Kinetex™
Ultra-High Performance
on Any LC System

Make ***any*** HPLC system perform like a UHPLC system
with Kinetex™ core-shell technology columns

phenomenex®
...breaking with tradition℠

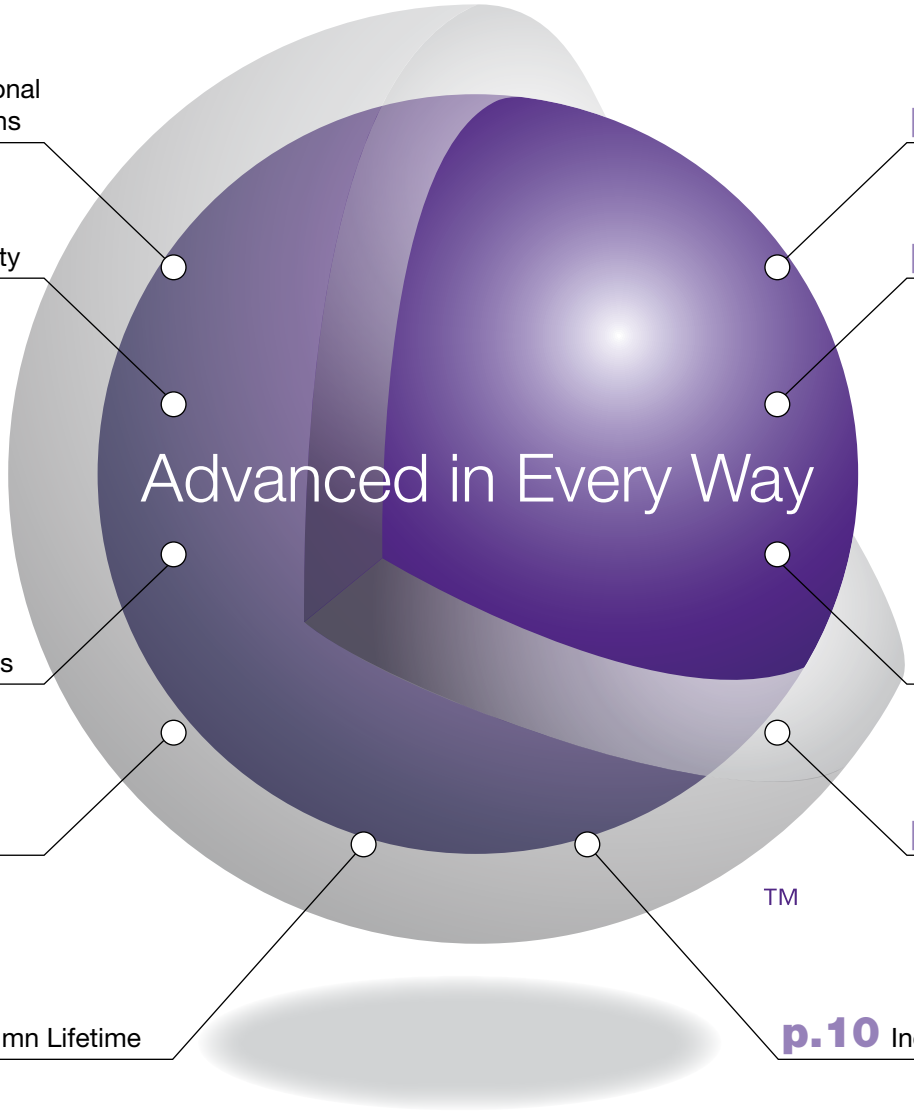
Ultra-High Performance on
ANY LC System

Introducing Kinetex™- a leap in column particle technology that will change the way you think about UHPLC (Ultra-High Performance Liquid Chromatography). Prepare to transform the performance of every HPLC instrument in your laboratory into UHPLC results by harnessing the power of core-shell technology†. You can **immediately improve resolution, throughput,** and **sensitivity** as well as **reduce solvent consumption.** No longer restricted by the HPLC/UHPLC system divide, you can develop high performance LC methods on any instrument and transfer them anywhere.

Welcome to the most versatile HPLC/UHPLC column on the planet

† See page 31 for an overview of core-shell technology.

