

ACE[®]

HPLC Columns

Catalogue 2011/12



Guaranteed Reproducibility
High Purity Base Deactivated Silica



ACE[®]
HPLC Columns



ACE® Ultra Inert Base Deactivated HPLC Columns

Contents

Page

ACE HPLC Columns	1-3
Independent Comparison of HPLC Columns #1	2
Independent Comparison of HPLC Columns #2	3

ACE 100Å HPLC Columns

Specifications	4-5
Validation/Reproducibility	6-7
Column Lifetime	8-9
ACE AQ	10
ACE C18-HL	11
Independent Comparison of HPLC Columns #3	12-13
Part Numbers	14-17

ACE 300Å Bioanalytical HPLC Columns

Specifications	18
Independent Comparison of HPLC Columns #4	19
Benefits of Ultra Inert Stationary Phases	20-22
Independent Comparison of HPLC Columns #5	23
Part Numbers	24-26

Product Highlights

Capillary and Nano Columns	27
LC/MS and Rapid Analysis Columns	
- Including Independent Comparison of HPLC Columns #6	28-31
Preparative Columns	32-34
Guard Cartridges	35
Column Kits	36-38
Custom Packed Columns and Additional Services	39

Applications	40-47
--------------------	-------

ACE performance
guarantee 

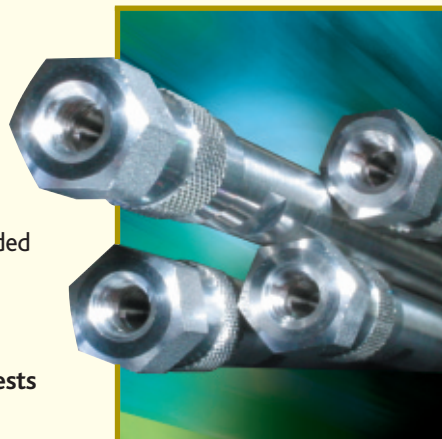
If ACE does not outperform the column you are currently using, simply contact us for a full refund and keep the ACE column FREE OF CHARGE.

ACE® - Excellent Chromatographic Performance

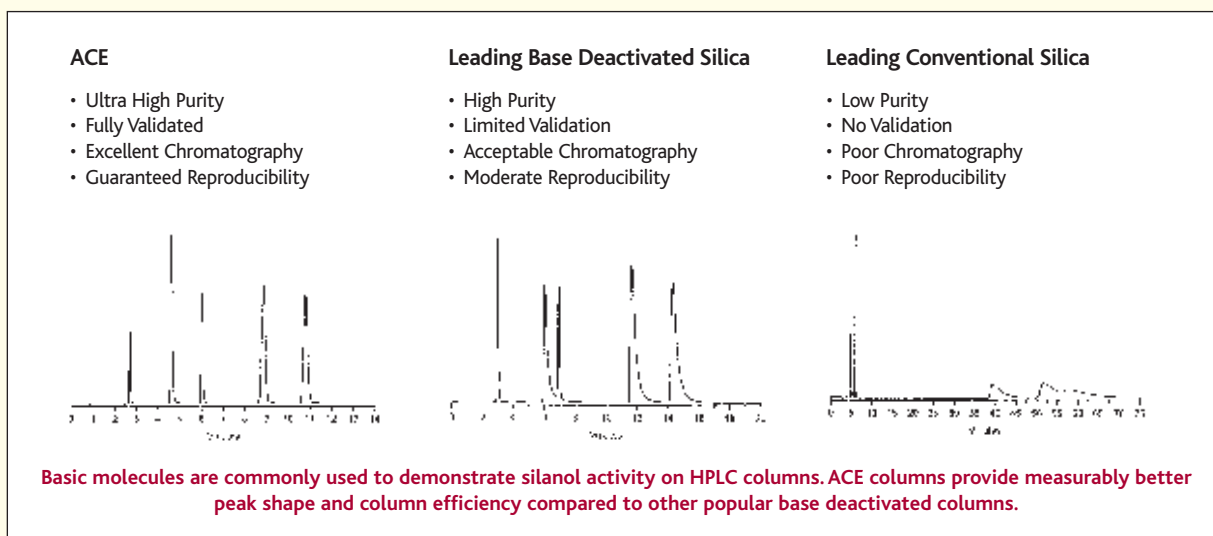
- Guaranteed Reproducibility
- LC/MS to Preparative Scale Dimensions
- Ultra Inert Base Deactivated HPLC Columns

ACE HPLC columns are designed to meet even the most challenging of chromatographic applications, giving excellent performance with acidic, basic and neutral molecules. A wide range of particle sizes, pore sizes, bonded chemistries and column dimensions are available.

Ultra-high purity, ultra-inert ACE columns also provide unmatched reproducibility and excellent column lifetime. Independent comparison tests show ACE HPLC columns give outstanding performance.



Excellent Performance with Acidic, Basic and Neutral Molecules



Independent Comparisons of HPLC Columns

Comparison #1 Silica vs/ Hybrid vs/ Monolith - 50 x 4.6mm C18

PAGE 2

Comparison #2 Small pore - 150 x 4.6mm, 5µm C18

PAGE 3

Comparison #3 Small pore - 150 x 4.6mm, 3µm & 5µm C18

PAGES 12-13

Comparison #4 Wide pore (300Å) - 250 x 4.6mm, 5µm C18

PAGE 19

Comparison #5 Wide pore (300Å) - 250 x 4.6mm, 5µm C18

PAGE 23

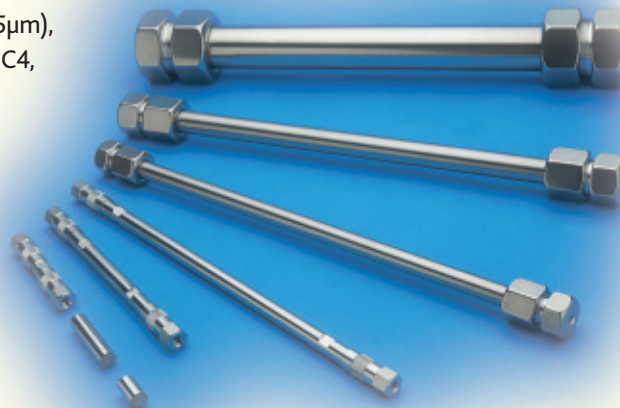
Comparison #6 LC/MS small pore - 50 x 2.1mm, 3µm C18

PAGE 29

ACE Ultra Inert Base Deactivated HPLC Columns

ACE columns are available in capillary through to preparative dimensions, with a wide range of particle sizes (3, 5, 10 and 15 μ m), pore sizes (100Å and 300Å) and surface chemistries (C18, C8, C4, CN, Phenyl, AQ, C18-HL and SIL).

ACE ultra inert HPLC columns are designed to meet even the most challenging of chromatographic applications, giving excellent performance with acidic, basic and neutral molecules. Excellent column performance (up to 200,000 plates/metre) and reproducible chromatography are ensured by the most stringent of validation protocols.



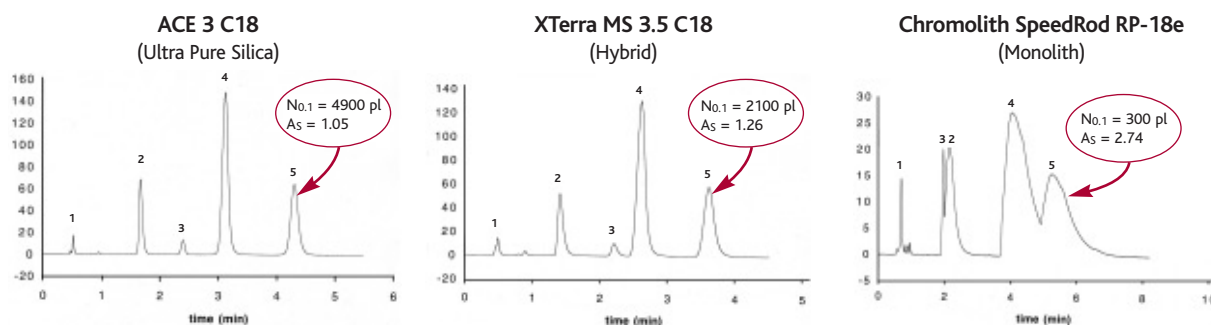
Independent comparison tests (including those shown below and also on pages 3, 12-13, 19, 23 and 29) show ACE columns give outstanding performance.

Independent Comparison of HPLC Columns #1

Comparison of Stationary Phase Technologies

- Independently tested at The School of Pharmacy, University of Sunderland, UK

- Leading Silica, Hybrid and Monolith Column Brands Tested
- 50 x 4.6mm Rapid Analysis Dimensions
- Inertness testing with basic molecules



Sample: 1) Norephedrine 2) Nortriptyline 3) Toluene 4) Imipramine 5) Amitriptyline, Mobile Phase: 65:35 MeOH/25mM KH₂PO₄ (pH6.0)
Column Dimensions: 50 x 4.6mm i.d., Flow Rate: 1.0ml/min Temperature: 22°C, Wavelength: 215nm

Conclusion:

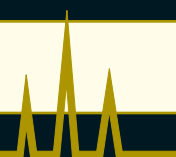
Significant differences in efficiency, peak shape and selectivity are observed when analyzing basic molecules.

Increased tailing and retention are indicative of undesirable secondary interactions between the test probes and silanol groups on the stationary phase surface. These interactions can also result in poor column reproducibility.

ACE HPLC columns were independently tested and found to be the highest efficiency, most inert columns available – making them the #1 choice in the development of reproducible HPLC methods.



ACE® Stationary Phases Virtually Eliminate the Negative Effects of Silanols on HPLC Separations



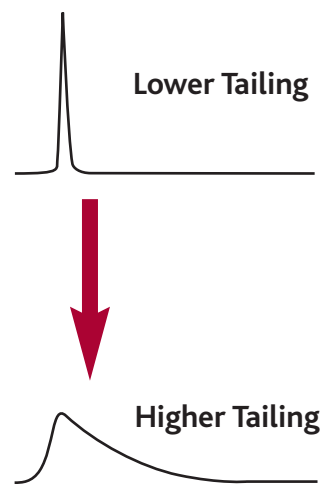
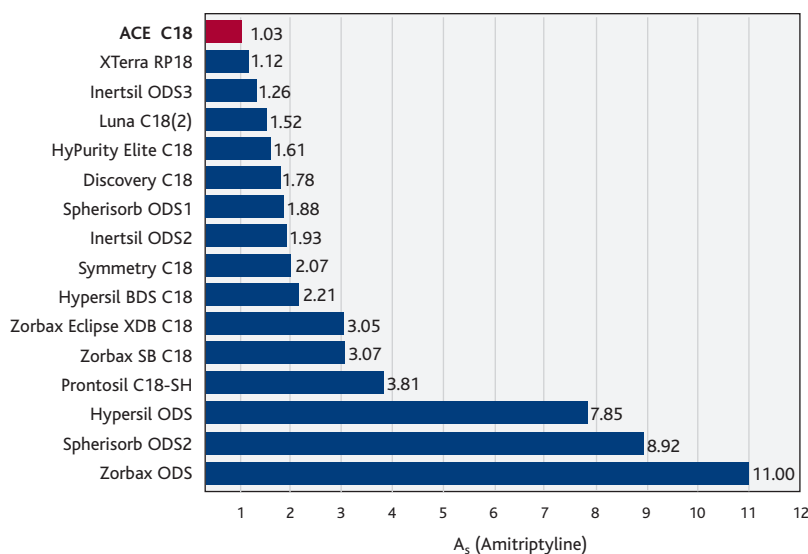
Comparison of Leading 5µm C18 Columns

- Data obtained from the National Institute of Standards and Testing (NIST), USA

- Leading 5µm C18 Column Brands
- Basic Molecule Testing
- Peak Asymmetry Investigation

"Elution of organic bases (eg; amitriptyline) with severe peak tailing is often associated with high silanol activity; however, the elution of such compounds with symmetrical peak shape is considered indicative of column deactivation"

Peak Asymmetry Comparison

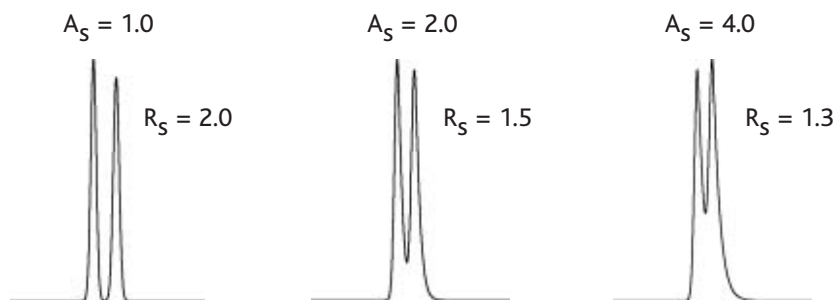
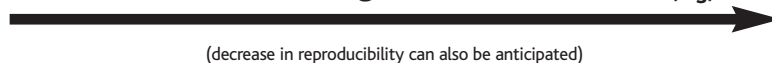


Column: 150 x 4.6mm, 5µm Mobile Phase: 80:20 MeOH/5mM potassium phosphate buffer (pH7.0) Flow: 2.0ml/min Temperature: 24°C

The above data was obtained from the National Institute of Standards and Testing (NIST), Certificate of Analysis for Standard Reference Material 870 - "Column Performance Test Mixture for Liquid Chromatography" at the NIST internet site <http://ois.nist.gov/srmcatalog/certificates/870.pdf> in September 2002. The NIST test mixture, which is designed to characterize general aspects of HPLC was revised in December 2002.

Importance of Peak Asymmetry (A_s)

- Increased Peak Tailing Decreases Resolution (R_s)



ACE® Stationary Phases Virtually Eliminate the Negative Effects of Silanols on HPLC Separations

- Ultra high purity base deactivated silica
- 3µm, 5µm, 10µm and 15µm particle sizes
- Fully validated columns
- Exceptional reproducibility
- Excellent efficiency (up to 200,000 plates/metre)

ACE fully validated columns are available in C18, C8, C4, CN, Phenyl, AQ, C18-HL and SIL chemistries in 3, 5, 10 and 15µm particle sizes. Each ACE phase offers significantly different hydrophobic or polar selectivity. Specifications of each phase are listed below.

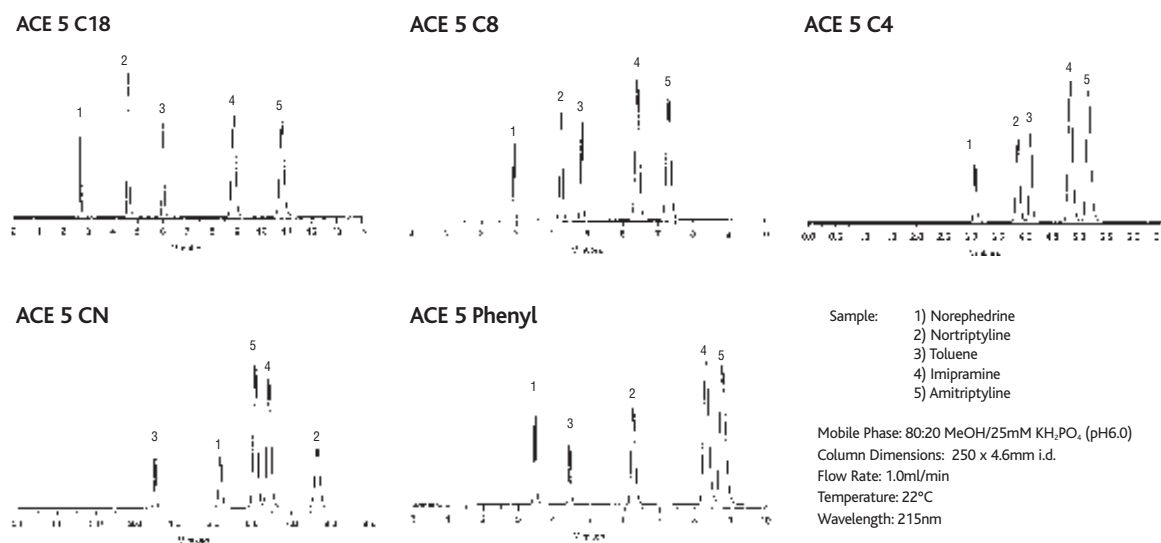
PHASE	FUNCTIONAL GROUP	ENDCAPPED	PARTICLE SIZE (µm)	PORE SIZE (Å)	SURFACE AREA (m ² /g)	CARBON LOAD (%)
C18	Octadecyl	Yes	3, 5, 10	100	300	15.5
C8	Octyl	Yes	3, 5, 10	100	300	9.0
C4	Butyl	Yes	3, 5, 10	100	300	5.5
CN	Cyano	Yes	3, 5, 10	100	300	5.5
Ph	Phenyl	Yes	3, 5, 10	100	300	9.5
AQ	Proprietary	Yes	3, 5, 10	100	300	14.0
SIL	Unbonded	-	3, 5, 10	100	300	-
C18-HL	Octadecyl	Yes	3, 5, 10, 15	90	400	20.0

Optimising Selectivity

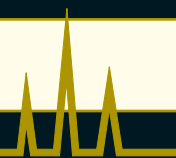
The availability of a range of phases enables complete method optimisation. Figure 4 demonstrates the alternative selectivities shown for a series of closely related tricyclic antidepressants. The C4, C8 and C18 phases show the expected increase in hydrophobic character without a major change in solute selectivity. However, significant changes in polar selectivity are clearly demonstrated with both cyano and phenyl phases. Traditionally, C18 or C8 bonded chemistries have been preferentially used in the

majority of applications, in part reflecting the lower stability of cyano or phenyl bonded phases. However, for a number of reversed-phase separations of polar compounds these latter materials provide the best selectivity. Within the ACE range of phases, all materials show comparable excellent stability and robustness (see pages 8 and 9). Hence for any application the column showing optimum selectivity can be chosen without the previous limitations of bonded phase stability.

Figure 4. Alternative Selectivity Offered with ACE C18, C8, C4, CN and Phenyl Phases

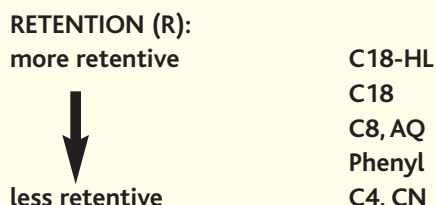


Amitriptyline is commonly used to demonstrate silanol activity on HPLC columns. ACE columns provide measurably better peak shape and column efficiency compared to other popular base deactivated columns.



Choosing the Bonded Phase that's Best for Your Application

As a general rule, retention increases with chain length of the bonded phase, that is:



We recommend starting most method development projects with C18 or C8, knowing that if more retention and hence more resolution is needed, your next choice is C18-HL (Hi-Load). Starting with C8 offers the benefit of shorter analysis times and/or lower organic solvent use. The elution order for most compounds will be the same on the aliphatic (C18, C8, C4) phases. If a different elution order is required for compound verification or to resolve matrix components, changing to a phenyl or CN phase is far simpler than trying to change selectivity by mobile phase changes. In many cases, the ACE CN and ACE Phenyl phases will offer a significant difference in selectivity from the aliphatic phases. ACE AQ (see p.10) is particularly recommended for applications requiring high aqueous content mobile phases. Improved resistance to phase collapse is seen compared to standard C18 phases.

Need even more resolution?

- Choose 3 micron ACE columns

With today's increased pace of drug discovery, fast and efficient methods are the rule. Short, narrow-bore columns are replacing the conventional 250 x 4.6mm versions. ACE HPLC columns are available in both 3µm and 5µm particle sizes. Although 5µm particles are sufficient for most applications, greater efficiency can be obtained by using smaller particles. This increased efficiency enables the use of shorter (<150mm) column lengths, resulting in decreased analysis times. Due to the excellent flow characteristics of ACE silica, you will not experience the high back pressures often encountered with other columns.

ACE LC/MS and rapid analysis columns are highlighted on pages 28-31.

Narrow-bore? Rapid analysis? LC/MS? Preparative? - No problem!

ACE bonded phases are available in 3µm, 5µm, 10µm and 15µm particle sizes, so regardless of your application, you can scale up or scale down and be assured of the same selectivity. For fast, high resolution preparative chromatography, a range of pre-packed ACE preparative and combinatorial chemistry columns are highlighted on pages 32-34.

Application Summary

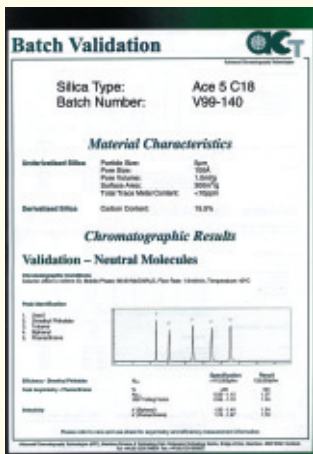
PHASE	DESCRIPTION	APPLICATION
C18	Optimised for maximum efficiency, superior peak shape and resolution. Utilises the same ultra high purity silica as all ACE phases.	A C18 phase for most HPLC applications. Available in a range of particle sizes, from LC/MS and microbore applications through to preparative scale separations.
C8	Increased bonding density compared to ACE C18. Similarly optimised for maximum efficiency, superior peak shape and resolution.	Recommended starting point for method development. Also suited to high aqueous conditions and for rapid analysis applications.
C4	Combines lower hydrophobicity with excellent chromatographic performance. Improved hydrolytic stability compared to conventional C4 phases.	Use for rapid analysis optimisation, when less retention than C8 or C18 is required. Also suitable for analysis of small proteins.
CN	Suitable for use in both normal - and reversed-phase modes. Greatly improved performance, stability and reproducibility compared to conventional CN phases.	Use to increase retention of polar compounds. Ideal for gradients and rapid screening applications due to fast equilibration capabilities.
Ph	Hydrophobicity between C4 and C8 phases, with increased polar selectivity. Improved performance, stability and reproducibility compared to conventional phenyl phases.	Offers alternative selectivity for aromatic, amine or polar compounds.
AQ	A unique C18 bonded phase with integral polar functionality. Resistant to phase collapse even with 100% aqueous mobile phase.	Recommended for applications where 100% aqueous mobile phases are required. Ideal for fast gradients due to rapid re-equilibration properties.
C18-HL	High surface area, high carbon load phase, leading to increased retention and loading compared to ACE C18.	Suitable for LC/MS due to increased retention characteristics. Availability of particle sizes up to 15µm ensures easy scale-up for preparative and process scale applications.

Reproducibility and Validation

Subtle changes in silanol activity are one of the primary causes of column to column selectivity changes. Base deactivated columns generally have better reproducibility than other column types due to fewer interactions

between silanols and polar compounds. ACE columns, by virtually eliminating silanol interactions, provide an outstanding level of column to column reproducibility for polar compounds.

Complete Validation



SILICA MANUFACTURE

Ultra pure reagents and strict control of the manufacturing process result in a high purity silica with uniform surface characteristics.

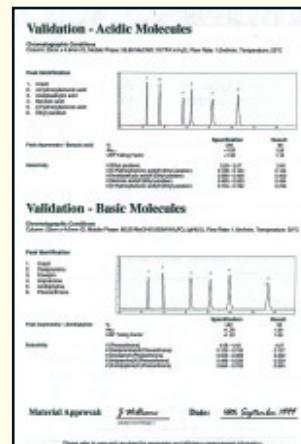
Advanced bonding techniques are then employed, resulting in a range of highly base deactivated phases that combine superb reproducibility with excellent robustness.



BATCH VALIDATION

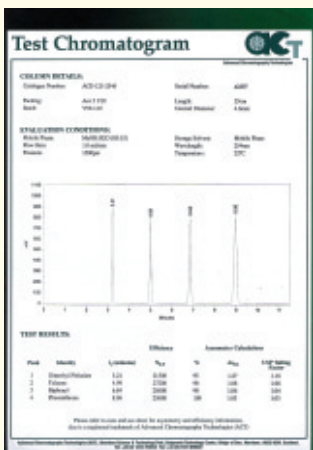
Every batch is extensively tested for selectivity and surface activity with a range of acidic, basic and neutral molecules.

ACE HPLC columns have the most stringent batch validation specification of any reversed-phase material.



COLUMN VALIDATION

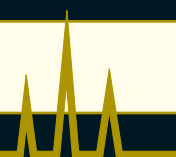
All columns are tested with a multi-component mixture to ensure excellent performance and peak shape are obtained.



ACE 5 C18 - Basic Molecule Validation Parameters;

Parameter	Unit	Specification	Result
Peak Asymmetry - Amitriptyline	%	>90	97
	As _{0.1}	<1.30	1.02
	USP Tailing Factor	<1.20	1.05
Selectivity	k'(Phenanthrene)	4.08 - 4.42	4.35
	k'(Desipramine)/ k'(Phenanthrene)	0.120 - 0.130	0.125
	k'(Doxepin)/ k'(Phenanthrene)	0.340 - 0.368	0.352
	k'(Imipramine)/ k'(Phenanthrene)	0.496 - 0.538	0.517
	k'(Amitriptyline)/ k'(Phenanthrene)	0.654 - 0.708	0.678

Sample: 1) Uracil 2) Desipramine 3) Doxepin 4) Imipramine 5) Amitriptyline 6) Phenanthrene, Mobile Phase: 80:20 MeOH/25mM KH₂PO₄ (pH6.0)
Column Dimensions: 250 x 4.6mm i.d., Flow Rate: 1.0ml/min Temperature: 22°C, Wavelength: 215nm



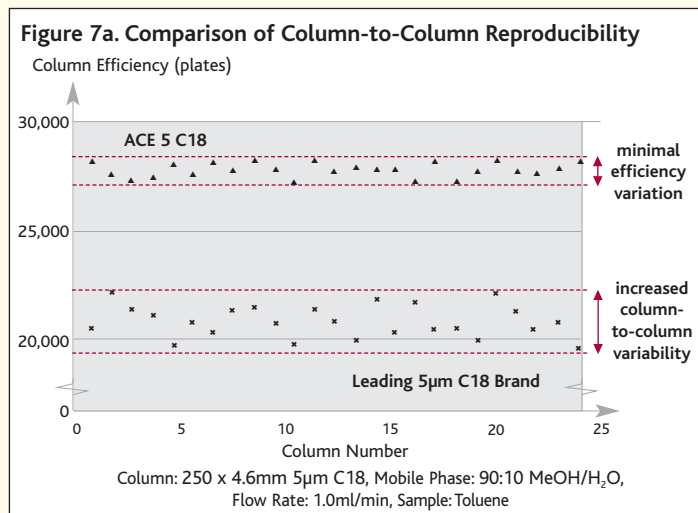
Benefits of Validated Columns

Method development and validation in regulated industries, including pharmaceutical and environmental, rely on the use of multiple columns and stationary phase batches. Production changes or batch differences in the HPLC column will have an adverse effect on method ruggedness. The use of fully validated ACE HPLC columns will ensure excellent column performance is maintained over the lifetime of an analytical method.

#1 Improved Column-to-Column Reproducibility

ACE ultra-inert columns consistently exhibit higher efficiencies and greater column-to-column reproducibility than leading competitor columns characterized by single validation procedures. Figure 7a demonstrates the increased performance and reduced column-to-column variation obtained with ACE columns compared to a leading brand. This indicates a higher degree of packing integrity with the ACE columns, which can in turn lead to increased column lifetime.

SUPERIOR PERFORMANCE AND PEAK SHAPE - GUARANTEED



100Å

#2 Improved Batch-to-Batch Reproducibility

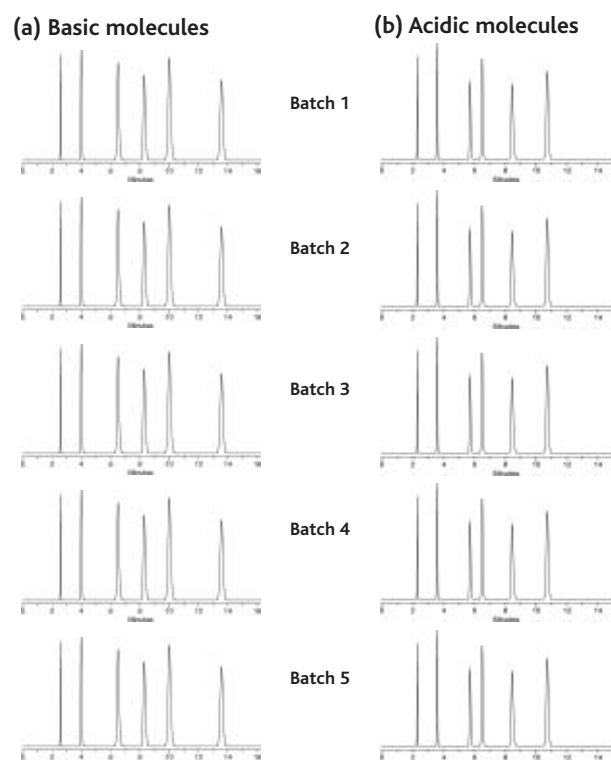
Variations between different batches of stationary phase are the most common cause of customer concern. ACE stationary phases virtually eliminate the unpredictable negative effects of silanols on HPLC separations, by maintaining a rigid control of the manufacturing process and establishing tight specifications for purity, selectivity, retention, efficiency and asymmetry. Therefore, absolute batch-to-batch reproducibility is guaranteed with ACE ultra-inert HPLC columns. Figure 7b demonstrates the excellent batch reproducibility for both basic and acidic molecules.

