AERIS™

Core-Shell Technology for Proteins and Peptides

Ultra-High Resolution and Performance on HPLC and UHPLC Systems

phenomenex®
...breaking with tradition℠

Welcome to
the Future of BioSeparations

Introducing **Aeris**™, a specialized line of reversed phase core-shell HPLC / UHPLC columns, built exclusively for the ultra-high performance separation and analysis of proteins and peptides.

These columns can provide improved **resolving power**, **selectivity**, **throughput**, **sensitivity**, **column lifetime**, and **method flexibility** compared to other fully porous and core-shell columns typically used for bioseparations.

Choose your optimal Aeris column

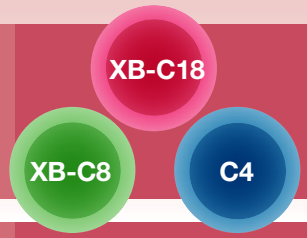
See page 6!

Aeris WIDEPORE

p16

Large pore optimized for protein diffusion

Multiple selectivities



3.6 µm particle for HPLC and UHPLC systems

Aeris PEPTIDE

p26

Small pore optimized for peptide diffusion

Ideal surface chemistry for resolving peptides

Two scalable particle sizes for method and system flexibility

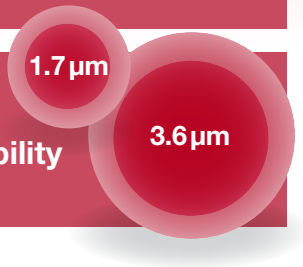


Table of Contents

Aeris Core-Shell Technology

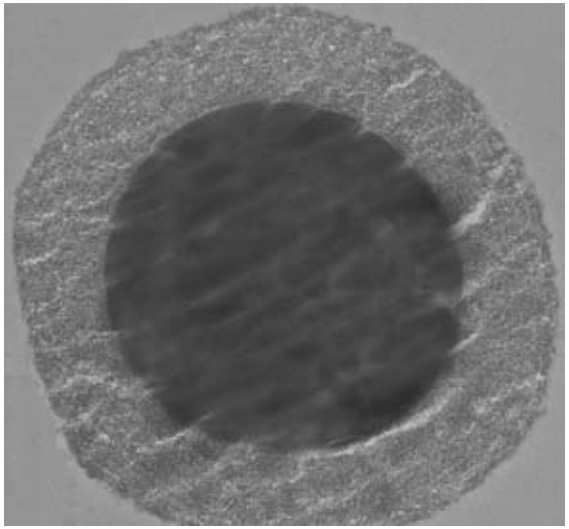
> *Aeris had better separation abilities and lower backpressure than other core-shell reverse phase columns I've tried with proteins. I had very good technical and customer support throughout the entire process! I'm very glad to have switched to Phenomenex columns!*
> -LYNN PRUISNER, TECHNOLOGY COMPANY

Core-Shell Particles Precision Engineered
for Protein and Peptide Separations

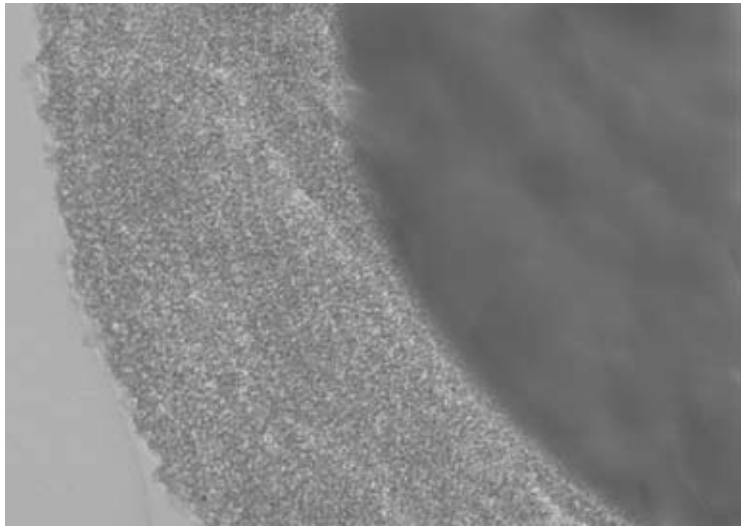
Core-shell particle technology provides **striking increases in peak capacity and resolution** at lower backpressures, giving chromatographers the ability to achieve ultra-high performance on ANY system, HPLC or UHPLC.

A uniform porous silica layer is grown around a solid, spherical silica core, providing effective retention and selectivity with improved resolution, speed, and recovery. Next, optimizing the pore size and shell thickness for intact proteins or smaller peptide fragments provides well-defined depth penetration of biomolecules leading to **maximum separation power**.

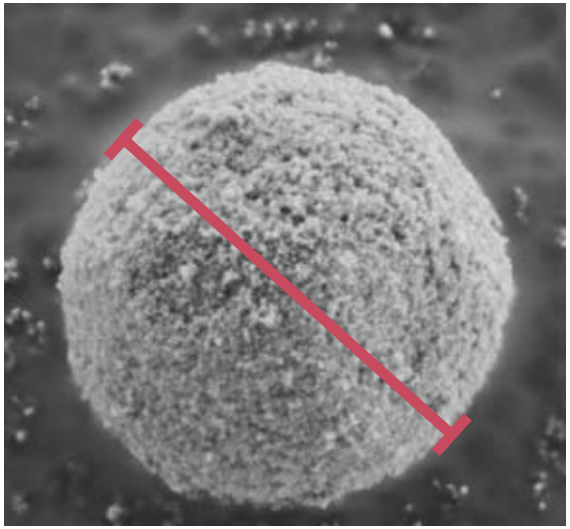
TEM and SEM of Aeris™ PEPTIDE 3.6µm Core-Shell Particles



Cross section of an Aeris core-shell particle



Magnified cross section of the porous "shell"



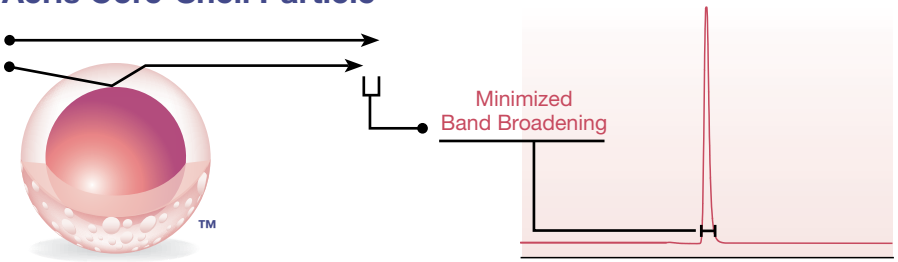
Uniform particle size and shape

The precise architecture of core-shell particles provides dramatic leaps in performance in two important ways:

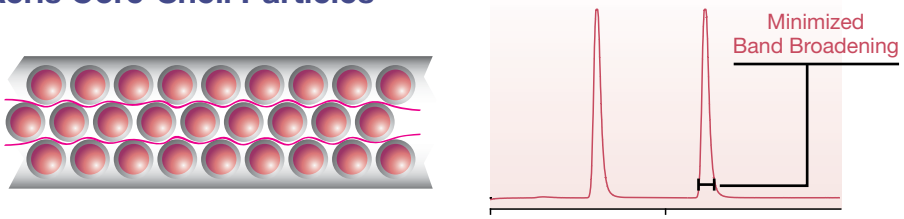
1. The thin, porous layer, or “shell”, decreases the diffusion path length, thus reducing the time it takes for biomolecules to adsorb/desorb into and out of the particle.

2. Uniform sizing and shape of the particles along with tight packing specifications reduces losses in efficiency and performance due to band broadening.

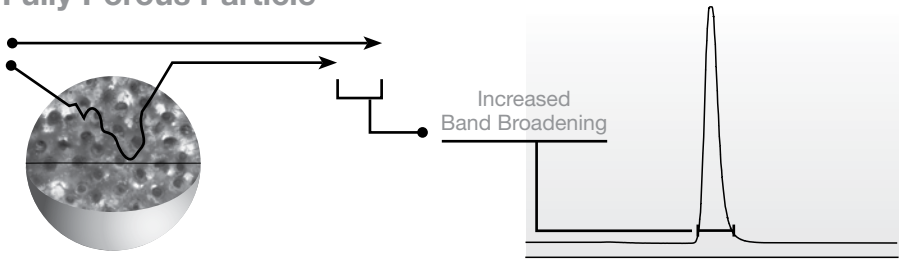
Aeris Core-Shell Particle



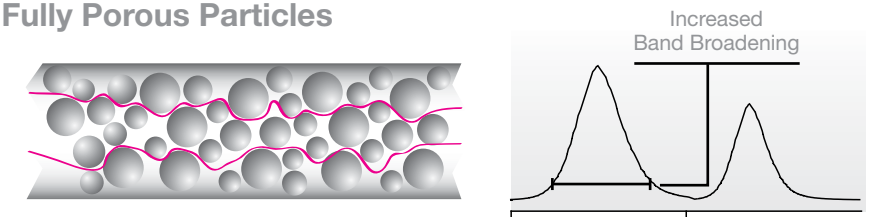
Aeris Core-Shell Particles



Fully Porous Particle



Fully Porous Particles

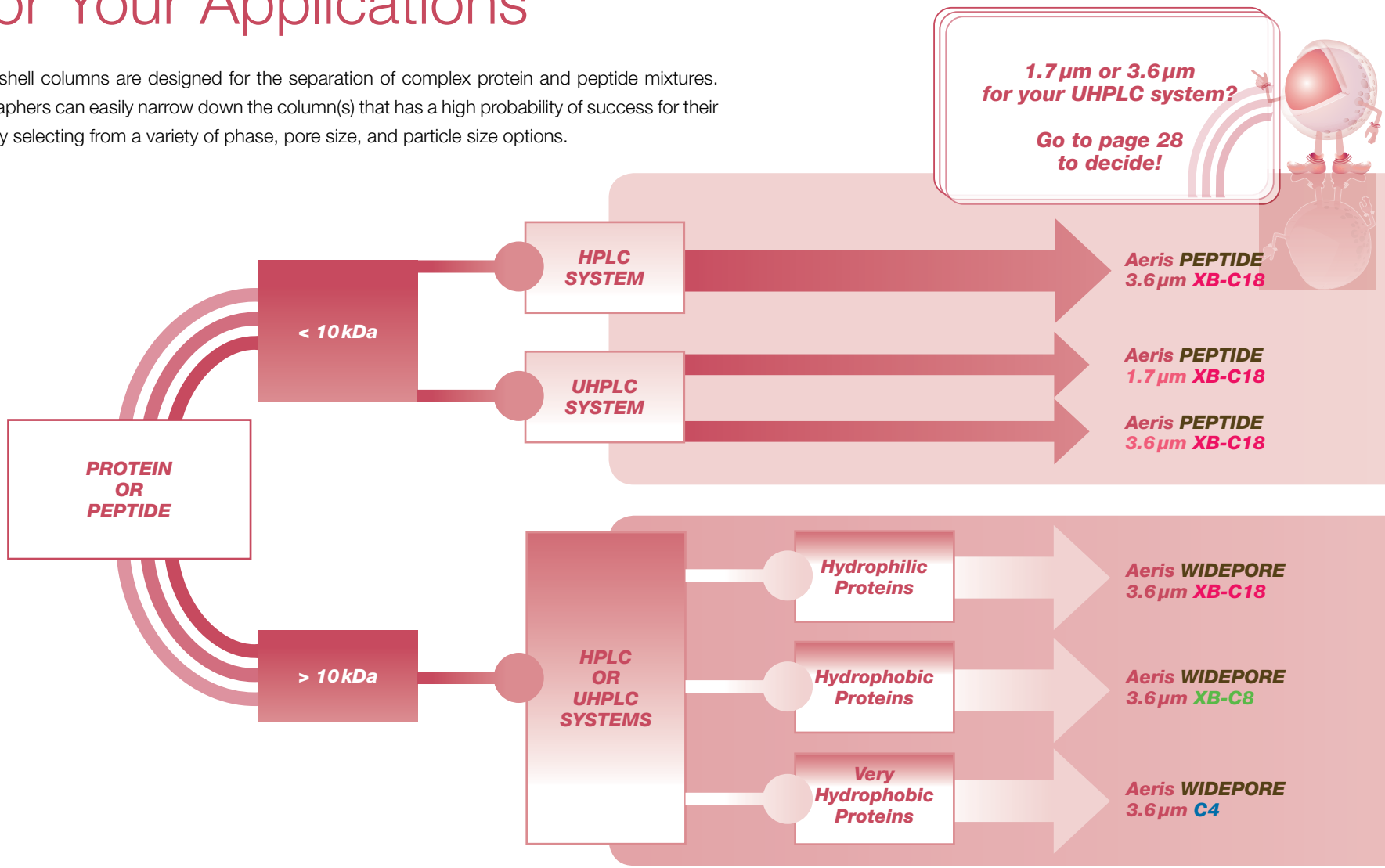


The result is

- **3.6 µm core-shell particles** that can perform like sub-2 µm columns on both HPLC and UHPLC systems at a fraction of the pressure
- **1.7 µm core-shell particles** that can provide higher peak capacities compared to fully porous sub-2 µm columns on UHPLC systems

Selecting the Optimal Aeris Column
for Your Applications

Aeris™ core-shell columns are designed for the separation of complex protein and peptide mixtures. Chromatographers can easily narrow down the column(s) that has a high probability of success for their separation by selecting from a variety of phase, pore size, and particle size options.

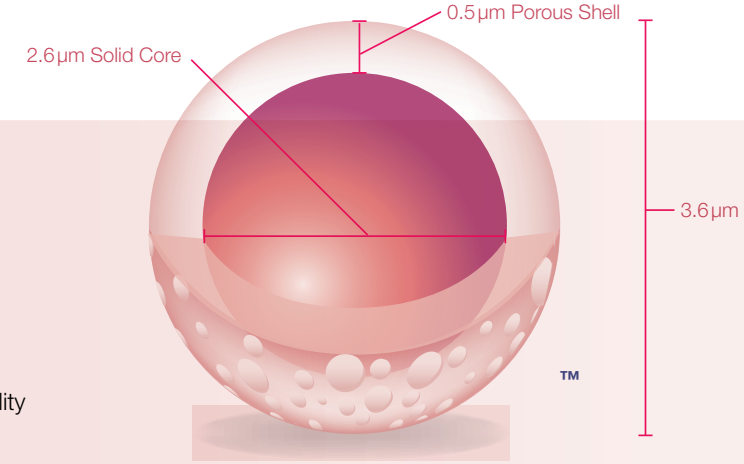


Aeris PEPTIDE

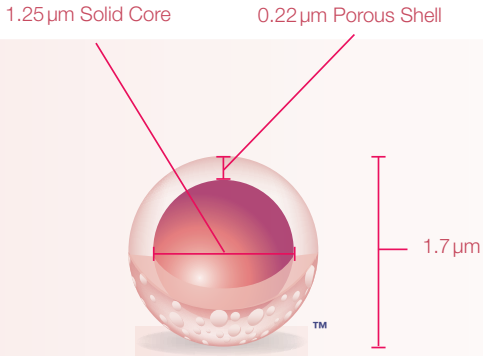
Recommended for the separation of low molecular weight peptides and peptide mapping.

- XB-C18 chemistry best suited for resolving peptides
- 1.7 µm and 3.6 µm particles for method development flexibility
- Small pore optimized for peptide diffusion

3.6 µm Core-Shell Particle



1.7 µm Core-Shell Particle

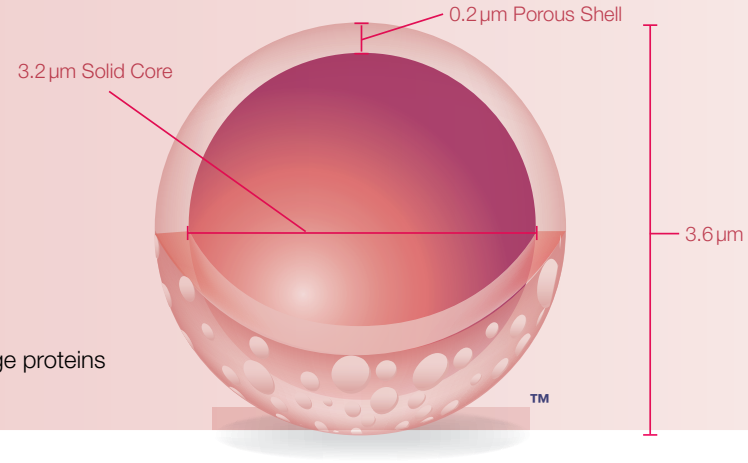


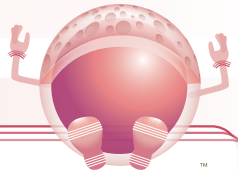
Aeris WIDEPORE

Recommended for the separation of intact proteins and large oligonucleotides.

