

MCI GEL™ XtalSpeed™

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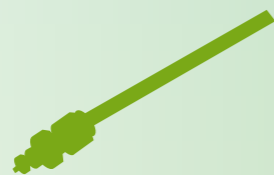
TECHNICAL INFORMATION 2017-2019

MITSUBISHI CHEMICAL CORPORATION



TECHNICAL INFORMATION
2017-2019





MCI GEL™ XtalSpeed™

Excellent performance

spherical and sharp particle size distribution

Persistence and highest quality

offeres packing materials and packed columns,
under strict quality control

Wide range of product line

MCI GEL™ has been designed based on technology of
the world famous Diaion™ and Sepabeads™,
specialized in polymeric packing materials including
from analytical to preparative use,
for ion exchange, reversed-phase mode

Abundant accumulation of technology and experience

for more than 50 years, MCI GEL™ has been used for
HPLC applications



CONTENTS

1 Column selection guide	3~4
Column selection guide	3
Product list by particle size and separation mode	4
USP List	4
2 Ion exchange columns and materials	5~22
Features	5
Column list and materials	6
[Applications] Sugars•Sugar alcohols•Organic acids《CK08,06 series》	7~12
Examples of peak retention time 《CK08E series》	13
Oligosaccharides 《CK04S•CK04SS•CK02A•CK02AS》	14~16
Amino acids《CK10U》	17~18
Sugars•Organic acids 《CA08F》	19~20
Nucleic acids etc. •Sugars•Human urine 《CDR10》	21~22
3 Ion chromatography columns and materials	23~27
Column list and materials	23~24
[Applications] Cations 《SCK01》	24~25
Cations 《CHK45》	25
Anions 《SCA04》	26~27
4 Bioseparation columns and materials	28~32
Bioseparation columns	28
Ion exchange chromatography column《XtalSpeed™ series》	29~30
Column list and materials	29
[Applications] Rituxan《XtalSpeed™ series》	30
Aqueous size exclusion columns 《CQP series》	31~32
Size exclusion chromatography columns	31
Column list and materials	31
[Applications] Calibration curves 《CQP series》	32
Proteins•Water soluble polymers 《CQP series》	32



5 Analytical and preparative chromatography columns and materials for pharmaceutical applications	33~53
Polymeric partition chromatography columns and materials MCI GEL™ CHP series	33
Separation mechanism of CHP series	33
Column list	34
Column durability	35
[Applications] Organic compounds•Insulin•Peptide 《CHP column series》	36~48
Polymeric chromatography materials 《CHP material series》	49~56
Chromatography material list	49
[Applications] Organic compounds 《CHP material series》	50~53
6 Chiral separation columns	54~59
Separation mechanism of CRS series	54
[Applications] Optical isomers 《CRS10W•CRS15W》	55~58
Separation conditions for various amino acids	59
7 SPE sorbent series	60
Solid phase extraction sorbents	60
Synthetic adsorbents and reversed-phase material list	60
Chelating type list	60
8 MCI GEL™ column list	61~62
9 MCI GEL™ material list	63~66
10 Compounds index	67~75

Nature of sample	Separation mode	MCI GEL™ column	pH range	Applications	Pages
Water Soluble	Size Exclusion	CQP10 CQP30	2 ~12	Proteins, Biopolymers Water soluble polymers	31~32
		Ion Exchange	XtalSpeed™	2 ~12	Proteins, Antibody
	Reversed-Phase	CMG20 CHPOD	2 ~12	Proteins, Peptides	33~53
		CHP20 CHP07	Full range	Proteins, Peptides	33~53
		Size Exclusion	CK02A CK02AS	6 ~7	Oligosaccharides
	Size Exclusion	CK04S CK04SS	6 ~7	Oligosaccharides	14~16
		CQP06	2 ~12	Peptides	31~32
	Ion Exclusion	CK10U	1 ~14	Amino acids	17~18
		CA08F CDR10	1 ~13	Organic acids Saccharides	19~22
		CDR10	1 ~13	Nucleotides	21~22
	Ion Chromatography	SCA04	3 ~7	Anions	23~27
		SCK01 CHK45	1.5~12	Cations	23~25
		Reversed-Phase	CMG20 CHPOD CHP20 CHP07	2 ~12 Full range	Organic Compounds peptide Organic Compounds peptide
	Mix mode	CHK40 CHK45	Full range	Amino acids, Nucleotide	34,45~48
Ion Exclusion	CK08EH	1 ~7	Organic acids	7,11~12	
	Ligand Exchange	CK08E Series	1 ~7	Saccharides	7~13
CRS10W CRS15W		5 ~7	Optical isomers (α -amino acids α -hydroxy carboxylic acids)	54~59	
Organic Solvent Soluble	Reversed-Phase	CHP20 CMG20 CHP07	Full range	Organic Compounds	33~53
		Normal Phase	CMG20 CHPOD	2 ~12	Organic Compounds
	Mix mode	CHK40 CHK45	Full range	Organic Compounds	34,45,48

● Product list by particle size and separation mode

Separation mode	Particle size [μm]	Analytical		Preparative			
		5	10	30	50	150	
Ion exchange	XtalSpeed™	CK	CK CA	CK CA		CK CA	
			CDR10		CQA_P CQK_P		
Ion chromatography		CHK45 SCA	SCK				
Size exclusion			CQP				
Normal phase	CHP20/C04	CHP20/C10	CHP20/P20	CHP20/P30	CHP20/P50	CHP20/P70	CHP20/P120
		CSP50/P10	CHP50/P20	CHP50/P30			
	CHP07/C04	CHP07/C10					CHP07/P120
	CMG20/C04	CMG20/C10					CMG20/P150
	CHPOD/C04	CMG20/P10		CMG20/P30			CHP85/P120 CHP87/P120
Mix mode		CHK40 CHK45					
Ligand exchange		CRS					

● USP LISTING OF MCI GEL™

USP Code	PACKING	MCI GEL™ Column	Page
L17	Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the hydrogen form, 6 to 12 μm in diameter	CK08EH	7
L19	Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the calcium form, 5 – 15 μm in diameter	CK08EC	7
L21	A rigid, spherical styrene-divinylbenzene copolymer, 3 to 30 μm in diameter	CHP20/C04 CHP20/C10	34
L25	Packing having the capacity to separate compounds with a molecular weight range from 100-5000 (as determined by polyethylene oxide), applied to neutral, anionic, and cationic water-soluble polymers. A polymethacrylate resin base, cross-linked with polyhydroxylated ether (surface contained some residual carboxyl functional groups) was found suitable	CQP06	31
L31	A hydroxide-selective, strong anion-exchange resin-quaternary amine bonded on latex particles attached to a core of 8.5-μm macroporous particles having a pore size of 2000 Å units and consisting of ethylvinylbenzene cross-linked with 55% divinylbenzene	SCA04	23
L32	A chiral ligand-exchange resin packing-L-proline copper complex covalently bonded to irregularly shaped silica particles, 5 to 10 μm in diameter	CRS10W CRS15W	54
L37	Packing having the capacity to separate proteins by molecular size over a range of 2,000 to 40,000 Da. It is a polymethacrylate gel	CQP30	31
L38	A methacrylate-based size-exclusion packing for water-soluble samples	CQP10 CQP30	31
L39	A hydrophilic polyhydroxymethacrylate gel of totally porous spherical resin	CMG20/C04 CMG20/C10	34
L58	Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the sodium form, about 6 to 30 μm diameter	CK08S CK08E CK04S CK02A	6
L71	A rigid, spherical polymethacrylate, 4 to 6 μm in diameter	CMG20/C04	34
L73	A rigid, spherical polydivinylbenzene particle, 5 to 10 μm in diameter	CDR10	21

○ Cation exchange resins
MCI GEL™ CK series

○ Anion exchange resins
MCI GEL™ CA series

Mitsubishi Chemical Ion Exchange Resins

MCI GEL™ specializes in polymer based packing materials. Specifically, polystyrene polymer based ion exchange resins are derived from over 50 years of manufacturing experience of Diaion™ product line. MCI GEL™ ion exchange resins for HPLC have been developed with the same attention to performance and quality. For several decades, Mitsubishi Chemical has been providing MCI GEL™ ion exchange columns are offered in a variety of chemistries, particle sizes and counter ions to support a broad range of applications.

Features

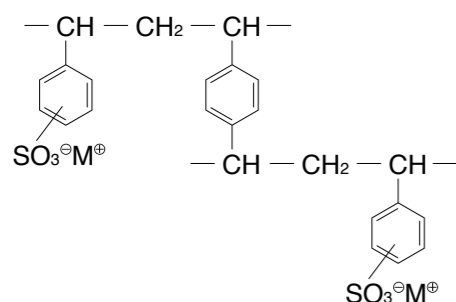
- Variety of products** gel type, porous type, DVB%, particle size, particle size distribution
analytical use, preparative use
- Persistence of high quality, excellent separation performance**
- Accumulation of abundant knowledge and experience of applications**

Ion exchange resins are generally used for analysis of amino acids, sugars, organic acids and amines, etc. MCI GEL™ custom pre-packed columns are specifically designed for each application using the most appropriate packing material among our product line and using the most suitable column dimensions.

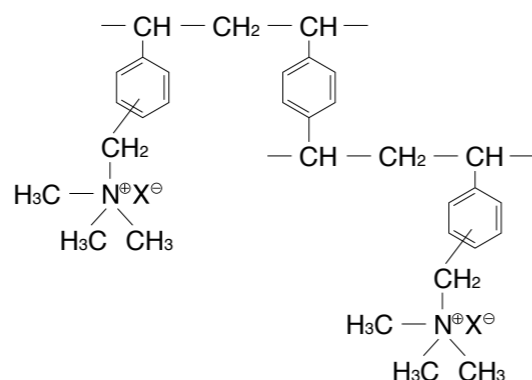
Typical application for each column is shown in this catalog. These data will suggest an appropriate column.

● Chemical structure of ion exchange resin

〈Strongly acidic cation exchange resin〉



〈Strongly basic anion exchange resin〉



● MCI GEL™ columns for HPLC

	Description					Typical usage					
	Product name	Column dimensions I.D×L [mm]	Packing material			USP	Amino acid	Mono saccharide	Oligo-saccharide	Carboxylic acid	Amine
			Cross linkage [%]	Counter ion	Particle size [μm]						
MCI GEL™ Cation exchange columns	MCI GEL™ CK10U	6×120	10	Na ⁺	5		○				○
	MCI GEL™ CK08S	8×500	8	Na ⁺	11	L58		○			
	MCI GEL™ CK08E	8.0×300 7.8×300	8	Na ⁺	9	L58		○			
	MCI GEL™ CK08EC	8.0×300 7.8×300	8	Ca ²⁺	9	L19		○			
	MCI GEL™ CK08ES	8×300	8	Ag ⁺	9			○	○		
	MCI GEL™ CK08EH	8.0×300 7.8×300	8	H ⁺	9	L17		○		○	○
	MCI GEL™ CK06SC	8×500	6	Ca ⁺	11			○	○		
	MCI GEL™ CK04S	10×200	4	Na ⁺	11	L58			○		
	MCI GEL™ CK04SS	10×200	4	Ag ⁺	11				○		
	MCI GEL™ CK02A	20×250	2	Na ⁺	20	L58			○		
MCI GEL™ CK02AS	20×250	2	Ag ⁺	20				○			
MCI GEL™ Anion exchange columns	MCI GEL™ CA08F	4.6×250	8	SO ₄ ²⁻	7			○		○	
	MCI GEL™ CDR10	4.6×250	High porous	AcO ⁻	7			○		○	○

● Packing materials

Packing materials are available. Please look at P.64 and P.65.

● Description of a gel type ion exchange column

MCI GEL™ CK08EC

for HPLC use

Cation=K }
Anion=A }

DVB%

Counter ion
(no letter=Na⁺, C=Ca²⁺
S=Ag⁺, H=H⁺)

Particle size (mode)
(A=20μm, S=11μm
E=9μm, F=7μm,
U=5μm)

● Note ; Pre-column and guard column

- Please consider using a guard column concerning purity of injection sample. Guard columns, are listed in the end of this catalog, should be selected in accordance with a main column.
- As for analysis of amino acids by MCI GEL™ CK10U, MCI GEL™ AFR2-PC is recommended as a pre-column. The AFR2-PC column is very effective to stabilize base line because it can trap ammonium ion in eluent. A peak caused of the ammonium ion may disturb base line stability.

CK08,06 series

Cation exchange columns applications; sugars, carboxylic acids, (poly)alcohols, etc.



CK08EC 8×300, 7.8×300

CK08EH 8×300, 7.8×300

Column list

MCI GEL™ column	Counter ion	Application areas	USP
MCI GEL™ CK08S MCI GEL™ CK08E	Na ⁺	General sugar separation columns	L58
MCI GEL™ CK08EC	Ca ²⁺	The most general sugar separation column Highly recommended for fructose and glucose This column conforms to US Pharmacopeia.	L19
MCI GEL™ CK08ES	Ag ⁺	Gel permeation chromatographic effect	
MCI GEL™ CK08EH	H ⁺	Organic acids with H ₃ PO ₄ eluent; sugars with distilled water eluent	L17
MCI GEL™ CK06SC	Ca ²⁺	Use for analysis of mono-saccharides and disaccharides.	

Application data of CK08EC

Fig. 2-1 Sugars

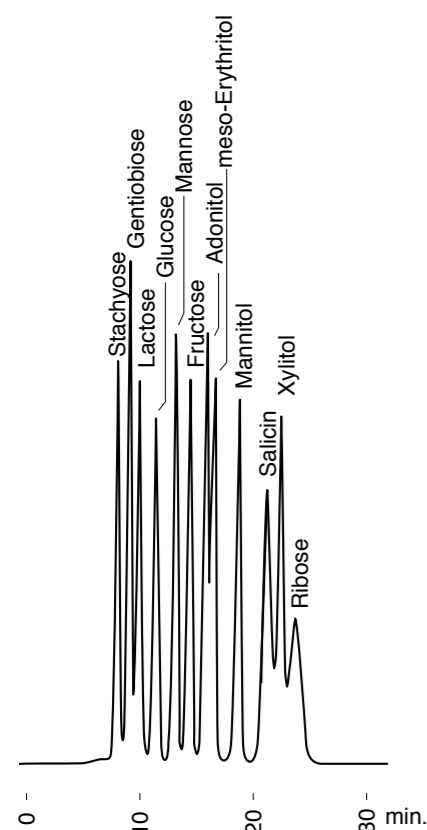
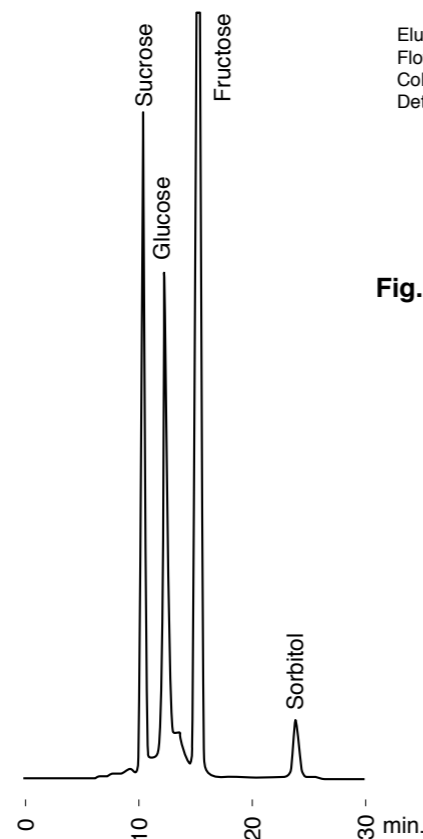
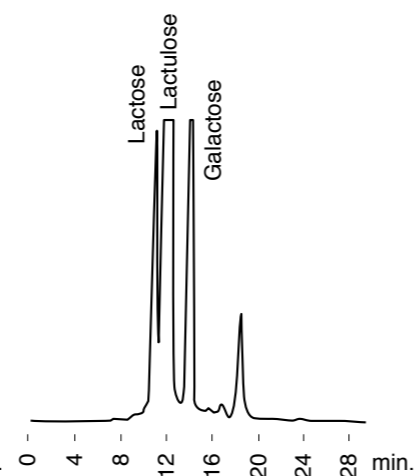


Fig. 2-2 Apple juice



Conditions
 Column : MCI GEL™ CK08EC
 8mm I.D.×300mm
 Eluent : H₂O
 Flow rate : 0.6 ml/min
 Column temp. : 75°C
 Detection : RI

Fig. 2-3 Lactulose syrup



Application data of CK08EC

Fig. 2-4 Sports drink A

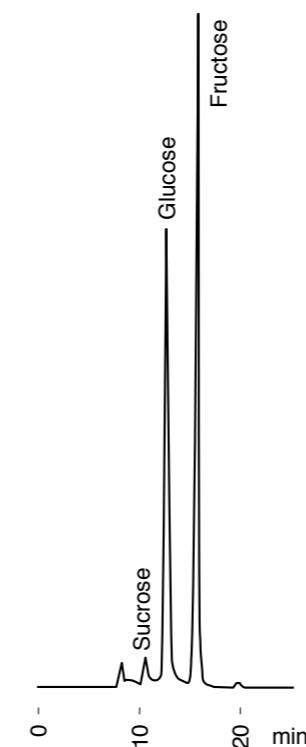


Fig. 2-5 Sports drink B

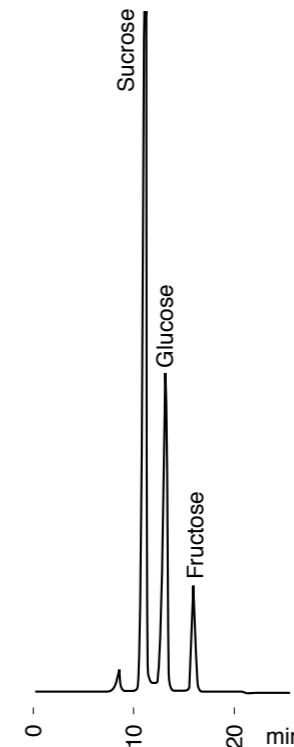


Fig. 2-6 Honey

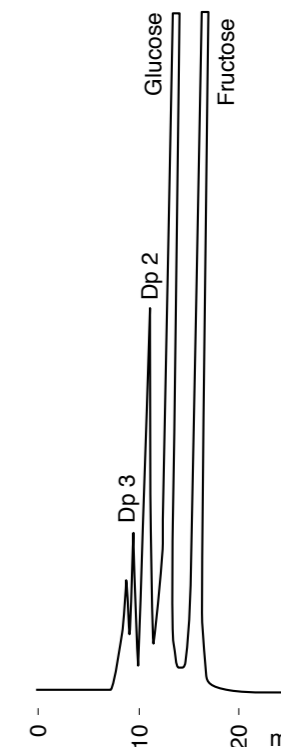


Fig. 2-7 Jam

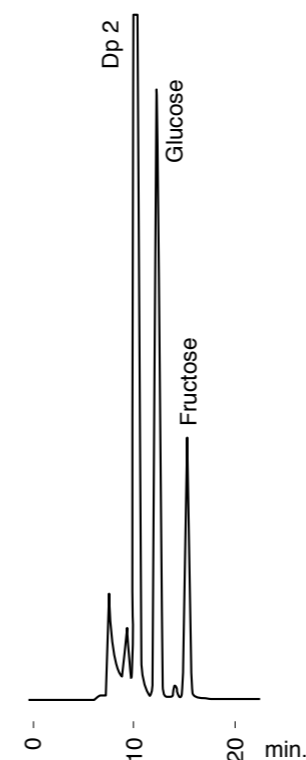
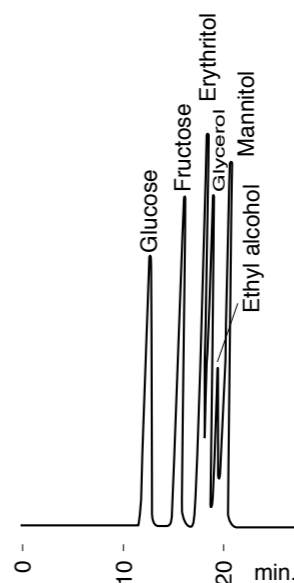


Fig. 2-8 Sugars/Alcohols



Conditions
 Column : MCI GEL™ CK08EC
 8mm I.D.×300mm
 Eluent : H₂O
 Flow rate : 0.6 ml/min
 Column temp. : 75°C
 Detection : RI

Application data of CK08EC

Fig. 2-9 Sugars / Alcoles (Comparison with competitor's column)

Conditions
 Column : 7.8x 300 mmI.D. (MCI GEL™ CK08EC / Competitor's Column)
 Eluent : Milli Q water
 Flow rate : 0.6 mL/min
 Temperature : 75 °C
 Sample Conc : 40mmol/ml each
 Injection : 20µL
 Detection : RI

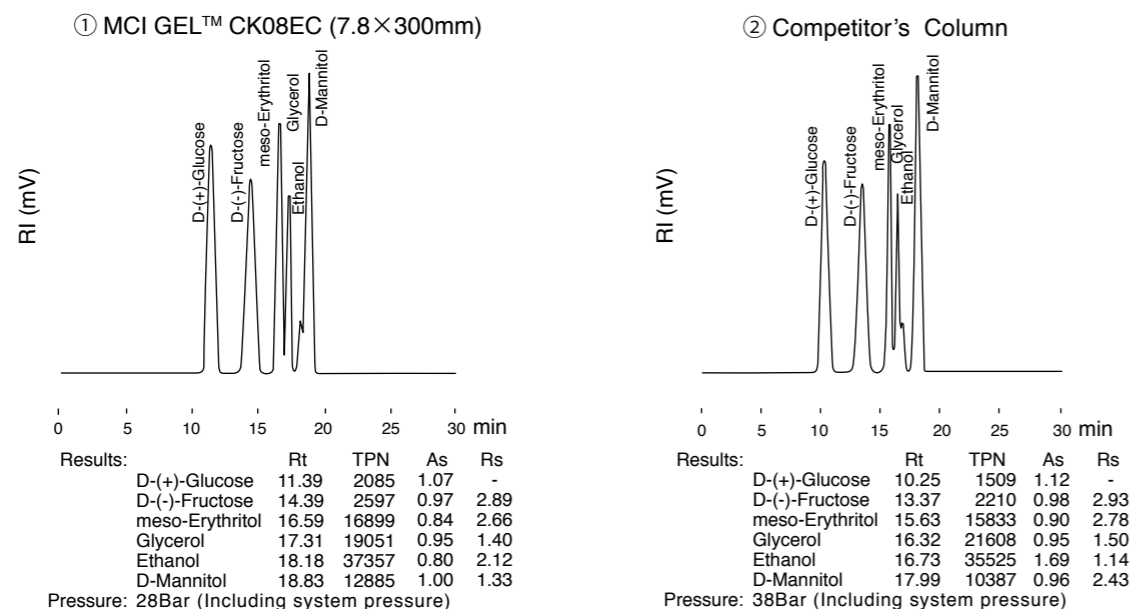
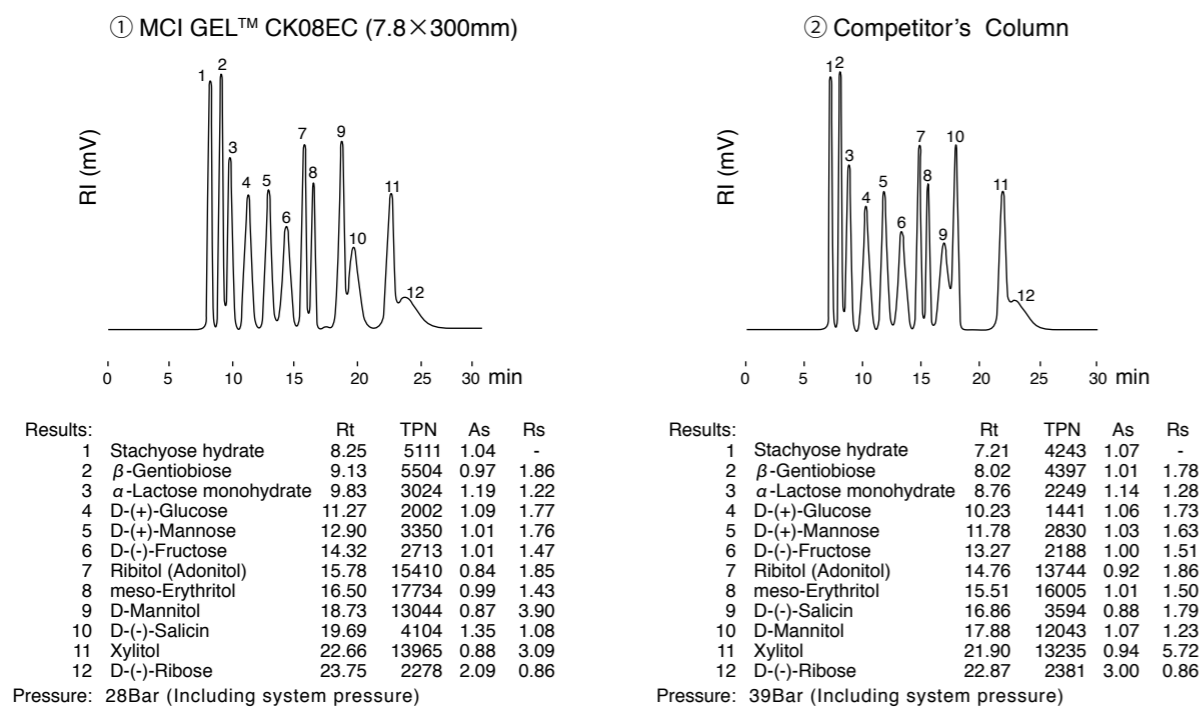


Fig. 2-10 Sugars (Comparison with competitor's column)

Conditions
 Column : 7.8x 300 mmI.D. (MCI GEL™ CK08EC / Competitor's Column)
 Eluent : Milli Q water
 Flow rate : 0.6 mL/min
 Temperature : 75 °C
 Sample Conc : 40mmol/ml each
 Injection : 20µL
 Detection : RI

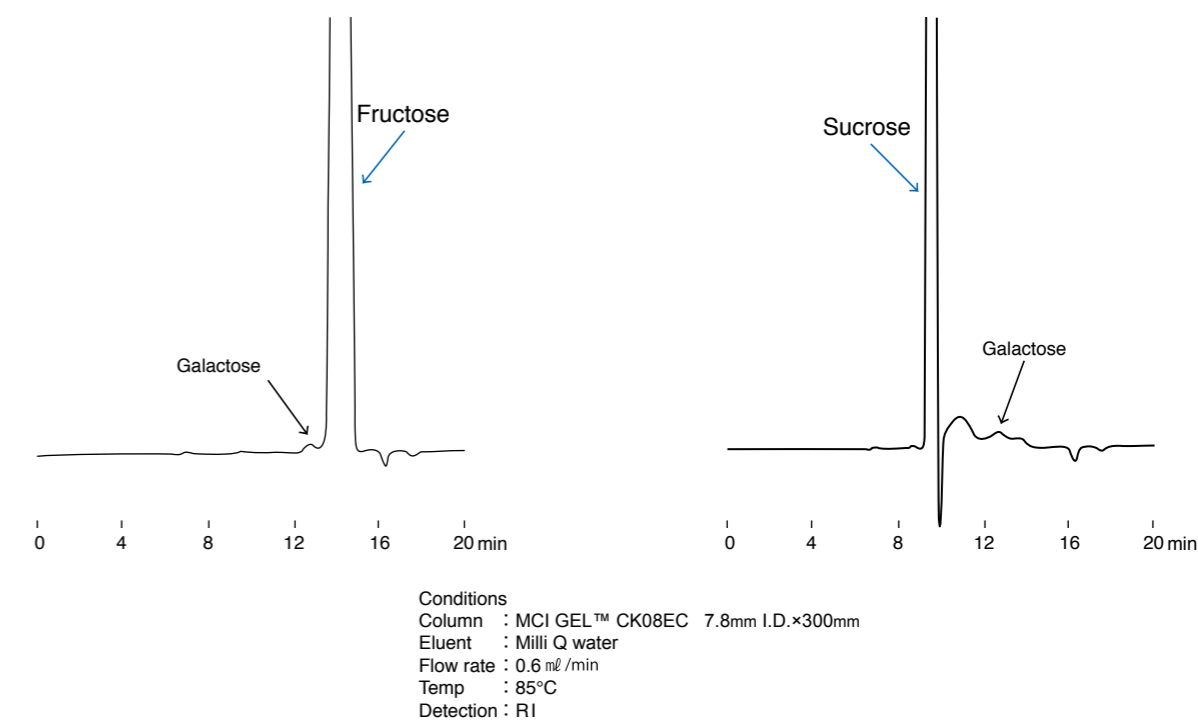


Application data of CK08EC

Fig. 2-11 Analysis of galactose impurity

① Galactose / Fructose = 0.1 / 99.9

② Galactose / Sucrose = 0.1 / 99.9

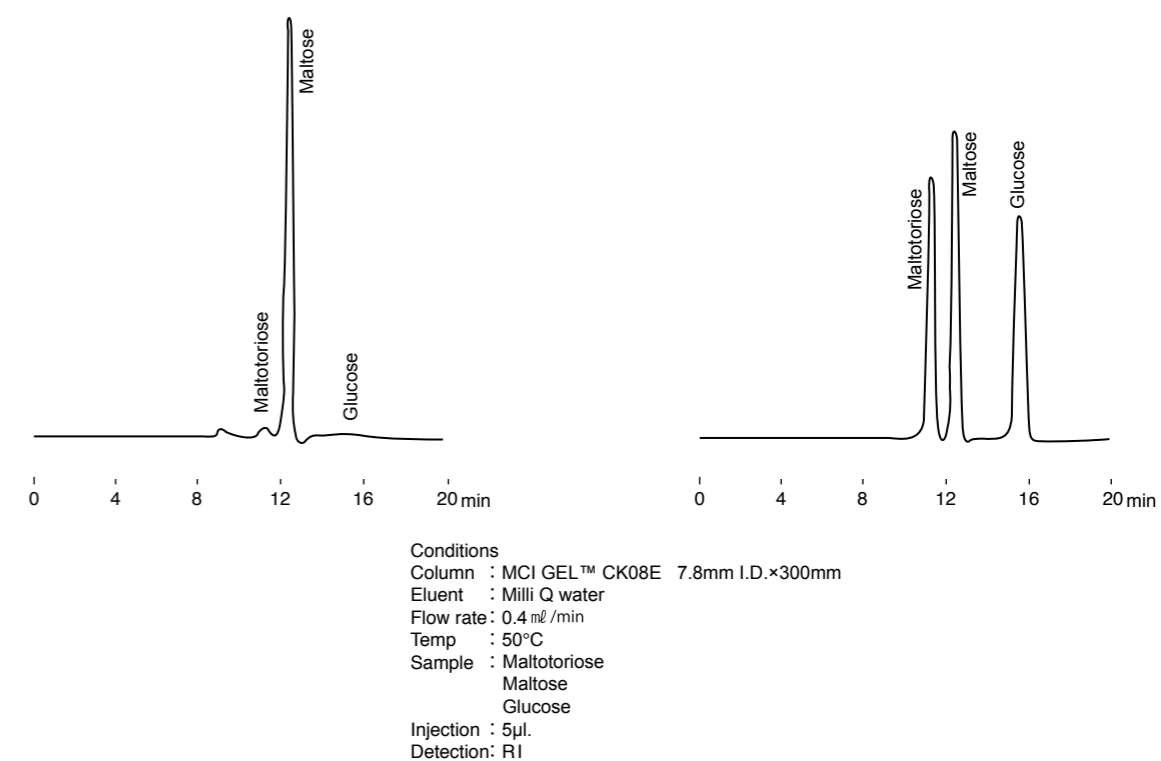


Application data of CK08E

Fig. 2-12 Maltose syrup powder

① Maltose syrup powder

② Mixture



Application data of CK08EH

Fig. 2-13 Carboxylic acids

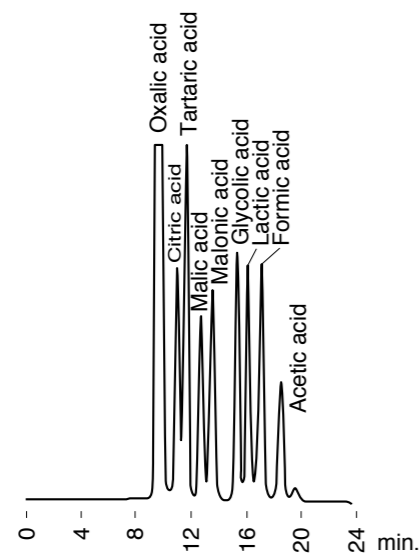
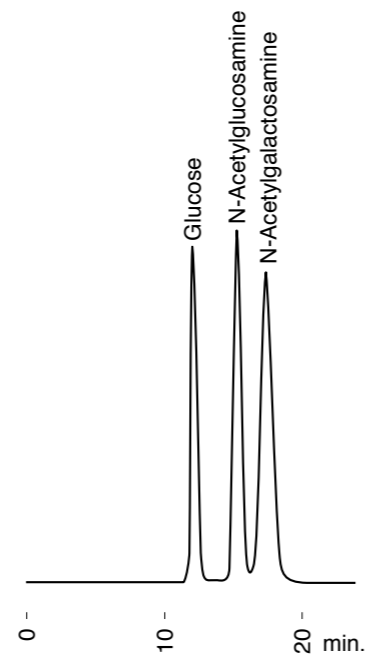
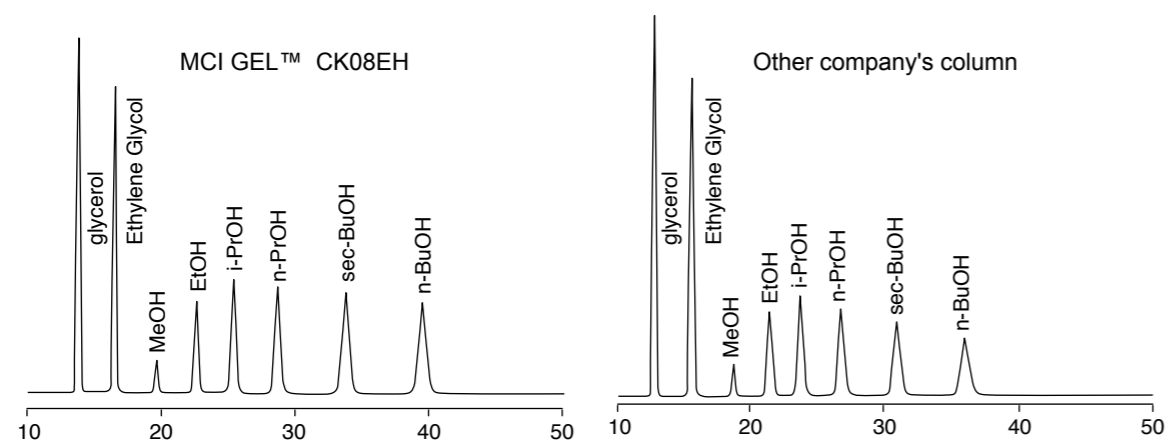


Fig. 2-14 Amino sugars



Conditions
 Column : MCI GEL™ CK08EH, 8mm I.D.×300mm
 Eluent : 1% H₃PO₄ (Fig.2-13,2-14)
 Flow rate : 0.6 ml /min
 Column temp. : 45°C (Fig. 2-13) , ambient (Fig. 2-14)
 Detection : 210nm (Fig. 2-13) , RI (Fig. 2-14)

Fig. 2-15 Alcohols



Conditions
 Column : MCI GEL™ CK08EH, 7.8mm I.D.×300mm
 Eluent : 1% H₃PO₄
 Temp : 60 °C
 Press : 2.5 bar
 Detection : RI
 Injection : 10.0 μL

Application data of CK08EH

Fig. 2-16 Chloroacetic acids

Conditions
 Column : MCI GEL™ CK08EH
 8mm I.D.×300mm
 Eluent : 1% H₃PO₄
 Flow rate : 0.6 ml /min
 Column temp. : 45°C
 Detection : 210nm

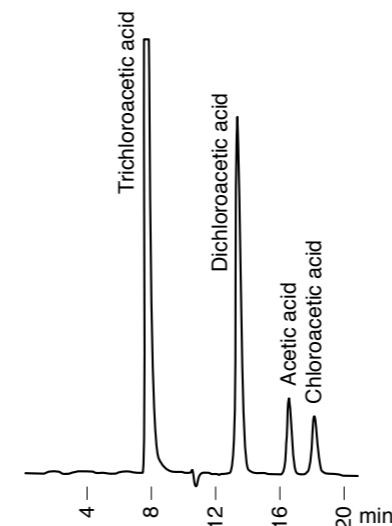


Fig. 2-17 Poly alcohols

Conditions
 Column : MCI GEL™ CK08EH
 8mm I.D.×300mm
 Eluent : 1% H₃PO₄
 Flow rate : 0.6 ml /min
 Column temp. : 25°C
 Detection : RI

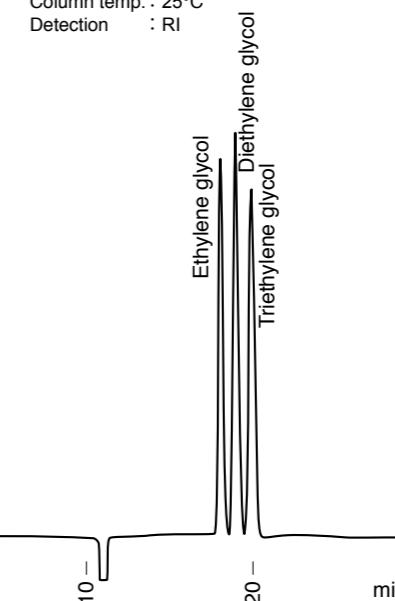
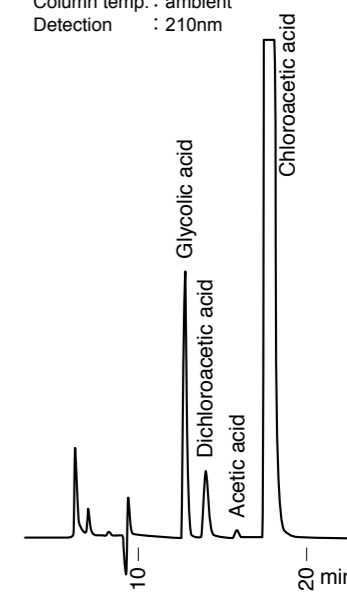


Fig. 2-18 Carboxylic acids

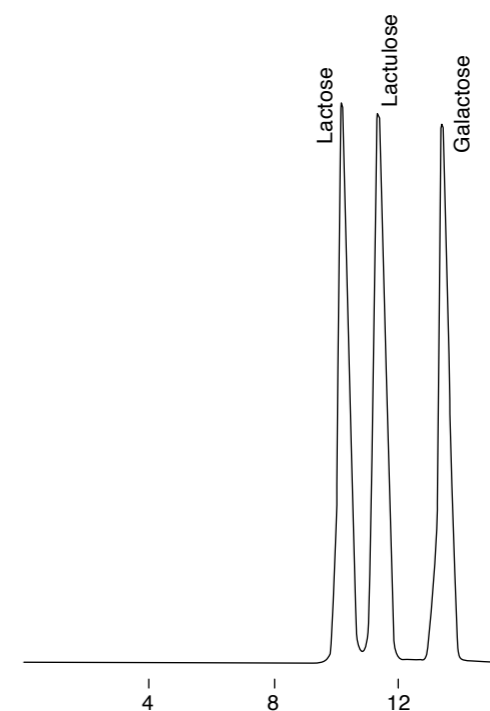
Conditions
 Column : MCI GEL™ CK08EH
 8mm I.D.×300mm
 Eluent : 2% H₃PO₄
 Flow rate : 0.6 ml /min
 Column temp. : ambient
 Detection : 210nm



Application data of CK06SC

Fig. 2-19 Lactose

Conditions
 Column : MCI GEL™ CK06SC
 8mm I.D.×500mm
 Eluent : H₂O
 Flow rate : 1.0 ml /min
 Column temp. : 75°C
 Detection : RI
 Injection volume : 20μL



● Peak retention time for Sugars and Sugar alcohols on various columns [min]

CK08EC Ca ²⁺	CK08E Na ⁺	CK08ES Ag ⁺
Stachyose	Stachyose	* Melezitose
Melezitose	Melezitose	* Stachyose
Raffinose	Raffinose	* Raffinose
Gentiobiose	Gentiobiose	* Sucrose
Cellobiose	Cellobiose	Trehalose
Trehalose	Trehalose	Cellobiose
Isomaltose	Sucrose	Gentiobiose
Sucrose	Isomaltose	Maltose
Maltose	Melibiose	Isomaltose
Melibiose	Maltose	Maltulose
Lactose	Maltulose	Lactose
Maltulose	Lactose	Melibiose
Lactulose	Lactulose	Lactulose
Glucose	Glucose	Adonitol
Xylose	Mannitol	Digitoxose
Galactose	Rhamnose	Rhamnose
Mannose	Adonitol	Glucose
Rhamnose	Sorbitol	Xylose
Fructose	Digitoxose	Xylitol
Fucose	Mannose	Erythritol
Inositol	Xylose	Mannitol
Arabinose	Galactose	Fructose
Digitoxose	Fructose	Dulcitol
Adonitol	Inositol	Galactose
Erythritol	Xylitol	Sorbitol
Mannitol	Fucose	Mannose
Salicin	Dulcitol	Arabinose
Dulcitol	Arabinose	Fucose
Xylitol	Erythritol	Ribose
Sorbitol	Ribose	Ribose
Ribose	Salicin	Inositol
		Salicin

Column temp : CK08EC...75°C, CK08E...45°C, CK08ES...75°C
 Column size : 8mm I.D.×300mm
 Eluent : H₂O
 Flow rate : 0.6 ml/min
 Sample : 1% aq. solution
 Injection vol. : 20μl

* ; These sugars, containing Fructose component, may partially be decomposed by CK08ES and CK08EH.

