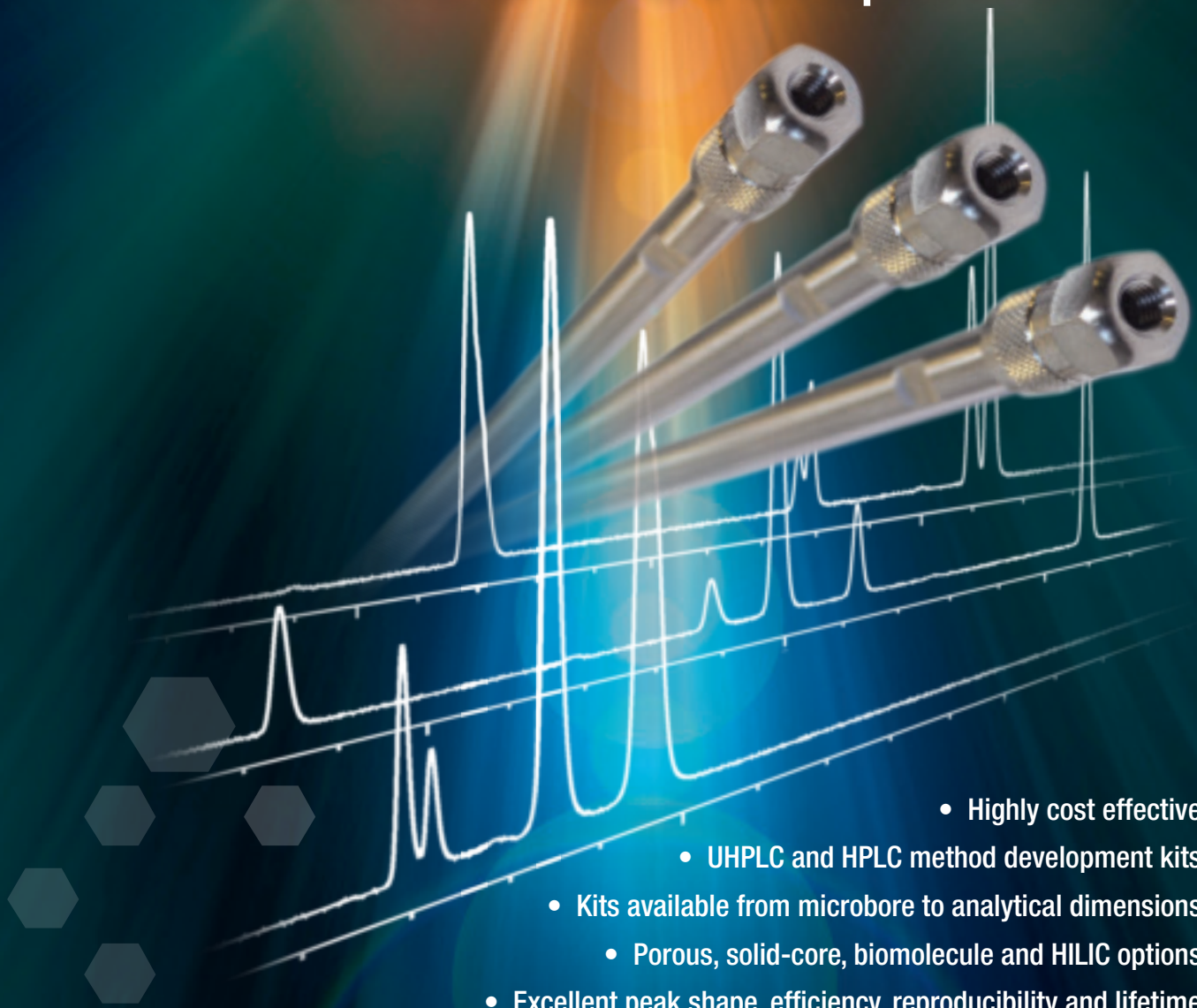
Selectivity Offer:
2 and 3 column kits available for the **same price** as a single column

ACE®

Method Development Kits

Intelligent Solutions for Method Development



- Highly cost effective
- UHPLC and HPLC method development kits
- Kits available from microbore to analytical dimensions
- Porous, solid-core, biomolecule and HILIC options
- Excellent peak shape, efficiency, reproducibility and lifetime
- Wide range of particle sizes and complementary phases available

Now Available NEW HILIC Method Development Kits

ACE®
UHPLC and HPLC Columns

ACE Method Development Kits

Intelligent Solutions for Method Development

- **Highly cost effective -** ACE Method Development Kits are available for the same price as a single column!
- 5 different ACE Method Development Kits available from microbore (0.5mm id) through to analytical (4.6mm id) dimensions for rapid, systematic method development.
- Each kit contains carefully selected ACE phases which enables the power of selectivity to be fully exploited.
- Each ACE phase provides different selectivity due to differing interactions.

		Bonded Phase	Separation Mechanism and Relative Strength[1]				
			Hydrophobic Binding	π-π Interaction	Dipole-Dipole	Hydrogen Bonding	Shape Selectivity
1	ACE Advanced Method Development Kit (see pages 4-7)	ACE C18	****	-	-	*	**
		ACE C18-AR	****	*** (donor)	*	**	***
		ACE C18-PFP	****	*** (acceptor)	****	***	****
2	ACE Extended Method Development Kit (see pages 8-11)	ACE SuperC18	****	-	-	-	**
		ACE C18-Amide	****	-	**	****	**/***
		ACE CN-ES	***	*	***	**	*
3	ACE UltraCore Method Development Kit (see pages 12-14)	ACE UltraCore SuperC18	***	-	-	-	**
		ACE UltraCore SuperPhenylHexyl	**	*** (donor)	*	**	***
4	ACE Bioanalytical 300Å Method Development Kit (see pages 15-17)	ACE C18-300	**	-	-	*	*
		ACE C4-300	*	-	-	-	-
		ACE Phenyl-300	*	** (donor)	*	**	**

[1] Approximate value – determined by semi-quantitative mechanism weightings and/or by reference to other ACE phases using >100 characterising analytes.

		Bonded Phase	Separation Mechanism and Relative Strength[2]					
			Partitioning	Anionic Analyte Interactions		Cationic Analyte Interactions		H-bonding
				Attraction	Repulsion	Attraction	Repulsion	
5	ACE HILIC Method Development Kit (see pages 18-21)	ACE HILIC-A	**	-	***	****	-	*
		ACE HILIC-B	***	****	-	-	***	*
		ACE HILIC-N	****	-	-	-	-	****

[2] Approximate value – determined by semi-quantitative mechanism weightings and/or by reference to other ACE phases using >50 characterising analytes.

FREE Method Development Support!

- Not sure which ACE phase or kit will work best for your application?
- FREE Application Support and FREE Method Development Service
- Trust your method development to our experts and free up time for your other projects!
- Contact our expert method development team via **info@ace-hplc.com** or contact your local distributor

Learn More: www.ace-hplc.com

Selectivity Offer: 2 and 3 column kits available for the **same price** as a single column

Why Use **ACE** Method Development Kits?

- ACE HPLC/UHPLC columns have earned a well deserved reputation for delivering excellent efficiency, reproducibility and lifetime.
- ACE Method Development Kits group together columns with different mechanisms of interaction to maximise selectivity and improve the likelihood of separating difficult or closely related analytes in mixtures.
- Screening columns containing different bonded phases under the same mobile phase conditions can help you achieve your desired separation more quickly, therefore increasing productivity.
- **Highly cost effective** to promote bonded phase investigation as part of an intelligent method development strategy, **ACE Method Development Kits are available for the same price as a single column!**

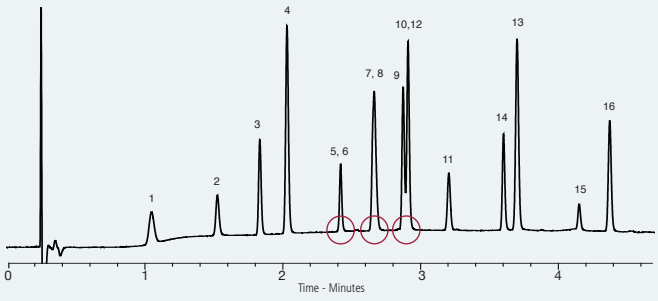
ACE® Stationary Phases Virtually Eliminate the Negative Effects of Silanols on UHPLC & HPLC Separations

Using ACE Method Development Kits to Improve Separations

Columns Within ACE Method Development Kits Provide Alternative Selectivity

Application #1901

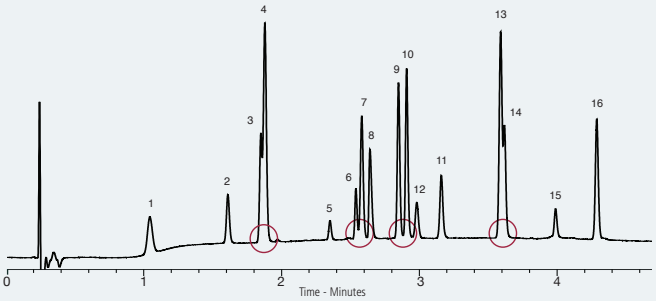
ACE C18



ACE C18 provides excellent peak shape, but here the essentially "hydrophobic-only" interaction results in co-elution.

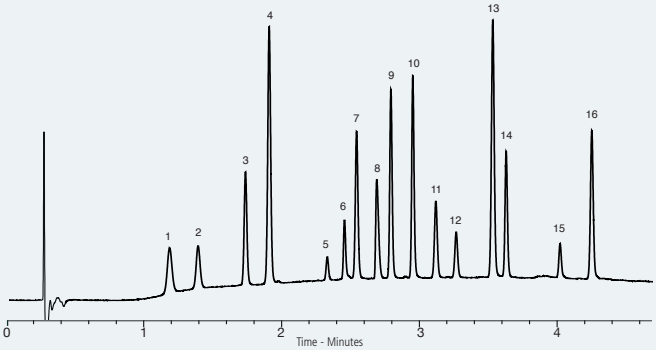
Investigation of alternative bonded phases using the same test conditions is recommended.

ACE C18-PFP



ACE C18-PFP provides additional interactions compared to alkyl C18 phases. Whilst these change selectivity, in this instance co-elution of different analyte pairs is observed.

ACE C18-AR



The ACE C18-AR phase provides a further change in selectivity due to different interaction contributions – ultimately enabling a successful separation.

Screening alternative phases can maximise selectivity and reduce method development time.

Sample: 1) metronidazole 2) 4-hydroxybenzoic acid 3) 3-hydroxybenzoic acid 4) benzyl alcohol 5) benzoic acid 6) myrecetin 7) p-cresol 8) propranolol 9) ethyl paraben 10) furosemide 11) anisole 12) 1,3,5-trinitrobenzene 13) toluene 14) nimesulide 15) mefenamic acid 16) 1,2,3-trichlorobenzene
Mobile Phase: A = 0.1% formic acid in H_2O B = 0.1% formic acid in MeCN Gradient: 3 – 100% B in 5 minutes
Column Dimensions: 50 x 2.1mm Flow Rate: 0.60ml/min Temperature: 40°C Detection: 210nm

ACE Advanced Method Development Kit

- Contains ACE C18, ACE C18-AR and ACE C18-PFP phases
- Ideal starting point for routine method development
- Available from microbore (0.5mm id) through to analytical (4.6mm id) dimensions (see p.7)
- Particularly recommended for compounds containing aromatic rings

Phase	Functional Group	Endcapped	Particle Size (µm)	Pore Size (Å)	Surface Area (m^2/g)	Carbon Load (%)	Recommended pH Range	100% Aqueous Compatible	USP Listing
ACE C18	Octadecyl (C18)	Yes	1.7, 2, 3, 5, 10	100	300	15.5	2.0-8.0[a]	No	L1
ACE C18-AR	C18 with integral Phenyl	Yes	1.7, 2, 3, 5, 10	100	300	15.5	2.0-8.0[a]	Yes	L1
ACE C18-PFP	C18 with integral PFP	Yes	1.7, 2, 3, 5, 10	100	300	14.3	2.0-8.0[a]	Yes	L1

[a] For optimum column lifetime, a pH range of 2-8 is recommended. To increase column lifetime at higher pH, organic buffers, low buffer concentrations, high % organic solvent and low temperatures must be considered. Further information is contained within "A Guide to HPLC and LC/MS Buffer Selection" by John Dolan – please contact your distributor to request your FREE copy or visit www.ace-hplc.com.

ACE C18

ACE C18 remains the "go-to" column of choice for HPLC and UHPLC separations. With an excellent reputation for performance, reproducibility and lifetime, ACE C18 provides a rugged, reproducible starting point for method development.

Recommended Applications

- Analytes differing in hydrophobicity
- Polar, moderately polar and non-polar analytes
- Uncharged acids and bases
- Ionized acids or bases using ion-pairing
- Ideal starting point for method development

ACE C18-AR

ACE C18-AR combines the excellent performance and advantages of the ACE C18 phase with the added selectivity of an integral phenyl group.

Recommended Applications

- Analytes with π-bonding and conjugated systems
- Analytes with electron delocalization and electron withdrawing groups, such as halogens, nitro groups, ketones, esters and acids
- Analytes with different dipole moments
- Analytes differing in hydrophobicity
- Stereoisomers, steroids, substituted aromatics and sulphur containing compounds
- Fully wettable - 100% aqueous buffer compatible
- Applications where C18 does not provide adequate separation
- Applications where conventional phenyl phases provide insufficient retention, poor stability, or significant bleed.

ACE C18-PFP

ACE C18-PFP brings together the stability, reproducibility and low bleed of the ACE C18 phase with the additional selectivity of an integral pentafluorophenyl (PFP) group.

Recommended Applications

- Analytes with π-bonding
- Analytes with electron donating groups, such as phenols, aromatic ethers and amines
- Analytes with proton donor groups
- Analytes with different dipole moments
- Analytes differing in hydrophobicity
- Stuctural isomers, steroids, substituted aromatics and taxanes
- Fully wettable - 100% aqueous buffer compatible
- Applications where C18 does not provide adequate separation
- Applications where conventional PFP phases provide insufficient retention, poor stability or significant bleed.

