Axia PREP LC columns offer:

- Increased Performance
- Groundbreaking Lifetimes
- Optimized Loadability
- Increased Reproducibility

THE ULTIMATE PRE-PACKED PREPARATIVE COLUMN FOR HPLC AND SFC GUARANTEED!

Axia PREP LC columns offer:

- Increased Performance
- Groundbreaking Lifetimes
- Optimized Loadability
- Increased Reproducibility

phenomenex®...breaking with tradition™
The Axia™ Advantage

Available in over 40 unique achiral and chiral selectivities, Axia advanced preparative column packing and column hardware design offer several advantages. Unlike traditional column packing methods, the Axia packing method offers increased sorbent bed density for increased performance and eliminates media bed collapse as a source of premature column failure in preparative HPLC/SFC columns.

If Axia packed columns do not provide at least an equivalent separation as compared to a competing preparative column of the same particle size, same phase, and dimensions, return the product with comparative data within 45 days for a FULL REFUND. Only applies to 21.2 mm ID columns.
I find Axia Columns to be very robust and durable. I often use the prep column for much longer than predicted with reproducible peaks. This saves us a significant amount of money.

David Wisnoski
GlaxoSmithKline, USA
Axia™ Technology vs. Traditional “OBD™” Prep Column Packing

Axia Packing Technology
Axia packed preparative columns involve a single axial compression step unlike conventional packed preparative columns. The ideal column bed density is custom calculated and automated for each specific media and column size. Computer control of the entire process ensures both proper bed density and column uniformity every time.

During the Axia packing process, the packing piston is locked in place, eliminating any decompression and then recompression of the media sorbent, thus maintaining media and column bed integrity. This solves common lifetime and performance problems associated with conventional packing processes for preparative columns.

Traditional Slurry Packing
Traditional slurry packing processes, like the Waters® OBD (Optimum Bed Density) column packing approach, involve the column being removed from the column packing station once it is packed.

Several potential problems with this packing method are:
- Variability in column performance due to increased number of manual operations required for assembly
- Potential silica media damage during recompression
- Level of process control is based on traditional slurry packing technology

Conventional Packing Process Involves:
Compression → Decompression → Recompression → Final Column

Diagram from Waters Corporation U.S. Patent No. 7,399,410
We are using chromatography media from Phenomenex for GPL/GMP purposes, therefore we audited Phenomenex USA as a manufacturer. From the beginning, we were impressed with Phenomenex and the attitude of their employees. Phenomenex is a unique company in many aspects. Their degree of dedication to customer service, to the organization of the QMS system and last but not least the positive atmosphere in the company is impressive. The outcome of the audit was to our fullest satisfaction.

Major Generic Pharma Company, Europe

Axia™ packed columns produce uniform media bed with intact particles

The highly tuned patented process and hardware eliminates potential decompression ensuring bed stability and optimal packing density.

The media found on the inlet frit of the Axia packed column shows no signs of damage unlike the media found on inlet frit of traditionally packed prep columns.

Traditional packed preparative columns produce non-uniform media beds with sheared and crushed particles

Decompression and then recompression during packing can damage the media and lead to increased column-to-column variability, flow disturbances, and decreased column lifetimes.
Axia™ Technology Outperforms Traditional Packing Processes!

Because of the constant pressure placed on the integrated packing piston, Axia packed columns possess the dynamic capability of maintaining a consistent, homogeneous media bed. This results in superior column performance no matter which media selectivity you choose.

To better understand how much Axia technology improves column performance over traditionally slurry packed preparative columns we scaled-up a 5 μm Lux® Cellulose-1 chiral media analytical column and packed the same media into two different 150 x 21.2 mm I.D. columns. One column was packed using Axia technology and the other prep column was packed using the traditional slurry packing process.

The Axia packing technology had a substantial increase in column efficiency resulting in increased resolution over traditionally packed preparative columns. With increased resolution you are able to increase your sample load enabling you to purify more target compound(s) per purification run. This equates to better throughput and economics.

Warfarin Chiral Purification in Normal Phase Mode

For more detailed information on this warfarin application, request technical note: TN-9002: Scaling from Analytical to Preparative Chiral Chromatography While Balancing Purity, Yield, and Throughput under HPLC and SFC Conditions

42% Increase in Efficiency

43% Increase in Resolution

Tip: For more detailed information on this warfarin application, request technical note: TN-9002: Scaling from Analytical to Preparative Chiral Chromatography While Balancing Purity, Yield, and Throughput under HPLC and SFC Conditions

Axia Technology and Hardware

Standard Packing and Hardware

Axia Technology and Hardware

Warfarin Chiral Purification in Normal Phase Mode
Unmatched Column Reproducibility

The completely automated Axia™ packing system provides feedback control and infinite tuning of packing density for specific media characteristics such as mechanical strength and porosity. An optimum higher bed density can be consistently reproduced column-to-column.

This directly translates into consistent efficiency and peak asymmetry measurements and decreases the column variability seen in traditionally packed preparative columns.