KINETEX™



Low Backpressure
sub-2 µm Efficiency

Ultra-High Backpressure, Not Required

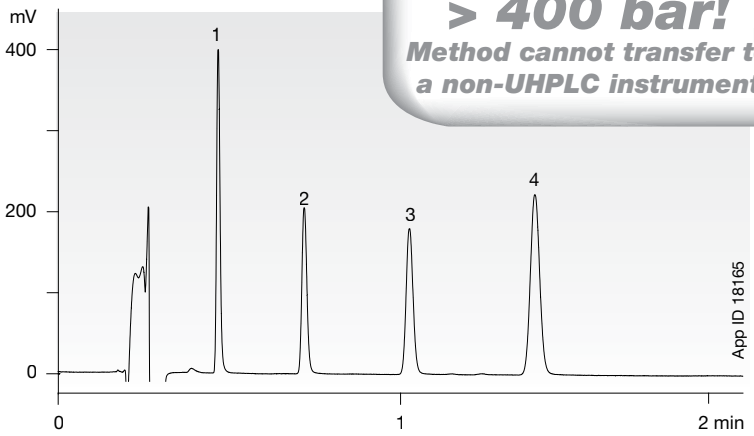
With the efficiency of a sub-2 µm column and typical operating backpressure less than 400 bar†, you can achieve the promise of UHPLC on **any LC system**.

Sub-2 µm

N = 272,080 p/m

> 400 bar!

Method cannot transfer to a non-UHPLC instrument

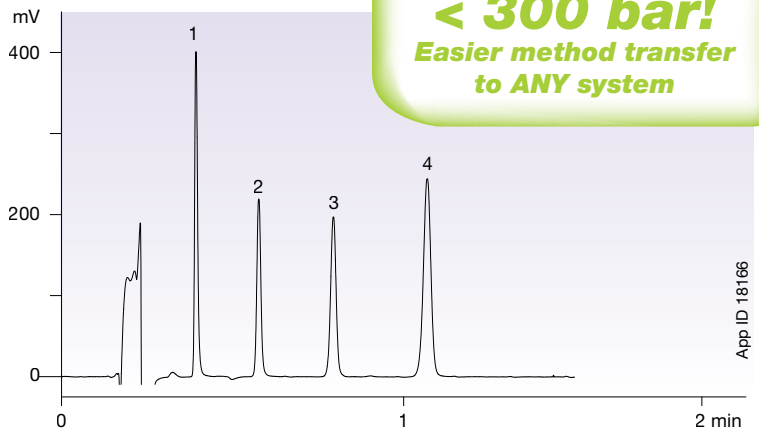


Kinetex™

N = 267,720 p/m

< 300 bar!

Easier method transfer to ANY system



Conditions for both columns

Column: Kinetex 2.6 µm C18
Traditional 1.7 µm C18
Dimensions: 50 x 2.1 mm
Mobile Phase: Acetonitrile / Water (50:50)
Flow Rate: 0.6 mL/min
Temperature: 25 °C
Detection: UV @ 254 nm
Instrument: *Waters® ACQUITY® UPLC®
Sample: 0.5 µL test mixture
1. Acetophenone
2. Benzene
3. Toluene
4. Naphthalene

† Kinetex 2.6 µm columns are pressure rated to 600 bar use on both HPLC and UHPLC instrumentation.
* ACQUITY and UPLC are registered trademarks of Waters Corporation. Phenomenex is not affiliated with Waters Corporation.
Comparative separations may not be representative of all applications.

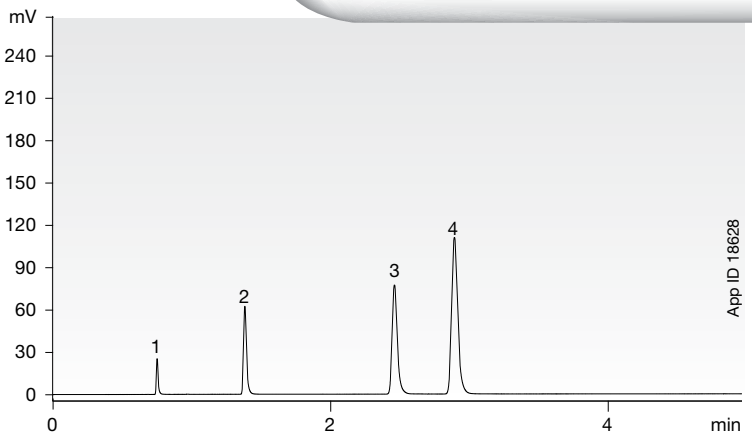
2x Efficiency

of Traditional 3 µm Columns

Replace traditional 3 µm or 5 µm analytical columns with Kinetex™ 2.6 µm core-shell columns for immediate performance improvements in efficiency, speed, resolution, and sensitivity. Optimize methods for UHPLC performance and transfer them to any system.

