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Reversed-Phase Columns

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Types and characteristics of reversed-phase columns

YMC reversed-phase columns enabling column selection from a wide range of products to suit the sample characteristics.

Elution behavior dependent on alkyl chain length

In reversed-phase chromatography, retention due to hydrophobicity generally depends directly on the carbon number of the stationary phase. The degree of retention due to hydrophobicity of the stationary phase can generally be listed in descending order by column type as ODS>C8>C4>TMS. Stationary phases with low hydrophobicity can be used effectively to reduce analysis time for samples having too strong of a retention on ODS. Stationary phases with low hydrophobicity are also useful for samples that are slightly soluble in organic solvents and need to be analyzed with mobile phase containing a low concentration of organic solvents.

Elution behavior affected by other factors

Phenyl and CN have available π electrons derived from their bonded phases. Phenyl and CN sometimes show different separation characteristics from stationary phases that are chemically bonded with straight alkyl chains. Since CN has medium-polar bonded phases, it can be used in both normal-phase and reversed-phase separation modes, depending on the mobile phase used.

Types of reversed-phase columns (I)

ODS	-C ₁₈ H ₃₇	Retention due to
C8	-C ₈ H ₁₇	High
C4	-C ₄ H ₉	T T
TMS	-CH ₃	Low

Types of reversed-phase columns (II)

Phenyl (Ph)		π electrons available
CN	-(CH ₂) ₃ -CN	π electrons available Can be used also in normal-phase

Elution behavior dependent on alkyl chain length



In this example, the retention behavior of a variety of compounds is shown to be dependent on the alkyl chain length of the stationary phase. Shorter alkyl chain lengths like C4 show reduced retention for neutral compounds due to the diminished hydrophobicity of the C4 stationary phase relative to longer alkyl chains phases like C8 and C18. The differences in the selectivity of stationary phases of different alkyl chain length is also illustrated for triphenylene, a planar molecule with restricted rotational movement. Triphenylene shows much shorter retention on C4 relative to C8 and C18 than would be expected on the basis of hydrophobicity of the stationary phase. Note the difference in elution order for triphenylene relative to imipramine and amylbenzene for this mixture on this series of stationary phases.

Types and characteristics of reversed-phase columns

Product name		Pore size (Å)	Particle size (µm)	C%	Endcapping	Usable pH range	Characteristics	Page
	YMC-UltraHT Pro C18 2			Processed with YMC CO., LTD.'s advanced andopping technology				
	Pro C18	120	3, 5, 10			2-8	 Superior separation of basic compounds 	78
	YMC-UltraHT Hydrosphere C18		2			2-8	 Superior separation of hydrophilic compounds 	79
	Hydrosphere C18	120	3, 5	12			• Can be used with 100% aqueous mobile phase	
Pro series		80	2.5	00	Yes	1 10	Highly durable ODS	80
	Pro C 18 RS	80	3, 5	22	-	1-10	 Superior separation of basic compounds and hydrophobic compounds 	80
	Pro C8	120	3, 5	10		2-7.5	 Processed with advanced endcapping technology Superior conception of basis compounds 	81
	Pro C4	120	3, 5	7	-	2-7.5	Superior separation of basic compounds Processed with advanced endcapping technology	81
		120	3 5 10	17			Different selectivity from ODS	
		200	5 10	10	-			
	OD3-A	200	3, 10	7	-		 ODS with wide pore size For separation of peptides and proteins 	02
		300	3, 5, 10		Yes			
	ODS-AM	120	3, 5	17	-		Outstanding batch-to-batch reproducibility	82
	ODS-AQ	120	3, 5, 10	14	-		Superior separation of hydrophilic compounds	83
		200	5, 10	10				
	ODS-AL	120	5	17	No		For separation utilizing residual silanol	83
YMC-Pack		120	3, 5, 10	10	-		 7.5 Moderate hydrophobicity Useful for separation of proteins and peptides 	84
	C ₈	200	5, 10	7		2-7.5		
		300	5, 10	4	-			
		120	3, 5, 10	7				
	C ₄	200	5, 10	5	– Yes		 Lower hydrophobicity than ODS and C8 Useful for separation of proteins and peptides 	84
		300	5, 10	3				
	TMS	120	3, 5, 10	4			 Reversed-phase packing material with the lowest hydrophobicity 	85
	Ph	120	3, 5, 10	9			 Reversed-phase packing material with π electrons 	85
		120	3, 5, 10	7			Can be used in both normal-phase and	86
	CN	300	5	3			reversed-phase modes	
	PROTEIN-RP	200	5	4	_	1.5-7.5	Useful for separation of proteins and peptides	86
YMCbasic		200	3, 5	7	Yes	s 2-7.5 Superior separation of basic compounds Useful for separation of proteins and peptic		87
YMC Carote	noid	_	3, 5	_	-	2-7.5	 C30 bonded column Useful for carotenoids separation 	87
	ODS-H80	80	4	22		1-9	High carbon ODS	
J'sphere	ODS-M80	80	4	14	Yes	0.75	Medium carbon ODS	88
	ODS-L80	80	4	9	1	2-7.5	• Low carbon ODS	1
YMC-Pack F	PolymerC18	_	6, 10	_	-	2-13	Polymer-based ODS	88

YMC-UltraHT Pro C18 / YMC-Pack Pro C18

- Superior separation of basic compounds
- Processed with advanced endcapping technology
- Excellent reproducibility
- Utilizes highly pure silica gel base

Perfectly endcapped ODS

YMC-UltraHT *Pro* C18/YMC-Pack *Pro* C18 include more advanced endcapping technology for strictly controlled processing of residual silanol groups that are likely to affect quality. *Pro* C18 is highly appropriate for basic compounds, including pharmaceutical products and agricultural chemicals.

Pore size : 120 Å

USP L1

Carbon content : 16%

Usable pH range : 2-8

(A990121B)



YMC-Pack *Pro* C18 is a high performance ODS column providing standard hydrophobicity, high resolution, high durability and excellent reproducibility. This column is highly appropriate for basic compounds that often elute with poor peak shapes on competitive columns.





Peptides

1. Oxytocin 2. Met-Enkep 3. Leu-Enkep 4. Angiotens 5. <i>α</i> -Mating f 6. Insulin	phalin phalin in I actor
Column	: YMC-Pack <i>Pro</i> C18 (3 μm, 120 Å) 75 X 4.6 mml.D.
Eluent	: A) water/TFA (100/0.1)
	B) acetonitrile/TFA (100/0.1)
	20-40%B (0-20 min)
Flow rate	: 1.0 mL/min
Temperatu	re : 37°C
Detection	: UV at 220 nm

YMC-UltraHT Hydrosphere C18 / Hydrosphere C18

- Strong retention of hydrophilic compounds
- Excellent reproducibility

Utilizes highly pure silica gel base

- Can be used with 100% aqueous mobile phase
- Superior separation of basic compounds

Hydrophilic ODS

YMC-UltraHT Hydrosphere C18/Hydrosphere C18 are designed to maintain adequate hydrophilicity on the packing surface for superior separation of hydrophilic compounds.