Additional Information

Product bulletins containing further details on the ACE C18, C18-AR and C18-PFP columns contained within the Advanced ACE Method Development Kit are available to download at **www.ace-hplc.com** Alternatively, please contact our technical support team via **info@ace-hplc.com** or contact your local distributor.

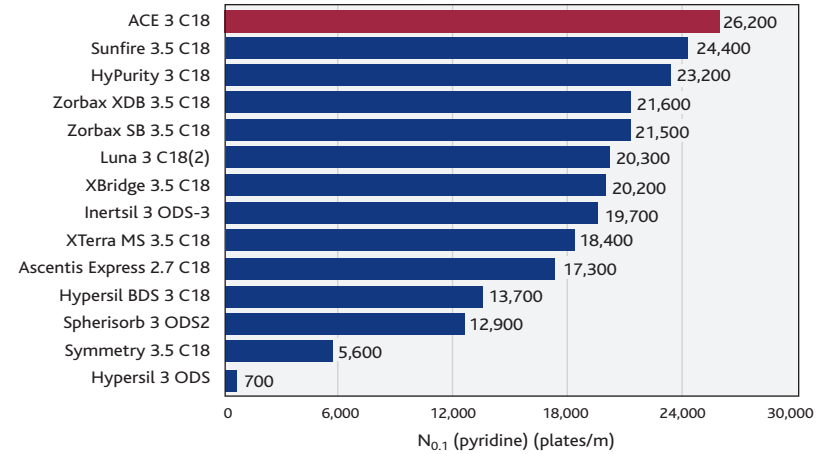
Learn More: www.ace-hplc.com

ACE C18 - Comparison of Column Inertness

- Column brands from major manufacturers investigated
- Comparison of column efficiency for pyridine – a basic molecule

Peak Efficiency Comparison

Application #1911



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

Column Dimensions: 50 x 2.1mm Sample: 1) uracil 2) pyridine 3) phenol Mobile Phase: 40:60 (v/v) MeOH/H_2O Flow Rate: 0.20ml/min
Temperature: 22°C Detection: 254nm

Comparative data may not be representative of all applications. Please see back page for acknowledgement of trademarks.

ACE C18 Delivers Excellent Performance

Rapid UHPLC Screening of 16 Pharmaceuticals and Related Compounds

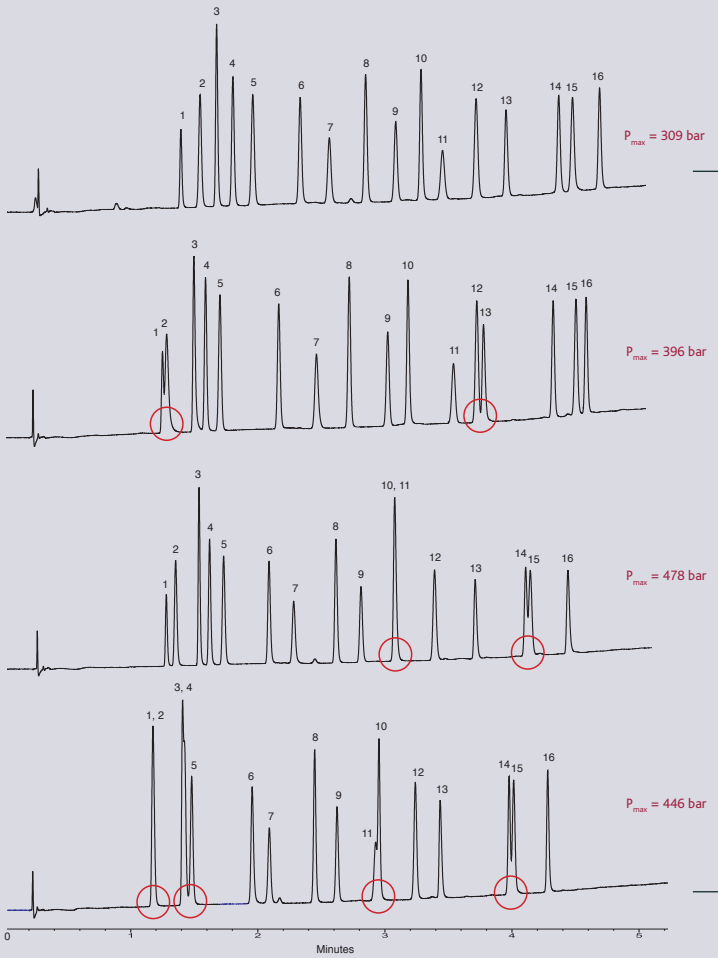
Application # 1503

ACE Excel 2 C18
(fully porous ultra-inert silica)

ZORBAX Eclipse 1.8 XDB C18
(fully porous silica)

Waters ACQUITY 1.7 BEH C18
(hybrid particle)

Phenomenex Kinetex 1.7 C18
(core shell particle)



These leading C18 phases provide an essentially hydrophobic-only interaction, and therefore exhibit similar selectivity with only slight differences between brands observed.

To implement a change in selectivity, the use of an alternative bonded phase (eg ACE C18-AR, ACE C18-PFP) that can leverage additional modes of interaction is recommended.

Sample: 1) N-acetylprocainamide 2) 3-hydroxybenzoic acid 3) pindolol 4) methylphenylsulphoxide 5) benzyl alcohol 6) quinoxaline 7) 1,4-dinitrobenzene 8) phenacetin 9) 1,2-dimethoxybenzene 10) furosemide 11) anisole 12) methyl benzoate 13) remacemide 14) nimesulide 15) ethyl benzoate 16) diflunisal
Mobile Phase: A = 20mM KH_2PO_4, pH 2.7 B = 20mM KH_2PO_4, pH 2.7 in MeOH/H_2O (65:35 v/v) Gradient: 3 – 100% B in 5 minutes
Column Dimensions: 50 x 2.1mm Flow Rate: 0.60ml/min Temperature: 60°C Detection: 214nm

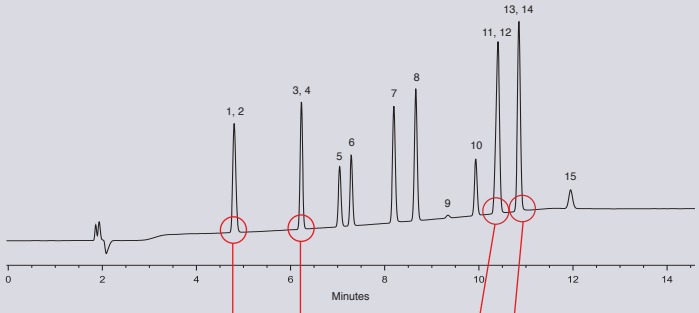
Comparative data may not be representative of all applications. Please see back page for acknowledgement of trademarks.

Leveraging the Unique Selectivity of **ACE** C18-AR

Improving an Analgesics Separation by Changing Phase

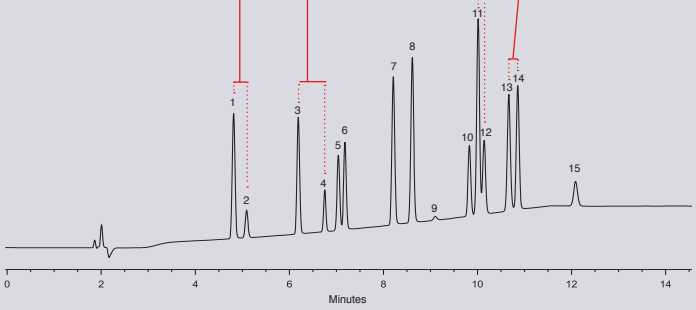
Application #1921

ACE 3 C18



C18 phase provides essentially hydrophobic-only interaction

ACE 3 C18-AR



Multi-mode interaction including π - π and hydrophobic interactions provides complete separation

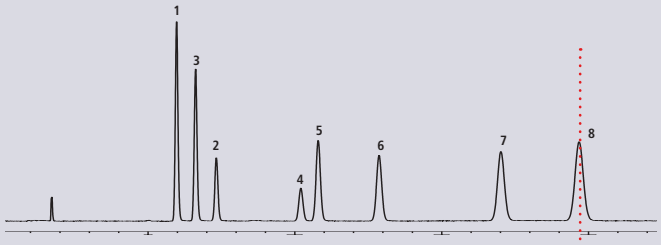
Sample: 1) 4-acetamidophenol 2) 4-aminobenzoic acid 3) 4-hydroxybenzoic acid 4) caffeine 5) 2-acetamidophenol 6) 3-hydroxybenzoic acid 7) salicylamide 8) acetanilide 9) phenol 10) acetylsalicylic acid 11) benzoic acid 12) sorbic acid 13) salicylic acid 14) phenylacetin 15) salicylaldehyde
Mobile Phase: A = 0.1% v/v formic acid in H_2O B = 0.1% v/v formic acid in MeCN Gradient: 5 - 35% B in 9 minutes, hold at 35% B until 14 minutes
Column Dimensions: 150 x 4.6mm Flow Rate: 1.00ml/min Temperature: 40°C Detection: 240nm

ACE C18-PFP Provides a Separation that a C18 or PFP Column Alone Cannot Achieve

The Importance of Maintaining Hydrophobicity During Multi-Mode Interactions

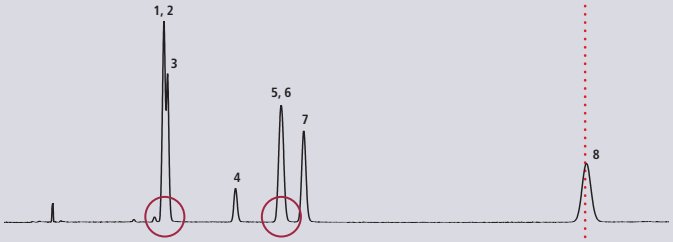
Application #1931

ACE 3 C18-PFP



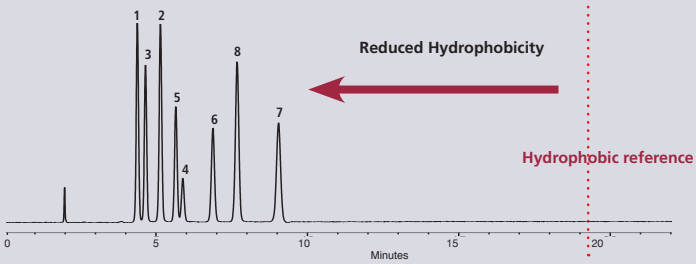
Multi-mode interaction including hydrophobic interaction provides complete separation

ACE 3 C18



C18 phase provides essentially hydrophobic-only interaction

Hypersil GOLD 3µm PFP
(example short chain PFP phase)



Significantly reduced hydrophobicity reduces the separation despite other interaction modes

Column Dimensions: 150 x 4.6mm Sample: 1) 1,2,3-trimethoxybenzene 2) 1,2,4-trimethoxybenzene 3) 1,2-dimethoxybenzene 4) 1,4-dimethoxybenzene 5) methoxybenzene 6) 1,3-dimethoxybenzene 7) 1,3,5-trimethoxybenzene 8) neutral molecule (reference)
Mobile Phase: 50:50 v/v MeOH/H_2O Flow Rate: 1.00ml/min Temperature: 40°C Detection: 254nm

Comparative data may not be representative of all applications. Please see back page for acknowledgement of trademarks.

ACE Advanced Method Development UHPLC/HPLC Column Kits

(Contains 3 columns: ACE C18, ACE C18-AR and ACE C18-PFP of specified dimensions)

	(UHPLC/HPLC hardware format with 1000bar/15000psi pressure limit)			
Column Dimensions	**1.7µm**	**2µm**	**3µm**	**5µm**
2.1 x 20mm	MDKA-17-0202U	MDKA-2-0202U	MDKA-3-0202U	MDKA-5-0202U
2.1 x 30mm	MDKA-17-0302U	MDKA-2-0302U	MDKA-3-0302U	MDKA-5-0302U
2.1 x 35mm	MDKA-17-3502U	MDKA-2-3502U	MDKA-3-3502U	MDKA-5-3502U
2.1 x 50mm	MDKA-17-0502U	MDKA-2-0502U	MDKA-3-0502U	MDKA-5-0502U
2.1 x 75mm	MDKA-17-7502U	MDKA-2-7502U	MDKA-3-7502U	MDKA-5-7502U
2.1 x 100mm	MDKA-17-1002U	MDKA-2-1002U	MDKA-3-1002U	MDKA-5-1002U
2.1 x 125mm	-	MDKA-2-1202U	MDKA-3-1202U	MDKA-5-1202U
2.1 x 150mm	-	MDKA-2-1502U	MDKA-3-1502U	MDKA-5-1502U
2.1 x 250mm	-	-	MDKA-3-2502U	MDKA-5-2502U
3.0 x 20mm	MDKA-17-0203U	MDKA-2-0203U	MDKA-3-0203U	MDKA-5-0203U
3.0 x 30mm	MDKA-17-0303U	MDKA-2-0303U	MDKA-3-0303U	MDKA-5-0303U
3.0 x 35mm	MDKA-17-3503U	MDKA-2-3503U	MDKA-3-3503U	MDKA-5-3503U
3.0 x 50mm	MDKA-17-0503U	MDKA-2-0503U	MDKA-3-0503U	MDKA-5-0503U
3.0 x 75mm	MDKA-17-7503U	MDKA-2-7503U	MDKA-3-7503U	MDKA-5-7503U
3.0 x 100mm	MDKA-17-1003U	MDKA-2-1003U	MDKA-3-1003U	MDKA-5-1003U
3.0 x 125mm	-	MDKA-2-1203U	MDKA-3-1203U	MDKA-5-1203U
3.0 x 150mm	-	MDKA-2-1503U	MDKA-3-1503U	MDKA-5-1503U
3.0 x 250mm	-	-	MDKA-3-2503U	MDKA-5-2503U
4.6 x 20mm	-	MDKA-2-0246U	MDKA-3-0246U	MDKA-5-0246U
4.6 x 30mm	-	MDKA-2-0346U	MDKA-3-0346U	MDKA-5-0346U
4.6 x 35mm	-	MDKA-2-3546U	MDKA-3-3546U	MDKA-5-3546U
4.6 x 50mm	-	MDKA-2-0546U	MDKA-3-0546U	MDKA-5-0546U
4.6 x 75mm	-	MDKA-2-7546U	MDKA-3-7546U	MDKA-5-7546U
4.6 x 100mm	-	MDKA-2-1046U	MDKA-3-1046U	MDKA-5-1046U
4.6 x 125mm	-	MDKA-2-1246U	MDKA-3-1246U	MDKA-5-1246U
4.6 x 150mm	-	MDKA-2-1546U	MDKA-3-1546U	MDKA-5-1546U
4.6 x 250mm	-	-	MDKA-3-2546U	MDKA-5-2546U

