetonitrile / methanol (95/5)
 Flow rate: 1.0 mL/min
 Temp.: 25 °C
 Detection: UV at 254 nm
 Inj.-vol.: 5 μ L

J'sphere ODS

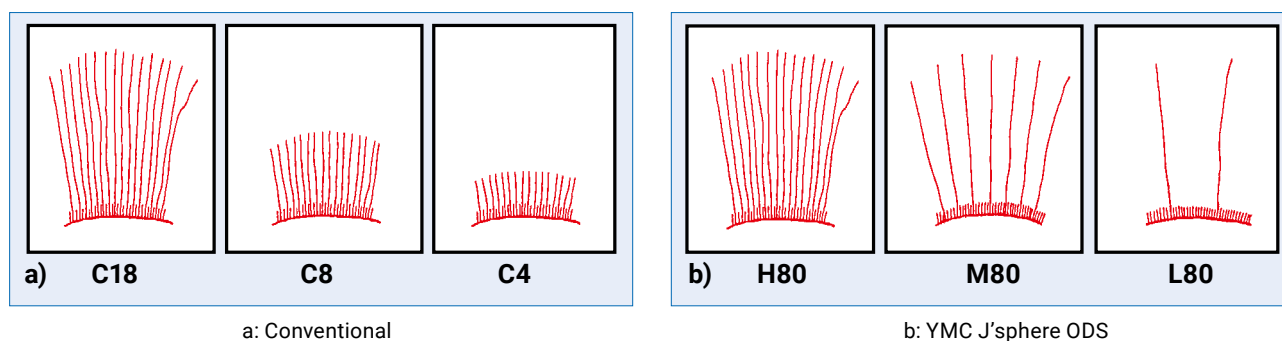
- *high quality RP columns*
- *high surface silica, 8 nm, 4 μ m*
- *polarity range created solely by C18*
- *bonding density*
- *metabolite recognition*
- *high siloxane content*
- *additional selectivity through H-bonding*
- *a selectivity concept designed for*
 - quality control
 - pharmaceuticals
 - organic intermediates
 - hormones, steroids

Specifications	J'sphere ODS-H80	J'sphere ODS-M80	J'sphere ODS-L80
Particle size / μ m	4	4	4
Pore size / nm	8	8	8
Surface area / m ² g ⁻¹	510	510	510
Carbon content / %	22	14	9
Recommended pH range	1.0 – 9.0	2.0 – 7.5	2.0 – 7.5

General

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 J'sphere ODS, the alkyl chain length is kept constant (as C18), but the content of C18 groups on the silica surface is varied to produce the three different J'sphere ODS packings with graduated hydrophobicity (see figure below).



Schematic comparison of reversed phases of different polarity.

