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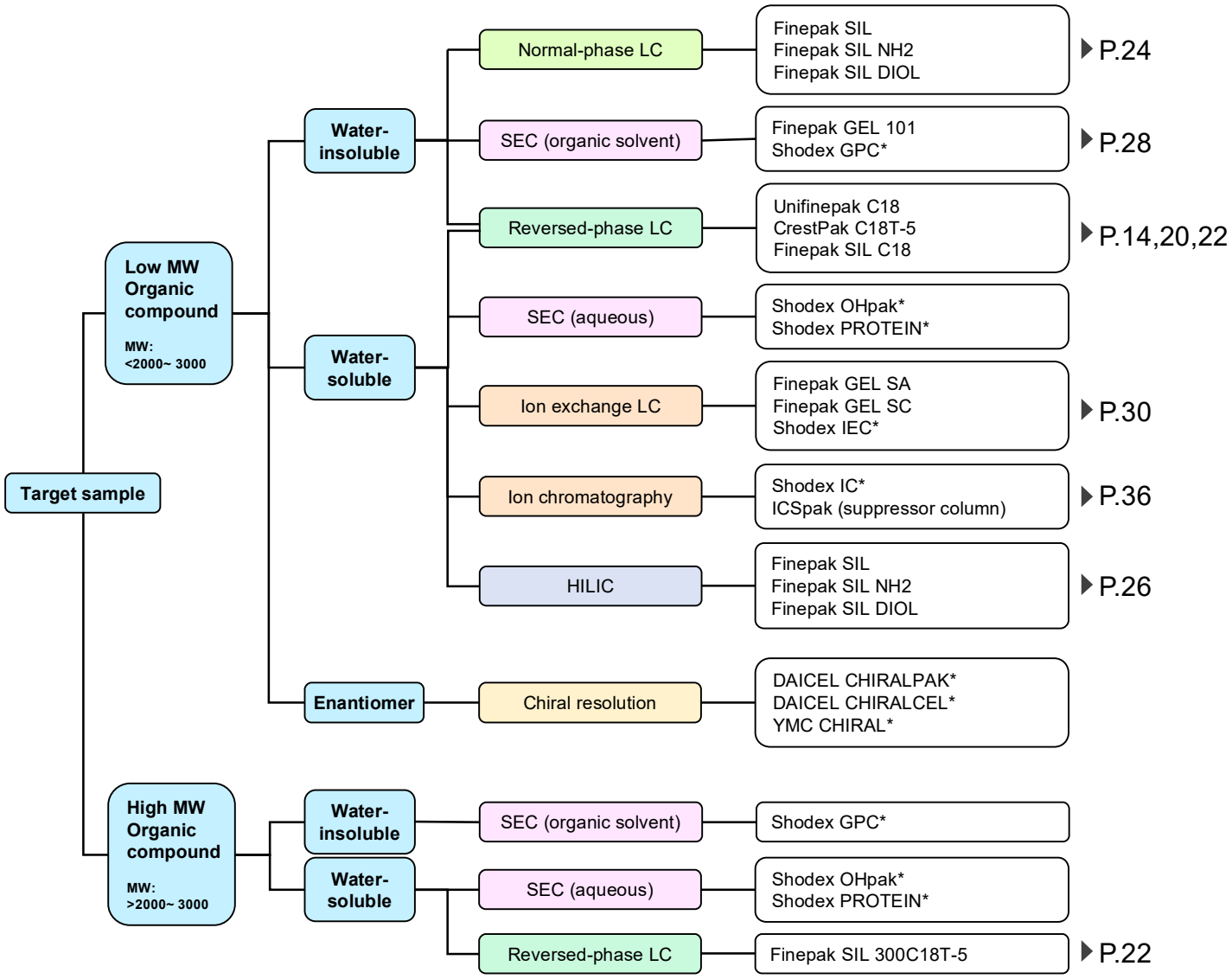
HPLC columns

JASCO Corporation

Contents

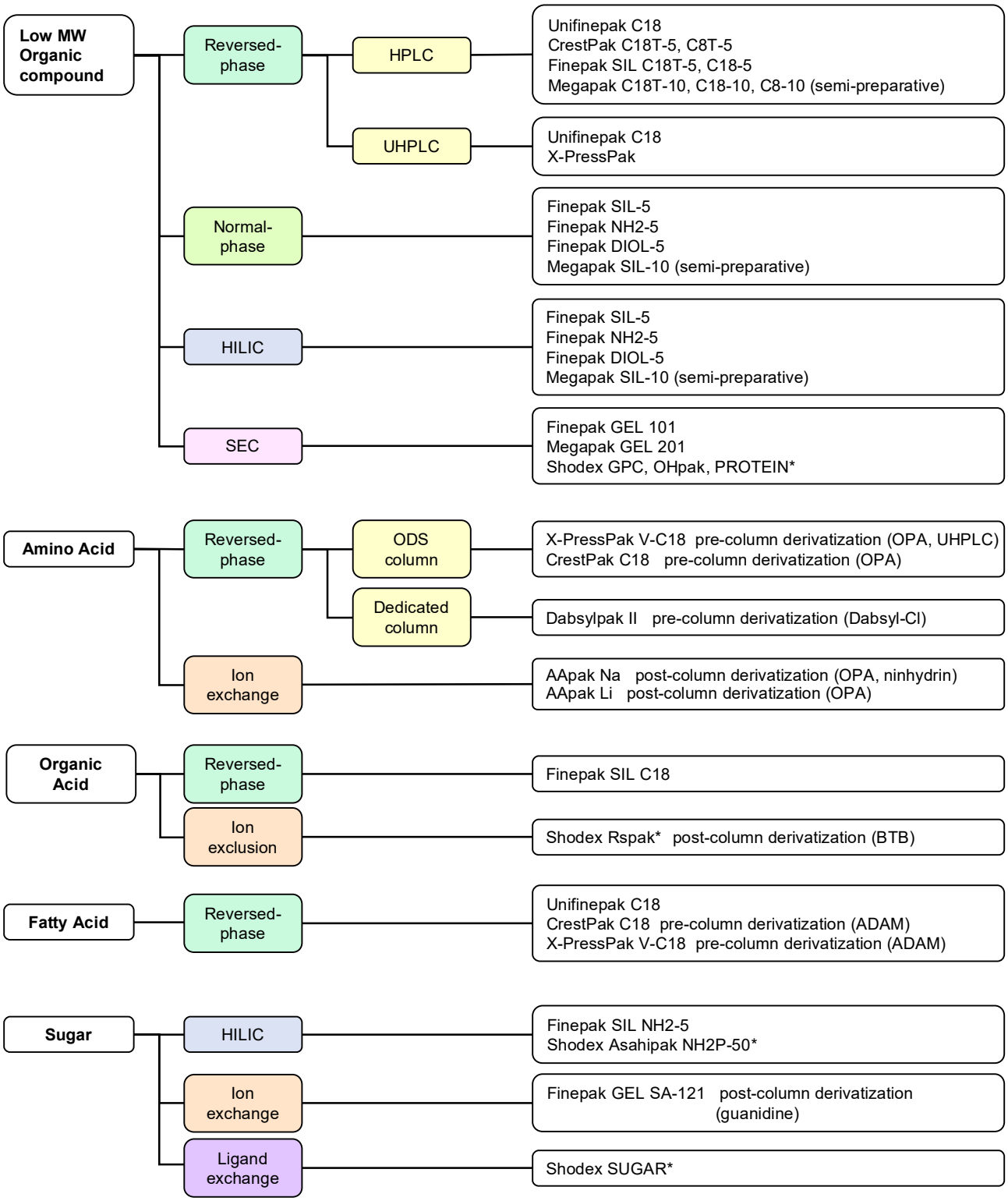
*All information is as of Feb. 2018. Specification on this catalogue is subject to change without notice.

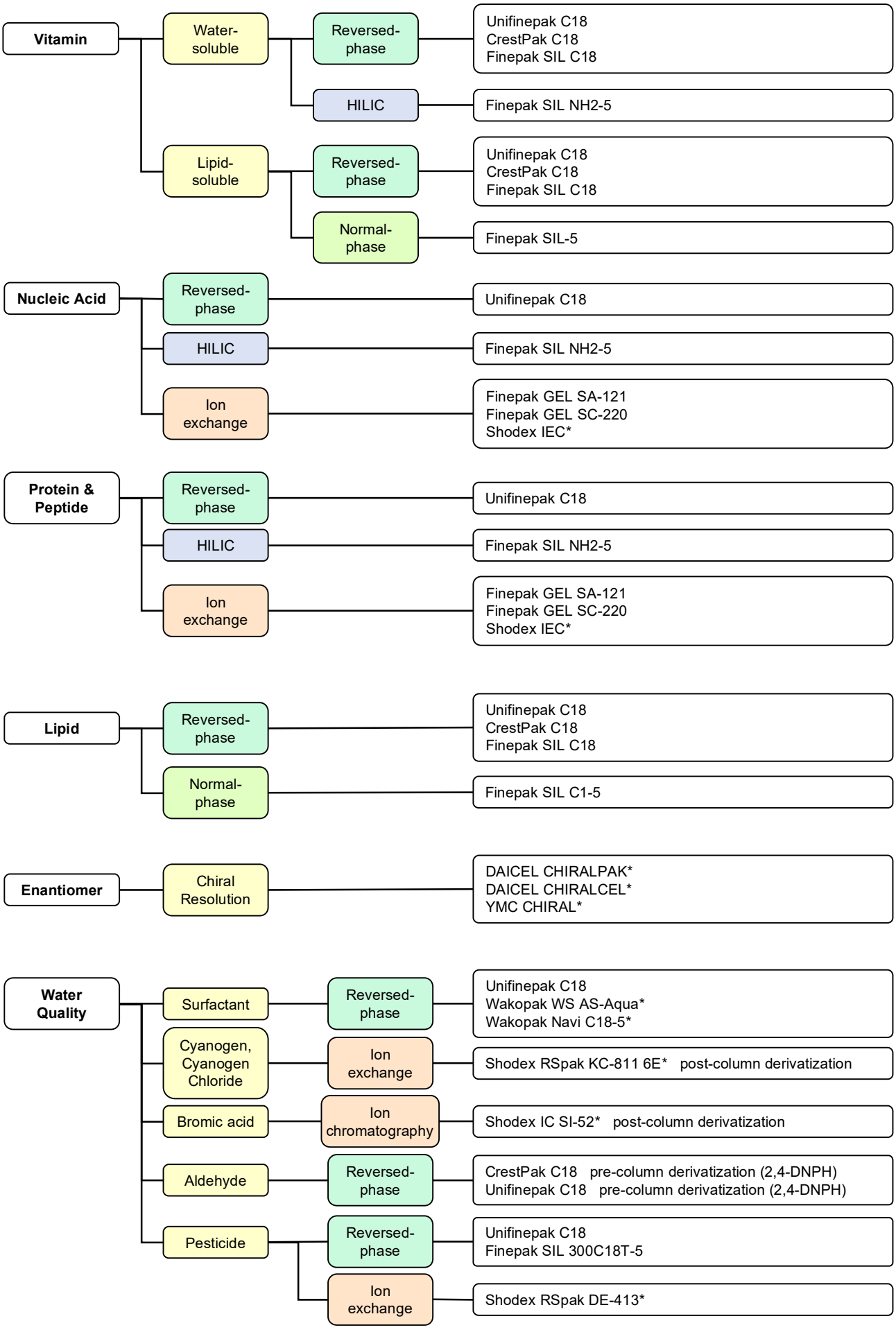
Column selection guide –Target sample-



*These columns are from other suppliers.

Column selection guide –Application or separation mode-

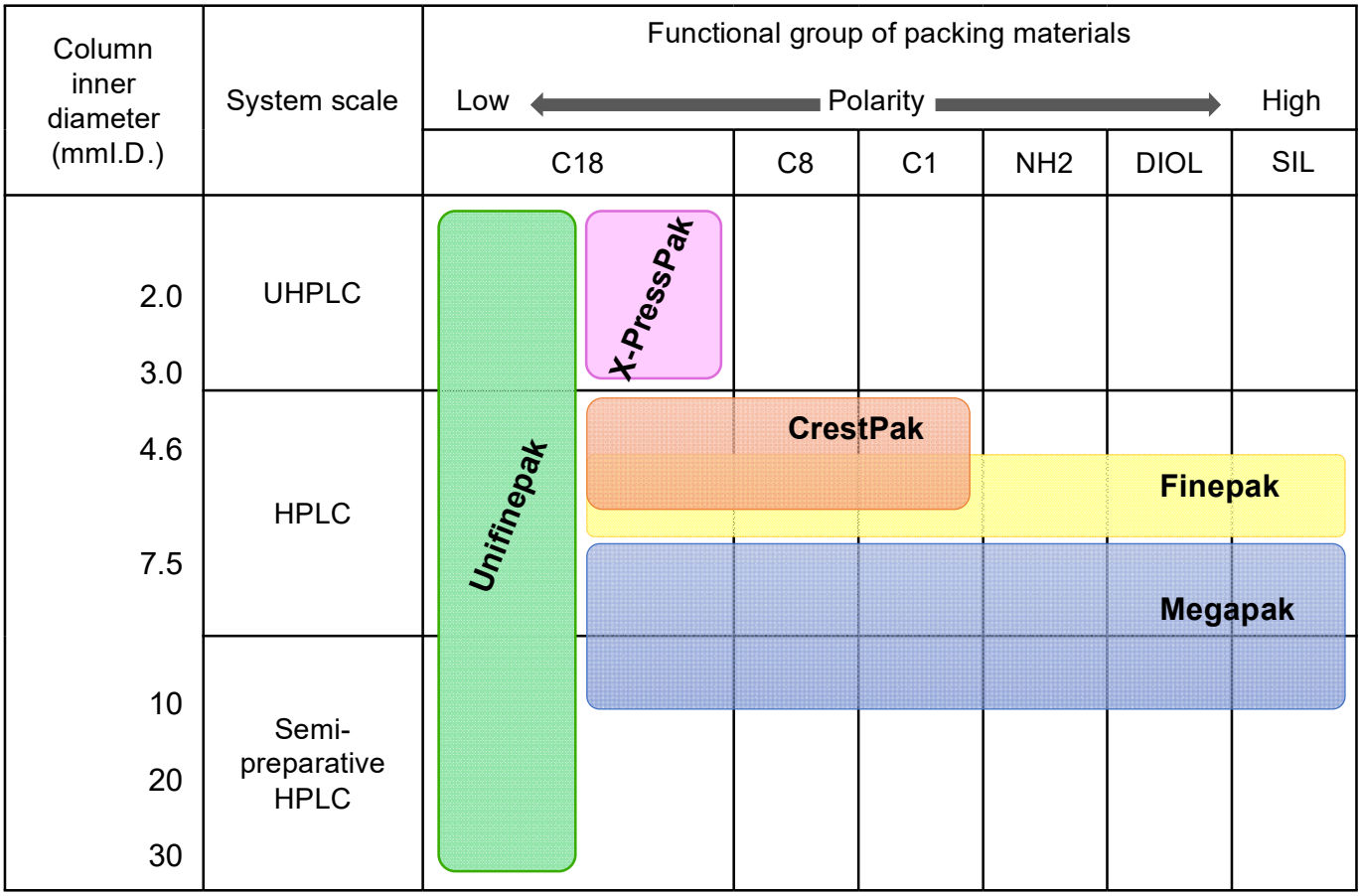




*These columns are from other suppliers

Column selection guide –Compatibility Table of HPLC system and column–

Following table is compatibility of a best-suited silica gel column for each system scale.



