ChiralTek Chiral Column & Media and SPE Catalog

For UPLC,HPLC,SFC, PSPE

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https://chiraltek-column.com

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1. About ChiralTek

About us

ChiralTek Pte Ltd (https://chiraltek-column.com) is a high-tech company headquartered in Singapore with strong R&D, manufacturing and technical support capabilities in the fields of high-resolution chiral separations and high-efficient sample preparations. The company's R&D and technical support teams are composed of professors and experts from world-class universities, and its sales network currently covers Asia Pacific, Europe and the United States. It has a branch in mainland China: ChiralTek (Wuhan) Co., Ltd. At present, it has established in-depth partnerships with many international high-tech companies. Our main business focuses on providing superior and more effective solutions to chiral separations and sample preparations. At present, ChiralTek manufactures chiral columns and novel chiral packing materials for the following ten series of chromatography columns for HPLC, SFC, UPLC, and SMB: Amylose-appended Cyclodextrin-immobilized ChiralAMCD columns, Amylose-appended Cellulose-immobilized ChiralAMCE columns, Cellulose-appended Cyclodextrin-immobilized ChiralCECD columns, Tandem hetero-Amylose-immobilized ChiralAMxAMy columns, Tandem hetero-Cellulose-immobilized ChiralCExCEy column, Amylose-immobilized ChiralAM columns, Cyclodextrin-immobilized ChiralCD columns, Cellulose-immobilized ChiralCE columns, Amylose-coated ChiralCTAM columns, and Cellulose-coated ChiralCTCE columns. ChiralTek is also the pioneer in designing and manufacturing the first type of positive-pressure solid phase extraction PSPE instruments that are free of carryover and cross contamination. A new type of ultra-high performance extraction UPE cartridges and a novel type of HLE series of universal SPE cartridges have been successfully developed by ChiralTek. When worked with the PSPE and other SPE instruments, the UPE and HLE cartridges can be easily used to achieve high-efficient sample preparations. Recently, ChiralTek's chiral columns & media and SPE products have been widely used in many fields including pharmaceutical analysis & chiral drug purification, trace biomarkers & metabolites determination, food & water quality analysis, clinical studies, and environmental analysis.

ChiralTek brands and products

ChiralTek is our company's own brand. Currently, all ChiralTek products are produced, tested and sold globally by our Singapore headquarters. ChiralTek®, 凯若泰®, and ChiralTek are registered trademarks of our company in China and Singapore. The novel type of complex chiral selector-immobilized columns & media including ChiralAMCD, ChiralAMCE, ChrialCECD, ChiralAMxAMy, and ChiralCExCEy series are specially-designed chiral columns& media which are firstly created and produced by ChiralTek via immobilizing proprietary complex chiral selectors containing two different chiral recognition moieties. ChiralTek is the first and the only commercial supplier for those complex chiral selectors-immobilized chiral columns & media which exhibit better chiral separations for a wider range of chiral compounds due to the co-operative functioning of the two different recognition moieties. ChrialTek PSPE systems are a novel type of user and environmental friendly positive SPE instruments.

Advantages and unique characteristics of ChiralTek chiral columns & media

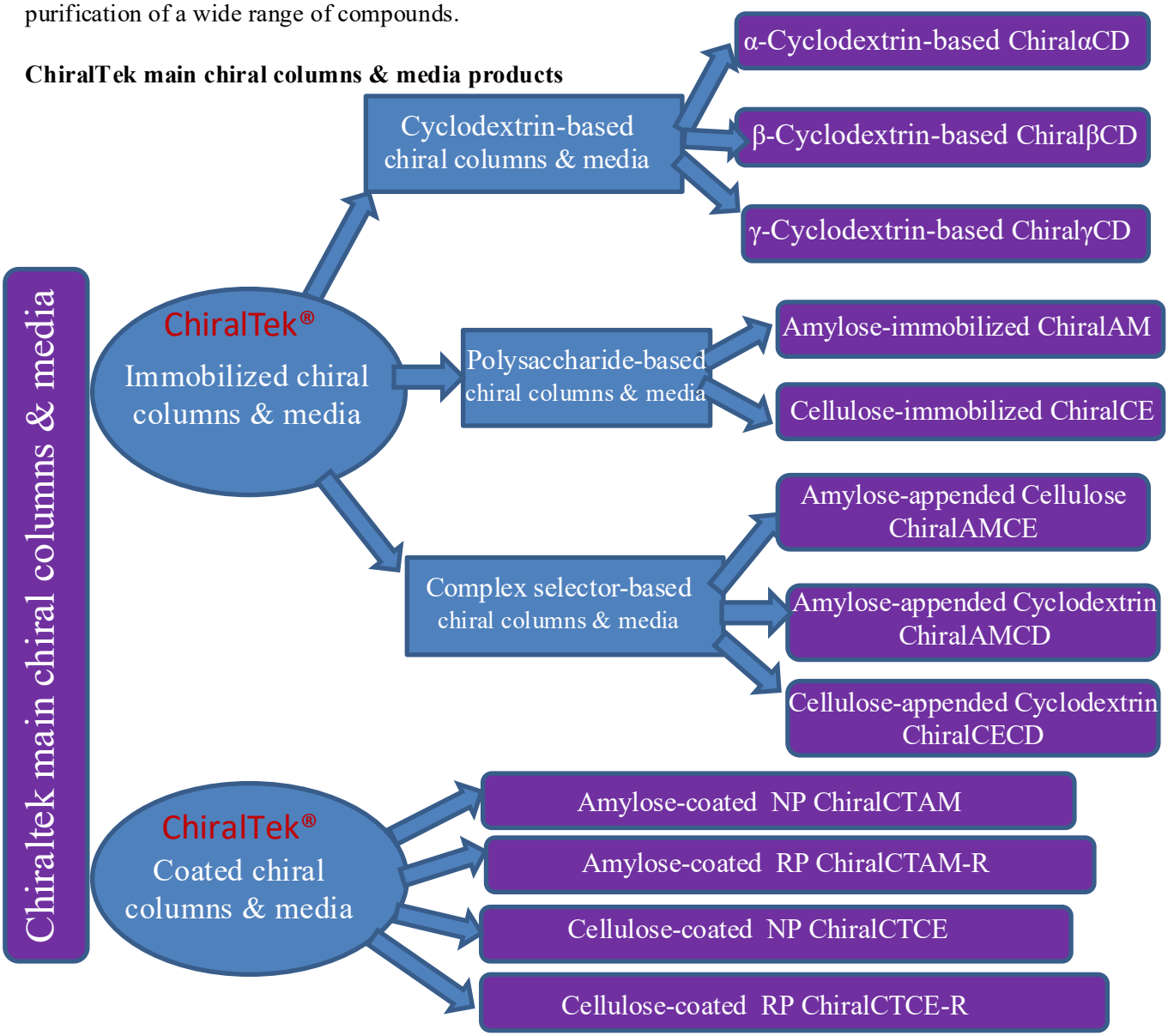
As the chemical structures bonding method are unique and different from other manufacturers' chiral columns & media, the ChiraTek immobilized chiral columns & media can provide effective and better chiral recognition for a wide range of chiral compounds under multi-mode chromatographic conditions. One complex chiral selector-immobilized column, such as ChiralAMCD, ChiralAMCE, ChrialCECD, ChiralAMxAMy, or ChiralCExCEy column, can be used as two different types of other supplier's single chiral selector-immobilized columns.

About ChiralTek

ChiralTek Product Features

The immobilized chiral columns & media produced by ChiralTek can be used for HPLC, UPLC, SFC, and SMB, and can separate a wide range of chiral and achiral compounds of various types under normal phase, reverse phase, and various organic polar chromatographic mobile phase conditions. ChiralCTAM and ChiralCTCE are two series of widely compatible coated chiral columns & media for normal phase chromatography, and correspondingly, ChiralCTAM-R and ChiralCTCE-R are special columns & media for reverse phase chromatography. The new UPE cartridges are environmentally friendly products that use only a very small amount of organic solvents and do not require additional evaporation or nitrogen blowing and concentration operations. They can achieve elution and enrichment in one single step and are suitable for reverse phase mode efficient extraction and automatic sample preparations. Since the HLE series of universal SPE cartridges contain multiple functional groups, they can be conveniently used for high efficient extraction and fractionation of complicated samples. ChiralTek PSPE is the first type of compact, potable, affordable, and cost-efficient commercial positive-pressure SPE systems that are free of carryover and cross contamination. ChiralTek PSPE is built for accurate trace analysis of complicated samples. ChiralTek also produces ODS-RPS series of reverse phase chromatography columns, which not only have high column efficiency but also good reproducibility, and can be applied for analytical determination and preparative purification of a wide range of compounds.

ChiralTek main chiral columns & media products



2. Microscopic Analysis of ChiralTek Packing Materials

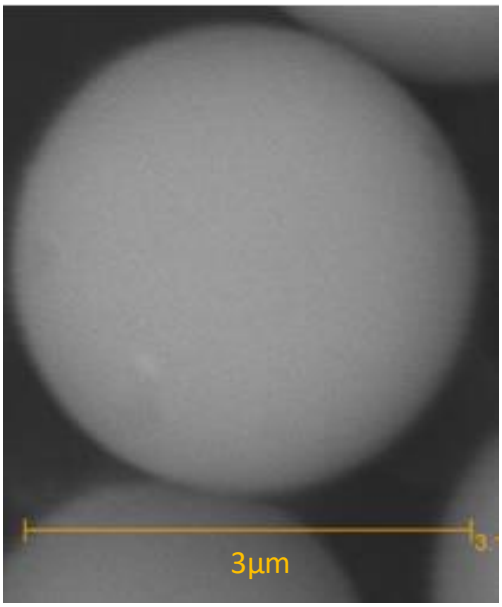


Fig 2.1A. SEM image of 3µm ChiralAM2 silica particles.

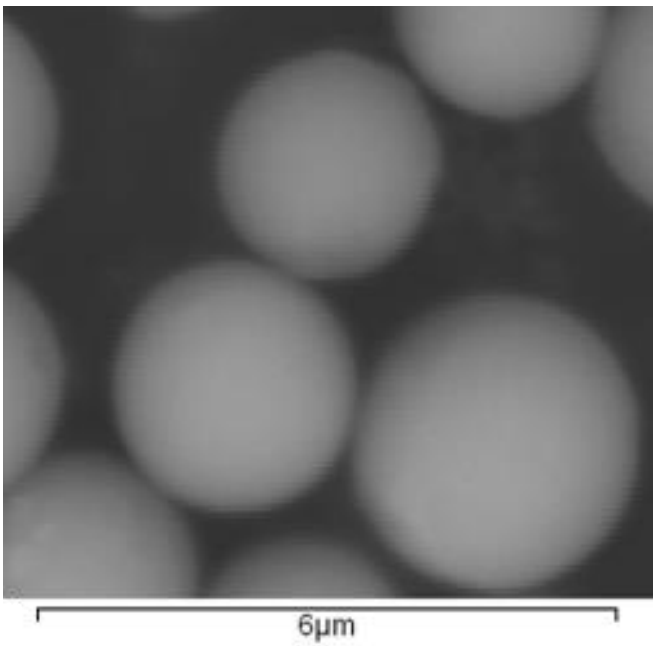


Fig 2.1B. SEM image of 3µm ChiralCD2 silica particles.

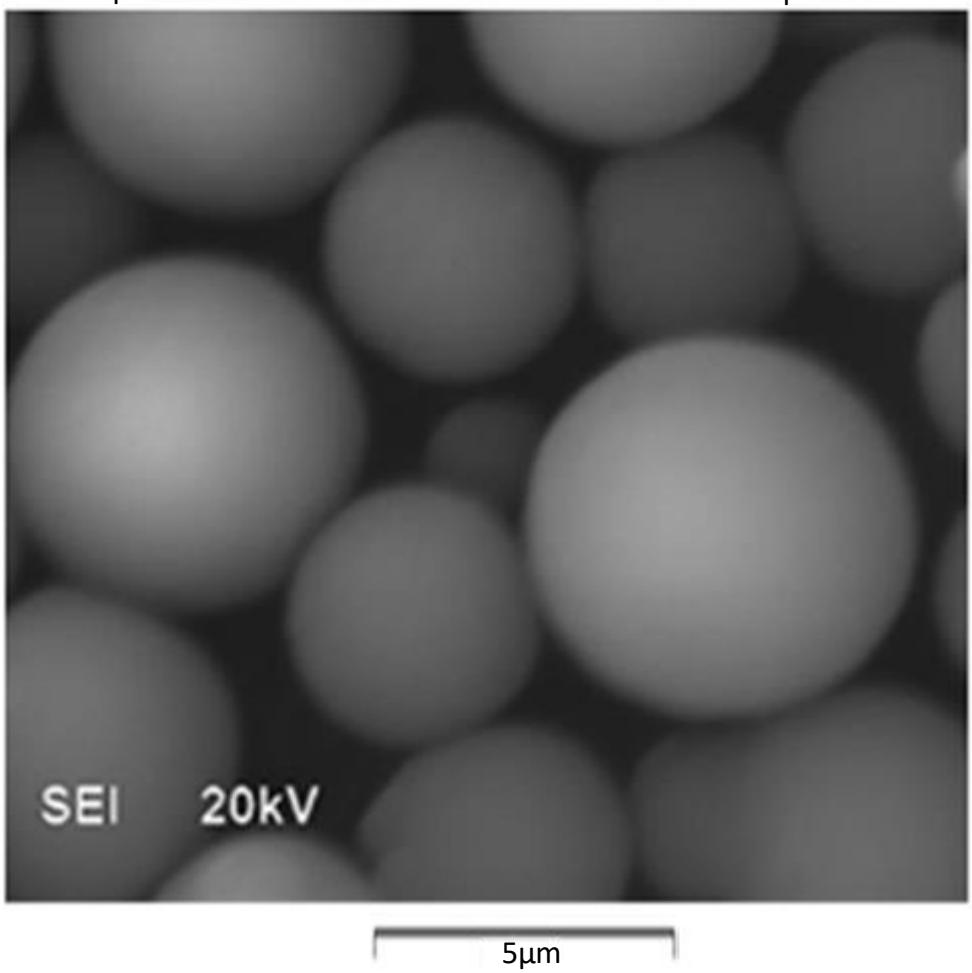
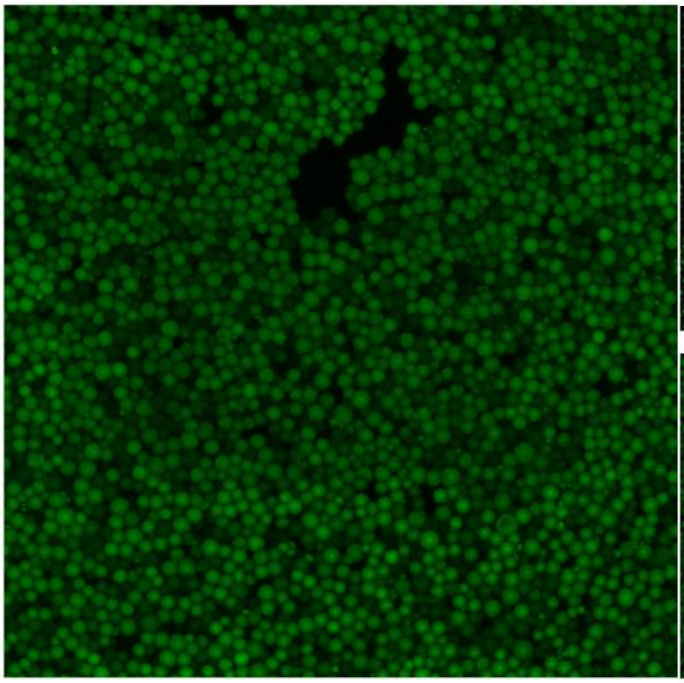
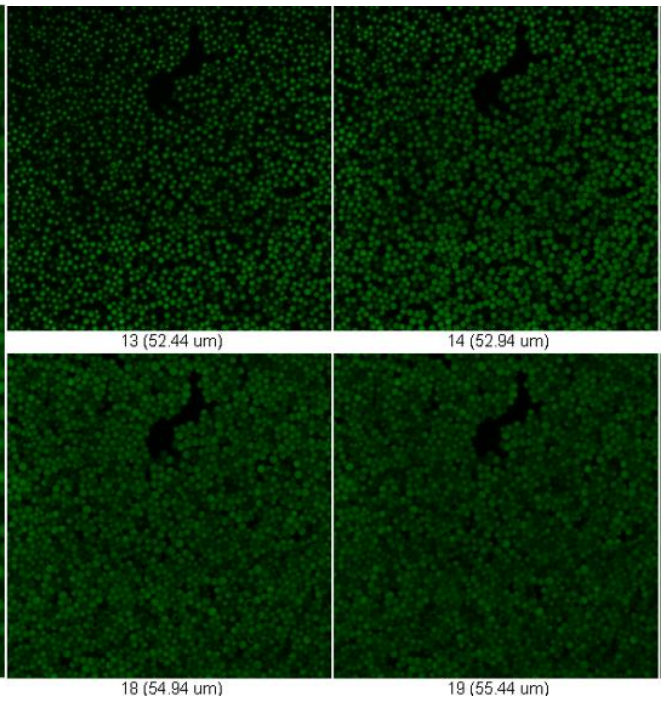


Fig 2.1C. SEM image of 5µm ChiralCD1 silica packing materials.

Confocal Laser Scanning Microscopic Analysis of ChiralTek Packing Materials



(I) An image of the front scan analysis. The scale on the left is 10μm



(II) Four images of different layers of scanning detection. The values in brackets in the figure indicate the focus detection depth, and the difference between the two adjacent images on the left and right indicates the thickness of the scanning layer.

Fig 2.2A. The Confocal laser scanning microscopic images of fluorescent moiety-bonded-ChiralCD silica particles with 3μm diameter.

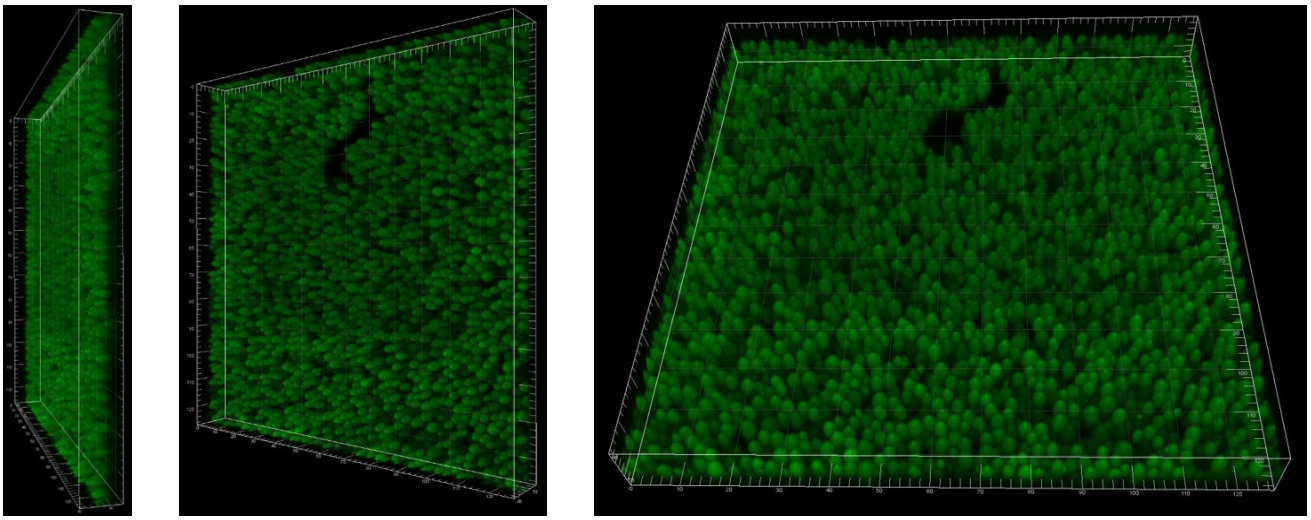


Fig 2.2B.Confocal laser scanning microscopic screenshots of 3D video of 3μm fluorescent moiety-bonded-ChiralCD silica particles.

3. ChiralTek Column Compatible and Alternative Replacement List

ChiralTek	Daicel	Supelco/Astec	Phenomenex	Merck/Astec
ChiralAM-2	IA		Lux i-Amylose-1	
ChiralCE-2	IB			
ChiralCE-4	IC		Lux i-Cellulose-5	
ChiralAM-13	ID			
ChiralAM-4	IE			
ChiralAM-3	IF			
ChiralAM-5	IG			
ChiralAM-6	IH			
ChiralCE-7	IJ			
ChiralCE-5	IK			
ChiralAM-1				
ChiralAM-7				
ChiralAM-8				
ChiralAM-9				
ChiralAM-10				
ChiralAM-11				
ChiralAM-12				
ChiralCE-1				
ChiralCE-3	IM			
ChiralCE-6				
ChiralCE-8				
ChiralCE-9				
ChiralCE-10				
ChiralCE-11				
ChiralCE-12				
ChiralCE-13				
ChiralCTCE-1	OC/OC-H			
ChiralCTCE-2	OD/OD-H		Lux Cellulose-1	
ChiralCTCE-7	OJ/OJ-H		Lux Cellulose-3	
ChiralCTCE-3	OZ/OZ-H		Lux Cellulose-2	
ChiralCTCE-9	OX/OX-H		Lux Cellulose-4	
ChiralCTCE-8	OG/OG-H			
ChiralCTAM-6	AS/AS-H			
ChiralCTAM-2	AD/AD-H		Lux Amylose-1	
ChiralCTAM-3	AZ/AZ-H			
ChiralCTAM-10	AY/AY-H		Lux Amylose-2	
ChiralCTCE-2R	OD-R/OD-RH			
ChiralCTCE-7R	OJ-R/OJ-RH			
ChiralCTCE-3R	OZ-R/OZ-RH			
ChiralCTCE-9R	OX-R/OX-RH			
ChiralCTAM-6R	AS-R/AS-RH			
ChiralCTAM-2R	AD-R/AD-RH			
ChiralCTAM-3R	AZ-R/AZ-RH			
ChiralCTAM-10R	AY-R/AY-RH			
ChiralCTCE-1R	OC-R/OC-RH			
ChiralCTCE-8R	OG-R/OG-RH			
ChiralCF6	CR(+)			
ChiralCF6	CR(-)			
ChiralβCD-0		Astec Cyclobond I 2000		
ChiralγCD-0		Astec Cyclobond II		
ChiralβCD-2		Astec Cyclobond I 2000 DMP		
ChiralβCD-1/βCD-2/βCD-3/βCD-4/βCD-5/βCD-6/βCD-7/βCD-8/βCD-9/βCD-10/βCD-11/βCD-12/βCD-13				ChiralDex series LC columns

ChiralTek Column Compatible and Alternative Replacement List

ChiralTek	Daicel	Supelco/Astec	Phenomenex	Merck/Astec
ChiralαCD-0/αCD-1/αCD-2/αCD-3/αCD-4/αCD-5/αCD-6/αCD-7/αCD-8/αCD-9/αCD-10/αCD-11/αCD-12/αCD-13				
ChiralγCD-1/γCD-2/γCD-3/γCD-4/γCD-5/γCD-6/γCD-7/γCD-8/γCD-9/γCD-10/γCD-11/γCD-12/γCD-13				
The complex chiral selector-immobilized columns & media				
ChiralAMCE-1				
ChiralAMCE-2	IA + IB			
ChiralAMCE-3	IF +			
ChiralAMCE-4	IC + IE			
ChiralAMCE-5	IG + IK			
ChiralAMCE-6	IH +			
ChiralAMCE-7	IJ +			
ChiralAMCE-13	ID +			
…				
ChiralAM2AM3	IA + IF			
ChiralAM2AMx	IA +			
ChiralAM4AM4	IF + IE			
ChiralAM4AM5	IE + IG			
ChiralCE2CE4	IB + IC			
ChiralCE2CE5	IB + IK			
ChiralCE3CEx				
…				
ChiralAMCD-2	IA +	+ Astec Cyclobond I 2000 DMP		
ChiralAMCD-3	IF +			+ ChiralDex series LC columns
ChiralAMCD-5	IG +			+ ChiralDex series LC columns
CECD2	IB +	+ Astec Cyclobond I 2000 DMP		
CECD5	IK+			+ ChiralDex series LC columns
…				

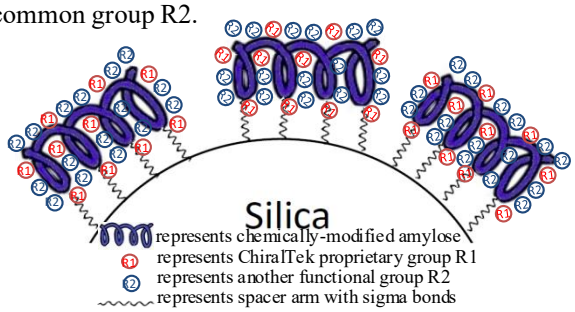
Remark： PS: x =1-13, This table only reflects the compatibility between ChiralTek and other brands. The compatibility between other brands may not be correct in this table. Currently, ChiralTek has the most types of chiral products. The blank represents that other brands do not have this type of chiral column. For subsequent updates, please consult our local distributor.

4. ChiralTek Chiral Chromatography Columns & Media

4.1 ChiralAM Amylose-immobilized Chiral Columns & Media

4.1.1 Unique Characteristics for ChiralAM columns & Media

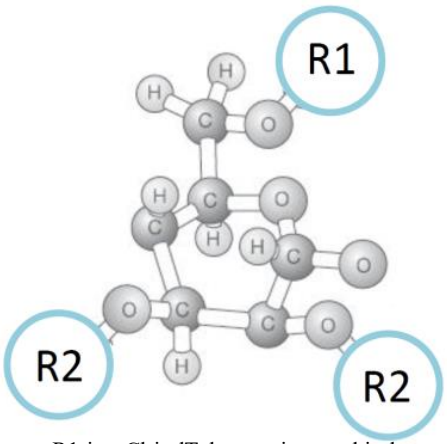
ChiralAM columns are a new type of chemically-modified amylose-immobilized silica particles-packed chiral columns. The ChiralAM particles were prepared through a specially-designed one-step reaction procedure by bonding the different functional groups-substituted amylose onto surface of high-quality porous silica (2μm, 3μm, 5μm, 8μm or 10μm). Therefore, high column efficiency can be easily achieved on the ChiralAM columns. As shown in Figure 4.1(A), the amylose selector contains two different derivatized functional groups: ChiralTek proprietary group R1 and the other common group R2.



ChiralAM-1：R2= Phenylcarbamate;
ChiralAM-2：R2= 3,5-Dimethylphenylcarbamate;
ChiralAM-3：R2= 3-Chloro-4-methyl-phenylcarbamate;
ChiralAM-4：R2= 3,5-Dichlorophenylcarbamate;
ChiralAM-5：R2= 3-Chloro-5-methyl-phenylcarbamate;
ChiralAM-6：R2= (S)-α-Methylbenzylcarbamate;
ChiralAM-7：R2= 4-Methylbenzoate;
ChiralAM-8：R2= 4-Methylphenylcarbamate;
ChiralAM-9：R2= 4-Chloro-3-methyl-phenylcarbamate;
ChiralAM-10：R2= 5-Chloro-2-methyl-phenylcarbamate;
ChiralAM-11：R2= 3-Chloro-2-methyl-phenylcarbamate;
ChiralAM-12：R2= 4-Chlorophenylcarbamate;
ChiralAM-13：R2= 3-Chlorophenylcarbamate.

Fig 4.1(A). Schematic diagram of the ChiralAM particles

The chemical structure of the chiral selectors of ChiralAM phases are different from other supplier's amylose-based phases. The typical structure of the bonded amylose selector unit in ChiralAM columns is showed in the following Figure 4.1(B). Due to the synergistic effect of the two functional groups R1 and R2, the ChiralAM not only have a wider chiral recognition range but also have higher enantioselectivity. Since the novel ChiralAM particles have higher content of the immobilized amyloses and contain more types of functional groups, the ChiralAM can provide different and generally better chiral separation abilities than other supplier's amylose-immobilized products.



R1 is a ChiralTek proprietary chiral group;
R2 is another common functional group.

Fig 4.1(B). Typical structure of general chiral selector glucose unit of the ChiralAM particles.

4.1.2. Application Restrictions and Requirements

The ChiralAM columns can be used under multiple modes conditions. For use under reversed-phase (RP) conditions, the columns need to be firstly flushed with ethanol and methanol following by mobile phase until reaching a constant pressure. Similarly, for use under normal phase (NP) conditions, the columns need to be flushed with ethanol or isopropanol following by mobile phase until achieving a stable baseline signal. A ChiralAM or C18 guard column can be used for RP conditions and a Diol guard column can be used for NP conditions. If non-standard mobile phases are to be used, please contact ChiralTek for technical support.

When using ChiralAM columns with 2μm or 3μm particles, low flow rate (e.g., 0.1-0.3 mL/min) should be applied in traditional HPLC with highly viscous mobile phases in order to avoid high back pressure.

Flow direction:	Arrow direction on the column label
Maximum tolerance pressure:	< 800 bar（~11600 psi，2μm、3μm column，UPLC or HPLC）
	< 600 bar (~9000 psi , 5μm analytical column, HPLC or SFC) < 200 bar (~3000 psi , 5μm, 8μm,10μm preparative column, HPLC or SFC)
Temperature:	1 – 40 ° C
Guard column:	ChiarlAM, C18, or Diol guard column
Mode:	HPLC、UPLC、SFC

4.1.3. Care and Maintenance of the ChiralAM Columns

1] It is strongly recommended to use ChiralAM, C18 or Diol guard columns to protect the ChiralAM columns.

[2] It'd be better to resolve samples in mobile phases and filter through 0.5μm membrane before injection.

[3]The solvent in the ChiralAM columns should be replaced with methanol (RP conditions) or ethanol / IPA (NP conditions) if the columns need to be stored for over a week's time.

[4]When worked in high pressure conditions, it's strongly recommended to gradually decrease flow rate to ensure column pressure lower than 100 bar (~1450 psi) before switching off the chromatograph pump.

4.1.4. Ordering Information for ChiralAM Chiral Column

Product List of Some Common ChiralAM Immobilized Columns from ChiralTek

Part Number	*Type*	*Dimension*	*Column Description*
852-AM1-01	ChiralAM-1	2μm, 200Å, 50 × 2.1mm	2μm, Phenylcarbamate-amylose immobilized ChiralAM-1column
8552-AM2-02	ChiralAM-2	2μm, 500Å, 100 × 2.1mm	2μm,3,5-Dimethylphenylcarbamate-amylose immobilized ChiralAM-2
8952-AM3-03	ChiralAM-3	2μm, 1000Å, 150 × 2.1mm	2μm,3-Chloro-4-methylphenylcarbamate-amylose immobilized ChiralAM-3
8553-AM4-04	ChiralAM-4	3μm, 500Å, 200 × 2.1mm	3μm,3,5-Dichlorophenylcarbamate-amylose immobilized ChiralAM-4
8553-AM5-01	ChiralAM-5	3μm, 500Å, 50 × 2.1mm	3μm,3-Chloro-5-methylphenylcarbamate-amylose immobilized ChiralAM-5
8553-AM6-02	ChiralAM-6	3μm, 500Å, 100 × 2.1mm	3μm, (S)-α-Methylbenzylcarbamate-amylose immobilized ChiralAM-6
8553-AM7-61	ChiralAM-7	3μm, 500Å, 50 × 4.6mm	3μm 4-Methylbenzoate-amylose immobilized ChiralAM-7 column
8553-AM8-62	ChiralAM-8	3μm, 500Å, 100 × 4.6mm	3μm 4-Methylphenylcarbamate-amylose immobilized ChiralAM-8 column
8553-AM9-03	ChiralAM-9	3μm, 500Å, 150 × 2.1mm	3μm 4-Chloro-3-methylphenylcarbamate-amylose immobilized ChiralAM-9
8553-AM10-04	ChiralAM-10	3μm, 500Å, 200 × 2.1mm	3μm 5-Chloro-2-methylphenylcarbamate-amylose immobilized ChiralAM-10
8553-AM11-05	ChiralAM-11	3μm, 500Å, 250 × 2.1mm	3μm 3-Chloro-2-methylphenylcarbamate-amylose immobilized ChiralAM-11
8953-AM12-01	ChiralAM-12	3μm, 1000Å, 50 × 2.1mm	3μm 4-Chlorophenylcarbamate-amylose immobilized ChiralAM-12 column
8955-AM13-05	ChiralAM-13	5μm, 1000Å, 250 × 4.6mm	5μm, 3-Chlorophenylcarbamate-amylose immobilized ChiralAM-13 column
8953-AM5-62	ChiralAM-5	3μm, 1000Å, 100 × 4.6mm	3μm,3-Chloro-5-methylphenylcarbamate-amylose immobilized ChiralAM-5
8953-AM5-03	ChiralAM-5	3μm, 1000Å, 150 × 2.1mm	3μm,3-Chloro-5-methylphenylcarbamate-amylose immobilized ChiralAM-5
8953-AM5-04	ChiralAM-5	3μm, 1000Å, 200 × 2.1mm	3μm,3-Chloro-5-methylphenylcarbamate-amylose immobilized ChiralAM-5
8953-AM5-05	ChiralAM-5	3μm, 1000Å, 250 × 2.1mm	3μm,3-Chloro-5-methylphenylcarbamate-amylose immobilized ChiralAM-5
8955-AM2-05	ChiralAM-2	5μm, 1000Å, 250 × 4.6mm	5μm,3,5-Dimethylphenylcarbamate-amylose immobilized ChiralAM-2
8955-AM3-05	ChiralAM-3	5μm, 1000Å, 250 × 4.6mm	5μm,3-Chloro-4-methylphenylcarbamate-amylose immobilized ChiralAM-3
8955-AM4-05	ChiralAM-4	5μm, 1000Å, 250 × 4.6mm	5μm,3-Chloro-5-methylphenylcarbamate-amylose immobilized ChiralAM-5
8955-AM5-05	ChiralAM-5	5μm, 1000Å, 250 × 4.6mm	5μm,3-Chloro-5-methylphenylcarbamate-amylose immobilized ChiralAM-5
8955-AM6-05	ChiralAM-6	5μm, 1000Å, 250 × 4.6mm	5μm, (S)-α-Methylbenzylcarbamate-amylose immobilized ChiralAM-6
7955-AM3-14	ChiralAM-3	5μm, 1000Å, 200 × 10.0mm	5μm,3-Chloro-4-methylphenylcarbamate-amylose immobilized ChiralAM-3
7955-AM5-25	ChiralAM-5	5μm, 1000Å, 250 × 21.5mm	5μm, 3-Chloro-5-methylphenylcarbamate-amylose immobilized ChiralAM-5
7955-AM5-35	ChiralAM-5	5μm, 1000Å, 250 × 30.0mm	5μm,3-Chloro-5-methylphenylcarbamate-amylose immobilized ChiralAM-5
7955-AM5-55	ChiralAM-5	5μm, 1000Å, 250 × 50.0mm	5μm,3-Chloro-5-methylphenylcarbamate-amylose immobilized ChiralAM-5
7958-AM5-25	ChiralAM-5	8μm, 1000Å, 250 × 21.5mm	8μm,3-Chloro-5-methylphenylcarbamate-amylose immobilized ChiralAM-5
7958-AM5-35	ChiralAM-5	8μm, 1000Å, 250 × 30.0mm	8μm,3-Chloro-5-methylphenylcarbamate-amylose immobilized ChiralAM-5
7958-AM5-55	ChiralAM-5	8μm, 1000Å, 250 × 50.0mm	8μm,3-Chloro-5-methylphenylcarbamate-amylose immobilized ChiralAM-5
7959-AM5-35	ChiralAM-5	10μm, 1000Å, 250 × 30.0mm	10μm,3-Chloro-5-methylphenylcarbamate-amylose immobilized ChiralAM-5
7959-AM5-55	ChiralAM-5	10μm, 1000Å, 250 × 50.0mm	10μm,3-Chloro-5-methylphenylcarbamate-amylose immobilized ChiralAM-5
8933-AMK1-1	ChiralKit-1	3μm, 1000Å, 50 × 4.6mm	Screening Kit-1（3 analytical columns）
8933-AMK2-2	ChiralKit-2	3μm, 1000Å, 50 × 4.6mm	Screening Kit-1（3 analytical columns）