"Axia columns provide me with first rate quality and engineering. Reliability, reproducibility, and durability are provided with all Axia columns that I use. I can literally purify 2500 samples per column. The time and cost savings are tremendous."

—Derrick Miyao
Large Biotech Manufacturer, USA

"We have used Phenomenex Axia prep-HPLC columns for several years and they consistently provide excellent separation and reproducibility for a variety of different compounds."

—Jeremy R. Wolf
ABC Laboratories, USA
Chiral Compound

Luna C18, Phenyl-Hexyl, C8, C5, or SCX
Jupiter Proteo

Kinetex
1st Core-Shell Preparative Column Ever!
Pages 10-13

Aeris
Core-Shell Peptide Media
Pages 14-15

Gemini
High pH Separations
Pages 16-17

Synergi
Unique Chemistries for Complex Mixtures
Pages 18-19

Luna
Proven Purification Performance
Pages 20-21

Clarity
Purification of Synthetic Oligonucleotides
Page 23

Lux
Polysaccharide Supports with Excellent Enantioselectivity
Pages 24-27

Molecule Type

Oligo
Peptide/Protein

< 10,000 Da

Aeris® XB-C18
Kinetex® EVO C18, Biphenyl, Phenyl-Hexyl, XB-C18, C18, or C8
Luna C18, Phenyl-Hexyl, C8, C5, or SCX
Jupiter® 300 Å C18 or C4

> 10,000 Da

Jupiter®
Increase Loadability for Biomolecule Separations
Page 22

WEB: www.phenomenex.com
First Core-Shell Preparative HPLC/SFC Column Ever!

Kinetex® Core-Shell Technology produces increased efficiencies over traditional, fully porous columns, yielding remarkable chromatographic resolution, higher peak capacities, and greater sensitivity, so labs can get even more out of their HPLC analyses!

The benefits of Kinetex Core-Shell Technology include:
- Increased efficiencies over traditional fully porous columns
- Seamless scalability from HPLC/UHPLC to Preparative LC
- Kinetex 5µm provides better performance than traditional fully porous 5 and 3µm materials

High Column Efficiency

Combining 5µm Kinetex core-shell and Axia™ technology can provide the highest separation efficiency of any pre-packed preparative HPLC column.

Waters® XBridge® 5µm C18 Prep OBD™

Kinetex 5 µm XB-C18 Axia Packed

App ID 21456

App ID 21455

- Over 55% Increase in Efficiency
- 150 x 19.0 mm
- N = 77,020 plates/meter

- 150 x 21.2 mm
- N = 121,620 plates/meter

Conditional for both columns:
- Columns: Kinetex 5 µm XB-C18 Axia Packed
- Water/ Acetonitrile (50:50)
- Flow Rate: 25 mL/min
- Temperature: Ambient
- Detection: UV @ 254 nm
- Injection Volume: 10 µL

Applications

<table>
<thead>
<tr>
<th>Packing Material</th>
<th>Type of Compounds</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kinetex C18</td>
<td>Small Molecules</td>
<td><img src="image" alt="Best Suited" /></td>
</tr>
<tr>
<td></td>
<td>Peptides</td>
<td><img src="image" alt="Very Good" /></td>
</tr>
<tr>
<td></td>
<td>Proteins</td>
<td><img src="image" alt="Very Good" /></td>
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<tr>
<td></td>
<td>Chiral</td>
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<tr>
<td></td>
<td>Oligonucleotides</td>
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<tr>
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<td>Acids</td>
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<tr>
<td></td>
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<td></td>
<td>Hydrophobic</td>
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<tr>
<td></td>
<td>Bases</td>
<td><img src="image" alt="Very Good" /></td>
</tr>
<tr>
<td></td>
<td>Available Surface</td>
<td><img src="image" alt="Best Suited" /></td>
</tr>
</tbody>
</table>

Key:
- ![Best Suited](image)
- ![Very Good](image)

*Columns are pH stable from 1.5-10 under isocratic conditions. Columns are pH stable 1.5-8.5 under gradient conditions. Comparative separations may not be representative of all applications.

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Phenomenex | WEB: www.phenomenex.com
Excellent Loadability!

With narrower peak widths than fully porous columns across every sample load, Axia™ packed Kinetex 5 µm columns give you the capability of increased sample load and higher throughput for vastly improved purification performance and economics.