Hydrophilic compounds are retained with much greater affinity than with conventional ODS columns, permitting the product to be used with 100% aqueous mobile phase, a problematic mobile phase for conventional ODS columns. Hydrosphere C18 is useful for separating a wide range of compounds, including nucleic acids and their derivatives, organic acids, saccharides, glycosides and peptides.

Appropriate for separation of hydrophilic compounds

Separation of organic acids



Reproducibility of retention time when used with 100% aqueous mobile phase



After completion of analysis, the now was stopped and the columns were left to stand overhight (ca. 15 nour

1. Cytosine	0	150 V 4.0 mml D
2 Uracil	Column	: 150 X 4.6 mmI.D.
	Eluent	: 20 mM KH ₂ PO ₄ -K ₂ HPO ₄ (pH 6.9)
3. Guanine	Flow rate	: 1.0 mL/min
4. Thymine	Temperature	: 37°C
5. Adenine	Detection	: UV at 254 nm

are used with 100% aqueous mobile phase, the apparent hydrophobicity decreases due to repulsive interactions between water and hydrophobic groups on the surface of the packing materials, reducing retention of compounds. In the experiment illustrated here, columns filled with 100% aqueous mobile phase were left to stand overnight. Retention times of nucleic acid bases were analyzed before and after standing and compared. The retention times of adenine after standing decreased to 89% of the original value for Brand II and to 71% of the original Brand III value. By contrast, Hydrosphere C18 retained 98% of its original retention for adenine. Hydrosphere C18 is designed to maintain adequate hydrophilicity on the packing surface so that hydration can be achieved, and when Hydrosphere C18 is used with mobile phase containing no organic solvent, the retention time is not significantly shortened and highly reproducible chromatograms can be obtained.

When conventional ODS columns

Pore size : 120 Å

USP L1

Carbon content : 12%

Usable pH range : 2-8

YMC-Pack Pro C18 RS

- Excellent acid resistance and alkaline resistance (pH 1 to 10)
- \bullet Superior separation of structural isomers and basic compounds
- Excellent reproducibility
- Utilizes highly pure silica gel base

High carbon ODS

YMC-Pack *Pro* C18 RS is a trifunctional type high carbon ODS column characterized by high resolution and high durability. It is applicable to a wide range of compounds, providing good separation of basic compounds that easily cause tailing peaks. The separation selectivity for compounds that differ only slightly in hydrophobicity is outstanding. It also has excellent resistance to acid and alkali, making it useful under demanding separation conditions.

Pore size : 80 Å

USP L1

Carbon content : 22%

Usable pH range : 1-10

Nicardipine hydrochloride



YMC-Pack Pro C8, C4

- Superior separation of basic compounds
- Excellent reproducibility
- Utilizes highly pure silica gel base

- C8 Pore size : 120 Å ■ Carbon content : 10%
 - Usable pH range : 2-7.5
 - USP L7
- C4 **■** Pore size : 120 Å
 - Carbon content : 7%
 - Usable pH range : 2-7.5
 - USP L26

Highly endcapped C8 and C4 reversed-phase columns

YMC-Pack *Pro* C8 and C4 are highly appropriate for basic compounds since more advanced endcapping technology is used for processing of their residual silanol groups that are likely to affect quality. The YMC-Pack *Pro* C8 and C4 stationary phase surface hydrophobicity is lower than that of ODS, making YMC-Pack *Pro* C8 and C4 useful for quick analysis of compounds that differ greatly in hydrophobicity. The separation behavior of hydrophilic compounds or planar compounds on YMC-Pack *Pro* C8 and C4 also differs from that on ODS, making YMC-Pack *Pro* C8 and C4 useful for separating compounds in cases where separation optimization is difficult to achieve using ODS.

Optimization of separation using Pro C8 and Pro C4



shorter than those on C18. When alkyl chain lengths of packing material bonded phases are shorter, hydrogen-bonding capacities tend to be greater; therefore, not only retention time, but also separation selectivity of *Pro* C8 and *Pro* C4 may differ from those of C18. Separation optimization is difficult to achieve for antiarrhythmics using *Pro* C18, even if the mobile phase is changed. In contrast, C8 and C4 can completely separate antiarrhythmics in a short time. As shown above, C8 and C4 may be useful in cases where separation optimization is difficult to achieve using C18.

YMC-Pack ODS-A

- Conventional ODS column
- Currently in use worldwide

Pore size : 120, 200, 300 Å
 Carbon content : 17%, 12%, 7%
 Usable pH range : 2-7.5

USP L1

Standard ODS

YMC-Pack ODS-A has a highly endcapped surface structure and appropriate hydrophobicity for separation of a wide range of compounds. It is produced under strict quality control with respect to 50 or more parameters in order to ensure stable quality. This product is highly regarded as the standard YMC-Pack packing material in various countries around the world.

Quality control system for excellent performance



The graph indicates batch-to-batch reproducibility with respect to hydrophobic interaction for 10 batches, an essential column performance characteristic. Extremely stable batch-to-batch reproducibility of the hydrophobic surface is achieved by strict control of variables.

In addition to measurement of the physical properties, a wide range of compounds including hydrophobic, acidic, basic and coordination compounds are analyzed under optimal conditions to evaluate column performance.

Analytical columns YMC-Pack ODS-AM

- Similar to ODS-A in selectivity
- Excellent reproducibility
- Useful for quality control purposes

ODS with outstanding batch-to-batch reproducibility

- ■Pore size : 120 Å
- Carbon content : 17%
- Usable pH range : 2-7.5
- USP L1

YMC-Pack ODS-AM is a product which especially emphasizes batch-to-batch reproducibility of the packing material. Strict control is performed on all aspects of quality, including physical properties of silica gel base and surface modifying processes, in order to ensure stable quality.

Special attention is given to batch-to-batch reproducibility



The separation factor (a) of methylparaben/2,6dimethylpyridine for 10 batches of ODS-AM packing material is plotted on the left graph. Excellent batch-to-batch reproducibility is achieved even in separation of basic compounds.

YMC-Pack ODS-AQ

- Useful for separation of hydrophilic compounds
- Can be used with 100% aqueous mobile phase
- Different selectivity from conventional ODS

Pore size : 120, 200 Å ■ Carbon content : 14%, 10% Usable pH range : 2-7.5 USP L1

Hydrophilic ODS

YMC-Pack ODS-AQ has moderate hydrophobicity and hydrogen-bonding capacity. It shows different retention behavior from that of YMC-Pack ODS-A, for samples with relatively high hydrophilicity. It is useful in fields including carbohydrate chemistry for oligosaccharides and glycosides, pharmacognosy and natural product chemistry.

Useful for separation of sugars



This product is useful for separations using mobile phases in which water content is relatively high, such as separation of sugars and glycosides.