2 MCI GEL™

CK04S, CK04SS
CK02A, CK02AS

Cation exchange columns applications; oligosaccharides

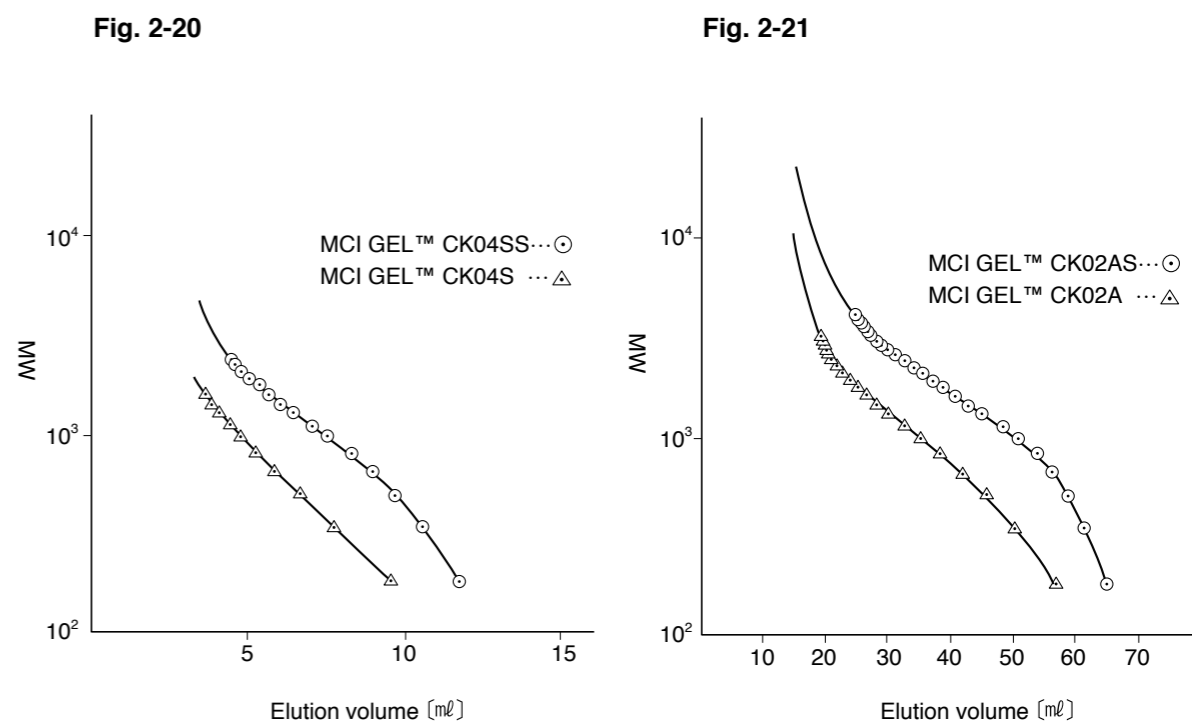
The separation mechanism is based on gel filtration chromatography and elution is achieved via simple distilled water. A larger molecule elutes ahead.



● Separation ability of each column

MCI GEL™ column	Counter ion	Separation ability (degree of polymerization)	USP
MCI GEL™ CK04S	Na ⁺	8~9	L58
MCI GEL™ CK04SS	Ag ⁺	12~13	
MCI GEL™ CK02A	Na ⁺	15~16	L58
MCI GEL™ CK02AS	Ag ⁺	19~20	

Calibration curves of malto-oligosaccharides



Comparison data of malto-oligosaccharides

Fig. 2-22 MCI GEL™ CK04S
10mm I.D.×200mm

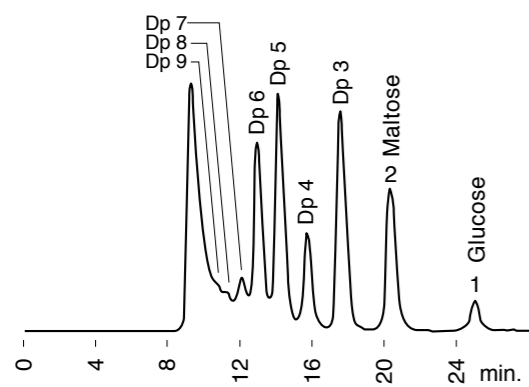


Fig. 2-23 MCI GEL™ CK04SS
10mm I.D.×200mm

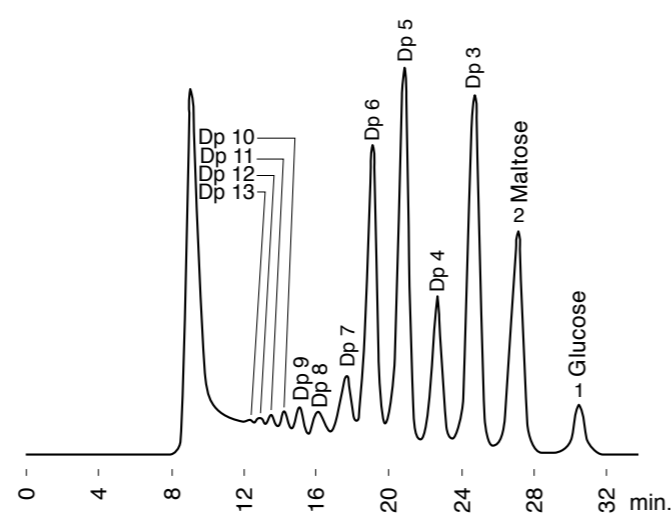


Fig. 2-24 MCI GEL™ CK02A
20mm I.D.×250mm

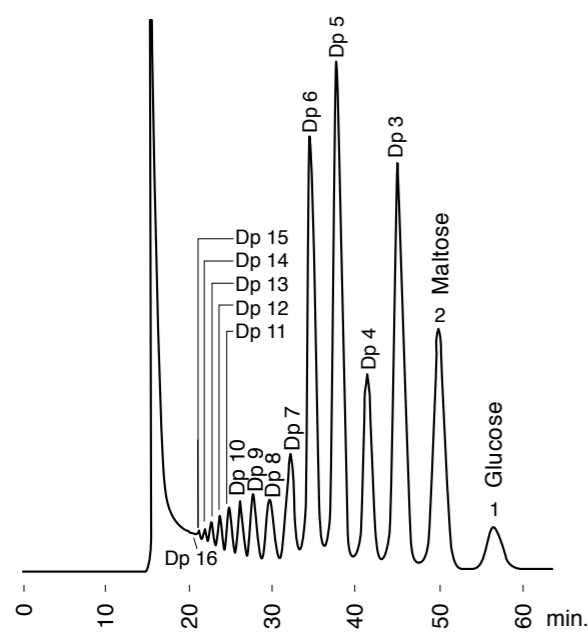
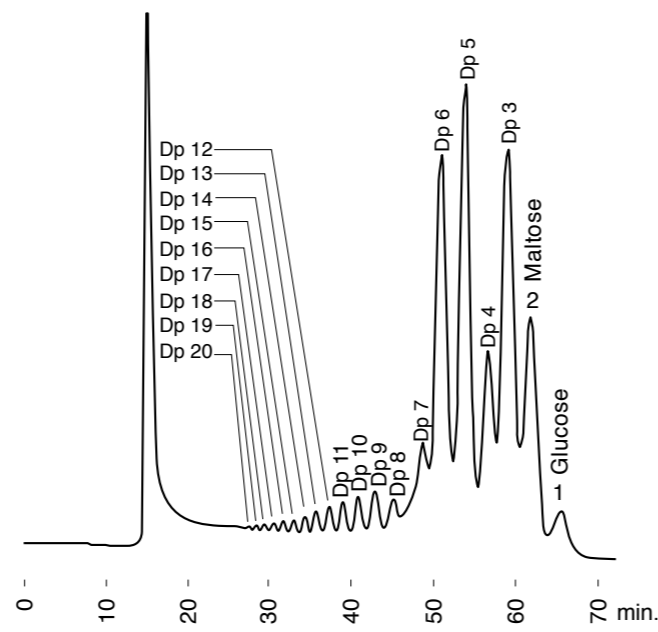


Fig. 2-25 MCI GEL™ CK02AS
20mm I.D.×250mm



Conditions
 Eluent : H₂O
 Flow rate : 0.4 ml/min (Fig. 2-22, 2-23, 2-26, 2-27)
 1.0 ml/min (Fig. 2-24, 2-25, 2-28)
 Column temp. : 85°C
 Detection : RI

Comparison data of authentic malto-oligosaccharides samples

Fig. 2-26 MCI GEL™ CK04S
10mm I.D.×200mm

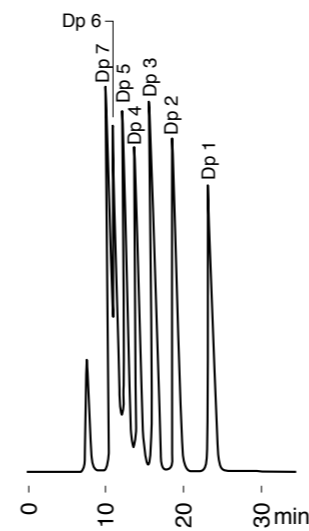


Fig. 2-27 MCI GEL™ CK04SS
10mm I.D.×200mm

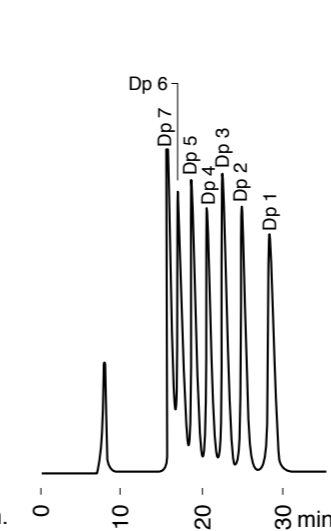
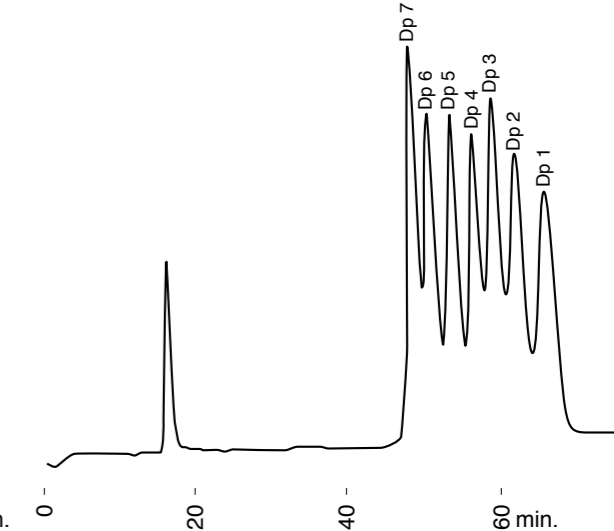


Fig. 2-28 MCI GEL™ CK02AS
20mm I.D.×250mm



Application data of CK04S

Fig. 2-29 Honey

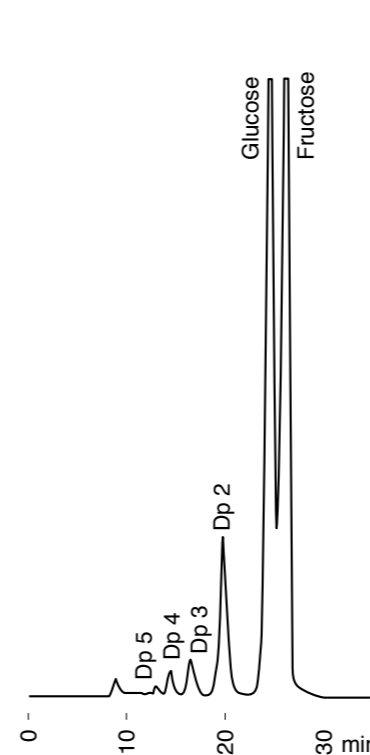


Fig. 2-30 Jam

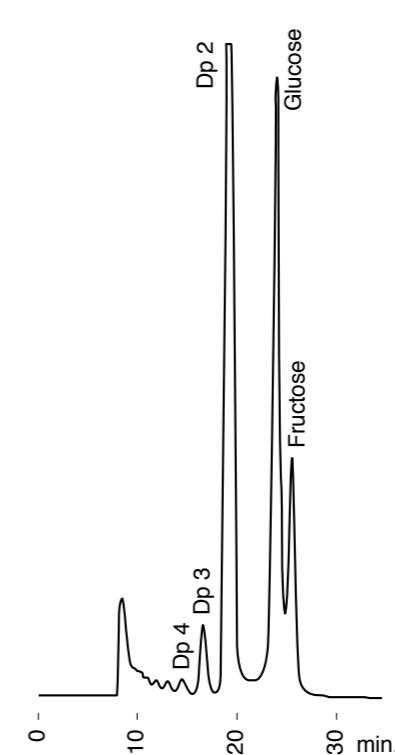
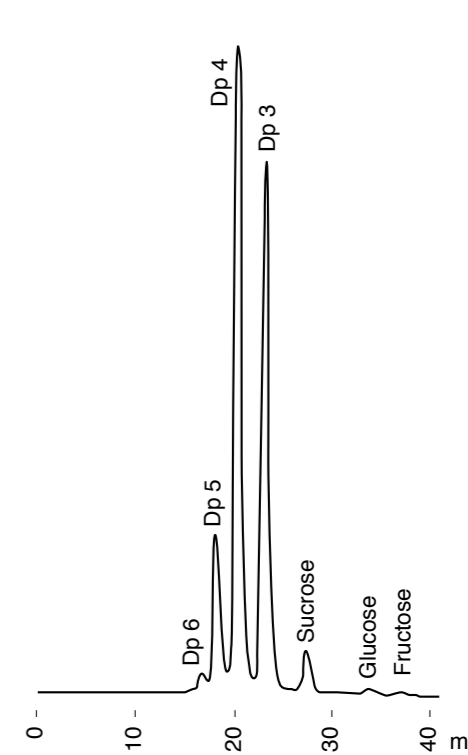


Fig. 2-31 Fructo-oligosaccharides



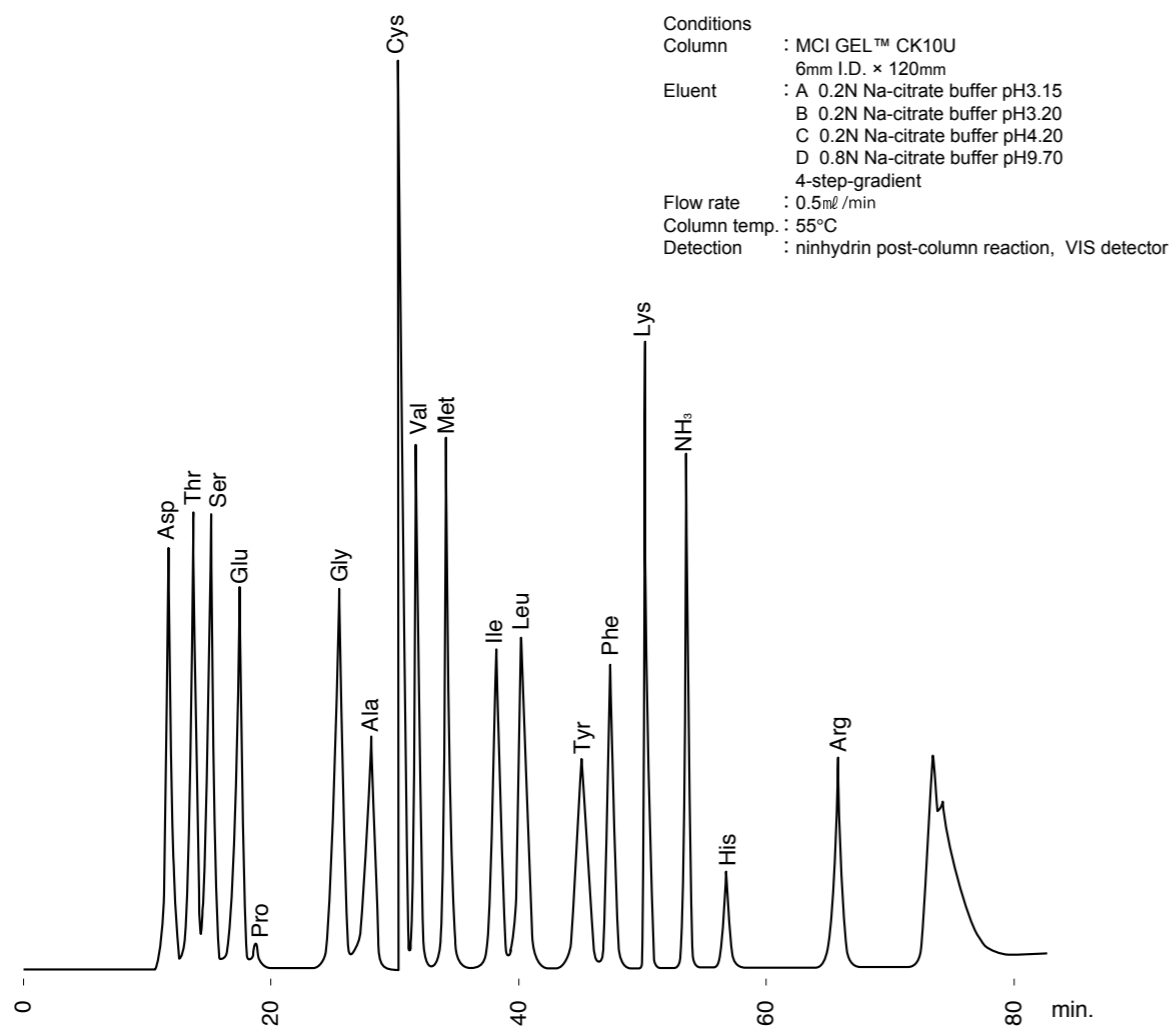
Conditions
 Column : MCI GEL™ CK04S
 10mm I.D.×200mm
 Eluent : H₂O
 Flow rate : 0.4 ml/min (Fig. 2-29, 2-30) 0.3 ml/min (Fig. 2-31)
 Column temp. : 85°C (Fig. 2-29, 2-30) 45°C (Fig. 2-31)
 Detection : RI



CK10U 6×120

Separation of amino acids

Fig. 2-32 Protein hydrolyzates amino acids



As for analysis of amino acids by a cation exchange column such as MCI GEL™ CK10U, MCI GEL™ AFR2-PC is recommended as a pre-column. The AFR2-PC column is very effective to stabilize base line because ammonium in eluent is trapped in this column. The ammonium ion may disturb base line stability. The AFR2-PC should be installed between an outlet of HPLC pump and an inlet of sample injector. A gradient elution, commonly used for amino acid analysis, is influenced by HPLC instrument. So to obtain a satisfactory chromatogram, gradient conditions should be optimized in accordance with the HPLC equipment.

Separation of amino acids

Fig. 2-33 Valine, β-Alanine

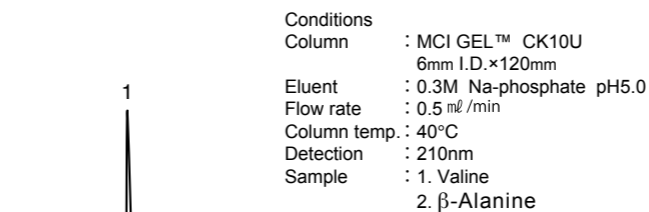


Fig. 2-34 γ-Aminobutyric acid

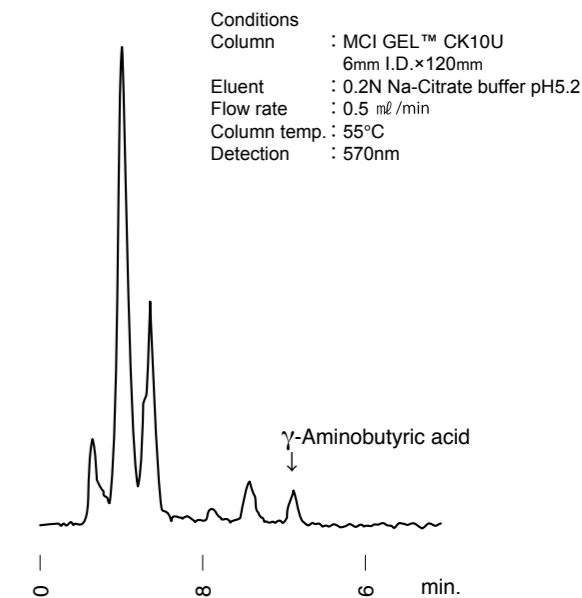


Fig. 2-35 cyclic amino acids

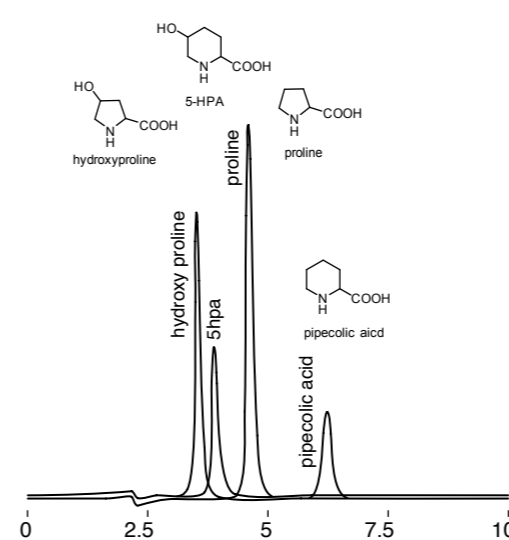


Fig. 2-36 alkyl amino acid

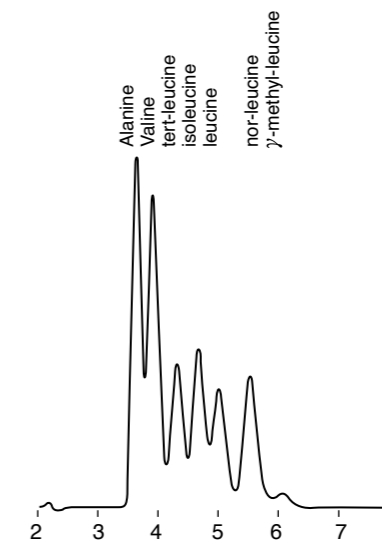
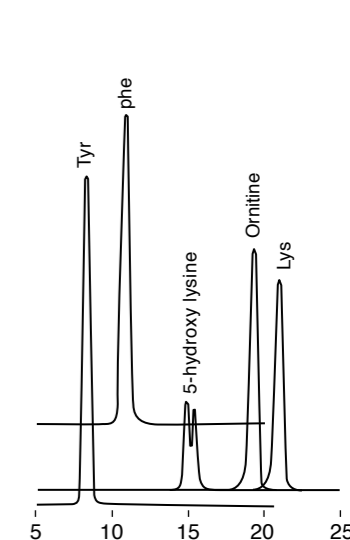


Fig. 2-37 basic amino acid and aromatic amino acids



MCI GEL™ CA08F packed column has been designed for the analysis of nucleotides, sugars, and organic acids by anion exchange chromatography mode. This column will provide excellent separation and short analysis time.

Application data of CA08F

Fig. 2-38 Sugars

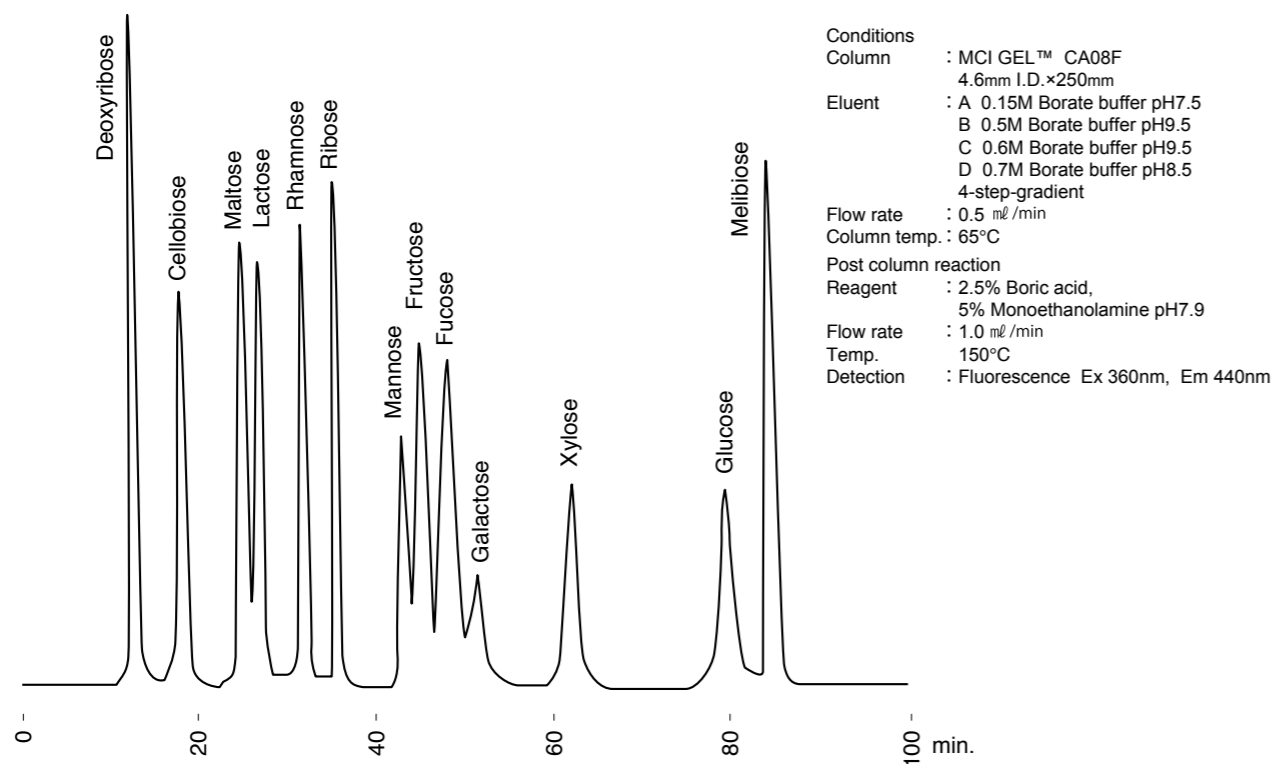
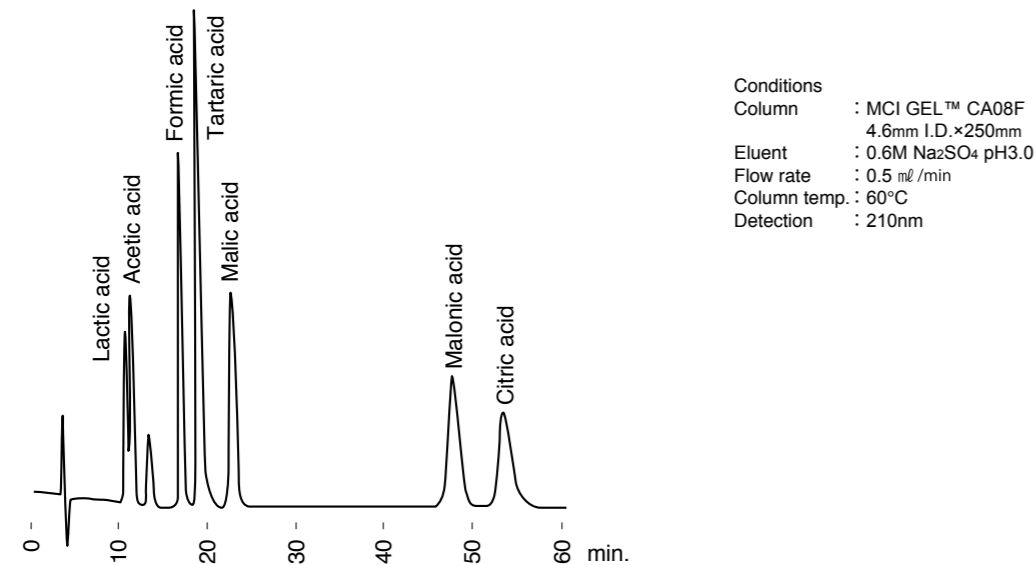


Fig. 2-39 Carboxylic acids



Application data of CA08F

Fig. 2-40 Carboxylic acids

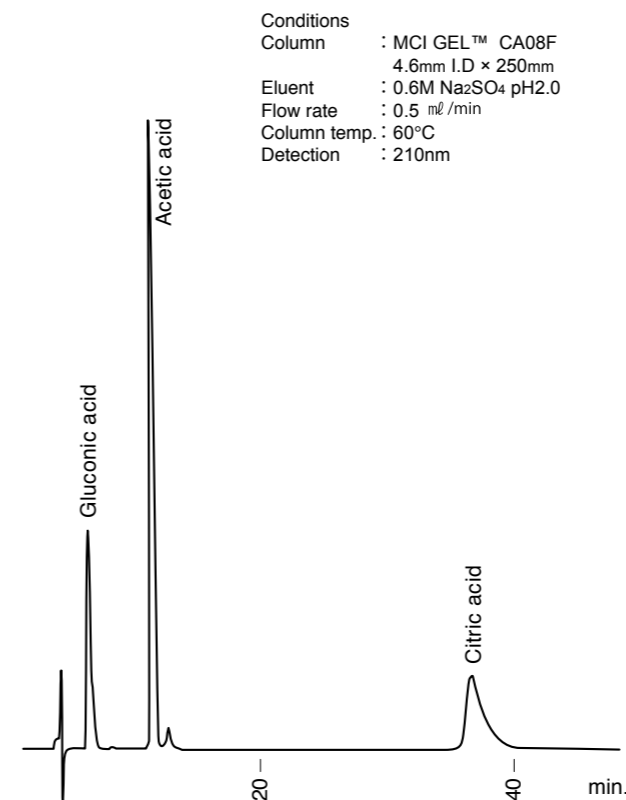


Fig. 2-41 Organic acid

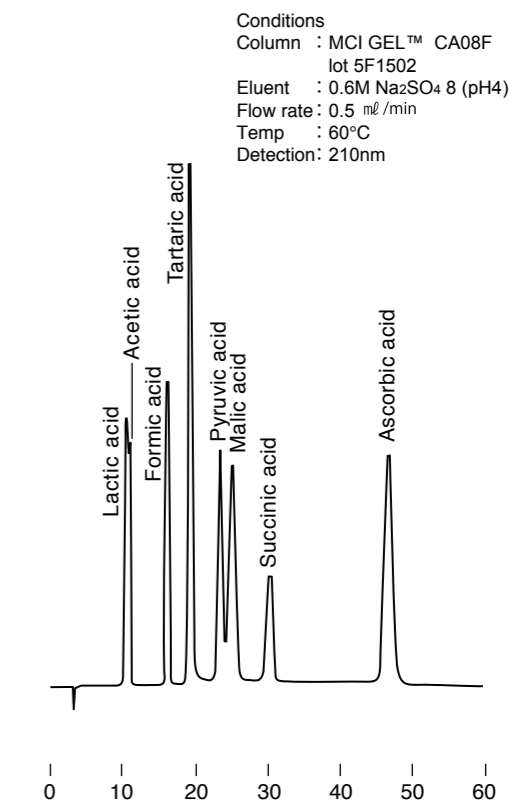
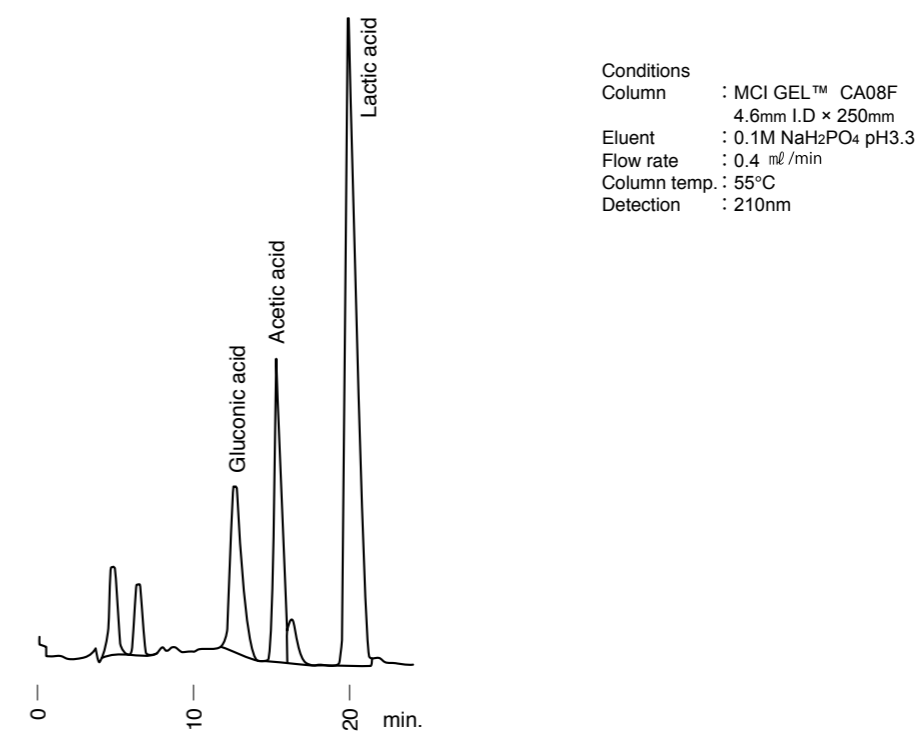


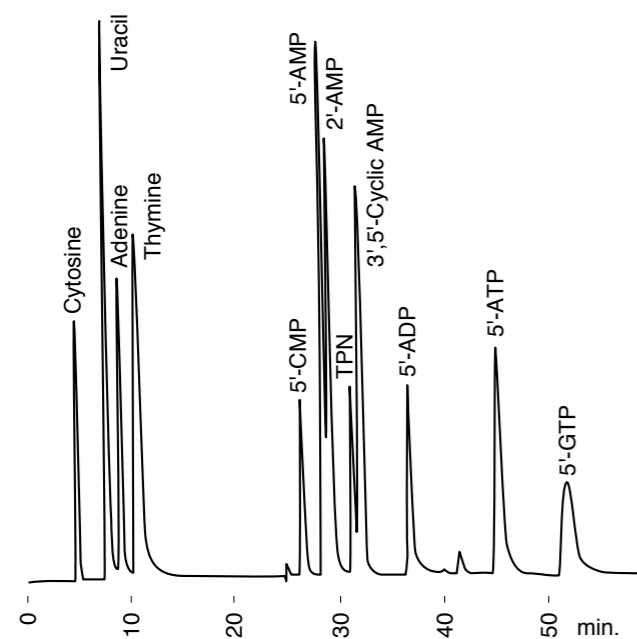
Fig. 2-42 Carboxylic acids



Packing material of MCI GEL™ CDR10 column is based on a high porous polystyrene functionalized with a quaternary ammonium anion exchange resin. Since a high porous type ion exchange resin is rigid, CDR10 allows usage of aggressive gradient elution, for example water to 6M of acetate buffer gradient. MCI GEL™ CDR10 is highly recommended for rapid analysis of physiological fluids like urine and blood.

