# Speciality Columns

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# 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 method for specific applications. For this reason, YMC introduce YMC30 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 then alternative process of C18 chain density.

# YMC30 / YMC Carotenoid

- **C30 chains**
- **very lipophilic**
- **exceptional selectivity pattern**
- **isomer recognition**

- **polar carotenes**
- **polar and nonpolar Xanthophylls**
- **steroids**
- **retinols**
- **fat-soluble vitamins**
- **LC-MS applications**

| YMC30 / YMC Carotenoid | Specification |
|---|---|
| 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 |

* Please inquire for bulk packing material.

## General

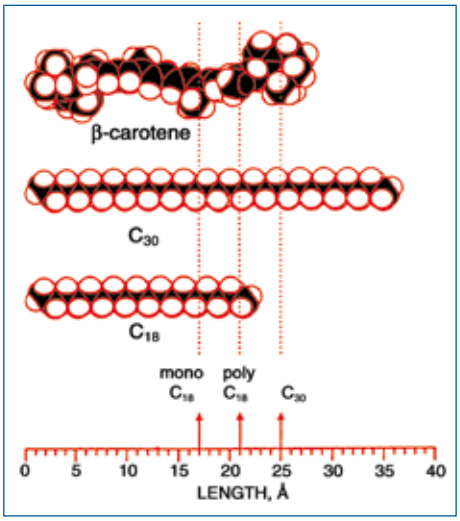
The separation of geometric and positional isomers is a challenging task in reversed phase chromatography. Subtle molecular differences have to be recognized and resolved by this particular stationary phase. Sander et al. have conclusively shown that polymeric C30 HPLC stationary phases are able to discriminate isomeric structures of long chain molecules [1,2].

## Properties

Compared to classical C18 stationary phases, YMC30 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 YMC30 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 YMC30 phase.

The resolving power of YMC30 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 YMC30 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)).**

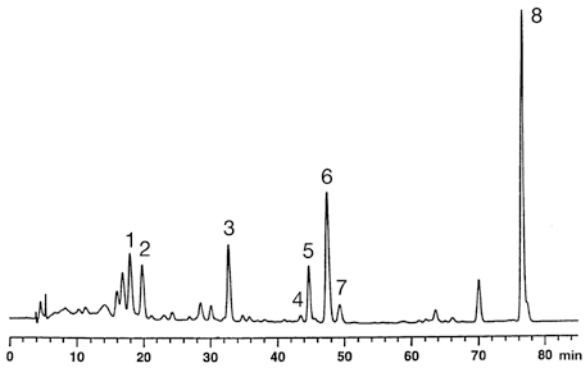
## Applications

YMC30 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.

# YMC30 / YMC Carotenoid

## Separation of natural compounds*

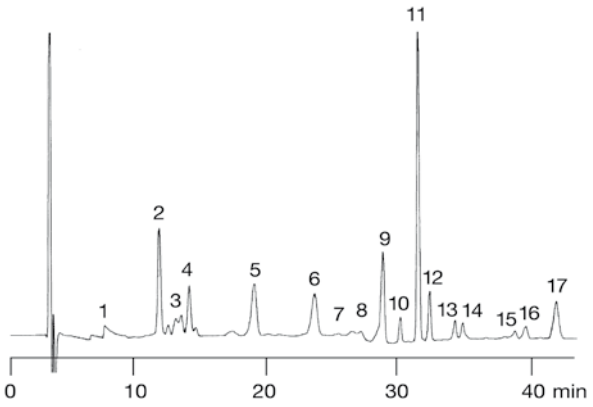
### Extract of SRM 2383, NIST food standard[a]




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: | YMC30 (5 µm) 250 x 4.6 mm ID |
| Part No.: | CT99S05-2546WT |
| Eluent: | A: MeOH / MTBE / $H_2O$ = 81/15/4 / B: MeOH / MTBE / $H_2O$ = 6/90/4 |
| Gradient: | 0-100% B (90 min) |
| Flow: | 1.0 ml/min |
| Detection: | UV at 450 nm |
| Temperature: | ambient |

### Carotenoid pigments in algae[b]



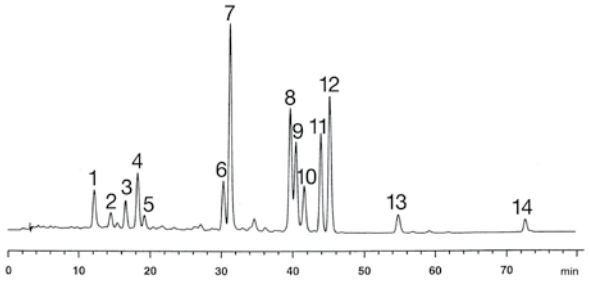

1: Chlorophyll $c_1$+$c_2$
2: Fucoxanthin
3: Neoxanthin
4: Violaxanthin
5: Diadinoxanthin
6: Lutein
7: Zeaxanthin
8: Diatoxanthin
9: Chlorophyll $b_x$
10: Chlorophyll $b_y$
11: Chlorophyll $a_x$
12: Chlorophyll $a_y$
13: β-Cryptoxanthin
14: Echinenone
15: Phaephorbid b
16: α-Carotene
17: β-Carotene

| | |
|---|---|
| Column: | YMC30 (5 µm) 250 x 4.6 mm ID |
| Part No.: | CT99S05-2546WT |
| Eluent: | A: methanol / acetone = 60/40<br>B: acetone / $H_2O$ = 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 |

