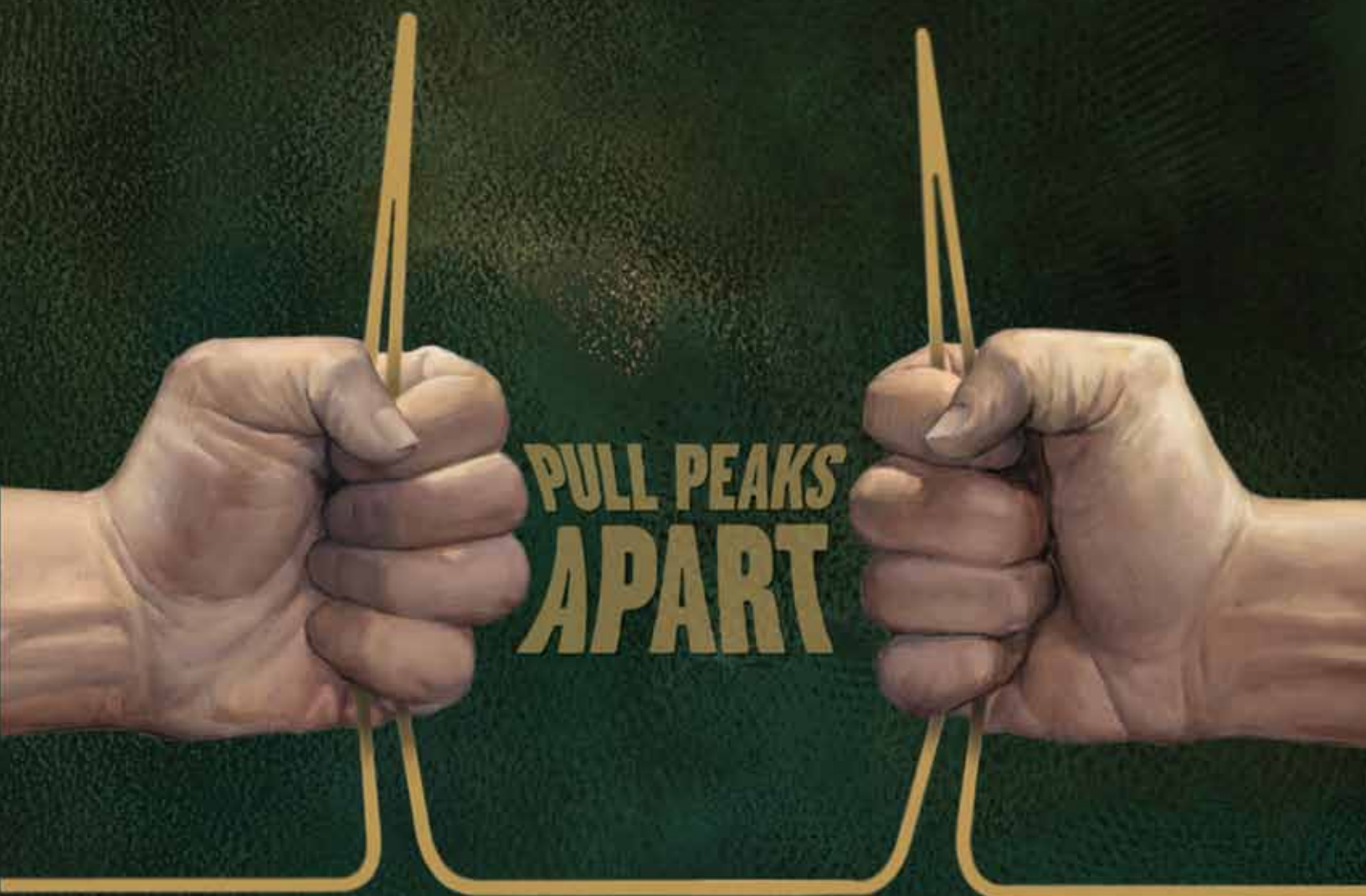


INTRODUCING ACE[®] C18-AR

A C18 with Extra Resolving Power for Better Separations



ACE C18-AR combines the retention and separation characteristics of a C18 phase with the extra selectivity of an integral phenyl functional group. The combination provides extra resolving power for a wide variety of sample mixtures.

ACE C18-AR USE THE POWER!

- **C18 WITH INTEGRAL PHENYL GROUP**

Leverages the selectivity of both C18 and phenyl in a single phase to separate mixtures not possible with either a C18 or Phenyl phase alone

- **ULTRA-INERT SILICA**

The same legendary peak shape and reproducibility that ACE columns are known for

- **COMPATIBLE WITH HIGHLY AQUEOUS MOBILE PHASES**

Facilitates the retention and separation of polar compounds

- **EXCEPTIONAL BONDED PHASE STABILITY**

Longer column lifetime and ultra-low bleed for LC-MS applications

Highly stable even at elevated temperatures



DESCRIPTION OF ACE C18-AR

ACE C18-AR uses the same inert, ultra high purity silica stationary phase support used for all other ACE phases. Bonded to this silica is a proprietary phase consisting of a C18 chain with integral phenyl functionality. The silica is then exhaustively end-capped to produce a phase where the negative effects of silanols have been virtually eliminated. When compared to other modern base deactivated columns, ACE columns consistently produce measurably better peak shape and column efficiency, especially when separating troublesome basic compounds. And, when compared to other modern base deactivated C18

columns, ACE C18-AR provides extra resolving power to succeed where ordinary C18 columns fail.

