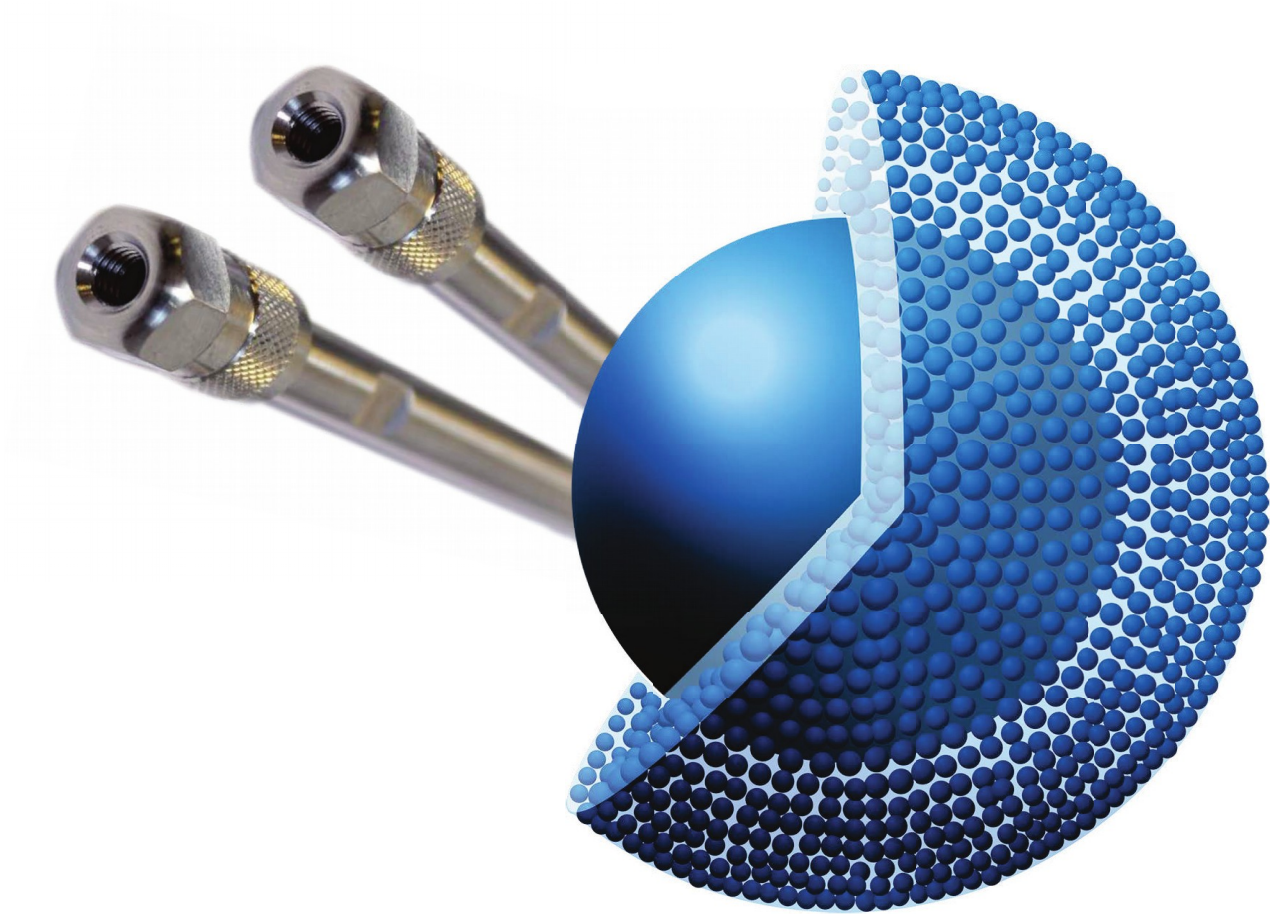
avantor™



Chromatography Solutions

# Avantor® ACE® UltraCore



AvantorACE®

# Avantor® ACE®

High throughput and high efficiency ultra-fast separations are achievable using Avantor ® ACE® UltraCore – ultra-inert solid-core (core-shell) columns. Avantor® ACE® UltraCore columns utilise ultra-high purity solid-core silica with a monodisperse particle distribution to combine high efficiency with low backpressure. Achieve UHPLC-like performance using HPLC instrumentation with Avantor ® ACE® UltraCore.

## FASTER SEPARATION WITHOUT LOSS OF RESOLUTION

High efficiency separations comparable with sub-2 µm packings but lower back pressure. Ideal for a wide range of analytes differing in hydrophobicity.

Three product types within the range:

– UltraCore BIO for the separation of large, biologically derived molecules. Ideal for separating compounds with a molecular weight of 5 kDa and above.
– UltraCore for the separation of standard small organic molecules. Ideal for the fast separation of mixtures containing small organic molecules of either synthetic or natural origin.
– UltraCore Super featuring encapsulated bonding technology (EBT) for small organic molecules in extreme pH conditions. Ideal when high pH buffers are required.

## ULTRACORE ADVANTAGE OVER FULLY POROUS MATERIAL (FPP)

Solid-core materials benefit from three key aspects;

– The size uniformity of the packing material means that it packs better, resulting in greater uniformity of the flow profile through the column.
– The dead volume in the column is reduced due to the solid-core, which significantly reduces the amount of longitudinal dispersion.
– Reduced mass transfer issues since the differential pathway between molecules entering the porous system and those that don't is substantially reduced.

This last phenomenon is exagerated by higher flow rates and when using larger molecular weight molecules, due to their slower diffusion rates. Thus, using a silica particle with a solid-core is ideally suited to the analysis of biomolecules as it provides enhanced chromatographic performance coupled with the ability to run at elevated flow rates.

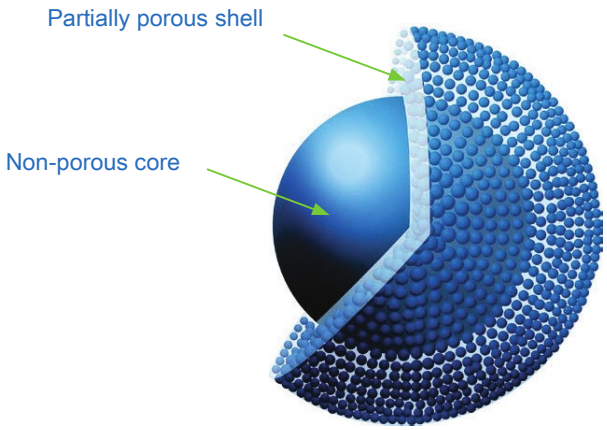



**Figure 1:** Schematic structure of a solid-core particle.

| Biomolecule | Molecular weight kDA Efficiency at 100 Å Efficiency a |
|---|---|
| Oxytocin Acetate | 1.0072 234449 213719 |
| Angiotensin I | 1.2945 239231 203898 |
| Angiotensin II | 1.0642 349538 288695 |
| Angiotensin III | 1.1113 332637 269406 |
| Bradykinin Acetate | 1.060 106321 81543 |
| Cytochrome C | 12 245487 517929 |
| Ribonuclease A | 13.7 124969 154193 |
| ß-lactoglobulin | 18.4 140722 280565 |
| Ovalbumin | 45 192084 324076 |
| BSA | 66.5 8551 33608 |

*NB comparison data collected using fully porous material to demonstrate effect of pore size change.

**Table 1**

retention and greater loading capacity.

## THE IMPORTANCE OF PORE SIZE

When working with larger molecules, typically from around 5 kDa in molecular weight to 150 kDa, it is important to make sure that the molecules have full access to all of the available stationary phase. Typical analytical HPLC phases have a pore size around 95 Å, and for smaller molecules which have a molecular weight less than 1 kDa, the molecules have full accessibility to the stationary phase. However, as the molecular weight increases the accessibility decreases, with individual molecules having different levels of access to a pore, dependant on the individual pore size and also the orientation of the molecule. This results in a loss of chromatographic efficiency evident by broad peaks with a limited Gaussian structure. Eventually the size of the molecule will become too big to enter the pore structure, resulting in a substantial reduction in the accessible available surface area causing a reduction in the retention time. Biomolecules above 5 kDa are too large to be used with a 95 Å material, as can be seen in the table 1, where a loss of efficiency occurs as molecules struggle to access all of the available surface. The correct selection of column according to pore size makes a significant difference in the chromatographic efficiency and consequently the resolution for larger molecules.