1. Maltoundecaose (G₁₁) 2. Maltododecaose (G₁₂) 3. Maltotridecaose (G₁₃) 4. Maltotetradecaose (G14) 5. Maltopentadecaose (G₁₅)

Column	: YMC-Pack ODS-AQ (5 μm, 120 Å)			
	150 X 4.6 mml.D.			
Eluent	: methanol/water (5/995)			
Flow rate	: 1.0 mL/min			
Temperatu	re : 37°C			
Detection	: RI, 8×10 ⁻⁶ RIU/FS			
Eluent Flow rate Temperatur Detection	: methanol/water (5/995) : 1.0 mL/min re : 37°C : RI, 8×10 ^{.6} RIU/FS			

Analytical columns

YMC-Pack ODS-AL

- ODS with residual silanol groups
- Utilizes secondary interaction caused by silanol groups

- Pore size : 120 Å Carbon content : 17%
- Usable pH range : 2-7.5
- USP L1

Non-endcapped ODS

YMC-Pack ODS-AL uses not only hydrophobic interaction but also secondary interaction caused by silanol groups that affect separation. This results in a different selectivity from conventional ODS columns. When ionic interaction is utilized, it is preferable to use a buffer in the mobile phase to achieve reproducibility of chromatograms.













- СООН

The figure shows separation of disinfectants under the conditions described in the Japanese Pharmacopoeia. The object is to select the column permitting the elution of benzoic acid, salicylic acid and theophylline, in this order, insuring complete separation of these peaks. With ODS-AQ, separation of salicylic acid and theophylline is incomplete. By contrast, ODS-AL provides excellent separation. Thus, ODS-AL may provide excellent separation when the separation conditions cannot be optimized on other ODS columns.

Column	: YMC-Pack ODS-AL and ODS-AQ (5 µm. 120 Å)				
	150 X 4.6 mml.D.				
Eluent	: 100 mM KH ₂ PO ₄ -Na ₂ HPO ₄ (pH 7.0)/methanol (75/25)				
Flow rate	: 0.8 mL/min				
Temperature: 30°C					
Detection : UV at 270 nm					
(Conditions described in Japanese Pharmacopoeia 16th ed.)					

YMC-Pack C₈

- Stationary phase with lower hydrophobicity than ODS
- Useful for separating samples with relatively high hydrophobicity
- Useful for separation of proteins and peptides

- Pore size : 120, 200, 300 Å
- Carbon content : 10%, 7%, 4%
- Usable pH range : 2-7.5
- ■USP L7

Reversed-phase column with moderate hydrophobicity

The hydrophobicity of YMC-Pack C_8 is moderate for a reversed-phase packing material. Retention times of samples on YMC-Pack C_8 tend to be shorter than those on ODS stationary phase. The moderate hydrophobicity of YMC-Pack C_8 makes it useful for separating samples with relatively high hydrophobicity.



Analytical columns YMC-Pack C₄

- Stationary phase with low hydrophobicity
- Different separation characteristics from ODS
- Useful for separation of proteins and peptides

- Pore size : 120, 200, 300 Å
- Carbon content : 7%, 5%, 3%
- Usable pH range : 2-7.5
- USP L26

Reversed-phase column with shorter alkyl chain

The YMC-Pack C_4 stationary phase surface hydrophobicity is lower than that of both ODS and C_8 . Retention times of samples on YMC-Pack C_4 therefore tend to be shorter than those on ODS or C_8 . Separation characteristics of YMC-Pack C_4 also differ from those of ODS. YMC-Pack C_4 achieves better separation than ODS for some types of samples.

Application

2,4-DNPH derivatives of aldehydes and ketones

- 1. Formaldehyde 2,4-DNPH
- 2. Acetaldehyde 2,4-DNPH
- 3. Acetone 2,4-DNPH
- 4. Acrolein 2,4-DNPH
- 5. Propionaldehyde, 2,4-DNPH
- 6. Crotonaldehyde 2,4-DNPH
- 7. Methylethylketone 2,4-DNPH
- 8. Isobutyraldehyde 2,4-DNPH
- 9. Benzaldehyde 2,4-DNPH
- 10. n-Valeraldehyde 2,4-DNPH
- 11. p-Tolualdehyde 2,4-DNPH
- 12. Capronaldehyde 2,4-DNPH
- Column
 : YMC-Pack C₄ (5 μm, 120 Å) 150 X 4.6 mml.D.

 Eluent
 : A) tetrahydrofuran/water (10/90) B) acetonitrile 35%B (0-7 min), 35-65%B (7-18 min), 100%B (18-19 min), 35%B (19-35 min)

 Flow rate
 : 1.5 mL/min

 remperature
 : 30°C

 Detection
 : UV at 360 nm

(T920302A)

YMC-Pack TMS

- Stationary phase with the lowest hydrophobicity among reversed-phase packing materials
- Different separation characteristics from ODS

Reversed-phase column with the lowest hydrophobicity

YMC-Pack TMS shows lower retention due to hydrophobic interaction than other packing materials, and it is useful for eluting highly hydrophobic compounds in a short time. In addition, it can sometimes achieve greater retention and better separation of hydrophilic compounds than other reversed-phase columns.

Shorten analysis time using TMS



Soy isoflavones

- 1. Daidzin
- 2. Genistin

3. Daidzein

4. Genistein

Column Eluent	: 50 X 2.0 mml.D. : A) water/formic acid (100/0.05)
Flow rate	: 0.2 mL/min
Temperatu	re: 37°C
Detection	: ESI positive mode

Pore size : 120 Å

USP L13

Carbon content : 4%Usable pH range : 2-7.5

TMS enables analysis time of highly hydrophobic compounds to shorten.

Analytical columns

YMC-Pack Ph

- Reversed-phase column with π electrons
- Unique selectivity due to π - π interaction
- Useful in cases where separation optimization is difficult to achieve using ODS
- Pore size : 120 Å
- Carbon content : 9%
- Usable pH range : 2-7.5
- ■USP L11

Different selectivity from ODS

20

YMC-Pack Ph has π electrons of phenyl group. YMC-Pack Ph shows different separation characteristics from alkyl-silica stationary phases including ODS for separation of solutes such as aromatic compounds, since π - π interaction between the stationary phase and solutes, as well as hydrophobic interaction, contribute to the separation.

Establishment of simple conditions using Ph



Catechins

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

Column	: 150 X 4.6 mml.D.				
Flow rate	: 1.0 mL/min				
Temperature: 37°C					
Detection	: UV at 280 nm				

Ph is suitable for separating catechins with simple mobile phase, whereas if using ODS and optimizing analysis conditions, the mobile phase, addition with ethyl acetate, is complicated.