Separation modes

Separation Mode		Features	Column
Reversed-phase Chromatography (RPC)		In reversed-phase chromatography, low polar stationary phase and high polar mobile phase are used. This is multi-purpose mode covering more than 70 % of whole HPLC analyses. Silica ODS columns with octadecyl-silylated silica gel are the most common in this mode. Others include silica gel columns with shorter alkyl chain, porous polymer or novel hybrid silica gel columns.	• Unifinepak C18 • CrestPak C18T-5, C8T-5, C1-5 • Finepak SIL C18T-5, C18-5, C1-5 • X-PressPak
Normal-phase Chromatography (NPC)		In normal-phase chromatography, high polar stationary phase and low polar mobile phase are used. Main target samples are lipid-soluble compounds. The most common columns are silica gel-based, but its strong adsorption requires much time in solvent replacement. To avoid delay in gradient elution method, silica-gel-based columns with polar functional group (CN, NH_2, DIOL) are also used.	• Finepak SIL-5 • Finepak SIL NH2-5 • Finepak SIL DIOL-5
Hydrophilic Interaction Chromatography (HILIC)		Hydrophilic interaction chromatography (HILIC) is a kind of normal-phase chromatography. In HILIC, organic solvent-rich eluent is used along with high polar functional group columns(such as silica-gel or DIOL). Sample is distributed between mobile phase and hydrated phase on the surface of stationary phase. In contrast to reversed - phase chromatography, high hydrophobic compounds are eluted earlier. Therefore, It is possible to analyze highly polar compounds that is difficult to be retained in reversed-phase mode. Organic solvent-rich elution provide higher sensitivity in MS analysis than reversed-phase mode.	• Finepak SIL-5 • Finepak SIL NH2-5 • Finepak SIL DIOL-5
Ion Exchange Chromatography (IEC)		In ion exchange chromatography, sample is retained with dissociable group on packing materials by ionic bond and then / eluted by exchanging with other ion in mobile phase. It is applied to ionic compounds and also for separation of biological polymer such as protein and peptide. Ion chromatography for inorganic ion is one of this mode.	• AApak Na • AApak Li • Finepak GEL SA • Finepak GEL SC • Shodex IEC DEAE-825 • Shodex IEC CM-825
Size Exclusion Chromatography (SEC)	**Organic Solvent SEC** (Gel Permeation Chromatography ; GPC)	In size exclusion chromatography (SEC), micropores of packing materials retain sample without interaction between sample and packing materials. Therefore, the separation only depends on the compound size and small-sized compounds elute later because they can go into smaller pore. It is mainly applied to average molecular weight(MW) and MW distribution analysis. It is also applied to the analysis of low molecular ingredients in high molecular samples. GPC is used for MW distribution analysis of synthesized compound with organic solvent as mobile phase.	• Finepak GEL 101 • Megapak GEL 201 • Shodex GPC
	Aqueous SEC (Gel Filtration Chromatography ; GFC)	GFC with aqueous solvent are utilized for separation, preparation and MW distribution analysis of water-soluble high MW compounds such as polysaccharides, protein.	• Shodex OHpak • Shodex PROTEIN

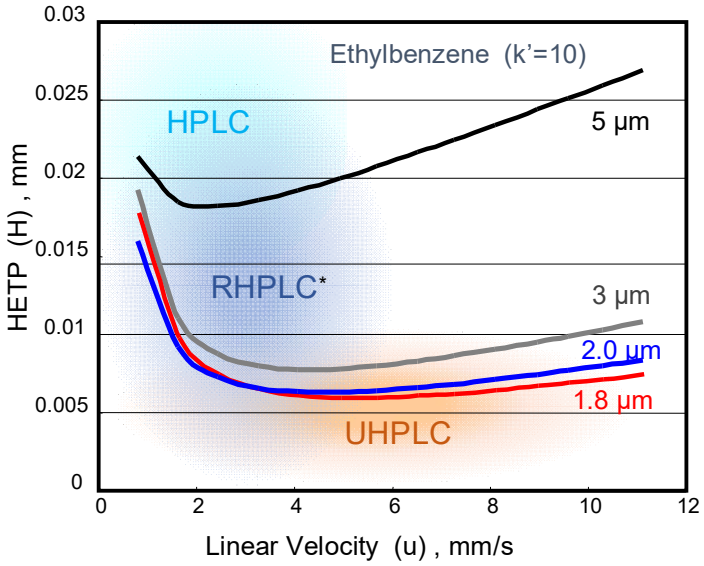
Attention on the system

In general, HPLC system is consisted of pump, injector, separation column, detector, and data processor(CDS). And it is need to configure the suitable system for columns.

- In UHPLC or a case of analysis with short retention time and sharp shape of peaks, rapid response is a must-have for detector and data processor. If it is not equipped, the number of theoretical plates may be reduced, and the reproducibility of retention time and peak are may be deteriorated.
- As seen in van Deemter plot, UHPLC provides high efficiency analysis using a sub- 2 μm column with high linear velocity. Pay attention to the pressure tolerance of the system and tubing, because the pressure increases under the analytical conditions of UHPLC.
- Line filters are recommended for removing particles in solvent which causes increased column pressure.
- When using semi-micro or UHPLC columns, system should be configured in order to avoid peak broadening.

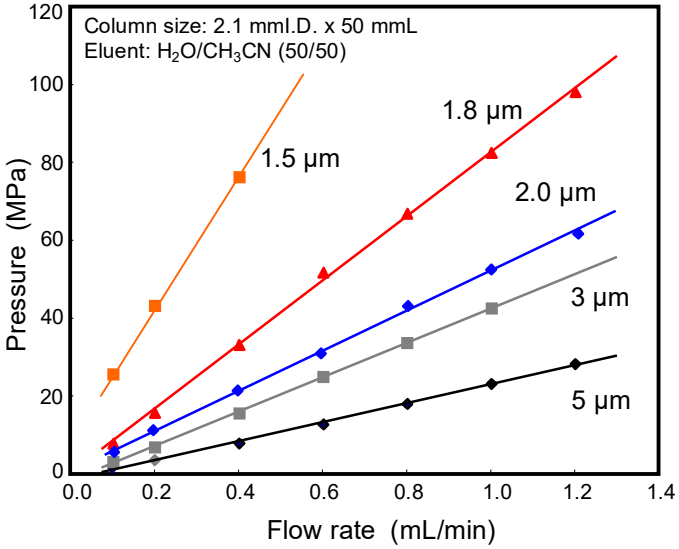
Choosing suitable system or detector cell will help to maximize capacity of high performance columns then enable to obtain best performance (high separation and high sensitivity detection).

van Deemter plot by particle size



*RHPLC (rapid separation HPLC) is a method of HPLC that covers wide range from conventional HPLC to part of UHPLC.

Flow rate and pressure by particle size

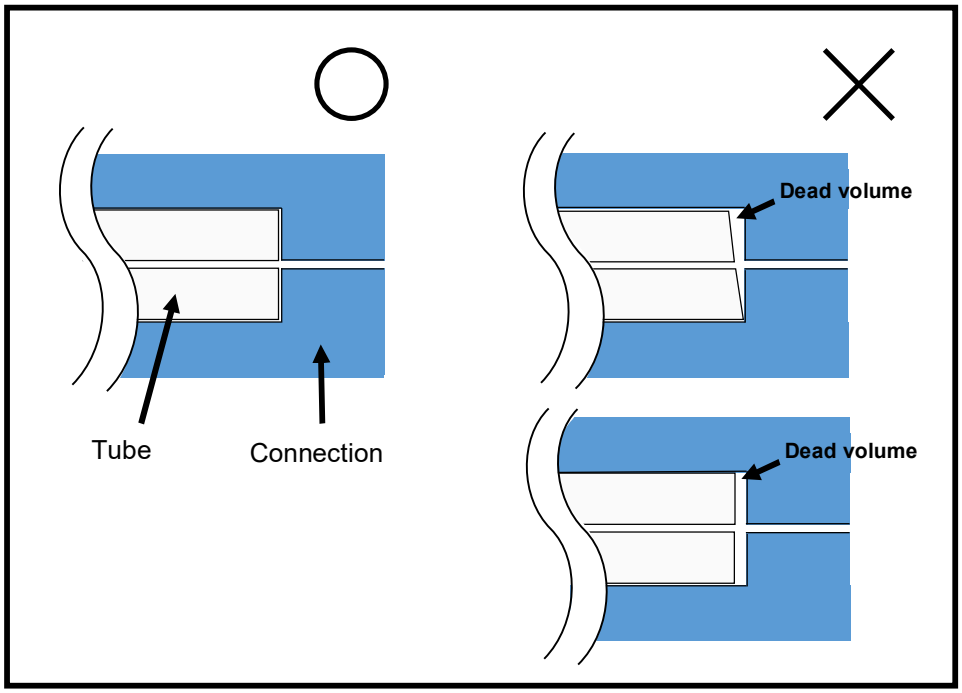


Attention on column connection

Dead volume at the tubing connection causes decreased number of theoretical plates or tailing peak. Pay attention to dead volume in tubing and cutting plane in order to avoid such problem.
UHPLC columns with sub-2 μm of particle size tend to be high pressure during delivering mobile phase compared to conventional HPLC. Check about pressure tolerance of system.

In order to avoid sample diffusion, tubing from injector to column and from column to detector should be short with small I.D. as much as possible and also dead volume in connection part should be prevented.
(UHPLC： 0.15 mmI.D. or less, HPLC： 0.25~ 0.5 mmI.D.)

<Tubing connection>



Guide of flow rate and sample load for size of silica-based column in HPLC

Below table shows referential values for 5 µm silica gel columns.

Flow rate depends on column I.D. and also maximum operating pressure of packing materials. In case of UHPLC columns, the measurement are performed under high linear velocity for high efficient separation. And when using columns with polymer packing, flow rate can be 3 mL/min for 20 mmI.D. column.

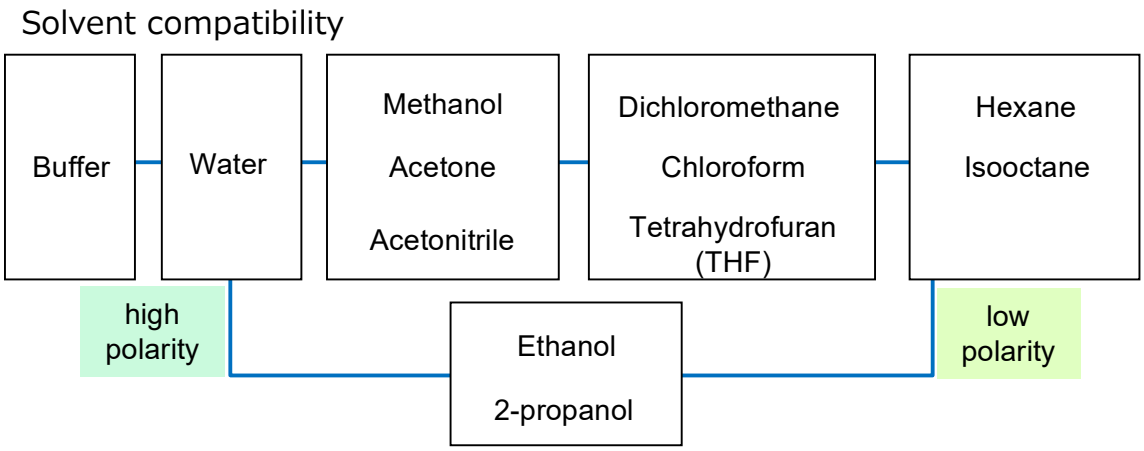
Injection volume is influenced by the separation between analyte and residual substances, packing materials, and sample solvent etc. (For example, if sample solvent have higher elution than mobile phase, injection volume should be small since compound may be eluted without enough separation. On the other hand, if elution of sample solvent is lower than mobile phase, injection volume may be larger.)

Max. sample load shown in below are the total sample mass for 250 mm length column. If other conditions such as packing materials and column length are all the same, flow rate and sample load can be changed proportionally for section area, and then equivalent chromatogram can be obtained

I.D.	Suggested flow rate	Injection volume	Max. sample load	Remarks
1.5 mm	0.1 mL/min	1 µL	0.5 mg	Semi-micro column. Packing material is mostly 5 µm.
2.1 mm	0.2 mL/min	2 µL	1 mg	
4.6 mm	1.0 mL/min	10~ 20 µL	5 mg	Most general analytical column which packing material is mostly 5 µm.
6.0 mm	1.7 mL/min	15~ 30 µL	8 mg	
7.5 mm	2.5 mL/min	20~ 40 µL	12 mg	Preparative column. Packing material is 5,10 µm or larger.
10 mm	4.0 mL/min	50~ 100 µL	20 mg	
20 mm	10 mL/min	180~ 360 µL	90 mg	
30 mm	25 mL/min	400~ 800 µL	200 mg	
50 mm	70 mL/min	1100~ 2200 µL	550 mg	
100 mm	200 mL/min	4500~ 9000 µL	2200 mg	

Solvent replacement

When replacing solvent in the column, please see the column instruction manual to use suitable solvent. The replacing solvent must be compatible to initial solvent. When replacing buffer solution to 100% organic solvent, pay attention to salt precipitation. Please find below figure for solvent compatibilities.