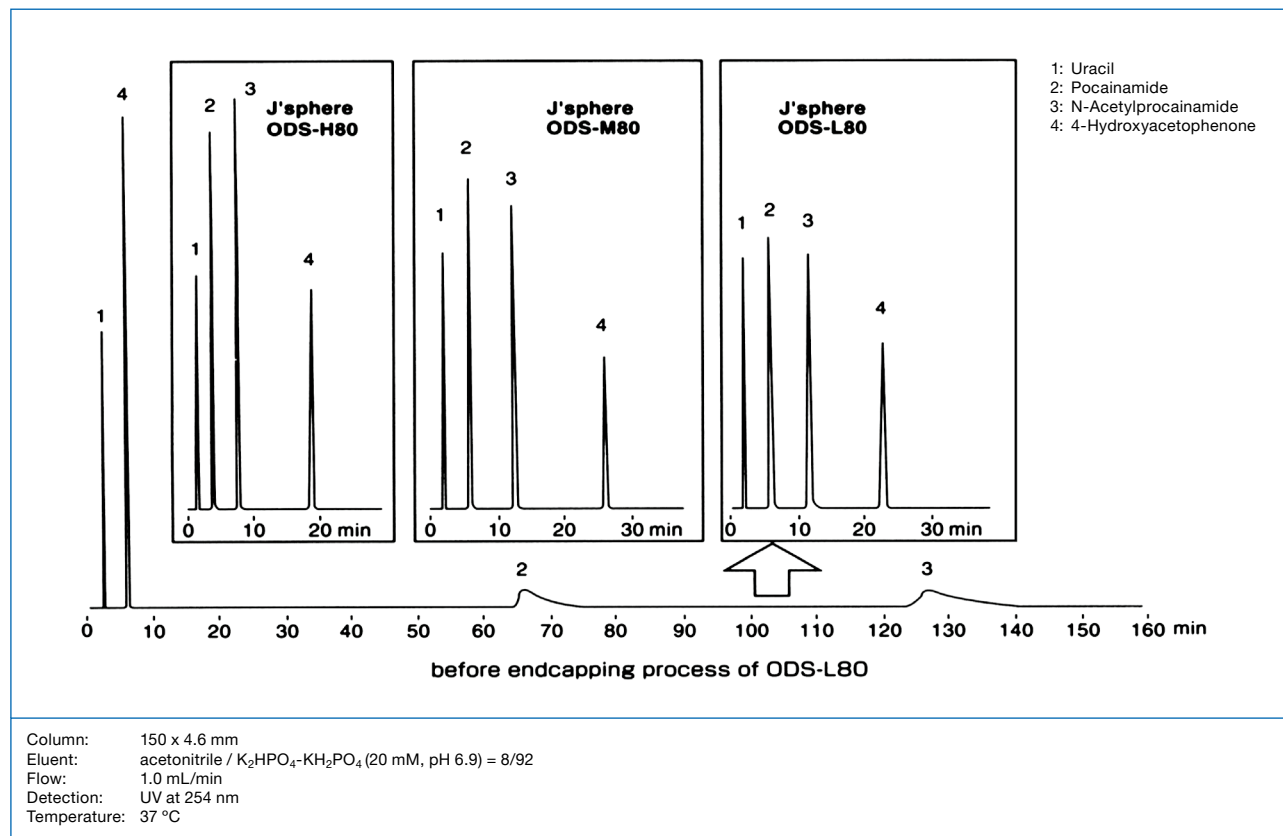
Physico-Chemical Properties

J'sphere ODS packings are based on a spherical, ultra pure, high surface area silica with a mean pore diameter of 8 nm and a mean particle diameter of 4 μ m. J'sphere silica has a very homogeneous surface providing additional siloxane

groups. They are almost of the same nature as ether groups and they are able to form H-bonding which is of great importance for the retentivity and selectivity of J'sphere ODS bonded phases.

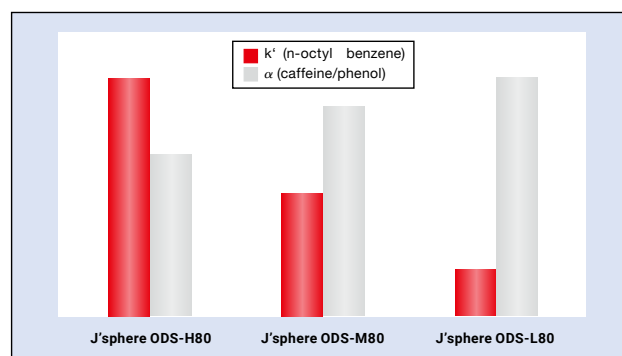
J'sphere ODS

An elaborate endcapping process is applied to react the remaining silanols to effectively suppress the undesired non-specific interactions (see figure below).



Three types of ODS are processed by endcapping technology to minimize the effect of residual silanol as much as possible.

The stepwise decrease of hydrophobicity in the J'sphere ODS-H80, M80 and L80 series is accompanied by a corresponding increase in the H-bonding capacity (see figure right). If a sample molecule is susceptible to H-bonding, the resulting interaction represents additional retention and enhances the selectivity in RP separations.