**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

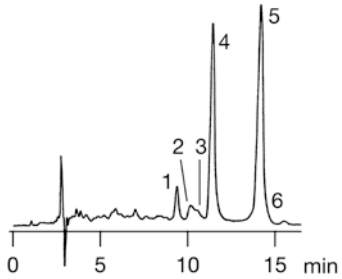
### Carotene and Xanthophyll standard[a]




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: | YMC30 (5 µm) 250 x 4.6 mm ID |
| Part No.: | CT99S05-2546WT |
| Eluent: | A: MeOH / MTBE / $H_2O$= 81/15/4 / B: MeOH / MTBE / $H_2O$= 6/90/4 |
| Gradient: | 1-100% B (90 min) |
| Flow: | 1.0 ml/min |
| Detection: | UV at 450 nm |
| Temperature: | ambient |

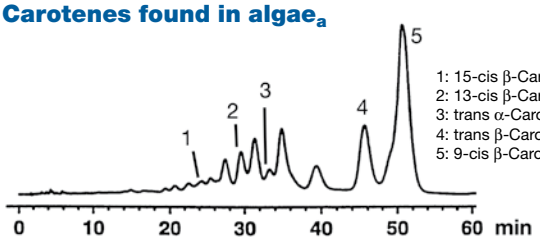
### Carotene isomers from commercially available capsules[a]




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: | YMC30 (5 µm) 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

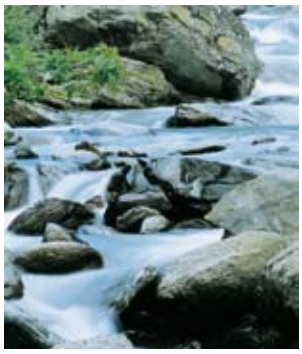
| | |
|---|---|
| Column: | YMC30 (5 µm) 250 x 4.6 mm ID |
| Part No.: | CT99S05-2546WT |
| Eluent: | MeOH / MTBE = 80/20 |
| Flow: | 2.0 ml/min |
| Detection: | UV at 450 nm |
| Temperature: | 3 °C |

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

* Application data by courtesy YMC Co., Ltd.

# YMC PAH

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



| YMC PAH | Specification |
|---|---|
| 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

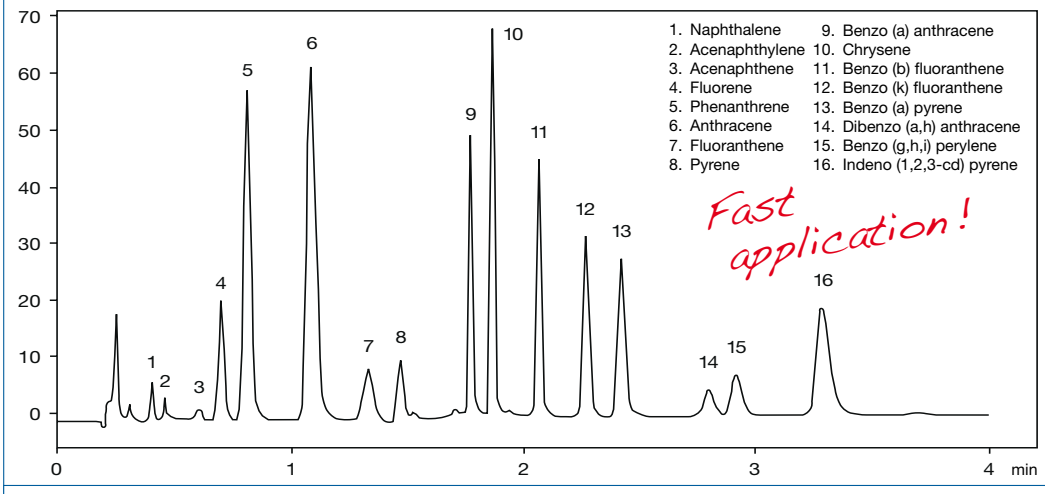
Polynuclear Aromatic Hydrocarbons (PAHs) are among the most frequently monitored environmental contaminants. YMC PAH columns have been specifically developed for the highly demanding analysis of Polynuclear Aromatic Hydrocarbons.