- XB-C18, XB-C8, and C4 phases for alternate selectivities
- 3.6 µm particle for system flexibility
- Thin shell optimized for fast protein adsorption/desorption
- High pore permeability for improved separation of very large proteins (up to 400 kDa)

3.6 µm Core-Shell Particle





Aeris WIDEPORE XB-C18 and Aeris PEPTIDE XB-C18 make a perfect pair for peptide mapping.
See p. 32 for more details.

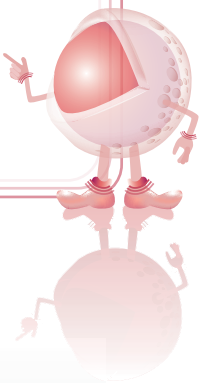
Improve Resolution on ANY System
by Leveraging Low Backpressure

Aeris™ PEPTIDE and Aeris WIDEPORE 3.6 µm columns can **perform like sub-2 µm columns at a fraction of the backpressure**. This allows chromatographers to utilize the resolving power of longer length (or coupled) columns without exceeding the pressure limits of their HPLC system. Scientists analyzing proteins and peptides can now have ultra-high resolution on HPLC or UHPLC systems.

Using a UHPLC system?

Try Aeris PEPTIDE 1.7 µm columns for ultra-high efficiency peptide maps and stability up to 1,000 bar.

See page 11!

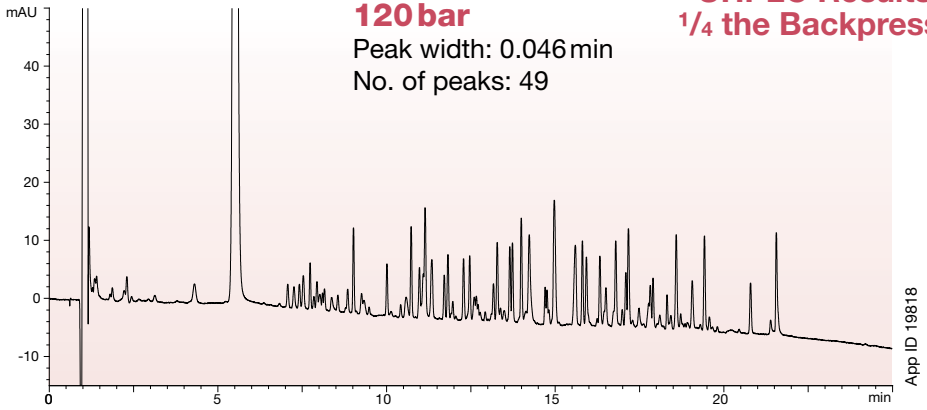


Sub-2 µm Performance at a Fraction of the Backpressure

Aeris WIDEPORE
3.6 µm XB-C18

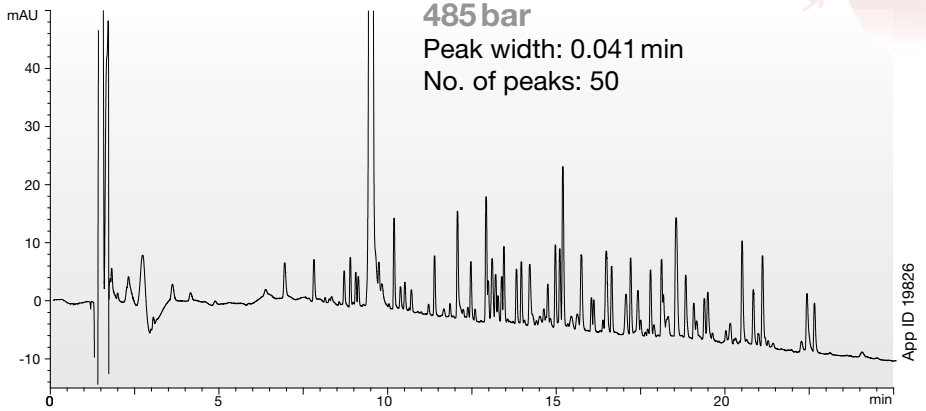
120 bar
Peak width: 0.046 min
No. of peaks: 49

UHPLC Results at 1/4 the Backpressure



*Waters® ACQUITY® BEH300
1.7 µm C18

485 bar
Peak width: 0.041 min
No. of peaks: 50



Conditions for both columns:

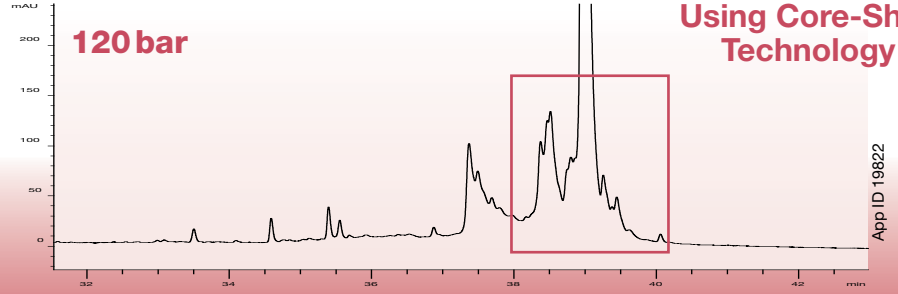
Column: Aeris WIDEPORE 3.6 µm XB-C18
ACQUITY® BEH300 1.7 µm C18
Dimensions: 150 x 2.1 mm
Mobile Phase: A: Water with 0.1 % TFA
B: Acetonitrile with 0.1 % TFA
Gradient: A/B (65:35) for 3 min to A/B (35:65) over 30 min
Flow Rate: 0.3 mL/min
Temperature: 40 °C
Injection Volume: 20 µL
Instrument: Agilent® 1200SL
Detection: UV @ 214 nm (ambient)
Sample: BSA (Bovine Serum Albumin) Tryptic Digest

* ACQUITY and Waters are registered trademarks, and BEH Technology is a trademark of Waters Corporation. Phenomenex is not affiliated with Waters Corporation. Study was performed using new columns and, to the extent possible, identical experimental conditions were applied. Comparative separations may not be representative of all applications.

Utilize Long Columns to Maximize Resolution on UHPLC Systems

Aeris WIDEPORE
3.6 µm XB-C18

120 bar

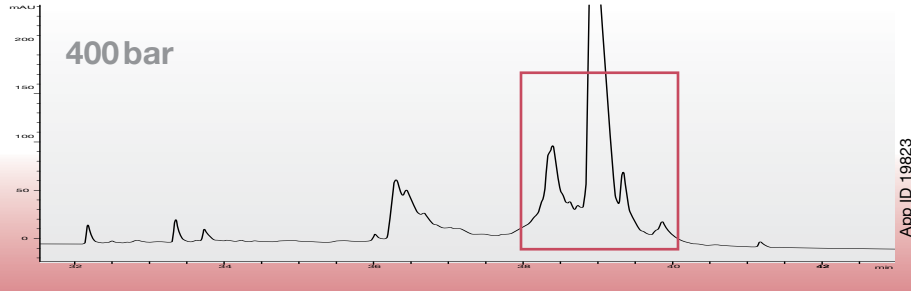


Increased Resolution Using Core-Shell Technology

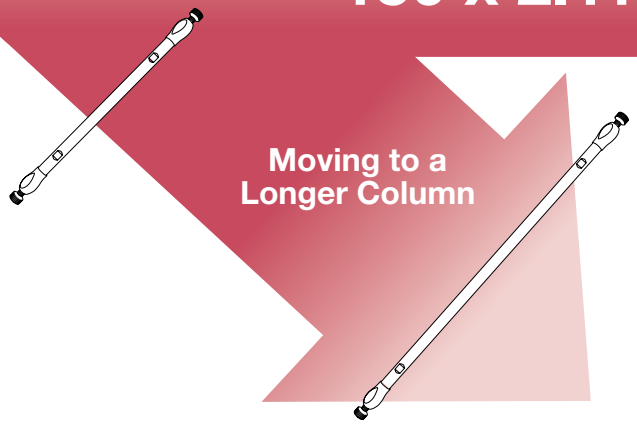
150 x 2.1 mm

***Waters® ACQUITY® BEH300**
1.7 µm C18

400 bar



150 x 2.1 mm

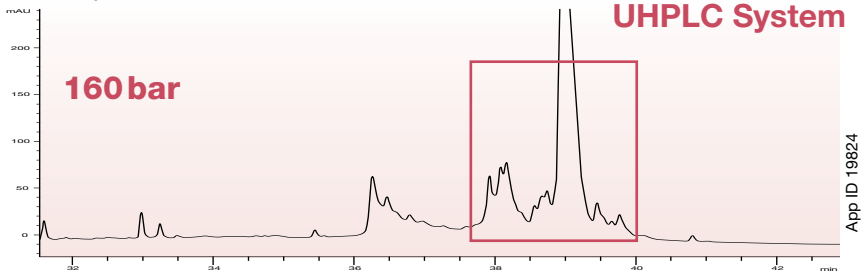


Moving to a Longer Column

250 x 2.1 mm

Aeris WIDEPORE
3.6 µm XB-C18

160 bar



Even Greater Resolution on Your UHPLC System

Conditions for all columns:

Column:	Aeris WIDEPORE 3.6 µm XB-C18 ACQUITY® BEH300 1.7 µm C18
Dimensions:	as noted in chromatogram
Mobile Phase:	A: Water with 0.1 % TFA B: Acetonitrile
Gradient:	A/B (90:10) for 5 min to A/B (50:50) over 45 min
Flow Rate:	0.2 mL/min
Temperature:	22 °C
Injection Volume:	20 µL
Instrument:	Agilent® 1200SL
Detection:	UV @ 210 nm
Sample:	Degraded Myoglobin

* Waters and ACQUITY are registered trademarks, and BEH Technology is a trademark of Waters Corporation. Phenomenex is not affiliated with Waters Corporation. Study was performed using new columns and, to the extent possible, identical experimental conditions were applied. Comparative separations may not be representative of all applications.

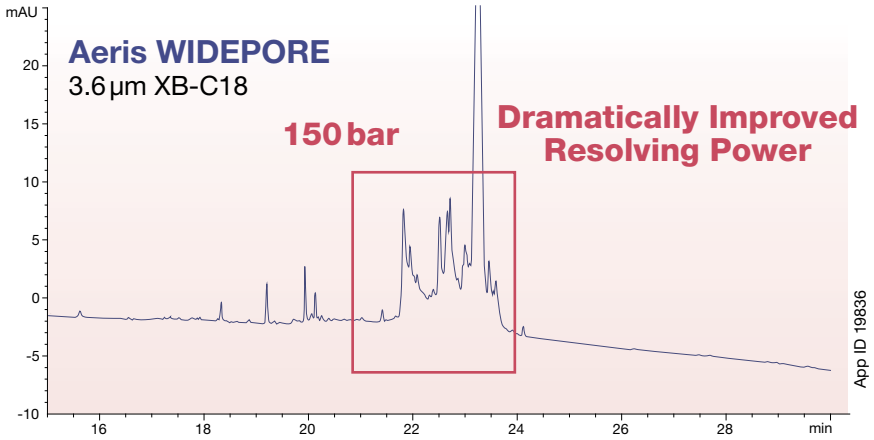
Achieve UHPLC Performance on HPLC Systems
by Replacing 3 µm and 5 µm Columns

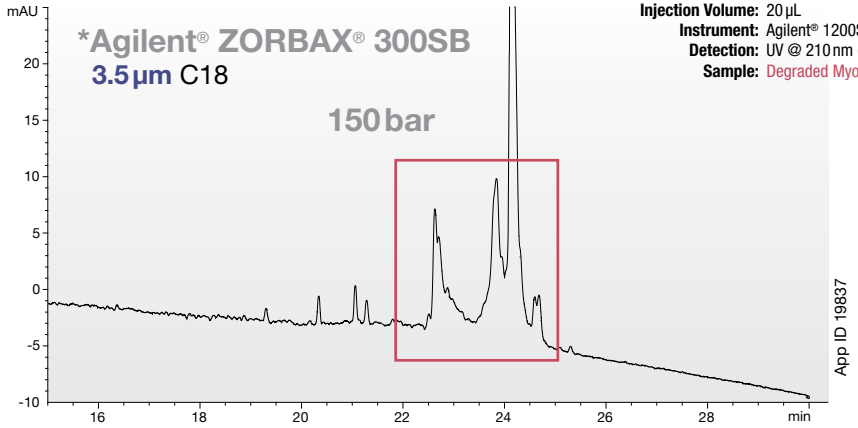
The innovative structure of 3.6 µm Aeris™ core-shell particles was specially designed to provide sub-2 µm performance at backpressures similar to fully porous 3 µm and 5 µm particles. Aeris columns can deliver increased resolution for existing protein and peptide separations performed on fully porous 3 µm and 5 µm columns, using the same HPLC system!

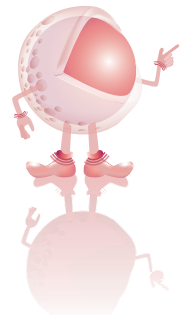
Now you can have **UHPLC performance on your HPLC system** and experience better performance and method flexibility than ever before.

Upgrade Existing Methods on 3 µm and 5 µm Fully Porous Columns to Aeris Core-Shell Technology

Conditions for both columns:
Column: Aeris WIDEPORE 3.6 µm XB-C18
ZORBAX® 300SB 3.5 µm C18
Dimensions: 150 x 4.6 mm
Mobile Phase: A: Water with 0.1 % TFA
B: Acetonitrile with 0.1 % TFA
Gradient: A/B (97:3) for 3 min to A/B (35:65) over 30 min
Flow Rate: 1.5 mL/min
Temperature: 40 °C
Injection Volume: 20 µL
Instrument: Agilent® 1200SL
Detection: UV @ 210 nm (ambient)
Sample: Degraded Myoglobin







Improving your current method is fast and easy with an Aeris core-shell column.

* Agilent and ZORBAX are registered trademarks of Agilent Technologies, Inc. Phenomenex is not affiliated with Agilent Technologies, Inc. Study was performed using new columns and, to the extent possible, identical experimental conditions were applied. Comparative separations may not be representative of all applications.