ACE Advanced Method Development Microbore HPLC Column Kits

(Contains 3 columns: ACE C18, ACE C18-AR and ACE C18-PFP of specified dimensions)

	(HPLC hardware format with 400bar/6000psi recommended pressure limit)					
	2µm		**3µm**		**5µm**	
Column Dimensions	**1/16" port**	**1/32" port**	**1/16" port**	**1/32" port**	**1/16" port**	**1/32" port**
0.5 x 30mm	MDKA-2-03005	MDKA-2-03005S	MDKA-3-03005	MDKA-3-03005S	MDKA-5-03005	MDKA-5-03005S
0.5 x 50mm	MDKA-2-05005	MDKA-2-05005S	MDKA-3-05005	MDKA-3-05005S	MDKA-5-05005	MDKA-5-05005S
0.5 x 75mm	MDKA-2-75005	MDKA-2-75005S	MDKA-3-75005	MDKA-3-75005S	MDKA-5-75005	MDKA-5-75005S
0.5 x 100mm	MDKA-2-10005	MDKA-2-10005S	MDKA-3-10005	MDKA-3-10005S	MDKA-5-10005	MDKA-5-10005S
0.5 x 125mm	MDKA-2-12005	MDKA-2-12005S	MDKA-3-12005	MDKA-3-12005S	MDKA-5-12005	MDKA-5-12005S
0.5 x 150mm	MDKA-2-15005	MDKA-2-15005S	MDKA-3-15005	MDKA-3-15005S	MDKA-5-15005	MDKA-5-15005S
0.5 x 250mm	-	-	-	-	MDKA-5-25005	MDKA-5-25005S
1.0 x 30mm	MDKA-2-0301	MDKA-2-0301S	MDKA-3-0301	MDKA-3-0301S	MDKA-5-0301	MDKA-5-0301S
1.0 x 50mm	MDKA-2-0501	MDKA-2-0501S	MDKA-3-0501	MDKA-3-0501S	MDKA-5-0501	MDKA-5-0501S
1.0 x 75mm	MDKA-2-7501	MDKA-2-7501S	MDKA-3-7501	MDKA-3-7501S	MDKA-5-7501	MDKA-5-7501S
1.0 x 100mm	MDKA-2-1001	MDKA-2-1001S	MDKA-3-1001	MDKA-3-1001S	MDKA-5-1001	MDKA-5-1001S
1.0 x 125mm	MDKA-2-1201	MDKA-2-1201S	MDKA-3-1201	MDKA-3-1201S	MDKA-5-1201	MDKA-5-1201S
1.0 x 150mm	MDKA-2-1501	MDKA-2-1501S	MDKA-3-1501	MDKA-3-1501S	MDKA-5-1501	MDKA-5-1501S
1.0 x 250mm	-	-	-	-	MDKA-5-2501	MDKA-5-2501S

Important Note: ACE microbore columns (1.0mm id and 0.5mm id) are available with either standard 1/16" (10-32 thread) connections or 1/32" (6-40 thread) connections. For use with Eksigent micro and nano LC systems, order columns with 1/32" connections and use either ACE 6-40 fittings (part number ACE-MC3210, 10 pack) or Eksigent 6-40 fittings (part number 5019621).

For 1/16" HPLC column connections up to 6000psi, PEEK™ 1/16" fingertight fittings (part number ACE-CC10, 10 pack) are recommended. For 1/32" microbore HPLC column connections up to 6000psi, PEEK™ 1/32" (6-40 thread) fingertight fittings (part number ACE-MC3210, 10 pack) are recommended. For 1/16" UHPLC column connections up to 25000psi, reuseable 1/16" fittings (part number EXL-CC10, 10 pack) are recommended. To further extend UHPLC and HPLC column lifetimes, ACE pre-column filters are recommended. For further details please contact your distributor or visit www.ace-hplc.com

ACE Extended Method Development Kit

- Contains ACE SuperC18, ACE C18-Amide and ACE CN-ES phases
- Use ACE SuperC18 to exploit selectivity changes at low, intermediate and high pH
- Available from microbore (0.5mm id) through to analytical (4.6mm id) dimensions (see p.11)
- ACE C18-Amide and ACE CN-ES phases both offer alternative selectivity, especially for polar molecules

Phase	Functional Group	Endcapped	Particle Size (µm)	Pore Size (Å)	Surface Area (m^2/g)	Carbon Load (%)	Recommended pH Range	100% Aqueous Compatible	USP Listing
ACE SuperC18	Octadecyl (C18)	Encapsulated bonding	1.7, 2, 3, 5, 10	90	400	14.8	1.5-11.5[a]	No	L1
ACE C18-Amide	C18 with integral amide polar group	Yes	1.7, 2, 3, 5, 10	100	300	16.4	2.0-8.0[b]	Yes	L1/L60
ACE CN-ES	CN with proprietary extended alkyl spacer	Yes	1.7, 2, 3, 5, 10	100	300	12.6	2.0-8.0[b]	Yes	L10

[a] ACE SuperC18 is designed for use with LC/MS compatible buffers. Further information is contained within "ACE SuperC18 - A Guide to Buffer Selection" – please contact your distributor to request your FREE copy or visit www.ace-hplc.com.

[b] For optimum column lifetime, a pH range of 2-8 is recommended. To increase column lifetime at higher pH, organic buffers, low buffer concentrations, high % organic solvent and low temperatures must be considered. Further information is contained within "A Guide to HPLC and LC/MS Buffer Selection" by John Dolan – please contact your distributor to request your FREE copy or visit www.ace-hplc.com

ACE SuperC18

ACE SuperC18 is a uniquely bonded, EBT endcapped C18 phase which offers unprecedented inertness, excellent efficiency and uncompromising durability over an extended pH range of 1.5 – 11.5.

Recommended Applications

- Analytes differing in hydrophobicity
- Polar, moderately polar and non-polar analytes
- Uncharged acids and bases
- Ionized acids or bases using ion-pairing
- Recommended starting point for developing methods at intermediate and high pH to exploit selectivity changes

ACE C18-Amide

ACE C18-Amide is a uniquely designed polar-embedded phase that offers enhanced retention and resolution of polar acidic, phenolic and hydroxy-substituted analytes. The extended spacer ligand technology provides extended column lifetime.

Recommended Applications

- Small water soluble analytes and polar molecules - especially acidic species
- Analytes with H bond donors, acids, bases and phenolic compounds
- Small peptides
- Analytes differing in hydrophobicity
- Fully wettable - 100% aqueous buffer compatible
- Applications where C18 does not provide adequate separation
- Applications where conventional amide/polar embedded phases provide insufficient retention, poor stability, or significant bleed

ACE CN-ES

ACE CN-ES is a unique phase having an extended alkyl chain with a terminal cyano group. It provides C18 levels of retention and stability compared to commercial cyano propyl phases which typically exhibit low retentivity and poor stability.

Recommended Applications

- Mixtures of very polar, polar and non-polar analytes
- Analytes with double and triple bonds
- Analytes differing in hydrophobicity
- Suitable for NP and RP separations
- Fully wettable - 100% aqueous buffer compatible
- Applications where a typical C18 column does not provide adequate separation
- Applications where traditional CN bonded phases provide insufficient retention, poor stability or significant bleed
- An orthogonal phase for method development

Additional information

Product bulletins containing further details on the ACE SuperC18, C18-Amide and CN-ES columns contained within the Extended ACE Method Development Kit are available to download at **www.ace-hplc.com** Alternatively, please contact our technical support team via **info@ace-hplc.com** or contact your local distributor.

Learn More: www.ace-hplc.com

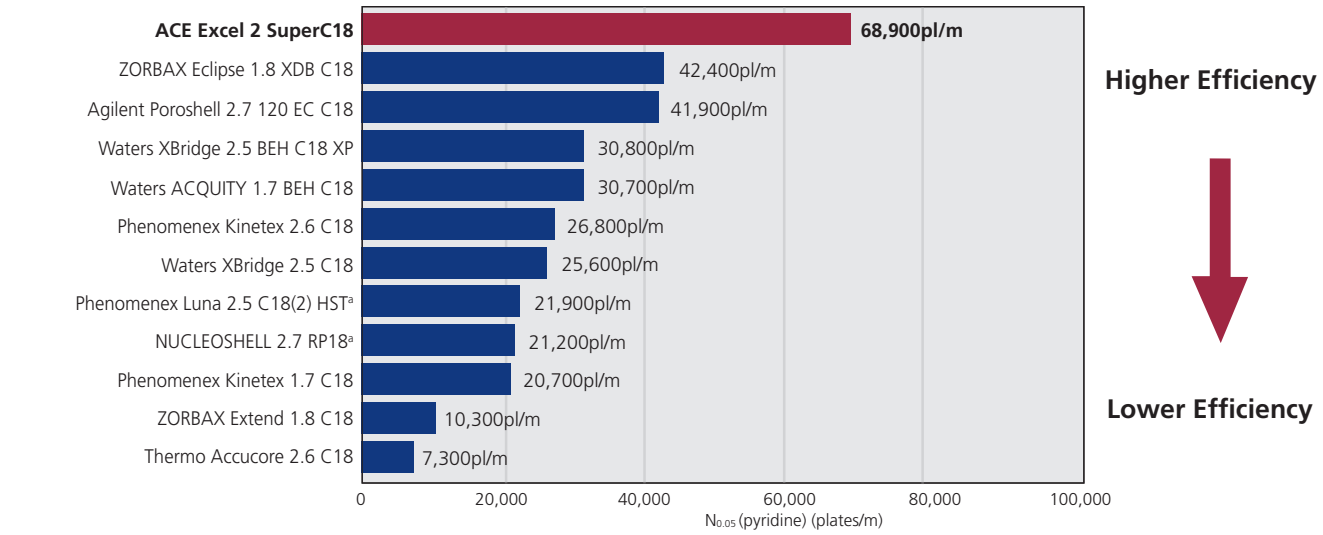
ACE SuperC18 Provides Excellent Column Inertness

- Leading column brands in 50 x 2.1mm LC/MS compatible dimensions at intermediate pH 5.8
- Silica, Hybrid and Superficially Porous particle technologies compared
- Comparison of column efficiency for pyridine – a basic molecule
- Efficiency measured at 5% peak height to account for peak tailing effects

Peak Efficiency Comparison

Reproduced with kind permission of The Open University, UK

Application # 1513



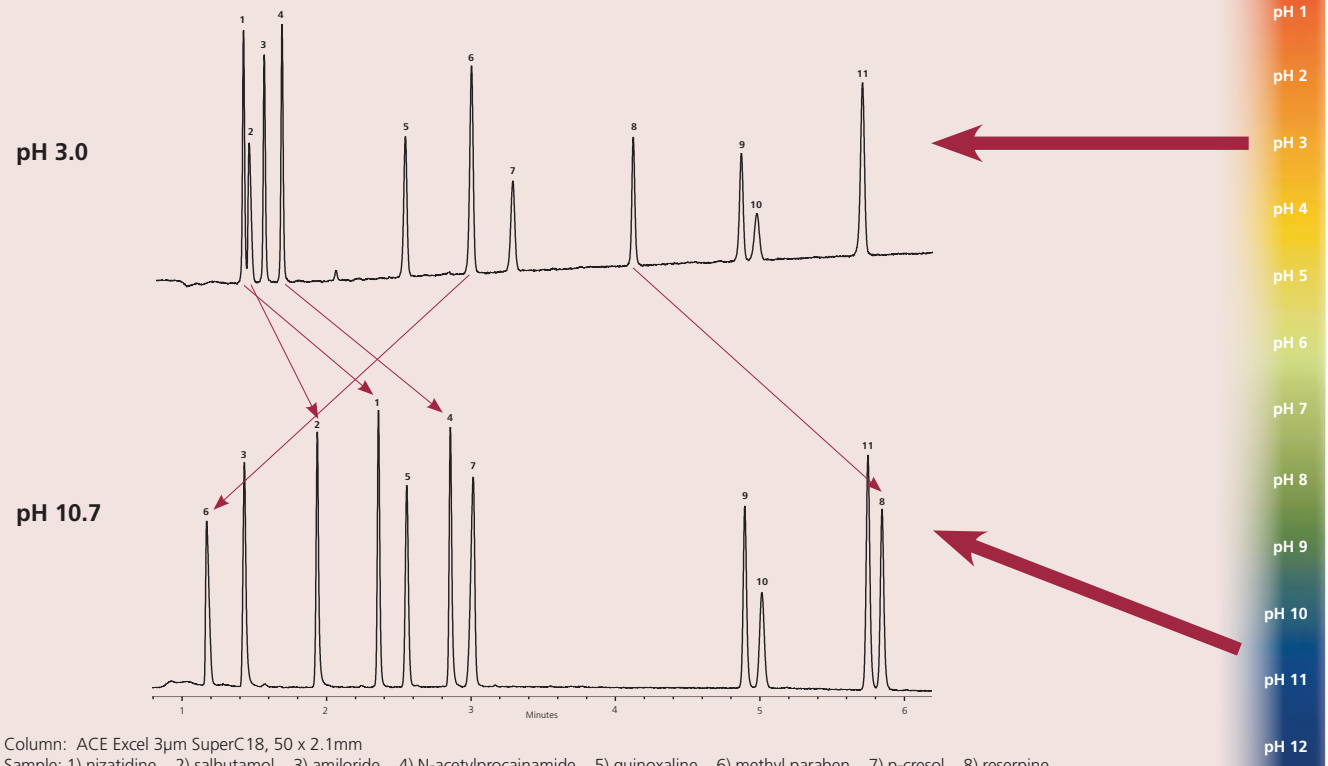
Column Dimensions: 50 x 2.1mm ([a] 50 x 2.0mm) Sample: 1) uracil 2) pyridine 3) phenol
Mobile Phase: 30:70 v/v MeOH/10mM NH_4OAc in H_2O (pH 5.8)
Flow Rate: 0.20ml/min Temperature: 22°C Detection: 254nm

Comparative data may not be representative of all applications. Please see back page for acknowledgement of trademarks.