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*



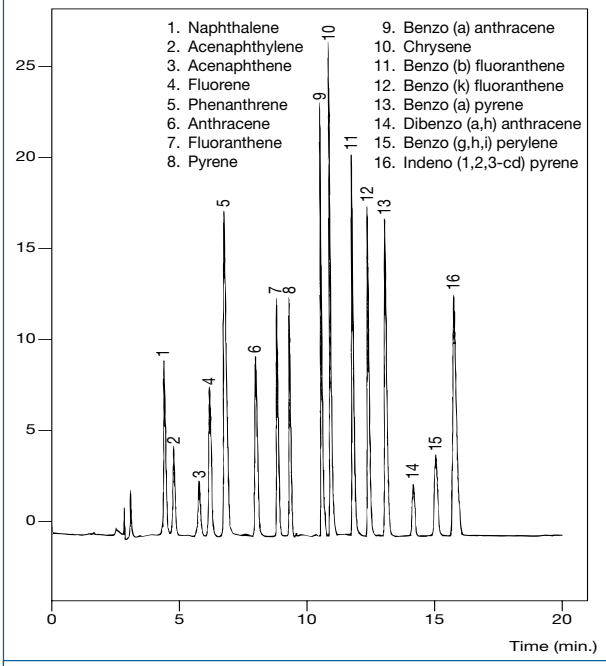

| | |
|---|---|
| Column: | YMC PAH (3 µm) 50 x 4.0 mm ID |
| Part No.: | YP99S03-0504QT |
| Eluent: | A) methanol / water (80/20) B) acetonitrile |
| Flow rate: | 2.0 ml/min |
| Temperature: | 24 °C |
| Detection: | UV at 254 nm |

Gradient

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

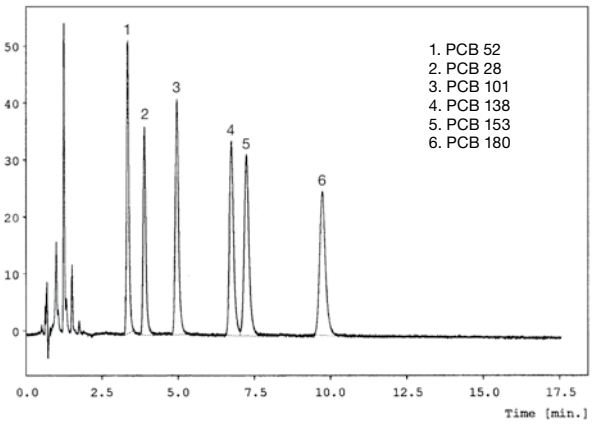
# YMC PAH

## 16 PAH according to EPA 610*




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

## PCB separation according EPA*

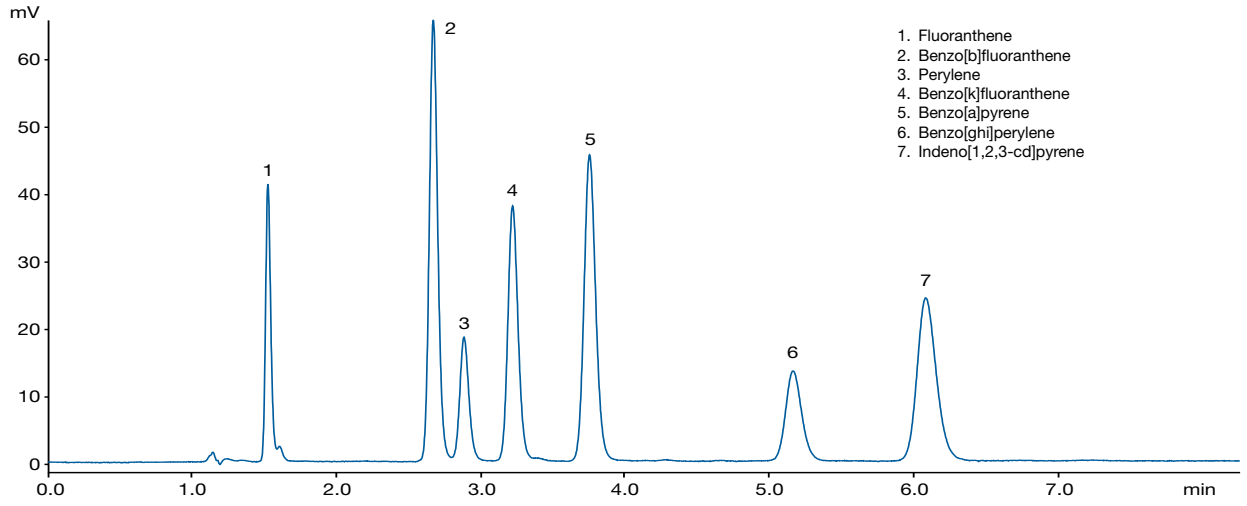



| | |
|---|---|
| Column: | YMC PAH (3 µm) 100 x 3.0 mm ID |
| Part No.: | YP99S05-1003QT |
| Eluent: | $CH_3CN$ / water (75/25) |
| Flow rate: | 0.6 ml/min |
| Temperature: | 30 °C |
| Detection: | UV at 220 nm |

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*



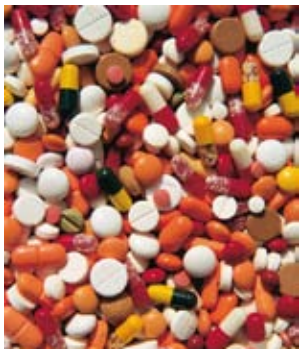

| | |
|---|---|
| Column: | YMC PAH (5 µm) 125 x 4.0 mm ID |
| Part No.: | YP99S05-R504QT |
| Eluent: | acetonitrile / methanol (95/5) |
| Flow rate: | 1.0 ml/min |
| Temp.: | 25 °C |
| Detection: | UV at 254 nm |
| Inj.-vol.: | 5 µl |

* Application data by courtesy YMC Co., Ltd.