Hydrophobicity (indicated by k' for n-octyl benzene) and H-bonding capacity (indicated by α of caffeine/phenol) of J'sphere ODS columns.

Selectivity Data

The exclusive use of C18 groups makes the hydrophobic interaction identical for all three types of J'sphere ODS packings; only the degree of hydrophobicity, i.e. the polarity, is varied.

In addition to the hydrophobic interaction, the surface siloxane groups of J'sphere ODS packings provide a pronounced H-bonding capacity contributing additional selectivity.

The ability to interact strongly via H-bonding, creates the opportunity to make use of an additional degree of freedom in selectivity. The "controlled hydrogen bonding capacity" of YMC J'sphere ODS packings represents an efficient tool for the chromatographic discrimination of closely related compounds presenting only minor molecular differences.

J'sphere ODS

Applications

J'sphere ODS-H80

J'sphere ODS-H80 is the most hydrophobic stationary phase in this series. It is densely covered with polymeric bonded C18 groups yielding a high carbon content and providing a strong, dominant, lipophilic interaction with the nonpolar sites of the sample molecules. However, the ability

to form H-bonding gives additional selectivity, which is essential for difficult separations, such as drug and corresponding metabolite discrimination. Even stereoisomers can be separated by J'sphere ODS-H80 columns.

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-L80

J'sphere ODS-L80 has a low polymeric bonded C18 coverage, providing only minor hydrophobic retention. The extremely high H-bonding capacity makes J'sphere ODS-L80

very useful for the separation of polar compounds. Such compounds frequently have molecular sites which are susceptible to H-bonding and hence, are easily separated by a H-bonding mechanism.

Conclusion

By using the graduated properties of J'sphere ODS columns, a great variety of chemical and pharmaceutical applications can be achieved. YMC J'sphere ODS analytical columns are

a good choice for the analysis of pharmaceuticals, organic intermediates, metabolites etc., due to their concept of fine-tuned approach by using different H-bonding capacities.

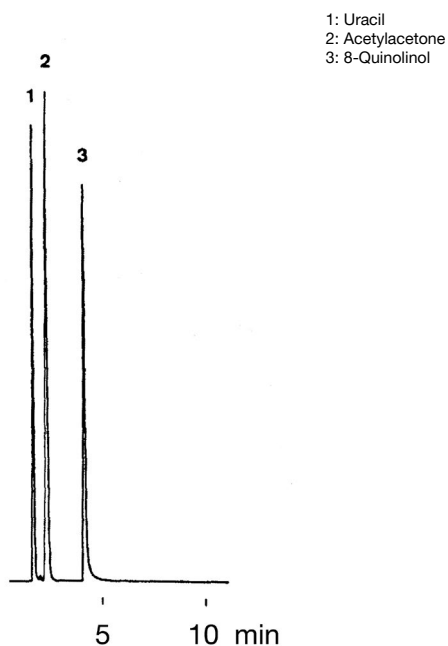
Quality Specifications

Based on the experience in high performance analytical selectivities and large scale silicas synthesis and bonded phases, the long term availability of high quality analytical J'sphere ODS columns is guaranteed. Sophisticated selec-

tivity tests for quality control ensure reproducible separations. These quality control tests guarantee the customer long term reproducible performance, which is essential for the validated analytical HPLC methods.