4.1.5. Ordering information of some Common ChiralAM Media

Part Number	Type	Specification	Description
092-AM2-100	ChiralAM-2	10μm, 1000Å, 100g	10μm 3,5-Dimethylphenylcarbamate-amylose immobilized ChiralAM-2 media
092-AM2-150	ChiralAM-2	10μm, 1000Å, 150g	10μmAM-23,5-Dimethylphenylcarbamate-amylose immobilized ChiralAM-2 media
092-AM2-500	ChiralAM-2	10μm, 1000Å, 500g	10μmAM-23,5-Dimethylphenylcarbamate-amylose immobilized ChiralAM-2 media
092-AM2-1000	ChiralAM-2	10μm, 1000Å, 1kg	10μmAM-23,5-Dimethylphenylcarbamate-amylose immobilized ChiralAM-2 media
092-AM2-5000	ChiralAM-2	10μm, 1000Å, 5kg	10μmAM-23,5-Dimethylphenylcarbamate-amylose immobilized ChiralAM-2 media
082-AM2-100	ChiralAM-2	8μm, 1000Å, 100g	8μmAM-23,5-Dimethylphenylcarbamate-amylose immobilized ChiralAM-2 media
082-AM2-150	ChiralAM-2	8μm, 1000Å, 150g	8μmAM-23,5-Dimethylphenylcarbamate-amylose immobilized ChiralAM-2 media
082-AM2-500	ChiralAM-2	8μm, 1000Å, 500g	8μmAM-23,5-Dimethylphenylcarbamate-amylose immobilized ChiralAM-2 media
082-AM2-1000	ChiralAM-2	8μm, 1000Å, 1kg	8μmAM-23,5-Dimethylphenylcarbamate-amylose immobilized ChiralAM-media
082-AM2-5000	ChiralAM-2	8μm, 1000Å, 5kg	8μmAM-23,5-Dimethylphenylcarbamate-amylose immobilized ChiralAM-2 media
093-AM3-100	ChiralAM-3	10μm, 1000Å, 100g	10μm 3-Chloro-4-methylphenylcarbamate-amylose immobilized ChiralAM-3
093-AM3-150	ChiralAM-3	10μm, 1000Å, 150g	10μm 3-Chloro-4-methylphenylcarbamate-amylose immobilized ChiralAM-3
093-AM3-500	ChiralAM-3	10μm, 1000Å, 500g	10μm 3-Chloro-4-methylphenylcarbamate-amylose immobilized ChiralAM-3
093-AM3-1000	ChiralAM-3	10μm, 1000Å, 1kg	10μm 3-Chloro-4-methylphenylcarbamate-amylose immobilized ChiralAM-3
093-AM3-5000	ChiralAM-3	10μm, 1000Å, 5kg	10μm 3-Chloro-4-methylphenylcarbamate-amylose immobilized ChiralAM-3
083-AM3-100	ChiralAM-3	8μm, 1000Å, 100g	8μm 3-Chloro-4-methylphenylcarbamate-amylose immobilized ChiralAM-3 media
083-AM3-150	ChiralAM-3	8μm, 1000Å, 150g	8μm 3-Chloro-4-methylphenylcarbamate-amylose immobilized ChiralAM-3 media
083-AM3-500	ChiralAM-3	8μm, 1000Å, 500g	8μm 3-Chloro-4-methylphenylcarbamate-amylose immobilized ChiralAM-3 media
083-AM3-1000	ChiralAM-3	8μm, 1000Å, 1kg	8μm 3-Chloro-4-methylphenylcarbamate-amylose immobilized ChiralAM-3 media
083-AM3-5000	ChiralAM-3	8μm, 1000Å, 5kg	8μm 3-Chloro-4-methylphenylcarbamate-amylose immobilized ChiralAM-3 media
084-AM4-100	ChiralAM-4	8μm, 1000Å, 100g	8μm3,5-Dichlorophenylcarbamate-amylose immobilized ChiralAM-4 media
084-AM4-150	ChiralAM-4	8μm, 1000Å, 150g	8μm3,5-Dichlorophenylcarbamate-amylose immobilized ChiralAM-4 packing media
084-AM4-500	ChiralAM-4	8μm, 1000Å, 500g	8μm3,5-Dichlorophenylcarbamate-amylose immobilized ChiralAM-4 packing media
095-AM5-500	ChiralAM-5	10μm, 1000Å, 500g	10μm3-Chloro-5-methylphenylcarbamate-amylose immobilized ChiralAM-5 media
095-AM5-1000	ChiralAM-5	10μm, 1000Å, 1kg	10μm3-Chloro-5-methylphenylcarbamate-amylose immobilized ChiralAM-5 media
095-AM5-5000	ChiralAM-5	10μm, 1000Å, 5kg	10μm3-Chloro-5-methylphenylcarbamate-amylose immobilized ChiralAM-5 media
086-AM6-100	ChiralAM-6	8μm, 1000Å, 100g	8μm (S)-α-Methylbenzylcarbamate-amylose immobilized ChiralAM-6 media
086-AM6-150	ChiralAM-6	8μm, 1000Å, 150g	8μm (S)-α-Methylbenzylcarbamate-amylose immobilized ChiralAM-6 media
086-AM6-500	ChiralAM-6	8μm, 1000Å, 500g	8μm (S)-α-Methylbenzylcarbamate-amylose immobilized ChiralAM-6 media
0813-AM13-150	ChiralAM-13	8μm, 1000Å, 150g	8μm 3-Chlorophenylcarbamate-amylose immobilized ChiralAM-13 packing media
0813-AM13-500	ChiralAM-13	8μm, 1000Å, 500g	8μm 3-Chlorophenylcarbamate-amylose immobilized ChiralAM-13 packing media
0913-AM13-1000	ChiralAM-13	10μm, 1000Å, 1kg	10μm 3-Chlorophenylcarbamate-amylose immobilized ChiralAM-13 media
0913-AM13-5000	ChiralAM-13	10μm, 1000Å, 5kg	10μm 3-Chlorophenylcarbamate-amylose immobilized ChiralAM-13 media

4.2. ChiralCD Cyclodextrin-immobilized Chiral Columns & Media

4.2.1. Unique Characteristics for ChiralCD columns & Media

ChiralCD columns are a series of new types of chemically-substituted cyclodextrin-immoblilized silica particles-packed chiral columns. The ChiralCD particles were synthesized by immobilizing a series of different functional groups-substituted α-, β-, or γ-cyclodextrins onto surface of high-quality porous silica (2μm, 3μm, 5μm, or 10μm) by linking ChiralTek proprietary chiral spacer arms at the wider torus rim of the cyclodextrins as shown in Figure 4.2(A). Due to the multiple functional groups available in the bonded stationary phases, the ChiralCD columns & media can be used under normal phase, reversed-phase and polar organic mobile phase conditions. The chiralCD columns can use both standard and non-standard mobile phases in HPLC, UPLC, SFC, and SMB.

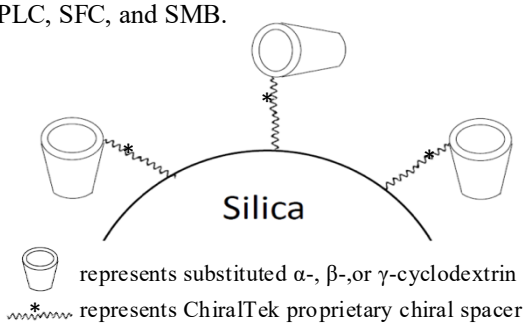


Fig 4.2 (A). Schematic diagram of the ChiralCD particle

Since the ChiralCD columns are the first commercial available chiral columns by anchoring cyclodextrins through the less reactive secondary hydroxyl at the wider torus rim of the cyclodextrins, the ChiralTek proprietary chiral spacer arms can provide extra unique steric interactions with solutes when entering the cyclodextrin cavities through the wider torus rim. Therefore, enhanced chiral selectivity can be easily achieved on the ChiralCD columns & media. As the chemical structure of ChiralCD particles is different from other supplier's cyclodextrin-based particles (shown in Figure 4.2(B)) and the ChiralCD phase contains higher content of bonded cyclodextrins, the new ChiralCD columns & media can provide different and generally better separation abilities than other supplier's cyclodextrin-based columns.

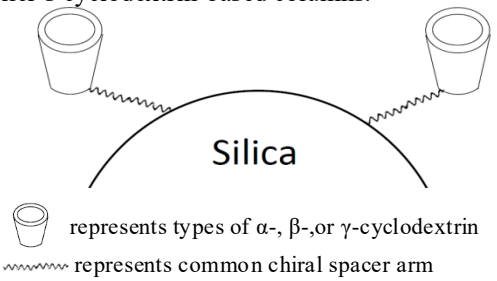


Figure 4.2 (B). Schematic diagram of other supplier's cyclodextrin-bonded phase

4.2.2. Application Restrictions and Requirements

The ChiralCD columns & media can be used under multiple modes conditions. For use under reversed-phase (RP) conditions, the columns need to be firstly flushed with ethanol and methanol following by mobile phase until reaching a constant pressure. Similarly, for use under normal phase (NP) conditions, the columns need to be flushed with ethanol or isopropanol (IPA) following by mobile phase until achieving a stable baseline signal. A ChiralCD or C18 guard column can be used for RP conditions and a Diol guard column can be used for NP conditions. If non-standard mobile phases are to be used, please contact ChiralTek for technical support. Since the strong alkalic compounds (e.g., NaOH etc.) can cause damages to the ChiralCD column bed & media, they cannot be used as mobile phase additives or sample solution additives.

When using ChiralCD columns with 2μm or 3μm particles, low flow rate (e.g., 0.1-0.3 mL/min) should be applied in traditional HPLC with highly viscous mobile phases (e.g., 100%IPA) in order to avoid high back pressure. However, there is no special flow rate limitation for use in UPLC and SFC.

Flow direction:	Arrow direction on the column label
Maximum tolerance pressure:	< 800 bar（~11600 psi，2μm、3μm column，UPLC or HPLC ）
	< 600 bar (~9000 psi , 5μm analytical column, HPLC or SFC) < 200 bar (~3000 psi , 5μm, 10μm preparative column, HPLC or SFC)
Temperature:	1 – 40 ° C
Guard column:	ChiarlCD, C18, or Diol guard column
Mode:	HPLC、UPLC、SFC

4.2.3. Care and Maintenance of the ChiralCD Columns

1] It is strongly recommended to use ChiralCD, C18 or Diol guard columns to protect the ChiralCD columns.

[2] It'd be better to resolve samples in mobile phases and filter through 0.5μm membrane before injection.

[3]The solvent in the ChiralCD columns should be replaced with methanol (RP conditions) or ethanol / IPA (NP conditions) if the columns need to be stored for over a week's time.

[4]When worked in high pressure conditions, it's strongly recommended to gradually decrease flow rate to ensure column pressure lower than 100 bar (~1450 psi) before switching off the chromatograph pump.

4.2.4. Ordering Information for ChiralCD Chiral Columns

Product List of Some Common ChiralCD Immobilized Columns from ChiralTek

Part Number	Type	Dimension	Description
822-αCD1-01	ChiralαCD-1	2μm, 50x2.1mm	Phenylcarbamate-α-CD-immobilized column
825-βCD1-05	ChiralβCD-1	5μm, 250x4.6mm	Phenylcarbamate-β-CD-immobilized column
823-ϒCD1-01	ChiralϒCD-1	3μm, 50x2.1mm	Phenylcarbamate-ϒ-CD-immobilized column
823-βCD2-02	ChiralβCD-2	3μm, 100x2.1mm	3,5-Dimethylphenylcarbamate-β-CD-immobilized column
823-βCD3-03	ChiralβCD-3	3μm, 150x2.1mm	3-Chloro-4-methyl-phenylcarbamate-β-CD column
823-βCD4-03	ChiralβCD-4	3μm, 150x2.1mm	3,5-Dichlorophenylcarbamate-β-CD-immobilized column
823-βCD5-03	ChiralβCD-5	3μm, 150x2.1mm	3-Chloro-5-methyl-phenylcarbamate-β-CD column
823-βCD6-03	ChiralβCD-6	3μm, 150x2.1mm	(s)- α-Methylbenzylcarbamate-β-CD-immobilized column
823-βCD7-03	ChiralβCD-7	3μm, 150x2.1mm	4-Methylbenzoate-β-CD-immobilized column
823-βCD8-03	ChiralβCD-8	3μm, 150x2.1mm	4-Methylphenylcarbamate-β-CD-immobilized column
823-βCD9-03	ChiralβCD-9	3μm, 150x2.1mm	4-Chloro-3-methyl-phenylcarbamate-β-CD column
823-βCD10-03	ChiralβCD-10	3μm, 150x2.1mm	5-Chloro-2-methyl-phenylcarbamate-β-CD column
823-αCD11-62	ChiralαCD-11	3μm, 100x4.6mm	3-Chloro-2-methyl-phenylcarbamate-α-CD column
825-αCD12-05	ChiralαCD-12	5μm, 250x4.6mm	4-Chlorophenylcarbamate-β-CD-immobilized column
823-βCD12-03	ChiralβCD-12	3μm, 150x2.1mm	3-Chlorophenylcarbamate-β-CD-immobilized column
825-βCD13-05	ChiralβCD-13	5μm, 250x4.6mm	3-Chloro-4-methyl-phenylcarbamate-β-CD column
823-βCD1-62	ChiralβCD-1	3μm, 100x4.6mm	Phenylcarbamate-β-CD-immobilized column
823-βCD12-62	ChiralβCD-4	3μm, 100x4.6mm	3,5-Dichlorophenylcarbamate-β-CD-immobilized column
825-ϒCD1-05	ChiralϒCD-1	5μm, 250x4.6mm	Phenylcarbamate-ϒ-CD-immobilized column
610-βCD2-25	ChiralβCD-2	10μm, 250x20mm	3,5-Dimethylphenylcarbamate-β-CD-immobilized preparative column
610-βCD2-35	ChiralβCD-2	10μm, 250x30mm	3,5-Dimethylphenylcarbamate-β-CD-immobilized preparative column
610-βCD3-35	ChiralβCD-3	10μm, 250x30mm	3-Chloro-4-methyl-phenylcarbamate-β-CD preparative column
610-βCD3-55	ChiralβCD-3	10μm, 250x50mm	3-Chloro-4-methyl-phenylcarbamate-β-CD preparative column
833-CDK1-13	ChiralKit-1	3μm, 150x2.1mm	Screening Kit-1（3 analytical columns）
833-CDK2-13	ChiralKit-2	3μm, 150x2.1mm	Screening Kit-1（3 analytical columns）

4.2.5. Ordering Information for ChiralCD Packing Media

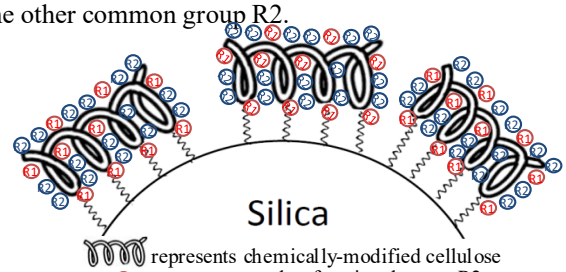
Specifications for Some Common ChiralCD Packing Media

Part Number	Type	Specification	Description
091-αCD1-100	ChiralαCD-1	10μm. 180Å, 100g	Phenylcarbamate-α-CD-immobilized packing media
092-βCD2-200	ChiralβCD-2	10μm. 180Å, 200g	3,5-Dimethylphenylcarbamate-β-CD-immobilized media
093-βCD3-500	ChiralβCD-3	10μm. 180Å, 500g	3-Chloro-4-methyl-phenylcarbamate-β-CD media
095-ϒCD5-1000	ChiralϒCD-5	10μm. 200Å, 1kg	3-Chloro-5-methyl-phenylcarbamate-ϒ-CD media

4.3 ChiralCE Cellulose-immobilized Chiral Columns & Media

4.3.1. Unique Characteristics for ChiralCE columns & Media

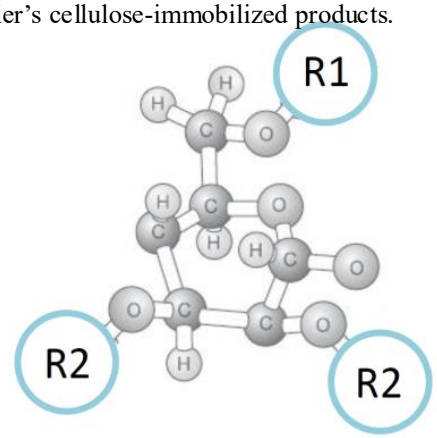
ChiralCE columns are a new type of chemically-modified cellulose-immobilized silica particles-packed chiral columns. The ChiralCE particles were prepared through a specially-designed one-step reaction procedure by bonding the different functional groups-substituted cellulose onto surface of high-quality porous silica (2μm, 3μm, 5μm, 8μm or 10μm). Therefore, high column efficiency can be easily achieved on the ChiralCE columns. As shown in Figure 4.3(A), the cellulose selector contains two different derivatized functional groups: ChiralTek proprietary group R1 and the other common group R2.



ChiralCE-1：R2= Phenylcarbamate;
ChiralCE-2：R2= 3,5-Dimethylphenylcarbamate;
ChiralCE-3：R2= 3-Chloro-4-methyl-phenylcarbamate;
ChiralCE-4：R2= 3,5-Dichlorophenylcarbamate;
ChiralCE-5：R2= 3-Chloro-5-methyl-phenylcarbamate;
ChiralCE-6：R2= (S)-α-Methylbenzylcarbamate;
ChiralCE-7：R2= 4-Methylbenzoate;
ChiralCE-8：R2= 4-Methylphenylcarbamate;
ChiralCE-9：R2= 4-Chloro-3-methyl-phenylcarbamate;
ChiralCE-10：R2= 5-Chloro-2-methyl-phenylcarbamate;
ChiralCE-11：R2= 3-Chloro-2-methyl-phenylcarbamate;
ChiralCE-12：R2= 4-Chlorophenylcarbamate.
ChiralCE-13：R2= 3-Chlorophenylcarbamate.

Figure 4.3(A). Schematic diagram of the ChiralCE phase

The chemical structure of the chiral selectors of ChiralCE phases are different from other supplier's cellulose-based phases. The typical structure of the immobilized cellulose selector unit in ChiralCE columns is showed in the following Figure 4.3(B). Due to the synergistic effect of the two functional groups R1 and R2, the ChiralCE not only have a wider chiral recognition range but also have higher enantioselectivity. Since the novel ChiralCE particles have higher content of the immobilized celluloses and contain more types of functional groups, the ChiralCE can provide different and generally better chiral separation abilities than other supplier's cellulose-immobilized products.



R1 is a ChiralTek proprietary chiral group;
R2 is another common functional group.

Fig 4.3(B). Typical structure of general chiral selector glucose unit of the ChiralCE particles.

4.2.2. Application Restrictions and Requirements

The ChiralCE columns & media can be used under multiple modes conditions. For use under reversed-phase (RP) conditions, the columns need to be firstly flushed with ethanol and methanol following by mobile phase until reaching a constant pressure. Similarly, for use under normal phase (NP) conditions, the columns need to be flushed with ethanol or isopropanol (IPA) following by mobile phase until achieving a stable baseline signal. A ChiralCE or C18 guard column can be used for RP conditions and a Diol guard column can be used for NP conditions. If non-standard mobile phases are to be used, please contact ChiralTek for technical support. Since the strong alkalic compounds (e.g., NaOH etc.) can cause damages to the ChiralCE column bed & packing media, they cannot be used as mobile phase additives or sample solution additives.

When using ChiralCE columns with 2μm or 3μm particles, low flow rate (e.g., 0.1-0.3 mL/min) should be applied in traditional HPLC with highly viscous mobile phases (e.g., 100%IPA) in order to avoid high back pressure. However, there is no special flow rate limitation for use in UPLC and SFC.

Flow direction:	Arrow direction on the column label
Maximum tolerance pressure:	< 800 bar（~11600 psi，2μm、3μm column，UPLC or HPLC）
	< 600 bar (~9000 psi , 5μm analytical column, HPLC or SFC) < 200 bar (~3000 psi , 5μm, 8μm, 10μm preparative column, HPLC or SFC)
Temperature:	1 – 40 ° C
Guard column:	ChiarlCE, C18, or Diol guard column
Mode:	HPLC、UPLC、SFC

4.2.3. Care and Maintenance of the ChiralCE Columns

1] It is strongly recommended to use ChiralCE, C18 or Diol guard columns to protect the ChiralCE columns.

[2] It'd be better to resolve samples in mobile phases and filter through 0.5μm membrane before injection.

[3]The solvent in the ChiralCE columns should be replaced with methanol (RP conditions) or ethanol / IPA (NP conditions) if the columns need to be stored for over a week's time.

[4]When worked in high pressure conditions, it's strongly recommended to gradually decrease flow rate to ensure column pressure lower than 100 bar (~1450 psi) before switching off the chromatograph pump.

4.3.4. Ordering Information for ChiralCE Chiral Column

Product List of Some Common ChiralCE Immobilized Columns from ChiralTek

Part Number	Type	Dimension	Column Description
812-CE1-01	ChiralCE-1	2μm, 120Å, 50 × 2.1mm	2μm Phenylcarbamate-cellulose immobilized ChiralCE-1column
8512-CE2-02	ChiralCE-2	2μm, 500Å, 100 × 2.1mm	2μm 3,5-Dimethylphenylcarbamate-cellulose immobilized ChiralCE-2
8912-CE3-03	ChiralCE-3	2μm, 1000Å, 150 × 2.1mm	2μm 3-Chloro-4-methylphenylcarbamate-cellulose immobilized ChiralCE-3
8513-CE4-04	ChiralCE-4	3μm, 500Å, 200 × 2.1mm	3μm 3,5-Dichlorophenylcarbamate-cellulose immobilized ChiralCE-4
8513-CE5-01	ChiralCE-5	3μm, 500Å, 50 × 2.1mm	3μm 3-Chloro-5-methylphenylcarbamate-cellulose immobilized ChiralCE-5
8513-CE6-02	ChiralCE-6	3μm, 500Å, 100 × 2.1mm	3μm (S)-α-Methylbenzylcarbamate-cellulose immobilized ChiralCE-6
8513-CE7-61	ChiralCE-7	3μm, 500Å, 50 × 4.6mm	3μm 4-Methylbenzoate-cellulose immobilized ChiralCE-7 column
8513-CE8-62	ChiralCE-8	3μm, 500Å, 100 × 4.6mm	3μm 4-Methylphenylcarbamate-cellulose immobilized ChiralCE-8 column
8513-CE9-03	ChiralCE-9	3μm, 500Å, 150 × 2.1mm	3μm 4-Chloro-3-methylphenylcarbamate-cellulose immobilized ChiralCE-9
8513-CE10-04	ChiralCE-10	3μm, 500Å, 200 × 2.1mm	3μm5-Chloro-2-methylphenylcarbamate-cellulose immobilized ChiralCE-10
8513-CE11-05	ChiralCE-11	3μm, 500Å, 250 × 2.1mm	3μm3-Chloro-2-methylphenylcarbamate-cellulose immobilized ChiralCE-11
8913-CE12-01	ChiralCE-12	3μm, 1000Å, 50 × 2.1mm	3μm 4-Chlorophenylcarbamate-cellulose immobilized ChiralCE-12 column
8915-CE13-05	ChiralCE-13	5μm, 1000Å, 250 × 4.6mm	5μm 3-Chlorophenylcarbamate-cellulose immobilized ChiralCE-13 column
8913-CE5-61	ChiralCE-5	3μm, 1000Å, 50 × 4.6mm	5μm, 3-Chloro-5-methylphenylcarbamate-cellulose immobilized ChiralCE-5
8913-CE5-62	ChiralCE-5	3μm, 1000Å, 100 × 4.6mm	3μm, 3-Chloro-5-methylphenylcarbamate-cellulose immobilized ChiralCE-5
8913-CE5-03	ChiralCE-5	3μm, 1000Å, 150 × 2.1mm	3μm, 3-Chloro-5-methylphenylcarbamate-cellulose immobilized ChiralCE-5
8913-CE5-04	ChiralCE-5	3μm, 1000Å, 200 × 2.1mm	3μm, 3-Chloro-5-methylphenylcarbamate-cellulose immobilized ChiralCE-5
8913-CE5-05	ChiralCE-5	3μm, 1000Å, 250 × 2.1mm	3μm, 3-Chloro-5-methylphenylcarbamate-cellulose immobilized ChiralCE-5
8915-CE2-05	ChiralCE-2	5μm, 1000Å, 250 × 4.6mm	5μm, 3,5-Dimethylphenylcarbamate-cellulose immobilized ChiralCE-2
8915-CE3-05	ChiralCE-3	5μm, 1000Å, 250 × 4.6mm	5μm, 3-Chloro-4-methylphenylcarbamate-cellulose immobilized ChiralCE-3
8915-CE4-05	ChiralCE-4	5μm, 1000Å, 250 × 4.6mm	5μm, 3,5-Dichlorophenylcarbamate-cellulose immobilized ChiralCE-4
8915-CE5-05	ChiralCE-5	5μm, 1000Å, 250 × 4.6mm	5μm, 3-Chloro-5-methylphenylcarbamate-cellulose immobilized ChiralCE-5
8915-CE6-05	ChiralCE-6	5μm, 1000Å, 250 × 4.6mm	5μm, (S)-α-Methylbenzylcarbamate-cellulose immobilized ChiralCE-6
7915-CE2-14	ChiralCE-2	5μm, 1000Å, 200 × 10.0mm	5μm 3,5-Dimethylphenylcarbamate-cellulose immobilized ChiralCE-2
7915-CE4-25	ChiralCE-4	5μm, 1000Å, 250 × 21.5mm	5μm 3,5-Dichlorophenylcarbamate-cellulose immobilized ChiralCE-4
7915-CE5-35	ChiralCE-5	5μm, 1000Å, 250 × 30mm	5μm3-Chloro-5-methylphenylcarbamate-cellulose immobilized ChiralCE-5
7918-CE3-55	ChiralCE-3	8μm, 1000Å, 250 × 50mm	8μm, 3-Chloro-4-methylphenylcarbamate-cellulose immobilized ChiralCE-3
7918-CE6-55	ChiralCE-6	8μm, 1000Å, 250 × 50mm	8μm, (S)-α-Methylbenzylcarbamate-cellulose immobilized ChiralCE-6
7919-CE12-25	ChiralCE-12	10μm, 1000Å, 250 × 21.5mm	10μm, 4-Chlorophenylcarbamate-cellulose immobilized ChiralCE-12 column
7919-CE13-35	ChiralCE-13	10μm, 1000Å, 250 × 30mm	10μm, 3-Chlorophenylcarbamate-cellulose immobilized ChiralCE-13
8933-CEK1-1	ChiralKit-1	3μm, 1000Å, 50 × 4.6mm	Screening Kit-1（3 analytical columns）
8933-CEK2-2	ChiralKit-2	3μm, 1000Å, 50 × 4.6mm	Screening Kit-1（3 analytical columns）

4.3.5. Ordering information of some Common ChiralCE Media

Part Number	Type	Specification	Description
092-CE2-100	ChiralCE-2	10μm, 1000Å, 100g	10μm 3,5-Dimethylphenylcarbamate-cellulose immobilized CE-2 media
092-CE2-150	ChiralCE-2	10μm, 1000Å, 150g	10μm 3,5-Dimethylphenylcarbamate-cellulose immobilized CE-2 media
092-CE2-500	ChiralCE-2	10μm, 1000Å, 500g	10μm 3,5-Dimethylphenylcarbamate-cellulose immobilized CE-2 media
092-CE2-1000	ChiralCE-2	10μm, 1000Å, 1kg	10μm 3,5-Dimethylphenylcarbamate-cellulose immobilized CE-2 media
092-CE2-5000	ChiralCE-2	10μm, 1000Å, 5kg	10μm 3,5-Dimethylphenylcarbamate-cellulose immobilized CE-2 media
082-CE2-100	ChiralCE-2	8μm, 1000Å, 100g	8μm 3,5-Dimethylphenylcarbamate-cellulose immobilized CE-2 media
082-CE2-150	ChiralCE-2	8μm, 1000Å, 150g	8μm 3,5-Dimethylphenylcarbamate-cellulose immobilized CE-2 media
082-CE2-500	ChiralCE-2	8μm, 1000Å, 500g	8μm 3,5-Dimethylphenylcarbamate-cellulose immobilized CE-2 media
082-CE2-1000	ChiralCE-2	8μm, 1000Å, 1kg	8μm 3,5-Dimethylphenylcarbamate-cellulose immobilized CE-2 media
082-CE2-5000	ChiralCE-2	8μm, 1000Å, 5kg	8μm 3,5-Dimethylphenylcarbamate-cellulose immobilized CE-2 media
093-CE3-100	ChiralCE-3	10μm, 1000Å, 100g	10μm 3-Chloro-4-methylphenylcarbamate-cellulose immobilized CE-3 media
093-CE3-150	ChiralCE-3	10μm, 1000Å, 150g	10μm 3-Chloro-4-methylphenylcarbamate-cellulose immobilized CE-3 media
093-CE3-500	ChiralCE-3	10μm, 1000Å, 500g	10μm 3-Chloro-4-methylphenylcarbamate-cellulose immobilized CE-3 media
093-CE3-1000	ChiralCE-3	10μm, 1000Å, 1kg	10μm 3-Chloro-4-methylphenylcarbamate-cellulose immobilized CE-3 media
093-CE3-5000	ChiralCE-3	10μm, 1000Å, 5kg	10μm 3-Chloro-4-methylphenylcarbamate-cellulose immobilized CE-3 media
083-CE3-100	ChiralCE-3	8μm, 1000Å, 100g	8μm 3-Chloro-4-methylphenylcarbamate-cellulose immobilized CE-3 media
083-CE3-150	ChiralCE-3	8μm, 1000Å, 150g	8μm 3-Chloro-4-methylphenylcarbamate-cellulose immobilized CE-3 media
083-CE3-500	ChiralCE-3	8μm, 1000Å, 500g	8μm 3-Chloro-4-methylphenylcarbamate-cellulose immobilized CE-3 media
083-CE3-1000	ChiralCE-3	8μm, 1000Å, 1kg	8μm 3-Chloro-4-methylphenylcarbamate-cellulose immobilized CE-3 media
083-CE3-5000	ChiralCE-3	8μm, 1000Å, 5kg	8μm 3-Chloro-4-methylphenylcarbamate-cellulose immobilized CE-3 media
084-CE4-100	ChiralCE-4	8μm, 1000Å, 100g	8μm 3,5-Dichlorophenylcarbamate-cellulose immobilized CE-4 media
084-CE4-150	ChiralCE-4	8μm, 1000Å, 150g	8μm 3,5-Dichlorophenylcarbamate-cellulose immobilized CE-4 media
084-CE4-500	ChiralCE-4	8μm, 1000Å, 500g	8μm 3,5-Dichlorophenylcarbamate-cellulose immobilized CE-4 media
095-CE5-500	ChiralCE-5	10μm, 1000Å, 500g	10μm3-Chloro-5-methylphenylcarbamate-cellulose immobilized CE-5 media
095-CE5-1000	ChiralCE-5	10μm, 1000Å, 1kg	10μm3-Chloro-5-methylphenylcarbamate-cellulose immobilized CE-5 media
095-CE5-5000	ChiralCE-5	10μm, 1000Å, 5kg	10μm3-Chloro-5-methylphenylcarbamate-cellulose immobilized CE-5 media
086-CE6-100	ChiralCE-6	8μm, 1000Å, 100g	8μm (S)-α-Methylbenzylcarbamate-cellulose immobilized CE-6 media
086-CE6-150	ChiralCE-6	8μm, 1000Å, 150g	8μm (S)-α-Methylbenzylcarbamate-cellulose immobilized CE-6 media
086-CE6-500	ChiralCE-6	8μm, 1000Å, 500g	8μm (S)-α-Methylbenzylcarbamate-cellulose immobilized CE-6 media
0813-CE13-150	ChiralCE-13	8μm, 1000Å, 150g	8μm 3-Chlorophenylcarbamate-cellulose immobilized CE-13 media
0813-CE13-500	ChiralCE-13	8μm, 1000Å, 500g	8μm 3-Chlorophenylcarbamate-cellulose immobilized CE-13 media
0913-CE13-1000	ChiralCE-13	10μm, 1000Å, 1kg	8μm 3-Chlorophenylcarbamate-cellulose immobilized CE-13 media
0913-CE13-5000	ChiralCE-13	10μm, 1000Å, 5kg	8μm 3-Chlorophenylcarbamate-cellulose immobilized CE-13 media

4.4 ChiralAMCD Amylose-appended Cyclodextrin-immobilized Chiral Columns & Media

4.4.1. Unique Characteristics for ChiralAMCD columns & Media

ChiralAMCD columns are the first type of chemically-modified amylose-appended cyclodextrin-immobilized silica particles-packed chiral columns (shown in Figure 4.4(A)). The ChiralAMCD particles were prepared through a specially-designed procedure by bonding the different functional groups-substituted amylose-appended cyclodextrin (AMCD) onto surface of high-quality porous silica (2 µm, 3µm, 5µm, 8µm, or 10µm). The column contains and media a unique complex chiral selector with two recognition moieties: amylose and cyclodextrin.

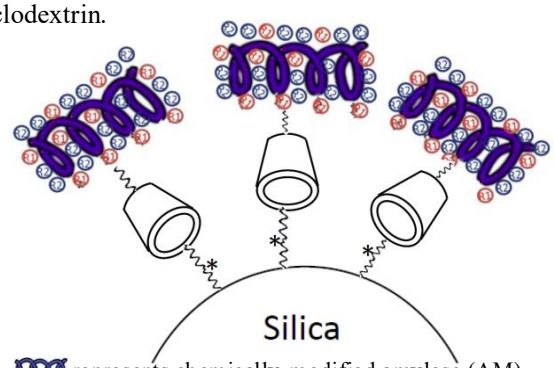


Figure 4.4 (A). Schematic diagram of the ChiralAMCD phase

Other manufacturers' columns contain a single type of chiral selector (e.g., amylose, or cyclodextrin, etc). The ChiralAMCD column contains both amylose and cyclodextrin. Figure 4.4(B) shows the schematic structure of the chemically-modified amylose-appended cyclodextrin selector in ChiralAMCD column. Due to the cooperative functioning of the amylose and cyclodextrin, the ChiralAMCD columns can provide different and generally better chiral separation abilities for a wider range of chiral compounds.