# J'sphere ODS

- high quality RP columns
- high surface silica, 8 nm, 4 µm
- polarity range created solely by C18 bonding density
- metabolite recognition
- high siloxane content
- additional selectivity through H-bonding

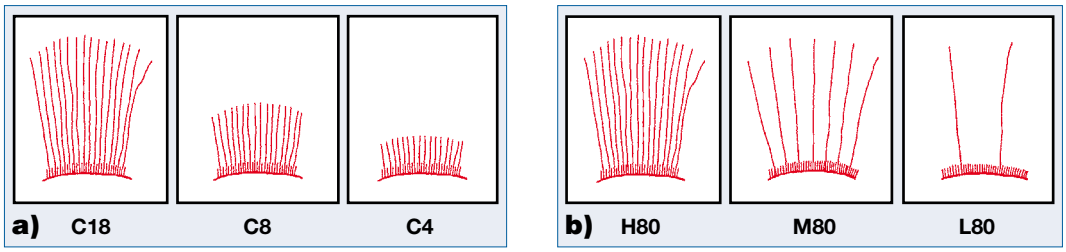
**a selectivity concept designed for**
- quality control
- pharmaceuticals
- organic intermediates
- hormones, steroids



| J'sphere ODS | JH | JM | JL |
|---|---|---|---|
| Particle Size / µm | 4 | 4 | 4 |
| Pore Size / nm | 8 | 8 | 8 |
| Surface area / $m^2g^{-1}$ | 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).




a: Conventional

b: YMC J'sphere ODS

**Schematic comparison of reversed phases of different polarity.**

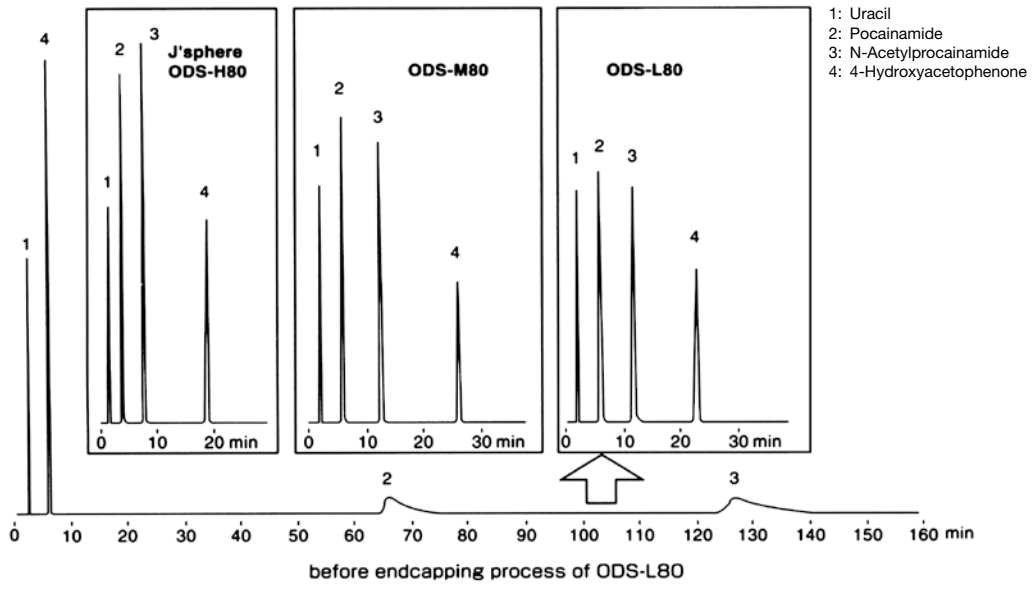
## Physico-Chemical Properties

J'sphere ODS packings are based on a spherical, ultra pure, high surface area silica with a mean pore diameter of 80 Å and a mean particle diameter of 4 µm.