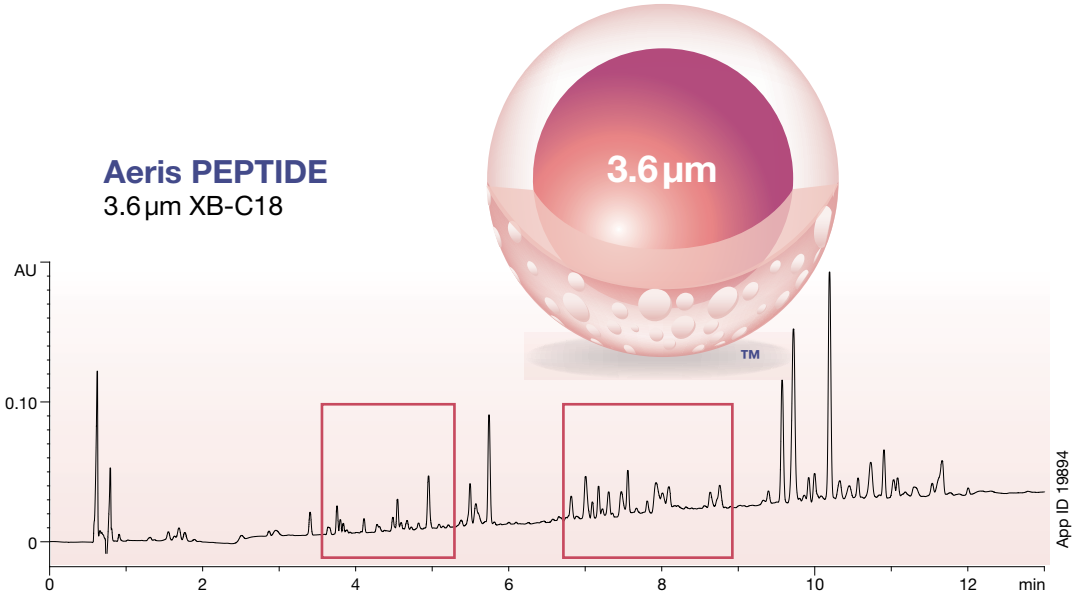
Increase Efficiency on UHPLC Systems
with Sub-2 µm Core-Shell Particles

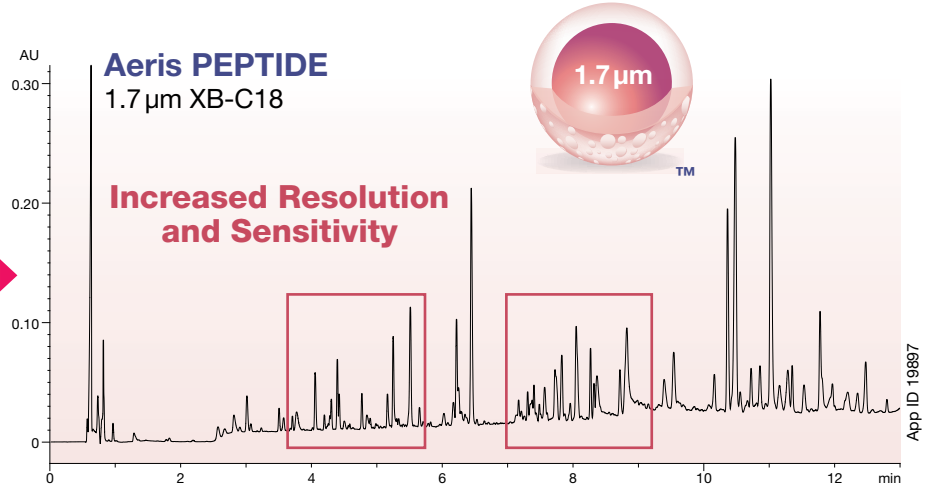
For labs that have adopted higher pressure capable UHPLC instruments, Aeris PEPTIDE 1.7 µm core-shell columns are an excellent solution for ultra-high resolution peptide and peptide mapping separations. Core-shell particle technology combined with a sub-2 µm particle size results in extremely high efficiencies that scientists can use to pull apart critical peaks.

Ultra-High Resolution Achieved with 1.7 µm Core-Shell Technology

Conditions for both columns:

Column:	Aeris PEPTIDE 3.6 µm XB-C18 Aeris PEPTIDE 1.7 µm XB-C18
Dimensions:	150 x 2.1 mm
Part Nos.:	00F-4057-AN 00F-4056-AN
Mobile Phase:	A: Water with 0.1 % TFA B: Acetonitrile with 0.08 % TFA
Gradient:	A/B (97:3) for 1.5 min to A/B (60:40) over 11 min to A/B (5/95) for 1 min
Flow Rate:	0.5 mL/min
Temperature:	40 °C
Injection Volume:	5 µL
Instrument:	Agilent® 1200SL
Detection:	UV @ 214 nm (ambient)
Sample:	Alpha-Casein Tryptic Digest



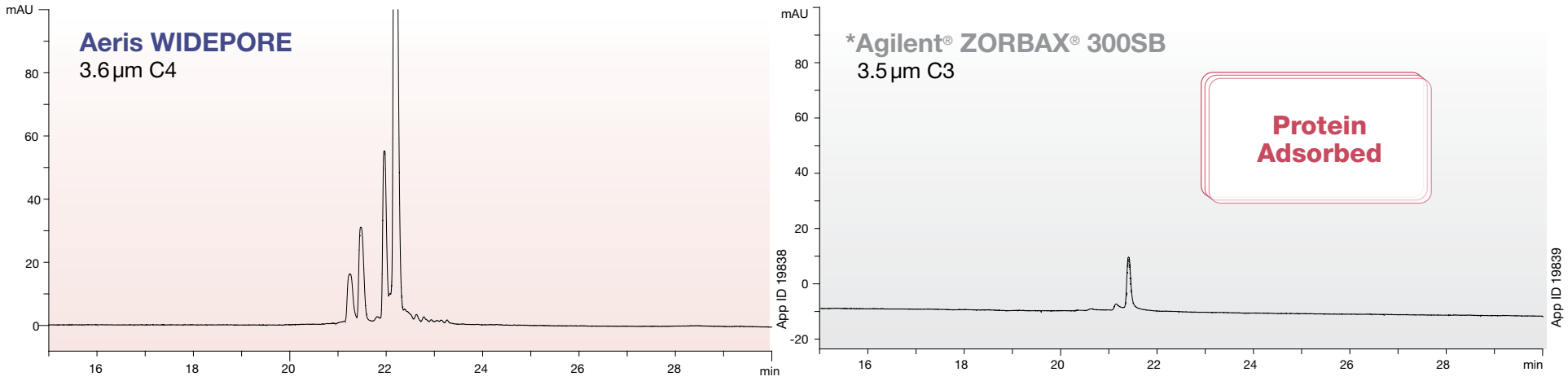


Study was performed using new columns and, to the extent possible, identical experimental conditions were applied. Comparative separations may not be representative of all applications.

Minimize Adsorption and Maximize Recoveries
for Accurate Results

Aeris™ phase chemistries and bonding technology create a highly inert surface, leading to greatly reduced irreversible adsorption, higher recoveries, and sharper, narrower peaks, providing high quality and accurate results for each consecutive analysis.

Maximize Recoveries of Hydrophobic Proteins



Conditions for both columns:

Column: Aeris WIDEPORE 3.6 µm C4
ZORBAX® 300SB 3.5 µm C3
Dimensions: 150 x 2.1 mm
Mobile Phase: A: Water with 0.1 % TFA
B: Acetonitrile with 0.1 % TFA
Gradient: A/B (97:3) to A/B (35:65) over 45 min

Flow Rate: 0.3 mL/min
Temperature: 40 °C
Injection Volume: 20 µL
Instrument: Agilent® 1200
Detection: UV @ 214 nm (ambient)
Sample: Human Epidermal Growth Factor

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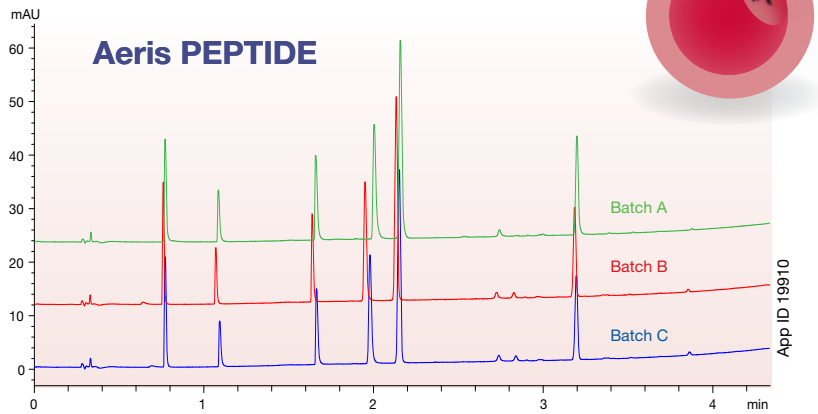
Tightly Controlled Quality
for Reproducible Data

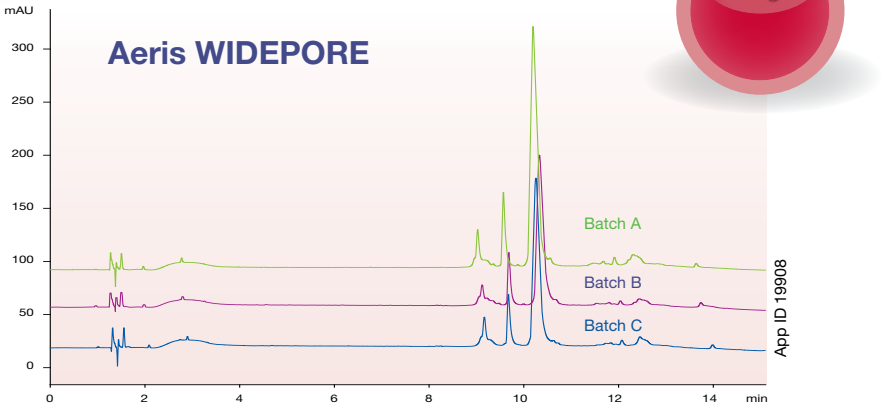
Every Aeris column and batch of media undergoes quality assurance tests for particle size distribution (both solid core and final particle), surface coverage, carbon load, pore diameter, pore size distribution, and other parameters to ensure **exceptional reproducibility for worry-free methods and confident results**.

Batch-to-Batch Reproducibility



Column: Aeris PEPTIDE 1.7 µm XB-C18
Dimensions: 50 x 4.6 mm
Part No.: 00B-4506-E0
Mobile Phase: A: Water with 0.1 % Formic Acid
B: Acetonitrile with 0.1 % Formic Acid
Gradient: A/B (95:5) to A/B (5:95) over 4 min
Flow Rate: 1.85 mL/min
Temperature: 30 °C
Injection Volume: 0.4 µL
Detection: UV @ 254 nm (ambient)
Sample: Selectivity Test Mixture

Batch-to-Batch Reproducibility



Column: Aeris WIDEPORE 3.6 µm XB-C18
Dimensions: 150 x 4.6 mm
Part No.: 00F-4482-E0
Mobile Phase: A: Water with 0.1 % Formic Acid
B: Acetonitrile with 0.085 % Formic Acid
Gradient: A/B (95:5) to A/B (5:95) over 20 min
Flow Rate: 1.0 mL/min
Temperature: 40 °C
Injection Volume: 0.2 µL
Detection: UV @ 210 nm (ambient)
Sample: Mouse IgG

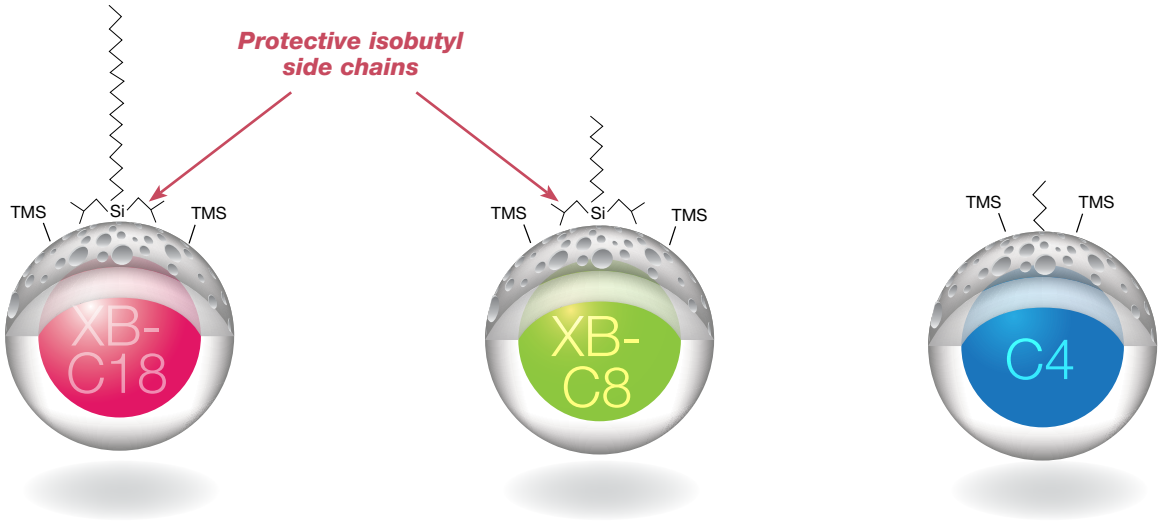
Greater Method Flexibility
with Specialty Surface Chemistries

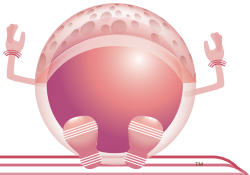
Aeris™ WIDEPORE columns are available in three surface chemistries (XB-C18, XB-C8, C4) to satisfy applications of all types, ranging from sticky, intact proteins to complex protein digests.

Aeris PEPTIDE columns utilize the XB-C18 chemistry, as it is optimal for peptides and peptide mapping applications.

The unique, sterically protected XB surface ligands are designed by bonding bulky isobutyl chains aside the alkyl chains, and then fully end-capping the surface to cover any remaining exposed silanols.

An added benefit of XB chemistry is its high temperature stability, which allows one to use elevated column temperatures up to 90 °C for improved peak shape and recovery.





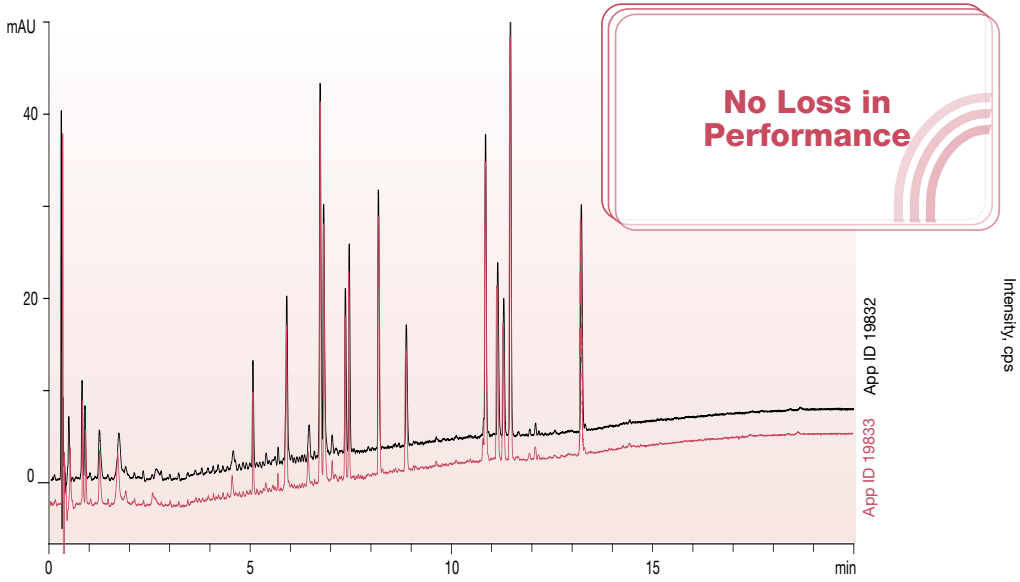
The Aeris WIDEPORE C4 phase does not use the XB chemistry, as shorter chain alkyl phases have higher bonding densities, thus providing steric hindrance. This means that chemical stability, inertness, and low bleed are maintained. The Aeris WIDEPORE C4 phase is an excellent complement to the other phases, and is also temperature stable to 90 °C

Long Column Lifetimes

Under Extreme Method Conditions

Aeris columns provide temperature stability up to 90 °C, and pH stability from 1.5 - 9, giving ample flexibility for method development and excellent column lifetime.

Over 1,000 Injections at 90 °C



Column: Aeris WIDEPORE 3.6 µm XB-C18
Dimensions: 50 x 4.6 mm
Part No.: 00B-4282-E0
Mobile Phase: A: Water with 0.1 % TFA
B: Acetonitrile with 0.1 % TFA
Gradient: A/B (97:3) for 3 min, then to A/B (35:65) over 20 min

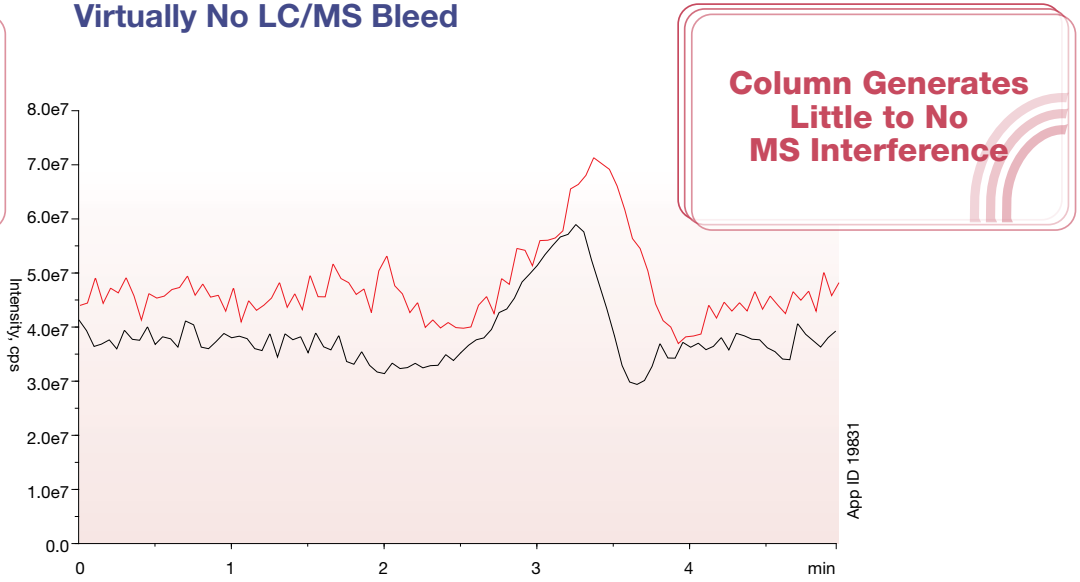
Flow Rate: 1.5 mL/min
Temperature: 90 °C
Injection Volume: 10 µL
Detection: UV @ 214 nm (ambient)
Sample: Apomyoglobin Digest

Low Column Bleed

for Amplified Mass Spec (MS) Sensitivity

Aeris columns show no significant phase bleed under LC/MS conditions, making them very suitable for protein and peptide analysis. Chemists can be assured accurate, dependable, and consistent results, time and time again.