With both 300 Å and 500 Å pore sizes available in the UltraCore BIO range, the optimum pore size can be chosen. These particle formats are ideally suited for the efficient separation of larger molecules over 5 kDa in molecular weight.

## ULTRACORE BENEFITS FOR BIOLOGICAL MACROMOLECULE SEPARATION

UltraCore particles are composed of a solid silica core, surrounded by a porous outer shell (Figure 1). Reduced mass transfer for large molecules using solid-core materials compared with a fully porous silica particles results in more efficient separations and increased analyte resolution.

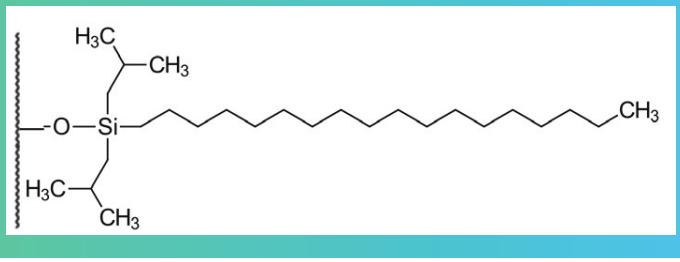
UltraCore columns give a reduced peak width and therefore improved resolution when compared to a fully porous alternative.

# Avantor® ACE® UltraCore BIO for

## PHASES AVAILABLE FOR AVANTOR® ACE® ULTRACORE BIO

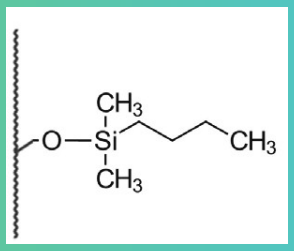
**C18:** Endcapped C18 phase, which can be used with 100% aqueous mobile phase. This is especially useful for the reversed-phase gradient separation of biologically derived compounds owing to the requirement for the start of the gradient often to be 0% organic. With excellent stability at low pH and high temperatures, these columns are ideal for the separation of a wide range of peptides and proteins.

ACE Ultra-Inert Silica Surface



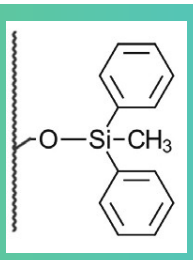

**C4:** Reversed-phase material for separations requiring a stationary phase with lower hydrophobicity. This is an important phase for large proteins given that the net interaction caused by the hydrophobic interaction is often strong in such molecules. The butyl ligand is well established in RP protein applications. This phase is well suited to the analysis of hydrophobic proteins over 5 kDa molecular weight.

ACE Ultra-Inert Silica Surface




**Phenyl2:** Reversed-phase material in which π-π and hydrophobic interactions take place. This phase is similar in hydrophobicity to a C4 but given the different interaction of the phenyl groups, it displays a high degree of orthogonality to C18 and C4. It is a good choice if the required separation is not achieved on a C4 phase.

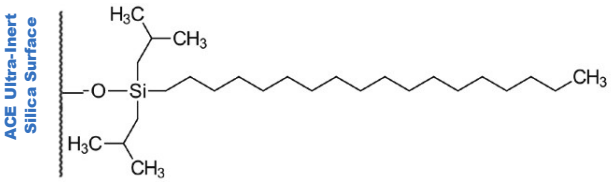
ACE Ultra-Inert Silica Surface




**Phase Comparison Table**

| Phase | USP Listing | Functional group | End-capping | Particle size (µm) | Pore size (Å) | Surface area ($m^2$/g) | Carbon load (%) | pH range |
|---|---|---|---|---|---|---|---|---|
| UltraCore BIO C18 | L1 | Octadecyl | Yes | 3.5 | 300 | 16 | 1.0 | 1-8 |
| UltraCore BIO C18 | L1 | Octadecyl | Yes | 2.5 | 500 | 23 | 1.4 | 1-8 |
| UltraCore BIO C4 | L26 | Butyl | Yes | 3.5 | 300 | 16 | 0.4 | 2-9 |
| UltraCore BIO C4 | L26 | Butyl | Yes | 2.5 | 500 | 23 | 0.6 | 2-9 |
| UltraCore BIO Phenyl2 | L11 | Diphenyl | Yes | 3.5 | 300 | 16 | 0.7 | 2-9 |
| UltraCore BIO Phenyl2 | L11 | Diphenyl | Yes | 2.5 | 500 | 23 | 1.0 | 2-9 |

# Avantor® ACE® UltraCore BIO




## SEPARATION OF SMALL PROTEINS USING AN AVANTORACE® ULTRACORE BIO C18 300Å

**TESTING CONDITIONS:**

Mobile Phase
**A:** Water + 0.1% TFA
**B:** 80% ACN/20% Water + 0.085% TFA

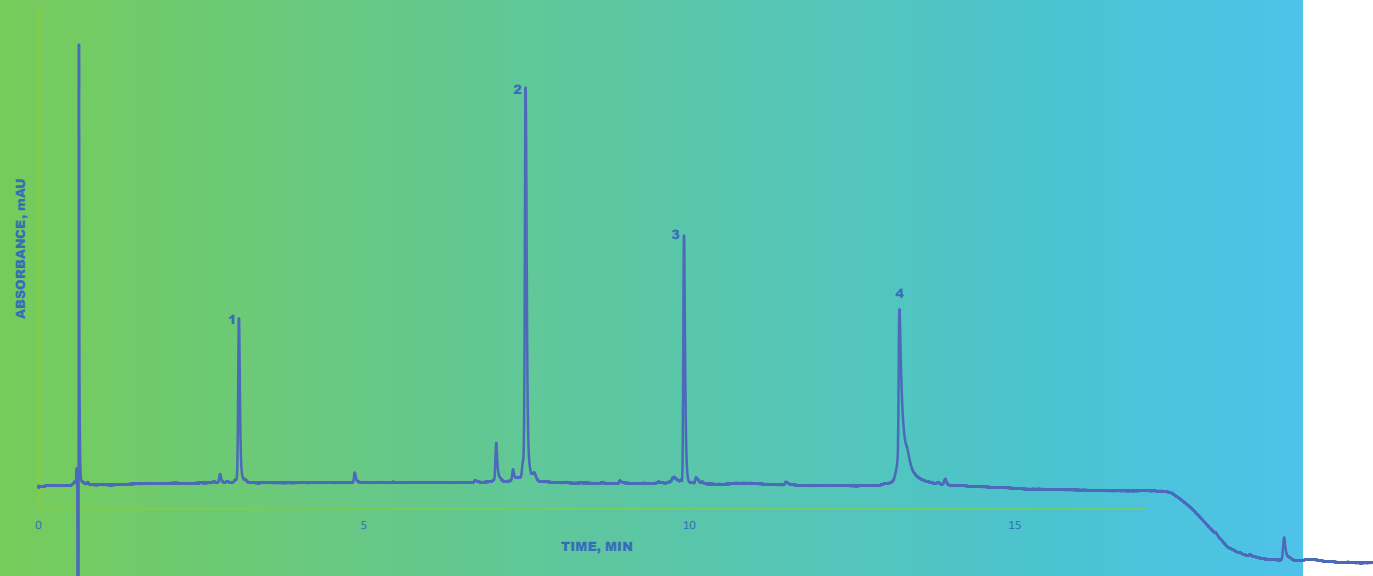
Gradient:

| Time | %B |
|---|---|
| 0.0 | 28.5 |
| 15.0 | 62.5 |
| 16.0 | 62.5 |
| 17.0 | 100 |
| 22.0 | 100 |

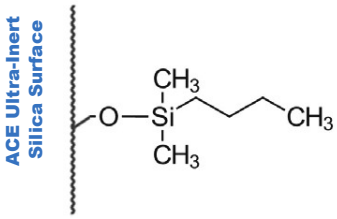
Wavelength: 215 nm
Injection: 5 µL Mix 1
Temperature: 60 °C
Flow Rate: 1.5 mL/min.
Column: UltraCore BIO C18-300, 3.5 µm, 4.6 x 100 mm

| Peak Number | Peak Identity | Retention Time | Molecular Weight (kDa) |
|---|---|---|---|
| 1 | Ribonuclease A | 3.1 | 13.7 |
| 2 | Lysozyme | 7.5 | 14.3 |
| 3 | Alpha-lactalbumin | 9.9 | 14 |
| 4 | Enolase | 13.2 | 46 |

The C18 stationary phase with pore sizes of 300 Å is suitable for separation of proteins up to approximately 60 kDa. As seen here, it is ideal for the separation of proteins of approximately 14 kDa in size.



