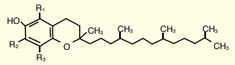
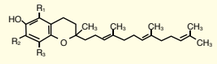
Application data of CHP series

Tocopherol



	R_1	R_2	R_3
1. α-tocopherol	CH_3	CH_3	CH_3
2. β-tocopherol	CH_3	H	CH_3
3. γ-tocopherol	H	CH_3	CH_3
4. δ-tocopherol	H	H	CH_3

Tocotrienol



	R_1	R_2	R_3
5. α-tocotrienol	CH_3	CH_3	CH_3
6. β-tocotrienol	CH_3	H	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

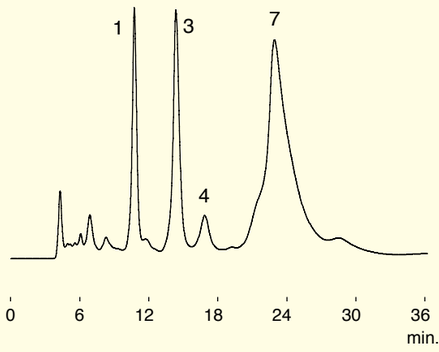


Fig. 5-42 Elution profile of Rice Bran Oil in preparative scale

Conditions
Column : MCI GEL™ CMG20/P30
20mm I.D.×500mm
Eluent : Hexane/C_2H_5OH = 98/2 (vol.)
Flow rate : 4.7 mℓ /min
Detection : 295 nm
Sample : Rice Bran Oil, 50 mg/mℓ
Injection : 1260μL

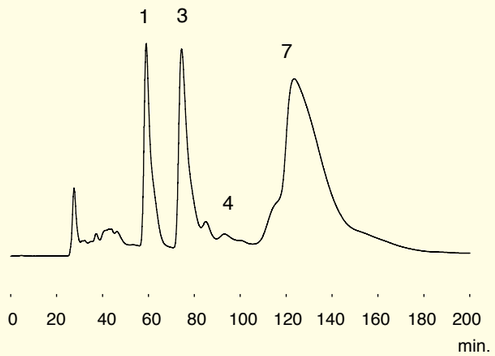


Fig. 5-43 Mixture of tocopherol and tocotrienol : Comparison with silica gel column

Conditions
Column : 1. Silica gel 5SIL, 4.6mmI.D.×250mm
2. MCI GEL™ CMG20/C04, 4.6mmI.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)

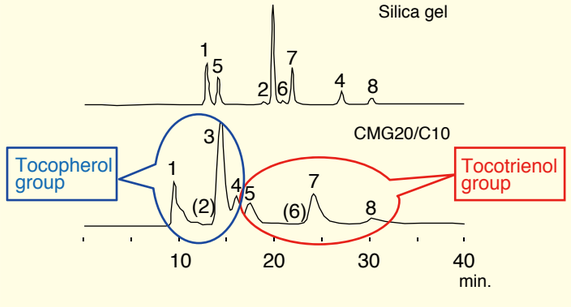
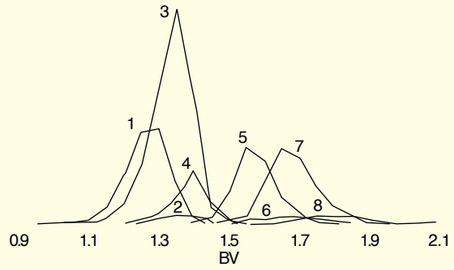


Fig. 5-44 Elution profile of tocopherol and tocotrienol in preparative scale

Conditions
Column : MCI GEL™ CMG20/P150, 41.2mmI.D.×550mm, ×4
Eluent : Hexane/EtOH = 90/10
Flow rate : 49.0mℓ /min (SV=1.0)
Column temp. : 25°C
Detection : UV 292n
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)

