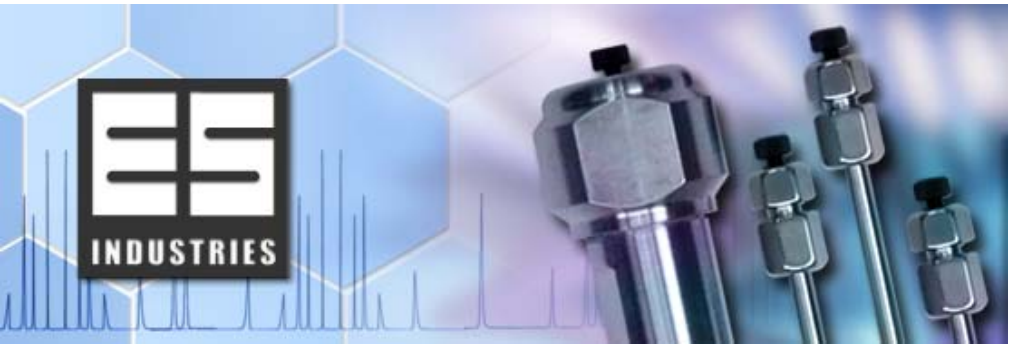
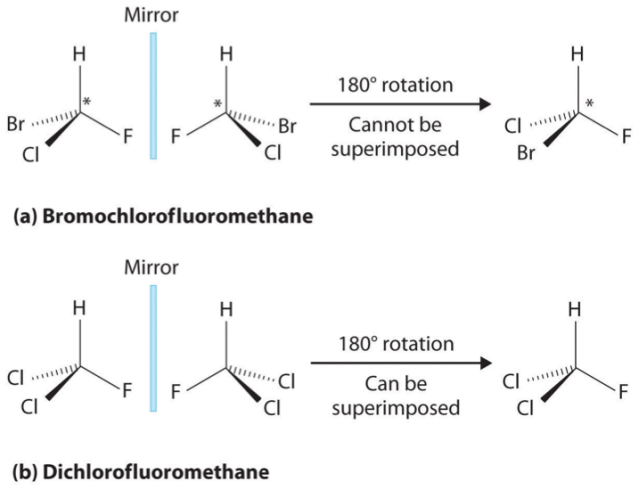


ChromegaChiral™ Columns

The right choice for chiral purification

Chiral Chromatography

The Background ...



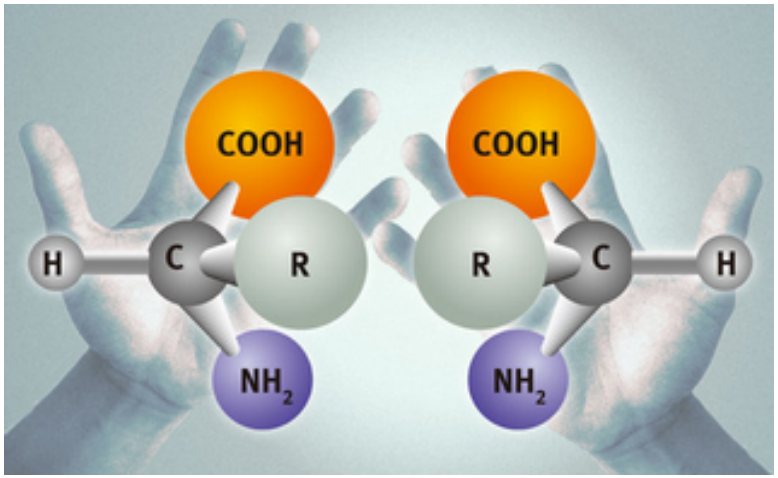
Comparison of Chiral and Achiral Molecules.
(a) Bromochlorofluoromethane is a chiral molecule whose stereo center is designated *. Rotation of its mirror image does not generate the original structure.
(b) In contrast, Dichlorofluoromethane and its mirror image can be rotated so they are superimposable and therefore achiral.

Chiral Stationary Phases (CSP) and Chirality

Chirality has become critically important in the pharmaceutical, chemical, and agricultural industries. The subtle differences that make compounds chiral can produce dramatically different pharmacological effects in biological systems. As a result, the demand for stereo selective separation techniques and analytical assays to evaluate the enantiomeric purity of chiral compounds, has increased. Chiral chromatography in the forms of HPLC and SFC has become a necessary tool - not only for the analytical determination of enantiomeric purity, but also for the isolation and purification of enantiomers.