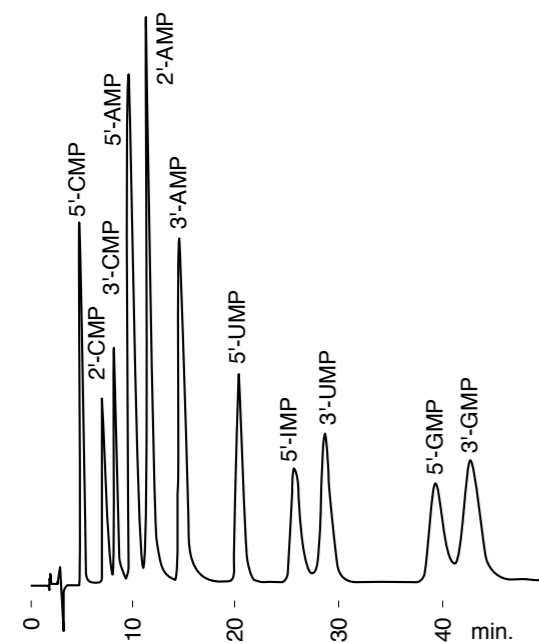
Application data of CDR10

Fig. 2-43 Nucleic acids and related substances



Conditions
 Column : MCI GEL™ CDR10
 4.6mm I.D.×250mm
 Eluent : A H₂O
 B 6M Acetate buffer pH4.4
 A→B 30min linear gradient
 Flow rate : 0.5 mL/min
 Column temp. : 60°C
 Detection : 254nm

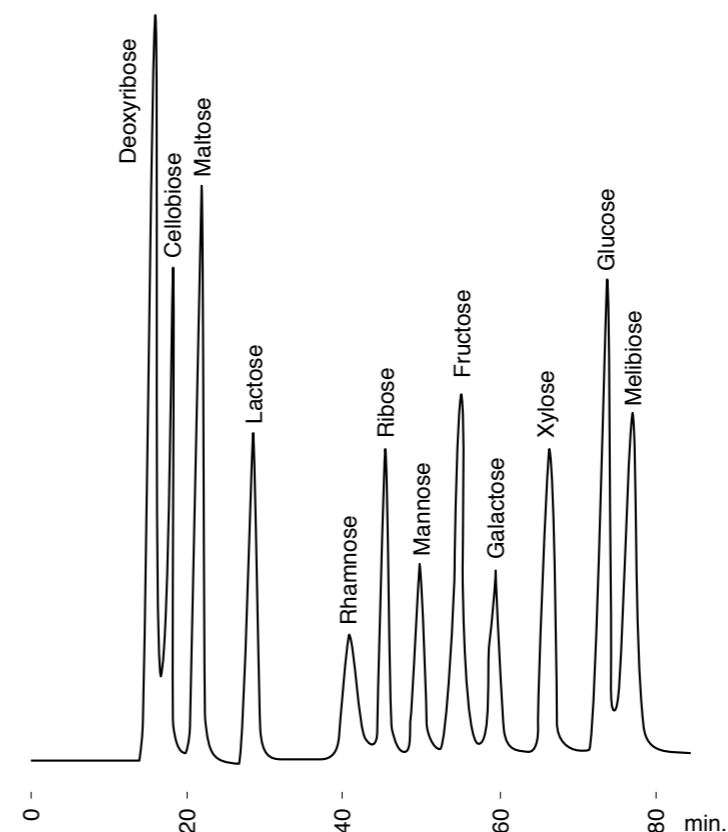
Fig. 2-44 Mono-nucleotides



Conditions
 Column : MCI GEL™ CDR10
 4.6mm I.D.×250mm
 Eluent : 1M Acetate buffer pH3.3
 Flow rate : 1.2 mL/min
 Column temp. : 60°C
 Detection : 254nm

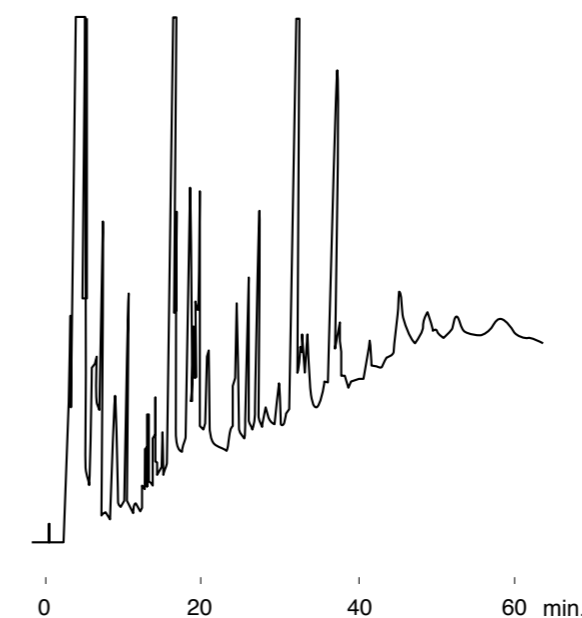
Application data of CDR10

Fig. 2-45 Sugars



Conditions
 Column : MCI GEL™ CDR10
 4.6mm I.D.×250mm
 Eluent : A 0.15M Borate buffer pH7.5
 B 0.6M Borate buffer pH9.5
 A→B60min linear gradient
 Flow rate : 0.5 mL/min
 Column temp. : 65°C
 Post column reaction
 Reagent : 2.5% Boric acid, 5% Monoethanolamine pH7.9
 Flow rate : 0.5
 Temp. : 150°C
 Detection : Fluorescence Ex 360nm, Em 440nm

Fig. 2-46 Human urine



Conditions
 Column : MCI GEL™ CDR10
 4.6mm I.D.×250mm
 Eluent : A 0.006M Acetate buffer pH4.4
 B 6M Acetate buffer pH4.4
 A→B 60min. linear gradient
 Flow rate : 1.0 mL/min
 Column temp. : 60°C
 Detection : 254nm

- Cation chromatography column MCI GEL™ SCK01
- Cation chromatography column MCI GEL™ CHK45/C05
- Anion chromatography column MCI GEL™ SCA04

The MCI GEL™ ion chromatography columns are based on surface functionalized cation and anion exchange resins designed for non-suppressed ion chromatography applications. The non-suppressed ion chromatography is an analysis technique of cations and anions with combination of a packed column of low capacity ion exchange resin and low concentration of electrolyte solution as an eluent. The advantage of the ion chromatography is that several ions can be analyzed by only one injection with free of complicated sample pre-treatment.

Cation chromatography column MCI GEL™ SCK01

Packing material of MCI GEL™ SCK01 is crosslinked polystyrene functionalized with sulfonic acid. This column is characterized by excellent resolution and rapid analysis for monovalent and divalent cations. Standard monovalent cations like Li⁺, Na⁺, NH₄⁺, K⁺, Rb⁺, Cs⁺ and simple amines such as mono-, di- and trimethylamine can be resolved using a nitric acid solution as eluent. Divalent cations, such as alkaline earth metals and transition metal elements, can be efficiently resolved using tartaric acid and complexing reagent such as ethylene diamine to selectively elute the metals from the column.

■ Note:

When using the MCI GEL™ SCK01 column for monovalent cations, it is recommended that a pre-column, MCI GEL™ SCK-PC, be used to trap heavy metals which might otherwise poison the SCK01 column resulting in a rapid loss of capacity and chromatographic performance.

Cation chromatography Column MCI GEL™ CHK45/C05

Packing material of MCI GEL™ CHK45/C05 is made of crosslinked polymethacrylate functionalized with carboxylic acid. By use of simple eluent system, MCI GEL™ CHK45/C05 can separate both monovalent and divalent cations in tap water, river water and other environmental water samples.

Anion chromatography column MCI GEL™ SCA04

Packing material of MCI GEL™ SCA04 is based on a hydrophilic vinyl polymer matrix functionalized with quaternary ammonium group and particle size of 5 μm. A solution of potassium hydrogen phthalate and a vanilic acid (VA)/N-methyldiethanolamine (MDEA) solution both can be used as a mobile phase. The unique VA/MDEA eluent, is developed for the SCA04 column, which allows users to determine 7 standard anions in 14 minutes without system peak.

■ Note:

A pre-column, MCI GEL™ SCA-PC is recommended for prevention of contamination to the SCA04 column when the VA/MDEA eluent is used. The SCA-PC is effectively prolong SCA04 column life. The SCA-PC should be installed between an outlet of HPLC pump and a sample injector.



SCA04 4.6×150 PEEK

Column list

Cation analysis	MCI GEL™ SCK01	6mm I.D×50mm	Stainless steel column
Cation analysis	MCI GEL™ SCK01	4.6mm I.D×150mm	Stainless steel column
Pre-column for cation analysis	MCI GEL™ SCK-PC	6mm I.D×50mm	Stainless steel column
Cation analysis	MCI GEL™ CHK45/C05	4.6mm I.D×150mm	Stainless steel column
Anion analysis	MCI GEL™ SCA04	4.6mm I.D×150mm	PEEK column
Pre-column for anion analysis	MCI GEL™ SCA-PC	8mm I.D×10mm	Stainless steel column

*USP L31 column

Application data of SCK01

Fig. 3-1 Monovalent cations

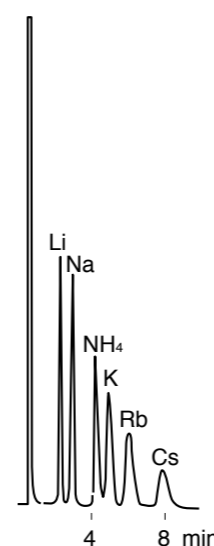


Fig. 3-2 Amines

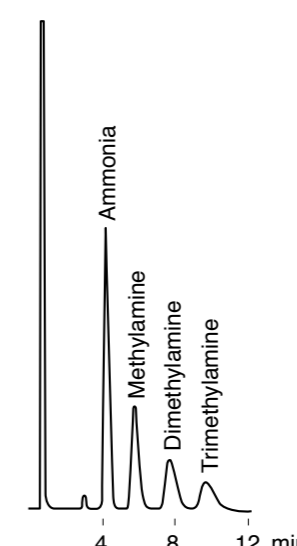


Fig. 3-3 Monovalent cations in rain

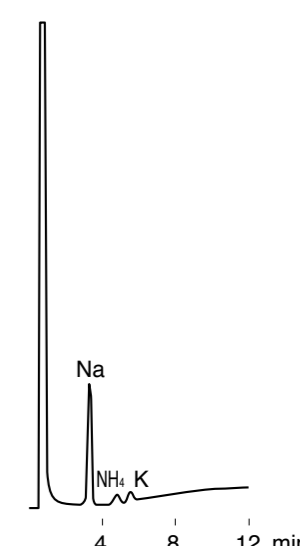


Fig. 3-4 Monovalent cations in tap water

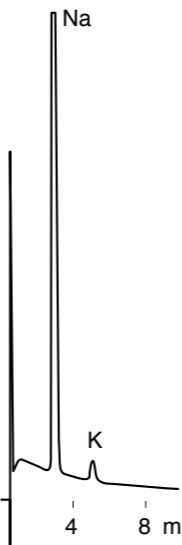


Fig. 3-5 Sports drink

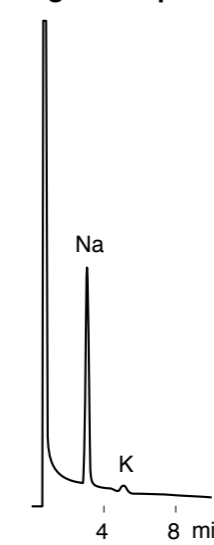
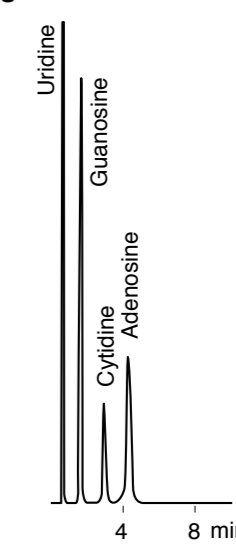


Fig. 3-6 Nucleoside



Conditions
 Column : MCI GEL™ SCK01 6mm I.D.×50mm
 Eluent : 5mM HNO₃
 Flow rate : 1.0 ml/min
 Column temp. : 40°C
 Detection : Conductivity (Fig. 3-1, 3-2, 3-3, 3-4, 3-5) 254nm (Fig. 3-6)

Application data of SCK01

Fig. 3-7 Alkaline earth metals

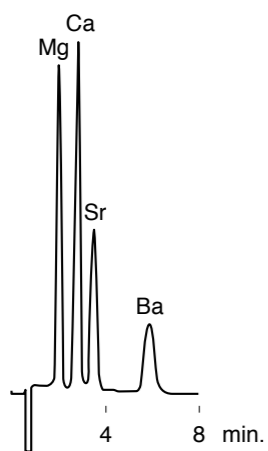


Fig. 3-8 Transition metals

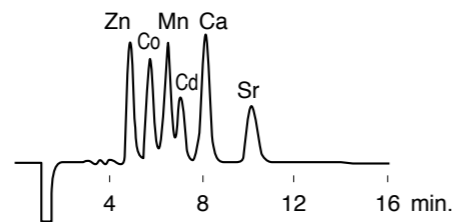
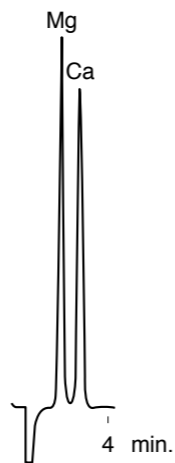


Fig. 3-9 Divalent cations



Application data of SCA04

Fig. 3-11 Standard anions eluent ; VA/MDEA

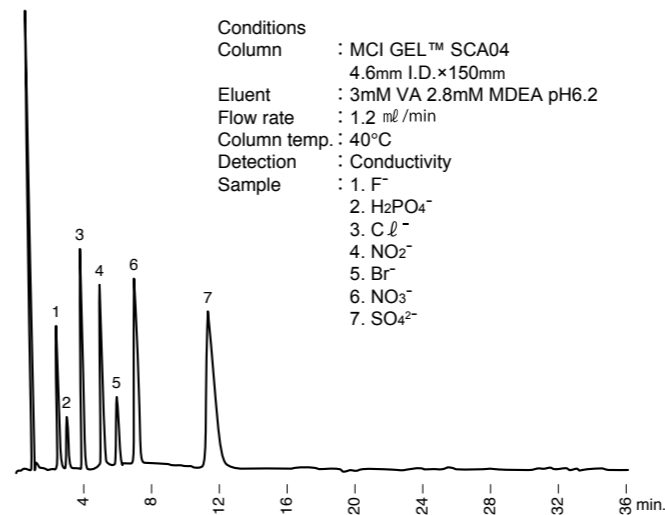
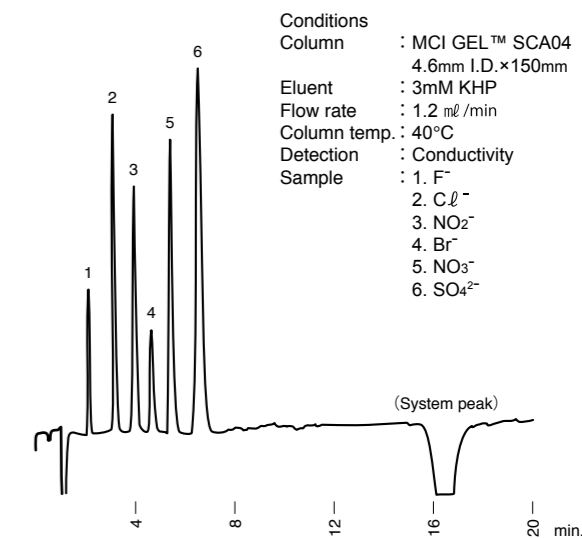


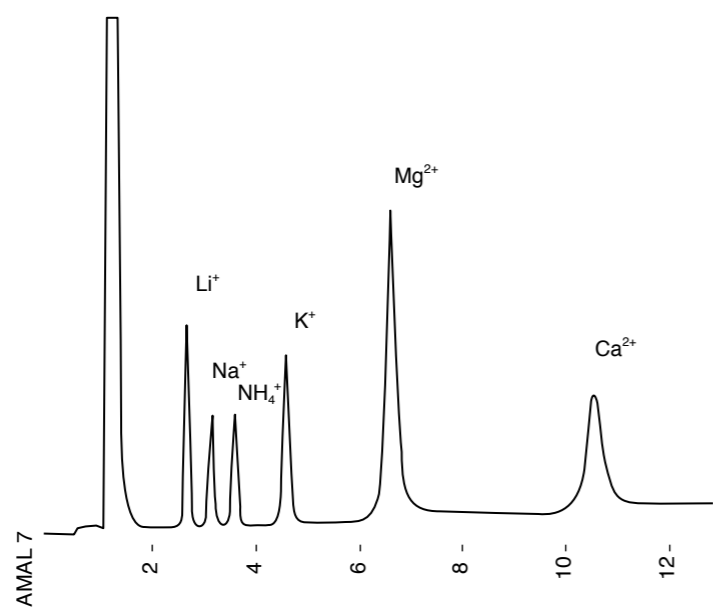
Fig. 3-12 Standard anions eluent ; Potassium hydrogenphthalate



Application data of CHK45/C05

Fig. 3-10 Mono, Divalent cations

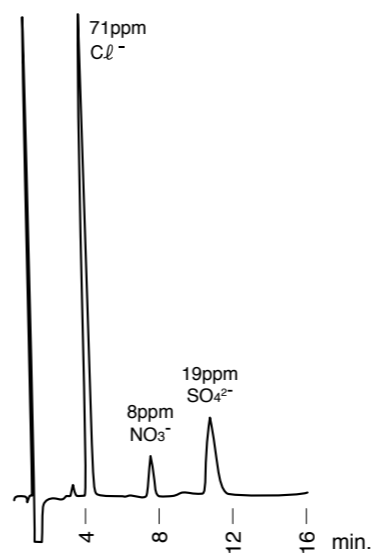
Conditions
 Column : MCI GEL™ CHK45/C05 (SUS)
 4.6mm I.D.×150mm
 Eluent : 4mM H₂SO₄
 Flow rate : 1.2 ml/min
 Temp. : 40°C
 Detection : Conductivity
 Sample inj : 100μL
 Li (0.5ppm), Na (1ppm), NH₄ (1ppm), K (4ppm), Mg (4ppm), Ca (4ppm)



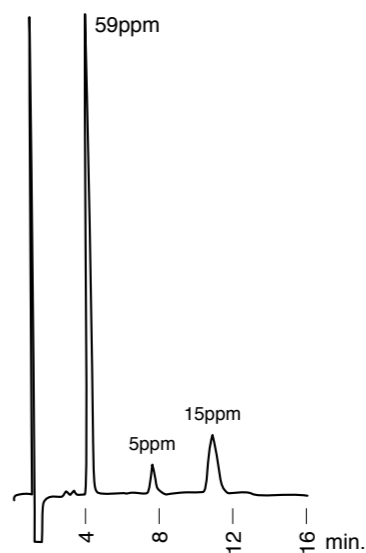
(Data provided by Professor Yokoyama of Yokohama National University)

Fig. 3-13 Rain

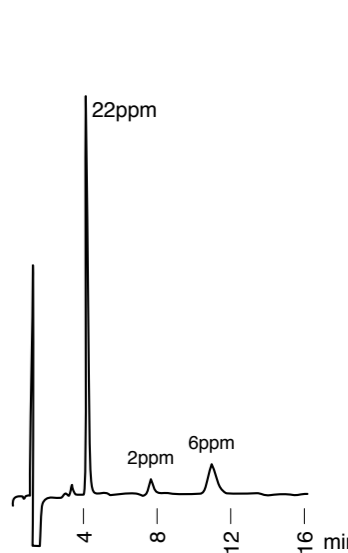
A; Beginning of rain fall



B; After 4 hours



C; After 38 hours



Application data of SCA04

Fig. 3-14 River water

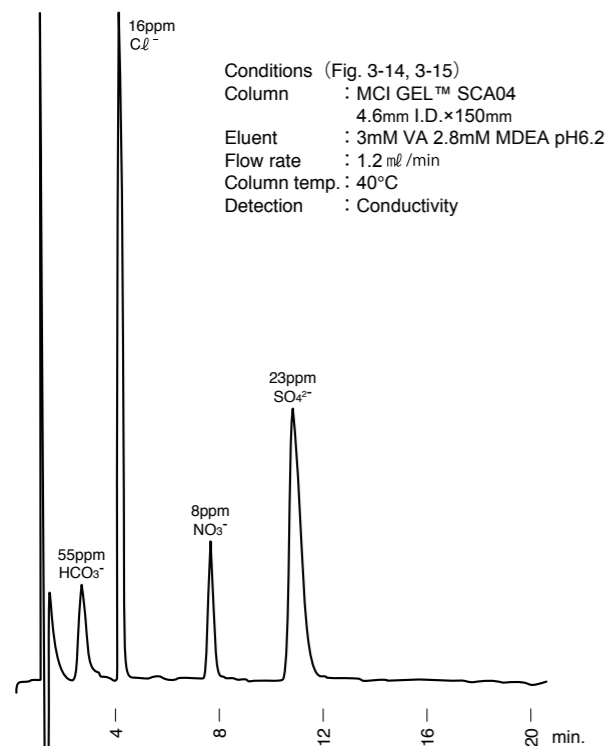


Fig. 3-15 Sulfur compounds

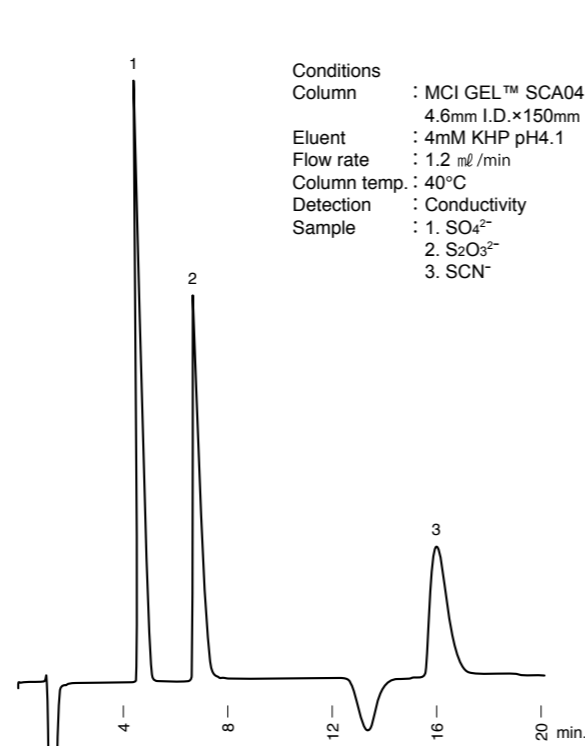
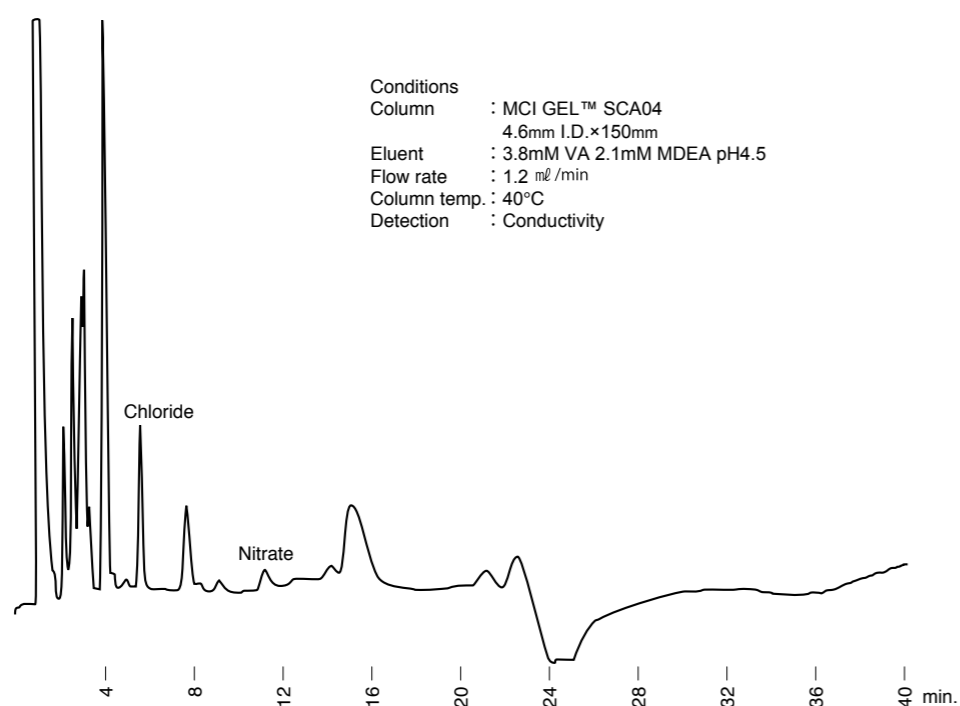


Fig. 3-16 Instant coffee



4 MCI GEL™ Bioseparation columns and materials

- Ion-exchange chromatography columns
XtalSpeed™ series
- Size-exclusion chromatography columns
MCI GEL™ CQP series

Bioseparation columns

MCI GEL™ bioseparation columns are based on a hydrophilic, wide-pore, and rigid polymer designed for analytical chromatography of proteins, peptides, enzymes, and other biomolecules.

MCI GEL™ CQP series are used for size-exclusion chromatography.

XtalSpeed™ series are ion-exchange columns used for protein purification. High-quality target proteins are obtained with this column at a high recovery rate. XtalSpeed™ series are used for both analytical and preparative purpose in protein crystallography and NMR research.

XtalSpeed™ series are also used for antibody variant analysis and protein isoform analysis.

Column name	USP	Separation mode	Functional Group
XtalSpeed™ SP01	—	Cation exchange	Sulfopropyl(SP)
XtalSpeed™ DA01	—	Anion exchange	Diethyl amino ethyl(DEAE)
XtalSpeed™ CM01	—	Cation exchange	carboxymethyl(CM)
XtalSpeed™ Q01	—	Anion exchange	Quaternary ammonium(QA)
MCI GEL™ CQP06	L25	Size exclusion	—
MCI GEL™ CQP10	L38	Size exclusion	—
MCI GEL™ CQP30	L37, L38	Size exclusion	—



XtalSpeed™ series Ion exchange chromatography columns

Ion exchange chromatography columns

XtalSpeed™ series columns are ion-exchange columns used for protein purification. They have been designed especially for protein crystallography and NMR research, and enable to purify target proteins with high quality at a high recovery rate and in a very short time and obtain protein crystals for further analysis.

We developed hydrophilic and chemically stable polymer layers based on highly porous polymer beads, reducing non-specific binding to the lowest level.

To eliminate other interactions and allow target proteins participate only in the ion-exchange mechanism, this column was able to separate similar proteins that other columns never succeeded to separate.

Even under large sample loading, this column maintains excellent selectivity. Taking these aspects into consideration, XtalSpeed™ series can be used as preparative columns for protein.

XtalSpeed™ SP01 is also used for antibody variant analysis.

Column list

Column name	Column size	Code	Housing	Functional Group
SP01	Φ4.6mm×50mm	0-047-11	PEEK	Sulfopropyl (SP)
	Φ4.6mm×100mm	0-047-12		
	Φ7.5mm×100mm	0-047-13		
	Φ11.5mm×100mm	0-047-14		
DA01	Φ4.6mm×50mm	0-047-01	PEEK	Diethylaminoethyl (DEAE)
	Φ4.6mm×100mm	0-047-04		
	Φ7.5mm×100mm	0-047-02		
	Φ11.5mm×100mm	0-047-03		
CM01	Φ4.6mm×50mm	0-047-31	PEEK	Carboxymethyl (CM)
	Φ4.6mm×100mm	0-047-32		
	Φ7.5mm×100mm	0-047-33		
	Φ11.5mm×100mm	0-047-34		
Q01	Φ4.6mm×50mm	0-047-21	PEEK	Quaternary ammonium (QA)
	Φ4.6mm×100mm	0-047-22		
	Φ7.5mm×100mm	0-047-23		
	Φ11.5mm×100mm	0-047-24		

Application data of XtalSpeed™ series

Fig. 4-1 Analysis of Rituximab

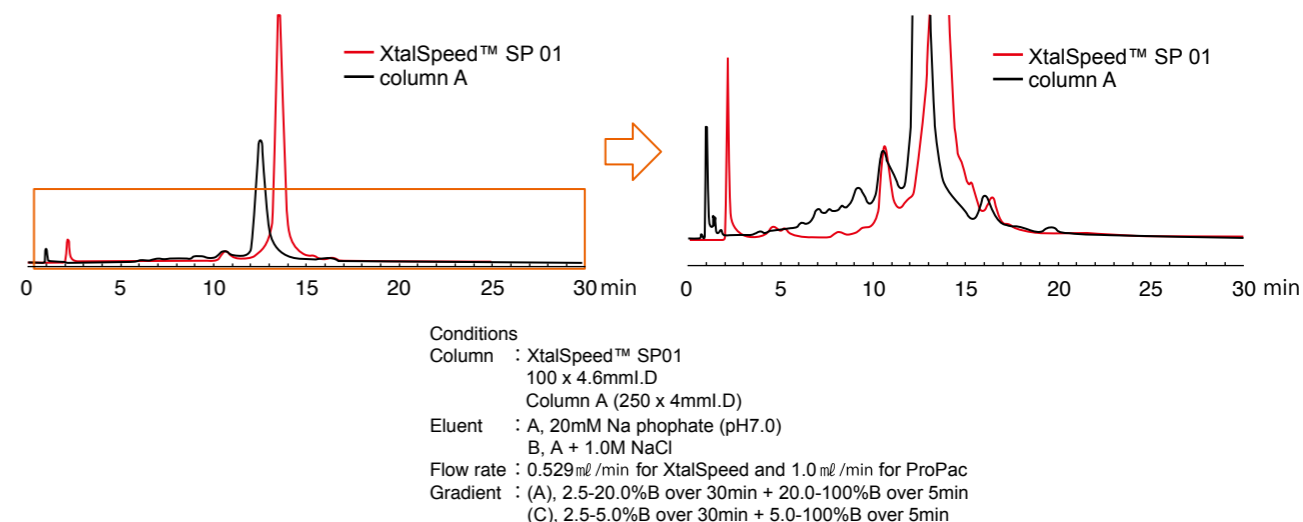


Fig. 4-2 Analysis of Hemoglobin A1C

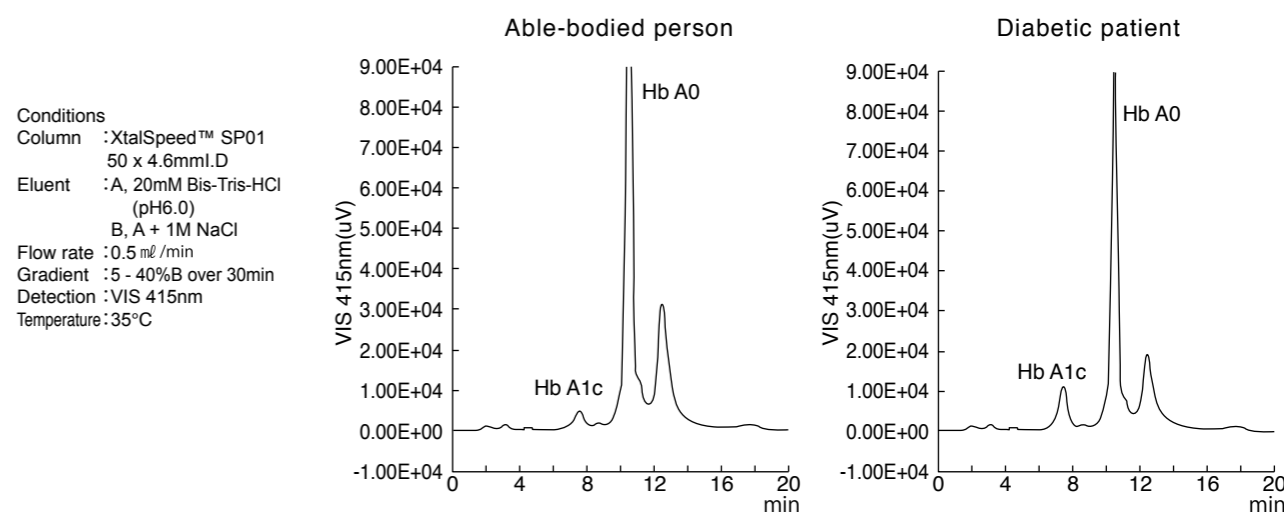
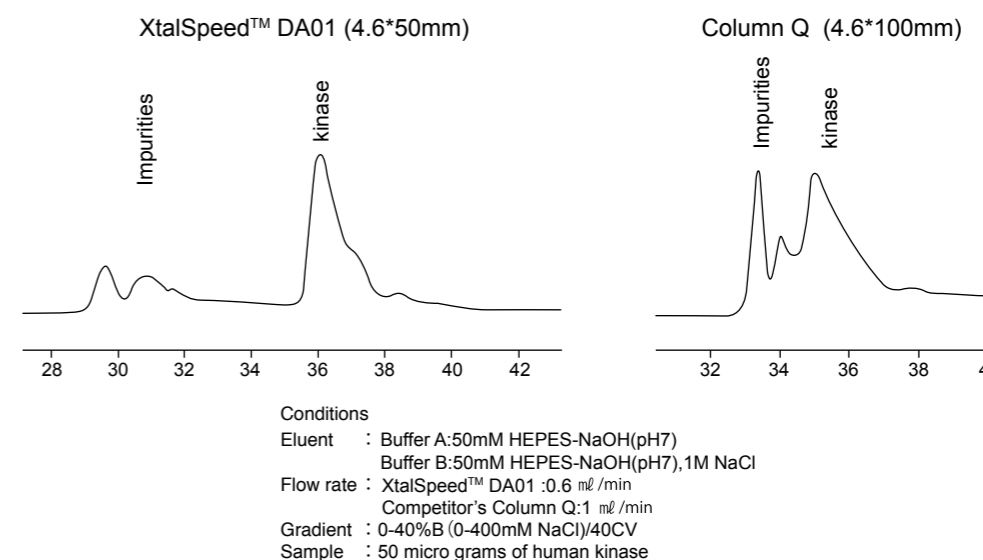


Fig. 4-3 Comparison of loadability



Size exclusion chromatography columns

Size exclusion chromatography is a liquid chromatographic technique which separates solute molecules according to their size in solution. The column is packed with porous particles and separation takes place as a result of the differential solute distribution outside and within the pores of the packing material. Solute molecules which are larger than the pores of the packing material will be excluded and therefore will elute first and have a lower retention time than the smaller one. The CQP series columns based on a hydrophilic polymer are designed for analysis of water soluble polymers such as oligosaccharides and PEG, etc.

Column list

●CQP series

MCI GEL™ column	USP	Column dimensions	Packing materials		Theoretical plates number [TP/column]	Exclusion limit [PEG]
			Particle size [μm]	Pore size [nm]		
MCI GEL™ CQP06	L25	7.5mm I.D. ×600mm	10	12	10000	~1×10 ³
MCI GEL™ CQP10	L38	7.5mm I.D. ×600mm	10	20	6000	~1×10 ⁴
MCI GEL™ CQP30	L37, L38	7.5mm I.D. ×600mm	10	60	6000	~1×10 ⁶

●Guard columns

MCI GEL™ column	Column dimensions
MCI GEL™ CQP06G	4.0mm I.D. ×50mm
MCI GEL™ CQP10G	4.0mm I.D. ×50mm
MCI GEL™ CQP30G	4.0mm I.D. ×50mm

Application data of CQP series

Fig. 4-4 Calibration curve

Conditions
 Column : MCI GEL™ CQP06
 MCI GEL™ CQP10
 MCI GEL™ CQP30
 7.5mm I.D. ×600mm
 Eluent : H₂O
 Flow rate : 1.0 ml/min
 Column temp. : ambient
 Detection : RI
 Sample : PEG 100μl inj.

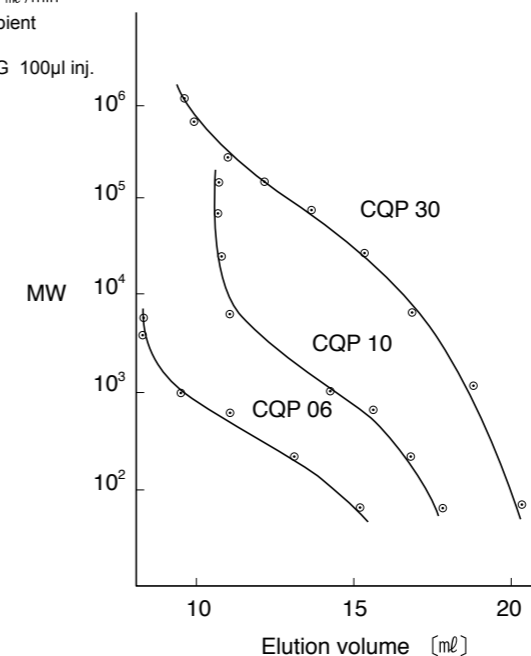


Fig. 4-5 Separation of PEG mixture

Conditions
 Column : MCI GEL™ CQP30 7.5mm I.D. ×600mm
 Eluent : H₂O
 Flow rate : 1.0 ml/min
 Column temp. : 25°C
 Detection : RI
 Sample : 1. PEG 145,000
 2. 40,000
 3. 6,000

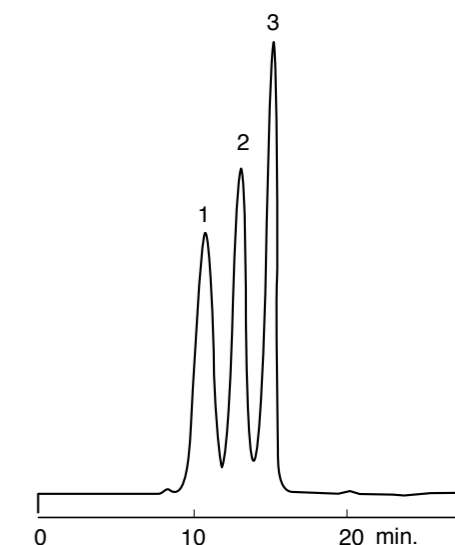


Fig. 4-6 Separation of protein mixture

Conditions
 Column : MCI GEL™ CQP30 7.5mm I.D. ×600mm
 Eluent : 14mM Tris-HClO₄ buffer
 Flow rate : 1.0 ml/min
 Column temp. : ambient
 Detection : 280nm
 Sample : 1. Ferritin (MW440,000)
 2. Ovalbumin (MW43,000)
 3. Myoglobin (MW17,500)
 4. Cytochrome c (MW12,400)

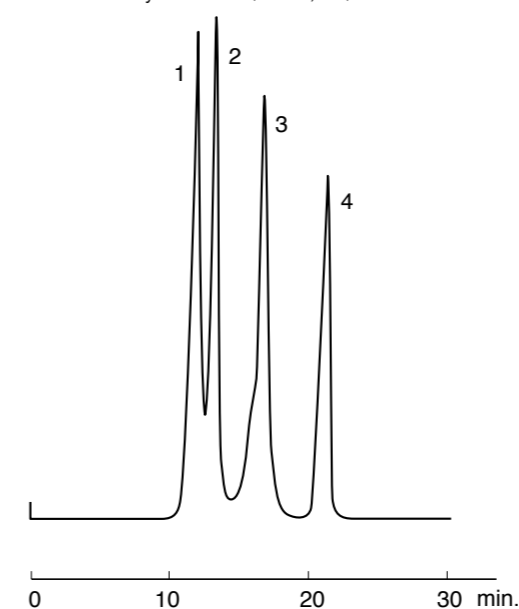
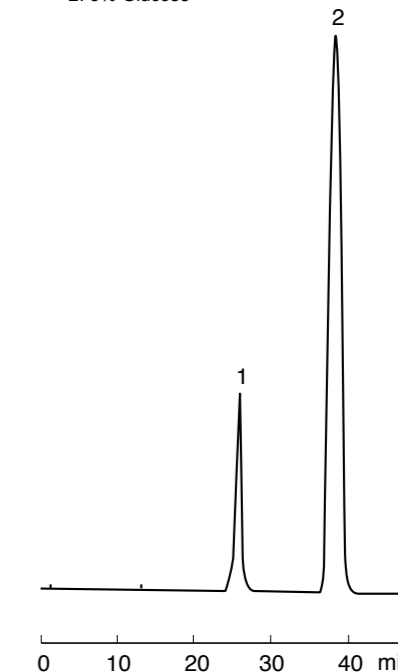


Fig. 4-7 Separation of gluconic acid and glucose

Conditions
 Column : MCI GEL™ CQP06 7.5mm I.D. ×600mm
 Eluent : H₂O
 Flow rate : 0.8 ml/min
 Column temp. : ambient
 Detection : RI
 Sample : 1. 5% Gluconic acid
 2. 5% Glucose



Analytical and preparative chromatography columns and materials for pharmaceutical applications

○Polymeric partition chromatography columns and materials MCI GEL™ CHP series

Separation mechanism of CHP series

High performance liquid chromatography relies on one of the following physical phenomena for efficient separation of solutes: partition, adsorption, size exclusion, or ion exchange. Of these, partition chromatography is the most commonly used method, and it separates solutes based on their difference in partitioning between a stationary phase and a mobile phase. This technique has currently become the mainstay in industry for the separation of organic compounds such as pharmaceuticals, agricultural chemicals, and other intermediates. Practically, partition chromatography can be performed in two different modes depending on the relative polarities of the stationary and mobile phases. In the normal phase (NP) mode, the mobile phase is less polar than the stationary phase while the situation is reversed in the reverse phase (RP) mode, where the mobile phase is significantly more polar than the stationary phase.