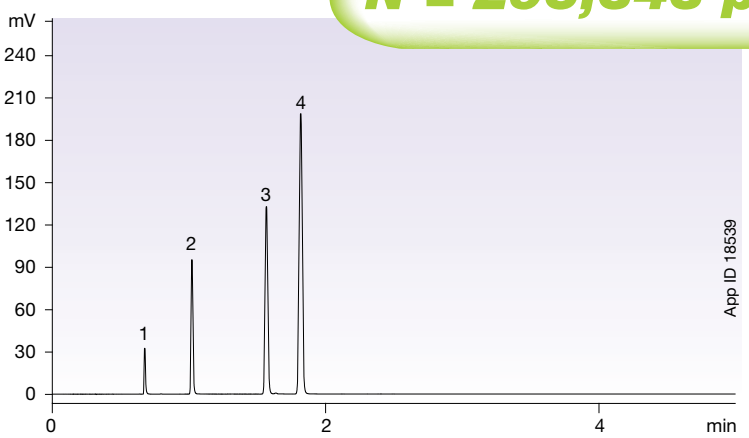
3 µm

N = 166,502 p/m



Kinetex™

N = 295,343 p/m



Conditions for both columns

Column: Kinetex 2.6 µm C18
Traditional 3 µm C18
Dimensions: 150 x 4.6 mm
Mobile Phase: Acetonitrile / Water (70:30)
Flow Rate: 1.8 mL/min
Temperature: 25 °C
Backpressure: 380 bar (Kinetex)
250 bar (Traditional 3 µm)
Detection: UV @ 254 nm
Instrument: Agilent 1200SL
Sample: 1. Uracil
2. Acetophenone
3. Toluene
4. Naphthalene

Comparative separations may not be representative of all applications.

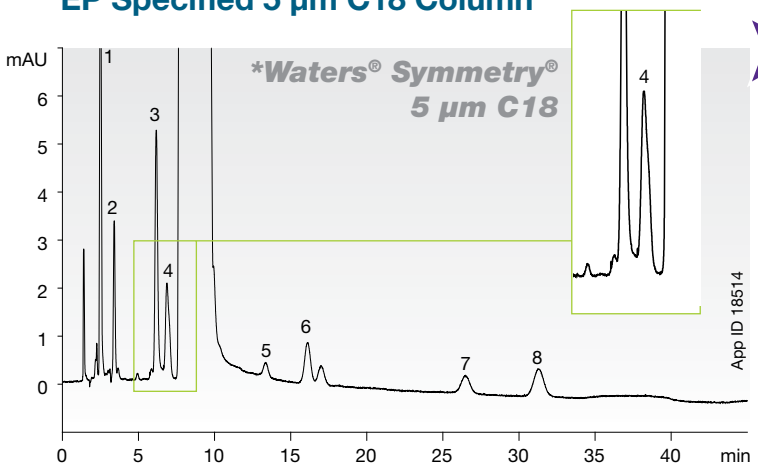
Replace 3 µm and 5 µm Columns
For Improved Speed, Resolution, and Sensitivity

Unlike traditionally fully porous particles, higher-pressure capable instruments are not required with Kinetex™ 2.6 µm core-shell technology to achieve ultra-high performance chromatography. Generating much lower backpressure (< 400 bar) at optimal linear velocities, you can now achieve 2-3x the column efficiencies of traditional fully porous 3 µm and 5 µm columns on any LC instrument. Use that extra efficiency to improve the resolution of a critical pair or consider decreasing your column length for higher throughput.

Optimization of Atenolol EP Method

This EP (European Pharmacopoeia [*Ph. Eur.*]) monograph is an impurity profile that uses an isocratic method. As shown to the right, Kinetex™ core-shell technology columns allow you to shorten the run time to less than 11 minutes and still maintain the resolution of all impurities.

EP Specified 5 µm C18 Column

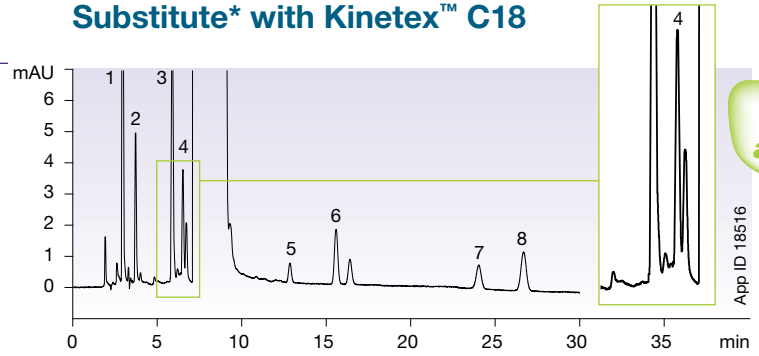


Dimensions: 150 x 3.9 mm
Mobile Phase: 12.5 mM Phosphoric acid in Water, pH 3.0 + 2.0 g Sodium Octanesulfonate + 0.8 g Tetrabutyl Ammonium Hydrogen Sulfate / Methanol / THF (80:18:2)
Flow Rate: 0.6 mL/min
Temperature: 22 °C
Detection: UV @ 226 nm
Sample: Atenolol Related Substance

1. Impurity B
2. Impurity A
3. Impurity J
4. Impurity I
5. Impurities D and E
6. Impurity F
7. Impurity G
8. Impurity H

* Waters and Symmetry are registered trademarks of Waters Corporation. Phenomenex is not affiliated with Waters Corporation.Comparative separations may not be representative of all applications.