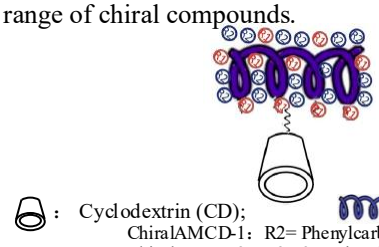


Figure 4.4 (B). Schematic diagram of the AMCD complex chiral selector of the ChiralAMCD phases

4.2.2. Application Restrictions and Requirements

The ChiralAMCD columns & media can be used under multiple modes conditions. For use under reversed-phase (RP) conditions, the columns need to be firstly flushed with ethanol and methanol following by mobile phase until reaching a constant pressure. Similarly, for use under normal phase (NP) conditions, the columns need to be flushed with ethanol or isopropanol (IPA) following by mobile phase until achieving a stable baseline signal. A ChiralAM or C18 guard column can be used for RP conditions and a Diol guard column can be used for NP conditions. If non-standard mobile phases are to be used, please contact ChiralTek for technical support. Since the strong alkalic compounds (e.g., NaOH etc.) can cause damages to the ChiralAMCD column bed & packing media, they cannot be used as mobile phase additives or sample solution additives.

When using ChiralAMCD columns with 2µm or 3µm particles, low flow rate (e.g., 0.1-0.3 mL/min) should be applied in traditional HPLC with highly viscous mobile phases (e.g., 100%IPA) in order to avoid high back pressure. However, there is no special flow rate limitation for use in UPLC and SFC.

Flow direction:	Arrow direction on the column label
Maximum tolerance pressure:	< 800 bar（~11600 psi，2µm、3µm column，UPLC or HPLC）
	< 600 bar (~9000 psi , 5µm analytical column, HPLC or SFC) < 200 bar (~3000 psi , 5µm, 10µm preparative column, HPLC or SFC)
Temperature:	1 – 40 ° C
Guard column:	ChiarlAM, C18, or Diol guard column
Mode:	HPLC、UPLC、SFC

4.2.3. Care and Maintenance of the ChiralAMCD Columns

1] It is strongly recommended to use ChiralAM, C18 or Diol guard columns to protect the ChiralCE columns.
[2] It'd be better to resolve samples in mobile phases and filter through 0.5µm membrane before injection.
[3]The solvent in the ChiralAMCD columns should be replaced with methanol (RP conditions) or ethanol / IPA (NP conditions) if the columns need to be stored for over a week's time.
[4]When worked in high pressure conditions, it's strongly recommended to gradually decrease flow rate to ensure column pressure lower than 100 bar (~1450 psi) before switching off the chromatograph pump.

4.4.4. Ordering Information for ChiralAMCD Chiral Column

Product List of Some Common ChiralAMCD Immobilized Columns from ChiralTek

Part Number	*Type*	*Dimension*	*Column Description*
862-AMαCD1-01	ChiralAMαCD-1	2μm, 50x2.1mm	Phenylcarbamate-amylose-appended αCD-immobilized ChiralAMαCD-1
865-AMβCD1-05	ChiralAMβCD-1	5μm, 250x4.6mm	Phenylcarbamate-amylose-appended βCD immobilized ChiralAMβCD-1
823-AMϒCD1-01	ChiralAMϒCD-1	3μm, 50x2.1mm	Phenylcarbamate-amylose-appended ϒCD immobilized ChiralAMϒCD-1
823-AMβCD2-02	ChiralAMβCD-2	3μm, 100x2.1mm	3,5-Dimethylphenylcarbamate-amylose-appended βCD immobilized ChiralAMβCD-2
863-AMβCD3-03	ChiralAMβCD-3	3μm, 150x2.1mm	3-Chloro-4-methylphenylcarbamate-amylose-appended βCD immobilized ChiralAMβCD-3
863-AMβCD4-03	ChiralAMβCD-4	3μm, 150x2.1mm	3,5-Dichlorophenylcarbamate-amylose-appended βCD immobilized ChiralAMβCD-4
863-AMβCD5-03	ChiralAMβCD-5	3μm, 150x2.1mm	3-Chloro-5-methylphenylcarbamate-amylose-appended βCD immobilized ChiralAMβCD-5
863-AMβCD6-03	ChiralAMβCD-6	3μm, 150x2.1mm	(S)-α-Methylbenzylcarbamate-amylose-appended βCD immobilized ChiralAMβCD-6
863-AMβCD7-03	ChiralAMβCD-7	3μm, 150x2.1mm	4-Methylbenzoate-amylose-appended βCD immobilized ChiralAMβCD-7 column
863-AMβCD8-03	ChiralAMβCD-8	3μm, 150x2.1mm	4-Methylphenylcarbamate-amylose-appended βCD immobilized ChiralAMβCD-8
863-AMβCD9-03	ChiralAMβCD-9	3μm, 150x2.1mm	4-Chloro-3-methylphenylcarbamate-amylose-appended βCD immobilized ChiralAMβCD-9
863-AMβCD10-03	ChiralAMβCD-10	3μm, 150x2.1mm	5-Chloro-2-methylphenylcarbamate-amylose-appended βCD immobilized ChiralAMβCD-10
863-AMαCD11-62	ChiralAMαCD-11	3μm, 100x4.6mm	3-Chloro-2-methylphenylcarbamate-amylose-appended αCD-immobilized ChiralAMαCD-11
865-AMαCD12-05	ChiralAMαCD-12	5μm, 250x4.6mm	3μm 4-Chlorophenylcarbamate-amylose-appended αCD immobilized ChiralAMαCD-12
863-AMβCD12-03	ChiralAMβCD-12	3μm, 150x2.1mm	3μm 4-Chlorophenylcarbamate-amylose-appended βCD immobilized ChiralAMβCD-12
865-AMβCD13-05	ChiralAMβCD-13	5μm, 250x4.6mm	3-Chlorophenylcarbamate-amylose-appended βCD immobilized ChiralAMβCD-13
863-AMβCD1-62	ChiralAMβCD-1	3μm, 100x4.6mm	Phenylcarbamate-amylose-appended βCD immobilized ChiralAMβCD-1
863-AMβCD2-62	ChiralAMβCD-2	3μm, 100x4.6mm	3,5-Dimethylphenylcarbamate-amylose-appended βCD immobilized ChiralAMβCD-2
863-AMβCD3-62	ChiralAMβCD-3	3μm, 100x4.6mm	3-Chloro-4-methylphenylcarbamate-amylose -appendedβCD immobilized ChiralAMβCD-3
865-AMϒCD1-05	ChiralAMϒCD-1	5μm, 250x4.6mm	Phenylcarbamate-amylose-appended ϒCD immobilized ChiralAMϒCD-1
610-AMβCD2-25	ChiralAMβCD-2	10μm, 250x20mm	3,5-Dimethylphenylcarbamate-amylose-appended βCD immobilized ChiralAMβCD-2
610-AMβCD2-35	ChiralAMβCD-2	10μm, 250x30mm	3,5-Dimethylphenylcarbamate-amylose-appended βCD immobilized ChiralAMβCD-2
610-AMβCD3-35	ChiralAMβCD-3	10μm, 250x30mm	3-Chloro-4-methylphenylcarbamate-amylose-appended βCD immobilized ChiralAMβCD-3
610-AMβCD3-55	ChiralAMβCD-3	10μm, 250x50mm	3-Chloro-4-methylphenylcarbamate-amylose βCD immobilized ChiralAMβCD-3
610-AMαCD2-25	ChiralAMαCD-2	10μm, 250x20mm	3,5-Dimethylphenylcarbamate-amylose βCD immobilized ChiralAMβCD-2
610-AMϒCD2-25	ChiralAMϒCD-2	10μm, 250x20mm	3,5-Dimethylphenylcarbamate-amylose ϒCD immobilized ChiralAMϒCD-2
863-AMCDK1-13	ChiralKit-1	3μm, 150x2.1mm	Screening Kit-1（3 analytical columns）
863-AMCDK2-13	ChiralKit-2	3μm, 150x2.1mm	Screening Kit-1（3 analytical columns）

4.4.5. Ordering Information for ChiralAMCD Chiral Packing Media

Specifications for Some Common ChiralAMCD Packing Media

Part Number	*Type*	*Specification*	*Description*
091-AMαCD1-100	ChiralAMαCD-1	10μm, 300Å, 100g	Phenylcarbamate-amylose-appended αCD-immobilized ChiralAMαCD-1
092-AMβCD2-200	ChiralAMβCD-2	10μm, 300Å, 200g	3,5-Dimethylphenylcarbamate-amylose βCD immobilized ChiralAMβCD-2
093-AMβCD3-500	ChiralAMβCD-3	10μm, 300Å, 500g	3-Chloro-4-methylphenylcarbamate-amylose βCD immobilized ChiralAMβCD-3
095-AMϒCD5-1000	ChiralAMϒCD-5	10μm, 300Å, 1kg	3-Chloro-5-methylphenylcarbamate-amylose βCD immobilized ChiralAMβCD-5

4.5 ChiralAMCE Amylose-appended Cellulose-immobilized Chiral Columns & Media

4.5.1. Unique Characteristics for ChiralAMCE columns & Media

ChiralAMCE columns are the first type of chemically-modified amylose-appended cellulose-immobilized silica particles-packed chiral columns (shown in Figure 4.5(A)). The ChiralAMCE particles were prepared through a specially-designed procedure by bonding different functional groups-substituted amylose-appended cellulose (AMCE) onto surface of high-quality porous silica (2μm, 3μm, 5μm, 8μm, or 10μm). The column contains a unique complex chiral selector with two recognition moieties: amylose and cellulose. A single ChiralAMCE column can be used as two chiral columns: one amylose column and one cellulose-based column.

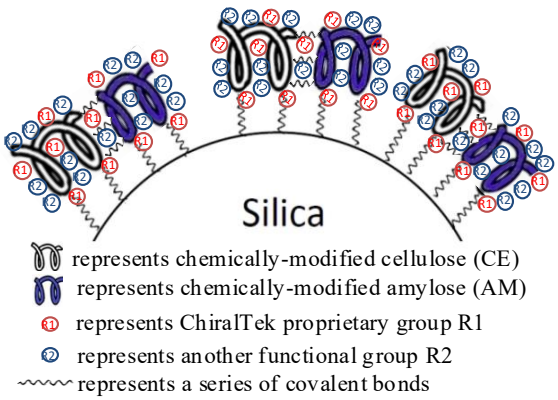
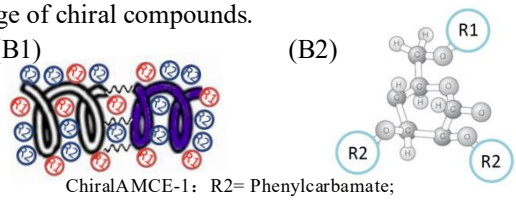


Figure 4.5(A). Schematic diagram of ChiralAMCE phase

Other manufacturers' columns contain a single type of chiral selector (e.g., amylose, or cellulose, etc). The ChiralAMCE column contains both amylose and cellulose. Figure 4.5(B) shows the schematic structure of the chemically-modified amylose-appended cellulose selector (B1) and the general glucose unit (B2) in ChiralAMCE column. Novel space structure with extra chiral recognition sites is formed between the amylose and cellulose moieties. Due to the cooperative functioning of the amylose and cellulose, the ChiralAMCE columns can provide different and generally better chiral separation abilities for a wider range of chiral compounds.

(B1) (B2)



ChiralAMCE-1: R2= Phenylcarbamate;
ChiralAMCE-2: R2= 3,5-Dimethylphenylcarbamate;
ChiralAMCE-3: R2= 3-Chloro-4-methyl-phenylcarbamate;
ChiralAMCE-4: R2= 3,5-Dichlorophenylcarbamate;
ChiralAMCE-5: R2= 3-Chloro-5-methyl-phenylcarbamate;
ChiralAMCE-6: R2= (S)-α-Methylbenzylcarbamate;
ChiralAMCE-7: R2= 4-Methylbenzoate;
ChiralAMCE-8: R2= 4-Methylphenylcarbamate;
ChiralAMCE-9: R2= 4-Chloro-3-methyl-phenylcarbamate;
ChiralAMCE-10: R2= 5-Chloro-2-methyl-phenylcarbamate;
ChiralAMCE-11: R2= 3-Chloro-2-methyl-phenylcarbamate;
ChiralAMCE-12: R2= 4-Chlorophenylcarbamate;
ChiralAMCE-13: R2= 3-Chlorophenylcarbamate.

Figure 4.5(B). Schematic diagram of AMCE complex selector

4.5.2. Application Restrictions and Requirements

The ChiralAMCE columns & media can be used under multiple modes conditions. For use under reversed-phase (RP) conditions, the columns need to be firstly flushed with ethanol and methanol following by mobile phase until reaching a constant pressure. Similarly, for use under normal phase (NP) conditions, the columns need to be flushed with ethanol or isopropanol (IPA) following by mobile phase until achieving a stable baseline signal. A ChiralCE or C18 guard column can be used for RP conditions and a Diol guard column can be used for NP conditions. If non-standard mobile phases are to be used, please contact ChiralTek for technical support. Since the strong alkalic compounds (e.g., NaOH etc.) can cause damages to the ChiralCE column bed & packing media, they cannot be used as mobile phase additives or sample solution additives.

When using ChiralAMCE columns with 2μm or 3μm particles, low flow rate (e.g., 0.1-0.3 mL/min) should be applied in traditional HPLC with highly viscous mobile phases (e.g., 100%IPA) in order to avoid high back pressure. However, there is no special flow rate limitation for use in UPLC and SFC.

Flow direction:	Arrow direction on the column label
Maximum tolerance pressure:	< 800 bar（~11600 psi，2μm、3μm column，UPLC or HPLC）
	< 600 bar (~9000 psi , 5μm analytical column, HPLC or SFC) < 200 bar (~3000 psi , 5μm, 8μm, 10μm preparative column, HPLC or SFC)
Temperature:	1 – 40 ° C
Guard column:	ChiarlCE, C18, or Diol guard column
Mode:	HPLC、UPLC、SFC

4.5.3. Care and Maintenance of the ChiralAMCE Columns

1] It is strongly recommended to use ChiralCE, C18 or Diol guard columns to protect the ChiralAMCE columns.
[2] It'd be better to resolve samples in mobile phases and filter through 0.5μm membrane before injection.
[3]The solvent in the ChiralAMCE columns should be replaced with methanol (RP conditions) or ethanol / IPA (NP conditions) if the columns need to be stored for over a week's time.
[4]When worked in high pressure conditions, it's strongly recommended to gradually decrease flow rate to ensure column pressure lower than 100 bar (~1450 psi) before switching off the chromatograph pump.

4.5.4. Ordering Information for ChiralAMCD Chiral Column

Product List of Some Common ChiralAMCE Immobilized Columns from ChiralTek			
Part Number	*Type*	*Dimension*	*Column Description*
8972-AMCE1-01	ChiralAMCE-1	2μm, 1000Å, 50 × 2.1mm	Phenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-1
8572-AMCE2-02	ChiralAMCE-2	2μm, 500Å, 100 × 2.1mm	3,5-Dimethylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-2
8972-AMCE3-03	ChiralAMCE-3	2μm, 1000Å, 150 × 2.1mm	3-Chloro-4-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-3
8573-AMCE4-04	ChiralAMCE-4	3μm, 500Å, 200 × 2.1mm	3,5-Dichlorophenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-4
8573-AMCE5-01	ChiralAMCE-5	3μm, 500Å, 50 × 2.1mm	3-Chloro-5-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-5
8573-AMCE6-02	ChiralAMCE-6	3μm, 500Å, 100 × 2.1mm	(S)-α-Methylbenzylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-6
8573-AMCE7-61	ChiralAMCE-7	3μm, 500Å, 50 × 4.6mm	4-Methylbenzoate-amylose-appended cellulose-immobilized ChiralAMCE-7 column
8573-AMCE8-62	ChiralAMCE-8	3μm, 500Å, 100 × 4.6mm	4-Methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-8
8573-AMCE9-03	ChiralAMCE-9	3μm, 500Å, 150 × 2.1mm	4-Chloro-3-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-9
8573-AMCE10-04	ChiralAMCE-10	3μm, 500Å, 200 × 2.1mm	5-Chloro-2-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-10
8573-AMCE11-05	ChiralAMCE-11	3μm, 500Å, 250 × 2.1mm	3-Chloro-2-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-11
8973-AMCE12-01	ChiralAMCE-12	3μm, 1000Å, 50 × 2.1mm	4-Chlorophenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-12 column
8975-AMCE13-05	ChiralAMCE-13	5μm, 1000Å, 250 × 4.6mm	3-Chlorophenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-13 column
8973-AMCE5-62	ChiralAMCE-5	3μm, 1000Å, 100 × 4.6mm	3-Chloro-5-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-5
8973-AMCE5-03	ChiralAMCE-5	3μm, 1000Å, 150 × 2.1mm	3-Chloro-5-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-5
8973-AMCE5-04	ChiralAMCE-5	3μm, 1000Å, 200 × 2.1mm	3-Chloro-5-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-5
8973-AMCE5-05	ChiralAMCE-5	3μm, 1000Å, 250 × 2.1mm	3-Chloro-5-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-5
8975-AMCE2-05	ChiralAMCE-2	5μm, 1000Å, 250 × 4.6mm	3,5-Dimethylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-2
8975-AMCE3-05	ChiralAMCE-3	5μm, 1000Å, 250 × 4.6mm	3-Chloro-4-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-3
8975-AMCE4-05	ChiralAMCE-4	5μm, 1000Å, 250 × 4.6mm	3,5-Dichlorophenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-4
8975-AMCE5-05	ChiralAMCE-5	5μm, 1000Å, 250 × 4.6mm	3-Chloro-5-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-5
8975-AMCE6-05	ChiralAMCE-6	5μm, 1000Å, 250 × 4.6mm	(S)-α-Methylbenzylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-6
7975-AMCE3-14	ChiralAMCE-3	5μm, 1000Å, 200 × 10.0mm	3-Chloro-4-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-3
7975-AMCE5-25	ChiralAMCE-5	5μm, 1000Å, 250 × 21.5mm	3-Chloro-5-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-5
7975-AMCE5-35	ChiralAMCE-5	5μm, 1000Å, 250 × 30.0mm	3-Chloro-5-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-5
7975-AMCE5-55	ChiralAMCE-5	5μm, 1000Å, 250 × 50.0mm	3-Chloro-5-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-5
7978-AMCE5-25	ChiralAMCE-5	8μm, 1000Å, 250 × 21.5mm	3-Chloro-5-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-5
7978-AMCE5-35	ChiralAMCE-5	8μm, 1000Å, 250 × 30.0mm	3-Chloro-5-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-5
7978-AMCE5-55	ChiralAMCE-5	8μm, 1000Å, 250 × 50.0mm	3-Chloro-5-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-5
7979-AMCE5-35	ChiralAMCE-5	10μm, 1000Å, 250 × 30.0mm	3-Chloro-5-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-5
7979-AMCE5-55	ChiralAMCE-5	10μm, 1000Å, 250 × 50.0mm	3-Chloro-5-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-5
8973-AMCEK1-1	ChiralKit-1	3μm, 1000Å, 50 × 4.6mm	Screening Kit-1（3 analytical columns）
8973-AMCEK2-2	ChiralKit-2	3μm, 1000Å, 50 × 4.6mm	Screening Kit-1（3 analytical columns）

4.5.5. Ordering Information for ChiralAMCD Chiral Media

Part Number	Type	Specification	Packing Media Description
092-AMCE2-100	ChiralAMCE-2	10µm, 1000Å, 100g	3,5-Dimethylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-2
092-AMCE2-150	ChiralAMCE-2	10µm, 1000Å, 150g	3,5-Dimethylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-2
092-AMCE2-500	ChiralAMCE-2	10µm, 1000Å, 500g	3,5-Dimethylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-2
092-AMCE2-1000	ChiralAMCE-2	10µm, 1000Å, 1kg	3,5-Dimethylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-2
092-AMCE2-5000	ChiralAMCE-2	10µm, 1000Å, 5kg	3,5-Dimethylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-2
082-AMCE2-100	ChiralAMCE-2	8µm, 1000Å, 100g	3,5-Dimethylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-2
082-AMCE2-150	ChiralAMCE-2	8µm, 1000Å, 150g	3,5-Dimethylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-2
082-AMCE2-500	ChiralAMCE-2	8µm, 1000Å, 500g	3,5-Dimethylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-2
082-AMCE2-1000	ChiralAMCE-2	8µm, 1000Å, 1kg	3,5-Dimethylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-2
082-AMCE2-5000	ChiralAMCE-2	8µm, 1000Å, 5kg	3,5-Dimethylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-2
093-AMCE3-100	ChiralAMCE-3	10µm, 1000Å, 100g	3-Chloro-4-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-3
093-AMCE3-150	ChiralAMCE-3	10µm, 1000Å, 150g	3-Chloro-4-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-3
093-AMCE3-500	ChiralAMCE-3	10µm, 1000Å, 500g	3-Chloro-4-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-3
093-AMCE3-1000	ChiralAMCE-3	10µm, 1000Å, 1kg	3-Chloro-4-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-3
093-AMCE3-5000	ChiralAMCE-3	10µm, 1000Å, 5kg	3-Chloro-4-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-3
083-AMCE3-100	ChiralAMCE-3	8µm, 1000Å, 100g	3-Chloro-4-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-3
083-AMCE3-150	ChiralAMCE-3	8µm, 1000Å, 150g	3-Chloro-4-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-3
083-AMCE3-500	ChiralAMCE-3	8µm, 1000Å, 500g	3-Chloro-4-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-3
083-AMCE3-1000	ChiralAMCE-3	8µm, 1000Å, 1kg	3-Chloro-4-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-3
083-AMCE3-5000	ChiralAMCE-3	8µm, 1000Å, 5kg	3-Chloro-4-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-3
084-AMCE4-100	ChiralAMCE-4	8µm, 1000Å, 100g	3,5-Dichlorophenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-4
084-AMCE4-150	ChiralAMCE-4	8µm, 1000Å, 150g	3,5-Dichlorophenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-4
084-AMCE4-500	ChiralAMCE-4	8µm, 1000Å, 500g	3,5-Dichlorophenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-4
095-AMCE5-500	ChiralAMCE-5	10µm, 1000Å, 500g	3-Chloro-5-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-5
095-AMCE5-1000	ChiralAMCE-5	10µm, 1000Å, 1kg	3-Chloro-5-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-5
095-AMCE5-5000	ChiralAMCE-5	10µm, 1000Å, 5kg	3-Chloro-5-methylphenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-5
086-AMCE6-100	ChiralAMCE-6	8µm, 1000Å, 100g	(S)-α-Methylbenzylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-6
086-AMCE6-150	ChiralAMCE-6	8µm, 1000Å, 150g	(S)-α-Methylbenzylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-6
086-AMCE6-500	ChiralAMCE-6	8µm, 1000Å, 500g	(S)-α-Methylbenzylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-6
0813-AMCE13-150	ChiralAMCE-13	8µm, 1000Å, 150g	3-Chlorophenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-13 media
0813-AMCE13-500	ChiralAMCE-13	8µm, 1000Å, 500g	3-Chlorophenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-13 media
0913-AMCE13-1000	ChiralAMCE-13	10µm, 1000Å, 1kg	3-Chlorophenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-13 media
0913-AMCE13-5000	ChiralAMCE-13	10µm, 1000Å, 5kg	3-Chlorophenylcarbamate-amylose-appended cellulose-immobilized ChiralAMCE-13 media

4.6 ChiralAMxAMy Tandem hetero-Amylose-immobilized Chiral Columns & Media

4.6.1. . Unique Characteristics for ChiralAMxAMy columns & Media

ChiralAMxAMy columns are the first type of tandem hetero-amylose derivative-bonded silica particles-packed chiral columns. The ChiralAMxAMy particles (as shown in Figure 4.6(A)) were prepared through a specially-designed procedure by immobilizing the novel type of complex selector, the tandem hetero-amylose derivative (AMxAMy), onto surface of high-quality porous silica (2μm, 3μm, 5μm, 8μm, or 10μm). The column & media contains a unique complex chiral selector with two recognition moieties: the derivatized amylose AMx and a different amylose derivative AMy. The AMx was linked with AMy by covalent bonds.

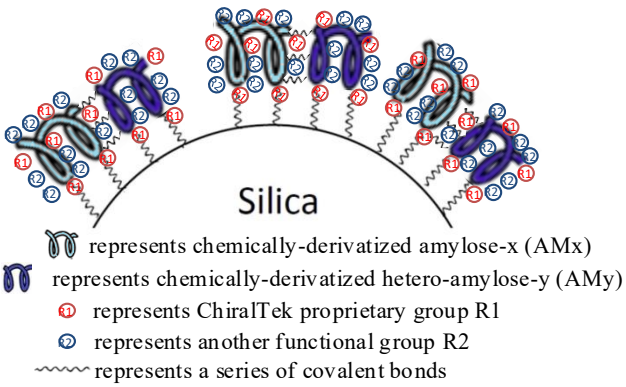
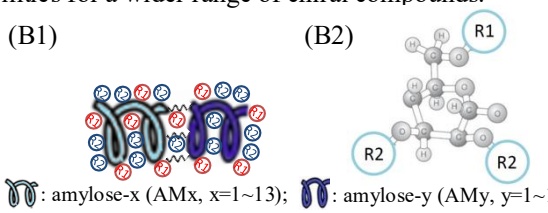


Fig4.6(A). Schematic diagram of ChiralAMxAMy phase

Other manufacturers' columns contain a single type of chiral selector (e.g., single amylose, or single cellulose, etc). The ChiralAMxAMy column contains tandem hetero-amylose complex selector. Figure (B) shows the schematic structure of the AMxAMy complex selector (B1) and the general glucose unit (B2) in the AMxAMy selector. Novel space structure with extra chiral recognition sites is formed between AMx and AMy moieties. Due to the cooperative functioning of the AMx and AMy moieties, the ChiralAMxAMy columns can provide different and generally better chiral separation abilities for a wider range of chiral compounds.



AM1：R2= Phenylcarbamate;
AM2：R2= 3,5-Dimethylphenylcarbamate;
AM3：R2= 3-Chloro-4-methyl-phenylcarbamate;
AM4：R2= 3,5-Dichlorophenylcarbamate;
AM5：R2= 3-Chloro-5-methyl-phenylcarbamate;
AM6：R2= (S)-α-Methylbenzylcarbamate;
AM7：R2= 4-Methylbenzoate;
AM8：R2= 4-Methylphenylcarbamate;
AM9：R2= 4-Chloro-3-methyl-phenylcarbamate;
AM10：R2= 5-Chloro-2-methyl-phenylcarbamate;
AM11：R2= 3-Chloro-2-methyl-phenylcarbamate;
AM12：R2= 4-Chlorophenylcarbamate;
AM13：R2= 3-Chlorophenylcarbamate.

Fig4.6 (B). Schematic diagram of AMxAMy selector

4.6.2. Application Restrictions and Requirements

The ChiralAMxAMy columns & media can be used under multiple modes conditions. For use under reversed-phase (RP) conditions, the columns need to be firstly flushed with ethanol and methanol following by mobile phase until reaching a constant pressure. Similarly, for use under normal phase (NP) conditions, the columns need to be flushed with ethanol or isopropanol (IPA) following by mobile phase until achieving a stable baseline signal. A ChiralAM or C18 guard column can be used for RP conditions and a Diol guard column can be used for NP conditions. If non-standard mobile phases are to be used, please contact ChiralTek for technical support. Since the strong alkalic compounds (e.g., NaOH etc.) can cause damages to the ChiralCE column bed & packing media, they cannot be used as mobile phase or sample solution additives.

When using ChiralAMxAMy columns with 2μm or 3μm particles, low flow rate (e.g., 0.1-0.3 mL/min) should be applied in traditional HPLC with highly viscous mobile phases (e.g., 100%IPA) in order to avoid high back pressure. However, there is no special flow rate limitation for use in UPLC and SFC.

Flow direction:	Arrow direction on the column label
Maximum tolerance pressure:	< 800 bar（~11600 psi，2μm、3μm column，UPLC or HPLC ）
	< 600 bar (~9000 psi , 5μm analytical column, HPLC or SFC) < 200 bar (~3000 psi , 5μm, 8μm, 10μm preparative column, HPLC or SFC)
Temperature:	1 – 40 ° C
Guard column:	ChiarlAM, C18, or Diol guard column
Mode:	HPLC、UPLC、SFC

4.6.3. Care and Maintenance of the ChiralAMxAMy Columns

1] It is strongly recommended to use ChiralAM, C18 or Diol guard columns to protect tChiralAMxAMy columns.
[2] It'd be better to resolve samples in mobile phases and filter through 0.5μm membrane before injection.
[3]The solvent in the ChiralAMxAMy columns should be replaced with methanol (RP conditions) or ethanol / IPA (NP conditions) if the columns need to be stored for over a week's time.
[4]When worked in high pressure conditions, it's strongly recommended to gradually decrease flow rate to ensure column pressure lower than 100 bar (~1450 psi) before switching off the chromatograph pump.

4.6.4. Ordering Information for ChiralAMxAMy Chiral Column

Product List of Some Common ChiralAMxAMy Immobilized Columns from ChiralTek			
Part Number	*Type*	*Dimension*	*Column Description*
8582-AM2AM3-01	ChiralAM2AM3	2μm, 500Å, 50 × 2.1mm	2μm AM2AM3 immobilized analytical column
8582-AM2AM4-02	ChiralAM2AM4	2μm, 500Å, 100 × 2.1mm	2μm AM2AM4immobilized analytical column
8582-AM2AM5-03	ChiralAM2AM5	2μm, 500Å, 150 × 2.1mm	2μm AM2AM5 immobilized analytical column
8983-AM3AM4-01	ChiralAM3AM4	3μm, 1000Å, 50 × 2.1mm	3μm AM3AM4 immobilized analytical column
8983-AM3AM5-02	ChiralAM3AM5	3μm, 1000Å, 100 × 2.1mm	3μm AM3AM5 immobilized analytical column
8983-AM4AM5-61	ChiralAM4AM5	3μm, 1000Å, 50 × 4.6mm	3μm AM4AM5 immobilized analytical column
8983-AM5AM6-62	ChiralAM5AM6	3μm, 1000Å, 100 × 4.6mm	3μm AM5AM6 immobilized analytical column
8583-AM6AM7-03	ChiralAM6AM7	3μm, 500Å, 150 × 2.1mm	3μm AM6AM7 immobilized analytical column
8583-AM8AM9-04	ChiralAM8AM9	3μm, 500Å, 200 × 2.1mm	3μm AM8AM9 immobilized analytical column
8583-AM9AM10-05	ChiralAM9AM10	3μm, 500Å, 250 × 2.1mm	3μm AM9AM10 immobilized analytical column
8985-AM9AM11-05	ChiralAM9AM11	5μm, 1000Å, 250 × 4.6mm	5μm AM9AM11 immobilized analytical column
883-AM9AM12-04	ChiralAM9AM12	3μm, 120Å, 200 × 2.1mm	3μm AM9AM12 immobilized analytical column
883-AM2AM3-05	ChiralAM2AM3	3μm, 120Å, 250 × 2.1mm	3μm AM2AM3 immobilized analytical column
8983-AM2AM4-03	ChiralAM2AM4	3μm, 1000Å, 150 × 2.1mm	3μm AM2AM4 immobilized analytical column
8983-AM2AM5-05	ChiralAM2AM5	3μm, 1000Å, 250 × 2.1mm	3μm AM2AM5 immobilized analytical column
8983-AM3AM4-01	ChiralAM3AM4	3μm, 1000Å, 50 × 2.1mm	3μm AM3AM4 immobilized analytical column
8983-AM3AM5-02	ChiralAM3AM5	3μm, 1000Å, 100 × 2.1mm	3μm AM3AM5 immobilized analytical column
8985-AM2AM4-03	ChiralAM2AM4	5μm, 1000Å, 150 × 2.1mm	5μm AM2AM4 immobilized analytical column
8988-AM2AM5-25	ChiralAM2AM5	8μm, 1000Å, 250 × 21.5mm	8μm AM2AM5 immobilized preparative column
8989-AM2AM5-35	ChiralAM2AM5	10μm, 1000Å, 250 × 30mm	10μm AM2AM5 immobilized preparative column
8989-AM3AM13-55	ChiralAM3AM13	5μm, 1000Å, 250 × 50mm	10μm AM3AM13 immobilized preparative column
8988-AM2AM4-25	ChiralAM2AM4	8μm, 1000Å, 250 × 21.5mm	8μm AM2AM4 immobilized preparative column
8989-AM2AM4-35	ChiralAM2AM4	10μm, 1000Å, 250 × 30mm	10μm AM2AM4 immobilized preparative column
8933-AMSK1-61	ChiralKit-1	3μm, 1000Å, 50 × 4.6mm	Screening Kit-1（3 analytical columns）
8933-AMSK2-61	ChiralKit-2	3μm, 1000Å, 50 × 4.6mm	Screening Kit-1（3 analytical columns）

4.6.5. Ordering Information for ChiralAMxAMy Chiral Media

Specifications for Some Common ChiralAMCD Packing Media			
Part Number	*Type*	*Specification*	*Description*
0824-AM2AM4-100	ChiralAM2AM4	8μm, 1000Å, 100g	8μm AM2AM5 immobilized packing media
0836-AM3AM6-200	ChiralAM3AM6	8μm, 1000Å, 200g	8μm AM3AM6 immobilized packing media
0923-AM2AM3-500	ChiralAM2AM3	10μm. 1000Å, 500g	10μm AM2AM3 immobilized packing media
0956-AM5AM6-1000	ChiralAM5AM6	10μm. 1000Å, 1kg	10μm AM5AM6 immobilized packing media

4.7 ChiralCECD Cellulose-appended Cyclodextrin-immobilized Chiral Columns & Media

4.7.1. Unique Characteristics for ChiralCECD columns & Media

ChiralCECD columns are the first type of chemically-modified cellulose-appended cyclodextrin-immobilized silica particles-packed chiral columns (shown in Figure 4.7(A)). The ChiralCECD particles were prepared through a specially-designed procedure by bonding the different functional groups-substituted cellulose-appended cyclodextrin (CECD) onto surface of high-quality porous silica (2 µm, 3µm, 5µm, or 10µm). The column contains a unique complex chiral selector with two recognition moieties: cellulose and cyclodextrin.

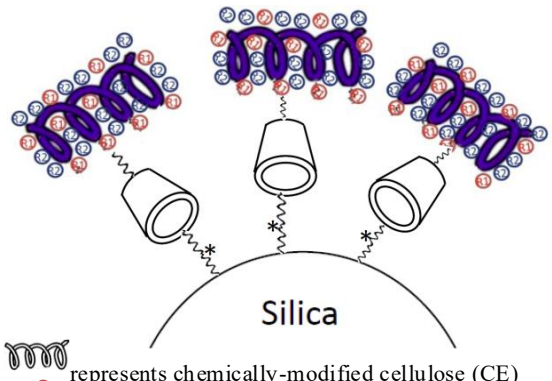
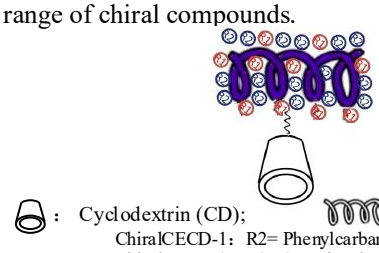


Figure 4.7(A). Schematic diagram of the ChiralCECD phase

Other manufacturers' columns contain a single type of chiral selector (e.g., cellulose, or cyclodextrin, etc). The ChiralCECD column contains both cellulose and cyclodextrin. Figure4.7(B) shows the schematic structure of the chemically-modified cellulose-appended cyclodextrin selector in ChiralCECD column. Due to the cooperative functioning of the cellulose and cyclodextrin, the ChiralCECD columns can provide different and generally better chiral separation abilities for a wider range of chiral compounds.