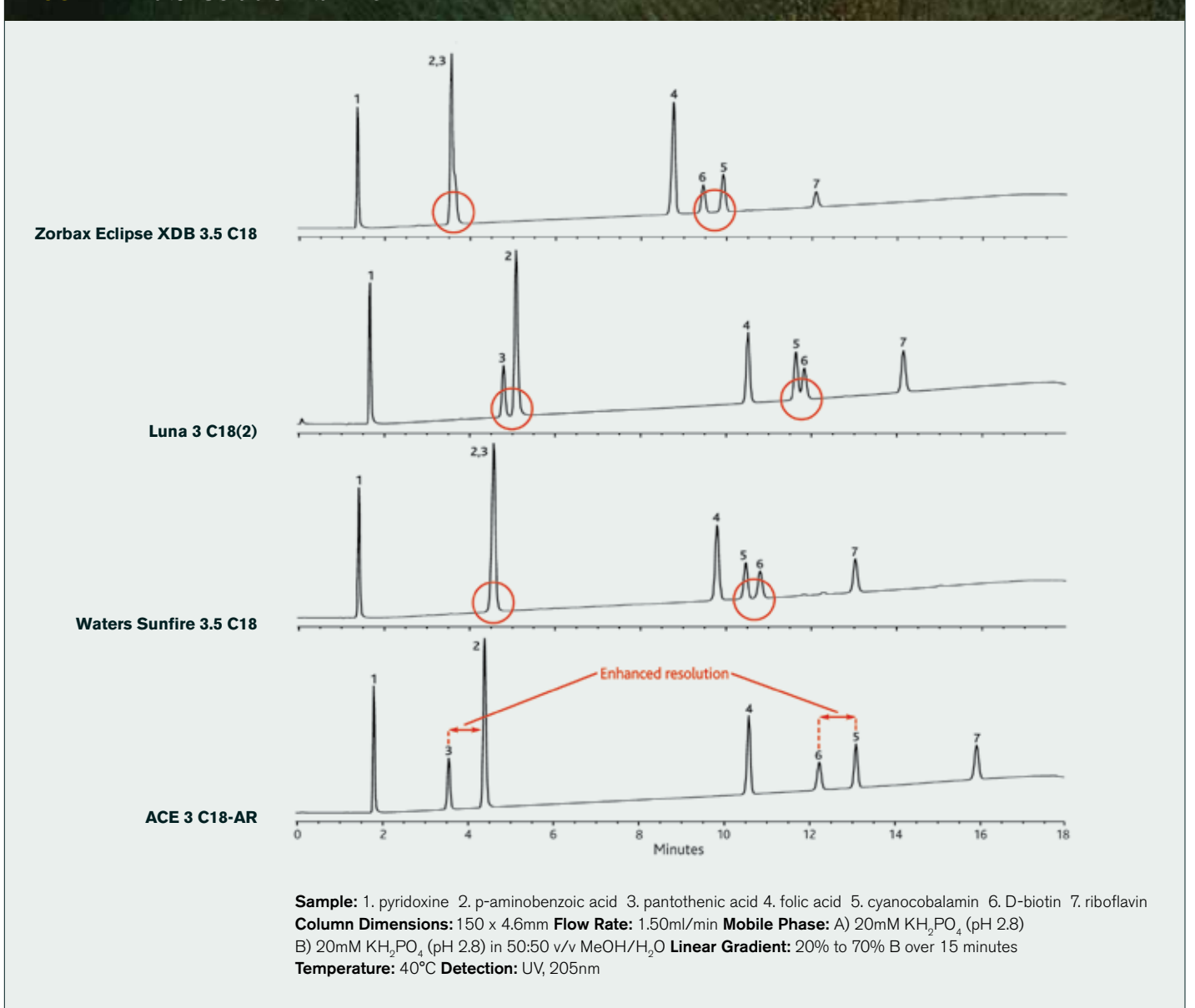
BENEFITS OF ACE C18-AR

More Separating Power than Ordinary C18 Columns

Water Soluble Vitamins: Figure 1

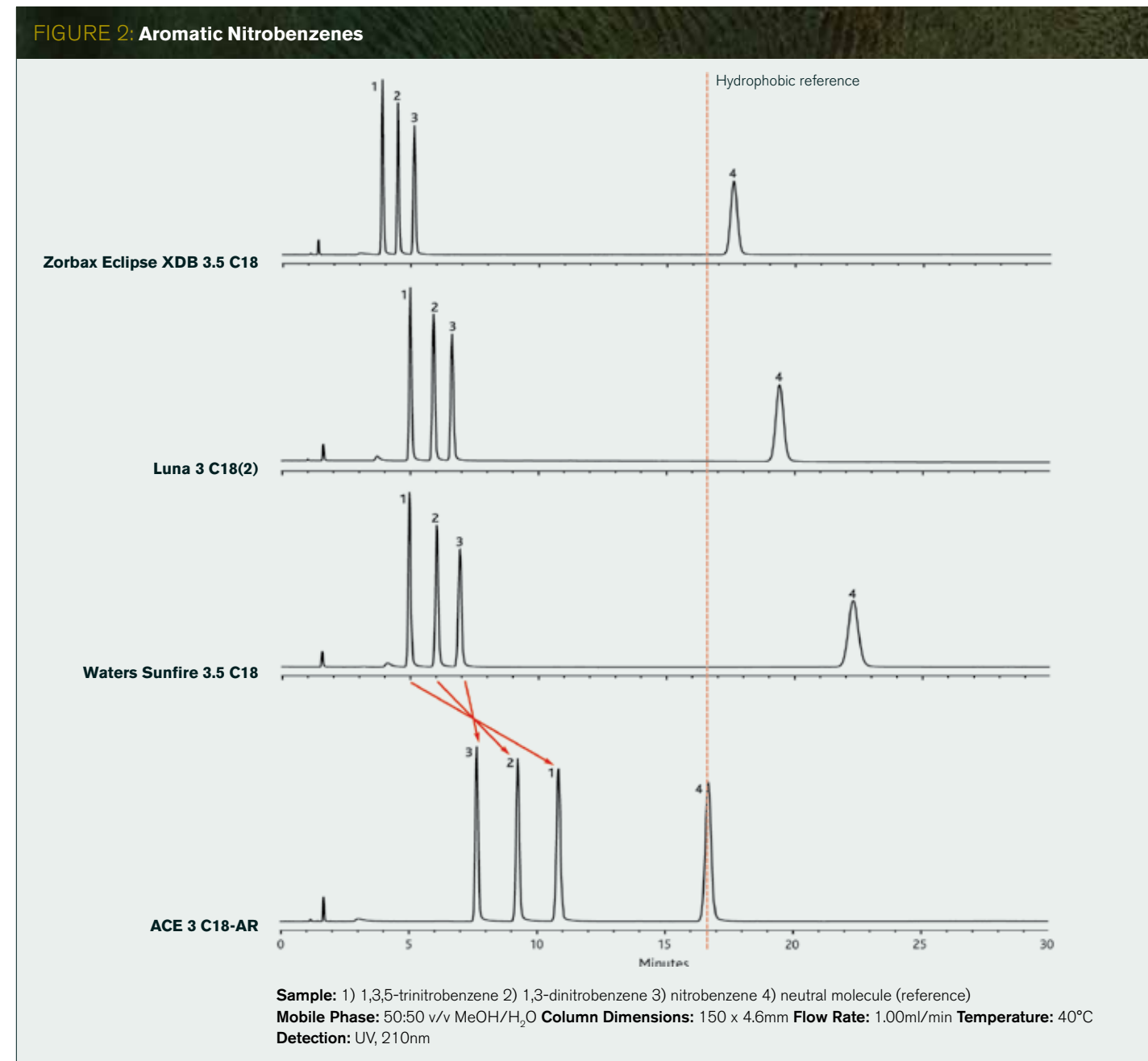
These comparison chromatograms illustrate how ACE C18-AR can achieve baseline resolution of all compounds in a sample when other C18 columns fail to do so.