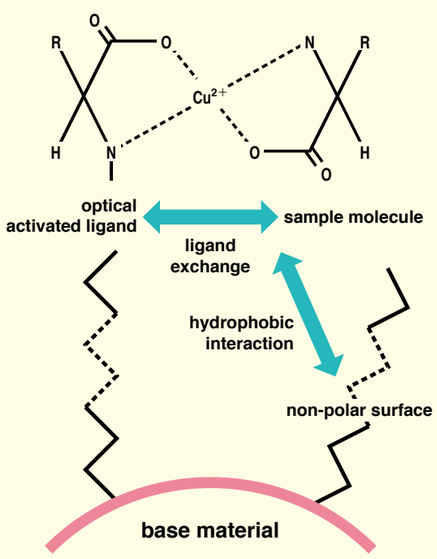
CRS10W 4.6×50

CRS15W 4.6×50

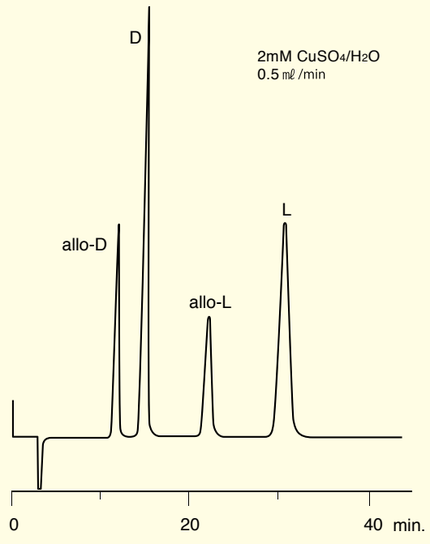
MCI GEL™ column	Column dimensions	Particle size (μm)	USP
MCI GEL™ CRS10W	4.6×50mm	3	L32
MCI GEL™ CRS15W	4.6×50mm	3	L32

Separation mechanism and performance of MCI GEL™ CRS series

Separation mechanism



Application of CRS10W
Fig. 6-1 DL-Isoleucine



●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 (CH_3CN or CH_3OH, max. of 15v/v%) to prevent adsorption onto the stationary phase.

●Separation performance

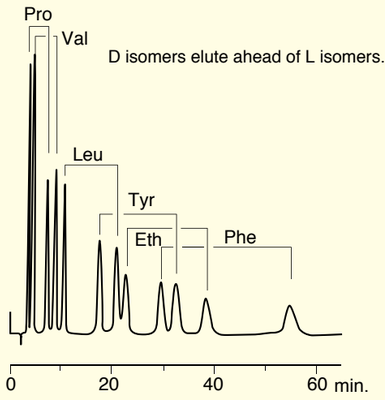
1. The CRS series columns separate over 20 D,L-α-Amino acids by only single column. The columns separate not only α-Amino acids but also α-Hydroxy carboxylic acids and derivative amino acids such as Acetylated amino acids.
2. The columns provide excellent resolution operated at room temperature.
3. The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

●USP L32 column

Application data of CRS10W

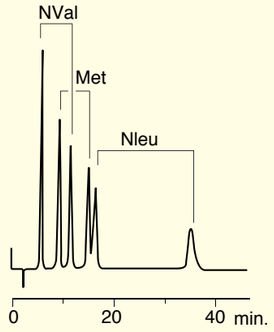
For all chromatograms, column temperature is room temperature and wave length is 254nm.
All eluents are $CuSO_4$ aqueous solution except for Fig. 6-9 and Fig. 6-10.

Fig. 6-2 Separation of amino acids mixture



D isomers elute ahead of L isomers.

Fig. 6-3 Separation of amino acids mixture



D isomers elute ahead of L isomers.

Fig. 6-4 Separation of DL-Ser.