Virtually No LC/MS Bleed



Column: Aeris WIDEPORE 3.6 µm XB-C18
Dimensions: 50 x 2.1 mm
Part No.: 00B-4282-AN
Mobile Phase: A: Water with 0.1 % Formic Acid
B: Acetonitrile with 0.1 % Formic Acid
Gradient: A/B (95:5) for 2.5 min, to A/B (5:95) hold for 0.5 min, then re-equilibrate

Flow Rate: 0.5 mL/min
Temperature: 25 °C
Detection: MS (API 4000™) Positive Ion Mode Q1 scan from 75 to 800 amu
Sample: Blank

Study was performed using new columns and, to the extent possible, identical experimental conditions were applied. Comparative separations may not be representative of all applications.

Aeris™ WIDEPORE Columns
for Intact Protein and Large Polypeptide Separations

Aeris WIDEPORE columns are packed with 3.6 µm core-shell particles that are specially engineered with a thin porous shell, large pores, and sterically protected XB surface chemistry to address the inherent separation challenges of proteins and large peptides. This unique mix of features results in low backpressures, fast rates of diffusion, and excellent selectivity, generating exceptional chromatographic resolution on both HPLC and UHPLC systems.

Recommended for…

- Protein structural characterization
- Stability indicating assays
- Post-translational modification identification
- PEGylated proteins, antibodies, biosimilars, etc.
- Impurity profiling
- Alternate peptide map selectivity
- Large oligonucleotides

3.6 µm Core-Shell Particle

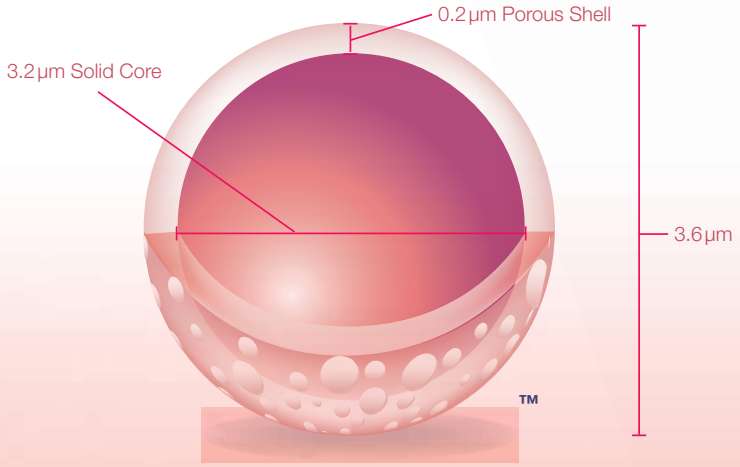
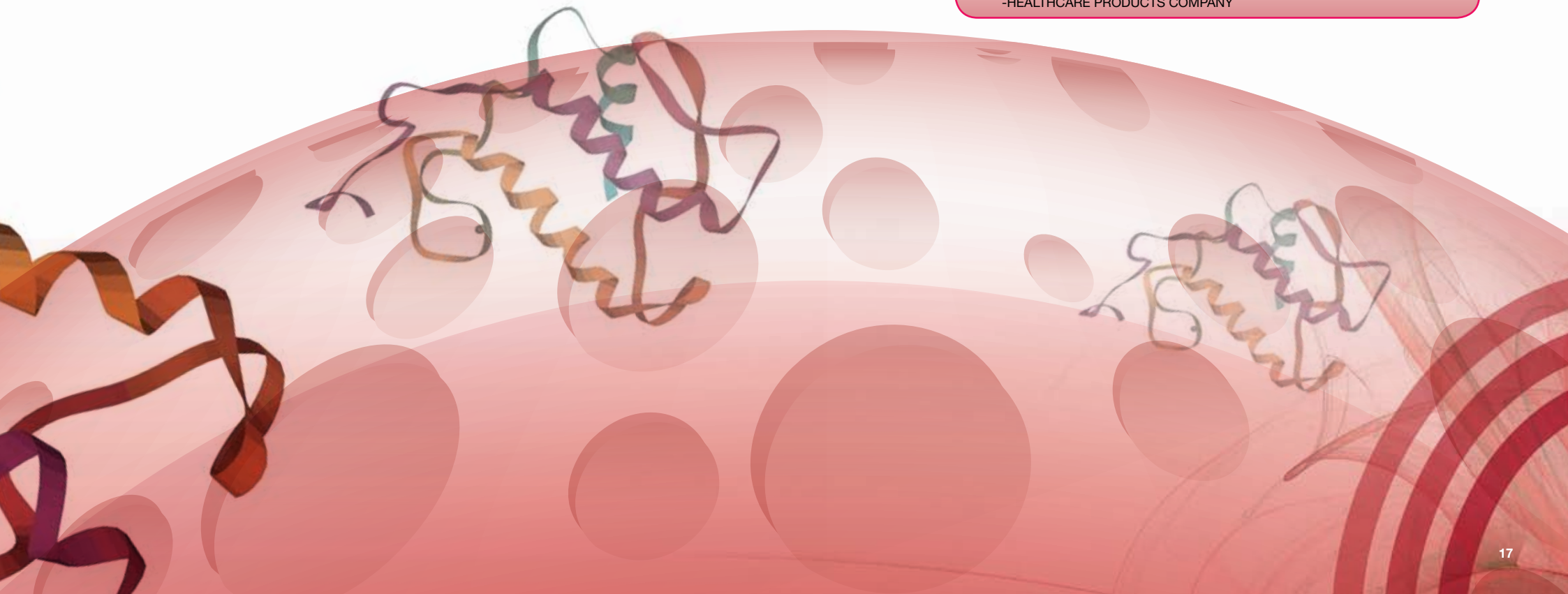


Table of Contents

Aeris WIDEPORE

> *The Aeris WIDEPORE column has given our company the opportunity to separate 2 forms of a protein (PEGylated & non-PEGylated). Prior to using Aeris the 2 peaks demonstrated little or no resolution. However by using the Aeris column the 2 peaks are separated by 5 minutes which is excellent.*
>
> -LARGE PHARMACEUTICAL COMPANY

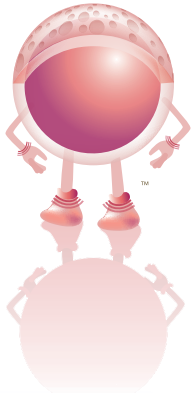
> *Started using the Aeris WIDEPORE XB-C18 and XB-C8 for oligonucleotides and aptamers with excellent results! Very good peak shapes and excellent plate counts on these columns. Really nice to see all of the peaks present in the samples w/o a very long run time. Columns seem to be very stable and have very reasonable backpressures!*
>
> -HEALTHCARE PRODUCTS COMPANY



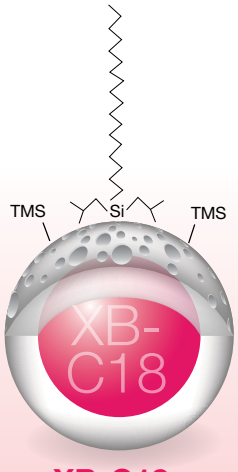
Easy Method Development
with Three Selectivities

Want more information on the novel XB chemistry?

See page 14!

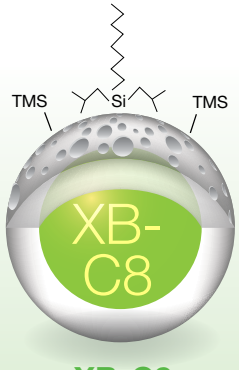


Aeris™ WIDEPORE 3.6 µm Core-Shell Stationary Phases:



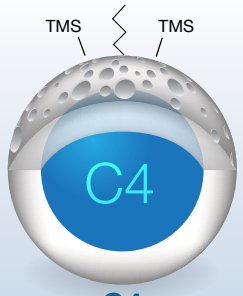
XB-C18
Maximum hydrophobicity recommended for:

- Proteins
- Hydrophilic proteins
- PEGylated proteins
- High temperature separations
- Alternative selectivity for peptide mapping



XB-C8
Moderate hydrophobicity recommended for:

- Proteins
- Moderately hydrophobic proteins
- Monoclonal antibodies
- Glycosylated proteins
- High temperature separations

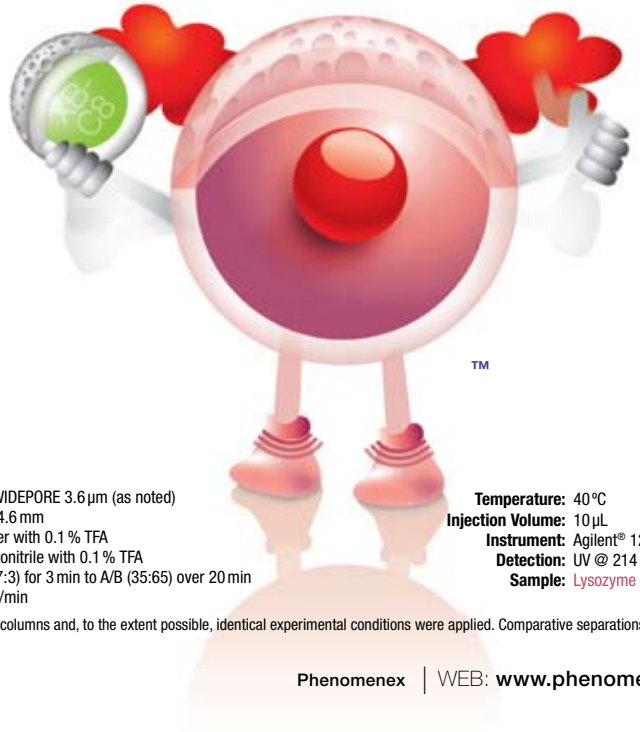


C4
Low hydrophobicity recommended for:

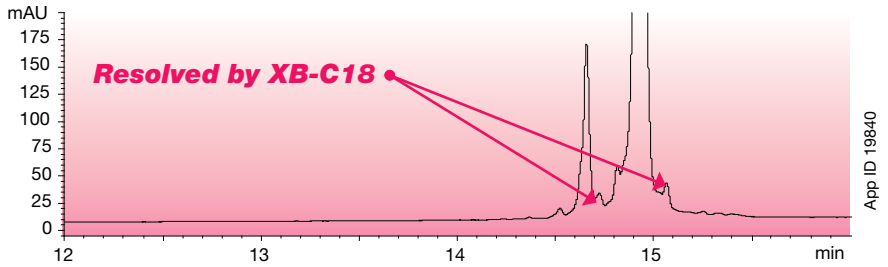
- Very large proteins
- Very hydrophobic proteins
- Membrane proteins
- Least retentive

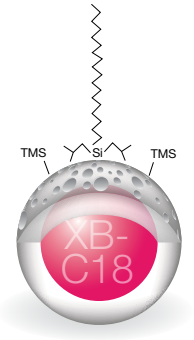
Easy Method Development
with Three Selectivities

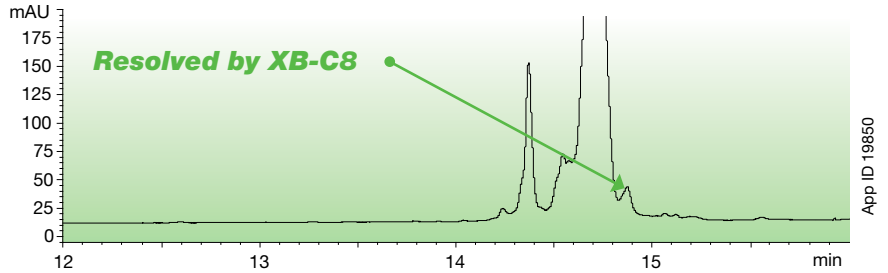
Because optimal separation conditions are different for each protein, we suggest evaluating all three surface chemistries to uncover the most suitable one for your separation. Once a phase is selected, the method can be further optimized with tweaks to the mobile phase, flow rate, gradient, or column dimension (length, internal diameter).

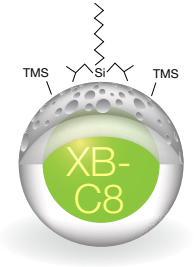


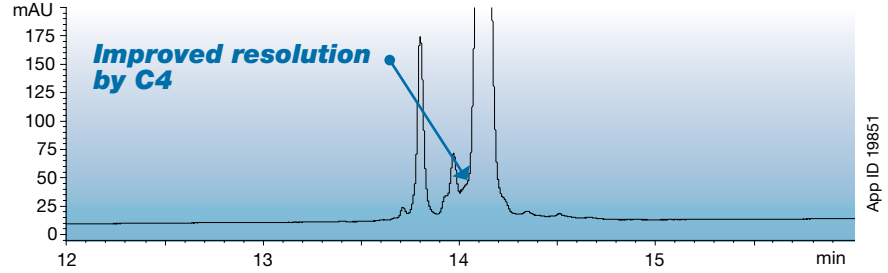
Aeris Phase Selectivity Differences

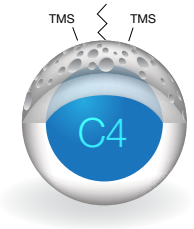












Conditions for all columns:
Column: Aeris WIDEPORE 3.6 µm (as noted)
Dimensions: 100 x 4.6 mm
Mobile Phase: A: Water with 0.1 % TFA
B: Acetonitrile with 0.1 % TFA
Gradient: A/B (97:3) for 3 min to A/B (35:65) over 20 min
Flow Rate: 1.5 mL/min

Temperature: 40 °C
Injection Volume: 10 µL
Instrument: Agilent® 1200
Detection: UV @ 214 nm (ambient)
Sample: Lysozyme (1 mg/mL)

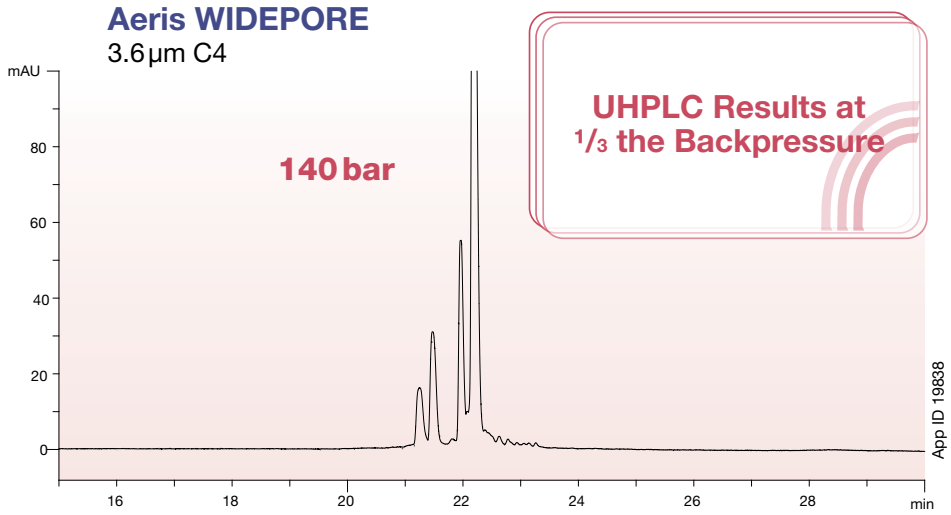
Study was performed using new columns and, to the extent possible, identical experimental conditions were applied. Comparative separations may not be representative of all applications.