ChiralCECD-1：R2= Phenylcarbamate;
ChiralCECD-2：R2= 3,5-Dimethylphenylcarbamate;
ChiralCECD-3：R2= 3-Chloro-4-methyl-phenylcarbamate;
ChiralCECD-4：R2= 3,5-Dichlorophenylcarbamate;
ChiralCECD-5：R2= 3-Chloro-5-methyl-phenylcarbamate;
ChiralCECD-6：R2= (S)-α-Methylbenzylcarbamate;
ChiralCECD-7：R2= 4-Methylbenzoate;
ChiralCECD-8：R2= 4-Methylphenylcarbamate;
ChiralCECD-9：R2= 4-Chloro-3-methyl-phenylcarbamate;
ChiralCECD-10：R2= 5-Chloro-2-methyl-phenylcarbamate;
ChiralCECD-11：R2= 3-Chloro-2-methyl-phenylcarbamate;
ChiralCECD-12：R2= 4-Chlorophenylcarbamate;
ChiralCECD-13：R2= 3-Chlorophenylcarbamate.

Figure.4.7(B). Schematic diagram of the CECD complex chiral selector of the ChiralCECD phases

4.7.2. Application Restrictions and Requirements

The ChiralCECD columns & media can be used under multiple modes conditions. For use under reversed-phase (RP) conditions, the columns need to be firstly flushed with ethanol and methanol following by mobile phase until reaching a constant pressure. Similarly, for use under normal phase (NP) conditions, the columns need to be flushed with ethanol or isopropanol (IPA) following by mobile phase until achieving a stable baseline signal. A ChiralAM or C18 guard column can be used for RP conditions and a Diol guard column can be used for NP conditions. If non-standard mobile phases are to be used, please contact ChiralTek for technical support. Since the strong alkalic compounds (e.g., NaOH etc.) can cause damages to the ChiralCECD column bed & packing media, they cannot be used as mobile phase additives or sample solution additives.

When using ChiralCECD columns with 2µm or 3µm particles, low flow rate (e.g., 0.1-0.3 mL/min) should be applied in traditional HPLC with highly viscous mobile phases (e.g., 100%IPA) in order to avoid high back pressure. However, there is no special flow rate limitation for use in UPLC and SFC.

Flow direction:	Arrow direction on the column label
Maximum tolerance pressure:	< 800 bar（~11600 psi，2µm、3µm column，UPLC or HPLC ）
	< 600 bar (~9000 psi , 5µm analytical column, HPLC or SFC) < 200 bar (~3000 psi , 5µm, 10µm preparative column, HPLC or SFC)
Temperature:	1 – 40 ° C
Guard column:	ChiarlCE, C18, or Diol guard column
Mode:	HPLC、UPLC、SFC

4.7.3. Care and Maintenance of the ChiralCECD Columns

1] It is strongly recommended to use ChiralCE, C18 or Diol guard columns to protect the ChiralCE D columns.
[2] It'd be better to resolve samples in mobile phases and filter through 0.5µm membrane before injection.
[3]The solvent in the ChiralCECD columns should be replaced with methanol (RP conditions) or ethanol / IPA (NP conditions) if the columns need to be stored for over a week's time.
[4]When worked in high pressure conditions, it's strongly recommended to gradually decrease flow rate to ensure column pressure lower than 100 bar (~1450 psi) before switching off the chromatograph pump.

4.7.4. Ordering Information for ChiralCECD Chiral Column

Product List of Some Common ChiralCECD Immobilized Columns from ChiralTek

Part Number	*Type*	*Dimension*	*Column Description*
842-CEαCD1-01	ChiralCEαCD-1	2μm, 50x2.1mm	Phenylcarbamate-cellulose-appended αCD-immobilized ChiralCEαCD-1
845-CEβCD1-05	ChiralCEβCD-1	5μm, 250x4.6mm	Phenylcarbamate-cellulose-appended βCD immobilized ChiralCEβCD-1
843-CEϒCD1-01	ChiralCEϒCD-1	3μm, 50x2.1mm	Phenylcarbamate-cellulose-appended ϒCD immobilized ChiralCEϒCD-1
843-CEβCD2-02	ChiralCEβCD-2	3μm, 100x2.1mm	3,5-Dimethylphenylcarbamate-cellulose-appended βCD immobilized ChiralCEβCD-2
843-CEβCD3-03	ChiralCEβCD-3	3μm, 150x2.1mm	3-Chloro-4-methylphenylcarbamate-cellulose-appended βCD immobilized ChiralCEβCD-3
843-CEβCD4-03	ChiralCEβCD-4	3μm, 150x2.1mm	3,5-Dichlorophenylcarbamate-cellulose-appended βCD immobilized ChiralCEβCD-4
843-CEβCD5-03	ChiralCEβCD-5	3μm, 150x2.1mm	3-Chloro-5-methylphenylcarbamate-cellulose-appended βCD immobilized ChiralCEβCD-5
843-CEβCD6-03	ChiralCEβCD-6	3μm, 150x2.1mm	(S)-α-Methylbenzylcarbamate-cellulose-appended βCD immobilized ChiralCEβCD-6
843-CEβCD7-03	ChiralCEβCD-7	3μm, 150x2.1mm	4-Methylbenzoate-cellulose-appended βCD immobilized ChiralCEβCD-7 column
843-CEβCD8-03	ChiralCEβCD-8	3μm, 150x2.1mm	4-Methylphenylcarbamate-cellulose-appended βCD immobilized ChiralCEβCD-8
843-CEβCD9-03	ChiralCEβCD-9	3μm, 150x2.1mm	4-Chloro-3-methylphenylcarbamate-cellulose-appended βCD immobilized ChiralCEβCD-9
843-CEβCD10-03	ChiralCEβCD-10	3μm, 150x2.1mm	5-Chloro-2-methylphenylcarbamate-cellulose-appended βCD immobilized ChiralCEβCD-10
843-CEαCD11-62	ChiralCEαCD-11	3μm, 100x4.6mm	3-Chloro-2-methylphenylcarbamate-cellulose-appended αCD-immobilized ChiralCEαCD-11
845-CEαCD12-05	ChiralCEαCD-12	5μm, 250x4.6mm	3μm 4-Chlorophenylcarbamate-cellulose-appended αCD immobilized ChiralCEαCD-12
843-CEβCD12-03	ChiralCEβCD-12	3μm, 150x2.1mm	3μm 4-Chlorophenylcarbamate-cellulose-appended βCD immobilized ChiralCEβCD-12
845-CEβCD13-05	ChiralCEβCD-13	5μm, 250x4.6mm	3-Chlorophenylcarbamate-cellulose-appended βCD immobilized ChiralCEβCD-13
843-CEβCD1-62	ChiralCEβCD-1	3μm, 100x4.6mm	Phenylcarbamate-cellulose-appended βCD immobilized ChiralCEβCD-1
843-CEβCD2-62	ChiralCEβCD-2	3μm, 100x4.6mm	3,5-Dimethylphenylcarbamate-cellulose-appended βCD immobilized ChiralCEβCD-2
843-CEβCD3-62	ChiralCEβCD-3	3μm, 100x4.6mm	3-Chloro-4-methylphenylcarbamate-cellulose -appendedβCD immobilized ChiralCEβCD-3
845-CEϒCD1-05	ChiralCEϒCD-1	5μm, 250x4.6mm	Phenylcarbamate-cellulose-appended ϒCD immobilized ChiralCEϒCD-1
610-CEβCD2-25	ChiralCEβCD-2	10μm, 250x20mm	3,5-Dimethylphenylcarbamate-cellulose-appended βCD immobilized ChiralCEβCD-2
610-CEβCD2-35	ChiralCEβCD-2	10μm, 250x30mm	3,5-Dimethylphenylcarbamate-cellulose-appended βCD immobilized ChiralCEβCD-2
610-CEβCD3-55	ChiralCEβCD-3	10μm, 250x50mm	3-Chloro-4-methylphenylcarbamate-cellulose-appended βCD immobilized ChiralCEβCD-3
610-CEαCD2-25	ChiralCEαCD-2	10μm, 250x20mm	3,5-Dimethylphenylcarbamate-cellulose αCD immobilized ChiralCEαCD-2
610-CEϒCD2-25	ChiralCEϒCD-2	10μm, 250x20mm	3,5-Dimethylphenylcarbamate-cellulose ϒCD immobilized ChiralCEϒCD-2
843-CECDK1-13	ChiralKit-1	3μm, 150x2.1mm	Screening Kit-1（3 analytical columns）
843-CECDK2-13	ChiralKit-2	3μm, 150x2.1mm	Screening Kit-2（6 analytical columns）

4.7.5. Ordering Information for ChiralCECD Chiral Packing Media

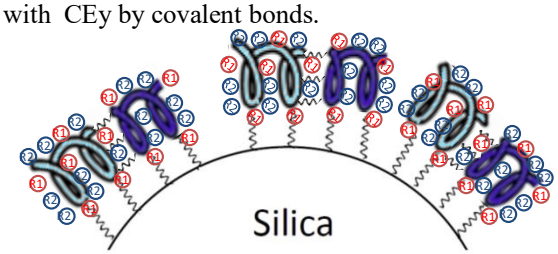
Specifications for Some Common ChiralCECD Packing Media

Part Number	*Type*	*Specification*	*Description*
091-CEαCD1-100	ChiralCEαCD-1	10μm. 300Å, 100g	Phenylcarbamate-cellulose-appended αCD-immobilized ChiralCEαCD-1
092-CEβCD2-200	ChiralCEβCD-2	10μm. 300Å, 200g	3,5-Dimethylphenylcarbamate-cellulose βCD immobilized ChiralCEβCD-2
093-CEβCD3-500	ChiralCEβCD-3	10μm. 300Å, 500g	3-Chloro-4-methylphenylcarbamate-cellulose βCD immobilized ChiralCEβCD-3
095-CEϒCD5-1000	ChiralCEϒCD-5	10μm. 300Å, 1kg	3-Chloro-5-methylphenylcarbamate-cellulose βCD immobilized ChiralCEβCD-5

4.8 ChiralCExCEy Tandem hetero-Cellulose-immobilized Chiral Columns & Media

4.8.1. Unique Characteristics for ChiralCExCEy Columns & Media

ChiralCExCEy columns are the first type of tandem hetero-cellulose derivative-bonded silica particles-packed chiral columns. The ChiralCExCEy particles (as shown in Figure 4.8(A)) were prepared through a specially-designed procedure by immobilizing the novel type of complex selector, the tandem hetero-cellulose derivative (CExCEy), onto surface of high-quality porous silica (2μm, 3μm, 5μm, 8μm, or 10μm). The column contains a unique complex chiral selector with two recognition moieties: the derivatized cellulose CEx and a different cellulose derivative CEy. The CEx was linked with CEy by covalent bonds.

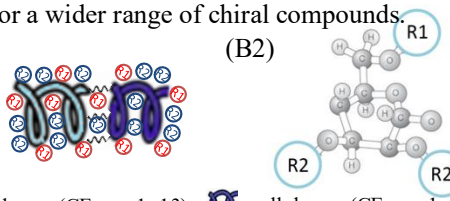


represents chemically-derivatized cellulose-x (CEx)
represents chemically-derivatized hetero-cellulose-y (CEy)
① represents ChiralTek proprietary group R1
② represents another functional group R2
represents a series of covalent bonds

Figure 4.8(A). Schematic diagram of ChiralCExCEy phase

Other manufacturers' columns contain a single type of chiral selector (e.g., single cellulose, or single amylose, etc). The ChiralCExCEy column contains tandem hetero-cellulose complex selector. Figure 4.8(B) shows the schematic structure of the CExCEy complex selector (B1) and the general glucose unit (B2) in the CExCEy selector. Novel space structure with extra chiral recognition sites is formed between CEx and CEy moieties. Due to the cooperative functioning of the CEx and CEy moieties, the ChiralCExCEy columns can provide different and generally better chiral separation abilities for a wider range of chiral compounds.

(B1) (B2)



: cellulose-x (CEx, x=1~13); : cellulose-y (CEy, y=1~13 , x≠y);

CE1: R2= Phenylcarbamate;
CE2: R2= 3,5-Dimethylphenylcarbamate;
CE3: R2= 3-Chloro-4-methyl-phenylcarbamate;
CE4: R2= 3,5-Dichlorophenylcarbamate;
CE5: R2= 3-Chloro-5-methyl-phenylcarbamate;
CE6: R2= (S)-α-Methylbenzylcarbamate;
CE7: R2= 4-Methylbenzoate;
CE8: R2= 4-Methylphenylcarbamate;
CE9: R2= 4-Chloro-3-methyl-phenylcarbamate;
CE10: R2= 5-Chloro-2-methyl-phenylcarbamate;
CE11: R2= 3-Chloro-2-methyl-phenylcarbamate;
CE12: R2= 4-Chlorophenylcarbamate;
CE13: R2= 3-Chlorophenylcarbamate.

Figure4.8 (B). Schematic diagram of CExCEy complex selector

4.8.2. Application Restrictions and Requirements

The ChiralCExCEy columns & media can be used under multiple modes conditions. For use under reversed-phase (RP) conditions, the columns need to be firstly flushed with ethanol and methanol following by mobile phase until reaching a constant pressure. Similarly, for use under normal phase (NP) conditions, the columns need to be flushed with ethanol or isopropanol (IPA) following by mobile phase until achieving a stable baseline signal. A ChiralAM or C18 guard column can be used for RP conditions and a Diol guard column can be used for NP conditions. If non-standard mobile phases are to be used, please contact ChiralTek for technical support. Since the strong alkalic compounds (e.g., NaOH etc.) can cause damages to the ChiralCExCEy column bed & packing media, they cannot be used as mobile phase or sample solution additives.

When using ChiralCExCEy columns with 2μm or 3μm particles, low flow rate (e.g., 0.1-0.3 mL/min) should be applied in traditional HPLC with highly viscous mobile phases (e.g., 100%IPA) in order to avoid high back pressure. However, there is no special flow rate limitation for use in UPLC and SFC.

Flow direction:	Arrow direction on the column label
Maximum tolerance pressure:	< 800 bar (~11600 psi, 2μm、3μm column, UPLC or HPLC)
	< 600 bar (~9000 psi , 5μm analytical column, HPLC or SFC) < 200 bar (~3000 psi , 5μm, 8μm, 10μm preparative column, HPLC or SFC)
Temperature:	1 – 40 ° C
Guard column:	ChiarlCE, C18, or Diol guard column
Mode:	HPLC、UPLC、SFC

4.8.3. Care and Maintenance of the ChiralCExCEy Columns

[1] It is strongly recommended to use ChiralCE, C18 or Diol guard columns to protect ChiralCExCEy columns.
[2] It'd be better to resolve samples in mobile phases and filter through 0.5μm membrane before injection.
[3]The solvent in the ChiralCExCEy columns should be replaced with methanol (RP conditions) or ethanol / IPA (NP conditions) if the columns need to be stored for over a week's time.
[4]When worked in high pressure conditions, it's strongly recommended to gradually decrease flow rate to ensure column pressure lower than 100 bar (~1450 psi) before switching off the chromatograph pump.

4.8.4. Ordering Information for ChiralCExCEy Chiral Column

Product List of Some Common ChiralCExCEy Immobilized Columns from ChiralTek			
Part Number	*Type*	*Dimension*	*Column Description*
8582-CE2CE3-01	ChiralCE2CE3	2μm, 500Å, 50 × 2.1mm	2μm CE2CE3immobilized analytical column
8582-CE2CE4-02	ChiralCE2CE4	2μm, 500Å, 100 × 2.1mm	2μm CE2CE4immobilized analytical column
8582-CE2CE5-03	ChiralCE2CE5	2μm, 500Å, 150 × 2.1mm	2μm CE2CE5immobilized analytical column
8983-CE3CE4-01	ChiralCE3CE4	3μm, 1000Å, 50 × 2.1mm	3μm CE3CE4immobilized analytical column
8983-CE3CE5-02	ChiralCE3CE5	3μm, 1000Å, 100 × 2.1mm	3μ CE3CE5immobilized analytical column
8983-CE4CE5-61	ChiralCE4CE5	3μm, 1000Å, 50 × 4.6mm	3μm CE4CE5immobilized analytical column
8983-CE5CE6-62	ChiralCE5CE6	3μm, 1000Å, 100 × 4.6mm	3μm CE5CE6immobilized analytical column
8583-CE6CE7-03	ChiralCE6CE7	3μm, 500Å, 150 × 2.1mm	3μm CE6CE7immobilized analytical column
8583-CE8CE9-04	ChiralCE8CE9	3μm, 500Å, 200 × 2.1mm	3μm CE8CE9immobilized analytical column
8583-CE9CE10-05	ChiralCE9CE10	3μm, 500Å, 250 × 2.1mm	3μm CE9CE10immobilized analytical column
8985-CE9CE11-05	ChiralCE9CE11	5μm, 1000Å, 250 × 4.6mm	5μm CE9CE11immobilized analytical column
883-CE9CE12-04	ChiralCE9CE12	3μm, 120Å, 200 × 2.1mm	3μm CE9CE12immobilized analytical column
883-CE2CE3-05	ChiralCE2CE3	3μm, 120Å, 250 × 2.1mm	3μm CE2CE3immobilized analytical column
8983-CE2CE4-03	ChiralCE2CE4	3μm, 1000Å, 150 × 2.1mm	3μm CE2CE4immobilized analytical column
8983-CE2CE5-05	ChiralCE2CE5	3μm, 1000Å, 250 × 2.1mm	3μm CE2CE5immobilized analytical column
8983-CE3CE4-01	ChiralCE3CE4	3μm, 1000Å, 50 × 2.1mm	3μm CE3CE4immobilized analytical column
8983-CE3CE5-02	ChiralCE3CE5	3μm, 1000Å, 100 × 2.1mm	3μm CE3CE5immobilized analytical column
8985-CE2CE4-03	ChiralCE2CE4	5μm, 1000Å, 150 × 2.1mm	5μm CE2CE4immobilized analytical column
8988-CE2CE5-25	ChiralCE2CE5	8μm, 1000Å, 250 × 21.5mm	8μm CE2CE5 immobilized preparative column
8989-CE2CE5-35	ChiralCE2CE5	10μm, 1000Å, 250 × 30mm	10μm CE2CE5 immobilized preparative column
8989-CE3CE13-55	ChiralCE3CE13	5μm, 1000Å, 250 × 50mm	10μm CE3CE13 immobilized preparative column
8988-CE2CE4-25	ChiralCE2CE4	8μm, 1000Å, 250 × 21.5mm	8μm CE2CE4 immobilized preparative column
8989-CE2CE4-35	ChiralCE2CE4	10μm, 1000Å, 250 × 30mm	10μm CE2CE4 immobilized preparative column
8933-CESK1-61	ChiralKit-1	3μm, 1000Å, 50 × 4.6mm	Screening Kit-1（3 analytical columns）
8933-CESK2-61	ChiralKit-2	3μm, 1000Å, 50 × 4.6mm	Screening Kit-2（6 analytical columns）

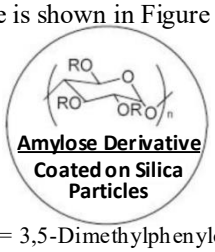
4.8.5. ChiralCExCEy手性填料订购信息

Specifications for Some Common ChiralCExCEy Packing Media			
Part Number	*Type*	*Specification*	*Description*
0824-CE2CE4-100	ChiralCE2CE4	8μm, 1000Å, 100g	8μm immobilizedCE2CE5 packing media
0836-CE3CE6-200	ChiralCE3CE6	8μm, 1000Å, 200g	8μm immobilized CE3CE6 packing media
0923-CE2CE3-500	ChiralCE2CE3	10μm. 1000Å, 500g	10μm immobilized CE2CE3 packing media
0956-CE5CE6-1000	ChiralCE5CE6	10μm. 1000Å, 1kg	10μm immobilized CE5CE6 packing media

4.9 ChiralCTAM Amylose-coated Normal Phase Chiral Columns & Media

4.9.1. Unique Characteristics for ChiralCTAM Columns & Media

ChiralCTAM columns are a new type of completely-substituted amylose-coated silica particles-packed chiral columns. The ChiralCTAM particles were prepared through a specially-designed procedure by coating the amylose derivatives onto the surface of the chemically-modified macroporous silica gel (2µm, 3µm, 5µm, 8µm or 10µm). The schematic chemical structure of the ChiralCTAM phase is shown in Figure 4.9(A).



ChiralCTAM-2：R= 3,5-Dimethylphenylcarbamate;
ChiralCTAM-3：R=3-Chloro-4-methyl-phenylcarbamate;
ChiralCTAM-6：R= (S)- α-Methylbenzylcarbamate;
ChiralCTAM-10：R= 5-Chloro-2-methyl-phenylcarbamate.

Figure 4.9(A). Schematic diagram of the ChiralCTAM phase

High-quality sphere macroporous silica particles with pore size 500Å, 1000Å and above are used to manufacture the ChiralCTAM phases. Therefore, high column efficiency can be easily achieved on the ChiralCTAM columns.

As ChiralCTAM particles are amylose derivative-coated chiral phases, they are designed only for normal phase conditions in HPLC, UPLC, and SFC. Typical mobile phases are mixtures of Hexane/IPA, or Hexane/EtOH, or Heptane/Butanol, or CO_2/EtOH, or CO_2/IPA, etc. with/or without organic acidic or basic additives. The ChiralCTAM columns cannot be used under reversed-phase or other non-typical mobile phase conditions .

Please use amylose-immobilized ChiralAM columns if other non-typical mobile phases or reversed-phase mobile phases are required for the chromatographic separations.

4.9.2. Application Restrictions and Requirements

The ChiralCTAM columns can be used only under normal mobile phase conditions with some organic acidic or basic additives. A proper chiral guard column or a common Diol guard column can be used for ChiralCTAM column under normal phase conditions. If the reversed-phase mobile phases are required, the ChiralCTAM-R series of reverse phase columns can be used to replace the ChiralCTAM columns.

The ChiralCTAM column is stored in Hexane/IPA (90:10, *v/v*) upon delivery. It is strongly recommended to flush the column with compatible mobile phase to achieve a stable baseline under normal phase condition before final application in UPLC, HPLC, or SFC.

Non-typical solvents, e.g., Acetone, Chloroform, Dichloromethane, DMF, DMSO, 1,4-Dioxane, Ethyl acetate, THF, Toluene, etc., cannot be used to resolve samples and cannot be used as mobile phase additives.

The column pressure for ChiralCTAM columns with 5µm particles is quite low in HPLC and SFC. However, when using ChiralCTAM columns with 2µm and 3µm particles, low flow rate (e.g., 0.1-0.5 mL/min) should be applied when used in traditional HPLC with highly viscous mobile phases in order to avoid high back pressure. However, there is no special flow rate limitation for use in UPLC or SFC.

Flow direction:	Arrow direction on the column label
Maximum tolerance pressure:	< 800 bar（~11600 psi，2µm、3µm column，UPLC or HPLC ）
	< 600 bar (~9000 psi , 5µm analytical column, HPLC or SFC) < 200 bar (~3000 psi , 5µm, 8µm, 10µm preparative column, HPLC or SFC)
Temperature:	1 – 40 ° C
Guard column:	ChiarlCTAM, or Diol guard column
Mode:	HPLC、UPLC、SFC

4.9.3. Care and Maintenance of the ChiralCTAM Columns

[1] It is strongly recommended to use guard columns to protect the ChiralCTAM columns;
[2] It'd be better to resolve samples in mobile phases and filter through 0.5µm membrane before injection;
[3] The non-typical solvents, e.g., Acetone, Chloroform, Dichloromethane, DMF, DMSO, 1,4-Dioxane, Ethyl acetate, THF, Toluene, etc., cannot be used to resolve samples or to use as mobile phase additives in HPLC.
[4] A small amount (e.g., 1% to 2%) of Chloroform or Dichloromethane may be added into CO_2/EtOH or CO_2/IPA under certain SFC conditions.
[5] When worked in high pressure conditions, it's strongly recommended to gradually decrease flow rate to ensure column pressure lower than 100 bar (~1450 psi) before switching off the chromatograph pump.

4.9.4. Ordering Information for ChiralCTAM Columns

Product List of Some Common ChiralCTAM Coated Columns from ChiralTek			
Part Number	*Type*	*Dimension*	*Column Description*
9022-CTAM2-01	ChiralCTAM-2	2μm, 1000Å, 50 × 2.1mm	2μm tris(3,5-dimethylphenyl-carbamate)-amylose -coated analytical column
9032-CTAM3-02	ChiralCTAM-3	2μm, 1000Å, 100 × 2.1mm	2μm tris(3-chloro-4-methyl-phenylcarbamate)-amylose-coated analytical column
9093-CTAM10-03	ChiralCTAM-10	3μm, 1000Å, 150 × 2.1mm	3μm tris(5-chloro-2-methyl-phenylcarbamate)-amylose-coated analytical column
9093-CTAM10-04	ChiralCTAM-10	3μm, 1000Å, 200 × 2.1mm	3μm tris(5-chloro-2-methyl-phenylcarbamate)-amylose-coated analytical column
9023-CTAM2-05	ChiralCTAM-2	3μm, 1000Å, 250 × 2.1mm	3μm tris(3,5-dimethylphenyl-carbamate)-amylose -coated analytical column
9023-CTAM2-61	ChiralCTAM-2	3μm, 1000Å, 50 × 4.6mm	3μm tris(3,5-dimethylphenyl-carbamate)-amylose -coated analytical column
9023-CTAM2-62	ChiralCTAM-2	3μm, 1000Å, 100 × 4.6mm	3μm tris(3,5-dimethylphenyl-carbamate)-amylose -coated analytical column
95023-CTAM2-62	ChiralCTAM-2	3μm, 500Å, 100 × 4.6mm	3μm tris(3,5-dimethylphenyl-carbamate)-amylose -coated analytical column
9033-CTAM3-61	ChiralCTAM-3	3μm, 1000Å, 50 × 4.6mm	3μm tris(3-chloro-4-methyl-phenylcarbamate)-amylose-coated analytical column
9033-CTAM3-62	ChiralCTAM-3	3μm, 1000Å, 100 × 4.6mm	3μm tris(3-chloro-4-methyl-phenylcarbamate)-amylose-coated analytical column
9025-CTAM2-05	ChiralCTAM-2	5μm, 1000Å, 250 × 4.6mm	5μm tris(3,5-dimethylphenyl-carbamate)-amylose -coated analytical column
9035-CTAM3-05	ChiralCTAM-3	5μm, 1000Å, 250 × 4.6mm	5μm tris(3-chloro-4-methyl-phenylcarbamate)-amylose-coated analytical column
9065-CTAM6-05	ChiralCTAM-6	5μm, 1000Å, 250 × 4.6mm	5μm tris((s)- α-methylbenzylcarbamate)-amylose-coated analytical column
9025-CTAM2-14	ChiralCTAM-2	5μm, 1000Å, 200 × 10.0mm	5μm tris(3,5-dimethylphenyl-carbamate)-amylose -coated semi-preparative column
9025-CTAM2-25	ChiralCTAM-2	5μm, 1000Å, 250 × 20.0mm	5μm tris(3,5-dimethylphenyl-carbamate)-amylose -coated preparative column
9025-CTAM2-35	ChiralCTAM-2	5μm, 1000Å, 250 × 30.0mm	5μm tris(3,5-dimethylphenyl-carbamate)-amylose -coated preparative column
9028-CTAM2-35	ChiralCTAM-2	8μm, 1000Å, 250 × 30.0mm	8μm tris(3,5-dimethylphenyl-carbamate)-amylose -coated preparative column
9028-CTAM2-55	ChiralCTAM-2	8μm, 1000Å, 250 × 50.0mm	8μm tris(3,5-dimethylphenyl-carbamate)-amylose -coated preparative column
9039-CTAM3-35	ChiralCTAM-3	10μm, 1000Å, 250 × 30.0mm	10μm tris(3-chloro-4-methyl-phenylcarbamate)-amylose-coated preparative column
9069-CTAM6-55	ChiralCTAM-6	10μm, 1000Å, 250 × 50.0mm	10μm tris((s)- α-methylbenzylcarbamate)-amylose-coated preparative column
803-CTAMK1-1	ChiralKit-1	3μm, 1000Å, 50 × 4.6mm	Screening Kit-1（2 analytical columns）
803-CTAMK1-2	ChiralKit-2	3μm, 1000Å, 50 × 4.6mm	Screening Kit-2（4 analytical columns）

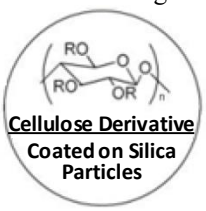
4.9.5. Ordering Information for ChiralCTAM Packing Media

Part Number	Type	Specification	Description
082-CTAM2-100	ChiralCTAM-2	8μm, 1000Å, 100g	8μm CTAM-2 tris(3,5-dimethylphenyl-carbamate)-amylose –coated silica packing media
082-CTAM2-150	ChiralCTAM-2	8μm, 1000Å, 150g	8μm CTAM-2 tris(3,5-dimethylphenyl-carbamate)-amylose –coated silica packing media
082-CTAM2-500	ChiralCTAM-2	8μm, 1000Å, 500g	8μm CTAM-2 tris(3,5-dimethylphenyl-carbamate)-amylose –coated silica packing media
082-CTAM2-1000	ChiralCTAM-2	8μm, 1000Å, 1kg	8μm CTAM-2 tris(3,5-dimethylphenyl-carbamate)-amylose –coated silica packing media
082-CTAM2-5000	ChiralCTAM-2	8μm, 1000Å, 5kg	8μm CTAM-2 tris(3,5-dimethylphenyl-carbamate)-amylose –coated silica packing media
092-CTAM2-100	ChiralCTAM-2	10μm, 1000Å, 100g	10μm CTAM-2 tris(3,5-dimethylphenyl-carbamate)-amylose –coated silica packing media
092-CTAM2-150	ChiralCTAM-2	10μm, 1000Å, 150g	10μm CTAM-2 tris(3,5-dimethylphenyl-carbamate)-amylose–coated silica packing media
093-CTAM3-500	ChiralCTAM-3	10μm, 1000Å, 500g	10μm CTAM-3 tris(3-chloro-4-methyl phenylcarbamate)-amylose-coated silica packing media
093-CTAM3-1000	ChiralCTAM-3	10μm, 1000Å, 1kg	10μm CTAM-3 tris(3-chloro-4-methyl phenylcarbamate)-amylose-coated silica packing media
092-CTAM2-5000	ChiralCTAM-3	10μm, 1000Å, 5kg	10μm CTAM-3 tris(3-chloro-4-methyl phenylcarbamate)-amylose-coated silica packing media
083-CTAM3-100	ChiralCTAM-3	8μm, 1000Å, 100g	8μm CTAM-3 tris(3-chloro-4-methyl phenylcarbamate)-amylose-coated silica packing media
083-CTAM3-150	ChiralCTAM-3	8μm, 1000Å, 150g	8μm CTAM-3 tris(3-chloro-4-methyl phenylcarbamate)-amylose-coated silica packing media
083-CTAM3-500	ChiralCTAM-3	8μm, 1000Å, 500g	8μm CTAM-3 tris(3-chloro-4-methyl phenylcarbamate)-amylose-coated silica packing media
086-CTAM6-1000	ChiralCTAM-6	8μm, 1000Å, 1kg	8μm CTAM-6 tris((s)- α-methylbenzylcarbamate)-amylose-coated silica packing media
086-CTAM6-5000	ChiralCTAM-6	8μm, 1000Å, 5kg	8μm CTAM-6 tris((s)- α-methylbenzylcarbamate)-amylose-coated silica packing media
086-CTAM6-100	ChiralCTAM-6	8μm, 1000Å, 100g	8μm CTAM-6 tris((s)- α-methylbenzylcarbamate)-amylose-coated silica packing media
086-CTAM6-150	ChiralCTAM-6	8μm, 1000Å, 150g	8μm CTAM-6 tris((s)- α-methylbenzylcarbamate)-amylose-coated silica packing media
096-CTAM6-150	ChiralCTAM-6	10μm, 1000Å, 150g	10μm CTAM-6 tris((s)- α-methylbenzylcarbamate)-amylose-coated silica packing media
096-CTAM6-500	ChiralCTAM-6	10μm, 1000Å, 500g	10μm CTAM-6 tris((s)- α-methylbenzylcarbamate)-amylose-coated silica packing media
0810-CTAM10-500	ChiralCTAM-10	8μm, 1000Å, 500g	10μm CTAM-10 tris(5-chloro-2-methyl-phenylcarbamate)-amylose-coated silica packing media
0910-CTAM10-1000	ChiralCTAM-10	10μm, 1000Å, 1kg	10μm CTAM-10 tris(5-chloro-2-methyl-phenylcarbamate)-amylose-coated silica packing media
0910-CTAM10-5000	ChiralCTAM-10	10μm, 1000Å, 5kg	10μm CTAM-10 tris(5-chloro-2-methyl-phenylcarbamate)-amylose-coated silica packing media

4.10 ChiralCTCE Cellulose-coated Normal Phase Chiral Columns & Media

4.10.1. Unique Characteristics for ChiralCTCE Columns & Media

ChiralCTCE columns are a new type of completely-substituted cellulose-coated silica particles-packed chiral columns. The ChiralCTCE particles were prepared through a specially-designed procedure by coating the cellulose derivatives onto the surface of the chemically-modified macroporous silica gel (2, 3, or 5µm for analytical columns and 8 or 10µm for preparative columns). The schematic chemical structure of the ChiralCTCE phase is shown in Figure 4.10(A).



ChiralCTCE-1：R= Phenylcarbamate;
ChiralCTCE-2：R= 3,5-Dimethylphenylcarbamate;
ChiralCTCE-3：R=3-Chloro-4-methyl-phenylcarbamate;
ChiralCTCE-7：R= 4-Methylbenzoate;
ChiralCTCE-8：R= 4-Methylphenylcarbamate;
ChiralCTCE-9：R= 4-Chloro-3-methyl-phenylcarbamate;

Figure 4.10(A). Schematic diagram of the ChiralCTCE phase

High-quality sphere macroporous silica particles with pore size 500Å, 1000Å and above are used to manufacture the ChiralCTCE phases. Therefore, high column efficiency can be easily achieved on the ChiralCTCE columns.

As ChiralCTCE particles are cellulose derivative-coated chiral phases, they are designed only for normal phase conditions in HPLC, UPLC, and SFC. Typical mobile phases are mixtures of Hexane/IPA, or Hexane/EtOH, or Heptane/Butanol, or CO_2/EtOH, or CO_2/IPA, etc. with/or without organic acidic or basic additives. The ChiralCTCE columns cannot be used under reversed-phase or other non-typical mobile phase conditions. ChiralTek also provides ChiralCTCE-R series of cellulose-coated chiral columns and packing media for the reversed-phase conditions only.

Please use cellulose-immobilized ChiralCE columns if other non-typical mobile phases or reversed-phase mobile phases are required for the chromatographic separations.

4.10.2. Application Restrictions and Requirements

The ChiralCTCE columns can be used only under normal mobile phase conditions with some organic acidic or basic additives. A proper chiral guard column or a common Diol guard column can be used for ChiralCTCE column under normal phase conditions. If the reversed-phase mobile phases are required, the ChiralCTCE-R series of reverse phase columns can be used to replace ChiralCTCE columns.

The ChiralCTCE column is stored in Hexane/IPA (90:10, *v/v*) upon delivery. It is strongly recommended to flush the column with compatible mobile phase to achieve a stable baseline under normal phase condition before final application in UPLC, HPLC, or SFC.