SUPERIOR REPRODUCIBILITY - GUARANTEED



ACE® Stationary Phases Virtually Eliminate the Negative Effects of Silanols on HPLC Separations

Figure 7b. ACE Batch-to-Batch Reproducibility



Column: ACE 5 C18, 250 x 4.6mm
Mobile Phase: 80:20 MeOH/0.025 KH₂PO₄(pH 6.0)
Flow Rate: 1.0ml/min Sample: 1.) Uracil
2.) Desipramine 3.) Doxepin 4.) Imipramine
5.) Amitriptyline 6.) Phenanthrene

Column: ACE 5 C18, 250 x 4.6mm
Mobile Phase: 35:65 MeCN/0.1% TFA in H₂O
Flow Rate: 1.0ml/min Sample: 1.) Uracil
2.) 4-Hydroxybenzoic acid 3.) Acetylsalicylic acid
4.) Benzoic acid 5.) 2-Hydroxybenzoic acid 6.) Ethyl paraben

Acidic Conditions

At low pH, column deterioration is caused by hydrolysis of the bonded phase, with a decrease in retention observed. The nature of the silica surface and bonding density are critical parameters. Conventional bonded phases are more susceptible to hydrolysis due to the lower purity silica and a low surface coverage. However, ACE phases combine an ultra high purity silica with dense bonding techniques to effectively prevent ligand cleavage under such conditions.

ACE - pH 1.8 Robustness

The high stability of ACE C18, C8, C4, CN, Phenyl and AQ phases is demonstrated in Figure 8b. After three months usage at pH 1.8, no retention loss is observed with any ACE phase. Even cyano bonded columns (regarded to be most vulnerable to hydrolysis) show excellent resistance, as also shown by Figure 8d.

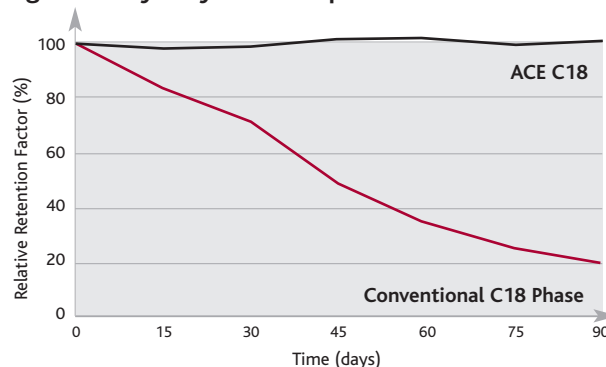
Evaluation Conditions (Figures 8b,c & d)

Column Dimensions: 150 x 4.6mm id
 Sample: 1) Uracil 2) Dimethyl phthalate 3) Toluene
 4) Biphenyl 5) Phenanthrene
 Mobile Phase: 50:50 MeCN/H₂O
 Flow Rate: 1.0 ml/min
 Temperature: 22°C

Acidic Exposure Conditions (Figures 8b,c & d)

Mobile Phase: 50:50 MeCN/0.1% TFA in H₂O (pH 1.8)
 Flow Rate: 1.0 ml/min
 Temperature: 22°C

Figure 8a. Hydrolysis at low pH



Acidic Exposure Conditions:

Mobile Phase: 50:50 MeCN/0.1% TFA in H₂O (pH1.8)
 Flow Rate: 1.0ml/min Temperature: 22°C

Figure 8b. Acidic Robustness at pH 1.8

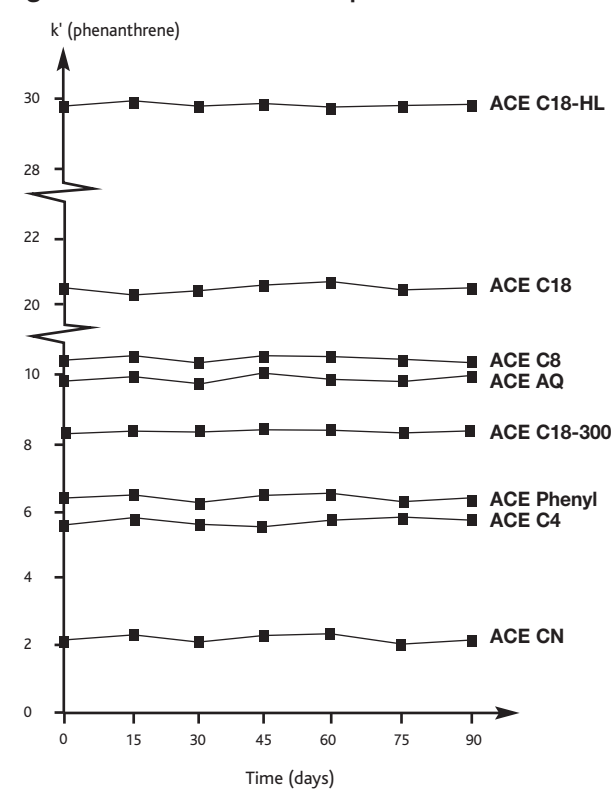


Figure 8c. ACE 5 C18 Acidic Robustness at pH 1.8

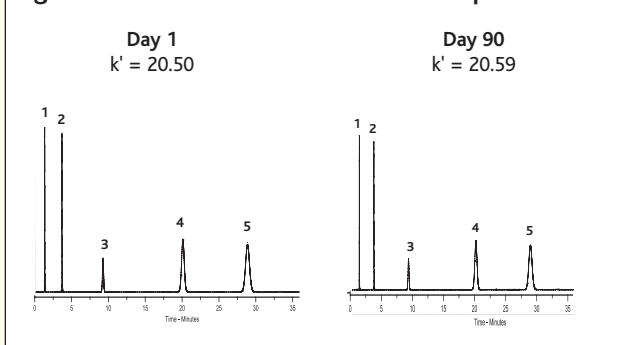
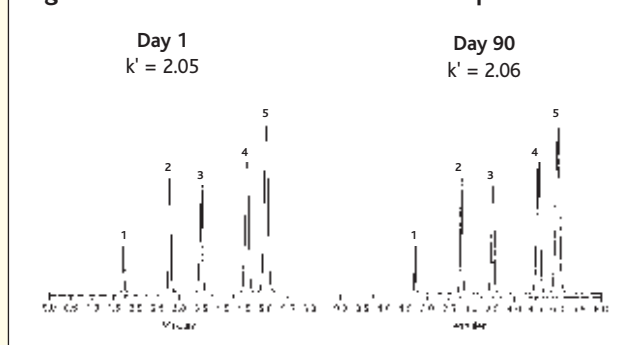
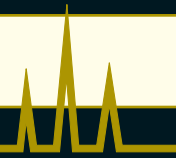


Figure 8d. ACE 5 CN Acidic Robustness at pH 1.8

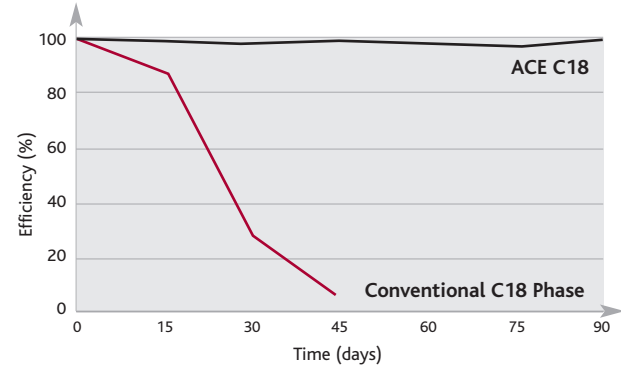




Basic Conditions

At high pH, column degradation is caused by dissolution of the silica support, resulting in a decrease of column efficiency. Conventional bonded phases are more susceptible to dissolution due to the lower purity silica and low surface coverage. Again, the ultra high purity ACE silica coupled with unique dense bonding technology effectively prevents silica dissolution.

Figure 9a. Silica Dissolution at High pH



Basic Exposure Conditions:

Mobile Phase: 50:50 MeCN/25mM pyrrolidine in H₂O (pH 11.0)
Flow Rate: 1.0ml/min Temperature: 22°C

ACE – pH 11.0 Robustness

Figure 9b demonstrates the ability of an ACE 5 C18 column to withstand highly alkaline conditions without loss of column efficiency after 3 months usage at pH 11.0.

Basic Exposure Conditions

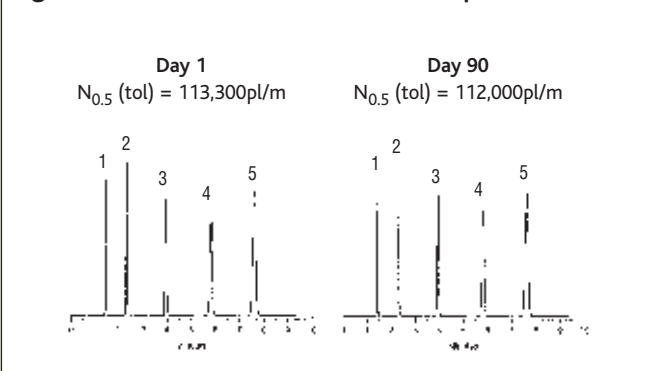
Mobile Phase: 50:50 MeCN/25mM pyrrolidine in H₂O (pH 11.0)
Flow Rate: 1.0ml/min
Temperature: 22°C

Evaluation Conditions

Sample: 1) Uracil 2) Dimethyl phthalate 3) Toluene
4) Biphenyl 5) Phenanthrene

Column Dimensions: 150 x 4.6mm i.d.
Mobile Phase: 70:30 MeCN/H₂O
Flow Rate: 1.0ml/min
Temperature: 22°C

Figure 9b. ACE 5 C18 Basic Robustness at pH 11.0



ACE LC/MS Column Stability at pH 10.5

Figure 9c highlights the stability of 50 x 2.1mm ACE 3 C18 columns when using an LC/MS compatible buffer at pH 10.5 over a 90 day test period.

Basic Exposure Conditions

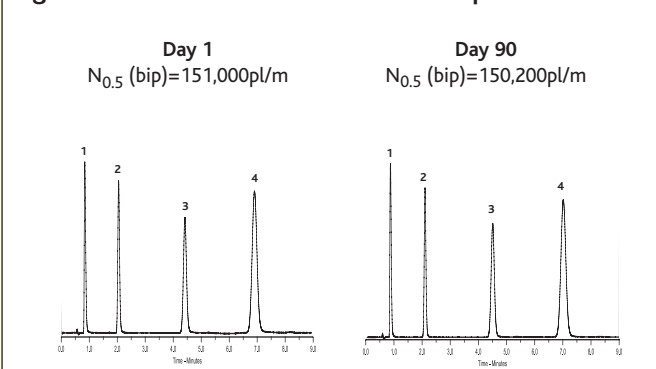
Mobile Phase: 80:20 MeCN/20mM NH₄OH in H₂O (pH 10.5)
Flow Rate: 0.20ml/min
Temperature: 22°C

Evaluation Conditions

Sample: 1) Dimethyl phthalate 2) Toluene 3) Biphenyl
4) Phenanthrene

Column Dimensions: 50 x 2.1mm i.d.
Mobile Phase: 70:30 MeOH/H₂O
Flow Rate: 0.20ml/min
Temperature: 22°C

Figure 9c. ACE 3 C18 LC/MS Robustness at pH 10.5



100Å

ACE AQ

- Retains polar compounds in 100% aqueous mobile phase
- Unique C18 bonded phase with integral polar functionality
- Resistant to retention loss in 100% aqueous mobile phase
- Rapid gradient re-equilibration (0-100%)
- Excellent peak shape with acidic, basic and neutral molecules

- Ideal for LC/MS applications
- Unmatched reproducibility

ACE AQ is an ultra-inert phase designed for the reversed-phase separation of very polar compounds with up to 100% aqueous mobile phase. ACE AQ is ideal for use with fast gradients due to its rapid re-equilibration properties and resistance to retention loss.

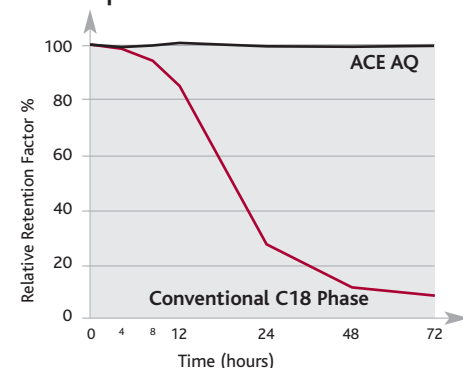
PHASE	FUNCTIONAL GROUP	ENDCAPPED	PARTICLE SIZE (µm)	PORE SIZE (Å)	SURFACE AREA (m ² /g)	CARBON LOAD (%)
AQ	Proprietary	Yes	3, 5, 10	100	300	14.0

Maximum Reproducibility in High Aqueous Mobile Phases

When separating very polar, water-soluble compounds, highly aqueous (>95%) mobile phases are often required to achieve sufficient retention. However, operating a conventional C18 column under such conditions can lead to poor chromatographic reproducibility. Over time peaks will elute with shorter and shorter retention times and resolution between peaks will deteriorate.

ACE AQ columns introduce an integral polar functionality, which prevents this retention loss when using highly aqueous mobile phases.

Figure 10a. Change in Retention with 100% Aqueous Mobile Phase



Ultra-Inert Silica for Excellent Chromatography

Many columns designed for use under high aqueous conditions are compromised by the low purity silica employed and exhibit poor peak shape with polar basic molecules. This results in poor chromatography and

ultimately leads to poor column reproducibility. ACE AQ columns are manufactured from the same ultra-inert, high purity silica as all ACE phases – ensuring excellent chromatography and excellent reproducibility are obtained.

Figure 10b. Leading Competitor Comparison – Hydrophilic Bases



Sample: 1) Nicotine 2) Benzylamine 3) Procainamide 4) Terbutaline 5) Salbutamol 6) Phenol Mobile Phase: 3.3:96.7 MeOH/20mM KH₂PO₄ (pH 2.7) Dimensions: 150 x 4.6mm i.d. Flow Rate: 1.0ml/min, Temperature: 60°C, Wavelength: 210nm

The competitor column (right chromatogram) shows a dramatic loss of performance for peaks 1 and 3, but the ultra-inert ACE AQ column (left chromatogram) maintains excellent peak shape with hydrophilic bases.

ACE C18-HL (Hi-Load)

- High surface area, high carbon load phase
- Increased loading and retention
- Optimised for preparative and process scale applications
- 3µm, 5µm, 10µm and 15µm particle sizes
- Exceptional chemical stability
- Excellent peak shape with acidic, basic and neutral molecules

PHASE	FUNCTIONAL GROUP	ENDCAPPED	PARTICLE SIZE (µm)	PORE SIZE (Å)	SURFACE AREA (m ² /g)	CARBON LOAD (%)
C18-HL	Octadecyl	Yes	3, 5, 10, 15	90	400	20.0



LC/MS to Preparative Scale Applications

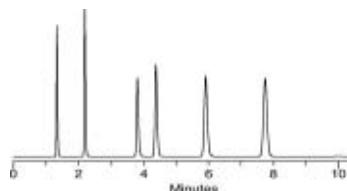
The increased retention characteristics of ACE C18-HL (see Figure 11a) make it an ideal selection for LC/MS applications. Retention can be maintained whilst reducing the aqueous content of the mobile phase, thus increasing sensitivity.

For preparative applications, the higher surface area leads to increased loading capacity. Available in 3µm, 5µm, 10µm and 15µm particle sizes and a wide range of column dimensions (see pages 14-17), ACE C18-HL columns show reproducible scale up from LC/MS to preparative scale dimensions.

100Å

Figure 11a. Reproducible Scale-Up with ACE C18-HL Columns

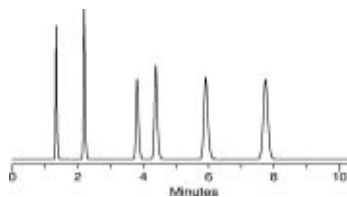
ACE 3 C18-HL



LC/MS

150 x 2.1mm i.d.
0.21ml/min

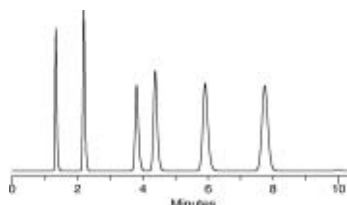
ACE 5 C18-HL



Analytical

150 x 4.6mm i.d.
1.00ml/min

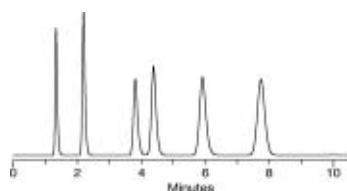
ACE 10 C18-HL



Semi-Preparative

150 x 10mm i.d.
4.7ml/min

ACE 15 C18-HL



Preparative

150 x 30.0mm i.d.
42.5ml/min

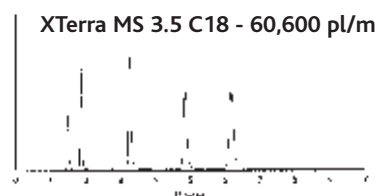
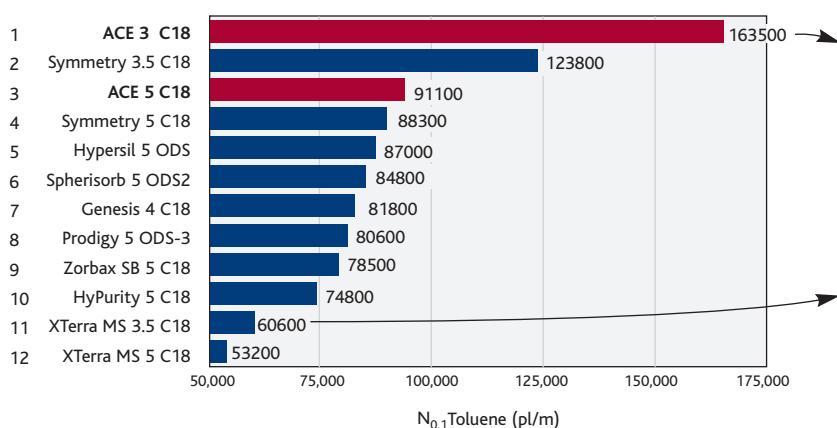
Sample: 1) Uracil 2) 4-Hydroxybenzoic acid 3) Acetylsalicylic acid 4) Benzoic acid 5) 2-Hydroxybenzoic acid 6) Ethyl paraben
Mobile Phase: 35:65 MeCN/0.1% TFA in H₂O, Temperature: 22°C, Wavelength: 254nm

Comparison of Leading 100Å 3µm and 5µm C18 Columns

- Independently tested at the University of Aberdeen, UK

- Leading 3µm and 5µm C18 column brands - 150 x 4.6mm i.d.
- Acidic, basic and neutral molecule tests
- Peak efficiency and asymmetry comparison

Neutral Molecules



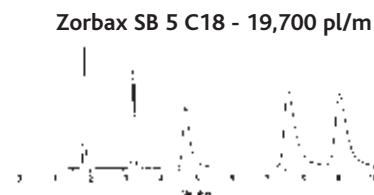
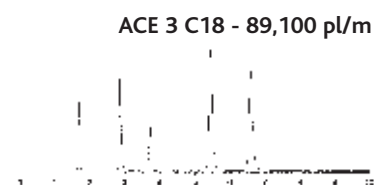
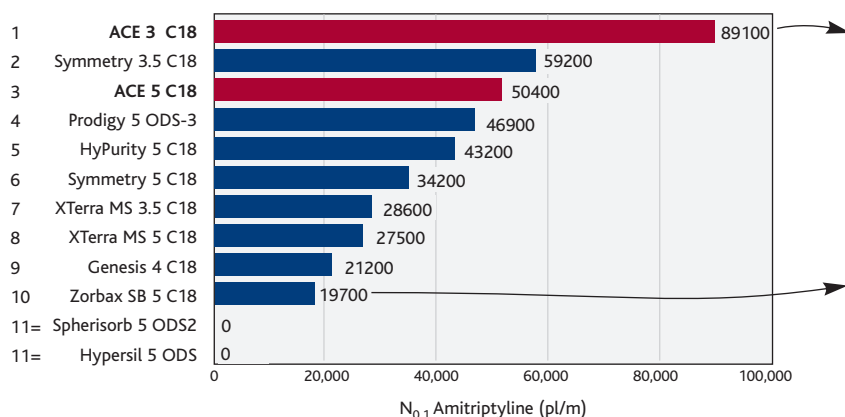
Independently Tested at The University of Aberdeen, UK

Summary:

Column efficiencies were seen to differ greatly. The use of high efficiency columns is recommended to reduce analysis time. Column length can be reduced without loss of resolution.

Column Dimensions: 150 x 4.6mm id
 Sample: 1) Uracil 2) Dimethyl phthalate
 3) Toluene 4) Biphenyl
 5) Phenanthrene
 Mobile Phase: 80:20 MeOH/H₂O
 Flow Rate: 1.0 ml/min
 Temperature: 22°C

Basic Molecules

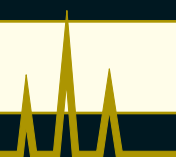


Independently Tested at The University of Aberdeen, UK

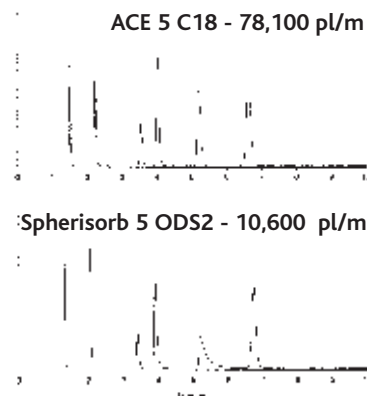
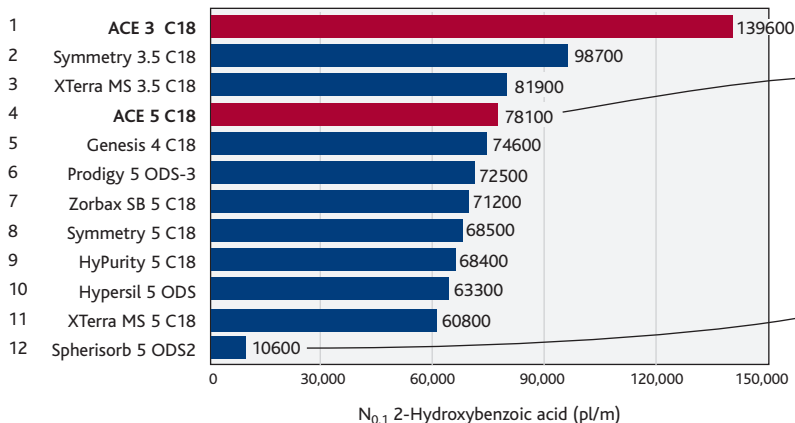
Summary:

C18 bonded columns show significant differences in chromatography for basic compounds. These variations are generally caused by undesirable secondary silanol interactions with the silica surface. Increasing silanol activity results in a deterioration of chromatographic performance. Highly inert "base deactivated" C18 columns with very low levels of silanol activity all exhibit similar selectivity, with differences limited to efficiency and peak shape.

Column Dimensions: 150 x 4.6mm id
 Sample: 1) Norephedrine
 2) Nortriptyline 3) Toluene
 4) Imipramine 5) Amitriptyline
 Mobile Phase: 80:20 MeOH/25mM KH₂PO₄ (pH 6)
 Flow Rate: 1.0 ml/min
 Temperature: 22°C



Acidic Molecules



Independently Tested at The University of Aberdeen, UK

Summary:

Testing with acidic molecules shows similar trends to those seen with basic molecules. Smaller particle size, highly inert "base deactivated" phases are again seen to offer improved separations.

Column Dimensions: 150 x 4.6mm id
 Sample: 1) Uracil 2) 4-Hydroxybenzoic acid
 3) Acetylsalicylic acid 4) Benzoic acid
 5) 2-Hydroxybenzoic acid 6) Ethyl paraben
 Mobile Phase: 35:65 MeCN/0.1% TFA in H₂O
 Flow Rate: 1.0 ml/min
 Temperature: 22°C

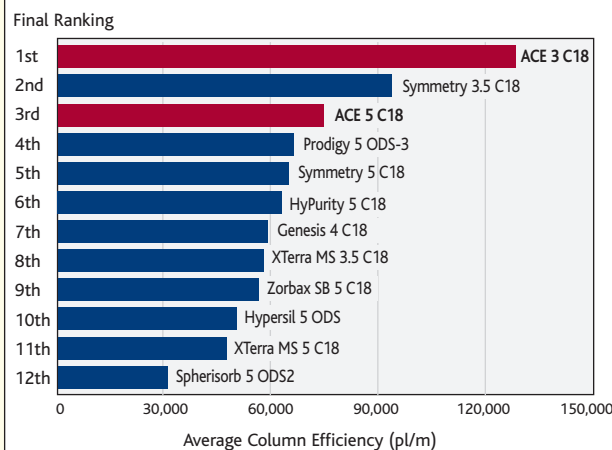
100Å

Final Ranking

The results from all three tests have been analysed and compared. As an aid to column comparison, a final ranking has been determined by averaging the column performance on each test (see Table below). This average ranking of column performance is illustrated by Figure 13.

COLUMN TYPE	COLUMN EFFICIENCY (pl/m)			
	NEUTRAL	BASIC	ACIDIC	AVERAGE
ACE 3 C18	163,500	89,100	139,600	130,700
Symmetry 3.5 C18	123,800	59,200	98,700	93,900
ACE 5 C18	91,100	50,400	78,100	73,200
Prodigy 5 ODS-3	80,600	46,900	72,500	66,700
Symmetry 5 C18	88,300	34,200	68,500	63,700
HyPurity 5 C18	74,800	43,200	68,400	62,100
Genesis 4 C18	81,800	21,200	74,600	59,200
XTerra MS 3.5 C18	60,600	28,600	81,900	57,000
Zorbax SB 5 C18	78,500	19,700	71,200	56,500
Hypersil 5 ODS	87,000	0	63,300	50,100
XTerra MS 5 C18	53,200	27,500	60,800	47,200
Spherisorb 5 ODS2	84,800	0	10,600	31,800

Figure 13 - Final Ranking



Conclusion:

Significant differences in efficiency, peak shape and selectivity are seen with C18 bonded columns when evaluating acidic and basic compounds. These variations are caused by undesirable secondary silanol interactions.

The selection of a high efficiency base deactivated phase with very low silanol activity will prove highly beneficial for the majority of analyses.

ACE C18 materials were the highest performing 3µm and 5µm phases respectively. Superior column efficiency and peak shape are combined to provide excellent separations with acidic, basic and neutral molecules.