YMC-Pack CN

- Normal-phase and reversed-phase modes are selectable according to the purpose of analysis
- Low hydrophobicity
- Unique selectivity due to cyano group

- Pore size : 120, 300 Å Carbon content : 7%, 3% Usable pH range : 2-7.5
- USP L10

Column can be used in both normal-phase and reversed-phase modes

YMC-Pack CN can be used in both normal-phase and reversed-phase modes, since it has cyanopropyl group of medium polarity chemically bonded to the stationary phase. It can be used in normal-phase mode with low-polarity mobile phase such as hexane. It can also be used in reversed-phase mode with highly-polar mobile phase such as methanol and water. The hydrophobicity of YMC-Pack CN is relatively low for a reversed-phase packing material, and it shows different selectivity from ODS due to π electrons of the cyano groups. YMC-Pack CN is useful for shortening analysis time when retention time is too long with ODS and useful in cases where separation optimization is difficult to achieve using ODS.

Application



Analytical columns

YMC-Pack PROTEIN-RP

- Improved recovery of proteins or peptides
- Improved durability when used with TFA solution
- Enables elution of high molecular weight proteins

- Pore size : 200 Å
- Carbon content : 4%
- Usable pH range : 1.5-7.5
- USP L26

Reversed-phase column for separation of proteins or peptides

YMC-Pack PROTEIN-RP is a reversed-phase column utilizing a silica gel base. It contains a stationary phase, specifically designed for separation of proteins or peptides. Problems that are associated with conventional reversed-phase columns with short alkyl chain lengths are minimized. Robust column lifetime and excellent recovery of hydrophobic proteins are typically possible with this phase.

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Improved durability when used with TFA solution





Test results of the stability of stationary phase with 0.1% aqueous TFA is shown above. Retention of diphenyl on competitor's C4 columns greatly decreases as time passes. This is caused by cleavage of butyl groups from the packing material due to acid hydrolysis. Retention of diphenyl on PROTEIN-RP is shown to be stable after 500 hours of TFA solution flow.

YMCbasic

- Superior separation of basic compounds
- Useful for separation of peptides
- Secondary interaction minimized as much as possible

Pore size : 200 Å Carbon content : 7% ■ Usable pH range : 2-7.5

(N061027C)

USP L7

Column for separation of basic compounds

YMCbasic is a reversed-phase silica-based C8 column designed for separation of basic compounds, including pharmaceutical products. It is highly evaluated as a base-deactivated phase in Europe and the U.S. It offers superior separation of acidic compounds as well as basic compounds. It is suitable for separating peptides with molecular weights in the range of several thousands, such as insulin.



40

Tryptic digest of BSA

: YMCbasic (5 µm) 150 X 2.0 mml.D. : A) water/TFA (100/0.1) B) acetonitrile/TFA (100/0.1) 5-35%B (0-50 min), 35-45%B (50-55 min), 45%B (55-60 min) : 0.2 mL/min Temperature: 37°C Detection : UV at 220 nm

Analytical columns

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YMC Carotenoid

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30

- Resolves polar and nonpolar geometric carotenoid isomers
- Separates carotenoids in blood samples, food products, natural product extracts, and commercial preparations

50

* undigested BSA

• Operates with low aqueous or non aqueous mobile phases desirable in LC/MS and prep fraction recovery

60 min

Carotenoid analytical column

YMC Carotenoid is C30 bonded silica-based reversed-phase column. It is for carotenoid analysis and useful for separation of geometric isomers.

Application



■ USP L62

- Usable pH range : 2-7.5

(A110401A)

_			
Carotono	and	vantho	nhvll
Calotene	anu	λαπιπο	

	carotene and xam	liopityii		
1. Astaxanthin		8. 15- <i>cis β</i> -Carotene		
	Capsanthin	 13-cis β -Carotene 		
	3. Lutein	10. a -Carotene		
	4. Zeaxanthin	11. trans β -Carotene		
	5. Canthaxanthin	12. 9- <i>cis β</i> -Carotene		
	6. β -Cryptoxanthin	13. δ -Carotene		
	7. Echinenone	14. Lycopene		
	Column : YMC Car	otenoid		
	250 X 4.6	6 mml.D.		
	Eluent : A) methar	: A) methanol/MTBE*/H ₂ O (81/15/4)		
	B) metha	nol/MTBE*/H ₂ O (6/90/4) **		
	0-100%B	(0-90 min)		
	Flow rate : 1.0 mL/m	in		
	Temperature: ambient			
	Detection : VIS at 450 nm			
	*methyl tert-butyl ether			
	**Gradient elution was performed by ternary gradient elution			
	Mobile phase B) is not misci	ble in this proportion. For binary		

gradient elution, methanol/MTBE/H₂O (7/90/3) is suitable as mobile phase B).

J'sphere ODS-H80, ODS-M80, ODS-L80

- Useful for method development
- High theoretical plate number

- Pore size : 80 Å
- Carbon content : ODS-H80 22% , ODS-M80 14% , ODS-L80 9%
- Usable pH range : ODS-H80 1-9, ODS-M80 L80 2-7.5
- ■USP L1

Three types of ODS, each with different ligand coverage

J'sphere offers a choice from three kinds of ODS made from the same silica gel base, each with different ligand coverage. Differences in ligand coverage considerably affect the hydrophobic retention behavior of solutes, as well as the separation behavior resulting from solute bonded phases or tertiary structure. J'sphere is useful for the optimization of separation conditions, since there is almost no need to consider interactions other than hydrophobic and hydrogen-bonding interactions (e.g., ionic or coordinate interaction).

Differences in separation characteristics



ODS columns with different ligand coverage have different hydrophobicity, hydrogen bonding capacity and steric selectivity for tertiary structures. ODS-H80 has exceptionally high hydrophobicity and low hydrogen bonding capacity, ODS-M80 has moderate hydrophobicity and hydrogen bonding capacity and ODS-L80 has low hydrophobicity, comparable to that of C8 and high hydrogen bonding capacity. J'sphere can be used with confidence to identify structural differences of solutes and is useful for improving the efficiency of separation optimization

■ Usable pH range : 2-13

Analytical columns

YMC-Pack PolymerC18

- Utilizes polymer base which is not affected by silanol
- Different separation characteristics from silica-based ODS
- Excellent pH stability

Polymer type C18

PolymerC18 is a C18 column made from methacrylate polymer. It has excellent pH stability and it is useful for separation of basic compounds because there are no silanol or metal impurities to cause secondary interaction. Since π electrons of the carbonyl group or the hydroxyl group on the surface of the base material show particular interactions with solutes, PolymerC18 can show different separation characteristics from silica-based ODS.