Use ACE SuperC18 to Investigate pH Effects

Exploit Selectivity by Adjusting pH

Application # 1510



Column: ACE Excel 3µm SuperC18, 50 x 2.1mm
Sample: 1) nizatidine 2) salbutamol 3) amiloride 4) N-acetylprocainamide 5) quinoxaline 6) methyl paraben 7) p-cresol 8) reserpine 9) piperine 10) toluene 11) felodipine
Temperature: 40°C Flow Rate: 0.42ml/min Wavelength: 254nm Gradient: 3 - 100% B in 7 minutes
Acidic Mobile Phase: A: 10mM ammonium formate in H_2O (pH 3.0) B: 10mM ammonium formate (pH 3.0) in 90:10 v/v MeCN/H_2O
Basic Mobile Phase: A: 0.1% NH_3 (= 18mM) in H_2O (pH 10.7) B: 0.1% NH_3 (=18mM), pH 10.7 in 90:10 v/v MeCN/H_2O

ACE C18-Amide Provides Enhanced Polar Selectivity

Advantages of Multi-Mode Interactions for HPLC Separations

Application # 1602

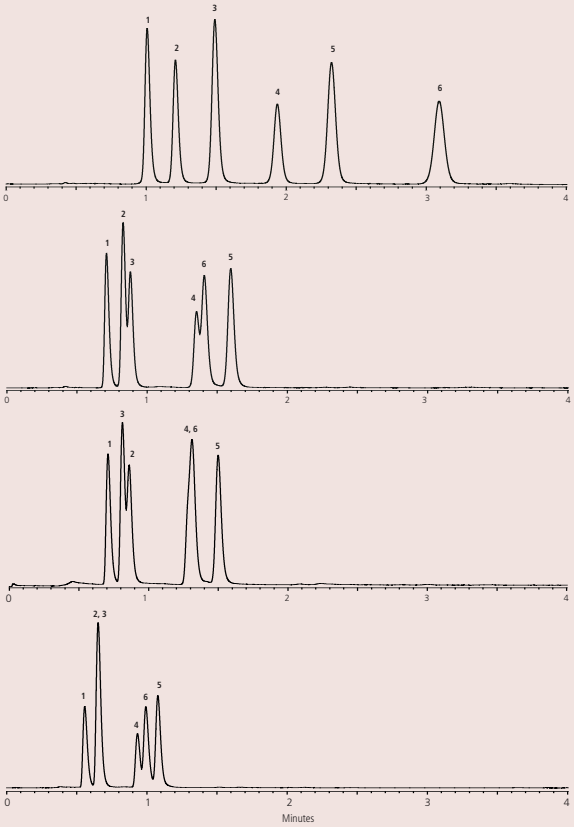
Reproduced with kind permission of The Open University, UK

ACE 2 C18-Amide
(ultra-inert fully porous silica)

ACE 2 C18
(ultra-inert fully porous silica)

Waters ACQUITY 1.7 BEH C18
(hybrid particle)

Phenomenex Kinetex 1.7 C18
(superficially porous particle)



ACE C18-Amide provides increased retention and improved separation due to enhanced polar selectivity

Leading C18 column brands provide similar selectivity

Column Dimensions: 50 x 2.1mm Sample: 1) resorcinol 2) catechol 3) 2-methyl resorcinol 4) 4-methyl catechol 5) 3-methyl catechol 6) 4-nitro catechol
Mobile Phase: 25:75 MeOH/25mM H_3PO_4 in H_2O Flow Rate: 0.30ml/min Temperature: 30°C Wavelength: 214nm

Comparative data may not be representative of all applications. Please see back page for acknowledgement of trademarks.

ACE CN-ES Provides Alternative Selectivity

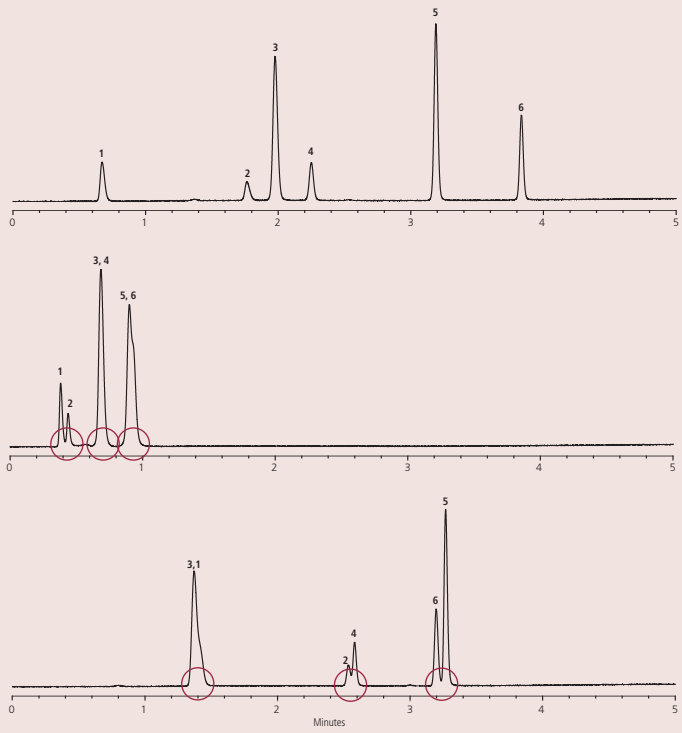
ACE CN-ES Provides a Separation that a C18 or CN Column Alone Cannot Achieve

Application # 1701

ACE 3 CN-ES

ACE 3 CN
(example short chain CN phase)

ACE 3 C18



ACE CN-ES phase provides complete separation due to hydrophobic AND dipole-dipole interactions

CN phase shows insufficient resolution (greatly reduced hydrophobic interaction)

C18 phase provides insufficient resolution (no dipole-dipole interaction)

Sample: 1) metronidazole 2) benzyl alcohol 3) hydrochlorothiazide 4) vanillin 5) methyl paraben 6) 1,2-dinitrobenzene
Mobile Phase: A = 0.1% formic acid in H_2O B = 0.1% formic acid in 90:10 MeOH/H_2O Gradient: 3 - 100% B in 5 minutes
Column Dimensions: 50 x 2.1mm Flow Rate: 0.60ml/min Temperature: 40°C Wavelength: 254nm

ACE Extended Method Development UHPLC/HPLC Column Kits

(Contains 3 columns: ACE SuperC18, ACE C18-Amide and ACE CN-ES of specified dimensions)

	(UHPLC/HPLC hardware format with 1000bar/15000psi pressure limit)			
Column Dimensions	**1.7µm**	**2µm**	**3µm**	**5µm**
2.1 x 20mm	MDKE-17-0202U	MDKE-2-0202U	MDKE-3-0202U	MDKE-5-0202U
2.1 x 30mm	MDKE-17-0302U	MDKE-2-0302U	MDKE-3-0302U	MDKE-5-0302U
2.1 x 35mm	MDKE-17-3502U	MDKE-2-3502U	MDKE-3-3502U	MDKE-5-3502U
2.1 x 50mm	MDKE-17-0502U	MDKE-2-0502U	MDKE-3-0502U	MDKE-5-0502U
2.1 x 75mm	MDKE-17-7502U	MDKE-2-7502U	MDKE-3-7502U	MDKE-5-7502U
2.1 x 100mm	MDKE-17-1002U	MDKE-2-1002U	MDKE-3-1002U	MDKE-5-1002U
2.1 x 125mm	-	MDKE-2-1202U	MDKE-3-1202U	MDKE-5-1202U
2.1 x 150mm	-	MDKE-2-1502U	MDKE-3-1502U	MDKE-5-1502U
2.1 x 250mm	-	-	MDKE-3-2502U	MDKE-5-2502U
3.0 x 20mm	MDKE-17-0203U	MDKE-2-0203U	MDKE-3-0203U	MDKE-5-0203U
3.0 x 30mm	MDKE-17-0303U	MDKE-2-0303U	MDKE-3-0303U	MDKE-5-0303U
3.0 x 35mm	MDKE-17-3503U	MDKE-2-3503U	MDKE-3-3503U	MDKE-5-3503U
3.0 x 50mm	MDKE-17-0503U	MDKE-2-0503U	MDKE-3-0503U	MDKE-5-0503U
3.0 x 75mm	MDKE-17-7503U	MDKE-2-7503U	MDKE-3-7503U	MDKE-5-7503U
3.0 x 100mm	MDKE-17-1003U	MDKE-2-1003U	MDKE-3-1003U	MDKE-5-1003U
3.0 x 125mm	-	MDKE-2-1203U	MDKE-3-1203U	MDKE-5-1203U
3.0 x 150mm	-	MDKE-2-1503U	MDKE-3-1503U	MDKE-5-1503U
3.0 x 250mm	-	-	MDKE-3-2503U	MDKE-5-2503U
4.6 x 20mm	-	MDKE-2-0246U	MDKE-3-0246U	MDKE-5-0246U
4.6 x 30mm	-	MDKE-2-0346U	MDKE-3-0346U	MDKE-5-0346U
4.6 x 35mm	-	MDKE-2-3546U	MDKE-3-3546U	MDKE-5-3546U
4.6 x 50mm	-	MDKE-2-0546U	MDKE-3-0546U	MDKE-5-0546U
4.6 x 75mm	-	MDKE-2-7546U	MDKE-3-7546U	MDKE-5-7546U
4.6 x 100mm	-	MDKE-2-1046U	MDKE-3-1046U	MDKE-5-1046U
4.6 x 125mm	-	MDKE-2-1246U	MDKE-3-1246U	MDKE-5-1246U
4.6 x 150mm	-	MDKE-2-1546U	MDKE-3-1546U	MDKE-5-1546U
4.6 x 250mm	-	-	MDKE-3-2546U	MDKE-5-2546U

ACE Extended Method Development Microbore HPLC Column Kits

(Contains 3 columns: ACE SuperC18, ACE C18-Amide and ACE CN-ES of specified dimensions)

	(HPLC hardware format with 400bar/6000psi recommended pressure limit)					
	2µm		**3µm**		**5µm**	
Column Dimensions	**1/16" port**	**1/32" port**	**1/16" port**	**1/32" port**	**1/16" port**	**1/32" port**
0.5 x 30mm	MDKE-2-03005	MDKE-2-03005S	MDKE-3-03005	MDKE-3-03005S	MDKE-5-03005	MDKE-5-03005S
0.5 x 50mm	MDKE-2-05005	MDKE-2-05005S	MDKE-3-05005	MDKE-3-05005S	MDKE-5-05005	MDKE-5-05005S
0.5 x 75mm	MDKE-2-75005	MDKE-2-75005S	MDKE-3-75005	MDKE-3-75005S	MDKE-5-75005	MDKE-5-75005S
0.5 x 100mm	MDKE-2-10005	MDKE-2-10005S	MDKE-3-10005	MDKE-3-10005S	MDKE-5-10005	MDKE-5-10005S
0.5 x 125mm	MDKE-2-12005	MDKE-2-12005S	MDKE-3-12005	MDKE-3-12005S	MDKE-5-12005	MDKE-5-12005S
0.5 x 150mm	MDKE-2-15005	MDKE-2-15005S	MDKE-3-15005	MDKE-3-15005S	MDKE-5-15005	MDKE-5-15005S
0.5 x 250mm	-	-	-	-	MDKE-5-25005	MDKE-5-25005S
1.0 x 30mm	MDKE-2-0301	MDKE-2-0301S	MDKE-3-0301	MDKE-3-0301S	MDKE-5-0301	MDKE-5-0301S
1.0 x 50mm	MDKE-2-0501	MDKE-2-0501S	MDKE-3-0501	MDKE-3-0501S	MDKE-5-0501	MDKE-5-0501S
1.0 x 75mm	MDKE-2-7501	MDKE-2-7501S	MDKE-3-7501	MDKE-3-7501S	MDKE-5-7501	MDKE-5-7501S
1.0 x 100mm	MDKE-2-1001	MDKE-2-1001S	MDKE-3-1001	MDKE-3-1001S	MDKE-5-1001	MDKE-5-1001S
1.0 x 125mm	MDKE-2-1201	MDKE-2-1201S	MDKE-3-1201	MDKE-3-1201S	MDKE-5-1201	MDKE-5-1201S
1.0 x 150mm	MDKE-2-1501	MDKE-2-1501S	MDKE-3-1501	MDKE-3-1501S	MDKE-5-1501	MDKE-5-1501S
1.0 x 250mm	-	-	-	-	MDKE-5-2501	MDKE-5-2501S

IMPORTANT NOTE: ACE microbore columns (1.0mm id and 0.5mm id) are available with either standard 1/16" (10-32 thread) connections or 1/32" (6-40 thread) connections. For use with Eksigent micro and nano LC systems, order columns with 1/32" connections and use either ACE 6-40 fittings (part number ACE-MC3210, 10 pack) or Eksigent 6-40 fittings (part number 5019621).

For 1/16" HPLC column connections up to 6000psi, PEEK™ 1/16" fingertight fittings (part number ACE-CC10, 10 pack) are recommended. For 1/32" microbore HPLC column connections up to 6000psi, PEEK™ 1/32" (6-40 thread) fingertight fittings (part number ACE-MC3210, 10 pack) are recommended. For 1/16" UHPLC column connections up to 25000psi, reuseable 1/16" fittings (part number EXL-CC10, 10 pack) are recommended. To further extend UHPLC and HPLC column lifetimes, ACE pre-column filters are recommended. For further details please contact your distributor or visit www.ace-hplc.com

ACE UltraCore Method Development Kits

- Contains ACE UltraCore SuperC18 and SuperPhenylHexyl phases
- Use to exploit selectivity changes at low, intermediate and high pH
- Available from microbore (0.5mm id) through to analytical (4.6mm id) dimensions (see p.14)
- Ultra inert core-shell particles and Encapsulated Bonding Technology (EBT™) provide excellent peak shape

Phase	Functional Group	Particle Size (µm)	Pore Size (Å)	Surface Area (m^2/g)	Carbon Load (%)	Maximum pH Range	USP Listing
ACE UltraCore 2.5 SuperC18	Octadecyl encapsulated	2.5	95	130	7.0	1.5-11.0[a]	L1
ACE UltraCore 2.5 SuperPhenylHexyl	Phenyl-Hexyl encapsulated	2.5	95	130	4.6	1.5-11.0[a]	L11
ACE UltraCore 5 SuperC18	Octadecyl encapsulated	5	95	100	5.4	1.5-11.0[a]	L1
ACE UltraCore 5 SuperPhenylHexyl	Phenyl-Hexyl encapsulated	5	95	100	3.6	1.5-11.0[a]	L11

[a] ACE UltraCore columns are designed for use with LC/MS compatible buffers. Further information is contained within "ACE UltraCore – A Guide to Buffer Selection" - please contact your distributor to request your FREE copy or visit www.ace-hplc.com.

