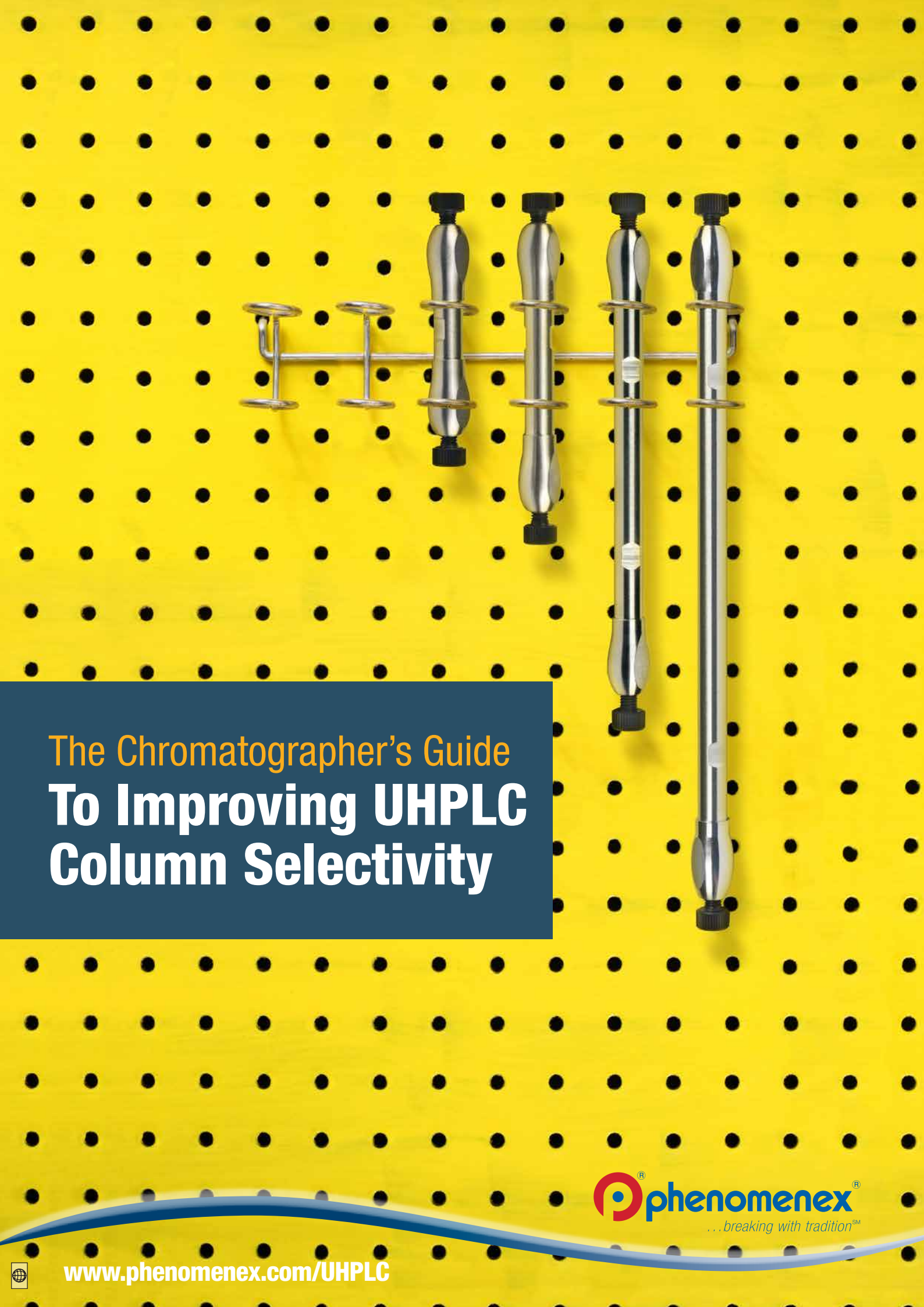


The Chromatographer's Guide

To Improving UHPLC Column Selectivity

phenomenex®

...breaking with tradition℠

www.phenomenex.com/UHPLC

Guide to Choosing the Most Effective Selectivity

Step 1
Understanding Solid Support and Efficiency

Step 2
How to Use Selectivity

Step 3
Our UHPLC Selectivities

Step 4
Applying Column Selectivities to Your UHPLC Analysis

Step 5
Order Your New Selectivity Tools

Select the Right Solid Support

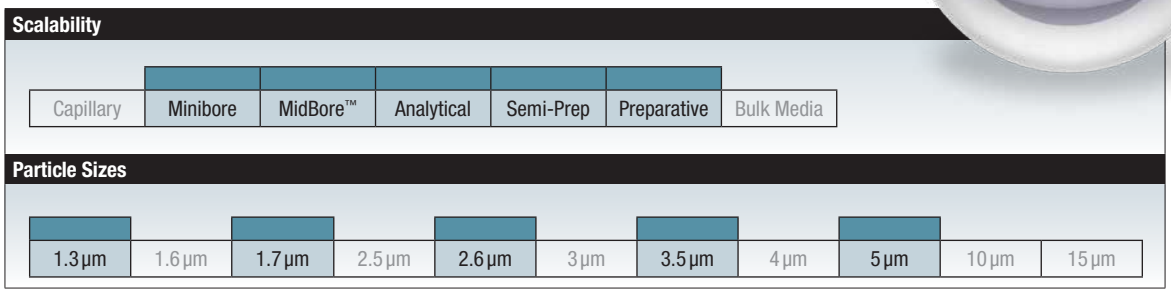
Phenomenex offers a full range of solid supports including core-shell and thermally modified fully porous. The morphology of the solid support has a significant impact on the resulting material characteristics and column performance.

Core-Shell and Organo-Silica Core-Shell

Unique solid silica core and porous shell that results in faster chromatography and higher efficiencies than conventional fully porous particles.

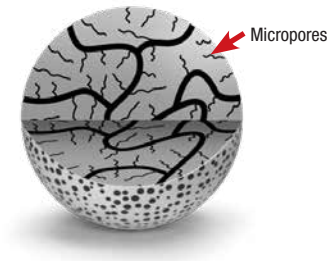
Well suited for:

- Performance gains on ANY LC system
- Easy system-to-system and lab-to-lab method transfer
- Methods where increased sensitivity is required
- Significantly improving the productivity of older, established methods



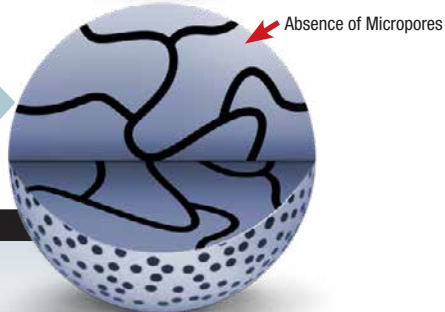
Fully Porous – Thermally Modified Silica

Unique high efficiency and extremely robust fully porous silica that offers astounding performance and inertness alongside versatile selectivities.



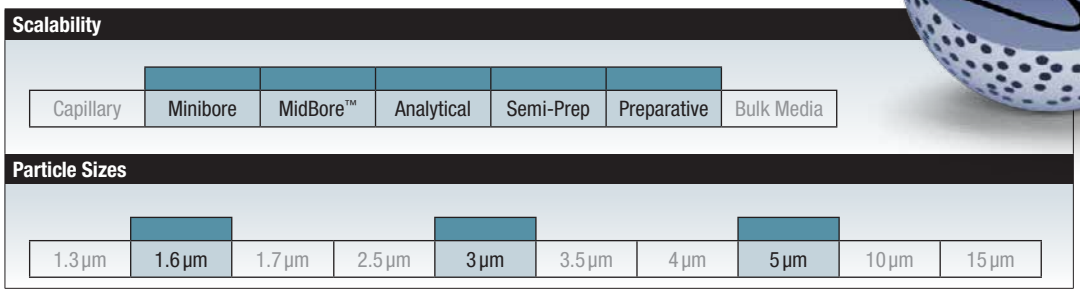
Well suited for:

- Astounding UHPLC, HPLC, and Preparative HPLC performance and efficiencies
- Greater separation muscle
- Better peak shape through an inert foundation
- Extreme ruggedness and dependability



Thermal Modified Pore Structure

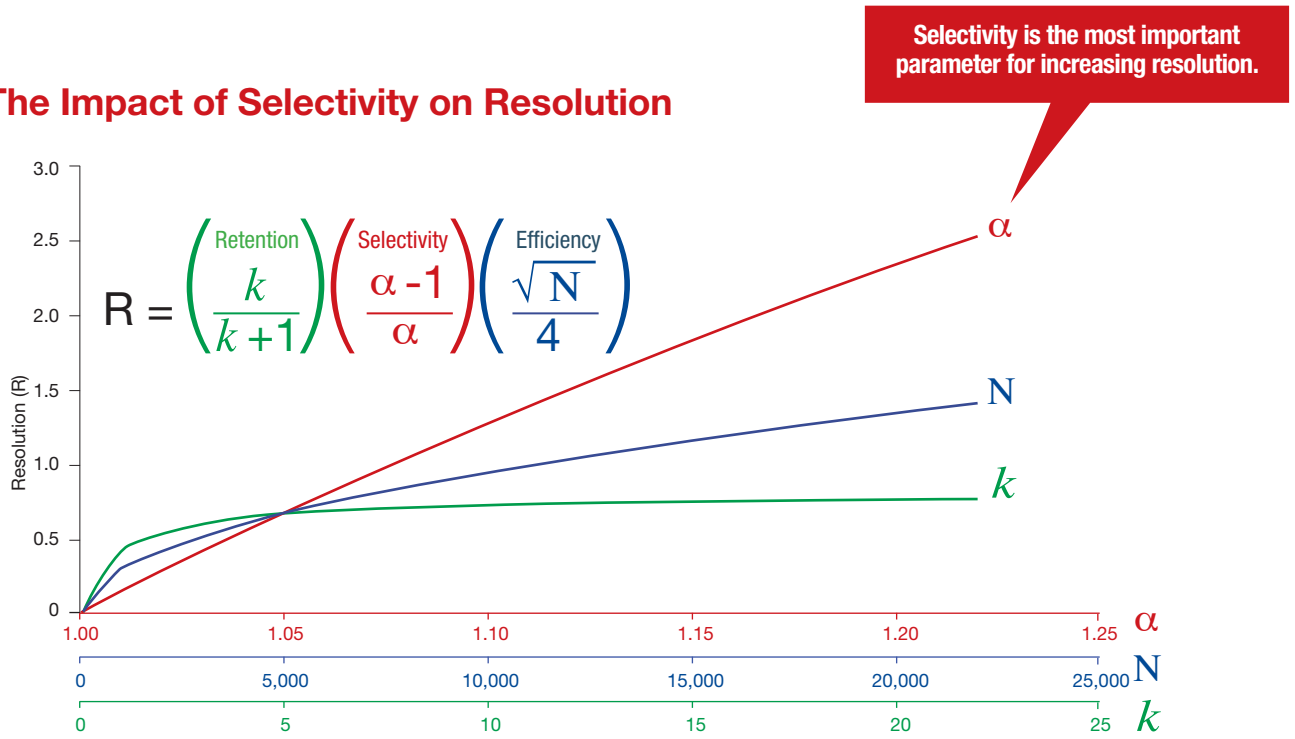
Most importantly, through our proprietary process, we eliminate micropores, further improving column efficiency, inertness, and reproducibility.