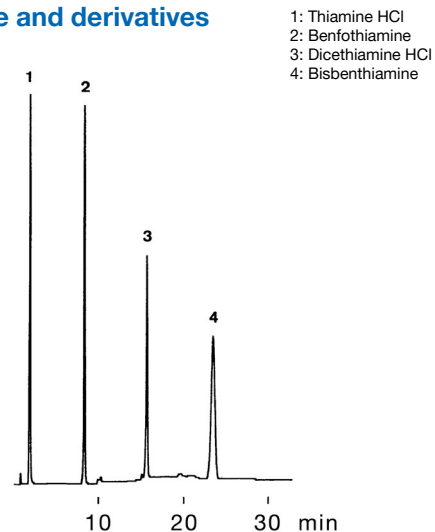
J'sphere ODS-H80

Elution profile of complexing agents



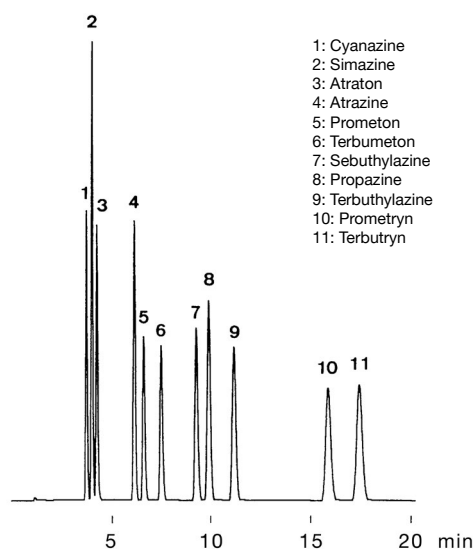
Column: J'sphere ODS-H80 (8 nm, 4 μ m) 150 x 4.6 mm ID
 Part No.: JH08S04-1546WT
 Eluent: K_2HPO_4 - KH_2PO_4 (20 mM, pH 6.9) / methanol = 40/60
 Flow: 1.0 mL/min
 Detection: UV at 254 nm
 Temperature: 37 $^{\circ}$ C

Thiamine and derivatives



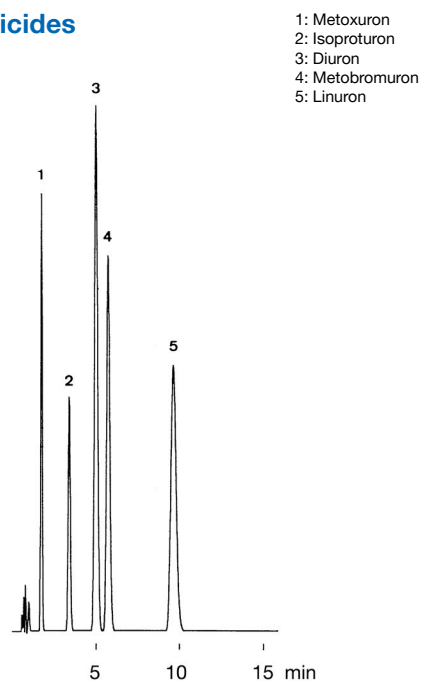
Column: J'sphere ODS-H80 (8 nm, 4 μ m) 75 x 4.6 mm ID
 Part No.: JH08S04-L546WT
 Eluent: A: $(NH_4)_2HPO_4$ (50 mM)
 B: methanol / $(NH_4)_2HPO_4$ (50 mM) = 60/40
 Gradient: 10-100% B (0-15 min, linear), 100% B (15-30 min)
 Flow: 1.0 mL/min
 Detection: UV at 260 nm
 Temperature: 37 $^{\circ}$ C

Triazine herbicides



Column: J'sphere ODS-H80 (8 nm, 4 μ m) 150 x 4.6 mm ID
 Part No.: JH08S04-1546WT
 Eluent: acetonitrile / $NH_4H_2PO_4$ (50 mM) = 45/55
 Flow: 1.0 mL/min
 Detection: UV at 230 nm
 Temperature: 37 $^{\circ}$ C

Urea herbicides

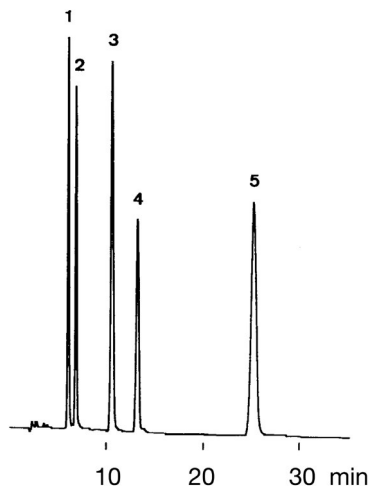


Column: J'sphere ODS-H80 (8 nm, 4 μ m) 150 x 4.6 mm ID
 Part No.: JH08S04-1546WT
 Eluent: THF / H_2O = 30/70
 Flow: 1.0 mL/min
 Detection: UV at 260 nm
 Temperature: 37 $^{\circ}$ C