Can be used with alkaline mobile phase



- 1. Barbital
- 2. Phenobarbital
- Pentobarbital
- 4. Hexobarbital
- 5. Secobarbital

 Column
 : YMC-Pack PolymerC18

 150 X 4.6 mml.D.

 Eluent
 : 50 mM Na₂HPO₄-Na₃PO₄ (pH 11.0)/methanol (75/25)

 Flow rate
 : 0.5 mL/min

 Temperature : 30°C
 Detection

 : UV at 254 nm

(Ordering Information - Columns-

YMC-UltraHT Pro C18/YMC-Pack Pro C18

Phase	Column I.D.	Column length (mm)						Guard cartridges	
dimension	(mm)	50	75	100	150	250	I.D. (mm)	uard cartridges 10 mm length	
120 Å	2.0	AS12S02-0502WT	AS12S02-L502WT	AS12S02-1002WT	—	—	—	—	
2 µm	3.0	AS12S02-0503WT	AS12S02-L503WT	AS12S02-1003WT	_	—	_	—	
	2.0	AS12S03-0502WT	AS12S03-L502WT	AS12S03-1002WT	AS12S03-1502WT	—	2.1	AS12S03-01Q1GC	
120 Å	3.0	AS12S03-0503WT	AS12S03-L503WT	AS12S03-1003WT	AS12S03-1503WT	—	3.0	AS12S03-0103GC	
3 µm	4.6	AS12S03-0546WT	AS12S03-L546WT	AS12S03-1046WT	AS12S03-1546WT	—	4.0	1010000 010400	
	6.0	AS12S03-0506WT	AS12S03-L506WT	AS12S03-1006WT	—	—	4.0	A312303-0104GC	
	2.0	AS12S05-0502WT	AS12S05-L502WT	AS12S05-1002WT	AS12S05-1502WT	AS12S05-2502WT	2.1	AS12S05-01Q1GC	
100 Å	3.0	AS12S05-0503WT	AS12S05-L503WT	AS12S05-1003WT	AS12S05-1503WT	AS12S05-2503WT	3.0	AS12S05-0103GC	
120 Α 5 μm	4.6	AS12S05-0546WT	AS12S05-L546WT	AS12S05-1046WT	AS12S05-1546WT	AS12S05-2546WT	4.0	1010005 010400	
	6.0	—	—	—	AS12S05-1506WT	AS12S05-2506WT	4.0	A312305-0104GC	
	10	_	—	_	AS12S05-1510WT	AS12S05-2510WT	10	AS12S05-0110CC	

YMC-UltraHT Hydrosphere C18/Hydrosphere C18

Phase	Column I.D.		C	Column length (mm)		Gua	rd cartridges
dimension	(mm)	50	75	100	150	250	I.D. (mm)	10 mm length
120 Å	2.0	HS12S02-0502WT	HS12S02-L502WT	HS12S02-1002WT	—	—	_	—
2 µm	3.0	HS12S02-0503WT	HS12S02-L503WT	HS12S02-1003WT	_	—	_	—
	2.0	HS12S03-0502WT	HS12S03-L502WT	HS12S03-1002WT	HS12S03-1502WT	—	2.1	HS12S03-01Q1GC
120 Å	3.0	HS12S03-0503WT	HS12S03-L503WT	HS12S03-1003WT	HS12S03-1503WT	—	3.0	HS12S03-0103GC
3 µm	4.6	HS12S03-0546WT	HS12S03-L546WT	HS12S03-1046WT	HS12S03-1546WT	—	4.0	HE12502 0104CC
	6.0	HS12S03-0506WT	HS12S03-L506WT	HS12S03-1006WT	_	—	4.0	H312303-0104GC
	2.0	HS12S05-0502WT	HS12S05-L502WT	HS12S05-1002WT	HS12S05-1502WT	HS12S05-2502WT	2.1	HS12S05-01Q1GC
100 Å	3.0	HS12S05-0503WT	HS12S05-L503WT	HS12S05-1003WT	HS12S05-1503WT	HS12S05-2503WT	3.0	HS12S05-0103GC
120 Α 5 μm	4.6	HS12S05-0546WT	HS12S05-L546WT	HS12S05-1046WT	HS12S05-1546WT	HS12S05-2546WT	4.0	LE12505 0104CC
	6.0	_	_	—	HS12S05-1506WT	HS12S05-2506WT	4.0	H312303-0104GC
	10	_	—	_	HS12S05-1510WT	HS12S05-2510WT	10	HS12S05-0110CC

YMC-Pack Pro C18 RS

Phase	Column I.D.	Column length (mm)					Guard cartridges	
dimension	(mm)	50	75	100	150	250	I.D. (mm)	10 mm length
	2.0	RS08S03-0502WT	RS08S03-L502WT	RS08S03-1002WT	RS08S03-1502WT		2.1	RS08S03-01Q1GC
80 Å	3.0	RS08S03-0503WT	RS08S03-L503WT	RS08S03-1003WT	RS08S03-1503WT	—	3.0	RS08S03-0103GC
3 µm	4.6	RS08S03-0546WT	RS08S03-L546WT	RS08S03-1046WT	RS08S03-1546WT	—	4.0	RE09202 0104CC
	6.0	RS08S03-0506WT	RS08S03-L506WT	RS08S03-1006WT	—	—	4.0	H300303-0104GC
	2.0	RS08S05-0502WT	RS08S05-L502WT	RS08S05-1002WT	RS08S05-1502WT	RS08S05-2502WT	2.1	RS08S05-01Q1GC
00 Å	3.0	RS08S05-0503WT	RS08S05-L503WT	RS08S05-1003WT	RS08S05-1503WT	RS08S05-2503WT	3.0	RS08S05-0103GC
80 Α 5 μm	4.6	RS08S05-0546WT	RS08S05-L546WT	RS08S05-1046WT	RS08S05-1546WT	RS08S05-2546WT	4.0	DE00805 010400
	6.0	—	—	—	RS08S05-1506WT	RS08S05-2506WT	4.0	H300303-0104GC
	10	—	—	—	RS08S05-1510WT	RS08S05-2510WT	10	RS08S05-0110CC

* Guard cartridge holder required, part no. XPGCH-Q1 for 2.1 - 4.0 mml.D. and XPCHSPW1 for 10 mml.D.

* See pp.114-116 for preparative columns other than those listed above.

(Ordering Information – Columns–

YMC-Pack Pro C8

Phase dimension	Column I.D.	Column length (mm)						Guard cartridges		
	(mm)	50	75	100	150	250	I.D. (mm)	10 mm length		
100 Å	2.0	OS12S03-0502WT	OS12S03-L502WT	OS12S03-1002WT	OS12S03-1502WT	—	2.1	OS12S03-01Q1GC		
120 A 3 um	3.0	OS12S03-0503WT	_	OS12S03-1003WT	OS12S03-1503WT	—	3.0	OS12S03-0103GC		
ο μπ	4.6	OS12S03-0546WT	OS12S03-L546WT	OS12S03-1046WT	OS12S03-1546WT	—	4.0	OS12S03-0104GC		
	2.0	OS12S05-0502WT	OS12S05-L502WT	OS12S05-1002WT	OS12S05-1502WT	—	2.1	OS12S05-01Q1GC		
120 Å 5 μm	3.0	OS12S05-0503WT	_	—	OS12S05-1503WT	OS12S05-2503WT	3.0	OS12S05-0103GC		
	4.6	OS12S05-0546WT	OS12S05-L546WT	OS12S05-1046WT	OS12S05-1546WT	OS12S05-2546WT	4.0	0010005 010400		
	6.0	—	_	—	OS12S05-1506WT	_	4.0	0512505-0104GC		