MCI GEL™ specializes in polymer-based packing materials. The use of polymer-based columns has become more widespread thanks to the many advantages of the polymer matrix like excellent selectivity, the absence of specific adsorption which is found commonly with silica-based packing, operability in a wide pH range and good chemical stability due to the inert nature of polymeric materials. The MCI GEL™ partition chromatography columns are based on a polystyrene and polymethacrylate porous polymer. As RP columns, they are applied to the separation of a wide variety of organic compounds, both in the isocratic and gradient elution mode. The compounds include peptides, insulin, small molecule APIs, nutraceutical compounds, water-soluble vitamins and nucleotides. As NP columns, they are used in the separation of various carotenoids, fat-soluble vitamins, steroids, and food additives. These columns tolerate various organic solvents like hexane, heptane, methylene chloride, and alcohols.

As NP columns, they are used in the separation of various carotenoids, fat-soluble vitamins, steroids, and food additives. Various organic solvents like Hexane Heptane, methylene chloride and alcohols can be used.

The MCI GEL™ packing materials are based on the same chemistries offered in the Diaion™ and Sepabeads™ synthetic adsorbent resins. These polymer chemistries, like Diaion™ HP series and Sepabeads™ SP series, are widely used and documented in the biopharmaceutical industry for fermentation extraction, the food industry and in industrial chromatographic separations. The MCI GEL™ packing materials are available as packed columns for analytical applications, and as bulk packing materials for analytical, preparative and production chromatography applications.

●Description of MCI GEL™ columns and materials

MCI GEL™ CHP20/C04

Matrix type

Particle size

C=Column
P=Material

CHP column series

Analytical and preparative chromatography columns and materials for pharmaceutical applications

MCI GEL™ CHP series are suitable for RP and NP chromatography. There are four kinds of columns of various hydrophobicities; porous polystyrene, modified porous polystyrene, polymethacrylate, and modified porous polymethacrylate. This range of packing materials offers tremendous scope for a proper selection of columns based on the properties of the target compounds.

Polystyrene packing: MCI GEL™ CHP20/C04, CHP20/C10

Modified polystyrene packing: MCI GEL™ CHP07/C04, CHP07/C10, CHK40/C04

Polymethacrylate packing: MCI GEL™ CMG20/C10

Modified polymethacrylate packing: MCI GEL™ CHPOD/C04, CHK45/C05

The hydrophobicities of the columns are in the following orders:

MCI GEL™ CHP07/C04, C10 > CHP20/C04, C10 > CHPOD/C04 ≥ ODS columns ≥ CMG20/C04, C10

Polymer columns for HPLC, with their superior chemical resistance, can be used with various mobile phases of broad pH range, acidic through alkaline. They have the following advantages due to their high hydrophobicities:

- 1) In reverse phase chromatographic methods to separate acidic or alkaline compounds, eluents that can suppress the ionic properties of such compounds are generally used. Polymer columns can be applied in these cases where ODS columns would be unsuitable.
- 2) Some extremely hydrophilic compounds, e.g., oligosaccharides, can be separated using strongly hydrophobic CHP07/C04 or CHP07/C10 columns.
- 3) Polymer columns can be washed with acidic and/or basic solutions in case of contamination.

Polymethacrylate columns, CMG20/C04 and CMG20/C10, can be applied both for reverse phase and normal phase chromatography.

Modified polystyrene packing, CHK40/C04, is a mixed-mode type material; both hydrophobic and hydrophilic interactions occur between the packing material surface and the analytes. This material is useful for compounds that are difficult to separate using existing ODS or other polymer-based columns. This column is also used in the normal phase mode and shows a unique separation profile.

All polymeric columns exhibit superior stability and yield in comparison to ODS columns, which may have free silanol groups even when end-capping agents have been used.

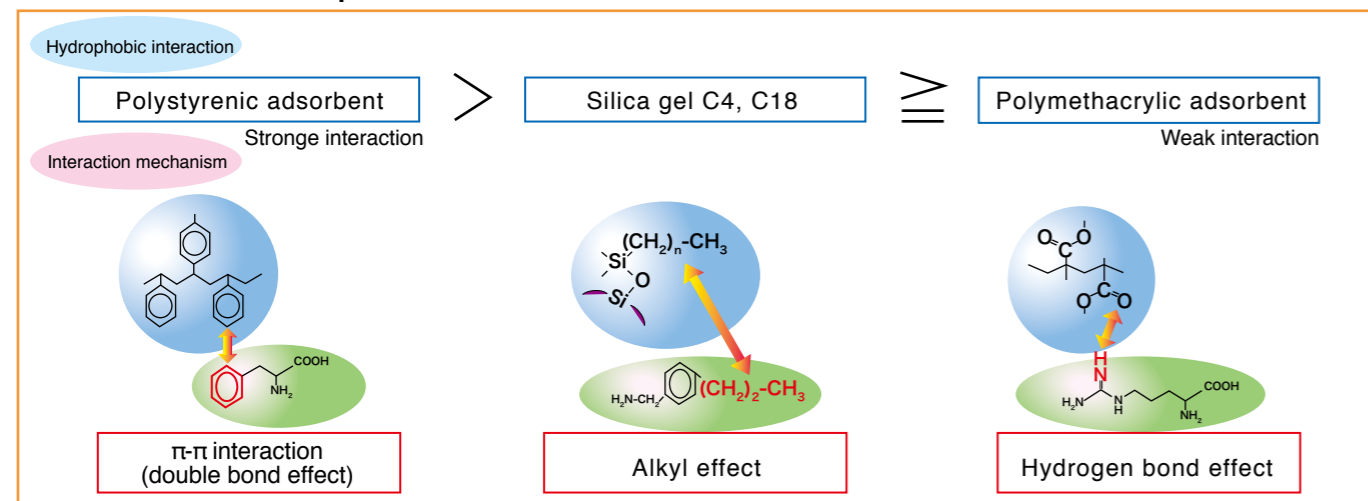
Column list

●CHP column series

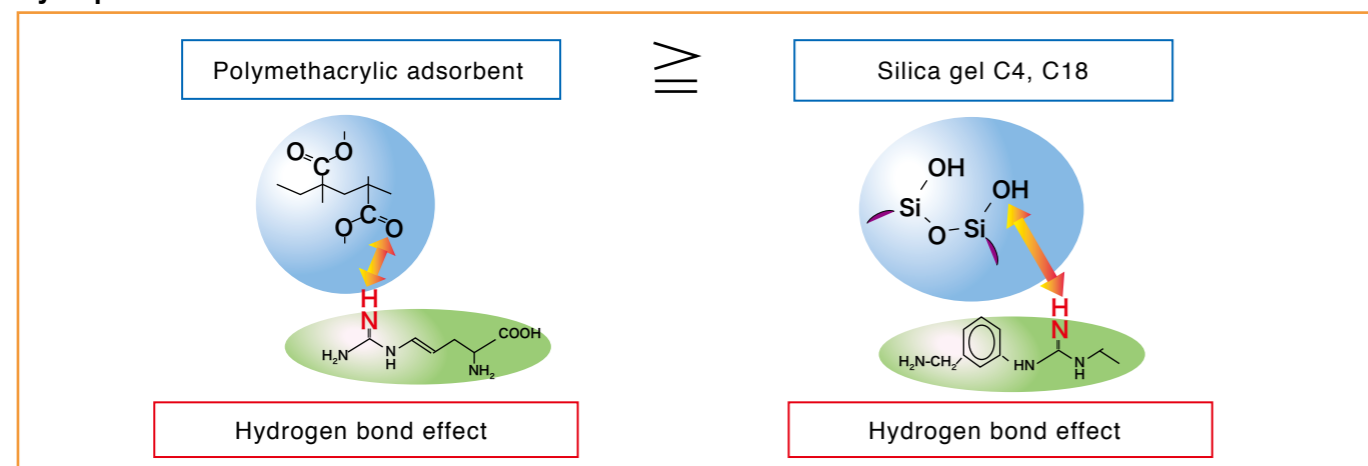
Matrix Type	Functional group	Product name	Particle size [μm]	Column size [mm I.D.×mm]	pH range	USP
Styrene Divinylbenzene	None	CHP20/C04	4	4.6×150 20×150	Full range	L21
		CHP20/C10	10	4.6×150 4.6×250 10×250 20×150 20×250		
	Br	CHP07/C04	4	4.6×150 20×200		
		CHP07/C10	10	4.6×150 4.6×250 10×150 20×150 20×250		
		Cation exchange group	CHK40/C04	4		4.6×150
	Methacrylates	None	CMG20/C04	4		4.6×150 20×150
CMG20/C10			10	4.6×150 4.6×250 10×250 20×150 20×250		
C18		CHPOD/C04	4	4.6×150 20×200		
Weak cation exchange group		CHK45/C05	5	4.6×150		

*CHP20/C04, CHP20/C10: USP classification is L21

Retentiveness in reverse phase mode



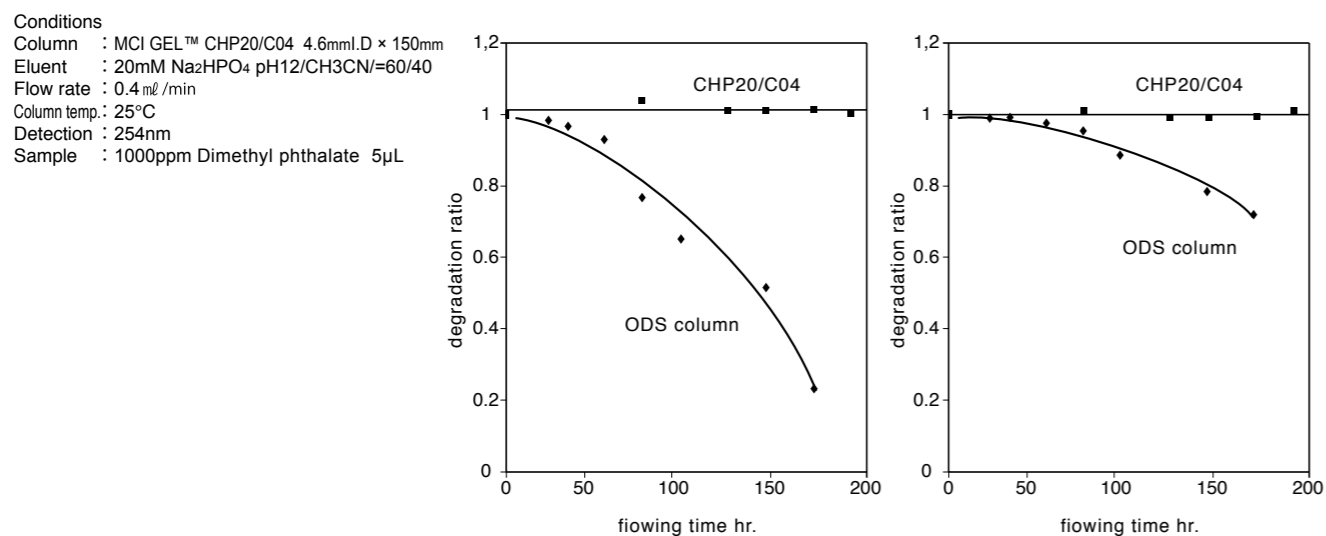
Hydrophobic interaction Interaction mechanism



Durability of polymeric column

The polymeric RP columns are chemically stable. Specifically, the columns have resistance to an alkaline eluent. The following graphs demonstrate stability of the polymeric columns. After feeding a solution of pH 12 into the MCI GEL™ CHP20/C04, there is no change of column performance.

Fig. 5-1 Column durability at pH12 comparison between CHP20/C04 and an ODS column



Application data of CHP series

Fig. 5-2 Separation of catecholamines

Conditions
 Column : MCI GEL™ CHP20/C04
 4.6mm I.D. x 150mm
 Eluent : 50mM Na-phosphate pH2.0,
 1.5% Hexanesulfonic acid /
 CH₃CN=80/20
 Flow rate : 0.25 ml/min
 Column temp.: ambient
 Detection : 280nm
 Sample : 1. Epinephrine
 2. Dopamine
 3. 5-Hydroxy tryptophan
 4. Serotonin
 5. Tryptophan

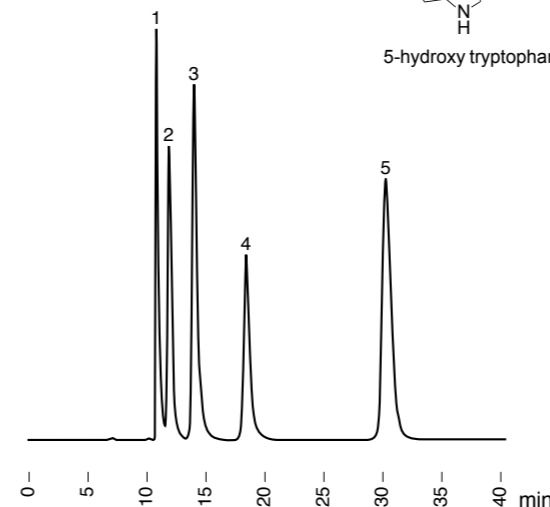
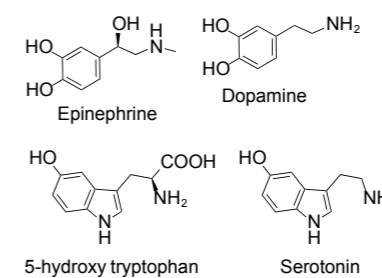


Fig. 5-3 Separation of phthalic acid esters

Conditions
 Column : MCI GEL™ CHP20/C04
 4.6mm I.D. x 150mm
 Eluent : H₂O/CH₃CN=50/50
 Flow rate : 0.75 ml/min
 Column temp.: 60°C
 Detection : 254nm
 Sample : 1. Dimethyl phthalate
 2. Diethyl phthalate
 3. Dipropyl phthalate

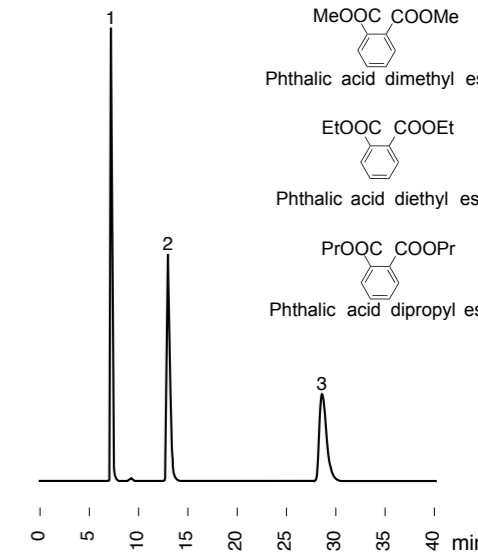
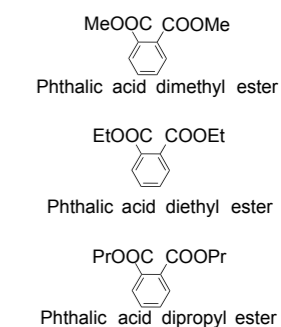


Fig. 5-4 Purine alkaloids

Conditions
 Column : MCI GEL™ CHP20/C04
 4.6mm I.D. x 150mm
 Eluent : H₂O/CH₃CN=10/90
 Flow rate : 0.4 ml/min
 Column temp.: 25°C
 Detection : 275nm
 Sample : 1. Theophylline
 2. Theobromine
 3. Caffeine

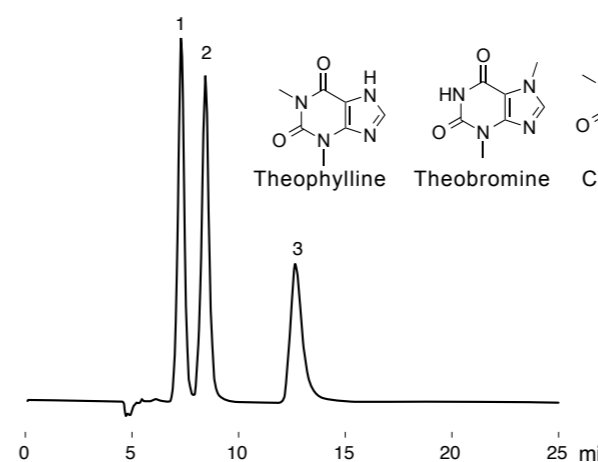
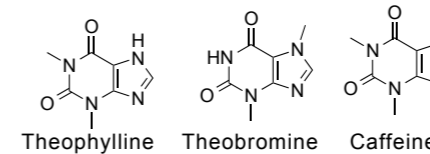
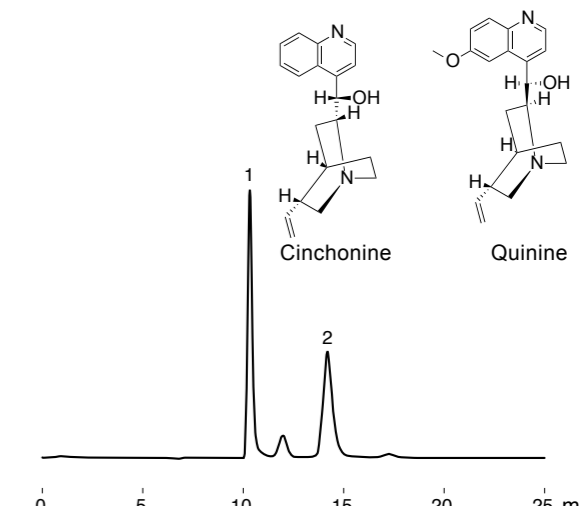
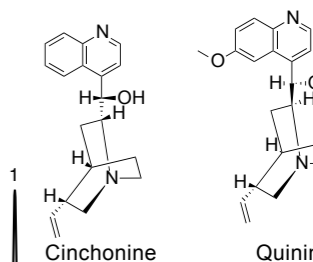


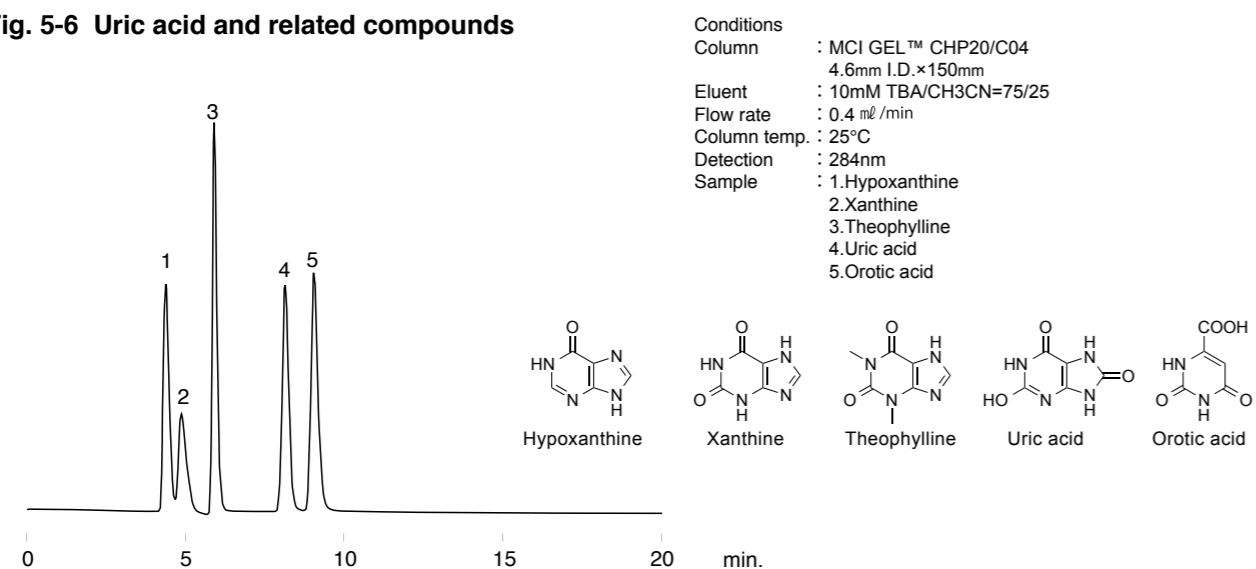
Fig. 5-5 Cinchona alkaloids

Conditions
 Column : MCI GEL™ CHP20/C04
 4.6mm I.D. x 150mm
 Eluent : 0.1M NaH₂PO₄ pH2.0
 CH₃CN=88/12
 Flow rate : 0.3 ml/min
 Column temp.: 25°C
 Detection : 275nm
 Sample : 1. Cinchonine
 2. Quinine



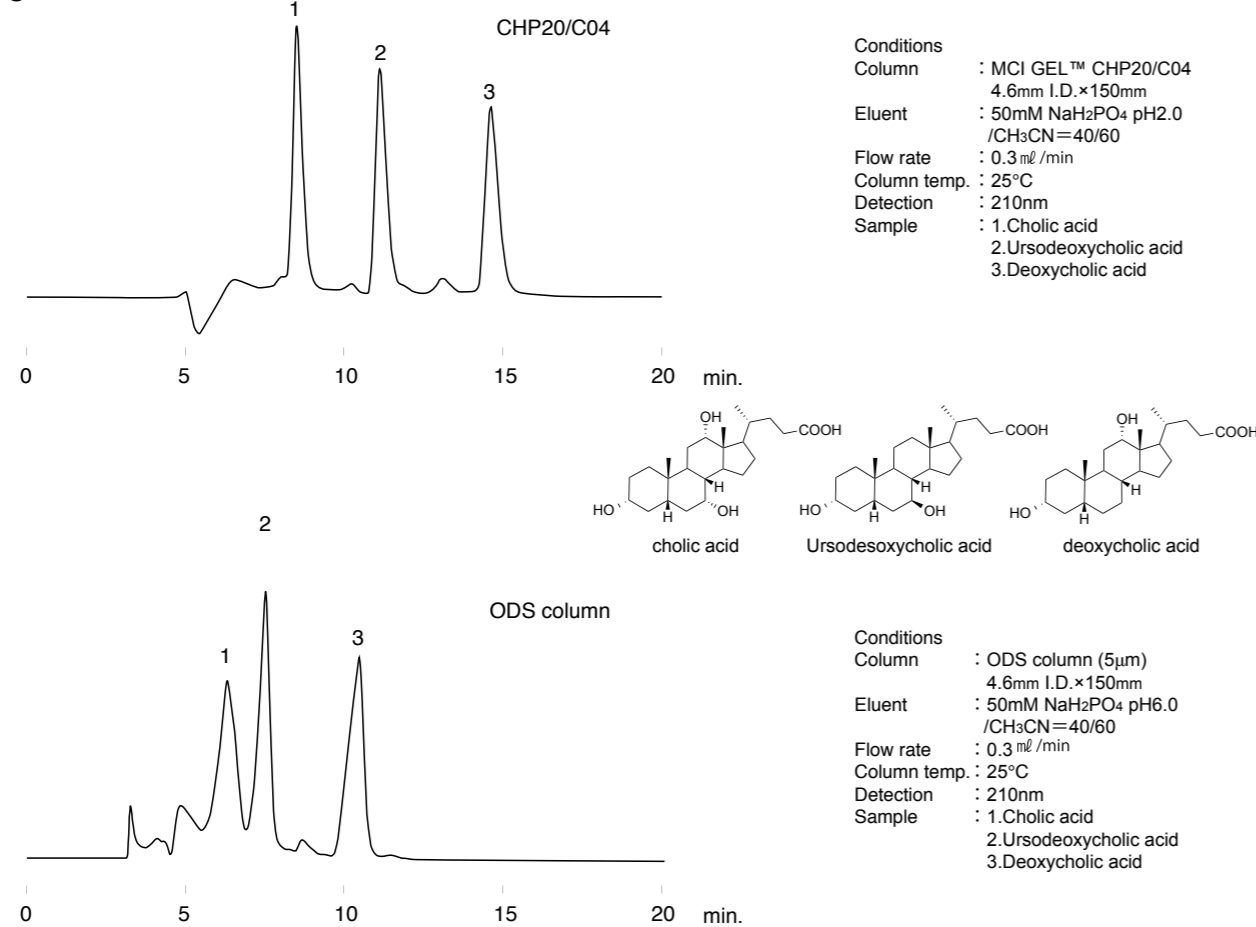
Application data of CHP series

Fig. 5-6 Uric acid and related compounds



Comparison with an ODS column

Fig. 5-7 Bile acids



Application data of CHP series

Fig. 5-8 Glycyrrhizae radix

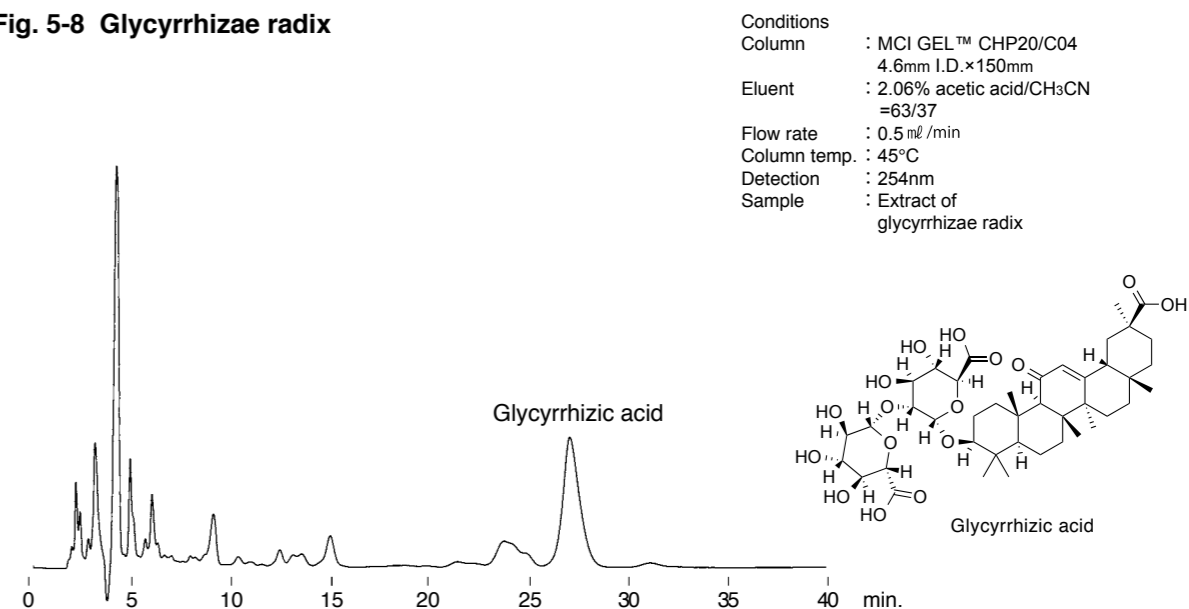
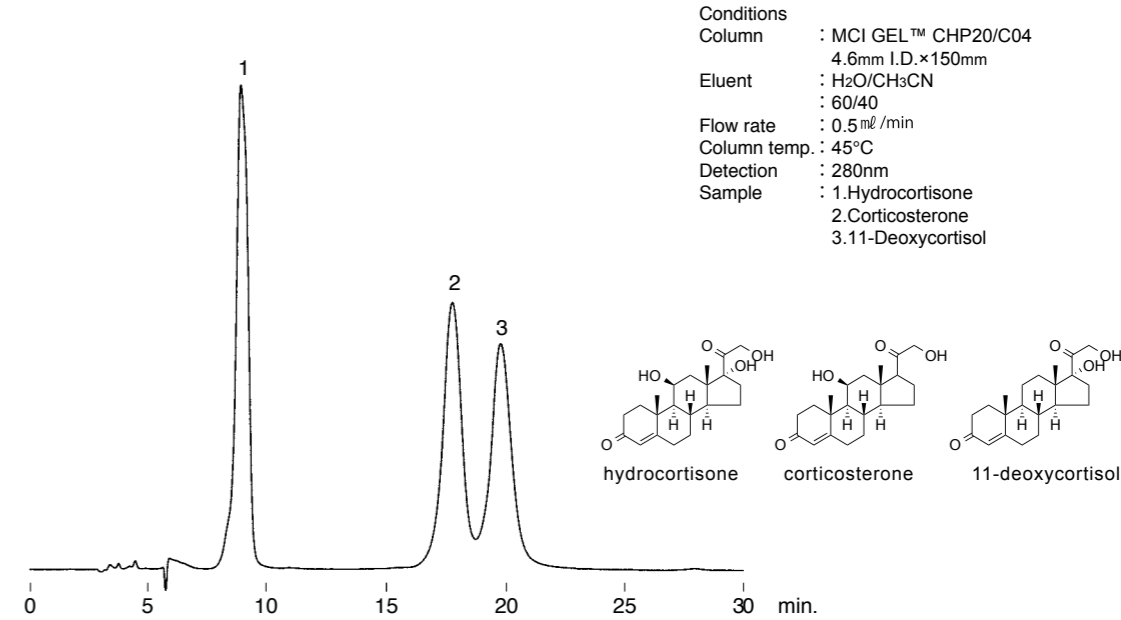
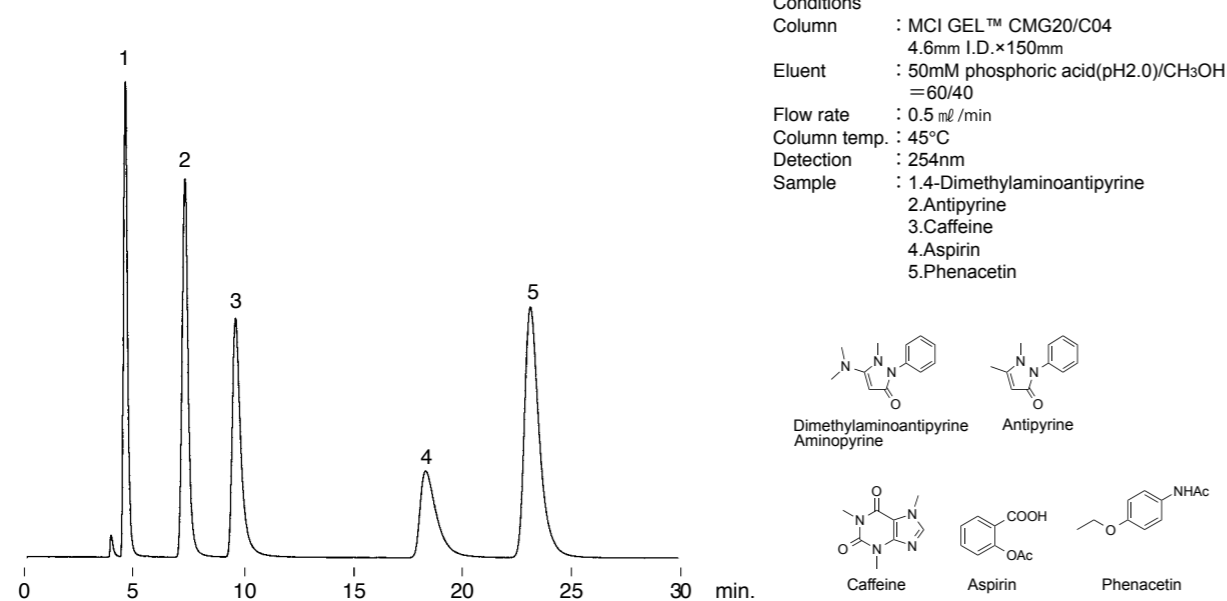


Fig. 5-9 Adrenal cortex hormones



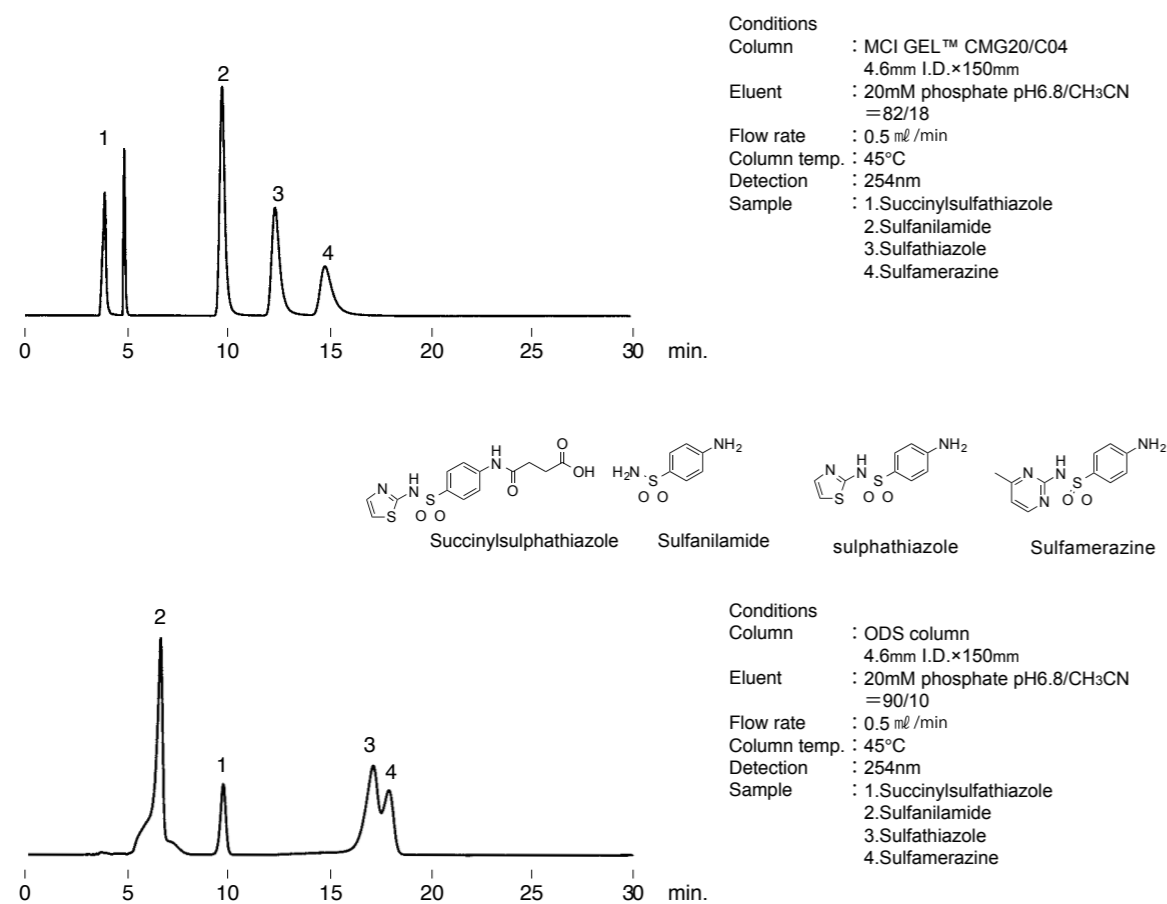
Application data of CHP series

Fig. 5-10 Ingredients of medicine



Comparison with an ODS column

Fig. 5-11 Sulfa drugs



Application data of CHP series

Fig. 5-12 Peptides

Conditions
 Column : MCI GEL™ CMG20/C04
 4.6mm I.D.×150mm
 Eluent : 0.1%TFA/CH₃CN
 =70/30
 Flow rate : 0.5 ml /min
 Column temp. : 25°C
 Detection : 220nm
 Sample : 1.Gly-Tyr
 2.Met Enkephalin
 3.Leu Enkephalin
 4.Angiotensin II

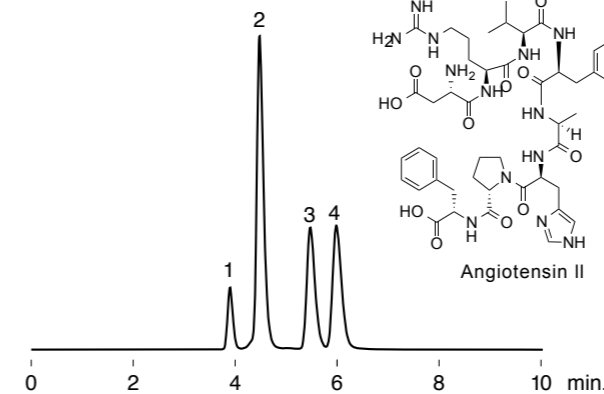
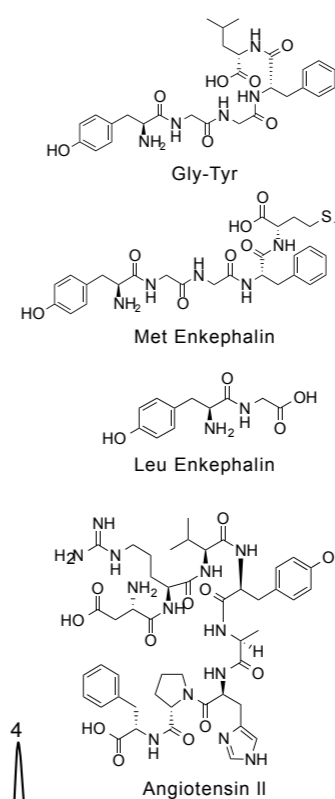