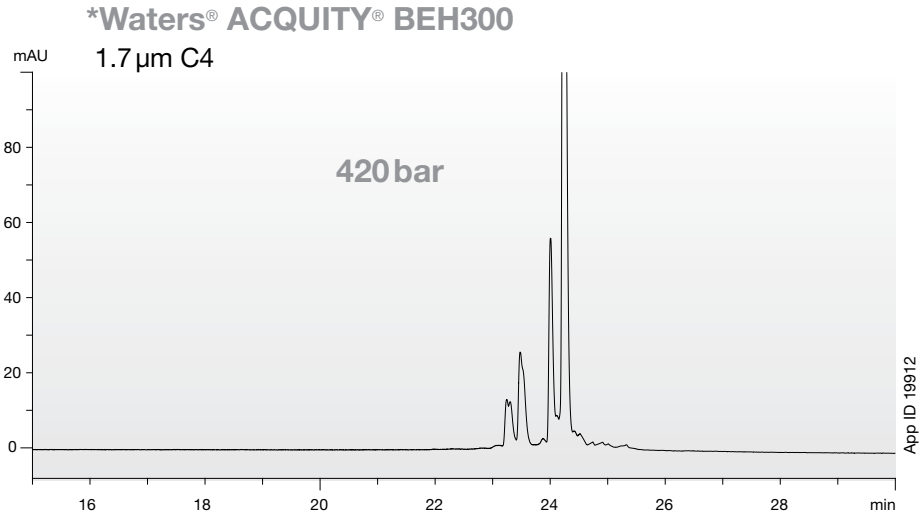
Maximize HPLC and UHPLC Resolving Power
with Unique 3.6 µm Core-Shell Particle

3.6 µm core-shell technology combined with inert surface chemistries and tight packing specifications results in Aeris™ WIDEPORE columns **delivering exceptional resolving power at significantly lower backpressures**. Chromatographers now have the ability to generate higher quality data than typically produced by columns packed with fully porous particles for every protein analysis – on HPLC or UHPLC systems.

Conditions for both columns:
Column: ACQUITY® BEH300 1.7 µm C4
Aeris WIDEPORE 3.6 µm C4
Dimensions: 150 x 2.1 mm
Mobile Phase: A: Water with 0.1 % TFA
B: Acetonitrile with 0.1 % TFA
Gradient: A/B (97:3) to A/B (35:65) over 45 min
Flow Rate: 0.3 mL/min
Temperature: 40 °C
Injection Volume: 10 µL
Instrument: Agilent® 1200
Detection: UV @ 214 nm (ambient)
Sample: Human Epidermal Growth Factor (EGF)

Performance Equivalent to sub-2 µm Particle at Low Backpressure



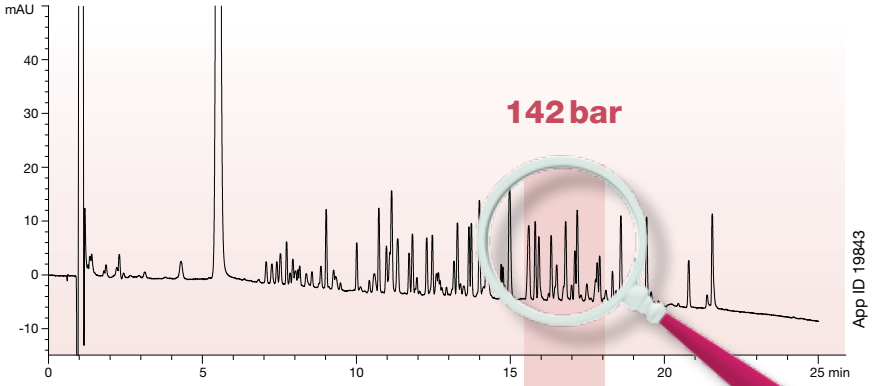


* Waters and ACQUITY are registered trademarks, and BEH Technology is a trademark of Waters Corporation. Phenomenex is not affiliated with Waters Corporation. Study was performed using new columns and, to the extent possible, identical experimental conditions were applied. Comparative separations may not be representative of all applications.

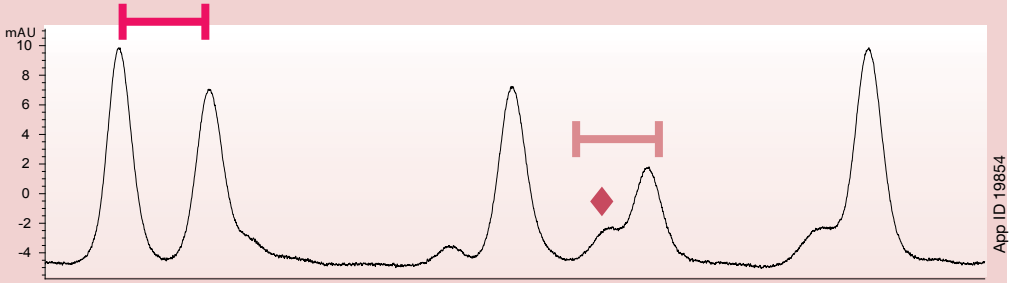
Increase Column Length to Improve Resolving Power

150 x 2.1 mm

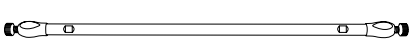
Aeris WIDEPORE
3.6 µm XB-C18



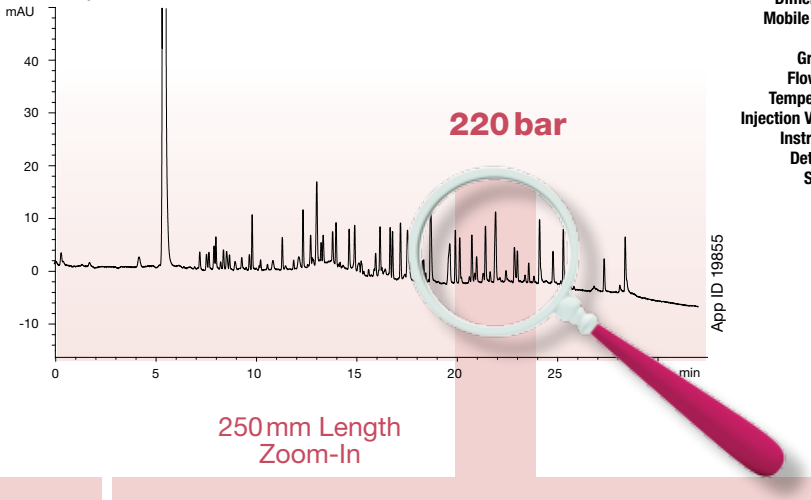
150 mm Length Zoom-In



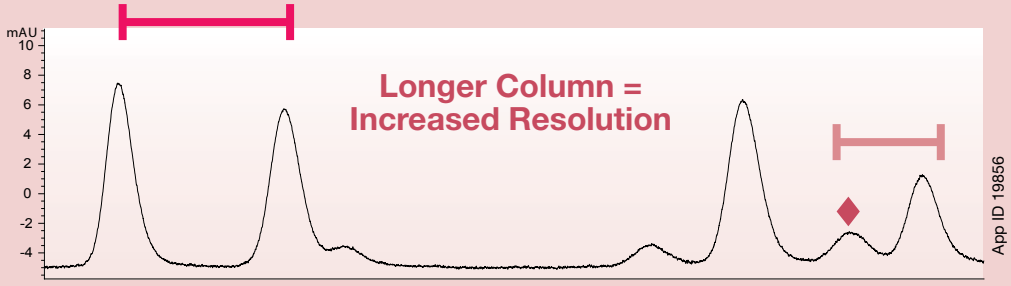
250 x 2.1 mm



Aeris WIDEPORE
3.6 µm XB-C18



250 mm Length Zoom-In

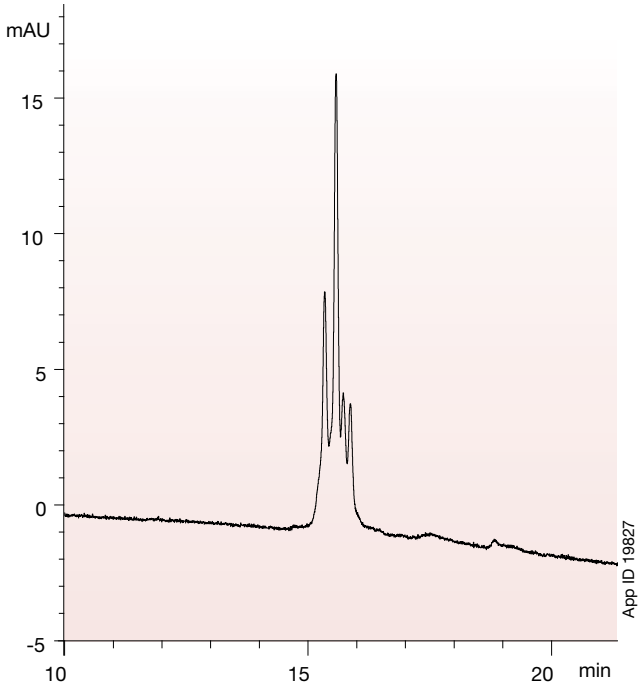


Conditions for both columns:

Column:	Aeris WIDEPORE 3.6 µm XB-C18
Dimensions:	as noted
Mobile Phase:	A: Water with 0.1 % TFA B: Acetonitrile with 0.1 % TFA
Gradient:	A/B (97:3) for 3 min to A/B (35:65) over 30 min
Flow Rate:	0.3 mL/min
Temperature:	40 °C
Injection Volume:	25 µL
Instrument:	Agilent® 1200
Detection:	UV @ 214 nm (ambient)
Sample:	BSA (Bovine Serum Albumin) Digest

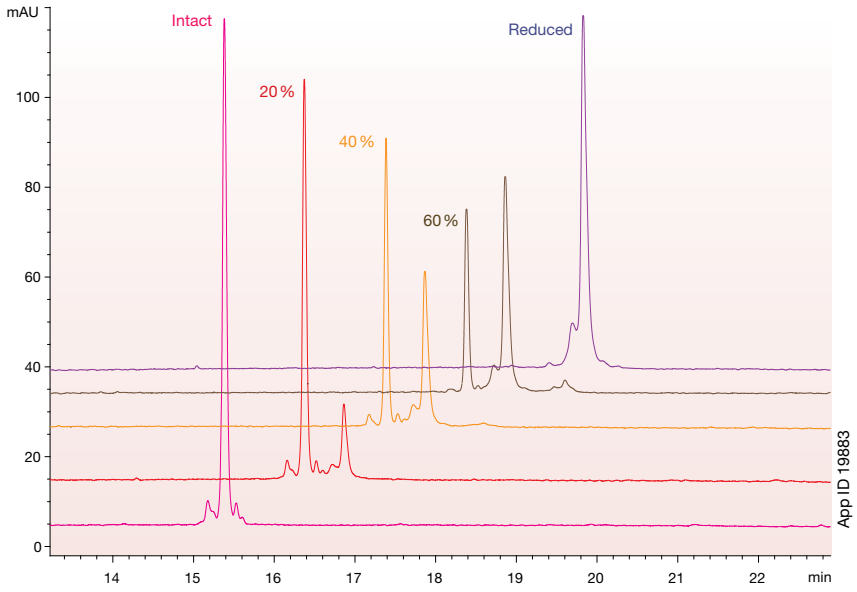
Intact Protein Characterization

Biosimilar Impurity Quantitation



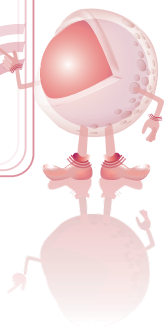
Column: Aeris™ WIDEPORE 3.6 µm XB-C8
Dimensions: 150 x 4.6 mm
Part No.: 00F-4481-E0
Mobile Phase: A: Water with 0.1 % TFA
B: Acetonitrile with 0.1 % TFA
Gradient: A/B (70:30) to A/B (35:65) over 30 min
Flow Rate: 1.0 mL/min
Temperature: 22 °C
Injection Volume: 5 µL
Instrument: Agilent® 1200
Detection: UV @ 214 nm (ambient)
Sample: Interferon alpha-2a

Protein Reduction



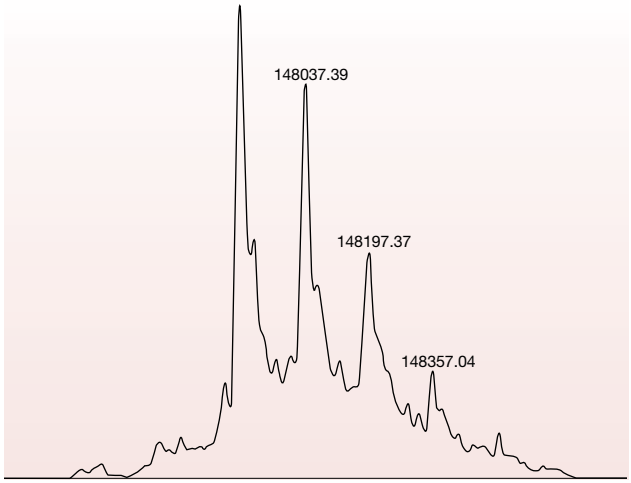
Column: Aeris WIDEPORE 3.6 µm C4
Dimensions: 150 x 4.6 mm
Part No.: 00F-4486-E0
Mobile Phase: A: Water with 0.1 % TFA
B: Acetonitrile with 0.1 % TFA
Gradient: A/B (97:3) for 3 min to A/B (35:65) over 30 min
Flow Rate: 1.2 mL/min
Temperature: 22 °C
Injection Volume: 20 µL
Instrument: Agilent 1200 SL
Detection: UV @ 214 nm (ambient)
Sample: RNase subject to reduction
100 % intact
20 % reduced
40 % reduced
60 % reduced
100 % reduced

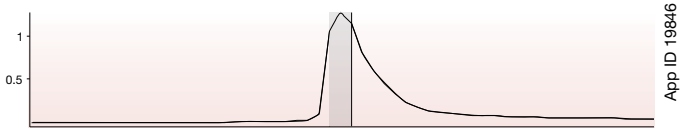
Aeris WIDEPORE 3.6 µm C4 successfully monitors peak shifts due to differences in protein shape



Intact Monoclonal Antibody (mAb) Separation

Human mAb



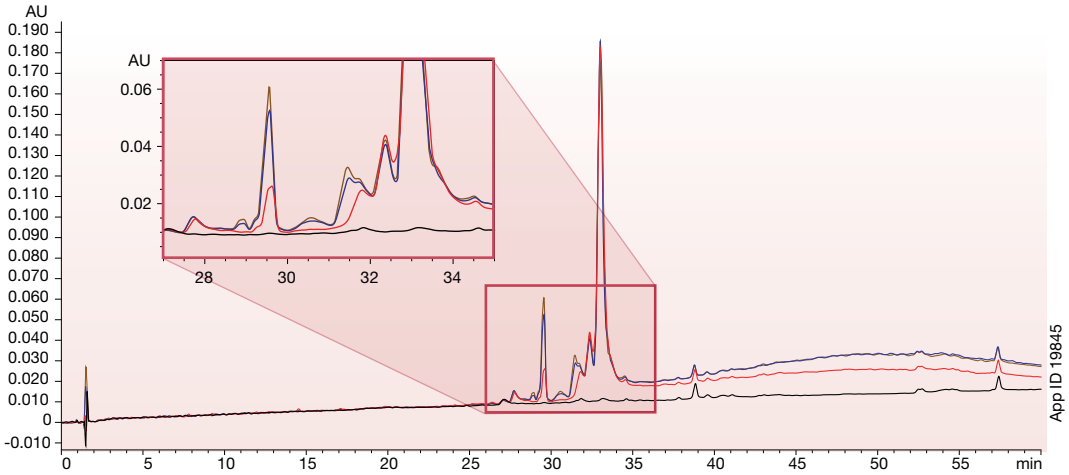


Column: Aeris WIDEPORE 3.6 µm XB-C18
Dimensions: 50 x 2.1 mm
Part No.: 00B-4482-AN
Mobile Phase: A: Water with 0.1 % Formic Acid
B: Acetonitrile with 0.1 % Formic Acid
Gradient: A/B (90:10) to A/B (10:90) over 6 min

Step No.	Time(min)	% A	% B
1	0	90	10
2	0.7	66	34
3	5	55	45
4	6	10	90

Flow Rate: 0.5 mL/min
Temperature: 22 °C
Detection: UV @ 214 (ambient)
Sample: Monoclonal antibody