Waters® XBridge® 5 µm C18 Prep OBD™

<table>
<thead>
<tr>
<th>Conditions for both columns:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columns:</td>
</tr>
<tr>
<td>Kinetex 5 µm C18 Axia Packed</td>
</tr>
<tr>
<td>XBridge 5 µm C18 Prep OBD</td>
</tr>
<tr>
<td>Dimensions:</td>
</tr>
<tr>
<td>50 x 21.2 mm (Kinetex)</td>
</tr>
<tr>
<td>50 x 19 mm (XBridge)</td>
</tr>
<tr>
<td>Mobile Phase:</td>
</tr>
<tr>
<td>A: Water with 0.5 % Formic acid</td>
</tr>
<tr>
<td>B: Acetonitrile with 0.5 % Formic acid</td>
</tr>
<tr>
<td>Gradient:</td>
</tr>
<tr>
<td>Time (min) % B</td>
</tr>
<tr>
<td>0  20</td>
</tr>
<tr>
<td>8  50</td>
</tr>
<tr>
<td>11  50</td>
</tr>
</tbody>
</table>

Flow Rate: 30 mL/min
Temperature: Ambient
Detection: UV @ 254 nm
Sample: 200 mg/mL in DMSO
1. Doxepin (From 1 - 500 mg on-column)
2. Amitriptyline (From 1 - 500 mg on-column)

Kinetex 5 µm C18 Axia Packed

Kinetex Axia Preparative columns are fantastic! I currently use two Kinetex 5 µm C18 150 x 21.2 mm columns in parallel for high throughput purifications (<100 mg scale), and Kinetex core shell media delivers significantly improved peak shape and lower back pressure compared to many of the industry. I can also analyze quickly my purified fractions with the same core shell phase on my analytical UPLC® system.

Chris DeVore
Neurocrine Biosciences, USA

Tip: If you would like to see a loading study performed with the combination of Axia Packing and Kinetex Core-Shell Particle Technologies, request technical note: TN-1058.
Seamless Scalability from HPLC/UHPLC to PREP

Kinetex® packed with Axia™ technology makes it the first core-shell sorbent commercially available for small-scale preparative applications. Combine this with the fact that the entire Kinetex core-shell line is fully scalable from 1.3 µm to 5 µm, means that transferring high performance HPLC/UHPLC methods to preparative HPLC and SFC formats is fast and simple.

For more information on the power of Kinetex core-shell scalability, request technical note: TN-1135.

Tip:
Seamless Scalability from HPLC/UHPLC to PREP
Kinetex Media
Waters® XBridge® 5 µm C18
150 x 4.6 mm
Kinetex 5 µm EVO C18
150 x 4.6 mm
Kinetex 5 µm EVO C18
150 x 21.2 mm AXIA

Comparative separations may not be representative of all applications.

Axia packed column has a great efficiency for the separation of several classes of natural compounds. Due to its low back pressure and therefore high flow work conditions, time for conditioning the columns is sped up greatly!

Sylvian Cretton
Europe

For more information on the power of Kinetex core-shell scalability, request technical note: TN-1135.
A Broad Spectrum of Column Selectivities

Kinetex® core-shell columns are available in a wide range of stationary phases, allowing you to optimize your separation for maximum resolution and loadability across HPLC, UHPLC, and preparative HPLC and SFC applications.

**C18**

**EVO C18**

**C8**

**Biphenyl**

**Phenyl-Hexyl**

**Conditions for all columns:**
- **Columns:** Kinetex 5 µm C18
  - Kinetex 5 µm EVO C18
  - Kinetex 5 µm C8
  - Kinetex 5 µm Biphenyl
  - Kinetex 5 µm Phenyl-Hexyl
- **Dimensions:** 100 x 4.6 mm
- **Mobile Phase:**
  - A: 0.1 % TFA in Water
  - B: 0.1 % TFA in Acetonitrile
- **Gradient:**
  - Time (min) % B
    - 0 5
    - 20 20
    - 22 20
    - 22.5 5
    - 25 5
- **Flow Rate:** 1.5 mL/min

**Temperature:** 22 °C
**Detection:** UV @ 330 nm

**Sample:** 1. Chlorogenic Acid
Others: Antioxidants from green coffee

For more information on Chlorogenic Acids from Green Coffee by HPLC, request technical note: TN-1134.
Increased Performance for Peptide Purifications

Based on core-shell particle technology, Aeris® PEPTIDE media is designed with small pores (100 Å), an inert XB-C18 surface chemistry, and multiple particle sizes to meet the selectivity, resolution and loading demands of chemists working with synthetic peptides. The benefits of Aeris PEPTIDE columns include:

- Optimized media for peptide purifications
- Multiple particle size options for method development flexibility and peptide impurity analysis
- Seamless scalability from HPLC/UHPLC to preparative HPLC

Multiple Particle Sizes For Added Versatility

<table>
<thead>
<tr>
<th>Packing Material</th>
<th>Particle Size (µm)</th>
<th>Pore Size (Å)</th>
<th>Surface Area (m²/g)</th>
<th>Carbon Load (%)</th>
<th>pH Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aeris PEPTIDE</td>
<td>1.7, 2.6, 3.6, 5</td>
<td>100</td>
<td>200</td>
<td>12</td>
<td>1.5-9</td>
</tr>
</tbody>
</table>

Applications, Type of Compounds, Loading

- Small Molecules
- Peptides
- Proteins
- Chiral
- Oligonucleotides
- Acids
- Polar
- Hydrophobic
- Bases

Available Surface Area

WEB: www.phenomenex.com
Develop, Purify, and Analyze Peptide Fractions with One Media

Aeris PEPTIDE is fully scalable in retention and selectivity with its 4 unique particle sizes (1.7 µm, 2.6 µm, 3.6 µm, and 5 µm) for easy transfer from HPLC and UHPLC methods to preparative applications.

