

- Excellent resolution of racemates
- Well established immobilized and coated polysaccharide phases
- HPLC and SFC columns
- Wide range of applications

Daicel chiral HPLC columns are the most widely referenced chiral columns. Chiral Technologies, a subsidiary of Daicel Corporation, offers the complete range of Daicel chiral columns and has the largest portfolio of chiral stationary phases for the separation of racemic mixtures. This includes the CHIRALPAK®, CHIRALCEL® and CROWNPAK® trademarks. Columns from microbore to preparative dimensions can be supplied, allowing smooth transition from laboratory to development, to pilot plant and production. In addition to the well established traditional CHIRALPAK and CHIRALCEL polysaccharide coated silica columns, Daicel manufacture the immobilized polysaccharide CHIRALPAK phases. Also see page 5 for new CHIRALPAK ZWIX zwitterionic chiral phases.

CHIRALPAK® IA, IB, IC, ID, IE and IF Immobilized Phases

- Immobilized chiral selector
- Broad application range
- Universal solvent compatibility – phases suitable for both NP and RP applications
- Higher screening success rate
- Robustness and extended durability

CHIRALPAK IA, IB, IC, ID, IE and IF HPLC and SFC columns are a newer generation of chiral stationary phases (CSPs), in which the polysaccharide chiral selector has been immobilized on to a wide pore silica matrix. This confers universal solvent compatibility on these highly selective chiral stationary phases, without compromising phase stability. The broader range of solvents used as eluents, introduces new selectivity profiles, improved productivity and additional robustness compared with traditional coated polysaccharide phases.

Chiral Selectors

CHIRALPAK IA - based on amylose *tris*(3,5-dimethylphenyl)carbamate (as in CHIRALPAK AD)

CHIRALPAK IB - based on cellulose *tris*(3,5-dimethylphenyl)carbamate (as in CHIRALCEL OD)

CHIRALPAK IC - based on cellulose *tris*(3,5-dichlorophenyl)carbamate

CHIRALPAK ID - based on amylose *tris*(3-chlorophenyl)carbamate

CHIRALPAK IE – based on amylose *tris*(3,5-dichlorophenyl)carbamate

CHIRALPAK IF – based on amylose *tris*(3-chloro, 4-methylphenyl)carbamate

Figures 1, 2 and 3 show examples of separations achieved on CHIRALPAK IA, IB and IC respectively. Figure 4 shows the baseline resolution of enantiomers and conformers of diastereomeric tofisopam on CHIRALPAK ID.