FIGURE 1: Water Soluble Vitamins



Aromatic Nitrobenzenes: Figure 2

The separation of aromatic nitrobenzenes offers an excellent example of how ACE C18-AR combines π - π selectivity of the phenyl functionality with the hydrophobic retention of the C18 chain to deliver quite a different separation from ordinary C18 phases. Notice how the elution order of the aromatic nitrobenzenes is reversed on ACE C18-AR compared to the other C18 phases, while the retention of the neutral marker is similar to other C18 phases.



Sulfur Compounds: Figure 3

Conventional C18 columns are unable to separate all four sulfur compounds. ACE C18-AR, however, delivers an excellent separation of all compounds.

Analgesics: Figure 4

A conventional C18 is unable to resolve all compounds in this complex mixture of analgesics. Using the identical gradient conditions, ACE C18-AR provides adequate separation of all 15 analgesics due to its extra resolving power.

FIGURE 3: Sulfur Compounds

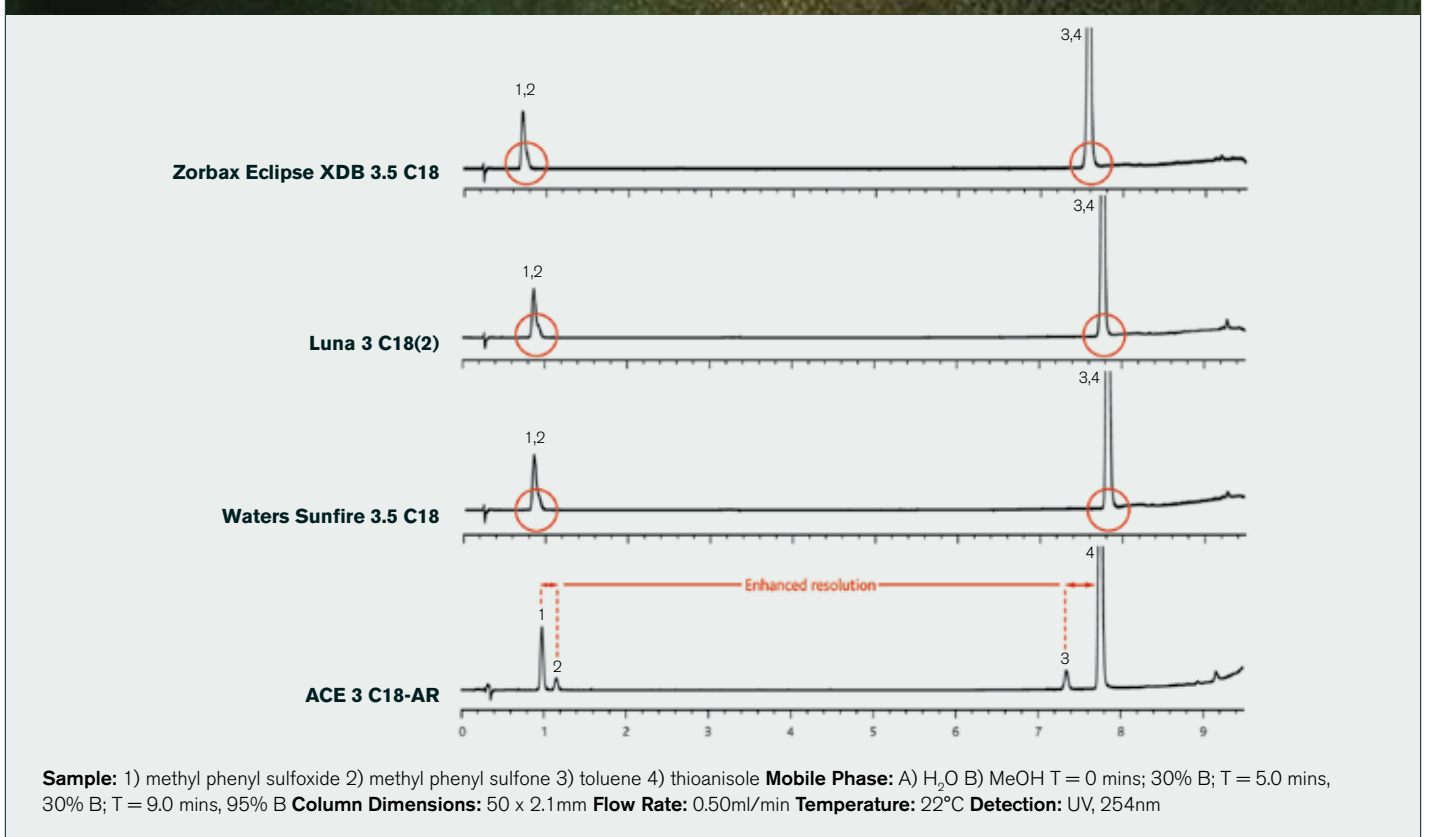
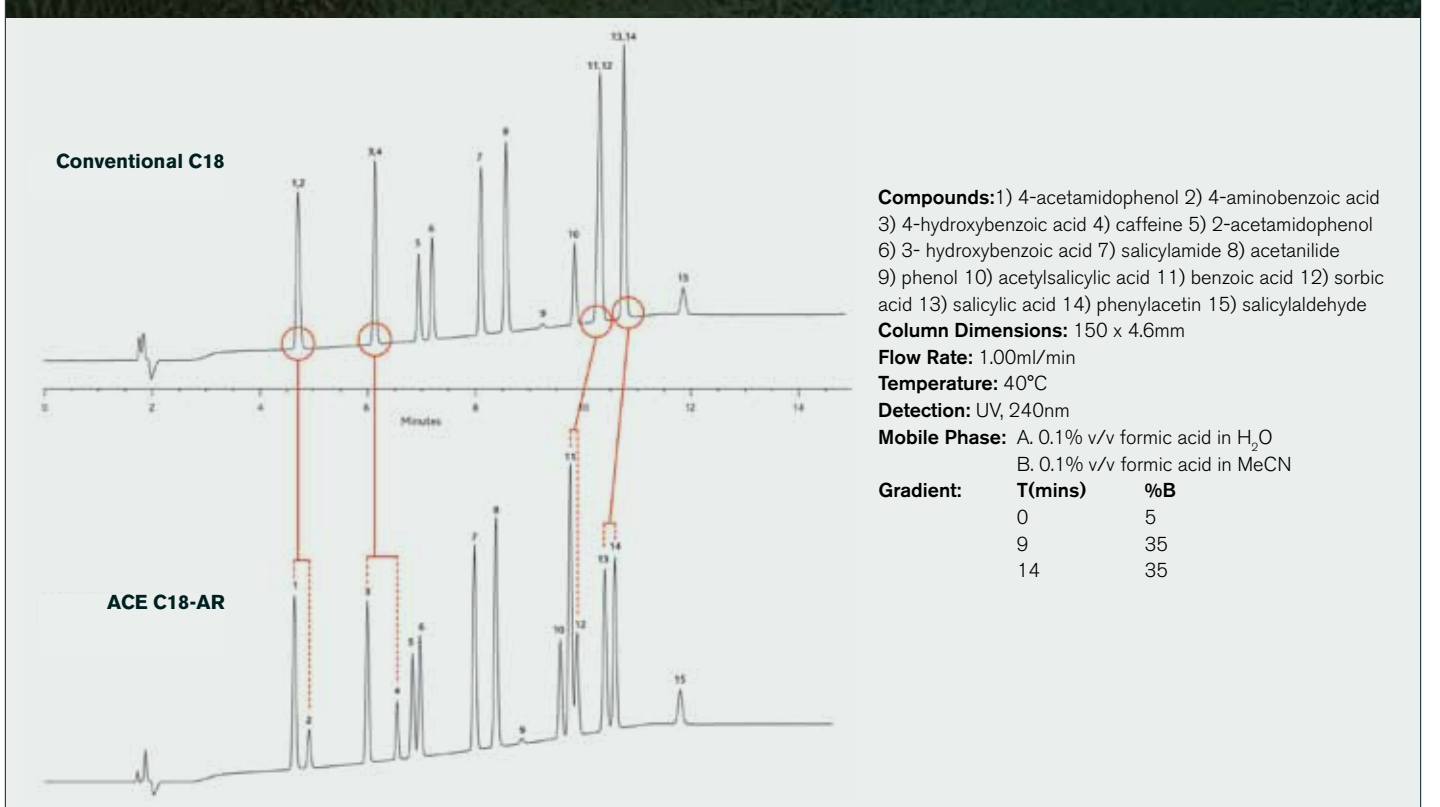