Aeris PEPTIDE 2.6 µm XB-C18

Analytical method
- Column: Aeris PEPTIDE 2.6 µm XB-C18
- Dimensions: 150 x 4.6 mm
- Part No.: 00F-4505-00
- Injection Volume: 10 µL
- Flow Rate: 1 mL/min
- Sample: Crude peptide mix

Preparative scale-up and fraction collection
- Column: Aeris PEPTIDE 5 µm XB-C18
- Axia Packed
- Dimensions: 150 x 21.2 mm
- Part No.: 00F-4632-P0-AX
- Injection Volume: 1 mL
- Flow Rate: 20 mL/min
- Sample: Crude peptide mix

Aeris PEPTIDE 5 µm XB-C18

Analytical fraction analysis
- Column: Aeris PEPTIDE 2.6 µm XB-C18
- Dimensions: 150 x 4.6 mm
- Part No.: 00F-4505-60
- Injection Volume: 10 µL
- Flow Rate: 1 mL/min
- Sample: Purified Fractions

Conditions for all separations (except as noted):
- Mobile Phase: A: 0.1% TFA in Water
  B: 0.1% TFA in Acetonitrile
- Gradient: Linear 85:15 (A/B) to 5:95 (A/B) over 10 minutes
- Temperature: Ambient
- Detection: 210 nm

Ordering information on page 30
Second-Generation TWIN-NX™ Technology

Gemini NX-C18
TWIN-NX technology uses an improved patented organo-silica grafting process which incorporates highly stabilizing ethane cross-linking. These organic groups are evenly incorporated into the grafted layers on the silica surface while maintaining a pure silica core. This not only provides resistance to high pH attack, but also maintains the high efficiency and mechanical strength of a silica particle.

Gemini features a pH stability from 1-12, making it optimal for high alkaline washes and high pH purifications of basic drugs.

Optimized parameters include:
- Innovative surface layer for increased pH stability
- High-surface area for increased loading
- Silica smoothness for stable packing beds
- Bonding density for excellent reproducibility

Dramatically improve sample resolution, productivity and performance of any preparative column media with Axia™ column hardware and packing technology. Axia packed prep column offers the opportunity for longer lifetime, higher loading and increased throughput.

Comparative separations may not be representative of all applications.

### Gemini 5 µm NX-C18 Axia Packed

**Conditions for both columns:**
- **Column:** Gemini 5 µm NX-C18
- **Waters 5 µm XBridge**
- **Dimensions:**
  - 150 x 21.2 mm (Gemini)
  - 150 x 19 mm (XBridge)
- **Mobile Phase:**
  - A: 20 mM Ammonium bicarbonate pH 10.0
  - B: Acetonitrile
- **Gradient:**
  - Time (min) % B
  - 0.1 50
  - 5.1 95
  - 6 95
  - 6.5 50
  - 8.9 50
- **Flow Rate:** 25 mL/min
- **Temperature:** 22 °C
- **Detection:** UV @ 268 nm
- **Sample:**
  - 1. Reserpine
  - 2. Unknown

### Waters® XBridge® 5 µm C18 Prep OBD™

**Flow Rate:** 25 mL/min
**Temperature:** 22 °C
**Detection:** UV @ 268 nm
**Sample:**
- 1. Reserpine
- 2. Unknown

**Key:**
- **Best Suited**
- **Very Good**

### Table

<table>
<thead>
<tr>
<th>Packing Material</th>
<th>Particle Size (µm)</th>
<th>Pore Size (Å)</th>
<th>Surface Area (m²/g)</th>
<th>Carbon Load (%)</th>
<th>pH Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gemini C18</td>
<td>3, 5, 10</td>
<td>110</td>
<td>375</td>
<td>14</td>
<td>1.0-12.0</td>
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<tr>
<td>Gemini C6-Phenyl</td>
<td>3, 5</td>
<td>110</td>
<td>375</td>
<td>12</td>
<td>1.0-12.0</td>
</tr>
<tr>
<td>Gemini NX-C18</td>
<td>3, 5, 10</td>
<td>110</td>
<td>375</td>
<td>14</td>
<td>1.0-12.0</td>
</tr>
</tbody>
</table>

**Applications**
- Small Molecules
- Peptides
- Proteins
- Chiral
- Oligonucleotides

**Type of Compounds**
- Acids
- Alcohols
- Amino Acids
- Amines
- Aromatic Compounds
- Nitriles
- Photochemicals
- Phosphates
- Sulfates
- Sulfonic Acids
- Thiocarbamates
- Thiols
- Triazines

**Leading**
- Available Surface Area

**WEB:** www.phenomenex.com

Phenomenex
Flexibility in pH Adjustments Allows for Increased Purification Performance.

Separating basic compounds at higher pH levels produces dramatic changes when compared to low pH conditions. At pH 10.5, the basic compounds become neutralized and are more hydrophobic. The retention for the uncharged basic compounds increases providing an increase in separation along with superior peak shapes.