J'sphere ODS-M80

Catechins

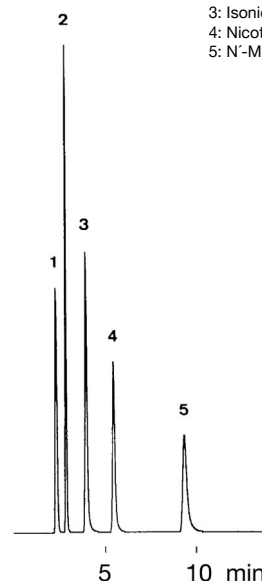
- 1: (-)-Epigallocatechin
- 2: (+)-Catechin
- 3: (-)-Epigallocatechin gallate
- 4: (-)-Epicatechin
- 5: (-)-Epicatechin gallate



Column: J'sphere ODS-M80 (8 nm, 4 μ m) 150 x 4.6 mm ID
 Part No.: JM08S04-1546WT
 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

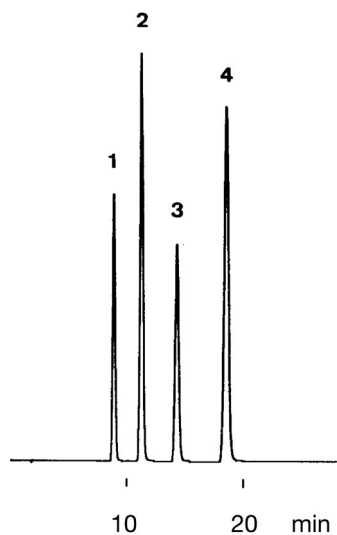
- 1: Isonicotinic acid
- 2: Nicotinic acid
- 3: Isonicotinic acid hydrazide
- 4: Nicotinamide
- 5: N'-Methylnicotinamide



Column: J'sphere ODS-M80 (8 nm, 4 μ m) 150 x 4.6 mm ID
 Part No.: JM08S04-1546WT
 Eluent: acetonitrile / KH_2PO_4 (20 mM) = 5/95
 Flow: 1.0 mL/min
 Detection: UV at 260 nm
 Temperature: 30 $^\circ\text{C}$

Aflatoxins

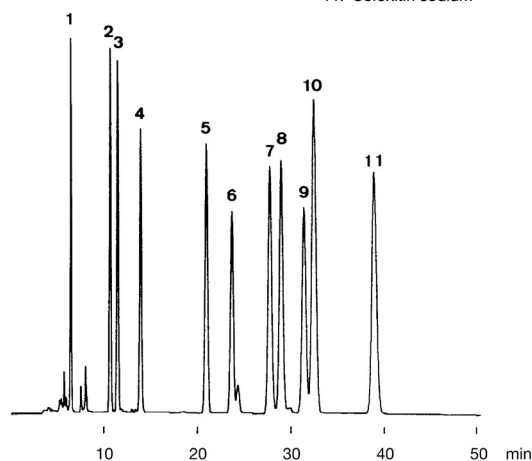
- 1: Aflatoxin G_2
- 2: Aflatoxin G_1
- 3: Aflatoxin B_2
- 4: Aflatoxin B_1



Column: J'sphere ODS-M80 (8 nm, 4 μ m) 150 x 4.6 mm ID
 Part No.: JM08S04-1546WT
 Eluent: methanol / water = 40/60
 Flow: 1.0 mL/min
 Detection: UV at 365 nm
 Temperature: 37 $^\circ\text{C}$