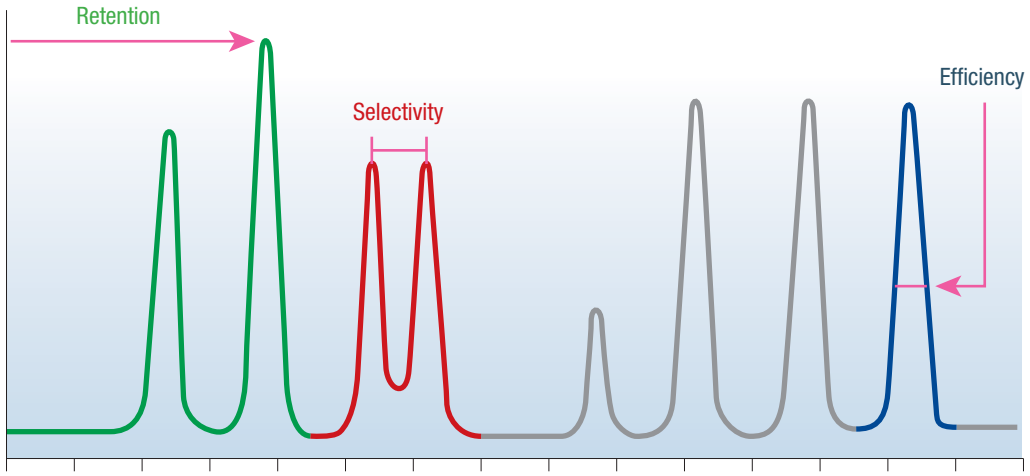


How Resolution is Affected by Selectivity and Efficiency

Selectivity (α) and efficiency (N) have the greatest impact on observed resolution (R), when compared to other chromatographic parameters. Often the simplest and most effective way to improve your chromatographic results is to change your column's phase or solid support. Phenomenex offers a wide breadth of phase chemistries across multiple solid supports for simplified method development and optimization.

The Impact of Selectivity on Resolution

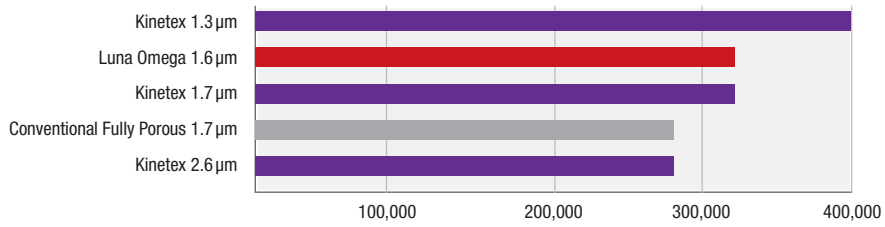




Efficiency Gains with Luna Omega and Kinetex

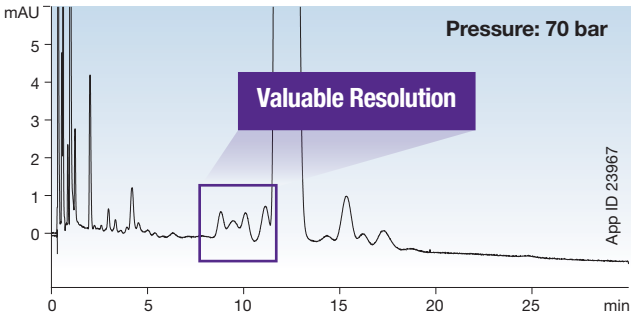
The undeniably high efficiency levels found in each Luna® Omega and Kinetex® column provide you with the potential of huge gains in method performance. While traditional silica and hybrid fully porous particles may claim high performance, when compared to Luna Omega or Kinetex, they fall short and prevent HPLC/UHPLC scientists from reaching their goals.

Efficiency Levels (plates/m)

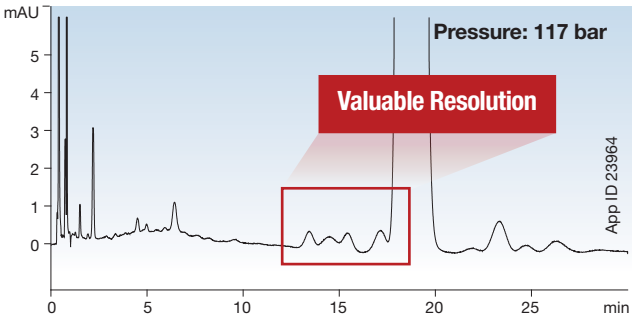


UHPLC Performance – Cyclosporine Impurity Profile

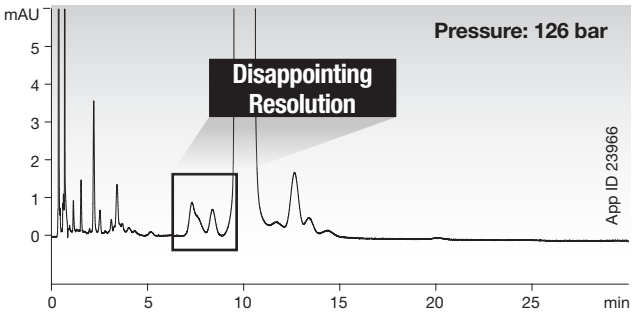
Kinetex 2.6 µm Polar C18



Luna Omega 1.6 µm Polar C18



Conventional 1.7 µm C18



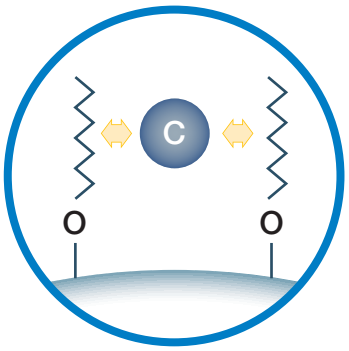
Conditions for all columns same except where noted:

Columns:	Kinetex 2.6 µm Polar C18 Luna Omega 1.6 µm Polar C18 Conventional Fully Porous 1.7 µm C18
Dimensions:	50 x 2.1 mm
Mobile Phase:	Acetonitrile/Tert-butyl methyl ether/Water/ Phosphoric acid (430:50:520:1)
Flow Rate:	0.30 mL/min
Temperature:	80 °C
Detection:	UV @ 210 nm
Sample:	Cyclosporine

Comparative separations may not be representative of all applications.

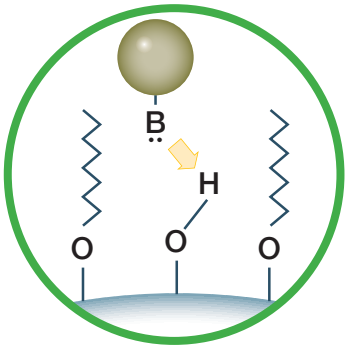
Profiling the Mechanisms of Selectivity

Observed selectivity is dictated by several primary molecular interactions. Below you'll find selectivity parameters used to help characterize reversed phase selectivity mechanisms.

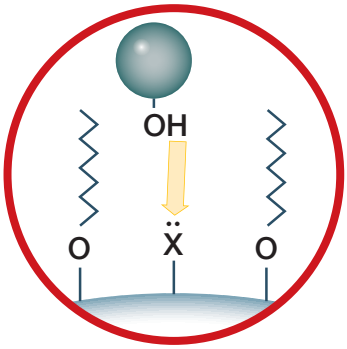


Hydrophobicity
The ability of a phase to hydrophobically interact with carbon groups

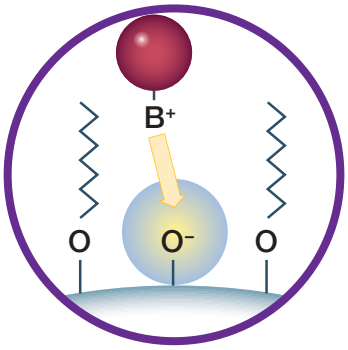
Steric Interaction
The ability of a phase to separate compounds based on structural differences



Hydrogen Bond Donating Capacity
The ability of a phase to hydrogen-bond with proton accepting groups



Hydrogen Bond Accepting Capacity
The ability of a phase to hydrogen-bond with proton donating groups



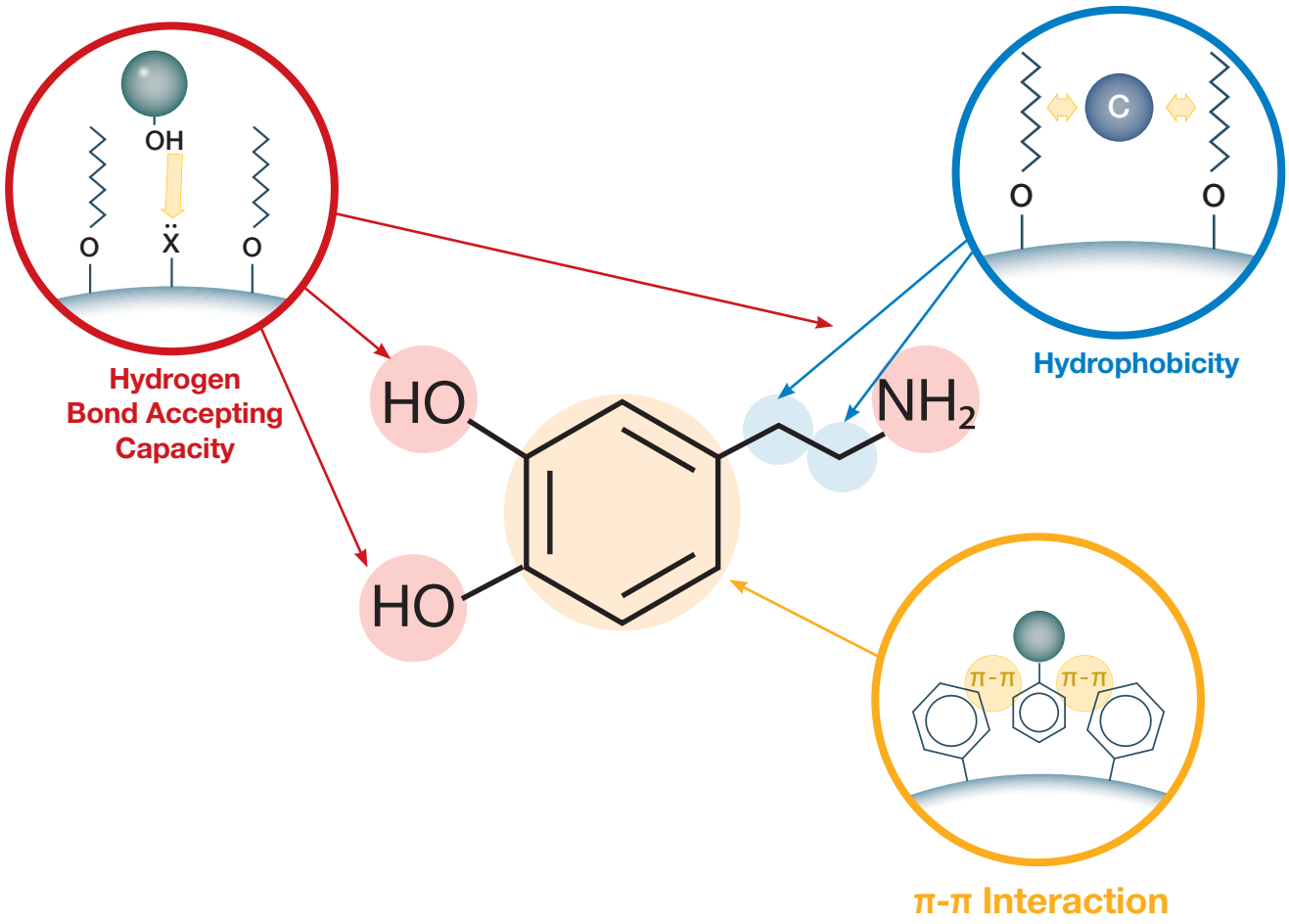
Cation Selectivity at pH 2.8
The ability of a phase to interact with cation groups at acidic pH

Cation Selectivity at pH 7.0
The ability of a phase to interact with cation groups at neutral pH

Relating Selectivity to UHPLC Stationary Phases

Follow the colors to connect functional groups to selectivity profiles! This color coordination demonstrates the relationship between atomic fragments of compounds and how to relate them to column selectivity profiles.

