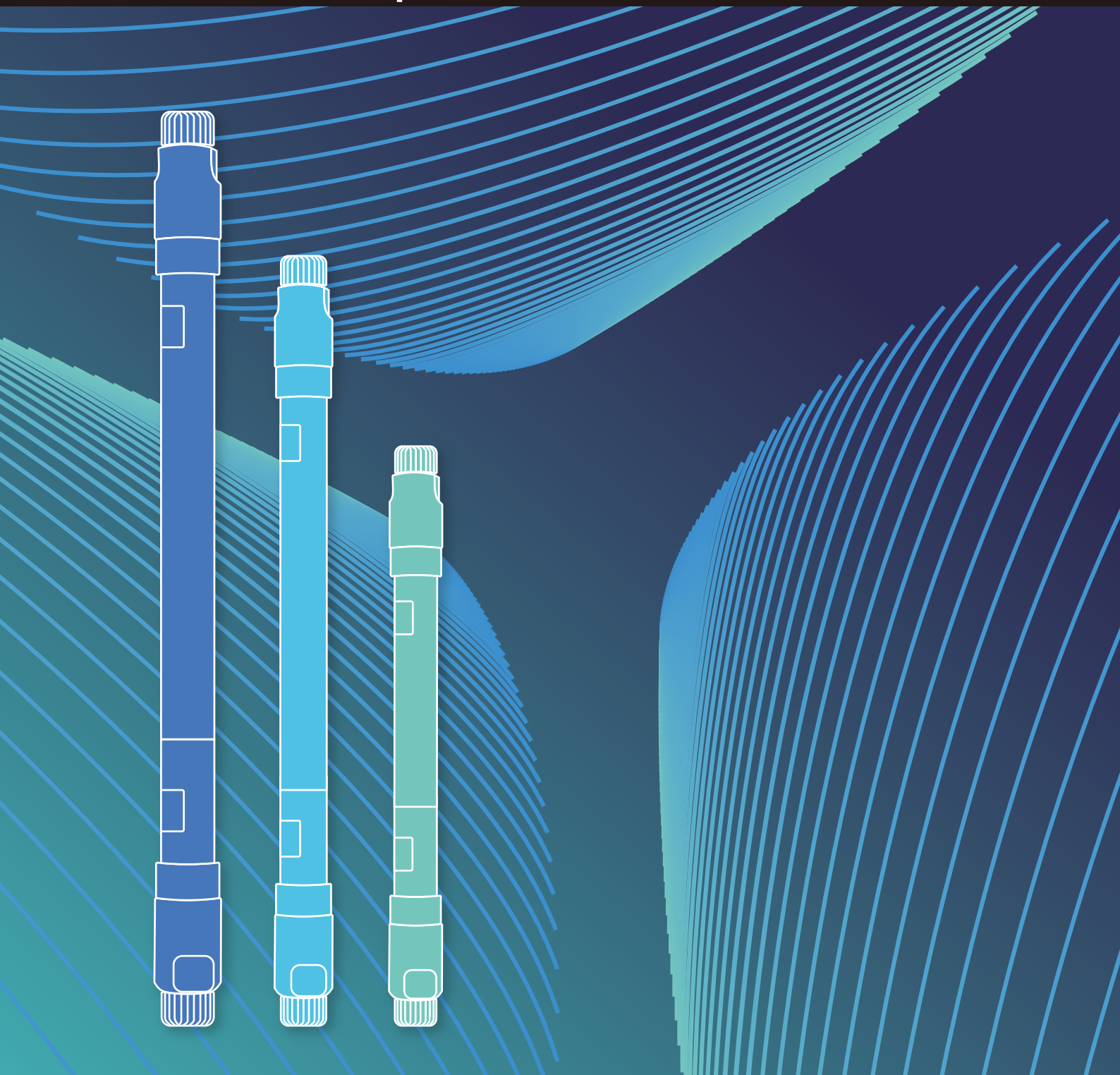
Exmere Ltd

Silica Engineering

Exsil Chiral

Simplify Chiral Separation

Over 30 Years of Experience



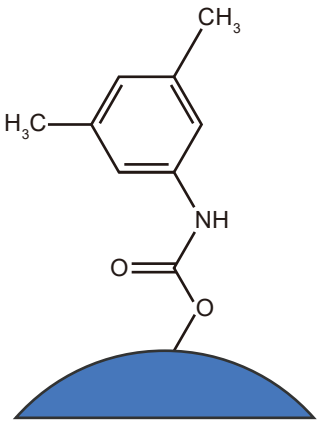
Discover new Possibilities

Silica Bulk for LC/SFC

the best for the best

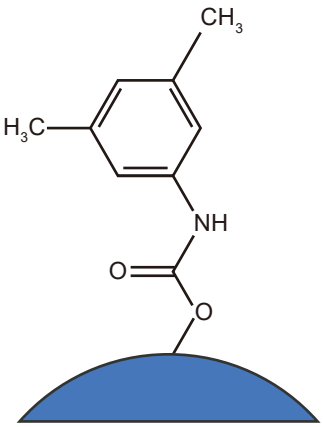
- Ultra High Efficiency
- Perfect Reproducibility
- Extensive CSPs
- Easy to Scale up

EXMERE IMMOBOLIZED POLYSACCHARIDE CHIRAL COLUMN FAMILY
MEETING ALL YOUR LC/SFC NEEDS



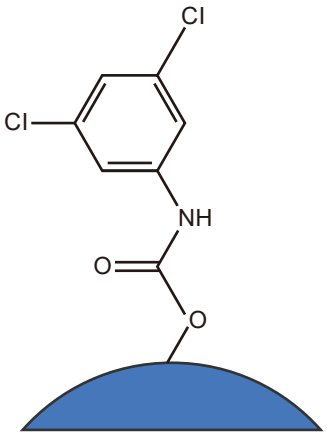
Exsil Chiral MIA

Amylose tris-(3,5-Dimethylphenyl) carbamate mod. Silica



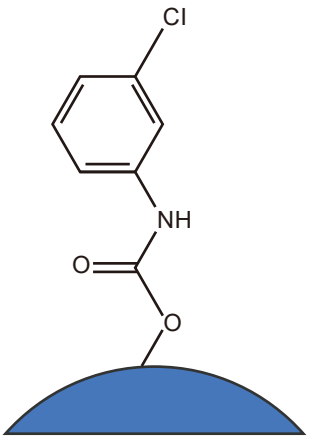
Exsil Chiral MIB

Cellulose tris-(3,5-Dimethylphenyl) carbamate mod. Silica



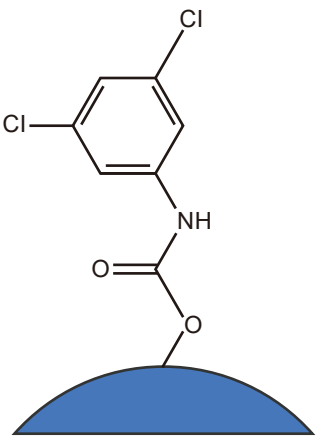
Exsil Chiral MIC

Cellulose tris-(3,5-Dichlorophenyl) carbamate mod. Silica



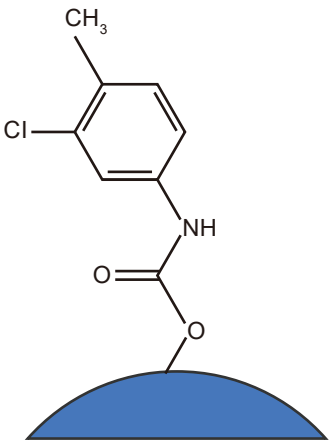
Exsil Chiral MID

Amylose tris-(3-Chlorophenyl) carbamate mod. Silica



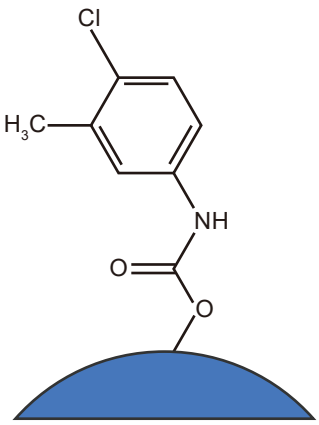
Exsil Chiral MIE

Amylose tris-(3,5-Dichlorophenyl) carbamate mod. Silica



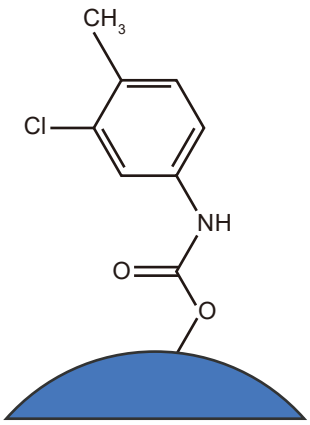
Exsil Chiral MIF

Amylose tris-(3-Chloro-4-Methylphenyl) carbamate mod. Silica



Exsil Chiral MIX

Cellulose tris-(4-Chloro-3-Methylphenyl) carbamate mod. Silica



Exsil Chiral MIZ

Cellulose tris-(3-Chloro-4-Methylphenyl) carbamate mod. Silica

EXPERTS FOR PREPARATIVE LC / HPLC & SFC

Particle Size: 3-50 µm

ID: 8-200 mm

LD: 50-500 mm

Multipackers

MultiPacker® packing station and Spring® columns can deliver improved performance, productivity, and safety. Unlike competitive systems, the column can be removed from the MultiPacker® packing station and the DAC (Dynamic Axial Compression) mechanism remains contained within the column.