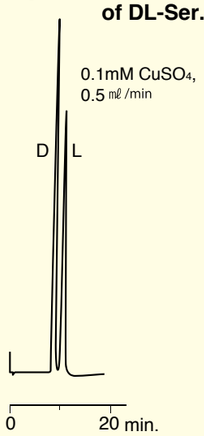


Fig. 6-5 Separation of DL-aspartic acid

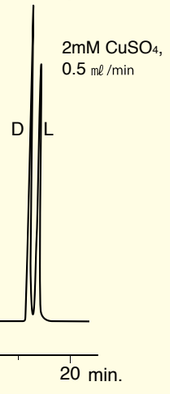


Fig. 6-6 Separation of DL-glutamic acid

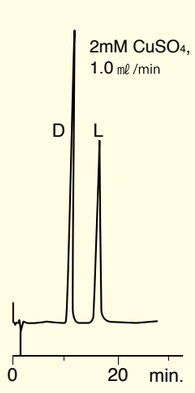


Fig. 6-7 Separation of DL-histidine

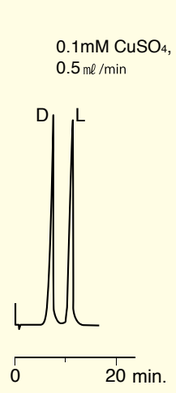


Fig. 6-8 Separation of DL-lysine

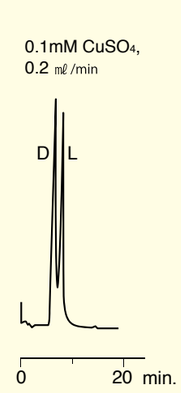


Fig. 6-9 Separation of DL-phenylalanine

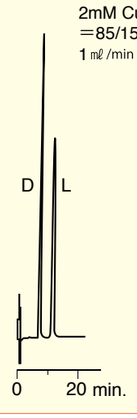


Fig. 6-10 Separation of DL-tryptophan

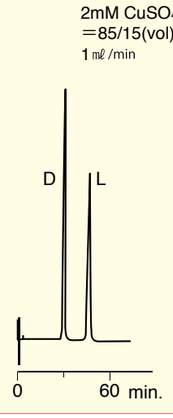


Fig. 6-11 Separation of DL-lactic acid

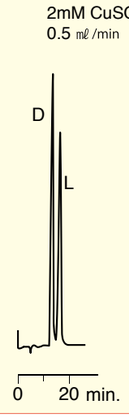
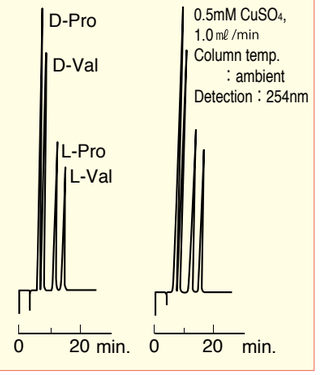


Fig. 6-12 Durability test

The sample was continuously injected 800 times for approximately 500 hrs. Changes of retention times and separation ability are not observed.



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

Application data of CRS10W

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

Conditions
Column : MCI GEL™ CRS10W 4.6mm I.D.×50mm
Eluent : 2mM $CuSO_4/CH_3OH$=85/15
Flow rate : 1.0 mℓ /min
Column temp. : 25°C
Detection : 254nm
Sample : 1. D-α-Phenylglycine
2. L-α-Phenylglycine

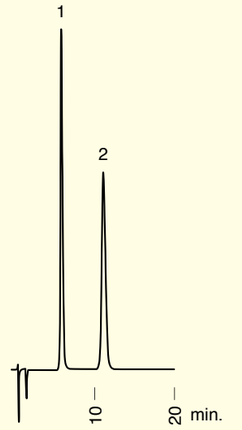


Fig. 6-14 Separation of methionine and acetylmethionine

Conditions
Column : MCI GEL™ CRS10W 4.6mm I.D.×50mm
Eluent : 2mM $CuSO_4/CH_3CN$=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

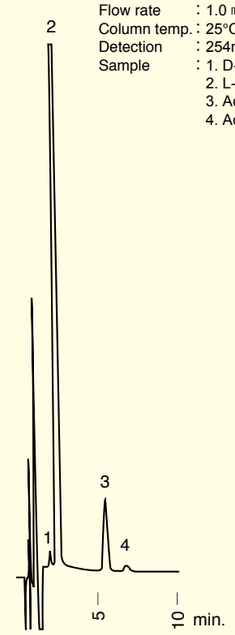


Fig. 6-15 D/L-Aspartic acid

Conditions
Column : MCI GEL™ CRS10W 4.6mm I.D.×50mm
Eluent : 0.4mM$CuSO_4$
Flow rate : 1.0 mℓ /min
Temp. : ambient
Detection : UV 254nm
Sample : D/L Aspartic acid