Clipped Variants

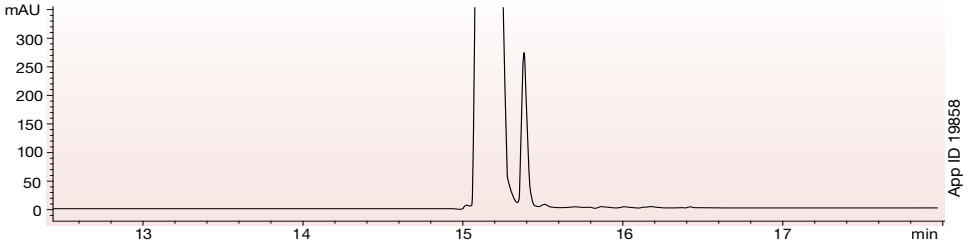


Column: Aeris WIDEPORE 3.6 µm XB-C18
Dimensions: 250 x 4.6 mm
Part No.: 00G-4482-E0
Mobile Phase: A: Water with 0.1 % TFA
B: Acetonitrile/IPA (50:50) with 0.1 % TFA
Gradient: A/B (90:10) to A/B (35:65) over 60 min
Flow Rate: 1.0 mL/min
Temperature: 22 °C
Injection Volume: 25 µL
Instrument: Agilent® 1200
Detection: UV @ 214 nm (ambient)
Sample: Proprietary customer monoclonal antibody with clipped variants

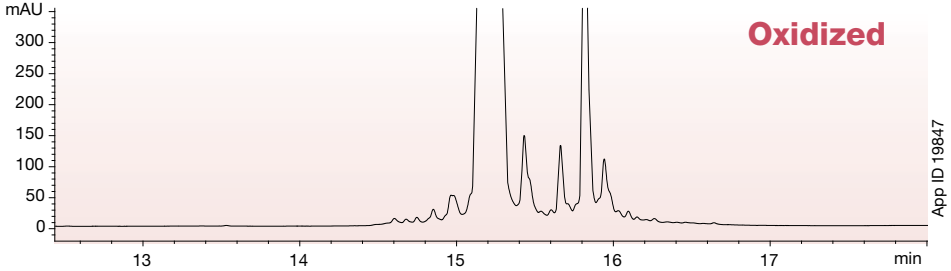
Post-Translational Modification Analysis

Oxidation

Control



Oxidized

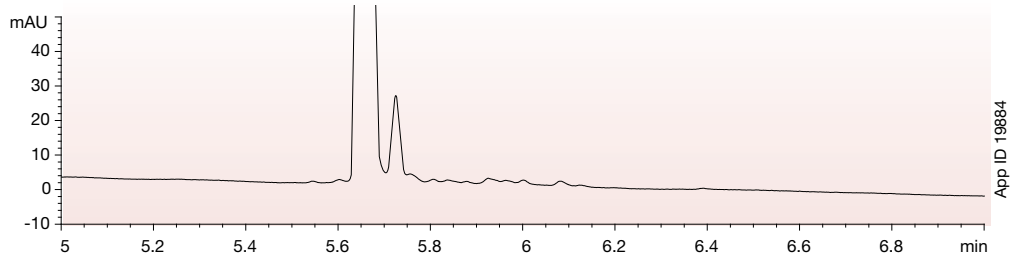


Column: Aeris™ WIDEPORE 3.6 µm XB-C18
Dimensions: 100 x 4.6 mm
Part No.: 00D-4482-E0
Mobile Phase: A: Water with 0.1 % TFA
B: Acetonitrile with 0.1 % TFA
Gradient: A/B (97:3) for 3 min to A/B (15:85) over 45 min

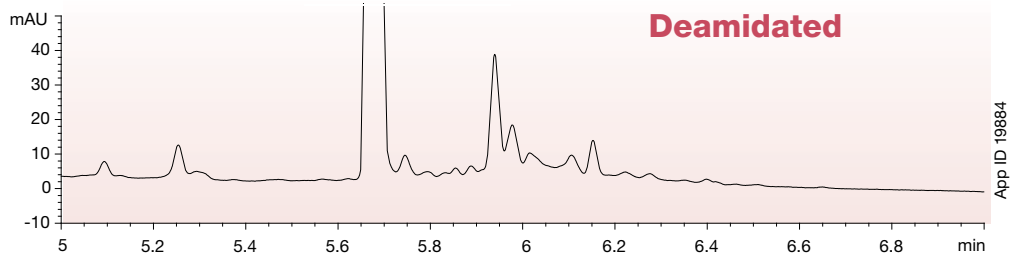
Flow Rate: 1.2 mL/min
Temperature: 22 °C
Injection Volume: 50 µL
Instrument: Agilent® 1100
Detection: UV @ 214 nm (ambient)
Sample: Insulin oxidized using 3 % hydrogen peroxide

Deamidation

Intact



Deamidated

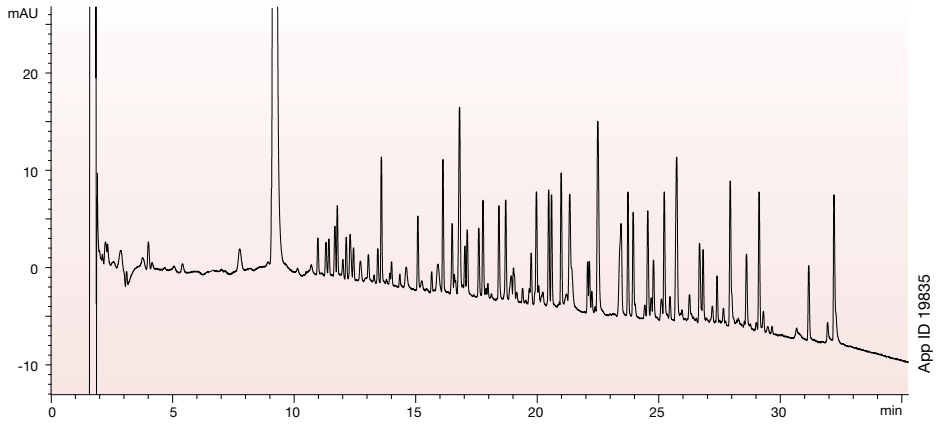


Column: Aeris WIDEPORE 3.6 µm XB-C18
Dimensions: 150 x 4.6 mm
Part No.: 00F-4482-E0
Mobile Phase: A: Water with 0.1 % TFA
B: Acetonitrile with 0.085 % TFA
Gradient: A/B (90:10) to A/B (35:65) over 10 min

Flow Rate: 1.2 mL/min
Temperature: 40 °C
Injection Volume: 1 µL
Instrument: Agilent® 1100
Detection: UV @ 214 nm (ambient)
Sample: Proprietary intact insulin 6 kDa deamidated

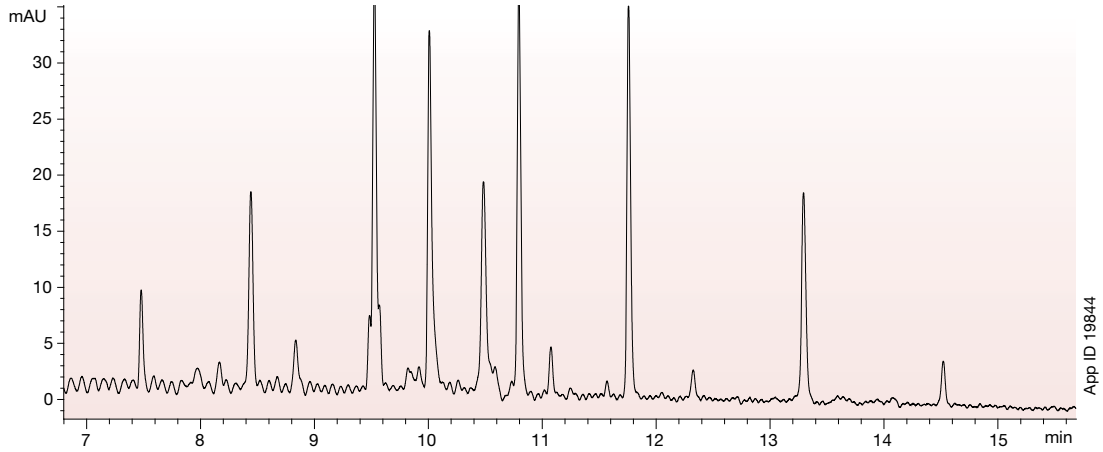
Peptide Mapping

Bovine Serum Albumin Tryptic Map



Column: Aeris WIDEPORE 3.6 µm XB-C18
Dimensions: 250 x 2.1 mm
Part No.: 00G-4282-AN
Mobile Phase: A: Water with 0.1 % TFA
B: Acetonitrile with 0.1 % TFA
Gradient: A/B (97:3) for 3 min to A/B (35:65) over 47 min
Flow Rate: 0.3 mL/min
Temperature: 40 °C
Injection Volume: 10 µL
Instrument: Agilent® 1200SL
Detection: UV @ 214 nm (ambient)
Sample: BSA Tryptic Digest

Apomyoglobin Digest



Column: Aeris WIDEPORE 3.6 µm XB-C18
Dimensions: 150 x 4.6 mm
Part No.: 00F-4282-E0
Mobile Phase: A: Water with 0.1 % TFA
B: Acetonitrile with 0.1 % TFA
Gradient: A/B (97:3) for 3 min to A/B (35:65) over 30 min
Flow Rate: 1.5 mL/min
Temperature: 22 °C
Injection Volume: 20 µL
Instrument: Agilent® 1200
Detection: UV @ 214 nm
Sample: Apomyoglobin Digest

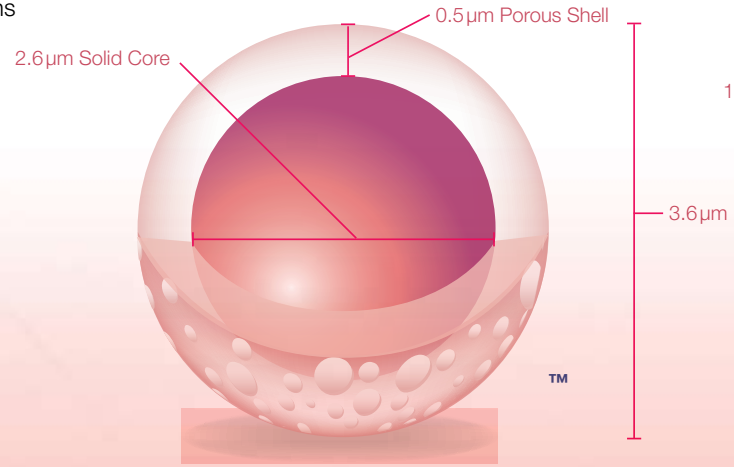
Aeris™ PEPTIDE Columns
for Peptide and Peptide Mapping Separations

Based on core-shell particle technology, Aeris PEPTIDE particles are designed with small pores, inert XB-C18 surface chemistry, and two different particle sizes (3.6 µm and 1.7 µm) to meet the resolution demands of chromatographers performing complex peptide and peptide map separations on HPLC and/or UHPLC systems.

Aeris PEPTIDE columns are built for the following:

- Synthetic peptide impurity analysis
- Peptide mapping
- Identifying protein modifications
  - Glycosylation
  - Substitution
  - Truncation
- Analyzing post-translational modifications
  - Deamidation
  - Oxidation
  - Deletions

3.6 µm Core-Shell Particle



1.7 µm Core-Shell Particle

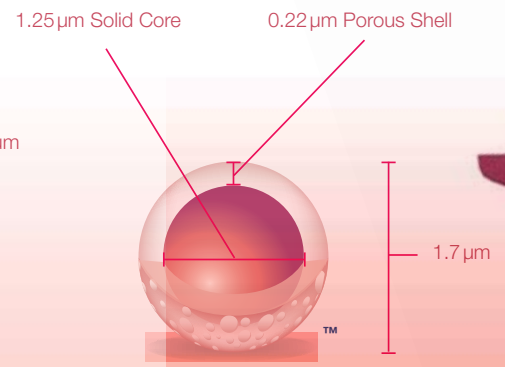
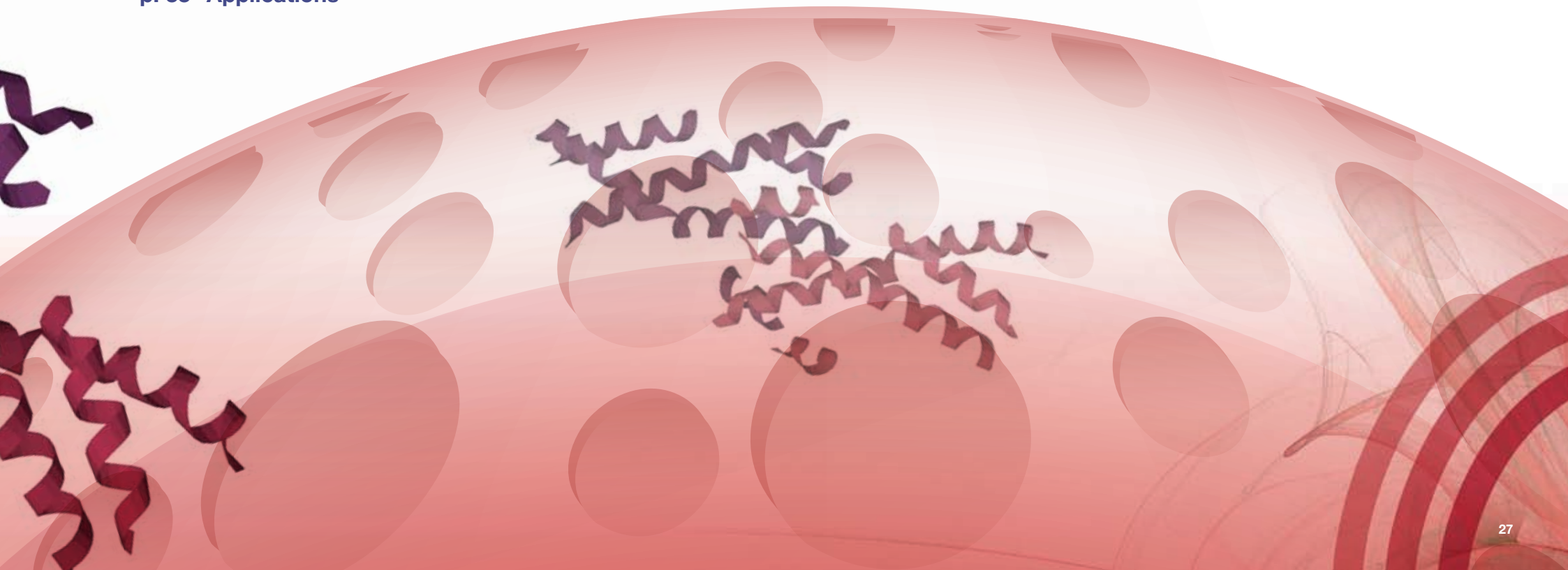