ACE® Stationary Phases Virtually Eliminate the Negative Effects of Silanols on HPLC Separations

ACE 100Å HPLC Columns - Part Numbers

ACE 3µm Columns

ACE 3µm C18

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-111-0201	ACE-111-0301	ACE-111-3501	ACE-111-0501	ACE-111-7501	ACE-111-1001	ACE-111-1201	ACE-111-1501	-	ACE-111-0101GD ¹
2.1mm	ACE-111-0202	ACE-111-0302	ACE-111-3502	ACE-111-0502	ACE-111-7502	ACE-111-1002	ACE-111-1202	ACE-111-1502	-	ACE-111-0102GD ²
3.0mm	ACE-111-0203	ACE-111-0303	ACE-111-3503	ACE-111-0503	ACE-111-7503	ACE-111-1003	ACE-111-1203	ACE-111-1503	-	ACE-111-0103GD ³
4.0mm	-	-	ACE-111-3504	ACE-111-0504	ACE-111-7504	ACE-111-1004	ACE-111-1204	ACE-111-1504	-	ACE-111-0103GD ³
4.6mm	ACE-111-0246	ACE-111-0346	ACE-111-3546	ACE-111-0546	ACE-111-7546	ACE-111-1046	ACE-111-1246	ACE-111-1546	-	ACE-111-0103GD ³

ACE 3µm C8

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-112-0201	ACE-112-0301	ACE-112-3501	ACE-112-0501	ACE-112-7501	ACE-112-1001	ACE-112-1201	ACE-112-1501	-	ACE-112-0101GD ¹
2.1mm	ACE-112-0202	ACE-112-0302	ACE-112-3502	ACE-112-0502	ACE-112-7502	ACE-112-1002	ACE-112-1202	ACE-112-1502	-	ACE-112-0102GD ²
3.0mm	ACE-112-0203	ACE-112-0303	ACE-112-3503	ACE-112-0503	ACE-112-7503	ACE-112-1003	ACE-112-1203	ACE-112-1503	-	ACE-112-0103GD ³
4.0mm	-	-	ACE-112-3504	ACE-112-0504	ACE-112-7504	ACE-112-1004	ACE-112-1204	ACE-112-1504	-	ACE-112-0103GD ³
4.6mm	ACE-112-0246	ACE-112-0346	ACE-112-3546	ACE-112-0546	ACE-112-7546	ACE-112-1046	ACE-112-1246	ACE-112-1546	-	ACE-112-0103GD ³

ACE 3µm C4

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-113-0201	ACE-113-0301	ACE-113-3501	ACE-113-0501	ACE-113-7501	ACE-113-1001	ACE-113-1201	ACE-113-1501	-	ACE-113-0101GD ¹
2.1mm	ACE-113-0202	ACE-113-0302	ACE-113-3502	ACE-113-0502	ACE-113-7502	ACE-113-1002	ACE-113-1202	ACE-113-1502	-	ACE-113-0102GD ²
3.0mm	ACE-113-0203	ACE-113-0303	ACE-113-3503	ACE-113-0503	ACE-113-7503	ACE-113-1003	ACE-113-1203	ACE-113-1503	-	ACE-113-0103GD ³
4.0mm	-	-	ACE-113-3504	ACE-113-0504	ACE-113-7504	ACE-113-1004	ACE-113-1204	ACE-113-1504	-	ACE-113-0103GD ³
4.6mm	ACE-113-0246	ACE-113-0346	ACE-113-3546	ACE-113-0546	ACE-113-7546	ACE-113-1046	ACE-113-1246	ACE-113-1546	-	ACE-113-0103GD ³

ACE 3µm CN

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-114-0201	ACE-114-0301	ACE-114-3501	ACE-114-0501	ACE-114-7501	ACE-114-1001	ACE-114-1201	ACE-114-1501	-	ACE-114-0101GD ¹
2.1mm	ACE-114-0202	ACE-114-0302	ACE-114-3502	ACE-114-0502	ACE-114-7502	ACE-114-1002	ACE-114-1202	ACE-114-1502	-	ACE-114-0102GD ²
3.0mm	ACE-114-0203	ACE-114-0303	ACE-114-3503	ACE-114-0503	ACE-114-7503	ACE-114-1003	ACE-114-1203	ACE-114-1503	-	ACE-114-0103GD ³
4.0mm	-	-	ACE-114-3504	ACE-114-0504	ACE-114-7504	ACE-114-1004	ACE-114-1204	ACE-114-1504	-	ACE-114-0103GD ³
4.6mm	ACE-114-0246	ACE-114-0346	ACE-114-3546	ACE-114-0546	ACE-114-7546	ACE-114-1046	ACE-114-1246	ACE-114-1546	-	ACE-114-0103GD ³

ACE 3µm Phenyl

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-115-0201	ACE-115-0301	ACE-115-3501	ACE-115-0501	ACE-115-7501	ACE-115-1001	ACE-115-1201	ACE-115-1501	-	ACE-115-0101GD ¹
2.1mm	ACE-115-0202	ACE-115-0302	ACE-115-3502	ACE-115-0502	ACE-115-7502	ACE-115-1002	ACE-115-1202	ACE-115-1502	-	ACE-115-0102GD ²
3.0mm	ACE-115-0203	ACE-115-0303	ACE-115-3503	ACE-115-0503	ACE-115-7503	ACE-115-1003	ACE-115-1203	ACE-115-1503	-	ACE-115-0103GD ³
4.0mm	-	-	ACE-115-3504	ACE-115-0504	ACE-115-7504	ACE-115-1004	ACE-115-1204	ACE-115-1504	-	ACE-115-0103GD ³
4.6mm	ACE-115-0246	ACE-115-0346	ACE-115-3546	ACE-115-0546	ACE-115-7546	ACE-115-1046	ACE-115-1246	ACE-115-1546	-	ACE-115-0103GD ³

ACE 3µm AQ

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-116-0201	ACE-116-0301	ACE-116-3501	ACE-116-0501	ACE-116-7501	ACE-116-1001	ACE-116-1201	ACE-116-1501	-	ACE-116-0101GD ¹
2.1mm	ACE-116-0202	ACE-116-0302	ACE-116-3502	ACE-116-0502	ACE-116-7502	ACE-116-1002	ACE-116-1202	ACE-116-1502	-	ACE-116-0102GD ²
3.0mm	ACE-116-0203	ACE-116-0303	ACE-116-3503	ACE-116-0503	ACE-116-7503	ACE-116-1003	ACE-116-1203	ACE-116-1503	-	ACE-116-0103GD ³
4.0mm	-	-	ACE-116-3504	ACE-116-0504	ACE-116-7504	ACE-116-1004	ACE-116-1204	ACE-116-1504	-	ACE-116-0103GD ³
4.6mm	ACE-116-0246	ACE-116-0346	ACE-116-3546	ACE-116-0546	ACE-116-7546	ACE-116-1046	ACE-116-1246	ACE-116-1546	-	ACE-116-0103GD ³

ACE 3µm C18-HL

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-311-0201	ACE-311-0301	ACE-311-3501	ACE-311-0501	ACE-311-7501	ACE-311-1001	ACE-311-1201	ACE-311-1501	-	ACE-311-0101GD ¹
2.1mm	ACE-311-0202	ACE-311-0302	ACE-311-3502	ACE-311-0502	ACE-311-7502	ACE-311-1002	ACE-311-1202	ACE-311-1502	-	ACE-311-0102GD ²
3.0mm	ACE-311-0203	ACE-311-0303	ACE-311-3503	ACE-311-0503	ACE-311-7503	ACE-311-1003	ACE-311-1203	ACE-311-1503	-	ACE-311-0103GD ³
4.0mm	-	-	ACE-311-3504	ACE-311-0504	ACE-311-7504	ACE-311-1004	ACE-311-1204	ACE-311-1504	-	ACE-311-0103GD ³
4.6mm	ACE-311-0246	ACE-311-0346	ACE-311-3546	ACE-311-0546	ACE-311-7546	ACE-311-1046	ACE-311-1246	ACE-311-1546	-	ACE-311-0103GD ³

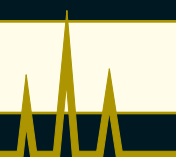
¹ 5 pack - use with cartridge holder H0001 and coupler C0001

² 5 pack - use with integral microbore cartridge holder H0004

³ 5 pack - use with integral analytical cartridge holder H0005

Please enquire for part numbers for SIL columns

ACE 100Å HPLC Columns - Part Numbers



ACE 5µm Columns

ACE 5µm C18

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-121-0201	ACE-121-0301	ACE-121-3501	ACE-121-0501	ACE-121-7501	ACE-121-1001	ACE-121-1201	ACE-121-1501	ACE-121-2501	ACE-121-0101GD ¹
2.1mm	ACE-121-0202	ACE-121-0302	ACE-121-3502	ACE-121-0502	ACE-121-7502	ACE-121-1002	ACE-121-1202	ACE-121-1502	ACE-121-2502	ACE-121-0102GD ²
3.0mm	ACE-121-0203	ACE-121-0303	ACE-121-3503	ACE-121-0503	ACE-121-7503	ACE-121-1003	ACE-121-1203	ACE-121-1503	ACE-121-2503	ACE-121-0103GD ³
4.0mm	-	-	ACE-121-3504	ACE-121-0504	ACE-121-7504	ACE-121-1004	ACE-121-1204	ACE-121-1504	ACE-121-2504	ACE-121-0103GD ³
4.6mm	ACE-121-0246	ACE-121-0346	ACE-121-3546	ACE-121-0546	ACE-121-7546	ACE-121-1046	ACE-121-1246	ACE-121-1546	ACE-121-2546	ACE-121-0103GD ³
7.75mm	-	-	-	ACE-121-0508	ACE-121-7508	ACE-121-1008	ACE-121-1208	ACE-121-1508	ACE-121-2508	ACE-121-0110GD ⁴
10.0mm	-	-	-	ACE-121-0510	ACE-121-7510	ACE-121-1010	ACE-121-1210	ACE-121-1510	ACE-121-2510	ACE-121-0110GD ⁴
21.2mm	-	-	-	ACE-121-0520	ACE-121-7520	ACE-121-1020	ACE-121-1220	ACE-121-1520	ACE-121-2520	ACE-121-0110GD ⁴
30.0mm	-	-	-	ACE-121-0530	ACE-121-7530	ACE-121-1030	-	ACE-121-1530	ACE-121-2530	ACE-121-0220GD ⁵

ACE 5µm C8

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-122-0201	ACE-122-0301	ACE-122-3501	ACE-122-0501	ACE-122-7501	ACE-122-1001	ACE-122-1201	ACE-122-1501	ACE-122-2501	ACE-122-0101GD ¹
2.1mm	ACE-122-0202	ACE-122-0302	ACE-122-3502	ACE-122-0502	ACE-122-7502	ACE-122-1002	ACE-122-1202	ACE-122-1502	ACE-122-2502	ACE-122-0102GD ²
3.0mm	ACE-122-0203	ACE-122-0303	ACE-122-3503	ACE-122-0503	ACE-122-7503	ACE-122-1003	ACE-122-1203	ACE-122-1503	ACE-122-2503	ACE-122-0103GD ³
4.0mm	-	-	ACE-122-3504	ACE-122-0504	ACE-122-7504	ACE-122-1004	ACE-122-1204	ACE-122-1504	ACE-122-2504	ACE-122-0103GD ³
4.6mm	ACE-122-0246	ACE-122-0346	ACE-122-3546	ACE-122-0546	ACE-122-7546	ACE-122-1046	ACE-122-1246	ACE-122-1546	ACE-122-2546	ACE-122-0103GD ³
7.75mm	-	-	-	ACE-122-0508	ACE-122-7508	ACE-122-1008	ACE-122-1208	ACE-122-1508	ACE-122-2508	ACE-122-0110GD ⁴
10.0mm	-	-	-	ACE-122-0510	ACE-122-7510	ACE-122-1010	ACE-122-1210	ACE-122-1510	ACE-122-2510	ACE-122-0110GD ⁴
21.2mm	-	-	-	ACE-122-0520	ACE-122-7520	ACE-122-1020	ACE-122-1220	ACE-122-1520	ACE-122-2520	ACE-122-0110GD ⁴
30.0mm	-	-	-	ACE-122-0530	ACE-122-7530	ACE-122-1030	-	ACE-122-1530	ACE-122-2530	ACE-122-0220GD ⁵

ACE 5µm C4

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-123-0201	ACE-123-0301	ACE-123-3501	ACE-123-0501	ACE-123-7501	ACE-123-1001	ACE-123-1201	ACE-123-1501	ACE-123-2501	ACE-123-0101GD ¹
2.1mm	ACE-123-0202	ACE-123-0302	ACE-123-3502	ACE-123-0502	ACE-123-7502	ACE-123-1002	ACE-123-1202	ACE-123-1502	ACE-123-2502	ACE-123-0102GD ²
3.0mm	ACE-123-0203	ACE-123-0303	ACE-123-3503	ACE-123-0503	ACE-123-7503	ACE-123-1003	ACE-123-1203	ACE-123-1503	ACE-123-2503	ACE-123-0103GD ³
4.0mm	-	-	ACE-123-3504	ACE-123-0504	ACE-123-7504	ACE-123-1004	ACE-123-1204	ACE-123-1504	ACE-123-2504	ACE-123-0103GD ³
4.6mm	ACE-123-0246	ACE-123-0346	ACE-123-3546	ACE-123-0546	ACE-123-7546	ACE-123-1046	ACE-123-1246	ACE-123-1546	ACE-123-2546	ACE-123-0103GD ³
7.75mm	-	-	-	ACE-123-0508	ACE-123-7508	ACE-123-1008	ACE-123-1208	ACE-123-1508	ACE-123-2508	ACE-123-0110GD ⁴
10.0mm	-	-	-	ACE-123-0510	ACE-123-7510	ACE-123-1010	ACE-123-1210	ACE-123-1510	ACE-123-2510	ACE-123-0110GD ⁴
21.2mm	-	-	-	ACE-123-0520	ACE-123-7520	ACE-123-1020	ACE-123-1220	ACE-123-1520	ACE-123-2520	ACE-123-0110GD ⁴
30.0mm	-	-	-	ACE-123-0530	ACE-123-7530	ACE-123-1030	-	ACE-123-1530	ACE-123-2530	ACE-123-0220GD ⁵

ACE 5µm CN

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-124-0201	ACE-124-0301	ACE-124-3501	ACE-124-0501	ACE-124-7501	ACE-124-1001	ACE-124-1201	ACE-124-1501	ACE-124-2501	ACE-124-0101GD ¹
2.1mm	ACE-124-0202	ACE-124-0302	ACE-124-3502	ACE-124-0502	ACE-124-7502	ACE-124-1002	ACE-124-1202	ACE-124-1502	ACE-124-2502	ACE-124-0102GD ²
3.0mm	ACE-124-0203	ACE-124-0303	ACE-124-3503	ACE-124-0503	ACE-124-7503	ACE-124-1003	ACE-124-1203	ACE-124-1503	ACE-124-2503	ACE-124-0103GD ³
4.0mm	-	-	ACE-124-3504	ACE-124-0504	ACE-124-7504	ACE-124-1004	ACE-124-1204	ACE-124-1504	ACE-124-2504	ACE-124-0103GD ³
4.6mm	ACE-124-0246	ACE-124-0346	ACE-124-3546	ACE-124-0546	ACE-124-7546	ACE-124-1046	ACE-124-1246	ACE-124-1546	ACE-124-2546	ACE-124-0103GD ³
7.75mm	-	-	-	ACE-124-0508	ACE-124-7508	ACE-124-1008	ACE-124-1208	ACE-124-1508	ACE-124-2508	ACE-124-0110GD ⁴
10.0mm	-	-	-	ACE-124-0510	ACE-124-7510	ACE-124-1010	ACE-124-1210	ACE-124-1510	ACE-124-2510	ACE-124-0110GD ⁴
21.2mm	-	-	-	ACE-124-0520	ACE-124-7520	ACE-124-1020	ACE-124-1220	ACE-124-1520	ACE-124-2520	ACE-124-0110GD ⁴
30.0mm	-	-	-	ACE-124-0530	ACE-124-7530	ACE-124-1030	-	ACE-124-1530	ACE-124-2530	ACE-124-0220GD ⁵

ACE 5µm Phenyl

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-125-0201	ACE-125-0301	ACE-125-3501	ACE-125-0501	ACE-125-7501	ACE-125-1001	ACE-125-1201	ACE-125-1501	ACE-125-2501	ACE-125-0101GD ¹
2.1mm	ACE-125-0202	ACE-125-0302	ACE-125-3502	ACE-125-0502	ACE-125-7502	ACE-125-1002	ACE-125-1202	ACE-125-1502	ACE-125-2502	ACE-125-0102GD ²
3.0mm	ACE-125-0203	ACE-125-0303	ACE-125-3503	ACE-125-0503	ACE-125-7503	ACE-125-1003	ACE-125-1203	ACE-125-1503	ACE-125-2503	ACE-125-0103GD ³
4.0mm	-	-	ACE-125-3504	ACE-125-0504	ACE-125-7504	ACE-125-1004	ACE-125-1204	ACE-125-1504	ACE-125-2504	ACE-125-0103GD ³
4.6mm	ACE-125-0246	ACE-125-0346	ACE-125-3546	ACE-125-0546	ACE-125-7546	ACE-125-1046	ACE-125-1246	ACE-125-1546	ACE-125-2546	ACE-125-0103GD ³
7.75mm	-	-	-	ACE-125-0508	ACE-125-7508	ACE-125-1008	ACE-125-1208	ACE-125-1508	ACE-125-2508	ACE-125-0110GD ⁴
10.0mm	-	-	-	ACE-125-0510	ACE-125-7510	ACE-125-1010	ACE-125-1210	ACE-125-1510	ACE-125-2510	ACE-125-0110GD ⁴
21.2mm	-	-	-	ACE-125-0520	ACE-125-7520	ACE-125-1020	ACE-125-1220	ACE-125-1520	ACE-125-2520	ACE-125-0110GD ⁴
30.0mm	-	-	-	ACE-125-0530	ACE-125-7530	ACE-125-1030	-	ACE-125-1530	ACE-125-2530	ACE-125-0220GD ⁵

¹ 5 pack - use with cartridge holder H0001 and coupler C0001

² 5 pack - use with integral microbore cartridge holder H0004

³ 5 pack - use with integral analytical cartridge holder H0005

⁴ 3 pack - use with semi-prep cartridge holder H0002 and column coupler C0001

⁵ 1 pack - use with prep cartridge holder H0006 and column coupler C0002

Please enquire for part numbers for SIL columns

ACE 100Å HPLC Columns - Part Numbers

ACE 5µm Columns - continued

ACE 5µm AQ

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-126-0201	ACE-126-0301	ACE-126-3501	ACE-126-0501	ACE-126-7501	ACE-126-1001	ACE-126-1201	ACE-126-1501	ACE-126-2501	ACE-126-0101GD ¹
2.1mm	ACE-126-0202	ACE-126-0302	ACE-126-3502	ACE-126-0502	ACE-126-7502	ACE-126-1002	ACE-126-1202	ACE-126-1502	ACE-126-2502	ACE-126-0102GD ²
3.0mm	ACE-126-0203	ACE-126-0303	ACE-126-3503	ACE-126-0503	ACE-126-7503	ACE-126-1003	ACE-126-1203	ACE-126-1503	ACE-126-2503	ACE-126-0103GD ³
4.0mm	-	-	ACE-126-3504	ACE-126-0504	ACE-126-7504	ACE-126-1004	ACE-126-1204	ACE-126-1504	ACE-126-2504	ACE-126-0103GD ³
4.6mm	ACE-126-0246	ACE-126-0346	ACE-126-3546	ACE-126-0546	ACE-126-7546	ACE-126-1046	ACE-126-1246	ACE-126-1546	ACE-126-2546	ACE-126-0103GD ³
7.75mm	-	-	-	ACE-126-0508	ACE-126-7508	ACE-126-1008	ACE-126-1208	ACE-126-1508	ACE-126-2508	ACE-126-0110GD ⁴
10.0mm	-	-	-	ACE-126-0510	ACE-126-7510	ACE-126-1010	ACE-126-1210	ACE-126-1510	ACE-126-2510	ACE-126-0110GD ⁴
21.2mm	-	-	-	ACE-126-0520	ACE-126-7520	ACE-126-1020	ACE-126-1220	ACE-126-1520	ACE-126-2520	ACE-126-0110GD ⁴
30.0mm	-	-	-	ACE-126-0530	ACE-126-7530	ACE-126-1030	-	ACE-126-1530	ACE-126-2530	ACE-126-0220GD ⁵

ACE 5µm C18-HL

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-321-0201	ACE-321-0301	ACE-321-3501	ACE-321-0501	ACE-321-7501	ACE-321-1001	ACE-321-1201	ACE-321-1501	ACE-321-2501	ACE-321-0101GD ¹
2.1mm	ACE-321-0202	ACE-321-0302	ACE-321-3502	ACE-321-0502	ACE-321-7502	ACE-321-1002	ACE-321-1202	ACE-321-1502	ACE-321-2502	ACE-321-0102GD ²
3.0mm	ACE-321-0203	ACE-321-0303	ACE-321-3503	ACE-321-0503	ACE-321-7503	ACE-321-1003	ACE-321-1203	ACE-321-1503	ACE-321-2503	ACE-321-0103GD ³
4.0mm	-	-	ACE-321-3504	ACE-321-0504	ACE-321-7504	ACE-321-1004	ACE-321-1204	ACE-321-1504	ACE-321-2504	ACE-321-0103GD ³
4.6mm	ACE-321-0246	ACE-321-0346	ACE-321-3546	ACE-321-0546	ACE-321-7546	ACE-321-1046	ACE-321-1246	ACE-321-1546	ACE-321-2546	ACE-321-0103GD ³
7.75mm	-	-	-	ACE-321-0508	ACE-321-7508	ACE-321-1008	ACE-321-1208	ACE-321-1508	ACE-321-2508	ACE-321-0110GD ⁴
10.0mm	-	-	-	ACE-321-0510	ACE-321-7510	ACE-321-1010	ACE-321-1210	ACE-321-1510	ACE-321-2510	ACE-321-0110GD ⁴
21.2mm	-	-	-	ACE-321-0520	ACE-321-7520	ACE-321-1020	ACE-321-1220	ACE-321-1520	ACE-321-2520	ACE-321-0110GD ⁴
30.0mm	-	-	-	ACE-321-0530	ACE-321-7530	ACE-321-1030	-	ACE-321-1530	ACE-321-2530	ACE-321-0220GD ⁵

ACE 10µm Columns

ACE 10µm C18

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
4.6mm	ACE-131-0246	ACE-131-0346	ACE-131-3546	ACE-131-0546	ACE-131-7546	ACE-131-1046	ACE-131-1246	ACE-131-1546	ACE-131-2546	ACE-131-0103GD ³
7.75mm	-	-	-	ACE-131-0508	ACE-131-7508	ACE-131-1008	ACE-131-1208	ACE-131-1508	ACE-131-2508	ACE-131-0110GD ⁴
10.0mm	-	-	-	ACE-131-0510	ACE-131-7510	ACE-131-1010	ACE-131-1210	ACE-131-1510	ACE-131-2510	ACE-131-0110GD ⁴
21.2mm	-	-	-	ACE-131-0520	ACE-131-7520	ACE-131-1020	ACE-131-1220	ACE-131-1520	ACE-131-2520	ACE-131-0110GD ⁴
30.0mm	-	-	-	ACE-131-0530	ACE-131-7530	ACE-131-1030	-	ACE-131-1530	ACE-131-2530	ACE-131-0220GD ⁵
50.0mm	-	-	-	enquire	enquire	enquire	enquire	enquire	enquire	enquire

ACE 10µm C8

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
4.6mm	ACE-132-0246	ACE-132-0346	ACE-132-3546	ACE-132-0546	ACE-132-7546	ACE-132-1046	ACE-132-1246	ACE-132-1546	ACE-132-2546	ACE-132-0103GD ³
7.75mm	-	-	-	ACE-132-0508	ACE-132-7508	ACE-132-1008	ACE-132-1208	ACE-132-1508	ACE-132-2508	ACE-132-0110GD ⁴
10.0mm	-	-	-	ACE-132-0510	ACE-132-7510	ACE-132-1010	ACE-132-1210	ACE-132-1510	ACE-132-2510	ACE-132-0110GD ⁴
21.2mm	-	-	-	ACE-132-0520	ACE-132-7520	ACE-132-1020	ACE-132-1220	ACE-132-1520	ACE-132-2520	ACE-132-0110GD ⁴
30.0mm	-	-	-	ACE-132-0530	ACE-132-7530	ACE-132-1030	-	ACE-132-1530	ACE-132-2530	ACE-132-0220GD ⁵
50.0mm	-	-	-	enquire	enquire	enquire	enquire	enquire	enquire	enquire

ACE 10µm C4

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
4.6mm	ACE-133-0246	ACE-133-0346	ACE-133-3546	ACE-133-0546	ACE-133-7546	ACE-133-1046	ACE-133-1246	ACE-133-1546	ACE-133-2546	ACE-133-0103GD ³
7.75mm	-	-	-	ACE-133-0508	ACE-133-7508	ACE-133-1008	ACE-133-1208	ACE-133-1508	ACE-133-2508	ACE-133-0110GD ⁴
10.0mm	-	-	-	ACE-133-0510	ACE-133-7510	ACE-133-1010	ACE-133-1210	ACE-133-1510	ACE-133-2510	ACE-133-0110GD ⁴
21.2mm	-	-	-	ACE-133-0520	ACE-133-7520	ACE-133-1020	ACE-133-1220	ACE-133-1520	ACE-133-2520	ACE-133-0110GD ⁴
30.0mm	-	-	-	ACE-133-0530	ACE-133-7530	ACE-133-1030	-	ACE-133-1530	ACE-133-2530	ACE-133-0220GD ⁵
50.0mm	-	-	-	enquire	enquire	enquire	enquire	enquire	enquire	enquire

¹ 5 pack - use with cartridge holder H0001 and coupler C0001

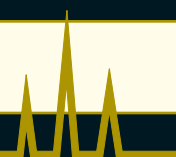
² 5 pack - use with integral microbore cartridge holder H0004

³ 5 pack - use with integral analytical cartridge holder H0005

⁴ 3 pack - use with semi-prep cartridge holder H0002 and column coupler C0001

⁵ 1 pack - use with prep cartridge holder H0006 and column coupler C0002

Please enquire for part numbers for SIL columns



ACE 10µm Columns - continued

ACE 10µm CN

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
4.6mm	ACE-134-0246	ACE-134-0346	ACE-134-3546	ACE-134-0546	ACE-134-7546	ACE-134-1046	ACE-134-1246	ACE-134-1546	ACE-134-2546	ACE-134-0103GD ³
7.75mm	-	-	-	ACE-134-0508	ACE-134-7508	ACE-134-1008	ACE-134-1208	ACE-134-1508	ACE-134-2508	ACE-134-0110GD ⁴
10.0mm	-	-	-	ACE-134-0510	ACE-134-7510	ACE-134-1010	ACE-134-1210	ACE-134-1510	ACE-134-2510	ACE-134-0110GD ⁴
21.2mm	-	-	-	ACE-134-0520	ACE-134-7520	ACE-134-1020	ACE-134-1220	ACE-134-1520	ACE-134-2520	ACE-134-0110GD ⁴
30.0mm	-	-	-	ACE-134-0530	ACE-134-7530	ACE-134-1030	-	ACE-134-1530	ACE-134-2530	ACE-134-0220GD ⁵
50.0mm	-	-	-	enquire	enquire	enquire	enquire	enquire	enquire	enquire

ACE 10µm Phenyl

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
4.6mm	ACE-135-0246	ACE-135-0346	ACE-135-3546	ACE-135-0546	ACE-135-7546	ACE-135-1046	ACE-135-1246	ACE-135-1546	ACE-135-2546	ACE-135-0103GD ³
7.75mm	-	-	-	ACE-135-0508	ACE-135-7508	ACE-135-1008	ACE-135-1208	ACE-135-1508	ACE-135-2508	ACE-135-0110GD ⁴
10.0mm	-	-	-	ACE-135-0510	ACE-135-7510	ACE-135-1010	ACE-135-1210	ACE-135-1510	ACE-135-2510	ACE-135-0110GD ⁴
21.2mm	-	-	-	ACE-135-0520	ACE-135-7520	ACE-135-1020	ACE-135-1220	ACE-135-1520	ACE-135-2520	ACE-135-0110GD ⁴
30.0mm	-	-	-	ACE-135-0530	ACE-135-7530	ACE-135-1030	-	ACE-135-1530	ACE-135-2530	ACE-135-0220GD ⁵
50.0mm	-	-	-	enquire	enquire	enquire	enquire	enquire	enquire	enquire

ACE 10µm AQ

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
4.6mm	ACE-136-0246	ACE-136-0346	ACE-136-3546	ACE-136-0546	ACE-136-7546	ACE-136-1046	ACE-136-1246	ACE-136-1546	ACE-136-2546	ACE-136-0103GD ³
7.75mm	-	-	-	ACE-136-0508	ACE-136-7508	ACE-136-1008	ACE-136-1208	ACE-136-1508	ACE-136-2508	ACE-136-0110GD ⁴
10.0mm	-	-	-	ACE-136-0510	ACE-136-7510	ACE-136-1010	ACE-136-1210	ACE-136-1510	ACE-136-2510	ACE-136-0110GD ⁴
21.2mm	-	-	-	ACE-136-0520	ACE-136-7520	ACE-136-1020	ACE-136-1220	ACE-136-1520	ACE-136-2520	ACE-136-0110GD ⁴
30.0mm	-	-	-	ACE-136-0530	ACE-136-7530	ACE-136-1030	-	ACE-136-1530	ACE-136-2530	ACE-136-0220GD ⁵
50.0mm	-	-	-	enquire	enquire	enquire	enquire	enquire	enquire	enquire

ACE 10µm C18-HL

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
4.6mm	ACE-331-0246	ACE-331-0346	ACE-331-3546	ACE-331-0546	ACE-331-7546	ACE-331-1046	ACE-331-1246	ACE-331-1546	ACE-331-2546	ACE-331-0103GD ³
7.75mm	-	-	-	ACE-331-0508	ACE-331-7508	ACE-331-1008	ACE-331-1208	ACE-331-1508	ACE-331-2508	ACE-331-0110GD ⁴
10.0mm	-	-	-	ACE-331-0510	ACE-331-7510	ACE-331-1010	ACE-331-1210	ACE-331-1510	ACE-331-2510	ACE-331-0110GD ⁴
21.2mm	-	-	-	ACE-331-0520	ACE-331-7520	ACE-331-1020	ACE-331-1220	ACE-331-1520	ACE-331-2520	ACE-331-0110GD ⁴
30.0mm	-	-	-	ACE-331-0530	ACE-331-7530	ACE-331-1030	-	ACE-331-1530	ACE-331-2530	ACE-331-0220GD ⁵
50.0mm	-	-	-	enquire	enquire	enquire	enquire	enquire	enquire	enquire

ACE 15µm Columns

ACE 15µm C18-HL

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
4.6mm	ACE-341-0246	ACE-341-0346	ACE-341-3546	ACE-341-0546	ACE-341-7546	ACE-341-1046	ACE-341-1246	ACE-341-1546	ACE-341-2546	ACE-341-0103GD ³
7.75mm	-	-	-	ACE-341-0508	ACE-341-7508	ACE-341-1008	ACE-341-1208	ACE-341-1508	ACE-341-2508	ACE-341-0110GD ⁴
10.0mm	-	-	-	ACE-341-0510	ACE-341-7510	ACE-341-1010	ACE-341-1210	ACE-341-1510	ACE-341-2510	ACE-341-0110GD ⁴
21.2mm	-	-	-	ACE-341-0520	ACE-341-7520	ACE-341-1020	ACE-341-1220	ACE-341-1520	ACE-341-2520	ACE-341-0110GD ⁴
30.0mm	-	-	-	ACE-341-0530	ACE-341-7530	ACE-341-1030	-	ACE-341-1530	ACE-341-2530	ACE-341-0220GD ⁵
50.0mm	-	-	-	enquire	enquire	enquire	enquire	enquire	enquire	enquire

³ 5 pack - use with integral analytical cartridge holder H0005

⁴ 3 pack - use with semi-prep cartridge holder H0002 and column coupler C0001

⁵ 1 pack - use with prep cartridge holder H0006 and column coupler C0002

Please enquire for part numbers for SIL columns

100Å

ACE 300Å Columns for Biotechnology

- 300Å ultra high purity silica
- Ultimate protein and peptide application column
- C18, C8, C4, CN and Phenyl chemistries
- 3µm, 5µm and 10µm particle sizes
- Unmatched reproducibility
- Exceptional chemical stability

Excellent peak shape and reproducibility have established ACE HPLC columns as the finest available. This quality is now available for protein chemists desiring the utmost in performance and reproducibility for the separation of peptides, proteins and other high molecular weight biomolecules.