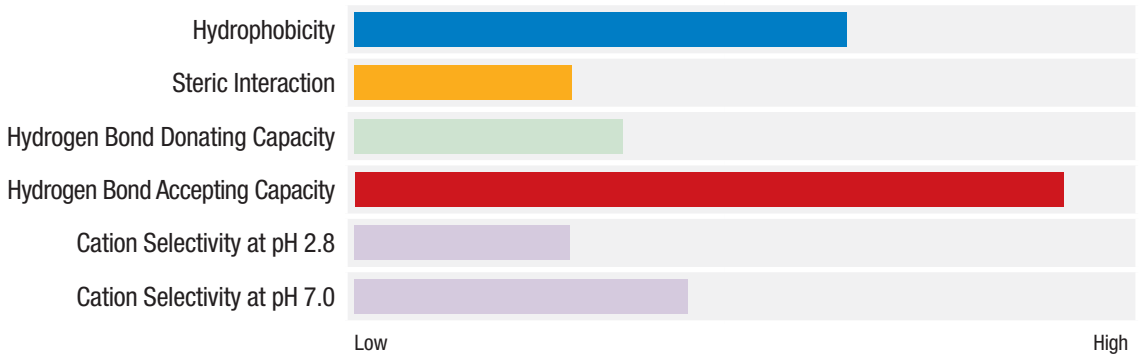
Define the Characteristics of Your Target Compounds



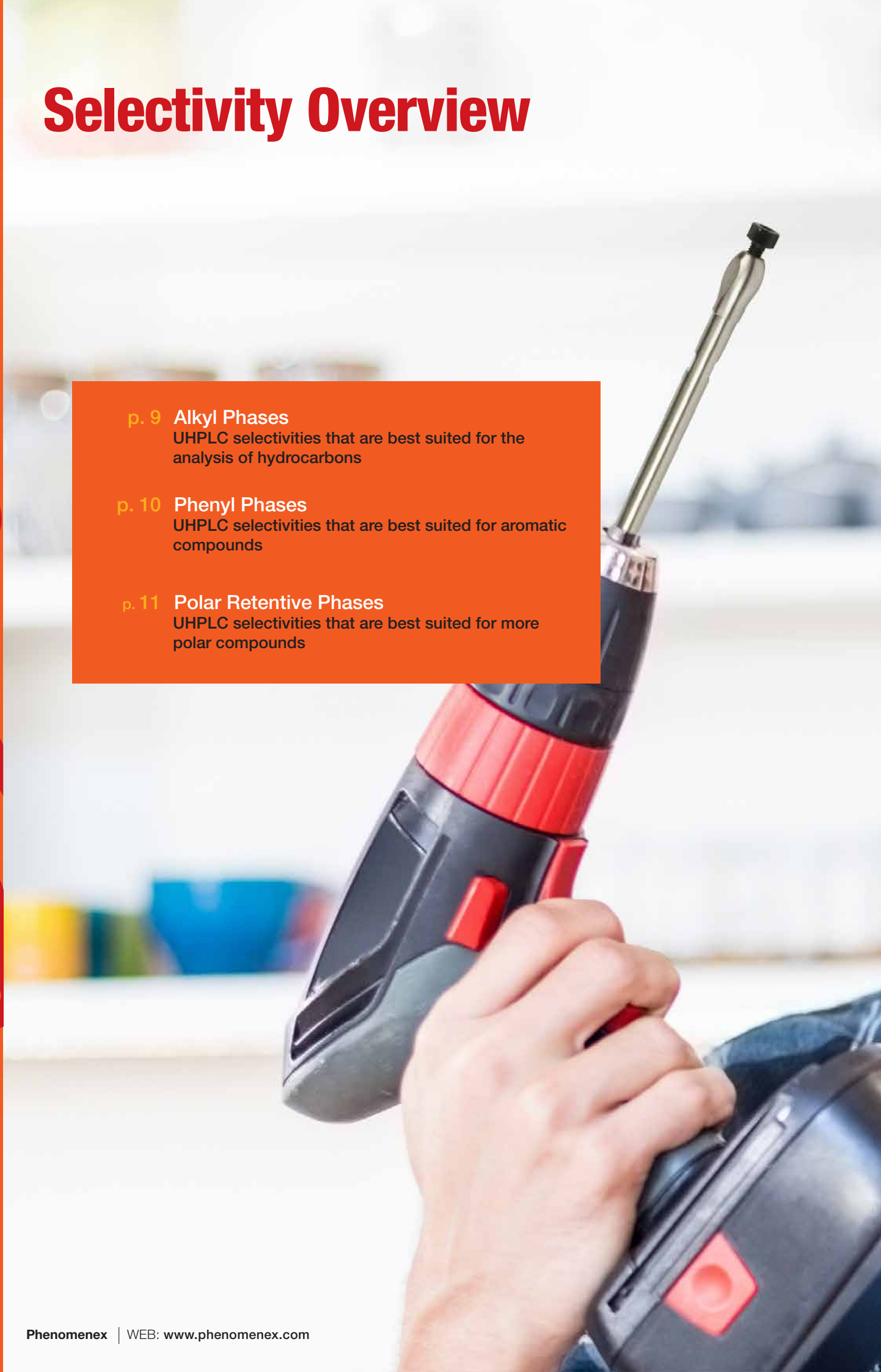
Match Your Target Compounds to the 5 Primary Selectivity Parameters

Three primary mechanisms of selectivity relate to the analyte of interest above. By referencing the column selectivity bar chart below, we can see the correlation between selectivity mechanisms and column selectivity profiles.

Example: **Luna® Omega 1.6 µm Polar C18 Selectivity Bar Chart**



Selectivity Overview



Alkyl Phases

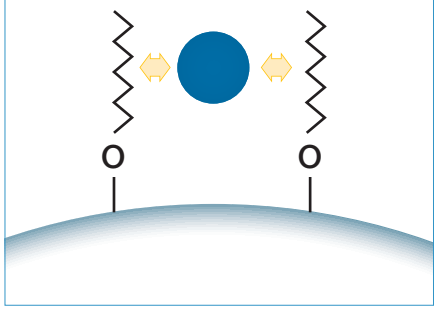
Application Spotlight

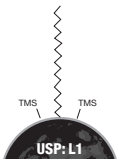
- Cannabinoids
- Analgesics
- Pharmaceuticals (USP: L1)

Find the right amount of hydrophobic selectivity for your separation. Below are UHPLC columns that are recommended for the separation of hydrocarbon-based compounds.

Hydrophobicity

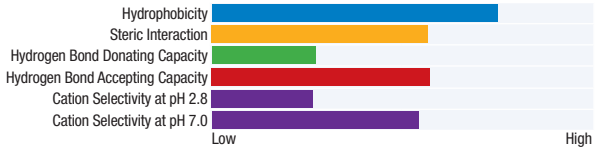
High column hydrophobicity values indicate greater retention of carbon-containing analytes.

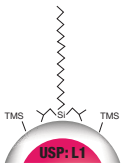




Luna® Omega C18

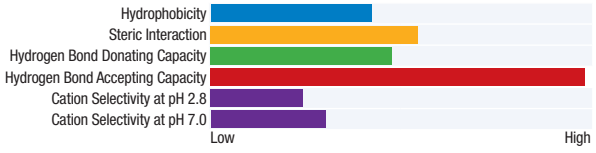
Rugged and highly efficient C18 with strong focus on hydrophobic retention of non-polar and polar compounds.

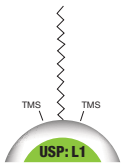




Kinetex® XB-C18

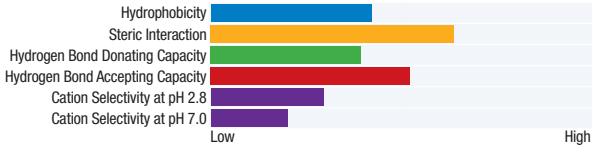
Di-isobutyl side chains differentiate this C18 column. Low ligand density and an inactive surface make this column a great hydrogen acceptor. This phase will demonstrate improved peak shape for basic compounds and increased retention of acids.

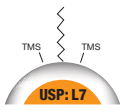




Kinetex C18

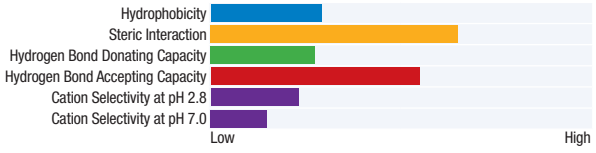
Very well balanced column providing some selectivity through steric, hydrogen, and cationic pathways. This is a great starting point for ultra-high efficiency separations.

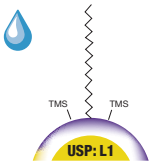




Kinetex C8

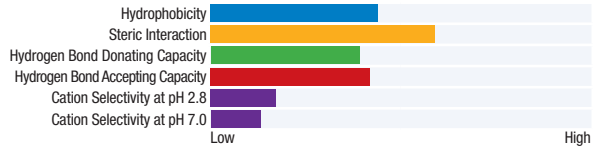
Brings the benefits of core-shell technology to USP L7 methods. The phase will provide moderate hydrophobicity and good steric and hydrogen donating selectivity.





Kinetex EVO C18

Novel pH 1-12 stable C18 that delivers robust methods and improved peak shape for bases.