ACE UltraCore - Columns Provide Improved Peak Shape

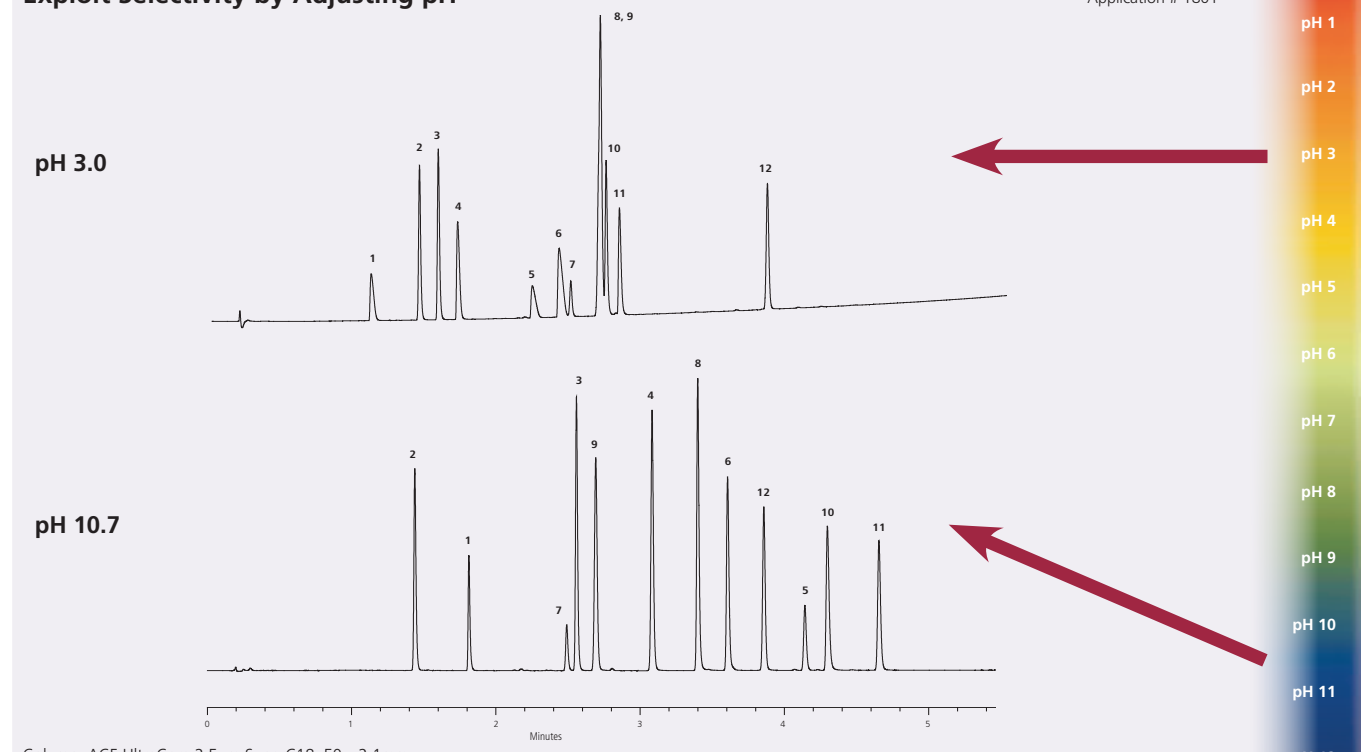
- ACE UltraCore SuperC18 and SuperPhenylHexyl phases are manufactured using our unique Encapsulated Bonding Technology (EBT™)
- This technology dramatically increases ligand coverage of the silica surface and effectively eliminates the negative effects of unbonded silanol groups
- The higher ligand coverage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

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

Use ACE UltraCore to Investigate pH Effects

Exploit Selectivity by Adjusting pH

Application # 1801



Column: ACE UltraCore 2.5µm SuperC18, 50 x 2.1mm
Sample: 1) atenolol 2) methylphenylsulphoxide 3) eserine 4) prilocaine 5) bupivacaine 6) tetracaine 7) 1,2,3,4-tetrahydro-1-naphthol 8) carvedilol 9) nitrobenzene 10) methdilazine 11) amitriptyline 12) valerophenone
Temperature: 40°C Flow Rate: 0.60ml/min Wavelength: 254nm Gradient: 3 – 100% B in 5 minutes
Acidic Mobile Phase: A: 20mM ammonium formate in H_2O (pH 3.0) B: 20mM ammonium formate (pH 3.0) in 90:10 (v/v) MeCN/H_2O
Basic Mobile Phase: A: 0.1% NH_3 (= 18mM) in H_2O (pH 10.7) B: 0.1% NH_3 (=18mM), pH 10.7 in 90:10 (v/v) MeCN/H_2O

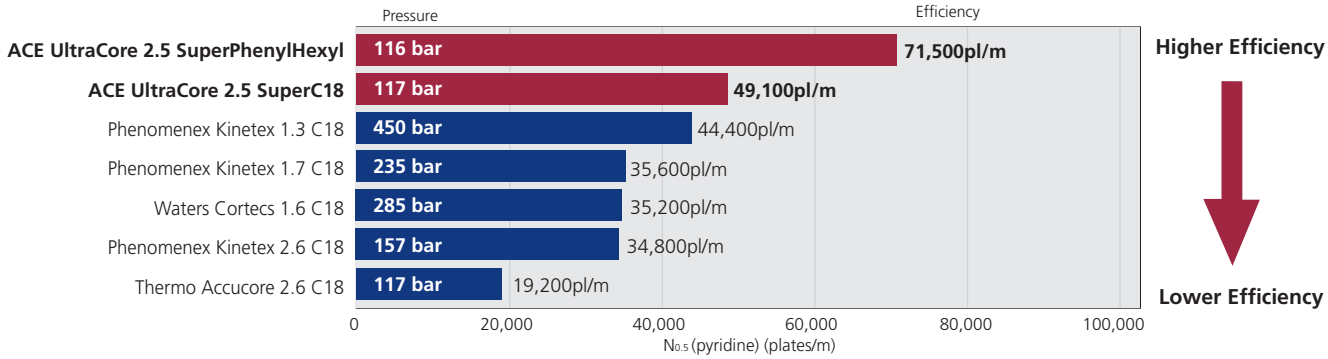
ACE UltraCore Columns are Highly Inert

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

Peak Efficiency Comparison

Application # 1802

Reproduced with kind permission of The Open University, UK



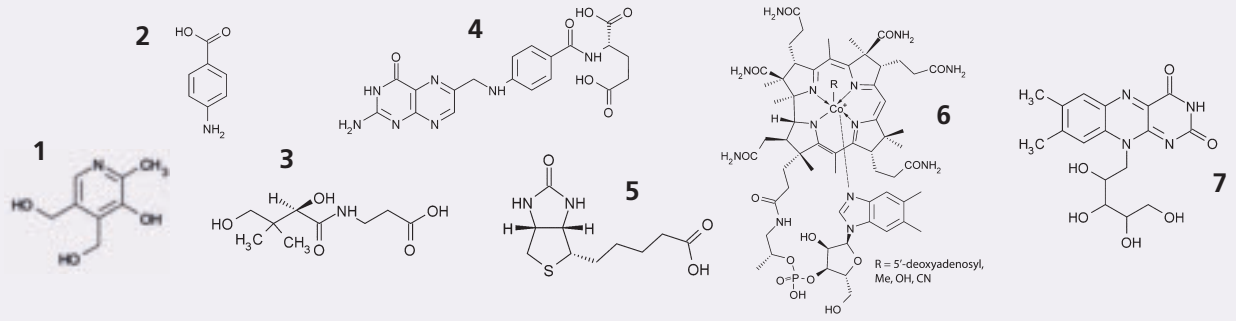
Column Dimensions: 50 x 2.1mm Sample: 1) uracil 2) pyridine 3) phenol
Mobile Phase: 30:70 v/v MeOH/10mM NH_4OAc in H_20 (pH 5.8) Flow Rate: 0.20ml/min Temperature: 22°C Detection: 254nm

Comparative data may not be representative of all applications. Please see back page for acknowledgement of trademarks.

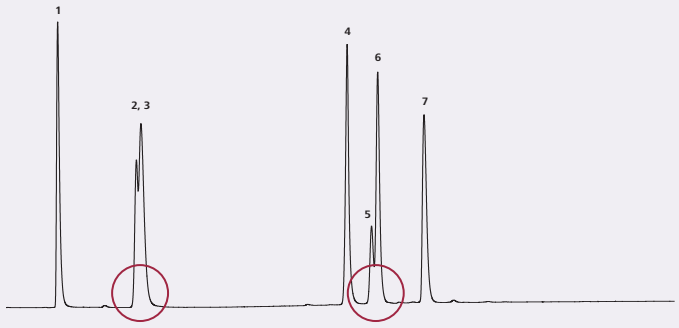
Introducing Selectivity Changes Using ACE UltraCore Method Development Kits

Vitamin Separation

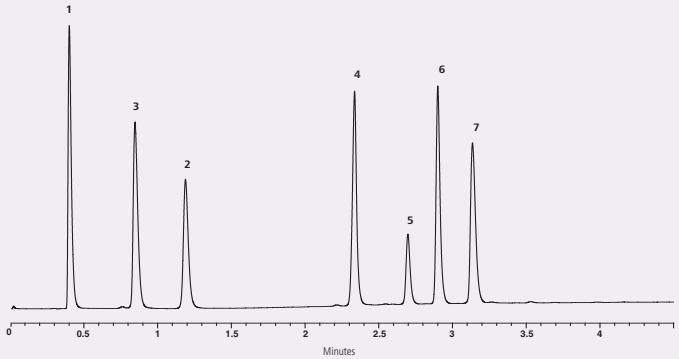
Application # 1941



ACE UltraCore SuperC18



ACE UltraCore SuperPhenylHexyl



Multi-mode interaction (including π-π and hydrophobic interactions) provides complete separation.

Column: 50 x 2.1mm, 2.5µm
Sample: 1) pyridoxine 2) p-aminobenzoic acid 3) pantothenic acid 4) folic acid 5) d-biotin 6) cyanocobalamin 7) riboflavin
Mobile Phase A: 20 mM KH_2PO_4 pH 2.7 (aq) B: 20 mM KH_2PO_4 pH 2.7 in MeOH:H_2O 50:50 (v/v)

Gradient:	Time (mins)	0	1.50	3.00	3.75	4.50
	%B	20	60	70	70	20

Flow Rate: 0.40 ml/min Temperature: 40°C Wavelength: 205nm

ACE UltraCore Method Development UHPLC/HPLC Column Kits

(Contains 2 columns: ACE UltraCore SuperC18 and ACE UltraCore SuperPhenylHexyl of specified dimensions)

(UHPLC/HPLC hardware format with 1000bar/15000psi pressure limit)		
Column Dimensions	**2.5µm**	**5µm**
2.1 x 20mm	MDKU-25-0202U	MDKU-5-0202U
2.1 x 30mm	MDKU-25-0302U	MDKU-5-0302U
2.1 x 35mm	MDKU-25-3502U	MDKU-5-3502U
2.1 x 50mm	MDKU-25-0502U	MDKU-5-0502U
2.1 x 75mm	MDKU-25-7502U	MDKU-5-7502U
2.1 x 100mm	MDKU-25-1002U	MDKU-5-1002U
2.1 x 125mm	MDKU-25-1202U	MDKU-5-1202U
2.1 x 150mm	MDKU-25-1502U	MDKU-5-1502U
2.1 x 250mm	-	MDKU-5-2502U
3.0 x 20mm	MDKU-25-0203U	MDKU-5-0203U
3.0 x 30mm	MDKU-25-0303U	MDKU-5-0303U
3.0 x 35mm	MDKU-25-3503U	MDKU-5-3503U
3.0 x 50mm	MDKU-25-0503U	MDKU-5-0503U
3.0 x 75mm	MDKU-25-7503U	MDKU-5-7503U
3.0 x 100mm	MDKU-25-1003U	MDKU-5-1003U
3.0 x 125mm	MDKU-25-1203U	MDKU-5-1203U
3.0 x 150mm	MDKU-25-1503U	MDKU-5-1503U
3.0 x 250mm	-	MDKU-5-2503U
4.6 x 20mm	MDKU-25-0246U	MDKU-5-0246U
4.6 x 30mm	MDKU-25-0346U	MDKU-5-0346U
4.6 x 35mm	MDKU-25-3546U	MDKU-5-3546U
4.6 x 50mm	MDKU-25-0546U	MDKU-5-0546U
4.6 x 75mm	MDKU-25-7546U	MDKU-5-7546U
4.6 x 100mm	MDKU-25-1046U	MDKU-5-1046U
4.6 x 125mm	MDKU-25-1246U	MDKU-5-1246U
4.6 x 150mm	MDKU-25-1546U	MDKU-5-1546U
4.6 x 250mm	-	MDKU-5-2546U

ACE UltraCore Method Development Microbore HPLC Column Kits

(Contains 2 columns: ACE UltraCore SuperC18 and ACE UltraCore SuperPhenylHexyl of specified dimensions)

(HPLC hardware format with 400bar/6000psi recommended pressure limit)				
	2.5µm		**5µm**	
Column Dimensions	**1/16" port**	**1/32" port**	**1/16" port**	**1/32" port**
0.5 x 30mm	MDKU-25-03005	MDKU-25-03005S	MDKU-5-03005	MDKU-5-03005S
0.5 x 50mm	MDKU-25-05005	MDKU-25-05005S	MDKU-5-05005	MDKU-5-05005S
0.5 x 75mm	MDKU-25-75005	MDKU-25-75005S	MDKU-5-75005	MDKU-5-75005S
0.5 x 100mm	MDKU-25-10005	MDKU-25-10005S	MDKU-5-10005	MDKU-5-10005S
0.5 x 125mm	MDKU-25-12005	MDKU-25-12005S	MDKU-5-12005	MDKU-5-12005S
0.5 x 150mm	MDKU-25-15005	MDKU-25-15005S	MDKU-5-15005	MDKU-5-15005S
0.5 x 250mm	-	-	MDKU-5-25005	MDKU-5-25005S
1.0 x 30mm	MDKU-25-0301	MDKU-25-0301S	MDKU-5-0301	MDKU-5-0301S
1.0 x 50mm	MDKU-25-0501	MDKU-25-0501S	MDKU-5-0501	MDKU-5-0501S
1.0 x 75mm	MDKU-25-7501	MDKU-25-7501S	MDKU-5-7501	MDKU-5-7501S
1.0 x 100mm	MDKU-25-1001	MDKU-25-1001S	MDKU-5-1001	MDKU-5-1001S
1.0 x 125mm	MDKU-25-1201	MDKU-25-1201S	MDKU-5-1201	MDKU-5-1201S
1.0 x 150mm	MDKU-25-1501	MDKU-25-1501S	MDKU-5-1501	MDKU-5-1501S
1.0 x 250mm	-	-	MDKU-5-2501	MDKU-5-2501S

IMPORTANT NOTE: ACE microbore columns (1.0mm id and 0.5mm id) are available with either standard 1/16" (10-32 thread) connections or 1/32" (6-40 thread) connections. For use with Eksigent micro and nano LC systems, order columns with 1/32" connections and use either ACE 6-40 fittings (part number ACE-MC3210, 10 pack) or Eksigent 6-40 fittings (part number 5019621).