ACE 300Å columns are available in an extensive range of dimensions and particle sizes for use in micro-scale separations, LC/MS analyses, high speed preparative analyses up to process scale.

PHASE	FUNCTIONAL GROUP	ENDCAPPED	PARTICLE SIZE (µm)	PORE SIZE (Å)	SURFACE AREA (m ² /g)	CARBON LOAD (%)
C18-300	Octadecyl	Yes	3, 5, 10	300	100	9.0
C8-300	Octyl	Yes	3, 5, 10	300	100	5.0
C4-300	Butyl	Yes	3, 5, 10	300	100	2.6
CN-300	Cyano	Yes	3, 5, 10	300	100	2.6
Ph-300	Phenyl	Yes	3, 5, 10	300	100	5.3

ACE 300Å Columns for Peptide and Protein Analyses

Chromatographers prefer inert stationary phases for the reversed-phase HPLC of ionic compounds because they minimize the negative effect of silanols on the separation. This results in improved peak shape and reproducibility when separating compounds that contain polar functional groups, especially amines.

A new generation of ultra-inert stationary phases, with extremely low silanol activity, has made it possible to achieve even better peak shape and reproducibility when separating these types of compounds.

Scientists working with small molecules have been rapidly adopting this new technology and the recent introduction of wide-pore (300Å) ultra-inert phases makes the benefits of this technology available to those wanting to separate peptides and proteins by reversed-phase HPLC (see Figures 18a and 18b).

Figure 18a. Proteins

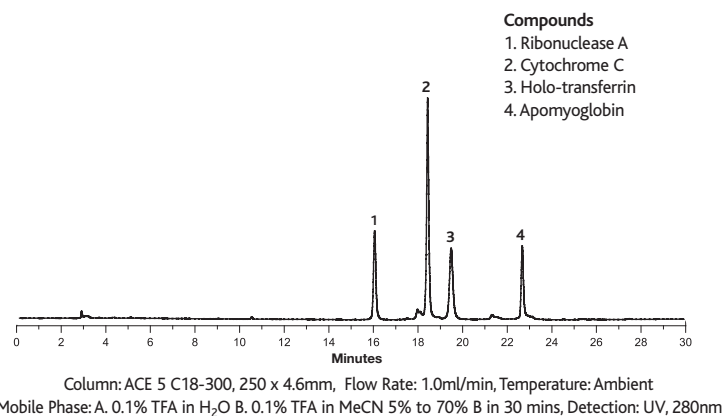
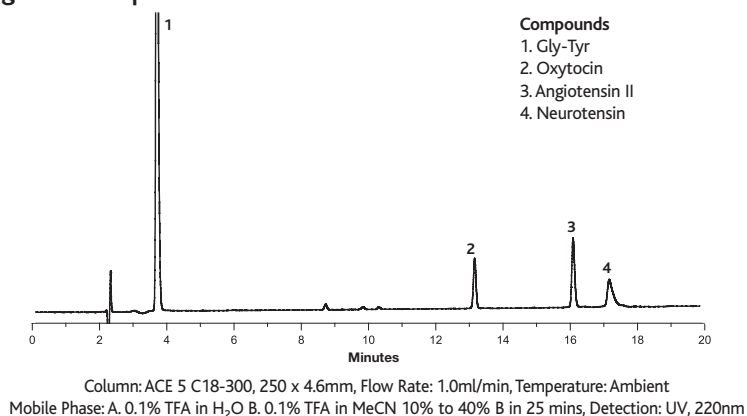
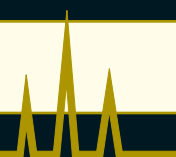


Figure 18b. Peptides





Comparison of Leading 300Å 5µm C18 Columns

- Leading 300Å 5µm, C18 Column Brands
- Neutral molecule test for packing integrity
- 2 basic molecule tests for silica inertness
- Peak efficiency and asymmetry comparison

In order to demonstrate the benefits of ultra-inert phases in biomolecule analysis, several commercially available 300Å pore size reversed-phase columns were tested using three different samples: neutral molecules to measure efficiency, pyridine/phenol to measure silanol activity and antidepressants to measure both silanol activity and

metal content. These are the same test procedures typically used to evaluate standard pore size columns (eg 100Å) used for the analysis of small molecules in the chemical and pharmaceutical industries. Columns were ranked by efficiency, N, measured at 10% peak height. In addition to measuring overall efficiency, this value also takes into consideration peak tailing usually caused by silanol interactions. The table below summarises the performance of various columns as determined by each test along with an overall ranking based on a combination of all three tests.

Results

Efficiency Measurements (N) For Leading 300Å (5µm, C18, 250 x 4.6mm) HPLC Columns

	TEST I	TEST II	TEST III	AVERAGE	
ACE C18-300	23,400	14,400	14,000	17,300	Test I: neutral molecule - toluene 80:20 MeOH/H ₂ O, 1.0ml/min
Jupiter C18	19,700	12,400	12,400	14,800	Test II: basic molecule 1- pyridine 60:40 MeOH/H ₂ O, 1.0ml/min
Zorbax 300SB-C18	18,900	14,400	6,600	13,300	Test III: basic molecule 2 - amitriptyline 80:20 MeOH/25mM KH ₂ PO ₄ (pH 6.0), 1.0ml/min
Symmetry 300 C18	17,500	9,000	6,700	11,000	
Nucleosil 300 C18	20,300	6,700	400	9,100	
Vydac Everest C18	20,000	5,900	800	8,900	
Vydac 218MS	14,600	1,300	1,400	5,800	
Vydac 218TP	14,200	1,700	800	5,600	

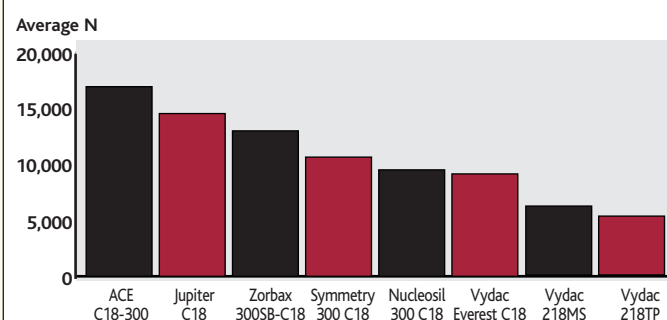
Column efficiency, as measured in Test I, is a reflection of how well a column is packed, as well as particle size and particle size distribution. Although many columns performed similarly in this test, those with lower plate counts reflect poorer physical characteristics of the silica particle. In Test II, efficiencies for pyridine are a good measure of active silanols on the silica surface. Active silanols account for most peak tailing and adsorptive losses of proteins. Since silanol activity is very hard to control in silica manufacture, columns exhibiting

low silanol activity are most likely to give consistent results column-to-column and batch-to-batch. In addition, polar and basic compounds will have better peak shapes and hence greater sensitivity on columns with low silanol activity. Since most biomolecules are polar and many are basic, columns with low silanol activity are desirable. In Test III, N values for tricyclic antidepressants measure metal content in addition to active silanol activity. Amitriptyline, chromatographed at neutral pH, is a standard test for measuring silica quality.

Conclusion

The overall ranking of the 300Å columns shown in Figure 19 reflects their performance based on how well they are packed and also the silanol and metal activity of the stationary phase. Chromatographers with experience in HPLC of basic pharmaceuticals know that columns giving good results on these tests will perform best for their samples. The benefits obtained from ultra-inert stationary phases are also important in wide-pore columns designed for the analysis of biomolecules.

Figure 19. 300Å (C18) Columns Ranked by Average Efficiency



By averaging N values obtained by each column in Tests I, II and III, columns can be ranked by overall quality, reflecting packing integrity and inertness.

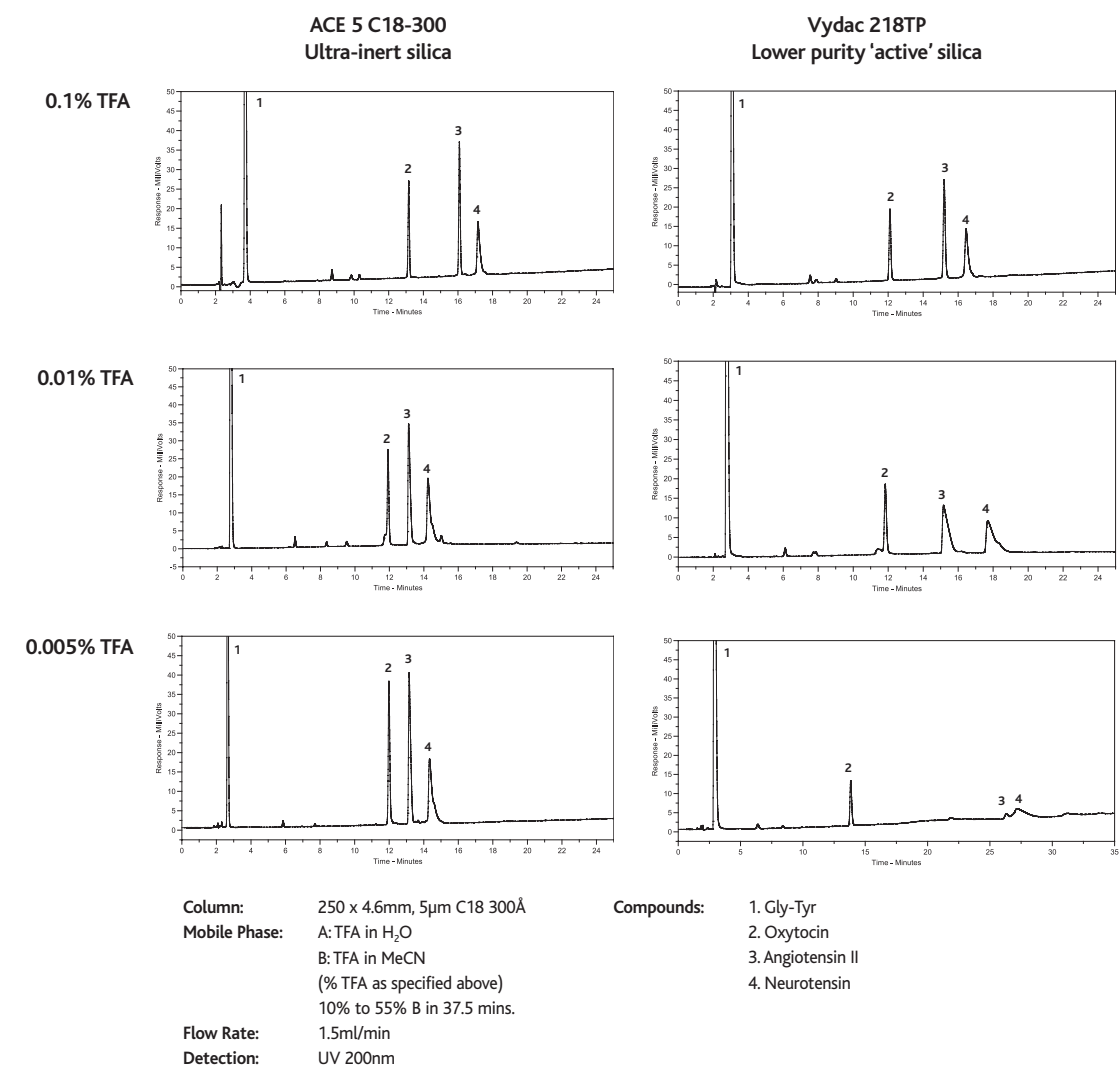
The Benefits of Ultra-Inert Stationary Phases for the Reversed-Phase HPLC of Biomolecules

Benefit #1 – Increased Sensitivity

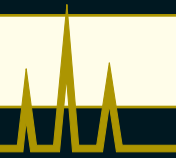
TFA or trifluoroacetic acid is used as a mobile phase additive for reversed-phase separations of peptides and proteins. This additive is typically used to improve both the peak shape and resolution of complex mixtures of peptides and proteins. As shown in Figure 20, the use of 0.1% TFA in the mobile phase enables a column packed with an active stationary phase to give peak widths comparable to those obtained from a new generation

column made from ultra-inert stationary phase. However, as the TFA concentration is lowered to 0.01% and finally 0.005%, peak widths on the ultra-inert phase stay the same, but degrade on the active stationary phase. The ability to analyse peptides and proteins using very low levels of TFA is beneficial for high sensitivity detection by mass spectrometry. TFA complexes with polypeptides and can enhance selectivity. However, this same complexation lowers sensitivity in the mass spectrometer.

Figure 20. Sensitivity and Peak Shape as a Function of TFA Concentration



Columns based on lower quality silica (chromatograms on right) show a dramatic loss in performance as TFA concentration is lowered. Columns from ultra-inert silica such as ACE maintain performance when TFA concentration is decreased.



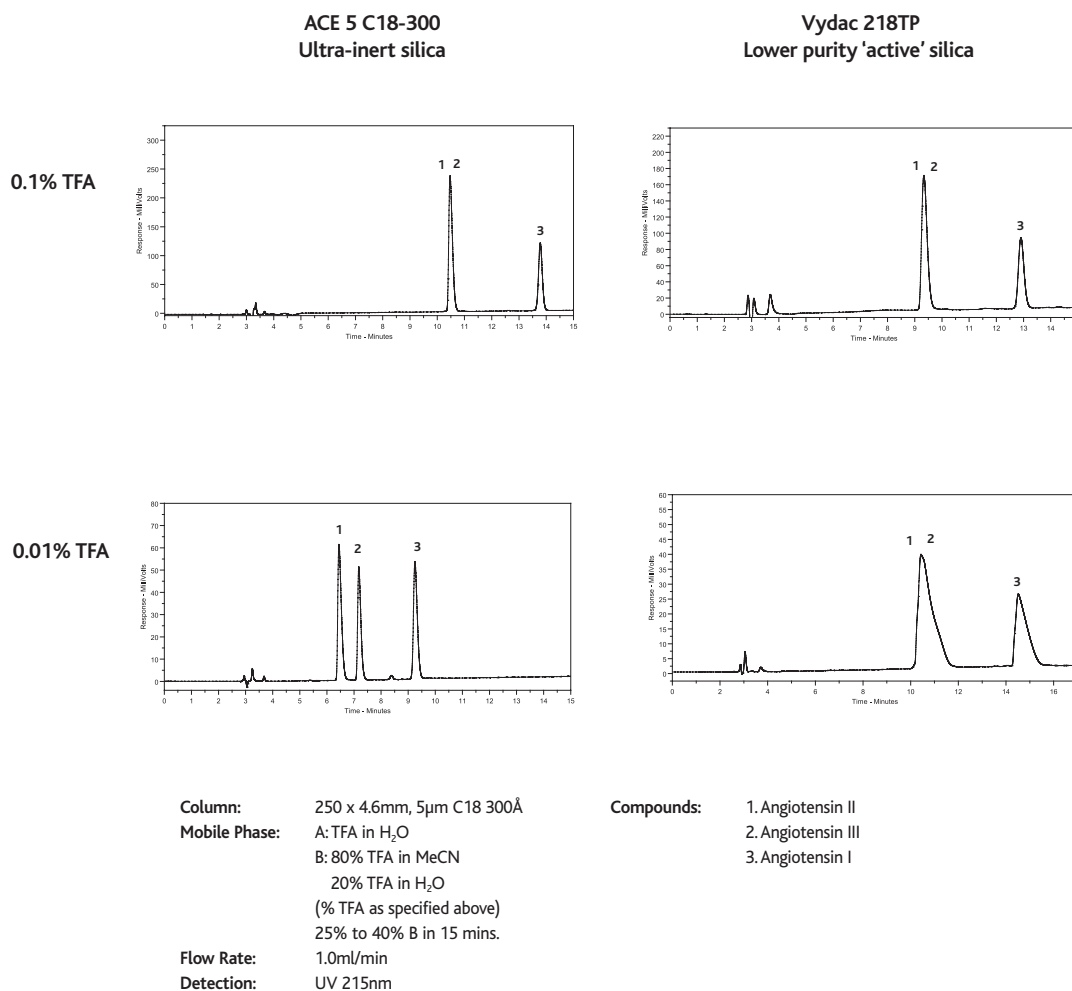
The Benefits of Ultra-Inert Stationary Phases for the Reversed-Phase HPLC of Biomolecules

Benefit #2 – Optimising Selectivity

The ability of TFA and other mobile phase additives to complex with peptides and proteins can be used to adjust selectivity and improve resolution. As shown in Figure 21, lowering TFA concentration from 0.1% to 0.01% enabled the resolution of angiotensin II and III. In the case of the

ultra-inert ACE column, peak shape and sensitivity remained constant with this change, as resolution improved dramatically. In the case of the Vydac column, packed with a more active stationary phase, peak shape was severely degraded.

Figure 21. Selectivity as a Function of TFA Concentration



Resolution has increased by lowering the TFA concentration. Columns made from lower quality silica show decreased performance.

300Å

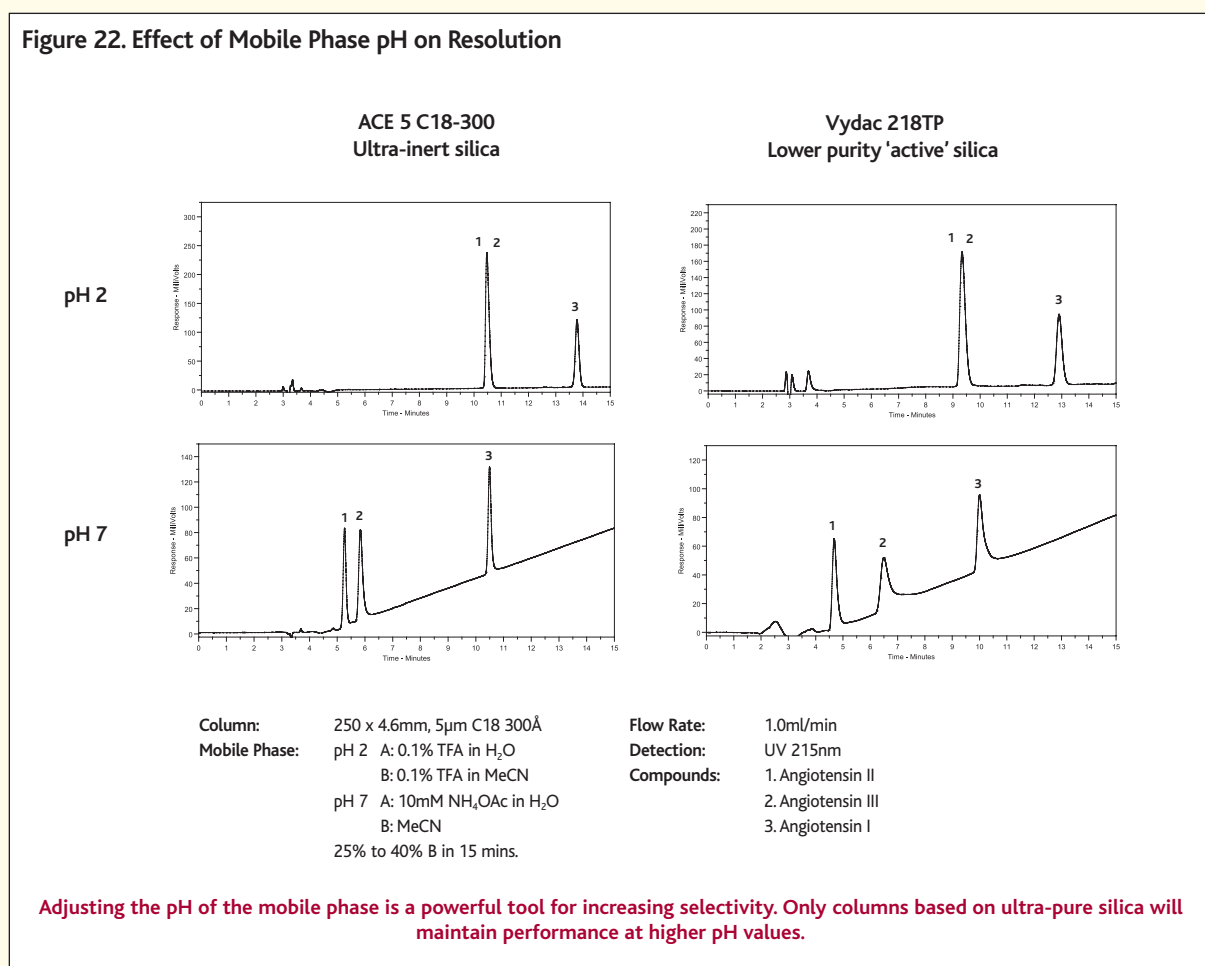
The Benefits of Ultra-Inert Stationary Phases for the Reversed-Phase HPLC of Biomolecules

Benefit #3 – Increased pH Range

Most biomolecules are charged. Peptides and proteins have numerous charges. From experience with small molecules, it is known that mobile phase pH can be a powerful tool for changing retention and thus optimizing the resolution of charged compounds. The same is true for peptides. Again using angiotensin II and III as an example, Figure 22 shows no resolution of these two peptides at pH 2 on either the ACE ultra-inert column or a column

packed with a more active stationary phase. By increasing the pH to 7, both columns now give good resolution. However, whereas the ACE ultra-inert column maintained good peak shape, the more active column showed poorer peak shape and a loss in performance. This phenomenon is observed in most reversed-phase applications with polar compounds. At high pH, silanol interactions are more prevalent and hence peak tailing becomes more apparent on active stationary phases.

Figure 22. Effect of Mobile Phase pH on Resolution



Summary

The chromatography of biomolecules, in particular peptides and proteins, can be improved by using HPLC columns packed with ultra-inert stationary phases. These columns will have reduced levels of silanol and metal activity to interfere with the separation. In addition, ultra-inert stationary phases perform well even when using low levels of TFA in the mobile phase. Using reduced levels of

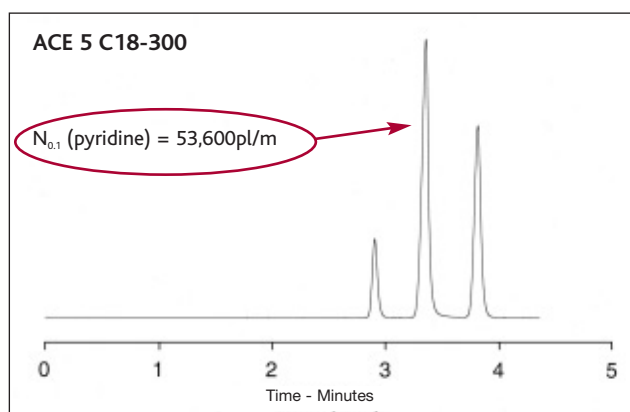
TFA improves mass spectral detection, in addition to providing a means of increasing selectivity and resolution. Mobile phase pH is another powerful means for improving selectivity and resolution. Ultra-inert columns, such as ACE, show no loss in performance at higher pH. Methods developed on ultra-inert columns will be more rugged over time as these columns are more reproducible column-to-column and lot-to-lot.