Denotes stationary phases that are 100 % aqueous stable

Material Characteristics

Phase	Particle Sizes (µm)	Pore Size (Å)	Effective Surface Area (m^2/g)	Effective Carbon Load %	pH Stability	Pressure Stability
Luna Omega C18	1.6	100	260	11	1.5 - 8.5*	1,000/600† bar
Kinetex XB-C18	1.7, 2.6, 3.5, 5	100	200	10	1.5-8.5*	
Kinetex C18	1.3, 1.7, 2.6, 5	100	200	12	1.5-8.5*	
Kinetex C8	1.7, 2.6, 5	100	200	8	1.5-8.5*	
Kinetex EVO C18	1.7, 2.6, 5	100	200	11	1.0-12.0	

* pH stability under gradient conditions. pH stability is 1.5 - 10 under isocratic conditions.
† 2.1 mm ID Kinetex columns are pressure stable up to 1000 bar.
When using Kinetex 1.3 µm or 1.7 µm, increased performance can be achieved, however high pressure-capable instrumentation is required.

Phenyl Phases

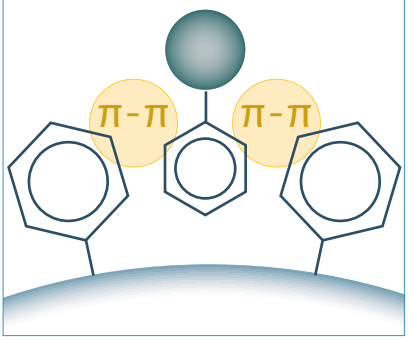
Application Spotlight

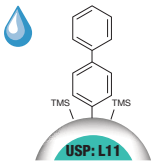
- Taxanes
- Mycotoxins
- Opiates

Aromatic interactions greatly promote steric interactions. Below are UHPLC columns that have the highest potential for pi-pi bond interaction.

Aromaticity

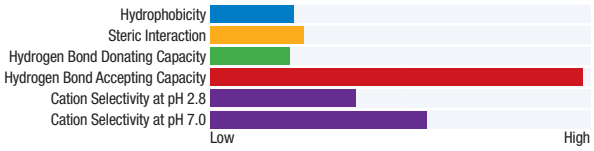
Column chemistries that contain ring structures interact with aromatic or phenyl containing compounds via pi-pi interactions (π stacking).

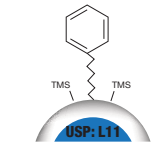




Kinetex® Biphenyl

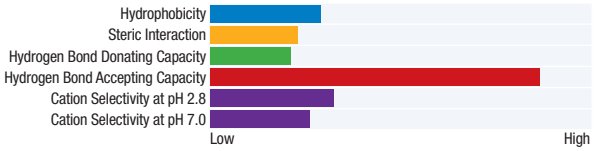
100 % aqueous stable reversed phase chemistry with hydrophobic, aromatic, and enhanced polar selectivity.

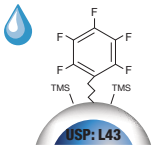




Kinetex Phenyl-Hexyl

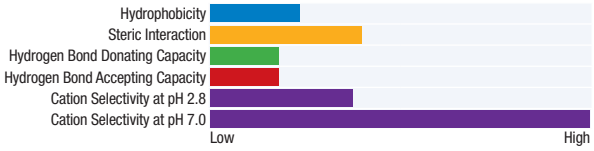
Aromatic and moderate hydrophobic selectivity result in the great retention and separation of aromatic hydrocarbons.





Kinetex F5

This pentafluorophenyl propyl column provides a very high degree of steric selectivity to separate structural isomers. The electronegative fluorine groups offer high selectivity for cationic compounds.



Denotes stationary phases that are 100 % aqueous stable

Material Characteristics

Phase	Particle Sizes (µm)	Pore Size (Å)	Effective Surface Area (m^2/g)	Effective Carbon Load %	pH Stability	Pressure Stability
Kinetex Biphenyl	1.7, 2.6, 5	100	200	11	1.5-8.5*	1,000/600† bar
Kinetex Phenyl-Hexyl	1.7, 2.6, 5	100	200	11	1.5-8.5*	
Kinetex F5	1.7, 2.6, 5	100	200	9	1.5-8.5	

* pH stability under gradient conditions. pH stability is 1.5 - 10 under isocratic conditions.

† 2.1 mm ID Kinetex columns are pressure stable up to 1000 bar.

When using Kinetex 1.3 µm or 1.7 µm, increased performance can be achieved, however high pressure-capable instrumentation is required.

Method Develoment Tip!

Try using methanol for the organic portion of the mobile phase. It can help promote pi-pi bond interaction!

Polar Retentive Phases

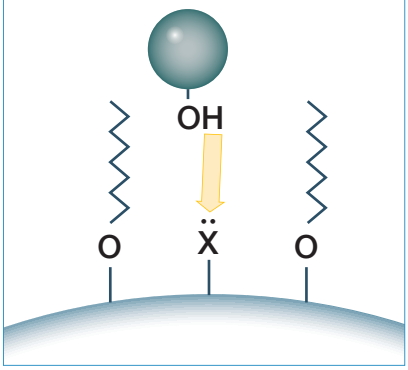
Application Spotlight

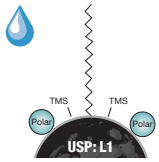
- Peptide Mapping
- Pesticides
- Nucleosides

Column phases with hydrogen bond accepting/donating capacity have increased polar selectivity and retention of polar compounds. Below are UHPLC columns that offer increased polar selectivity/retention.

Hydrogen Bond Accepting Capacity

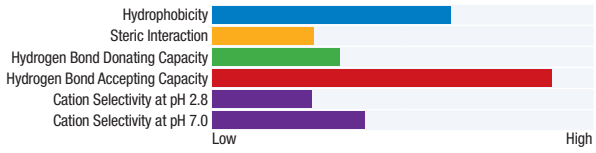
Hydrogen bond accepting groups on the silica surface interact with hydrogen bond donating functionalities on analytes.

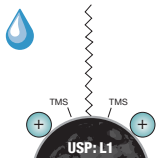




Luna® Omega Polar C18

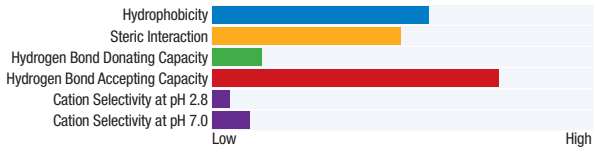
100 % aqueous stability and enhanced selectivity/ retention for polar analytes without diminishing useful non-polar retention. The C18 ligand provides general hydrophobic interactions while a polar modified particle surface provides enhanced polar compound retention.

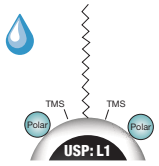




Luna Omega PS C18

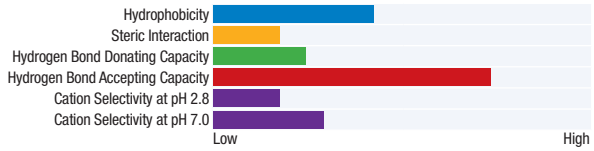
Unique, 100 % aqueous stable mixed-mode phase that provides both polar and non-polar retention. The surface contains a positive charged ligand which aids in the retention of acidic compounds through ionic interactions, while the C18 ligand promotes general reversed phase hydrophobic retention. The positively charged surface also improves basic compound peak shape through ionic repulsion.





Kinetex® Polar C18

Combined C18 and polar modified surface that provide polar and non-polar retention alongside 100 % aqueous stability.



Denotes stationary phases that are 100 % aqueous stable

Material Characteristics

Phase	Particle Sizes (µm)	Pore Size (Å)	Surface Area (m^2/g)	Carbon Load (%)	pH Stability	Pressure Stability
Kinetex Polar C18	2.6	100	200	9	1.5 - 8.5*	1,000/600† bar
Luna Omega Polar C18	1.6, 3, 5	100	260	9	1.5 - 8.5*	
Luna Omega PS C18	1.6, 3, 5	100	260	9	1.5 - 8.5*	

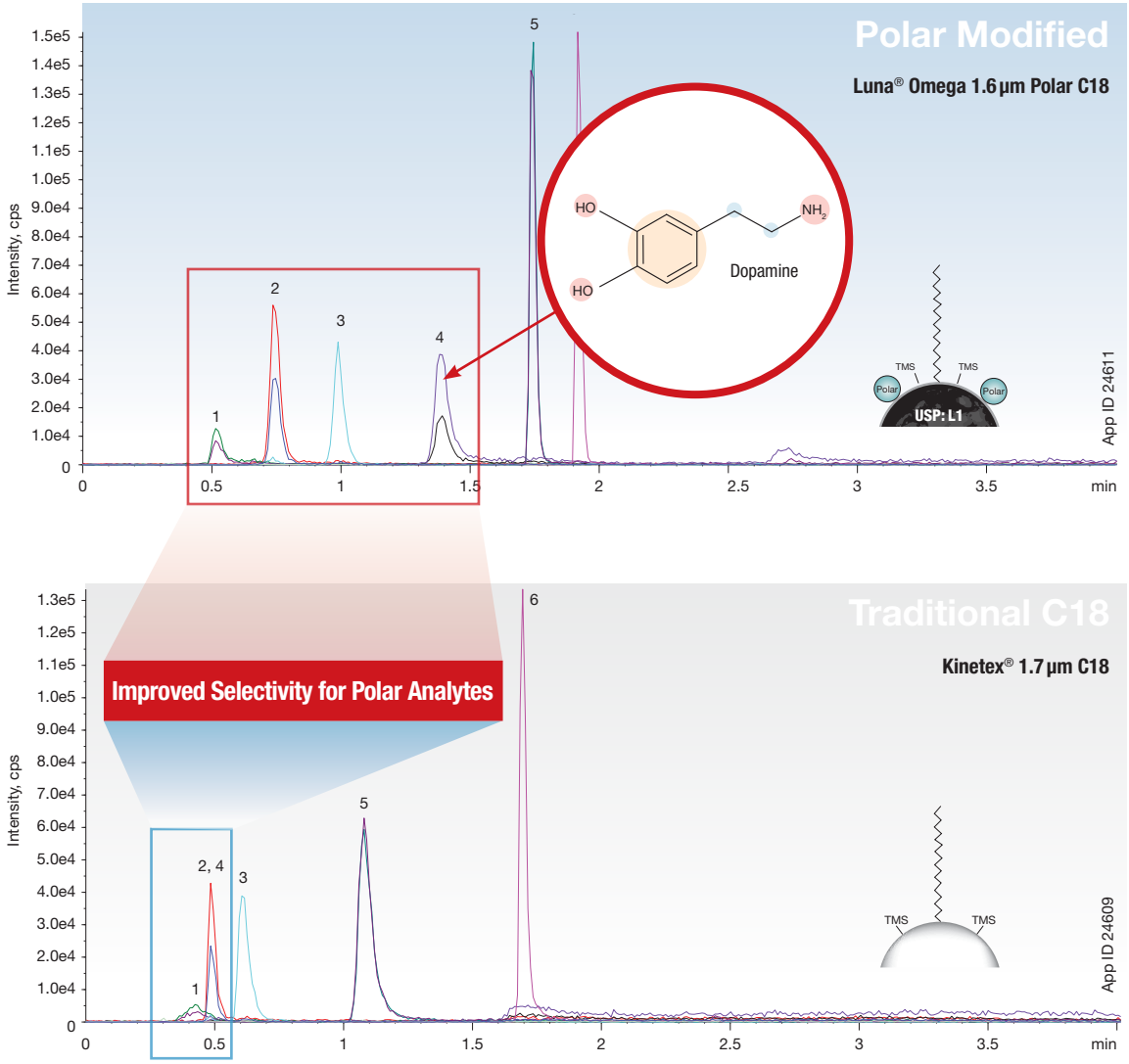
* pH stability under gradient conditions. pH stability is 1.5 - 10.0 under isocratic conditions.
† 2.1 mm ID Kinetex columns are pressure stable up to 1000 bar.