Spring® Columns

The Spring® column system has a unique portable design with patented internal dynamic axial compression (DAC) technology that gives DAC performance independently from the external packing device.
The columns are suitable for HPLC and SFC.

Polysaccharide Immobilized Chiral Column

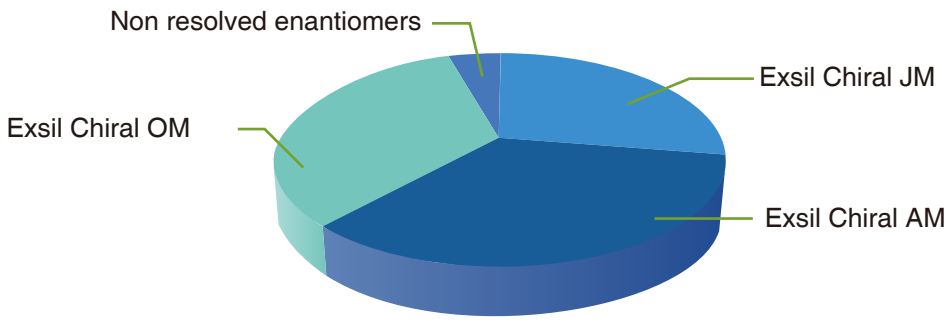
NPLC+SFC	RPLC	Chiral Stationary Phase Description	Particle Size
Exsil-Chiral-MIA	Exsil-Chiral-MIA-R	Amylose tris-(3,5-dimethylphenyl)carbamate mod. Silica	3, 5, 10, 20 µm
Exsil-Chiral-MIB	Exsil-Chiral-MIB-R	Cellulose tris-(3,5-dimethylphenyl)carbamate mod. Silica	3, 5, 10, 20 µm
Exsil-Chiral-MIC	Exsil-Chiral-MIC-R	Cellulose tris-(3,5-Dichlorophenyl)carbamate mod. Silica	3, 5, 10, 20 µm
Exsil-Chiral-MID	Exsil-Chiral-MID-R	Amylose tris-(3-Chlorophenyl)carbamate mod. Silica	3, 5, 10, 20 µm
Exsil-Chiral-MIE	Exsil-Chiral-MIE-R	Amylose tris-(3,5-Dichlorophenyl)carbamate mod. Silica	3, 5, 10, 20 µm
Exsil-Chiral-MIF	Exsil-Chiral-MIF-R	Amylose tris-(3-Chloro-4-Methylphenyl)carbamate mod. Silica	3, 5, 10, 20 µm
Exsil-Chiral-MIX	Exsil-Chiral-MIX-R	Cellulose tris-(4-Chloro-3-Methylphenyl)carbamate mod. Silica	3, 5, 10, 20 µm
Exsil-Chiral-MIZ	Exsil-Chiral-MIZ-R	Cellulose tris-(3-Chloro-4-Methylphenyl)carbamate mod. Silica	3, 5, 10, 20 µm

MORE THAN 90% OF SEPARATIONS

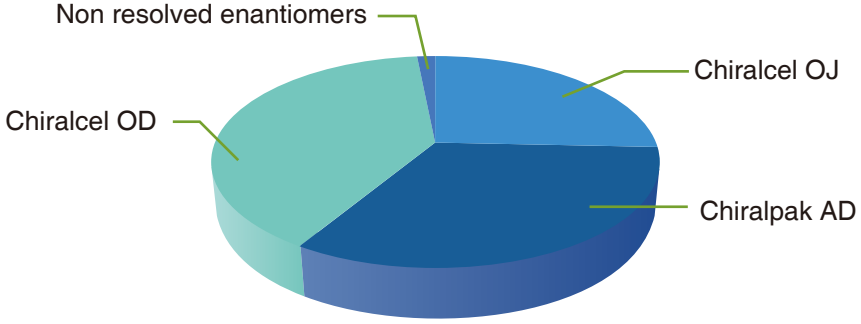
Exsil chiral columns are complementary and successful in achieving more than 90% of separations of the solute set.

Exsil Chiral JM and OM allow performing rather equivalent performance compared to their original homologous CSP's. Only Exsil Chiral AM shows a lower number of successful separations than Chiralpak AD (similarly to all other AD clones). Exsil Chiral CM does not resolve the 8% of non - separated enantiomers but is rather redundant to the other three for this particular solute set.

EXSIL CHIRAL COLUMNS



DAICEL CHIRAL COLUMNS



EVALUATION OF EXSIL CHIRAL OM vs. OD

Evaluation of a silica phase modified with cellulose tris-(3,5-dimethylphenyl-carbamate) "Exsil Chiral-OM" in supercritical fluid chromatography. Syame Khater and Caroline West, University of Orleans, CNRS UMR 7311, ICOA

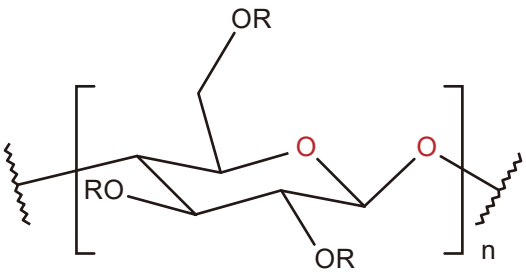
EXPERIMENT

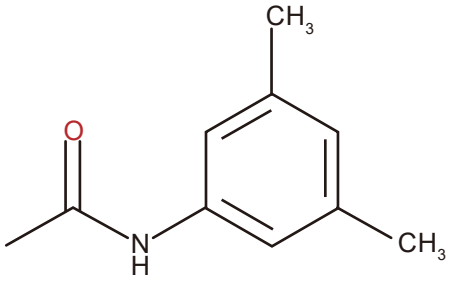
All experiments were performed on a Jasco SFC system and an Acquity UPC² system. Exsil Chiral-OM is based on silica coated with tris-(3,5-dimethylphenylcarbamate) of cellulose. Two hundred and thirty achiral compounds and one hundred and thirty chiral racemic compounds were screened on different polysaccharide-type chiral stationary phases in SFC in the following operating conditions:

CO2 /MeOH (90:10), flow rate 3 ml/min, oven temperature 25°C, outlet pressure 150 bars.

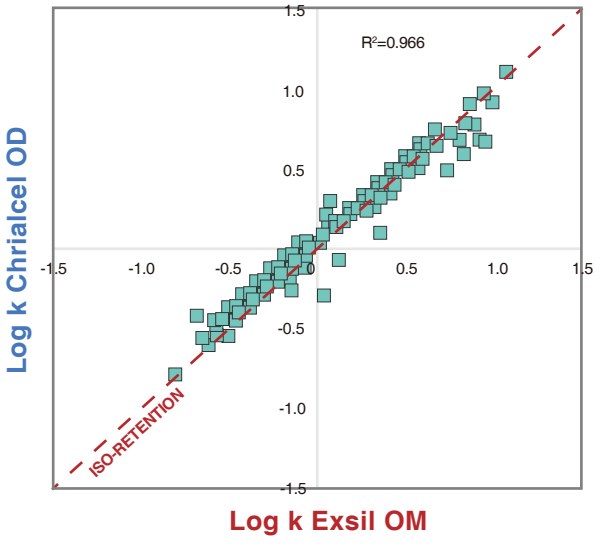
NON-SPECIFIC INTERACTIONS AND RETENTION

Retention on tris-(3,5-dimethylphenylcarbamate) of cellulose could be explained by non-specific interactions such as π-π interactions, hydrogen bonding and stereo-induced interactions.