YMC-Pack Pro C4

Phase dimension	Column I.D.	Column length (mm)						Guard cartridges	
	(mm)	50	75	100	150	250	I.D. (mm)	10 mm length	
100 Å	2.0	BS12S03-0502WT	BS12S03-L502WT	BS12S03-1002WT	BS12S03-1502WT	—	2.1	BS12S03-01Q1GC	
120 A 3 um	3.0	BS12S03-0503WT	—	BS12S03-1003WT	BS12S03-1503WT	—	3.0	BS12S03-0103GC	
ο μπ	4.6	BS12S03-0546WT	BS12S03-L546WT	BS12S03-1046WT	BS12S03-1546WT	—	4.0	BS12S03-0104GC	
	2.0	BS12S05-0502WT	BS12S05-L502WT	BS12S05-1002WT	BS12S05-1502WT	—	2.1	BS12S05-01Q1GC	
120 Å 5 μm	3.0	BS12S05-0503WT	_	—	BS12S05-1503WT	BS12S05-2503WT	3.0	BS12S05-0103GC	
	4.6	BS12S05-0546WT	BS12S05-L546WT	BS12S05-1046WT	BS12S05-1546WT	BS12S05-2546WT	4.0	R612805 010400	
	6.0	—	_	-	BS12S05-1506WT	—	4.0	D312303-0104GC	

YMC-Pack ODS-A

Phase	Column I.D.	Column length (mm)					Guard cartridges		
dimension	(mm)	50	75	100	150	250	I.D. (mm)	10 mm length	
	2.0	AA12S03-0502WT	AA12S03-L502WT	AA12S03-1002WT	AA12S03-1502WT	—	2.1	AA12S03-01Q1GC	
120 Å 3 μm	3.0	AA12S03-0503WT	_	AA12S03-1003WT	AA12S03-1503WT	—	3.0	AA12S03-0103GC	
	4.6	—	AA12S03-L546WT	AA12S03-1046WT	AA12S03-1546WT	—	4.0	4410000 010400	
	6.0	—	—	AA12S03-1006WT	AA12S03-1506WT	—	4.0	AA12503-0104GC	
	2.0	—	AA12S05-L502WT	—	AA12S05-1502WT	AA12S05-2502WT	2.1	AA12S05-01Q1GC	
100 Å	3.0	—	—	—	AA12S05-1503WT	AA12S05-2503WT	3.0	AA12S05-0103GC	
120 A 5 um	4.6	—	AA12S05-L546WT	AA12S05-1046WT	AA12S05-1546WT	AA12S05-2546WT	10	A 412805 0104CC	
ο μπ	6.0	—	—	AA12S05-1006WT	AA12S05-1506WT	AA12S05-2506WT	4.0	AA12305-0104GC	
	10	—	_	—	AA12S05-1510WT	AA12S05-2510WT	10	AA12S05-0110CC	
	2.0	—	AA30S05-L502WT	—	AA30S05-1502WT	AA30S05-2502WT	2.1	AA30S05-01Q1GC	
300 Å 5 μm	4.6	—	AA30S05-L546WT	AA30S05-1046WT	AA30S05-1546WT	AA30S05-2546WT	4.0		
	6.0	—	—	AA30S05-1006WT	AA30S05-1506WT	AA30S05-2506WT	4.0	AA30505-0104GC	
	10	—	—	—	AA30S05-1510WT	AA30S05-2510WT	10	AA30S05-0110CC	

YMC-Pack ODS-AM

Phase	Column I.D.		C	Column length (mm)			Guard cartridges	
dimension	(mm)	50	75	100	150	250	I.D. (mm)	10 mm length
	2.0	AM12S03-0502WT	AM12S03-L502WT	AM12S03-1002WT	AM12S03-1502WT	—	2.1	AM12S03-01Q1GC
120 Å	3.0	AM12S03-0503WT	—	AM12S03-1003WT	AM12S03-1503WT	—	3.0	AM12S03-0103GC
3 µm	4.6	—	AM12S03-L546WT	AM12S03-1046WT	AM12S03-1546WT	—	4.0	AM12802 0104CC
	6.0	_	—	AM12S03-1006WT	AM12S03-1506WT	AM12S03-2506WT	4.0	AW12303-0104GC
	2.0	—	AM12S05-L502WT	AM12S05-1002WT	AM12S05-1502WT	AM12S05-2502WT	2.1	AM12S05-01Q1GC
100 Å	3.0	—	—	—	AM12S05-1503WT	AM12S05-2503WT	3.0	AM12S05-0103GC
120 A 5 µm	4.6	_	AM12S05-L546WT	AM12S05-1046WT	AM12S05-1546WT	AM12S05-2546WT	4.0	AM12805 010400
	6.0	—	—	AM12S05-1006WT	AM12S05-1506WT	AM12S05-2506WT	4.0	AW12303-0104GC
	10	_	—	—	AM12S05-1510WT	AM12S05-2510WT	10	AM12S05-0110CC

* Guard cartridge holder required, part no. XPGCH-Q1 for 2.1 - 4.0 mml.D. and XPCHSPW1 for 10 mml.D.

* See pp.114-116 for preparative columns other than those listed above.

Ordering Information -Columns-

YMC-Pack ODS-AQ

Phase	Column I.D.	Column length (mm)					Guard cartridges		
dimension	(mm)	50	75	100	150	250	I.D. (mm)	10 mm length	
	2.0	AQ12S03-0502WT	AQ12S03-L502WT	AQ12S03-1002WT	AQ12S03-1502WT	—	2.1	AQ12S03-01Q1GC	
120 Å	3.0	AQ12S03-0503WT	—	AQ12S03-1003WT	AQ12S03-1503WT	_	3.0	AQ12S03-0103GC	
3 µm	4.6	—	—	AQ12S03-1046WT	AQ12S03-1546WT	—	4.0	1012502 010400	
	6.0	_	—	AQ12S03-1006WT	AQ12S03-1506WT	_	4.0	AQ12505-0104GC	
	2.0	—	AQ12S05-L502WT	—	AQ12S05-1502WT	AQ12S05-2502WT	2.1	AQ12S05-01Q1GC	
100 Å	3.0	—	—	—	AQ12S05-1503WT	AQ12S05-2503WT	3.0	AQ12S05-0103GC	
120 Α 5 μm	4.6	_	AQ12S05-L546WT	AQ12S05-1046WT	AQ12S05-1546WT	AQ12S05-2546WT	4.0	A010005 010400	
	6.0	—	—	AQ12S05-1006WT	AQ12S05-1506WT	AQ12S05-2506WT	4.0	AQ12505-0104GC	
	10	_	_	_	AQ12S05-1510WT	AQ12S05-2510WT	10	AQ12S05-0110CC	