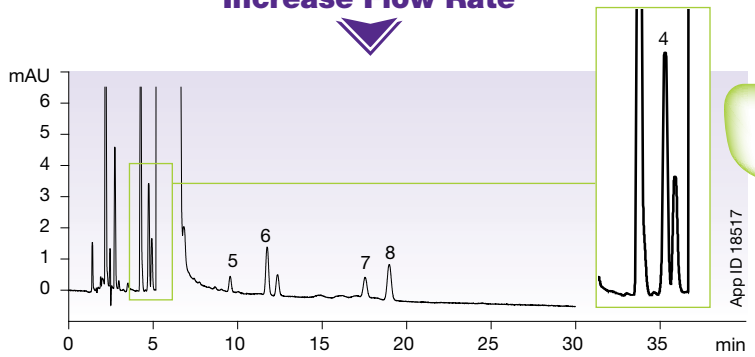
Substitute* with Kinetex™ C18



Improved Resolution and Higher Sensitivity

Column: Kinetex 2.6 µm C18
Dimensions: 150 x 4.6 mm
Part No.: 00F-4462-E0
Flow Rate: 0.6 mL/min

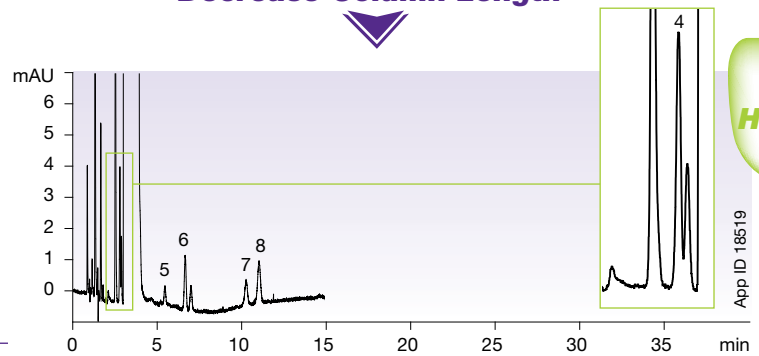
Increase Flow Rate



30 % Faster Analysis

Column: Kinetex 2.6 µm C18
Dimensions: 150 x 4.6 mm
Part No.: 00F-4462-E0
Flow Rate: 0.8 mL/min

Decrease Column Length‡



66 % Higher Throughput than Original EP Method

Column: Kinetex 2.6 µm C18
Dimensions: 100 x 4.6 mm
Part No.: 00D-4462-E0
Flow Rate: 1.0 mL/min

Conditions are same except as noted
Mobile Phase: 12.5 mM Phosphoric acid in Water, pH 3.0 + 2.0 g Sodium Octanesulfonate + 0.8 g Tetrabutyl Ammonium Hydrogen Sulfate / Methanol / THF (80:18:2)
Temperature: 22 °C
Detection: UV @ 226 nm
Sample: Atenolol Related Substance

1. Impurity B
2. Impurity A
3. Impurity J
4. Impurity I
5. Impurities D and E
6. Impurity F
7. Impurity G
8. Impurity H

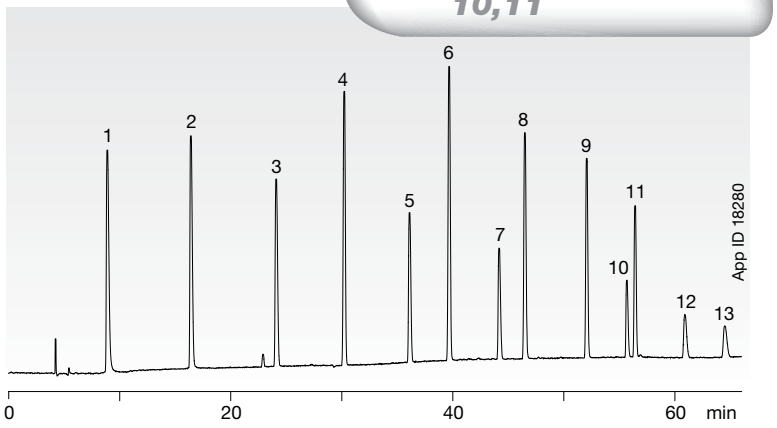
* Decrease in column particle within allowable EP and USP pharma particles size change (+/- 50 %)
‡ Decrease in column particle within allowable EP and USP column length change (+/- 50 %)

Decrease Run Time
Increase Resolution

In the past, the options for fast LC were limited to costly system upgrades, compromises in column performance or only modest improvements in throughput. Now, Kinetex™ core-shell technology delivers on the promise of UHPLC performance via dramatically faster analysis with similar or better resolution on **any LC platform**.