Cephalosporin antibiotics

- 1: Cefsulodin sodium
- 2: Cephalixin hydrate
- 3: Cefaclor
- 4: Cephradine
- 5: Cephaloglycin
- 6: Cephalirin sodium
- 7: Cefotaxime sodium
- 8: Cephaloridine
- 9: Cefazolin sodium
- 10: Cefuroxime sodium
- 11: Cefoxitin sodium

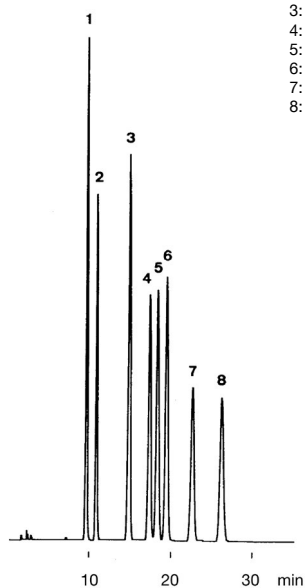


Column: J'sphere ODS-M80 (8 nm, 4 μ m) 250 x 4.6 mm ID
 Part No.: JM08S04-2546WT
 Eluent: acetonitrile / KH_2PO_4 (100 mM) = 10/90
 Flow: 0.8 mL/min
 Detection: UV at 260 nm
 Temperature: 37 $^\circ\text{C}$

J'sphere ODS-L80

Adrenocorticosteroids

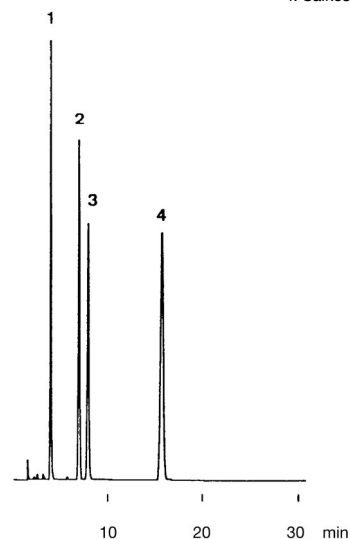
- 1: Hydrocortisone
- 2: Cortisone
- 3: Methylprednisolone
- 4: Betamethasone
- 5: Dexamethasone
- 6: Corticosterone
- 7: Beclomethasone
- 8: Triamcinolone acetonide



Column: J'sphere ODS-L80 (8 nm, 4 μ m) 150 x 4.6 mm ID
 Part No.: JL08S04-1546WT
 Eluent: acetonitrile / water = 27/73
 Flow: 1.0 mL/min
 Detection: UV at 260 nm
 Temperature: 37 °C

Saikosaponins

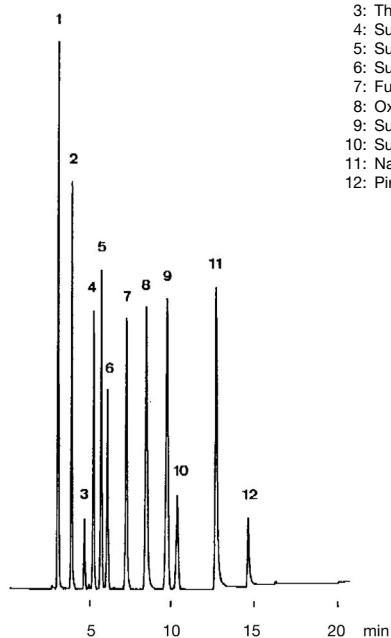
- 1: Saikosaponin c
- 2: Saikosaponin a
- 3: Saikosaponin b₂
- 4: Saikosaponin d



Column: J'sphere ODS-L80 (8 nm, 4 μ m) 150 x 4.6 mm ID
 Part No.: JL08S04-1546WT
 Eluent: acetonitrile / water = 38/62
 Flow: 1.0 mL/min
 Detection: UV at 210 nm
 Temperature: 37 °C