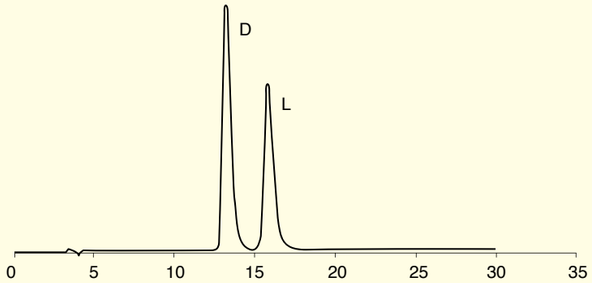
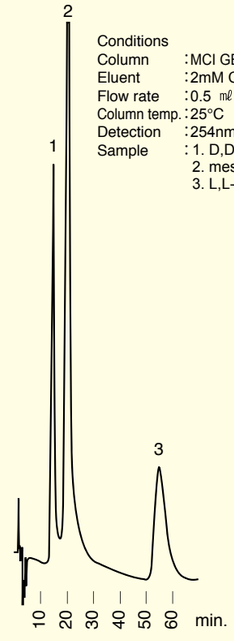


Fig. 6-16 Separation of diaminopimelic acid

Conditions
Column : MCI GEL™ CRS10W 4.6mm I.D.×50mm
Eluent : 2mM $CuSO_4$
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

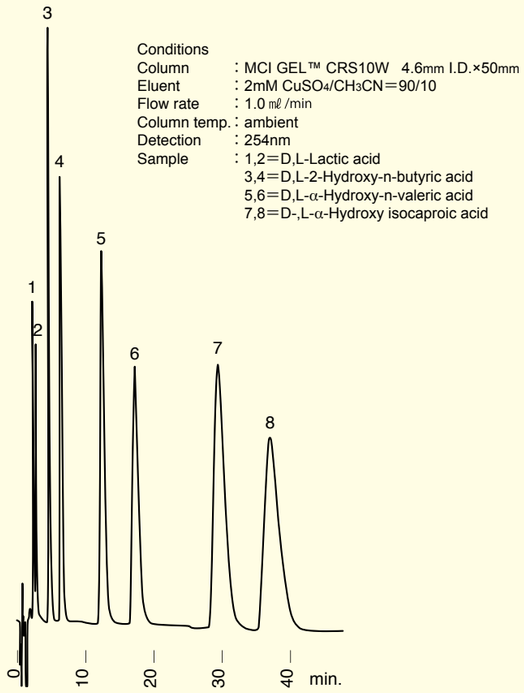


Fig. 6-18 Separation of 2-hydroxy carboxylic acids

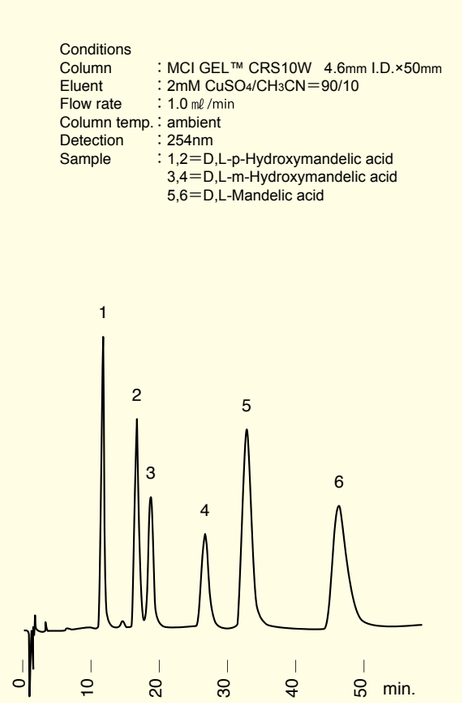


Fig. 6-19 D/L Alanine

Conditions
Column : MCI GEL™ CRS10W 4.6mm I.D.×50mm
Eluent : 0.1mMCuSO4
Flow rate : 1.0 mℓ/min
Temp. : 30°C
Detection : UV 254nm
Sample : D/L Alanine