5 µm

$Rs_{10,11} = 3.11$



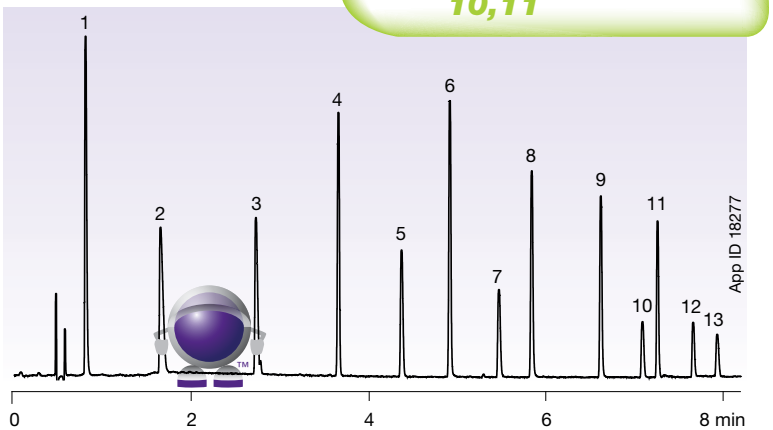
Column: Traditional 5 µm C18
Dimensions: 250 x 4.6 mm
Mobile Phase: A: Water
B: Acetonitrile

Gradient: Time (min)	% B	Time (min)	% B
0	5	66	95
4.78	5	66.01	5
51.52	95	86.38	5

Flow Rate: 0.714 mL/min
Temperature: 45 °C
Detection: UV @ 258 nm
Sample:
1. Acetone
2. 2-Butanone
3. 2-Pentanone
4. Acetophenone
5. 2-Heptanone
6. Butyrophenone
7. 2-Nonanone
8. Hexanophenone
9. Octanophenone
10. 2-Tridecanone
11. Decanophenone
12. 2-Pentadecanone
13. 2-Hexadecanone

Kinetex™

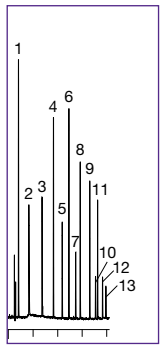
$Rs_{10,11} = 4.96$



Column: Kinetex 2.6 µm C18
Dimensions: 100 x 4.6 mm
Part No.: 00D-4462-E0
Mobile Phase: A: Water
B: Acetonitrile

Gradient: Time (min)	% B	Time (min)	% B
0	5	8.2	95
0.65	5	8.21	5
7.01	95	10.97	5

Flow Rate: 2.1 mL/min
Temperature: 45 °C
Detection: UV @ 258 nm
Backpressure: 360 bar
Sample:
1. Acetone
2. 2-Butanone
3. 2-Pentanone
4. Acetophenone
5. 2-Heptanone
6. Butyrophenone
7. 2-Nonanone
8. Hexanophenone
9. Octanophenone
10. 2-Tridecanone
11. Decanophenone
12. 2-Pentadecanone
13. 2-Hexadecanone



Original

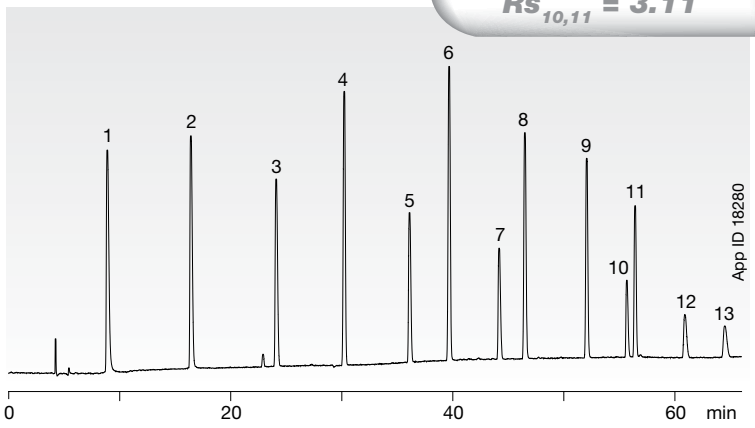
Decrease Run Time

Maximize Throughput

For the ultimate sample throughput demands, Kinetex™ columns provide the efficiency needed to significantly reduce run times. In this separation of 13 ketones, a 20-fold increase in productivity is accomplished while still maintaining resolution.