Comparison of Leading Wide Pore Columns

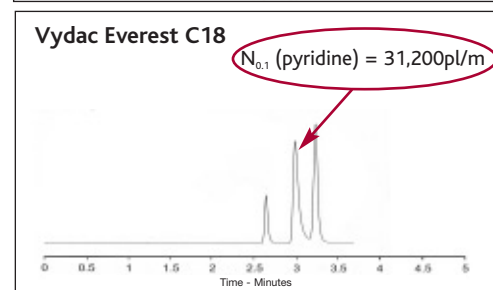
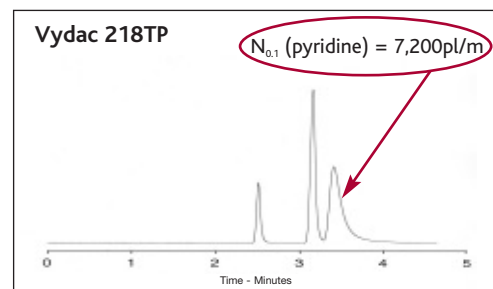
- Independently tested at The School of Pharmacy, University of Sunderland, UK

- Leading 300Å 5µm, C18 column brands - 250 x 4.6mm i.d.
- 2 Basic silica inertness tests
- Peak efficiency and asymmetry comparison

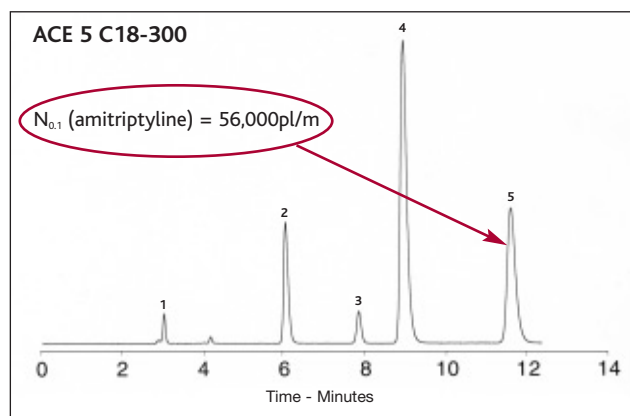
Inertness Test 1



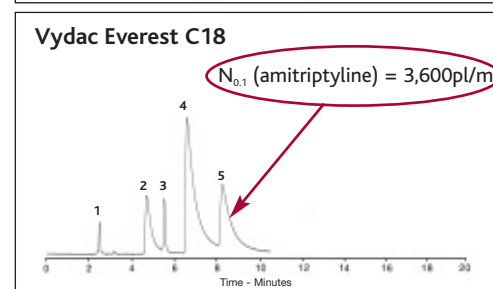
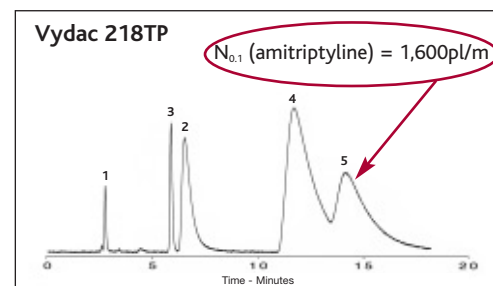
Sample: 1) Uracil 2) Pyridine 3) Phenol Mobile Phase: 60:40 MeOH/H₂O Flow Rate: 1.0 ml/min



Inertness Test 2



Sample: 1) Norephedrine 2) Nortriptyline 3) Toluene 3) Imipramine 4) Amitriptyline Mobile Phase: 65:35 MeOH/25mM KH₂PO₄ (pH 6.0) Flow Rate: 1.0 ml/min



300Å

Conclusion

Significant differences in efficiency, peak shape and selectivity are seen with these 300Å C18 bonded phases when analyzing basic molecules. These variations are caused by undesirable secondary silanol interactions, which can also result in poor column reproducibility.

Since most biomolecules are polar, and many are basic, these inertness tests can be used to accurately predict the best column for the analysis of biomolecules, where an ultra-inert column with low silanol activity is highly desirable.

ACE 300Å columns have been repeatedly shown to be the most inert columns available.

ACE 300Å HPLC Columns - Part Numbers

ACE 3µm Columns

ACE 3µm C18-300

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-211-0201	ACE-211-0301	ACE-211-3501	ACE-211-0501	ACE-211-7501	ACE-211-1001	ACE-211-1201	ACE-211-1501	-	ACE-211-0101GD ¹
2.1mm	ACE-211-0202	ACE-211-0302	ACE-211-3502	ACE-211-0502	ACE-211-7502	ACE-211-1002	ACE-211-1202	ACE-211-1502	-	ACE-211-0102GD ²
3.0mm	ACE-211-0203	ACE-211-0303	ACE-211-3503	ACE-211-0503	ACE-211-7503	ACE-211-1003	ACE-211-1203	ACE-211-1503	-	ACE-211-0103GD ³
4.0mm	-	-	ACE-211-3504	ACE-211-0504	ACE-211-7504	ACE-211-1004	ACE-211-1204	ACE-211-1504	-	ACE-211-0103GD ³
4.6mm	ACE-211-0246	ACE-211-0346	ACE-211-3546	ACE-211-0546	ACE-211-7546	ACE-211-1046	ACE-211-1246	ACE-211-1546	-	ACE-211-0103GD ³

ACE 3µm C8-300

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-212-0201	ACE-212-0301	ACE-212-3501	ACE-212-0501	ACE-212-7501	ACE-212-1001	ACE-212-1201	ACE-212-1501	-	ACE-212-0101GD ¹
2.1mm	ACE-212-0202	ACE-212-0302	ACE-212-3502	ACE-212-0502	ACE-212-7502	ACE-212-1002	ACE-212-1202	ACE-212-1502	-	ACE-212-0102GD ²
3.0mm	ACE-212-0203	ACE-212-0303	ACE-212-3503	ACE-212-0503	ACE-212-7503	ACE-212-1003	ACE-212-1203	ACE-212-1503	-	ACE-212-0103GD ³
4.0mm	-	-	ACE-212-3504	ACE-212-0504	ACE-212-7504	ACE-212-1004	ACE-212-1204	ACE-212-1504	-	ACE-212-0103GD ³
4.6mm	ACE-212-0246	ACE-212-0346	ACE-212-3546	ACE-212-0546	ACE-212-7546	ACE-212-1046	ACE-212-1246	ACE-212-1546	-	ACE-212-0103GD ³

ACE 3µm C4-300

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-213-0201	ACE-213-0301	ACE-213-3501	ACE-213-0501	ACE-213-7501	ACE-213-1001	ACE-213-1201	ACE-213-1501	-	ACE-213-0101GD ¹
2.1mm	ACE-213-0202	ACE-213-0302	ACE-213-3502	ACE-213-0502	ACE-213-7502	ACE-213-1002	ACE-213-1202	ACE-213-1502	-	ACE-213-0102GD ²
3.0mm	ACE-213-0203	ACE-213-0303	ACE-213-3503	ACE-213-0503	ACE-213-7503	ACE-213-1003	ACE-213-1203	ACE-213-1503	-	ACE-213-0103GD ³
4.0mm	-	-	ACE-213-3504	ACE-213-0504	ACE-213-7504	ACE-213-1004	ACE-213-1204	ACE-213-1504	-	ACE-213-0103GD ³
4.6mm	ACE-213-0246	ACE-213-0346	ACE-213-3546	ACE-213-0546	ACE-213-7546	ACE-213-1046	ACE-213-1246	ACE-213-1546	-	ACE-213-0103GD ³

ACE 3µm CN-300

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-214-0201	ACE-214-0301	ACE-214-3501	ACE-214-0501	ACE-214-7501	ACE-214-1001	ACE-214-1201	ACE-214-1501	-	ACE-214-0101GD ¹
2.1mm	ACE-214-0202	ACE-214-0302	ACE-214-3502	ACE-214-0502	ACE-214-7502	ACE-214-1002	ACE-214-1202	ACE-214-1502	-	ACE-214-0102GD ²
3.0mm	ACE-214-0203	ACE-214-0303	ACE-214-3503	ACE-214-0503	ACE-214-7503	ACE-214-1003	ACE-214-1203	ACE-214-1503	-	ACE-214-0103GD ³
4.0mm	-	-	ACE-214-3504	ACE-214-0504	ACE-214-7504	ACE-214-1004	ACE-214-1204	ACE-214-1504	-	ACE-214-0103GD ³
4.6mm	ACE-214-0246	ACE-214-0346	ACE-214-3546	ACE-214-0546	ACE-214-7546	ACE-214-1046	ACE-214-1246	ACE-214-1546	-	ACE-214-0103GD ³

ACE 3µm Phenyl-300

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-215-0201	ACE-215-0301	ACE-215-3501	ACE-215-0501	ACE-215-7501	ACE-215-1001	ACE-215-1201	ACE-215-1501	-	ACE-215-0101GD ¹
2.1mm	ACE-215-0202	ACE-215-0302	ACE-215-3502	ACE-215-0502	ACE-215-7502	ACE-215-1002	ACE-215-1202	ACE-215-1502	-	ACE-215-0102GD ²
3.0mm	ACE-215-0203	ACE-215-0303	ACE-215-3503	ACE-215-0503	ACE-215-7503	ACE-215-1003	ACE-215-1203	ACE-215-1503	-	ACE-215-0103GD ³
4.0mm	-	-	ACE-215-3504	ACE-215-0504	ACE-215-7504	ACE-215-1004	ACE-215-1204	ACE-215-1504	-	ACE-215-0103GD ³
4.6mm	ACE-215-0246	ACE-215-0346	ACE-215-3546	ACE-215-0546	ACE-215-7546	ACE-215-1046	ACE-215-1246	ACE-215-1546	-	ACE-215-0103GD ³

¹ 5 pack - use with cartridge holder H0001 and coupler C0001

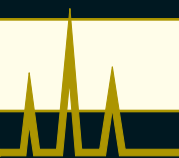
² 5 pack - use with integral microbore cartridge holder H0004

³ 5 pack - use with integral analytical cartridge holder H0005

ACE performance guarantee ✓

If ACE does not outperform the column you are currently using, simply contact us for a full refund and keep the ACE column FREE OF CHARGE.

ACE 300Å HPLC Columns - Part Numbers



ACE 5µm Columns

ACE 5µm C18-300

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-221-0201	ACE-221-0301	ACE-221-3501	ACE-221-0501	ACE-221-7501	ACE-221-1001	ACE-221-1201	ACE-221-1501	ACE-221-2501	ACE-221-0101GD ¹
2.1mm	ACE-221-0202	ACE-221-0302	ACE-221-3502	ACE-221-0502	ACE-221-7502	ACE-221-1002	ACE-221-1202	ACE-221-1502	ACE-221-2502	ACE-221-0102GD ²
3.0mm	ACE-221-0203	ACE-221-0303	ACE-221-3503	ACE-221-0503	ACE-221-7503	ACE-221-1003	ACE-221-1203	ACE-221-1503	ACE-221-2503	ACE-221-0103GD ³
4.0mm	-	-	ACE-221-3504	ACE-221-0504	ACE-221-7504	ACE-221-1004	ACE-221-1204	ACE-221-1504	ACE-221-2504	ACE-221-0103GD ³
4.6mm	ACE-221-0246	ACE-221-0346	ACE-221-3546	ACE-221-0546	ACE-221-7546	ACE-221-1046	ACE-221-1246	ACE-221-1546	ACE-221-2546	ACE-221-0103GD ³
7.75mm	-	-	-	ACE-221-0508	ACE-221-7508	ACE-221-1008	ACE-221-1208	ACE-221-1508	ACE-221-2508	ACE-221-0110GD ⁴
10.0mm	-	-	-	ACE-221-0510	ACE-221-7510	ACE-221-1010	ACE-221-1210	ACE-221-1510	ACE-221-2510	ACE-221-0110GD ⁴
21.2mm	-	-	-	ACE-221-0520	ACE-221-7520	ACE-221-1020	ACE-221-1220	ACE-221-1520	ACE-221-2520	ACE-221-0110GD ⁴
30.0mm	-	-	-	enquire	enquire	enquire	-	enquire	enquire	enquire

ACE 5µm C8-300

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-222-0201	ACE-222-0301	ACE-222-3501	ACE-222-0501	ACE-222-7501	ACE-222-1001	ACE-222-1201	ACE-222-1501	ACE-222-2501	ACE-222-0101GD ¹
2.1mm	ACE-222-0202	ACE-222-0302	ACE-222-3502	ACE-222-0502	ACE-222-7502	ACE-222-1002	ACE-222-1202	ACE-222-1502	ACE-222-2502	ACE-222-0102GD ²
3.0mm	ACE-222-0203	ACE-222-0303	ACE-222-3503	ACE-222-0503	ACE-222-7503	ACE-222-1003	ACE-222-1203	ACE-222-1503	ACE-222-2503	ACE-222-0103GD ³
4.0mm	-	-	ACE-222-3504	ACE-222-0504	ACE-222-7504	ACE-222-1004	ACE-222-1204	ACE-222-1504	ACE-222-2504	ACE-222-0103GD ³
4.6mm	ACE-222-0246	ACE-222-0346	ACE-222-3546	ACE-222-0546	ACE-222-7546	ACE-222-1046	ACE-222-1246	ACE-222-1546	ACE-222-2546	ACE-222-0103GD ³
7.75mm	-	-	-	ACE-222-0508	ACE-222-7508	ACE-222-1008	ACE-222-1208	ACE-222-1508	ACE-222-2508	ACE-222-0110GD ⁴
10.0mm	-	-	-	ACE-222-0510	ACE-222-7510	ACE-222-1010	ACE-222-1210	ACE-222-1510	ACE-222-2510	ACE-222-0110GD ⁴
21.2mm	-	-	-	ACE-222-0520	ACE-222-7520	ACE-222-1020	ACE-222-1220	ACE-222-1520	ACE-222-2520	ACE-222-0110GD ⁴
30.0mm	-	-	-	enquire	enquire	enquire	-	enquire	enquire	enquire

ACE 5µm C4-300

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-223-0201	ACE-223-0301	ACE-223-3501	ACE-223-0501	ACE-223-7501	ACE-223-1001	ACE-223-1201	ACE-223-1501	ACE-223-2501	ACE-223-0101GD ¹
2.1mm	ACE-223-0202	ACE-223-0302	ACE-223-3502	ACE-223-0502	ACE-223-7502	ACE-223-1002	ACE-223-1202	ACE-223-1502	ACE-223-2502	ACE-223-0102GD ²
3.0mm	ACE-223-0203	ACE-223-0303	ACE-223-3503	ACE-223-0503	ACE-223-7503	ACE-223-1003	ACE-223-1203	ACE-223-1503	ACE-223-2503	ACE-223-0103GD ³
4.0mm	-	-	ACE-223-3504	ACE-223-0504	ACE-223-7504	ACE-223-1004	ACE-223-1204	ACE-223-1504	ACE-223-2504	ACE-223-0103GD ³
4.6mm	ACE-223-0246	ACE-223-0346	ACE-223-3546	ACE-223-0546	ACE-223-7546	ACE-223-1046	ACE-223-1246	ACE-223-1546	ACE-223-2546	ACE-223-0103GD ³
7.75mm	-	-	-	ACE-223-0508	ACE-223-7508	ACE-223-1008	ACE-223-1208	ACE-223-1508	ACE-223-2508	ACE-223-0110GD ⁴
10.0mm	-	-	-	ACE-223-0510	ACE-223-7510	ACE-223-1010	ACE-223-1210	ACE-223-1510	ACE-223-2510	ACE-223-0110GD ⁴
21.2mm	-	-	-	ACE-223-0520	ACE-223-7520	ACE-223-1020	ACE-223-1220	ACE-223-1520	ACE-223-2520	ACE-223-0110GD ⁴
30.0mm	-	-	-	enquire	enquire	enquire	-	enquire	enquire	enquire

ACE 5µm CN-300

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-224-0201	ACE-224-0301	ACE-224-3501	ACE-224-0501	ACE-224-7501	ACE-224-1001	ACE-224-1201	ACE-224-1501	ACE-224-2501	ACE-224-0101GD ¹
2.1mm	ACE-224-0202	ACE-224-0302	ACE-224-3502	ACE-224-0502	ACE-224-7502	ACE-224-1002	ACE-224-1202	ACE-224-1502	ACE-224-2502	ACE-224-0102GD ²
3.0mm	ACE-224-0203	ACE-224-0303	ACE-224-3503	ACE-224-0503	ACE-224-7503	ACE-224-1003	ACE-224-1203	ACE-224-1503	ACE-224-2503	ACE-224-0103GD ³
4.0mm	-	-	ACE-224-3504	ACE-224-0504	ACE-224-7504	ACE-224-1004	ACE-224-1204	ACE-224-1504	ACE-224-2504	ACE-224-0103GD ³
4.6mm	ACE-224-0246	ACE-224-0346	ACE-224-3546	ACE-224-0546	ACE-224-7546	ACE-224-1046	ACE-224-1246	ACE-224-1546	ACE-224-2546	ACE-224-0103GD ³
7.75mm	-	-	-	ACE-224-0508	ACE-224-7508	ACE-224-1008	ACE-224-1208	ACE-224-1508	ACE-224-2508	ACE-224-0110GD ⁴
10.0mm	-	-	-	ACE-224-0510	ACE-224-7510	ACE-224-1010	ACE-224-1210	ACE-224-1510	ACE-224-2510	ACE-224-0110GD ⁴
21.2mm	-	-	-	ACE-224-0520	ACE-224-7520	ACE-224-1020	ACE-224-1220	ACE-224-1520	ACE-224-2520	ACE-224-0110GD ⁴
30.0mm	-	-	-	enquire	enquire	enquire	-	enquire	enquire	enquire

ACE 5µm Phenyl-300

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
1.0mm	ACE-225-0201	ACE-225-0301	ACE-225-3501	ACE-225-0501	ACE-225-7501	ACE-225-1001	ACE-225-1201	ACE-225-1501	ACE-225-2501	ACE-225-0101GD ¹
2.1mm	ACE-225-0202	ACE-225-0302	ACE-225-3502	ACE-225-0502	ACE-225-7502	ACE-225-1002	ACE-225-1202	ACE-225-1502	ACE-225-2502	ACE-225-0102GD ²
3.0mm	ACE-225-0203	ACE-225-0303	ACE-225-3503	ACE-225-0503	ACE-225-7503	ACE-225-1003	ACE-225-1203	ACE-225-1503	ACE-225-2503	ACE-225-0103GD ³
4.0mm	-	-	ACE-225-3504	ACE-225-0504	ACE-225-7504	ACE-225-1004	ACE-225-1204	ACE-225-1504	ACE-225-2504	ACE-225-0103GD ³
4.6mm	ACE-225-0246	ACE-225-0346	ACE-225-3546	ACE-225-0546	ACE-225-7546	ACE-225-1046	ACE-225-1246	ACE-225-1546	ACE-225-2546	ACE-225-0103GD ³
7.75mm	-	-	-	ACE-225-0508	ACE-225-7508	ACE-225-1008	ACE-225-1208	ACE-225-1508	ACE-225-2508	ACE-225-0110GD ⁴
10.0mm	-	-	-	ACE-225-0510	ACE-225-7510	ACE-225-1010	ACE-225-1210	ACE-225-1510	ACE-225-2510	ACE-225-0110GD ⁴
21.2mm	-	-	-	ACE-225-0520	ACE-225-7520	ACE-225-1020	ACE-225-1220	ACE-225-1520	ACE-225-2520	ACE-225-0110GD ⁴
30.0mm	-	-	-	enquire	enquire	enquire	-	enquire	enquire	enquire

¹ 5 pack - use with cartridge holder H0001 and coupler C0001

² 5 pack - use with integral microbore cartridge holder H0004

³ 5 pack - use with integral analytical cartridge holder H0005

⁴ 3 pack - use with semi-prep cartridge holder H0002 and column coupler C0001

300Å

ACE 300Å HPLC Columns - continued

ACE 10µm C18-300

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
4.6mm	ACE-231-0246	ACE-231-0346	ACE-231-3546	ACE-231-0546	ACE-231-7546	ACE-231-1046	ACE-231-1246	ACE-231-1546	ACE-231-2546	ACE-231-0103GD ³
7.75mm	-	-	-	ACE-231-0508	ACE-231-7508	ACE-231-1008	ACE-231-1208	ACE-231-1508	ACE-231-2508	ACE-231-0110GD ⁴
10.0mm	-	-	-	ACE-231-0510	ACE-231-7510	ACE-231-1010	ACE-231-1210	ACE-231-1510	ACE-231-2510	ACE-231-0110GD ⁴
21.2mm	-	-	-	ACE-231-0520	ACE-231-7520	ACE-231-1020	ACE-231-1220	ACE-231-1520	ACE-231-2520	ACE-231-0110GD ⁴
30.0mm	-	-	-	enquire	enquire	enquire	-	enquire	enquire	enquire

ACE 10µm C8-300

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
4.6mm	ACE-232-0246	ACE-232-0346	ACE-232-3546	ACE-232-0546	ACE-232-7546	ACE-232-1046	ACE-232-1246	ACE-232-1546	ACE-232-2546	ACE-232-0103GD ³
7.75mm	-	-	-	ACE-232-0508	ACE-232-7508	ACE-232-1008	ACE-232-1208	ACE-232-1508	ACE-232-2508	ACE-232-0110GD ⁴
10.0mm	-	-	-	ACE-232-0510	ACE-232-7510	ACE-232-1010	ACE-232-1210	ACE-232-1510	ACE-232-2510	ACE-232-0110GD ⁴
21.2mm	-	-	-	ACE-232-0520	ACE-232-7520	ACE-232-1020	ACE-232-1220	ACE-232-1520	ACE-232-2520	ACE-232-0110GD ⁴
30.0mm	-	-	-	enquire	enquire	enquire	-	enquire	enquire	enquire

ACE 10µm C4-300

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
4.6mm	ACE-233-0246	ACE-233-0346	ACE-233-3546	ACE-233-0546	ACE-233-7546	ACE-233-1046	ACE-233-1246	ACE-233-1546	ACE-233-2546	ACE-233-0103GD ³
7.75mm	-	-	-	ACE-233-0508	ACE-233-7508	ACE-233-1008	ACE-233-1208	ACE-233-1508	ACE-233-2508	ACE-233-0110GD ⁴
10.0mm	-	-	-	ACE-233-0510	ACE-233-7510	ACE-233-1010	ACE-233-1210	ACE-233-1510	ACE-233-2510	ACE-233-0110GD ⁴
21.2mm	-	-	-	ACE-233-0520	ACE-233-7520	ACE-233-1020	ACE-233-1220	ACE-233-1520	ACE-233-2520	ACE-233-0110GD ⁴
30.0mm	-	-	-	enquire	enquire	enquire	-	enquire	enquire	enquire

ACE 10µm CN-300

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
4.6mm	ACE-234-0246	ACE-234-0346	ACE-234-3546	ACE-234-0546	ACE-234-7546	ACE-234-1046	ACE-234-1246	ACE-234-1546	ACE-234-2546	ACE-234-0103GD ³
7.75mm	-	-	-	ACE-234-0508	ACE-234-7508	ACE-234-1008	ACE-234-1208	ACE-234-1508	ACE-234-2508	ACE-234-0110GD ⁴
10.0mm	-	-	-	ACE-234-0510	ACE-234-7510	ACE-234-1010	ACE-234-1210	ACE-234-1510	ACE-234-2510	ACE-234-0110GD ⁴
21.2mm	-	-	-	ACE-234-0520	ACE-234-7520	ACE-234-1020	ACE-234-1220	ACE-234-1520	ACE-234-2520	ACE-234-0110GD ⁴
30.0mm	-	-	-	enquire	enquire	enquire	-	enquire	enquire	enquire

ACE 10µm Phenyl-300

COLUMN DIAMETER	COLUMN LENGTH									GUARD CARTRIDGE
	20 mm	30 mm	35 mm	50 mm	75 mm	100 mm	125 mm	150 mm	250 mm	
4.6mm	ACE-235-0246	ACE-235-0346	ACE-235-3546	ACE-235-0546	ACE-235-7546	ACE-235-1046	ACE-235-1246	ACE-235-1546	ACE-235-2546	ACE-235-0103GD ³
7.75mm	-	-	-	ACE-235-0508	ACE-235-7508	ACE-235-1008	ACE-235-1208	ACE-235-1508	ACE-235-2508	ACE-235-0110GD ⁴
10.0mm	-	-	-	ACE-235-0510	ACE-235-7510	ACE-235-1010	ACE-235-1210	ACE-235-1510	ACE-235-2510	ACE-235-0110GD ⁴
21.2mm	-	-	-	ACE-235-0520	ACE-235-7520	ACE-235-1020	ACE-235-1220	ACE-235-1520	ACE-235-2520	ACE-235-0110GD ⁴
30.0mm	-	-	-	enquire	enquire	enquire	-	enquire	enquire	enquire

³ 5 pack - use with integral analytical cartridge holder H0005

⁴ 3 pack - use with semi-prep cartridge holder H0002 and column coupler C0001

ACE performance guarantee ✓

If ACE does not outperform the column you are currently using, simply contact us for a full refund and keep the ACE column FREE OF CHARGE.

Capillary and Nano Columns

- Capillary (500µm and 300µm) and nano (100µm and 75µm) dimensions
- Wide range of bonded phases available
- 100Å and 300Å pore sizes
- High efficiency, long lifetime and guaranteed reproducibility
- LC/MS and LC/MS/MS applications



Ultra Inert High Efficiency Columns

In addition to the extensive range of analytical (1.0-4.6mm i.d.) through to preparative (21.2-50mm i.d.) columns (see pages 14-17 and 24-26), ACE columns are now available in capillary (500µm and 300µm) and nano (100µm and 75µm) dimensions. ACE capillary and nano columns are available

with all ACE bonded phase chemistries in both 100Å and 300Å pore sizes. The same features that make ACE ultra-inert base deactivated columns the choice of method development chemists also make them the ideal choice for capillary and nano HPLC applications.

Improved Mass Limit of Detection

Capillary and nano HPLC is gaining acceptance for applications where limited sample amounts lead to problems in detection sensitivity. This is relevant in the areas of pharmacokinetics, trace analysis and in particular the expanding fields of bioanalytical and proteomic analysis. ACE capillary and nano columns are ideal for use with detectors requiring very low flow rates, such as electrospray LC-MS.

ACE capillary and nano HPLC columns offer high sensitivity due to their low dispersion characteristics. Table 27 shows the theoretical sensitivity increase of each i.d. column compared with a 4.6mm i.d. analytical column and 1mm i.d. microbore column. This increase in sensitivity can be important for accurate quantitation of sample limited applications.

For maximum performance, columns should be used with fully optimized HPLC systems (eg. minimize system dead volume using short lengths of <75µm connection tubing).

Table 27. Sensitivity Increase

COLUMN I.D. (mm)	TYPICAL FLOW RATE (µL/min)	THEORETICAL SENSITIVITY INCREASE ¹
4.6	1000	1
1.0	40	21
0.5	10	85
0.3	3	235
0.1	0.5	2100
0.075	0.3	3760

¹For same sample mass

Trace Enrichment/Guard Columns

Capillary HPLC guard columns (5mm x 300µm or 500µm i.d.) prolong the lifetime of the capillary column. They are also suitable for trace enrichment and column switching applications, particularly for concentration of low abundance analytes or desalting of biological samples. These short columns can be used to separate analyte from matrix prior to analysis with detectors such as ESI-MS, where baseline resolution is not required.

Column Availability

ACE capillary and nano columns are available with all bonded phase chemistries, 100Å or 300Å pore sizes and 3, 5 or 10µm particle sizes. When ordering, replace X with the appropriate material code (see page 48).

Example: 150mm x 300µm i.d. ACE 3 C18-300 column – Part Number = ACE-211-15003.

COLUMN DIAMETER		COLUMN LENGTH (mm)					GUARD COLUMN (1 pk)
µm	mm	30	50	100	150	250 ¹	
75	0.075	enquire	enquire	X-1000075	X-1500075	X-2500075	-
100	0.10	enquire	enquire	X-10001	X-15001	X-25001	-
300	0.30	X-03003	X-05003	X-10003	X-15003	X-25003	X-005003GD
500	0.50	X-03005	X-05005	X-10005	X-15005	X-25005	X-005005GD

¹250mm column length not available with 3µm particle size.

ACE LC/MS and Rapid Analysis Columns

- High performance – excellent peak shape for higher sensitivity
- Choice of 13 low bleed phases for complete optimization
- Ultra-inert silica enables MS compatible buffers to be used
- 20mm, 30mm, 35mm and 50mm column lengths
- 1.0, 2.1, 3.0, 4.0 and 4.6mm i.d.s

Nowhere is the need for a truly ultra-inert base deactivated HPLC column more important than in high-throughput analysis or LC/MS. Even subtle differences in silanol activity between columns can markedly affect the chromatography in the very short, fast columns typically used. In addition, any peak tailing due to silanol activity can have a profound effect on detection limits in high sensitivity assays.

ACE ultra-inert base deactivated HPLC columns virtually eliminate the negative effects of silanols in HPLC separations. This unequalled performance is now available in 20, 30, 35 and 50mm length columns, with diameters from 1.0 to 4.6mm i.d. The ACE columns are suitable for high throughput and LC/MS applications, and are the ideal choice for high volume screening assays used for drug analysis and combinatorial libraries where robust, reproducible columns are essential.



“ This is the most inert column we have tested. ”

Analytical Chemist, Industrial Chemical Company

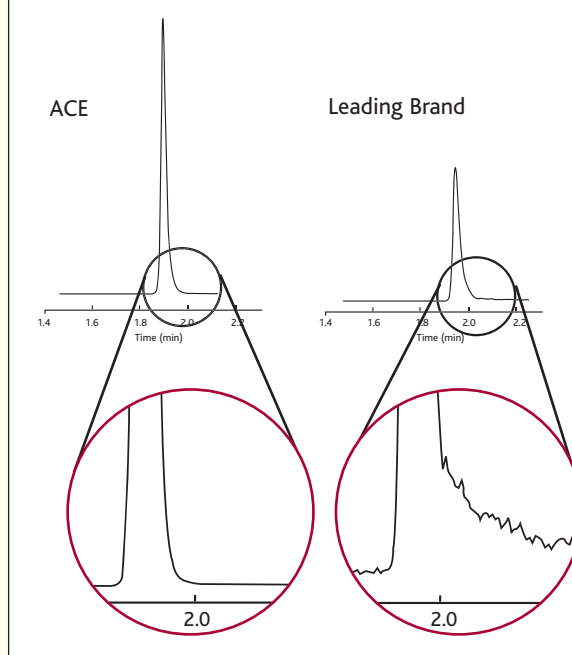
Maximum Resolution

ACE LC/MS columns, apart from being the most inert on the market, are also the most efficient, and are manufactured and validated to the same exacting standards as all ACE columns. Increased efficiency is an important benefit given the short columns typically used in LC/MS and rapid analysis applications.