Welcome to ChromegaChiral

The Logic and History …



As a leader in chiral separations the ChromegaChiral products offer a broad range of Chiral Stationary Phases (CSPs) for analytical and preparative chromatography needs. Existing chiral stationary phases can separate a wide variety of chiral mixtures, however there are still enantiomeric mixtures that are difficult to separate limiting their characterization. This provides our drive to develop new CSP's with differing chiral selectivities, e.g. ChromegaChiral CCA-F4 a chiral phase with embedded Fluorine atoms.

Product Features Include:

- Excellent Selectivity Range • High Pressure Limit
- Wide Range of Applications • Fast Optimization
- Superior Resolution and Efficiency
- One column for both SFC and HPLC use

Columns are available available in 10 to 50 mm internal diameters and particle size from 3 – 20 µm

ChromegaChiral Columns

With unique selectivities

ChromegaChiral CCO

Similar in selectivity to ChiralPak® OD.
A polysaccharide coated chiral stationary phase and columns which are produced using a unique production process of coating the proven chiral selector, tris-(3,5-dimethylphenyl) carbamoyl cellulose on high purity, high performance silica.

ChromegaChiral CCA

Similar in selectivity to ChiralPak® AD.
A polysaccharide coated chiral stationary phase and columns which are produced using a unique production process of coating the proven chiral selector, tris-(3,5-dimethylphenyl) carbamoyl amylose on high purity silica.

ChromegaChiral CCC

A modified cellulose including the combination of 3 chloro-4 methylphenylcarbamate and 3,5-dichlorophenylcarbamate bonding groups coated on high purity silica particles resulting in unique separation characteristics.

ChromegaChiral CC2

Similar separation behavior to Phenomenex Lux® Cellulose-2
A modified cellulose including 3-chloro-4 methylphenylcarbamate bonding groups coated on high purity, high performance spherical silica particles.

ChromegaChiral CC3

Similar in selectivity to ChiralPak® AY-H.
ChromegaChiral CC3 (amylose tris(5-chloro-2-methylphenylcarbamate) is for high resolution chiral separations based on a new halogenated carbohydrate based chiral stationary phase.

ChromegaChiral CC4

Similar in selectivity to ChiralPak® OZ-H.
ChromegaChiral CC4 (cellulose tris(4-chloro-3-methylphenylcarbamate) is is a modified cellulose coated on high purity, high performance spherical silica particles. The chemical modification includes the chemical bonding of 4-chloro-3 methylphenylcarbamate to cellulose.

ChromegaChiral Columns

With unique selectivities

ChromegaChiral CCJ

Similar in selectivity to ChiralPak® OJ-H.
ChromegaChiral CCJ (cellulose 4-methylbenzoate) is a new product for high resolution chiral separations based on a new halogenated carbohydrate based chiral stationary phase.

ChromegaChiral CCO-F4

ChromegaChiral CCO F4 is a 4-Fluoro 3-methylphenyl cellulose phase which can be used in SFC or HPLC. The addition of a fluorine atom into a phenyl carbamate cellulose structure is useful in promoting a fluorophilic retention mechanism which provides improved retention for fluorinated compounds.

ChromegaChiral CCS

ChromegaChiral CCS (amylose tris [(S)-α-methylbenzylcarbamate]) permits the enantiomeric separation of 1-Indanol without the addition of DEA (Diethyl amine). Historically DEA has been commonly used to improve peak shape for chiral separations of basic compounds.

ChromegaChiral CCO-F4T3

ChromegaChiral CCO-F4T3 incorporates a fluoro group into a phenyl cellulose structure and promotes a different fluorophilic retention mechanism than other fluorinated CSP's; proving to be useful in medicinal chemistry and drug discovery.

ChromegaChiral CCO-F2

ChromegaChiral CCO F2 is a 2-Fluoro 5-methylphenyl cellulose phase which can be used in SFC or HPLC. The addition of a fluorine atom into a phenyl carbamate cellulose structure can be useful in promoting a fluorophilic retention mechanism which can provide improved retention for fluorinated compounds.

ChromegaChiral CCA-F4

ChromegaChiral CCA F4 incorporates a fluoro group in its structure. The addition of a fluorine atom into a phenyl carbamate amylose structure can be useful in promoting fluorophilic retention mechanism which can provide improved retention for fluorinated compounds.