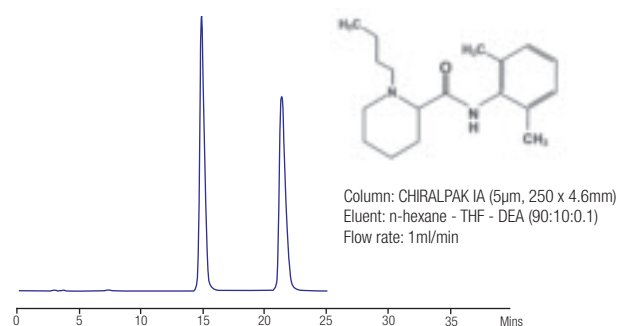


Figure 1. Analysis of bupivacaine on CHIRALPAK IA

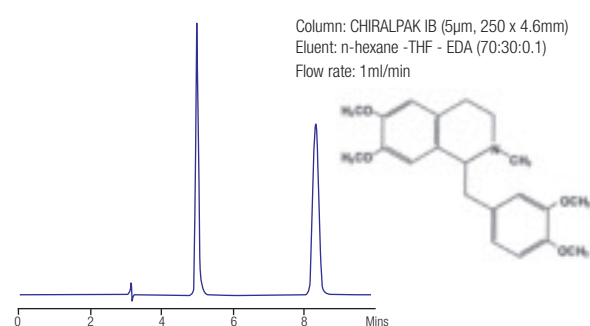


Figure 2. Analysis of laudanosine on CHIRALPAK IB

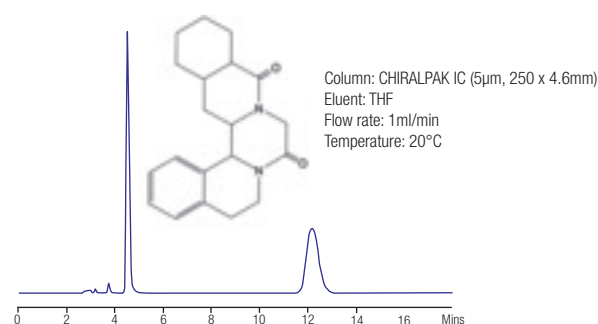


Figure 3. Analysis of praziquantel on CHIRALPAK IC

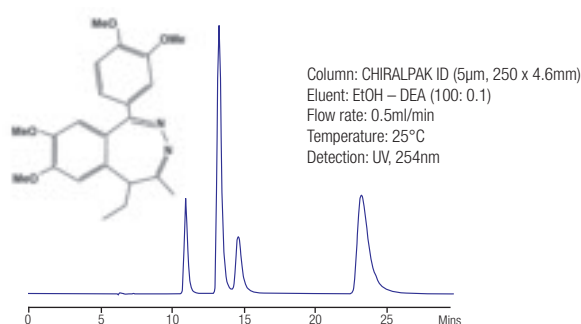


Figure 4. Analysis of tofisopam on CHIRALPAK ID

CHIRALPAK® Immobilized Phases (continued)

3µm Fast Analysis Immobilized Phase Columns

The immobilized product line has been extended by the introduction of 3µm versions of the CHIRALPAK IA, IB, IC, ID, IE and IF phases (CHIRALPAK IA-3, IB-3, IC-3, ID-3, IE-3 and IF-3). These columns are intended for high speed, high efficiency separations of enantiomers and offer the same selectivity and stability characteristics as their 5µm immobilized counterparts. Methods can be transferred directly from 5µm to 3µm particle size columns. Figure 5 shows the fast separation of ornidazole on CHIRALPAK IA-3 in less than one minute.

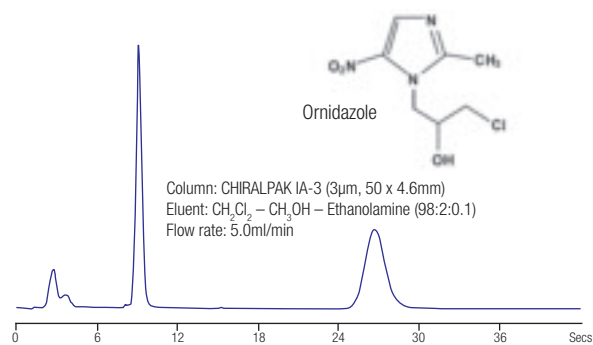


Figure 5. Fast separation on CHIRALPAK IA-3

Features of Immobilized Phases

1) Wide Solvent Compatibility – The immobilization of the selector confers a wide solvent compatibility to these highly selective chiral stationary phases, without compromising phase stability. This is in contrast to traditional, coated polysaccharide phases which have restricted solvent compatibility due to solubility of the polymer coating in certain solvents, including chloroform, methylene chloride, ethyl acetate, acetone, THF and DMF. Immobilized phases can be used in all chromatographic modes: normal- and reversed-phase HPLC, SFC, analytical and preparative, and the same column can be used with all eluent combinations. Figure 6 shows the use of CHIRALPAK IC in different chromatographic modes.

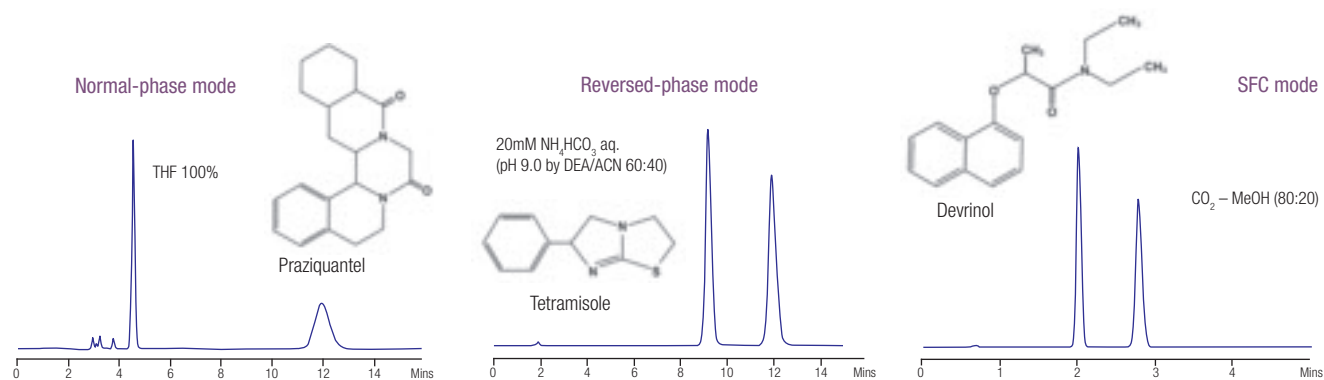


Figure 6. Different chromatographic modes with CHIRALPAK IC

2) Column Regeneration – CHIRALPAK immobilized columns are more robust than their coated analogues. If columns have been used with additives or with multiple solvent changes, a regeneration procedure may be implemented to eliminate any change in chiral recognition. Please contact Hichrom for further details.