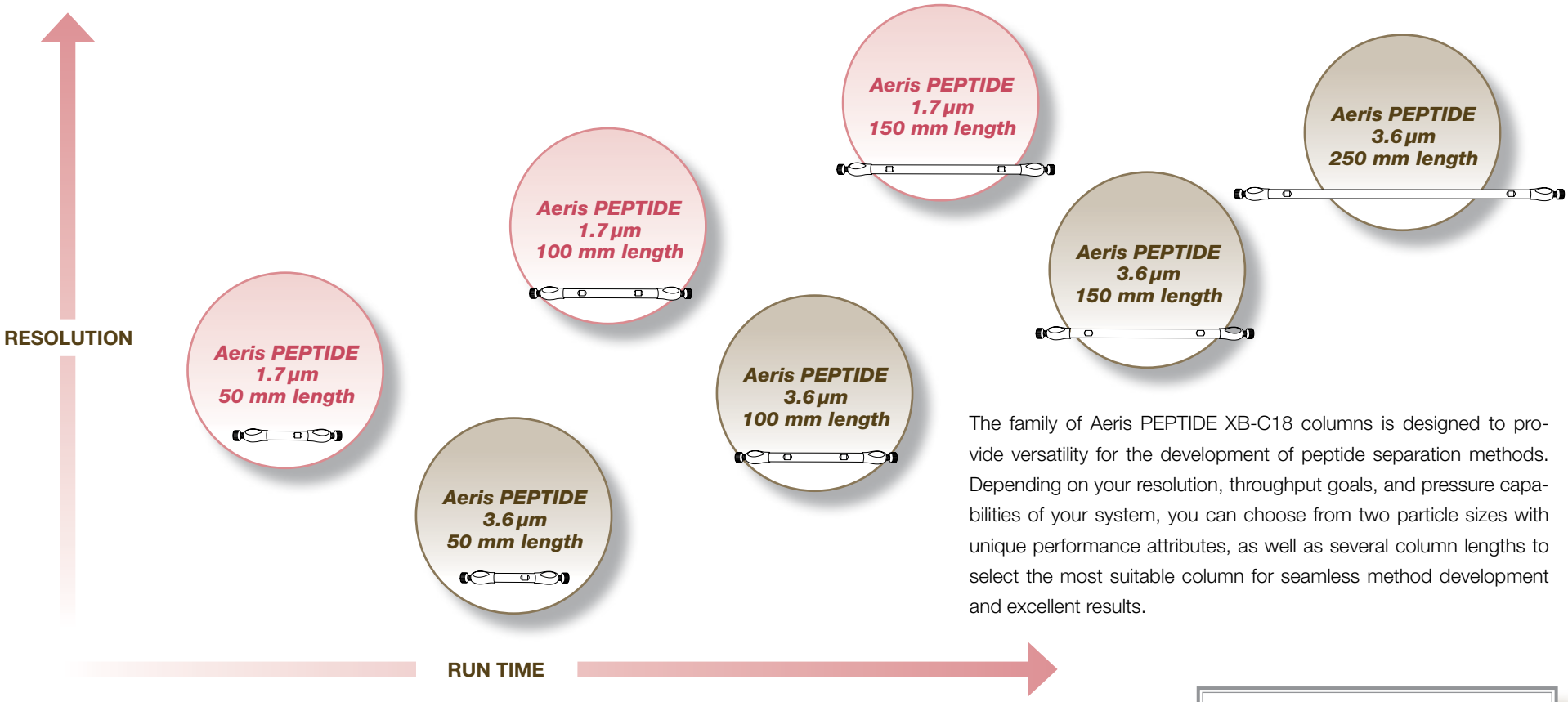
Table of Contents

Aeris PEPTIDE

> *Using the Aeris PEPTIDE column gave us the same resolution separation for cyanobacterial peptides that we could achieve using a smaller particle size column, but with far lower back-pressures. This will allow us to transfer the methods to lower pressure HPLC systems whilst retaining our separation.*
>
> *-LARGE PHARMACEUTICAL COMPANY*



Select the Most Suitable Aeris™ PEPTIDE Column
to Achieve Your Separation Goals



The family of Aeris PEPTIDE XB-C18 columns is designed to provide versatility for the development of peptide separation methods. Depending on your resolution, throughput goals, and pressure capabilities of your system, you can choose from two particle sizes with unique performance attributes, as well as several column lengths to select the most suitable column for seamless method development and excellent results.

Maximize Performance on UHPLC Systems
with Aeris PEPTIDE 1.7 µm Technology

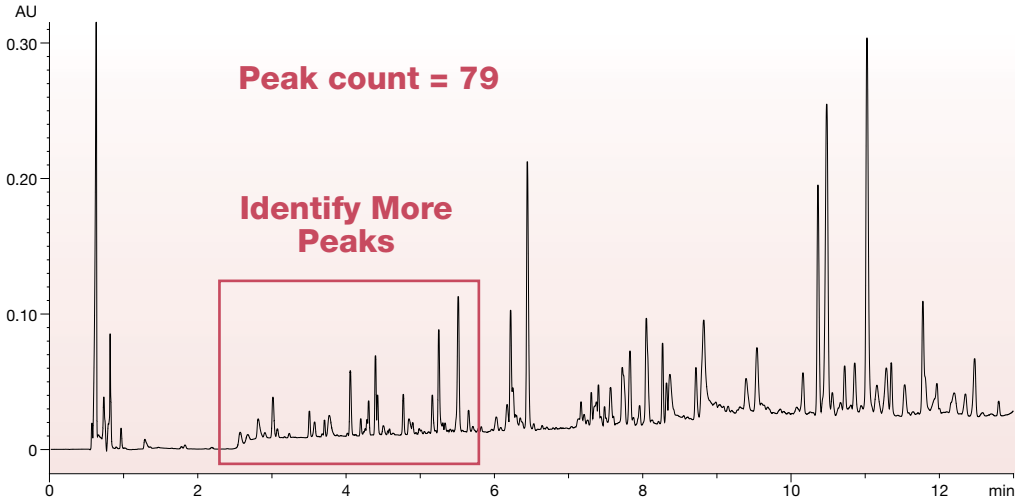
With pressure stability up to 1,000 bar and the high efficiencies brought about by core-shell particle technology, the sub-2 µm Aeris PEPTIDE column produces breakthrough chromatographic performance on UHPLC systems. Use Aeris PEPTIDE 1.7 µm columns to boost the performance of sub-2 µm fully porous peptide mapping methods.

Increase Peak Count with 1.7 µm Aeris Core-Shell Technology

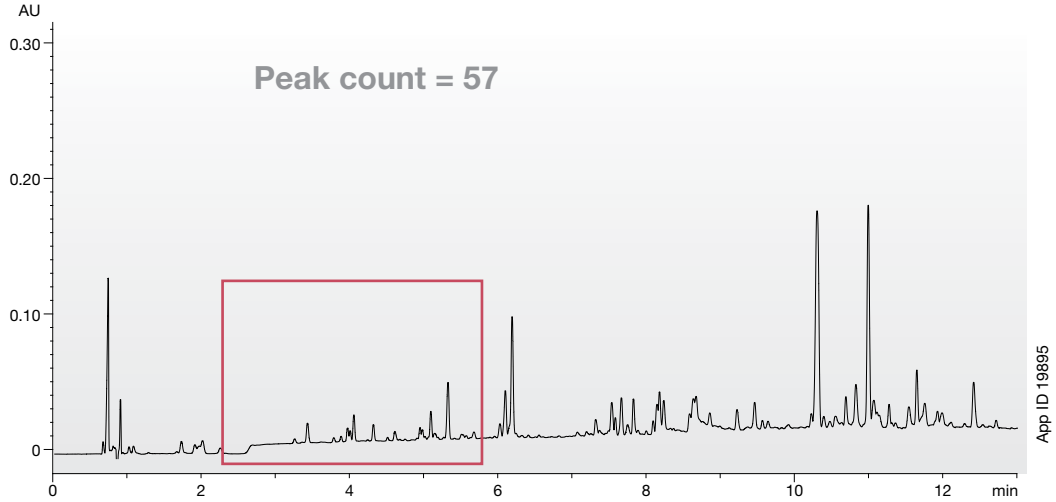
Conditions for both columns:

Column: Aeris PEPTIDE 1.7 µm XB-C18
ACQUITY® BEH300 1.7 µm C18
Dimensions: 150 x 2.1 mm
Mobile Phase: A: Water with 0.1 % TFA
B: Acetonitrile with 0.08 % TFA
Gradient: A/B (97:3) for 1.5 min to A/B (60:40) over 11 min to A/B (5:95) over 1 min
Flow Rate: 0.5 mL/min
Temperature: 40 °C
Injection Volume: 5 µL
Instrument: Aglient® 1200SL
Detection: UV @ 214 nm (ambient)
Sample: Alpha-Casein Tryptic Digest

Aeris PEPTIDE
1.7 µm XB-C18



***Waters® ACQUITY® BEH300**
1.7 µm C18



* Waters and ACQUITY are registered trademarks, and BEH Technology is a trademark of Waters Corporation. Phenomenex is not affiliated with Waters Corporation.
Study was performed using new columns and, to the extent possible, identical experimental conditions were applied. Comparative separations may not be representative of all applications.

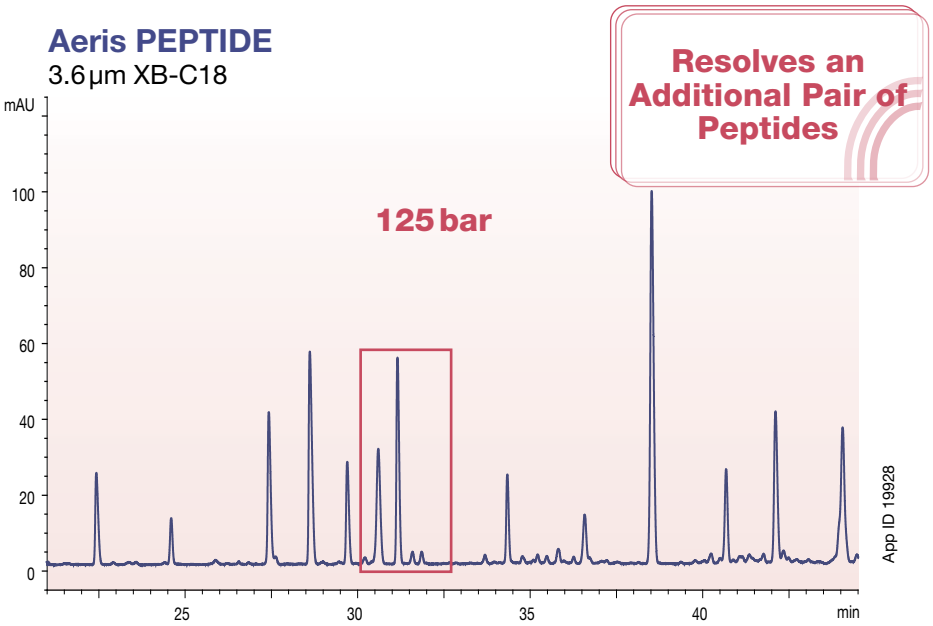
Ultra-High Resolving Power on HPLC and UHPLC Systems
with Aeris PEPTIDE 3.6 µm Columns

The Aeris™ PEPTIDE 3.6 µm core shell column was designed with one purpose in mind: to maximize the separation of large numbers of peptides on any HPLC or UHPLC system. Because core-shell particles remove the backpressure constraints of HPLC or UHPLC systems, chromatographers can **achieve the ultra-high performance of similar length sub-2 µm columns at a fraction of the backpressure**.

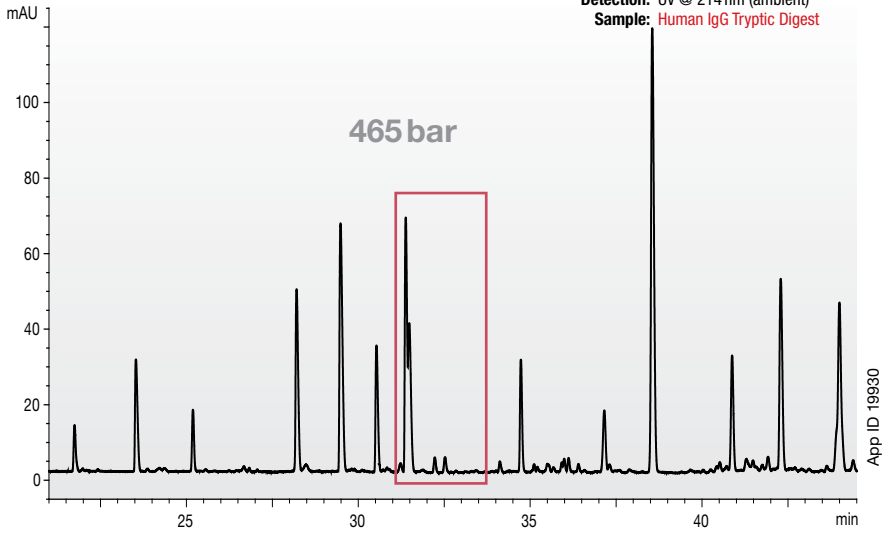
UHPLC Performance at HPLC Compatible Backpressures

Conditions for both columns:
Column: Aeris PEPTIDE 3.6 µm XB-C18
ACQUITY® BEH300 1.7 µm C18
Dimensions: 150 x 2.1 mm
Mobile Phase: A: Water with 0.1 % TFA
B: Acetonitrile with 0.1 % TFA
Gradient: A/B (97:3) for 5 min to A/B (55:45) over 55 min
Flow Rate: 0.3 mL/min
Temperature: 40 °C
Instrument: Agilent® 1200SL
Detection: UV @ 214 nm (ambient)
Sample: Human IgG Tryptic Digest

Aeris PEPTIDE
3.6 µm XB-C18

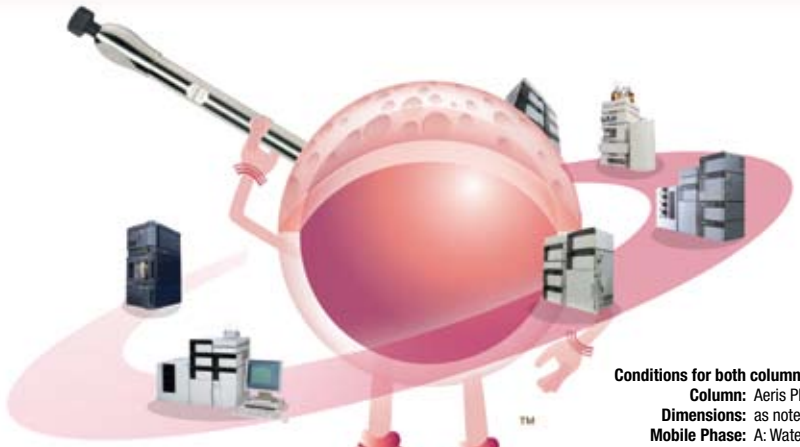


***Waters® ACQUITY® BEH300**
1.7 µm C18



* Waters and ACQUITY are registered trademarks, and BEH Techonology is a trademark of Waters Corporation. Phenomenex is not affiliated with Waters Corporation.
Study was performed using new columns and, to the extent possible, identical experimental conditions were applied. Comparative separations may not be representative of all applications.

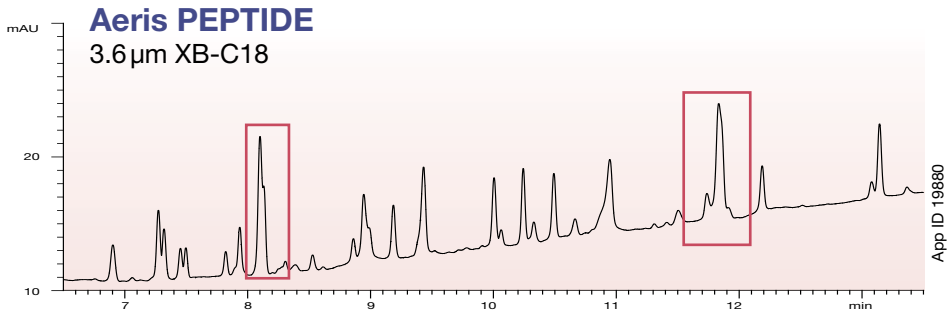
Use longer (or coupled) 3.6 µm columns on UHPLC and HPLC systems to resolve critical peaks

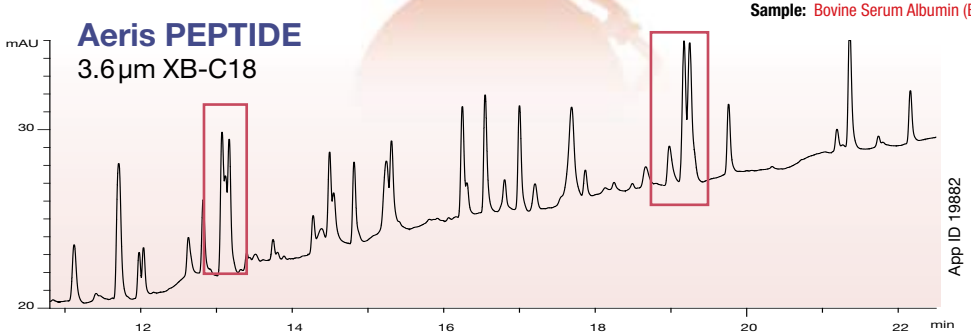


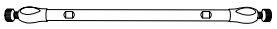
For applications like peptide separations and peptide mapping where resolution is the primary goal, the lower backpressure of Aeris PEPTIDE 3.6 µm core-shell columns allow one to use longer columns for higher resolving power resulting in increased separation of closely eluting peptides.