Gemini® NX-C18 with 0.5 % TFA

High pH 10.5

- Column: Gemini NX-C18 5 μm
- Dimensions: 50 x 21.2 mm
- Mobile Phase: A: 0.5 % TFA in Water
  B: Acetonitrile
- Gradient: 5 % B to 95 % B in 5 min
- Flow Rate: 30 mL/min
- Detection: UV @ 254 nm
- Sample: 1. Diphenhydramine
  2. Oxybutynin
  3. Terfenadine

Gemini® NX-C18 with 0.5 % TFA

Low pH 2

- Column: Gemini NX-C18 5 μm
- Dimensions: 50 x 21.2 mm
- Mobile Phase: A: 0.5 % TFA in Water
  B: Acetonitrile
- Gradient: 5 % B to 95 % B in 5 min
- Flow Rate: 30 mL/min
- Detection: UV @ 254 nm
- Sample: 1. Diphenhydramine
  2. Propranolol

Our Phenomenex Gemini and Luna® Axia™ packed columns are the workhorses in our lab. These columns exhibit outstanding performance for challenging separations while also handling a high workload for standard separations. Longevity has also been excellent with some columns lasting 2 years or more. Dependability is so important in my line of work and these columns never disappoint!!

-Major Pharmaceutical Company, USA
Increased Loading with Unique Selectivities

Synergi is available in four unique phases, each offering dramatic differences in:
- Selectivity
- Retention time
- Resolution

The unique selectivity profiles found within the Synergi product line offer complementary selectivity to the standard C18, C8, or silica phases traditionally employed in preparative HPLC.

**Synergi Polar-RP**
For Polar and Aromatic Mixtures
(100 % Aqueous Stable)

- Ether linkage increases aromaticity of the phenyl group and also provides π-π interactions with conjugated compounds
- Polar endcapping provides added retention for polar compounds

**Synergi Fusion-RP**
Balanced Non-polar and Polar Performance
(100 % Aqueous Stable)

- Embedded polar group complements C18 ligand with balanced polar selectivity
- TMS endcapping ensures sharp peaks

**Synergi Hydro-RP**
Strong Non-polar and Polar Retention
(100 % Aqueous Stable)

- Polar endcapping provides added retention for polar compounds

**Synergi Max-RP**
Excellent for Basic Compounds at Neutral pH

- High density ligands and extensive endcapping ensure sharp peaks

### Applications

<table>
<thead>
<tr>
<th>Packing Material</th>
<th>Particle Size (µm)</th>
<th>Pore Size (Å)</th>
<th>Surface Area (m²/g)</th>
<th>Carbon Load (%)</th>
<th>pH Range</th>
<th>Loading</th>
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<tbody>
<tr>
<td>Synergi Fusion-RP</td>
<td>4, 10</td>
<td>80</td>
<td>475</td>
<td>12</td>
<td>1.5-10.0*</td>
<td>□</td>
</tr>
<tr>
<td>Synergi Max-RP</td>
<td>4, 10</td>
<td>80</td>
<td>475</td>
<td>17</td>
<td>1.5-10.0*</td>
<td>□</td>
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<tr>
<td>Synergi Hydro-RP</td>
<td>4, 10</td>
<td>80</td>
<td>475</td>
<td>19</td>
<td>1.5-7.5</td>
<td>□</td>
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<tr>
<td>Synergi Polar-RP</td>
<td>4, 10</td>
<td>80</td>
<td>475</td>
<td>11</td>
<td>1.5-7.0</td>
<td>□</td>
</tr>
</tbody>
</table>

*PhRange is 1.5-10 under isocratic conditions and 1.5-9.0 under gradient conditions.

**Phenomenex | WEB: www.phenomenex.com**
Selectivity Like No Other

Offering a balanced combination of hydrophobic and polar selectivity, Synergi™ Fusion-RP separates compounds exhibiting moderately polar and hydrophobic characteristics.

The slightest variations in compound polarity and aromaticity are exploited by Synergi Polar-RP to achieve the greatest separation between polar and/or aromatic compounds.

Increased resolution of polar compounds with Synergi Polar-RP compared to traditional C18 phases

Hydrophobic basic compounds

Synergi 4 µm Fusion-RP

Improved Peak Shape and Superior Selectivity

Synergi 4 µm Polar-RP

Improved Selectivity! Longer Polar Retention

Typical C18

Waters® 5 µm SymmetryShield™ RPC18

Waters 5 µm XTerra® RP18

Waters 5 µm Symmetry® C18

We regularly use RP stationary phases from Phenomenex for our separation problems. Especially Synergi Polar-RP was found to often show the desired selectivity, distinguishing this phase from other RP phases.

CARBOGEN AMCIS, Switzerland

Comparative separations may not be representative of all applications.

Phenomenex | WEB: www.phenomenex.com
Media for One of the World’s Leading PREP HPLC Columns

Luna® high surface area (400 m²/g) silica packing materials provide optimized parameters specifically designed for the purification of small molecules and peptides. This media allows high loading with excellent lifetimes.