Fig. 5-13 Proteins

Conditions
 Column : MCI GEL™ CMG20/C04
 4.6mm I.D.×150mm
 Eluent : A;0.05%TFA/CH₃CN
 =80/20
 B;0.05%TFA/CH₃CN
 =20/80
 A→B 30min.linear
 Flow rate : 0.5 ml /min
 Column temp. : 25°C
 Detection : 280nm
 Sample : 1.Ribonuclease A
 2.Cytochrome c
 3.α-Chymotrypsinogen A

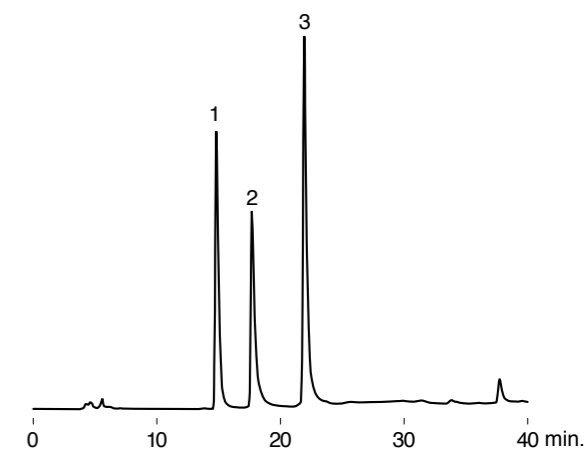


Fig. 5-14 Procainamide, Procaine

Conditions
 Column : MCI GEL™ CMG20/C04
 4.6mm I.D.×150mm
 Eluent : 20mM phosphate pH7.2/CH₃CN
 =65/35
 Flow rate : 0.5 ml /min
 Column temp. : 45°C
 Detection : 254nm
 Sample : 1.Procainamide
 2.Procaine

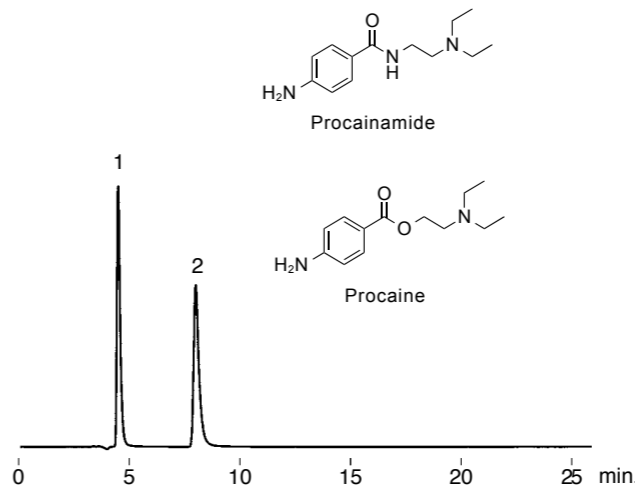
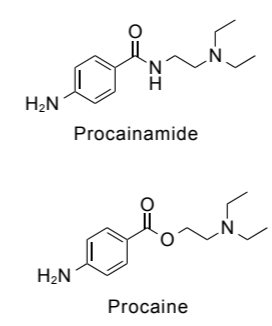
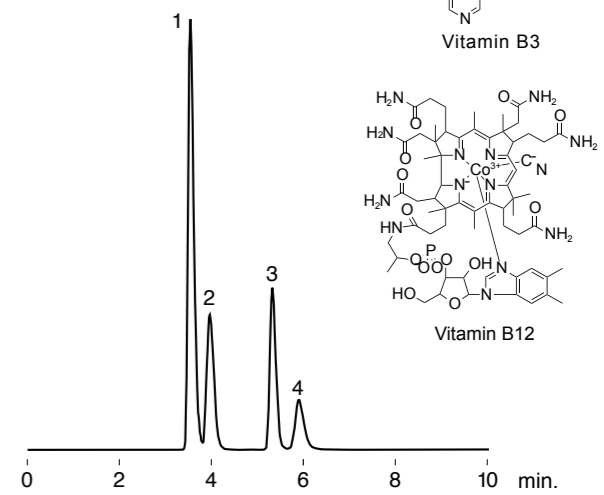
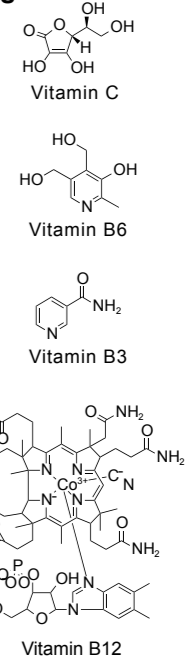


Fig. 5-15 Water-soluble vitamins

Conditions
 Column : MCI GEL™ CMG20/C04
 4.6mm I.D.×150mm
 Eluent : 8mM Na₂HPO₄ pH7.0/CH₃CN
 =85/15
 Flow rate : 0.5 ml /min
 Column temp. : 25°C
 Detection : 254nm
 Sample : 1.Vitamin C
 2.Vitamin B6
 3.Vitamin B3
 4.Vitamin B12



Application data of CHP series

Fig. 5-16 Pravastatin sodium

Conditions
 Column : MCI GEL™ CHP20/C10 (10µm 250 ×4.6mm I.D.) and ODS (10µm 250 ×4.6mm I.D.)
 Eluent : A :0.1% Formic acid; B :0.1% Formic acid in AcCN;
 Gradient : 45%B-95%B over 29min.
 Flow rate : 1.00 ml/min
 Column temp.: 25°C
 Detection : UV238nm
 Sample : Pravastatin sodium, Mevastatin and Simvastatin, 1mg/ml each;
 Injection : 5µl

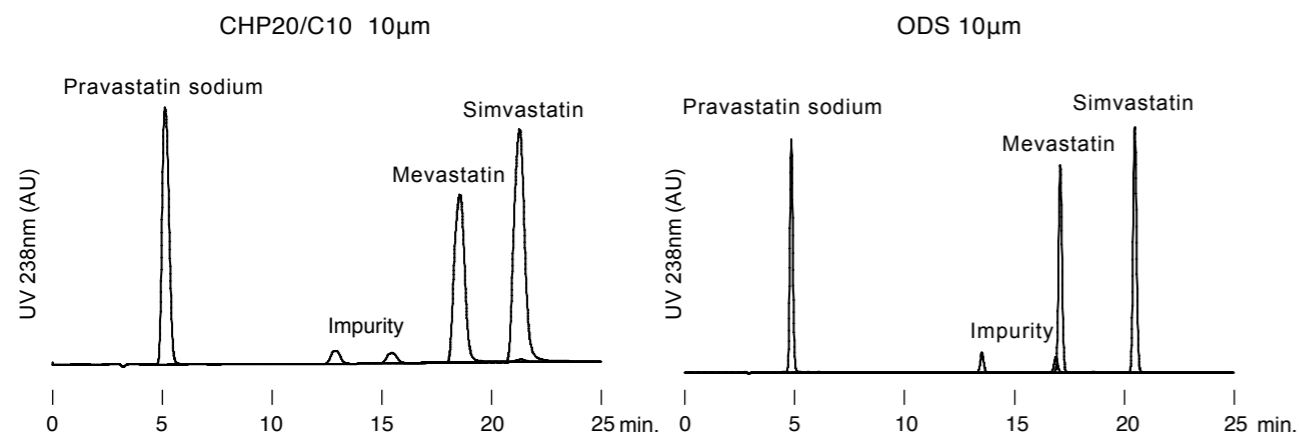
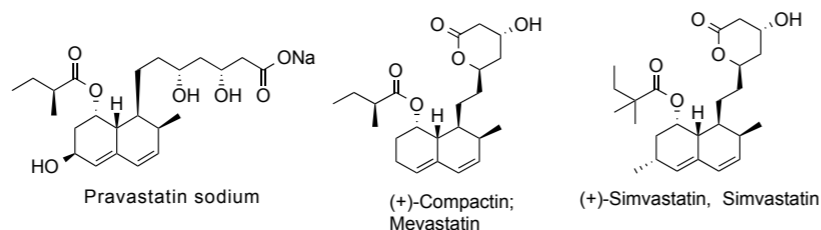
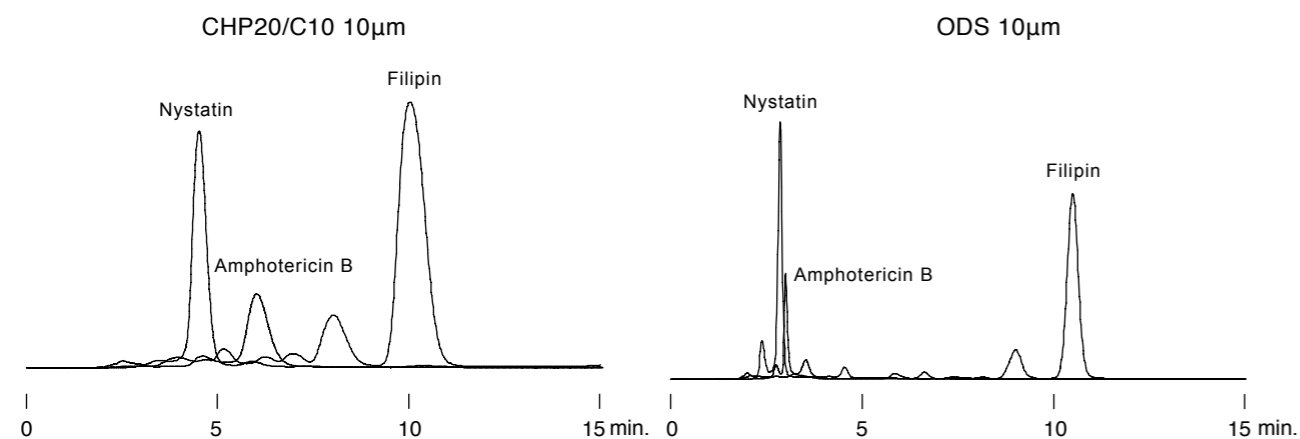
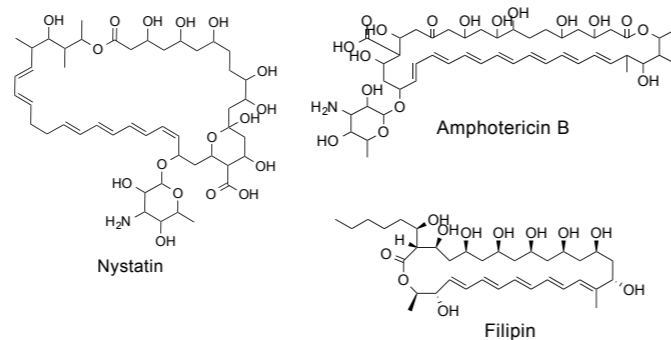


Fig. 5-17 Polyene antibiotics

Conditions
 Column : MCI GEL™ CHP20/C10 (10µm 250 ×4.6mm I.D.) and ODS (10µm 250 ×4.6mm I.D.)
 Eluent : A :0.1% Formic acid; B :0.1% Formic acid in AcCN; A/B=60/40;
 Flow rate : 1.00 ml/min
 Column temp.: 25°C
 Detection : UV305nm for Nystatin, VIS405nm for Amphotericin B and UV340nm for Filipin;
 Sample : Pravastatin sodium, Mevastatin and Simvastatin, 1mg/ml each;
 Injection : 10µl



Application data of CHP series

Fig. 5-18 Proteins

Conditions
 Column : MCI GEL™ CMG20/C10 (4.6mm I.D.×250mm)
 Eluent : A 0.05% TFA/CH₃CN=80/20 B 0.05% TFA/CH₃CN=30/70 A → B 45min linear gradient
 Flow rate : 0.5 ml/min
 Column temp.: 25°C
 Detection : 280nm
 Sample : 1. Ribonuclease A
 2. Cytochrome C
 3. Transferrin
 4. α-Chymotrypsinogen A
 5. β-Lactoglobulin

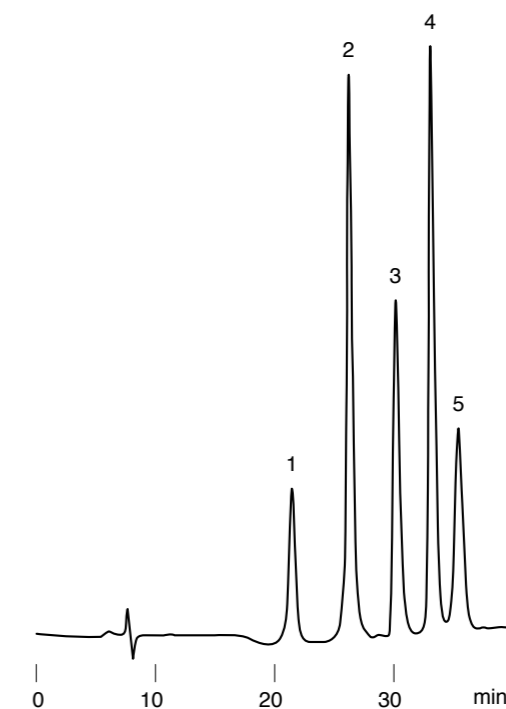
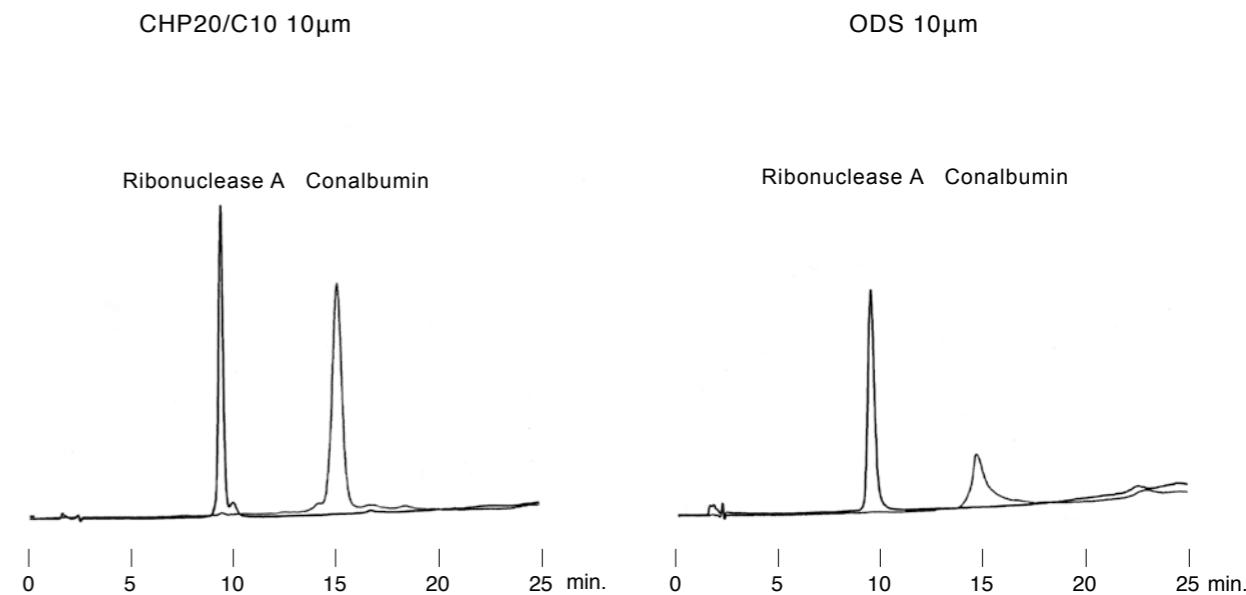


Fig. 5-19 Proteins



Conditions
 Column : 150 ×4.6mm I.D.
 Eluent : A :0.1% TFA; B :0.1% TFA in AcCN
 Flow rate : 1.00 ml/min
 Column temp.: 20%B-60%B over 20min;
 Detection : UV280nm;
 Sample : Ribonuclease A and Conalbumin 2mg/ml;
 Injection : 10µl

Application data of CHP series

Fig. 5-20 Insulin

Conditions
 Column : MCI GEL™ CHP20/C10
 MCI GEL™ CMG20/C10
 ODS 10 μ m
 4.6mm I.D.×150mm
 Eluent : A) 0.1%TFA, H₂O
 B) 0.1%TFA, CH₃OH
 Gradient : 20%B→60%B over 20min.
 Flow rate : 1.0 ml/min
 Column temp. : 40°C
 Detection : 280nm
 Sample : Insulin Glargine and human recombinant , 1mg/ml each
 Injection : 10 μ l

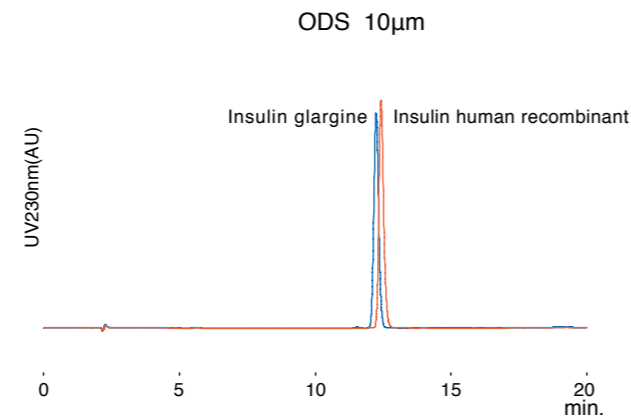
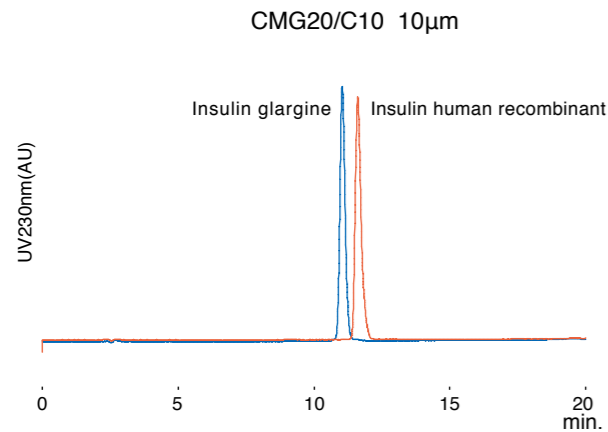
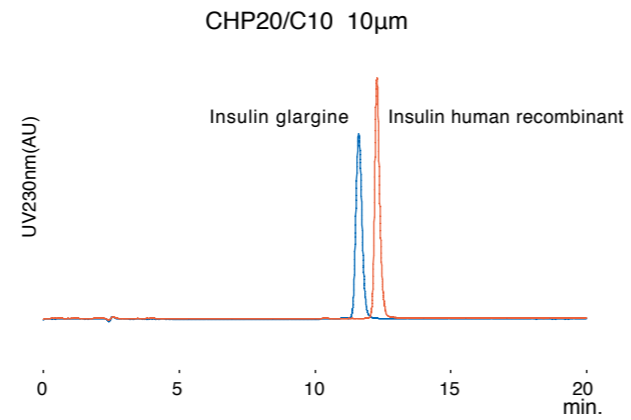
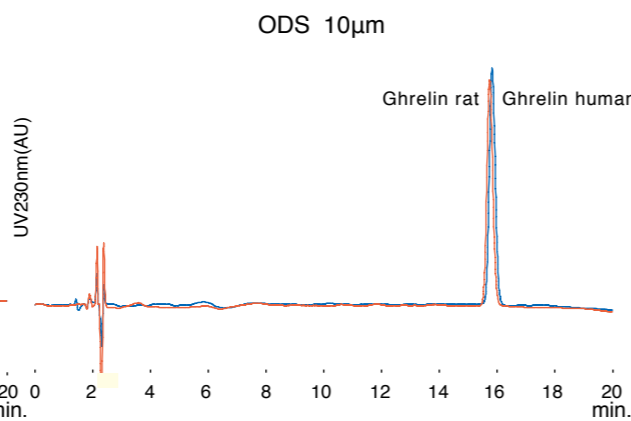
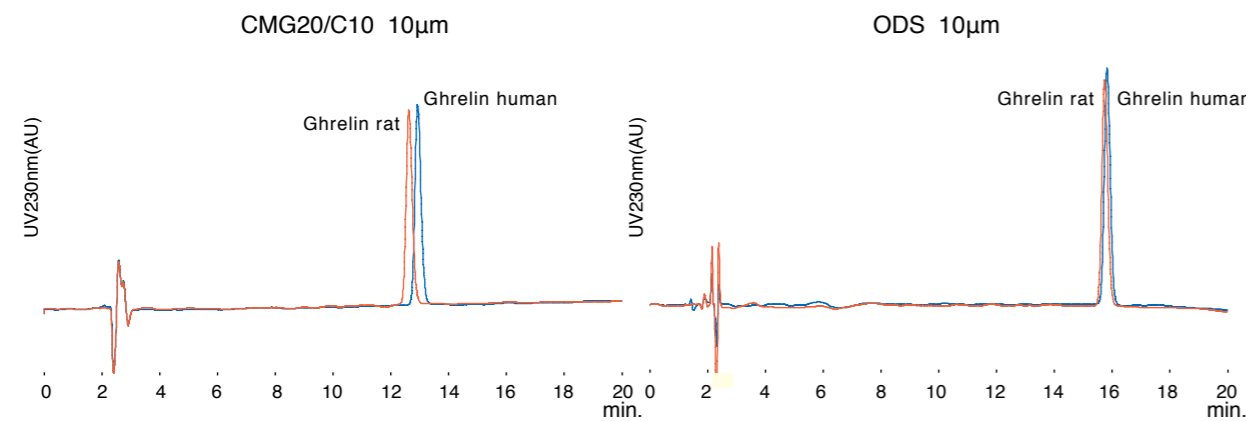


Fig. 5-21 Ghrelin

Conditions
 Column : MCI GEL™ CMG20/C10
 ODS 10 μ m
 4.6mm I.D.×150mm
 Eluent : A) 0.1%TFA, H₂O
 B) 0.1%TFA, AcCN
 Gradient : 10%B→60%B over 25min.
 Flow rate : 1.0 ml/min
 Column temp. : 40°C
 Detection : 230nm
 Sample : Ghrelin rat and Ghrelin human ,0.1mmol/l each
 Injection : 10 μ l



Application data of CHP series

Fig. 5-22 Leuprorelin

Conditions
 Column : MCI GEL™ CHP20/C10
 MCI GEL™ CMG20/C10
 ODS 10 μ m
 4.6mm I.D.×150mm
 Eluent : A) 0.1%TFA, H₂O
 B) 0.1%TFA, AcCN
 Gradient : 20%B→60%B over 20min.
 Flow rate : 1.0 ml/min
 Column temp. : 40°C
 Detection : 280nm
 Sample : Leuprorelin, LHRH human, LHRH salmon and Buserelin , 1mg/ml each
 Injection : 10 μ l

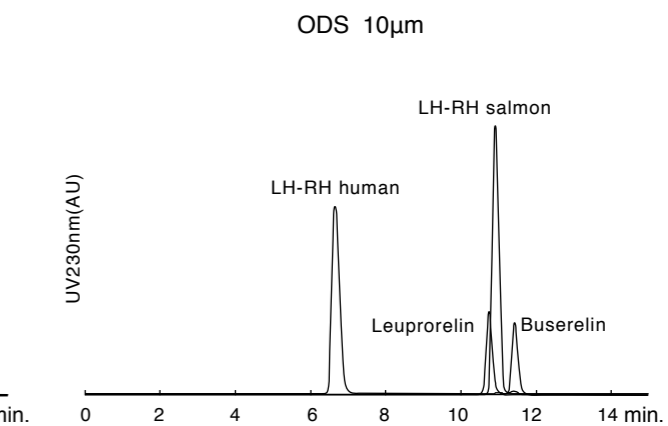
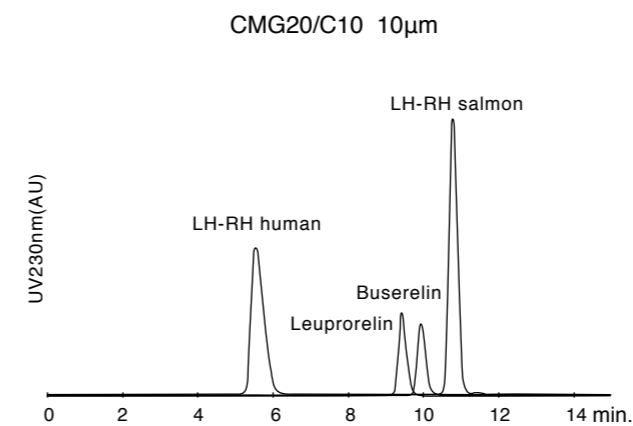
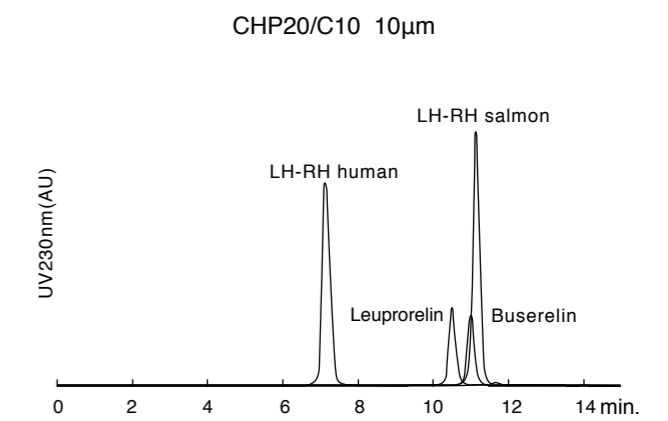
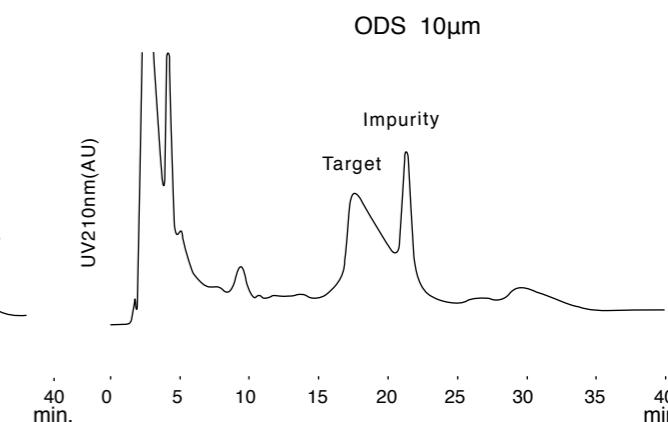
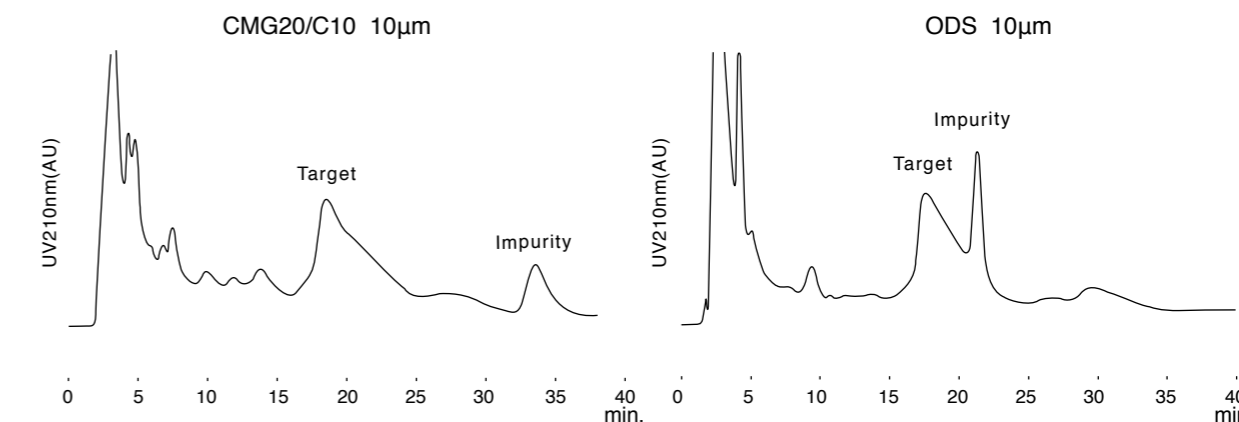


Fig. 5-23 Sifuvirtide

Conditions
 Column : MCI GEL™ CMG20/C10
 ODS 10 μ m
 4.6mm I.D.×150mm
 Eluent : 0.1%TFA, CH₃CN=68/32
 Flow rate : 1.0 ml/min
 Column temp. : 40°C
 Detection : 210nm
 Sample : Sifuvirtide crude(purity 35.5%) 2.1mg/ml
 Injection : 0.4ml



Column selection guide
 1 Ion exchange columns and materials
 2 Ion chromatography columns and materials
 3 Bioprocession columns and materials
 4 Analytical and preparative chromatography columns and materials for pharmaceutical applications
 5 Chiral separation columns
 6 SFE sorbent series
 7 MCI GEL™ column list
 8 MCI GEL™ material list
 9 Compounds index
 10

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 8 MCI GEL™ material list
 9 Compounds index
 10

Application data of CHP series

Fig. 5-24 ssRNA Ladder Marker

Conditions
 Column : MCI GEL™ CMG20/C10
 ODS 10 μ m
 4.6mm I.D.×150mm
 Eluent : A)100mM TEAA, H₂O
 B)100mM TEAA, CH₃CN
 Gradient : CHP10/C10 10%B→40%B over 30min
 ODS 10 μ m 8%B→40%B over 30min
 Flow rate : 1.0 ml /min
 Column temp. : 40°C
 Detection : 260nm
 Sample : 14-30 ssRNA Ladder Marker [max.0.04mg/ml]
 Injection : 5 μ l

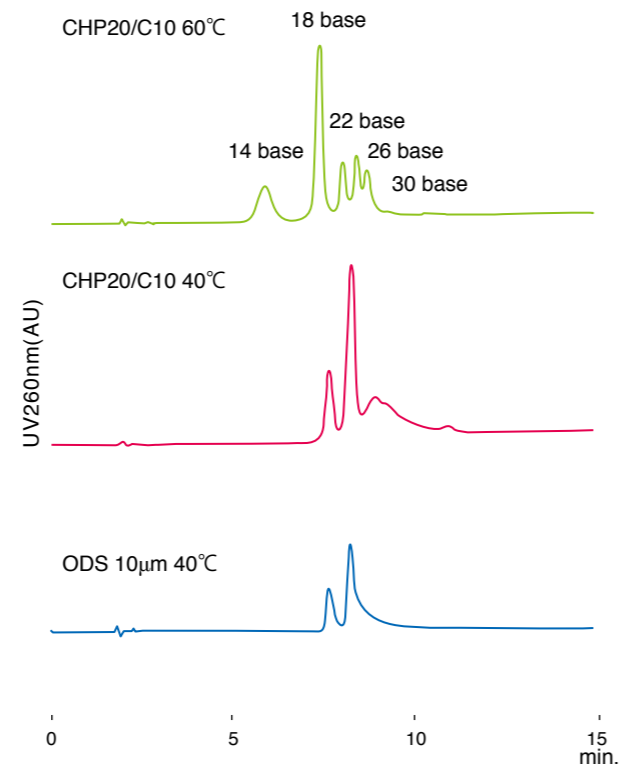
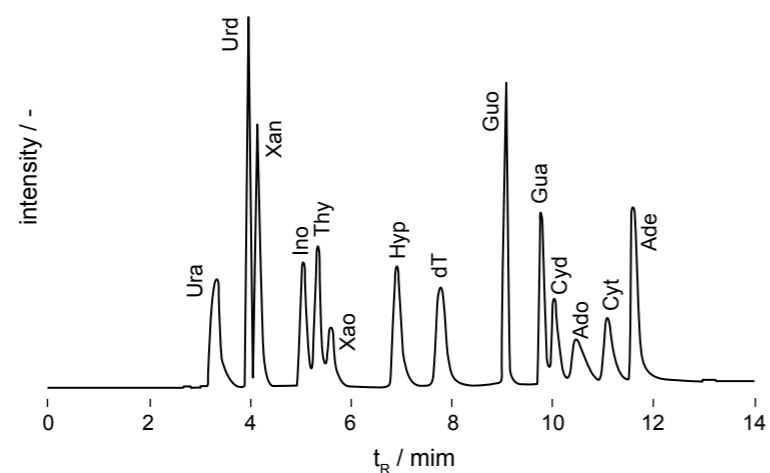


Fig. 5-25 Nucleotide

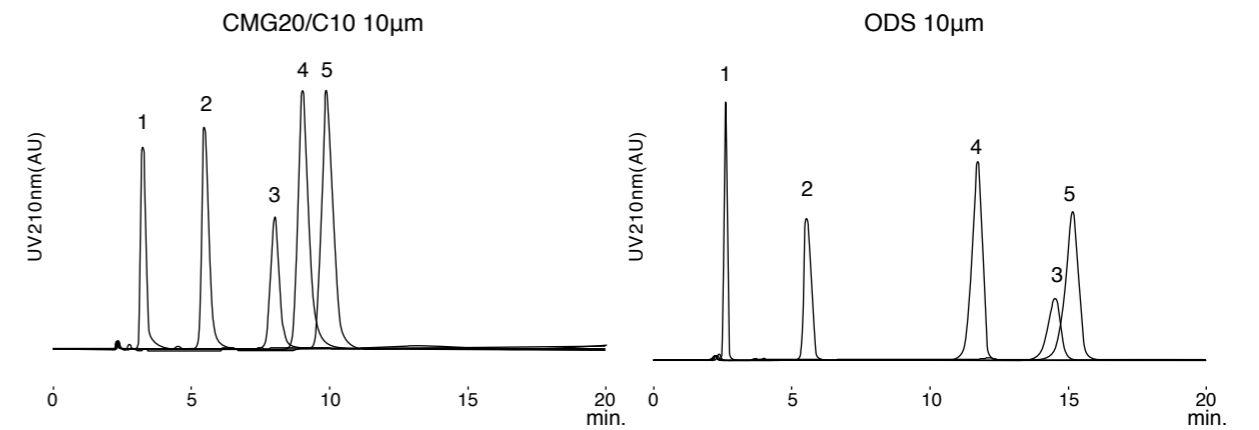
Conditions
 Column : MCI GEL™ CHK40/C04
 4.6mm I.D.×150mm
 Eluent : A)19 mM H₂PO₄ / 1 mM NaH₂PO₄ / 5.0% ACN
 B)20 mM Na₂HPO₄ / 100 mM NaClO₄ / 30% ACN
 Gradient : 0-4.0min 0%B 4.0-5.0min 0→30%B 5.0min-6.0min 30%B 6.0min-7.0min 30→50%B
 7.0min-10.0min 50→65%B 10.0min-11.0min 65%B 11.0min- 0%B
 Flow rate : 0.8 ml /min
 Column temp. : 50°C
 Detection : UV260nm
 Sample : 1.Ura, 2.Xan, 3.Thy, 4.Hyp, 5.Gua, 6.Cyt, 7.Ade, 8.Urd, 9.Xao, 10.dT, 11.Ino, 12.Guo, 13.Cyd, 14.Ado
 Injection : 20 μ l



(Data provided by Professor Yokoyama of Yokohama National University)

Application data of CHP series

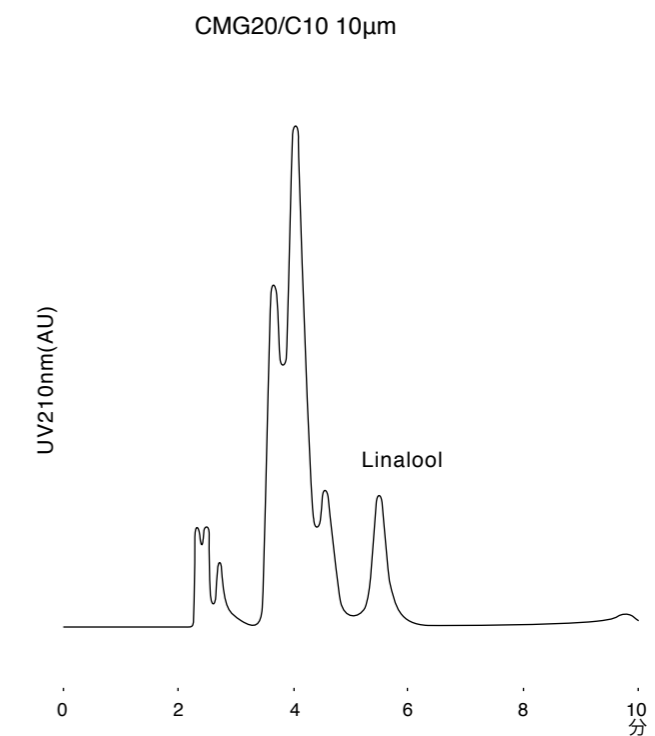
Fig. 5-26 Linalool



Conditions
 Column : MCI GEL™ CMG20/C10
 ODS 10 μ m
 4.6mm I.D.×150mm
 Eluent : Hexan/Ethanol=99.5/0.5
 Flow rate : 1.0 ml /min
 Column temp. : 40°C
 Detection : 210nm
 Sample : 1:Linalyl Acrylate 1mg/ml
 2:Linalool 1mg/ml
 3: β -Citronellol 1mg/ml
 4:Nerol 0.5mg/ml
 5:Geraniol 0.5mg/ml
 Injection : 10 μ l

Fig. 5-27 Coriander

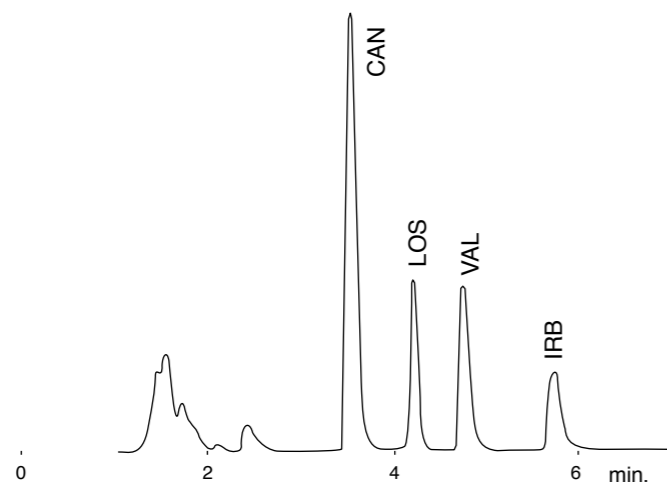
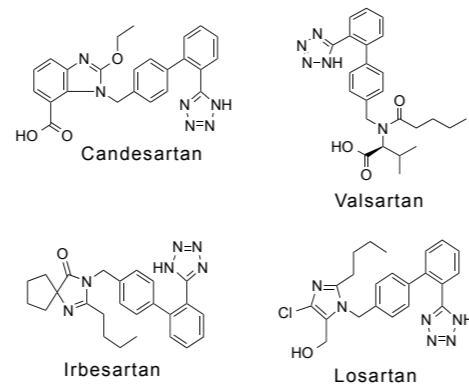
Conditions
 Column : MCI GEL™ CMG20/C10
 4.6mm I.D.×150mm
 Eluent : Hexan/Ethanol=99.5/0.5
 Flow rate : 1.0 ml /min
 Column temp. : 40°C
 Detection : 210nm
 Sample : Coriander
 Injection : 10 μ l