Applying Column Selectivities to Your UHPLC Analysis

Thinking Outside the Traditional C18 Phase

The extent to which resolution depends on selectivity becomes evident when a chromatographer takes advantage of technologic advances in polar stationary phases in order to improve their analysis. Below is an example of resolution improvements obtained by switching from a traditional C18 to a column with additional selectivity mechanisms.

Polar Selectivity of Catecholamines



Conditions for both columns:

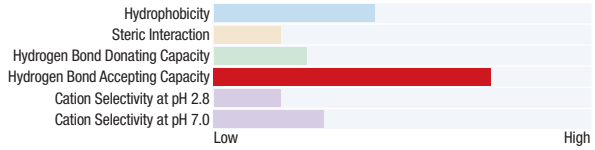
Columns: Luna Omega 1.6 µm Polar C18
Kinetex 1.7 µm C18
Dimensions: 50 x 2.1 mm
Mobile Phase: A: 10 mM Ammonium Formate with 0.1 % Formic Acid
B: Acetonitrile with 0.1 % Formic Acid
Gradient:

Time (min)	% B
0	0
3	90

Flow Rate: 0.4 mL/min
Injection Volume: 1 µL
Temperature: 22 °C
Detection: MS/MS (SCIEX API 4000™)
Sample: 1. Norepinephrine
2. Epinephrine
3. Normetanephrine
4. Dopamine
5. Metanephrine
6. Serotonin

Improved Separation with Polar C18

The increased hydrogen bond accepting capacity of the Luna Omega Polar C18 column improves polar selectivity for analytes such as dopamine.

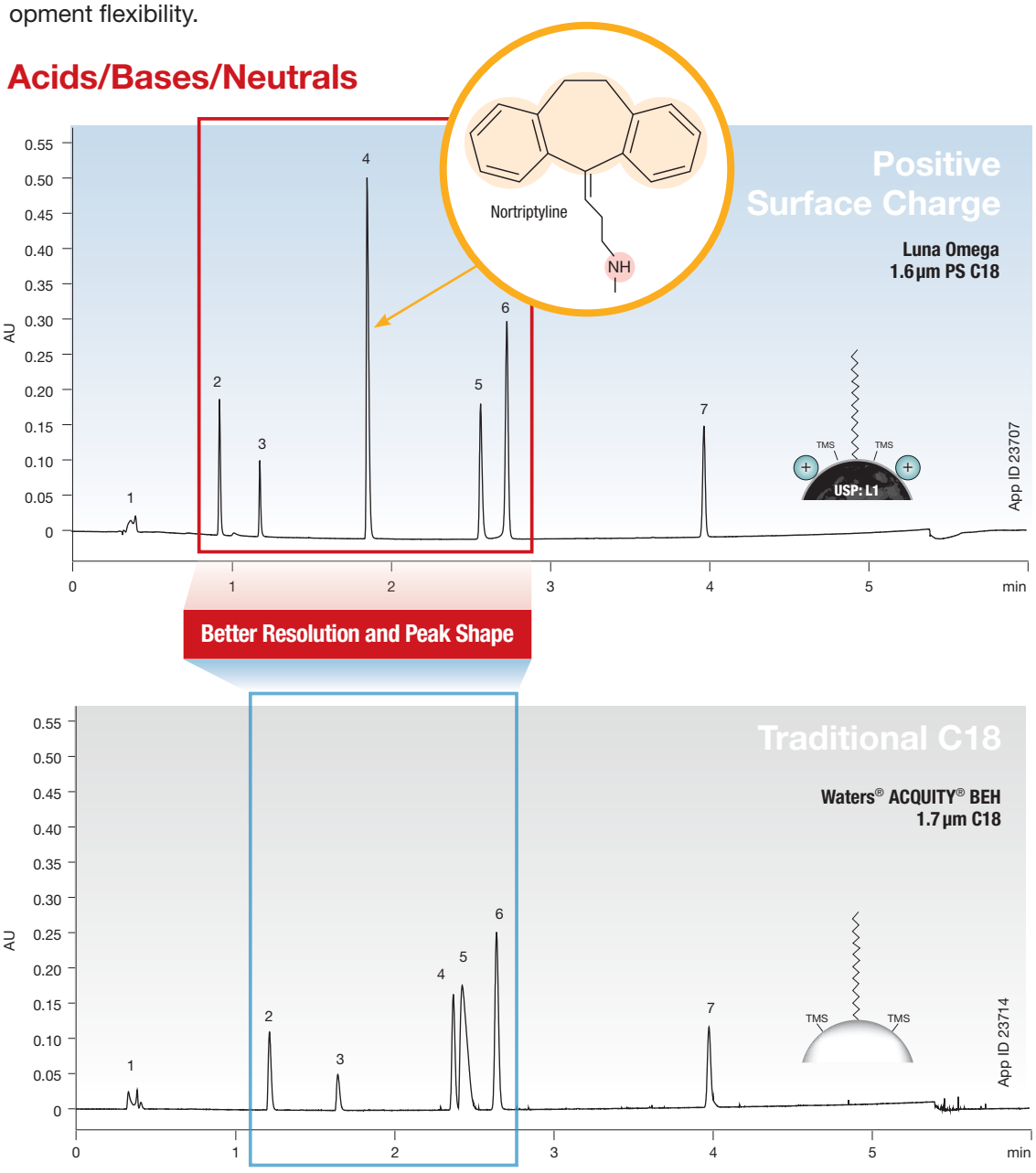


Comparative separations may not be representative of all applications.

Thinking Outside the Traditional C18 Phase

Traditional C18 phases may not always be the best option. A UHPLC column that has both polar and hydrophobic versatility allows for great method development flexibility.

Acids/Bases/Neutrals



Conditions for both columns:

Columns: Luna Omega 1.6µm PS C18
ACQUITY BEH 1.7µm C18

Dimensions: 50 x 2.1 mm

Mobile Phase: A: Water with 0.1 % Formic Acid
B: Acetonitrile with 0.1 % Formic Acid

Gradient:

Time (min)	% B
0	5
5	95
5.01	5
8	5

Flow Rate: 0.4 mL/min

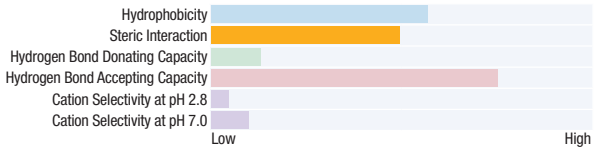
Temperature: 22 °C

Detection: UV @ 254 nm

Sample:
1. Uracil
2. Pindolol
3. Chlorpheniramine
4. Nortriptyline
5. 3-Methyl-4-nitrobenzoic acid
6. 5-Methyl salicylaldehyde
7. Hexanophenone

Improved Separation with PS C18

The increase in steric interaction of the Luna Omega PS C18 column improves resolution for aromatic analytes such as nortriptyline.



Comparative separations may not be representative of all applications.

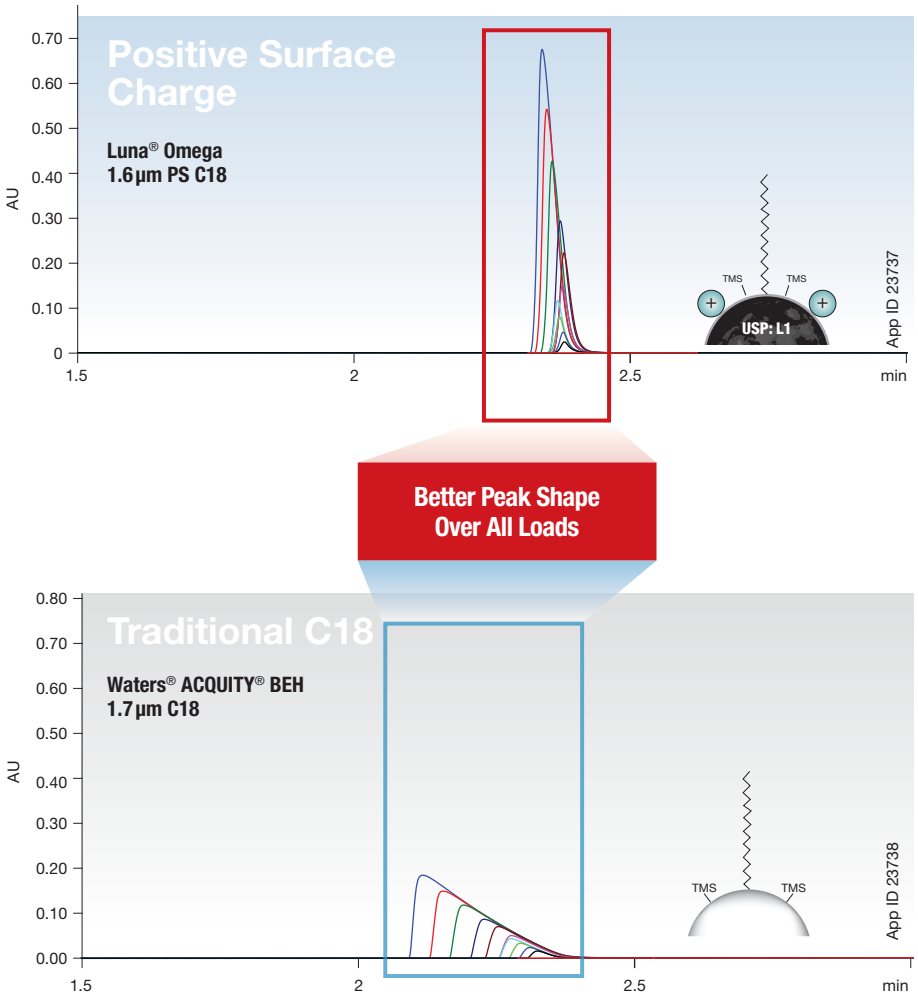
Thinking Outside the Traditional C18 Phase

Traditional UHPLC C18 phases can be prone to peak tailing for highly basic compounds and this tailing can become exacerbated when higher loadability is required. The Luna® Omega PS C18's combination of a high surface area and novel surface chemistry allows for better peak shape as loading increases.

Why is Loadability Important?