Non-typical solvents, e.g., Acetone, Chloroform, Dichloromethane, DMF, DMSO, 1,4-Dioxane, Ethyl acetate, THF, Toluene, etc., cannot be used to resolve samples and cannot be used as mobile phase additives.

The column pressure for ChiralCTCE columns with 5µm particles is quite low in HPLC and SFC. However, when using ChiralCTAM columns with 2µm and 3µm particles, low flow rate (e.g., 0.1-0.5 mL/min) should be applied when used in traditional HPLC with highly viscous mobile phases in order to avoid high back pressure. However, there is no special flow rate limitation for use in UPLC or SFC.

Flow direction:	Arrow direction on the column label
Maximum tolerance pressure:	< 800 bar（~11600 psi，2µm、3µm column，UPLC or HPLC ）
	< 600 bar (~9000 psi , 5µm analytical column, HPLC or SFC) < 200 bar (~3000 psi , 5µm, 8µm, 10µm preparative column, HPLC or SFC)
Temperature:	1 – 40 ° C
Guard column:	ChiarlCTCE, or Diol guard column
Mode:	HPLC、UPLC、SFC

4.10.3. Care and Maintenance of the ChiralCTCE Columns

[1] It is strongly recommended to use guard columns to protect the ChiralCTCE columns;
[2] It'd be better to resolve samples in mobile phases and filter through 0.5µm membrane before injection;
[3] The non-typical solvents, e.g., Acetone, Chloroform, Dichloromethane, DMF, DMSO, 1,4-Dioxane, Ethyl acetate, THF, Toluene, etc., cannot be used to resolve samples or to use as mobile phase additives in HPLC.
[4] A small amount (e.g., 1% to 2%) of Chloroform or Dichloromethane may be added into CO_2/EtOH or CO_2/IPA under certain SFC conditions.
[5] When worked in high pressure conditions, it's strongly recommended to gradually decrease flow rate to ensure column pressure lower than 100 bar (~1450 psi) before switching off the chromatograph pump.

4.10.4. Ordering Information for ChiralCTCE Columns

Product List of Some Common ChiralCTCE Coated Columns from ChiralTek			
Part Number	*Type*	*Dimension*	*Column Description*
8022-CTCE1-01	ChiralCTCE-1	2μm, 1000Å, 50 × 2.1mm	2μm tris(phenylcarbamate)-cellulose-coated analytical column
8032-CTCE2-02	ChiralCTCE-2	2μm, 1000Å, 100 × 2.1mm	2μm tris(3,5-dimethylphenyl-carbamate)-cellulose-coated analytical column
8033-CTCE3-03	ChiralCTCE-3	3μm, 1000Å, 150 × 2.1mm	3μm tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated analytical column
8073-CTCE7-03	ChiralCTCE-7	3μm, 1000Å, 150 × 2.1mm	3μm tris(4-methylbenzoate)-cellulose-coated analytical column
8023-CTCE8-05	ChiralCTCE-8	3μm, 1000Å, 250 × 2.1mm	3μm tris(4-methylphenylcarbamate)-cellulose-coated analytical column
8023-CTCE9-61	ChiralCTCE-9	3μm, 1000Å, 50 × 4.6mm	3μm tris(4-chloro-3-methyl-phenylcarbamate)-cellulose-coated analytical column
8023-CTCE2-62	ChiralCTCE-2	3μm, 1000Å, 100 × 4.6mm	3μm tris(3,5-dimethylphenyl-carbamate)-cellulose-coated analytical column
85023-CTCE2-61	ChiralCTCE-2	3μm, 500Å, 50 × 4.6mm	3μm tris(3,5-dimethylphenyl-carbamate)-cellulose-coated analytical column
85023-CTCE2-62	ChiralCTCE-2	3μm, 500Å, 100 × 4.6mm	3μm tris(3,5-dimethylphenyl-carbamate)-cellulose-coated analytical column
8033-CTCE3-61	ChiralCTCE-3	3μm, 1000Å, 50 × 4.6mm	3μm tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated analytical column
8033-CTCE3-62	ChiralCTCE-3	3μm, 1000Å, 100 × 4.6mm	3μm tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated analytical column
8025-CTCE2-05	ChiralCTCE-2	5μm, 1000Å, 250 × 4.6mm	5μm tris(3,5-dimethylphenyl-carbamate)-cellulose-coated analytical column
8035-CTCE3-05	ChiralCTCE-3	5μm, 1000Å, 250 × 4.6mm	5μm tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated analytical column
8075-CTCE7-05	ChiralCTCE-7	5μm, 1000Å, 250 × 4.6mm	5μm tris(4-methylbenzoate)-cellulose-coated analytical column
7025-CTCE2-14	ChiralCTCE-2	5μm, 1000Å, 200 × 10.0mm	5μm tris(3,5-dimethylphenyl-carbamate)-cellulose-coated semi-preparative column
7025-CTCE2-25	ChiralCTCE-2	5μm, 1000Å, 250 × 20.0mm	5μm tris(3,5-dimethylphenyl-carbamate)-cellulose-coated preparative column
7025-CTCE2-35	ChiralCTCE-2	5μm, 1000Å, 250 × 30.0mm	5μm tris(3,5-dimethylphenyl-carbamate)-cellulose-coated preparative column
7038-CTCE3-25	ChiralCTCE-3	8μm, 1000Å, 250 × 20.0mm	8μm tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated preparative column
7038-CTCE3-35	ChiralCTCE-3	8μm, 1000Å, 250 × 30.0mm	8μm tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated preparative column
7039-CTCE3-55	ChiralCTCE-3	10μm, 1000Å, 250 × 50.0mm	10μm tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated preparative column
803-CTCEK1-1	ChiralKit-1	3μm, 1000Å, 50 × 4.6mm	Screening Kit-1（3 analytical columns）
803-CTCEK2-2	ChiralKit-2	3μm, 1000Å, 50 × 4.6mm	Screening Kit-2（6 analytical columns）

4.10.5. Ordering Information for ChiralCTCE Packing Media

Part Number	Type	Specification	Description
082-CTCE2-100	ChiralCTCE-2	8µm, 1000Å, 100g	8µm CTCE-2 tris(3,5-dimethylphenyl-carbamate)-cellulose-coated silica packing media
082-CTCE2-150	ChiralCTCE-2	8µm, 1000Å, 150g	8µm CTCE-2 tris(3,5-dimethylphenyl-carbamate)-cellulose-coated silica packing media
082-CTCE2-500	ChiralCTCE-2	8µm, 1000Å, 500g	8µm CTCE-2 tris(3,5-dimethylphenyl-carbamate)-cellulose-coated silica packing media
082-CTCE2-1000	ChiralCTCE-2	8µm, 1000Å, 1kg	8µm CTCE-2 tris(3,5-dimethylphenyl-carbamate)-cellulose-coated silica packing media
082-CTCE2-5000	ChiralCTCE-2	8µm, 1000Å, 5kg	8µm CTCE-2 tris(3,5-dimethylphenyl-carbamate)-cellulose-coated silica packing media
092-CTCE2-100	ChiralCTCE-2	10µm, 1000Å, 100g	10µm CTCE-2 tris(3,5-dimethylphenyl-carbamate)-cellulose-coated silica packing media
092-CTCE2-150	ChiralCTCE-2	10µm, 1000Å, 150g	10µm CTCE-2 tris(3,5-dimethylphenyl-carbamate)-cellulose-coated silica packing media
093-CTCE3-500	ChiralCTCE-3	10µm, 1000Å, 500g	10µm CTCE-3 tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated silica media
093-CTCE3-1000	ChiralCTCE-3	10µm, 1000Å, 1kg	10µm CTCE-3 tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated silica media
092-CTCE2-5000	ChiralCTCE-3	10µm, 1000Å, 5kg	10µm CTCE-3 tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated silica media
083-CTCE3-100	ChiralCTCE-3	8µm, 1000Å, 100g	8µm CTCE-3 tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated silica media
083-CTCE3-150	ChiralCTCE-3	8µm, 1000Å, 150g	8µm CTCE-3 tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated silica media
083-CTCE3-500	ChiralCTCE-3	8µm, 1000Å, 500g	8µm CTCE-3 tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated silica media
087-CTCE7-1000	ChiralCTCE-7	8µm, 1000Å, 1kg	8µm CTCE-7 tris(4-methylbenzoate)-cellulose-coated silica packing media
087-CTCE7-5000	ChiralCTCE-7	8µm, 1000Å, 5kg	8µm CTCE-7 tris(4-methylbenzoate)-cellulose-coated silica packing media
087-CTCE7-100	ChiralCTCE-7	8µm, 1000Å, 100g	8µm CTCE-7 tris(4-methylbenzoate)-cellulose-coated silica packing media
087-CTCE7-150	ChiralCTCE-7	8µm, 1000Å, 150g	8µm CTCE-7 tris(4-methylbenzoate)-cellulose-coated silica packing media
097-CTCE7-150	ChiralCTCE-7	10µm, 1000Å, 150g	10µm CTCE-7 tris(4-methylbenzoate)-cellulose-coated silica packing media
097-CTCE7-500	ChiralCTCE-7	10µm, 1000Å, 500g	10µm CTCE-7 tris(4-methylbenzoate)-cellulose-coated silica packing media
089-CTCE9-500	ChiralCTCE-9	8µm, 1000Å, 500g	8µm CTCE-9 tris(4-chloro-3-methyl-phenylcarbamate)-cellulose-coated silica media
099-CTCE9-1000	ChiralCTCE-9	10µm, 1000Å, 1kg	10µm CTCE-9 tris(4-chloro-3-methyl-phenylcarbamate)-cellulose-coated silica media
099-CTCE9-5000	ChiralCTCE-9	10µm, 1000Å, 5kg	10µm CTCE-9 tris(4-chloro-3-methyl-phenylcarbamate)-cellulose-coated silica media

4.11 ChiralCTAM-R Amylose-coated Reverse Phase Chiral Columns & Media

4.11.1. Unique Characteristics for ChiralCTAM-R Reverse Phase Columns & Media

ChiralCTAM-R columns are a new type of completely-substituted amylose-coated silica particles-packed chiral columns. The ChiralCTAM-R particles were prepared through a specially-designed procedure by coating the amylose derivatives onto the surface of the chemically-modified macroporous silica gel (2, 3, or 5µm for analytical columns and 8 or 10µm for preparative columns). The schematic chemical structure of the ChiralCTAM-R phase is shown in Figure 4.11(A).

ChiralCTAM-2R：R= 3,5-Dimethylphenylcarbamate;
ChiralCTAM-3R：R=3-Chloro-4-methyl-phenylcarbamate;
ChiralCTAM-6R：R= (S)-α-Methylbenzylcarbamate;
ChiralCTAM-10R：R= 5-Chloro-2-methyl-phenylcarbamate.

Figure 4.11(A). Schematic diagram of the ChiralCTAM-R phase

High-quality sphere macroporous silica particles with pore size 500Å, 1000Å and above are used to manufacture the ChiralCTAM-R phases. Therefore, high column efficiency can be easily achieved on the ChiralCTAM-R columns.

As ChiralCTAM-R particles are amylose derivative-coated chiral phases, they are designed only for polar organic and reversed-phase conditions in HPLC and UPLC. Typical mobile phases are mixtures of MeOH/ACN, or MeOH/H_2O, or ACN/H_2O, etc. with/or without organic acidic or basic additives. The ChiralCTAM-R columns cannot be used under normal phase or other non-typical mobile phase conditions. ChiralTek also provides ChiralCTAM series of amylose-coated chiral columns and packing media for normal phase conditions only.

Please use amylose-immobilized ChiralAM columns if other non-typical mobile phases or normal phase mobile phases are required for the chromatographic separations.

4.11.2. Application and Requirements

The ChiralCTAM-R columns can be used only under polar organic and reversed-phase conditions with some organic acidic or basic additives. A proper chiral guard column or a common NH_2 or C18 guard column can be used for ChiralCTAM-R columns.

The ChiralCTAM-R column is stored in ACN/H_2O (40:60, *v/v*) upon delivery. It is strongly recommended to flush the column with compatible mobile phase to achieve a stable baseline under polar organic mode or reversed-phase conditions before final application in UPLC or HPLC.

Non-typical solvents, e.g., Acetone, Chloroform, Dichloromethane, DMF, DMSO, 1,4-Dioxane, Ethyl acetate, THF, Toluene, etc., cannot be used to resolve samples and cannot be used as mobile phase additives.

The column pressure for ChiralCTAM-R columns with 5µm particles is quite low in HPLC. However, when using ChiralCTAM-R columns with 2µm and 3µm particles, low flow rate (e.g., 0.1-0.5 mL/min) should be applied when used in traditional HPLC with highly viscous mobile phases in order to avoid high back pressure. However, there is no special flow rate limitation for use in UPLC.

Flow direction:	Arrow direction on the column label
Maximum tolerance pressure:	< 800 bar（~11600 psi，2µm、3µm column，UPLC or HPLC ）
	< 600 bar (~9000 psi , 5µm analytical column, HPLC or SFC) < 200 bar (~3000 psi , 5µm, 8µm, 10µm preparative column, HPLC or SFC)
Temperature:	1 – 40 ° C
Guard column:	ChiarlCTAM-R, C18, or NH_2 guard column
Mode:	HPLC、UPLC、SFC

4.11.3. Care and Maintenance of the ChiralCTAM-R Columns

[1] It is strongly recommended to use guard columns to protect the ChiralCTAM-R columns;
[2] It'd be better to resolve samples in mobile phases and filter through 0.5µm membrane before injection;
[3] The non-typical solvents, e.g., Acetone, Chloroform, Dichloromethane, DMF, DMSO, 1,4-Dioxane, Ethyl acetate, THF, Toluene, etc., cannot be used to resolve samples or to use as mobile phase additives in HPLC.
[4] A small amount (e.g.0.01% to 0.1%) of organic acidic or basic additives and buffers can be used under certain mobile phase conditions. However, frequent changes of additives may shorten lifespan of the columns.
[5] When worked in high pressure conditions, it's strongly recommended to gradually decrease flow rate to ensure column pressure lower than 100 bar (~1450 psi) before switching off the chromatograph pump.

4.11.4. . Ordering Information for ChiralCTAM-R Columns

Product List of Some Common ChiralCTMR-R Coated Columns from ChiralTek			
Part Number	*Type*	*Dimension*	*Column Description*
9022-CTAM2R-01	ChiralCTAM-2R	2μm, 1000Å, 50 × 2.1mm	2μm tris(3,5-dimethylphenyl-carbamate)-amylose-coated reverse phase analytical column
9032-CTAM3R-02	ChiralCTAM-3R	2μm, 1000Å, 100 × 2.1mm	2μm tris(3-chloro-4-methyl-phenylcarbamate)-amylose-coated reverse phase analytical column
9093-CTAM10R-03	ChiralCTAM-10R	3μm, 1000Å, 150 × 2.1mm	3μm tris(5-chloro-2-methyl-phenylcarbamate)-amylose-coated reverse phase analytical column
9093-CTAM10R-04	ChiralCTAM-10R	3μm, 1000Å, 200 × 2.1mm	3μm tris(5-chloro-2-methyl-phenylcarbamate)-amylose-coated reverse phase analytical column
9023-CTAM2R-05	ChiralCTAM-2R	3μm, 1000Å, 250 × 2.1mm	3μm tris(3,5-dimethylphenyl-carbamate)-amylose-coated reverse phase analytical column
9023-CTAM2R-61	ChiralCTAM-2R	3μm, 1000Å, 50 × 4.6mm	3μm tris(3,5-dimethylphenyl-carbamate)-amylose-coated reverse phase analytical column
9023-CTAM2R-62	ChiralCTAM-2R	3μm, 1000Å, 100 × 4.6mm	3μm tris(3,5-dimethylphenyl-carbamate)-amylose-coated reverse phase analytical column
95023-CTAM2R-62	ChiralCTAM-2R	3μm, 500Å, 100 × 4.6mm	3μm tris(3,5-dimethylphenyl-carbamate)-amylose-coated reverse phase analytical column
9033-CTAM3R-61	ChiralCTAM-3R	3μm, 1000Å, 50 × 4.6mm	3μm tris(3-chloro-4-methyl-phenylcarbamate)-amylose-coated reverse phase analytical column
9033-CTAM3R-62	ChiralCTAM-3R	3μm, 1000Å, 100 × 4.6mm	3μm tris(3-chloro-4-methyl-phenylcarbamate)-amylose-coated reverse phase analytical column
9025-CTAM2R-05	ChiralCTAM-2R	5μm, 1000Å, 250 × 4.6mm	5μm tris(3,5-dimethylphenyl-carbamate)-amylose-coated reverse phase analytical column
9035-CTAM3R-05	ChiralCTAM-3R	5μm, 1000Å, 250 × 4.6mm	5μm tris(3-chloro-4-methyl-phenylcarbamate)-amylose-coated reverse phase analytical column
9065-CTAM6R-05	ChiralCTAM-6R	5μm, 1000Å, 250 × 4.6mm	5μm tris((s)-α-Methylbenzylcarbamate)-amylose-coated reverse phase analytical column
9025-CTAM2R-14	ChiralCTAM-2R	5μm, 1000Å, 200 × 10.0mm	5μm tris(3,5-dimethylphenyl-carbamate)-amylose-coated reverse phase preparative column
9025-CTAM2R-25	ChiralCTAM-2R	5μm, 1000Å, 250 × 20.0mm	2μm tris(3,5-dimethylphenyl-carbamate)-amylose-coated reverse phase preparative column
9025-CTAM2R-35	ChiralCTAM-2R	5μm, 1000Å, 250 × 30.0mm	2μm tris(3,5-dimethylphenyl-carbamate)-amylose-coated reverse phase preparative column
9028-CTAM2R-35	ChiralCTAM-2R	8μm, 1000Å, 250 × 30.0mm	2μm tris(3,5-dimethylphenyl-carbamate)-amylose-coated reverse phase preparative column
9028-CTAM2R-55	ChiralCTAM-2R	8μm, 1000Å, 250 × 50.0mm	2μm tris(3,5-dimethylphenyl-carbamate)-amylose-coated reverse phase preparative column
9039-CTAM3R-35	ChiralCTAM-3R	10μm, 1000Å, 250 × 30.0mm	10μm tris(3-chloro-4-methyl-phenylcarbamate)-amylose-coated reverse phase preparative column
9069-CTAM6R-55	ChiralCTAM-6R	10μm, 1000Å, 250 × 50.0mm	10μm tris((s)-α-Methylbenzylcarbamate)-amylose-coated reverse phase preparative column
9025-CTAM10R-14	ChiralCTAM-10R	5μm, 1000Å, 200 × 10.0mm	5μm tris(5-chloro-2-methyl-phenylcarbamate)-amylose-coated reverse phase semi-preparative column
803-CTAMRK1-1	ChiralKit-1	3μm, 1000Å, 50 × 4.6mm	Screening Kit-1（2 analytical columns）
803-CTAMRK1-2	ChiralKit-1	3μm, 1000Å, 50 × 4.6mm	Screening Kit-2（4 analytical columns）

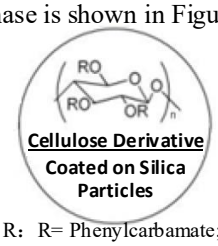
4.11.5. Ordering Information for ChiralCTAM-R Packing Media

Part Number	Type	Specification	Description
082-CTAM2R-100	ChiralCTAM-2R	8μm, 1000Å, 100g	8μm CTAM-2R tris(3,5-dimethylphenyl-carbamate)-amylose-coated silica packing media
082-CTAM2R-150	ChiralCTAM-2R	8μm, 1000Å, 150g	8μm CTAM-2R tris(3,5-dimethylphenyl-carbamate)-amylose-coated silica packing media
082-CTAM2R-500	ChiralCTAM-2R	8μm, 1000Å, 500g	8μm CTAM-2R tris(3,5-dimethylphenyl-carbamate)-amylose-coated silica packing media
082-CTAM2R-1000	ChiralCTAM-2R	8μm, 1000Å, 1kg	8μm CTAM-2R tris(3,5-dimethylphenyl-carbamate)-amylose-coated silica packing media
082-CTAM2R-5000	ChiralCTAM-2R	8μm, 1000Å, 5kg	8μm CTAM-2R tris(3,5-dimethylphenyl-carbamate)-amylose-coated silica packing media
092-CTAM2R-100	ChiralCTAM-2R	10μm, 1000Å, 100g	10μm CTAM-2R tris(3,5-dimethylphenyl-carbamate)-amylose-coated silica packing media
092-CTAM2R-150	ChiralCTAM-2R	10μm, 1000Å, 150g	10μm CTAM-2R tris(3,5-dimethylphenyl-carbamate)-amylose-coated silica packing media
093-CTAM3R-500	ChiralCTAM-3R	10μm, 1000Å, 500g	10μm CTAM-3R tris(3-chloro-4-methyl-phenylcarbamate)-amylose-coated silica media
093-CTAM3R-1000	ChiralCTAM-3R	10μm, 1000Å, 1kg	10μm CTAM-3R tris(3-chloro-4-methyl-phenylcarbamate)-amylose-coated silica media
092-CTAM2R-5000	ChiralCTAM-3R	10μm, 1000Å, 5kg	10μm CTAM-3R tris(3-chloro-4-methyl-phenylcarbamate)-amylose-coated silica media
083-CTAM3R-100	ChiralCTAM-3R	8μm, 1000Å, 100g	8μm CTAM-3R tris(3-chloro-4-methyl-phenylcarbamate)-amylose-coated silica media
083-CTAM3R-150	ChiralCTAM-3R	8μm, 1000Å, 150g	8μm CTAM-3R tris(3-chloro-4-methyl-phenylcarbamate)-amylose-coated silica media
083-CTAM3R-500	ChiralCTAM-3R	8μm, 1000Å, 500g	8μm CTAM-3R tris(3-chloro-4-methyl-phenylcarbamate)-amylose-coated silica media
086-CTAM6R-1000	ChiralCTAM-6R	8μm, 1000Å, 1kg	8μm CTAM-6R tris((s)-α-Methylbenzylcarbamate)-amylose-coated silica packing media
086-CTAM6R-5000	ChiralCTAM-6R	8μm, 1000Å, 5kg	8μm CTAM-6R tris((s)-α-Methylbenzylcarbamate)-amylose-coated silica packing media
086-CTAM6R-100	ChiralCTAM-6R	8μm, 1000Å, 100g	8μm CTAM-6R tris((s)-α-Methylbenzylcarbamate)-amylose-coated silica packing media
086-CTAM6R-150	ChiralCTAM-6R	8μm, 1000Å, 150g	8μm CTAM-6R tris((s)-α-Methylbenzylcarbamate)-amylose-coated silica packing media
096-CTAM6R-150	ChiralCTAM-6R	10μm, 1000Å, 150g	10μm CTAM-6R tris((s)-α-Methylbenzylcarbamate)-amylose-coated silica packing media
096-CTAM6R-500	ChiralCTAM-6R	10μm, 1000Å, 500g	10μm CTAM-6R tris((s)-α-Methylbenzylcarbamate)-amylose-coated silica packing media
0810-CTAM10R-500	ChiralCTAM-10R	8μm, 1000Å, 500g	10μm CTAM-10R tris(5-chloro-2-methyl-phenylcarbamate)-amylose-coated silica media
0910-CTAM10R-1000	ChiralCTAM-10R	10μm, 1000Å, 1kg	10μm CTAM-10R tris(5-chloro-2-methyl-phenylcarbamate)-amylose-coated silica media
0910-CTAM10R-5000	ChiralCTAM-10R	10μm, 1000Å, 5kg	10μm CTAM-10R tris(5-chloro-2-methyl-phenylcarbamate)-amylose-coated silica media

4.12 ChiralCTCE-R Cellulose-coated Reverse Phase Chiral Columns & Media

4.12.1. Unique Characteristics for ChiralCTCE-R Reverse Phase Columns & Media

ChiralCTCE-R columns are a new type of completely-substituted cellulose-coated silica particles-packed chiral columns. The ChiralCTCE-R particles were prepared through a specially-designed procedure by coating the cellulose derivatives onto the surface of the chemically-modified macroporous silica gel (2, 3, or 5µm for analytical columns and 8 or 10µm for preparative columns). The schematic chemical structure of the ChiralCTCE-R phase is shown in Figure 4.12(A).



ChiralCTCE-1R：R= Phenylcarbamate;
ChiralCTCE-2R：R= 3,5-Dimethylphenylcarbamate;
ChiralCTCE-3R：R=3-Chloro-4-methyl-phenylcarbamate;
ChiralCTCE-7R：R= 4-Methylbenzoate;
ChiralCTCE-8R：R= 4-Methylphenylcarbamate;
ChiralCTCE-9R：R= 4-Chloro-3-methyl-phenylcarbamate;

High-quality sphere macroporous silica particles with pore size 500Å, 1000Å and above are used to manufacture the ChiralCTCE-R phases. Therefore, high column efficiency can be easily achieved on the ChiralCTCE-R columns.

As ChiralCTCE-R particles are cellulose derivative-coated chiral phases, they are designed only for polar organic and reversed-phase conditions in HPLC and UPLC. Typical mobile phases are mixtures of MeOH/ACN, or MeOH/H_2O, or ACN/H_2O, etc. with/or without organic acidic or basic additives. The ChiralCTCE-R columns cannot be used under normal phase or other non-typical mobile phase conditions. ChiralTek also provides ChiralCTCE chiral columns and packing media for normal phase conditions only.

Please use cellulose-immobilized ChiralCE columns or normal phase coating ChiralCTCE columns if other non-typical mobile phases or normal mobile phases are required for the chromatographic separations.

4.12.2. Application and Requirements

The ChiralCTCE-R columns can be used only under polar organic and reversed-phase conditions with some organic acidic or basic additives. A proper chiral guard column or a common NH_2 or C18 guard column can be used for ChiralCTCE-R columns.

The ChiralCTCE-R column is stored in ACN/H_2O (40:60, *v/v*) upon delivery. It is strongly recommended to flush the column with compatible mobile phase to achieve a stable baseline under polar organic mode or reversed-phase conditions before final application in UPLC or HPLC.

Non-typical solvents, e.g., Acetone, Chloroform, Dichloromethane, DMF, DMSO, 1,4-Dioxane, Ethyl acetate, THF, Toluene, etc., cannot be used to resolve samples and cannot be used as mobile phase additives.

The column pressure for ChiralCTCE-R columns with 5µm particles is quite low in HPLC. However, when using ChiralCTCE-R columns with 2µm and 3µm particles, low flow rate (e.g., 0.1-0.5 mL/min) should be applied when used in traditional HPLC with highly viscous mobile phases in order to avoid high back pressure. However, there is no special flow rate limitation for use in UPLC.

Flow direction:	Arrow direction on the column label
Maximum tolerance pressure:	< 800 bar（~11600 psi，2µm、3µm column，UPLC or HPLC ）
	< 600 bar (~9000 psi , 5µm analytical column, HPLC or SFC) < 200 bar (~3000 psi , 5µm, 8µm, 10µm preparative column, HPLC or SFC)
Temperature:	1 – 40 ° C
Guard column:	ChiarlCTCE-R, C18, or NH_2 guard column
Mode:	HPLC、UPLC、SFC

4.12.3. Care and Maintenance of the ChiralCTCE-R Columns

[1] It is strongly recommended to use guard columns to protect the ChiralCTCE-R columns;
[2] It'd be better to resolve samples in mobile phases and filter through 0.5µm membrane before injection;
[3] The non-typical solvents, e.g., Acetone, Chloroform, Dichloromethane, DMF, DMSO, 1,4-Dioxane, Ethyl acetate, THF, Toluene, etc., cannot be used to resolve samples or to use as mobile phase additives in HPLC.
[4] A small amount (e.g.0.01% to 0.1%) of organic acidic or basic additives and buffers can be used under certain mobile phase conditions. However, frequent changes of additives may shorten lifespan of the columns.
[5] When worked in high pressure conditions, it's strongly recommended to gradually decrease flow rate to ensure column pressure lower than 100 bar (~1450 psi) before switching off the chromatograph pump.

4.12.4. Ordering Information for ChiralCTCE-R Columns

Product List of Some Common ChiralCTCE-R Coated Columns from ChiralTek			
Part Number	*Type*	*Dimension*	*Column Description*
8022-CTCE1R-01	ChiralCTCE-1R	2μm, 1000Å, 50 × 2.1mm	2μm tris(phenylcarbamate)-cellulose-coated reverse phase analytical column
8032-CTCE2R-02	ChiralCTCE-2R	2μm, 1000Å, 100 × 2.1mm	2μm tris(3,5-dimethylphenyl-carbamate)-cellulose-coated reverse phase analytical column
8033-CTCE3R-03	ChiralCTCE-3R	3μm, 1000Å, 150 × 2.1mm	3μm tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated reverse phase analytical column
8073-CTCE7R-03	ChiralCTCE-7R	3μm, 1000Å, 150 × 2.1mm	3μm tris(4-methylbenzoate)-cellulose-coated reverse phase analytical column
8023-CTCE8R-05	ChiralCTCE-8R	3μm, 1000Å, 250 × 2.1mm	3μm tris(4-methylphenylcarbamate)-cellulose-coated reverse phase analytical column
8023-CTCE9R-61	ChiralCTCE-9R	3μm, 1000Å, 50 × 4.6mm	3μm tris(4-chloro-3-methyl-phenylcarbamate)-cellulose-coated reverse phase analytical column
8023-CTCE2R-62	ChiralCTCE-2R	3μm, 1000Å, 100 × 4.6mm	3μm tris(3,5-dimethylphenyl-carbamate)-cellulose-coated reverse phase analytical column
85023-CTCE2R-61	ChiralCTCE-2R	3μm, 500Å, 50 × 4.6mm	3μm tris(3,5-dimethylphenyl-carbamate)-cellulose-coated reverse phase analytical column
85023-CTCE2R-62	ChiralCTCE-2R	3μm, 500Å, 100 × 4.6mm	3μm tris(3,5-dimethylphenyl-carbamate)-cellulose-coated reverse phase analytical column
8033-CTCE3R-61	ChiralCTCE-3R	3μm, 1000Å, 50 × 4.6mm	3μm tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated reverse phase analytical column
8033-CTCE3R-62	ChiralCTCE-3R	3μm, 1000Å, 100 × 4.6mm	3μm tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated reverse phase analytical column
8025-CTCE2R-05	ChiralCTCE-2R	5μm, 1000Å, 250 × 4.6mm	5μm tris(3,5-dimethylphenyl-carbamate)-cellulose-coated reverse phase analytical column
8035-CTCE3R-05	ChiralCTCE-3R	5μm, 1000Å, 250 × 4.6mm	5μm tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated reverse phase analytical column
8075-CTCE7R-05	ChiralCTCE-7R	5μm, 1000Å, 250 × 4.6mm	5μm tris(4-methylbenzoate)-cellulose-coated reverse phase analytical column
7025-CTCE2R-14	ChiralCTCE-2R	5μm, 1000Å, 200 × 10.0mm	5μm tris(3,5-dimethylphenyl-carbamate)-cellulose-coated reverse phase preparative column
7025-CTCE2R-25	ChiralCTCE-2R	5μm, 1000Å, 250 × 20.0mm	5μm tris(3,5-dimethylphenyl-carbamate)-cellulose-coated reverse phase preparative column
7025-CTCE2R-35	ChiralCTCE-2R	5μm, 1000Å, 250 × 30.0mm	5μm tris(3,5-dimethylphenyl-carbamate)-cellulose-coated reverse phase preparative column
7038-CTCE3R-25	ChiralCTCE-3R	8μm, 1000Å, 250 × 20.0mm	8μm tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated reverse phase preparative column
7038-CTCE3R-35	ChiralCTCE-3R	8μm, 1000Å, 250 × 30.0mm	8μm tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated reverse phase preparative column
7039-CTCE3R-55	ChiralCTCE-3R	10μm, 1000Å, 250 × 50.0mm	8μm tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated reverse phase preparative column
803-CTCERK1-1	ChiralKit-1	3μm, 1000Å, 50 × 4.6mm	Screening Kit-1（3 analytical columns）
803-CTCERK2-2	ChiralKit-2	3μm, 1000Å, 50 × 4.6mm	Screening Kit-2（6 analytical columns）

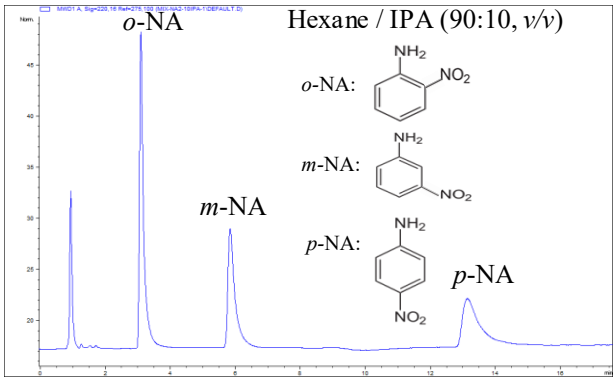
4.12.5. Ordering Information for ChiralCTCE-R Packing Media

Part Number	Type	Specification	Description
082-CTCE2R-100	ChiralCTCE-2R	8µm, 1000Å, 100g	8µm CTCE-2R tris(3,5-dimethylphenyl-carbamate)-cellulose-coated silica packing media
082-CTCE2R-150	ChiralCTCE-2R	8µm, 1000Å, 150g	8µm CTCE-2R tris(3,5-dimethylphenyl-carbamate)-cellulose-coated silica packing media
082-CTCE2R-500	ChiralCTCE-2R	8µm, 1000Å, 500g	8µm CTCE-2R tris(3,5-dimethylphenyl-carbamate)-cellulose-coated silica packing media
082-CTCE2R-1000	ChiralCTCE-2R	8µm, 1000Å, 1kg	8µm CTCE-2R tris(3,5-dimethylphenyl-carbamate)-cellulose-coated silica packing media
082-CTCE2R-5000	ChiralCTCE-2R	8µm, 1000Å, 5kg	8µm CTCE-2R tris(3,5-dimethylphenyl-carbamate)-cellulose-coated silica packing media
092-CTCE2R-100	ChiralCTCE-2R	10µm, 1000Å, 100g	10µm CTCE-2R tris(3,5-dimethylphenyl-carbamate)-cellulose-coated silica packing media
092-CTCE2R-150	ChiralCTCE-2R	10µm, 1000Å, 150g	10µm CTCE-2R tris(3,5-dimethylphenyl-carbamate)-cellulose-coated silica packing media
093-CTCE3R-500	ChiralCTCE-3R	10µm, 1000Å, 500g	10µm CTCE-3R tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated silica media
093-CTCE3R-1000	ChiralCTCE-3R	10µm, 1000Å, 1kg	10µm CTCE-3R tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated silica media
092-CTCE2R-5000	ChiralCTCE-3R	10µm, 1000Å, 5kg	10µm CTCE-3R tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated silica media
083-CTCE3R-100	ChiralCTCE-3R	8µm, 1000Å, 100g	8µm CTCE-3R tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated silica media
083-CTCE3R-150	ChiralCTCE-3R	8µm, 1000Å, 150g	8µm CTCE-3R tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated silica media
083-CTCE3R-500	ChiralCTCE-3R	8µm, 1000Å, 500g	8µm CTCE-3R tris(3-chloro-4-methyl-phenylcarbamate)-cellulose-coated silica media
087-CTCE7R-1000	ChiralCTCE-7R	8µm, 1000Å, 1kg	8µm CTCE-7R tris(4-methylbenzoate)-cellulose-coated silica packing media
087-CTCE7R-5000	ChiralCTCE-7R	8µm, 1000Å, 5kg	8µm CTCE-7R tris(4-methylbenzoate)-cellulose-coated silica packing media
087-CTCE7R-100	ChiralCTCE-7R	8µm, 1000Å, 100g	8µm CTCE-7R tris(4-methylbenzoate)-cellulose-coated silica packing media
087-CTCE7R-150	ChiralCTCE-7R	8µm, 1000Å, 150g	8µm CTCE-7R tris(4-methylbenzoate)-cellulose-coated silica packing media
097-CTCE7R-150	ChiralCTCE-7R	10µm, 1000Å, 150g	10µm CTCE-7R tris(4-methylbenzoate)-cellulose-coated silica packing media
097-CTCE7R-500	ChiralCTCE-7R	10µm, 1000Å, 500g	10µm CTCE-7R tris(4-methylbenzoate)-cellulose-coated silica packing media
089-CTCE9R-500	ChiralCTCE-9R	8µm, 1000Å, 500g	10µm CTCE-9R tris(4-chloro-3-methyl-phenylcarbamate)-cellulose-coated silica media
099-CTCE9R-1000	ChiralCTCE-9R	10µm, 1000Å, 1kg	10µm CTCE-9R tris(4-chloro-3-methyl-phenylcarbamate)-cellulose-coated silica media
099-CTCE9R-5000	ChiralCTCE-9R	10µm, 1000Å, 5kg	10µm CTCE-9R tris(4-chloro-3-methyl-phenylcarbamate)-cellulose-coated silica media

5. Typical Application Chromatograms and Optimization Solutions for ChiralTek columns

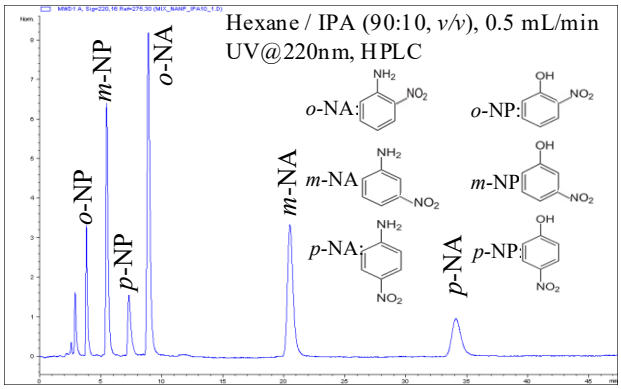
5.1. Typical Chromatograms and Optimization Schemes for Analytical Chiral Columns

ChiralTek chiral columns can be used to separate achiral isomers. For example, ChiralCD and ChialCE columns have better separation ability and chromatographic performance for positional isomers of o-, m-, p-nitrophenol (NP) and o-, m-, p-nitroaniline (NA) than other common amino columns or ODS columns. In addition, the same ChiralCD and ChialCE columns can be used for normal phase or reverse phase chromatography conditions.