For 1/16" HPLC column connections up to 6000psi, PEEK™ 1/16" fingertight fittings (part number ACE-CC10, 10 pack) are recommended. For 1/32" microbore HPLC column connections up to 6000psi, PEEK™ 1/32" (6-40 thread) fingertight fittings (part number ACE-MC3210, 10 pack) are recommended. For 1/16" UHPLC column connections up to 25000psi, reuseable 1/16" fittings (part number EXL-CC10, 10 pack) are recommended. To further extend UHPLC and HPLC column lifetimes, ACE pre-column filters are recommended. For further details please contact your distributor or visit www.ace-hplc.com

ACE Bioanalytical 300Å Method Development Kits

- Contain ACE C18-300, ACE C4-300 and ACE Phenyl-300 phases
- Ideal starting point for protein and peptide method development
- Available from microbore (0.5mm id) through to analytical (4.6mm id) dimensions (see p. 17)
- Ultra-inert 300Å phases provide excellent peak shape and reproducibility

Phase	Functional Group	Particle Size (µm)	Pore Size (Å)	Surface Area (m^2/g)	Carbon Load (%)	Recommended pH Range	USP Listing
ACE C18-300	Octadecyl (C18)	3, 5, 10	300	100	9.0	2.0-8.0[a]	L1
ACE C4-300	Butyl (C4)	3, 5, 10	300	100	2.6	2.0-8.0[a]	L26
ACE Phenyl-300	Phenyl	3, 5, 10	300	100	5.3	2.0-8.0[a]	L11

[a] For optimum column lifetime, a pH range of 2-8 is recommended. To increase column lifetime at higher pH, organic buffers, low buffer concentrations, high % organic solvent and low temperatures must be considered. Further information is contained within "A Guide to HPLC and LC/MS Buffer Selection" by John Dolan – please contact your distributor to request your FREE copy or visit www.ace-hplc.com.

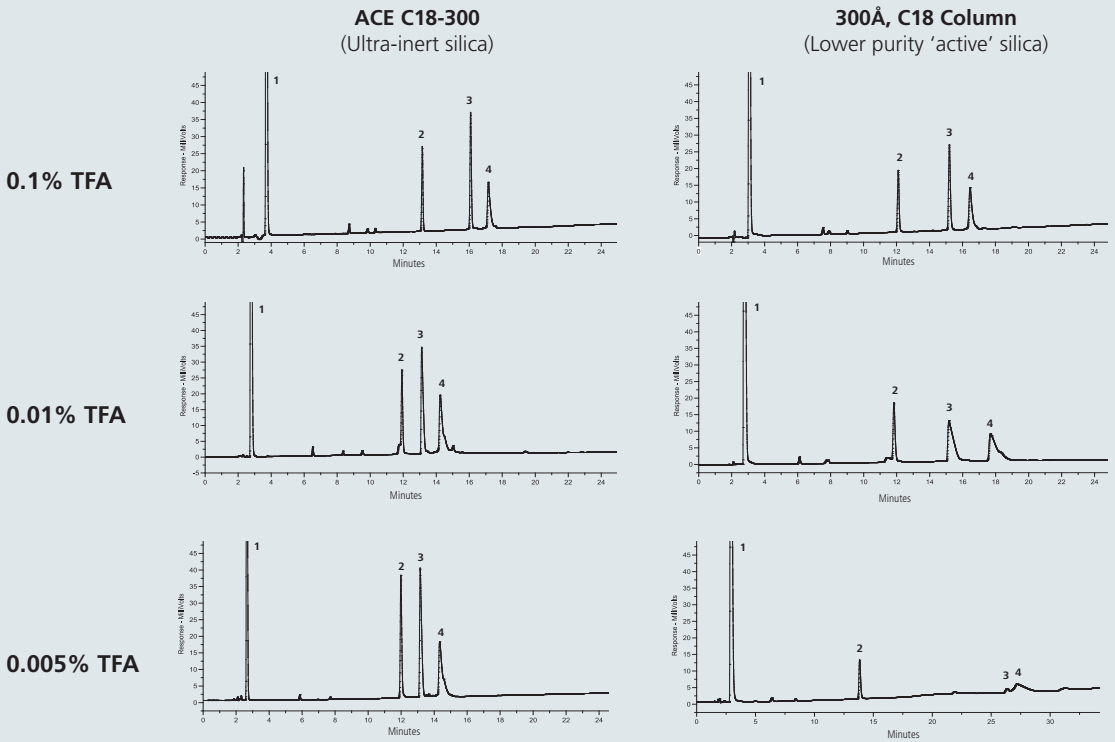
ACE 300Å Ultra-Inert Columns Provide Improved Peak Shape

ACE 300Å ultra-inert HPLC columns are manufactured using advanced technology that virtually eliminates the negative effects of silanols and metal contamination for the separation of peptides, proteins and other high molecular weight biomolecules.

The ultra-inert characteristics of ACE 300Å columns permit the use of as little as 0.005% TFA in the mobile phase. Lower purity columns show unacceptable peak tailing even when using as much as 0.01% TFA. The ability to run at reduced TFA concentrations results in increased sensitivity.

ACE 300Å Bioanalytical Columns Provide Excellent Peak Shape

Application # 2001



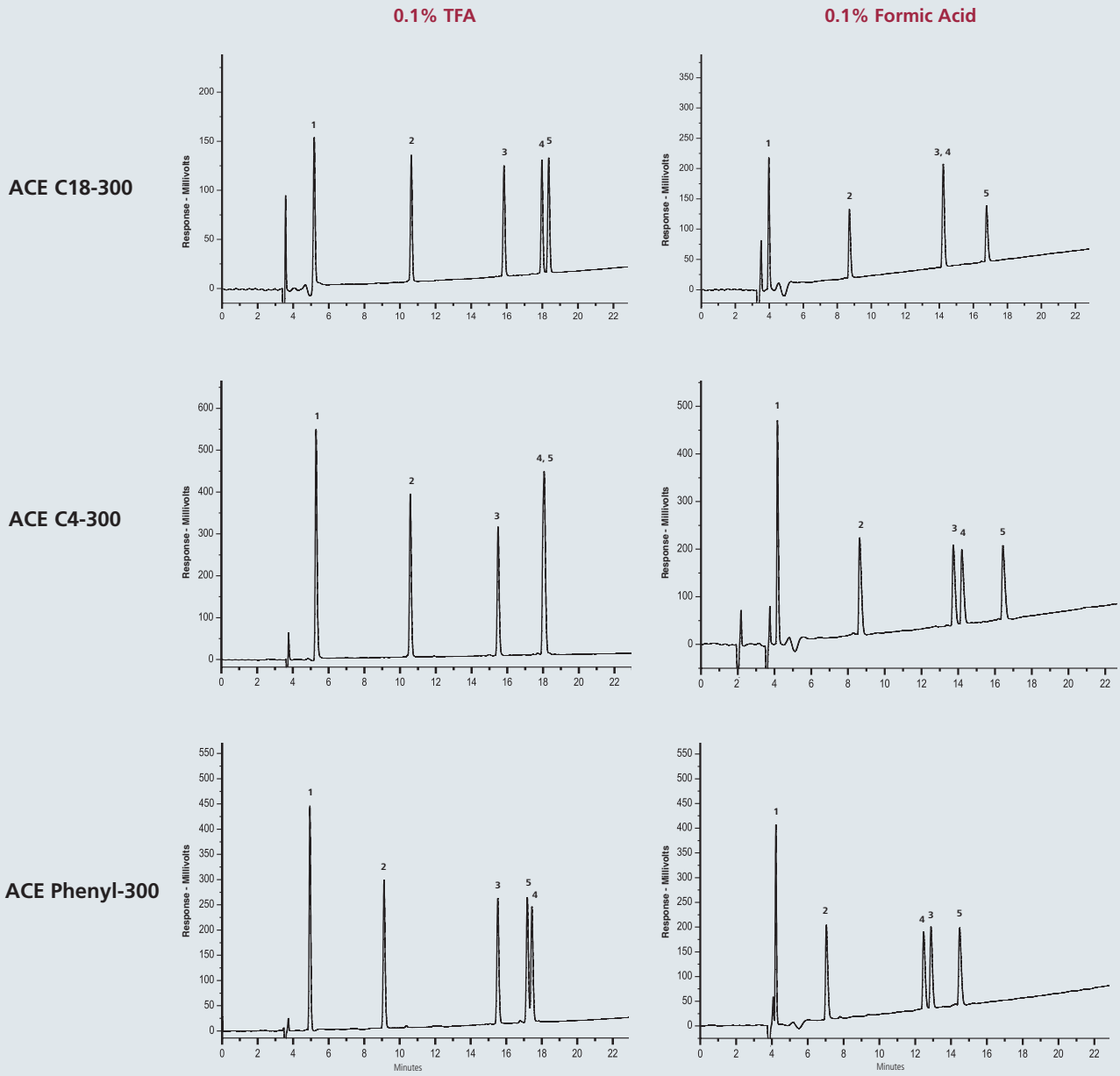
Columns: 250 x 4.6mm, 5µm
Sample: 1) Gly-Tyr 2) Oxytocin 3) Angiotensin II 4) Neurotensin
Mobile Phase: A = TFA in H_2O (% as specified above) B = TFA in MeCN (% as specified above) Gradient: 10 - 55% B in 37.5 minutes
Flow Rate: 1.50ml/min Temperature: 22°C Wavelength: 200nm

Comparative data may not be representative of all applications. Please see back page for acknowledgement of trademarks.

Using **ACE** Bioanalytical 300Å Method Development Kits to Optimise Selectivity

Introducing Selectivity Changes by Careful Consideration of Bonded Phase and Mobile Phase Additive

Application # 2002



The ACE 300Å C18, C4 and Phenyl chemistries contained within ACE Bioanalytical 300Å Method Development Kits enable the analyst to investigate selectivity effects due to phase variations. The ultra-inert characteristics of the ACE 300Å silica enable different mobile phase additives to be investigated without a deterioration in peak shape or sensitivity.

Columns: 250 x 4.6mm, 5µm
Sample: 1) Gly-Tyr 2) Val-Tyr-Val 3) Methionine enkephalin 4) Angiotensin II 5) Leucine enkephalin
Mobile Phase: A = 0.1% TFA in H_2O or 0.1% Formic Acid in H_2O (as specified above) B = MeCN Gradient: 10 – 40% B in 25 minutes
Flow Rate: 1.00ml/min Temperature: 22°C Wavelength: 220nm

ACE Bioanalytical 300Å Method Development HPLC Column Kits

(Contains 3 columns: ACE C18-300, ACE C4-300 and ACE Phenyl-300 of specified dimensions)

(HPLC hardware format with 275bar/4000psi pressure limit)		
Column Dimensions	**3µm**	**5µm**
2.1 x 20mm	MDKB-3-0202	MDKB-5-0202
2.1 x 30mm	MDKB-3-0302	MDKB-5-0302
2.1 x 35mm	MDKB-3-3502	MDKB-5-3502
2.1 x 50mm	MDKB-3-0502	MDKB-5-0502
2.1 x 75mm	MDKB-3-7502	MDKB-5-7502
2.1 x 100mm	MDKB-3-1002	MDKB-5-1002
2.1 x 125mm	MDKB-3-1202	MDKB-5-1202
2.1 x 150mm	MDKB-3-1502	MDKB-5-1502
2.1 x 250mm	-	MDKB-5-2502
3.0 x 20mm	MDKB-3-0203	MDKB-5-0203
3.0 x 30mm	MDKB-3-0303	MDKB-5-0303
3.0 x 35mm	MDKB-3-3503	MDKB-5-3503
3.0 x 50mm	MDKB-3-0503	MDKB-5-0503
3.0 x 75mm	MDKB-3-7503	MDKB-5-7503
3.0 x 100mm	MDKB-3-1003	MDKB-5-1003
3.0 x 125mm	MDKB-3-1203	MDKB-5-1203
3.0 x 150mm	MDKB-3-1503	MDKB-5-1503
3.0 x 250mm	-	MDKB-5-2503
4.6 x 20mm	MDKB-3-0246	MDKB-5-0246
4.6 x 30mm	MDKB-3-0346	MDKB-5-0346
4.6 x 35mm	MDKB-3-3546	MDKB-5-3546
4.6 x 50mm	MDKB-3-0546	MDKB-5-0546
4.6 x 75mm	MDKB-3-7546	MDKB-5-7546
4.6 x 100mm	MDKB-3-1046	MDKB-5-1046
4.6 x 125mm	MDKB-3-1246	MDKB-5-1246
4.6 x 150mm	MDKB-3-1546	MDKB-5-1546
4.6 x 250mm	-	MDKB-5-2546