FIGURE 4: Analgesics

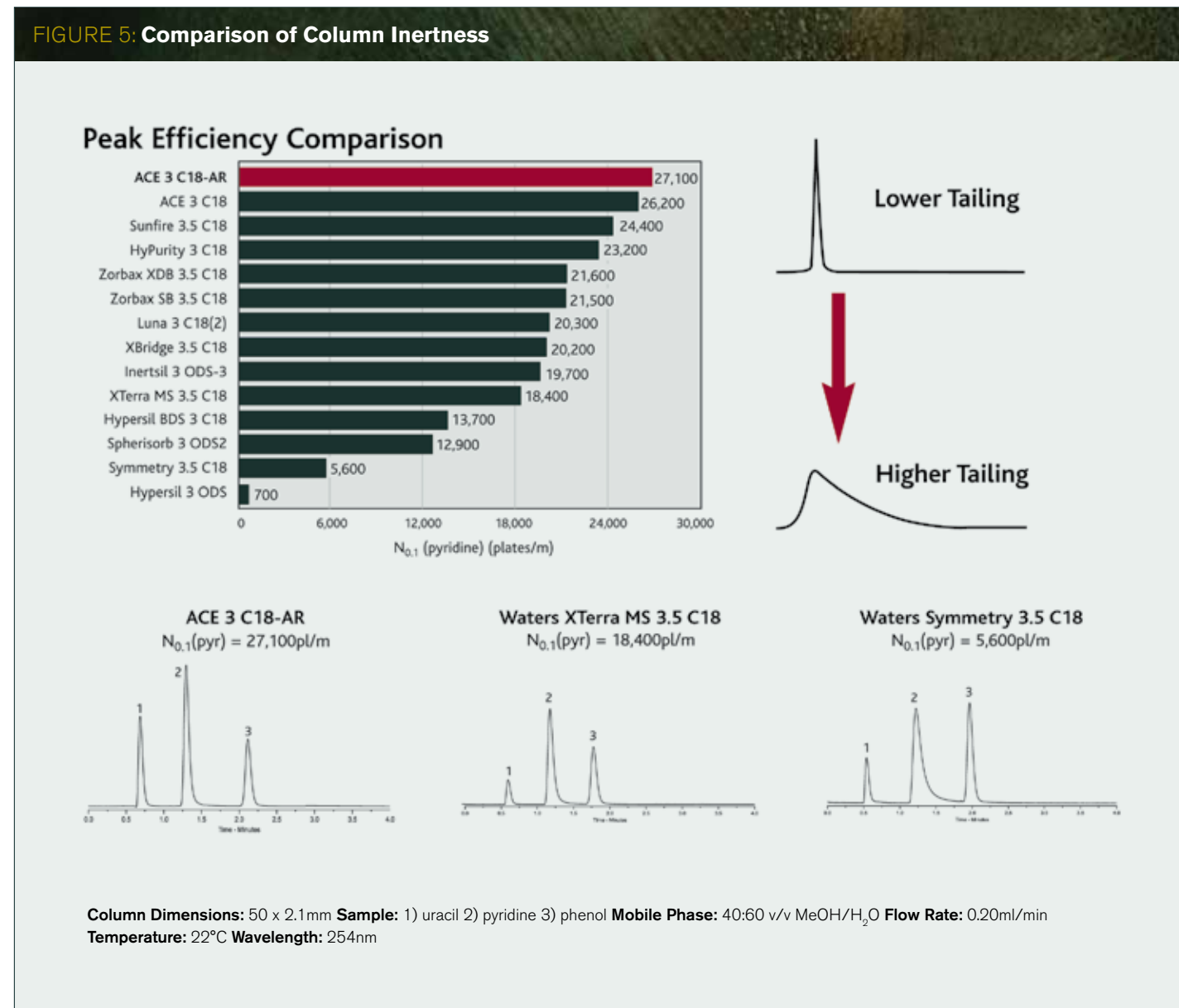


ULTRA INERT BASE DEACTIVATED PHASE

Comparison of Column Inertness: Figure 5

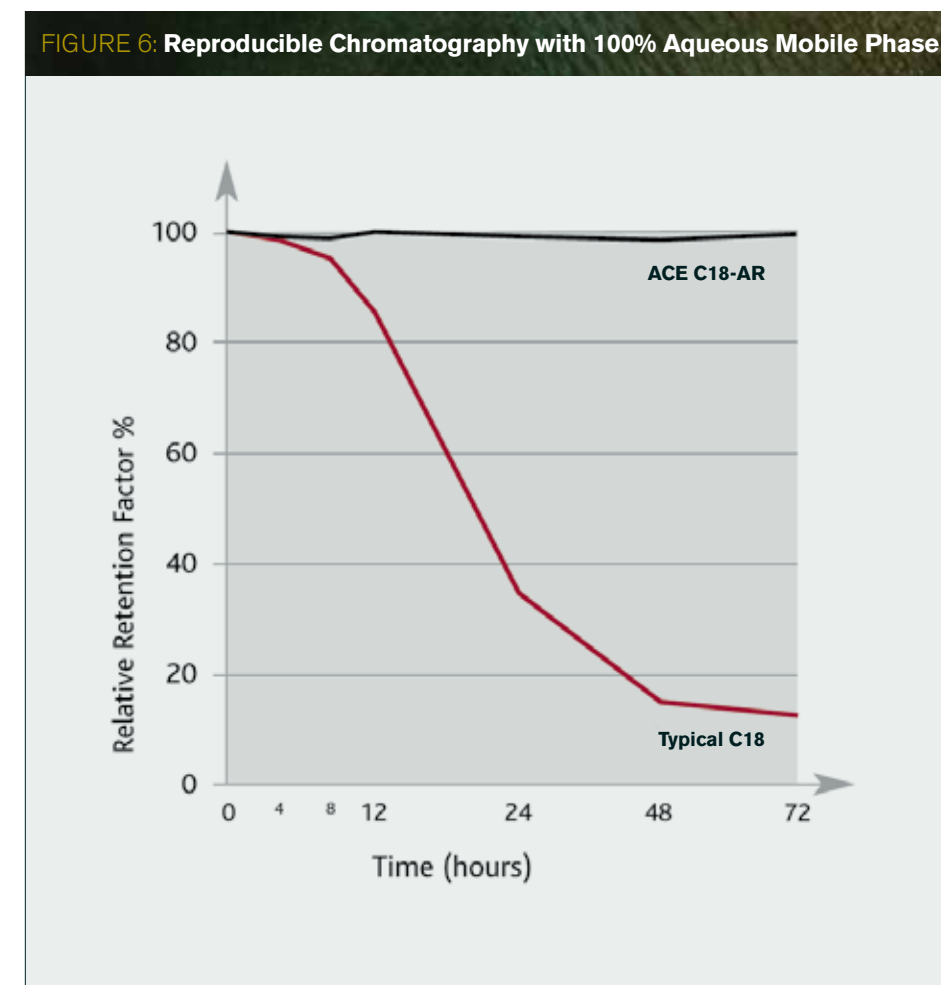
Interactions between polar solutes and silanol sites on the stationary phase support can cause tailing peaks and poor column efficiency. In this column comparison, pyridine was used as a probe to investigate silanol interactions (a measure of column inertness) for a selection of commonly used C18 columns. Columns with higher plate count for pyridine have less silanol interaction and

less peak broadening/tailing than columns with lower plate count. The better performing columns, such as ACE C18-AR, SunFire C18, and Zorbax XDB, are new generation base deactivated phases and are the ones that should be chosen for separating polar compounds, especially bases.