Application data of CHP series

Fig. 5-28 Application data of CHK40/C04: Separation of Sartans

Conditions
 Column : MCI GEL™ CHK40/C04
 4.6mm I.D.×150mm
 Eluent : A) 10 mM NaH₂PO₄ +0.2 mM Na₂HPO₄ (25%ACN)
 B) 10 mM NaH₂PO₄ +1.0 mM Na₂HPO₄ (40%ACN)
 Gradient : 0.5min 0%B 0.5-2.0min 50%B
 2.0min- 90%B
 Flow rate : 1.0 mL/min
 Column temp.: 50°C
 Detection : UV
 Sample : Candesaratan(CAN), Losartan(LOS),
 Valsartan(VAL), Irbesartan(IRB)
 Injection : 20μL



(Data provided by Professor Yokoyama of Yokohama National University)

(Polyphenon 60)

Fig. 5-29 Modified Styrene Divinylbenzene CHP07/C04

Conditions
 Column : MCI GEL™ CHP07/C04
 4.6mm I.D.×150mm
 Eluent : CH₃OH/10mM-Acetic acid=60/40
 Flow rate : 0.46 mL/min
 Column temp.: 60°C
 Detection : 280nm
 Sample : Polyphenon 60(10mg/mL) each 10μL

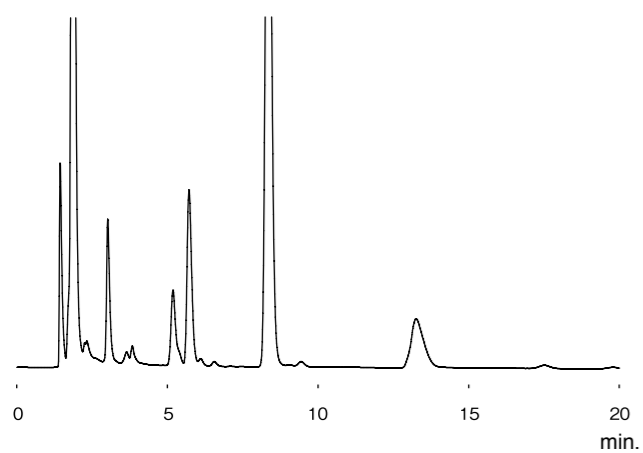
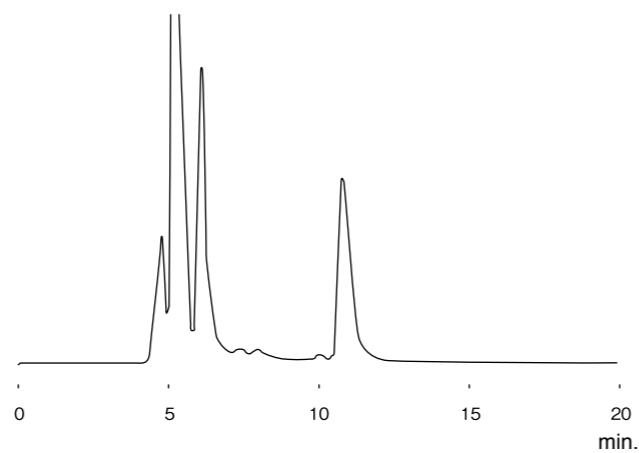


Fig. 5-30 Styrene Divinylbenzene CHP20/C04

Conditions
 Column : MCI GEL™ CHP20/C04
 4.6mm I.D.×150mm
 Eluent : CH₃OH/10mM-Acetic acid=60/40
 Flow rate : 0.46 mL/min
 Column temp.: 60°C
 Detection : 280nm
 Sample : Polyphenon 60(10mg/mL) each 10μL



Application data of CHP series

(TritonX-100)

Fig. 5-31 C18-alkylated aliphatics CHPOD/C04

Conditions
 Column : MCI GEL™ CHPOD/C04
 4.6mm I.D.×150mm
 Eluent : 50vol%CH₃CN
 Flow rate : 0.50 mL/min
 Column temp.: 40°C
 Detection : 254nm
 Sample : Triton X-100
 (Polyoxyethylene octyl phenyl ether)
 1% each 10μL

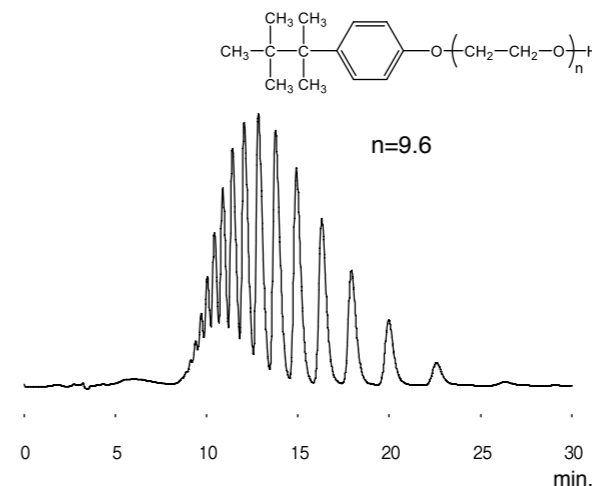


Fig. 5-32 ODS-1HU (ODS)

Conditions
 Column : MCI GEL™ ODS-1HU
 4.6mm I.D.×250mm
 Eluent : 50vol%CH₃CN
 Flow rate : 1.00 mL/min
 Column temp.: 40°C
 Detection : 254nm
 Sample : Triton X-100
 (Polyoxyethylene octyl phenyl ether)
 1% each 10μL

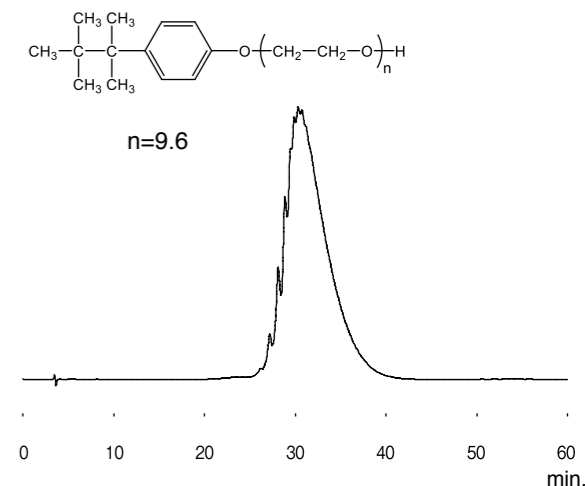
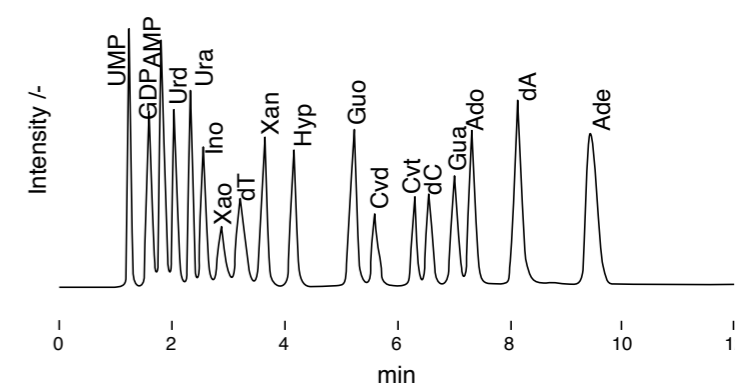
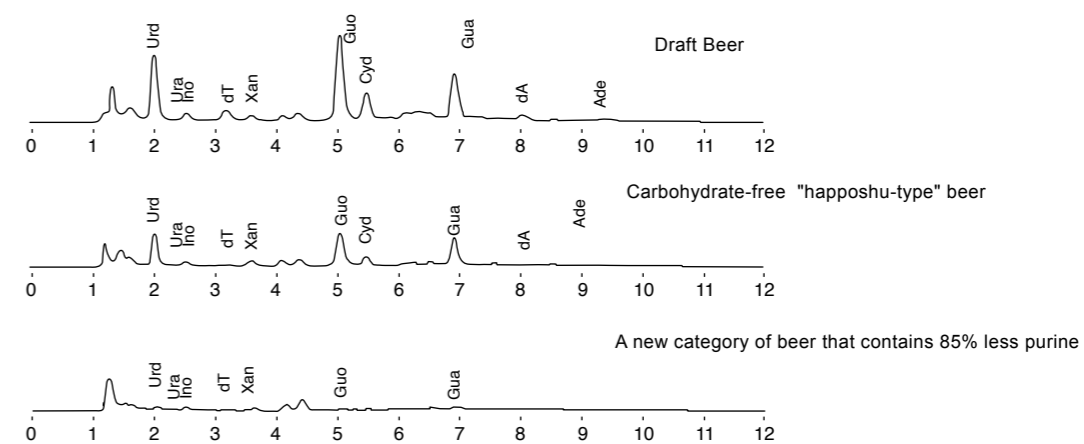


Fig. 5-33 Application data of Nucleic base/Nucleoside and Beer

Conditions
 Column : MCI GEL™ CHK45/C05
 4.6mm I.D.×150mm
 Eluent : A) 8 mM H₃PO₄
 B) 10 mM H₃PO₄ /30% ACN
 Gradient : 0-0.7min 0%B 0.7-3.0min 0→40%B 3.0-3.2min 40%B
 3.2-3.5min 40→80%B 3.5-8.0min 80%B 8.0min- 0%B
 Flow rate : 1.3mL/min
 Column temp.: 45°C
 Detection : UV260nm
 Injection : 20μL



Analysis of various category beer



(Data provided by Professor Yokoyama of Yokohama National University)

MCI GEL™ CHP material series are chromatography materials of porous type polymers.

Because polymeric materials are chemically stable, wide pH range, from acidic to alkaline eluents are able to be applied to MCI GEL™ CHP material series.

MCI GEL™ CHP50 series and CHP20 series are both ST/DVB polymers, but they differences in porosity. Pore size of CHP20 series is fairly larger than that of CHP50 series. Appropriate packing material can be selected in accordance with molecular size of injection samples.

●CHP material series

Base polymer	Functional group	Product name	Particle size [μm]	Pore diameter [nm]	Main application	Equivalent HPLC column
Styrene Divinylbenzene	None	CHP20/P20	20	45	drug compounds Peptides Proteins	CHP20/C04 CHP20/C10
		CHP20/P30	30			
		CHP20/P50	50			
		CHP20/P70	70			
		CHP20/P120	120			
	CHP50/P20	20	25	—		
	CHP50/P30	30				
CSP50/P10	10	25	CHP20/C10			
Polymethacrylate	None	CHP07/P120	120	25	CHP07/C04 CHP07/C10	
		CMG20/P10	10	25	CMG20/C04 CMG20/C10	
		CMG20/P30	30			
CMG20/P150	150					

Application data of CHP 50

Fig. 5-34 Phthalic acid esters

Conditions
 Column : MCI GEL™ CHP50/P20, 10mm I.D.×250mmL
 Eluent : H₂O/CH₃CN=20/80
 Flow rate : 0.75 ml/min
 Column temp. : 25°C
 Detection : 254nm,
 Sample : 1. Dimethyl phthalate 0.5%
 2. Dipropyl phthalate 0.5%
 3. Dibutyl phthalate 0.5%
 Injection : 100μl

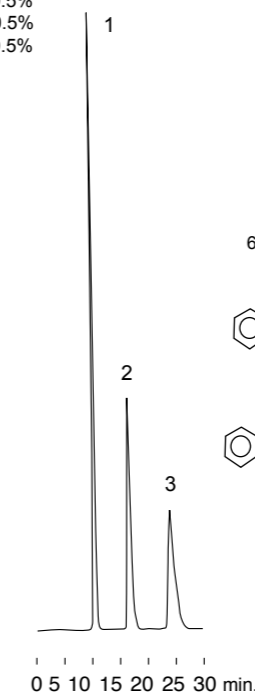
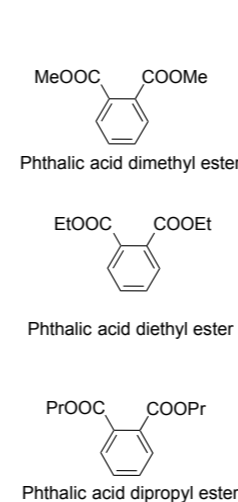


Fig. 5-35 Penicillin antibiotics

Conditions
 Column : MCI GEL™ CHP series, 10mm I.D.×250mmL
 Eluent : CH₃OH/0.05M Phosphate buffer (pH8.0)=60/40
 Flow rate : 2.18 ml/min
 Column temp. : 25°C
 Detection : 254nm,
 Sample : 1. 6-Aminopenicillanic acid 1000ppm
 2. Penicillin G 1000ppm
 3. Penicillin V 1000ppm
 Injection : 100μl

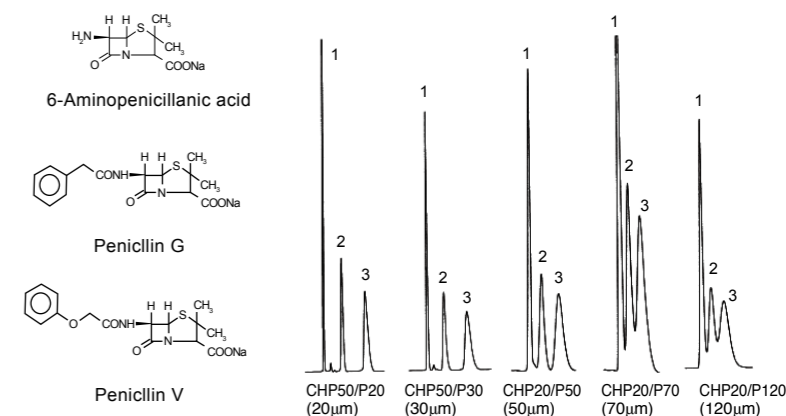
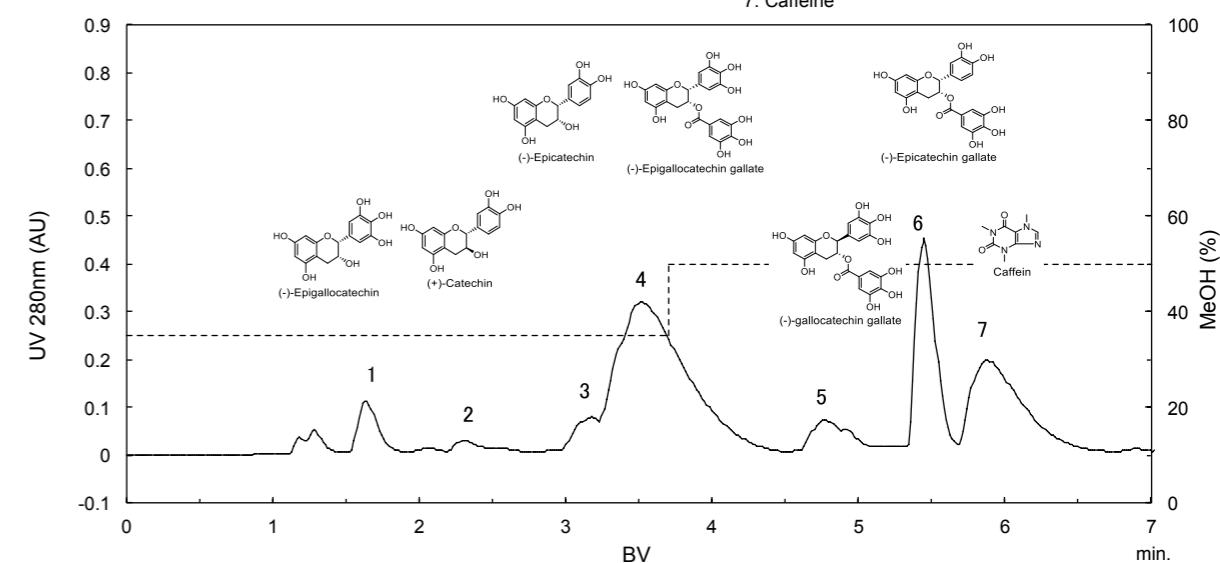


Fig. 5-36 Extract of green tea leaves

Conditions
 Column : MCI GEL™ CHP50/P20, 32mm I.D.×465mm
 Eluent : 0-185min, CH₃OH:0.01M Acetic acid(35:65)
 185-350min, CH₃OH:0.01M Acetic acid(50:50)
 Flow rate : 7.48 ml/min
 Detection : 280nm
 Sample : extract of green tea leaves, injection volume 18.7 ml

1. Epigallocatechin
 2. Catechin
 3. Epicatechin
 4. Epigallocatechin gallate
 5. Gallic acid
 6. Epicatechin gallate
 7. Caffeine



Application data of CHP 20

Fig.5-37 Senna pulv. extract

Conditions

Chromatogram A	Chromatogram B	Chromatogram C
Column : MCI GEL™ CHP20/C10 4.6mm I.D.×250mm	Column : MCI GEL™ CHP20/P20 10.0mm I.D.×250mm	Column : MCI GEL™ CHP20/P30 10.0mm I.D.×250mm
Eluent : CH ₃ OH/1% Acetic acid = 60/40 (vol.)	Eluent : CH ₃ OH/1% Acetic acid = 60/40 (vol.)	Eluent : CH ₃ OH/1% Acetic acid = 60/40 (vol.)
Flow rate : 0.5 ml/min	Flow rate : 2.4 ml/min	Flow rate : 2.4 ml/min
Detection : 270nm	Detection : 270nm	Detection : 270 nm
Sample : Extract of senna pulv. 10μL	Sample : Extract of senna pulv. 80μL	Sample : Extract of senna pulv. 80μL

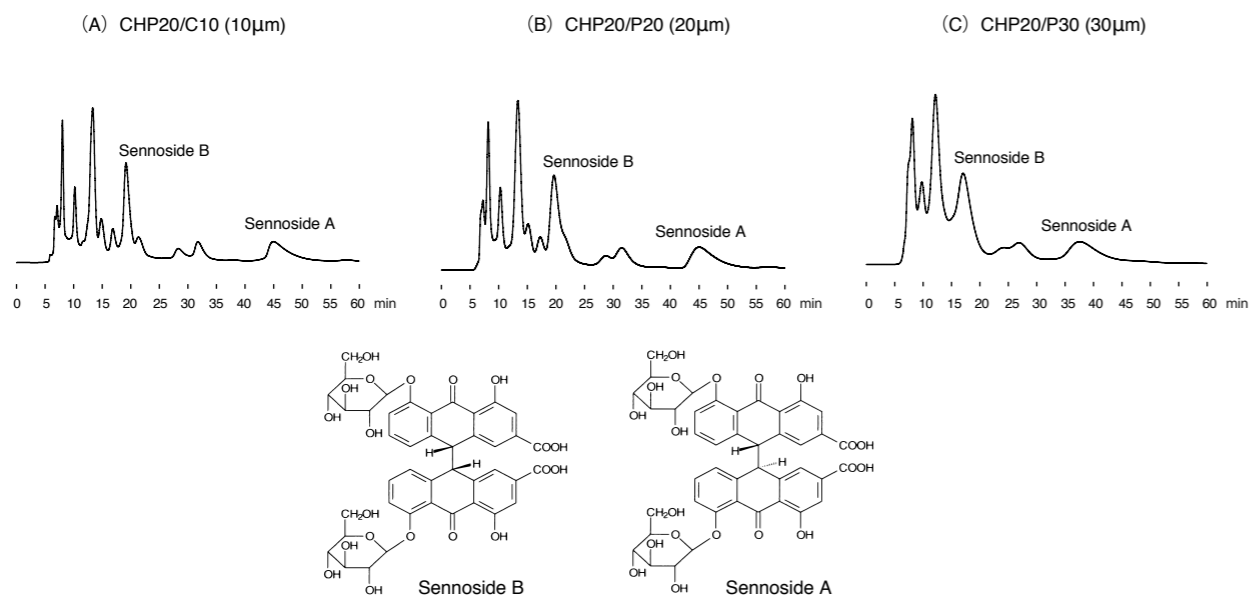
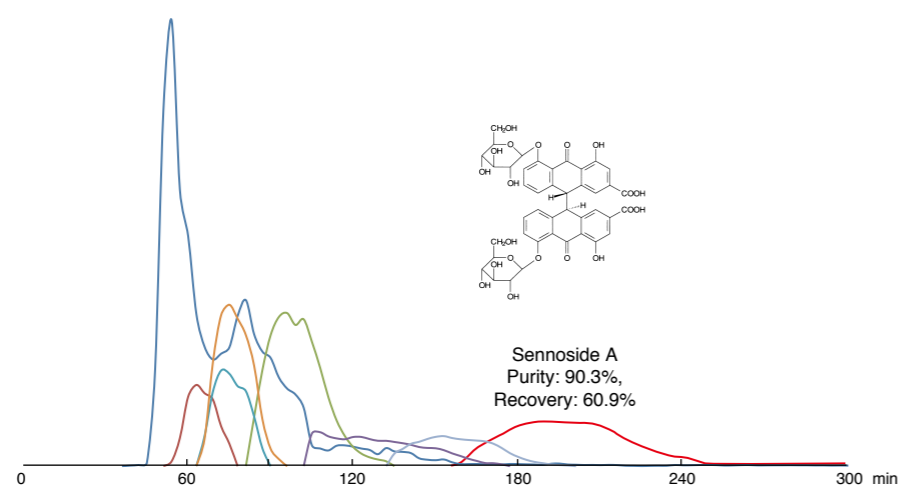


Fig. 5-38 Elution profile of senna pulv. extract separated on MCI GEL™ CHP20/P30

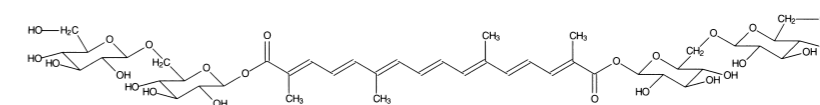
Conditions

Column	: MCI GEL™ CHP20/P30 32mm I.D.×490mm
Eluent	: CH ₃ OH + 1% Acetic acid = 60 + 40 (vol.)
Flow rate	: 7.88 ml/min
Detection	: 270 nm
Sample	: Extract of senna pulv., partially purified by Diaion HP20
Injected amount	: 39.4 ml



Application data of CHP series

Fig. 5-39 Elution profile of gardenia fructus extract separated on MCI GEL™ CHP20/P30



Crocin
Purity: 95.4%,
Recovery: 66.2%

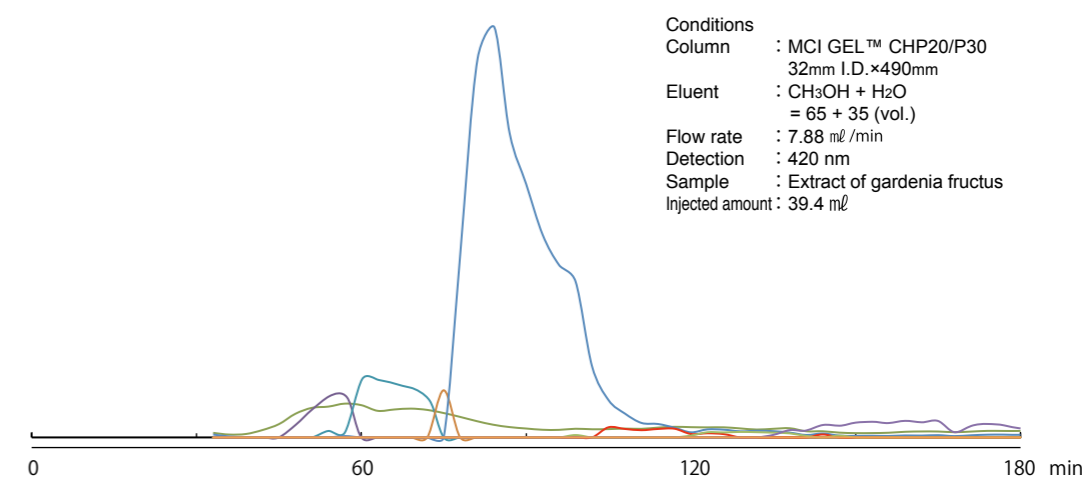
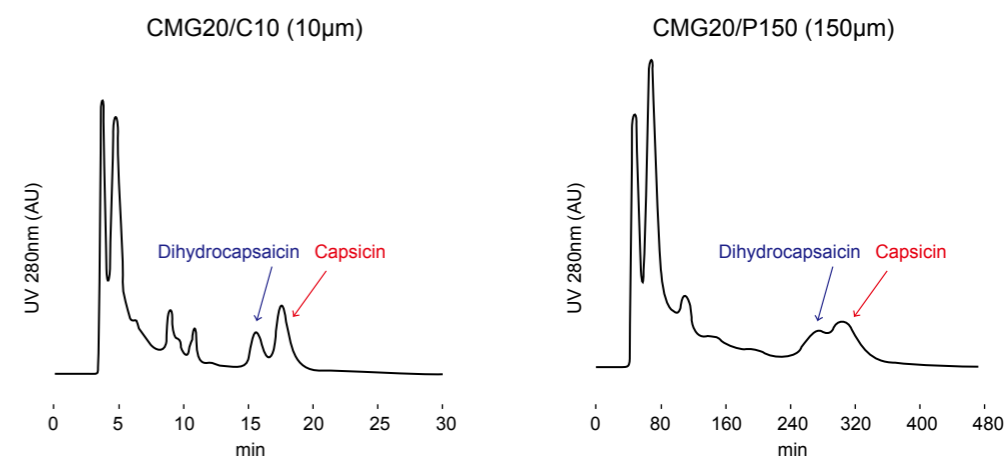


Fig. 5-40 Capsaicin

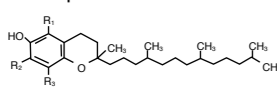


Conditions

Column	: MCI GEL™ CMG20/C10, 4.6mm I.D.×250mm MCI GEL™ CMG20/P150, 20mm I.D.×500mm
Eluent	: Hexane/EtOH=87.5/12.5;
Flow rate	: 1.00 ml/min for CMG20/C10, 2.36 ml/min for CMG20/P150;
Column temp.	: 25°C
Detection	: UV 280nm
Sample	: Capsici Fructus extract;
Injection	: 20ml for CMG20/C10, 1.5ml for CMG20/P150.

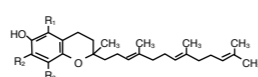
Application data of CHP series

Tocopherol



- | | | | |
|-------------------------|-----------------|-----------------|-----------------|
| 1. α -tocopherol | R ₁ | R ₂ | R ₃ |
| 2. β -tocopherol | CH ₃ | CH ₃ | CH ₃ |
| 3. γ -tocopherol | H | CH ₃ | CH ₃ |
| 4. δ -tocopherol | H | H | CH ₃ |

Tocotrienol



- | | | | |
|--------------------------|-----------------|-----------------|-----------------|
| 5. α -tocotrienol | R ₁ | R ₂ | R ₃ |
| 6. β -tocotrienol | CH ₃ | CH ₃ | CH ₃ |
| 7. γ -tocotrienol | H | CH ₃ | CH ₃ |
| 8. δ -tocotrienol | H | H | CH ₃ |

Fig. 5-41 Vitamin E in Rice Bran Oil

Conditions
 Column : MCI GEL™ CMG20/C10
 4.6mm I.D.×150mm
 Eluent : Hexane-EtOH = 98/2 (vol.)
 Flow rate : 0.5 ml/min
 Detection : 295nm
 Sample : Rice Bran Oil, 50 mg/ml
 Injection : 10µL

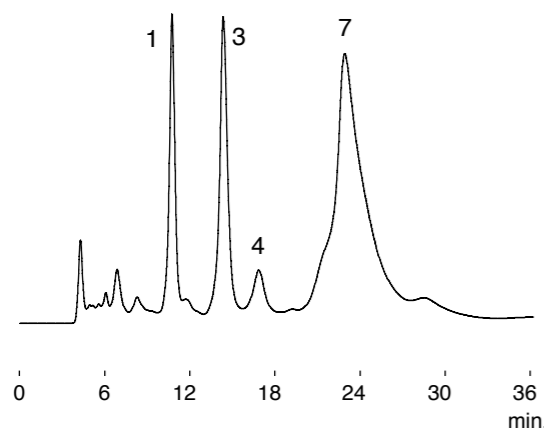


Fig. 5-42 Elution profile of Rice Bran Oil in preparative scale

Conditions
 Column : MCI GEL™ CMG20/P30
 20mm I.D.×500mm
 Eluent : Hexane/C₂H₅OH = 98/2 (vol.)
 Flow rate : 4.7 ml/min
 Detection : 295 nm
 Sample : Rice Bran Oil, 50 mg/ml
 Injection : 1260µL

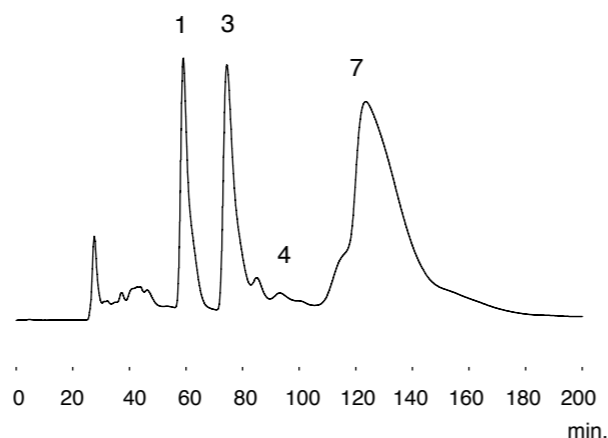


Fig. 5-43 Mixture of tocopherol and tocotrienol : Comparison with silica gel column

Conditions
 Column : 1. Silica gel 5SIL, 4.6mm I.D.×250mm
 2. MCI GEL™ CMG20/C04, 4.6mm I.D.×150mm
 Eluent : 1. Hexane/EtOH = 99/1
 2. Hexane/EtOH = 98/2
 Flow rate : 1.0 ml/min
 Column temp. : 25°C
 Detection : UV 292nm
 Sample : Mixture of tocopherol and tocotrienol
 Injection : 10µl (1mg/mL)

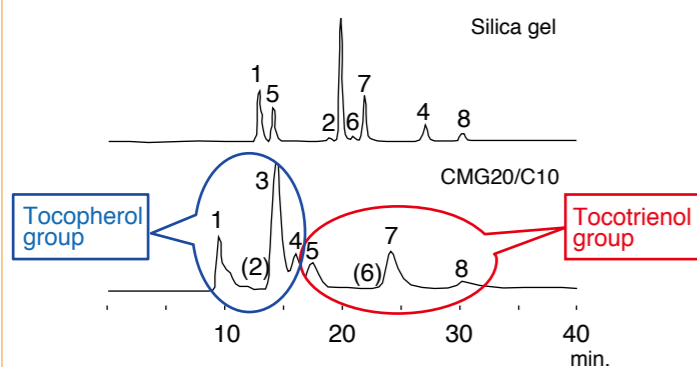
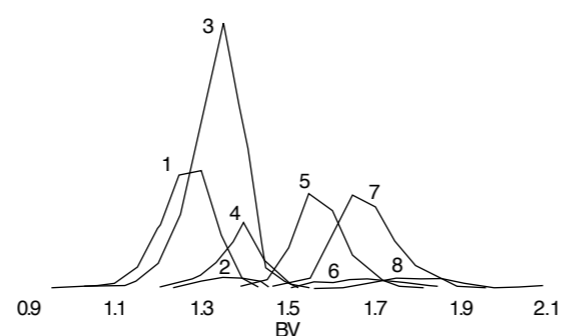


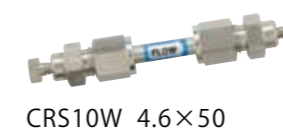
Fig. 5-44 Elution profile of tocopherol and tocotrienol in preparative scale

Conditions
 Column : MCI GEL™ CMG20/P150, 41.2mm I.D.×550mm, ×4
 Eluent : Hexane/EtOH = 90/10
 Flow rate : 49.0 ml/min (SV=1.0)
 Column temp. : 25°C
 Detection : UV 292nm
 Sample : Mixture of tocopherol and tocotrienol
 Injection : 150 mL (50g/L)



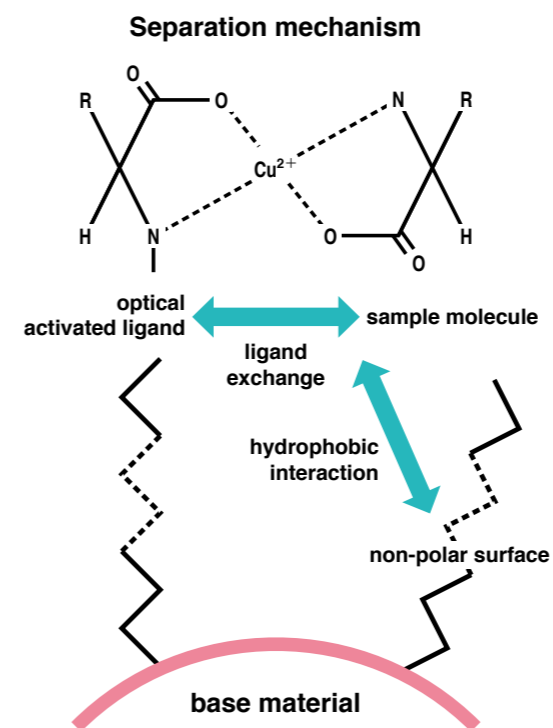
6 MCI GEL™ Chiral separation columns

Chiral separation columns MCI GEL™ CRS10W (DLAA) MCI GEL™ CRS15W (LDAA)



MCI GEL™ column	Column dimensions	Particle size (µm)	USP
MCI GEL™ CRS10W	4.6×50mm	3	L32
MCI GEL™ CRS15W	4.6×50mm	3	L32

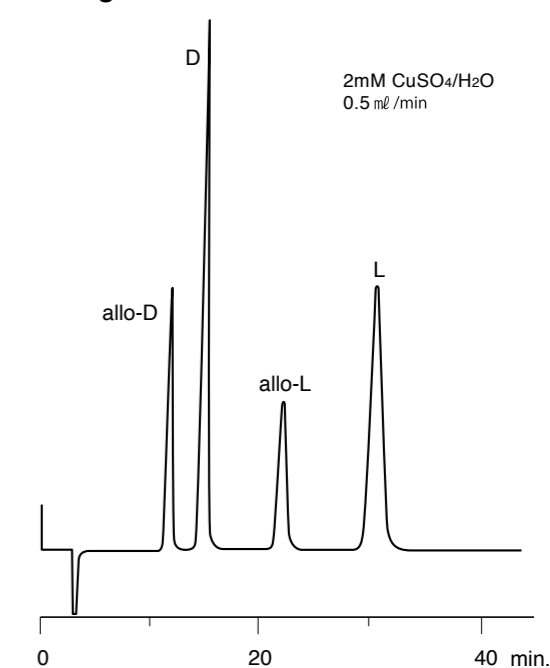
Separation mechanism and performance of MCI GEL™ CRS series



● Separation mechanism

MCI GEL™ CRS10W and its companion product MCI GEL™ CRS15W (an optical isomer of CRS10W) are based on a 3µm with 10nm mean pore diameter of silica gel coated with N,N-Dioctyl-L(or D)-alanine which is a novel optical activated ligand. The chiral resolution mechanism is a combination of ligand exchange and hydrophobic interaction. A copper sulfate aqueous solution is used as an eluent. Elution samples are directly detected at wave length of 254 nm because complex compound, composed of sample molecule and copper in the eluent, are object of detection. With the CRS10W, D-isomers generally elute in front of L-isomers while L-isomers elute ahead of D-isomers on the CRS15W. The hydrophobic interaction mechanism allows hydrophilic samples to elute faster than hydrophobic molecules. Long alkyl chain or aromatic compounds will elute late or require an organic solvent (CH₃CN or CH₃OH, max. of 15v/v%) to prevent adsorption onto the stationary phase.

Application of CRS10W Fig. 6-1 DL-Isoleucine



● Separation performance

1. The CRS series columns separate over 20 D,L- α -Amino acids by only single column. The columns separate not only α -Amino acids but also α -Hydroxy carboxylic acids and derivative amino acids such as Acetylated amino acids.
2. The columns provide excellent resolution operated at room temperature.
3. The columns show high durability.

● USP L32 column

Application data of CRS10W

For all chromatograms, column temperature is room temperature and wave length is 254nm.
All eluents are CuSO₄ aqueous solution except for Fig. 6-9 and Fig. 6-10.

Fig. 6-2 Separation of amino acids mixture

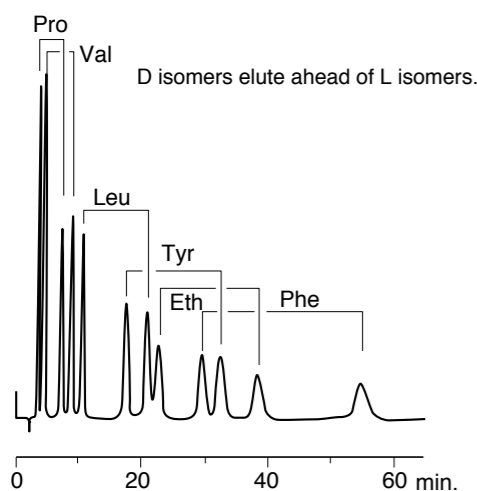


Fig. 6-3 Separation of amino acids mixture

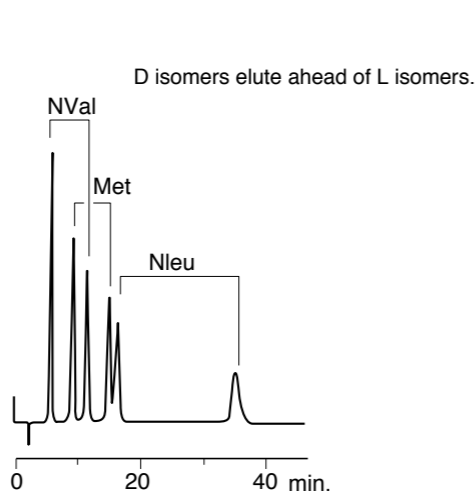


Fig. 6-4 Separation of DL-Ser.