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

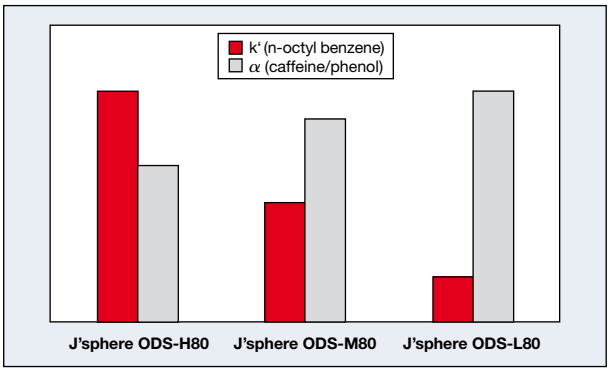
An elaborate endcapping process is applied to react the remaining silanols to effectively suppress the undesired non-specific interactions (see figure below).




| | |
|---|---|
| Column: | 150 x 4.6 mm |
| Eluent: | acetonitrile / $K_2HPO_4$-$KH_2PO_4$ (20 mM, pH 6.9) = 8/92 |
| Flow: | 1.0 ml/min |
| Detection: | UV at 254 nm |
| Temperature: | 37 °C |

**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 $\alpha$ 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.

* Application data by courtesy YMC Co., Ltd.

# 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

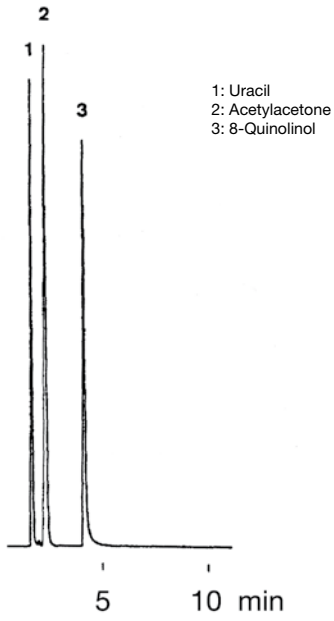
By using the graduated properties of J'sphere ODS columns, a great variety of chemical and pharmaceutical applications can be achieved. YMC J'sphere ODS analytical columns are a good choice for the analysis of pharmaceuticals, organic intermediates, metabolites etc., due to their concept of fine-tuned 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 selectivity 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

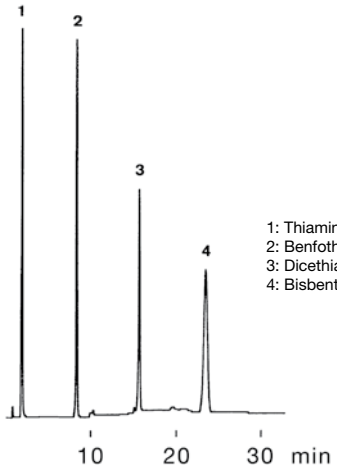
## Elution profile of complexing agents*




1: Uracil
2: Acetylacetone
3: 8-Quinolinol

| | |
|---|---|
| Column: | J'sphere ODS-H80 (8 nm, 4 µm) 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 °C |

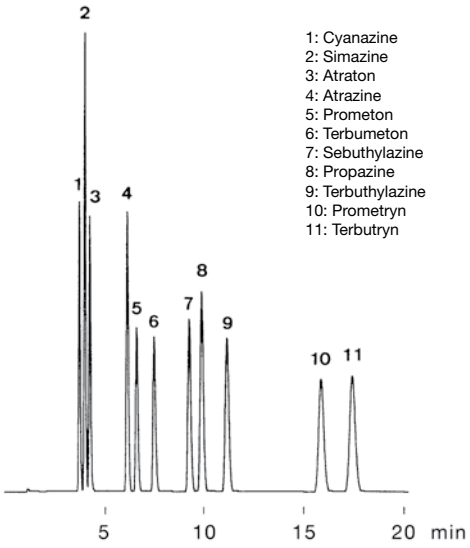
## Thiamine and derivatives*




1: Thiamine HCl
2: Benfothiamine
3: Dicethiamine HCl
4: Bisbenthiamine

| | |
|---|---|
| Column: | J'sphere ODS-H80 (8 nm, 4 µm) 75 x 4.6 mm ID |
| Part No.: | JH08S04-L546WT |
| Eluent: | A: $(NH_4)_2HPO_4$ (50 mM)<br>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 °C |

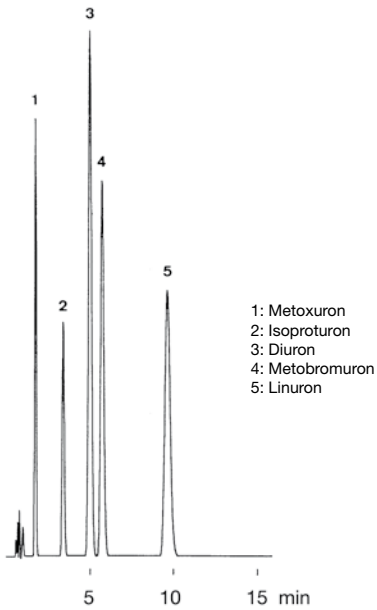
## Triazine herbicides*




1: Cyanazine
2: Simazine
3: Atraton
4: Atrazine
5: Prometon
6: Terbumeton
7: Sebuthylazine
8: Propazine
9: Terbuthylazine
10: Prometryn
11: Terbutryn

| | |
|---|---|
| Column: | J'sphere ODS-H80 (8 nm, 4 µm) 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 °C |