Compatible with Highly Aqueous Mobile Phases: Figure 6

It is not advisable to use typical C18 columns with highly aqueous mobile phases. Using these hydrophobic phases with less than 10% organic modifier in the mobile phase can result in poor reproducibility. There have been numerous explanations for this phenomena, but the most commonly accepted explanation is that mobile phase will extrude from the pores of the stationary phase support due to the highly hydrophobic nature of the C18 bonded phase. ACE C18-AR, although exhibiting the highly retentive characteristics of a hydrophobic phase, has sufficient “polarity” due to its phenyl functionality to permit it to be used with highly aqueous mobile phases, even 100% aqueous. This feature makes ACE C18-AR columns particularly well suited for separating very polar, water soluble compounds that may well require highly aqueous mobile phase conditions to achieve sufficient retention for an adequate separation.



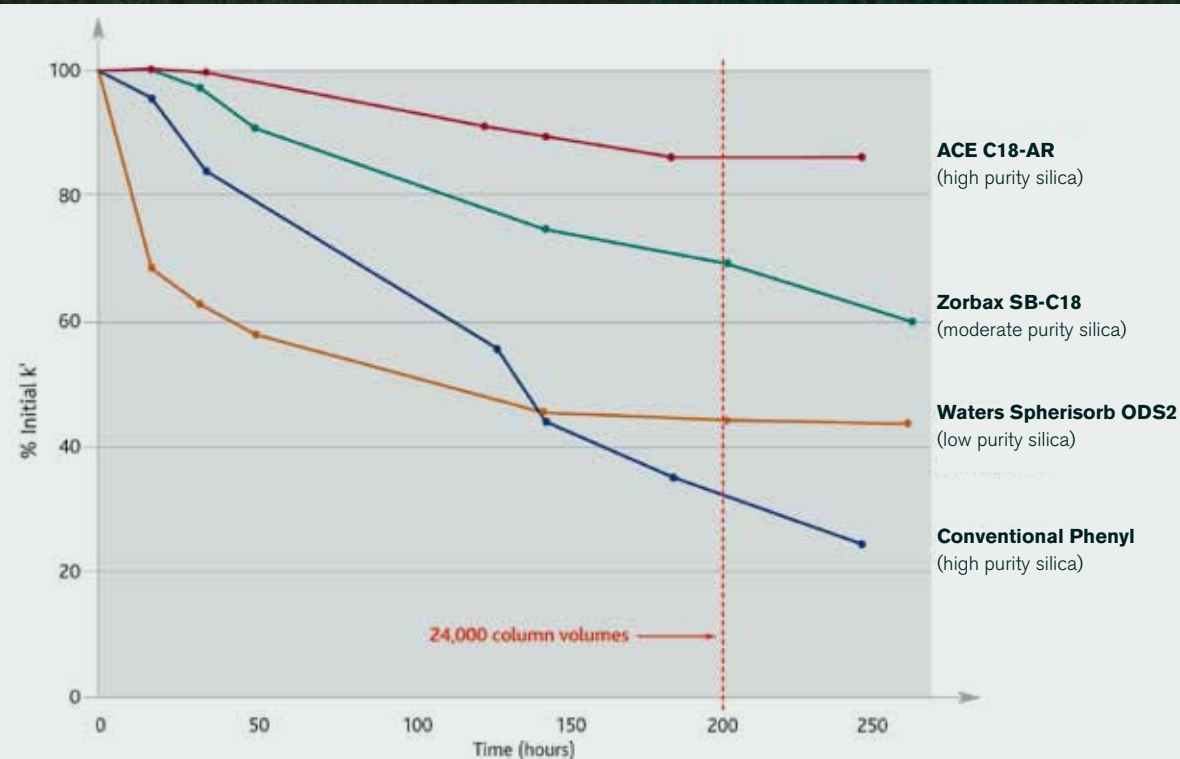
Exceptional Bonded Phase Stability

The lifetime of a column can be reduced by loss of bonded phase through acid hydrolysis of the siloxane bond to the silica stationary phase support. This acid hydrolysis increases with decreasing mobile phase pH and increasing column temperature. Short alkyl phases, such as C4 and C3, and phenyl phases are much more vulnerable to loss of bonded phase than are C18 phases. In fact, the poorer stability of phenyl phases is one of the main reasons that this phase has not been chosen more often for method development.

Figure 7 compares the performance of columns under conditions designed to accelerate loss of bonded phase.

Of particular note is the better stability of ACE C18-AR compared to the Zorbax StableBond SB-C18, a bonded phase specifically designed for high temperature and low mobile phase pH conditions. Also of note is how much more stable ACE C18-AR is compared to a typical base deactivated phenyl column. ACE C18-AR allows you to take advantage of the selectivity of a phenyl phase and still enjoy the ruggedness and durability of a C18 phase.