ChromegaChiral Columns

New phases with unique selectivities

ChromegaChiral CCU

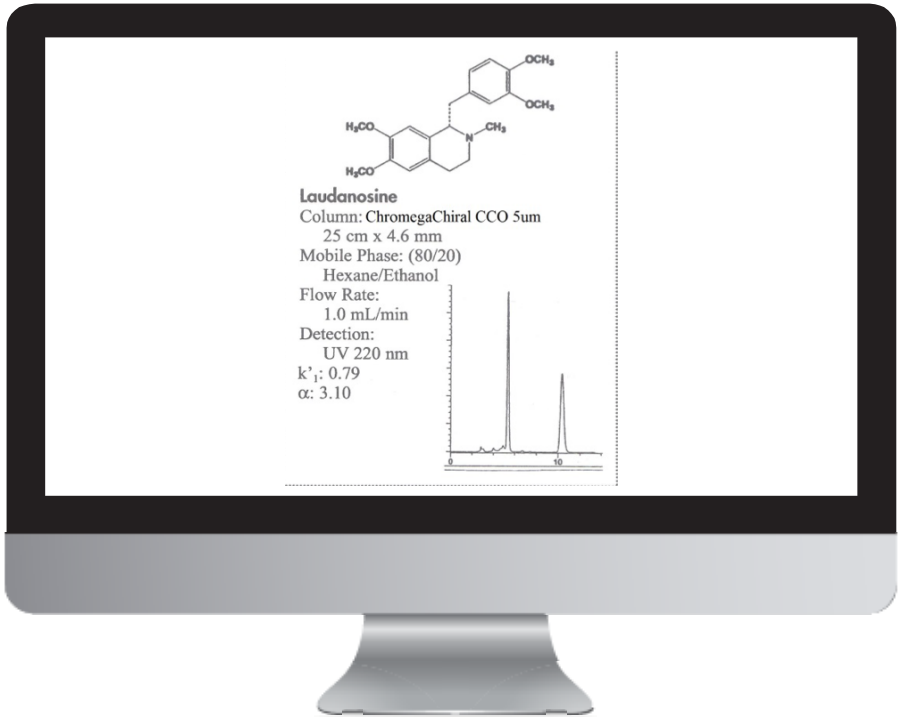
ChromegaChiral CCU a modified amylose includes the combination of methylbenzylcarbamate and 3-chloro 4 methylphenylcarbamate groups. This combination stabilizes the solubility of coated phase making for a durable phase similar to other widely used coated phases.

ChromegaChiral CCX

ChromegaChiral CCX a modified amylose includes the combination of methylbenzylcarbamate and 3,5-dimetheylphenylcarbamate groups. This combination stabilizes the solubility of coated phase making for a durable phase similar to other widely used coated phases.

ChromegaChiral CCO Example

This is an application example of ChromegaChiral CCO



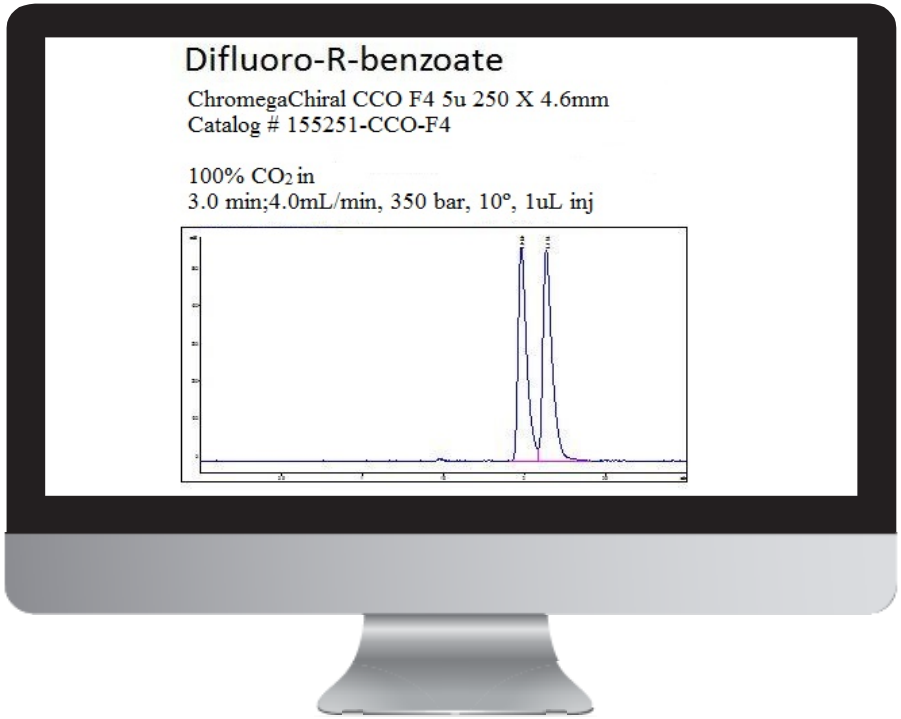
Similar selectivity to ChiralPak® OD!