## Urea herbicides*



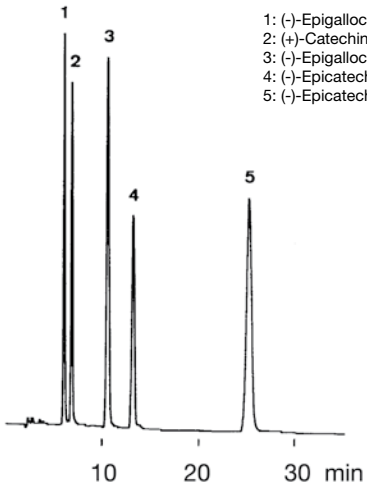

1: Metoxuron
2: Isoproturon
3: Diuron
4: Metobromuron
5: Linuron

| | |
|---|---|
| Column: | J'sphere ODS-H80 (8 nm, 4 µm) 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 °C |

* Application data by courtesy YMC Co., Ltd.

# J'sphere ODS-M80

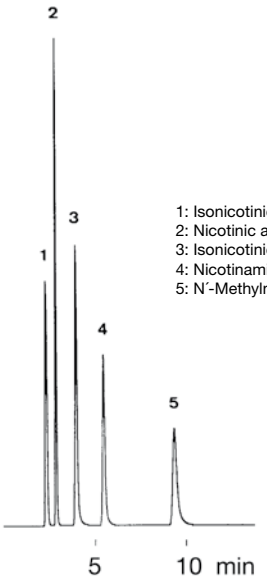
## Catechins*




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

| | |
|---|---|
| Column: | J'sphere ODS-M80 (8 nm, 4 µm) 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 °C |

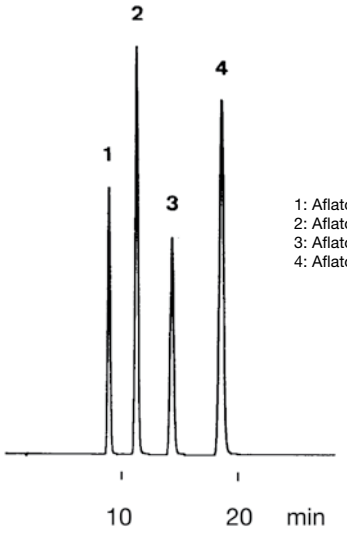
## Nicotinic acid analogues*




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

| | |
|---|---|
| Column: | J'sphere ODS-M80 (8 nm, 4 µm) 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 °C |

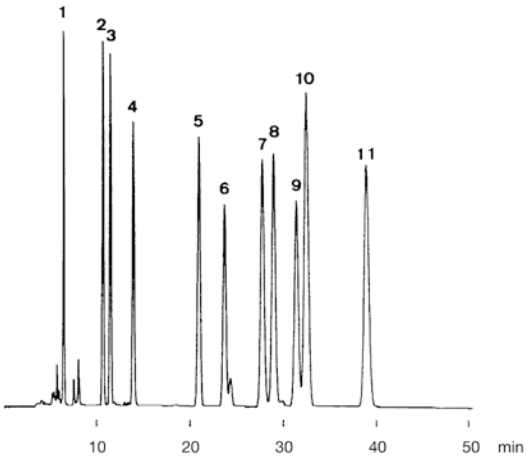
## Aflatoxins*




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

| | |
|---|---|
| Column: | J'sphere ODS-M80 (8 nm, 4 µm) 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 °C |

## Cephalosporin antibiotics*

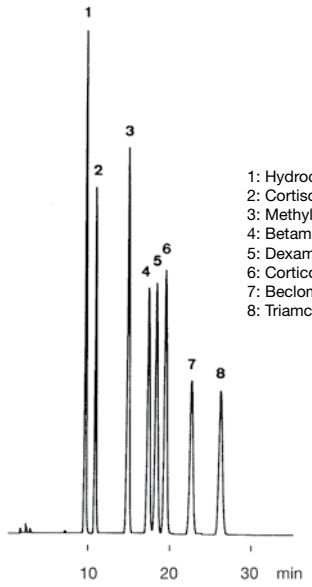



1: Cefsulodin sodium
2: Cephalexin hydrate
3: Cefaclor
4: Cephradine
5: Cephaloglycin
6: Cephapirin sodium
7: Cefotaxime sodium
8: Cephaloridine
9: Cefazolin sodium
10: Cefuroxime sodium
11: Cefoxitin sodium

| | |
|---|---|
| Column: | J'sphere ODS-M80 (8 nm, 4 µm) 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 °C |

# J'sphere ODS-L80

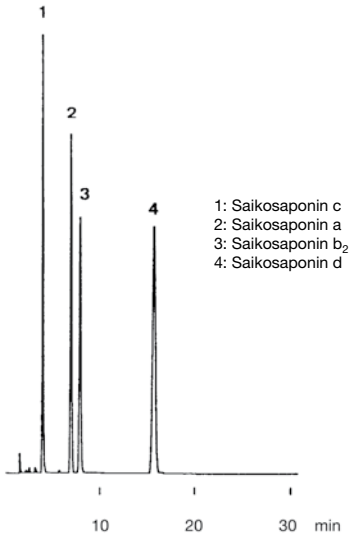
## Adrenocorticosteroids*




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 µm) 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 |