# Avantor® ACE® UltraCore BIO

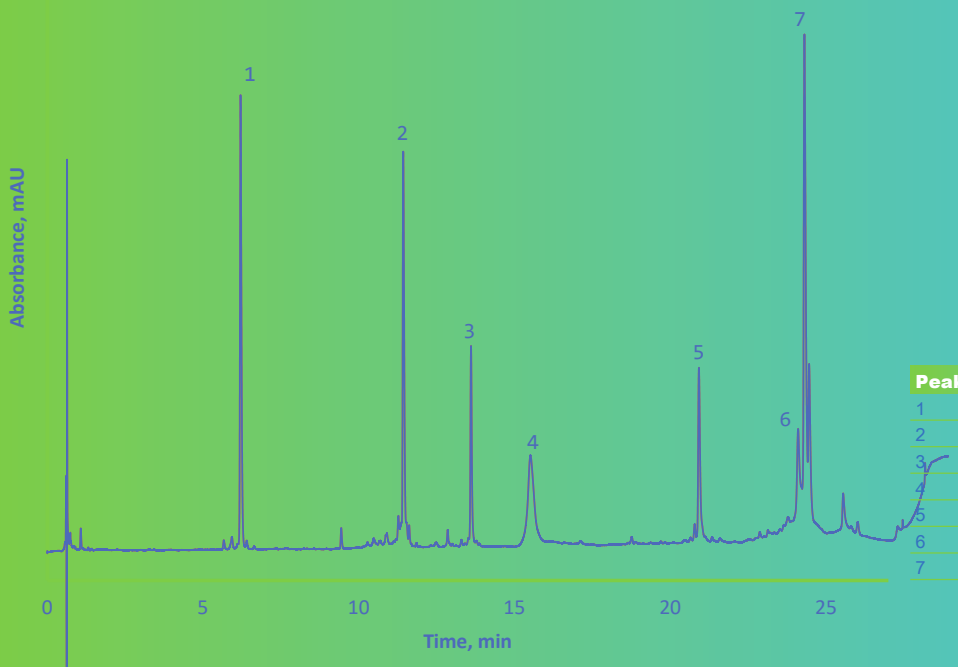



## SEPARATION OF ENZYMES AND PROTEINS ON AN AVANTOR® ACE® ULTRACORE BIO C4

**TESTING CONDITIONS:**

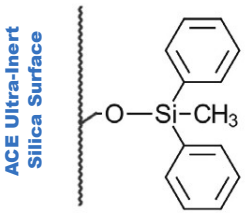
| | |
|---|---|
| Mobile Phase | **A:** Water + 0.1% TFA |
| | **B:** 80% ACN/20% Water + 0.085% TFA |
| Gradient: | **Time** **%B** |
| | 0.0 25 |
| | 25.0 57.5 |
| | 26.0 57.5 |
| | 27.0 100 |
| | 29.0 100 |
| Wavelength: | 220 nm |
| Injection: | 5 µL Mix 1 |
| Temperature: | 60 °C |
| Flow Rate: | 1.5 mL/min. |
| Column: | UltraCore BIO C4-300, 3.5 µm, 4.6 x 100 mm |

The 300 Å pore size is ideal for the separation of small proteins. The chromatogram shows narrow peak widths, giving well resolved peaks. The C4 phase, with lower hydrophobicity than the C18, is particularly well suited to separations of this type.




| Peak Number | Peak Identity | Retention Time |
|---|---|---|
| 1 | Ribonuclease A | 6.2 |
| 2 | Cytochrome c | 11.4 |
| 3 | Lysozyme | 13.6 |
| 4 | Holo-transferrin | 15.5 |
| 5 | Apomyoglobin | 20.9 |
| 6 | Enolase | 24.1 |
| 7 | Carbonic Anhydrase | 24.3 |

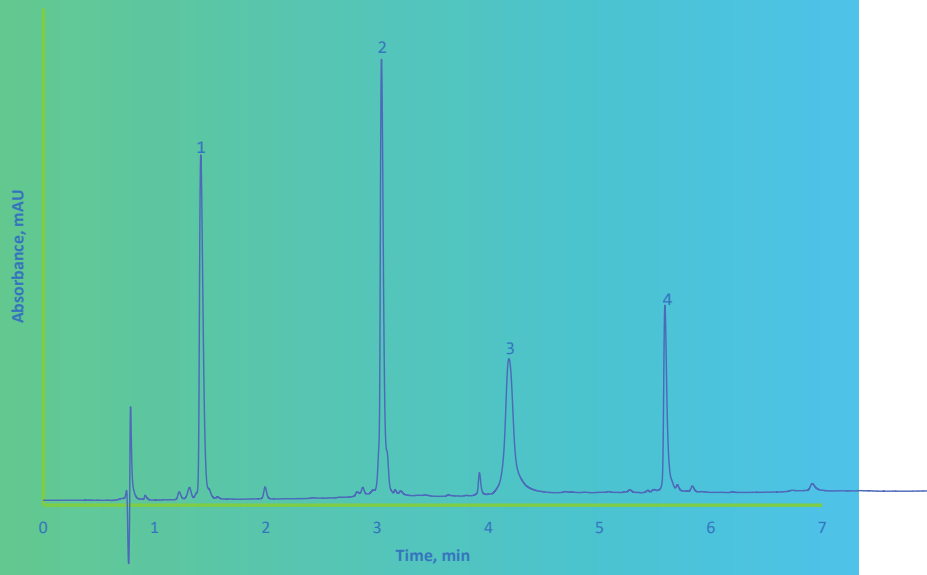
# Avantor® ACE® UltraCore BIO




## SEPARATION OF 4 PROTEINS TO SHOW SUPERIOR PERFORMANCE OF THE PHENYL2 PHASE

**TESTING CONDITIONS:**

| | |
|---|---|
| Mobile Phase | **A:** Water + 0.1% TFA |
| | **B:** 80% ACN/20% Water + 0.085% TFA |
| Gradient: | **Time** **%B** |
| | 0.0 31 |
| | 7.0 60 |
| | 8.0 60 |
| Wavelength: | 220 nm |
| Injection: | 3 µL Mix 1 |
| Temperature: | 60 °C |
| Flow Rate: | 0.4 mL/min. |
| Column: | UltraCore BIO Phenyl2-300, 3.5 µm, 2.1 x 150 mm |




| Peak Number | Peak Identity | Retention Time |
|---|---|---|
| 1 | Ribonuclease A | 1.4 |
| 2 | Cytochrome c | 3.0 |
| 3 | Holo-transferrin | 4.1 |
| 4 | Apomyoglobin | 5.6 |

The chromatogram shows the superior performance of the phenyl phase. It is clearly demonstrated how very fast, high efficiency separations can be achieved for the separation of biomolecules using a column of this type.

# Avantor® ACE®

## RETENTION OF TRASTUZUMAB SHOWING 3 OVERLAID CHROMATOGRAMS COMPARING RETENTION TIMES ACROSS THREE DIFFERENT PHASES ON 500 Å ULTRACORE SILICA.