ChromegaChiral CCO is a polysaccharide coated chiral stationary phase and columns which are produced using a unique production process of coating the proven chiral selector, tris-(3,5-dimethylphenyl) carbamoyl cellulose on high purity, high performance silica. Scale up from analytical to preparative scale using HPLC or SFC conditions is possible with the line of products available..

- Great peak shape
- High efficiency, high resolution.

ChromegaChiral CCO-F4 Example

This is an application example of ChromegaChiral CCO-F4



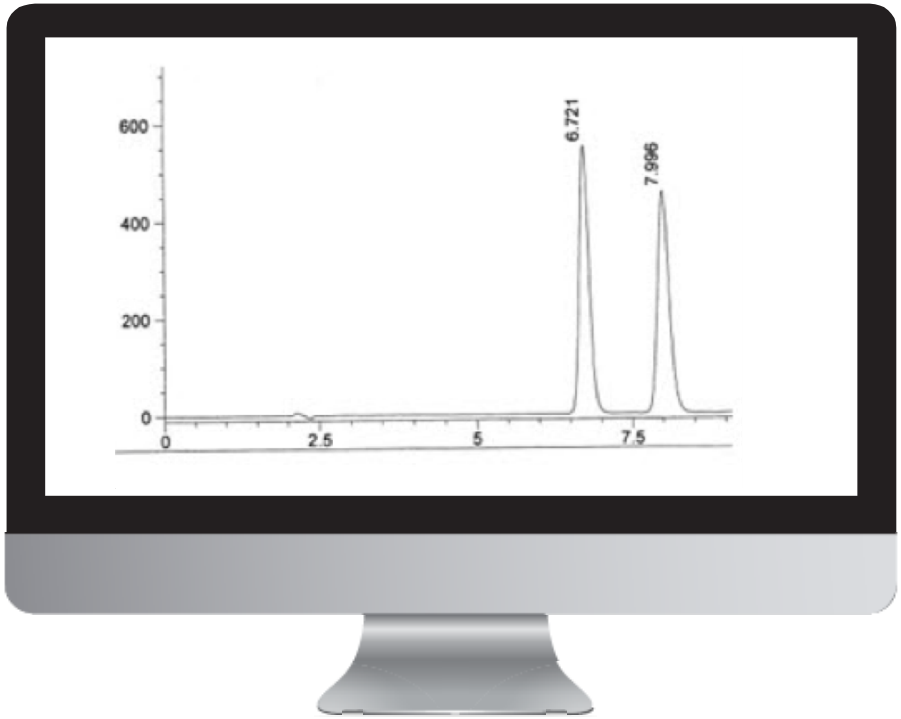
Unique phase – with unique specificity!

ChromegaChiral CCO F4 is a 4-Fluoro 3-methylphenyl cellulose phase which can be used in SFC or HPLC. The addition of a fluorine atom into a phenyl carbamate cellulose structure is useful in promoting a fluorophilic retention mechanism which provides improved retention for fluorinated compounds. A fluorophilic retention mechanism is particularly useful in medicinal chemistry and drug discovery, where more than a third of all newly approved small molecule drugs contain fluorine.

- Already a winner in the pharmaceutical industry.