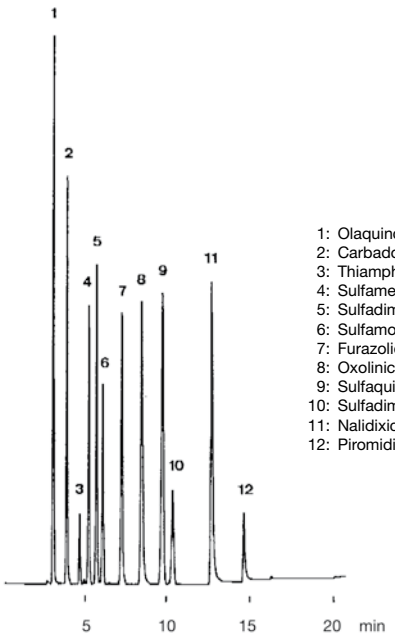
## Saikosaponins*




1: Saikosaponin c
2: Saikosaponin a
3: Saikosaponin $b_2$
4: Saikosaponin d

| | |
|---|---|
| Column: | J'sphere ODS-L80 (8 nm, 4 µm) 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 |

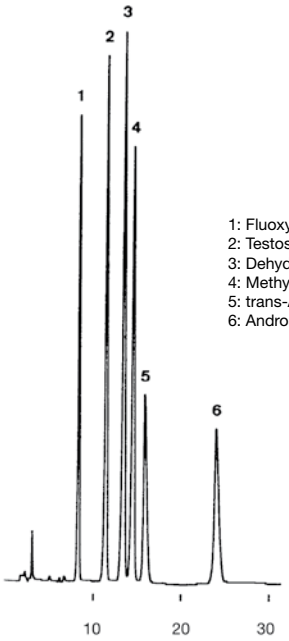
## Antibacterial agents*




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

| | |
|---|---|
| Column: | J'sphere ODS-L80 (8 nm, 4 µm) 250 x 4.6 mm ID |
| Part No.: | JL08S04-2546WT |
| Eluent: | A: acetonitrile / $NH_4H_2PO_4$ (50 mM) = 10/90<br>B: acetonitrile / $NH_4H_2PO_4$ (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: Dehydoisoandrosterone
4: Methyltestosterone
5: trans-Androsterone
6: Androsterone

| | |
|---|---|
| Column: | J'sphere ODS-L80 (8 nm, 4 µm) 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 |

* Application data by courtesy YMC Co., Ltd.

# Ordering Information

## YMC30

| Phase dimension | Column ID [mm] | Column length [mm] | | | | | Guard cartridges* with 10 mm length [pack of 5] |
|---|---|---|---|---|---|---|---|
| | | 30 (WT) / 33 (QT) | 50 | 100 | 150 | 250 | |
| 3 µm | 2.1 | CT99S03-H3Q1QT | CT99S03-05Q1QT | CT99S03-10Q1QT | CT99S03-15Q1QT | CT99S03-25Q1QT | CT99S03-01Q1GC |
| | 3.0 | CT99S03-H303QT | CT99S03-0503QT | CT99S03-1003QT | CT99S03-1503QT | CT99S03-2503QT | CT99S03-0103GC |
| | 4.0 | CT99S03-H304QT | CT99S03-0504QT | CT99S03-1004QT | CT99S03-1504QT | CT99S03-2504QT | CT99S03-0104GC |
| | 4.6 | CT99S03-0346WT | CT99S03-0546WT | CT99S03-1046WT | CT99S03-1546WT | CT99S03-2546WT | CT99S03-0104GC |
| 5 µm | 2.1 | CT99S05-H3Q1QT | CT99S05-05Q1QT | CT99S05-10Q1QT | CT99S05-15Q1QT | CT99S05-25Q1QT | CT99S05-01Q1GC |
| | 3.0 | CT99S05-H303QT | CT99S05-0503QT | CT99S05-1003QT | CT99S05-1503QT | CT99S05-2503QT | CT99S05-0103GC |
| | 4.0 | CT99S05-H304QT | CT99S05-0504QT | CT99S05-1004QT | CT99S05-1504QT | CT99S05-2504QT | CT99S05-0104GC |
| | 4.6 | CT99S05-0346WT | CT99S05-0546WT | CT99S05-1046WT | CT99S05-1546WT | CT99S05-2546WT | CT99S05-0104GC |