- Analytical conformation parallel to purification
- Dealing with high API concentrations when conducting stability tests
- High sample loading to visualize low-level analytes of interest

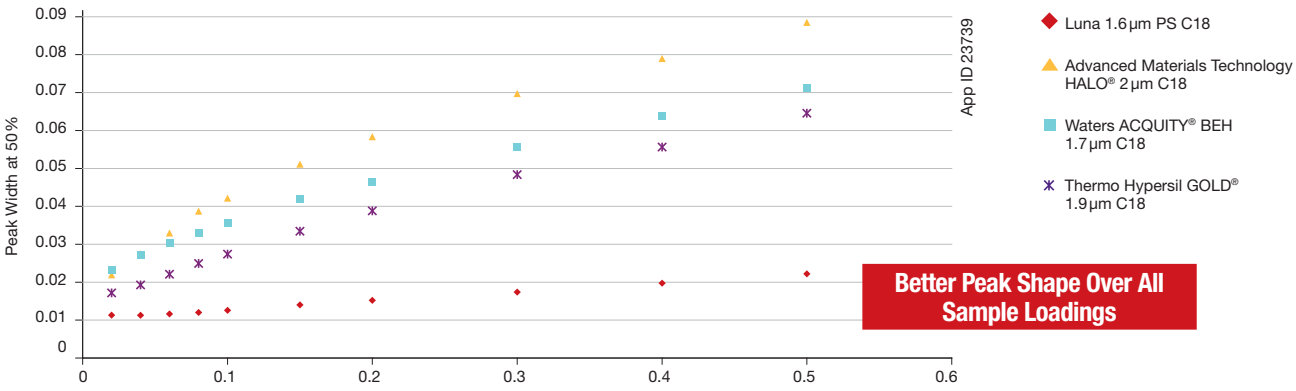
Amitriptyline Loading Study



Conditions for both columns:

Columns:	Luna Omega 1.6 µm PS C18 ACQUITY BEH 1.7 µm C18
Dimensions:	50 x 2.1 mm
Mobile Phase:	A: Water with 0.1 % Formic Acid B: Acetonitrile with 0.1 % Formic Acid
Gradient:	**Time (min) % B** 0 5 5 80
Flow Rate:	0.4 mL/min
Temperature:	22 °C
Detection:	UV @ 254 nm
Sample:	Amitriptyline

Luna Omega PS C18 50 x 2.1 mm vs. Other Columns

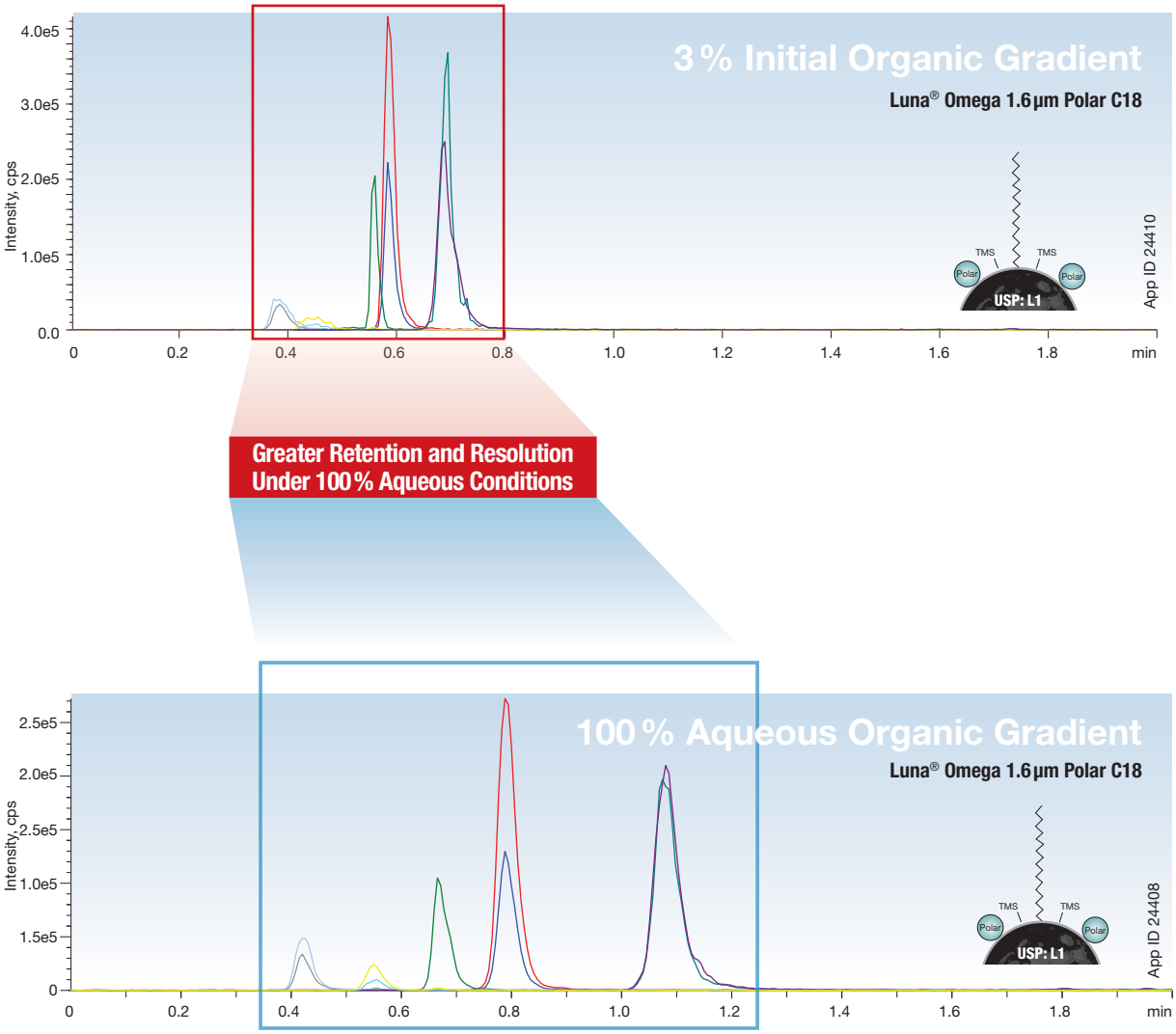


Comparative separations may not be representative of all applications.

Improve Polar Separations with 100% Aqueous Stable Phases

A powerful tool in the chromatographer's toolbox is the ability to use 100% aqueous conditions to promote polar selectivity and increased retention. Traditional C18 phases are known to collapse under 100% aqueous conditions, causing a loss of retention and method development headaches.

Catecholamines



Conditions for both separations:

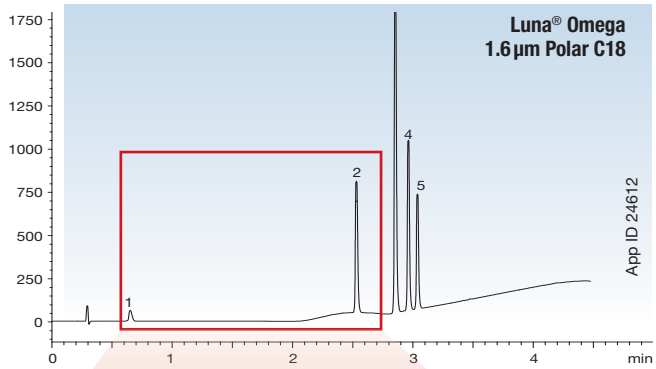
Column: Luna Omega 1.6µm Polar C18
Dimension: 50 x 2.1 mm
Part No.: 00B-4748-AN
Mobile Phase: A: Water with 0.1% Formic Acid
B: Acetonitrile with 0.1% Formic Acid
Gradient:

Time (min)	% B
0	3 (except where noted)
3	100

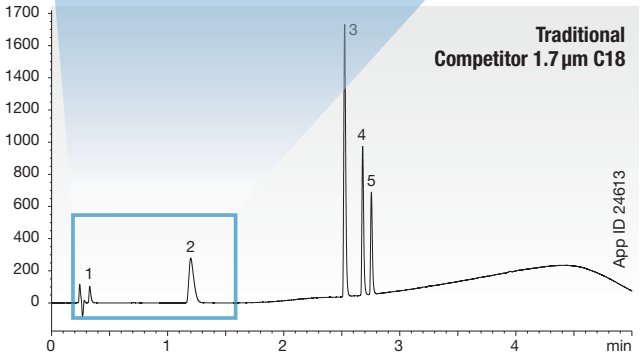
Flow Rate: 0.4 mL/min
Temperature: 40 °C
Detection: MS/MS (SCIEX API 4000™) (ambient)
Sample: 1. Norepinephaine
2. Epinephrine
3. Normetanephrine
4. Dopamine
5. Metanephrine
6. 3-Hydroxytyramine

Improve Polar Separations with 100% Aqueous Stable Phases

Dipeptides in 100% Aqueous Conditions



100% Aqueous Conditions Increase Retention and Selectivity of Polar Analytes



Column: Luna Omega 1.6µm Polar C18
Dimensions: 50 x 2.1 mm
Part No.: 00B-4748-AN
Mobile Phase: A: Water with 0.1% TFA
B: Acetonitrile with 0.1% TFA
Gradient:

Time (min)	% B
0	0
3	75

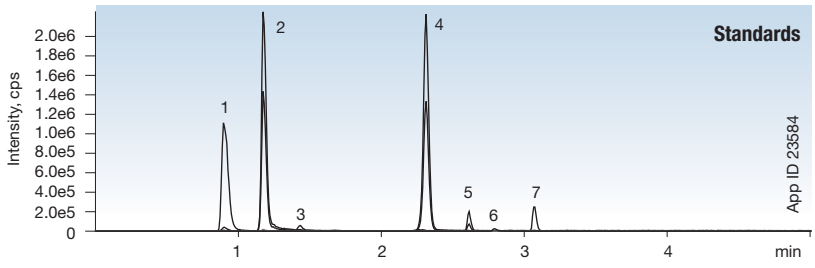
Flow Rate: 0.6 mL/min
Injection Volume: 1 µL
Temperature: 40 °C
Detection: UV @ 210 nm (ambient)
Sample: 1. Arg-Glu
2. Gly-Tyr
3. Trp-Gly
4. Gly-Trp
5. Pro-Trp

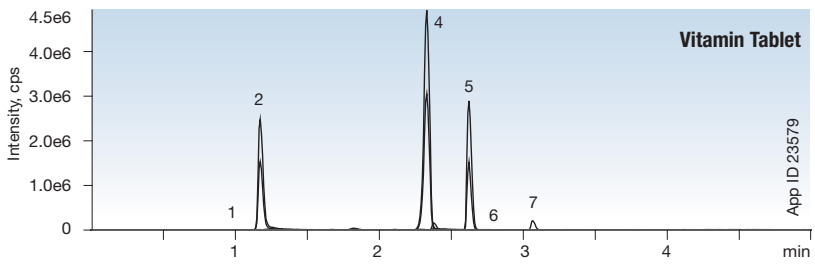
Column: Competitor 1.7 µm C18
Dimensions: 50 x 2.1 mm
Mobile Phase: A: Water with 0.1% TFA
B: Acetonitrile with 0.1% TFA
Gradient:

Time (min)	% B
0	3
3	75

Flow Rate: 0.6 mL/min
Injection Volume: 1 µL
Temperature: 40 °C
Detection: UV @ 210 nm (ambient)
Sample: 1. Arg-Glu
2. Gly-Tyr
3. Trp-Gly
4. Gly-Trp
5. Pro-Trp