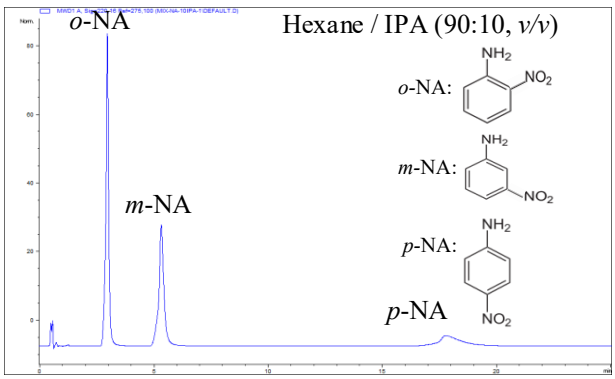
Column: ChiralγCD-1
Dimension: 3μm, 150 × 2.1 mm I.D.
Part No. 823-γCD1-03
LC Mode: HPLC (HPLC (Agilent1100)
Flow rate: 0.5mL/min
Detection: UV@220nm
Temperature: Ambient

Fig 5.1-1. Separation of o-, m-, and p-nitroaniline (NA) positional isomers on a ChiralγCD-1 column (3μm, 150 x 2.1mm) under normal phase HPLC conditions.



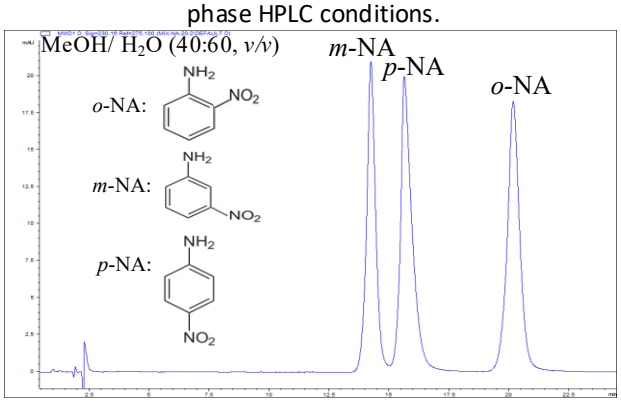
Column: ChiralCE-2
Dimension: 3μm, 150 × 2.1 mm I.D.
Part No. 8513-CE2-03
LC Mode: HPLC (HPLC (Agilent1100)
Flow rate: 0.5mL/min
Detection: UV@220nm
Temperature: Ambient

Fig 5.1-3. Separation of positional isomers of o-, m-, p-nitrophenol (NP) and o-, m-, p-nitroaniline (NA) on a ChiralCE-2 column (3μm, 150 x 2.1mm) under normal phase HPLC conditions.



Column: ChiralβCD-2
Dimension: 3μm, 150 × 2.1 mm I.D.
Part No. 823-βCD2-03
LC Mode: HPLC (Agilent1100)
Flow rate: 0.5 mL/min
Detection: UV@220nm
Temperature: Ambient

Fig 5.1-2. Separation of o-, m-, and p-nitroaniline (NA) positional isomers on a ChiralβCD-2 column (3μm, 150 x 2.1mm) under normal phase HPLC conditions.



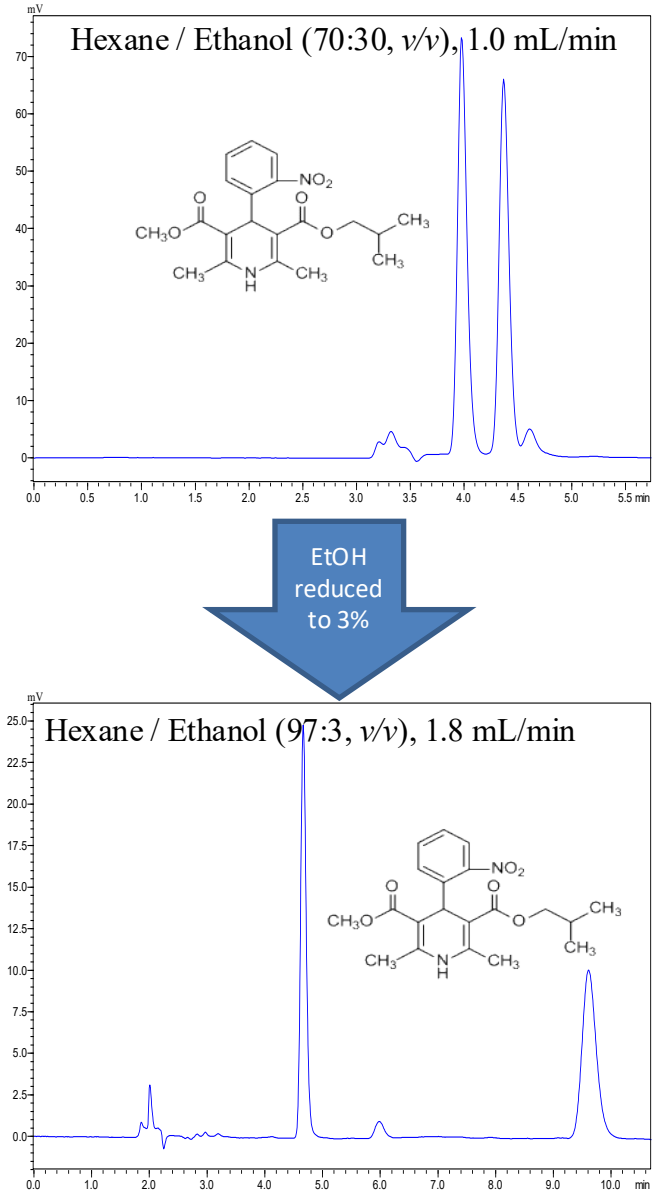
Column: ChiralCE-2
Dimension: 3μm, 150 × 2.1 mm I.D.
Part No. 8513-CE2-03
LC Mode: HPLC (HPLC (Agilent1100)
Flow rate: 0.2mL/min
Detection: UV@230nm
Temperature: Ambient

Fig 5.1-4. Separation of o-, m-, and p-nitroaniline (NA) positional isomers on a ChiralCE-2 column (3μm, 150 x 2.1mm) under reversed-phase HPLC conditions.

5.1. Typical Chromatograms and Optimization Schemes for Analytical Chiral Columns

Under normal phase conditions, reducing the alcohol content, the ChiralTek columns can significantly improve the chiral separation without tailing.

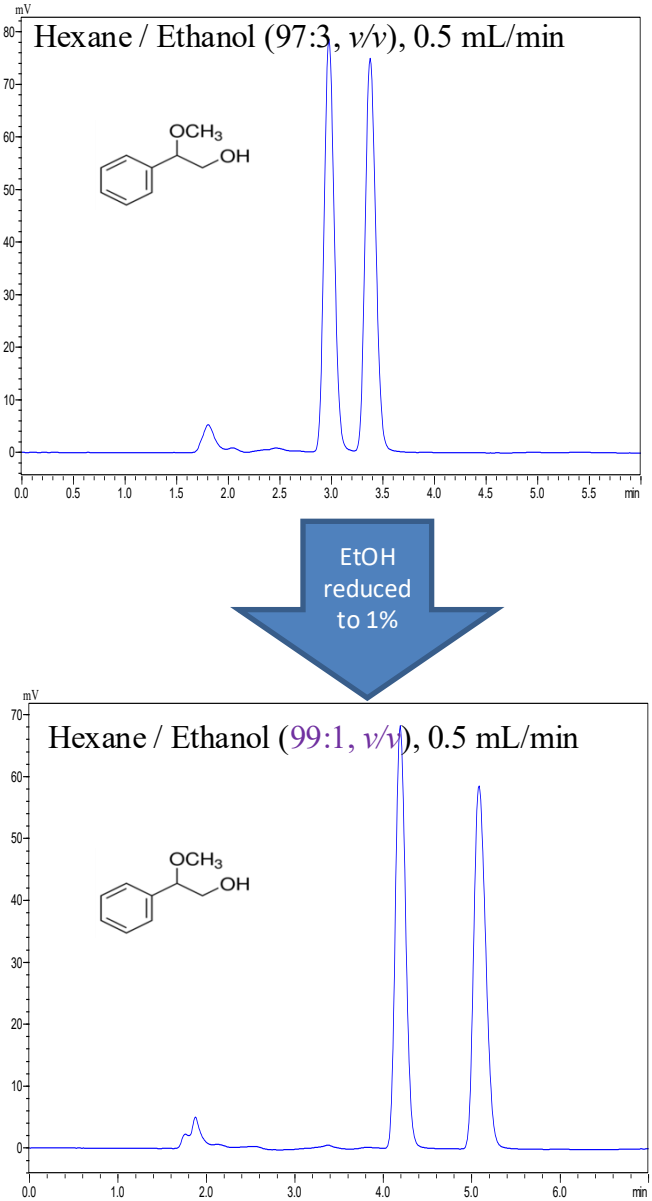
Nisoldipine on ChiralAMCE-5 column



Column: ChiralAMCE-5
Dimension: 5µm, 250 × 4.6 mm I.D.
Part No. 8975-AMCE5-05
LC Mode: HPLC (Shimadzu LC 20)
Flow rate: 1.0 & 1.8 mL/min
Detection: UV@220nm
Temperature: Ambient

Fig 5.1-5. Chiral separation of nisoldipine on ChiralAMCE-5 standard column under normal phase HPLC conditions. Reducing ethanol to 3% significantly improved the chiral separation performance.

2-Methoxy-2-phenylethanol on ChiralAM-5



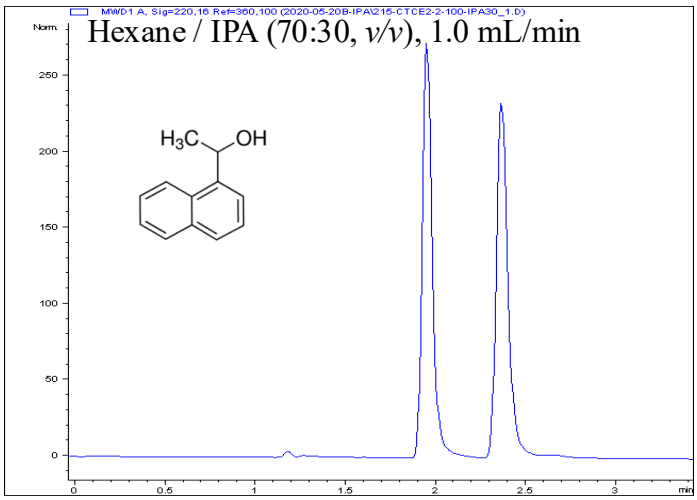
Column: ChiralAM-5
Dimension: 3µm, 250 × 2.1 mm I.D.
Part No. 8953-AM5-05
LC Mode: HPLC (Shimadzu LC20)
Flow rate: 0.5 mL/min
Detection: UV@220nm
Temperature: Ambient

Fig 5.1-6. Chiral separation of 2-Methoxy-2-phenylethanol on a ChiralAM-5 microbore column under normal phase HPLC conditions. Reducing ethanol to 1% significantly improved the chiral separation.

5.1. Typical Chromatograms and Optimization Schemes for Analytical Chiral Columns

Under normal phase conditions, reducing the alcohol content, the ChiralTek columns can significantly improve the chiral separation without tailing.

1-(1-Naphthyl)ethanol on ChiralCTCE-2 column

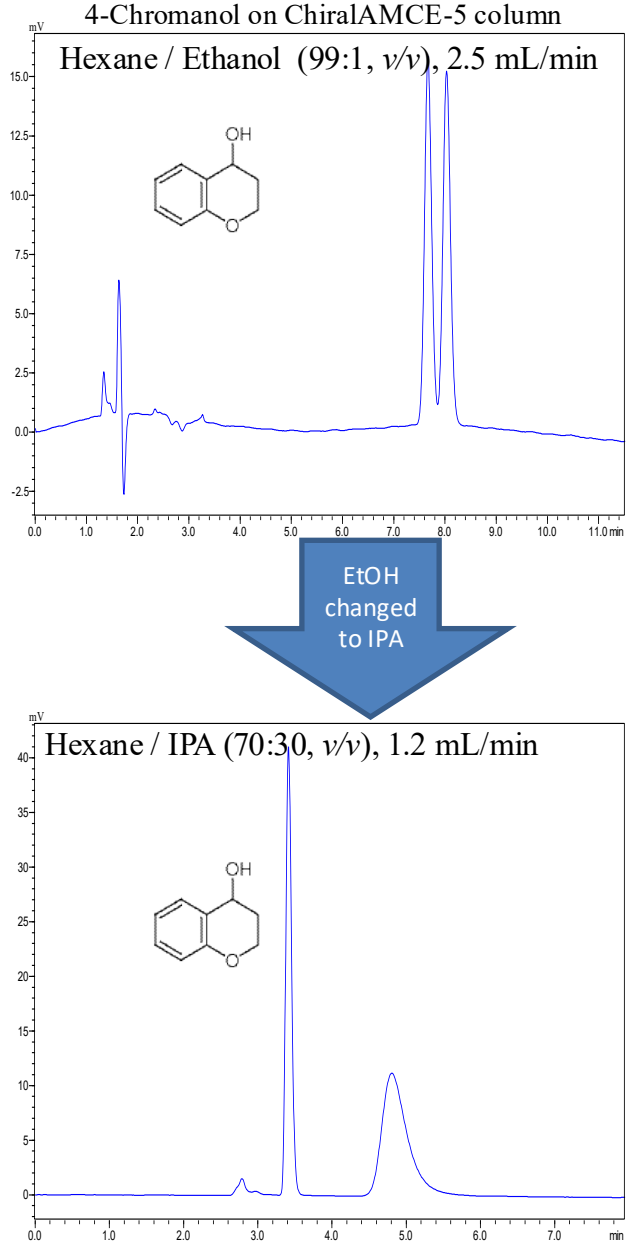


Column: ChiralCTCE-2
Dimension: 3µm, 100 × 4.6 mm I.D.
Part No. 85023-CTCE2-62
LC Mode: HPLC (Agilent1100)
Flow rate: 1.0 mL/min
Detection: UV@210nm
Temperature: Ambient

Fig 5.1-7. Chiral separation of 1-(1-naphthyl)ethanol on ChiralCTCE-2 fast column under normal phase HPLC conditions. Reducing ethanol to 10% significantly improved the chiral separation.

Under normal phase conditions, changing the type of alcohol (ethanol <--> isopropanol), the separation of the ChiralTek columns can be significantly improved.

4-Chromanol on ChiralAMCE-5 column

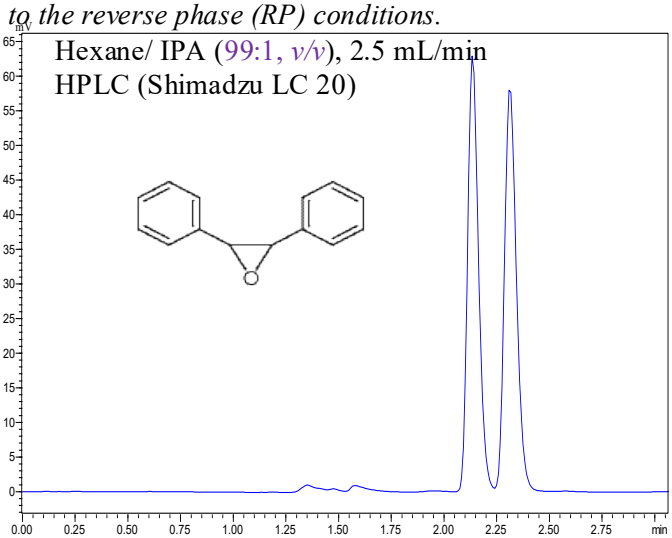


Column: ChiralAMCE-5
Dimension: 5µm, 250 × 4.6 mm I.D.
Part No. 8975-AMCE5-05
LC Mode: HPLC (Shimadzu LC20)
Flow rate: 2.5 & 1.2 mL/min
Detection: UV@220nm
Temperature: Ambient

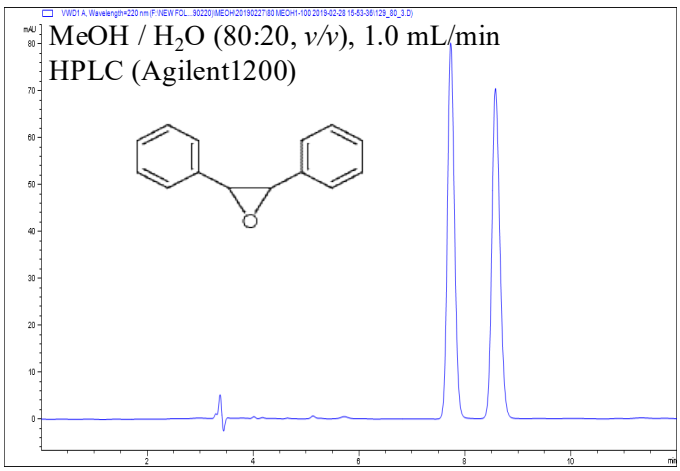
Fig 5.1-8. Chiral separation of 4-chromanol on ChiralAMCE5 standard column under normal phase HPLC conditions. The replacement of 1% ethanol with 30% isopropanol significantly improved the chiral separation.

5.1. Typical Chromatograms and Optimization Schemes for Analytical Chiral Columns

Under normal phase (NP) conditions, after the alcohol content is reduced to the limit of 1%, the chiral separation can be significantly improved by switching to the reverse phase (RP) conditions.



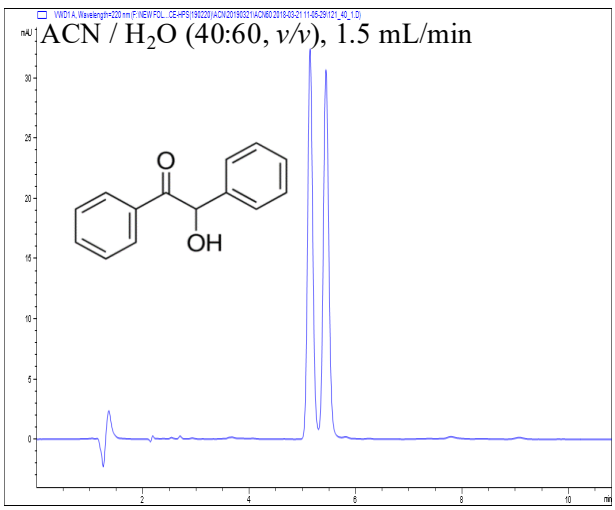
Normal phase switched to reverse phase



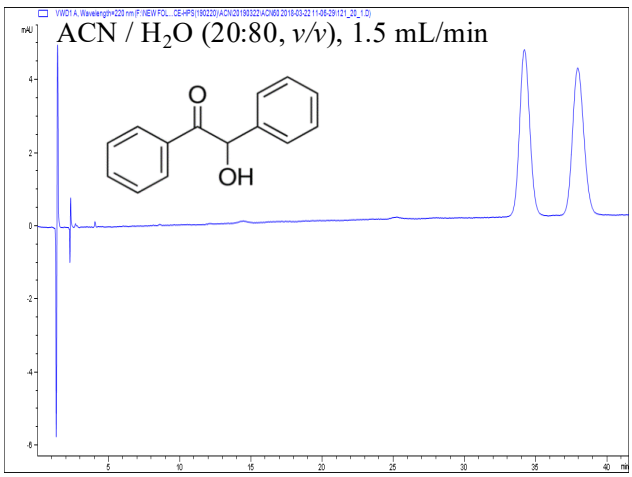
Column:	ChiralAMCE-5
Dimension:	5µm, 250 × 4.6 mm I.D.
Part No.	8975-AMCE5-05
LC Mode:	HPLC
Flow rate:	2.5 &1.0 mL/min
Detection:	UV@220nm
Temperature:	Ambient

Fig 5.1-9. Under HPLC conditions, chiral separation of trans-stilbene oxide on the same ChiralAMCE-5 standard column. Changing the mobile phase from normal phase to reverse phase system significantly improved chiral separation.

Under reverse phase conditions, increasing the water content, ChiralTek columns can significantly improve the chiral separations without tailing.



Increase water content in mobile phase



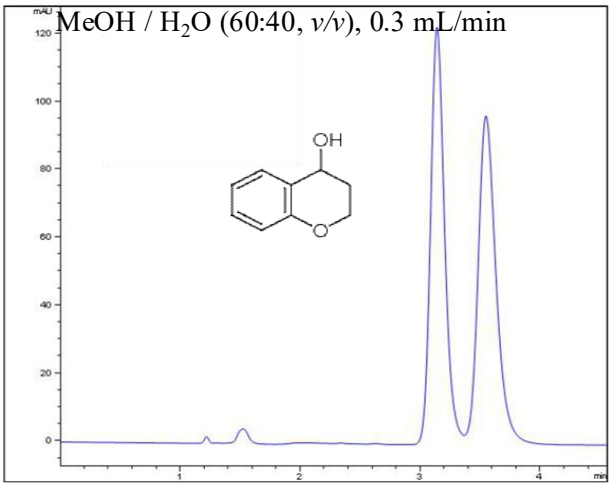
Column:	ChiralAMCE-5
Dimension:	5µm, 250 × 4.6 mm I.D.
Part No.	8975-AMCE5-05
LC Mode:	HPLC (Agilent1200)
Flow rate:	1.5 mL/min
Detection:	UV@220nm
Temperature:	Ambient

Fig 5.1-10. Chiral separation of benzoin on ChiralAMCE-5 standard column under reverse phase HPLC conditions. Increasing the water content in the mobile phase significantly improved chiral separation.

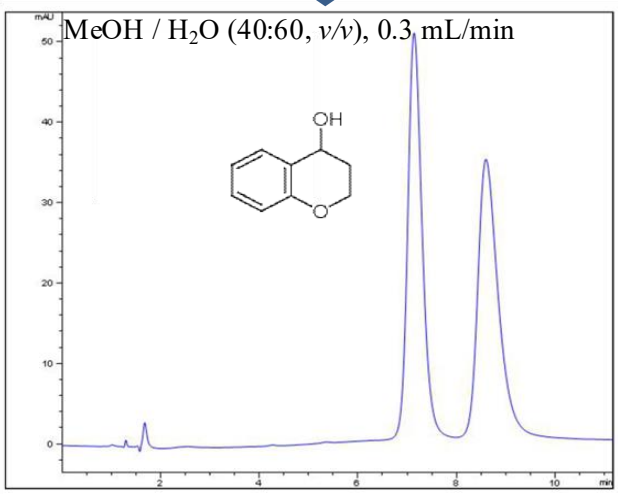
5.1. Typical Chromatograms and Optimization Schemes for Analytical Chiral Columns

Under reverse phase conditions, increasing the water content, ChiralTek columns can significantly improve the chiral separations without tailing.

4-Chromanol on ChiralCEβCD-2 column



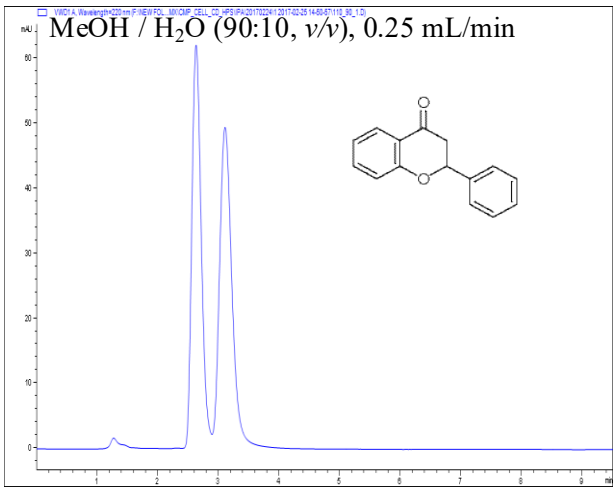
Increase water content in mobile phase



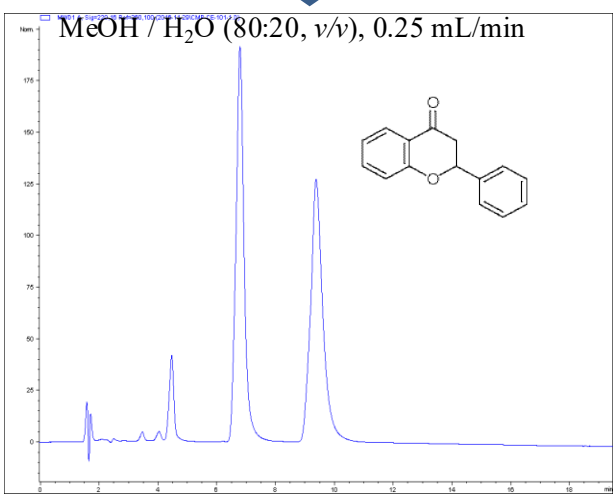
Column:	ChiralCEβCD-2
Dimension:	3µm, 150 × 2.1 mm I.D.
Part No.	843-CEβCD2-03
LC Mode:	HPLC (Shimadzu LC20)
Flow rate:	0.3 mL/min
Detection:	UV@220nm
Temperature:	Ambient

Fig 5.1-11. Chiral separation of 4-chromanol on a ChiralCEβCD-2 column under reversed-phase HPLC conditions. Increasing the water content in the mobile phase significantly improves chiral separation.

Flavanone on ChiralCEβCD-3 column



Increase water content in mobile phase

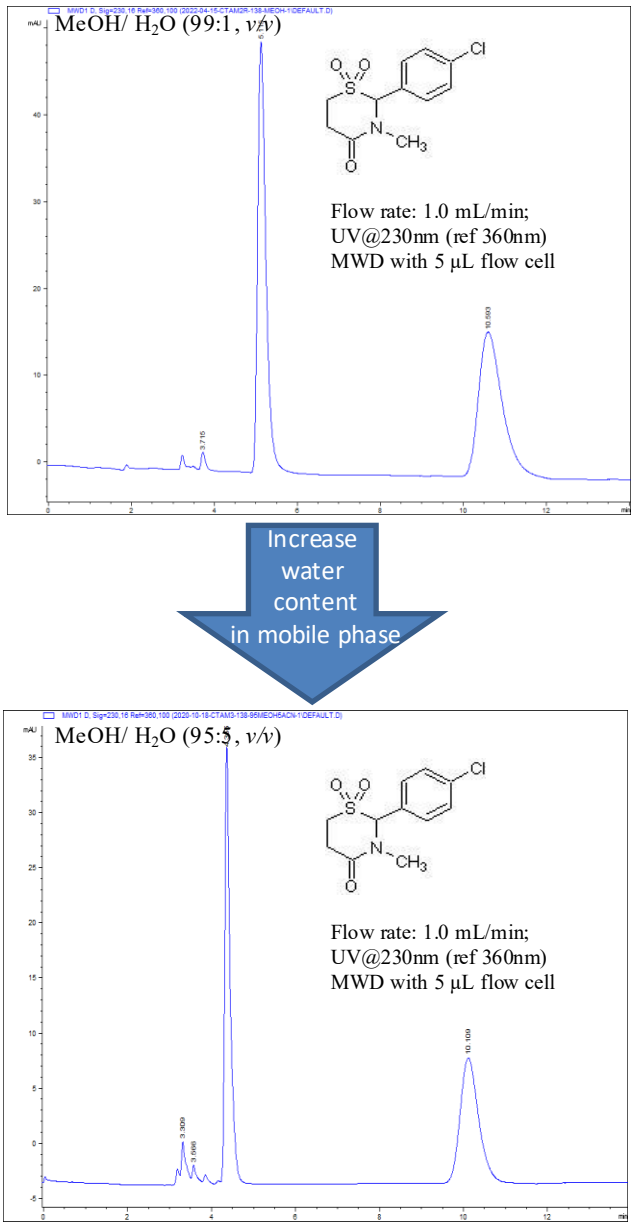


Column:	ChiralCEβCD-3
Dimension:	3µm, 150 × 2.1 mm I.D.
Part No.	843-CEβCD3-03
Serial No.	84333161101
LC Mode:	HPLC (Agilent1100)
Flow rate:	0.25 mL/min
Detection:	UV@220 nm (ref 360nm)
Temperature:	Ambient

Fig 5.1-12. Chiral separation of flavanone on ChiralCEβCD-3 microbore column under reversed phase HPLC conditions. Increasing the water content in the mobile phase significantly improved chiral separation.

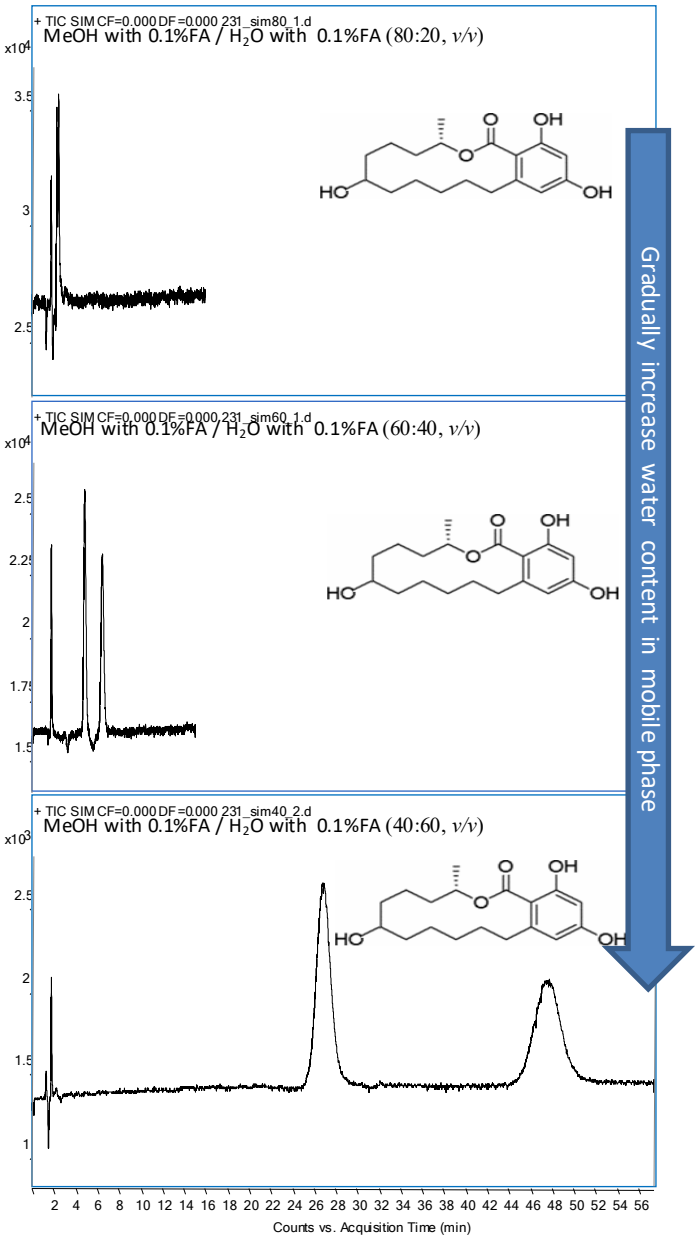
5.1. Typical Chromatograms and Optimization Schemes for Analytical Chiral Columns

Under reverse phase conditions, increasing the water content, ChiralTek columns can significantly improve the chiral separations without tailing.



Column: ChiralCTAM-3R
Dimension: 5µm, 250 × 4.6 mm I.D.
Part No. 9035-CTAM3R-05
LC Mode: HPLC (Agilent1100)
Flow rate: 1.0 mL/min
Detection: UV@220nm
Temperature: Ambient

Fig 5.1-13. Chiral separation of Chlormezanone on a ChiralCTAM-3R column under reversed-phase HPLC conditions. Increasing the water content in the mobile phase significantly improves chiral separation.