Notes about solvents to use

There are following cautions in delivering mobile phase.
Before doing measurement or cleaning, make sure the properties of measurement sample and mobile phase.

- Please avoid to use basic mobile phase to silica gel columns
  →silica gel will be dissolved and its performance will be deteriorated.
  Applicable pH range for CrestPak is 2.0~ 7.0.

  Unifinepak with hybrid silica gel is available with mobile phase(pH range 1.0~ 12.0).

- For using ion pair reagents, we strongly recommend to prepare dedicated columns.
  → Ion pair reagents will stick to modified group on packing materials and may not be cleared perfectly.

  →Addition reagents such as amine or acids in mobile phase may not be cleaned perfectly and the effect remains.

- Since tiny particle is packed, fine mesh filter is adopted in UHPLC columns. In case of using mobile phase such as buffer solution, membrane filtration may be necessary in order to avoid salt precipitation and clogging.

Column cleaning

Impurities from eluent or sample may accumulate in a column then deteriorates separation capacity. In such situation, column cleaning is may be effective.

Before cleaning, check applicable solvents and cleaning method described in the column instruction manual and also properties of measured samples and mobile phases.

1. In case of increased column pressure due to clogging.
   Connect column inversely, then flush it with low flow rate (about half of analytical settings).
   The flow after the column should be removed in order to prevent pollution on the system.
   Before starting next measurement, sample pretreatment such as membrane filtration of sample is needed.

2. In case of deteriorated separation due to absorbed substance on packing materials.
   If mobile phase includes salt, remove it firstly by delivering salt-free solvent (water/organic solvent=50/50). (If polymer packing materials is used, please pay attention to the amount of organic solvent to avoid swelling or shrinking.)
   Then deliver mobile phase which dissolves absorbed substance and flush it.
   In case of absorbed substance on ODS column is hydrophobic, flush it with organic solvent such as acetonitrile, methanol, THF.
   If basic components including basic ion pair reagent remain in the column, it may be effective to use an acidic aqueous solution containing about 0.1% of acid (phosphoric acid or acetic acid) added to the washing solvent.

In general, column cleaning consumes solvent around 5 ~ 10 times of column volume. However, it is difficult to identify the substances absorbed on the column, and the above cleaning method may not be effective. For example proteins are difficult components to remove by cleaning.

Each column series – details

Reversed-phase columns (C18) hybrid silica gel

Unifinepak C18

Base:	Hybrid silica gel
Particle size:	1.9 µm, 3 µm, 5 µm
Pore size:	12 nm
Bonding:	Octadecyl
End-capping:	Yes
pH range:	1 - 12

Unifinepak series adopts hybrid silica gel as the base materials.
Unifinepak C18 is a reversed-phase column. Octadecylsilyl group is modified on the hybrid silica gel, and residual silanol groups are treated. It shows high durability and provides excellent peak shape even under analysis conditions of 100%aqueous mobile phase and high pH mobile phase with could not be achieved with ordinary silica gel column.
Unifinepak is recommended as a first-choice column. There are variable particle size and column size with the same packing materials, it facilitates method conversion in range from UHPLC to conventional and preparative HPLC.

Analytical columns

Product name	Column size	Particle size (µm)	Pore size (nm)	Pressure (MPa)
Unifinepak C18 02050-1.9M	2.0 mmI.D. x 50 mmL	1.9	12	100
Unifinepak C18 02075-1.9M	2.0 mmI.D. x 75 mmL			
Unifinepak C18 02100-1.9M	2.0 mmI.D. x 100 mmL			
Unifinepak C18 02150-1.9M	2.0 mmI.D. x 150 mmL			
Unifinepak C18 03050-1.9M	3.0 mmI.D. x 50 mmL			
Unifinepak C18 03075-1.9M	3.0 mmI.D. x 75 mmL			
Unifinepak C18 03100-1.9M	3.0 mmI.D. x 100 mmL			
Unifinepak C18 03150-1.9M	3.0 mmI.D. x 150 mmL			
Unifinepak C18 02050-3M	2.0 mmI.D. x 50 mmL	3	12	30
Unifinepak C18 02100-3M	2.0 mmI.D. x 100 mmL			
Unifinepak C18 02150-3M	2.0 mmI.D. x 150 mmL			
Unifinepak C18 03050-3M	3.0 mmI.D. x 50 mmL			
Unifinepak C18 03100-3M	3.0 mmI.D. x 100 mmL			
Unifinepak C18 03150-3M	3.0 mmI.D. x 150 mmL			
Unifinepak C18 04050-3M	4.6 mmI.D. x 50 mmL			
Unifinepak C18 04100-3M	4.6 mmI.D. x 100 mmL			
Unifinepak C18 04150-3M	4.6 mmI.D. x 150 mmL			
Unifinepak C18 04250-3M	4.6 mmI.D. x 250 mmL			
Unifinepak C18 03050-5M	3.0 mmI.D. x 50 mmL	5	12	30
Unifinepak C18 03100-5M	3.0 mmI.D. x 100 mmL			
Unifinepak C18 03150-5M	3.0 mmI.D. x 150 mmL			
Unifinepak C18 04050-5M	4.6 mmI.D. x 50 mmL			
Unifinepak C18 04100-5M	4.6 mmI.D. x 100 mmL			
Unifinepak C18 04150-5M	4.6 mmI.D. x 150 mmL			
Unifinepak C18 04250-5M	4.6 mmI.D. x 250 mmL			

Semi-preparative columns (10, 20, 30 mmI.D.)

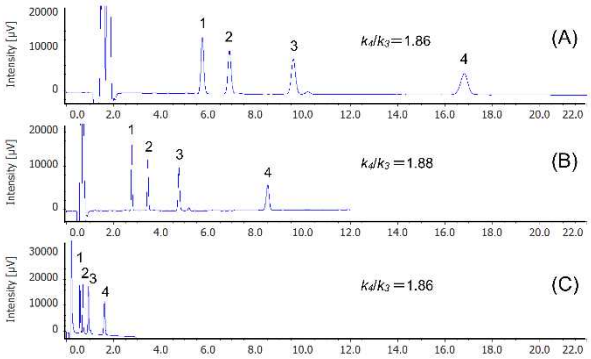
Product name	Column size	Particle size (µm)	Pore size (nm)	Pressure (MPa)
Unifinepak C18 10150-5M	10 mmI.D. x 150 mmL	5	12	30
Unifinepak C18 10250-5M	10 mmI.D. x 250 mmL			
Unifinepak C18 20150-5M	20 mmI.D. x 150 mmL			
Unifinepak C18 20250-5M	20 mmI.D. x 250 mmL			
Unifinepak C18 30150-5M	30 mmI.D. x 150 mmL			
Unifinepak C18 30250-5M	30 mmI.D. x 250 mmL			

Unifinepak Application data

No.	Title	Column
220058H	Analysis of fatty acids using the LC-4000 Series Rapid Separation HPLC	Unifinepak C18 02150-1.9M, 04150-5M
250024HX	Analysis of furfural in transformer oil	Unifinepak C18 04150-5M
410009X	Analysis of sterols by Ultra High-Performance Liquid Chromatography	Unifinepak C18 02150-1.9M

Comparison of separation in fatty acids analysis

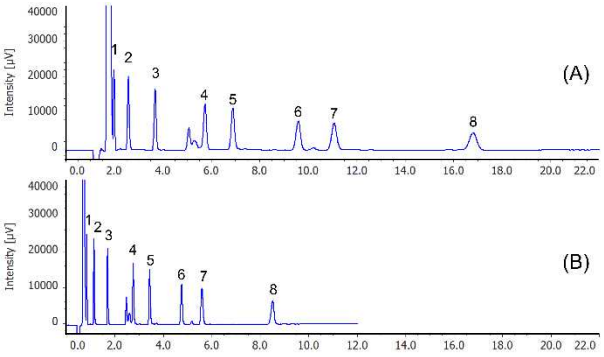
Unifinepak has particle diameter-variations with same selectivity, so equivalent separation can be obtained even after doing method transfer using method conversion program (option)



Column:	A) Unifinepak C18 (4.6 mmI.D. x 150 mmL, 5 μm) B) Unifinepak C18 (2.0 mmI.D. x 150 mmL, 1.9 μm) C) Unifinepak C18 (2.0 mmI.D. x 30 mmL, 1.9 μm)
Eluent:	0.1%TFA/Acetonitrile (20/80)
Flow rate:	A; 1.2 mL/min, B-C; 0.6 mL/min
Column temp.:	40 ºC
Detector:	RI-4035
Injection volume:	A; 10 μL, B-C; 2 μL
Standard sample:	Fatty acids mixture (1 mg/mL each) 1. Myristic acid, 2. Linoleic acid, 3. Palmitic acid, 4. Stearic acid

Ref.: LC application data No.220058H

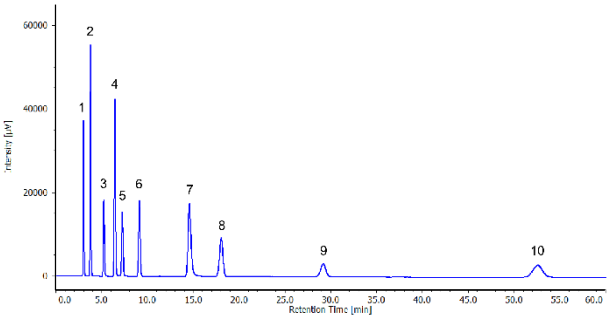
Analysis of 8 fatty acids



Column:	A) Unifinepak C18 (4.6 mmI.D. x 150 mmL, 5 μm) B) Unifinepak C18 (2.0 mmI.D. x 150 mmL, 1.9 μm)
Eluent:	0.1%TFA/Acetonitrile (20/80)
Flow rate:	A; 1.2 mL/min, B; 0.6 mL/min
Column temp.:	40 ºC
Detector:	RI-4035
Injection volume:	A; 10 μL, B; 2 μL
Standard sample:	Fatty acids mixture (1 mg/mL each) 1. Caprylic acid, 2. Capric acid, 3. Lauric acid, 4. Myristic acid, 5. Linoleic acid, 6. Palmitic acid, 7. Elaidic acid, 8. Stearic acid

Ref.: LC application data No.220058H

Analysis of nucleosides and nucleobases using 100% aqueous mobile phase

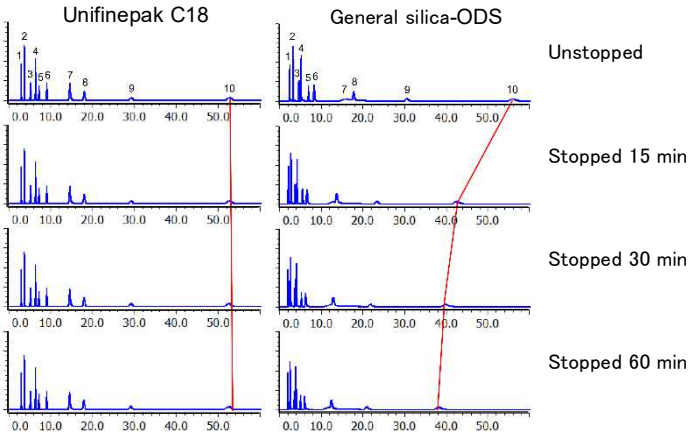


Column:	Unifinepak C18 (4.6mmI.D. x 150mmL, 5μm)
Eluent :	30 mM Ammonium formate
Flow rate:	1.0 mL/min
Column temp.:	40 ºC
Wavelength:	250 nm
Injection volume:	10 μL
Standard sample:	Nucleosides and nucleobases mixture (10 μg/mL each) 1. Cytosine, 2. Uracil, 3. Cytidine, 4. Guanine, 5. Uridine, 6. Thymine, 7. Adenine, 8. Guanosine, 9. Thymidine, 10. Adenosine

Ref.: LC application data No.420009H

Change in retention time using 100% aqueous mobile phase

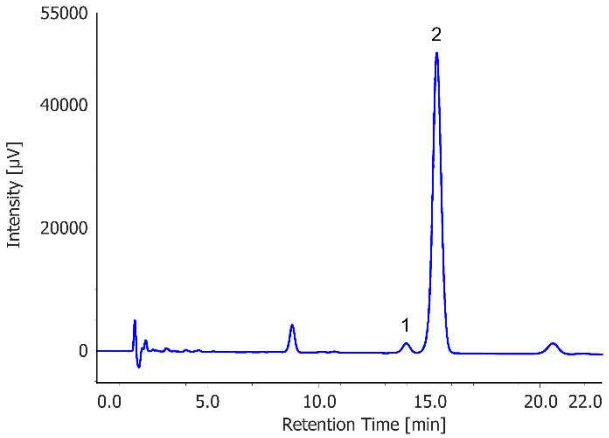
Unifinepak offers stable retention time under 100% aqueous mobile phase even after stopping pump.