Water Soluble Vitamins under 100% Aqueous Conditions





Conditions same for both separations:
Column: Luna Omega 1.6µm Polar C18
Dimensions: 50 x 2.1 mm
Part No.: 00B-4748-AN
Mobile Phase: A: 10 mM Ammonium Formate with 0.1% Formic Acid
B: Acetonitrile with 0.1% Formic Acid
Gradient:

Time (min)	% B
0	0
4	90
4.1	0
7	0

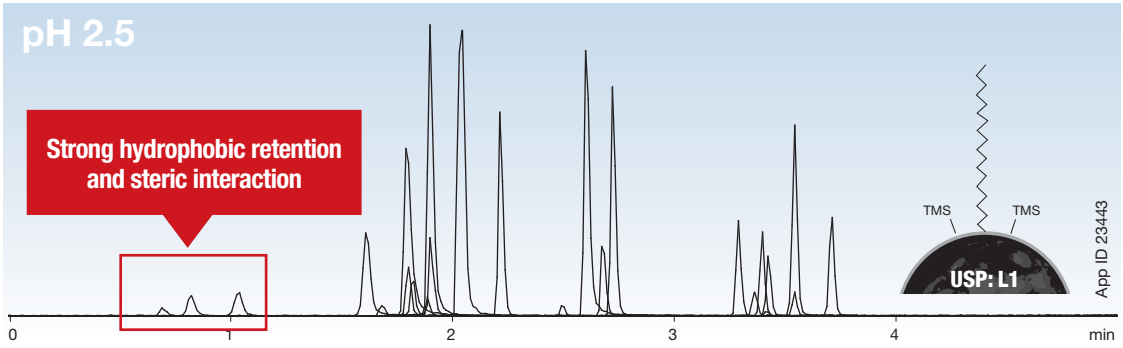
Flow Rate: 0.4 mL/min
Temperature: 40 °C
Detection: MS/MS (SCIEX API 4000™) @ 450 °C
Sample: 1. Pyridoxamine
2. Thiamine
3. Nicotinic acid
4. Pyridoxine
5. Pantothenic acid
6. Folic acid
7. Riboflavin

Comparative separations may not be representative of all applications.

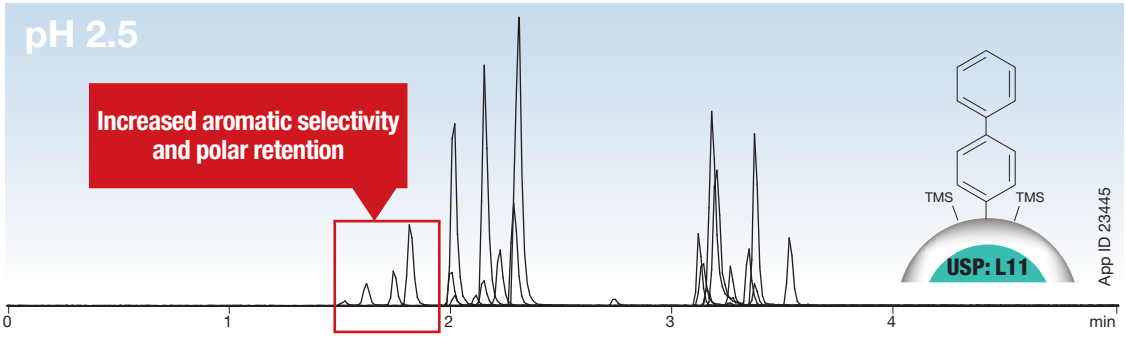
Utilizing Unique Selectivities

The elution order of analytes can change depending upon the predominate selectivity characteristics of a UHPLC column and the utilized mobile phase. Therefore, by altering the stationary phase or mobile phase conditions, we can observe a unique elution order and extend retention of more polar analytes.

Luna® Omega 1.6 µm C18



Kinetex® 1.7 µm Biphenyl



Conditions for both columns:

Columns: Luna Omega 1.6 µm C18
Kinetex 1.7 µm Biphenyl

Dimensions: 50 x 2.1 mm

Part No.: 00B-4742-AN
00B-4628-AN

Mobile Phase: A: Water with 0.1 % Formic Acid
B: Acetonitrile with 0.1 % Formic Acid

Gradient:

Time (min)	% B
0	5
4	95
5	95
5.1	5

Flow Rate: 0.4 mL/min

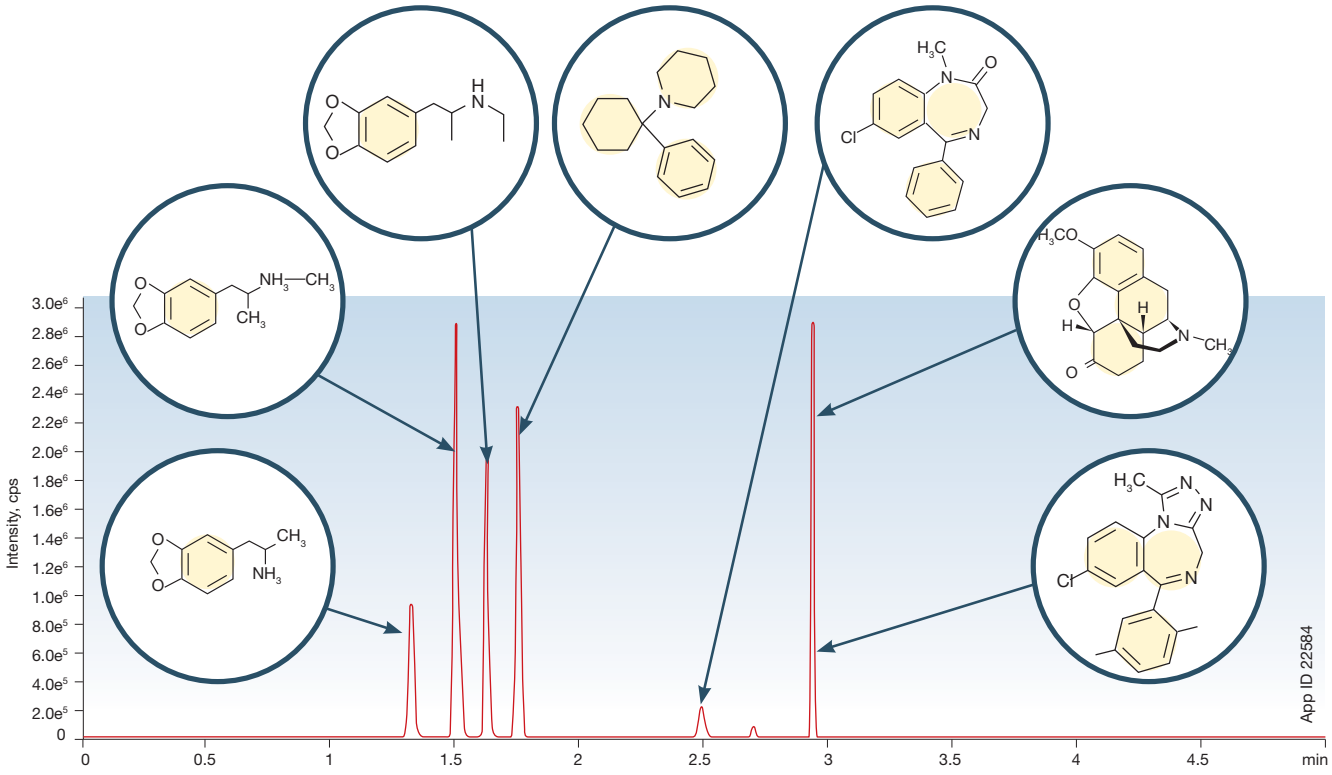
Temperature: 40 °C

Detection: MS/MS (SCIEX API 4000™) (ambient)

Sample: Drugs of Abuse

Aromatic Based Selectivity

Compounds with aromatic ring structures offer a specific type of selectivity associated with pi-pi bond interaction. The compound's aromaticity provides pi electrons that have the potential to interact with pi bonds, which can be found on phenyl-based stationary phases. This provides a unique, orthogonal selectivity compared to a traditional C18 phase.



Column: Kinetex® 1.7 µm Biphenyl
Dimensions: 50 x 2.1 mm
Part No.: 00B-4628-AN
Mobile Phase: A: Water with 0.1 % Formic Acid
B: Acetonitrile with 0.1 % Formic Acid

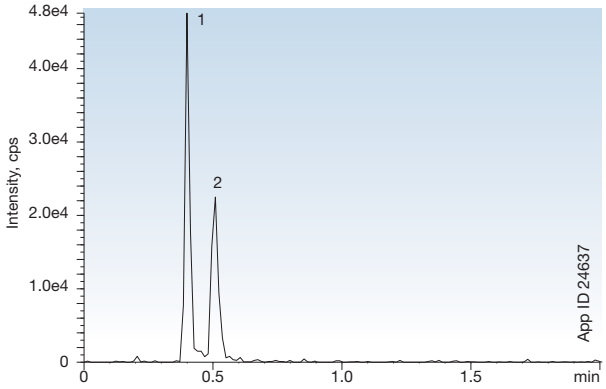
Gradient:

Time (min)	% B
0	5
4	100
5	100
7	5

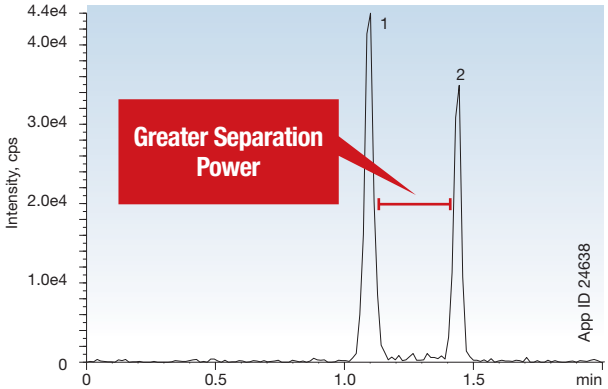
Flow Rate: 0.5 mL/min
Injection Volume: 10 µL
Temperature: 40 °C
Detection: MS/MS (SCIEX API 4000™) (ambient)
Sample: Drugs of Abuse

Increased Separation of Aromatic Compounds Using a Biphenyl Phase

Kinetex 1.7 µm C18



Kinetex 1.7 µm Biphenyl



Conditions for both columns:

Columns: Kinetex® 1.7 µm C18
Kinetex® 1.7 µm Biphenyl
Dimensions: 50 x 2.1 mm
Part No.: 00B-4628-AN
00B-4475-AN
Mobile Phase: A: Water with 0.1 % Formic Acid
B: Methanol with 0.1 % Formic Acid

Gradient:

Time (min)	% B
0	10
4	100
4.1	10

Flow Rate: 400 µL/min
Injection Volume: 10 µL
Temperature: 50 °C
Backpressure: 450 Bar
Detection: MS/MS (SCIEX API 4000™) (ambient)
Sample: 1. Morphine
2. Hydromorphone

Protect Your Column's Selectivity

SecurityGuard ULTRA
UHPLC Column Protection

Save Time and Money

It's a fact! Chemical contaminants and particulates are a natural part of any chromatographic analysis. The easiest way to extend column performance is to remove these contaminants and particulates with SecurityGuard ULTRA before they reach your UHPLC column and degrade your chromatography.