5 µm

> 60 min
$Rs_{10,11}$ = 3.11



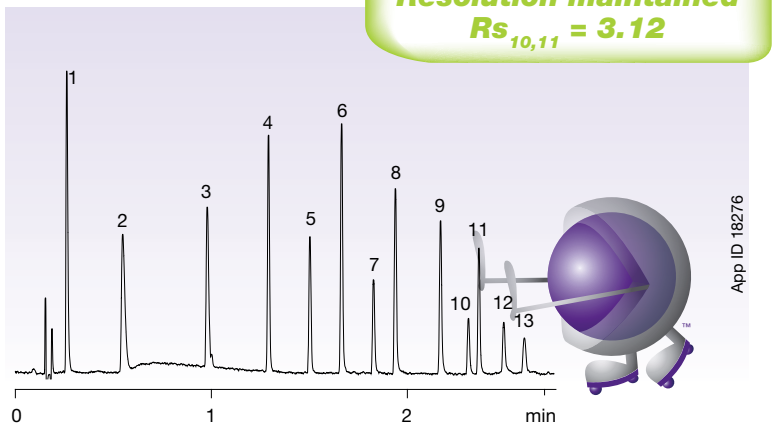
Column: Traditional 5 µm C18
Dimensions: 250 x 4.6 mm
Mobile Phase: A: Water
B: Acetonitrile

Gradient: Time (min)	% B	Time (min)	% B
0	5	66	95
4.78	5	66.01	5
51.52	95	86.38	5

Flow Rate: 0.714 mL/min
Temperature: 45 °C
Detection: UV @ 258 nm
Sample:
1. Acetone
2. 2-Butanone
3. 2-Pentanone
4. Acetophenone
5. 2-Heptanone
6. Butyrophenone
7. 2-Nonanone
8. Hexanophenone
9. Octanophenone
10. 2-Tridecanone
11. Decanophenone
12. 2-Pentadecanone
13. 2-Hexadecanone

Kinetex™

< 3 min
Resolution maintained
$Rs_{10,11}$ = 3.12



Column: Kinetex 2.6 µm C18
Dimensions: 50 x 4.6 mm
Part No.: 00B-4462-E0
Mobile Phase: A: Water
B: Acetonitrile

Gradient: Time (min)	% B	Time (min)	% B
0	5	2.75	95
0.23	5	2.76	5
2.19	95	3.61	5

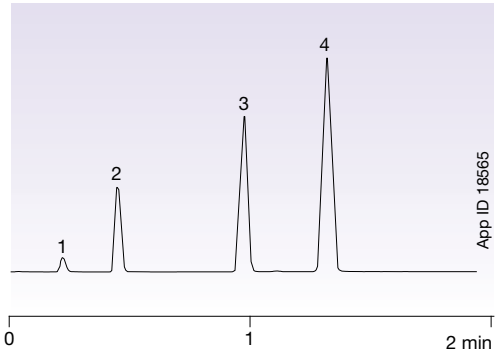
Flow Rate: 3.4 mL/min
Temperature: 45 °C
Detection: UV @ 258 nm
Backpressure: 350 bar
Sample:
1. Acetone
2. 2-Butanone
3. 2-Pentanone
4. Acetophenone
5. 2-Heptanone
6. Butyrophenone
7. 2-Nonanone
8. Hexanophenone
9. Octanophenone
10. 2-Tridecanone
11. Decanophenone
12. 2-Pentadecanone
13. 2-Hexadecanone

Comparative separations may not be representative of all applications.

Easier Method Transfer
to ANY LC System

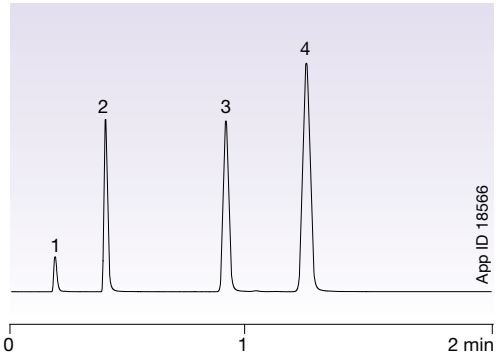
UHPLC methods developed with fully porous sub-2 µm columns often generate backpressure higher than HPLC system limitations. With Kinetex™ 2.6 µm core-shell technology, you are no longer restricted from developing high performance LC methods on **any instrument** and transferring them anywhere.