Antibacterial agents

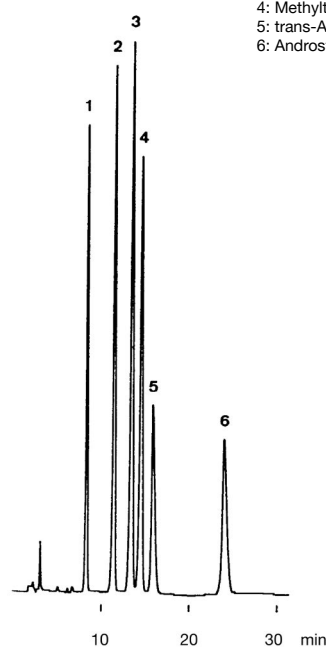
- 1: Olaquinox
- 2: Carbadox
- 3: Thiamphenicol
- 4: Sulfamerazine
- 5: Sulfadimidine
- 6: Sulfamonomethoxine
- 7: Furazolidone
- 8: Oxolinic acid
- 9: Sulfaminoxaline
- 10: Sulfadimethoxine
- 11: Nalidixic acid
- 12: Piromidic acid



Column: J'sphere ODS-L80 (8 nm, 4 μ m) 250 x 4.6 mm ID
 Part No.: JL08S04-2546WT
 Eluent: A: acetonitrile / $\text{NH}_4\text{H}_2\text{PO}_4$ (50 mM) = 10/90
 B: acetonitrile / $\text{NH}_4\text{H}_2\text{PO}_4$ (50 mM) = 80/20
 Gradient: 25% B (0-5 min), 25-100% B (5-15 min), 100% B (15-20 min)
 Flow: 1.0 mL/min
 Detection: UV at 240 nm
 Temperature: 37 °C

Androgens

- 1: Fluoxymesterone
- 2: Testosterone
- 3: Dehydroisoandrosterone
- 4: Methyltestosterone
- 5: trans-Androsterone
- 6: Androsterone



Column: J'sphere ODS-L80 (8 nm, 4 μ m) 150 x 4.6 mm ID
 Part No.: JL08S04-1546WT
 Eluent: methanol / acetonitrile / water = 45/15/40
 Flow: 0.8 mL/min
 Detection: UV at 210 nm
 Temperature: 30 °C