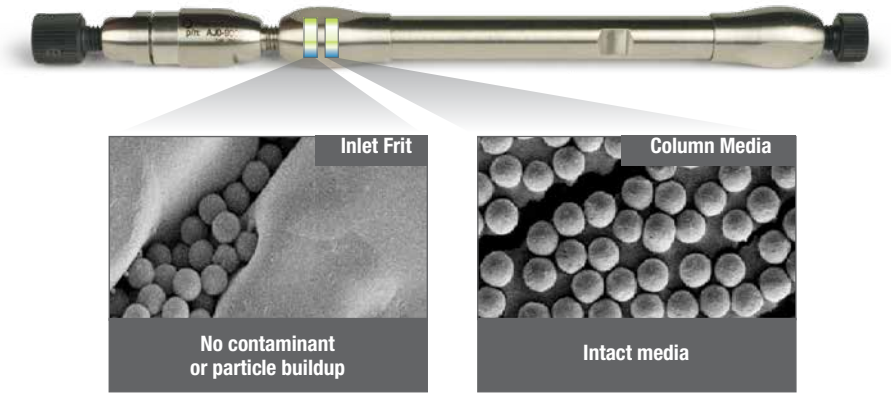
With SecurityGuard ULTRA, you will experience:

- Increased UHPLC column lifetime
- Better column performance
- More reproducible chromatography
- Fewer wasted columns

SecurityGuard ULTRA

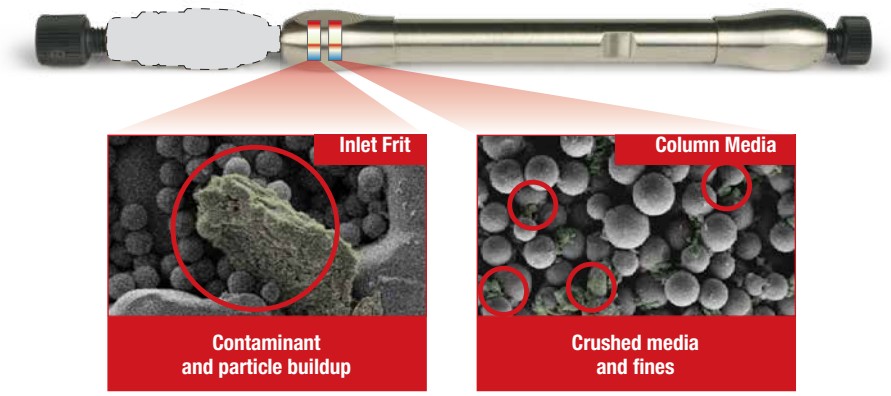
For all core-shell and/or < 3 µm particle columns (< 20,000 psi / 1,378 bar)

With SecurityGuard ULTRA



(24000 times magnification)

Without SecurityGuard ULTRA



(24000 times magnification)

> "We used to have to change out our columns every 2 to 3 months and ever since we started using the SecurityGuard cartridges we can do at least 6 months before changing a column out."
>
> T. Serviss

The opinions stated herein are solely those of the speaker and not necessarily those of any company or organization.

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A Phenomenex Technical Specialist is here
to help nearly 24 hours a day!

As Voted by You

Kinetex® Core-Shell LC Columns Earned the SelectScience Gold Seal of Quality Award

SelectScience® 2017 GOLD Seal of Quality

Amgen®

"The Kinetex column has worked great for our validated assays. We easily converted our HPLC methods to UPLC methods using the Kinetex column and have enjoyed being able to run fast UPLC chromatography..."

GlycosBIO® Food Sciences

"I really love the Kinetex columns. I now have shorter HPLC method runs and nice peak resolution. Methods that used to take 30 to 40 minutes on other columns now take 15–20 minutes. I'm enjoying the fact that my samples are analyzed more quickly without compromising the quality of the peaks in the chromatograms."

University of Texas MD Anderson Cancer Center

"We have drastically improved sensitivity, reproducibility, and lifetime on our column after switching to the Kinetex technology."

KINETEX® Core-Shell Technology™

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Kinetex Core-Shell UHPLC Column Ordering Information

1.7 µm Minibore Columns (mm)					SecurityGuard™ ULTRA Cartridges‡
Phases	30 x 2.1	50 x 2.1	100 x 2.1	150 x 2.1	3/pk
EVO C18	—	00B-4726-AN	00D-4726-AN	00F-4726-AN	AJ0-9298
F5	—	00B-4722-AN	00D-4722-AN	00F-4722-AN	AJ0-9322
Biphenyl	—	00B-4628-AN	00D-4628-AN	00F-4628-AN	AJ0-9209
XB-C18	00A-4498-AN	00B-4498-AN	00D-4498-AN	00F-4498-AN	AJ0-8782
C18	00A-4475-AN	00B-4475-AN	00D-4475-AN	00F-4475-AN	AJ0-8782
C8	00A-4499-AN	00B-4499-AN	00D-4499-AN	00F-4499-AN	AJ0-8784
HILIC	00A-4474-AN	00B-4474-AN	00D-4474-AN	—	AJ0-8786
Phenyl-Hexyl	—	00B-4500-AN	00D-4500-AN	00F-4500-AN	AJ0-8788

for 2.1 mm ID

1.7 µm MidBore™ Columns (mm)				SecurityGuard ULTRA Cartridges‡
Phases	30 x 3.0	50 x 3.0	100 x 3.0	3/pk
XB-C18	00A-4498-Y0	00B-4498-Y0	00D-4498-Y0	AJ0-8775
C18	—	00B-4475-Y0	00D-4475-Y0	AJ0-8775
C8	00A-4499-Y0	00B-4499-Y0	00D-4499-Y0	AJ0-8777
HILIC	—	00B-4474-Y0	—	AJ0-8779

for 3.0 mm ID

1.7 µm Microbore Columns (mm)			
Phases	50 x 1.0	100 x 1.0	150 x 1.0
EVO C18	00B-4726-A0	00D-4726-A0	00F-4726-A0
Biphenyl	00B-4628-A0	00D-4628-A0	00F-4628-A0

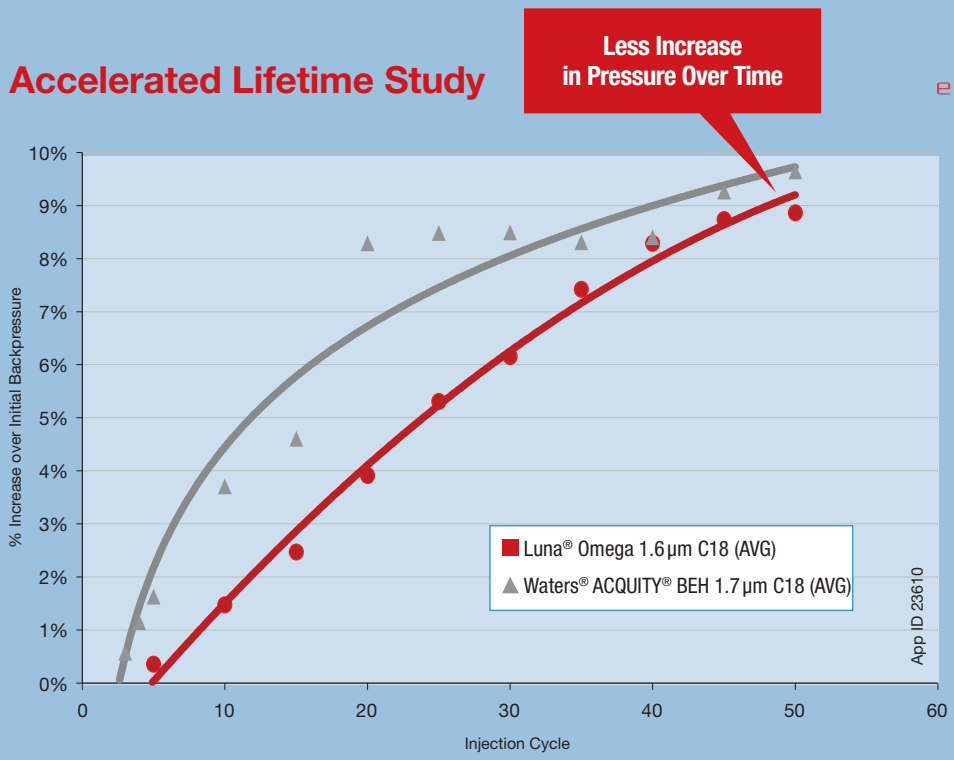
1.3 µm Minibore Columns (mm)		
Phases	30 x 2.1	50 x 2.1
C18	00A-4515-AN	00B-4515-AN

‡SecurityGuard ULTRA cartridges require holder, Part No.: AJ0-9000

Luna® Omega Offers Better UHPLC Column Lifetimes

Phenomenex columns are engineered for durability and are able to withstand high system pressure. For example, lifetime studies are conducted to ensure superior performance and long column lifetimes.

Accelerated Lifetime Study



explore LUNA® OMEGA

Conditions for both columns:

Columns:	Luna Omega 1.6 µm C18 ACQUITY BEH 1.7 µm C18
Dimensions:	50 x 2.1 mm
Mobile Phase:	A: Water with 0.1 % Formic Acid B: Acetonitrile with 0.1 % Formic Acid
Gradient:	**Time (min) / % B** 0 / 5 4 / 95 4.1 / 5
Flow Rate:	0.4 mL/min
Temperature:	25 °C
Detection:	UV @ 210 nm
Sample:	Protein Matrix

Luna Omega UHPLC Column Ordering Information

1.6 µm Microbore Columns (mm)			
Phases	**50 x 1.0**	**100 x 1.0**	**150 x 1.0**
Polar C18	00B-4748-A0	00D-4748-A0	00F-4748-A0
C18	00B-4742-A0	00D-4742-A0	00F-4742-A0
PS C18	00B-4752-A0	00D-4752-A0	-

1.6 µm Minibore Columns (mm)					SecurityGuard™ ULTRA Cartridges‡
Phases	**30 x 2.1**	**50 x 2.1**	**100 x 2.1**	**150 x 2.1**	**3/pk**
Polar C18	00A-4748-AN	00B-4748-AN	00D-4748-AN	00F-4748-AN	AJ0-9505
PS C18	00A-4752-AN	00B-4752-AN	00D-4752-AN	00F-4752-AN	AJ0-9508
C18	00A-4742-AN	00B-4742-AN	00D-4742-AN	00F-4742-AN	AJ0-9502
					for 2.1 mm ID

‡SecurityGuard ULTRA cartridges require holder, Part No.: AJ0-9000

guarantee

If Phenomenex analytical columns do not provide at least an equivalent separation as compared to a competing column of the same particle size, similar phase and dimensions, return the Phenomenex column with comparative data within 45 days for a FULL REFUND.

The Chromatographer's Guide
To Improving UHPLC Column Selectivity

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