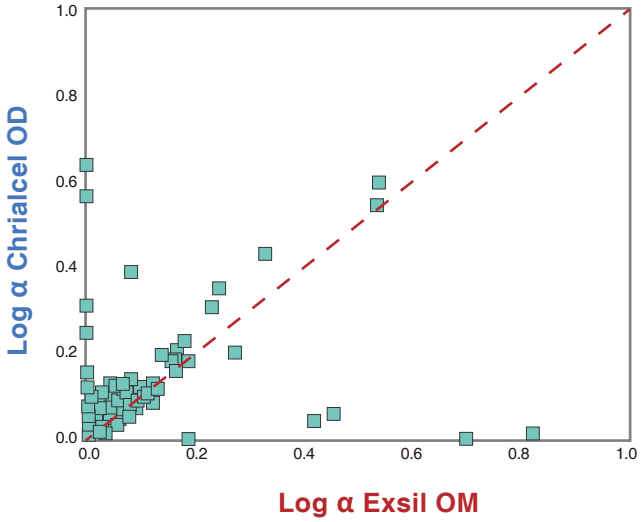


The investigation on non-specific interactions that control retention is based on the analysis of 230 achiral compounds. The κ-κ plot on the right compares the logarithms of retention factors of 168 achiral species on Chiralcel OD vs. Exsil Chiral-OM. The phases are expected to be similar since they possess the same chiral selector (R^2 =0.966). They would provide similar non-specific interactions.



PERFORMANCE

The α-α plot on the right side compares the logarithm of separation factors measured for 130 racemates on Exsil Chiral-OM and Chiralcel OD.
The major part of the compounds is located on the dotted line, indicating similar separation behaviour of the two columns. Chiralcel OD provides a higher number of unique hits. Indeed, 81% of the tested chiral species are resolved on Exsil Chiral-OM against 86% on Chiralcel OD. However, some racemates are well separated on Exsil chiral-OM with little or no separation on Chiralcel OD.

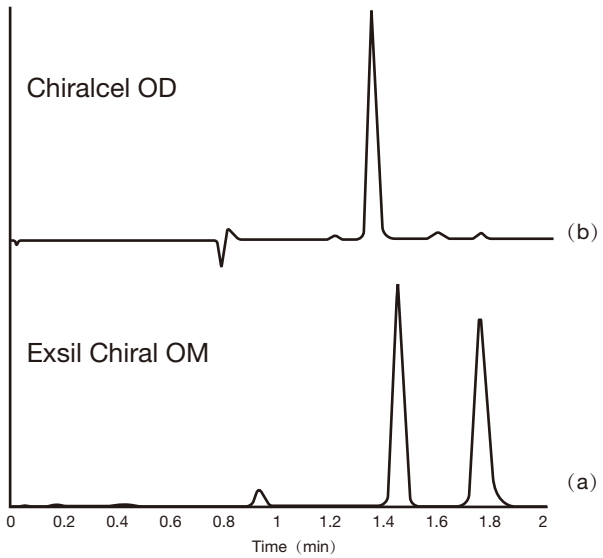


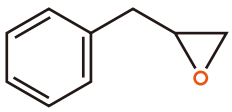
APPLICATIONS

The following chromatograms illustrate the complementary of the generic phases having cellulose tris-(3,5-dimethylphenyl-carbamate) as chiral selector in the course of method development

• Focus on Exsil Chiral-OM versus Chiralcel OD.

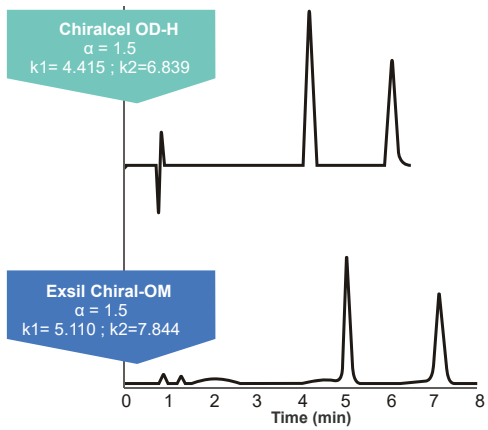
The chromatograms illustrate the chiral compounds that are well resolved on Exsil Chiral-OM (a) but have no separation on Chiralcel OD (b) .

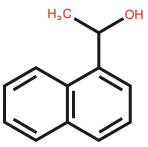




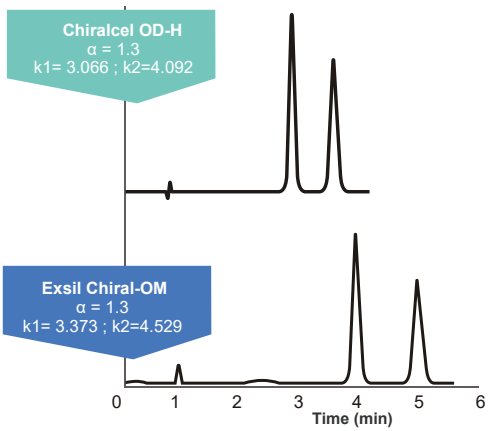
(2,3-epoxypropyl)-benzene

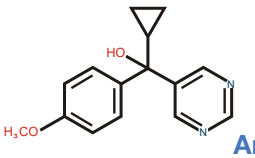
COMPARISON OF EXSIL CHIRAL OM AND CHIRACEL OD-H



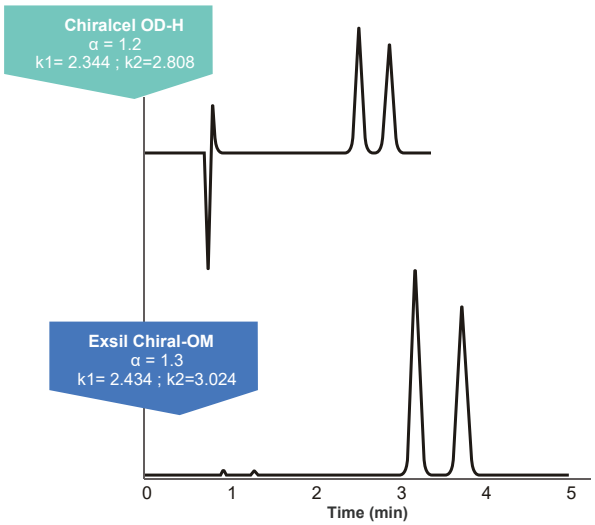


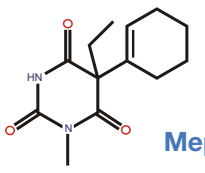
1-(1-Naphthyl)-ethanol



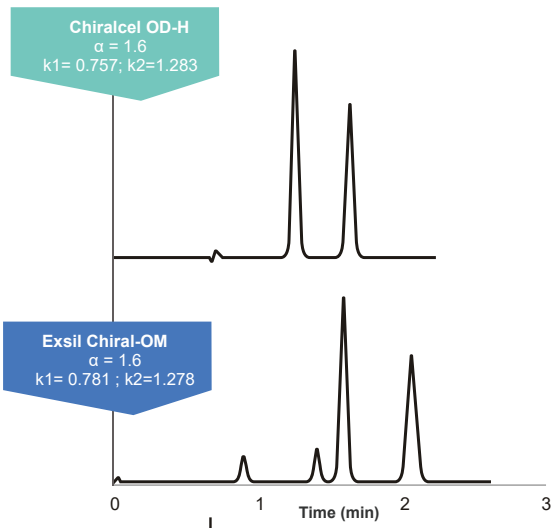


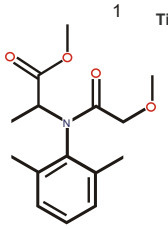
Ancymidol





Mephobarbital



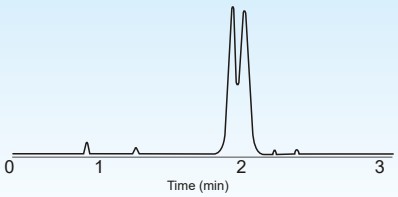


Metalaxyl

COMPARISON OF USP-L40 CHIRAL COLUMNS

The analysis of fenamiphos, gluthetimide and 5-methyl-5-phenylhydantoin on Exsil Chiral-OM (left-hand chromatogram) provide a better starting point for method development than those on RegisCell, Lux Cellulose-1 and Cellucoat, respectively (right-hand chromatogram).

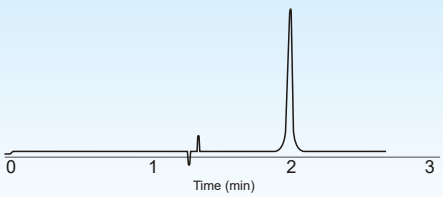
SEPARATION



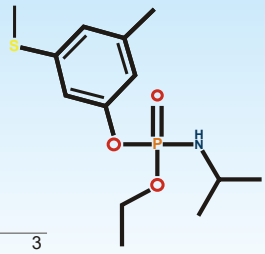
Exsil Chiral-OM

VS.