Ordering Information

3/4 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 Carotenoid	2.0	CT99S03-0502WT	CT99S03-1002WT	CT99S03-1502WT	CT99S03-2502WT	CT99S03-01Q1GC
	2.1	CT99S03-05Q1WT	CT99S03-10Q1WT	CT99S03-15Q1WT	CT99S03-25Q1WT	CT99S03-01Q1GC
	3.0	CT99S03-0503WT	CT99S03-1003WT	CT99S03-1503WT	CT99S03-2503WT	CT99S03-0103GC
	4.0	CT99S03-0504WT	CT99S03-1004WT	CT99S03-1504WT	CT99S03-2504WT	CT99S03-0104GC
	4.6	CT99S03-0546WT	CT99S03-1046WT	CT99S03-1546WT	CT99S03-2546WT	CT99S03-0104GC
YMC PAH	2.0	YP99S03-0502WT	YP99S03-1002WT	YP99S03-1502WT	YP99S03-2502WT	YP99S03-01Q1GC
	2.1	YP99S03-05Q1WT	YP99S03-10Q1WT	YP99S03-15Q1WT	YP99S03-25Q1WT	YP99S03-01Q1GC
	3.0	YP99S03-0503WT	YP99S03-1003WT	YP99S03-1503WT	YP99S03-2503WT	YP99S03-0103GC
	4.0	YP99S03-0504WT	YP99S03-1004WT	YP99S03-1504WT	YP99S03-2504WT	YP99S03-0104GC
	4.6	YP99S03-0546WT	YP99S03-1046WT	YP99S03-1546WT	YP99S03-2546WT	YP99S03-0104GC
J'sphere ODS-H80	2.0	JH08S04-0502WT	JH08S04-1002WT	JH08S04-1502WT	JH08S04-2502WT	JH08S04-01Q1GC
	2.1	JH08S04-05Q1WT	JH08S04-10Q1WT	JH08S04-15Q1WT	JH08S04-25Q1WT	JH08S04-01Q1GC
	3.0	JH08S04-0503WT	JH08S04-1003WT	JH08S04-1503WT	JH08S04-2503WT	JH08S04-0103GC
	4.0	JH08S04-0504WT	JH08S04-1004WT	JH08S04-1504WT	JH08S04-2504WT	JH08S04-0104GC
	4.6	JH08S04-0546WT	JH08S04-1046WT	JH08S04-1546WT	JH08S04-2546WT	JH08S04-0104GC
J'sphere ODS-M80	2.0	JM08S04-0502WT	JM08S04-1002WT	JM08S04-1502WT	JM08S04-2502WT	JM08S04-01Q1GC
	2.1	JM08S04-05Q1WT	JM08S04-10Q1WT	JM08S04-15Q1WT	JM08S04-25Q1WT	JM08S04-01Q1GC
	3.0	JM08S04-0503WT	JM08S04-1003WT	JM08S04-1503WT	JM08S04-2503WT	JM08S04-0103GC
	4.0	JM08S04-0504WT	JM08S04-1004WT	JM08S04-1504WT	JM08S04-2504WT	JM08S04-0104GC
	4.6	JM08S04-0546WT	JM08S04-1046WT	JM08S04-1546WT	JM08S04-2546WT	JM08S04-0104GC
J'sphere ODS-L80	2.0	JL08S04-0502WT	JL08S04-1002WT	JL08S04-1502WT	JL08S04-2502WT	JL08S04-01Q1GC
	2.1	JL08S04-05Q1WT	JL08S04-10Q1WT	JL08S04-15Q1WT	JL08S04-25Q1WT	JL08S04-01Q1GC
	3.0	JL08S04-0503WT	JL08S04-1003WT	JL08S04-1503WT	JL08S04-2503WT	JL08S04-0103GC
	4.0	JL08S04-0504WT	JL08S04-1004WT	JL08S04-1504WT	JL08S04-2504WT	JL08S04-0104GC
	4.6	JL08S04-0546WT	JL08S04-1046WT	JL08S04-1546WT	JL08S04-2546WT	JL08S04-0104GC

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 Carotenoid	2.0	CT99S05-0502WT	CT99S05-1002WT	CT99S05-1502WT	CT99S05-2502WT	CT99S05-01Q1GC
	2.1	CT99S05-05Q1WT	CT99S05-10Q1WT	CT99S05-15Q1WT	CT99S05-25Q1WT	CT99S05-01Q1GC
	3.0	CT99S05-0503WT	CT99S05-1003WT	CT99S05-1503WT	CT99S05-2503WT	CT99S05-0103GC
	4.0	CT99S05-0504WT	CT99S05-1004WT	CT99S05-1504WT	CT99S05-2504WT	CT99S05-0104GC
	4.6	CT99S05-0546WT	CT99S05-1046WT	CT99S05-1546WT	CT99S05-2546WT	CT99S05-0104GC
YMC PAH	2.0	YP99S05-0502WT	YP99S05-1002WT	YP99S05-1502WT	YP99S05-2502WT	YP99S05-01Q1GC
	2.1	YP99S05-05Q1WT	YP99S05-10Q1WT	YP99S05-15Q1WT	YP99S05-25Q1WT	YP99S05-01Q1GC
	3.0	YP99S05-0503WT	YP99S05-1003WT	YP99S05-1503WT	YP99S05-2503WT	YP99S05-0103GC
	4.0	YP99S05-0504WT	YP99S05-1004WT	YP99S05-1504WT	YP99S05-2504WT	YP99S05-0104GC
	4.6	YP99S05-0546WT	YP99S05-1046WT	YP99S05-1546WT	YP99S05-2546WT	YP99S05-0104GC

*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) or use our online chat on our homepage (www.ymc.eu).