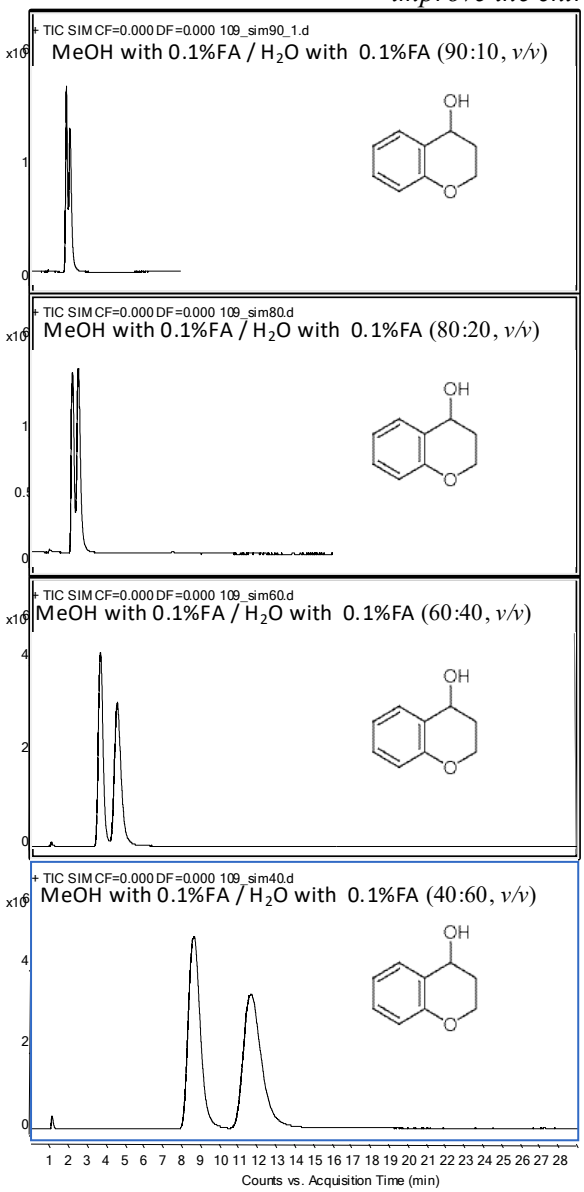


Column: ChiralCE-2
Dimension: 3µm, 150 × 2.1 mm I.D.
Part No. 813-CE2-03
LC Mode: UPLC-MS (Agilent1290)
Flow rate: 0.25 mL/min
Detection: MSD@SIM 323 *m/z*
Temperature: Ambient

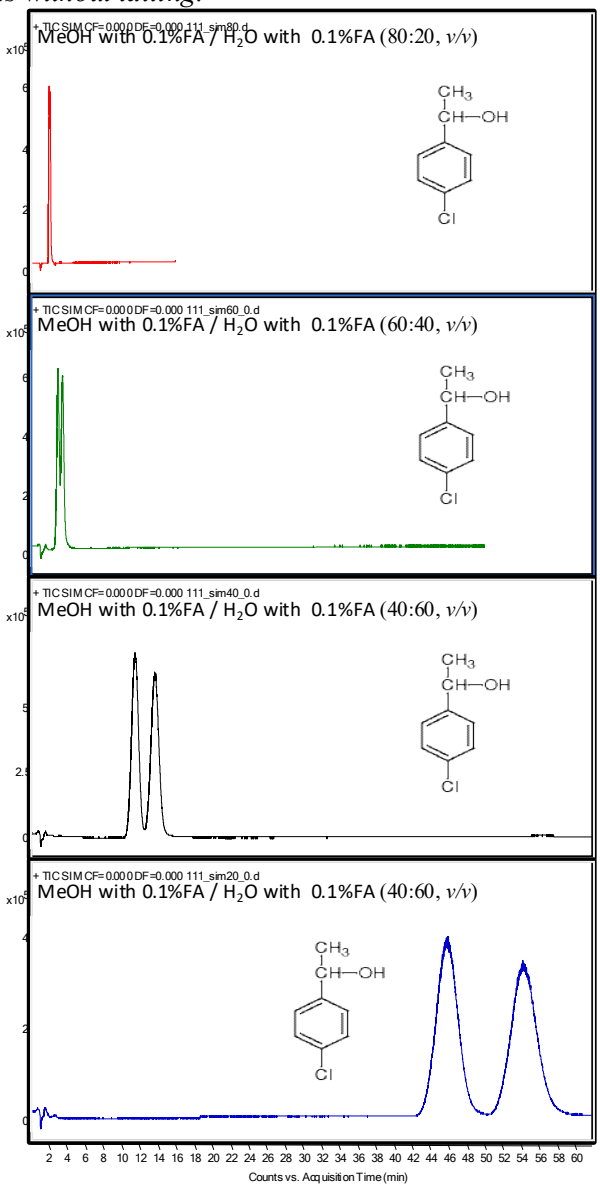
Fig 5.1-14. Chiral separation of (α and β)-Zearalanol on a ChiralCE2 column under reversed-phase UPLC conditions. Increasing the water content in the mobile phase significantly improves chiral separation.

5.1分析型手性色谱柱典型应用图谱及优化方案

Under reverse phase conditions, increasing the water content, ChiralTek columns can significantly improve the chiral separations without tailing.



Gradually increase water content in mobile phase



Column: ChiralβCD-1
Dimension: 3μm, 150 × 2.1 mm I.D.
Part No. 823-βCD1-03
LC Mode: UPLC-MS (Agilent1290)
Flow rate: 0.25 mL/min
Detection: MSD@SIM 151 *m/z*
Temperature: Ambient

Fig 5.1-15. Chiral separation of 4-Chromanol on a ChiralβCD-1 column under reversed-phase UPLC conditions. Increasing the water content in the mobile phase significantly improves chiral separation.

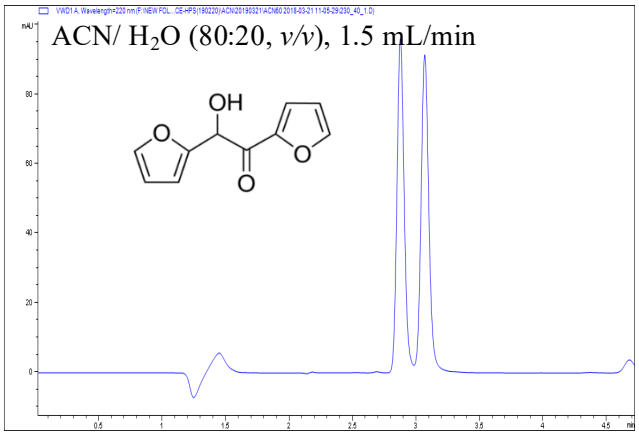
Column: ChiralβCD-1
Dimension: 3μm, 150 × 2.1 mm I.D.
Part No. 823-βCD1-03
LC Mode: UPLC-MS (Agilent1290)
Flow rate: 0.25 mL/min
Detection: MSD@SIM 157.6 *m/z*
Temperature: Ambient

Fig 5.1-16. Chiral separation of 4-Chloro-α-methylbenzyl Alcohol on a ChiralβCD-1 column under reversed-phase UPLC conditions. Increasing the water content in the mobile phase significantly improves chiral separation.

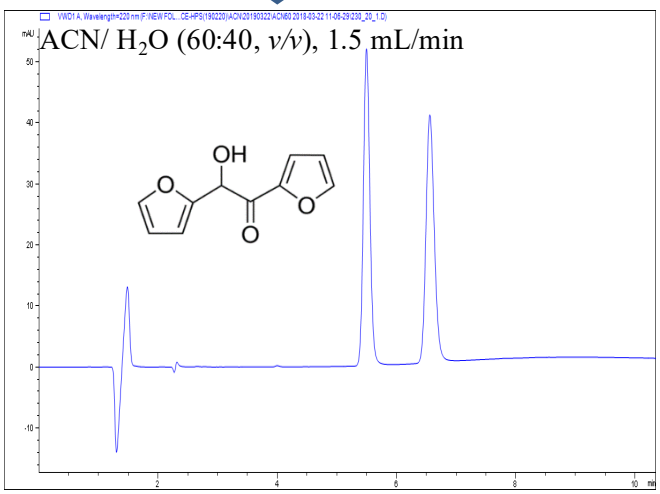
5.1. Typical Chromatograms and Optimization Schemes for Analytical Chiral Columns

Under reverse phase conditions, increasing the water content, ChiralTek columns can significantly improve the chiral separations without tailing.

Furoin on ChiralAMCE-5 column



Increase water content in mobile phase

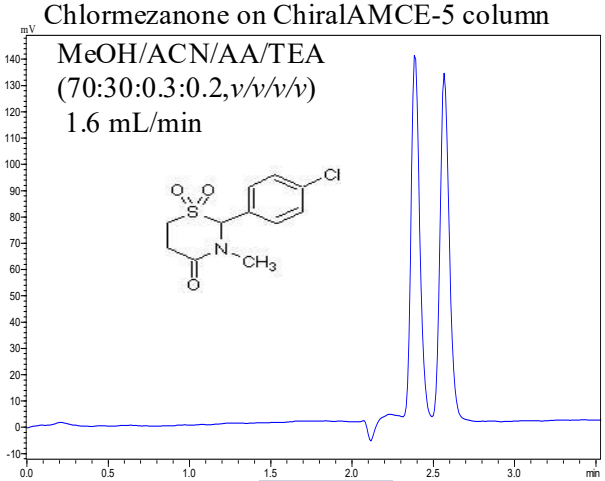


Column:	ChiralAMCE-5
Dimension:	5µm, 250 × 4.6 mm I.D.
Part No.	8975-AMCE5-05
LC Mode:	HPLC (Agilent1200)
Flow rate:	1.5 mL/min
Detection:	UV@220nm
Temperature:	Ambient

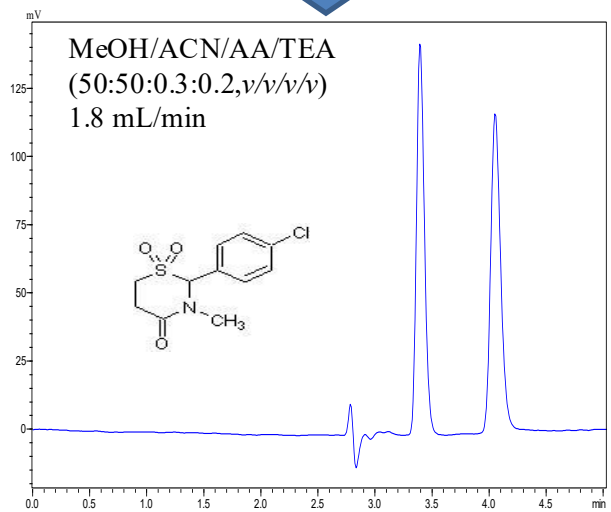
Fig 5.1-17. Chiral separation of Furoin on a ChiralAMCE-5 column under reversed-phase HPLC conditions. Increasing the water content in the mobile phase significantly improves chiral separation.

Under polar organic conditions, changing the Methanol content, ChiralTek columns can significantly improve the chiral separations.

Chlormezanone on ChiralAMCE-5 column



Change Methanol content in mobile phase



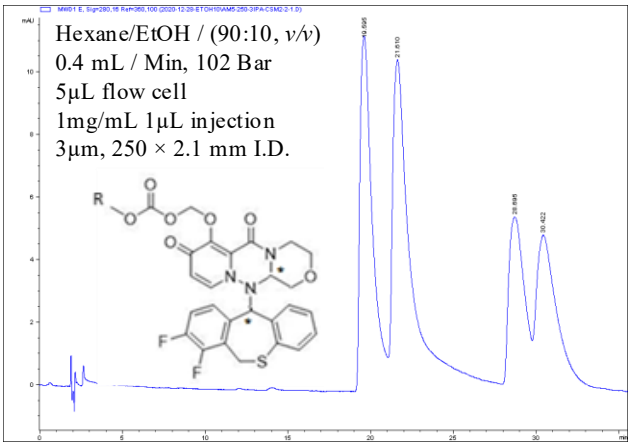
Column:	ChiralAMCE-5
Dimension:	5µm, 250 × 4.6 mm I.D.
Part No.	8975-AMCE5-05
LC Mode:	HPLC (Shimadzu LC20)
Flow rate:	1.6 & 1.8 mL/min
Detection:	UV@220nm
Temperature:	Ambient

Fig 5.1-18. Chiral separation of Chlormezanone on a ChiralAMCE-5 column under polar organic HPLC conditions. Changing the Methanol content in the mobile phase significantly improves chiral separation.

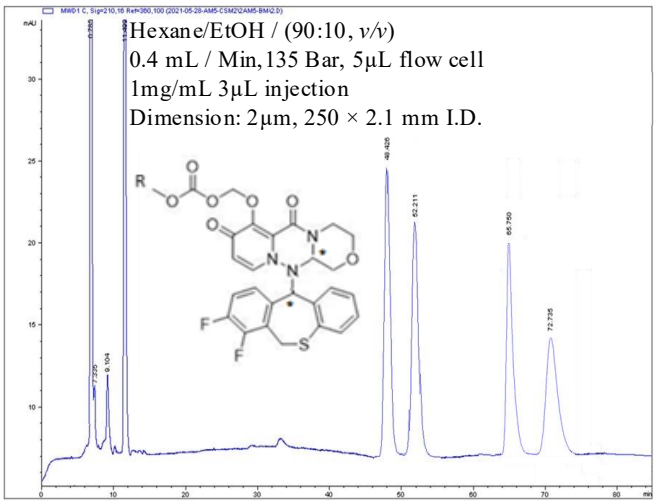
5.1. Typical Chromatograms and Optimization Schemes for Analytical Chiral Columns

Use chiral columns with smaller particle size packing media, ChiralTek columns can significantly improve the chiral separations.

Separation of the 4 chiral isomers of Polyfluoro-Aromatic Hydrocarbon on ChiralAM-5 column

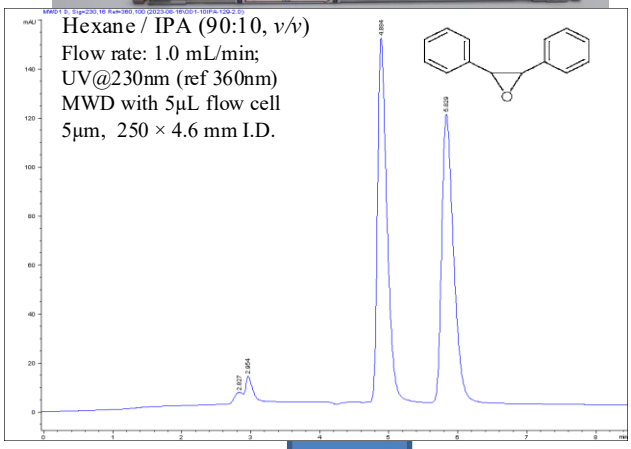


Change 3µm column to 2µm column

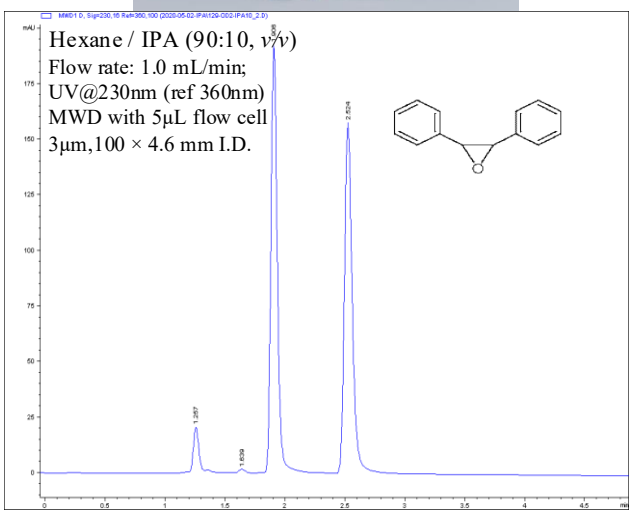


Column: ChiralAM-5
Dimension: 3µm, 250 × 2.1 mm I.D. （上）
2µm, 250 × 2.1 mm I.D. （下）
Part No. 8993-AM5-05（上）
8952-AM5-05（下）
LC Mode: HPLC (Agilent1100)
Flow rate: 0.4 mL/min
Detection: UV@220nm

Fig 5.1-19. Separation of the 4 chiral isomers of Polyfluoro-Aromatic Hydrocarbon on ChiralAM-5 column. Replacement of the 3 µm column with a 2 µm column significantly improved the chiral separation.



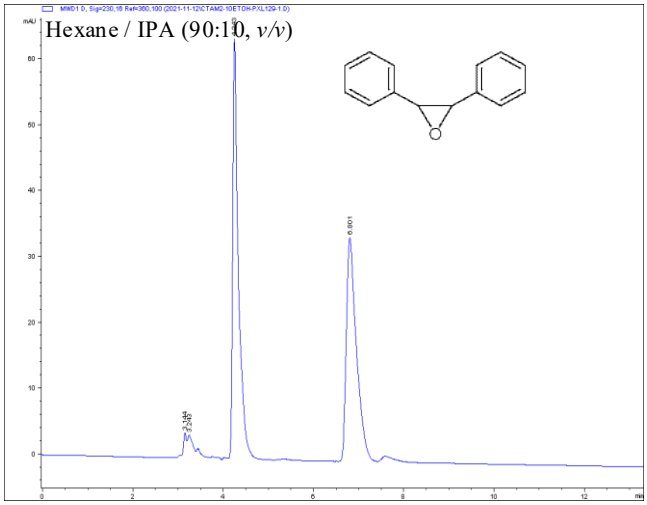
Change 5 µm to 3µm



Column: ChiralCTCE-2
Dimension: 5µm, 250 × 4.6 mm I.D. （上）
3µm, 100 × 4.6 mm I.D. （下）
Part No. 8025-CTCE2-05（上）
85023-CTCE2-62（下）
LC Mode: HPLC (Agilent1100)
Flow rate: 1 mL/min
Detection: UV@230nm

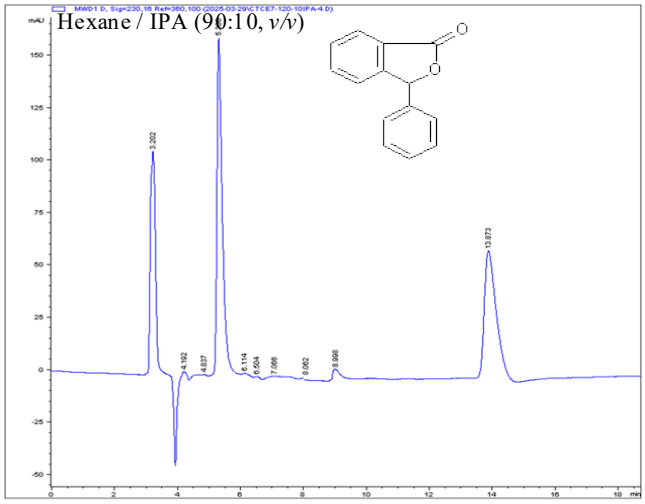
Fig 5.1-20. Chiral separation of Trans-Stilbene Oxide on ChiralCTCE2 column. Replacement of the 5 µm standard column with a 2 µm fast column significantly improved the chiral separation.

5.1. Typical Chromatograms and Optimization Schemes for Analytical Chiral Columns



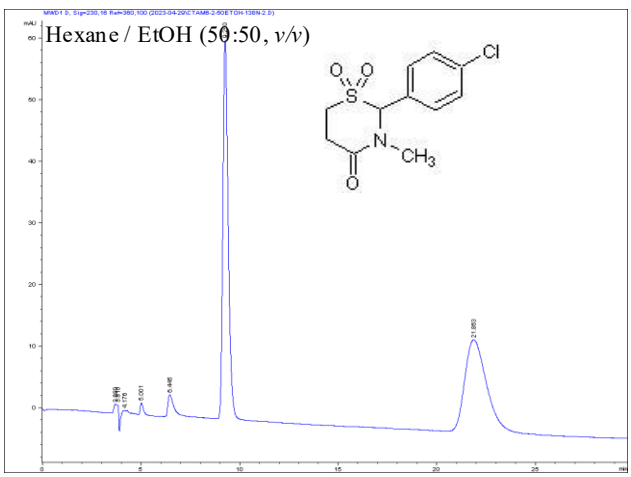
Column: ChiralCTAM-2
Dimension: 5µm, 250 × 4.6 mm I.D.
Part No. 9025-CTAM2-05
LC Mode: HPLC (Agilent1100)
Flow rate: 1.0 mL/min
Detection: UV@230nm
Temperature: Ambient

Fig 5.1-21. Chiral separation of Trans-Stilbene Oxide on a ChiralCTAM-2 standard column.



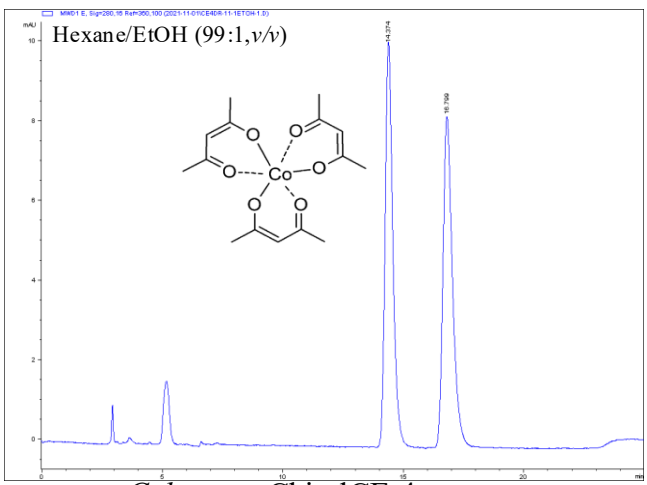
Column: ChiralCTCE-7
Dimension: 5µm, 250 × 4.6 mm I.D.
Part No. 8075-CTCE7-05
LC Mode: HPLC (Agilent1100)
Flow rate: 1.0 mL/min
Detection: UV@230nm
Temperature: Ambient

Fig 5.1-23. Chiral separation of 3-Phenylphthalide on a ChiralCTCE-7 standard column.



Column: ChiralCTAM-6
Dimension: 5µm, 250 × 4.6 mm I.D.
Part No. 9065-CTAM6-05
LC Mode: HPLC (Agilent1100)
Flow rate: 1.0 mL/min
Detection: UV@230nm
Temperature: Ambient

Fig 5.1-22. Chiral separation of Chlormezanone on a ChiralCTAM-6 standard column.

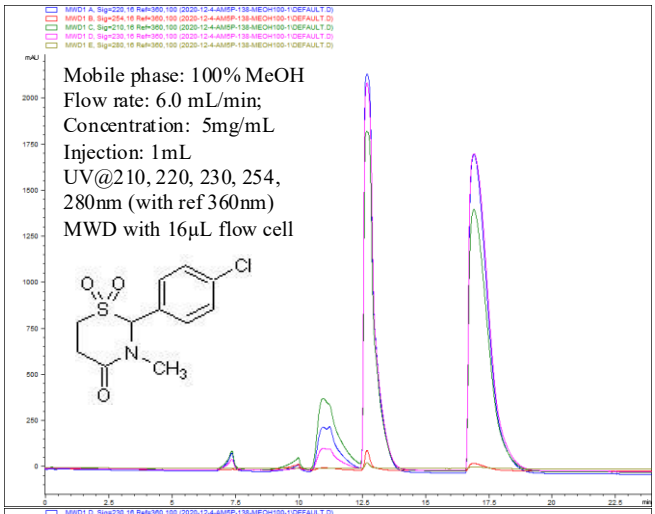


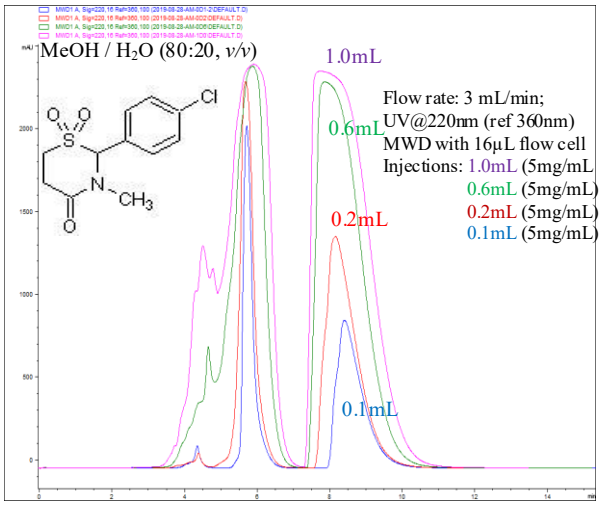
Column: ChiralCE-4
Dimension: 5µm, 250 × 4.6 mm I.D.
Part No. 8915-CE4-05
LC Mode: HPLC (Agilent1100)
Flow rate: 1.0 mL/min
Detection: UV@280nm
Temperature: Ambient

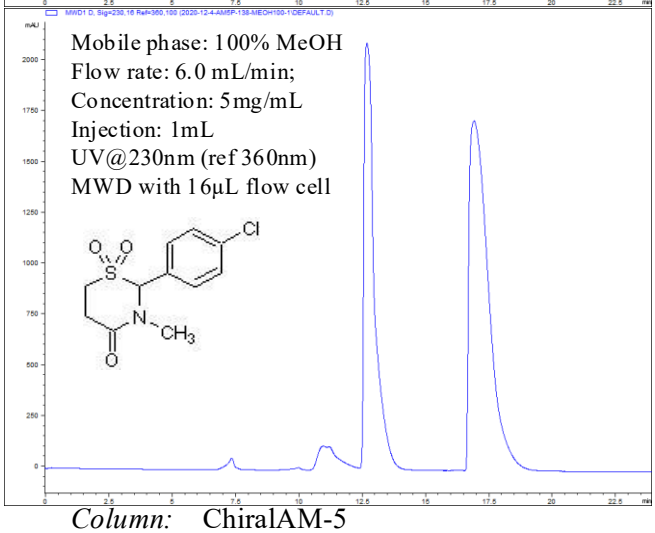
Fig 5.1-24. Chiral separation of Tris(2,4-pentanedionato) cobalt on a ChiralCE-4 standard column.

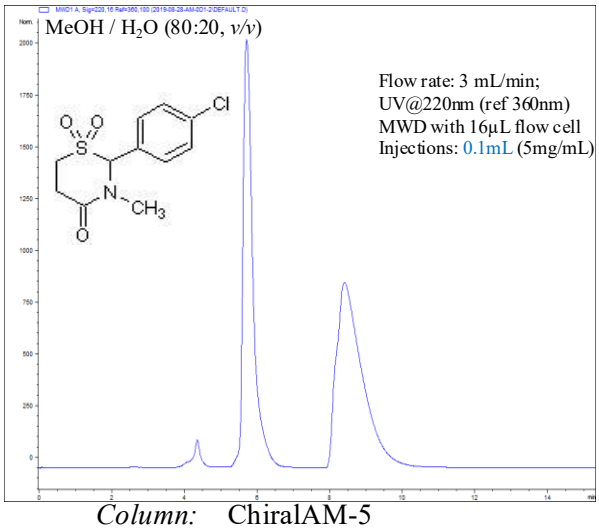
5.2 Chromatograms and Optimization Schemes for Preparative Chiral Columns

Chlormezanone on ChiralAM-5 preparative columns









Column:	ChiralAM-5
Dimension:	5μm, 250 × 21.5 mm I.D.
Part No.	7955-AM5-25
LC Mode:	HPLC (Jasco)
Flow rate:	6.0 mL/min
Detection:	UV@210, 220, 230, 254, 280nm
Temperature:	Ambient

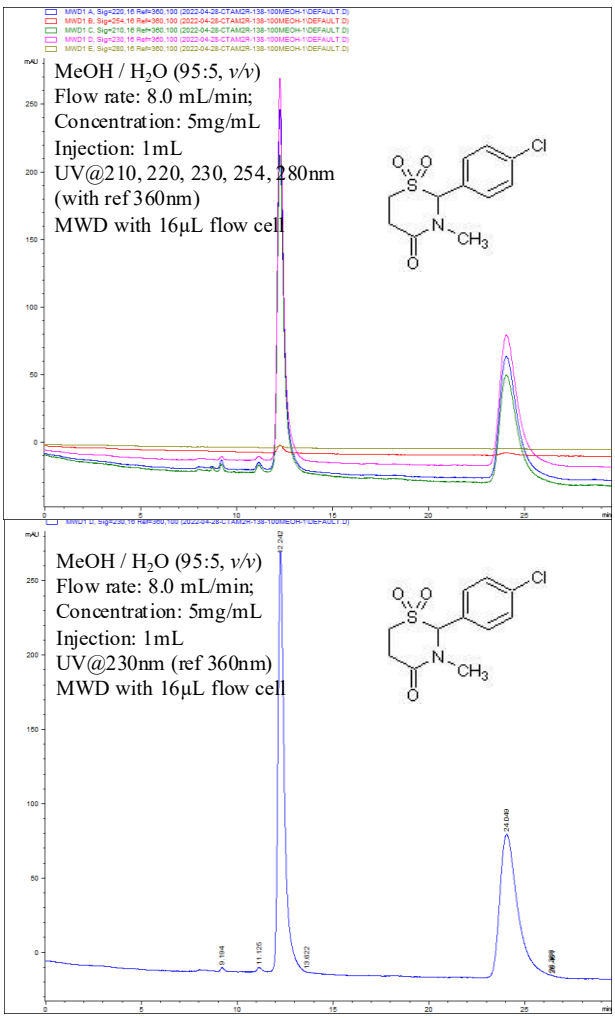
Fig 5.2-1. Chiral separation of Chlormezanone on a ChiralAM-5 preparative column (250 × 21.5 mm I.D).

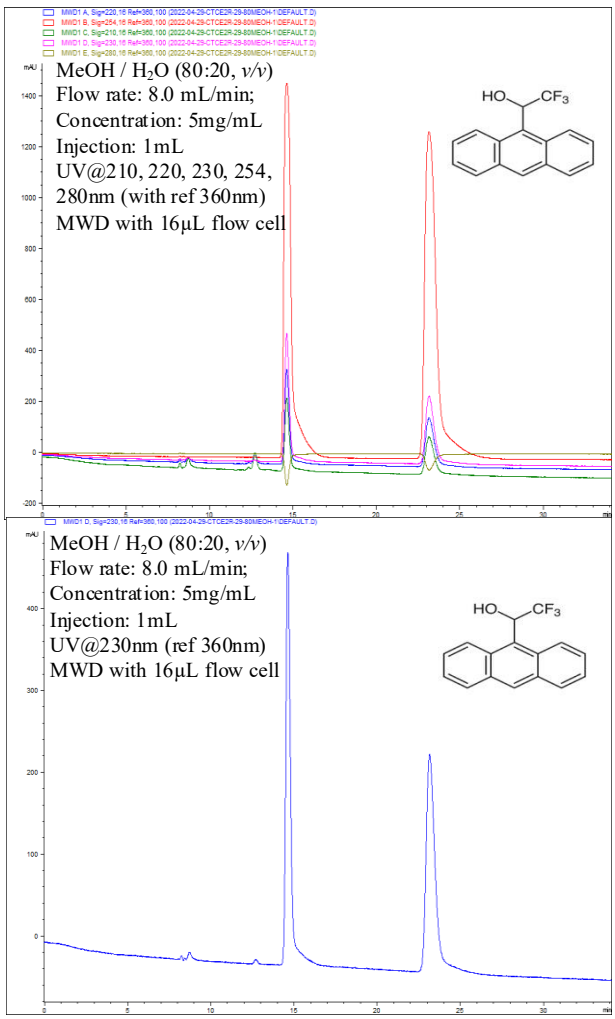
Column:	ChiralAM-5
Dimension:	5μm, 200 × 10 mm I.D.
Part No.	7955-AM5-14
LC Mode:	HPLC (Jasco)
Flow rate:	3.0 mL/min
Detection:	UV@210, 220, 230, 254, 280nm
Temperature:	Ambient

Fig 5.2-2. Chiral separation of Chlormezanone on a ChiralAM-5 semi-preparative column (200 × 10 mm I.D).

5.2 Chromatograms and Optimization Schemes for Preparative Chiral Columns

Chlormezanone on ChiralCTAM-2R preparative column and 2,2,2-Trifluoro-1-(9-anthryl)ethanol on ChiralCTCE-2R preparative column





Column:	ChiralCTAM-2R
Dimension:	5μm, 250 × 21.5 mm I.D.
Part No.	9025-CTAM2R-25
LC Mode:	HPLC (Jasco)
Flow rate:	8.0 mL/min
Detection:	UV@210, 220, 230, 254, 280nm
Temperature:	Ambient

Fig 5.2-3. Chiral separation of Chlormezanone on a ChiralCTAM-2R preparative column (250 × 21.5 mm I.D).

Column:	ChiralCTCE-2R
Dimension:	5μm, 250 × 21.5 mm I.D.
Part No.	7025-CTCE2R-25
LC Mode:	HPLC (Jasco)
Flow rate:	8.0 mL/min
Detection:	UV@210, 220, 230, 254, 280nm
Temperature:	Ambient

Fig 5.2-4. Chiral separation of 2,2,2-Trifluoro-1-(9-anthryl)ethanol on ChiralCTCE-2R preparative column.

6. ChiralTek SPE Cartridges and PSPE Instruments

6.1 ChiralTek Ultra-high Performance Extraction UPE Cartridges

6.1.1 Unique Characteristics for UPE Cartridges

The Ultra-high Performance Extraction (UPE) cartridges are a novel type of solid phase extraction (SPE) cartridges manufactured by ChiralTek. The UPE particles were prepared through a specially-designed procedure by bonding C18 (ODS) and ChiralTek proprietary functional groups onto high-quality porous spherical silica particles as shown in Fig 6.1-1

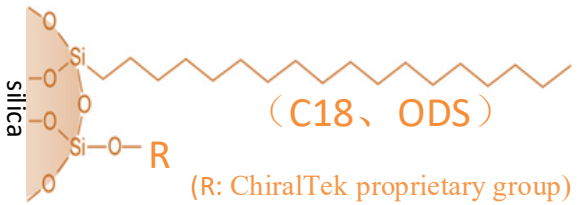


Fig 6.1-1. Schematic diagram of the structure for the UPE particle

As shown in Fig 6.11, in addition to the common C18 (ODS) group, the UPE also contains the Chiral proprietary group R. Due to the synergistic effect of the R and C18 (ODS) group, the UPE cartridge has extremely high sample capacity and extraction recovery yield, as well as excellent reproducibility. It is suitable for ultra-high efficient extraction and automatic sample processing in reversed phase mode SPE.

UPE cartridges are a new type of C18-immbolized extraction cartridges. It does not require nitrogen blowing for pre-concentration. The elution, enrichment and re-constitution can be completed in one single step. It is a type of environmentally friendly SPE cartridges.

Fig 6.1-2. Photo of ChiraTek UPE20 cartridges (3mL, 20mg)

Compared to other traditional SPE cartridges, the UPE cartridges contain much thinner column beds and much smaller volume of the packing materials (only 5 to 10% of other traditional SPE Cartridges). After loading the sample, extremely small amount of organic solvents (0.3mL for UPE-20 and UPE-30; 1.5mL for UPE-60 and UPE90 cartridges) can be used to quickly elute out and simultaneously concentrate the extracts from the UPE cartridges. The elute can be collected in a 1.5mL HPLC vials for direct injection and final analysis.

6.1.2 UPE Cartridge Product Features and Compatible Application Devices

UPE cartridges are specially designed to work perfectly with simple syringe pump devices and ChiralTek PSPE series positive pressure solid phase extractors to completely eliminate cross contamination. UPE cartridges are particularly suitable for small-volume complex samples, including biological samples, food, and environmental samples. Using UPE cartridges, elution and pre-concentration can be completed in one single step without additional heating or nitrogen drying procedures. Therefore, when used with PSPE equipment, UPE cartridges are ideal for trace analysis of complex samples.