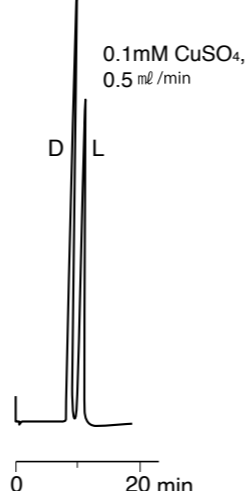


Fig. 6-5 Separation of DL-aspartic acid

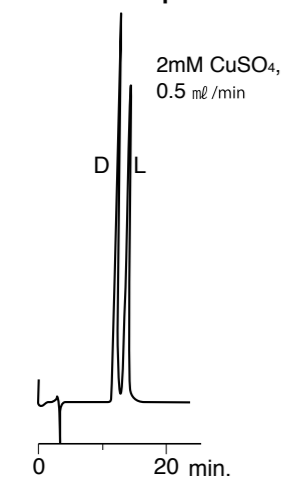


Fig. 6-6 Separation of DL-glutamic acid

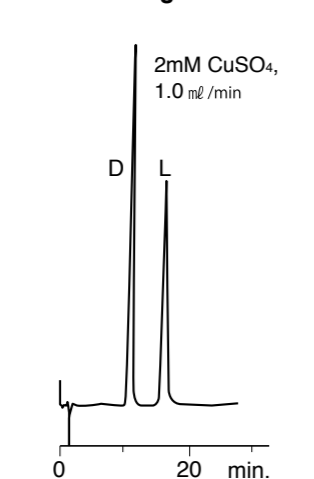


Fig. 6-7 Separation of DL-histidine

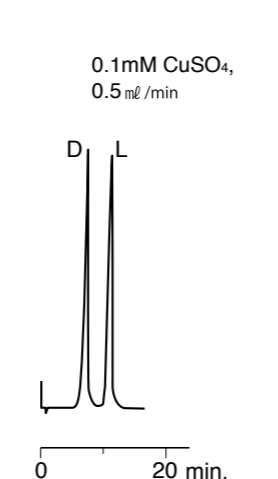


Fig. 6-8 Separation of DL-lysine

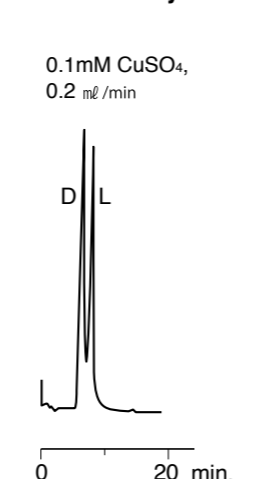


Fig. 6-9 Separation of DL-phenylalanine



Fig. 6-10 Separation of DL-tryptophan

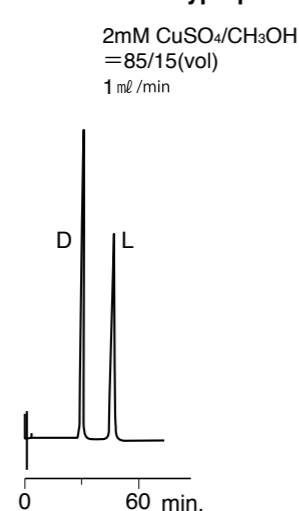


Fig. 6-11 Separation of DL-lactic acid

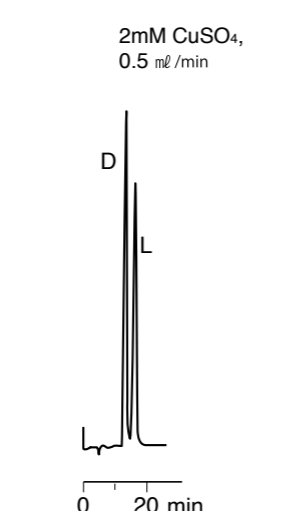
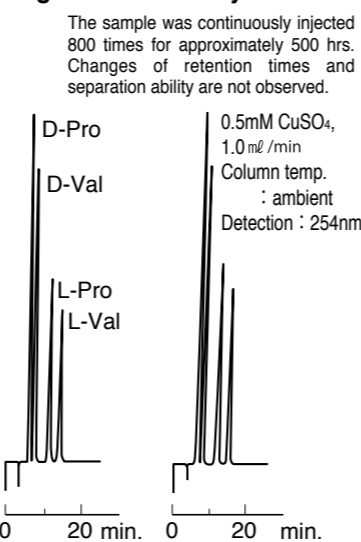


Fig. 6-12 Durability test



Application data of CRS10W

Fig. 6-13 Separation of DL- α -Phenylglycine

Conditions
Column : MCI GEL™ CRS10W 4.6mm I.D.×50mm
Eluent : 2mM CuSO₄/CH₃OH=85/15
Flow rate : 1.0 ml/min
Column temp. : 25°C
Detection : 254nm
Sample : 1. D- α -Phenylglycine
2. L- α -Phenylglycine

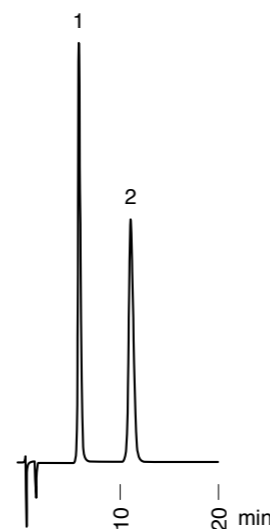


Fig. 6-14 Separation of methionine and acetylmethionine

Conditions
Column : MCI GEL™ CRS10W 4.6mm I.D.×50mm
Eluent : 2mM CuSO₄/CH₃CN=90/10
Flow rate : 1.0 ml/min
Column temp. : 25°C
Detection : 254nm
Sample : 1. D-Met
2. L-Met
3. Acetyl-D-Met
4. Acetyl-L-Met

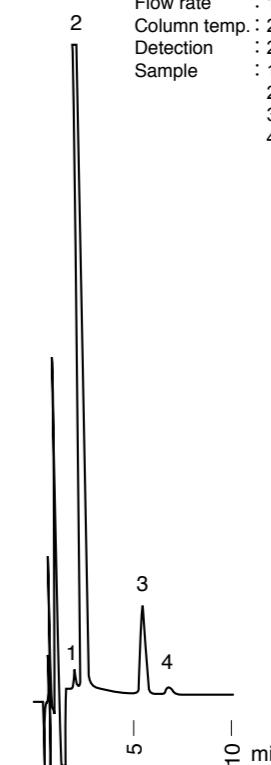


Fig. 6-15 D/L-Aspartic acid

Conditions
Column : MCI GEL™ CRS10W 4.6mm I.D.×50mm
Eluent : 0.4mM CuSO₄
Flow rate : 1.0 ml/min
Temp. : ambient
Detection : UV 254nm
Sample : D/L Aspartic acid

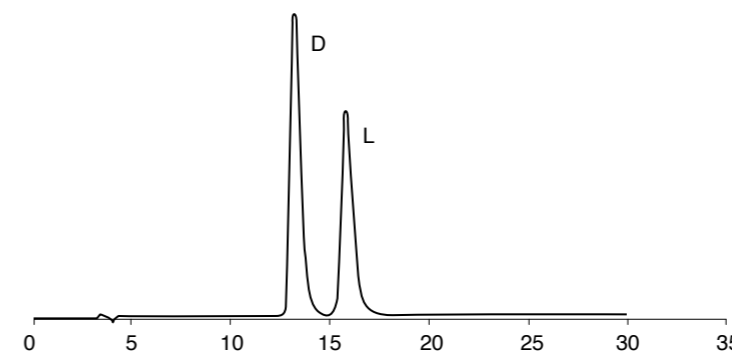
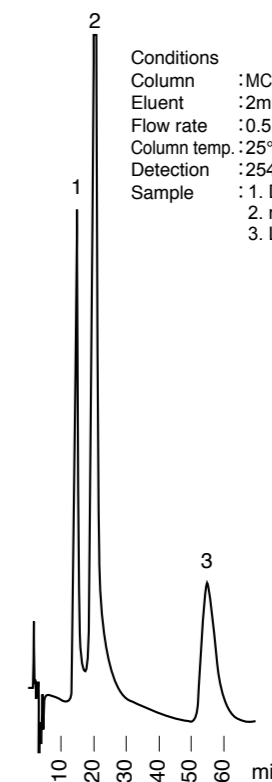


Fig. 6-16 Separation of diaminopimelic acid

Conditions
Column : MCI GEL™ CRS10W 4.6mm I.D.×50mm
Eluent : 2mM CuSO₄
Flow rate : 0.5 ml/min
Column temp. : 25°C
Detection : 254nm
Sample : 1. D,D-2,6-Diaminopimelic acid
2. meso-2,6-Diaminopimelic acid
3. L,L-2,6-Diaminopimelic acid



Application data of CRS10W

Fig. 6-17 Separation of 2-hydroxy carboxylic acids

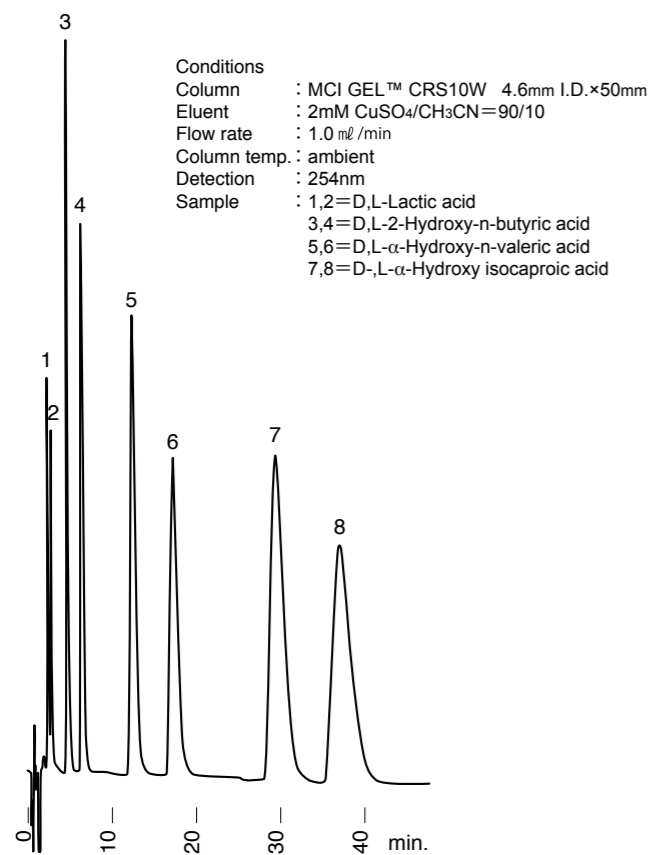


Fig. 6-18 Separation of 2-hydroxy carboxylic acids

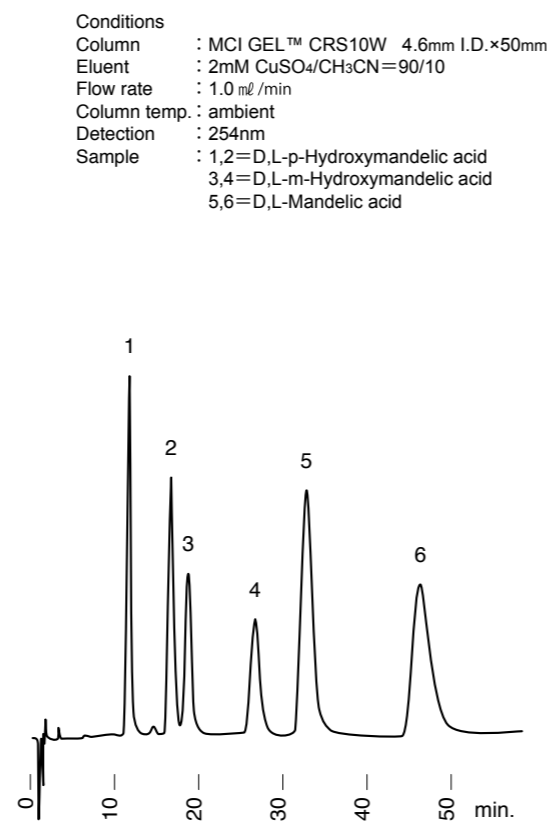


Fig. 6-19 D/L Alanine

Conditions
 Column : MCI GEL™ CRS10W 4.6mm I.D.×50mm
 Eluent : 0.1mM CuSO₄
 Flow rate : 1.0 ml/min
 Temp. : 30°C
 Detection : UV 254nm
 Sample : D/L Alanine

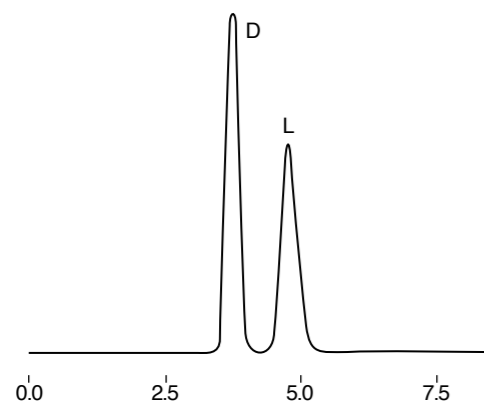
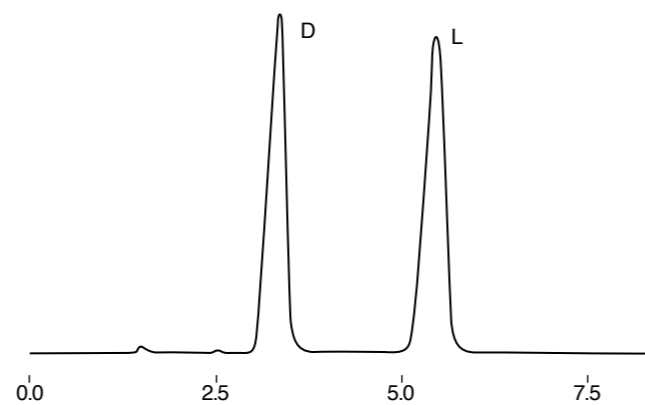


Fig. 6-20 DL-P-Hydroxyphenylglycine

Conditions
 Column : MCI GEL™ CRS10W 4.6mm I.D.×50mm
 Eluent : 2mM CuSO₄:MeOH=85:15
 Flow rate : 1.0 ml/min
 Temp. : 30°C
 Detection : UV 254nm
 Sample : DL-P-ydroxyphenylglycine



Comparison data of CRS10W and CRS15W

Fig. 6-21 Separation of DL-alanine

CRS15W

CRS10W

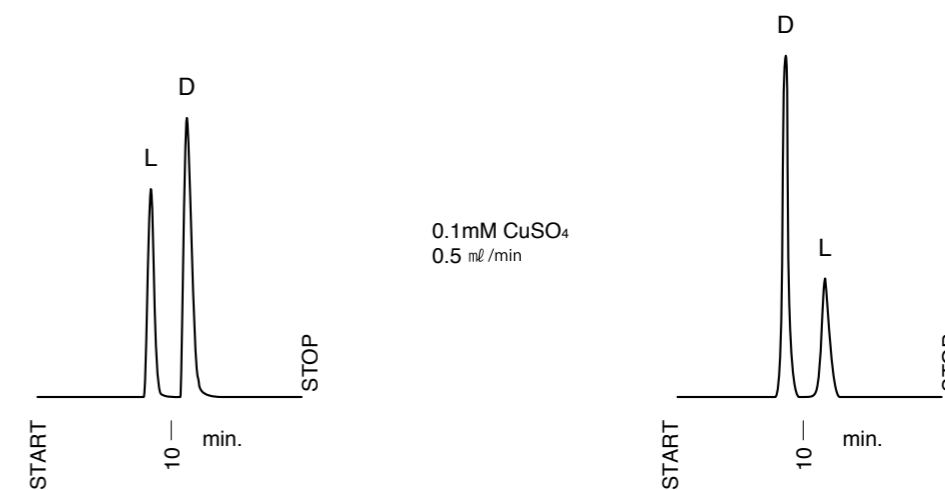
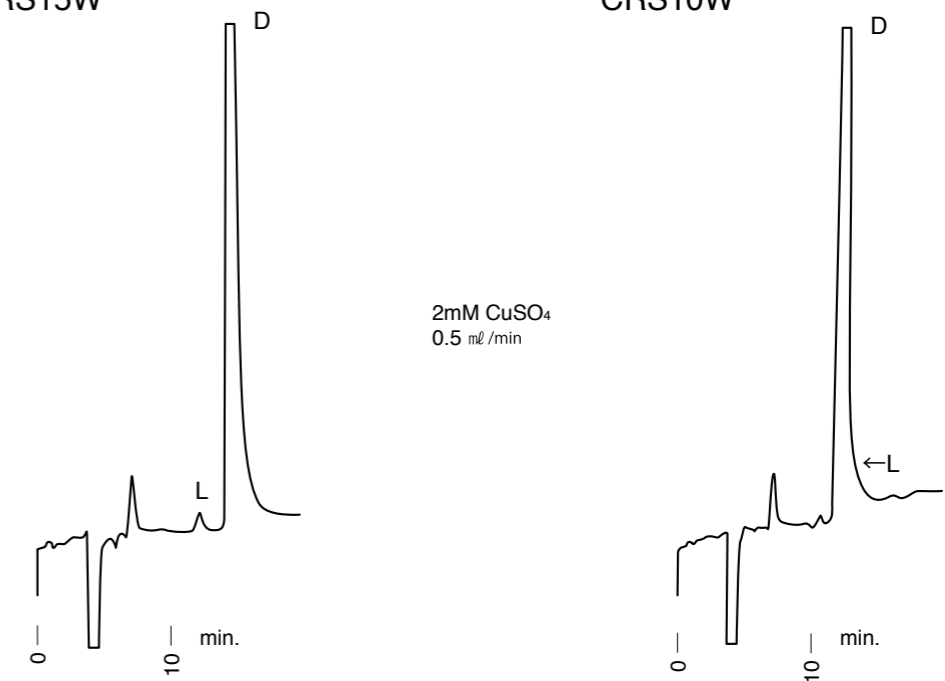


Fig. 6-22 Analysis of a trace of L-lactic acid in 50 ppm D-lactic acid

The CRS15W is recommended for analysis of a trace of L-isomer in a principal D-isomer when the CRS10W does not provide an adequate chromatogram.

CRS15W

CRS10W



Examples of chromatographic conditions and datas

	Amino acids	CuSO ₄ aq. soln. [mM]	Flow rate [ml/min]	Retention time; L-isomers [min]	Separation factor [α]	Separation rate [Rs]
1	Orn•HCl	0.1	0.2	6.8	1.26	<1
2	Lys•HCl	0.1	0.2	7.7	1.45	<1
3	Ala	0.1	0.5	11.0	1.39	1.4
4	His•HCl	0.1	0.5	10.5	1.63	1.7
5	Ser	0.1	0.5	10.1	1.25	1.0
6	Thr	0.1	0.5	11.3	1.29	1.3
7	Cit	0.5	0.5	10.4	1.75	2.3
8	Hyp	1.0	0.2	23.8	1.23	1.1
9	Pro	1.0	1.0	7.3	2.13	4.5
10	Val	1.0	1.0	8.9	2.04	5.0
11	Nval	1.0	1.0	11.5	2.07	4.7
12	Asp	2.0	0.5	13.2	1.18	0.8
13	Glu	2.0	1.0	16.2	1.54	2.3
14	Ileu(DL)	2.0	0.5	30.4	2.14	6.5
15	Ileu(allo)	2.0	0.5	21.9	1.97	6.0
16	Leu	2.0	1.0	14.6	1.97	4.6
17	Nleu	2.0	1.0	24.1	2.16	6.5
18	Met	2.0	1.0	10.3	1.64	2.6
19	Tyr	2.0	1.0	22.5	1.85	5.3
20	Eth	2.0	1.0	26.4	1.69	5.0
21	Phe	2.0	1.0	37.8	1.84	6.3

1. Column temperature; ambient Detection; 254nm
2. These are example data and do not guarantee the column specifications.
3. Improved resolution or appropriate chromatogram can be obtained by further investigating chromatographic conditions.
4. For each amino acid in the table, D-isomer elutes ahead of L-isomer except for Hydroxyproline.

Notes

1. It will take hours for equilibrium between ligand of stationary phase and copper ion of eluent. Two to three hours of conditioning the column with the eluent is advised before sample injection or after changing concentration of CuSO₄ of eluent.
2. For acidic amino acids, higher CuSO₄ concentration of eluent provides better resolution.
3. For weakly retained hydrophilic amino acids, low flow rate (0.2-0.5 mL/min) yields better resolution.
4. Peak area may decrease with continuous injection of samples, when the concentration of amino acids in sample solution is much higher than that of CuSO₄ in the eluent.
5. Please be careful not to flow both water soluble organic solvents (CH₃CN, CH₃OH, etc) and non water soluble organic solvents (n-hexane, chloroform, etc) into the column. The column will be fatally damaged and will never separate optical isomers. Please be particularly careful if HPLC equipment is used together with RP mode and NP mode.
6. Please do not use acid or alkali solutions to adjust pH of eluent. And also do not use buffer solutions. These solutions may cause forming precipitation, hence cause of blockage of the column.
7. For strongly retained hydrophobic amino acids, addition of CH₃CN or CH₃OH in the eluent enables faster elution. The concentration of these organic solvents should be below 15 v/v%.
8. DOPA and other non-polar amino acids will be strongly adsorbed on the packing material and will cause contamination of the column.
9. Regeneration of contaminated column is difficult.

7

MCI GEL™

SPE sorbent series

Solid phase extraction sorbents

For a pretreatment of analytical sample, we provide various SPE sorbents with various chemical structure, hydrophobicity, and micro-pore sizes. You can select our SPE sorbents depending on your molecule nature.

- CHP85/P120, CHP87/P120, CHPOD/P30: SPE sorbents with a controlled micro-pore size, high performance small molecule adsorption except large molecule mixture, like proteins.
- CSP800: SPE sorbents with high concentration ratio and high recovery, excellent for enrichment trace organic compounds and non-ionic substances such as trichloroethylene from environmental water. These SPE sorbents are to prepare samples for mutagenicity study or GC/MS analysis.
- SFP08/P25: SPE sorbents dedicated for small drug molecules extraction. Superior purity of this SPE extracts offers easier and faster sample preparation.
- CHL10P, CHL20P, CLB20P: SPE sorbents for rare earth metals that contains chelating functional group. CLB10P: SPE sorbents for borate, arsenic and selenium ions that contains glucamine groups on high porous ST/DVB matrix.

Material list

● Synthetic adsorbents and reversed-phase materials

Name	Mean particle size [μm]	Pore size	Surface area [m ² /g]	pH range	Typical Application
CHP85/P120	120	middle	880-940	full range	Small molecules extraction
CHP87/P120	120	small	820-910	full range	
CHPOD/P30	30	large	340-380	2~12	
CSP800	120	middle	790-920	full range	Enrichment of trace of organic compounds
SFP08/P25	25	middle	>1000	full range	Small molecules extraction

● Chelating type

Name	Functional group	Mean particle size [μm]	Ion exchange capacity [meq/ml]	Effective pH range	Typical Application
CHL10P	Iminodiacetic acid	120	>1.5	2-6	Metal Extraction
CHL20P	Polyamine	120	>1.8	2-6	Metal Extraction
CLB10P	Glucamine	120	>1.0	>3	Extraction Bron Removal

Main column				Guard/Pre-column						
Code No.	Name	Column dimensions [mm]	USP	Code No.	Name	Column dimensions [mm]				
Ion exchange chromatography cation exchange resin for amino acids				0-019-01	CK10U	6×120	0-033-21	AFR2-PC	6×50	
Ion exchange chromatography cation exchange resin for sugars				0-009-01	CK08S	8×500	L58	0-009-11	CK08SG	6×50
0-010-01	CK08E	8×300	L58	0-010-11	CK08EG	6×50				
0-010-06		7.8×300								
0-010-02	CK08EC	8×300	L19	0-010-12	CK08ECG	6×50				
0-010-07		7.8×300								
0-010-03	CK08ES	8×300		0-010-13	CK08ESG	6×50				
Ion exchange chromatography cation exchange resin for carboxylic acids				0-010-05	CK08EH	8×300	L17	0-010-15	CK08EHG	6×50
0-010-08		7.8×300								
Ion exchange chromatography cation exchange resin for oligosaccharides				0-001-01	CK02A	20×250	L58	0-001-11	CK02AG	8×10
0-001-02	CK02AS	20×250		0-001-12	CK02ASG	8×10				
0-003-01	CK04S	10×200	L58	0-017-11	CK10SG	6×50				
				0-003-11	CK04SG	8×10				
0-003-02	CK04SS	10×200		0-017-11	CK10SG	6×50				
				0-003-12	CK04SSG	8×10				
Ion exchange chromatography anion exchange resin for carboxylic acids and sugars				0-111-01	CA08F	4.6×250		0-111-11	CA08FG	4×10
0-119-01	CDR10	4.6×250		0-119-11	CDR10G	4×10				
Ion chromatography for cations				0-034-01	SCK01	6×50		0-034-21	SCK-PC	6×50
0-034-04	SCK01	4.6×150								
0-407-01	CHK45/C05	4.6×150								
Ion chromatography for anions				0-133-02	SCA04/PEEK	4.6×150	L31	0-133-12	SCA04G	4.6×30
								0-130-22	SCA-PC	8×10
Bioseparation for size exclusion				0-213-01	CQP06	7.5×600	L25	0-213-11	CQP06G	4×50
0-214-01	CQP10	7.5×600	L38	0-214-11	CQP10G	4×50				
0-215-01	CQP30	7.5×600	L37, 38	0-215-11	CQP30G	4×50				

Main column				Main column			
Code No.	Name	Column dimensions [mm]	USP	Code No.	Name	Column dimensions [mm]	USP
Analytical and preparative chromatography columns for pharmaceutical applications [CHP column series]				XtalSpeed™ series			
0-401-05	CHP20/C04	4.6X150	L21	0-047-21	Q01	4.6X50	
0-401-03	CHP20/C04	20X150	L21	0-047-22	Q01	4.6X100	
				0-047-23	Q01	7.5X100	
0-403-05	CHP20/C10	4.6X150	L21	0-047-24	Q01	11.5X100	
0-403-01	CHP20/C10	4.6X250	L21	0-047-31	CM01	4.6X50	
0-403-02	CHP20/C10	10X250	L21	0-047-32	CM01	4.6X100	
0-403-03	CHP20/C10	20X150	L21	0-047-33	CM01	7.5X100	
0-403-04	CHP20/C10	20X250	L21	0-047-34	CM01	11.5X100	
0-405-01	CHP07/C04	4.6X150					
0-405-04	CHP07/C04	20X200					
0-405-06	CHP07/C10	4.6X150					
0-406-01	CHP07/C10	4.6X250					
0-406-02	CHP07/C10	10X150					
0-406-03	CHP07/C10	20X150					
0-406-04	CHP07/C10	20X250					
0-402-05	CMG20/C04	4.6X150	L39				
0-402-03	CMG20/C04	20X150	L39				
0-202-06	CMG20/C10	4.6X150	L39				
0-202-05	CMG20/C10	4.6X250	L39				
0-202-02	CMG20/C10	10X250	L39				
0-202-03	CMG20/C10	20X150	L39				
0-202-04	CMG20/C10	20X250	L39				
0-404-01	CHK40/C04	4.6X150					
0-407-01	CHK45/C05	4.6X150					
0-504-01	CHPOD/C04	4.6X150					
0-504-04	CHPOD/C04	20X200					
XtalSpeed™ series							
0-047-01	DA01	4.6X50					
0-047-04	DA01	4.6X100					
0-047-02	DA01	7.5X100					
0-047-03	DA01	11.5X100					
0-047-11	SP01	4.6X50					
0-047-12	SP01	4.6X100					
0-047-13	SP01	7.5X100					
0-047-14	SP01	11.5X100					

Characteristics

1. Excellent performance

Sphere packing and sharp particle size distribution provide high performance.

2. Persistence and highest quality

Produced with Mitsubishi Chemical's excellent technology, experience and under strict quality control.

3. Wide range of product line

MCI GEL™ packing materials include ion exchange resins (cation and anion), non-functionalized polymer used for reversed phase chromatography and other varieties of products. Also MCI GEL™ offers mean particle size of 4 μm to approximately 300 μm packing materials, this means that MCI GEL™ products are applied to analysis use and preparative use.

4. Abundant experience

Mitsubishi Chemical has been supplying packing materials for more than 50 years.

● Ion exchange chromatography cation exchange resins [CK series, AFR series]

Code No.	Name	Packing size [g]	Base material	Functional group	Counter ion	Mean particle size [μm]	Cross linkage [%]	Ion exchange capacity [meq/g]	Typical Application
1-001-01	CK02A	10	ST/DVB	RSO ₃ ⁻	Na ⁺	20	2	>4.5	Oligosaccharides
1-003-01	CK04S	10	ST/DVB	RSO ₃ ⁻	Na ⁺	11	4	>4.5	Oligosaccharides
1-003-02	CK04S	25							
1-003-03	CK04S	50							
1-004-01	CK06S	10	ST/DVB	RSO ₃ ⁻	Na ⁺	11	6	>4.45	Oligosaccharides
1-004-02	CK06S	25							
1-004-03	CK06S	50							
1-009-01	CK08S	10	ST/DVB	RSO ₃ ⁻	Na ⁺	11	8	>4.40	Sugars, Carboxylic acids
1-009-02	CK08S	25							
1-009-03	CK08S	50							
1-010-01	CK08E	10	ST/DVB	RSO ₃ ⁻	Na ⁺	9	8	>4.40	Sugars, Carboxylic acids
1-010-02	CK08E	25							
1-010-03	CK08E	50							
1-013-01	CK08Y	50	ST/DVB	RSO ₃ ⁻	Na ⁺	25	8	>4.40	Sugars, Carboxylic acids
1-013-02	CK08Y	300							
1-014-01	CK08P	100 ml	ST/DVB	RSO ₃ ⁻	H ⁺	120	8	>1.8	Sugars, Carboxylic acids (meq/ml)
1-017-01	CK10S	10	ST/DVB	RSO ₃ ⁻	Na ⁺	11	10	>4.3	Carboxylic acids, Amino acids
1-017-02	CK10S	25							
1-017-03	CK10S	50							
1-018-01	CK10F	5	ST/DVB	RSO ₃ ⁻	Na ⁺	7	10	>4.3	Amino acids
1-018-02	CK10F	10							
1-019-01	CK10U	3	ST/DVB	RSO ₃ ⁻	Na ⁺	5	10	>4.3	Amino acids
1-019-03	CK10U	5							
1-019-04	CK10U	10							
1-020-05	CK10M	5	ST/DVB	RSO ₃ ⁻	Na ⁺	4	10	>4.3	Amino acids
1-020-06	CK10M	3							
1-024-02	CK12U	5	ST/DVB	RSO ₃ ⁻	Na ⁺	5	12	>4.3	Amino acids
1-021-01	CK10Y	50	ST/DVB	RSO ₃ ⁻	Na ⁺	25	10	>4.3	Amino acids
1-033-01	AFR2	5	ST/DVB	RSO ₃ ⁻	H ⁺	25	-	>2.7	Ammonia trap

Abbreviation; ST/DVB = Styrene-divinylbenzene copolymer

● Ion exchange chromatography anion exchange resins [CA series, CDR series]

Code No.	Name	Packing size [g]	Base material	Functional group	Counter ion	Mean particle size [μm]	Cross linkage [%]	Ion exchange capacity [meq/mL]	Typical Application
1-104-01	CA06S	10	ST/DVB	QA	Cl ⁻	11	6	>1.2	Sugars, Carboxylic acids
1-104-02	CA06S	25							
1-104-03	CA06S	50							
1-109-01	CA08S	10	ST/DVB	QA	Cl ⁻	11	8	>1.2	Sugars, Carboxylic acids
1-109-02	CA08S	25							
1-109-03	CA08S	50							
1-111-01	CA08F	5	ST/DVB	QA	Cl ⁻	7	8	>1.2	Sugars, Carboxylic acids
1-111-02	CA08F	10							
1-112-01	CA08Y	50	ST/DVB	QA	Cl ⁻	25	8	>1.2	Sugars, Carboxylic acids
1-113-01	CA08P	100 mL	ST/DVB	QA	Cl ⁻	120	8	>1.3	Sugars, Carboxylic acids
1-116-01	CA10S	10	ST/DVB	QA	Cl ⁻	11	10	>1.2	Sugars, Carboxylic acids
1-116-02	CA10S	25							
1-116-03	CA10S	50							
1-119-01	CDR10	7	ST/DVB	QA	Cl ⁻	7	-	>0.3	Nucleic acids, Sugars
1-119-02	CDR10	14							

Abbreviations ; ST/DVB=styrene-divinyl benzene copolymer QA ; Quaternary ammonium

● Ion chromatography materials [SCA, SCK series]

Code No.	Name	Packing size [g]	Base material	Functional group	Counter ion	Mean particle size [μm]	Ion exchange capacity [μeq/g]	Typical Application
1-034-01	SCK01	5	ST/DVB	RSO ³⁻	H ⁺	11	25	Cation analysis
1-034-02	SCK01	10						
1-133-01	SCA04	5	HMA	QA	Cl ⁻	5	30	Anion analysis
1-133-02	SCA04	10						

Abbreviations; ST/DVB = Styrene-divinylbenzene copolymer HMA = Polyhydroxymethacrylate QA = Quaternary ammonium

● Bioseparation columns -Size exclusion chromatography materials- [CQP series]

Code No.	Name	Packing size [mL]	Base material	Mean particle size [μm]	Pore size [nm]	Exclusion limit	Typical Application
1-222-01	CQP30P	100	HMA	30	60	1×10 ⁶	Water soluble polymer

Abbreviation; HMA = Polyhydroxymethacrylate

● Bioseparation columns -Ion exchange materials- [CQA series, CQK series]

Code No.	Name	Packing size [mL]	Base material	Functional group	Counter ion	Mean particle size [μm]	Pore size [nm]	pH range	Typical Application
1-127-01	CQA31P	100	HMA	DEAE	Cl ⁻	30	60	<11	Proteins
1-131-01	CQA35P	100	HMA	QA	Cl ⁻	30	60	2~12	Proteins
1-037-01	CQK30P	100	HMA	SP	Na ⁺	30	60	1~13	Proteins
1-039-01	CQK31P	100	HMA	CM	Na ⁺	30	60	>4	Proteins

Abbreviations; HMA = Polyhydroxymethacrylate SP = Sulfopropyl CM = Carboxymethyl DEAE = Diethylaminoethyl QA = Quaternary ammonium

● Analytical and preparative chromatography materials for pharmaceutical applications [CHP material series]

Code No.	Product Name	Packing size [mL]	Base material	Mean particle size [μm]	Pore size [nm]	pH range	Typical Application
1-307-06	CHP20/P20	25	ST/DVB	20	45	full range	Reversed-phase chromatography
1-307-07	CHP20/P20	100					
1-307-08	CHP20/P20	1,000					
1-305-06	CHP20/P30	25	ST/DVB	30	45	full range	Reversed-phase chromatography
1-305-07	CHP20/P30	100					
1-305-08	CHP20/P30	1,000					
1-310-01	CHP20/P50	100g	ST/DVB	50	45	full range	Reversed-phase chromatography
1-313-02	CHP20/P70	500	ST/DVB	70	45	full range	Reversed-phase chromatography
1-313-03	CHP20/P70	1,000					
1-313-04	CHP20/P70	10,000					
1-311-01	CHP20/P120	100	ST/DVB	120	45	full range	Reversed-phase chromatography
1-311-02	CHP20/P120	500					
1-311-03	CHP20/P120	1,000					
1-311-04	CHP20/P120	10,000					
1-311-05	CHP20/P120	50,000					
1-304-06	CHP50/P20	25	ST/DVB	20	25	full range	Reversed-phase chromatography
1-304-07	CHP50/P20	100					
1-304-08	CHP50/P20	1,000					
1-303-06	CHP50/P30	25	ST/DVB	30	25	full range	Reversed-phase chromatography
1-303-07	CHP50/P30	100					
1-303-08	CHP50/P30	1,000					
1-312-01	CSP50/P10	10g	ST/DVB	10	25	full range	Reversed-phase chromatography
1-312-03	CSP50/P10	1,000					
1-314-02	CHP07/P120	100	ST/DVB	120	25	full range	Reversed-phase chromatography
1-314-03	CHP07/P120	1,000					
1-314-04	CHP07/P120	10,000					
1-314-05	CHP07/P120	50,000					
1-309-01	CMG20/P10	10g	MA	10	25	2~12	Reversed-phase chromatography
1-309-03	CMG20/P10	1,000					
1-306-06	CMG20/P30	25	MA	30	25	2~12	Reversed-phase chromatography
1-306-07	CMG20/P30	100					
1-306-08	CMG20/P30	1,000					
1-308-02	CMG20/P150	100	MA	150	25	2~12	Reversed-phase chromatography
1-308-03	CMG20/P150	1,000					
1-308-04	CMG20/P150	10,000					
1-308-05	CMG20/P150	50,000					

Abbreviations; MA = Polymethacrylate ST/DVB=Styrene-divinylbenzene copolymer

● Synthetic adsorbent and reversed-phase materials

Code No.	Product Name	Packing size	Mean particle size [μm]	Pore size	pH range	Typical Application
1-315-02	CHP85/P120	100mL	120	Middle	Full range	Small molecules extraction
1-316-02	CHP87/P120	100mL	120	Small	Full range	
1-505-02	CHPOD/P30	100g	30	Large	2~12	
1-219-01	CSP800	50mL	120	Middle	Full range	Enrichment of trace of organic compounds
1-317-01	SFP08/P25	50g	25	Middle	Full range	Small molecules extraction

● Chelating resins for solid phase extraction in pretreatment

Code No.	Product Name	Packing size	Functional group	Particle size	Exchange capacity	Typical Application
1-601-02	CHL10P	100g	Iminodiacetic acid	120	>1.5	Metal Extraction
1-602-02	CHL20P	100g	Polyamine	120	>1.8	Metal Extraction
1-603-02	CLB10P	100g	Glucamine	120	>1.0	Bron Removal