FIGURE 7: Accelerated Column Stability Study - 80°C at pH 1.9



Acidic Exposure Conditions: Mobile Phase: 5:95 MeOH/0.1% TFA in H₂O (pH 1.9) Flow Rate: 0.20ml/min Temperature: 80°C
Column Dimensions: 50 x 2.1mm

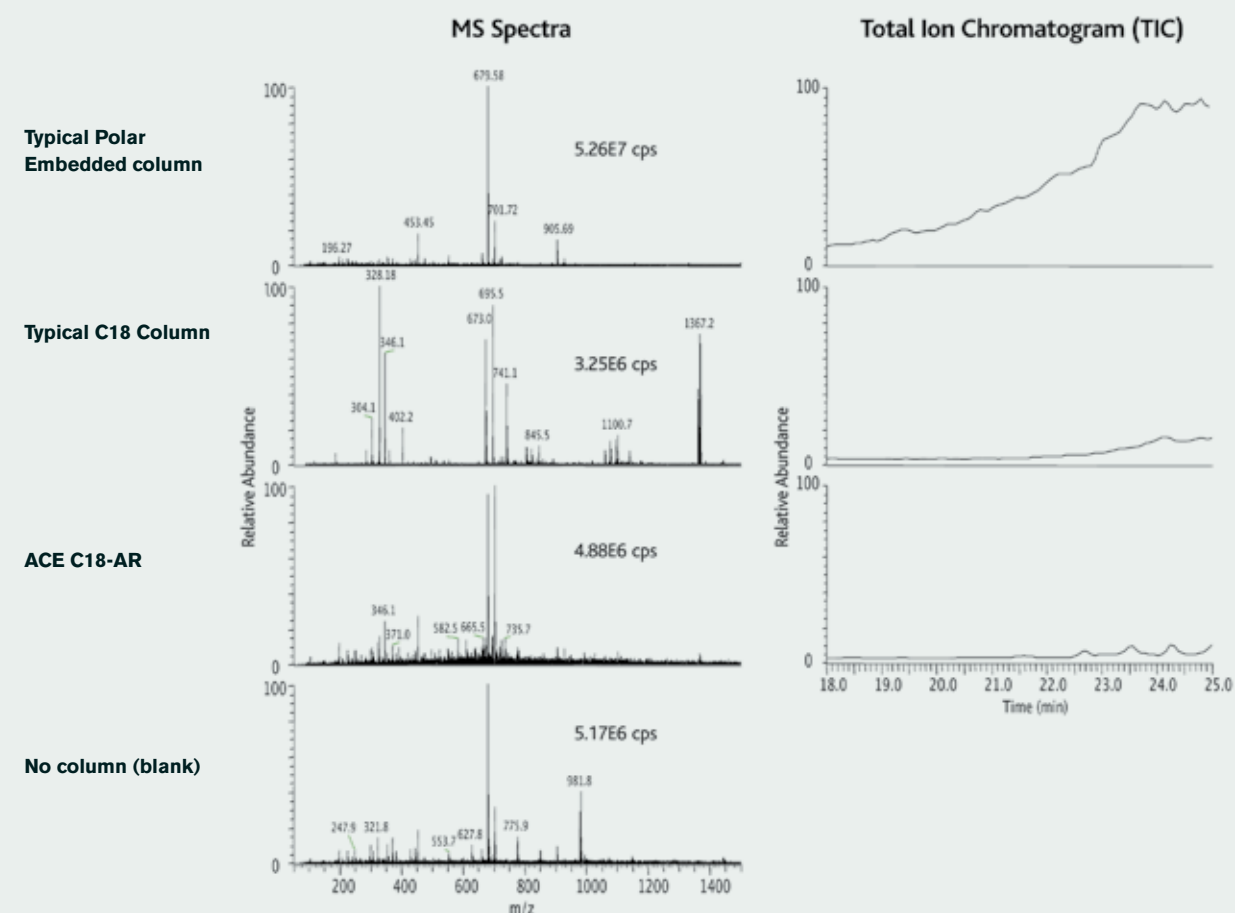
Using conditions designed to accelerate column degradation, ACE C18-AR phase shows little retention loss, with lifetime equivalent to the highly robust ACE C18 phase. Both phases are manufactured from the same ultra pure silica, and outlast the Zorbax SB-C18, a phase previously recognized to provide excellent stability for high temperature and low pH applications.

As expected, a C18 bonded column based upon a low purity silica (Waters Spherisorb ODS2) shows a greatly reduced lifetime under these accelerated conditions.

Of particular note is the result comparing the lifetime of a conventional phenyl column to ACE C18-AR. Despite the use of a high purity silica, the lifetime of the phenyl column is diminished compared with ACE C18-AR, suggesting that ACE C18-AR may be suitable for applications in which phenyl columns are seen to exhibit reduced lifetime.

In Figure 8, column bleed is monitored during an 18 to 25 minute segment of a gradient where column bleed is at its highest. The Total Ion Chromatogram shows the bleed detected during this segment. The column containing the polar embedded phase exhibits a significant level of column bleed, creating a problem for some LC/MS applications. Both the C18 and ACE C18-AR columns exhibit minimum bleed, making these columns suitable for most LC/MS applications.

FIGURE 8: ACE C18-AR Exhibits Low Column Bleed for LC/MS



Column Dimensions: 150 x 3.0mm **Flow Rate:** 0.43ml/min **Temperature:** 60°C **Detection:** ESI mode (ThermoFisher Deca LCQ ion trap), full scan range 50 – 1500m/z **Mobile Phase:** A. 0.1% (v/v) formic acid in H₂O B. 0.1% (v/v) formic acid in MeCN

Gradient:	T(mins)	%B
	0	5
	20	90
	25	90
	26	5

The TIC trace and MS spectra for the polar embedded column (previously seen to show significant bleed by UV detection) again shows a high level of column bleed when analyzing by LC/MS. The MS spectra from a blank run (performed with no column attached)

enables the background system bleed to be quantified. Both the ACE C18-AR column and a typical C18 column exhibit bleed levels similar to the blank run, denoting that negligible column bleed is occurring.