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

## YMC PAH

| Phase dimension | Column ID [mm] | Column length [mm] | | | | | Guard cartridges* with 10 mm length [pack of 5] |
|---|---|---|---|---|---|---|---|
| | | 30 (WT) / 33 (QT) | 50 | 100 | 150 | 250 | |
| 3 µm | 2.1 | YP99S03-H3Q1QT | YP99S03-05Q1QT | YP99S03-10Q1QT | YP99S03-15Q1QT | YP99S03-25Q1QT | YP99S03-01Q1GC |
| | 3.0 | YP99S03-H303QT | YP99S03-0503QT | YP99S03-1003QT | YP99S03-1503QT | YP99S03-2503QT | YP99S03-0103GC |
| | 4.0 | YP99S03-H304QT | YP99S03-0504QT | YP99S03-1004QT | YP99S03-1504QT | YP99S03-2504QT | YP99S03-0104GC |
| | 4.6 | YP99S03-0346WT | YP99S03-0546WT | YP99S03-1046WT | YP99S03-1546WT | YP99S03-2546WT | YP99S03-0104GC |
| 5 µm | 2.1 | YP99S05-H3Q1QT | YP99S05-05Q1QT | YP99S05-10Q1QT | YP99S05-15Q1QT | YP99S05-25Q1QT | YP99S05-01Q1GC |
| | 3.0 | YP99S05-H303QT | YP99S05-0503QT | YP99S05-1003QT | YP99S05-1503QT | YP99S05-2503QT | YP99S05-0103GC |
| | 4.0 | YP99S05-H304QT | YP99S05-0504QT | YP99S05-1004QT | YP99S05-1504QT | YP99S05-2504QT | YP99S05-0104GC |
| | 4.6 | YP99S05-0346WT | YP99S05-0546WT | YP99S05-1046WT | YP99S05-1546WT | YP99S05-2546WT | YP99S05-0104GC |

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

## J'sphere ODS-H80

| Phase dimension | Column ID [mm] | Column length [mm] | | | | | Guard cartridges* with 10 mm length [pack of 5] |
|---|---|---|---|---|---|---|---|
| | | 30 (WT) / 33 (QT) | 50 | 100 | 150 | 250 | |
| 8 nm 4 µm | 2.1 | JH08S04-H3Q1QT | JH08S04-05Q1QT | JH08S04-10Q1QT | JH08S04-15Q1QT | JH08S04-25Q1QT | JH08S04-01Q1GC |
| | 3.0 | JH08S04-H303QT | JH08S04-0503QT | JH08S04-1003QT | JH08S04-1503QT | JH08S04-2503QT | JH08S04-0103GC |
| | 4.0 | JH08S04-H304QT | JH08S04-0504QT | JH08S04-1004QT | JH08S04-1504QT | JH08S04-2504QT | JH08S04-0104GC |
| | 4.6 | JH08S04-0346WT | JH08S04-0546WT | JH08S04-1046WT | JH08S04-1546WT | JH08S04-2546WT | JH08S04-0104GC |

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

## J'sphere ODS-M80

| Phase dimension | Column ID [mm] | Column length [mm] | | | | | Guard cartridges* with 10 mm length [pack of 5] |
|---|---|---|---|---|---|---|---|
| | | 30 (WT) / 33 (QT) | 50 | 100 | 150 | 250 | |
| 8 nm 4 µm | 2.1 | JM08S04-H3Q1QT | JM08S04-05Q1QT | JM08S04-10Q1QT | JM08S04-15Q1QT | JM08S04-25Q1QT | JM08S04-01Q1GC |
| | 3.0 | JM08S04-H303QT | JM08S04-0503QT | JM08S04-1003QT | JM08S04-1503QT | JM08S04-2503QT | JM08S04-0103GC |
| | 4.0 | JM08S04-H304QT | JM08S04-0504QT | JM08S04-1004QT | JM08S04-1504QT | JM08S04-2504QT | JM08S04-0104GC |
| | 4.6 | JM08S04-0346WT | JM08S04-0546WT | JM08S04-1046WT | JM08S04-1546WT | JM08S04-2546WT | JM08S04-0104GC |

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

## J'sphere ODS-L80

| Phase dimension | Column ID [mm] | Column length [mm] | | | | | Guard cartridges* with 10 mm length [pack of 5] |
|---|---|---|---|---|---|---|---|
| | | 30 (WT) / 33 (QT) | 50 | 100 | 150 | 250 | |
| 8 nm 4 µm | 2.1 | JL08S04-H3Q1QT | JL08S04-05Q1QT | JL08S04-10Q1QT | JL08S04-15Q1QT | JL08S04-25Q1QT | JL08S04-01Q1GC |
| | 3.0 | JL08S04-H303QT | JL08S04-0503QT | JL08S04-1003QT | JL08S04-1503QT | JL08S04-2503QT | JL08S04-0103GC |
| | 4.0 | JL08S04-H304QT | JL08S04-0504QT | JL08S04-1004QT | JL08S04-1504QT | JL08S04-2504QT | JL08S04-0104GC |
| | 4.6 | JL08S04-0346WT | JL08S04-0546WT | JL08S04-1046WT | JL08S04-1546WT | JL08S04-2546WT | JL08S04-0104GC |

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

**For other dimensions please refer to page 247**