**Optimized loading parameters include:**
- Silica smoothness for stable packed beds
- Optimum pore size/distribution provide outstanding performance
- High pore volume offers increased surface area
- Fine tuned bonding density for excellent reproducibility
- Greater loading capacity with an extended pH range of 1.5 to 10.0°

We routinely use Axia™ packed columns from Phenomenex for peptide purifications. Among various preparative HPLC columns we have used, the Axia packed Luna columns (5 µm) stand out. We have been very satisfied with the increased loading capacity and excellent performance.

Guangcheng Jiang
Ferring Research Institute, Inc., USA

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**Applications**

<table>
<thead>
<tr>
<th>Packing Material</th>
<th>Particle Size (µm)</th>
<th>Pore Size (Å)</th>
<th>Surface Area (m²/g)</th>
<th>Carbon Load (%)</th>
<th>pH Range</th>
<th>Type of Compounds</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luna C18(2)</td>
<td>3.5, 5, 10, 10-PREP, 15</td>
<td>100</td>
<td>400</td>
<td>17.5</td>
<td>1.5-10.0°</td>
<td>Small Molecules</td>
<td>Good</td>
</tr>
<tr>
<td>Luna C8(2)</td>
<td>3.5, 10, 10-PREP, 15</td>
<td>100</td>
<td>400</td>
<td>13.5</td>
<td>1.5-10.0°</td>
<td>Peptides</td>
<td>Very Good</td>
</tr>
<tr>
<td>Luna C5</td>
<td>5, 10</td>
<td>100</td>
<td>440</td>
<td>12.5</td>
<td>1.5-10.0°</td>
<td>Proteins</td>
<td>Good</td>
</tr>
<tr>
<td>Luna Phenyl-Hexyl</td>
<td>3.5, 10, 10-PREP, 15</td>
<td>100</td>
<td>400</td>
<td>17.5</td>
<td>1.5-10.0°</td>
<td>Chiral</td>
<td>Good</td>
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<td>Bases</td>
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</table>

*pH range is 1.5-10 under isocratic conditions and 1.5-8.5 under gradient conditions.

---

**Phenomenex | WEB: www.phenomenex.com**
Simple Scale-Up

Axia™ column technology provides the same high efficiency chromatographic performance for preparative scale columns (21.2, 30, and 50 mm ID) as obtained in 4.6 mm ID analytical columns. This improvement in preparative column performance across all lengths and internal diameters makes it easier to select the appropriate column size to achieve the desired purity and yield without having to compromise on performance.

Proven Media for Peptide Purifications

Optimal compromise between throughput, recovery, yield. Ability to perform high loading (0.74 g on column) and achieve high purity (>98%) in a single purification run.

Preparative Purification of Bivalirudin (20 amino acid peptide also known as Angiomax)

Purification Elution Profile at 1.5% Specific Load

Purity Confirmation of Combined Fractions

11 Combined fractions 27.8 – 29.8 min; Recovery 80.5% with purity ≥ 98.5%

Phenomenex | WEB: www.phenomenex.com
The Jupiter HPLC column portfolio, including Jupiter 300 and Jupiter Proteo, offers optimized reversed phase solutions for peptide and protein purification. Identify, purify, and analyze almost any protein with Jupiter columns.

**Jupiter Proteo 90 Å**
- For separation of proteins and peptides < 10,000 MW
- C12 bonded onto an ultra-high surface area (475 m²/g) silica for increased peak capacity and resolution of peptide separations
- Direct scale up from analytical to preparative and bulk materials

**Resolve Peptides with Similar Hydrophobicity**
Jupiter Proteo is able to fully resolve peptides that differ in hydrophobicity by one methyl group.

**Jupiter 300 Å**
- For separation of proteins > 10,000 MW
- Available with C18 and C4 bonded phases
- 1.5 – 10 pH stability for method ruggedness and easy protein removal
- Direct scale up to preparative and bulk materials

**Compare PEGylated vs. Native Forms of Proteins**
Reversed phase separation of PEGylated and native proteins on a Jupiter 300 C4 column. Note the good resolution of multiple PEGylated forms for all proteins tested.

---

**Applications**

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<th>Type of Compounds</th>
<th>Loading</th>
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<td>acids</td>
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<tr>
<td>Peptides</td>
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<tr>
<td>Proteins</td>
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</table>

**Key**

- Best Suited
- Very Good

**Comparative separations may not be representative of all applications.**

---

“We purchased the Jupiter 300 C18 300 Å column a few months ago and have been quite impressed with its performance. The Jupiter 300 column provides better separation of the proteins. As for reproducibility, the control profiles have not changed since day one of its use.”

**Major Biotech Company, Europe**
Purification of Synthetic Oligonucleotides

Clarity Oligo-RP™
Unique media specifically designed for reversed phase purification of oligonucleotides with balanced hydrophobicity and polar selectivity. The media is based on composite particle TWIN™ technology that provides improved selectivity and efficiency for oligonucleotides when compared to competing hybrid, polymer, and silica media.