ACE C18-AR COLUMNS PART NUMBERS

ANALYTICAL COLUMNS

Dimensions	Particle Size	Part Number	Price
4.6 x 250	5	ACE-129-2546	\$615.00
4.6 x 150	5	ACE-129-1546	\$560.00
4.6 x 150	3	ACE-119-1546	\$615.00
4.6 x 100	5	ACE-129-1046	\$480.00
4.6 x 100	3	ACE-119-1046	\$520.00
4.6 x 75	5	ACE-129-7546	\$470.00
4.6 x 75	3	ACE-119-7546	\$495.00
4.6 x 50	5	ACE-129-0546	\$400.00
4.6 x 50	3	ACE-119-0546	\$435.00
4.6 x 30	5	ACE-129-0346	\$375.00
4.6 x 30	3	ACE-119-0346	\$400.00
4.6 x 20	5	ACE-129-0246	\$375.00
4.6 x 20	3	ACE-119-0246	\$375.00
3.0 x 250	5	ACE-129-2503	\$615.00
3.0 x 150	5	ACE-129-1503	\$560.00
3.0 x 150	3	ACE-119-1503	\$615.00
3.0 x 100	5	ACE-129-1003	\$480.00
3.0 x 100	3	ACE-119-1003	\$520.00
3.0 x 75	5	ACE-129-7503	\$470.00
3.0 x 75	3	ACE-119-7503	\$495.00
3.0 x 50	5	ACE-129-0503	\$400.00
3.0 x 50	3	ACE-119-0503	\$435.00
3.0 x 30	5	ACE-129-0303	\$375.00
3.0 x 30	3	ACE-119-0303	\$400.00
3.0 x 20	5	ACE-129-0203	\$375.00
3.0 x 20	3	ACE-119-0203	\$375.00

NARROW BORE COLUMNS

Dimensions	Particle Size	Part Number	Price
2.1 x 250	5	ACE-129-2502	\$615.00
2.1 x 150	5	ACE-129-1502	\$560.00
2.1 x 150	3	ACE-119-1502	\$615.00
2.1 x 100	5	ACE-129-1002	\$480.00
2.1 x 100	3	ACE-119-1002	\$520.00
2.1 x 75	5	ACE-129-7502	\$470.00
2.1 x 75	3	ACE-119-7502	\$495.00
2.1 x 50	5	ACE-129-0502	\$400.00
2.1 x 50	3	ACE-119-0502	\$435.00
2.1 x 30	5	ACE-129-0302	\$375.00
2.1 x 30	3	ACE-119-0302	\$400.00
2.1 x 20	5	ACE-129-0202	\$375.00
2.1 x 20	3	ACE-119-0202	\$375.00
1.0 x 250	5	ACE-129-2501	\$615.00
1.0 x 150	5	ACE-129-1501	\$560.00
1.0 x 150	3	ACE-119-1501	\$615.00
1.0 x 100	5	ACE-129-1001	\$480.00
1.0 x 100	3	ACE-119-1001	\$520.00
1.0 x 75	5	ACE-129-7501	\$470.00
1.0 x 75	3	ACE-119-7501	\$495.00
1.0 x 50	5	ACE-129-0501	\$400.00
1.0 x 50	3	ACE-119-0501	\$435.00

Guard Cartridges for 3.0 and 4.6 mm ID analytical columns. Five guard cartridges per pack. Holder (H0005) required.

Dimensions	Particle Size	Part Number	Price
3.0 x 10	5	ACE-129-0103GD	\$275.00
3.0 x 10	3	ACE-119-0103GD	\$275.00
Integral guard holder for above		H0005	\$190.00

Guard Cartridges for 2.1 mm ID narrow bore columns. Five guard cartridges per pack. Holder (H0004) required.

Dimensions	Particle Size	Part Number	Price
2.1 x 10	5	ACE-129-0102GD	\$275.00
2.1 x 10	3	ACE-119-0102GD	\$275.00
Integral guard holder for above		H0004	\$190.00

Guard Cartridges for 1.0 mm ID narrow bore columns. Five guard cartridges per pack. Holder (H0001) and column coupler (C0001) required.

Dimensions	Particle Size	Part Number	Price
1.0 x 10	5	ACE-129-0101GD	\$275.00
1.0 x 10	3	ACE-119-0101GD	\$275.00
Guard holder for above		H0001	\$190.00

PREPARATIVE COLUMNS

Dimensions	Particle Size	Part Number	Price
10.0 x 50	5	ACE-129-0510	\$800.00
10.0 x 75	5	ACE-129-7510	\$910.00
10.0 x 150	5	ACE-129-1510	\$1,115.00
10.0 x 250	5	ACE-129-2510	\$1,390.00
21.2 x 50	5	ACE-129-0520	\$1,525.00
21.2 x 50	10	ACE-139-0520	\$1,390.00
21.2 x 75	5	ACE-129-7520	\$1,755.00
21.2 x 75	10	ACE-139-7520	\$1,565.00
21.2 x 100	5	ACE-129-1020	\$1,990.00
21.2 x 100	10	ACE-139-1020	\$1,730.00
21.2 x 150	5	ACE-129-1520	\$2,510.00
21.2 x 150	10	ACE-139-1520	\$2,075.00
21.2 x 250	5	ACE-129-2520	\$3,465.00
21.2 x 250	10	ACE-139-2520	\$2,790.00

Guard Cartridges for 10 and 21.2 mm ID preparative columns. Three guard cartridges per pack. Holder (H0002) and column coupler (C0001) required.

Dimensions	Particle Size	Part Number	Price
10 x 10	5	ACE-129-0110GD	\$280.00
10 x 10	10	ACE-139-0110GD	\$280.00
Guard holder for above		H0002	\$230.00



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