In Figure 28, the top chromatograms show the LC/MS signal intensity obtained for equivalent injections on different brands of 30 x 4.6mm C8 columns. The lower chromatograms are an expanded scale, which show significant baseline tailing on the leading column brand, whereas the ACE column yields near perfect symmetry.

Such peak shape improvements may be typically seen when using high efficiency, ultra-inert columns such as ACE.

Figure 28 Effect of Peak Tailing on Signal Strength in LC/MS

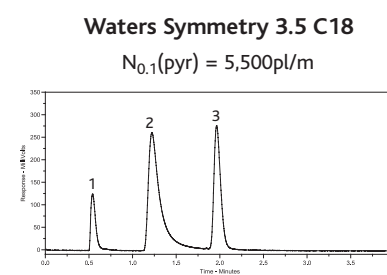
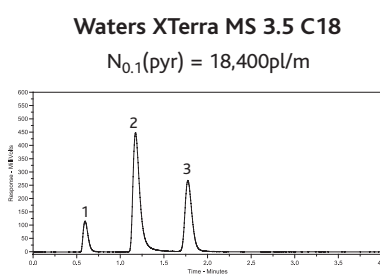
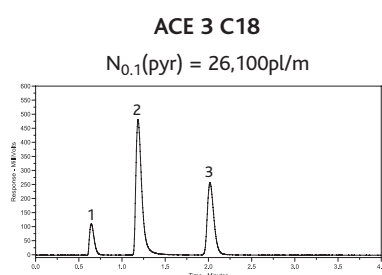
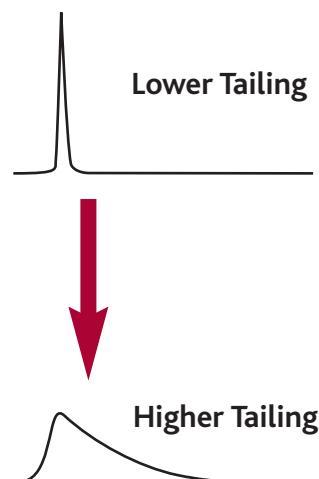
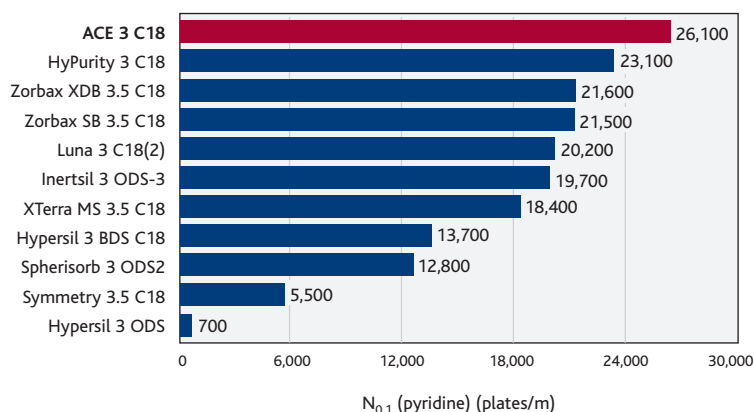


Comparison of Leading LC/MS 3µm Small Pore Columns

- Independently tested by Peter Levison Associates, UK

- Leading 3µm, small pore C18 column brands
- 50 x 2.1mm i.d. LC/MS compatible dimensions
- Basic molecule inertness test
- Peak efficiency and asymmetry investigation

Peak Efficiency Comparison



Column: 50 x 2.1mm i.d. Sample: 1) Uracil 2) Pyridine 3) Phenol Mobile Phase: 40:60 MeOH/H₂O Flow Rate: 0.20ml/min Temperature: 22°C Wavelength: 254nm

Conclusion:

Significant differences in efficiency, peak shape and selectivity are seen when analyzing pyridine - a small highly basic molecule.

Increased tailing and retention are indicative of undesirable secondary interactions between pyridine and silanol groups on the stationary phase surface. These interactions can also result in poor column reproducibility.

ACE LC/MS columns were independently tested and found to be the highest efficiency, most inert columns available.

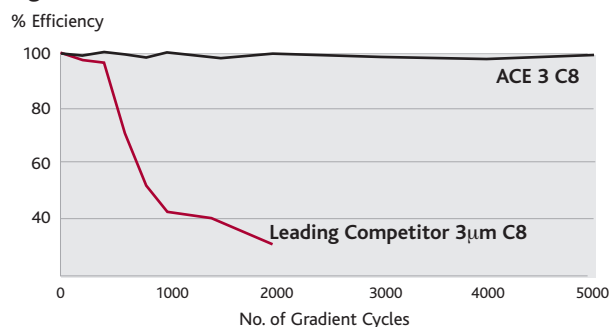


ACE® Stationary Phases Virtually Eliminate the Negative Effects of Silanols on HPLC Separations

Increased Column Robustness

The requirement for long lifetime columns is essential for high throughput analyses, where mid-run column failure must be avoided. The high flow, fast gradient conditions typically employed have been shown to cause premature column bed failure due to the rapid pressure and solvent miscibility changes within the column itself. ACE LC/MS and rapid analyses columns are manufactured by a unique process which results in increased column bed stability, thus increasing column lifetime. As shown in Figure 30a, ACE columns significantly outlast a leading competitor column when tested under generic fast gradient conditions.

Figure 30a. ACE Column Robustness



Column Dimensions: 50 x 3.0mm, 3µm C8, Flow Rate: 1.25ml/min
 Mobile Phase: A: 5:95 MeCN/10mM NH₄OAc, B: 95:5 MeCN/10mM NH₄OAc
 Gradient: T(mins) 0 2.25 2.50 3.00
 %A 0 100 0 0
 %B 100 0 0 100

LC/MS Buffer Compatibility

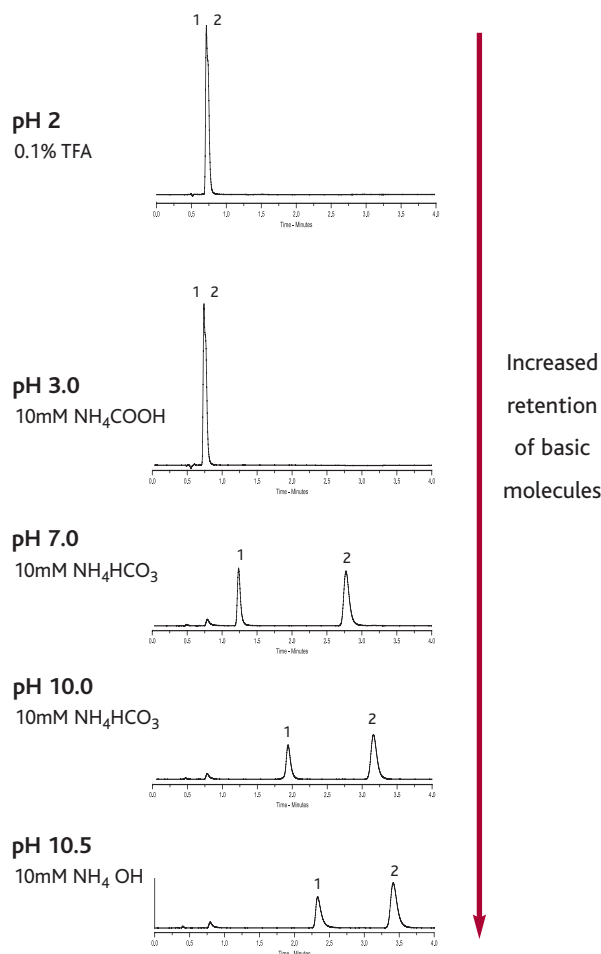
A number of independent studies (see pages 2, 3, 12, 13, 19, 23 and 29) have shown ACE columns to be the most inert on the market. This makes ACE the column of choice for LC/MS due to the extremely low requirement for buffer salts or modifiers to achieve good peak shape.

ACE columns have been demonstrated to be extremely robust at high and low pH (see pages 8 and 9). This broad pH operating range enables thorough optimization of pH and simplifies method development to a single column rather than selecting 3 different columns with low, intermediate and high pH stability.

For maximum LC/MS compatibility under acidic conditions organic acids such as formic, acetic and TFA are recommended. Under basic conditions ammonium bicarbonate, ammonium acetate and ammonium hydroxide buffers are recommended.

Figure 30b demonstrates the resolution obtained with 2 basic compounds at different mobile phase pHs on an ACE ultra-inert HPLC column.

Figure 30b. pH Investigation with LC/MS Buffers



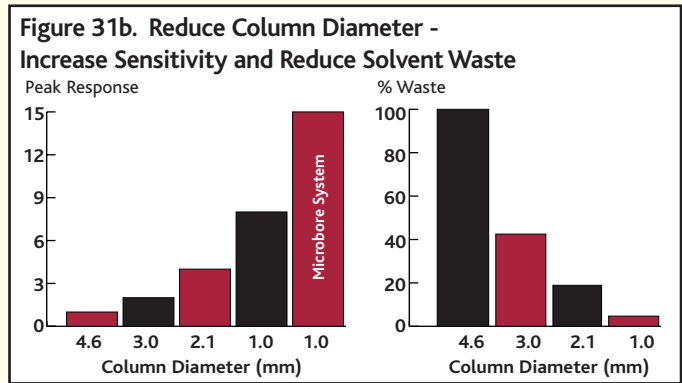
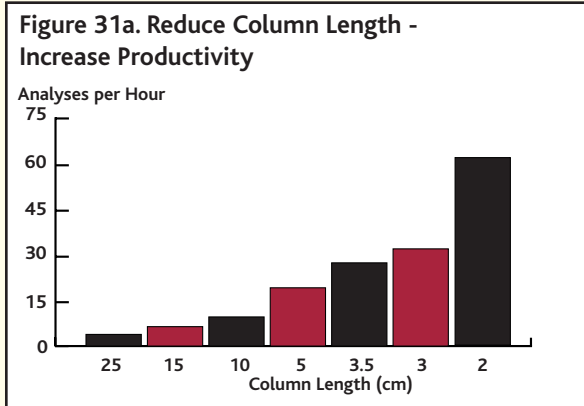
Column: ACE 3 C18, 50 x 2.1 mm i.d., Flow Rate: 0.20ml/min Mobile Phase: 80:20 MeOH/buffer, Temperature: 22°C Sample: 1) Nortriptyline 2) Amitriptyline, Wavelength: 215 nm

ACE HPLC columns have a broad pH operating range, allowing simplified method development on a single column.

Reduce Analysis Costs

- Reduce analysis time
- Increase sensitivity
- Reduce waste

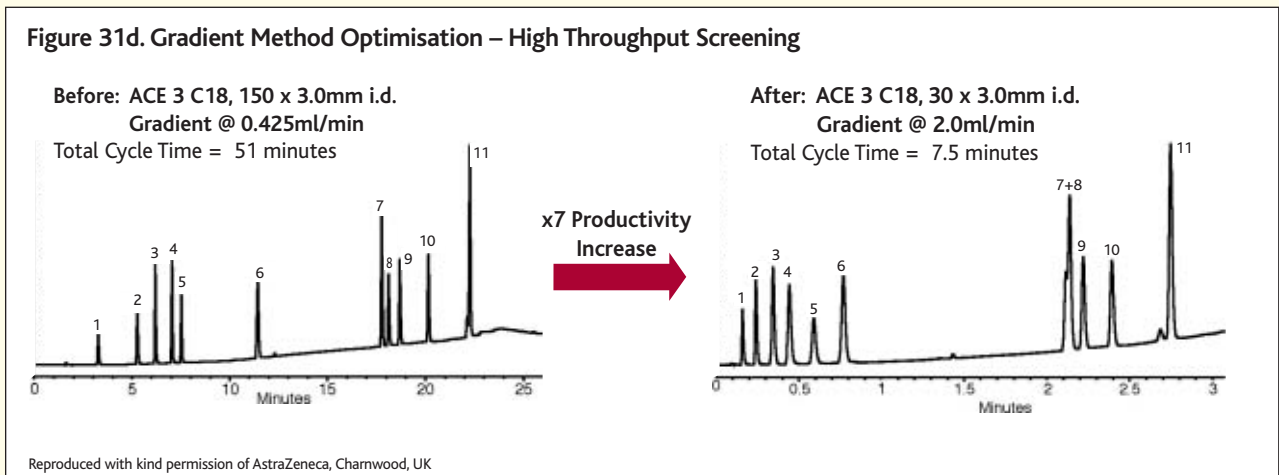
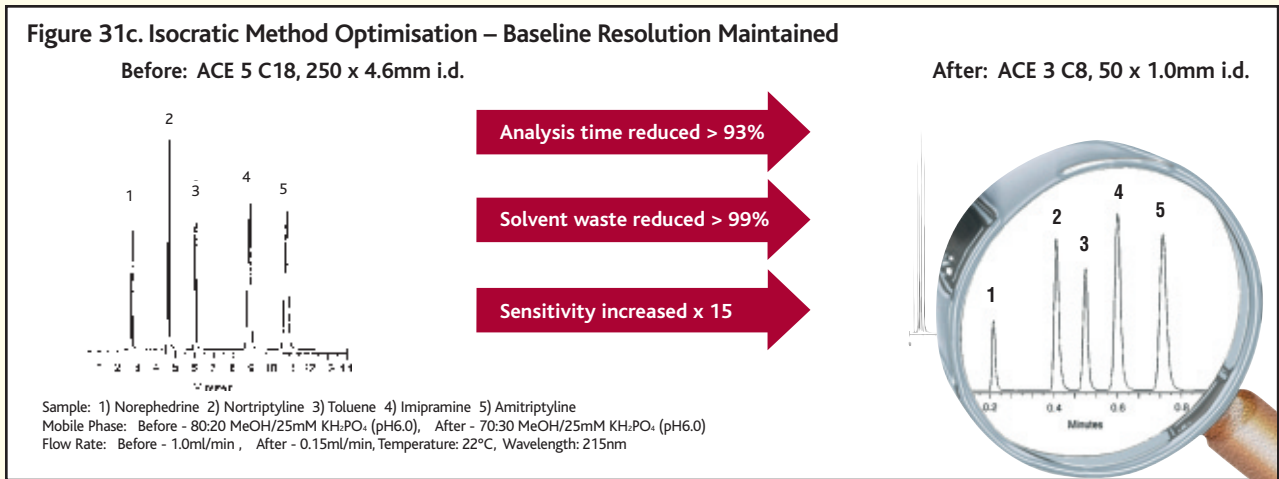
ACE LC/MS and Rapid Analysis columns are available in a wide range of lengths and internal diameters, to enable complete method optimization. Reduced column lengths are used to increase productivity (see Figure 31a) whereas reducing column diameter improves sensitivity and reduces solvent waste (Figure 31b).



Method Optimisation

As shown in Figures 31c and 31d, the optimum phase, column dimensions and evaluation conditions can be

selected to simultaneously optimize productivity, reduce waste and increase sensitivity, whilst still maintaining baseline resolution.



ACE Preparative HPLC Columns

- Ultra high purity base deactivated silica
- 5, 10 and 15µm particle sizes available
- Fully validated columns
- Exceptional reproducibility
- Excellent efficiencies
- High sample recovery
- Excellent column lifetime
- 100Å and 300Å pore sizes



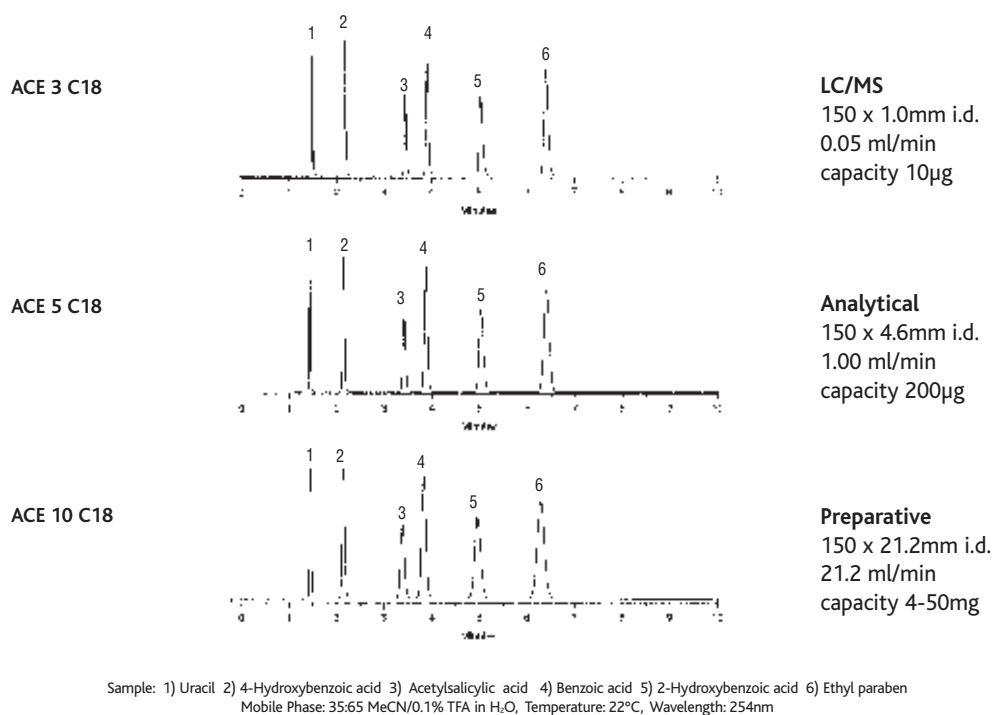
Achieve Reproducible High Performance Preparative Separations

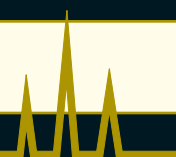
Chromatographers with experience in preparative HPLC know that resolution and loadability are of the utmost importance. The greater the resolution, the higher the sample load and the faster pure compound is obtained. The ability to optimize resolution at the preparative scale means starting with high performance separations at the analytical scale. The same features that make ACE ultra-inert base deactivated analytical columns the choice of method development chemists also make them the ideal choice for scale-up and process methods.

ACE preparative HPLC columns offer the following benefits:

- **Loadability** – high surface area and carbon load for maximum sample capacity
- **Selectivity** – available in 8 surface chemistries to optimize sample capacity
- **Rugged** – reliable, long-term performance
- **Guaranteed reproducibility** – complete column/batch validation as for ACE analytical columns
- **Guard cartridges** – available for maximum column protection

Figure 32. Reproducible Scale-Up with ACE C18 Columns





Select the Optimum Bonded Phase

ACE high performance preparative columns are available in 8 surface chemistries including AQ and C18-HL (Hi-Load),

making it possible to optimize your preparative resolution and in doing so, increase loadability. See Table 33a for specifications.

Get High Purity Product Fast

ACE preparative HPLC columns are available in a wide range of column dimensions and particle sizes (see pages 14-17 and 24-26) for complete optimization of preparative assays.

Table 33a. Specifications for ACE high performance preparative HPLC columns

For maximum loadability, 30mm or 50mm i.d. columns are recommended. Use a 50mm length 'combinatorial' column with a 5µm particle size to maximize the speed of your analysis. To maximize resolution, choose a 250mm length column with a 5µm particle size. See Table 33b for loading specifications.

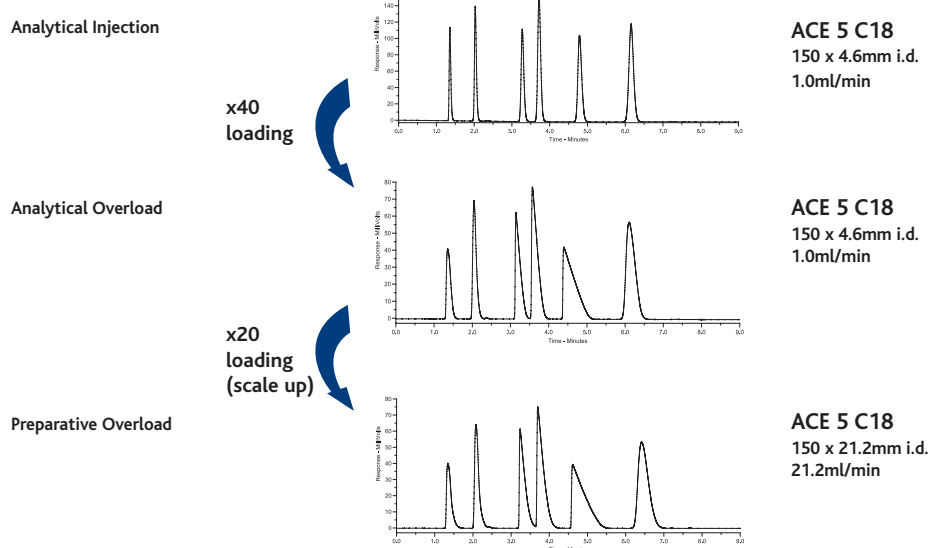
PHASE	PARTICLE SIZE (µm)	PORE SIZE (Å)	SURFACE AREA (m ² /g)	CARBON LOAD (%)
C18	5, 10	100	300	15.5
C8	5, 10	100	300	9.0
C4	5, 10	100	300	5.5
CN	5, 10	100	300	5.5
Ph	5, 10	100	300	9.5
AQ	5, 10	100	300	14.0
SIL	5, 10	100	300	-
C18-HL	5, 10, 15	90	400	20.0
C18-300	5, 10	300	100	9.0
C8-300	5, 10	300	100	5.0
C4-300	5, 10	300	100	2.6
CN-300	5, 10	300	100	2.6
Ph-300	5, 10	300	100	5.3

Figure 33c demonstrates a typical preparative method development strategy. Since ACE columns are shown to give reproducible scale-up and are available in the widest range of column dimensions, loading studies may be performed at an analytical level with complete confidence that this can be fully transferred to preparative scale columns.

Table 33b. Typical sample capacities (loadability) for 25cm length columns

COLUMN SIZE	COLUMN I.D. (mm)	RELATIVE FLOW RATE (ml/min)	WEIGHT OF PHASE (g)	TYPICAL INJECTION VOLUME	SAMPLE CAPACITY PER INJECTION	
					OPTIMUM	OVERLOAD
Analytical	4.6	1.0	2.5	10µl	2mg	85mg
Semi-Preparative	7.75	2.8	7	30µl	6mg	240mg
Semi-Preparative	10	4.7	12	50µl	10mg	400mg
Preparative	21.2	21	53	200µl	45mg	1.8g
Preparative	30	42.5	106	400µl	90mg	3.6g
Process	50	118	295	1200µl	250mg	10g
Process	100	473	1182	4800µl	1g	40g

Figure 33c. Scale-Up Strategy



Sample: 1) Uracil 2) 4-Hydroxybenzoic acid 3) Acetylsalicylic acid 4) Benzoic acid 5) 2-Hydroxybenzoic acid 6) Ethyl paraben
 Mobile Phase: 35:65 MeCN/0.1% TFA in H₂O, Temperature: 22°C, Wavelength: 254nm

ACE columns allow reproducible scale-up from analytical (middle chromatogram) to preparative dimensions (bottom chromatogram) without compromising resolution.

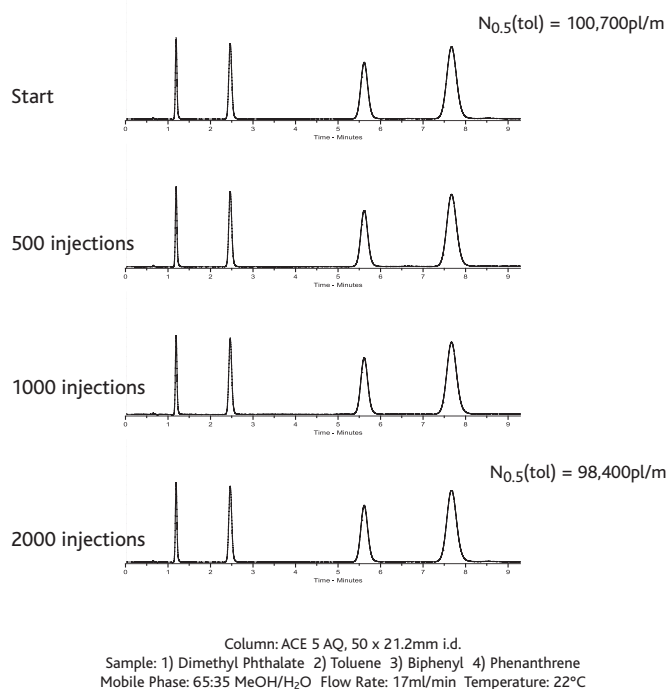
Increased Preparative Column Lifetimes

A fundamental requirement for successful preparative applications is a robust, rugged column. ACE materials have previously been shown to have excellent chemical stability under highly acidic (p.8) and highly basic (p. 9) conditions.

The high mechanical stability of the ultra-inert ACE silica and the unique preparative packing methods employed result in a high efficiency, extremely stable packed silica bed – leading to increased preparative column lifetimes.

Figure 34a demonstrates the excellent column performance maintained with a 50 x 21.2mm ACE 5 AQ column over an extended test period.

Figure 34a. ACE Preparative Column Robustness



Combinatorial Chemistry Columns

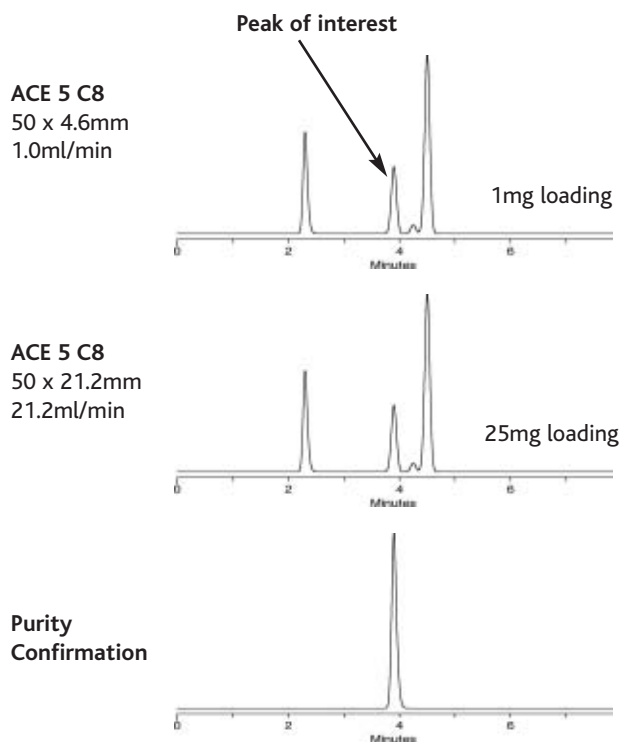
- High throughput preparative applications
- Identical scale-up from analytical columns
- Full range of ACE phases available
- High efficiency, long lifetime and guaranteed reproducibility

A combinatorial chemistry approach to novel drug synthesis is now widely used within the pharmaceutical industry. High throughput screening is performed at an analytical scale (typically 50 x 4.6mm columns), which is a requirement for easy one-step scale-up to preparative dimensions (typically 50 x 21.2mm columns). Figure 34b illustrates such a combinatorial chemistry approach.

ACE columns are offered in a wide range of dimensions (p. 14-17 and 24-26) for simple, reproducible scale-up.

A range of combinatorial chemistry column kits (containing matched preparative and analytical columns) are listed on page 38.

Figure 34b. Schematic Combinatorial Scale-Up and Isolation of an Active Molecule



The full range of ACE preparative columns is listed on pages 14-17 (100Å) and pages 24-26 (300Å).