YMC-Pack ODS-AL

Phase dimension	Column I.D.	D. Column length (mm)						Guard cartridges		
	n (mm)	50	75	100	150	250	I.D. (mm)	10 mm length		
120 Å 5 µm	2.0	—	—	—	AL12S05-1502WT	AL12S05-2502WT	2.1	AL12S05-01Q1GC		
	4.6	—	AL12S05-L546WT	AL12S05-1046WT	AL12S05-1546WT	AL12S05-2546WT	4.0	AL 12805 0104CC		
	6.0	—	—	AL12S05-1006WT	AL12S05-1506WT	AL12S05-2506WT	4.0	AL12305-0104GC		
	10	—	—	—	AL12S05-1510WT	AL12S05-2510WT	10	AL12S05-0110CC		

YMC-Pack C₈

Phase	Column I.D.		(Guard cartridges			
dimension	(mm)	50	75	100	150	250	I.D. (mm)	10 mm length
100 Å	2.0	OC12S03-0502WT	OC12S03-L502WT	OC12S03-1002WT	OC12S03-1502WT	—	2.1	OC12S03-01Q1GC
120 A 3 µm	3.0	OC12S03-0503WT	—	OC12S03-1003WT	OC12S03-1503WT	—	3.0	OC12S03-0103GC
	4.6	—	—	OC12S03-1046WT	OC12S03-1546WT	—	4.0	OC12S03-0104GC
	2.0	—	—	—	OC12S05-1502WT	OC12S05-2502WT	2.1	OC12S05-01Q1GC
120 Å	4.6	—	OC12S05-L546WT	OC12S05-1046WT	OC12S05-1546WT	OC12S05-2546WT	4.0	0012805 010400
5 µm	6.0	—	—	OC12S05-1006WT	OC12S05-1506WT	OC12S05-2506WT	4.0	0012303-010400
	10	—	—	—	OC12S05-1510WT	OC12S05-2510WT	10	OC12S05-0110CC
200 Å 5 μm	4.6	—	_	—	OC20S05-1546WT	OC20S05-2546WT	4.0	OC20S05-0104GC
	2.0	—	—	—	OC30S05-1502WT	OC30S05-2502WT	2.1	OC30S05-01Q1GC
300 Å 5 μm	4.6	—	OC30S05-L546WT	OC30S05-1046WT	OC30S05-1546WT	OC30S05-2546WT	4.0	0020505 010460
	6.0	—	—	OC30S05-1006WT	OC30S05-1506WT	OC30S05-2506WT	4.0	0030303-010400
	10	—		—	OC30S05-1510WT	OC30S05-2510WT	10	OC30S05-0110CC

YMC-Pack C₄

Phase	Column I.D.		C	Column length (mm)		Gua	rd cartridges
dimension	(mm)	50	75	100	150	250	I.D. (mm)	10 mm length
100 Å	2.0	BU12S03-0502WT	BU12S03-L502WT	BU12S03-1002WT	BU12S03-1502WT	—	2.1	BU12S03-01Q1GC
120 A 3 µm	3.0	BU12S03-0503WT	—	BU12S03-1003WT	BU12S03-1503WT	—	3.0	BU12S03-0103GC
	4.6	—	—	BU12S03-1046WT	BU12S03-1546WT	—	4.0	BU12S03-0104GC
	2.0	—	—	—	BU12S05-1502WT	BU12S05-2502WT	2.1	BU12S05-01Q1GC
120 Å	4.6	—	BU12S05-L546WT	BU12S05-1046WT	BU12S05-1546WT	BU12S05-2546WT	4.0	BU12805 010400
5 µm	6.0	—	—	BU12S05-1006WT	BU12S05-1506WT	BU12S05-2506WT	4.0	BU12305-0104GC
	10	—	_	—	BU12S05-1510WT	BU12S05-2510WT	10	BU12S05-0110CC
	2.0	—	—	—	BU30S05-1502WT	BU30S05-2502WT	2.1	BU30S05-01Q1GC
300 Å 5 μm	4.6	—	BU30S05-L546WT	BU30S05-1046WT	BU30S05-1546WT	BU30S05-2546WT	10	BU20805 0104GC
	6.0	—	—	BU30S05-1006WT	BU30S05-1506WT	BU30S05-2506WT	4.0	000000-010400
	10	—	—	—	BU30S05-1510WT	BU30S05-2510WT	10	BU30S05-0110CC

* Guard cartridge holder required, part no. XPGCH-Q1 for 2.1 - 4.0 mml.D. and XPCHSPW1 for 10 mml.D.

 $\pmb{\ast}$ See pp.114-116 for preparative columns other than those listed above.

(Ordering Information –Columns–

YMC-Pack TMS

Phase dimension	Column I.D.		(Guard cartridges				
	(mm)	50	75	100	150	250	I.D. (mm)	10 mm length
120 Å 3 μm	4.6	—	—	TM12S03-1046WT	TM12S03-1546WT	—	4.0	TM12S03-0104GC
	2.0	—	—	—	TM12S05-1502WT	TM12S05-2502WT	2.1	TM12S05-01Q1GC
120 Å	4.6	—	TM12S05-L546WT	TM12S05-1046WT	TM12S05-1546WT	TM12S05-2546WT	4.0	TM12905 0104GC
5 µm	6.0	—	—	TM12S05-1006WT	TM12S05-1506WT	TM12S05-2506WT	4.0	1012303-010400
	10	—	—	—	TM12S05-1510WT	TM12S05-2510WT	10	TM12S05-0110CC

YMC-Pack Ph

Phase	Column I.D. (mm)	Column length (mm)						Guard cartridges	
dimension		50	75	100	150	250	I.D. (mm)	10 mm length	
120 Å 3 µm	2.0	PH12S03-0502WT	PH12S03-L502WT	PH12S03-1002WT	PH12S03-1502WT	—	2.1	PH12S03-01Q1GC	
	3.0	PH12S03-0503WT	_	PH12S03-1003WT	PH12S03-1503WT	—	3.0	PH12S03-0103GC	
	4.6	—	—	PH12S03-1046WT	PH12S03-1546WT	—	4.0	PH12S03-0104GC	
120 Å 5 µm	2.0	—	—	—	PH12S05-1502WT	PH12S05-2502WT	2.1	PH12S05-01Q1GC	
	4.6	—	PH12S05-L546WT	PH12S05-1046WT	PH12S05-1546WT	PH12S05-2546WT	10		
	6.0	—	—	PH12S05-1006WT	PH12S05-1506WT	PH12S05-2506WT	4.0	FH12303-0104GC	
	10	—	_	—	PH12S05-1510WT	PH12S05-2510WT	10	PH12S05-0110CC	