**TESTING CONDITIONS:**

Mobile Phase **A:** Water + 0.1% TFA
**B:** 80% ACN/20% Water + 0.085% TFA

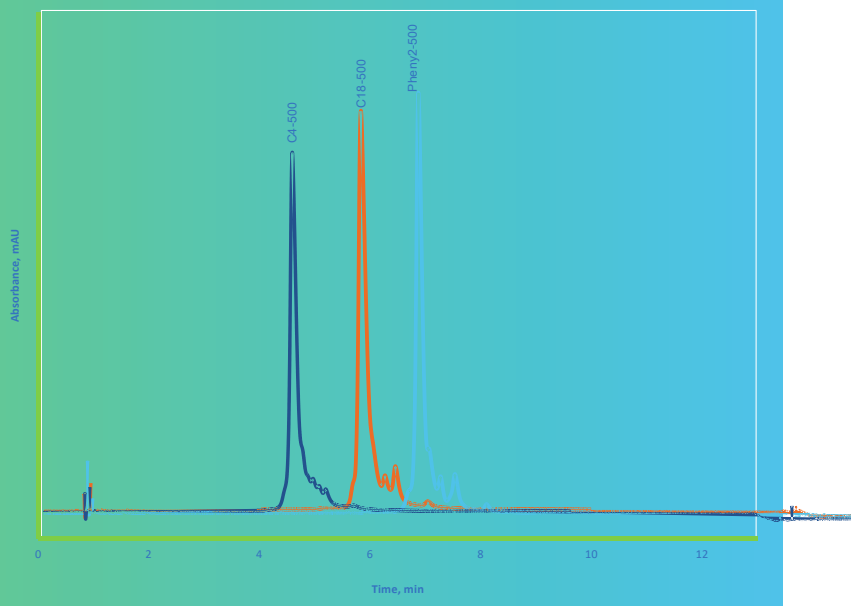
Gradient:

| Time | %B | Total Flow (mL/min) |
|---|---|---|
| 0.0 | 40.0 | 0.4 |
| 12.0 | 47.5 | 0.4 |
| 12.5 | 47.5 | 0.4 |
| 13.0 | 100 | 0.4 |
| 13.5 | 100 | 0.7 |
| 16.0 | 100 | 0.7 |

Wavelength: 280 nm
Injection: 2 µL Trastuzumab
Temperature: 80 °C
Flow Rate: 0.4 mL/min.

| Retention Time (min) | Column |
|---|---|
| 4.7 | UltraCore BIO C4-500, 2.5 µm, 2.1 x 150 mm |
| 5.8 | UltraCore BIO C18-500, 2.5 µm, 2.1 x 150 mm |
| 6.8 | UltraCore BIO Phenyl2-500, 2.5 µm, 2.1 x 150 mm |

500 Å is a suitable pore size for the reversed-phase separation of antibodies of approximately 150 kDa in molecular weight. The 500 Å pore size retains the mAb well and a difference can clearly be observed when comparing the three different stationary phases. This is a useful tool to enable clear separation of the protein of interest from any similar compounds such as mAb fragments or impurities with similar retention.




All 300 Å phases have HPLC hardware with 600 bar (9000 psi) pressure limit. 500 Å columns have HPLC/UHPLC hardware with 600 bar (9000 psi) pressure limit for 4.6 mm ID or 1000 bar (14,500 psi) for 2.1 and 3.0 mm ID

## ORDERING TABLE ULTRACORE BIO:

| | 300 Å, 3.5 µm | | | 500 Å, 2.5 µm | | |
|---|---|---|---|---|---|---|
| **Dimensions** | **C18** | **C4** | **Phenyl2** | **C18** | **C4** | **Phenyl2** |
| 2.1 × 50 mm | BIO-350-0521 | BIO-351-0521 | BIO-352-0521 | BIO-250-0521 | BIO-251-0521 | BIO-252-0521 |
| 2.1 × 100 mm | BIO-350-1021 | BIO-351-1021 | BIO-352-1021 | BIO-250-1021 | BIO-251-1021 | BIO-252-1021 |
| 2.1 × 150 mm | BIO-350-1521 | BIO-351-1521 | BIO-352-1521 | BIO-250-1521 | BIO-251-1521 | BIO-252-1521 |
| 3.0 × 50 mm | BIO-350-0530 | BIO-351-0530 | BIO-352-0530 | BIO-250-0530 | BIO-251-0530 | BIO-252-0530 |
| 3.0 × 100 mm | BIO-350-1030 | BIO-351-1030 | BIO-352-1030 | BIO-250-1030 | BIO-251-1030 | BIO-252-1030 |
| 3.0 × 150 mm | BIO-350-1530 | BIO-351-1530 | BIO-352-1530 | BIO-250-1530 | BIO-251-1530 | BIO-252-1530 |
| 4.6 × 50 mm | BIO-350-0546 | BIO-351-0546 | BIO-352-0546 | BIO-250-0546 | BIO-251-0546 | BIO-252-0546 |
| 4.6 × 100 mm | BIO-350-1046 | BIO-351-1046 | BIO-352-1046 | BIO-250-1046 | BIO-251-1046 | BIO-252-1046 |
| 4.6 × 150 mm | BIO-350-1546 | BIO-351-1546 | BIO-352-1546 | BIO-250-1546 | BIO-251-1546 | BIO-252-1546 |
| Guard cartridges (3pk) | BIO-350-521G | BIO-351-521G | BIO-352-521G | BIO-250-521G | BIO-251-521G | BIO-252-521G |
| Guard cartridges (3pk) | BIO-350-530G | BIO-351-530G | BIO-352-530G | BIO-250-530G | BIO-251-530G | BIO-252-530G |
| Guard cartridges (3pk) | BIO-350-546G | BIO-351-546G | BIO-352-546G | BIO-250-546G | BIO-251-546G | BIO-252-546G |

* Guard cartridges require guard holder BIO-GRD-0001

# Avantor® ACE® UltraCore for

The use of solid-core particles is well established, but has really gained prominence in recent years as they are able to generate higher efficiencies than comparably sized fully porous particles and show less of a performance drop-off at higher flow rates. This has been especially utilised in the small molecule application area.

**The Avantor® ACE® UltraCore 95 Å range offers;**

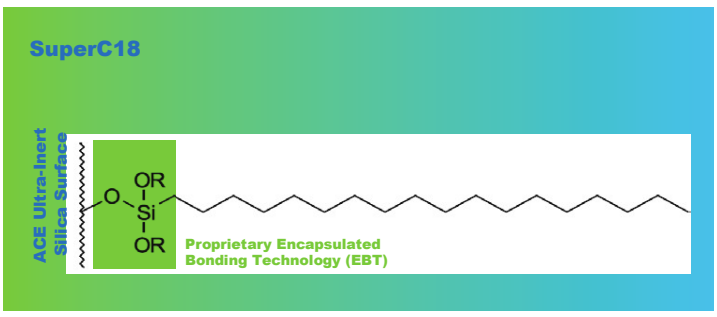
– High purity, base-deactivated silica with excellent reproducibility
– 2.5 µm solid-core particles, which give comparable efficiencies to sub 2 µm FPP with the advantage of lower back pressure
– 5 µm solid-core particles which can be used to replace 5 µm FPPs of the same chemistry to significantly increase separation speed and improve sample throughput
– 3.5 µm solid-core particles offering sub-3 µm FPP efficiencies and are available in alternative selectivities for method development

# Avantor® ACE® UltraCore

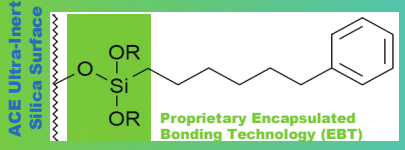
– Ultra-inert solid-core particles
– SuperC18 and SuperPhenylHexyl phases – with complementary selectivity for method development over a wide pH range
– Extended pH range 1.0–11.0
– Designed for LC-MS applications

| Phase | USP Listing | Functional group | End-capping | Particle size (µm) | Pore size (Å) | Surface area (m²/g) | Carbon load (%) | pH range |
|---|---|---|---|---|---|---|---|---|
| UltraCore SuperC18 | L1 | Octadecyl | Encapsulated | 2.5 | 95 | 130 | 7.0 | 1.5-11 |
| | | | | 5 | | 100 | 5.4 | |
| UltraCore SuperPhenylHexyl | L11 | Phenyl-Hexyl | Encapsulated | 2.5 | 95 | 130 | 4.6 | 1.5-11 |
| | | | | 5 | | 100 | 3.6 | |