Guard Cartridges

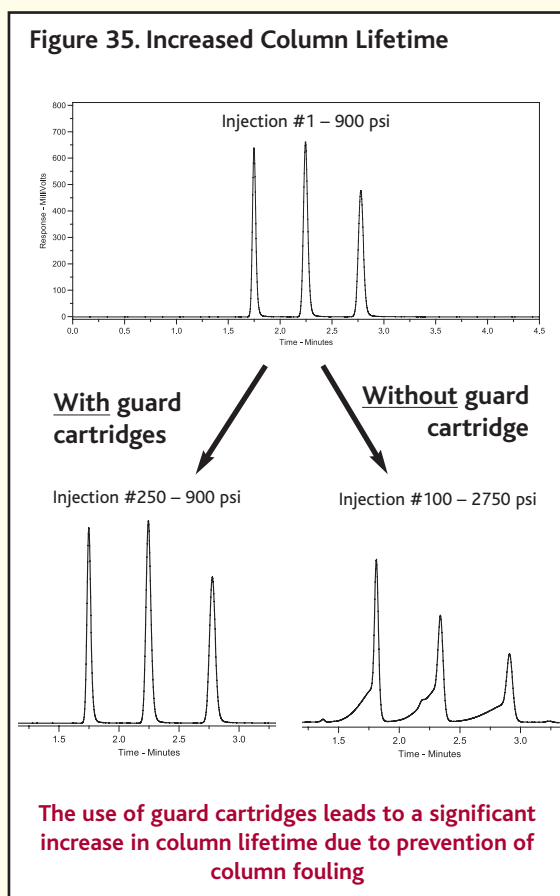
- Protection of columns from 1.0 to 50mm i.d.
- No loss in column performance or selectivity
- Significantly extends column lifetime
- Available in cost effective multipacks
- Available for all phases and dimensions

Use Guard Cartridges to Increase Column Lifetime

The use of a guard cartridge is recommended to protect the column from both frit blockage and irreversible sample adsorption. By placing a guard cartridge between column and injection valve, contaminants which would otherwise damage the column are trapped on the disposable cartridge. This procedure significantly extends column lifetime without affecting performance or selectivity (See figure 35).

Without column protection, column fouling leads to increased back pressure and peak splitting and/or severe peak tailing.

It is generally recommended that for effective column protection, guard cartridges should be replaced when the column back pressure increases by 10%, or column efficiency or resolution decreases by 10%.



Protection for 1.0mm to 50mm Diameter Columns

Guard cartridges are available for every ACE phase and column dimension to ensure maximum column protection for all applications. The table below indicates the pack size and confirms whether a connector between column and cartridge holder is required.

ACE analytical columns (2.1 to 4.6mm i.d.) are now available with an integral zero dead volume guard holder which also enables simple cartridge replacement (see photo right). Compared to conventional 'stand alone' designs, this zero dead volume holder provides improved system efficiency, especially with 2.1mm i.d. columns.

Part numbers for all ACE guard cartridges are listed on pages 14-17 and 24-26.



GUARDS

	COLUMN DIAMETER (mm)									
	1.0	2.1	3.0	4.0	4.6	7.75	10.0	21.2	30.0	50.8
Cartridge Pack Size	5	5	3			1				
Holder Required	H0001	H0004	H0005			H0002			H0006	
Coupler Required	C0001	-	-			C0001			C0002	

Method Development Kits

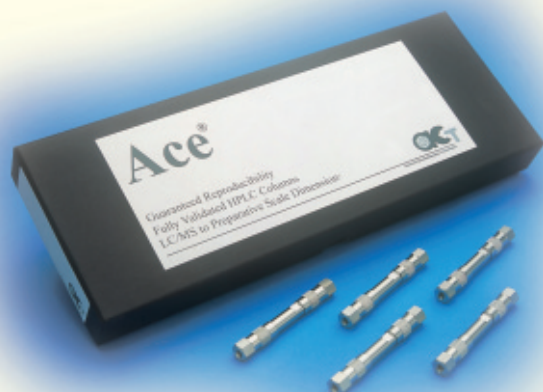
- Change selectivity to improve resolution
- Detect hidden impurities
- Rapid method development
- 3 or 5 column kits
- LC/MS cartridge screening kits

Method development kits enable the optimum bonded phase to be selected for a specific application. A more detailed discussion of each phase and suitable application areas is listed on pages 4 and 5.

The availability of a range of phases offering different selectivities enables resolution optimisation, improves the chances of impurity detection and increases the speed at which methods are developed. A selection of kits containing either five columns (complete method development kits and LC/MS method development kits) or three columns (selectivity kits) are offered.

Complete Method Development Kits

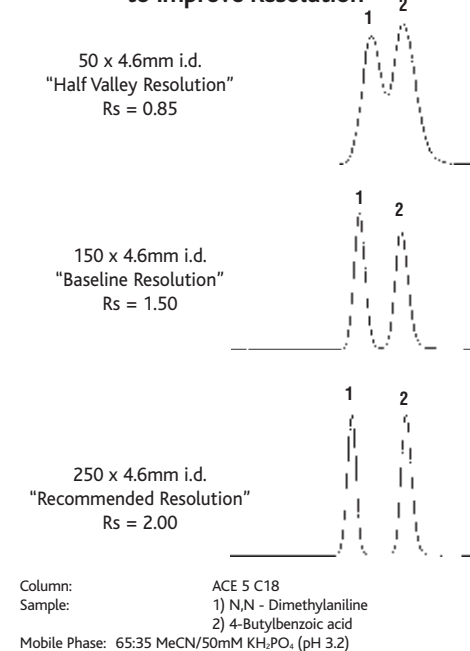
- Complete 5 column kit
- Contains C18, C8, C4, CN and Phenyl phases
- Extremely cost effective



Each kit contains five columns packed with C18, C8, C4, CN and Phenyl phases. Column lengths of 50, 150 and 250mm are routinely available with both 3 and 5µm particle sizes. Additional column dimensions are also available on request - please contact your local distributor for details.

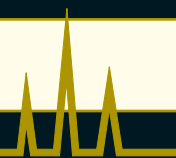
The use of 50mm length columns is particularly recommended for rapid method development applications. As shown by Figure 36, a 50mm column may be used to achieve partial resolution of the peaks of interest. Column length and/or particle size can then be optimised to improve resolution. Significant time savings usually result from such a method development strategy.

Figure 36. Optimisation of Column Length to Improve Resolution



COMPLETE METHOD DEVELOPMENT KITS	50 X 4.6mm	150 X 4.6mm	250 X 4.6mm
3µm Complete Method Development Kit (C18, C8, C4, CN & Ph phases)	ACE-MDK3-0546	ACE-MDK3-1546	-
5µm Complete Method Development Kit (C18, C8, C4, CN & Ph phases)	ACE-MDK5-0546	ACE-MDK5-1546	ACE-MDK5-2546

Additional column dimensions are available on request - please contact your local distributor for further information.



LC/MS Method Development Kits

- Complete 5 column kit
- C18, C8, C4, CN and Phenyl phases
- High performance LC/MS columns
- Full range of diameters and lengths available
- Ideal for rapid, economical multi-phase screening

LC/MS Method Development Kits enable rapid, economical multi-phase screening. Each kit contains 5 fully validated columns packed with C18, C8, C4, CN and phenyl phases. Columns are available in 20, 30, 35 and 50mm lengths with 4.6, 4.0, 3.0, 2.1 and 1.0mm internal diameters. Both 3 and 5µm particle sizes are available, with typical efficiencies equivalent to standard analytical columns. Examples of the most popular kits are listed below.

LC/MS METHOD DEVELOPMENT KITS	20 X 2.1mm	30 X 2.1mm	50 X 2.1mm
3µm LC/MS Method Development Kit (C18, C8, C4, CN, Ph phases)	ACE-MDK3-0202	ACE-MDK3-0302	ACE-MDK3-0502
5µm LC/MS Method Development Kit (C18, C8, C4, CN, Ph phases)	ACE-MDK5-0202	ACE-MDK5-0302	ACE-MDK5-0502

LC/MS Method Development Kits are also available in 1.0, 3.0, 4.0 and 4.6mm internal diameters – please contact your distributor for further information.

Selectivity Kits

- 3 column kits
- Hydrophobicity Kit (C18, C8 and C4 columns)
- Polarity Kit (C18, CN and Phenyl columns)
- C18 Kit (C18, C18-HL and C18-300 columns)

Selectivity kits are recommended when complete 5 column kits are not required, and are available in 50, 150 and 250mm column lengths with 3 and 5µm particle sizes. Three types of selectivity kit are offered; Hydrophobic Selectivity Kits contain C18, C8 and C4 columns, Polar Selectivity Kits contain C18, CN and Phenyl columns and C18 Selectivity Kits contain C18, C18-HL and C18-300 columns.



HYDROPHOBIC SELECTIVITY KITS	50 X 4.6mm	150 X 4.6mm	250 X 4.6mm
3µm Hydrophobic Selectivity Kit (C18, C8 and C4 phases)	ACE-HSK3-0546	ACE-HSK3-1546	-
5µm Hydrophobic Selectivity Kit (C18, C8 and C4 phases)	ACE-HSK5-0546	ACE-HSK5-1546	ACE-HSK5-2546

POLAR SELECTIVITY KITS	50 X 4.6mm	150 X 4.6mm	250 X 4.6mm
3µm Polar Selectivity Kit (C18, CN and phenyl phases)	ACE-PSK3-0546	ACE-PSK3-1546	-
5µm Polar Selectivity Kit (C18, CN and phenyl phases)	ACE-PSK5-0546	ACE-PSK5-1546	ACE-PSK5-2546

C18 SELECTIVITY KITS	50 X 4.6mm	150 X 4.6mm	250 X 4.6mm
3µm C18 Selectivity Kit (C18, C18-HL and C18-300 phases)	ACE-CSK3-0546	ACE-CSK3-1546	-
5µm C18 Selectivity Kit (C18, C18-HL and C18-300 phases)	ACE-CSK5-0546	ACE-CSK5-1546	ACE-CSK5-2546

Additional column dimensions are available on request - please contact your local distributor for further information.

Method Validation Kits

- Guaranteed assay reproducibility
- Ensure long term compliance
- Rapid method validation
- Available for any ACE column

ACE phases are widely recognized to offer outstanding reproducibility. To aid method validation, a convenient kit containing three columns of the same bonded phase and dimensions, packed with three different batches of silica is available.

This enables the chromatographer to rapidly confirm separation reproducibility. Method Validation Kits are available for all phases and column dimensions. Examples of the most popular kits are listed below.



METHOD VALIDATION KITS	50 X 4.6mm	150 X 4.6mm	250 X 4.6mm
3µm Method Validation Kit (three different batches of the same phase)	X-0546-MVK	X-1546-MVK	-
5µm Method Validation Kit (three different batches of the same phase)	X-0546-MVK	X-1546-MVK	X-2546-MVK

When ordering, replace X with the appropriate material code (see page 48).

Example: 250 x 4.6mm i.d. ACE 5 C18 Method Validation Kit - Part Number = ACE-121-2546-MVK

Method Validation Kits are available for all phases and column dimensions - please contact your local distributor for further information.

Combinatorial Chemistry Column Kits

- Matched analytical and preparative columns
- Simple, reproducible scale-up
- High sample throughput

A combinatorial chemistry approach to novel drug synthesis is now widely used within the pharmaceutical industry. In addition to the range of columns listed on pages 14-17 and 24-26, combinatorial chemistry column kits are offered containing a pair of analytical and preparative columns.

Both columns are manufactured from the same batch of silica to guarantee precise, reproducible scale-up from analytical to preparative conditions. All phases are available in both 5 or 10µm particle sizes. Examples of the most popular kits are listed below - additional dimensions are also available on request. Further details about ACE preparative columns are listed on pages 32-34.

KITS



COMBINATION CHEMISTRY COLUMN KITS	50 X 7.75mm & 50 X 4.6mm	50 X 10.0mm & 50 X 4.6mm	50 X 21.2mm & 50 X 4.6mm
Combinatorial Chemistry Column Kit (contains 2 columns)	X-0508-CCK	X-0510-CCK	X-0520-CCK

When ordering, replace X with the appropriate material code (see page 48). Example: Combinatorial Chemistry Column Kit containing 50 x 4.6mm i.d. & 50 x 21.2mm i.d. ACE 5 C18 columns - Part Number = ACE-121-0520-CCK

Combinatorial Chemistry Column Kits are available for all phases and column dimensions - please contact your local distributor for further information.

Custom Packed Columns

In addition to the wide range of ACE column dimensions previously listed, we also routinely manufacture columns of unique dimensions which are required for a particular application.

Additional column hardware geometries (including bio-inert PEEK) are also available on request. Please contact your local distributor for further details about our custom packing service.



Batch Reservation Service (Free)

ACE materials are recognised to offer outstanding reproducibility and have the most stringent batch specifications of any chromatographic silica.

However, for particularly challenging applications we also offer a free batch reservation service which completely eliminates batch related reproducibility concerns. Based on your projected column usage, we will reserve the quantity of silica you need and pack columns as and when they are required.

Please contact your local distributor for further details about our free batch reservation service.

Applications Service (Free)

As an initial step in method development or improvement, we invite you to request a search on our applications database, which contains over 25,000 analytes separated on a wide range of column materials. Searches can be performed for an individual compound, mixture of components or a specific column. This proves useful in aiding selection of a suitable column for a particular analysis or in identifying alternate columns for a given assay.

Our technical staff are able to discuss and recommend separation strategies for customers using the applications database, and if appropriate develop and optimise the most suitable HPLC method for you. Please contact your local distributor for further details about our free applications service.

A brief summary of some of our most commonly requested applications is listed on pages 40-47.

Warranty

ACE products are warranted to be free from defects in materials or workmanship. Advanced Chromatography Technologies will promptly replace any defective goods unless such defects are attributed to customer abuse, misuse or neglect. Please contact your local distributor or Advanced Chromatography Technologies for further information.

By Application Type

	Page
Angiotensins	41
Antihistamines and Expectorants.....	41
Avenacins	41
Beta Blockers.....	41
Cold Medicine Components	42
Cyclosporin Mixture.....	42
Hippuric Acid.....	42
Insulins	42
Local Anaesthetics	43
Maleic and Fumaric Acids.....	43
Nitroanilines	43
Organic Acids	43
Organotin Compounds	44
Peptide Test Mix	44

By Compound

4-Butylbenzoic acid	45
2-Methylhippuric acid	42
Acetaminophen	42
Acetylsalicylic acid (aspirin)	42, 43
p-Aminobenzoic acid.....	47
Amitriptyline.....	46
Angiotensin I.....	41
Angiotensin II	41, 44
Angiotensin III.....	41
Apomyoglobin	45
L-Ascorbic acid (vitamin C)	42, 43, 47
Aspirin (acetylsalicylic acid).....	42, 43
Avenacin A-1	41
Avenacin A-2	41
Avenacin B-1	41
Avenacin B-2	41
Benzoic acid.....	43, 45
d-Biotin (vitamin H).....	47
Cadaverine	44
Caffeine.....	42
Chlorpheniramine maleate	41
Cocaine	43
Cyanocobalamin (vitamin B12).....	47
Cyclosporins	42
Cytochrome C	45
Dextromethorphan.....	41
Dibutyltin	44
N,N-Dimethylaniline	45
Dimethyl phthalate	45
Ethenzamide	42
Ethyl paraben	45
Folic acid (vitamin M)	47
Fumaric acid	43
Gly-Tyr.....	44
Guaiacol	41
Guaiifenesin	41
Hippuric acid.....	42
Holo-transferrin.....	45
p-Hydroxybenzoic acid	45
Imipramine	46
Insulin (bovine)	42
Insulin (human).....	42
Insulin (porcine).....	42
Isopilocarpine	44
Lignocaine	43
Maleic acid	41, 43
Methyl paraben	45
Metoprolol.....	41
Neurotensin	44

Page

Pilocarpine	44
Polyamines.....	44
Polyethylene Glycol 1000	45
Preservatives	45
Protein Test Mix.....	45
Selectivity Test Mix.....	45
Tricyclic Antidepressants	46
Trifluralin.....	46
Tryptic Digest of BSA.....	46
Vitamins – Fat Soluble	46
Vitamins – Water Soluble (isocratic).....	47
Vitamins – Water Soluble (gradient).....	47
Vitamins – Water Soluble (isocratic).....	47
Vitamins – Water Soluble (gradient).....	47

Niacinamide	47
Nicotinic acid	47
m-Nitroaniline	43
o-Nitroaniline	43
p-Nitroaniline	43
Norephedrine	41, 46
Nortriptyline	46
Oxprenolol.....	41
Oxytocin.....	44
Pantothenic acid	47
Phenol	45
Phthalic acid	45
Pilocarpine	44
Pindolol.....	41
Polyethylene glycol (PEG) 1000	45
Procaine	43
Propranolol	41
Propyl paraben	45
Putrescine.....	44
Pyridine.....	45
Pyridoxal	47
Pyridoxamine	47
Pyridoxine	47
Riboflavin (vitamin B2).....	47
Ribonuclease A	45
Salicylamide	41
Salicylic acid	43
Sorbic acid	45
Thiamine (vitamin B1)	47
Thioctic acid	47
Toluene	45, 46
Tributyltin.....	44
Trifluralin.....	46
Uracil	45
Vitamin A	46
Vitamin A acetate.....	46
Vitamin B1 (thiamine)	47
Vitamin B2 (riboflavin)	47
Vitamin B5 (pantothenic acid)	47
Vitamin B12 (cyanocobalamin).....	47
Vitamin C (ascorbic acid)	42, 43, 47
Vitamin D2	46
Vitamin D3	46
Vitamin E	46
Vitamin E acetate	46
Vitamin H (d-biotin)	47
Vitamin K1.....	46
Vitamin K3.....	46
Vitamin M (folic acid)	47

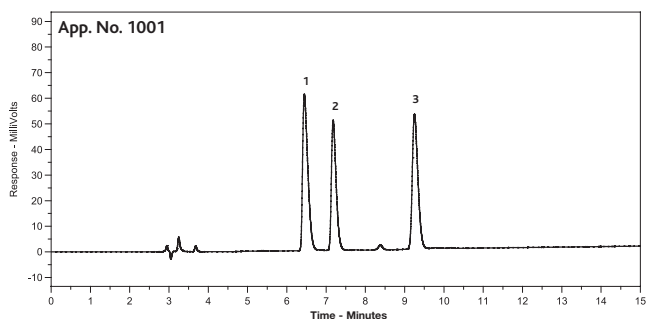
Angiotensins

Conditions

Column: ACE 5 C18-300, 250 x 4.6mm
 Part Number: ACE-221-2546
 Mobile Phase: A. 0.1% TFA in H₂O
 B. 80:20 MeCN/0.1% TFA in H₂O
 Flow Rate: 1.0ml/min
 Gradient: T (mins) %A %B
 0 75 25
 15 60 40
 Temperature: Ambient
 Detection: UV, 215nm

Compounds

1. Angiotensin II
2. Angiotensin III
3. Angiotensin I



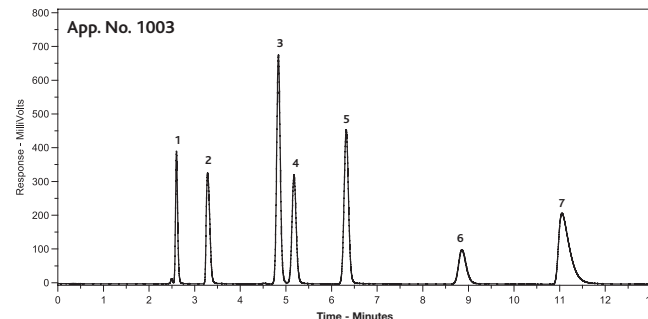
Antihistamines and Expectorants

Conditions

Column: ACE 5 C18, 250 x 4.6mm
 Part Number: ACE-121-2546
 Mobile Phase: 50:50 MeOH/50mM KH₂PO₄ (pH 3.0)
 Flow Rate: 1.0ml/min
 Temperature: 22°C
 Detection: UV, 220nm

Compounds

1. Maleic acid
2. Norephedrine
3. Salicylamide
4. Guaifenesin
5. Guaiacol
6. Chlorpheniramine maleate
7. Dextromethorphan



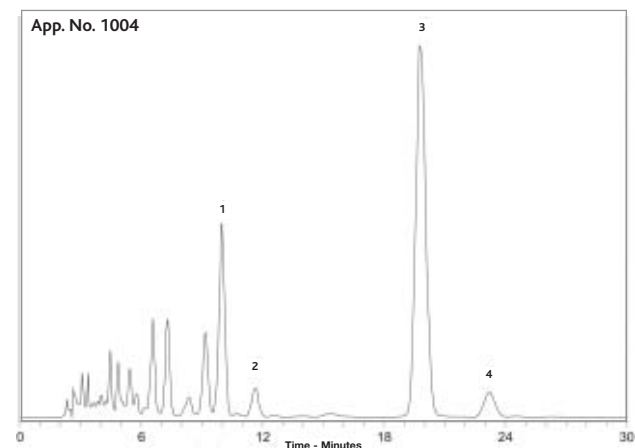
Avenacins

Conditions

Column: ACE 5 C18, 250 x 4.6mm
 Part Number: ACE-121-2546
 Mobile Phase: 70:30 MeOH/H₂O
 Flow Rate: 1.0ml/min
 Temperature: Ambient
 Detection: UV, 225nm
 Sample: Partially purified extract from oat root

Compounds

1. Avenacin A-2
2. Avenacin B-2
3. Avenacin A-1
4. Avenacin B-1



Reproduced with kind permission of Sainsbury Laboratory, John Innes Centre, UK

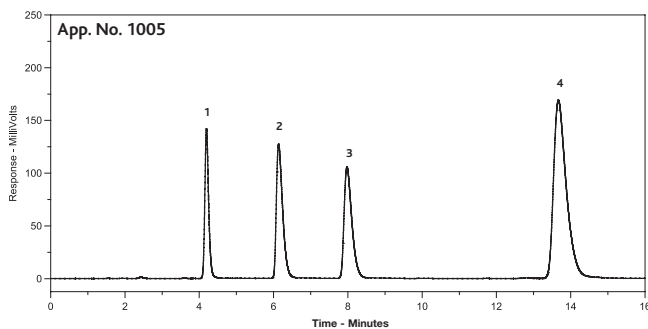
Beta Blockers

Conditions

Column: ACE 5 C18, 250 x 4.6mm
 Part Number: ACE-121-2546
 Mobile Phase: 65:35 MeOH/50mM 1-methylpiperidine (pH 11)
 Flow Rate: 1.0ml/min
 Temperature: Ambient
 Detection: UV, 215nm

Compounds

1. Pindolol
2. Metoprolol
3. Oxprenolol
4. Propranolol



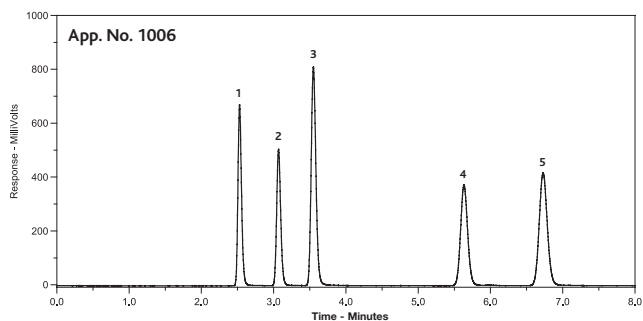
Cold Medicine Components

Conditions

Column: ACE 5 C18, 250 x 4.6mm
 Part Number: ACE-121-2546
 Mobile Phase: 50:50 MeOH/50mM KH₂PO₄ (pH 3.0)
 Flow Rate: 1.0ml/min
 Temperature: 22°C
 Detection: UV, 220nm

Compounds

1. Vitamin C
2. Acetaminophen
3. Caffeine
4. Aspirin
5. Ethenzamide



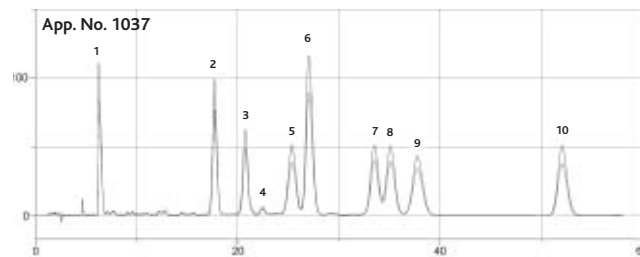
Cyclosporin Mixture

Conditions

Column: ACE 5 C18, 250 x 3.0mm
 Part Number: ACE-121-2503
 Mobile Phase: 46:51:3:0.1 H₂O/MeCN/MTBE/H₃PO₄
 Flow Rate: 0.8ml/min
 Temperature: 80°C
 Detection: UV, 210nm

Compounds

1. Isocyclosporin A
2. Cyclosporin C
3. Cyclosporin B
4. Cyclosporin L
5. Cyclosporin U
6. Cyclosporin A
7. Dihydrocyclosporin A
8. Cyclosporin G
9. Cyclosporin D
10. Cyclosporin E



Reproduced with kind permission of Camurus AB, Lund, Sweden

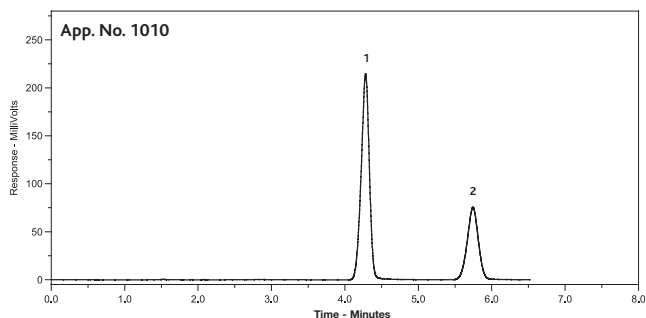
Hippuric Acid

Conditions

Column: ACE 5 C18, 150 x 4.6mm
 Part Number: ACE-121-1546
 Mobile Phase: 85:15 10mM KH₂PO₄ (pH 3.5)/MeCN
 Flow Rate: 1.0ml/min
 Temperature: Ambient
 Detection: UV, 254nm

Compounds

1. Hippuric acid
2. 2-Methylhippuric acid



Insulins

Conditions

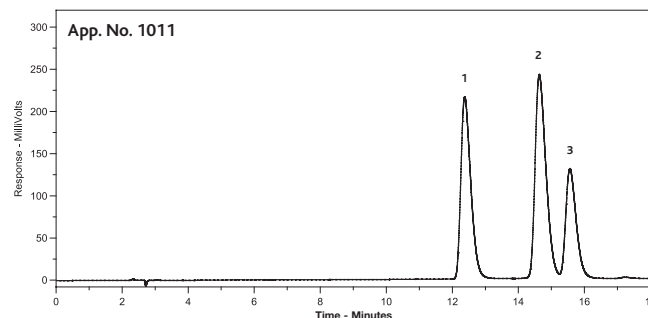
Column: ACE 5 C18, 250 x 4.6mm
 Part Number: ACE-121-2546
 Mobile Phase: A. 29:71 MeCN/H₂O + 0.1% TFA
 B. 32:68 MeCN/H₂O + 0.1% TFA
 Flow Rate: 1.0ml/min
 Gradient:

T(mins)	%A	%B
0	90	10
16	10	90

 Temperature: Ambient
 Detection: UV, 215nm

Compounds

1. Bovine insulin
2. Human insulin
3. Porcine insulin



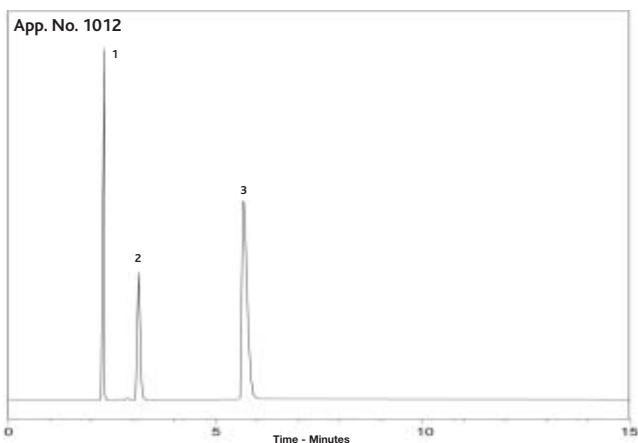
Local Anaesthetics

Conditions

Column: ACE 5 AQ, 250 x 4.6mm
 Part Number: ACE-126-2546
 Mobile Phase: 21:79:0.1 MeCN/H₂O/2.5M H₂SO₄
 Flow Rate: 1.5 ml/min
 Detection: UV

Compounds

1. Procaine
 2. Lignocaine
 3. Cocaine



Reproduced with kind permission of Forensic Science Laboratories, Lothian and Borders Police, UK