Kinetex™ 4.6 mm ID
on Agilent 1100

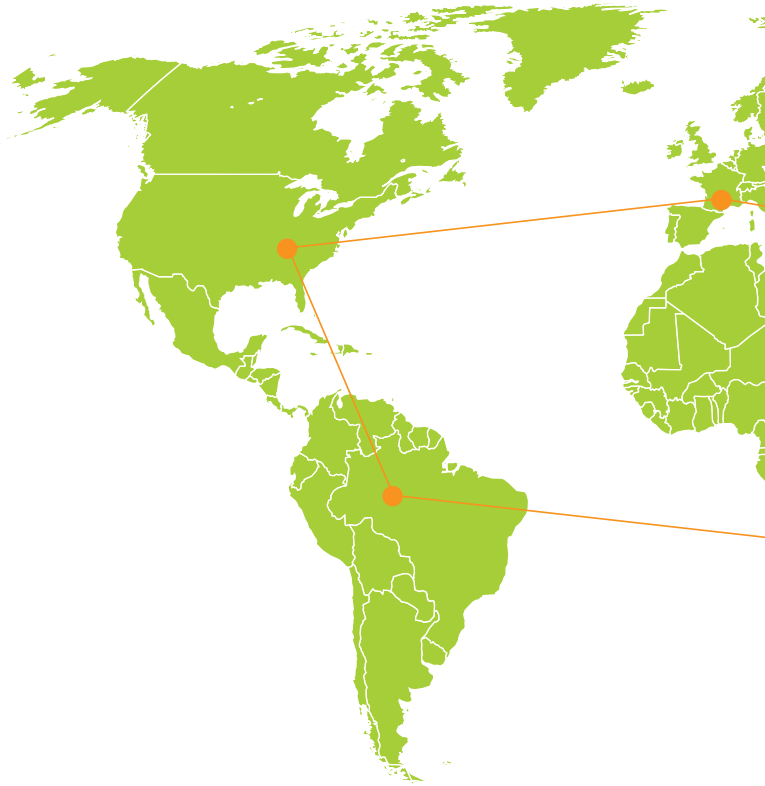


Column: Kinetex 2.6 µm C18
Dimensions: 50 x 4.6 mm
Part No.: 00B-4462-E0
Mobile Phase: Acetonitrile / Water (50:50)
Flow Rate: 2.35 mL/min
Temperature: Ambient
Detection: UV @ 254 nm
Sample: 1. Uracil
2. Acetophenone
3. Toluene
4. Naphthalene

Kinetex™ 2.1 mm ID
on Agilent 1200SL



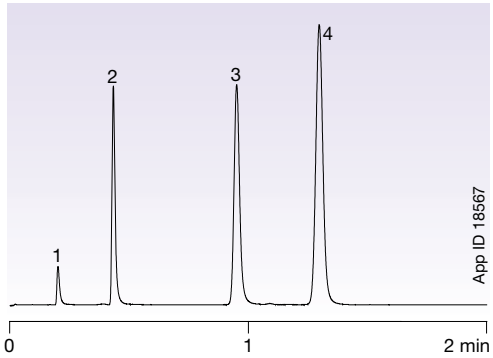
Column: Kinetex 2.6 µm C18
Dimensions: 50 x 2.1 mm
Part No.: 00B-4462-AN
Mobile Phase: Acetonitrile / Water (50:50)
Flow Rate: 0.49 mL/min
Temperature: Ambient
Detection: UV @ 254 nm
Sample: 1. Uracil
2. Acetophenone
3. Toluene
4. Naphthalene



In these examples different internal diameters of Kinetex™ columns are used on various systems to illustrate the versatility of Kinetex™ core-shell technology. Please note the flow rates are scaled to maintain the same linear velocity.

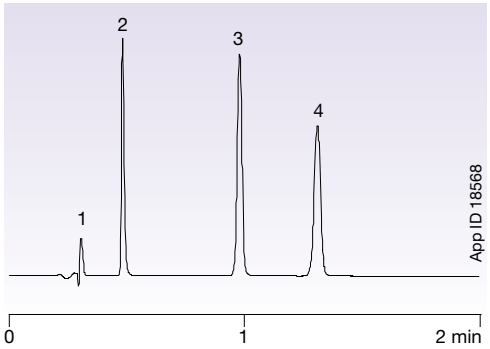
Column: Kinetex 2.6 µm C18
Dimensions: 50 x 3.0 mm
Part No.: 00B-4462-Y0
Mobile Phase: Acetonitrile / Water (50:50)
Flow Rate: 1.0 mL/min
Temperature: Ambient
Detection: UV @ 254 nm
Sample: 1. Uracil
2. Acetophenone
3. Toluene
4. Naphthalene

Kinetex™ 3.0 mm ID
on *Shimadzu Prominence™ UFLCXR™



Column: Kinetex 2.6 µm C18
Dimensions: 50 x 2.1 mm
Part No.: 00B-4462-AN
Mobile Phase: Acetonitrile / Water (50:50)
Flow Rate: 0.49 mL/min
Temperature: Ambient
Detection: UV @ 254 nm
Sample: 1. Uracil
2. Acetophenone
3. Toluene
4. Naphthalene