Column:	Unifinepak C18 (4.6 mmI.D. x 150 mmL, 5 μm) Silica-ODS (4.6 mmI.D. x 150 mmL, 5 μm)
Eluent :	30 mM Ammonium formate
Flow rate:	1.0 mL/min
Column temp.:	40 ºC
Wavelength:	250 nm
Injection volume:	10 μL
Standard sample:	Nucleosides and nucleobases mixture (10 μg/mL each) 1. Cytosine, 2. Uracil, 3. Cytidine, 4. Guanine, 5. Uridine, 6. Thymine, 7. Adenine, 8. Guanosine, 9. Thymidine, 10. Adenosine

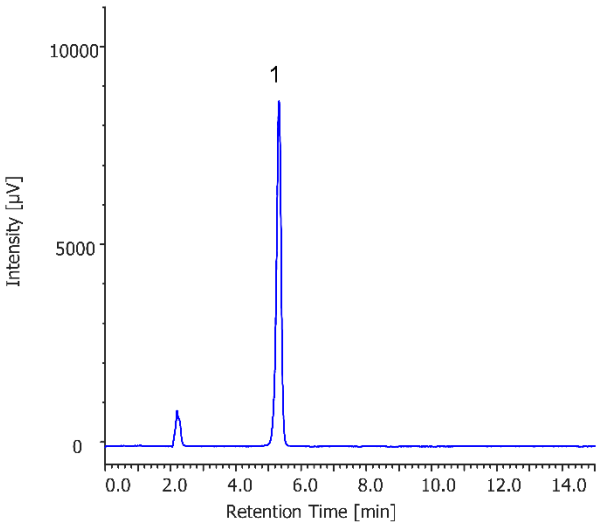
Ref.: LC application data No.420009H

Analysis of glycyrrhizinate



Column:	Unifinepak C18 (4.6 mmI.D. x 150 mmL, 5 μm)
Eluent:	0.05 M Ammonium acetate in water/acetonitrile/ acetic acid (72/28/0.5)
Flow rate:	1.0 mL/min
Column temp.:	40 ºC
Wavelength:	254 nm
Injection volume:	10 μL
Standard sample:	Glycyrrhizic acid 250 mg/L

Analysis of furfural



Column:	Unifinepak C18 (4.6 mmI.D. x 150 mmL, 5 μm)
Eluent:	Water/Acetonitrile (85/15)
Flow rate:	1.0 mL/min
Column temp.:	40 ºC
Wavelength:	278 nm
Injection volume:	10 μL
Standard sample:	Furfural 1 μg/mL

Reversed-phase columns (C18) with monomeric bond, ultra pure silica gel

X-PressPak series

V-C18

AQ-C18

Base:	Ultra pure silica gel
Particle size:	2 µm
Pore size:	12 nm
Bonding:	Octadecyl
End-capping:	Yes
pH range:	2 - 8

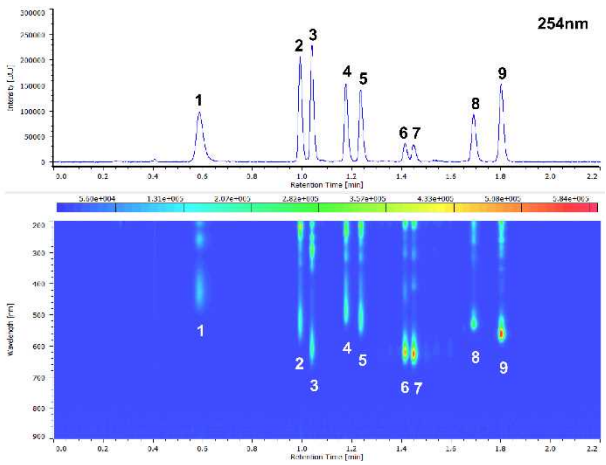
X-PressPak series - high-performance UHPLC column are designed maximum pressure 50 MPa.
V-C18 adopts monomeric bonded C18. Octadecyl-group is modified on the 2 µm particle sized porous silica gel, and residual silanol groups is treated.
AQ-C18 is filled with packing materials designed to maintain high hydrophilicity even the surface is inactivated. This column can be used under 100% aqueous mobile phase.
This series has variable I.D. and lengths columns according to the applications.

Product name	Column size	Bonding	Particle size (µm)	Pore size (nm)	Pressure (MPa)
X-PressPak V-C18	2.0 mmI.D. x 50 mmL	C18	2	12	50
X-PressPak V-C18-W	3.0 mmI.D. x 50 mmL				
X-PressPak V-C18-WL	3.0 mmI.D. x 75 mmL				
X-PressPak AQ-C18	2.0 mmI.D. x 50 mmL	C18	2	12	50
X-PressPak AQ-C18-W	3.0 mmI.D. x 50 mmL				
X-PressPak AQ-C18-WL	3.0 mmI.D. x 75 mmL				
X-PressPak V-C18 3pcs./set	2.0 mmI.D. x 50 mmL	C18	2	12	50

X-PressPak Application data

No.	Title	Column
220056X	Ultra high-speed analysis of free fatty acids in vegetable oil using ADAM derivatization by Ultra High-performance Liquid Chromatography	X-PressPak V-C18-W
420008X	High-speed separation of ATP and its degradation products by Ultra High-performance Liquid Chromatography and its application to evaluation of degree of freshness of fish meat	X-PressPak AQ-C18-W
430020X	High speed separation of amino acids using pre-column derivatization by a UHPLC system and its application to wine analysis	X-PressPak V-C18
430030X	Analysis of amino acids using on-line pre-column derivatization with OPA with Rapid Separation High Performance Liquid Chromatography	X-PressPak V-C18
520015X	High speed separation of catechins by Extreme Liquid Chromatography (X-LC ®) and its application to analysis of green tea	X-PressPak AQ-C18W
620017X	Ultra-high speed separation of food additives in soft drink using Extreme High Pressure Liquid Chromatography system (X-LC ®) with 4λ-UV detector	X-PressPak V-C18
620019X	High speed analysis of food colorings in powder juice by Ultra High-performance Liquid Chromatography with photodiode array detection	X-PressPak V-C18
748011X	High-speed analysis of veterinary drugs by Ultra High-performance Liquid Chromatography with photodiode array detection	X-PressPak V-C18

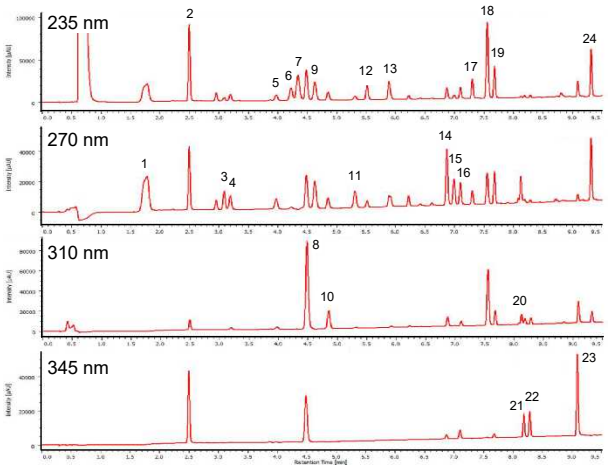
Analysis of food coloring



Column:	X-PressPak V-C18 (2.0 mmI.D. x 50 mmL)
Eluent	A:0.01M Ammonium acetate/Acetonitrile (95/5) B:Acetonitrile Gradient elution 1cycle; 5.0 min
Flow rate:	0.4 mL/min
Column temp.:	40 ºC
Wavelength:	200-900 nm
Injection volume:	1 µL
Standard sample:	9 Food coloring standards 1. Tartrazine, 2. Amaranth, 3. Indigotine, 4. Sunset Yellow FCF, 5. Allura Red AC, 6. Fast Green FCF, 7. Brilliant Blue FCF, 8. Erythrosine, 9. Acid Red

Ref.: LC application data No.620019X

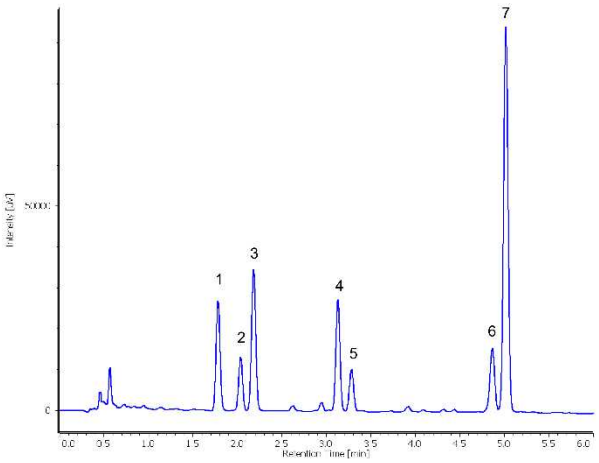
Analysis of veterinary drugs



Column:	X-PressPak V-C18 (2.0 mmI.D. x 50 mmL)
Eluent	A: 0.05% H_3PO_4, 32mM $NaClO_4$ in Water B: 0.05% H_3PO_4, 32mM $NaClO_4$ in Acetonitrile Gradient elution 1cycle; 10 min
Flow rate:	0.6 mL/min
Column temp.:	40 ºC
Wavelength:	200-650 nm
Injection volume:	1 µL
Standard sample:	1. AMP, 2. OQD, 3. CLP, 4. SMR, 5. SDD, 6. TPC, 7. LEV, 8. 5H-TBZ, 9. ALB-met, 10. TBZ, 11. SMMX, 12. TMP,13. OMP, 14. OXA, 15. SDMX, 16. SQX, 17. PYR, 18. NAA, 19. FBZ, 20. TIL, 21. β-TB, 22. α-TB, 23. NCZ, 24. DLZ

Ref.: LC application data No.748011X

Analysis of catechin



Column:	X-PressPak AQ-C18W (3.0 mmI.D. x 50 mmL)
Eluent	A: 0.2% Phosphoric acid/Acetonitrile (90/10) B: 0.2% Phosphoric acid/Acetonitrile (50/50) Gradient elution 1cycle; 8.0 min
Flow rate:	0.7 mL/min
Column temp.:	30 ºC
Wavelength:	280 nm
Injection volume:	1 µL
Standard sample:	1. Epigallocatechin, 2. Caffeine, 3. Catechin, 4. Epicatechin, 5. Epigallocatechin gallate, 6. Epicatechin gallate, 7. Catechin gallate

Ref.: LC application data No.520015X

Reversed-phase columns (C18) with monomeric bond, ultra pure silica gel

CrestPak series
C18T-5
C8T-5
C1-5

Base:	Ultra pure silica gel
Particle size:	5 µm
Pore size:	10 nm
Bonding:	Octadecyl, Octyl, Trimethyl
End-capping:	Yes(except for C1)
pH range:	2 - 7

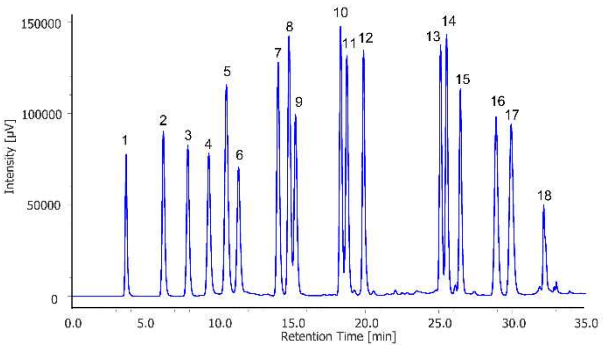
CrestPak series adopts ultra pure silica gel (particle size 5 µm, pore size10 nm with low metal impurities). Metal impurities contained in silica gel increase the influence of residual silanol group. And also metal impurities on surface of packing materials become adsorption points, which affect coordinated compounds analysis.
CrestPak C18T-5 adopts monomeric bonded C18. Octadecyl group is modified on silica gel, and residual silanol group is treted. This column is a popular ODS column for reversed-phase HPLC analysis, which can use mobile phase pH 2-7.
In the CrestPak series, columns chemically bonded C8 and C1 are also available.
They have less hydrophobic interaction compared to C18 so it helps to obtain appropriate retention time for highly hydrophobic samples.

Product name	Column size	Bonding	End-capping	Particle size (µm)	Pore size (nm)	Pressure (MPa)
CrestPak C18T-5	4.6 mmI.D. x 250 mmL	C18	Yes	5	10	30
CrestPak C18S	4.6 mmI.D. x 150 mmL					
CrestPak C18T-5P	4.6 mmI.D. x 35 mmL					
CrestPak C8T-5	4.6 mmI.D. x 250 mmL	C8				
CrestPak C8T-5P	4.6 mmI.D. x 35 mmL					
CrestPak C1-5	4.6 mmI.D. x 250 mmL	C1	No			
CrestPak C1S	4.6 mmI.D. x 150 mmL					
CrestPak C1-5P	4.6 mmI.D. x 35 mmL					

CrestPak Application data

No.	Title	Column
430012H	Analysis of amino acids by automated pre-column derivatization with OPA	CrestPak C18S
430029H	Analysis of amino acids using on-line pre-column derivatization with OPA	CrestPak C18S
510003H	Analysis of capsaicin and dihydrocapsaicin in capsicum	CrestPak C18S
620022H	Analysis of p-hydroxybenzoate ester	CrestPak C18S
620023H	Analysis of benzoic acid, sorbic acid and dehydroacetic acid	CrestPak C18S
620024H	Analysis of saccharin sodium	CrestPak C18S

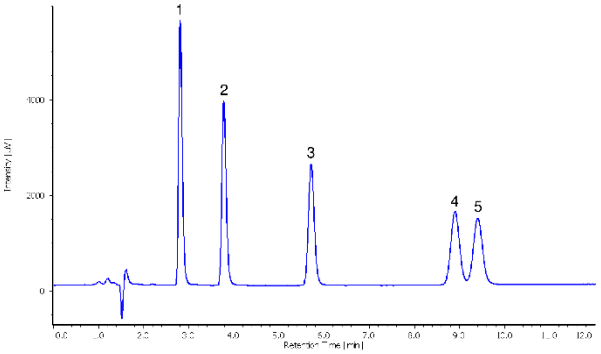
Analysis of amino acid by OPA pre-column derivatization



Column:	CrestPak C18S (4.6 mmI.D. x 150 mmL, 5 μm)
Eluent :	A; Sodium acetate buffer/methanol/THF (89/10/1) B; Methanol/THF (90/10) Gradient elution 1cycle; 60 min
Flow rate:	1.0 mL/min
Column temp.:	20 ºC
Wave length:	Ex; 345 nm, Em; 455 nm, Gain; x100
Injection volume:	10 μL
Standard sample:	18 amino acids 1 nmol/mL each 1. Aspartic acid, 2. Glutamic acid, 3. Asparagine, 4. Histidine, 5. Serine, 6. Glutamine, 7. Arginine, 8. Glycine, 9. Threonine, 10. Taurine, 11. Alanine, 12. Tyrosine, 13. Methionine, 14. Valine, 15. Phenylalanine, 16. Isoleucine, 17. Leucine, 18. Lysine