3) Screening Strategies – Column screening is simpler, faster and more successful using the four main Daicel immobilized phases (IA, IB, IC and ID). The recommended eluent combinations and typical starting conditions for screening these phases are shown in Table 1.

Table 1. Immobilized primary screening solvents

Primary screening mixtures	Alkane-2-PrOH	Alkane/EtOH	Alkane/MtBE/EtOH	Alkane/DCM/EtOH
Typical starting conditions	80:20	80:20	0:98:2	50:50:2
Advised optimization range	99:1 to 50:50	99:1 to 50:50	80:20:0 to 0:40:60	85:15:0 to 0:100:0

When used in alkane/alcohol solvents, the immobilized columns can separate a significant number of small molecules, combined with the advantage of speed and ease of injecting in any suitable solvent. Figure 7 shows the increased success rate due to the introduction of the newer CHIRALPAK ID phase into a column screen of 123 compounds using a single eluent combination of hexane – 2-PrOH. When these immobilized phase columns are used with the set of four primary screening solvents, the separation success rate can approach 99%. If the desired chiral separation is not achieved, then an extended secondary screen can be applied.

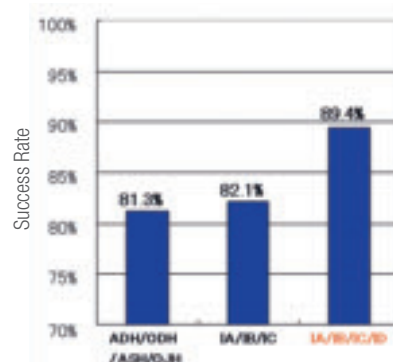


Figure 7. Screening success rates with single eluent

Please see page 86 for ordering information for CHIRALPAK immobilized phases.

Ordering Information - Immobilized Phases

CHIRALPAK 5µm Phase	Column Dimensions (mm)					Analytical Guard Cartridge ¹ (For 4.6mm i.d. Columns)	Semi-prep Guard Column ² (For 10 and 20mm i.d. Columns)
	150 x 2.1	150 x 4.6	250 x 4.6	250 x 10	250 x 20		
IA	80394	80324	80325	80335	80345	80311	80337
IB	81394	81324	81325	81335	81345	81311	81337
IC	83394	83324	83325	83335	83345	83311	83337
ID	84394	84324	84325	84335	84345	84311	84337
IE	85394	85324	85325	85335	85345	85311	85337
IF	86394	86324	86325	86335	86345	86311	86337

CHIRALPAK 3µm Phase	Column Dimensions (mm)					Analytical Guard Cartridge ¹ 3/pk (For 4.6mm i.d. Columns)
	150 x 2.1	50 x 4.6	100 x 4.6	150 x 4.6	250 x 4.6	
IA-3	80594	80522	80523	80524	80525	80511
IB-3	81594	81522	81523	81524	81525	81511
IC-3	83594	83522	83523	83524	83525	83511
ID-3	84594	84522	84523	84524	84525	84511
IE-3	85594	85522	85523	85524	85525	85511
IF-3	86594	86522	86523	86524	86525	86511

¹ Use with holder 00011

and column coupler 000D1

² No holder required

Ordering Information - Traditional Phases

10µm Phase ¹	Column Dimensions (mm)				Analytical Guard Cartridge ² (For 4.6mm i.d. Columns)	Semi-prep Guard Column ³ (For 10mm i.d. Columns)
	150 x 2.1	250 x 4.6	250 x 10	250 x 20		
Normal-phase						
CHIRALPAK AD	19094	19025	19035	19045	19311 ⁴	19032
CHIRALPAK AS	20094	20025	20035	20045	20311 ⁴	20032
CHIRALCEL OD	-	14025	14035	14045	14311 ⁴	14032
CHIRALCEL OJ	-	17025	17035	17045	17311 ⁴	17032
Reversed-phase						
CHIRALCEL OD-R	-	14625	-	-	14611	-