RP-HPLC Preparative Purification
- Easily separate N-1 failure sequences from target oligo with > 90 % purities
- Purify oligos up to 60 nt in length
- Trityl-off purification of DNA, RNA, thioates, and modified/labeled oligonucleotides
- 3 μm, 5 μm, 10 μm particles for seamless scaling

Clarity Oligo-WAX™
Clarity Oligo-WAX is a crosslinked weak anion exchanger media designed for successful ion-exchange purification of synthetic DNA/RNA. Oligo-WAX is an advantageous combination of purity, capacity, mechanical strength, cost, and efficiency.

Purify Failure Sequences and Contaminants from Target Sequence
Ion-exchange is an excellent separation mode for purifying contaminants and failure sequences from target sequences. Clarity Oligo-WAX, due to its increased efficiency compared to other ion-exchange columns, has the ability to recognize minute charge differences in nucleotide sequences such as failure sequences or base substitutions.

Preparative 20nt DNA Oligo-RP Purification

We have used the Axia™ prep columns and not had problems with them. I have never had to adjust for retention gaps. This speaks directly to the quality of Phenomenex’s phases and the quality of their PREP columns.

-Major Biotech Company, USA

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<tr>
<th>Applications</th>
<th>Type of Compounds</th>
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Packing Material: | Particle Size (μm) | Pore Size (Å) | Surface Area (m²/g) | Carbon Load (%) | pH Range |
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Phenomenex  | WEB: www.phenomenex.com |
Complete Chiral Solutions

Achieving optimal chiral separation is easier than ever with six unique Lux polysaccharide stationary phases to screen. Choose a phase, then transfer the method to lab scale, process, pilot, and commercial scale.

Lux chiral preparative columns simplify the separation process:
- Unique and traditional phases that increase the success rate of the chiral screen
- Consistent particle size distribution so performance is maintained
- Mechanically strong media for increased stability
- Available in multiple particle sizes for direct scale up (3 µm and 5 µm packed columns for screening and small scale purifications; 10 µm and 20 µm bulk media for process scale purifications)

Resolve Your Enantiomers with Six Unique Phases

The Lux family of bulk cellulose chiral selectors provides a variety of complementary selectivities.

Screen for the most effective chiral separation under the following conditions:
- Reversed Phase
- Polar Organic
- Normal Phase
- Supercritical Fluid Chromatography (SFC)

### Lux Cellulose-1
Cellulose tris(3,5-dimethylphenylcarbamate) Guaranteed Alternative to CHIRALCEL® OD®, OD-H®, OD-3, OD-RH®, and OD-3R

### Lux Cellulose-2
Cellulose tris(3-chloro-4-methylphenylcarbamate) Guaranteed Alternative to CHIRALCEL OZ, OZ-H®, OZ-3, OZ-RH®, and OZ-3R

### Lux Cellulose-3

### Lux Cellulose-4
Cellulose tris(4-chloro-3-methylphenylcarbamate) Guaranteed Alternative to CHIRALCEL OX-H®, OX-3, OX-RH®, and OX-3R

### Lux Amylose-1
Amylose tris(3,5-dimethylphenylcarbamate) Guaranteed Alternative to CHIRALPAK® AD®, AD-H®, AD-3, AD-RH®, and AD-3R

### Lux Amylose-2
Amylose tris(5-chloro-2-methylphenylcarbamate) Guaranteed Alternative to CHIRALPAK® AY®, AY-H®, AY-3, AY-RH®, and AY-3R

### Lux Amylose-3
Amylose tris(5-chloro-2-methylphenylcarbamate) Guaranteed Alternative to CHIRALPAK® AY®, AY-H®, AY-3, AY-RH®, and AY-3R

### Lux Amylose-4
Amylose tris(5-chloro-2-methylphenylcarbamate) Guaranteed Alternative to CHIRALPAK® AY®, AY-H®, AY-3, AY-RH®, and AY-3R

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<tr>
<th>Chiral Applications</th>
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</tr>
<tr>
<td>Small Molecules</td>
<td>Peptides</td>
<td>Polypeptides</td>
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</table>
Column Screening for Optimal Chiral Resolution

Being able to utilize differences in selectivity in each of the six Lux® columns can help develop methods more efficiently by offering broad and complementary chiral recognition abilities.

In the example below, a simple screen determined which column gave the best separation.

Etozolin

Based on a five phase screen under reversed phase conditions, the optimal chiral stationary phase for resolving Etozolin is Lux Cellulose-3.