Ref.: LC application data No.430029H

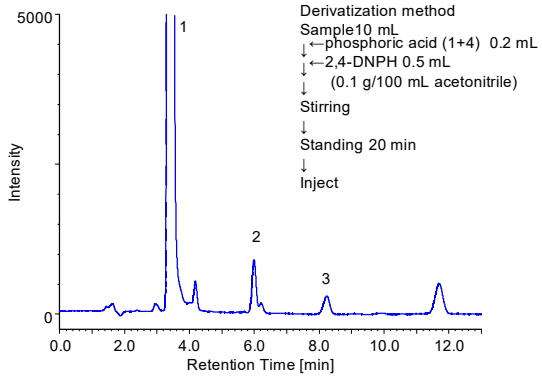
Analysis of p-hydroxybenzoate esters



Column:	CrestPak C18S (4.6 mmI.D. x 150 mmL, 5 μm)
Eluent :	Acetonitrile/5 mmol/L Citrate buffer (pH 4.1) (60/40)
Flow rate:	1.0 mL/min
Column temp.:	40 ºC
Wavelength:	270 nm
Injection volume:	10 μL
Standard sample:	*p*-Hydroxybenzoate ester 1 μg/mL each in water 1. Methyl *p*-hydroxybenzoate, 2. Ethyl *p*-hydroxybenzoate, 3. Propyl *p*-hydroxybenzoate, 4. Isobutyl *p*-hydroxybenzoate, 5. Butyl *p*-hydroxybenzoate

Ref.: LC application data No. 620022H

Analysis of folmaldehyde and acetaldehyde by pre-column derivatization



Column:	CrestPak C18S (4.6 mmI.D. x 150 mmL, 5 μm)
Eluent :	Acetonitrile/water (50/50)
Flow rate:	1.0 mL/min
Column temp.:	40 ºC
Wave length:	360 nm
Injection volume:	50 μL
Standard sample:	1. 2,4-DNPH, 2. 2,4-DNPH-formaldehyde (0.005 mg/L) , 3. 2,4-DNPH-acetaldehyde (0.005 mg/L)

Reversed-phase columns (C18) with polymeric bond

Finepak series

C18T-5 **C18T-10** **300C18T-5**
C18-5 **C18-10**
C8-5 **C1-5**

Base:	Silica gel
Particle size:	5 µm, 10 µm
Pore size:	10 nm, 30 nm
Bonding:	Octadecyl, Octyl, Trimethyl
End-capping:	Various
pH range:	2 - 7

Finepak SIL C18T-5 adopts polymeric bonded C18 of 5 µm particle size. Trifunctional octadecyl group is chemically bonded on porous silica gel, and residual silanol group is treated.
In general, this column is used for reversed phase HPLC with polar mobile phase such as water/methanol and water/acetonitrile(pH 2-7).
The difference of alkyl-chain length bonded to silica gel reflects retention time of the sample. As alkyl chain becomes short, retention becomes weak. Choose appropriate column for the length of carbon chain of analyte.
C1 column is available for basic-compounds as it has less residual silanol groups.
Pore size of Finepak SIL 300C18T-5 is designed as 30 nm (300 Å) so that it is appropriate for separation of water-soluble polymers.

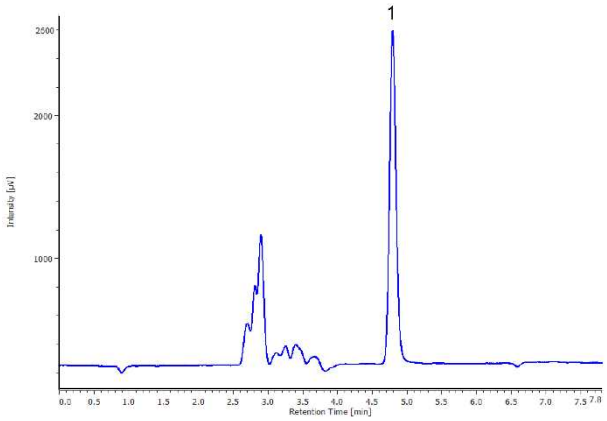
Product name	Column size	Bonding	End-capping	Particle size (µm)	Pore size (nm)	Pressure (MPa)
Finepak SIL C18T-5	4.6 mmI.D. x 250 mmL	C18	Yes	5	10	30
Finepak SIL C18S	4.6 mmI.D. x 150 mmL					
Finepak SIL C18T-5P	4.6 mmI.D. x 50 mmL					
Finepak SIL C18-5	4.6 mmI.D. x 250 mmL	C18	No			
Finepak SIL C18-5P	4.6 mmI.D. x 50 mmL					
Finepak SIL C8-5	4.6 mmI.D. x 250 mmL	C8	No			
Finepak SIL C8-5P	4.6 mmI.D. x 50 mmL					
Finepak SIL C1-5	4.6 mmI.D. x 250 mmL	C1	No			
Finepak SIL C1-5P	4.6 mmI.D. x 50 mmL					
Finepak SIL 300C18T-5	4.6 mmI.D. x 250 mmL	C18	Yes		30	
Finepak SIL 300C18T-5P	4.6 mmI.D. x 50 mmL					
Finepak SIL C18T-10	4.6 mmI.D. x 250 mmL	C18	Yes	10	10	
Finepak SIL C18T-10P	4.6 mmI.D. x 50 mmL					
Finepak SIL C18-10	4.6 mmI.D. x 250 mmL	C18	No			
Finepak SIL C18-10P	4.6 mmI.D. x 50 mmL					
Finepak SIL C8-10	4.6 mmI.D. x 250 mmL	C8	No			
Finepak SIL C8-10P	4.6 mmI.D. x 50 mmL					
Finepak SIL C1-10	4.6 mmI.D. x 250 mmL	C1	No			
Finepak SIL C1-10P	4.6 mmI.D. x 50 mmL					

* Please see P. 21 Megapak for semi-preparative scale columns equivalent to Finepak.

Finepak Application data

No.	Title	Column
210002H	Analysis of polyphenols	Finepak SIL C18S
220044H	Analysis of fatty acids in sucrose fatty acid ester	Finepak SIL C18S
460007H	Analysis of triglycerides using reversed-phase LC	Finepak SIL C18S

Analysis of diquat



Column:	Finepak SIL 300 C18T-5 (4.6 mmI.D. x 250 mmL)
Eluent :	Dissolve 13.5 mL phosphoric acid, 3.0 g sodium 1-pentane sulfonate, 10 mL diethylamine in water to make 1000 mL
Flow rate:	1.0 mL/min
Column temp.:	40 ºC
Wave length:	313 nm
Injection volume:	100 µL
Standard sample:	Diquat 0.05 mg/L

Normal-phase columns

Finepak series
SIL-5
NH2-5
DIOL-5

Base: Silica gel
Particle size: 5 µm
Pore size: 6 nm, 10 nm
Bonding: None, Aminopropyl, Diol
End-capping: No
pH range: 2 - 7

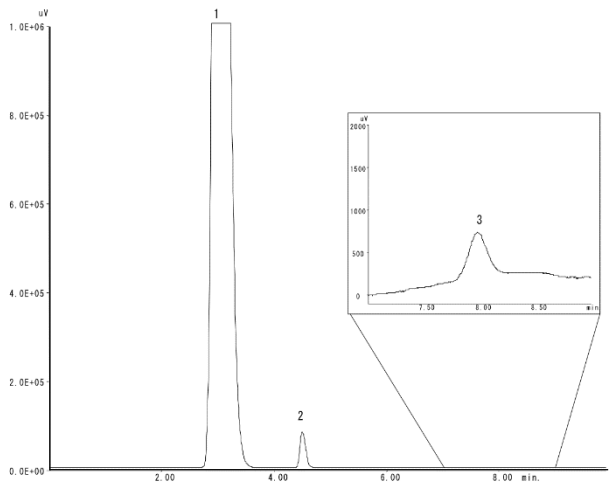
In normal-phase chromatography, high polar stationary phase with low polar mobile phase are used, and main separation targets are lipid-soluble compounds. Silica gel column is typical column used in this mode includes ones with polar functional group (DIOL, NH_2) on the silica gel. The separation selectivity is affected by these functional group. Better separation can be achieved by using appropriate columns depending on the compounds.

Product name	Column size	Bonding	End-capping	Particle size (µm)	Pore size (nm)	Pressure (MPa)
Finepak SIL-5	4.6 mmI.D. x 250 mmL	OH	-	5	6	30
Finepak SIL-5P	4.6 mmI.D. x 50 mmL					
Finepak SIL NH2-5	4.6 mmI.D. x 250 mmL	NH_2	No		10	
Finepak SIL NH2-5P	4.6 mmI.D. x 50 mmL					
Finepak SIL DIOL-5	4.6 mmI.D. x 250 mmL	DIOL	No		10	
Finepak SIL DIOL-5P	4.6 mmI.D. x 50 mmL					

Finepak Application data

No.	Title	Column
220053H	Determination of fatty acid methyl ester and triglyceride in mixture of biodiesel fuel and diesel fuel	Finepak SIL-5

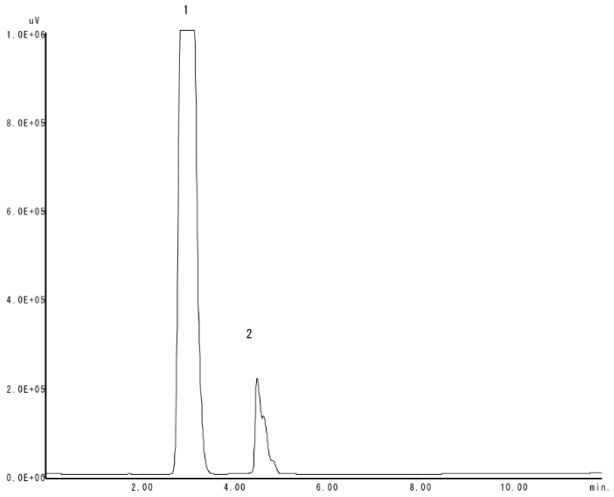
Analysis of fatty acid methyl ester and triglycerides in diesel fuel



Column:	Finepak SIL-5 (4.6 mmI.D. x 250 mmL, 5 µm)
Eluent :	2-propanol/n-hexane (0.4/99.6)
Flow rate:	1.0 mL/min
Column temp.:	40 ℃
Detector:	RI
Injection volume:	5 µL
Standard sample:	1. Peak derived from diesel oil, 2. Methyl stearate (10 mg/mL) , 3. Trilinolein (0.1 mg/mL)

Ref.: LC application data No.220053H

Analysis of biodiesel fuel and diesel fuel



Column:	Finepak SIL-5 (4.6 mmI.D. x 250 mmL, 5 µm)
Eluent :	2-propanol/n-hexane (0.4/99.6)
Flow rate:	1.0 mL/min
Column temp.:	40 ℃
Detector:	RI
Injection volume:	5 µL
Sample:	Mixture of biodiesel fuel and diesel fuel (5/95) . 1. Peak derived from diesel fuel, 2. Fatty acid methyl ester (FAME)

Ref.: LC application data No.220053H

Hydrophilic interaction (HILIC) columns

Finepak series
SIL-5
NH2-5
DIOL-5

Base: Silica gel
Particle size: 5 µm
Pore size: 6 nm, 10 nm
Bonding: None, Aminopropyl, Diol
End-capping: No
pH range: 2 - 7

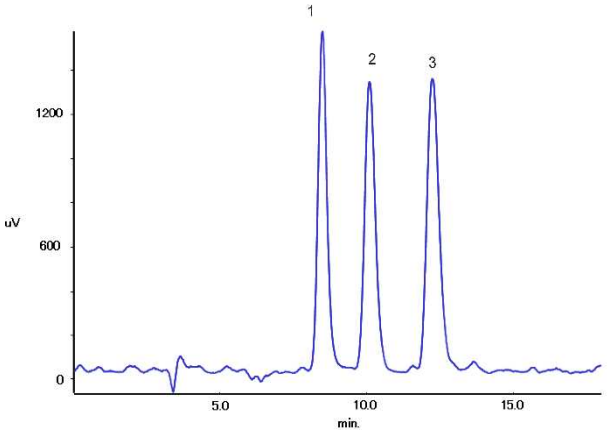
Silica gel columns / NH_2 columns are also available for hydrophilic interaction chromatography (HILIC) with polar solvent such as methanol, acetonitrile, and water, not only for normal-phase mode with non-polar solvent such as hexane. Low polar solvent such as isooctane is filling to column at shipment. For solvent replacement, please refer to the instruction manual. Separation in HILIC mode is performed using mobile phase with high organic solvent ratio. So high polar compounds can get enough retention and separation which is not obtained in reversed-phase mode.