Note: 4.0mm id ACE Bioanalytical 300Å Method Development Kits also available – please enquire

ACE Bioanalytical 300Å Method Development Microbore HPLC Column Kits

(Contains 3 columns: ACE C18-300, ACE C4-300 and ACE Phenyl-300 of specified dimensions)

(HPLC hardware format with 275bar/4000psi recommended pressure limit)				
	3µm		**5µm**	
Column Dimensions	**1/16" port**	**1/32" port**	**1/16" port**	**1/32" port**
0.5 x 30mm	MDKB-3-03005	MDKB-3-03005S	MDKB-5-03005	MDKB-5-03005S
0.5 x 50mm	MDKB-3-05005	MDKB-3-05005S	MDKB-5-05005	MDKB-5-05005S
0.5 x 75mm	MDKB-3-75005	MDKB-3-75005S	MDKB-5-75005	MDKB-5-75005S
0.5 x 100mm	MDKB-3-10005	MDKB-3-10005S	MDKB-5-10005	MDKB-5-10005S
0.5 x 125mm	MDKB-3-12005	MDKB-3-12005S	MDKB-5-12005	MDKB-5-12005S
0.5 x 150mm	MDKB-3-15005	MDKB-3-15005S	MDKB-5-15005	MDKB-5-15005S
0.5 x 250mm	-	-	MDKB-5-25005	MDKB-5-25005S
1.0 x 30mm	MDKB-3-0301	MDKB-3-0301S	MDKB-5-0301	MDKB-5-0301S
1.0 x 50mm	MDKB-3-0501	MDKB-3-0501S	MDKB-5-0501	MDKB-5-0501S
1.0 x 75mm	MDKB-3-7501	MDKB-3-7501S	MDKB-5-7501	MDKB-5-7501S
1.0 x 100mm	MDKB-3-1001	MDKB-3-1001S	MDKB-5-1001	MDKB-5-1001S
1.0 x 125mm	MDKB-3-1201	MDKB-3-1201S	MDKB-5-1201	MDKB-5-1201S
1.0 x 150mm	MDKB-3-1501	MDKB-3-1501S	MDKB-5-1501	MDKB-5-1501S
1.0 x 250mm	-	-	MDKB-5-2501	MDKB-5-2501S

IMPORTANT NOTE: ACE microbore columns (1.0mm id and 0.5mm id) are available with either standard 1/16" (10-32 thread) connections or 1/32" (6-40 thread) connections. For use with Eksigent micro and nano LC systems, order columns with 1/32" connections and use either ACE 6-40 fittings (part number ACE-MC3210, 10 pack) or Eksigent 6-40 fittings (part number 5019621).

For 1/16" HPLC column connections up to 6000psi, PEEK™ 1/16" fingertight fittings (part number ACE-CC10, 10 pack) are recommended. For 1/32" microbore HPLC column connections up to 6000psi, PEEK™ 1/32" (6-40 thread) fingertight fittings (part number ACE-MC3210, 10 pack) are recommended. For 1/16" UHPLC column connections up to 25000psi, reuseable 1/16" fittings (part number EXL-CC10, 10 pack) are recommended. To further extend UHPLC and HPLC column lifetimes, ACE pre-column filters are recommended. For further details please contact your distributor or visit www.ace-hplc.com

ACE HILIC Method Development Kits

- Contains ACE HILIC-A, ACE HILIC-B and ACE HILIC-N phases
- Alternative and improved selectivity to reversed-phase for polar and very polar analytes
- Available from microbore (0.5mm id) through to analytical (4.6mm id) dimensions (see p. 21)
- ACE HILIC-A, ACE HILIC-B and ACE HILIC-N provide alternative selectivity to each other

Phase	Functional Group	Endcapped	Particle Size (µm)	Pore Size (Å)	Surface Area (m^2/g)	Carbon Load (%)	Recommended pH Range	USP Listing
ACE HILIC-A	Proprietary SIL	No	1.7, 3, 5	100	300	-	2.0-7.0	L3
ACE HILIC-B	Proprietary Aminopropyl	No	1.7, 3, 5	100	300	4.0	2.0-7.0	L8
ACE HILIC-N	Proprietary Polyhydroxy	No	1.7, 3, 5	100	300	7.0	2.0-7.0	Pending

To extend column lifetime under HPLC conditions (up to 5000 psi / 350 bar), ACE guard cartridges (5/pk) or ACE pre-column filters (5/pk) are recommended. For the guard system a guard cartridge holder (H0001) and coupler (C0001) are also required. To extend column lifetime under UHPLC conditions (up to 15000 psi / 1000 bar) an ACE UHPLC pre-column filter is recommended.

What is HILIC?

- Hydrophilic Interaction Liquid Chromatography (HILIC) was first described by Alpert*.
- HILIC is ideal for the separation and retention of polar species including polar neutral and polar ionised analytes.
- HILIC separations typically include a polar stationary phase with high organic solvent containing mobile phases.
- Mechanistically HILIC is complex (Fig 1) and provides multiple modes of interaction between the analyte, stationary phase, eluent and water enriched layer at the stationary phase particle-eluent interface**.

* A. J. Alpert, J. Chromatogr., 499 (1990) 177.
** See the FREE ACE guide to reproducible HILIC method development for more information – order your copy now.

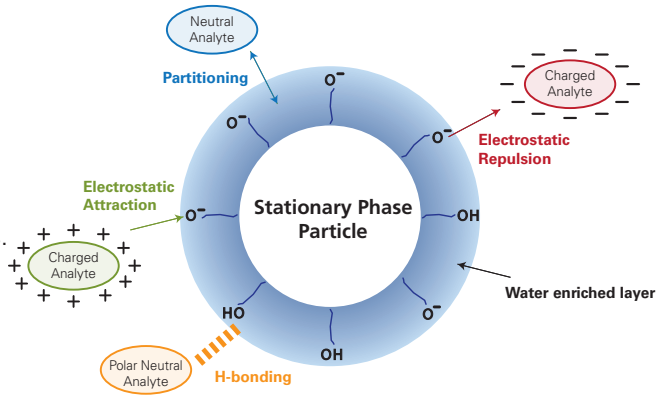


Figure 1. Schematic of interactions between different types of polar analytes and a stationary phase in HILIC mode

When Should You Consider HILIC?

- HILIC provides the retention and separation of hydrophilic or polar to very polar analytes not well retained in RPLC.
- Hydrophilic or polar to very polar analytes have log P values (measure of lipophilicity) of around zero or less (Fig 2A).
- Generally, polar analytes are suitable for HILIC if they elute before caffeine in gradient RPLC (Fig 2B).

Figure 2A. Analyte suitability for HILIC from Log P

Figure reproduced with permission and adapted from work first published in Chromatography Today, Volume 8, Issue 4, November/December 2015

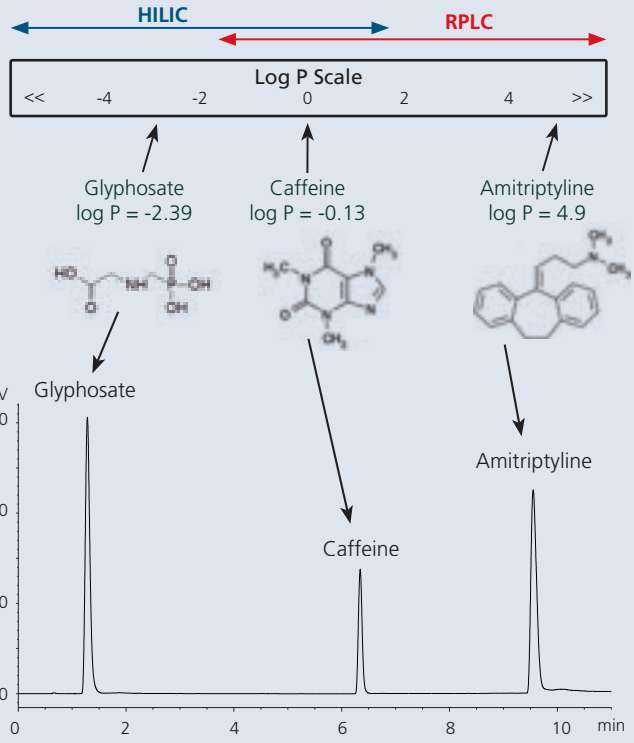


Figure 2B. Analyte suitability for HILIC from gradient RPLC

Column: ACE Excel C18, 100 x 3.0mm, 2µm
Part Number: EXL-101-1003U
Mobile Phase: A = 10mM ammonium formate, pH 3.0 (aq) B = 10mM ammonium formate, pH 3.0 in 90:10 v/v MeCN:H_2O
Gradient: 5-100% B in 10 minutes
Detection: ELSD Flow Rate: 0.4mL min
Temperature: 30 °C Injection: 10µL
Analysed using VWR-Hitachi Chromaster with VWR ELSD90.

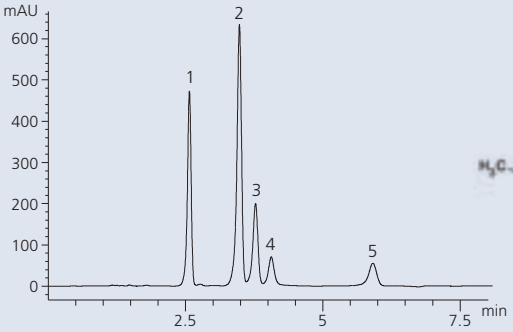
ACE HILIC Columns – 3 Alternative Selectivities

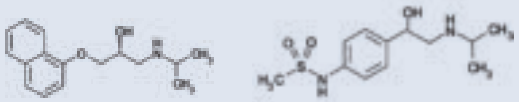
ACE HILIC-A	ACE HILIC-B	ACE HILIC-N
An acidic character phase with an ionisable negative surface charge depending on mobile phase pH	A basic character phase with an ionisable positive surface charge depending on mobile phase pH	A neutral character phase capable of H-bonding amongst other mechanisms of interaction

ACE HILIC-A

• An **acidic character** phase.

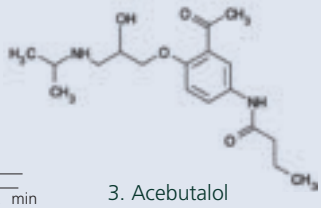
β-blockers (ACE AN#4530)



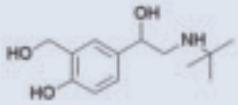


1. Propranolol

2. Sotalol



3. Acebutalol



4. Salbutamol

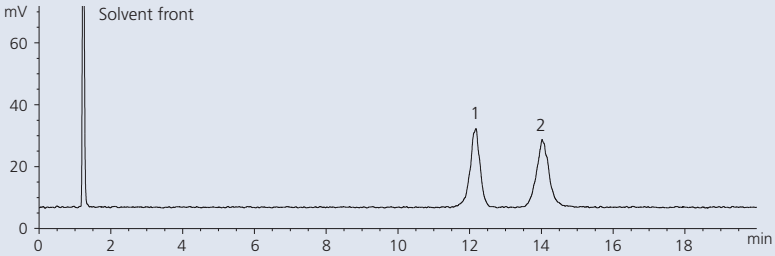
5. Atenolol

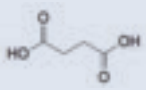
Column: ACE HILIC-A,150 x 4.6mm, 5µm Part Number: HILA-5-1546U Mobile Phase: 12mM ammonium formate pH 4.7 in MeCN/H_2O (88:12 v/v)
Flow Rate: 1.5mL/min Injection: 2µL Temperature: 25 °C Detection: 230nm

ACE HILIC-B

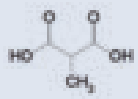
• A **basic character** phase.

Succinic acid and methylmalonic acid (ACE AN#4520)





1. Succinic acid



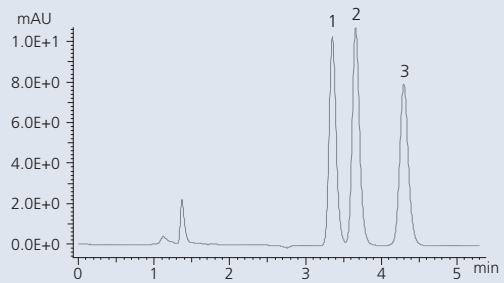
2. Methylmalonic acid

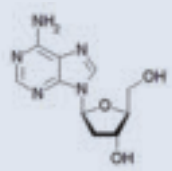
Column: ACE HILIC-B, 150 x 4.6mm, 5µm Part Number: HILB-5-1546U Mobile Phase: 10mM ammonium formate pH 3.0 in MeCN/H_2O (90:10 v/v)
Flow Rate: 1.5mL/min Temperature: 25 °C Injection: 5µL Detection: ELSD (Evaporator temp: 30 °C, Nebuliser temp: 30 °C, Gas speed: 1 SLM)

ACE HILIC-N

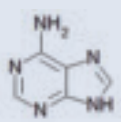
• A polar **neutral character** phase.