**SuperC18**

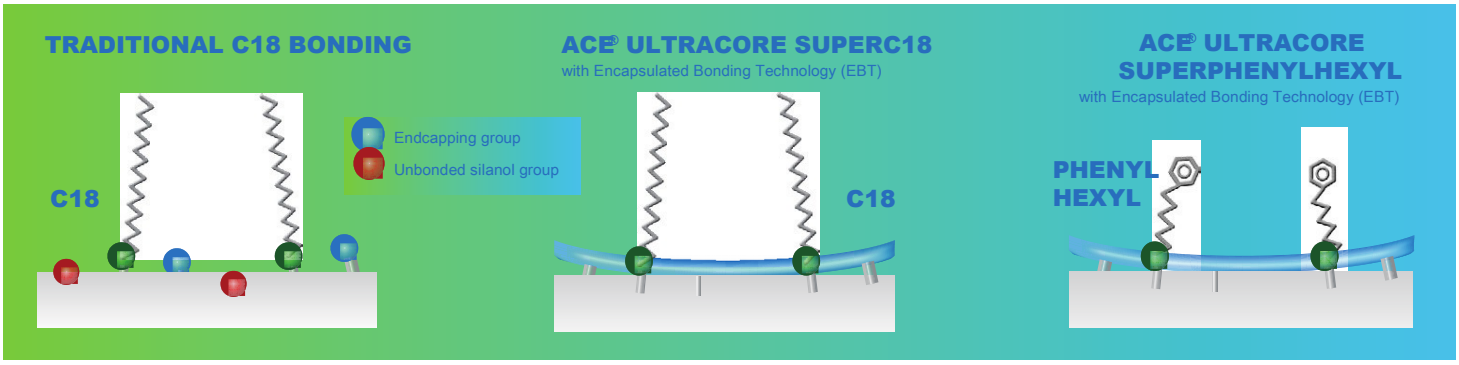



**SuperPhenylHexyl**



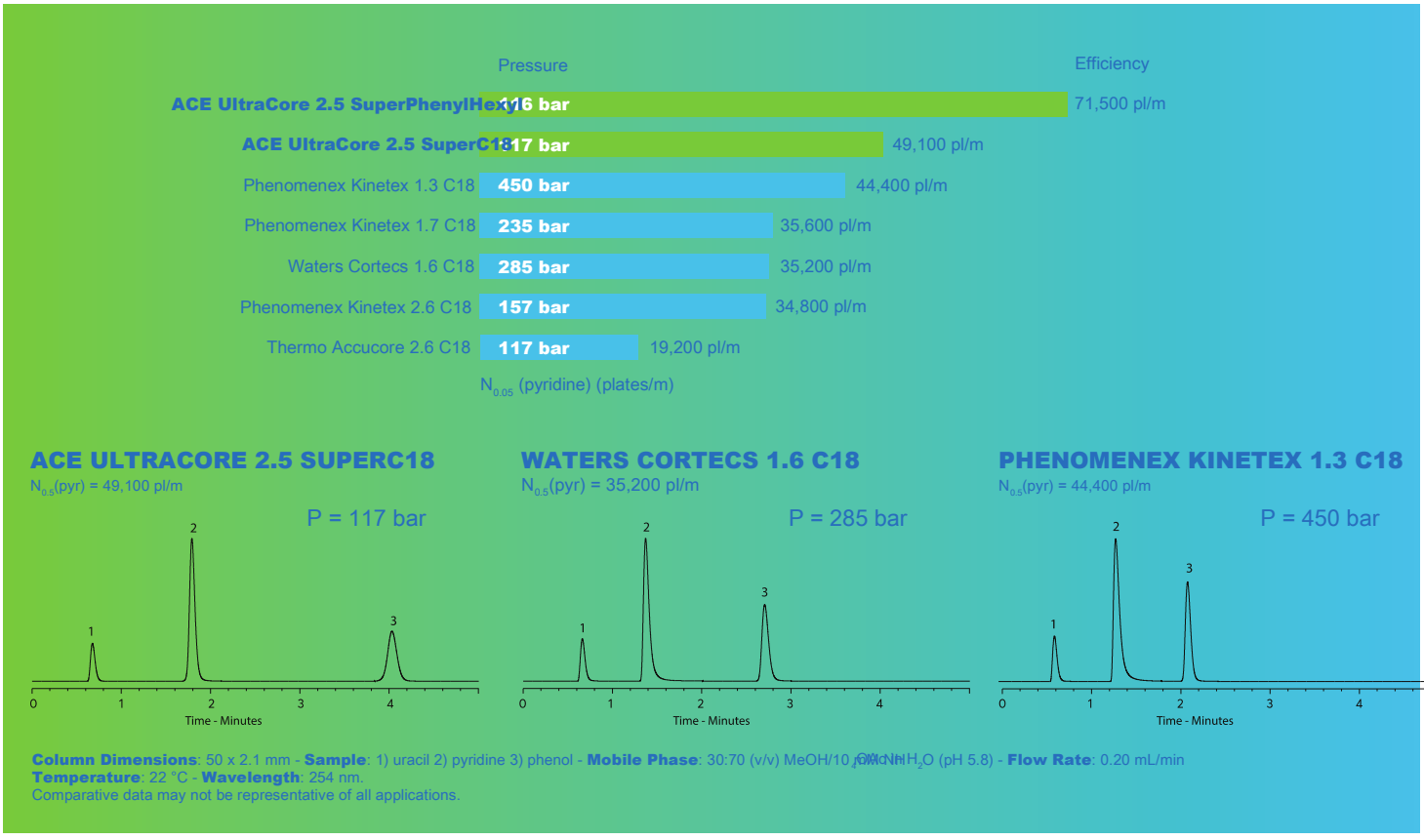
# AVANTORACE® ULTRACORE

Avantor® ACE® UltraCore SuperC18 and SuperPhenylHexyl phases are manufactured using our unique Encapsulated Bonding Technology (EBT). This technology dramatically increases ligand coverage of the silica surface and effectively eliminates the negative effects of unbonded silanol groups. The higher ligand coverage results in improved inertness, chromatographic performance and stability.




## Avantor® ACE® UltraCore columns are highly inert.

– Solid-core columns from leading manufacturers investigated
– Comparison of column efficiency for pyridine – a basic molecule




**Column Dimensions**: 50 x 2.1 mm - **Sample**: 1) uracil 2) pyridine 3) phenol - **Mobile Phase**: 30:70 (v/v) MeOH/10 mM $NH_4OAc$ in $H_2O$ (pH 5.8) - **Flow Rate**: 0.20 mL/min
**Temperature**: 22 °C - **Wavelength**: 254 nm.
Comparative data may not be representative of all applications.

## EXAMPLE APPLICATIONS

– Water-soluble vitamins using UltraCore SuperPhenylHexyl
– Tryptic digest of BSA using 3 x coupled UltraCore SuperC18 columns

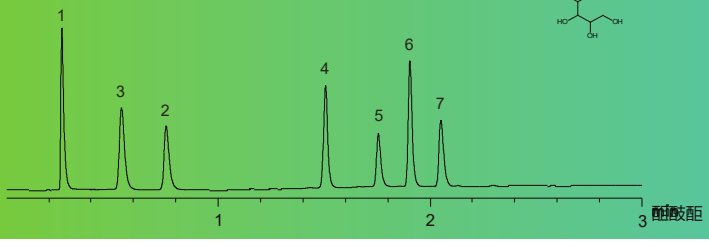
### ACE ULTRACORE 2.5 SUPERPHENYLHEXYL

**Column Dimensions**: 50 x 2.1 mm, 2.5 µm
Gradient analysis
Mobile Phase: A: 20 mM $KH_2PO_4$ pH 2.7 (aq)
B: 20 mM $KH_2PO_4$ pH 2.7 in MeOH:Water 50:50 v/v

| Time (mins) | %B |
|---|---|
| 0 | 20 |
| 1 | 60 |
| 2 | 70 |

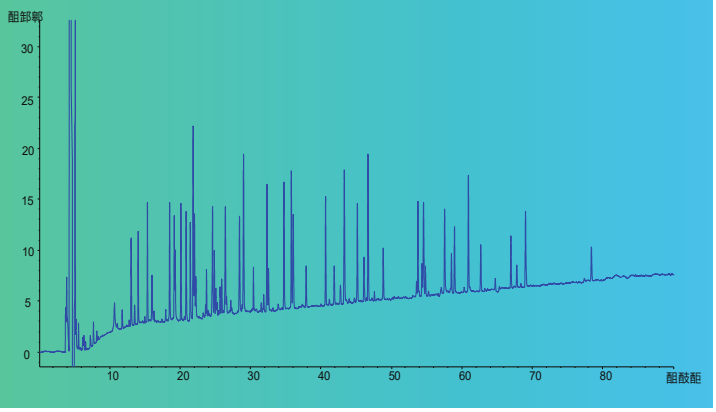
Flow Rate: 0.60 mL/min
Temperature: 40 °C
Detection: 205 nm