5µm Phase	Column Dimensions (mm)					Analytical Guard Cartridge ² 3/pk (For 4.6mm i.d. Columns)
	150 x 2.1	150 x 4.6	250 x 4.6	250 x 10 ⁵	250 x 20	
Normal-phase						
CHIRALPAK AD-H	19394	19324	19325	19335	19345	19311
CHIRALPAK AS-H	20394	20324	20325	20335	20345	20311
CHIRALCEL OD-H	14394	14324	14325	14335	14345	14311
CHIRALCEL OJ-H	17394	17324	17325	17335	17345	17311
CHIRALPAK AZ-H	61394	61324	61325	61335	61345	61311
CHIRALPAK AY-H	47394	47324	47325	47335	47345	47311
CHIRALCEL OZ-H	42394	42324	42325	42335	42345	42311
CHIRALCEL OX-H	63394	63324	63325	63335	63345	63311
Reversed-phase						
CHIRALPAK AD-RH	19794	19724	-	-	-	19711
CHIRALPAK AS-RH	20794	20724	-	-	-	20711
CHIRALCEL OD-RH	14794	14724	-	-	-	14711
CHIRALCEL OJ-RH	17794	17724	-	-	-	17711
CHIRALPAK AZ-RH	61794	61724	-	-	-	61711
CHIRALPAK AY-RH	47794	47724	-	-	-	47711
CHIRALCEL OZ-RH	42794	42724	-	-	-	42711
CHIRALCEL OX-RH	63794	63724	-	-	-	63711

¹ Other phases and column dimensions available

² Use with holder 00011 and column coupler 000D1

³ No holder required

⁴ 5µm material

⁵ Semi-prep guard column available – please enquire

Ordering Information - Traditional Phases (continued)

3µm Phase	Column Dimensions (mm)					Analytical Guard Cartridge ¹ 3/µk (For 4.6mm i.d. Columns)
	150 x 2.1	50 x 4.6	100 x 4.6	150 x 4.6	250 x 4.6	
Normal-phase						
CHIRALPAK AD-3	19594	19522	19523	19524	19525	19511
CHIRALPAK AS-3	-	20522	20523	20524	20525	20511
CHIRALCEL OD-3	14594	14522	14523	14524	14525	14511
CHIRALCEL OJ-3	-	17522	17523	17524	17525	17511
CHIRALPAK AZ-3	-	61522	61523	61524	61525	61511
CHIRALPAK AY-3	-	47522	47523	47524	47525	47511
CHIRALCEL OZ-3	-	42522	42523	42524	42525	42511
CHIRALCEL OX-3	63594	63522	63523	63524	63525	63511
Reversed-phase						
CHIRALPAK AD-3R	19894	19822	19823	19824	-	19811
CHIRALPAK AS-3R	-	20822	20823	20824	-	20811
CHIRALCEL OD-3R	14894	14822	14823	14824	-	14811
CHIRALCEL OJ-3R	-	17822	17823	17824	-	17811
CHIRALPAK AY-3R	-	47822	47823	47824	-	47811
CHIRALPAK AZ-3R	-	61822	61823	61824	-	61811
CHIRALCEL OZ-3R	-	42822	42823	42824	-	42811
CHIRALCEL OX-3R	63894	63822	63823	63824	-	63811

¹ Use with holder 00011 and column coupler 000D1

Ordering Information - SFC Phases

5µm Phase	Column Dimensions ¹ (mm)		
	100 x 4.6	250 x 10	250 x 20
CHIRALPAK IA SFC	80423	80435	80445
CHIRALPAK IB SFC	81423	81435	81445
CHIRALPAK IC SFC	83423	83435	83445
CHIRALPAK ID SFC	84423	84435	84445
CHIRALPAK IE SFC	85423	85435	85445
CHIRALPAK IF SFC	86423	86435	86445
CHIRALPAK AD-H SFC	19423	19435	19445
CHIRALPAK AS-H SFC	20423	20435	20445
CHIRALCEL OD-H SFC	14423	14435	14445
CHIRALCEL OJ-H SFC	17423	17435	17445
CHIRALPAK AZ-H SFC	61423	61435	61445
CHIRALPAK AY-H SFC	47423	47435	47445
CHIRALCEL OZ-H SFC	42423	42435	42445
CHIRALCEL OX-H SFC	63423	63435	63445

¹ Please enquire regarding larger i.d. prep columns