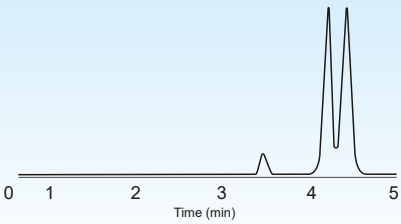
NO SEPARATION



RegisCell

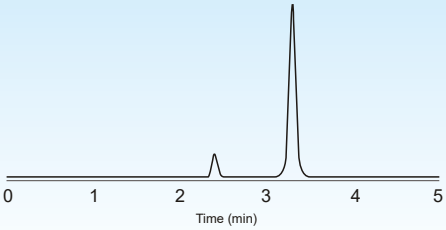


Fenamiphos

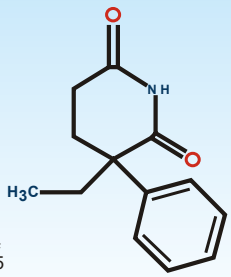


Exsil Chiral-OM

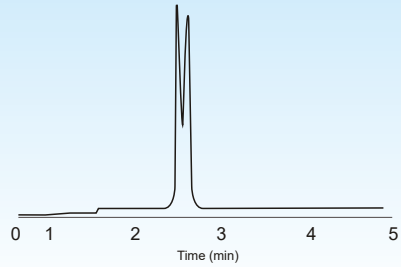
VS.



Lux Cellulose-1

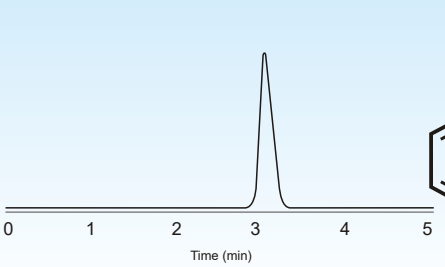


Gluthetimide

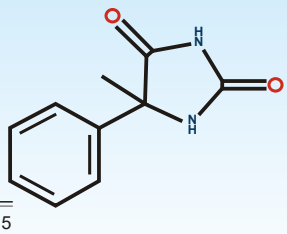


Exsil Chiral-OM

VS.



CelluCoat



5-Methyl-5-phenylhydantoin

EXSIL CHIRAL-AM (USP-L51)

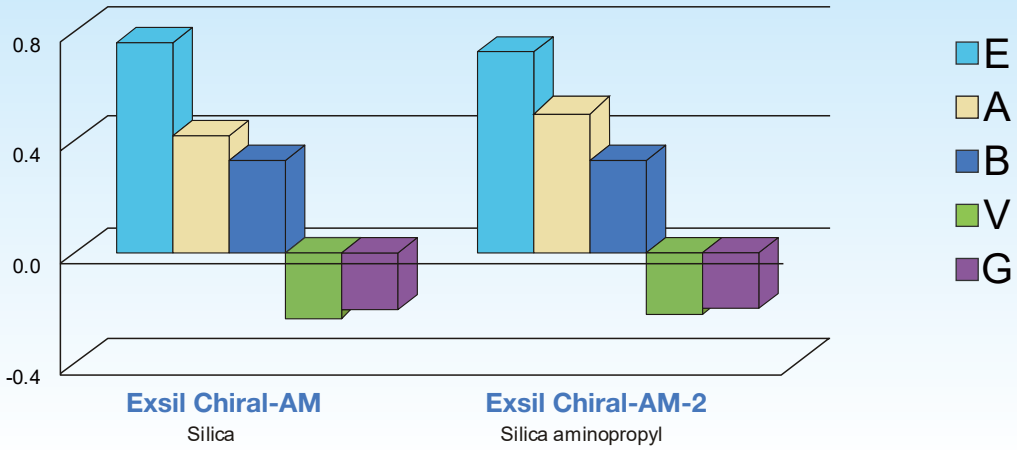
QUESTION:

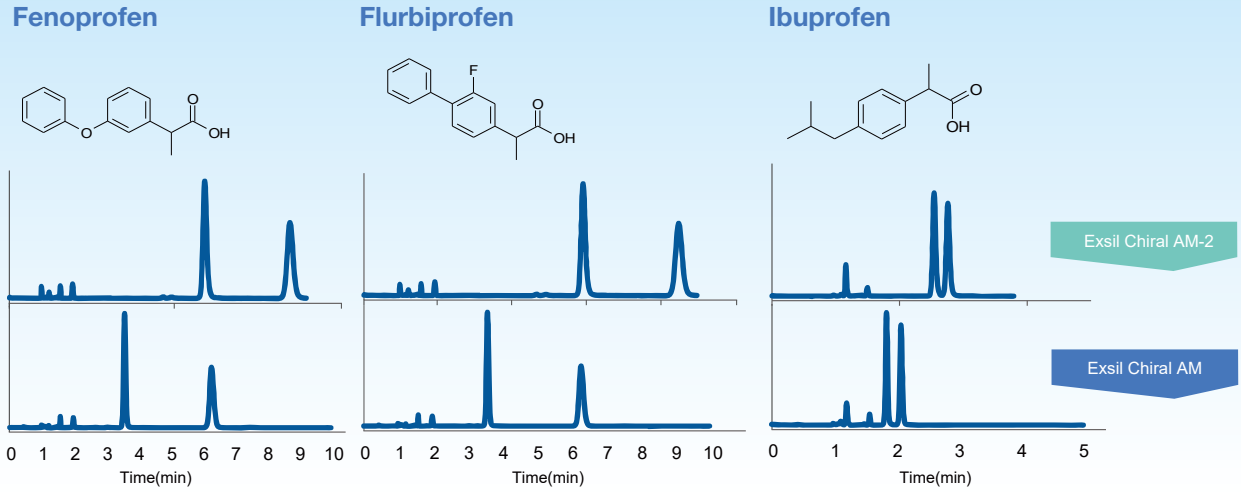
Does the nature of silica treatment affect the retention ability?

ANSWER:

The interactions with hydrogen donor (a coefficient in yellow) are significantly lower on AM. Interactions with acids are thus lower.

The analysis of 3 nonsteroidal anti-inflammatory drugs (Fenoprofen, Flurbiprofen and Ibuprofen) on AM-2 (upper chromatograms) thus provides higher retention than that on AM (bottom chromatograms)

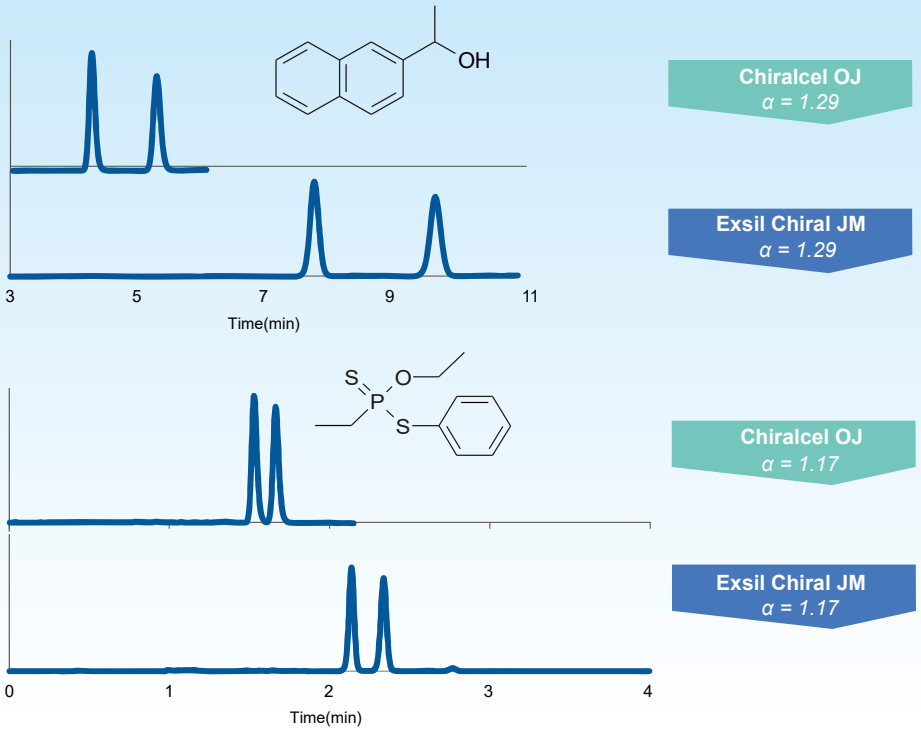


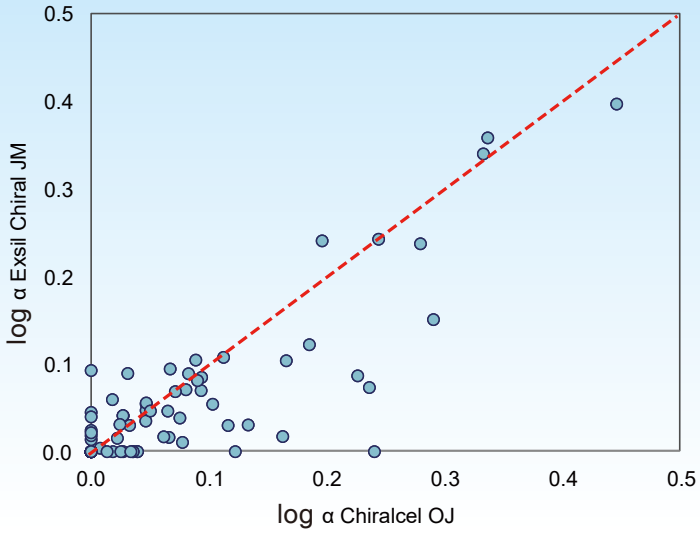


SEPARATION ABILITY OF JM AND OJ (USP-L80)