Conditions for both columns:
Column: Aeris PEPTIDE 3.6 µm XB-C18
Dimensions: as noted
Mobile Phase: A: Water with 0.1 % Formic Acid
B: Acetonitrile with 0.1 % Formic Acid
Gradient: A/B (97:3) for 3 min to A/B (35:65) over 30 min
Flow Rate: 1.2 mL/min
Temperature: 40 °C
Injection Volume: 25 µL
Instrument: Agilent® 1200
Detection: UV @ 214 nm (ambient)
Sample: Bovine Serum Albumin (BSA) Tryptic Digest

Utilize Long Columns to Maximize Separation Power







150 x 4.6 mm

140 bar

Minimal Increase in Backpressure

250 x 4.6 mm

200 bar

Bundle Aeris™ PEPTIDE with Aeris WIDEPORE
for Detailed Peptide Maps

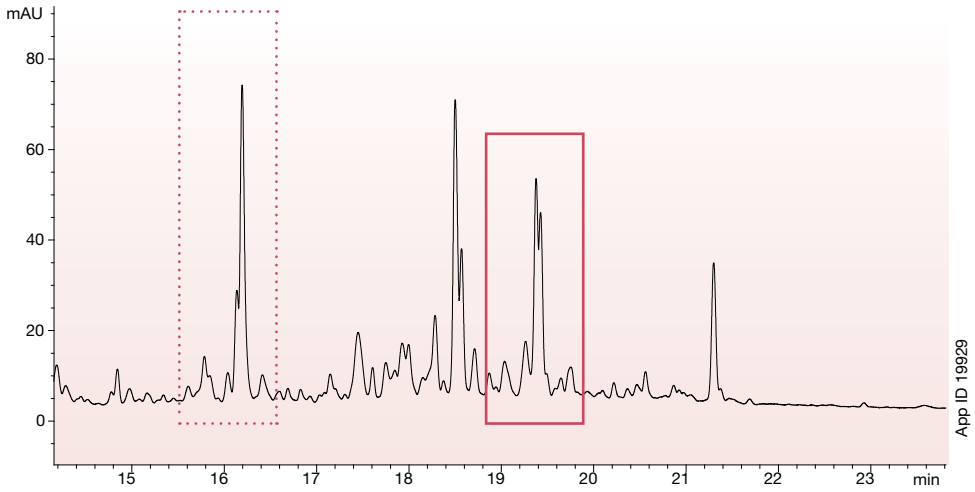
Aeris PEPTIDE 3.6 µm XB–C18 and Aeris WIDEPORE 3.6 µm XB-C18 are a “must-have” pair for chromatographers who analyze complex peptide mixtures. Because each has a unique pore size and surface area, they exhibit different selectivity. Protein chemists can take advantage of this diversity to achieve the critical resolution of target peptides in various regions of the map, thus simplifying their method development.

Utilize Differences in Small and Large Pore Size Selectivity for Optimal Resolution

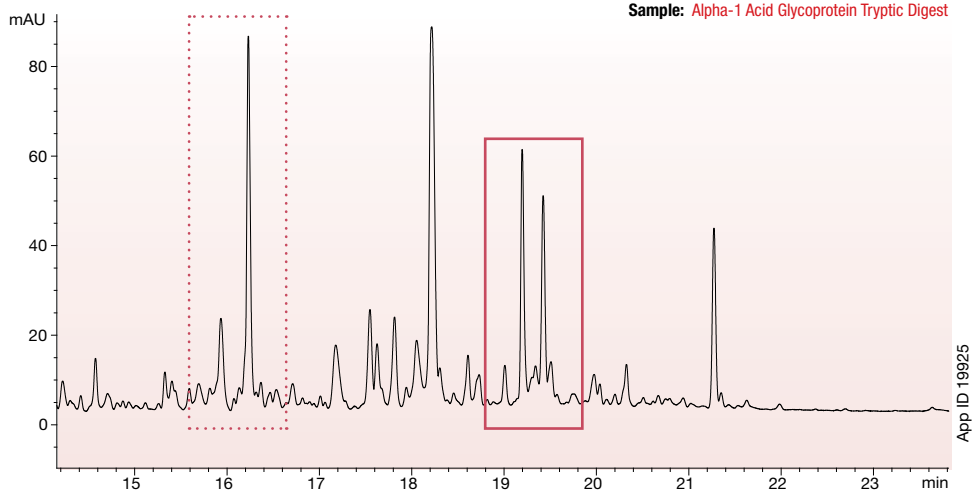
Conditions for both columns:

Column: Aeris PEPTIDE 3.6 µm XB-C18
Aeris WIDEPORE 3.6 µm XB-C18
Dimensions: 150 x 4.6 mm
Part Nos.: 00F-4507-E0
00F-4482-E0
Mobile Phase: A: Water with 0.1 % TFA
B: Acetonitrile with 0.1 % TFA
Gradient: A/B (97:3) for 3 min to A/B (35:65) over 30 min
Flow Rate: 1.5 mL/min
Temperature: 40 °C
Instrument: Agilent® 1200SL
Detection: UV @ 214 nm (ambient)
Sample: Alpha-1 Acid Glycoprotein Tryptic Digest

Aeris PEPTIDE
3.6 µm XB-C18

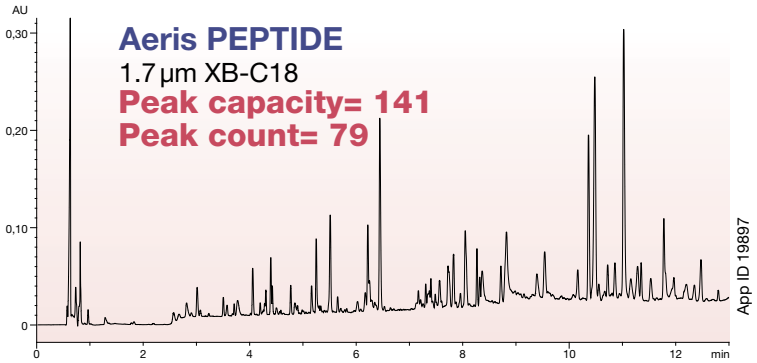


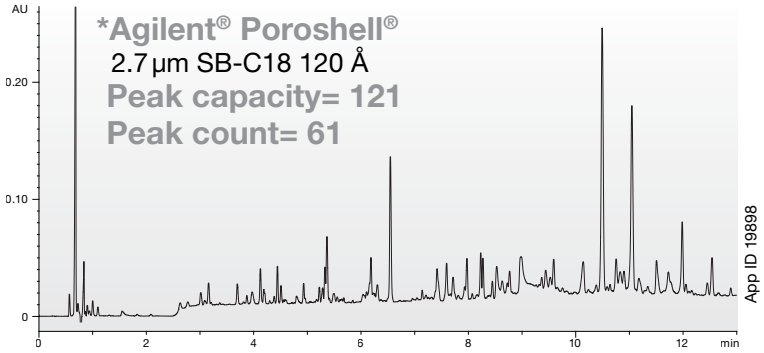
Aeris WIDEPORE
3.6 µm XB-C18



Peptide Mapping on Core-Shell Technologies

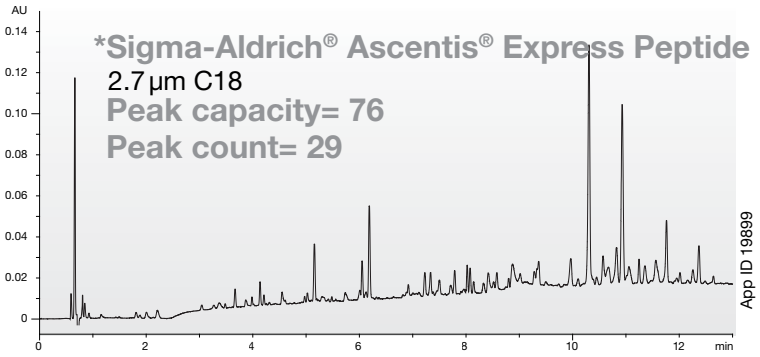
Aeris PEPTIDE vs. Other Core-Shell Columns





Conditions same for all columns:

Columns: Aeris PEPTIDE 1.7 µm XB-C18
Poroshell® 2.7 µm SB-C18 120 Å
Ascentis® Express Peptide 2.7 µm C18
Dimensions: 150 x 2.1 mm
Mobile Phase: A: Water with 0.1 % Formic Acid
B: Acetonitrile with 0.08 % Formic Acid
Gradient: A/B (97:3) for 1.5 min to A/B (60:40) over 11 min to A/B (5:95) over 1 min
Flow Rate: 0.5 mL/min
Temperature: 40 °C
Instrument: Agilent® 1200SL
Detection: UV @ 214 nm (ambient)
Sample: Alpha-Casein Tryptic Digest



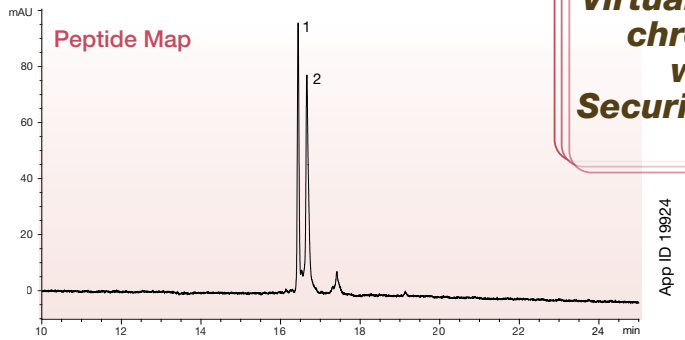
* Agilent and Poroshell are registered trademarks of Agilent Technologies, Inc. Ascentis Express Peptide is a registered trademark of Sigma-Aldrich Biotechnology. Phenomenex is not affiliated with Agilent Technologies, Inc or Sigma-Aldrich Biotechnology. Comparative separations may not be representative of all applications.

Extend the Lifetime of your

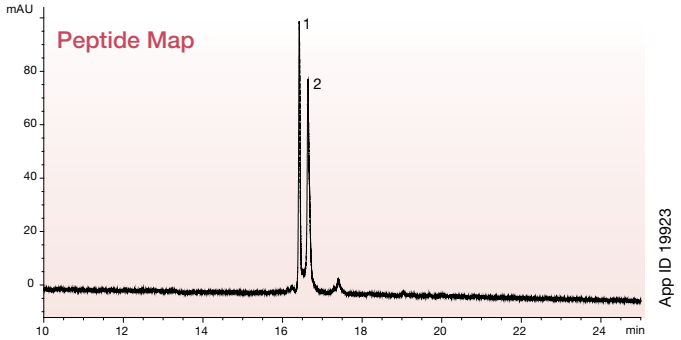
Aeris Core-Shell Columns with SecurityGuard ULTRA

The SecurityGuard ULTRA guard cartridge system protects Aeris core-shell columns from damaging chemical contaminants, protein adsorption, and microparticulates. This innovative and easy-to-use column protection system will not alter chromatography or contribute to extra dead volume and is pressure rated up to 20,000 psi for UHPLC systems.

***With* SecurityGuard ULTRA**



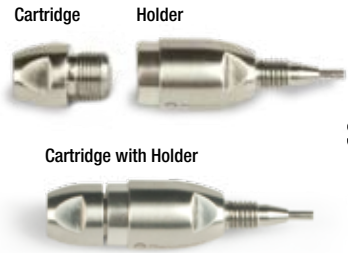
***Without* SecurityGuard ULTRA**



Conditions same for both separations:

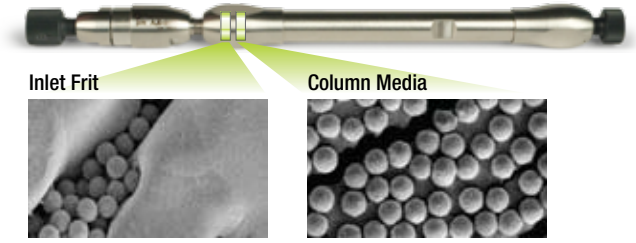
Columns: Aeris WIDEPORE 3.6 µm XB-C18
Dimensions: 150 x 4.6 mm
Mobile Phase: A: Water with 0.1 % TFA
B: Acetonitrile with 0.085 % TFA
Gradient: A/B (97:3) for 3 min to A/B (35:65) over 30 min
Flow Rate: 1.2 mL/min
Temperature: 40 °C
Instrument: Agilent® 1200
Detection: UV @ 214 nm (ambient)
Sample: 1. Intact RNase A
2. Reduced RNase A

Virtually no change in chromatography when using SecurityGuard ULTRA!

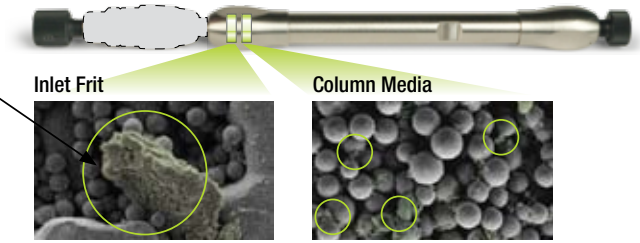


SecurityGuard™ ULTRA
UHPLC Column Protection

***With* SecurityGuard ULTRA**



***Without* SecurityGuard ULTRA**



Contaminant and particle buildup

Ordering information on page 35

guarantee

If SecurityGuard ULTRA cartridge protection system does not perform as well or better than your current guard cartridge system of similar phase and dimensions, return the product with comparative data within 45 days for a FULL REFUND.

Ordering Information

Aeris WIDEPORE 3.6 µm Minibore Columns (mm)

	50 x 2.1	100 x 2.1	150 x 2.1	250 x 2.1	SecurityGuard™ ULTRA Cartridges* 3/pk
XB-C18	00B-4482-AN	00D-4482-AN	00F-4482-AN	00G-4482-AN	AJ0-8783
XB-C8	00B-4481-AN	00D-4481-AN	00F-4481-AN	00G-4481-AN	AJ0-8785
C4	00B-4486-AN	00D-4486-AN	00F-4486-AN	00G-4486-AN	AJ0-8899

Aeris WIDEPORE 3.6 µm Analytical Columns (mm)

	100 x 4.6	150 x 4.6	250 x 4.6	SecurityGuard ULTRA Cartridges* 3/pk
XB-C18	00D-4482-E0	00F-4482-E0	00G-4482-E0	AJ0-8769
XB-C8	00D-4481-E0	00F-4481-E0	00G-4481-E0	AJ0-8771
C4	00D-4486-E0	00F-4486-E0	00G-4486-E0	AJ0-8901

Aeris PEPTIDE 1.7 µm Minibore Columns (mm)

	50 x 2.1	100 x 2.1	150 x 2.1	SecurityGuard ULTRA Cartridges* 3/pk
XB-C18	00B-4506-AN	00D-4506-AN	00F-4506-AN	AJ0-8948

Aeris PEPTIDE 3.6 µm Minibore Columns (mm)

	50 x 2.1	100 x 2.1	150 x 2.1	250 x 2.1	SecurityGuard ULTRA Cartridges* 3/pk
XB-C18	00B-4507-AN	00D-4507-AN	00F-4507-AN	00G-4507-AN	AJ0-8948

Aeris PEPTIDE 3.6 µm Analytical Columns (mm)

	100 x 4.6	150 x 4.6	250 x 4.6	SecurityGuard ULTRA Cartridges* 3/pk
XB-C18	00D-4507-E0	00F-4507-E0	00G-4507-E0	AJ0-8946

* SecurityGuard ULTRA cartridges require holder part number, AJ0-9000

SecurityGuard™ ULTRA Cartridge Holder* (for 2.1 to 4.6 mm ID columns)

SecurityGuard ULTRA Guard Cartridge Holder	ea
	AJ0-9000

Material Characteristics

Packing Material	Total Particle Size (µm)	Porous Shell (µm)	Core Size (µm)	Pore Size (Å)	pH Stability	Temp Stability	Pressure Stability
Aeris WIDEPORE	3.6	0.2	3.2	200	1.5 - 9	90 °C	600 bar
Aeris PEPTIDE	1.7	0.22	1.25	100	1.5 - 9	90 °C	1000 bar
Aeris PEPTIDE	3.6	0.5	2.6	100	1.5 - 9	90 °C	600 bar

guarantee

If Aeris core-shell columns do not provide at least an equivalent separation as compared to a competing column of the same phase, return the column with comparative data within 45 days for a FULL REFUND.

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f: 02-9428-6445
auinfo@phenomenex.com

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f: 01-319-1300
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t: 02 511 8666 (Dutch)
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beinfo@phenomenex.com

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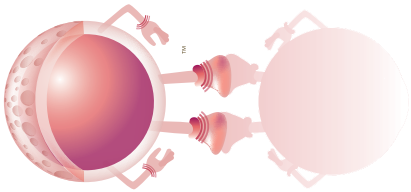
Core-Shell Technology
for Proteins and Peptides



AERIS™

BR88220612_W