Product name	Column size	Bonding	End-capping	Particle size (µm)	Pore size (nm)	Pressure (MPa)
Finepak SIL-5	4.6 mmI.D. x 250 mmL	OH	-	5	6	30
Finepak SIL-5P	4.6 mmI.D. x 50 mmL					
Finepak SIL NH2-5	4.6 mmI.D. x 250 mmL	NH_2	No		10	
Finepak SIL NH2-5P	4.6 mmI.D. x 50 mmL					
Finepak SIL DIOL-5	4.6 mmI.D. x 250 mmL	DIOL	No		10	
Finepak SIL DIOL-5P	4.6 mmI.D. x 50 mmL					

Finepak Application data

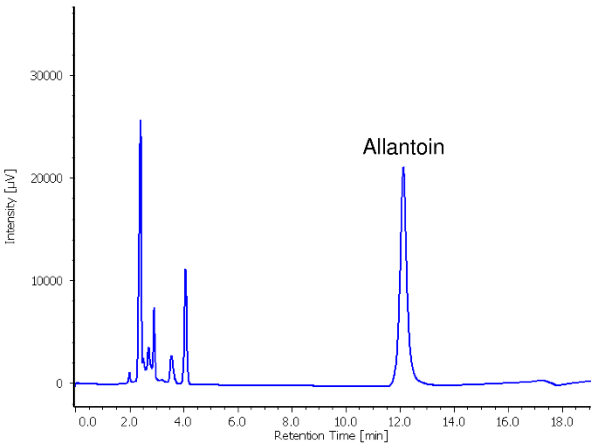
No.	Title	Column
610050H	Analysis of sugar with OR detector	Finepak SIL NH2-5
747012H	Analysis of allantoin	Finepak SIL NH2-5
840011H	Analysis of nonionic surfactant by High Performance Liquid Chromatography with Evaporative Light Scattering Detection	Finepak SIL NH2-5

Analysis of cyclodextrin by OR detector



Column: Finepak SIL NH2-5 (4.6 mmI.D. x 250 mmL, 5 µm)
Eluent : Acetonitrile/Water (65/35)
Flow rate: 1.0 mL/min
Column temp.: 50 ºC
Detector: OR-2090
Injection volume: 20 µL
Standard sample: 1. α-Cyclodextrin, 2. β-Cyclodextrin, 3. γ-Cyclodextrin

Analysis of allantoin in eye drops



Column: Finepak SIL NH2-5 (4.6 mmI.D. x 250 mmL, 5 µm)
Eluent : Acetonitrile/Water (80/20)
Flow rate: 1.0 mL/min
Column temp.: 40 ºC
Detector: 210 nm
Injection volume: 10 µL
Standard sample: Eye drops diluted 10 times

Ref.: LC application data No.747012H

Size exclusion (SEC) columns

Finepak GEL 101
Megapak GEL 201

Base:	Styrene-divinylbenzen copolymer
Particle size:	5~ 8 µm, 8~ 12 µm
Exclusion limit:	MW 3000 (in terms of PS)
Solvent:	THF, Chloroform, Toluene, Ethyl acetate

Finepak GEL series are polymer-based columns for analysis scale of organic solvent SEC(GPC), which is designed to have high separation capacity in low molecular weight compounds such as an oligomer.
Megapak GEL series are organic solvent SEC(GPC) for preparative scale, which have the equivalent performance, and different particle sizes compared to Finepak GEL series.
Packing material is porous polymer gel based on styrene-divinylbenzen copolymer, exclusion limit MW converted by polystyrene is 3000.
We can provide solvent substituted column corresponding to THF, chloroform, toluene and ethyl acetate which are generally used to GPC. THF is replaceable to other solvents, but repeated replacement of solvents deteriorates column performance, so operation in the same solvent are strongly recommended.

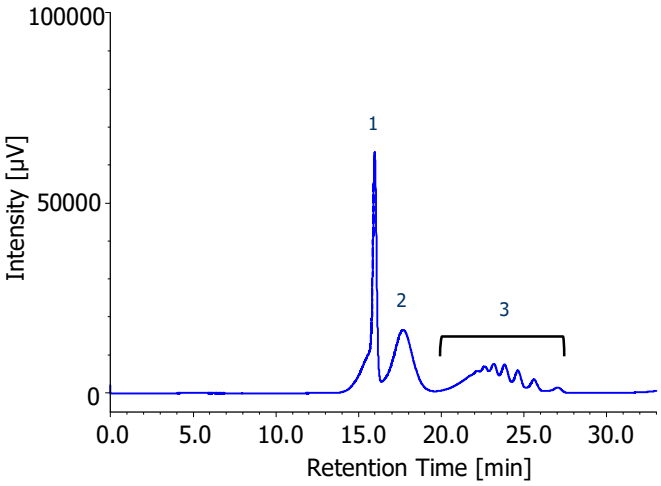
Analytical columns

Product name	Column size	Initial solvent	Exclusion limit (polystyrene)	Particle size (µm)	Pressure (MPa)
Finepak GEL 101F	7.5 mmI.D. x 500 mmL	THF	3000	5~ 8	6
Finepak GEL S101F	7.5 mmI.D. x 300 mmL				
Finepak GEL 101FP	7.5 mmI.D. x 50 mmL				
Finepak GEL 101C	7.5 mmI.D. x 500 mmL	Chloroform			
Finepak GEL S101C	7.5 mmI.D. x 300 mmL				
Finepak GEL 101CP	7.5 mmI.D. x 50 mmL				
Finepak GEL 101T	7.5 mmI.D. x 500 mmL	Toluene			
Finepak GEL 101TP	7.5 mmI.D. x 50 mmL				
Finepak GEL 101E	7.5 mmI.D. x 500 mmL	Ethyl acetate			
Finepak GEL 101EP	7.5 mmI.D. x 50 mmL				

Semi-preparative columns (10, 20, 30 mmI.D.)

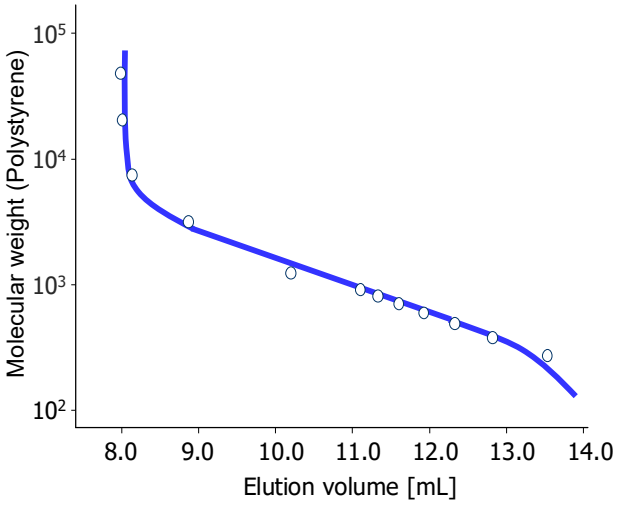
Product name	Column size	Initial solvent	Exclusion limit (polystyrene)	Particle size (µm)	Pressure (MPa)
Megapak GEL 201F	20 mmI.D. x 500 mmL	THF	3000	8~ 12	6
Megapak GEL 201FP	20 mmI.D. x 125 mmL				
Megapak GEL 201C	20 mmI.D. x 500 mmL	Chloroform			
Megapak GEL 201CP	20 mmI.D. x 125 mmL				

Analysis of polystyrene with Finepak GEL 101



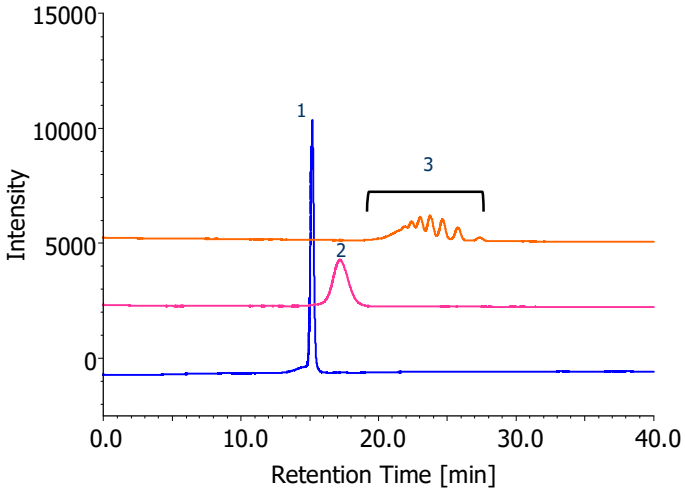
Column:	Finepak GEL 101F (7.5 mmI.D. x 500 mmL)
Eluent :	THF
Flow rate:	0.5 mL/min
Column temp.:	Room temp.
Injection volume:	5 μL
Wavelength:	250 nm
Standard Sample:	Polystyrene (1 mg/mL each) 1; Mw 46500 2; Mw 3070 3; Mw 580

Calibration curve of polystyrene with Finepak GEL 101



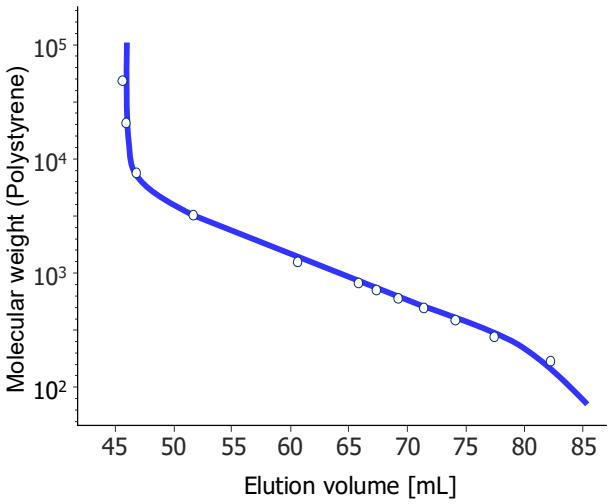
Column:	Finepak GEL 101F (7.5 mmI.D. x 500 mmL)
Eluent :	THF
Flow rate:	0.5 mL/min
Column temp.:	Room temp.

Analysis of polystyrene with Megapak GEL 201



Column:	Megapak GEL 201F (20 mmI.D. x 500 mmL)
Eluent :	THF
Flow rate:	3.0 mL/min
Column temp.:	Room temp.
Injection volume:	20 μL
Wavelength:	250 nm
Standard Sample:	Polystyrene (1 mg/mL each) 1; Mw 46500 2; Mw 3070 3; Mw 580

Calibration curve of polystyrene with Megapak GEL 201



Column:	Megapak GEL 201F (20 mmI.D. x 500 mmL)
Eluent :	THF
Flow rate:	3.0 mL/min
Column temp.:	Room temp.

Ion exchange columns

Finepak GEL SA
Finepak GEL SC

Base: Styrene-divinylbenzen copolymer
Particle size: 7 µm, 11 µm
Functional group: Quaternary ammonium, Sulfonic acid

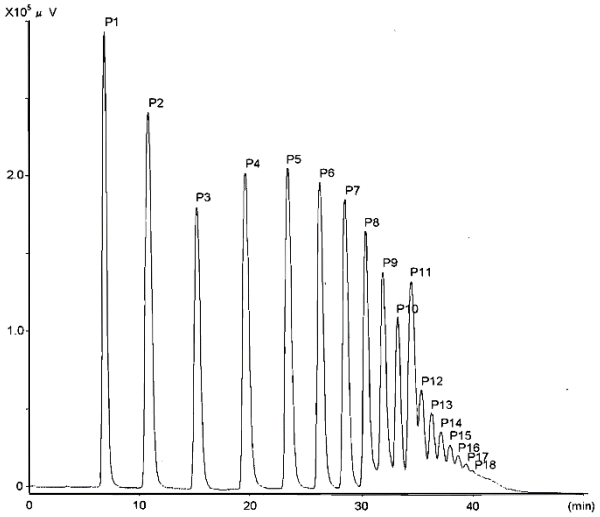
In ion exchange chromatography, ionic samples are retained by ionic bond to dissociable group of packing material and eluted by exchanging other ions in mobile phase. In this mode, a column bonded an ion exchange group to a porous polymer is general used.
Finepak GEL SA are anion exchange columns packed with strong base anion exchange resin, which chemically bonded quaternary ammonium group to styrene-divinylbenzen porous copolymer.
Finepak GEL SC are cation exchange columns packed with strong acid cation exchange resin, which chemically bonded sulfonic acid group to styrene-divinylbenzen porous copolymer.

Product name	Column size	Functional group	Particle size (µm)	Cross linkage (%)	Pressure (MPa)
Finepak GEL SA-121	6.0 mmI.D. x 100 mmL	$-N^+Me_3$	7	-	0.3
Finepak GEL SA-121P	6.0 mmI.D. x 10 mmL				
Finepak GEL SA-220	6.0 mmI.D. x 100 mmL		11	10	1.2
Finepak GEL SC-120	6.0 mmI.D. x 100 mmL	$-SO_3^-$	7		2.0
Finepak GEL SC-220	6.0 mmI.D. x 100 mmL		11		

Finepak Application data

No.	Title	Column
350002H	Analysis of polyphosphoric acid used for food additive	Finepak GEL SA-121
450002H	Analysis of xylose in blood	Finepak GEL SA-121
610041H	Analysis of sugar in wine	Finepak GEL SA-121
610043H	Analysis of sugar in potato and yam	Finepak GEL SA-121

Analysis of polyphosphoric acid



Column:	Finepak GEL SA-121
Eluent:	A; 0.1M KCl + 1% EDTA-4Na (pH10) B; 1M KCl + 1% EDTA-4Na (pH10) Gradient elution
Column temp.:	60 ºC
Reagent:	5g $(NH_4)\ Mo_7 / 4H_2O$ + 0.6g Zn in 1.8M H_2SO_4
Reagent flow rate:	0.5 mL/min
Reaction temp.:	140 ºC
Wavelength:	830 nm
Injection volume:	20 µL
Sample:	Polyphosphoric acid

Ref.: LC application data No.350002H

Semi-preparative columns

Unifinepak C18

Megapak series

C18T-10 **C18-10**
C8-10 **C1-10**
SIL-10 **GEL 201**

Unifinepak C18 offers semi-preparative scale column with the same packing material to analysis scale columns. Method conversion software enable to scale up easily from analytical scale to preparative scale.
Megapak SIL series are semi-preparative column and it uses silica-base packing that particle size is 10 µm corresponding to Finepak. Several kinds of column are prepared for example C18, C8 and C1. Two kind of size (7.5mmI.D. and 10mmI.D.) are prepared according to sample loading amount.
Megapak GEL series are high performance preparative column for organic solvent SEC (GPC) with polymeric packing material and most suitable for low molecular compound such as oligomer.

Unifinepak C18 semi-preparative columns (10, 20, 30 mmI.D.)