YMC-Pack CN

Phase	Column I.D. (mm)		Guard cartridges					
dimension		50	75	100	150	250	I.D. (mm)	10 mm length
100 Å	2.0	CN12S03-0502WT	CN12S03-L502WT	CN12S03-1002WT	CN12S03-1502WT	—	2.1	CN12S03-01Q1GC
120 A 3 um	3.0	CN12S03-0503WT	_	CN12S03-1003WT	CN12S03-1503WT	—	3.0	CN12S03-0103GC
3 μπ	4.6	—	—	CN12S03-1046WT	CN12S03-1546WT	—	4.0	CN12S03-0104GC
	2.0	—	—	—	CN12S05-1502WT	CN12S05-2502WT	2.1	CN12S05-01Q1GC
120 Å	4.6	—	CN12S05-L546WT	CN12S05-1046WT	CN12S05-1546WT	CN12S05-2546WT	4.0	CN12805 0104CC
5 µm	6.0	—	—	CN12S05-1006WT	CN12S05-1506WT	CN12S05-2506WT	4.0	CIV12305-0104GC
	10	—	_	—	CN12S05-1510WT	CN12S05-2510WT	10	CN12S05-0110CC
000 Å	2.0	—	—	—	CN30S05-1502WT	CN30S05-2502WT	2.1	CN30S05-01Q1GC
300 A	4.6	—	CN30S05-L546WT	CN30S05-1046WT	CN30S05-1546WT	CN30S05-2546WT	4.0	CN20005 010400
υμπ	6.0	—	—	CN30S05-1006WT	CN30S05-1506WT	CN30S05-2506WT	4.0	CN30303-0104GC

YMC-Pack PROTEIN-RP

Particle size (µm)	Column I.D. (mm)), Column length (mm)						Guard cartridges	
		50	75	100	150	250	I.D. (mm)	10 mm length	
5	2.0	—	—	—	PR99S05-1502WT	PR99S05-2502WT	2.1	PR99S05-01Q1GC	
	4.6	—	—	—	PR99S05-1546WT	PR99S05-2546WT	4.0	PR99S05-0104GC	
	10	—	—	—	—	PR99S05-2510WT	10	PR99S05-0110CC	

YMCbasic

Phase	Column I.D. (mm)	Column length (mm)						Guard cartridges	
dimension		50	75	100	150	250	I.D. (mm)	10 mm length	
200 Å 3 µm	2.0	BA99S03-0502WT	BA99S03-L502WT	BA99S03-1002WT	BA99S03-1502WT	—	2.1	BA99S03-01Q1GC	
	3.0	BA99S03-0503WT	_	BA99S03-1003WT	BA99S03-1503WT	—	3.0	BA99S03-0103GC	
	4.6	BA99S03-0546WT	—	BA99S03-1046WT	BA99S03-1546WT	—	4.0	BA99S03-0104GC	
200 Å 5 µm	2.0	—	—	—	BA99S05-1502WT	—	2.1	BA99S05-01Q1GC	
	3.0	—	_	—	BA99S05-1503WT	—	3.0	BA99S05-0103GC	
	4.6	BA99S05-0546WT	—	BA99S05-1046WT	BA99S05-1546WT	BA99S05-2546WT	4.0		
	6.0	—	_	—	BA99S05-1506WT	BA99S05-2506WT	4.0	BA99505-0104GC	

YMC Carotenoid

Particle size	Column I.D. (mm)	Column length (mm)						Guard cartridges	
(µm)		50	75	100	150	250	I.D. (mm)	10 mm length	
3	4.6	—	—	CT99S03-1046WT	CT99S03-1546WT	—	4.0	CT99S03-0104GC	
5	4.6	—	—	—	CT99S05-1546WT	CT99S05-2546WT	4.0	CT99S05-0104GC	

* Guard cartridge holder required, part no. XPGCH-Q1 for 2.1 - 4.0 mml.D. and XPCHSPW1 for 10 mml.D.

* See pp.115-116 for preparative columns other than those listed above.

Ordering Information -Columns-

J'sphere

Phase	Column I.D.		Guard cartridges				
dimension	(mm)	75	100	150	250	I.D. (mm)	10 mm length
	2.0	JH08S04-L502WT	JH08S04-1002WT	JH08S04-1502WT	JH08S04-2502WT	2.1	JH08S04-01Q1GC
ODS-H80	3.0	—	—	JH08S04-1503WT	JH08S04-2503WT	3.0	JH08S04-0103GC
80 Å	4.6	JH08S04-L546WT	_	JH08S04-1546WT	JH08S04-2546WT	4.0	1100004 010400
4 µm	6.0	—	—	JH08S04-1506WT	JH08S04-2506WT	4.0	JH08S04-0104GC
	10	—	—	JH08S04-1510WT	JH08S04-2510WT	10	JH08S04-0110CC
	2.0	JM08S04-L502WT	JM08S04-1002WT	JM08S04-1502WT	JM08S04-2502WT	2.1	JM08S04-01Q1GC
ODS-M80	3.0	—	_	JM08S04-1503WT	JM08S04-2503WT	3.0	JM08S04-0103GC
80 Å	4.6	JM08S04-L546WT	—	JM08S04-1546WT	JM08S04-2546WT	4.0	IM00004 010400
4 µm	6.0	—	—	JM08S04-1506WT	JM08S04-2506WT	4.0	JIM08504-0104GC
	10	—	—	JM08S04-1510WT	JM08S04-2510WT	10	JM08S04-0110CC
	2.0	JL08S04-L502WT	JL08S04-1002WT	JL08S04-1502WT	JL08S04-2502WT	2.1	JL08S04-01Q1GC
ODS-L80	3.0	—	—	JL08S04-1503WT	JL08S04-2503WT	3.0	JL08S04-0103GC
80 Å	4.6	JL08S04-L546WT	—	JL08S04-1546WT	JL08S04-2546WT	4.0	11.09504.010400
4 µm	6.0	—	—	JL08S04-1506WT	JL08S04-2506WT	4.0	JL00304-0104GC
	10	_	_	JL08S04-1510WT	JL08S04-2510WT	10	JL08S04-0110CC

YMC-Pack PolymerC18

Particle size (µm)	Column I.D.		Guard cartridges				
	(mm)	75	100	150	250	I.D. (mm)	10 mm length
6	2.0	PC99S06-L502WT	_	PC99S06-1502WT	_	2.1	PC99S06-01Q1GC
	4.6	—	_	PC99S06-1546WT	PC99S06-2546WT	4.0	
	6.0	—	—	PC99S06-1506WT	PC99S06-2506WT	4.0	PC99300-0104GC
	10	—	_	—	PC99S06-2510WT	10	PC99S06-0110CC
10	4.6	—	—	—	PC99S10-2546WT	4.0	PC00810.01046C
	6.0			_	PC99S10-2506WT	4.0	F 035310-010400
	10	—	—	—	PC99S10-2510WT	10	PC99S10-0110CC

* Guard cartridge holder required, part no. XPGCH-Q1 for 2.1 - 4.0 mml.D. and XPCHSPW1 for 10 mml.D.

 $\pmb{\ast}$ See pp.115-116 for preparative columns other than those listed above.