1 Pyridoxine (vitamin B6)
2 p-Aminobenzoic acid
3 Pantothenic acid (vitamin B5)
4 Folic acid (vitamin B9 or vitamin M)
5 d-Biotin (vitamin B7 or vitamin H)
6 Cyanocobalamin (vitamin B12)
7 Riboflavin (vitamin B2)




### ACE ULTRACORE 2.5 SUPERC18

**Column Dimensions**: (3x) 150 x 2.1 mm
Mobile Phase: A: 0.05% TFA in $H_2O$
B: 0.05% TFA in MeCN
Gradient: 10 to 40% B in 90 mins
Flow Rate: 0.21 mL/min
Injection: 20 µL
Temperature: 60 °C
Detection: UV, 214 nm




## ORDERING INFORMATION

### Avantor® ACE® Ultracore 2.5 µm particle sizes

**HPLC/UHPLC hardware format with 1,000 bar / 15,000 psi pressure limit**

| Column dimensions | SuperC18 | SuperPhenylHex |
|---|---|---|
| 2.1 x 50 mm | CORE-25A-0502U | CORE-25B-0502U |
| 2.1 x 75 mm | CORE-25A-7502U | CORE-25B-7502U |
| 2.1 x 100 mm | CORE-25A-1002U | CORE-25B-1002U |
| 2.1 x 125 mm | CORE-25A-1202U | CORE-25B-1202U |
| 2.1 x 150 mm | CORE-25A-1502U | CORE-25B-1502U |
| 3.0 x 50 mm | CORE-25A-0503U | CORE-25B-0503U |
| 3.0 x 75 mm | CORE-25A-7503U | CORE-25B-7503U |
| 3.0 x 100 mm | CORE-25A-1003U | CORE-25B-1003U |
| 3.0 x 125 mm | CORE-25A-1203U | CORE-25B-1203U |
| 3.0 x 150 mm | CORE-25A-1503U | CORE-25B-1503U |
| 4.6 x 50 mm | CORE-25A-0546U | CORE-25B-0546U |
| 4.6 x 75 mm | CORE-25A-7546U | CORE-25B-7546U |
| 4.6 x 100 mm | CORE-25A-1046U | CORE-25B-1046U |
| 4.6 x 125 mm | CORE-25A-1246U | CORE-25B-1246U |
| 4.6 x 150 mm | CORE-25A-1546U | CORE-25B-1546U |
| Guards for 2.1 & 3.0 mm id columns (3 pk)* | CORE-A-GD2U | CORE-B-GD2U |
| Guards for 4.6 mm id columns (3 pk)* | CORE-A-GD4U | CORE-B-GD4U |

*Guards require holder H0011

### Avantor® ACE® UltraCore 5 µm particle sizes

**HPLC/UHPLC hardware format with 1,000 bar / 15,000 psi pressure limit**

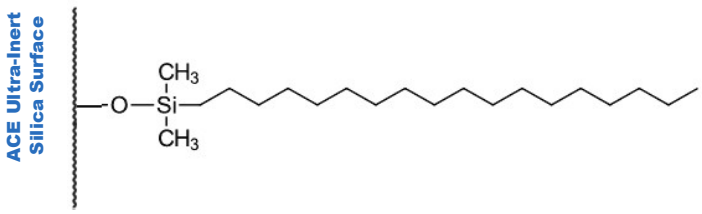
| Column dimensions | SuperC18 | SuperPhenylHex |
|---|---|---|
| 2.1 x 50 mm | CORE-5A-0502U | CORE-5B-0502U |
| 2.1 x 75 mm | CORE-5A-7502U | CORE-5B-7502U |
| 2.1 x 100 mm | CORE-5A-1002U | CORE-5B-1002U |
| 2.1 x 125 mm | CORE-5A-1202U | CORE-5B-1202U |
| 2.1 x 150 mm | CORE-5A-1502U | CORE-5B-1502U |
| 2.1 x 250 mm | CORE-5A-2502U | CORE-5B-2502U |
| 3.0 x 50 mm | CORE-5A-0503U | CORE-5B-0503U |
| 3.0 x 75 mm | CORE-5A-7503U | CORE-5B-7503U |
| 3.0 x 100 mm | CORE-5A-1003U | CORE-5B-1003U |
| 3.0 x 125 mm | CORE-5A-1203U | CORE-5B-1203U |
| 3.0 x 150 mm | CORE-5A-1503U | CORE-5B-1503U |
| 3.0 x 250 mm | CORE-5A-2503U | CORE-5B-2503U |
| 4.6 x 50 mm | CORE-5A-0546U | CORE-5B-0546U |
| 4.6 x 75 mm | CORE-5A-7546U | CORE-5B-7546U |
| 4.6 x 100 mm | CORE-5A-1046U | CORE-5B-1046U |
| 4.6 x 125 mm | CORE-5A-1246U | CORE-5B-1246U |
| 4.6 x 150 mm | CORE-5A-1546U | CORE-5B-1546U |
| 4.6 x 250 mm | CORE-5A-2546U | CORE-5B-2546U |
| Guards for 2.1 & 3.0 mm id columns (5 pk)* | CORE-A-0102GD | CORE-B-0102GD |
| Guards for 2.1 & 3.0 mm id columns (5 pk)* | CORE-A-0103GD | CORE-B-0103GD |

*For use at HPLC pressures. Guards require holder H0001 & Coupler C0001

# Avantor® ACE® UltraCore

This densely bonded octadecyl phase can be used to separate acidic, basic and neutral molecules, based on hydrophobic retention mechanisms. Often known as the workhorse stationary phase, it can be utilised for common application areas where high sensitivity is required.

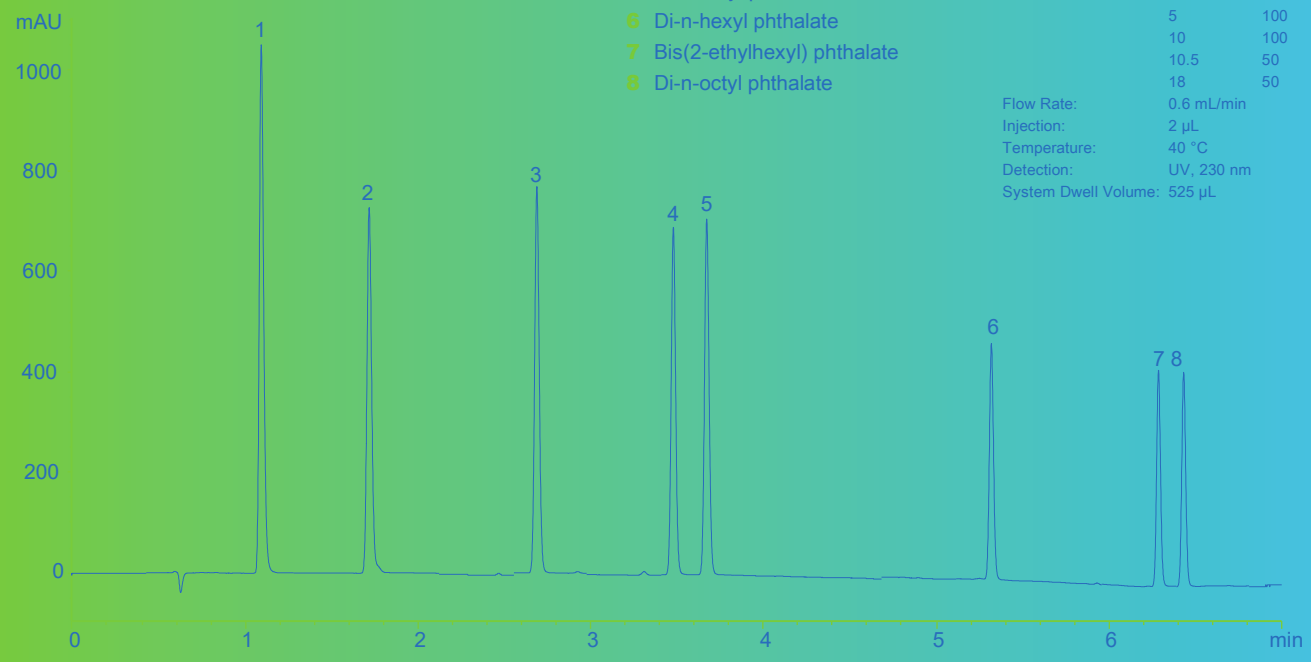
– High efficiency separations comparable with sub-2 µm packings but lower back pressure
– Ideal for a wide range of analytes differing in hydrophobicity




| Phase | USP Listing | Functional group | Endcapping | Particle size (µm) | Pore size (Å) | Surface area (m²/g) | Carbon load (%) | Low pH/T limit | High pH/T limit | 100% aqueous compatible |
|---|---|---|---|---|---|---|---|---|---|---|
| UltraCore C18 | L1 | Octadecyl | Yes | 3.5 | 95 | 115 | 8.2 | 2/60ºC | 9/40ºC | No |