10 MCI GEL™ Compounds index

	Compound	Classification	MCI GEL™ column	Figure	Page
1	Acetic acid	Acetic acid	CK08EH	2-13	11
2	Acetic acid	Acetic acid	CK08EH	2-16	12
3	Acetic acid	Acetic acid	CK08EH	2-18	12
4	Acetic acid	Acetic acid	CA08F	2-39	19
5	Acetic acid	Acetic acid	CA08F	2-40	20
6	Acetic acid	Acetic acid	CA08F	2-41	20
7	Acetic acid	Acetic acid	CA08F	2-42	20
8	N-Acetylgalactosamine	N-Acetylgalactosamine	CK08EH	2-14	11
9	N-Acetylglucosamine	N-Acetylglucosamine	CK08EH	2-14	11
10	Acetyl-D-Met.	Acetyl-D-Met.	CRS10W	6-14	56
11	Acetyl-L-Met.	Acetyl-L-Met.	CRS10W	6-14	56
12	Adenine	Nucleic base	CDR10	2-43	21
13	Adenine	Nucleic base	CHK40/C04	5-25	45
14	Adenine	Nucleic base	CHK45/C05	5-33	48
15	Adenosine	Nucleoside	SCK01	3-6	24
16	Adenosine	Nucleoside	CHK40/C04	5-25	45
17	Adenosine	Nucleoside	CHK45/C05	5-33	48
18	Adonitol	Adonitol	CK08EC	2-1	7
19	5'-ADP	Nucleotide	CDR10	2-43	21
20	Alanine	Alanine	CK10U	2-32	17
21	Alanine	Amino acid	CK10U	2-36	18
22	β-Alanine	β-Alanine	CK10U	2-33	18
23	D-Alanine	D-Alanine	CRS10W/CRS15W	6-21	58
24	D-Alanine	D-Amino acid	CRS10W	6-19	57
25	L-Alanine	L-Alanine	CRS10W/CRS15W	6-21	58
26	L-Alanine	L-Amino acid	CRS10W	6-19	57
27	γ-Aminobutyric acid	γ-Aminobutyric acid	CK10U	2-34	18
28	6-Aminopenicillanic acid	6-Aminopenicillanic acid	CHP50/P20	5-35	50
29	Ammonia	Ammonia	SCK01	3-2	24
30	Ammonium ion	Cation	SCK01	3-1	24
31	Ammonium ion	Cation	SCK01	3-3	24
32	Ammonium ion	Cation	CHK45/C05	3-10	25
33	2'-AMP	Nucleotide	CDR10	2-43	21
34	2'-AMP	Nucleotide	CDR10	2-44	21
35	3'-AMP	Nucleotide	CDR10	2-44	21
36	5'-AMP	Nucleotide	CDR10	2-43	21
37	5'-AMP	Nucleotide	CDR10	2-44	21
38	AMP	Nucleotide	CHK45/C05	5-33	48
39	Amphotericin B	Amphotericin B	CHP20/C10	5-17	41
40	Angiotensin II	Angiotensin II	CMG20/C04	5-12	40
41	Antipyrine	Antipyrine	CMG20/C04	5-10	39
42	Arginine	Arginine	CK10U	2-32	17
43	Ascorbic acid	Carboxylic acid	CA08F	2-41	20
44	Aspartic acid	Aspartic acid	CK10U	2-32	17
45	D-Aspartic acid	D-Aspartic acid	CRS10W	6-5	55
46	D-Aspartic acid	D-Amino acid	CRS10W	6-15	56
47	L-Aspartic acid	L-Aspartic acid	CRS10W	6-5	55
48	L-Aspartic acid	L-Amino acid	CRS10W	6-15	56
49	Aspirin	Aspirin	CMG20/C04	5-10	39
50	5'-ATP	Nucleotide	CDR10	2-43	21
51	Barium ion	Barium ion	SCK01	3-7	25
52	Bromide ion	Bromide ion	SCA04	3-11	26
53	Bromide ion	Bromide ion	SCA04	3-12	26
54	Buserelin	Buserelin	CHP20/C10	5-22	44
55	Buserelin	Buserelin	CMG20/C10	5-22	44
56	n-Butyl alcohol	n-Butyl alcohol	CK08EH	2-15	11
57	sec-Butyl alcohol	sec-Butyl alcohol	CK08EH	2-15	11
58	Cadmium ion	Cadmium ion	SCK01	3-8	25
59	Caffeine	Caffeine	CHP20/C04	5-4	36
60	Caffeine	Caffeine	CMG20/C04	5-10	39

	Compound	Classification	MCI GEL™ column	Figure	Page
61	Caffeine	Caffeine	CHP50/P20	5-36	50
62	Calcium ion	Calcium ion	SCK01	3-7	25
63	Calcium ion	Calcium ion	SCK01	3-8	25
64	Calcium ion	Calcium ion	SCK01	3-9	25
65	Calcium ion	Cation	CHK45/C05	3-10	25
66	Candesartan	Candesartan	CHK40/C04	5-28	47
67	Capsaicin	Alkaloid	CMG20/C10	5-40	52
68	Carbonate ion	Carbonate ion	SCA04	3-14	27
69	Catechin	Catechin	CHP50/P20	5-36	50
70	Cellobiose	Cellobiose	CA08F	2-38	19
71	Cellobiose	Cellobiose	CDR10	2-45	22
72	Cesium ion	Cation	SCK01	3-1	24
73	Chloride ion	Anion	SCA04	3-11	26
74	Chloride ion	Anion	SCA04	3-12	26
75	Chloride ion	Anion	SCA04	3-13	26
76	Chloride ion	Anion	SCA04	3-14	27
77	Chloride ion	Anion	SCA04	3-16	27
78	Chloroacetic acid	Carboxylic acid	CK08EH	2-16	12
79	Chloroacetic acid	Carboxylic acid	CK08EH	2-18	12
80	Cholic acid	Bile acid	CHP20/C04	5-7	37
81	α-Chymotrypsinogen A	Protein	CMG20/C04	5-13	40
82	α-Chymotrypsinogen A	Protein	CMG20/C10	5-18	42
83	Cinchonine	Cinchona alkaloid	CHP20/C04	5-5	36
84	Citric acid	Carboxylic acid	CK08EH	2-13	11
85	Citric acid	Carboxylic acid	CA08F	2-39	19
86	Citric acid	Carboxylic acid	CA08F	2-40	20
87	2'-CMP	Nucleotide	CDR10	2-44	21
88	3'-CMP	Nucleotide	CDR10	2-44	21
89	5'-CMP	Nucleotide	CDR10	2-43	21
90	5'-CMP	Nucleotide	CDR10	2-44	21
91	Cobalt ion	Cation	SCK01	3-8	25
92	Conalbumin	Protein	CHP20/C10	5-19	42
93	Corticosterone	Adrenal cortical hormone	CHP20/C04	5-9	38
94	Crocin	Crocin	CMG20/P30	5-39	52
95	3',5'-Cyclic AMP	Nucleotide	CDR10	2-43	21
96	Cystine	Amino acid	CK10U	2-32	17
97	Cytidine	Nucleoside	SCK01	3-6	24
98	Cytidine	Nucleoside	CHK40/C04	5-25	45
99	Cytidine	Nucleoside	CHK45/C05	5-33	48
100	Cytosine	Nucleic base	CDR10	2-43	21
101	Cytosine	Nucleic base	CHK40/C04	5-25	45
102	Cytosine	Nucleic base	CHK45/C05	5-33	48
103	Cytochrome c	Protein	CQP30	4-6	32
104	Cytochrome c	Protein	CMG20/C04	5-13	40
105	Cytochrome c	Protein	CMG20/C10	5-18	42
106	β-Citronellol	Perfume	CMG20/C10	5-26	46
107	Deoxycholic acid	Bile acid	CHP20/C04	5-7	37
108	11-Deoxycortisol	Adrenal cortical hormone	CHP20/C04	5-9	38
109	Deoxyribose	Deoxysugar	CA08F	2-38	19
110	Deoxyribose	Deoxysugar	CDR10	2-45	22
111	D,D-2,6-Diaminopimelic acid	D,D-Diamino carboxylic acid	CRS10W	6-16	56
112	L,L-2,6-Diaminopimelic acid	L,L-Diamino carboxylic acid	CRS10W	6-16	56
113	meso-2,6-Diaminopimelic acid	meso-Diamino carboxylic acid	CRS10W	6-16	56
114	Dibutyl phthalate	Aromatic ester	CHP50/P20	5-34	50
115	Dichloroacetic acid	Carboxylic acid	CK08EH	2-16	12
116	Dichloroacetic acid	Carboxylic acid	CK08EH	2-18	12
117	Diethylene glycol	Polyalcohol	CK08EH	2-17	12
118	Diethyl phthalate	Aromatic ester	CHP20/C04	5-3	36
119	Dihydrocapsaicin	Alkaloid	CMG20/C10	5-40	52
120	Dimethylamine	Amine	SCK01	3-2	24
121	4-Dimethylaminoantipyrine	Medicine	CMG20/C04	5-10	39
122	Dimethyl phthalate	Aromatic ester	CHP20/C04	5-3	36
123	Dimethyl phthalate	Aromatic ester	CHP50/P20	5-34	50
124	Dipropyl phthalate	Aromatic ester	CHP20/C04	5-3	36
125	Dipropyl phthalate	Aromatic ester	CHP50/P20	5-34	50

	Compound	Classification	MCI GEL™ column	Figure	Page
126	Dopamine	Catecholamine	CHP20/C04	5-2	36
127	Epicatechin	Catechol	CHP50/P20	5-36	50
128	Epicatechin gallate	Catechol	CHP50/P20	5-36	50
129	Epigallocatechin	Catechol	CHP50/P20	5-36	50
130	Epigallocatechin gallate	Catechol	CHP50/P20	5-36	50
131	Epinephrine	Catecholamine	CHP20/C04	5-2	36
132	Erythritol	Sugar alcohol	CK08EC	2-8	8
133	Erythritol	Sugar alcohol	CK08EC	2-9	9
134	Erythritol	Sugar alcohol	CK08EC	2-10	9
135	meso-Erythritol	Sugar alcohol	CK08EC	2-1	7
136	D-Ethionine	D-Amino acid	CRS10W	6-2	55
137	L-Ethionine	L-Amino acid	CRS10W	6-2	55
138	Ethyl alcohol	Alcohol	CK08EC	2-8	8
139	Ethyl alcohol	Alcohol	CK08EH	2-15	11
140	Ethyl alcohol	Alcohol	CK08EC	2-9	9
141	Ethylene glycol	Polyalcohol	CK08EH	2-15	11
142	Ethylene glycol	Polyalcohol	CK08EH	2-17	12
143	Ferritin	Protein	CQP30	4-6	32
144	Filipin	Antibiotic	CHP20/C10	5-17	41
145	Fluoride ion	Anion	SCA04	3-11	26
146	Fluoride ion	Anion	SCA04	3-12	26
147	Formic acid	Carboxylic acid	CK08EH	2-13	11
148	Formic acid	Carboxylic acid	CA08F	2-39	19
149	Formic acid	Carboxylic acid	CA08F	2-41	20
150	Fructose	Sugar	CK08EC	2-1	7
151	Fructose	Sugar	CK08EC	2-2	7
152	Fructose	Sugar	CK08EC	2-4	8
153	Fructose	Sugar	CK08EC	2-5	8
154	Fructose	Sugar	CK08EC	2-6	8
155	Fructose	Sugar	CK08EC	2-7	8
156	Fructose	Sugar	CK08EC	2-8	8
157	Fructose	Sugar	CK08EC	2-9	9
158	Fructose	Sugar	CK08EC	2-10	9
159	Fructose	Sugar	CK08EC	2-11	10
160	Fructose	Sugar	CK04S	2-28	16
161	Fructose	Sugar	CK04S	2-29	16
162	Fructose	Sugar	CK04S	2-30	16
163	Fructose	Sugar	CA08F	2-38	19
164	Fructose	Sugar	CDR10	2-45	22
165	Fructo-oligosaccharide	Fructo-oligosaccharide	CK04S	2-30	16
166	Fucose	Sugar	CA08F	2-38	19
167	Galactose	Sugar	CK08EC	2-3	7
168	Galactose	Sugar	CK08EC	2-11	10
169	Galactose	Sugar	CK06SC	2-19	12
170	Galactose	Sugar	CA08F	2-38	19
171	Galactose	Sugar	CDR10	2-45	22
172	Gallocatechin	Catechol	CHP50/P20	5-36	50
173	GDP	Nucleotide	CHK45/C05	5-33	48
174	Gentiobiose	Disaccharide	CK08EC	2-1	7
175	Gentiobiose	Disaccharide	CK08EC	2-10	9
176	Geraniol	Perfume	CMG20/C10	5-26	46
177	Ghrelin human	Peptide	CMG20/C10	5-21	43
178	Ghrelin rat	Peptide	CMG20/C10	5-21	43
179	Gluconic acid	Carboxylic acid	CA08F	2-40	20
180	Gluconic acid	Carboxylic acid	CA08F	2-42	20
181	Gluconic acid	Carboxylic acid	CQP06	4-7	32
182	Glucose	Sugar	CK08EC	2-1	7
183	Glucose	Sugar	CK08EC	2-2	7
184	Glucose	Sugar	CK08EC	2-4	8
185	Glucose	Sugar	CK08EC	2-5	8
186	Glucose	Sugar	CK08EC	2-6	8
187	Glucose	Sugar	CK08EC	2-7	8
188	Glucose	Sugar	CK08EC	2-8	8
189	Glucose	Sugar	CK08EC	2-9	9
190	Glucose	Sugar	CK08EC	2-10	9

	Compound	Classification	MCI GEL™ column	Figure	Page
191	Glucose	Sugar	CK08E	2-12	10
192	Glucose	Sugar	CK08EH	2-14	11
193	Glucose	Sugar	CK04S	2-28	16
194	Glucose	Sugar	CK04S	2-29	16
195	Glucose	Sugar	CK04S	2-30	16
196	Glucose	Sugar	CA08F	2-38	19
197	Glucose	Sugar	CDR10	2-45	22
198	Glucose	Sugar	CQP06	4-7	32
199	Glutamic acid	Amino acid	CK10U	2-32	17
200	D-Glutamic acid	D-Amino acid	CRS10W	6-6	55
201	L-Glutamic acid	L-Amino acid	CRS10W	6-6	55
202	Glycerol	Polyalcohol	CK08EC	2-8	8
203	Glycerol	Polyalcohol	CK08EC	2-9	9
204	Glycerol	Polyalcohol	CK08EH	2-15	11
205	Glycine	Amino acid	CK10U	2-32	17
206	Glycolic acid	Carboxylic acid	CK08EH	2-13	11
207	Glycolic acid	Carboxylic acid	CK08EH	2-18	12
208	Glycyrrhizic acid	Glycyrrhizic acid	CHP20/C04	5-8	38
209	Gly-Tyr	Peptide	CMG20/C04	5-12	40
210	3'-GMP	Nucleotide	CDR10	2-44	21
211	5'-GMP	Nucleotide	CDR10	2-44	21
212	5'-GTP	Nucleotide	CDR10	2-43	21
213	Guanosine	Nucleoside	SCK01	3-6	24
214	Guanosine	Nucleoside	CHK40/C04	5-25	45
215	Guanosine	Nucleoside	CHK40/C04	5-25	45
216	Guanosine	Nucleoside	CHK45/C05	5-33	48
217	Guanosine	Nucleoside	CHK45/C05	5-33	48
218	Histidine	Amino acid	CK10U	2-32	17
219	D-Histidine	D-Amino acid	CRS10W	6-7	55
220	L-Histidine	L-Amino acid	CRS10W	6-7	55
221	Hemoglobin A0	Protein	SP01	4-2	30
222	Hemoglobin A1c	Protein	SP01	4-2	30
223	5-HPA	Amino acid	CK10U	2-35	18
224	Hydrocortisone	Adrenal cortical hormone	CHP20/C04	5-9	38
225	5-Hydroxytryptophan	Amino acid	CHP20/C04	5-2	36
226	D-2-Hydroxy-n-butyric acid	D-α-Hydroxycarboxylic acid	CRS10W	6-17	57
227	L-2-Hydroxy-n-butyric acid	L-α-Hydroxycarboxylic acid	CRS10W	6-17	57
228	D-α-Hydroxy isocaproic acid	D-α-Hydroxycarboxylic acid	CRS10W	6-17	57
229	L-α-Hydroxy isocaproic acid	L-α-Hydroxycarboxylic acid	CRS10W	6-17	57
230	5-hydroxy lysine	Amino acid	CK10U	2-37	18
231	D-α-Hydroxy-n-valeric acid	D-α-Hydroxycarboxylic acid	CRS10W	6-17	57
232	L-α-Hydroxy-n-valeric acid	L-α-Hydroxycarboxylic acid	CRS10W	6-17	57
233	D-m-Hydroxymandelic acid	D-α-Hydroxycarboxylic acid	CRS10W	6-18	57
234	L-m-Hydroxymandelic acid	L-α-Hydroxycarboxylic acid	CRS10W	6-18	57
235	D-p-Hydroxymandelic acid	D-α-Hydroxycarboxylic acid	CRS10W	6-18	57
236	L-p-Hydroxymandelic acid	L-α-Hydroxycarboxylic acid	CRS10W	6-18	57
237	D-P-Hydroxy phenylglycine	D-Amino acid	CRS10W	6-20	57
238	L-P-Hydroxy phenylglycine	L-Amino acid	CRS10W	6-20	57
239	Hydroxy proline	Amino acid	CK10U	2-35	18
240	Hypoxanthine	6-Hydroxypurine	CHP20/C04	5-6	37
241	Hypoxanthine	Nucleic base	CHK40/C04	5-25	45
242	Hypoxanthine	Nucleic base	CHK45/C05	5-33	48
243	5'-IMP	Nucleotide	CDR10	2-44	21
244	Inosine	Nucleoside	CHK40/C04	5-25	45
245	Inosine	Nucleoside	CHK45/C05	5-33	48
246	Insulin human recombinant	Peptide	CHP20/C10	5-20	43
247	Insulin glargine	Peptide	CHP20/C10	5-20	43
248	Insulin human recombinant	Peptide	CMG20/C10	5-20	43
249	Insulin glargine	Peptide	CMG20/C10	5-20	43
250	Irbesartan	Sartan	CHK40/C04	5-28	47
251	Isoleucine	Amino acid	CK10U	2-32	17
252	Isoleucine	Amino acid	CK10U	2-36	18
253	D-Isoleucine	D-Amino acid	CRS10W	6-1	54
254	L-Isoleucine	L-Amino acid	CRS10W	6-1	54
255	allo-D-Isoleucine	D-Amino acid	CRS10W	6-1	54

	Compound	Classification	MCI GEL™ column	Figure	Page
256	allo-L-Isoleucine	L-Amino acid	CRS10W	6-1	54
257	Isopropyl alcohol	Alcohol	CK08EH	2-15	11
258	Kinase	Enzyme	DA01	4-3	30
259	Lactic acid	Carboxylic acid	CK08EH	2-13	11
260	Lactic acid	Carboxylic acid	CA08F	2-39	19
261	Lactic acid	Carboxylic acid	CA08F	2-41	20
262	Lactic acid	Carboxylic acid	CA08F	2-42	20
263	D-Lactic acid	D- α -Hydroxycarboxylic acid	CRS10W	6-11	55
264	L-Lactic acid	L- α -Hydroxycarboxylic acid	CRS10W	6-11	55
265	D-Lactic acid	D- α -Hydroxycarboxylic acid	CRS10W	6-17	57
266	L-Lactic acid	L- α -Hydroxycarboxylic acid	CRS10W	6-17	57
267	D-Lactic acid	D- α -Hydroxycarboxylic acid	CRS10W/CRS15W	6-22	58
268	L-Lactic acid	L- α -Hydroxycarboxylic acid	CRS10W/CRS15W	6-22	58
269	β -Lactoglobulin	Protein	CMG20/C10	5-18	42
270	Lactose	Disaccharide	CK08EC	2-1	7
271	Lactose	Disaccharide	CK08EC	2-3	7
272	Lactose	Disaccharide	CK06SC	2-19	12
273	Lactose	Disaccharide	CA08F	2-38	19
274	Lactose	Disaccharide	CDR10	2-45	22
275	Lactose monohydrate	Disaccharide	CK08EC	2-10	9
276	Lactulose	Disaccharide	CK08EC	2-3	7
277	Lactulose	Disaccharide	CK06SC	2-19	12
278	Leucine	Amino acid	CK10U	2-32	17
279	Leucine	Amino acid	CK10U	2-36	18
280	Nor-Leucine	Amino acid	CK10U	2-36	18
281	D-Leucine	D-Amino acid	CRS10W	6-2	55
282	L-Leucine	L-Amino acid	CRS10W	6-2	55
283	Leu-Enkephalin	Peptide	CMG20/C04	5-12	40
284	Leuprorelin	Peptide	CHP20/C10	5-22	44
285	Leuprorelin	Peptide	CMG20/C10	5-22	44
286	LH-RH human	Peptide	CHP20/C10	5-22	44
287	LH-RH human	Peptide	CMG20/C10	5-22	44
288	LH-RH salmon	Peptide	CHP20/C10	5-22	44
289	LH-RH salmon	Peptide	CMG20/C10	5-22	44
290	Linalool	Perfume	CMG20/C10	5-26	46
291	Linalool	Perfume	CMG20/C10	5-27	46
292	Linalyl acetate	Perfume	CMG20/C10	5-26	46
293	Lithium ion	Cation	SCK01	3-1	24
294	Lithium ion	Cation	CHK45/C05	3-10	25
295	Losartan	Sartan	CHK40/C04	5-28	47
296	Lysine	Amino acid	CK10U	2-32	17
297	Lysine	Amino acid	CK10U	2-37	18
298	D-Lysine	D-Amino acid	CRS10W	6-8	55
299	L-Lysine	L-Amino acid	CRS10W	6-8	55
300	Magnesium ion	Cation	SCK01	3-7	25
301	Magnesium ion	Cation	SCK01	3-9	25
302	Magnesium ion	Cation	CHK45/C05	3-10	25
303	Malic acid	Carboxylic acid	CK08EH	2-13	11
304	Malic acid	Carboxylic acid	CA08F	2-39	19
305	Malic acid	Carboxylic acid	CA08F	2-41	20
306	Malonic acid	Carboxylic acid	CK08EH	2-13	11
307	Malonic acid	Carboxylic acid	CA08F	2-39	19
308	Maltose	Disaccharide	CA08F	2-38	19
309	Maltose	Disaccharide	CDR10	2-45	22
310	Maltose	Disaccharide	CK08E	2-12	10
311	Maltotriose	Disaccharide	CK08E	2-12	10
312	D-Mandelic acid	D- α -Hydroxycarboxylic acid	CRS10W	6-18	57
313	L-Mandelic acid	L- α -Hydroxycarboxylic acid	CRS10W	6-18	57
314	Manganese ion	Cation	SCK01	3-8	25
315	Mannitol	Sugar alcohol	CK08EC	2-1	7
316	Mannitol	Sugar alcohol	CK08EC	2-8	8
317	Mannitol	Sugar alcohol	CK08EC	2-9	9
318	Mannitol	Sugar alcohol	CK08EC	2-10	9
319	Mannose	Sugar	CK08EC	2-1	7
320	Mannose	Sugar	CK08EC	2-10	9

	Compound	Classification	MCI GEL™ column	Figure	Page
321	Mannose	Sugar	CA08F	2-38	19
322	Mannose	Sugar	CDR10	2-45	22
323	Melibiose	Disaccharide	CA08F	2-38	19
324	Melibiose	Disaccharide	CDR10	2-45	22
325	Met-Enkephalin	Peptide	CMG20/C04	5-12	40
326	Methionine	Amino acid	CK10U	2-32	17
327	D-Methionine	D-Amino acid	CRS10W	6-3	55
328	L-Methionine	L-Amino acid	CRS10W	6-3	55
329	D-Methionine	D-Amino acid	CRS10W	6-14	56
330	L-Methionine	L-Amino acid	CRS10W	6-14	56
331	Methyl alcohol	Alcohol	CK08EH	2-15	11
332	Methylamine	Amine	SCK01	3-2	24
333	γ -methyl leucine	Amino acid	CK10U	2-36	18
334	Mevastatin	Medicine	CHP20/C10	5-16	41
335	Myoglobin	Protein	CQP30	4-6	32
336	Nerol	Perfume	CMG20/C10	5-26	46
337	Nitrate ion	Anion	SCA04	3-11	26
338	Nitrate ion	Anion	SCA04	3-12	26
339	Nitrate ion	Anion	SCA04	3-13	26
340	Nitrate ion	Anion	SCA04	3-14	27
341	Nitrate ion	Anion	SCA04	3-16	27
342	Nitrate ion	Anion	SCA04	3-11	26
343	Nitrate ion	Anion	SCA04	3-12	26
344	D-Norleucine	D-Amino acid	CRS10W	6-3	55
345	L-Norleucine	L-Amino acid	CRS10W	6-3	55
346	D-Norvaline	D-Amino acid	CRS10W	6-3	55
347	L-Norvaline	L-Amino acid	CRS10W	6-3	55
348	Nystatin	Antibiotic	CHP20/C10	5-17	41
349	Oligosaccharide	Dp1-Dp9	CK04S	2-21	15
350	Oligosaccharide	Dp1-Dp13	CK04SS	2-22	15
351	Oligosaccharide	Dp1-Dp16	CK02A	2-23	15
352	Oligosaccharide	Dp1-Dp20	CK02AS	2-24	15
353	Oligosaccharide	Dp1-Dp7	CK04S	2-25	16
354	Oligosaccharide	Dp1-Dp7	CK04SS	2-26	16
355	Oligosaccharide	Dp1-Dp7	CK02AS	2-27	16
356	Ornithine	Amino acid	CK10U	2-37	18
357	Orotic acid	Carboxylic acid	CHP20/C04	5-6	37
358	Ovalbumin	Protein	CQP30	4-6	32
359	Oxalic acid	Carboxylic acid	CK08EH	2-13	11
360	PEG MW 145,000	PEG	CQP30	4-5	32
361	PEG MW 40,000	PEG	CQP30	4-5	32
362	PEG MW 6,000	PEG	CQP30	4-5	32
363	Penicillin G	Antibiotic	CHP50/P20	5-35	50
364	Penicillin V	Antibiotic	CHP50/P20	5-35	50
365	Phenacetin	Medicine	CMG20/C04	5-10	39
366	Phenylalanine	Amino acid	CK10U	2-32	17
367	Phenylalanine	Amino acid	CK10U	2-37	18
368	D-Phenylalanine	D-Amino acid	CRS10W	6-2	55
369	L-Phenylalanine	L-Amino acid	CRS10W	6-2	55
370	D-Phenylalanine	D-Amino acid	CRS10W	6-9	55
371	L-Phenylalanine	L-Amino acid	CRS10W	6-9	55
372	D- α -Phenylglycine	D-Amino acid	CRS10W	6-13	56
373	L- α -Phenylglycine	L-Amino acid	CRS10W	6-13	56
374	Phosphate ion	Anion	SCA04	3-11	26
375	Pipecolic acid	Amino acid	CK10U	2-35	18
376	Polyphenon 60	Polyphenol	CHP07/C04	5-29	47
377	Polyphenon 60	Polyphenol	CHP20/C04	5-30	47
378	Potassium ion	Cation	SCK01	3-1	24
379	Potassium ion	Cation	SCK01	3-3	24
380	Potassium ion	Cation	SCK01	3-4	24
381	Potassium ion	Cation	SCK01	3-5	24
382	Potassium ion	Cation	CHK45/C05	3-10	25
383	Pravastatin Na	Medicine	CHP20/C10	5-16	41
384	Procainamide	Anesthetic	CMG20/C04	5-14	40
385	Procaine	Anesthetic	CMG20/C04	5-14	40

	Compound	Classification	MCI GEL™ column	Figure	Page
386	Proline	Amino acid	CK10U	2-32	17
387	Proline	Amino acid	CK10U	2-35	18
388	D-Proline	D-Amino acid	CRS10W	6-2	55
389	L-Proline	L-Amino acid	CRS10W	6-2	55
390	n-Propyl alcohol	Alcohol	CK08EH	2-15	11
391	Pyruvic acid	Carboxylic acid	CA08F	2-41	20
392	Quinine	Cinchona alkaloid	CHP20/C04	5-5	36
393	Rhamnose	Sugar	CA08F	2-38	19
394	Rhamnose	Sugar	CDR10	2-45	22
395	Ribitol(Adnitol)	Sugar alcohol	CK08EC	2-10	9
396	Ribonuclease A	Protein	CMG20/C04	5-13	40
397	Ribonuclease A	Protein	CMG20/C10	5-18	42
398	Ribonuclease A	Protein	CHP20/C10	5-19	42
399	Ribose	Sugar	CK08EC	2-1	7
400	Ribose	Sugar	CK08EC	2-10	9
401	Ribose	Sugar	CA08F	2-38	19
402	Ribose	Sugar	CDR10	2-45	22
403	Rituximab	Monoclonal antibody	SP01	4-1	30
404	Rubidium ion	Cation	SCK01	3-1	24
405	Salicin	Phenol glycoside	CK08EC	2-1	7
406	Salicin	Phenol glycoside	CK08EC	2-10	9
407	Sennoside A	Sennoside A	CHP20/C10	5-37	51
408	Sennoside B	Sennoside B	CHP20/C10	5-37	51
409	Sennoside A	Sennoside A	CHP20/P20	5-37	51
410	Sennoside B	Sennoside B	CHP20/P20	5-37	51
411	Sennoside A	Sennoside A	CHP20/P30	5-37	51
412	Sennoside B	Sennoside B	CHP20/P30	5-37	51
413	Sennoside A	Sennoside A	CHP20/P30	5-38	51
414	Serine	Amino acid	CK10U	2-32	17
415	D-Serine	D-Amino acid	CRS10W	6-4	55
416	L-Serine	L-Amino acid	CRS10W	6-4	55
417	Serotonin	Catecholamine	CHP20/C04	5-2	36
418	Sifuvirtide	Peptide	CMG20/C10	5-23	44
419	Simvastatin	Medicine	CHP20/C10	5-16	41
420	Sodium ion	Cation	SCK01	3-1	24
421	Sodium ion	Cation	SCK01	3-3	24
422	Sodium ion	Cation	SCK01	3-4	24
423	Sodium ion	Cation	SCK01	3-5	24
424	Sodium ion	Cation	CHK45/C05	3-10	25
425	Sorbitol	Sugar alcohol	CK08EC	2-2	7
426	ssRNA	RNA	CHP20/C10	5-24	45
427	Stachyose	Tetrasaccharide	CK08EC	2-1	7
428	Stachyose hydrate	Sugar	CK08EC	2-10	9
429	Strontium ion	Cation	SCK01	3-7	25
430	Strontium ion	Cation	SCK01	3-8	25
431	Succinic acid	Carboxylic acid	CA08F	2-41	20
432	Succinylsulfathiazole	Sulfa drug	CMG20/C04	5-11	39
433	Sucrose	Disaccharide	CK08EC	2-2	7
434	Sucrose	Disaccharide	CK08EC	2-4	8
435	Sucrose	Disaccharide	CK08EC	2-5	8
436	Sucrose	Disaccharide	CK08EC	2-11	10
437	Sucrose	Disaccharide	CK04S	2-30	16
438	Sulfate ion	Anion	SCA04	3-11	26
439	Sulfate ion	Anion	SCA04	3-12	26
440	Sulfate ion	Anion	SCA04	3-13	26
441	Sulfamerazine	Sulfa drug	CMG20/C04	5-11	39
442	Sulfanilamide	Sulfa drug	CMG20/C04	5-11	39
443	Sulfathiazole	Sulfa drug	CMG20/C04	5-11	39
444	Tartaric acid	Carboxylic acid	CK08EH	2-13	11
445	Tartaric acid	Carboxylic acid	CA08F	2-39	19
446	Tartaric acid	Carboxylic acid	CA08F	2-41	20
447	Tert-leucine	Amino acid	CK10U	2-36	18
448	Theobromine	Purine alkaloid	CHP20/C04	5-4	36
449	Theophylline	Purine alkaloid	CHP20/C04	5-4	36
450	Theophylline	Purine alkaloid	CHP20/C04	5-6	37

	Compound	Classification	MCI GEL™ column	Figure	Page
451	Thiocyanic ion	Anion	SCA04	3-15	27
452	Thiosulfuric ion	Anion	SCA04	3-15	27
453	Threonine	Amino acid	CK10U	2-32	17
454	Thymidine	Nucleoside	CHK40/C04	5-25	45
455	Thymidine	Nucleoside	CHK45/C05	5-33	48
456	Thymine	Nucleic base	CDR10	2-43	21
457	Thymine	Nucleic base	CHK40/C04	5-25	45
458	D-α-Tocopherol	Vitamin	CMG20/C04	5-41	53
459	D-γ-Tocopherol	Vitamin	CMG20/C04	5-41	53
460	D-δ-Tocopherol	Vitamin	CMG20/C04	5-41	53
461	D-α-Tocopherol	Vitamin	CMG20/P30	5-42	53
462	D-γ-Tocopherol	Vitamin	CMG20/P30	5-42	53
463	D-δ-Tocopherol	Vitamin	CMG20/P30	5-42	53
464	D-α-Tocopherol	Vitamin	CMG20/C04	5-43	53
465	D-β-Tocopherol	Vitamin	CMG20/C04	5-43	53
466	D-γ-Tocopherol	Vitamin	CMG20/C04	5-43	53
467	D-δ-Tocopherol	Vitamin	CMG20/C04	5-43	53
468	D-α-Tocopherol	Vitamin	CMG20/P150	5-44	53
469	D-β-Tocopherol	Vitamin	CMG20/P150	5-44	53
470	D-γ-Tocopherol	Vitamin	CMG20/P150	5-44	53
471	D-δ-Tocopherol	Vitamin	CMG20/P150	5-44	53
472	D-α-Tocopherol	Vitamin	CMG20/C10	5-41	53
473	D-γ-Tocopherol	Vitamin	CMG20/C10	5-41	53
474	D-δ-Tocopherol	Vitamin	CMG20/C10	5-41	53
475	D-γ-Tocotrienol	Vitamin	CMG20/C04	5-41	53
476	D-γ-Tocotrienol	Vitamin	CMG20/P30	5-42	53
477	D-α-Tocotrienol	Vitamin	CMG20/C04	5-43	53
478	D-β-Tocotrienol	Vitamin	CMG20/C04	5-43	53
479	D-γ-Tocotrienol	Vitamin	CMG20/C04	5-43	53
480	D-δ-Tocotrienol	Vitamin	CMG20/C04	5-43	53
481	D-α-Tocotrienol	Vitamin	CMG20/P150	5-44	53
482	D-β-Tocotrienol	Vitamin	CMG20/P150	5-44	53
483	D-γ-Tocotrienol	Vitamin	CMG20/P150	5-44	53
484	D-δ-Tocotrienol	Vitamin	CMG20/P150	5-44	53
485	D-γ-Tocotrienol	Vitamin	CMG20/C10	5-41	53
486	TPN	Nucleotide	CDR10	2-43	21
487	Transferrin	Protein	CMG20/C10	5-18	42
488	Trichloroacetic acid	Carboxylic acid	CK08EH	2-16	12
489	Triethylene glycol	Polyalcohol	CK08EH	2-17	12
490	Trimethylamine	Amine	SCK01	3-2	24
491	TritonX-100	Surfactant	CHPOD/04	5-31	48
492	TritonX-100	Surfactant	ODS-1HU	5-32	48
493	Tryptophan	Amino acid	CHP20/C04	5-2	36
494	D-Tryptophan	D-Amino acid	CRS10W	6-10	55
495	L-Tryptophan	L-Amino acid	CRS10W	6-10	55
496	Tyrosine	Amino acid	CK10U	2-32	17
497	Tyrosine	Amino acid	CK10U	2-37	18
498	D-Tyrosine	D-Amino acid	CRS10W	6-2	55
499	L-Tyrosine	L-Amino acid	CRS10W	6-2	55
500	3'-UMP	Nucleotide	CDR10	2-44	21
501	5'-UMP	Nucleotide	CDR10	2-44	21
502	UMP	Nucleotide	CHK45/C05	5-33	48
503	Uracil	Nucleic base	CDR10	2-43	21
504	Uracil	Nucleic base	CHK40/C04	5-25	45
505	Uracil	Nucleic base	CHK45/C05	5-33	48
506	Uric acid	2,6,8-Trioxypurine	CHP20/C04	5-6	37
507	Uridine	Nucleoside	SCK01	3-6	24
508	Uridine	Nucleoside	CHK40/C04	5-25	45
509	Uridine	Nucleoside	CHK45/C05	5-33	48
510	Urine	Urine	CDR10	2-46	22
511	Ursodeoxycholic acid	Bile acid	CHP20/C04	5-7	37
512	Valine	Amino acid	CK10U	2-32	17
513	Valine	Amino acid	CK10U	2-33	18
514	Valine	Amino acid	CK10U	2-36	18
515	D-Valine	D-Amino acid	CRS10W	6-2	55

	Compound	Classification	MCI GEL™ column	Figure	Page
516	L-Valine	L-Amino acid	CRS10W	6-2	55
517	Valsartan	Sartan	CHK40/C04	5-28	47
518	Vitamin B3	Water soluble vitamin	CMG20/C04	5-15	40
519	Vitamin B6	Water soluble vitamin	CMG20/C04	5-15	40
520	Vitamin B12	Water soluble vitamin	CMG20/C04	5-15	40
521	Vitamin C	Water soluble vitamin	CMG20/C04	5-15	40
522	Xanthine	2,6-Dihydropyrimidine	CHP20/C04	5-6	37
523	Xanthine	Nucleic base	CHK40/C04	5-25	45
524	Xanthine	Nucleic base	CHK45/C05	5-33	48
525	Xanthine oxidase	Nucleic base	CHK45/C05	5-33	48
526	Xanthosine	Nucleoside	CHK40/C04	5-25	45
527	Xylitol	Sugar alcohol	CK08EC	2-1	7
528	Xylitol	Sugar alcohol	CK08EC	2-10	9
529	Xylose	Sugar	CA08F	2-38	19
530	Xylose	Sugar	CDR10	2-45	22
531	Zinc ion	Cation	SCK01	3-7	25

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D I A I O N™

SEPABEADES™

MabSpeed™

ChromSpeed™

Ion Exchange Resins (DIAION™)

Strongly Acidic Cation Exchange Resins
(Gel, Porous, Highly Porous Type and Industrial Chromatography)
DIAION™ SK, UBK, PK series

Weakly Acidic Cation Exchange Resins
(Methacrylic and Acrylic Type)
DIAION™ WK series

Strongly Basic Anion Exchange Resins
(Gel, Porous, and Highly Porous Type)
DIAION™ SA, UBA, PA, HPA series

Weakly Basic Anion Exchange Resins
(Acrylic, Polyamine, and Dimethylamine Type)
DIAION™ WA series

Chelating Resins (DIAION™)

Iminodiacetate type, Polyamine Type, and Glucamine Type
DIAION™ CR series

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Aromatic Type, Modified Aromatic Type, and Methacrylic Type
DIAION™ HP series
SEPABEADS

Bioseparation Media

Affinity Chromatography Resins
MabSpeed™ RP series

Strongly Acidic Cation Exchange Resins
ChromSpeed™ S series

Weakly Acidic Cation Exchange Resins
ChromSpeed™ CM series

Strongly Basic Anion Exchange Resins
ChromSpeed™ Q series

Weakly Basic Anion Exchange Resins
ChromSpeed™ DA series

Screening Columns
MabSpeed™, ChromSpeed™