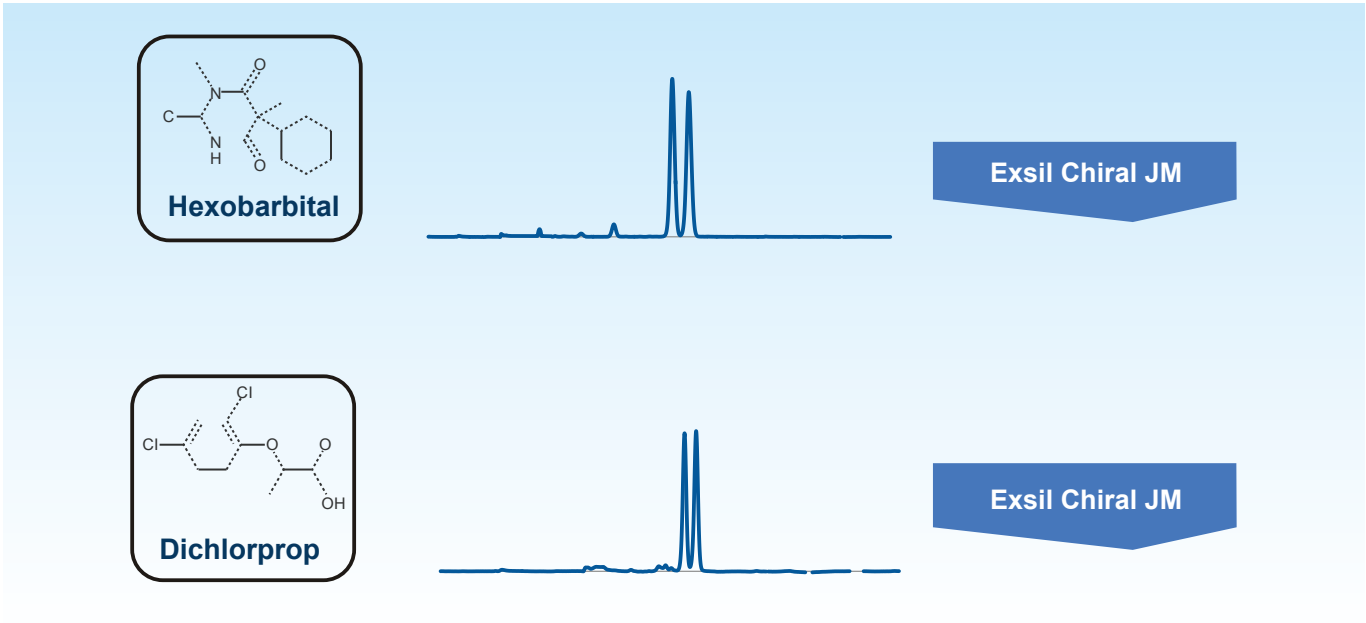
The log α - log α plot compares the separation ability of JM and OJ.

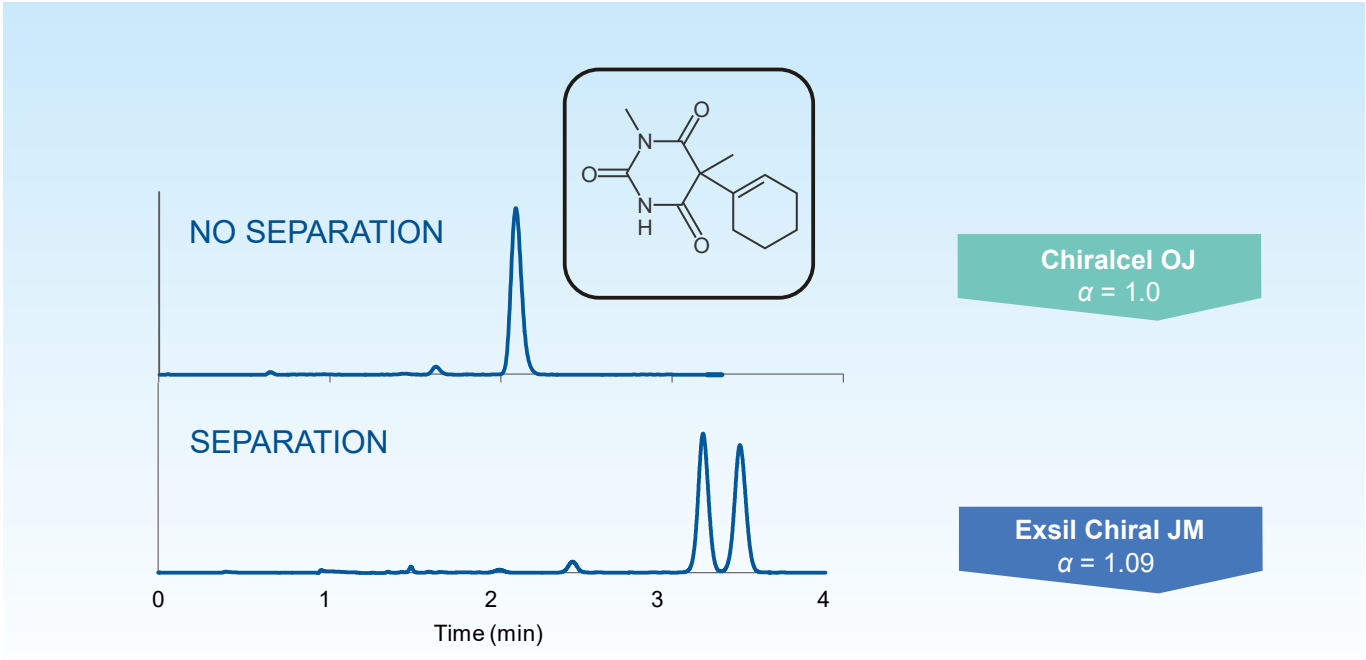
The data points located on the first bisector (red dotted line) show similar separation profiles. The chromatograms of 1-(2-Naphthyl)-ethanol and Fonofos illustrate chiral compounds with identical separation factors on both columns.





The analysis of Hexobarbital on Exsil Chiral-JM provides a better starting point for method development than those on Chiral-AM or Chiral-OM.





COMPARISON OF EXSIL CHIRAL-AM / OM / NR WITH HPLC

Exsil Chiral-AM and Exsil Chiral-OM

are new polysaccharide Chiral Stationary Phases. The chiral selectors are amylose-tris-(3,5-dimethylphenyl-carbamate) for Chiral-AM and cellulose-tris-(3,5-dimethylphenyl-carbamate) for Chiral-OM. Both selectors are coated with an ultra pure silica with 1000 Å pores.
Exsil Chiral-AM is equivalent to Chiralpak AD, and Exsil Chiral-OM is equivalent to Chiralcel OD from Daicel. Dr. Maisch's company offers them in 2 different CSP versions: Exsil Chiral-AM and Chiral-OM are designed for separations in normal phase mode, Exsil Chiral-AM-RP and Chiral-OM-RP for separations in reversed phase mode. Both Exsil Chiral-AM and Chiral-OM columns are able to separate neutral, acidic and basic racemates.

Exsil Chiral-NR

is an immobilized brush-type phase with very broad generality and complementary selectivity to Exsil Chiral-AM and OM. In many cases it is similar to Exsil Chiral-AM or Chiral-OM, but much more stable. The Chiral-NR selector is covalently bound, so that you can use all HPLC-eluents. This is similar to the immobilized IA, IB and IC columns.
It is a perfect column for preparative separation.