## SEPARATION OF PHTHALATES

1 Dimethyl phthalate
2 Diethyl phthalate
3 Di-n-propyl phthalate
4 Benzyl butyl phthalate
5 Di-n-butyl phthalate
6 Di-n-hexyl phthalate
7 Bis(2-ethylhexyl) phthalate
8 Di-n-octyl phthalate



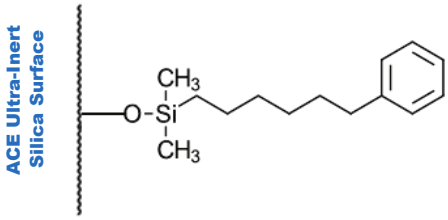

**TESTING CONDITIONS**

| | |
|---|---|
| Column: | UltraCore C18 |
| Dimensions: | 100 x 3.0 mm |
| Mobile Phases: | **A:** 0.1% Formic acid in $H_2O$ |
| | **B:** 0.1% Formic acid in MeCN |
| Gradient: | **Time (mins) %B** |
| | 0 50 |
| | 5 100 |
| | 10 100 |
| | 10.5 50 |
| | 18 50 |
| Flow Rate: | 0.6 mL/min |
| Injection: | 2 µL |
| Temperature: | 40 °C |
| Detection: | UV, 230 nm |
| System Dwell Volume: | 525 µL |

# Avantor® ACE® UltraCore

The Phenylhexyl phase is especially well suited for retention of aromatic compounds where π-π interactions can be exploited.

– Ideal for analytes with π-bonding
– Complementary selectivity to other UltraCore bonded phases

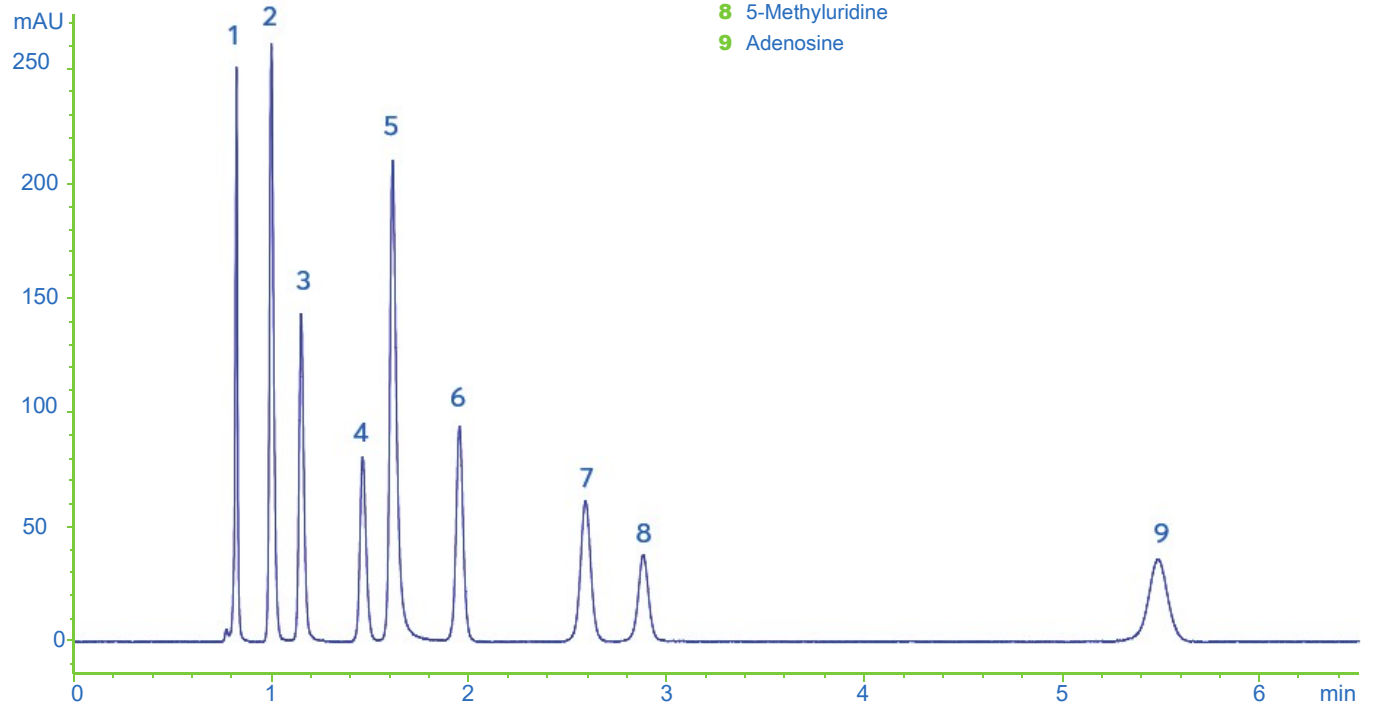



| Phase | USP Listing | Functional group | End-capping | Particle size (µm) | Pore size (Å) | Surface area (m²/g) | Carbon load (%) | Low pH/T limit | High pH/T limit | 100% aqueous compatible |
|---|---|---|---|---|---|---|---|---|---|---|
| UltraCore Phenylhexyl | L11 | Phenylhexyl | Yes | 3.5 | 95 | 115 | 6.2 | 2/60ºC | 9/40ºC | Yes |

## SEPARATION OF NUCLEOSIDES & NUCLEOBASES

1 Cytosine
2 Uracil
3 Guanine
4 Uridine
5 Adenine
6 Thymine
7 Guanosine
8 5-Methyluridine
9 Adenosine

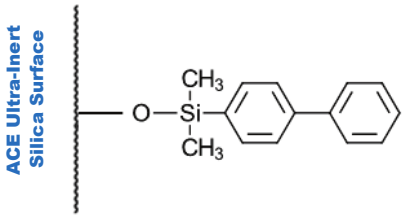
Column: UltraCore 3.5 Phenyhexyl
Dimensions: 100 x 3.0 mm
Mobile Phase: 10 mM ammonium formate pH 4.2 in $H_2O$
Flow Rate: 0.6 mL/min
Injection: 3 µL
Temperature: 40 °C
Detection: UV, 254 nm



# Avantor® ACE® UltraCore

This biphenyl phase is especially well suited for retention of aromatic compounds that elute early on alkyl phases.