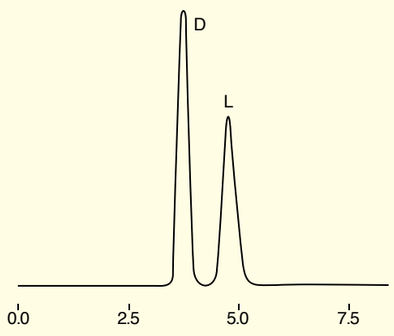
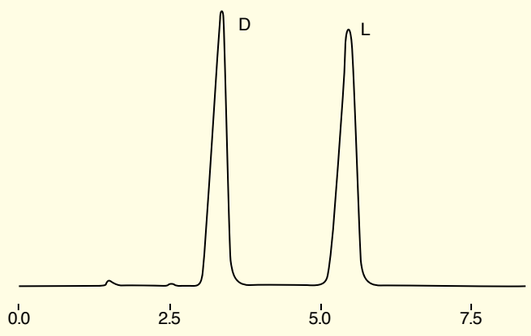


Fig. 6-20 DL-P-Hydroxyphenylglycine

Conditions
Column : MCI GEL™ CRS10W 4.6mm I.D.×50mm
Eluent : 2mMCuSO4: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

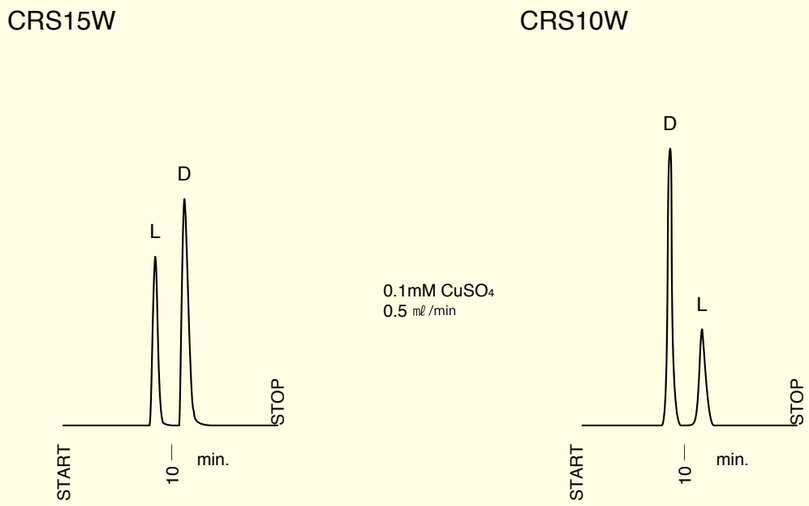
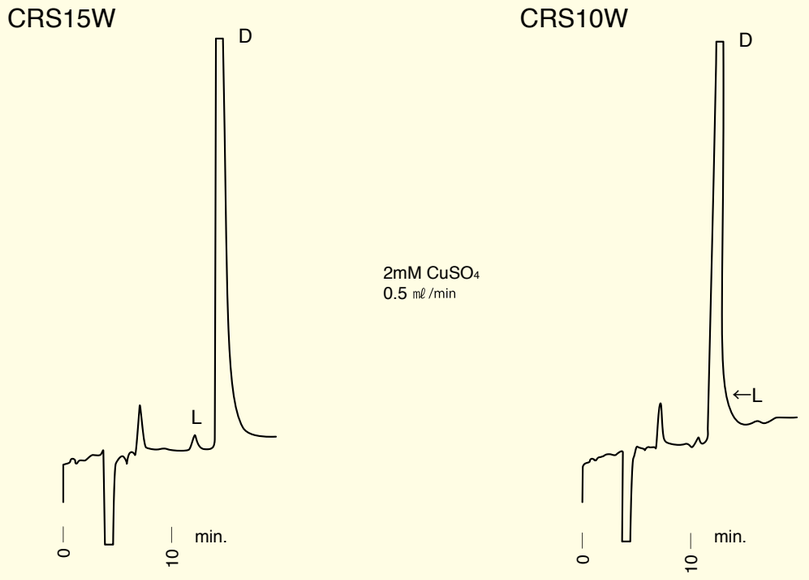


Fig. 6-22 Analysis of a trace of L-lactic acid in 50 ppm D-lactic acid

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.



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 $CuSO_4$ of eluent.
2. For acidic amino acids, higher $CuSO_4$ 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 $CuSO_4$ in the eluent.
5. Please be careful not to flow both water soluble organic solvents (CH_3CN, CH_3OH, 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 CH_3CN or CH_3OH 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	Iminodiaceteic 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