ChromegaChiral CCA Example

This is an application example of ChromegaChiral CCA



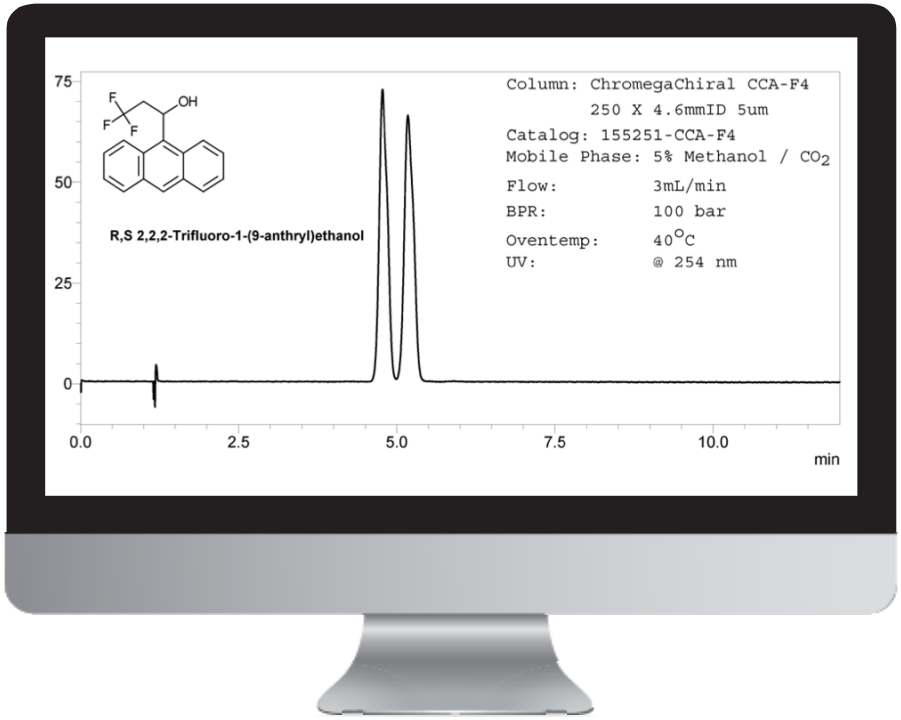
Similar selectivity to ChiralPak® AD!

ChromegaChiral CCA is a polysaccharide coated chiral stationary phase and columns which are produced using a unique production process of coating the proven chiral selector, tris-(3,5-dimethylphenyl) carbamoyl amylose on high purity silica gel. Scale up from analytical to preparative scale using HPLC or SFC conditions is possible with the line of products available..

- Competes very well with the leading material in the market
- Great resolution between isomers

ChromegaChiral CCA-F4 Example

This is an application example of ChromegaChiral CCA-F4



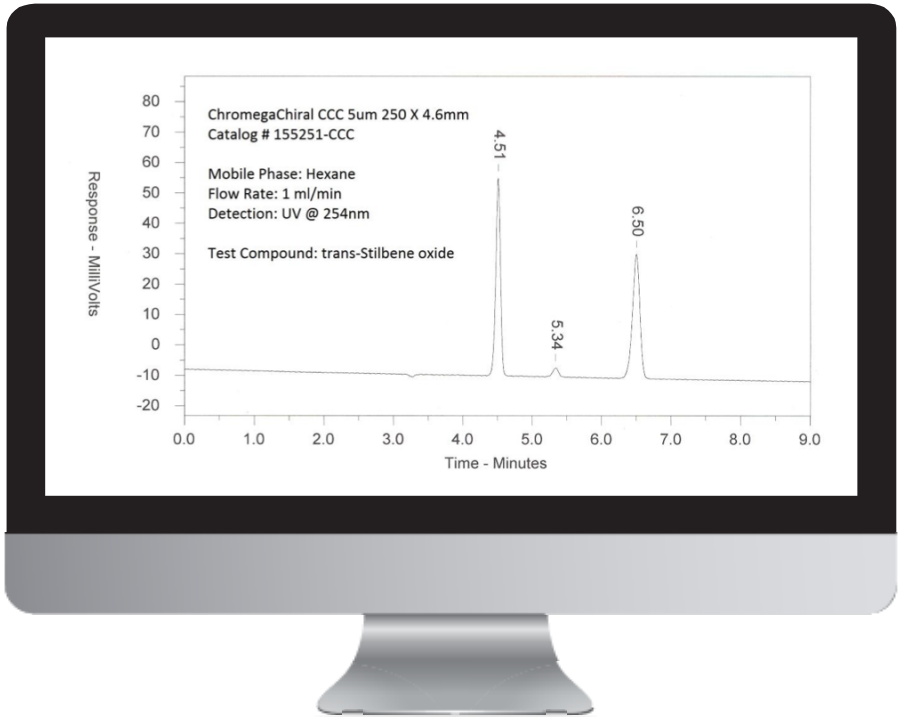
Unique phase – with unique specificity!