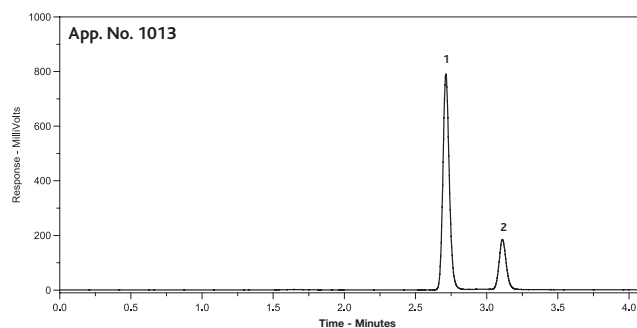
Maleic and Fumaric Acids

Conditions

Column: ACE 5 AQ, 250 x 4.6mm
 Part Number: ACE-126-2546
 Mobile Phase: 50mM KH₂PO₄(pH 7.0)
 Flow Rate: 1.0ml/min
 Temperature: Ambient
 Detection: UV, 210nm

Compounds

1. Fumaric acid
 2. Maleic acid



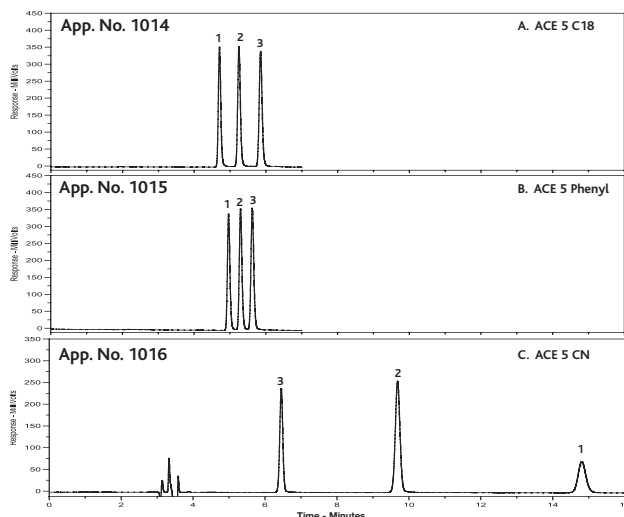
Nitroanilines

Conditions

Columns: A. ACE 5 C18, B. ACE 5 Phenyl,
 C. ACE 5 CN
 Column Dimensions: 250 x 4.6mm
 Mobile Phase:
 Columns A & B: 50:50 MeCN/50mM K₂HPO₄ (pH 3.15)
 Column C: 90:10 Heptane/EtOAc
 Flow Rate: 1.0ml/min
 Temperature: Ambient
 Detection: UV, 254nm

Compounds

1. p-Nitroaniline
 2. m-Nitroaniline
 3. o-Nitroaniline



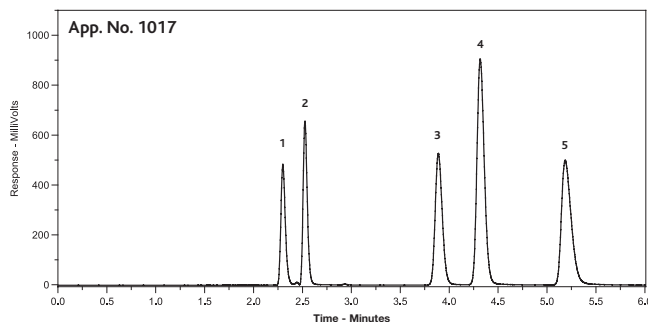
Organic Acids

Conditions

Column: ACE 5 C18, 250 x 4.6mm
 Part Number: ACE-121-2546
 Mobile Phase: 30:70 MeOH/50mM
 KH₂PO₄ (pH 5.7)
 Flow Rate: 1.0ml/min
 Temperature: 22°C
 Detection: UV, 220nm

Compounds

1. L-Ascorbic acid
 2. Maleic acid
 3. Acetylsalicylic acid
 4. Benzoic acid
 5. Salicylic acid



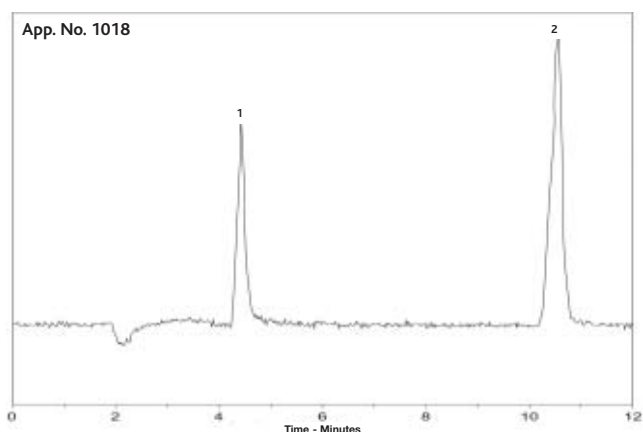
Organotin Compounds

Conditions

Column: ACE 3 C18, 150 x 2.1mm
 Part Number: ACE-111-1502
 Mobile Phase: 65:23:12:0.05
 MeCN/H₂O/CH₃CO₂H/TEA
 Flow Rate: 0.2ml/min
 Detection: ICP-MS

Compounds

1. Dibutyltin
 2. Tributyltin



Reproduced with kind permission of LGC Ltd., Middlesex, UK

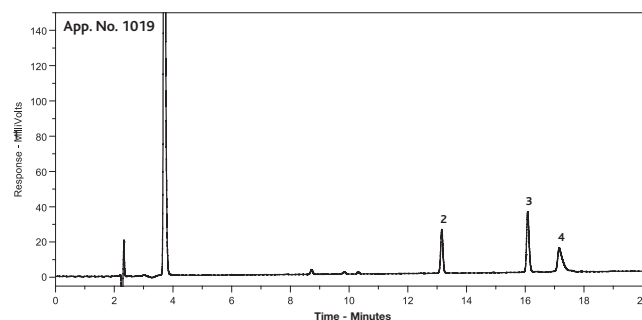
Peptide Test Mix

Conditions

Column: ACE 5 C18-300, 250 x 4.6mm
 Part Number: ACE-221-2546
 Mobile Phase: A. 0.1% TFA in H₂O
 B. 0.1% TFA in MeCN
 Flow Rate: 1.0ml/min
 Gradient: T(mins) %A %B
 0 90 10
 25 60 40
 Temperature: Ambient
 Detection: UV, 220nm

Compounds

1. Gly-Tyr
 2. Oxytocin
 3. Angiotensin II
 4. Neurotensin



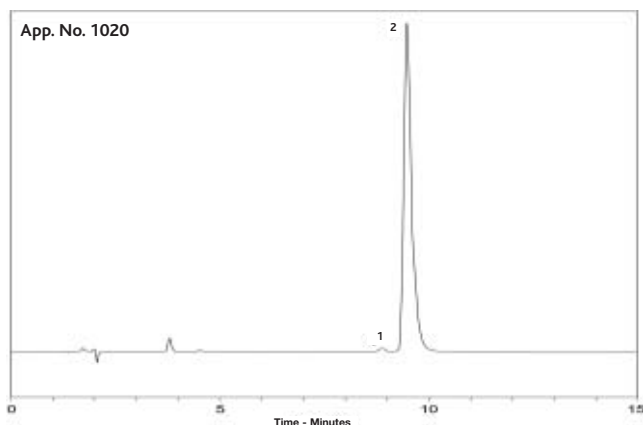
Pilocarpine

Conditions

Column: ACE 5 C18, 150 x 4.6mm
 Part Number: ACE-121-1546
 Mobile Phase: 15:85 MeCN/2mM
 tetrabutylammonium
 dihydrogen phosphate
 Flow Rate: 1.0ml/min
 Detection: UV, 254nm

Compounds

1. Isopilocarpine
 2. Pilocarpine



Reproduced with kind permission of Controlled Therapeutics, Scotland, UK

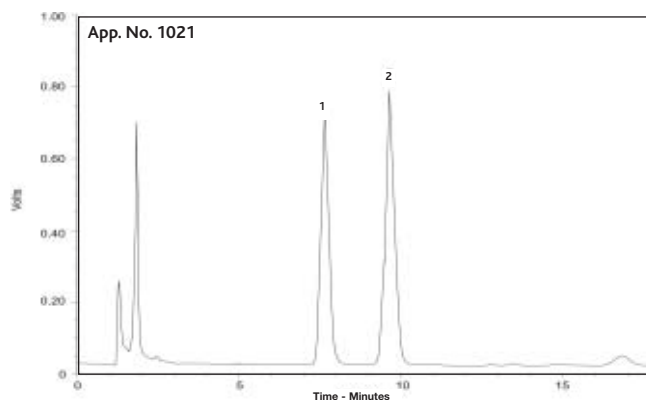
Polyamines

Conditions

Column: ACE 5 C18, 150 x 4.6mm
 Part Number: ACE-121-1546
 Mobile Phase: 90:10 MeOH/TRIS buffer
 (pH 7.0)
 Flow Rate: 1.2ml/min
 Detection: Fluorescence - λ_{ex} 340nm
 λ_{em} 450nm

Compounds

1. Putrescine
 2. Cadaverine
 (as OPA derivatives)



Reproduced with kind permission of Centre for Chemical Sciences, Royal Holloway University of London, UK

Polyethylene Glycol 1000

Conditions

Column: ACE 3 C8, 150 x 4.6mm

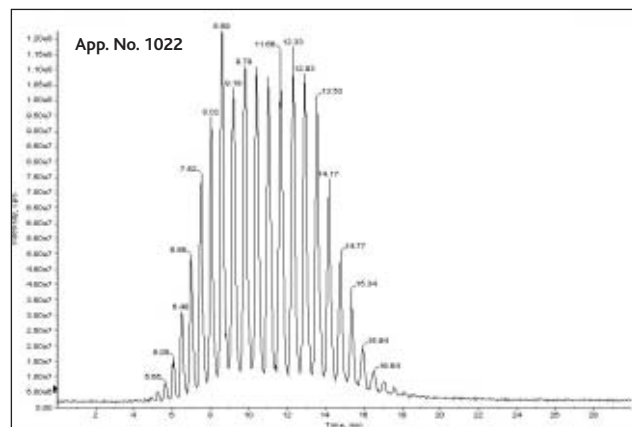
Part Number: ACE-112-1546

Mobile Phase: A. 0.1% HCO₂H in H₂O B. MeOH

Flow Rate: 1.0ml/min

Gradient:	T(mins)	0	45	50	60
%A		50	15	50	50
%B		50	85	50	50

Detection: APCI (negative ion)



Reproduced with kind permission of Wickham Laboratories, UK

Preservatives

Conditions

Column: ACE 5 C18, 250 x 4.6mm

Part Number: ACE-121-2546

Mobile Phase: 40:60 MeCN/50mM

KH₂PO₄ (pH 4.4)

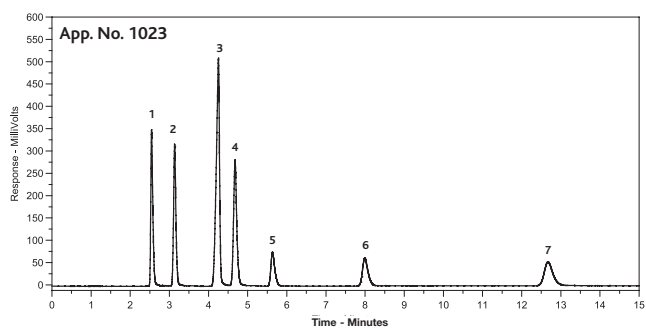
Flow Rate: 1.0ml/min

Temperature: Ambient

Detection: UV, 230nm

Compounds

1. Phthalic acid
2. p-Hydroxybenzoic acid
3. Benzoic acid
4. Sorbic acid
5. Methyl paraben
6. Ethyl paraben
7. Propyl paraben



Protein Test Mix

Conditions

Column: ACE 5 C18-300, 250 x 4.6mm

Part Number: ACE-221-2546

Mobile Phase: A. 0.1% TFA in H₂O

B. 0.1% TFA in MeCN

Flow Rate: 1.0ml/min

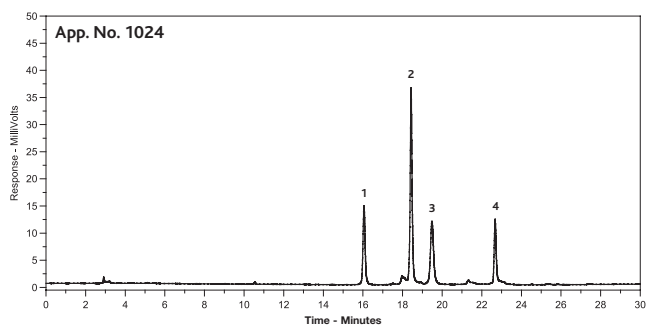
Gradient:	T(mins)	%A	%B
	0	95	5
	30	30	70

Temperature: Ambient

Detection: UV, 280nm

Compounds

1. Ribonuclease A
2. Cytochrome C
3. Holo-transferrin
4. Apomyoglobin



Selectivity Test Mix

Conditions

Column: ACE 5 C18, 250 x 4.6mm

Part Number: ACE-121-2546

Mobile Phase: 60:40 MeCN/50mM

KH₂PO₄ (pH 3.2)

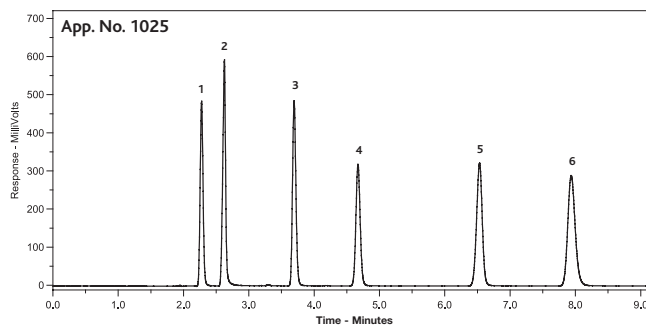
Flow Rate: 1.0ml/min

Temperature: Ambient

Detection: UV, 254nm

Compounds

1. Uracil
2. Pyridine
3. Phenol
4. Dimethyl phthalate
5. N,N-Dimethylaniline
6. 4-Butylbenzoic acid



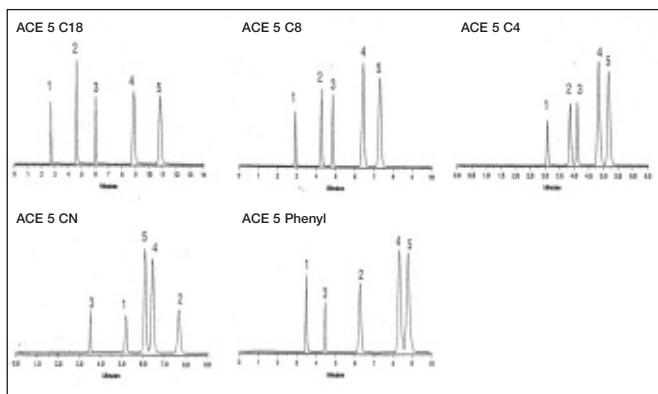
Tricyclic Antidepressants

Conditions

Column: ACE 5 C18, ACE 5 C8, ACE 5 C4, ACE 5 CN and ACE 5 Phenyl
Column Dimensions: 250 x 4.6mm
Mobile Phase: 80:20 MeOH/25mM KH_2PO_4 (pH 6.0)
Flow Rate: 1.0ml/min
Temperature: 22°C
Detection: UV, 215nm

Compounds

1. Norephedrine
2. Nortriptyline
3. Toluene
4. Imipramine
5. Amitriptyline



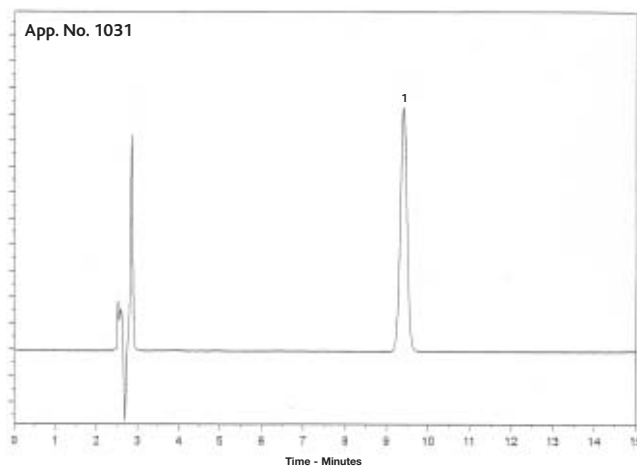
Trifluralin

Conditions

Column: ACE 5 C18, 250 x 4.6mm
Part Number: ACE-121-2546
Mobile Phase: 85:15 MeOH/ H_2O
Flow Rate: 1.0ml/min
Temperature: Ambient
Detection: UV, 254nm

Compounds

1. Trifluralin



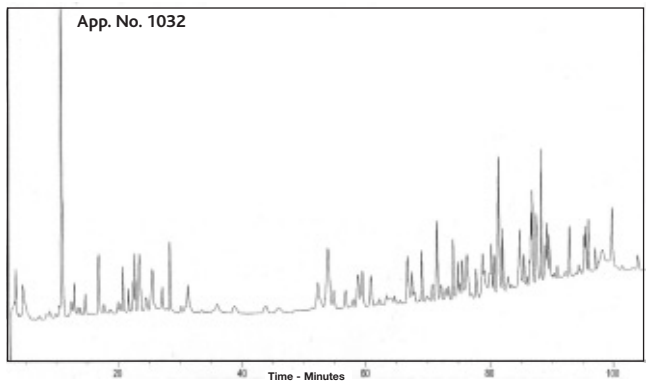
Tryptic Digest of BSA

Conditions

Column: ACE 5 C18-300, 150 x 4.6mm
Part Number: ACE-221-1546
Mobile Phase: A. 1% TFA in H_2O
 B. 50:50 1% TFA in MeCN/ H_2O
Flow Rate: 1.0ml/min
Gradient:

T(mins)	0	5	25	45	75	95	115	120
%A	96	96	80	80	60	35	30	96
%B	4	4	20	20	40	65	70	4

Temperature: Ambient
Detection: UV, 214nm



Reproduced with kind permission of Department of Food Biosciences, University of Reading, UK

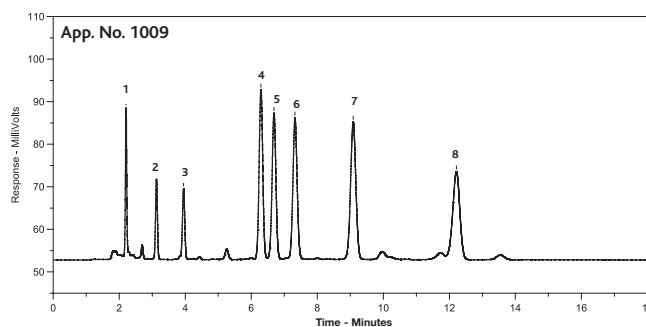
Vitamins – Fat Soluble

Conditions

Column: ACE 5 C18, 250 x 4.6mm
Part Number: ACE-121-2546
Mobile Phase: MeOH
Flow Rate: 1.5ml/min
Temperature: 30°C
Detection: UV, 280nm

Compounds

1. Vitamin K3
2. Vitamin A
3. Vitamin A acetate
4. Vitamin D2
5. Vitamin D3
6. Vitamin E
7. Vitamin E acetate
8. Vitamin K1



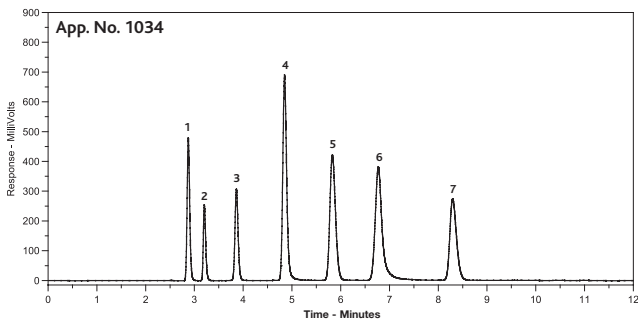
Vitamins – Water Soluble (Isocratic)

Conditions

Columns: ACE 5 C18, 250 x 4.6mm
 Part Number: ACE-121-2546
 Mobile Phase: 3:97 MeOH/50mM
 KH_2PO_4 (pH 3.0)
 Flow Rate: 1.0ml/min
 Temperature: Ambient
 Detection: UV, 205nm

Compounds

1. Pyridoxamine
 2. Thiamine (Vitamin B1)
 3. L-Ascorbic acid (Vitamin C)
 4. Nicotinic acid
 5. Pyridoxal
 6. Impurity
 7. Pyridoxine



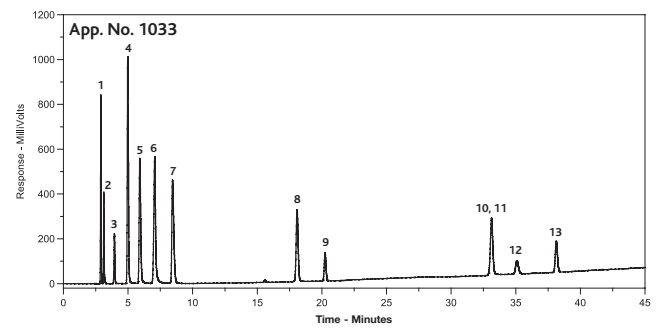
Vitamins – Water Soluble (Gradient)

Conditions

Column: ACE 5 C18, 250 x 4.6mm
 Part Number: ACE-121-2546
 Mobile Phase: A. 50mM KH_2PO_4 (pH 3.0)
 B. MeOH
 Flow Rate: 1.0ml/min
 Gradient: T(mins) %A %B
 0 97 3
 5 97 3
 45 55 45
 50 20 80
 Temperature: Ambient
 Detection: UV, 205nm

Compounds

1. Pyridoxamine
 2. Thiamine (Vitamin B1)
 3. L-Ascorbic acid (Vitamin C)
 4. Nicotinic acid
 5. Pyridoxal
 6. Impurity
 7. Pyridoxine
 8. p-Aminobenzoic acid
 9. Pantothenic acid (Vitamin B5)
 10. Folic acid (Vitamin M)
 11. Cyanocobalamin (Vitamin B12)
 12. d-Biotin (Vitamin H)
 13. Riboflavin (Vitamin B2)



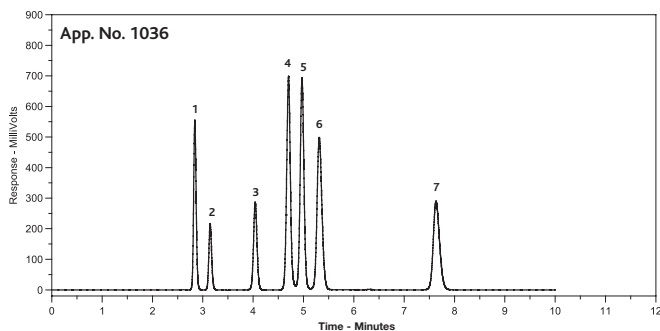
Vitamins – Water Soluble (Isocratic)

Conditions

Column: ACE 5 C8, 250 x 4.6mm
 Part Number: ACE-122-2546
 Mobile Phase: 3:97 MeOH/50mM
 KH_2PO_4 (pH 2.5)
 Flow Rate: 1.0ml/min
 Temperature: Ambient
 Detection: UV, 205nm

Compounds

1. Pyridoxamine
 2. Thiamine (Vitamin B1)
 3. L-Ascorbic acid (Vitamin C)
 4. Niacinamide (Vitamin B3)
 5. Pyridoxal
 6. Nicotinic acid
 7. Pyridoxine



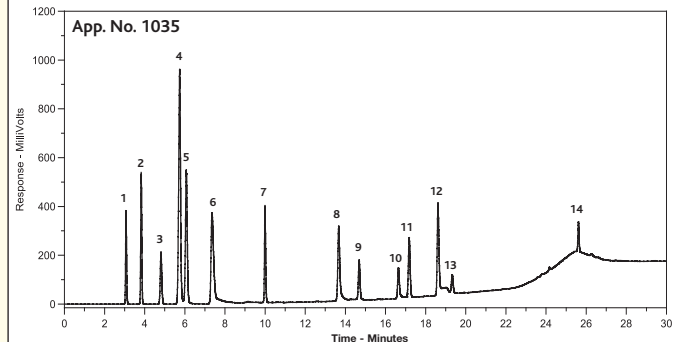
Vitamins – Water Soluble (Gradient)

Conditions

Column: ACE 5 C8, 250 x 4.6mm
 Part Number: ACE-122-2546
 Mobile Phase: A. 50mM KH_2PO_4 (pH 2.5)
 B. MeOH
 Flow Rate: 1.0ml/min
 Gradient: T(mins) %A %B
 0 3 16.5 19.5
 %A 100 100 55 20
 %B 0 0 45 80
 Temperature: Ambient
 Detection: UV, 205nm

Compounds

1. Pyridoxamine
 2. Thiamine (Vitamin B1)
 3. L-Ascorbic acid (Vitamin C)
 4. Niacinamide (Vitamin B3)
 5. Nicotinic acid
 6. Pyridoxal
 7. Pyridoxine
 8. p-Aminobenzoic acid
 9. Pantothenic acid (Vitamin B5)
 10. Folic acid (Vitamin M)
 11. Cyanocobalamin (Vitamin B12)
 12. Riboflavin (Vitamin B2)
 13. d-Biotin (Vitamin H)
 14. Thiocotic acid



Column Ordering Information

Part numbers for ACE 100Å columns are listed on pages 14-17.

Part numbers for ACE 300Å columns are listed on pages 24-26.

For ACE Capillary and Nano columns (page 27), ACE Validation Kits (page 38) and ACE Combinatorial Chemistry Kits (page 38), replace "X" with the required material code from the following tables:

ACE 100Å Materials:

PARTICLE SIZE	PHASE REQUIRED						
	C18	C8	C4	CN	PHENYL	AQ	C18-HL
3µm	ACE-111	ACE-112	ACE-113	ACE-114	ACE-115	ACE-116	ACE-311
5µm	ACE-121	ACE-122	ACE-123	ACE-124	ACE-125	ACE-126	ACE-321
10µm	ACE-131	ACE-132	ACE-133	ACE-134	ACE-135	ACE-136	ACE-331
15µm	-	-	-	-	-	-	ACE-341

Example: 250 x 4.6mm i.d. ACE 5 C18 Method Validation Kit - Part Number = ACE-121-2546-MVK

Please enquire for part numbers for SIL columns

ACE 300Å Materials:

PARTICLE SIZE	PHASE REQUIRED				
	C18-300	C8-300	C4-300	CN-300	PHENYL-300
3µm	ACE-211	ACE-212	ACE-213	ACE-214	ACE-215
5µm	ACE-221	ACE-222	ACE-223	ACE-224	ACE-225
10µm	ACE-231	ACE-232	ACE-233	ACE-234	ACE-235

Example: 100 x 0.3mm i.d. ACE 3 C18-300 Capillary Column - Part Number = ACE-211-10003

Please contact your distributor for part numbers of custom packed columns (page 38) and additional ordering assistance.

ACE Lab Tool

Part Number: ACE-BLT1

This quality product is useful for many routine tasks within the laboratory. Manufactured by Leatherman®, the ACE Blast™ tool carries a 25 year warranty, is supplied with a leather sheath and has an optimised handle design with Zytel® inserts to provide a comfortable grip at all times.



Blast is a trademark of Leatherman Tool Group, Inc.

Your decision has lasting effects.



Ultra Inert Base-Deactivated HPLC Columns



For Performance, Selectivity
and Guaranteed Reproducibility

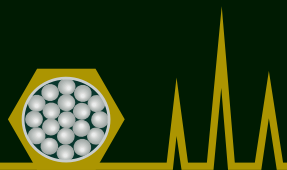
ACE performance
guarantee ✓

If ACE does not outperform the column you are currently using,
simply contact us for a full refund and keep the ACE column
FREE OF CHARGE.

www.ace-hplc.com



ACE[®] products are available through
our international network of distributors



ACE[®]
HPLC Columns

Advanced Chromatography Technologies, 1 Berry Street, Aberdeen, AB25 1HF, Scotland
Tel: +44 (0) 1224 704554 Fax: +44 (0) 1224 841301 info@ace-hplc.com www.ace-hplc.com

P0218-05-07-003-7000