CHIRAL TECHNOLOGIES INC
DAICEL GROUP
Innovation Begins Here
Immobilized Chiral Stationary Phases

The $R^3$ Advantage
Why Immobilized Phases? Move Ahead

- Stable to all normal phase, polar & reversed phase solvents ... just like the achiral HPLC columns you use
- Solvent flexibility enhances the probability of success
- For preparative separations the wide range of compatible solvents allows best sample solubility
- New Chiral Selectors previously not accessible, due to their solubility in the mobile phase, are now possible (CHIRALPAK IC / IE and ID)

Our portfolio of R³ Advantage CSPs
Robust, Reliable, Reproducible – continues to expand
## Immobilized Chiral Stationary Phases

<table>
<thead>
<tr>
<th>I-CSP</th>
<th>Selector</th>
<th>Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>IA</td>
<td>Amylose 3,5-dimethylphenylcarbamate</td>
<td><img src="" alt="Structure" /></td>
</tr>
<tr>
<td>IB</td>
<td>Cellulose 3,5-dimethylphenylcarbamate</td>
<td><img src="" alt="Structure" /></td>
</tr>
<tr>
<td>IC</td>
<td><strong>Cellulose</strong>&lt;br&gt;3,5-dichlorophenylcarbamate</td>
<td><img src="" alt="Structure" /></td>
</tr>
<tr>
<td>ID</td>
<td>Amylose 3-chlorophenylcarbamate</td>
<td><img src="" alt="Structure" /></td>
</tr>
<tr>
<td>IE</td>
<td><strong>Amylose</strong>&lt;br&gt;3,5-dichlorophenylcarbamate</td>
<td><img src="" alt="Structure" /></td>
</tr>
<tr>
<td>IF</td>
<td>Amylose 3-chloro-4-methylphenylcarbamate</td>
<td><img src="" alt="Structure" /></td>
</tr>
</tbody>
</table>
### Polysaccharide Chiral Stationary Phases Coated Selectors

<table>
<thead>
<tr>
<th>Memory effects</th>
<th>Care has to be taken to regenerate coated selectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solvent immiscibility</td>
<td>Solvent immiscibility may cause column inlet clogged causing high pressure developed</td>
</tr>
<tr>
<td>Analyte solubility</td>
<td>Solvent selection restricted</td>
</tr>
</tbody>
</table>
## Immobilized Stationary Phases

### Move Ahead

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Coated Selectors</th>
<th>Immobilized Selectors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reliability</strong></td>
<td>Daicel authentic selectors</td>
<td>Daicel authentic selectors</td>
</tr>
<tr>
<td><strong>Robustness</strong></td>
<td>Restricted solvent selection</td>
<td><strong>Solvent flexibility</strong></td>
</tr>
<tr>
<td><strong>Reproducibility</strong></td>
<td>Affected by possible memory effects</td>
<td><strong>Easy column regeneration</strong></td>
</tr>
<tr>
<td>Loading capacity</td>
<td>High loading capacity</td>
<td>High loading capacity greatly improved due to analyte solubility</td>
</tr>
</tbody>
</table>
**Complementarity**

**CHIRALPAK IA**

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**Meclizine**

Column size: 0.46mm ID x 250mm long  
Mobile phase: n-Hexane/IPA/DEA=95/5/0.1  
Flow rate: 1.0ml/min  
Temperature: 25℃  
Detection: UV 254nm

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**γ-Phenyl-γ-butyrolactone**

Column size: 0.46mm ID x 250mm long  
Mobile phase: n-Hexane/EtOH=90/10  
Flow rate: 1.0ml/min  
Temperature: 25℃  
Detection: UV 220nm
Complementarity
CHIRALPAK IB & IC

Indapamide

Column size: 0.46mm x 250mm long
Mobile phase: n-Hexane/EtOH/DEA=50/50/0.1
Flow rate: 1.0ml/min
Temperature: 25°C
Detection: UV 254nm

5-Benzylhydantoin

Column size: 0.46mm x 250mm long
Mobile phase: n-Hexane/IPA=80/20
Flow rate: 1.0ml/min
Temperature: 25°C
Detection: UV 220nm
Complementarity
CHIRALPAK ID

Amlodipine

Column size: 0.46mm x 25 mm long
Mobile phase: n-hexane/IPA/MEA*=80/20/0.1
Flow rate: 1.0ml/min.
Temperature: 40°C
Detection: UV 254nm

*MEA=2-aminoethanol

Cisapride

Column size: 0.46mm x 250mm long
Mobile phase: n-Hexane/IPA/DEA=50/50/0.1
Flow rate: 1.0ml/min.
Temperature: 25°C
Detection: UV 254nm
Complementarity
CHIRALPAK IE

Retention Time [min]

Column size: 0.46mm ID x 250 mm long
Mobile phase: n-Hexane/EtOH/AcOH/DEA=50/50/0.1/0.1
Flow rate: 1.0ml/min.
Temperature: 25°C
Detection: UV 230nm

Cetirizine

\[
\text{Cl} - \text{C}_6\text{H}_4 - \text{N} - \text{CH}_2 - \text{CH}_2 - \text{O} - \text{O} - \text{COOH}
\]
Complementarity
CHIRALPAK IF

Retention Time [min]

Column size 0.46mm ID x 250mm long
Mobile phase n-Hexane/EtOH/DEA=50/50/0.1
Flow rate 1.0ml/min.
Temperature 25℃
Detection UV 230nm

Methyclothiazide

H₂N
O
S
O
Cl
Complete Product Portfolio

Polysaccharides: CHIRALPAK® and CHIRALCEL®

Normal and Reversed Phases

- Immobilized polysaccharides: IA, IB, IC, ID, IE, IF
- AD, AS, AY, AZ
- OB, OC, OD, OF, OG, OJ, OK, OZ
- 3-µm polysaccharides: IA, IB, IC, ID, IE, IF
  AD, AS, AY, AZ, OD, OJ, OZ, OX

Specialty Selectors

- Protein-based Phases -- CHIRALPAK AGP, HSA and CBH
- Ligand Exchange: MA+, WH
- Chiral Crown Ethers: CR+, CR-
- Lindner Anion Exchange Phases: QD-AX, QN-AX