ChromegaChiral CCA F4 incorporates a fluoro group in its structure. The addition of a fluorine atom into a phenyl carbamate amylose structure promotes a fluorophilic retention mechanism which provides improved retention for fluorinated compounds. A fluorophilic retention mechanism is particularly useful in medicinal chemistry and drug discovery, where more than a third of all newly approved small molecule drugs contain fluorine atoms. ChromegaChiral CCA-F4 is an 4-Fluoro 3-methylphenyl amylose phase which can be used in SFC or HPLC.

- Another unique winner in the pharmaceutical industry.

ChromegaChiral CCC Example

This is an application example of ChromegaChiral CCC



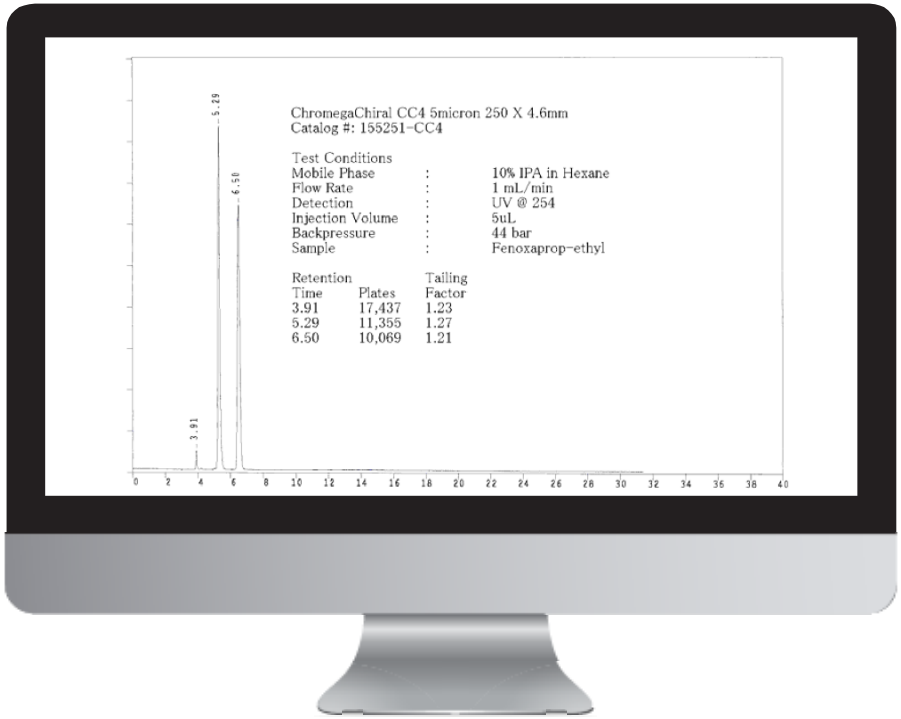
Easy to scale-up!

ChromegaChiral CCC is a modified cellulose including the combination of 3-chloro-4 methylphenylcarbamate and 3,5-dichloro-phenylcarbamate bonding groups coated on high purity, high performance spherical silica particles. This combination of bonded groups stabilizes the solubility of coated phase making for a durable phase. The use of cellulose modified with chlorinated phenyl groups provides unique separation characteristics and results in the separation of many previously unresolved/poorly resolved chiral mixtures.

- A unique alternative to ChromegaChiral CCO and CCA
- Great resolution and peak shape – important for scale-up

ChromegaChiral CC4 Example

This is an application example of ChromegaChiral CC4



Similar selectivity to ChiralPak® OZ-H!

ChromegaChiral CC4 (cellulose tris(4-chloro-3-methylphenylcarbamate) is based on a new halogenated carbohydrate based chiral stationary phase. It is a modified cellulose coated on high purity, high performance spherical silica particles. The chemical modification includes the chemical bonding of 4-chloro-3 Methylphenylcarbamate to cellulose. The use of cellulose modified with chlorinated phenyl groups provides a separation opportunity for many previously unresolved and poorly resolved chiral mixtures..

- Fast Separation
- Great peak shape

Chiral Column Flow Chart

This is an example of the selection process