Eluents:

In normal phase mode, typical eluents are hexane / IPA or heptane / IPA mixtures.
Basic samples: To prevent peak tailing of basic compounds please add 0.1 – 0.5% Diethylamine or Triethylamine.
Acidic samples: To prevent peak tailing of acidic compounds please add 0.1 – 0.5% TFA or acetic acid.
In reversed phase mode, typical eluents are Acetonitrile / Water mixtures. You can also use MeOH or Ethanol instead of Acetonitrile. The water content must be below 85%.
For basic compounds please use 0.5 – 1N Perchlorate or 0.1% TFA. For acidic compounds please use $HClO_4$ / $NaClO_4$ buffers together with ACN.

Sample preparation / Temperature / Pressure / Guard:

Please dissolve the samples in the eluent. The samples should be filtered. For a longer life span, a guard column is recommended. Best temperature range: 0-40 °C. Max-pressure is 150 bar.

Attention:

Please never use coated (not immobilized) chiral phases with the following eluents, which may destroy the columns: Ethers, THF, Dioxane, Dichlormethane, Chloroform, Ketones, Ethylacetate, DMSO, Dimethylformamide (DMF), Dimethylacetamide and 50-100% IPA.

Comparison of 3 most important chiral columns by Dr. Maisch:

Table 1. Chromatographic properties of the neutral racemates.

Eluent: Heptane / IPA (90/10), Flow: 1 ml/min, Column dimension: 250 x 4.6 mm

Column	Exsil Chiral-NR	Exsil Chiral-OM	Exsil Chiral-AM
Benzoin	a = 2.6 k'1 =2.4 N =7500	a = 1.5 k'1 =2.7 N =6800	a = 1.4 k1 =5.5 N =14000
1,1-Binaphtol	a = n.s. k'1 = 1.2	a =1.2 k'1 = 3.7 N = 2600	a = 1.3 k'1 = 10.0 N = 6200
Trans-Stilbenoxide	a = 3.3 k'1 = 0.78 N = 8900	a = 2.1 k'1 = 0.81 N = 1 1000	a = 3.0 k'1 = 0.79 N = 12000
1,1-Binaphtol	a = n.s. k'1 = 1.2	a =1.2 k'1 = 3.7 N = 2600	a = 1.3 k'1 = 10.0 N = 6200

Table 2. Chromatographic properties of the basic racemates.

Eluent: Heptane / IPA (90/10) + 0.1% DEA, Flow: 1 ml/min, Column dimension: 250 x 4.6 mm

Column	Exsil Chiral-NR	Exsil Chiral-OM	Exsil Chiral-AM
Bupivacine	a = 1.5 k'1 =5.7 N = 5800	a = 1.15 k'1 =0.6 N = 4600	
Carbinoxamine	a = 1.2 k'1 = 5.0 N = 400	a =1.4 k'1 = 0.7 N = 7500	a = 1.4 k'1 = 1.3 N = 10000
Clenbuterol	a = 1.4 k'1 = 2.1 N = 3800	a = no separation k'1 = 0.7	a = no separation k'1 = 1.9
Ketamine	a = 1.1 k'1 = 2.0 N =6 200	a = 1.2 k'1 =1.1 N = 6500	a = 1.0 k'1 =1.2
Oxamniquine	a = 1.1 k'1 = 10.6 N = 3100	a = 1.1 k'1 =3.8 N =3100	a = 1.2 k'1 = 5.6 N = 10400
Oxprenolol	a = 1.3 k'1 = 2.3 N = 3000	a = 6.3 k'1 = 1.9 N = 3200	a = 1.7 k'1 = 1.1 N = 9000
1-(1-Phenyl)-ethylamine	a = no separation k'1 = 2.2	a = 1,3 k'1 = 1,1 N = 7500	a = no separation k'1 = 0,5
Troeger 's base	a = 1.9 k'1 = 1.1 N = 5900	a = 1.3 k'1 = 1.0 N = 6000	a = 1.8 k'1 = 0.8 N = 9000

Table 3. Chromatographic properties of the acidic racemates.

Eluent: Heptane / IPA (90/10) + 0.1% TFA , Flow: 1 ml/min, Column dimension: 250 x 4.6 mm

Column	Exsil Chiral-NR	Exsil Chiral-OM	Exsil Chiral-AM
CBZ-Alanine (210 nm)	a = 1.3 k'1 = 3.2 N = 5700	a = 2.9 k'1 = 2.0 N = 3100	a = 2.1 k'1 = 3.7 N = 9200
Flurbiprofen	a = 1.3 k'1 = 1.0 N = 6900	a = 1.1 k'1 = 0.7 N = 6000	a = 1.7 k'1 = 1.2 N = 11600
Sulindac	a = no separation k'1 = 3.0		a = 1.4 k'1 = 1.9 N = 10200
Proglumide Eluent: Heptane/EtOH (9/1)+ 0.1 TFA	a = 1.6 k'1 = 4.3 N = 5900	a = 2.2 k'1 = 0.7 N = 3800	a = 1.8 k'1 = 2.4 N = 5000

Rules of thumb for chiral separation

Exsil Chiral-NR	Exsil Chiral-OM	Exsil Chiral-AM
-Sample needs an oxygen at or near the chiral centre and an aromatic ring. -More predictable. -Inversion of elution order possible. -Very high prep. capacity -Stable in all HPLC-eluents.	-High versatile chiral phase. -No aromatic ring necessary. -No inversion of elution order possible -Scale up possible -Caution: Not stable in all eluents.	-Highest generality of all chiral phases. -No aromatic ring necessary. -No inversion of elution order possible -Scale up possible -Caution: Not stable in all eluents.

ORDERING INFORMATION

(Same prices for 4.6 mm, 4.0 mm, 3.0 mm and 2.0 mm id columns)

Exsil Chiral-NR

Immobilized brush-type phases, Dinitro-compounds.

π-electron acceptor / π-electron donor phase. Particularly for aromatic compounds with O or N near chiral-centre.

Chiral separations in NP and RP-Modus

with: 3 µm (PN:6136231)	250 x 4.6 mm 150 x 4.6 mm 100 x 4.6 mm
with: 5 µm (PN:6136251), 8 µm (PN:6136281)	250 x 4.6 mm 150 x 4.6 mm 100 x 4.6 mm 250 x 10 mm 250 x 20 mm

Exsil Chiral-NR-R Reversed Elution order compared to Exsil Chiral-NR / Antipode of Chiral-NR

with: 3 µm (PN:6136230), 5 µm (PN:6136250)	250 x 4.6 mm 150 x 4.6 mm 100 x 4.6 mm 250 x 10 mm 250 x 20 mm

Exsil Chiral-OM (USP-L40, Cellulose tris-(3.5-dimethylphenyl-carbamate) mod. Silica)

Exsil Chiral-OM, 3 µm / Exsil Chiral-OM-R, 3 µm 250 x 4.6 mm 100 x 4.6 mm	Alternative to Daicel OD-3 / OD-3R 150 x 4.6 mm 50 x 4.6 mm	 125 x 4.6 mm 33 x 4.6 mm
Exsil Chiral-OM, 5 µm / Exsil Chiral-OM-R, 5 µm 250 x 4.6 mm 250 x 10 mm	Alternative to Daicel OD-H / OD-RH 150 x 4.6 mm 250 x 20 mm	 100 x 4.6 mm
Exsil Chiral-OM, 10 µm / Exsil Chiral-OM-R, 10 µm 250 x 4.6 mm 250 x 10 mm	Alternative to Daicel OD / OD-R 150 x 4.6 mm 250 x 20 mm	 100 x 4.6 mm
Exsil Chiral-OM, 20 µm / Exsil Chiral-OMR, 20 µm 250 x 4.6 mm 250 x 10 mm	Alternative to Daicel OD / OD-R 150 x 4.6 mm 250 x 20 mm	 100 x 4.6 mm

Exsil Chiral-AM (USP-L51,Amylose tris-3,5-dimethylphenylcarbamate mod. Silica)

Exsil Chiral-AM, 3 µm / Exsil Chiral-AM-R, 3 µm 250 x 4.6 mm 100 x 4.6 mm	Alternative to Daicel AD-3 / AD-3R 150 x 4.6 mm 50 x 4.6 mm	 125 x 4.6 mm 33 x 4.6 mm
Exsil Chiral-AM, 5 µm / Exsil Chiral-AM-R, 5 µm 250 x 4.6 mm 250 x 10 mm	Alternatives to Daicel AD-H / AD-RH 150 x 4.6 mm 250 x 20 mm	 100 x 4.6 mm
Exsil Chiral-AM, 10 µm / Exsil Chiral-AM-R, 10 µm 250 x 4.6 mm 250 x 10 mm	Alternatives to Daicel AD / AD-R 150 x 4.6 mm 250 x 20 mm	 100 x 4.6 mm
Exsil Chiral-AM, 20 µm / Exsil Chiral-AM-R, 20 µm 250 x 4.6 mm 250 x 10 mm	Alternatives to Daicel AD / AD-R 150 x 4.6 mm 250 x 20 mm	 100 x 4.6 mm