Product name	Column size	Bonding	End-capping	Particle size (µm)	Pore size (nm)	Pressure (MPa)
Unifinepak C18 10150-5M	10 mmI.D. x 150 mmL	C18	Yes	5	12	30
Unifinepak C18 10250-5M	10 mmI.D. x 250 mmL					
Unifinepak C18 20150-5M	20 mmI.D. x 150 mmL					
Unifinepak C18 20250-5M	20 mmI.D. x 250 mmL					
Unifinepak C18 30150-5M	30 mmI.D. x 150 mmL					
Unifinepak C18 30250-5M	30 mmI.D. x 250 mmL					

Megapak SIL series

Product name	Column size	Bonding	End-capping	Particle size (µm)	Pore size (nm)	Pressure (MPa)
Megapak SIL C18T-10	7.5 mmI.D. x 250 mmL	C18	Yes	10	10	30
Megapak SIL C18T-10	10 mmI.D. x 250 mmL					
Megapak SIL C18-10	7.5 mmI.D. x 250 mmL	C18	No			
Megapak SIL C18-10	10 mmI.D. x 250 mmL					
Megapak SIL C8-10	7.5 mmI.D. x 250 mmL	C8				
Megapak SIL C8-10	10 mmI.D. x 250 mmL					
Megapak SIL C1-10	7.5 mmI.D. x 250 mmL	C1				
Megapak SIL C1-10	10 mmI.D. x 250 mmL					
Megapak SIL-10	7.5 mmI.D. x 250 mmL	OH	-			20
Megapak SIL-10	10 mmI.D. x 250 mmL					

Megapak GEL series

Product name	Column size	Initial solvent	Exclusion limit (polystyrene)	Particle size (µm)	Pressure (MPa)
Megapak GEL 201F	20 mmI.D. x 500 mmL	THF	3000	8~ 12	6
Megapak GEL 201FP	20 mmI.D. x 125 mmL				
Megapak GEL 201C	20 mmI.D. x 500 mmL	Chloroform			
Megapak GEL 201CP	20 mmI.D. x 125 mmL				

* Please ask us for columns filled with other kind of organic solvent.

application specific columns

Columns for amino acid analysis

Ion exchange resin type

AApak Na-LG, AApak Li-LG
AApak Na, AApak Na II-H, AApak Na II-S2, AApak Li

Ammonia filter

AECpak Na-LG, AECpak Li-LG, AECpak, AECpak II

Silica gel packing type

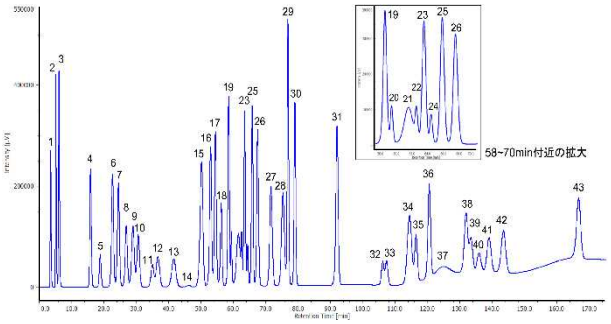
Dabsylpak II

Product name	Column size	Purpose
AApak Li-LG	6.0 mmI.D. x 80 mmL	Amino acid analysis Li type 4solvent LG
AECpak Li-LG	4.6 mmI.D. x 35 mmL	Ammonia filter Li type 4solvent LG
AApak Na-LG	6.0 mmI.D. x 50 mmL	Amino acid analysis Na type 4solvent LG
AECpak Na-LG	4.6 mmI.D. x 35 mmL	Ammonia filter Na type 4solvent LG
AApak Li	6.0 mmI.D. x 100 mmL	Amino acid analysis Li type
AApak Na	6.0 mmI.D. x 100 mmL	Amino acid analysis Na type
AApak Na Ⅱ-H	6.0 mmI.D. x 80 mmL	Amino acid analysis Na type High separation
AApak Na Ⅱ-S2	6.0 mmI.D. x 60 mmL	Amino acid analysis Na type Rapid analysis
AECpak	4.6 mmI.D. x 125 mmL	Ammonia filter
AECpak Ⅱ	4.6 mmI.D. x 50 mmL	Ammonia filter For High separation, Rapid analysis
Dabsylpak Ⅱ	4.6 mmI.D. x 150 mmL	Dabsyl amino acid analysis
Dabsylpak ⅡP	4.6 mmI.D. x 35 mmL	Pre-column for Dabsylpak Ⅱ

Amino acid analysis - Application data

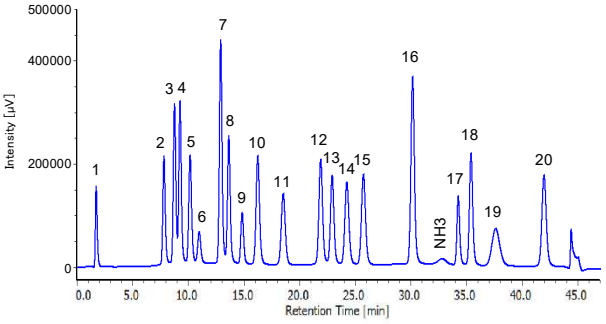
No.	Title	Column
430021H	Analysis of protein hydrolysate amino acids using OPA post-column derivatization by quaternary low pressure gradient system	AApak Na-LG, AECpak Na-LG
430022H	Analysis of dabsyl amino acids by High-Performance Liquid Chromatography	Dabsylpak II

Analysis of free amino acids by OPA post-column derivatization



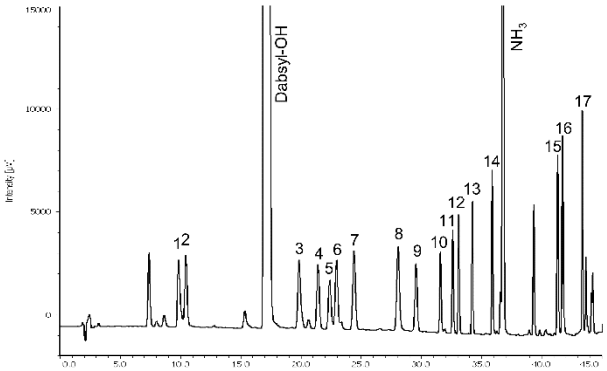
Column:	AApak Li-LG (6.0 mmI.D. x 80 mmL, 5 µm)
Ammonia filter:	AECpak Li-LG (4.6 mmI.D. x 35 mmL)
Eluent:	Amino Buffer Li-LG (1st ~ 4th for LC-4000)
Reagent:	Amino Reagent Li-LG (Hypo, OPA)
Eluent flow rate:	0.35 mL/min
Reagent flow rate:	0.2 mL/min each
Column temp.:	Temperature Gradient (38 → 70 ºC)
Wavelength:	Ex. 345 nm, Em. 455 nm, Gain x10
Injection volume:	10 µL
Standard:	43 amino acids in 0.2 N citric buffer (pH2.2) 1: p-Ser, 2: Tau, 3: PEA, 4: Asp, 5: Hypro, 6: Thr, 7: Ser, 8: Asn,9: Glu, 10: Gln, 11: Sarco, 12: Thea, 13: a-AAA, 14: Pro 15: Gly, 16: Ala, 17: Cit, 18: a-AnBA, 19: Val, 20: Cys, 21: Glc, 22: Cystathionine, 23: Met, 24: DPA, 25: Ile, 26: Leu, 27: Tyr, 28: Phe, 29: b-Ala, 30: b-AIBA, 31: GABA, 32: allo-Hylys, 33: Hylys, 34: EA, 35: Orn, 36: Lys, 37: Trp, 38: His, 39: 1-MeHis, 40: Ans, 41: Car, 42: 3-MeHis, 43:Arg

Analysis of proteinogenic amino acids by OPA post-column derivatization



Column:	AApak Na-LG (6.0 mmI.D. x 50 mmL, 5 µm)
Ammonia filter:	AECpak Na-LG (4.6 mmI.D. x 35 mmL)
Eluent:	Amino Buffer Na-LG (1st ~ 4th)
Reagent:	Amino Reagent Na-LG (Hypo, OPA)
Eluent flow rate:	0.5 mL/min
Reagent flow rate:	0.5 mL/min
Column temp.:	60 ˚ºC
Reaction temp.:	60 ºC
Wavelength: Ex.	345 nm, Em. 455 nm, Gain x10
Injection volume:	10 µL
Standard solution:	20 amino acids each 50 nmol/mL in 0.2 M citrate buffer (pH2.2) 1: Cysteic acid, 2: Asparatic acid, 3: Threonine, 4: Serine, 5: Glutamic acid, 6: Proline, 7: Glycine, 8: Alanine 9: Cystine, 10: Valine, 11: Methionine, 12: Isoleucine, 13: Leucine, 14: Tyrosine, 15: Phenylalanine, 16: GABA, 17: Lysine, 18: Histidine, 19: Tryptophan, 20: Arginine

Analysis of dabsyl amino acids



Column:	Dabsylpak II (4.6 mmI.D. x 150 mmL, 5 µm)
Pre-column:	Dabsylpak II-P (4.6 mmI.D. x 35 mmL, 5 µm)
Eluent A:	20mM Sodium acetate (pH6.0)
Eluent B:	Acetonitrile Gradient elution 1cycle; 55 min
Flow rate:	1.0 mL/min
Column temp.:	45 ºC
Wavelength:	465 nm
Injection volume:	20 µL
Standard sample:	Amino acids mixture 40pmol each, Type H 1: Aspartic acid, 2: Glutamic acid, 3: Serine, 4: Threonine, 5: Arginine, 6: Glycine, 7: Alanine, 8: Proline, 9: Valine, 10: Methionine, 11: Isoleucine, 12: Leucine, 13: Phenylalanine, 14: Cystine 15: Lysine, 16: Histidine, 17: Tyrosine

Ref.: LC application data No.430022H

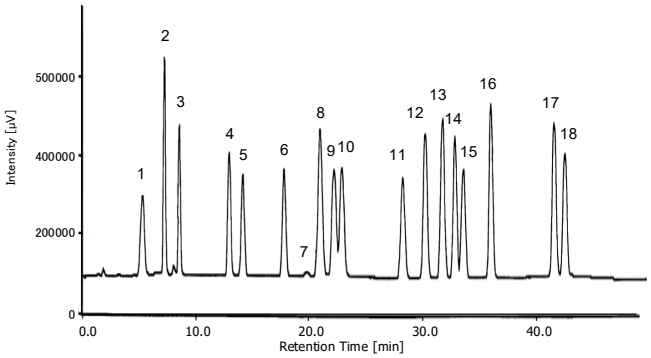
Other application specific columns

Product name	Column size	Purpose
Aminometapak	4.6 mmI.D. x 125 mmL	For mass-screening of inborn amino acid error of metabolism, reversed-phase
Aminometapak-EX	4.6 mmI.D. x 50 mmL	For mass-screening of inborn amino acid error of metabolism, ion exchange
Guanidinopak Ⅱ	6.0 mmI.D. x 35 mmL	Guanidino compound analysis
Polyaminepak	6.0 mmI.D. x 35 mmL	Polyamine analysis
Histaminepak	6.0 mmI.D. x 50 mmL	Histamine analysis
Carbamatepak	4.0 mmI.D. x 150 mmL	Carbamate pesticide analysis
CarbamatepakP	4.6 mmI.D. x 35 mmL	Pre-column for Carbamatepak
Catecholpak	4.6 mmI.D. x 150 mmL	Catecholamine analysis
Catecholpak PNB	4.6 mmI.D. x 35 mmL	Catecholamine analysis pre-column
Catecholpak PNB	4.6 mmI.D. x 10 mmL	Catecholamine analysis pre-column
Catecholpak Ⅱ	4.6 mmI.D. x 250 mmL	Neuroblast analysis
Bilepak Ⅱ	4.6 mmI.D. x 125 mmL	Bilic acid analysis
Bilepak ⅡP	4.6 mmI.D. x 50 mmL	Bilepak Ⅱ pre-column
Enzymepak 3α-HSD	4.0 mmI.D. x 20 mmL	Bilic acid analysis enzymatic column
NPpak	4.6 mmI.D. x 250 mmL	Nitroarene analysis
NPpak G	4.6 mmI.D. x 35 mmL	Nitroarene analysis guard column
NPpak PR	4.0 mmI.D. x 10 mmL	Nitroarene analysis pre-column
NPpak RS	4.0 mmI.D. x 10 mmL	Nitroarene analysis reduction column
NPpak RL	4.6 mmI.D. x 35 mmL	Nitroarene analysis reduction column
Catalysispak Pt	4.6 mmI.D. x 10 mmL	Reduction column, Vitamin K analysis
ICSpak	4.6 mmI.D. x 100 mmL	Ion chromatography suppressor
ICSpak 2pcs/set	4.6 mmI.D. x 100 mmL	Ion chromatography suppressor 2 pcs/set
Clean up column	4.6 mmI.D. x 50 mmL	Ghost peak removing column for water mobile phase

Specific purpose column Application data

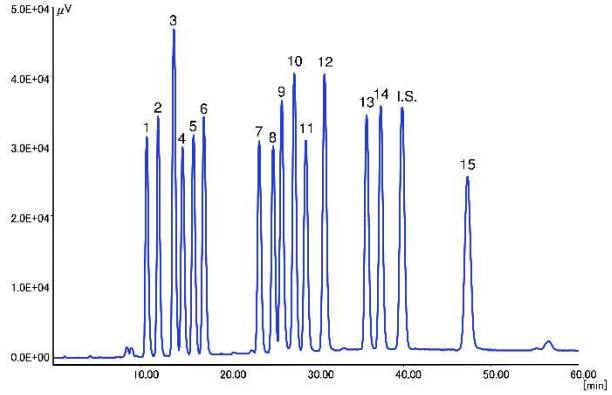
No.	Title	Column
430009H	Mass screening for inborn error of amino acid metabolism (1)	Aminometapak
450003H	Simultaneous determination of VMA, HVA, and creatinine	Catecholpak II
220052HRE	Simultaneous determination of bile acids utilizing immobilized enzyme column	Bilepak-II, Enzymepak 3a-HSD
820010H	Simultaneous detection of PAHs and nitroarenes with increased selectivity and sensitivity	NPpak, NPpak-RS
720051H	Analysis of vitamin K using reduction catalyst column	CrestPak C18S, Catalysispak Pt
110020I	Analysis of anions using chemical suppressor	ICSpak, Shodex IC SI-90 4E

Analysis of 18 N-methyl-carbamate pesticides



Column:	Carbamatepak (4.0 mmI.D. x 150 mmL, 5 μm)
Eluent :	A; Water, B; Methanol, C;THF Gradient elution 1cycle; 50 min
Eluent flow rate:	1.0 mL/min
Column temp.:	40 ºC
Reagent-1:	50 mM NaOH (0.5 mL/min)
Reagent-2:	OPA buffer (0.5 mL/min)
Reaction temp.:	80 ºC and 40 ºC
Wavelength:	Ex. 339 nm, Em. 455 nm, Gain x10
Injection volume:	10 μL
Standard sample:	18 N-methylcarbamate pesticides 1. Oxamyl, 2. Methomyl, 3. Methiocarb sulfoxide, 4. Aldicarb, 5. Methiocarb sulfpne, 6. Mthiodicarb, 7. Pirimicarb, 8. Metholcarb, 9. Propoxur, 10. Carbofuran, 11. Bendiocarb, 12. Xylylcarb, 13. Macbal, 14. Carbaryl, 15. Eyhiofencarb, 16. Isoprocarb, 17. Fenobcarb, 18. Methiocarb