– Ideal for analytes with π-bonding, electron withdrawing or delocalised groups
– Alternative selectivity to alkyl phases and traditional phenyl phases

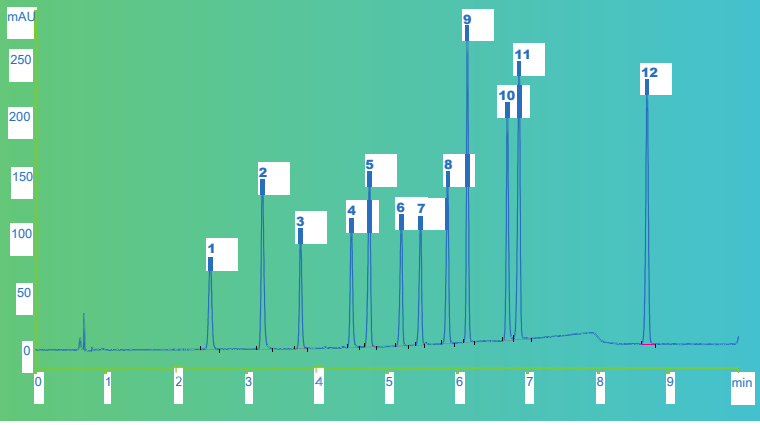



| Phase | USP Listing | Functional group | End-capping | Particle size (µm) | Pore size (Å) | Surface area ($m^2/g$) | Carbon load (%) | Low pH/T limit | High pH/T limit | 100% aqueous compatible |
|---|---|---|---|---|---|---|---|---|---|---|
| UltraCore Biphenyl | L11 | Biphenyl | Yes | 3.5 | 95 | 115 | 6.5 | 2/60ºC | 9/40ºC | Yes |

## SEPARATION OF BENZIMIDAZOLES

Column: UltraCore 3.5 Biphenyl
Dimensions: 100 x 3.0 mm
Mobile Phases: **A:** 20 mM $KH_2PO_4$ pH 6.5 in $H_2O$
**B:** 20 mM $KH_2PO_4$ pH 6.5 in MeCN/$H_2O$ 70:30 v/v
Gradient:

| Time (mins) | %B |
|---|---|
| 0 | 25 |
| 10 | 100 |
| 12 | 100 |
| 13 | 25 |
| 20 | 25 |




1 Carbendazim
2 Thiabendazole
3 Amino Mebendazole
4 Cambendazole
5 Oxibendazole
6 Mebendazole
7 Flubendazole
8 Albendazole
9 Triclabendazole Sulphone
10 Triclabendazole Sulphoxide
11 Fenbendazole
12 Triclabendazole

## ORDERING INFORMATION

### Avantor® ACE® Ultracore 3.5µm particle sizes

**HPLC hardware format with 6000 bar / 9,000 psi pressure limit**

| Column dimensions | C18 | Phenylhexyl | Biphenyl |
|---|---|---|---|
| 2.1 x 50 mm | CORE-35F-521 | CORE-35G-521 | CORE-35D-521 |
| 3.0 x 50 mm | CORE-35F-530 | CORE-35G-530 | CORE-35D-530 |
| 4.6 x 50 mm | CORE-35F-546 | CORE-35G-546 | CORE-35D-546 |
| 2.1 x 100 mm | CORE-35F-1021 | CORE-35G-1021 | CORE-35D-1021 |
| 3.0 x 100 mm | CORE-35F-1030 | CORE-35G-1030 | CORE-35D-1030 |
| 4.6 x 100 mm | CORE-35F-1046 | CORE-35G-1046 | CORE-35D-1046 |
| 2.1 x 150 mm | CORE-35F-1521 | CORE-35G-1521 | CORE-35D-1521 |
| 3.0 x 150 mm | CORE-35F-1530 | CORE-35G-1530 | CORE-35D-1530 |
| 4.6 x 150 mm | CORE-35F-1546 | CORE-35G-1546 | CORE-35D-1546 |

**HPLC hardware format with 6000 bar / 9,000 psi pressure limit**

| Column dimensions | C18 | Phenylhexyl | Biphenyl |
|---|---|---|---|
| Guards (for 2.1 mm id columns) 3 pk* | CORE-35F-21GD | CORE-35G-21GD | CORE-35D-21GD |
| Guards (for 3.0 mm id columns) 3 pk* | CORE-35F-30GD | CORE-35G-30GD | CORE-35D-30GD |
| Guards (for 4.6 mm id columns) 3 pk* | CORE-35F-46GD | CORE-35G-46GD | CORE-35D-46GD |

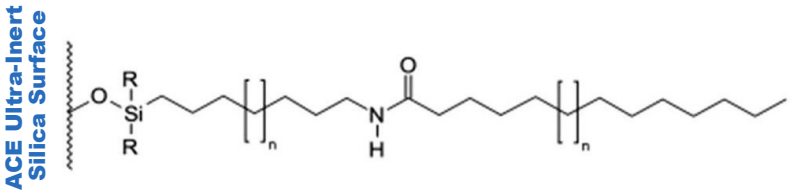
*Guards require holder BIO-GRD-0001

For any application support or additional questions please contact **chromsupport@avantorsciences.com**

# Avantor® ACE® UltraCore

The C18-Amide phase incorporates additional mechanisms of interaction such as H-bonding to give an alternative selectivity for moderately polar analytes.

– Can retain more polar compounds in 100% aqueous mobile phase
– Alternative selectivity to alkyl phases




| Phase | USP Listing | Functional group | End-capping | Particle size (µm) | Pore size (Å) | Surface area (m2/g) | Carbon load (%) | Low pH/T limit | High pH/T limit | 100% aqueous compatible |
|---|---|---|---|---|---|---|---|---|---|---|
| UltraCore C18-Amide | L60 | Polar Embedded Amide | Yes | 3.5 | 95 | 120 | 5.5 | 2/60ºC | 9/40ºC | Yes |

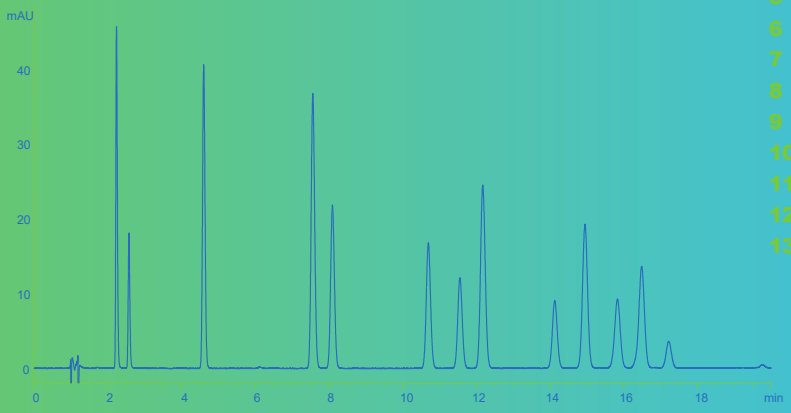
## SEPARATION OF PHENOLIC COMPOUNDS

Column: Avantor® ACE® UltraCore C18-Amide
Dimensions: 100 x 3.0 mm
Mobile Phases: **A:** 0.1% Formic acid in $H_2O$
**B:** 0.1% Formic acid in ACN

Gradient:

| Time (mins) | %B |
|---|---|
| 0 | 20 |
| 20 | 40 |
| 22 | 95 |
| 24 | 95 |
| 25 | 20 |
| 35 | 20 |

Flow Rate: 0.43 mL/min
Injection: 5 µL
Temperature: 40 °C
Detection: UV, 274 nm
System Dwell Volume: 525 µL




1 Resorcinol
2 Catechol
3 Phenol
4 m-Cresol
5 o-Cresol
6 3,4-Xylenol
7 3,5-Xylenol
8 2,4-Xylenol
9 3,4,5-Trimethylphenol
10 2-Naphthol
11 2,4,6-Trimethylphenol
12 2,3,5-Trimethylphenol
13 1-Naphthol

## ORDERING INFORMATION

### Avantor® ACE® UltraCore C18-Amide 3.5µm particle size

**HPLC hardware format with 6000 bar / 9,000 psi pressure limit**

| Column dimensions | Catalogue numb |
|---|---|
| 2.1 x 50 mm | CORE-35E-521 |
| 3.0 x 50 mm | CORE-35E-530 |
| 4.6 x 50 mm | CORE-35E-546 |
| 2.1 x 100 mm | CORE-35E-1021 |
| 3.0 x 100 mm | CORE-35E-1030 |
| 4.6 x 100 mm | CORE-35E-1046 |
| 2.1 x 150 mm | CORE-35E-1521 |
| 3.0 x 150 mm | CORE-35E-1530 |

**HPLC hardware format with 6000 bar / 9,000 psi pressure limit**

| Column dimensions | Catalogue numb |
|---|---|
| 4.6 x 150 mm | CORE-35E-1546 |
| Guards (for 2.1 mm id columns) 3pk* | CORE-35E-21GD |
| Guards (for 3.0 mm id columns) 3pk* | CORE-35E-30GD |
| Guards (for 4.6 mm id columns) 3pk* | CORE-35E-46GD |

*Guards require holder BIO-GRD-0001

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