Exsil Chiral-AMS (Amylose tris-(S)- α -Methylbenzyl-Carbamate mod. Silica)

Exsil Chiral-AMS, 3 µm / Exsil Chiral-AMS-R, 3 µm
250 x 4.6 mm
100 x 4.6 mm

Alternatives to Daicel AS-3 / AS-3R
150 x 4.6 mm
50 x 4.6 mm
125 x 4.6 mm
33 x 4.6 mm

Exsil Chiral-AMS, 5 µm / Exsil Chiral-AMS-R, 5 µm
250 x 4.6 mm
250 x 10 mm

Alternatives to Daicel AS-H / AS-3R
150 x 4.6 mm
250 x 20 mm
100 x 4.6 mm

Exsil Chiral-AMS, 10 µm / Exsil Chiral-AMS-R, 10 µm
250 x 4.6 mm
250 x 10 mm

Alternatives to Daicel AS / AS-3R
150 x 4.6 mm
250 x 20 mm
100 x 4.6 mm

Exsil Chiral-CM USP-L70 (Tris-(Phenylcarbamate)-Cellulose mod. Silica)

Exsil Chiral-CM, 3 µm / Exsil Chiral-CM-R, 3 µm
250 x 4.6 mm

Alternative to Daicel OC-3
150 x 4.6 mm
100 x 4.6 mm

Exsil Chiral-CM, 5 µm / Exsil Chiral-CM-R, 5 µm
250 x 4.6 mm
250 x 10 mm

Alternative to Daicel OC-H
150 x 4.6 mm
250 x 20 mm
100 x 4.6 mm

Exsil Chiral-CM, 10 µm / Exsil Chiral-CM-R, 10 µm
250 x 4.6 mm
250 x 10 mm

Alternative to Daicel OC
150 x 4.6 mm
250 x 20 mm
100 x 4.6 mm

Exsil Chiral-JM USP-L80 (Tris-(4-Methylbenzoyl)-Cellulose mod. Silica)

Exsil Chiral-JM, 3 µm / Exsil Chiral-JM-R, 3 µm
250 x 4.6 mm

Alternative to Daicel OJ-3 / OJ-3R
150 x 4.6 mm
100 x 4.6 mm

Exsil Chiral-JM, 5 µm / Exsil Chiral-JM-R, 5 µm
250 x 4.6 mm
250 x 10 mm

Alternative to Daicel OJ-H / OJ-RH
150 x 4.6 mm
250 x 20 mm
100 x 4.6 mm

Exsil Chiral-JM, 10 µm / Exsil Chiral-JM-R, 10 µm
250 x 4.6 mm
250 x 10 mm

Alternative to Daicel OJ / OJR
150 x 4.6 mm
250 x 20 mm
100 x 4.6 mm

Exsil Chiral- ZM (Cellulose tris-3-Chloro-4-Methylphenylcarbamate mod. Silica)

Exsil Chiral-ZM, 3 µm / Exsil Chiral-ZM-R, 3 µm
250 x 4.6 mm
100 x 4.6 mm

Alternative to Daicel OZ-3 / OZ-3H
150 x 4.6 mm
50 x 4.6 mm
125 x 4.6 mm
33 x 4.6 mm

Exsil Chiral-ZM, 5 µm / Exsil Chiral-ZM-R, 5 µm
250 x 4.6 mm
250 x 10 mm

Alternative to Daicel OZ-H
150 x 4.6 mm
250 x 20 mm
100 x 4.6 mm

Exsil Chiral-ZA (Amylose tris-3-Chloro-4-Methylphenylcarbamate mod. Silica)

Exsil Chiral-ZA, 3 µm / Exsil Chiral-ZA-R, 3 µm
250 x 4.6 mm
100 x 4.6 mm

Alternative to Daicel AZ-3 / AZ-3R
150 x 4.6 mm
50 x 4.6 mm
125 x 4.6 mm
33 x 4.6 mm

Exsil Chiral-ZA, 5 µm / Exsil Chiral-ZA-R, 5 µm
250 x 4.6 mm
250 x 10 mm

Alternative to Daicel AZ-H /AZ-HR
150 x 4.6 mm
250 x 20 mm
100 x 4.6 mm

Exsil Chiral-YM (Amylose tris-5-Chloro-2-Methylphenylcarbamate mod. Silica)

Exsil Chiral-YM, 3 µm / Exsil Chiral-YM-R, 3 µm
250 x 4.6 mm
100 x 4.6 mm

Alternatives to Daicel AY-3 / AY-3R
150 x 4.6 mm
50 x 4.6 mm
125 x 4.6 mm
33 x 4.6 mm

EXSIL-CHIRAL

Exsil Chiral-BM	(Tris-(Benzoyl)-Cellulose mod.Silica)		
Exsil Chiral-BM, 5 µm / Exsil Chiral-BM-R, 5 µm	250 x 4.6 mm 250 x 10 mm	Alternatives to Daicel OB-H / OB-RH 150 x 4.6 mm 250 x 20 mm	100 x 4.6 mm
Exsil Chiral-BM, 10 µm / Exsil Chiral-BM-R, 10 µm	250 x 4.6 mm 250 x 10 mm	Alternatives to Daicel OB / OB-R 150 x 4.6 mm 250 x 20 mm	100 x 4.6 mm

Other Chiral Phases	
Exsil Chiral-PS, 8 µm, Chiral separations in NP and RP-Modus (for aromatic compounds with S or P, for example: Sulfoxides, Phosphine Oxides, Phosphonates, Thiophosphine Oxides, Phosphine Selenides, Phosphine Boranes) (PN:5135150)	250 x 4.0 mm
Exsil Chiral-OH, 8 µm, Chiral separations in NP-Modus (Aromatic Alcohols with OH near chiral centre, Aryl Carbinols) (PN:5135151)	250 x 4.0 mm
Exsil Chiral-AA, 8 µm, Chiral separations in NP and RP-Modus (for all amino acids, L-form elutes first) (PN:6136826)	250 x 4.0 mm
Exsil Chiral-TAG, 8 µm Chiral separations in NP and RP-Modus (Teicoplanin Aglycon: for Aminoalkohols, N-blocked amino acids, a-Hydroxy Acids, Oxazolidinons, Hydantoins, Imides, Amino Acids) USP-L63 (PN:5135153)	250 x 4.0 mm
Exsil Chiral-Beta-CD, 5 µm USP-L45 (Dansyl-Aminoacids, Barbiturates, Propranolol Sulfonamide, Prostaglandines) (PN:5135154.s2504)	250 x 4.0 mm
Exsil Chiral-Gamma-CD, 5 µm (PN:5135155.s2504)	250 x 4.0 mm
Exsil Chiral-D-PhenylGlycin, 5µm USP-L36, N-(3,5-Dinitrobenzoyl)-D-Phenylglycin. (Herbicides + Pharmaca (Alcohols, Carbon. acids , Esters, Sulfoxides) Fenoprop-Methyl, Mecoprop-Methyl, Supidimid) (PN:5135156.s2504)	250 x 4.0 mm
Exsil Chiral-L-PhenylGlycin, 5µm USP-L36, N-(3,5-Dinitrobenzoyl)-L-Phenylglycin. Antipode to D-PhenylGlycin (Herbicides + Pharmaca (Alkohols, Carbon. Acids , Esters, Sulfoxides) Fenoprop-Methyl, Mecoprop-Methyl, Supidimid) (PN:5135157.s2504)	250 x 4.0 mm
Exsil Chiral-L-Leucin, 5 µm N-(3,5-Dinitrobenzoyl)-L-Leucin, (PN:5135158.s2546)	250 x 4.6 mm
Exsil Chiral-L-Prolin, 5 µm Davankov-Ligand exchange, Aminoacids, Hydantoine, Succinimide, Gluthetimide, Barbiturate, Sulfoxide (PN:5135159.s2504)	250 x 4.0 mm

Other Chiral Phases

Exsil L-Hydroxy-Prolin, 5 µm

Alternative to Nucleosil Chiral-1, USP-L32
Ligand exchange, Eluent: 2-10 mM Coppersulfate , 20-60 C°
(For DL-Atrolactinacid, DL-Mandelic acids, DL-Lactic acid, DL-Asparagin, DL-Serin, DL-Phenylalanin, DL-Threonin, DL-Prolin, DL-Histidin, DL-Valin, DL-Tyrosin, DL-Tryptophan),
(PN:5135160.s2504) | 250 x 4.0 mm