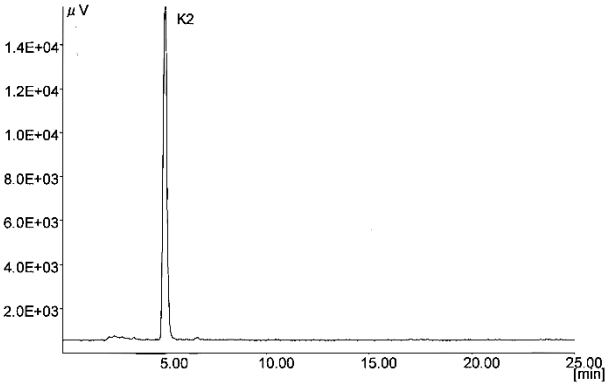
Simultaneous determination of bile acids utilizing immobilized enzyme column



Column:	Bilepak-Ⅱ (4.6 mmI.D. x 125 mmL, 5 μm)
Enzyme column:	Enzymepak 3a-HSD (4.0 mmI.D. x 20 mmL)
Eluent	A: 30mM Ammonium acetate (pH6.8) /Acetonitrile/ Methanol (60/20/20) B: 30mM Ammonium acetate (pH6.8) /Acetonitrile/ Methanol (40/30/30) Gradient elution 1cycle; 80 min
Flow rate:	1.0 mL/min
Reagent:	0.3mM NAD Reagent (pH7.8)
Reagent flow rate:	1.0 mL/min
Column temp.:	25 ºC
Wavelength:	Ex. 345 nm, Em. 470 nm, Gain x100
Injection volume:	10 μL
Standard sample:	15 Bile acids (50μmol/mL each) 1: GUDCA, 2: TUDCA, 3: UDCA, 4: GCA, 5: TCA, 6: CA, 7: GCDCA, 8: TCDCA, 9: GDCA, 10: TDCA, 11: CDCA, 12: DCA,13: GLCA, 14: TLCA, I.S.: 5-pregnan-3,17,20-triol, 15: LCA

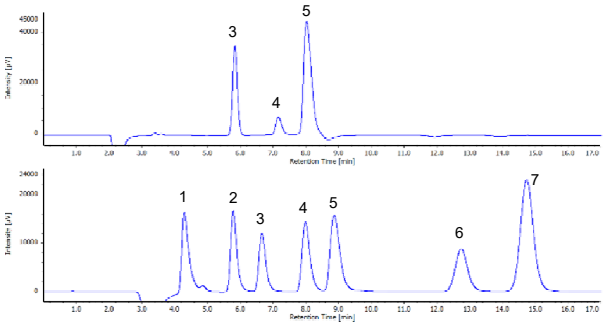
Ref.: LC application data No.220052HRE

Analysis of vitamin K_2 using reduction catalysis column



Column:	CrestPak C18S (4.6 mmI.D. x 150 mmL, 5 μm) Catalysispak Pt (4.6 mmI.D. x 10 mmL)
Eluent:	Acetonitrile/Methanol (70/30)
Flow rate:	1.0 mL/min
Column temp.:	40 ºC
Wavelength:	Ex. 320 nm, Em. 430 nm, Gain x100
Injection volume:	10 μL
Standard sample:	Supplement

Analysis of anions using chemical suppressor



Column:	Shodex IC SI-90 4E (4.6 mmI.D. x 250 mmL)
Suppressor:	ICSpak (4.6 mmI.D. x 100 mmL)
Eluent:	1.8mM Na_2CO_3 + 1.7mM $NaHCO_3$
Flow rate:	1.0 mL/min
Column temp.:	25 ºC
Wave length:	215 nm
Injection volume:	100 μL
Standard sample:	Anion Mixture (Described below) 1: F^-, 2: Cl^-, 3: NO_2^-, 4: Br^-, 5: NO_3^-, 6: PO_4^{3-}, 7: SO_4^{2-}

Ref.: LC application data No.110020I

JASCO columns for liquid chromatography

Analytical columns P.14 – P.31

Unifinepak C18 analytical columns (UHPLC~HPLC)

Product name	Column size	Particle size (μm)	Pressure (MPa)
Unifinepak C18 02050-1.9M	2.0 x 50 mm	1.9	100
Unifinepak C18 02075-1.9M	2.0 x 75 mm		
Unifinepak C18 02100-1.9M	2.0 x 100 mm		
Unifinepak C18 02150-1.9M	2.0 x 150 mm		
Unifinepak C18 03050-1.9M	3.0 x 50 mm		
Unifinepak C18 03075-1.9M	3.0 x 75 mm		
Unifinepak C18 03100-1.9M	3.0 x 100 mm		
Unifinepak C18 03150-1.9M	3.0 x 150 mm		
Unifinepak C18 02050-3M	2.0 x 50 mm	3	30
Unifinepak C18 02100-3M	2.0 x 100 mm		
Unifinepak C18 02150-3M	2.0 x 150 mm		
Unifinepak C18 03050-3M	3.0 x 50 mm		
Unifinepak C18 03100-3M	3.0 x 100 mm		
Unifinepak C18 03150-3M	3.0 x 150 mm		
Unifinepak C18 04050-3M	4.6 x 50 mm		
Unifinepak C18 04100-3M	4.6 x 100 mm		
Unifinepak C18 04150-3M	4.6 x 150 mm		
Unifinepak C18 04250-3M	4.6 x 250 mm		
Unifinepak C18 03050-5M	3.0 x 50 mm	5	30
Unifinepak C18 03100-5M	3.0 x 100 mm		
Unifinepak C18 03150-5M	3.0 x 150 mm		
Unifinepak C18 04050-5M	4.6 x 50 mm		
Unifinepak C18 04100-5M	4.6 x 100 mm		
Unifinepak C18 04150-5M	4.6 x 150 mm		
Unifinepak C18 04250-5M	4.6 x 250 mm		

Organic solvent SEC analytical columns

Product name	Column size	Initial solvent	Particle size (μm)	Exclusion limit
Finepak GEL 101F	7.5 x 500 mm	THF	5 - 8	3000
Finepak GEL S101F	7.5 x 300 mm	THF		
Finepak GEL 101C	7.5 x 500 mm	Chloroform		
Finepak GEL S101C	7.5 x 300 mm	Chloroform		
Finepak GEL 101T	7.5 x 500 mm	Toluene		
Finepak GEL 101E	7.5 x 500 mm	Ethyl acetate		

X-PressPak analytical columns (UHPLC)

Product name	Column size	Particle size (μm)	Pressure (MPa)
X-PressPak V-C18	2.0 x 50 mm	2	50
X-PressPak V-C18-W	3.0 x 50 mm		
X-PressPak V-C18-WL	3.0 x 75 mm		
X-PressPak V-C18-WXL	3.0 x 100 mm		
X-PressPak AQ-C18	2.0 x 50 mm		
X-PressPak AQ-C18-W	3.0 x 50 mm		
X-PressPak AQ-C18-WXL	3.0 x 100 mm		

Silica gel packing analytical columns

Product name	Column size	Bonding	Particle size (μm)
CrestPak C18S	4.6 x 150 mm	C18	5
CrestPak C18T-5	4.6 x 250 mm		
CrestPak C8T-5	4.6 x 250 mm	C8	
CrestPak C1S	4.6 x 150 mm	C1	
CrestPak C1-5	4.6 x 250 mm		
Finepak SIL C18T-5	4.6 x 250 mm	C18	
Finepak SIL C18S	4.6 x 150 mm		
Finepak SIL C18T-10	4.6 x 250 mm		10
Finepak SIL C18-5	4.6 x 250 mm		5
Finepak SIL C18-10	4.6 x 250 mm		10
Finepak SIL C8-5	4.6 x 250 mm	C8	5
Finepak SIL C8-10	4.6 x 250 mm		10
Finepak SIL C1-5	4.6 x 250 mm	C1	5
Finepak SIL C1-10	4.6 x 250 mm		10
Finepak SIL-5	4.6 x 250 mm	OH	5
Finepak SIL NH2-5	4.6 x 250 mm	NH2	
Finepak SIL DIOL-5	4.6 x 250 mm	DIOL	

Polymer ion exchange columns

Product name	Column size	Functional group	Particle size (μm)
Finepak GEL SA-121	6.0 x 100 mm	$-N^+Me_3$	7
Finepak GEL SA-220	6.0 x 100 mm		11
Finepak GEL SC-120	6.0 x 100 mm	$-SO_3^-$	7
Finepak GEL SC-220	6.0 x 100 mm		11

Semi-preparative columns P.32

Unifinepak C18 semi-preparative columns

Product name	Column size	Particle size (μm)	Pressure (MPa)
Unifinepak C18 10150-5M	10 x 150 mm	5	30
Unifinepak C18 10250-5M	10 x 250 mm		
Unifinepak C18 20150-5M	20 x 150 mm		
Unifinepak C18 20250-5M	20 x 250 mm		
Unifinepak C18 30150-5M	30 x 150 mm		
Unifinepak C18 30250-5M	30 x 250 mm		

Organic solvent SEC semi-preparative columns

Product name	Column size	Initial solvent	Particle size (μm)	Exclusion limit
Megapak GEL 201F	20 x 500 mm	THF	8 - 12	3000
Megapak GEL 201C	20 x 500 mm	Chloroform		

Silica gel packing semi-preparative columns

Product name	Column size	Bonding	Particle size (μm)
Megapak SIL-10	7.5 x 250 mm	OH	10
Megapak SIL-10	10 x 250 mm		
Megapak SIL C18-10	7.5 x 250 mm	C18	
Megapak SIL C18-10	10 x 250 mm		
Megapak SIL C18T-10	7.5 x 250 mm		
Megapak SIL C18T-10	10 x 250 mm		
Megapak SIL C8-10	7.5 x 250 mm	C8	
Megapak SIL C8-10	10 x 250 mm		
Megapak SIL C1-10	7.5 x 250 mm	C1	
Megapak SIL C1-10	10 x 250 mm		

Application specific columns P.34-37

Product name	Column size	Purpose
AApak Li-LG	6.0 x 80 mm	Amino acid analysis Li type 4solvent LG
AECpak Li-LG	4.6 x 35 mm	Ammonia filter Li type 4solvent LG
AApak Na Ⅱ-H	6.0 x 80 mm	Amino acid analysis Na type High separation
AApak Na Ⅱ-S2	6.0 x 60 mm	Amino acid analysis Na type Rapid analysis
AECpak Ⅱ	4.6 x 50 mm	Ammonia filter Na type For High separation, Rapid analysis
AApak Na-LG	6.0 x 50 mm	Amino acid analysis Na type 4solvent LG
AECpak Na-LG	4.6 x 35 mm	Ammonia filter Na type 4solvent LG
Dabsylpak Ⅱ	4.6 x 150 mm	Dabsyl amino acid analysis
Aminometapak	4.6 x 125 mm	Inborn amino acid error of metabolism reversed-phase
Aminometapak-EX	4.6 x 50 mm	Inborn amino acid error of metabolism ion exchange
Guanidinopak Ⅱ	6.0 x 35 mm	Guanidino compounds analysis
Polyaminepak	6.0 x 35 mm	Polyamine analysis

Product name	Column size	Purpose
Histaminepak	6.0 x 50 mm	Histamine analysis
Carbamatepak	4.0 x 150 mm	Carbamate pesticides analysis
Catecholpak	4.6 x 150 mm	Catecholamine analysis
Catecholpak Ⅱ	4.6 x 250 mm	Neuroblast analysis
Bilepak Ⅱ	4.6 x 125 mm	Bilic acid analysis
Enzymepak 3α-HSD	4.0 x 20 mm	Bilic acid analysis enzymatic column
NPpak	4.6 x 250 mm	Nitroarene analysis
NPpak RS	4.0 x 10 mm	Nitroarene analysis reduction column
NPpak RL	4.6 x 35 mm	Nitroarene analysis reduction column
Catalysispak Pt	4.6 x 10 mm	Reduction column VitaminK analysis
ICSpak	4.6 x 100 mm	Ion chromatography suppressor
Clean up column	4.6 x 50 mm	Ghost peak removing column from aqueous mobile phase

Application data with columns from other suppliers

Some applications measured by JASCO LC system with other supplier's columns are show below.

Application data using other supplier's columns

No.	Title	Column
110016I	Analysis of cations	Shodex IC YK-421
220050H	Analysis of organic acids in sake	Shodex RSpak KC-811
220059H	Analysis of organic acid in alcoholic beverages	Shodex RSpak KC-811
220060H	Analysis of organic acids Including levulinic acid in soy sauce	Shodex RSpak KC-811
820022H	Analysis of aldehydes in water using post-column derivatization by High Performance Liquid Chromatography	Shodex RSpak KC-811 6E
820023H	Analysis of aldehydes using post-column derivatization by High Performance Liquid Chromatography	Shodex RSpak KC-811 6E
820024H	Analysis of formaldehyde in air using post-column derivatization by High Performance Liquid Chromatography	Shodex RSpak KC-811 6E
310013G	Analysis of nylon 6 by semi-micro scale GPC	Shodex LF-404 x 2
310014G	Analysis of epoxy resin-based adhesive by semi-micro scale GPC	Shodex KF-401HQ, KF-402HQ
320010G	Analysis of polystyrene oligomers by semi-micro GPC	Shodex KF-401HQ
610062G	Analysis of chondroitin sulfate sodium salt by SEC	Shodex Asahipak GF-510 HQ
720062H	Analysis of fat-soluble vitamins by photodiode array detection	Shodex Asahipak ODP-50 4E
101016H	Chiral analysis of ibuprofen using a circular dichroism detector	CHRALCEL AD-RH
101018H	Chiral analysis of warfarin using a circular dichroism detector	CHRALCEL OD-RH
745025H	Analysis of combination cold remedy	Develosil ODS-HG-5
610063H	Analysis of sugar alcohols by semi-micro HPLC	Inertsil Amide