Nucleobases and nucleosides (ACE AN#4550)

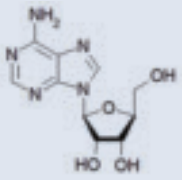




1. Deoxyadenosine



2. Adenine



3. Adenosine

Column: ACE HILIC-N, 150 x 4.6mm, 5µm Part Number: HILN-5-1546U Mobile Phase: 10mM ammonium formate pH 4.7 in MeCN/H_2O (90:10 v/v)
Flow Rate: 1.5mL/min Temperature: 25 °C Injection: 5µL Detection: 254nm

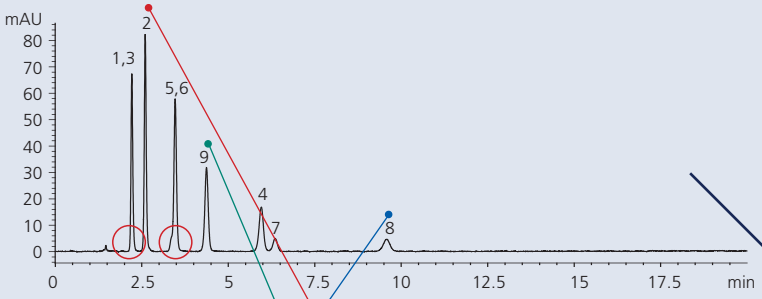
ACE HILIC Method Development

- ACE HILIC columns provide alternative selectivity to each other.
- The power of systematic screening of different phase chemistries for HILIC method development is seen below.
- Maximise your HILIC method development success by following the ACE HILIC method development protocol using three optimised ACE HILIC column chemistries – protocol available in the **FREE HILIC Method Development guide.**

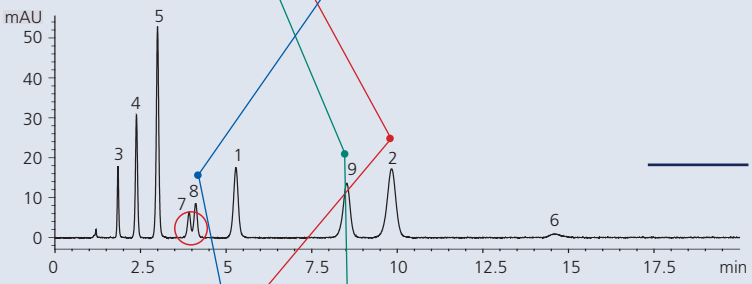
Advantages of using ACE HILIC Method Development Kits

Explore Selectivity: Method Development Kits available: 3 column kit for the **same price** as a single column see page 21

ACE HILIC-A

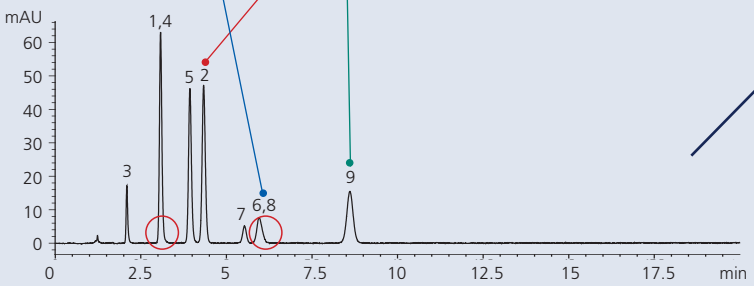


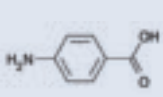
ACE HILIC-B

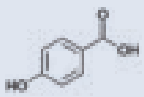


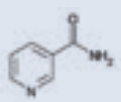
Different Elution Orders and Retention Times Observed

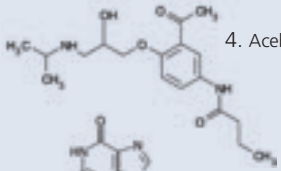
ACE HILIC-N



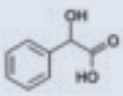

1. p-Aminobenzoic acid

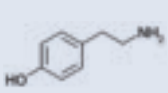

2. 4-Hydroxybenzoic acid

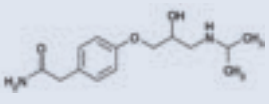

3. Nicotinamide

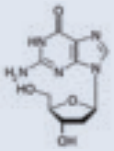

4. Acebutolol


5. Adenine


6. Mandelic acid


7. Tyramine


8. Atenolol


9. 2-Deoxyguanosine

Columns: All 150 x 4.6mm, 5µm (Part numbers: ACE HILIC-A: HILA-5-1546U, ACE HILIC-B: HILB-5-1546U, ACE HILIC-N: HILN-5-1546U)
Mobile Phase: 10mM ammonium formate pH 4.7 in MeCN/H_2O (90:10 v/v) Flow Rate: 1.5mL/min Temperature: 25 °C Detection: 254nm
Sample: 1) p-Aminobenzoic acid 2) 4-Hydroxybenzoic acid 3) Nicotinamide 4) Acebutolol 5) Adenine 6) Mandelic acid 7) Tyramine 8) Atenolol 9) 2-Deoxyguanosine

Conclusions

ACE HILIC columns provide alternative selectivity to each other – ideal for HILIC method development.

FREE HILIC Method Development Technical Guide

A 38 page HILIC Method Development Technical Guide illustrating a tried and tested approach to HILIC method development is available. Request your copy today and learn how to develop reproducible and robust HILIC methods simply and efficiently. Available at **www.ace-hplc.com** Alternatively, please contact our technical support team via **info@ace-hplc.com**

ACE HILIC Method Development UHPLC/HPLC Column Kits

(Contains 3 columns: ACE HILIC-A, ACE HILIC-B and ACE HILIC-N of specified dimensions)

(UHPLC/HPLC hardware format with 1000bar/15000psi pressure limit)			
Column Dimensions	**1.7µm**	**3µm**	**5µm**
2.1 x 20mm	MDKH-17-0202U	MDKH-3-0202U	MDKH-5-0202U
2.1 x 30mm	MDKH-17-0302U	MDKH-3-0302U	MDKH-5-0302U
2.1 x 35mm	MDKH-17-3502U	MDKH-3-3502U	MDKH-5-3502U
2.1 x 50mm	MDKH-17-0502U	MDKH-3-0502U	MDKH-5-0502U
2.1 x 75mm	MDKH-17-7502U	MDKH-3-7502U	MDKH-5-7502U
2.1 x 100mm	MDKH-17-1002U	MDKH-3-1002U	MDKH-5-1002U
2.1 x 125mm	-	MDKH-3-1202U	MDKH-5-1202U
2.1 x 150mm	-	MDKH-3-1502U	MDKH-5-1502U
2.1 x 250mm	-	MDKH-3-2502U	MDKH-5-2502U
3.0 x 20mm	MDKH-17-0203U	MDKH-3-0203U	MDKH-5-0203U
3.0 x 30mm	MDKH-17-0303U	MDKH-3-0303U	MDKH-5-0303U
3.0 x 35mm	MDKH-17-3503U	MDKH-3-3503U	MDKH-5-3503U
3.0 x 50mm	MDKH-17-0503U	MDKH-3-0503U	MDKH-5-0503U
3.0 x 75mm	MDKH-17-7503U	MDKH-3-7503U	MDKH-5-7503U
3.0 x 100mm	MDKH-17-1003U	MDKH-3-1003U	MDKH-5-1003U
3.0 x 125mm	-	MDKH-3-1203U	MDKH-5-1203U
3.0 x 150mm	-	MDKH-3-1503U	MDKH-5-1503U
3.0 x 250mm	-	MDKH-3-2503U	MDKH-5-2503U
4.6 x 20mm	-	MDKH-3-0246U	MDKH-5-0246U
4.6 x 30mm	-	MDKH-3-0346U	MDKH-5-0346U
4.6 x 35mm	-	MDKH-3-3546U	MDKH-5-3546U
4.6 x 50mm	-	MDKH-3-0546U	MDKH-5-0546U
4.6 x 75mm	-	MDKH-3-7546U	MDKH-5-7546U
4.6 x 100mm	-	MDKH-3-1046U	MDKH-5-1046U
4.6 x 125mm	-	MDKH-3-1246U	MDKH-5-1246U
4.6 x 150mm	-	MDKH-3-1546U	MDKH-5-1546U
4.6 x 250mm	-	MDKH-3-2546U	MDKH-5-2546U

Selectivity Offer:
Each 3 column kit is available for the **same price** as a single column

ACE HILIC Method Development Microbore HPLC Column Kits

(Contains 3 columns: ACE HILIC-A, ACE HILIC-B and ACE HILIC-N of specified dimensions)

(HPLC hardware format with 400bar/6000psi recommended pressure limit)				
	3µm		**5µm**	
Column Dimensions	**1/16" port**	**1/32" port**	**1/16" port**	**1/32" port**
0.5 x 30mm	MDKH-3-03005	MDKH-3-03005S	MDKH-5-03005	MDKH-5-03005S
0.5 x 50mm	MDKH-3-05005	MDKH-3-05005S	MDKH-5-05005	MDKH-5-05005S
0.5 x 75mm	MDKH-3-75005	MDKH-3-75005S	MDKH-5-75005	MDKH-5-75005S
0.5 x 100mm	MDKH-3-10005	MDKH-3-10005S	MDKH-5-10005	MDKH-5-10005S
0.5 x 125mm	MDKH-3-12005	MDKH-3-12005S	MDKH-5-12005	MDKH-5-12005S
0.5 x 150mm	MDKH-3-15005	MDKH-3-15005S	MDKH-5-15005	MDKH-5-15005S
0.5 x 250mm	-	-	MDKH-5-25005	MDKH-5-25005S
1.0 x 30mm	MDKH-3-0301	MDKH-3-0301S	MDKH-5-0301	MDKH-5-0301S
1.0 x 50mm	MDKH-3-0501	MDKH-3-0501S	MDKH-5-0501	MDKH-5-0501S
1.0 x 75mm	MDKH-3-7501	MDKH-3-7501S	MDKH-5-7501	MDKH-5-7501S
1.0 x 100mm	MDKH-3-1001	MDKH-3-1001S	MDKH-5-1001	MDKH-5-1001S
1.0 x 125mm	MDKH-3-1201	MDKH-3-1201S	MDKH-5-1201	MDKH-5-1201S
1.0 x 150mm	MDKH-3-1501	MDKH-3-1501S	MDKH-5-1501	MDKH-5-1501S
1.0 x 250mm	-	-	MDKH-5-2501	MDKH-5-2501S

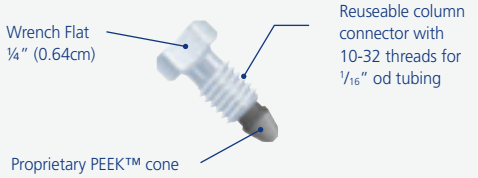
IMPORTANT NOTE: ACE microbore columns (1.0mm id and 0.5mm id) are available with either standard 1/16" (10-32 thread) connections or 1/32" (6-40 thread) connections. For use with Eksigent micro and nano LC systems, order columns with 1/32" connections and use either ACE 6-40 fittings (part number ACE-MC3210, 10 pack) or Eksigent 6-40 fittings (part number 5019621).

For 1/16" HPLC column connections up to 6000psi, PEEK™ 1/16" fingertight fittings (part number ACE-CC10, 10 pack) are recommended. For 1/32" microbore HPLC column connections up to 6000psi, PEEK™ 1/32" (6-40 thread) fingertight fittings (part number ACE-MC3210, 10 pack) are recommended. For 1/16" UHPLC column connections up to 25000psi, reuseable 1/16" fittings (part number EXL-CC10, 10 pack) are recommended. To further extend UHPLC and HPLC column lifetimes, ACE pre-column filters are recommended. For further details please contact your distributor or visit www.ace-hplc.com

UHPLC, HPLC and Microbore Column Accessories

UHPLC Column Connectors

- Pressure rating >1700 bar (>25000 psi)
- Compatible with all UHPLC systems[1]
- Compatible with all UHPLC column brands
- Eliminates poor connections
- Innovative reusable design



ACE Excel UHPLC Column Connector
(p/n EXL-CC10, 10 pack)

All UHPLC column brands require correct installation in order to realise maximum column efficiency. To avoid connection problems, permanently swaged fittings are not recommended as they do not allow free movement between the tubing, fitting and column inlet on installation. This can result in a poorly connected column that shows unexpected peak tailing due to the introduction of extra column volume (dead volume) to the system. Alternatively, a leak at the inlet fitting connection may be observed.

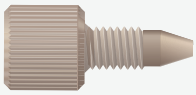
ACE Excel UHPLC Column Connectors (p/n EXL-CC10, 10 pack) enable the inlet end of UHPLC columns to be correctly installed every time. Their unique reuseable design ensures that they maintain a 1700 bar (25000 psi) pressure rating with repeated use, yet do not permanently swage onto the inlet tubing. To maximise the lifetime of the fitting, the use of a torque wrench (p/n EXL-TW) is required.

At the outlet end of the UHPLC column (where pressure demands are lower but a correct connection remains important), ACE Fingertight HPLC Column Connectors (p/n ACE-CC10, 10 pack, see below) may alternatively be used.

[1]**Note:** For inlet connections onto a Waters Acquity system (containing a Waters Acquity 1/16" fitting and ferrule on the inlet tubing) the use of a pre-column filter incorporating the unique Waters Acquity column port profile is alternatively recommended (p/n EXL-PCF10/ACQ - 10 pack) to ensure maximum compatibility with the Waters Acquity system fittings.

HPLC Column Connectors

- Fingertight to 350 bar (5000 psi)
- Reuseable and simple to install
- Eliminates poor connections
- Compatible with all HPLC column brands and instruments



ACE Fingertight HPLC Column Connector
(p/n ACE-CC10, 10 pack)

ACE Fingertight HPLC Column Connectors (p/n ACE-CC10, 10 pack) are recommended for the connection of both the inlet and outlet ends of HPLC columns.

Manufactured from premium quality PEEK™, the fittings simply hand tighten to provide a perfect column connection, and are pressure rated to 350 bar/5000 psi.

ACE Fingertight HPLC Column Connectors may additionally be used at the outlet end of UHPLC columns, where pressure demands are lower but a correct connection remains important.

Microbore HPLC Column Connectors

- Fingertight to 400 bar (6000 psi)
- Reuseable and simple to install
- Compatible with both capillary (360µm od) and 1/32" od connection tubing

ACE Microbore 1/32" Column Connector
(p/n ACE-MC3210, 10 pack)

ACE Microbore 1/32" Column Connectors (p/n ACE-MC3210, 10 pack) are recommended for the connection of inlet and outlet ends of ACE Microbore HPLC columns with 1/32" ports.

Each pack comes complete with 10 fittings and 10 capillary sleeves (which enable the fittings to be used with 360µm od tubing), plus a fingertight tightening adaptor.

These fittings are additionally compatible with any other brand of microbore column terminating with 1/32" ports and 6-40 threads.

Your decision has lasting effects.

ACE®

Ultra-Inert Base-Deactivated UHPLC/HPLC Columns
For Performance, Selectivity and Guaranteed Reproducibility

ACE®

ACE® products are available through our international network of distributors

www.ace-hplc.com

ACE®

UHPLC and HPLC Columns

Advanced Chromatography Technologies Ltd, 1 Berry Street, Aberdeen, AB25 1HF, Scotland

Tel : +44 (0) 1224 704 554 • Fax: +44 (0) 1224 841 301 • www.ace-hplc.com • email: info@ace-hplc.com

P2557-09-17-003-10000