Exsil Chiral-AGP, 5 µm (300 A° Silicagel with chiral AGP–Protein, USP-L41)

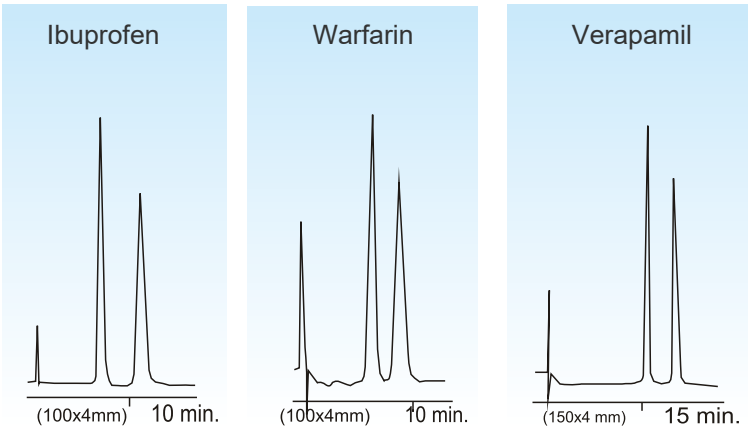
100 x 4 mm (PN: 5135161.s1004)
150 x 3 mm (PN: 5135161.s1503)
Guards: 5 x 3 mm: 2 pieces (PN:5135161.v0003)
Guard-holder (PN:82.00)

100 x 3 mm (PN: 5135161.s1003)
50 x 3 mm (PN: 5135161.s0503)

150 x 2 mm (PN:5135161.s1502)
50 x 2 mm (PN:5135161.s0502)
Guards: 5 x 2 mm: 2 pieces (PN:5135161.v0002)
Guard-holder (PN:92.00)

100 x 2 mm (PN:5135161.s1002)

Chiral separation of Ibuprofen, Warfarin and Verapamil



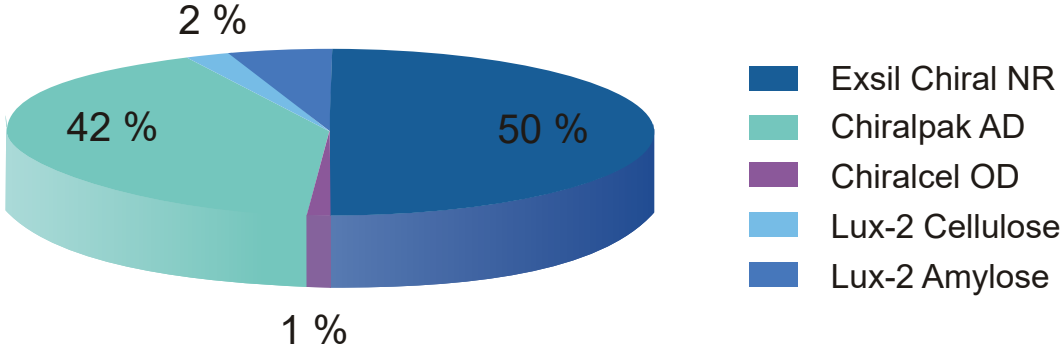
Exsil Chiral-AGP, 5 µm

Eluents:
Ibuprofen
100 mM Na-phosphate buffer, pH 7.0

Warfarin
10% -Propanol in 10 mM Na-phosphate buffer, pH 7.0

Verapamil
12% ACN in 10 mM Na-phosphate buffer, pH 7.0

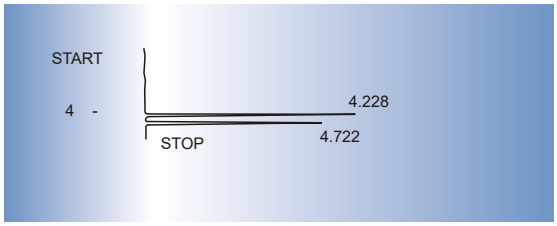
CHIRAL PREPARATIVE SEPARATIONS WITH HPLC BY HOFFMANN-LA ROCHE, BASEL IN 2014



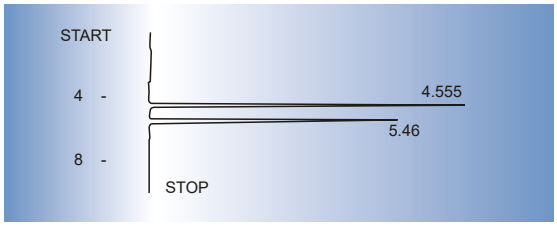
COMPARISON OF CHIRAL PHASES

Column dimensions: 250 x 4.6 mm, Flow: 1 ml/min, Temperature: ambient, Eluent: n-Heptane / Isopropanol (85/15), Sample: Trans-Stilbene-Oxide

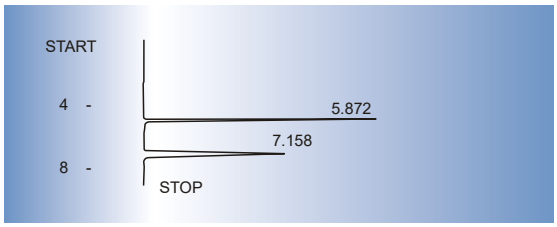
Exsil Chiral-AMS, 5 µm
Alfa-value: 1.35
Typ. N/m: 70 – 80,000



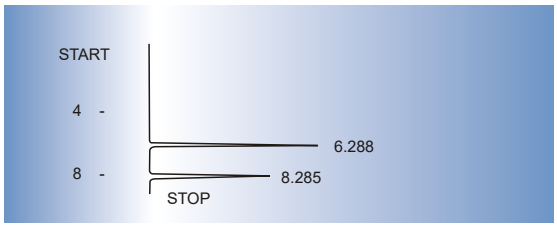
Exsil Chiral-ZA, 5 µm
Alfa-value: 1.5
Typ. N/m: 70 - 80,000



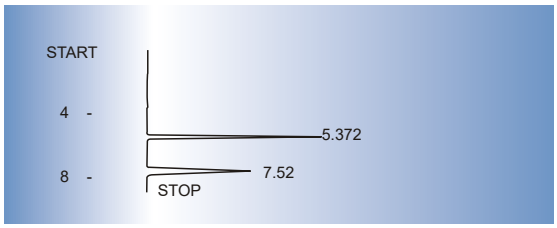
Exsil Chiral-OM, 5 µm
Alfa-value: 2.0
Typ. N/m: 60 -80,000



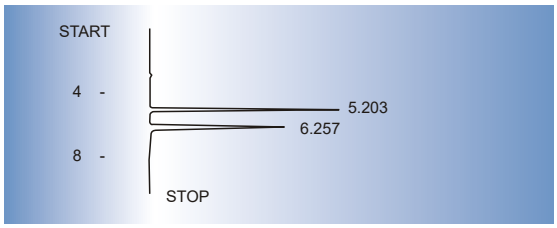
Exsil Chiral-JM, 5 µm
Alfa-value: 1.6
Typ. N/m: 70 -80,000



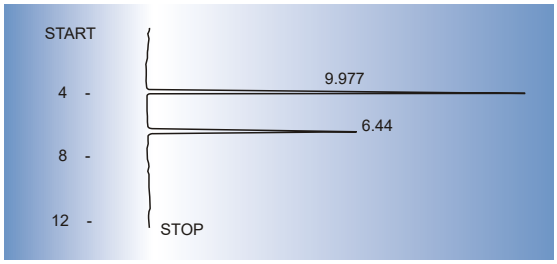
Exsil Chiral-YM, 5 µm
Alfa-value: 1.8
Typ. N/m: 40 - 55,000



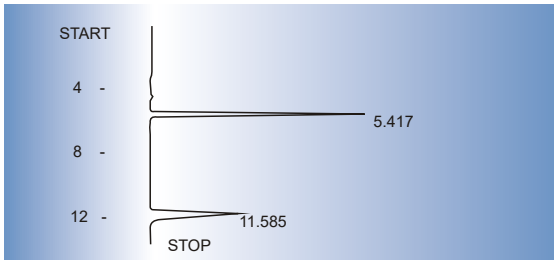
Exsil Chiral-CM, 5 µm
Alfa-value: 1.4
Typ. N/m: 40 – 55,000



Exsil Chiral-ZM, 5 µm
Alfa-value: 3.0
Typ. N/m: 50 - 70,000



Exsil Chiral-NR, 8 µm
Alfa-value: 3.3
Typ. N/m: 25 - 35,000



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