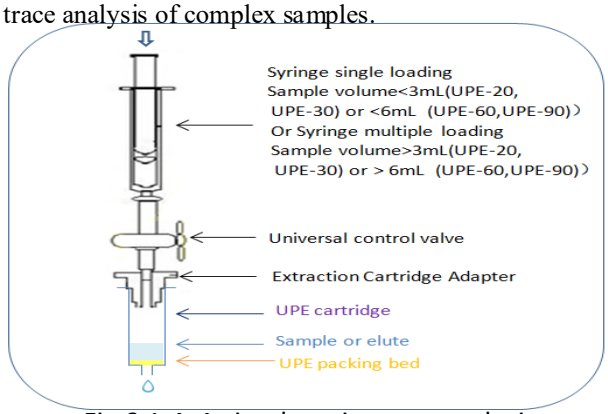


Fig 6.1-4. A simple syringe pump device

Fig 6.1-3 Photo of ChiraTek UPE90 cartridges (6mL, 90mg)

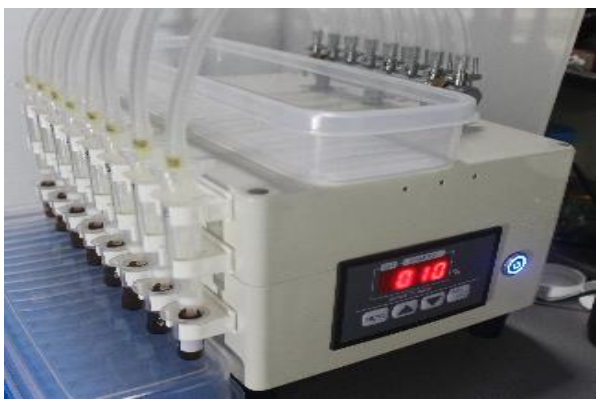


Fig 6.1-5. ChiralTek PSPE-08A Instrument

6.1.3 Typical Applications for UPE Cartridges Product

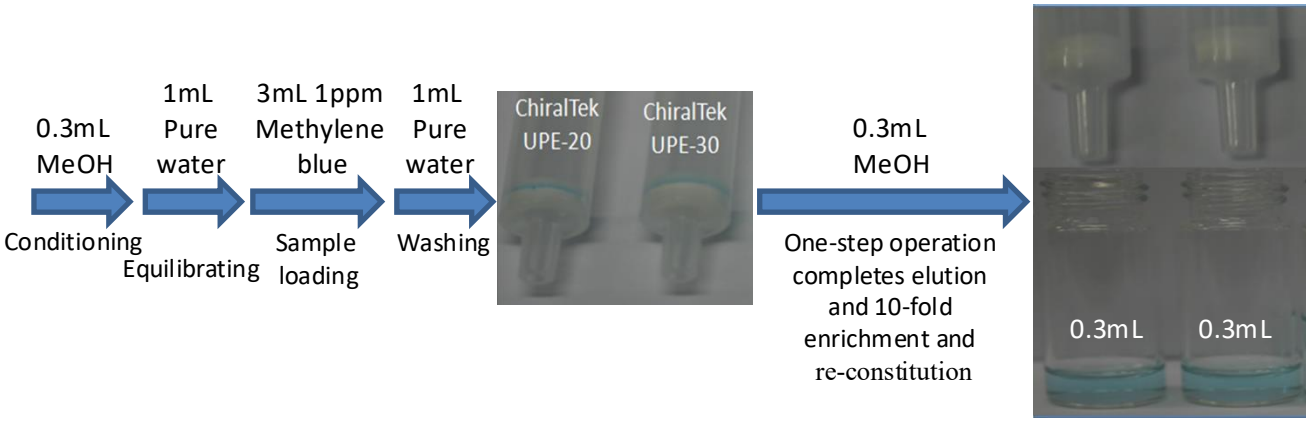


Fig 6.1-6. Diagram for ultra-efficient and complete extraction of 1ppm methylene blue aqueous solution sample operation process using Chiraltek UPE20 & UPE30 cartridges

6.1.4 UPE Cartridges Product Specifications

The common UPE Cartridges Product Specifications are as follows：

(1) ChiralTek UPE-20,（20mg/3mL，120Å， 50 PCs/box） Ultra-high efficient cartridges are equivalent to conventional SPE cartridges of other brands 100mg-200mg/3mL C18 SPE cartridges；
(2)ChiralTek UPE-30,（30mg/3mL，120Å， 50 PCs/box） Ultra-high efficient cartridges are equivalent to conventional SPE cartridges of other brands 200mg-500mg/3mL C18 SPE cartridges;
(3)ChiralTek UPE-60,（60mg/6mL，120Å， 25 PCs/box） Ultra-high efficient cartridges are equivalent to conventional SPE cartridges of other brands 500mg-1000mg/6mL C18 SPE cartridges；
(4)ChiralTek UPE-90,（90mg/6mL，120Å， 25 PCs/box） Ultra-high efficient cartridges are equivalent to conventional SPE cartridges of other brands 1000mg-2000mg/6mL C18 SPE cartridges.

6.1.5 Ordering information for the UPE cartridges

Order Information for ChiralTek Ultra-high Performance UPE Cartridges				
Product No.	**Model**	**Specification**	**Remarks**	**Organic solvent for conditioning and final elution**
880-UPE-20	UPE-20	20mg/3mL，120Å，50 PCs/box	Replacement for 100-200mg/3mL ODS (C18) conventional SPE cartridges	0.3mL
880-UPE-30	UPE-30	30mg/3mL，120Å，50 PCs/box	Replacement for 200-500mg/3mL ODS (C18) conventional SPE cartridges	0.3mL
880-UPE-60	UPE-60	60mg/6mL，120Å，25 PCs/box	Replacement for 500-1000mg/6mL ODS (C18) conventional SPE cartridges	1.5mL
880-UPE-90	UPE-90	90mg/6mL，120Å，25 PCs/box	Replacement for 1000-2000mg/6mL ODS (C18) conventional SPE cartridges	1.5mL

6.2 ChiralTek Universal Hydrophilic and Lipophilic Extraction HLE Cartridges

6.2.1 Unique Characteristics for ChiralTek HLE Cartridges

The Hydrophilic and Lipophilic Extraction (HLE) cartridges are a new type of universal solid phase extraction (SPE) cartridges manufactured by ChiralTek. The HLE particle was prepared through a specially-designed procedure by bonding multiple chemical function groups, including Diol, C18 (ODS), vinylpyrrolidone and divinylbenzene (HLB) etc., onto a special type of porous composite material. By using a ChiralTek proprietary packing approach, the HLE particles were then packed into kinds of polypropylene tubes with different sizes to produce different model of HLE cartridge products. The following Figure 6.2-1 shows a typical photo of model HLE-80 cartridges which are suitable for extraction of small volume samples (0.5 – 50mL).

Since this novel HLE cartridges contains multiple chemical function groups, they can be used under traditional normal and reverse phase elution conditions and modern gradient elution conditions to extract types of hydrophilic and lipophilic compounds from complicated samples.

When worked with automated SPE instruments, the HLE cartridges can be used to easily achieve high efficient sample treatments for different types of complicated samples. Another model HLE-300 cartridges (as shown in Figure 6.2-2 are suitable for median volume samples (50 – 500mL). The HLE-1000 model cartridges are designed for large volume samples (500mL and above). The HLE cartridges can also be used as direct replacement of Waters HLB cartridges.

Fig 6.2-1. Typical Photo for HLE-80 cartridges (80mg/3mL 80-120Å)

Fig 6.2-2. Typical Photo for HLE-300 cartridges (300mg/6mL 80-120Å)

6.2.2 HLE Product Features and Applications

Multiple elution modes, including gradient elution, can be used to extract and purify different types of small molecular compounds in the samples due to the multiple chemical function groups available in the HLE cartridges. The single HLE cartridge can also be used to as Flash column to fractionate the complicated sample into different groups of compounds according to the polarity, hydrophilic, and lipophilic abilities by using multiple mode elution approaches. It is strongly recommended to use 100% isopropyl alcohol (IPA) as the intermediate solvent when switchingbetween hydrophilic and lipophilic elution conditions.

Since the single HLE cartridge contains Doil, C18 (ODS), vinylpyrrolidone and divinylbenzene (HLB) groups, the high-capacity cartridge,. e.g., HLE-1000 and HLE-2000 cartridges etc., can be used as multiple functional Flash chromatographic column for separation and purification of complicated samples, such as Traditional Chinese Medicinal herbs and other nature products, when worked with kinds of automated SPE instruments.

The HLE column bed will turn a light yellow color after conditioning with IPA or methanol. This light yellow color is normal for the composite material particles. The HLE column wall is made of polypropylene. The two frits are made of polyethylene. Most common normal and reversed phase elution solvents and solutions are compatible with polypropylene and polyethylene materials. The HLE cartridges have many different models with different specifications and column capacities. Please choose proper model according to the sample volume and contents in the sample.

6.2.3 ChrialTek HLE Cartridges Product Specifications

The common UPE Cartridges Product Specifications are as follows：

(1)ChiralTek HLE-80,（80mg/3mL，80-120Å， 50 PCs/box）universal extraction cartridges for small volume （0.5 - 50mL）samples；
(2)ChiralTek HLE-150.（150mg/3mL，80-120Å， 50 PCs/box ）universal extraction cartridges for small volume （0.5 - 50mL）samples；
(3) ChiralTek HLE-300,（300mg/6mL，80-120Å，20 PCs/box ）universal extraction cartridges for median volume 50 - 500mL）samples；
(4)ChiralTek HLE-1000,（1000mg/6mL，80-120Å，20 PCs/box ）universal extraction cartridges for large volume samples (500-1000mL) samples;
(5)ChiralTek HLE-2000,（2000mg/12mL，80-120Å，10 PCs/box ）universal extraction cartridges for very large volume samples (1000mL and above) samples;

6.2.4 Ordering information for the HLE cartridges

Product List of ChiralTek HLE Universal Cartridges			
Product No.	**Model**	**Specification**	**Remarks**
880-HLE-80	HLE-80	80mg/3mL，80-120Å，50 PCs/box	For small volume samples (0.5 - 50mL)
880-HLE-150	HLE-150	150mg/3mL，80-120Å，50 PCs/box	For small volume samples (0.5 - 50mL)
880-HLE-300	HLE-300	300mg/6mL，80-120Å，20 PCs/box	For median volume samples (50 - 500mL)
880-HLE-1000	HLE-1000	1000mg/6mL，80-120Å，20 PCs/box	For large volume samples (500-1000mL)
880-HLE-2000	HLE-2000	2000mg/12mL，80-120Å，10 PCs/box	For very large volume samples (1000mL and above)

6.3 ChiralTek Positive-pressure Solid Phase Extraction PSPE instruments

6.3.1 Unique Characteristics for ChiralTek PSPE Series of Positive-pressure SPE Systems

The PSPE series extractor is a cost-effective and novel positive pressure solid phase extraction (PSPE) system first invented by Singapore Chiraltek. It is the first positive pressure SPE instrument that completely avoids sample cross contamination. It is controlled by a built-in push-button single-chip microcomputer with LCD display function. It is compact, pratical and easy to operate. For small-volume samples, there is no contact between the sample and all solvents and solutions and the pipes of the PSPE, which avoids cross contamination of the sample and greatly improves the accuracy of the tests and analysis. It is suitable for extraction and analysis of various trace substances. It is especially suitable for the processing of small-volume and complex biological and environmental samples (such as determining blood drug concentration and water quality monitoring, etc.).

There are four types of PSPE systems: A, B, C, and D. Types A and C are suitable for small-volume samples, while types B and D are suitable for both large-volume and small-volume samples. Types A and B can use 1mL, 3mL and 6mL SPE cartridges, and types C and D can use 3mL, 6mL and 12mL SPE cartridges. Each type of PSPE has two different configurations: 8 channels and 12 channels. All models of PSPE systems can be used to process small volume samples. For small volume samples, the samples and all solvents and solutions have no contact with the pipes of the PSPE instrument. Therefore, when processing small volume samples, there is no need to clean the PSPE system before and after extraction, which is friendly to operators and the environment.

Fig 6.3-1. ChiralTek PSPE-08A Instrument

Fig 6.3-3. ChiralTek PSPE-08C Instrument

Fig 6.3-2. ChiralTek PSPE-08B Instrument

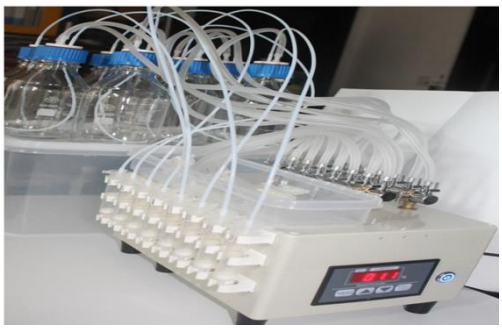


Fig 6.3-4. ChiralTek PSPE-08D Instrument

6.2.2 ChiralTek PSPE Product Features

The PSPE-08B, PSPE-08D, PSPE-12B, and PSPE-12D systems are equipped with two independent piping systems. One set of piping is used for automatic continuous loading of large volume samples, and the other set of piping is used for conditioning and elution. Therefore, both large and small volume liquid samples can be processed. Small volume samples need to be loaded manually, while large volume samples can be loaded automatically and continuously (with no upper limit on volume). For small volume samples, the sample and all solvents and solutions have no contact with the extractor pipes and pipelines, and there is no need to clean the PSPE pipelines before and after extraction.

When large-volume samples are loaded automatically and continuously, only a small section of the pipeline is in contact with the sample, and only this section of the pipeline needs to be cleaned after extraction. When processing large and small-volume samples, all activation and elution solvents have no contact with the extractor pipelines and pipelines, effectively reducing and avoiding cross contamination, and are particularly suitable for trace analysis. For all PSPE systems, the SPE cartridge outlet does not need to be connected to any pipeline or base, and the eluent directly enters the sample vials (PE vials or HPLC vials, etc.). This design not only simplifies extracting operation, but also avoids cross contamination and residual contamination.

6.2.3 ChiralTek PSPE Special Applications

The PSPE systems are particularly suitable for using ChiralTek's first ultra-high performance solid phase extraction (UPE) cartridges. Only a very small volume of organic solvent is required for conditioning and eluting (0.2~0.3 mL (UPE-20 and UPE-30 3mL cartridge), 1~1.5mL solvent (UPE-60 and UPE-90 6mL cartridges), or 2~3 mL solvent (UPE-120 and UPE-180 12mL cartridges). No additional nitrogen blowing or heating drying operations are required, and elution, enrichment and re-constitution can be completed in one single step. The novel PSPE is a positive pressure extraction instrument that completely avoids sample cross contamination. The PSPE systems are environmentally friendly instruments with a variety of flexible configurations that can process various types of samples with different volumes.

When processing small-volume samples, the samples and all solvents and solutions have no contact with the PSPE pipelines, avoiding cross-contamination and greatly improving the accuracy of the analysis. This makes PSPE an ideal instrument for trace analysis. It is especially suitable for the processing of small-volume and complex biological and environmental samples (such as determining blood drug concentration and water quality monitoring, etc.). The operating voltage of the PSPE is 12V, which can be powered by an external wide-voltage (100-240V) power adapter (standard default configuration) or by a 12v car battery or 12V powerbank battery.Due to its small size and low power consumption, when powered by an external battery, the PSPE system can also be used as a portable scientific research equipment in the field.

6.3. ChiralTek PSPE Specifications

To meet needs of various users, the PSPE systems have a variety of different configurations. The main specifications of the typical eight models of the PSPE systems are shown in the following table.

Part No. / Parameters	980-PSPE-08A	980-PSPE-08B	980-PSPE-08C	980-PSPE-08D
Number of channels	8	8	8	8
Cartridge volume :	1、3、6 mL SPE	1、3、6 mL SPE	3、6、12 mL SPE	3、6、12 mL SPE
Material of casing:	ABS	ABS	ABS	ABS
System control:	Single-chip Microcomputer	Single-chip Microcomputer	Single-chip Microcomputer	Single-chip Microcomputer
Maximum pressure:	5 bar	5 bar	5 bar	5 bar
Power source:	100-240 V	100-240 V	100-240 V	100-240 V
Input voltage:	12 V	12 V	12 V	12 V
Power consumption:	< 6 A (at 12 VDC)	< 6 A (at 12 VDC)	< 6 A (at 12 VDC)	< 6 A (at 12 VDC)
Weight (Kg):	3	3.5	3	3.5
Dimension (cm):	28 x 20 x 18	28 x 20 x 18	28 x 20 x 18	28 x 20 x 18

Part No. / Parameters	980-PSPE-12A	980-PSPE-12B	980-PSPE-12C	980-PSPE-12D
Number of channels	12	12	12	12
Cartridge volume :	1、3、6 mL SPE	1、3、6 mL SPE	3、6、12 mL SPE	3、6、12 mL SPE
Material of casing:	ABS	ABS	ABS	ABS
System control:	Single-chip Microcomputer	Single-chip Microcomputer	Single-chip Microcomputer	Single-chip Microcomputer
Maximum pressure:	6 bar	6 bar	6 bar	6 bar
Power source:	100-240 V	100-240 V	100-240 V	100-240 V
Input voltage:	12 V	12 V	12 V	12 V
Power consumption:	< 7 A (at 12 VDC)	< 7 A (at 12 VDC)	< 7 A (at 12 VDC)	< 7 A (at 12 VDC)
Weight (Kg):	5	5.5	5	5.5
Dimension (cm):	40 x 28 x 20	40 x 28 x 20	40 x 28 x 20	40 x 28 x 20

6.3.5 Order Information for ChiralTek PSPE systems

Specifications and order information of ChiralTek PSPE systems		
Part No.	Specifications and descriptions	Remarks
980-PSPE-08A	Single-chip microcomputer-controlled air pump-driven P-SPE-08A mainframe with 8-channel rack for 6mL, 3mL, and 1mL SPE cartridges, suitable for small volume samples (0.1mL-6*N mL/when repeating sample loading procedure for N times), manual sample loading.	100~240V external power supply
980-PSPE-08B	Single-chip microcomputer-controlled air pump-driven P-SPE-08B mainframe with 8-channel rack for 6mL, 3mL, and 1mL SPE cartridges, suitable for both small and large volume samples, automatic loading large volume samples (no upper volume limit).	100~240V external power supply
980-PSPE-08C	PSingle-chip microcomputer-controlled air pump-driven P-SPE-08C mainframe with 8-channel rack for12mL, 6mL, and 3mL SPE cartridges, suitable for small volume samples (0.2mL-12*N mL/when repeating sample loading procedure for N times), manual sample loading.	100~240V external power supply
980-PSPE-08D	Single-chip microcomputer-controlled air pump-driven P-SPE-08D mainframe with 8-channel rack for 12mL, 6mL, and 3mL SPE cartridges, suitable for both small and large volume samples, automatic loading large volume samples (no upper volume limit).	100~240V external power supply
980-PSPE-12A	Single-chip microcomputer-controlled air pump-driven P-SPE-12A mainframe with 12-channel rack for 6mL, 3mL, and 1mL SPE cartridges, suitable for small volume samples (0.1mL-6*N mL/when repeating sample loading procedure for N times), manual sample loading.	100~240V external power supply
980-PSPE-12B	Single-chip microcomputer-controlled air pump-driven P-SPE-12B mainframe with 12-channel rack for 6mL, 3mL, and 1mL SPE cartridges, suitable for both small and large volume samples, automatic loading large volume samples (no upper volume limit).	1100~240V external power supply
980-PSPE-12C	Single-chip microcomputer-controlled air pump-driven P-SPE-12C mainframe with 12-channel rack for 12mL, 6mL, and 3mL SPE cartridges, suitable for small volume samples (0.2mL-12*N mL/when repeating sample loading procedure for N times), manual sample loading.	100~240V external power supply
980-PSPE-12D	Single-chip microcomputer-controlled air pump-driven P-SPE-12D mainframe with 12-channel rack for 12mL, 6mL, and 3mL SPE cartridges, suitable for both small and large volume samples, automatic loading large volume samples (no upper volume limit).	100~240V external power supply

7. ChiralTek ODS-RPS Columns for Conventional Reversed-phase Chromatography

7.1 ChiralTek ODS-RPS Columns for Analytical and Preparative Chromatography

7.1.1. Unique Characteristics for ChiralTtek™ ODS-RPS columns

ChiralTtek™ ODS-RPS columns are a series of new types of C18-bonded silica particles-packed columns for reversed-phase (RP) chromatography. By applying a special manufacture processing procedure, the ODS-RPS particles were synthesized by synergically immobilizing commonly-used C18 group and other two ChiralTek proprietary end-capping groups R1 & R2 onto surface of high-quality porous silica (2μm, 3μm, 5μm, or 10μm) as shown in Figure (A). Due to the Synergistic cooperative functioning of C18 group and R1 & R2, the ODS-RPS columns not only have high column efficiency but also good reproducibility, and can be used under various types of non-standard and atypical reversed-phase mobile phase conditions. The ODS-RPS series of chromatographic columns contain a higher concentration of C18 groups, thus having the characteristics of high column capacity.

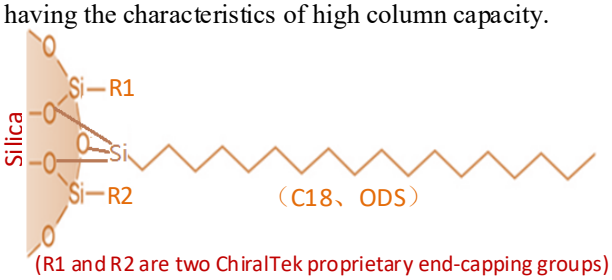


Figure (A). Schematic diagram of the ChiralTtek™ ODS-RPS phase

Due to the use of two special ChiralTek proprietary end-capping groups, the ODS-RPS bonded silica spheres are completely capped. Therefore, the ODS-RPS series chromatographic columns not only have good reproducibility, but also have super stability and are suitable for dynamic axial compression columns. Therefore, ODS-RPS series preparative columns are also very suitable for various high-throughput preparative chromatography and can efficiently achieve preparative-grade purification of complex mixtures.

ODS-RPS columns have good separation capabilities for a wide range of compounds, such as acidic, alkaline, neutral, and metal chelates. The ODS-RPS columns have various specifications, among which 2 and 3μm-silica packed columns (2.1mm ID) are suitable for modern UPLC, 5μm-silica packed columns (4.6mm ID) are for conventional HPLC, and 10μm-silica packed columns (21.5, 30, 50mm ID, etc.) are suitable for various types of preparative chromatography. In addition, there are also preparative condition optimization columns (4.6mm ID) packed with 10μm-silica. This optimization column can quickly and efficiently optimize the mobile phase conditions of preparative chromatography on analytical instruments.

7.1.2. Application Restrictions and Requirements

The ODS-RPS columns are suitable for reversed-phase mobile phase conditions. Before using a new column, it must be flushed with MeOH or ACN, and then balanced with mobile phase until reaching a constant column pressure. ODS-RPS columns can be used in traditional HPLC, modern UPLC and SFC. When using ChiralTtek™ ODS-RPS columns with 2μm and 3μm silica particles, low flow rate (e.g., 0.1-0.3 mL/min) should be applied when used in traditional HPLC with highly viscous mobile phases in order to avoid high back pressure.

When used in modern UPLC or SFC, ODS-RPS columns have no particular restrictions on the flow rate of the mobile phase.

Flow direction:	Arrow direction on the column label
Maximum tolerance pressure:	< 800 bar（~11600 psi，2μm、3μm column，UPLC or HPLC ）
	< 600 bar (~9000 psi , 5μm analytical column, HPLC or SFC) < 200 bar (~3000 psi, 10μm preparative column, HPLC or SFC)
Temperature:	1 – 40 ° C
Guard column:	C18, or C8 guard column
Mode:	HPLC、UPLC、SFC

7.1.3. Care and Maintenance of the ODS-RPS Columns

[1] It is strongly recommended to use C18 or C8 guard columns to protect the ODS-RPS columns.
[2] It'd be better to resolve samples in mobile phases and filter through 0.5μm membrane before injection.
[3]The solvent in the ODS-RPS columns should be replaced with methanol or acertonitrile if the columns need to be stored for over a week's time.
[4]When worked in high pressure conditions, it's strongly recommended to gradually decrease flow rate to ensure column pressure lower than 100 bar (~1450 psi) before switching off the chromatograph pump.

7.1.4. Notice and Other Considerations

[1]When using highly viscous mobile phases or solvents (e.g, 100%EtOH or 100%IPA etc.), a low flow rate of about 0.1-0.3mL/min should be applied in traditional HPLC in order to avoid extreme high pressure. However, there is no special flow rate limitation in UPLC for the ODS-RPS columns.
[2]Diethylamine, butylamine, or amino ethyl alcohol (0.1%) can be used as mobile phase additives for basic compounds.
[3] Formic acid, acetic acid, or trifluoroacetic acid (0.1%) can be used as mobile phase additives for acidic compounds.
[4] Since the strong alkalic compounds (e.g., NaOH etc.) can cause damages to the ODS-RPS column bed, they cannot be used as mobile phase additives or sample solution additives.

7.1.5. Ordering Information for some ChiralTtek™ ODS-RPSColumns

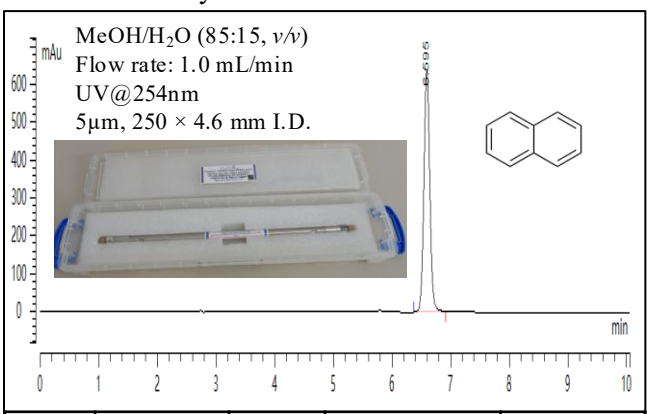
Product List of Some Common ChiralTtek™ ODS-RPS Columns

Part Number	*Type*	*Dimension*	*Column Description*
802-ODSRPS-01	C18、ODS	2μm, 120Å, 50x2.1mm	ODS-RPS micro-diameter analytical column
802-ODSRPS-02	C18、ODS	2μm, 120Å, 100x2.1mm	ODS-RPS micro-diameter analytical column
802-ODSRPS-03	C18、ODS	2μm, 120Å, 150x2.1mm	ODS-RPS micro-diameter analytical column
802-ODSRPS-04	C18、ODS	2μm, 120Å, 200x2.1mm	ODS-RPS micro-diameter analytical column
802-ODSRPS-05	C18、ODS	2μm, 120Å, 250x2.1mm	ODS-RPS micro-diameter analytical column
803-ODSRPS-01	C18、ODS	3μm, 120Å, 50x2.1mm	ODS-RPS micro-diameter analytical column
803-ODSRPS-02	C18、ODS	3μm, 120Å, 100x2.1mm	ODS-RPS micro-diameter analytical column
803-ODSRPS-03	C18、ODS	3μm, 120Å, 150x2.1mm	ODS-RPS micro-diameter analytical column
803-ODSRPS-04	C18、ODS	3μm, 120Å, 200x2.1mm	ODS-RPS micro-diameter analytical column
803-ODSRPS-05	C18、ODS	3μm, 120Å, 250x2.1mm	ODS-RPS micro-diameter analytical column
805-ODSRPS-02	C18、ODS	5μm, 120Å, 100x4.6mm	ODS-RPS conventional analytical column
805-ODSRPS-03	C18、ODS	5μm, 120Å, 150x4.6mm	ODS-RPS conventional analytical column
805-ODSRPS-04	C18、ODS	5μm, 120Å, 200x4.6mm	ODS-RPS conventional analytical column
805-ODSRPS-05	C18、ODS	5μm, 120Å, 250x4.6mm	ODS-RPS conventional analytical column
810-ODSRPS-05	C18、ODS	10μm, 120Å, 250x4.6mm	ODS-RPS preparative condition optimization column
810-ODSRPS-14	C18、ODS	10μm, 120Å, 200x10mm	ODS-RPS semi-preparative column
810-ODSRPS-15	C18、ODS	10μm, 120Å, 250x10mm	ODS-RPS semi-preparative column
810-ODSRPS-25	C18、ODS	10μm, 120Å, 250x21.5mm	ODS-RPS preparative column
810-ODSRPS-35	C18、ODS	10μm, 120Å, 250x30mm	ODS-RPS preparative column
810-ODSRPS-55	C18、ODS	10μm, 120Å, 250x50mm	ODS-RPS preparative column

ChiralTtek™ ODS-RPS with other dimensions are also available. Please visit English website https://chiraltek-column.com for downloading the latest version of full product manual and application notes for ODS-RPS columns. Please call an international phone number (+65)-93656129 (whatsapp with the same number) to directly contact ChiralTek technical support team in Singapore.

7.2 Typical Chromatograms and Optimization for the ODS-RPS Columns

Naphthalene on 5μm ODS-RPS-packed conventional analytical column for HPLC

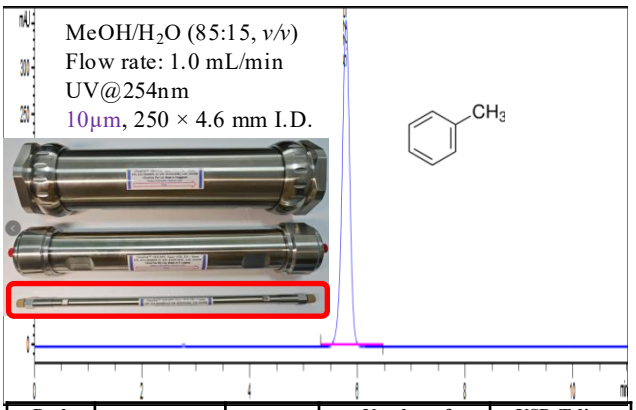


Peak No.	Name	Time	Number of Theoretical Plates	USP Taling Factor
1	Naphthalene	6.595	86840	1.05

Column: ChiralTek ODS-RPS
Dimension: 5μm, 250 × 4.6 mm I.D.
Part No. 805-ODSRPS-05
LC Mode: HPLC
Flow rate: 1.0 mL/min
Detection: UV@254nm

Fig 7.2-1 Detection of Naphthalene on 5μm ODS-RPS-packed conventional analytical column in HPLC.

Toluene on 10μm ODS-RPS-packed preparative condition optimization column

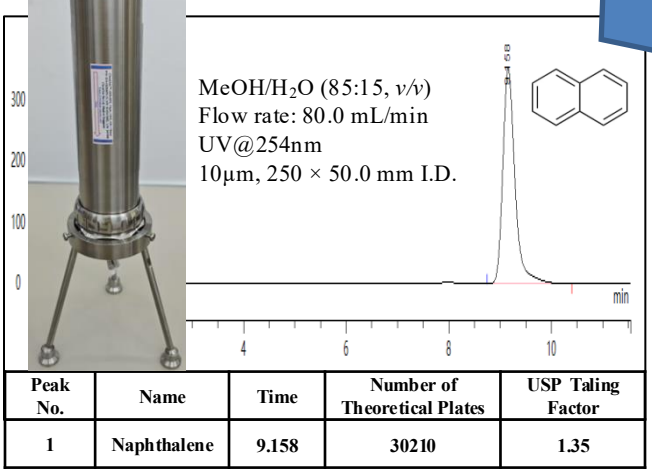


Peak No.	Name	Time	Number of Theoretical Plates	USP Taling Factor
1	Toluene	5.779	32852	0.921

Column: ChiralTek ODS-RPS
Dimension: 10μm, 250 × 4.6 mm I.D.
Part No. 810-ODSRPS-05
LC Mode: HPLC
Flow rate: 1.0 mL/min
Detection: UV@254nm

Fig 7.2-2 Optimization of separation condition using Toluene on 10μm ODS-RPS-packed preparative condition optimization column

Direct scale-up to preparative column after optimization

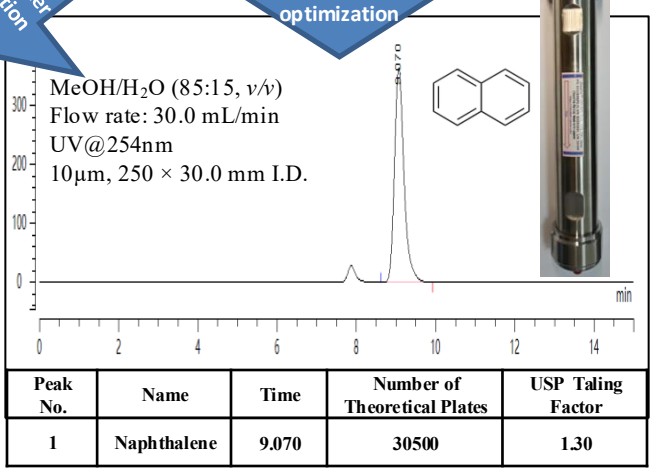


Peak No.	Name	Time	Number of Theoretical Plates	USP Taling Factor
1	Naphthalene	9.158	30210	1.35

Column: ChiralTek ODS-RPS
Dimension: 10μm, 250 × 50 mm I.D.
Part No. 810-ODSRPS-55
LC Mode: Preparative LC
Flow rate: 80.0 mL/min
Detection: UV@254nm

Fig 7.2-3 Detection of Naphthalene on 10μm-ODS-RPS-packed preparative column in preparative LC.

Direct scale-up to preparative column after optimization



Peak No.	Name	Time	Number of Theoretical Plates	USP Taling Factor
1	Naphthalene	9.070	30500	1.30

Column: ChiralTek ODS-RPS
Dimension: 10μm, 250 × 30 mm I.D.
Part No. 810-ODSRPS-35
LC Mode: Preparative LC
Flow rate: 30.0 mL/min
Detection: UV@254nm

Fig 7.2-4 Detection of Naphthalene on 10μm-ODS-RPS-packed preparative column in preparative LC.

8. SCI Research Papers Related to ChiralTek and Its Products

7.1 SCI Research Papers Related to ChiralTek Chiral Columns & Media

[1] J.Sun, H.Wang, L.Xu, Y.Wang, J.Yi, X.Zhou, J.Yin, X.Yin, Q.Wei, Y.Gong*, "Application of a new type of 3-chloro-5-methylphenylcarbamate-β-cyclodextrin-bonded silica particles as chiral stationary phase for multi-mode HPLC", *Chromatographia*, **2023**, *86*, 135-142. DOI:10.1007/s10337-023-04236-5 (On page 135 of the paper, ChiralTek is listed as the corresponding address.)

[2] L.Xu, H.Wang, J.Yi, M.Meng, J.Sun, X.Yin, X.Zhou, J.Yin, Y.Wang, J.Hou, Q.Wei, Y.Gong*, "Preparation and application of 3-(methylene-bis(1',4'-phenylene)dicarbamate-2,3-bis(3,5-dimethylphenylcarbamate)-amylose)-2-hydroxylpropoxy-propylsilyl-appended silica particles as chiral stationary phase for HPLC", *Journal of Chromatographic Science*, **2021**, 1, 1-7. https://doi.org/10.1093/chromsci/bmab073 (On the first page of the paper, ChiralTek is listed as the corresponding address.)

[3] J. Yi, L. Xu, H. Wang, X. Yin, X. Zhou, J. Yin, Y. Wang, J. Hou, Q. Wei, Y. Gong*, "Preparation and application of partially-substituted phenylcarbamate-(3-(2-O-β-cyclodextrin)-2-hydroxypropoxy)-propylsilyl-appended silica particles as chiral stationary phase for multi-mode HPLC", *Chromatographia*, **2020**, 83, 1021-1028. https://doi.org/10.1007/s10337-020-03908-w (On page 1021 of the paper, ChiralTek is listed as the corresponding address.)

7.2 SCI Research Papers Related to ChiralTek SPE and PSPE Products

[4] T.Yang, Y.Huang, Y.Zhou, S.Chen, H.Wang, Y.Hu, J.Liu, Z.Jiang, Q.Lu, X.Yin*, "Simultaneous quantification of oestrogens and androgens inthe serum of patients with benign prostatic hyperplasia by liquid chromatography–Tandem mass spectrometry", *Andrologia,* **2020***, 1-11,* DOI: 10.1111/and.13611 (Section 2.1 of this paper reports the use of the ChiralTek UPE30 extraction cartridges)

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