Lux 5 µm Cellulose-3

Optimal Resolution

Lux 5 µm Amylose-2

Lux 5 µm Cellulose-1

Lux 5 µm Cellulose-2

Lux 3 µm Cellulose-4

Innovative chiral selector will succeed where others fail

Lux 5 µm Cellulose-4

Optimal Resolution

CHIRALCEL® 5 µm OD-H®

CHIRALPAK® 5 µm AD®-H

CHIRALPAK, CHIRALCEL, OD-H, and AD are registered trademarks of DAICEL Corporation. Columns used for comparison were manufactured by DAICEL Corporation. Phenomenex is in no way affiliated with DAICEL Corporation. Comparative separations may not be representative of all applications.
Load More with an Increase in Column Length

Axia™ column technology allows separation to scale up directly based on column length. With the 100 mm length column a 32 mg/load separation was achieved and an increased sample load of 80 mg/load was achieved on the longer 250 mm length column. As expected when increasing the load, the peak width and tailing increased but there was no loss of resolution.

Conditions for all columns:
- Columns: Lux® 5 µm Cellulose-1
- Dimensions: as noted
- Mobile Phase: Methanol / Isopropanol (90:10)
- Flow Rate: as noted
- Detection: as noted
- Sample: Dissolved in mobile phase as noted

**App ID 17780**
- Dimensions: 100 x 4.6 mm
- Flow Rate: 1 mL/min
- Detection: UV @ 220 nm
- Sample: 5 µg in 2 µL

**App ID 17781**
- Dimensions: 100 x 21.2 mm
- Flow Rate: 20 mL/min
- Detection: UV @ 220 nm and 254 nm
- Sample: 32 mg in 640 µL

**App ID 17782**
- Dimensions: 250 x 21.2 mm
- Flow Rate: 20 mL/min
- Detection: UV @ 220 nm and 254 nm
- Sample: 80 mg in 1600 µL

---

Lux Axia preparative column are wonderful! I regularly use Lux chiral stationary phase Cellulose-2 and Cellulose-4 and less frequently, the Lux Amylose-2. In our community of chiral analysis/purification scientists, there are some who use the CC4 column instead of the *equivalent* Lux Cellulose-4. On several occasions we’ve seen separation and good peak shape on the Lux Cellulose-4 that was completely missing from the CC4. Customer support and delivery times are always within a few days.

Julia G. Christie
GlaxoSmithKline, USA
Easy SFC Scale-up

SFC Purification of Terfenadine

Baseline Separation of Enantiomers

**Lux® Cellulose-1 offers great peak shape at 220 nm**

- **App ID 18865**

**Overloading study with increased analytical load showing impurities eluting after major enantiomers only detected at 254 nm**

- **App ID 18866**

**Tip:**

For SFC column screening, use Lux 150 x 3.0 mm ID columns.

**App ID 18867**

Analytical and Axia™ packed columns have been extensively tested on various SFC systems and all column ID’s and lengths are SFC compatible.

**Polarimeter**

- **App ID 18865**

**High loading capacity media along with stacking injections allow for increased yields and productivity**

- **App ID 18867**

**Closers stacked injections can not be used due to the impurities eluting after the major enantiomers**

- **App ID 18867**

**Ordering information on page 31**

**Lux Media**

**Dimensions:** 250 x 4.6 mm
- Flow Rate: 2.5 mL/min
- Detection: UV @ 220 nm
- Load: 300 µg in 10 µL

**Overloading study with increased analytical load showing impurities eluting after major enantiomers only detected at 254 nm**

- **App ID 18866**

- **Flow Rate:** 2.5 mL/min
- **Detection:** UV @ 200 nm
- **Load:** 1.5 mg in 50 µL

- **Dimensions:** 250 x 4.6 mm
- **Flow Rate:** 2.5 mL/min
- **Detection:** UV @ 220 nm
- **Load:** 1.5 mg in 50 µL

**Analytical and Axia™ packed columns have been extensively tested on various SFC systems and all column ID’s and lengths are SFC compatible.**

**Phenomenex**

**WEB:** www.phenomenex.com
Let Us Do the Work for You

PhenoLogix, our in-house application support lab, saves you time and money by screening multiple scout columns and solvent strategies for new purification methods or revalidating your current methods. We work together to make you successful by minimizing your process purification development time and optimizing your purification method.

Chiral Screening
- Normal Phase
- Reversed Phase
- Polar Organic
- SFC

Method Optimization Services
- Fast Turnaround
- Easy Method Transfer
- Continued Support

Preparative and Process Scale-Up
- Media Screening
- Small Scale Purification
- DAC Packing Assistance

A New Era of Technical Support Services
Our scientists at American Peptide have taken advantage of Phenomenex’s column packing services, application development, and project-specific consultation services for some of our most challenging separations.

American Peptide Company, USA
### Ordering Information

#### Achiral Phases

**Aeris**

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**Jupiter**

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**Guarantee**

If Axia™ packed columns do not provide at least an equivalent separation as compared to a competing preparative column of the same particle size, same phase, and dimensions, return the product with comparative data within 45 days for a FULL REFUND. Only applies to 21.2 mm ID columns.

For additional sizes not displayed, please contact your Phenomenex technical consultant or local distributor.

WEB: www.phenomenex.com
### Luna®

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**Tip:**
Protect your Axia™ Prep Columns with SecurityGuard.

Contact your local Phenomenex representative for ordering information or visit: www.phenomenex.com/guardit