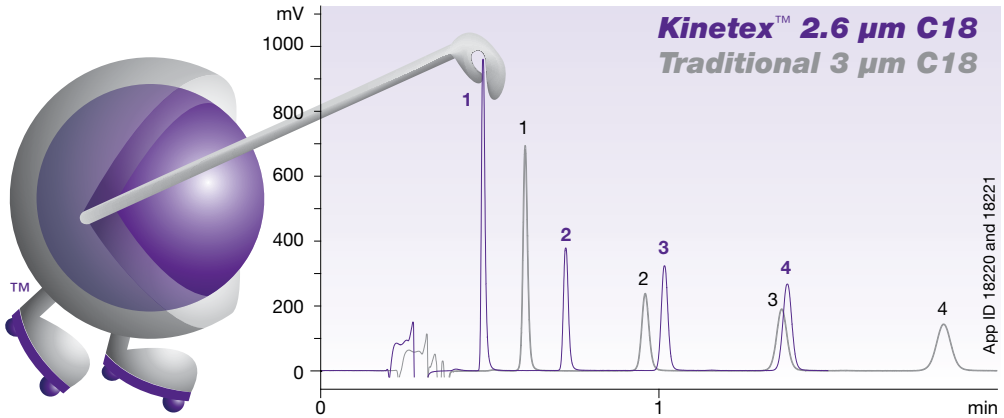
Kinetex™ 2.1 mm ID
on *Waters® ACQUITY® UPLC®



* ACQUITY and UPLC are registered trademarks of Waters Corporation. Prominence and UFLC are trademarks of Shimadzu Corporation. Phenomenex is not affiliated with Agilent Technologies or the above companies.

Increase Sensitivity

The combination of the small particle size, narrow particle size distribution, and the significantly shorter diffusion path results in much higher column efficiencies and increased chromatographic resolution. The increased efficiencies provide an immediate benefit on sensitivity since higher chromatographic efficiencies translate into significantly narrower and taller peaks, making it easier to detect low level impurities.



Conditions same except where noted:

Dimensions: 50 x 2.1 mm (Kinetex)
50 x 2.0 mm (Traditional)
Mobile Phase: Acetonitrile / Water (50:50)
Flow Rate: 0.5 mL/min
Temperature: 25 °C
Instrument: Waters® ACQUITY® UPLC®
Detection: UV @ 254 nm
Sample: 1. Acetophenone
2. Benzene
3. Toluene
4. Naphthalene

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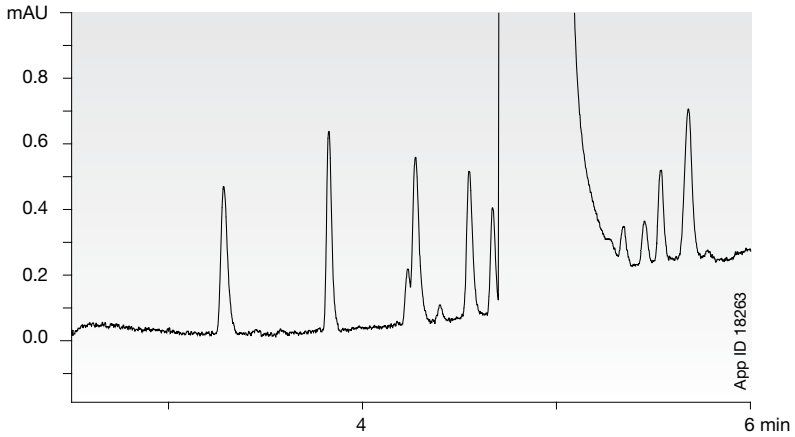
Improved

Resolution and Sensitivity Comparison

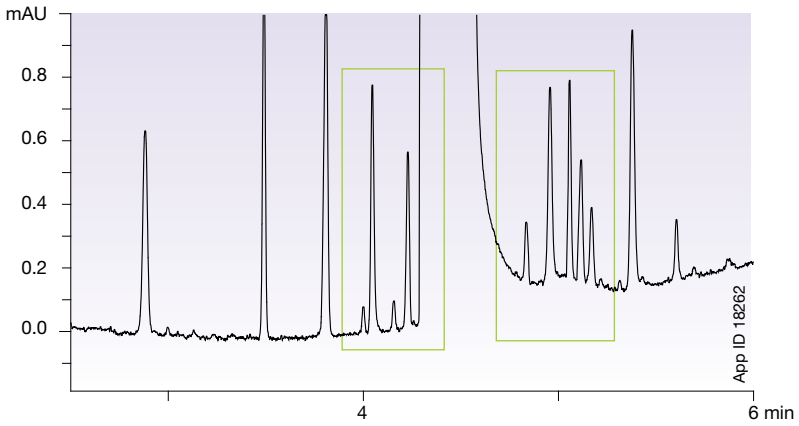
*ZORBAX® 3.5 µm SB-C18



Dimensions: 150 x 4.6 mm
Mobile Phase: A: Water
B: Acetonitrile
Gradient: (95:5) A/B for 1.16 min, then to (5:95) A/B
Flow Rate: 1.5 mL/min
Temperature: 45 ºC
Detection: UV @ 254 nm
Instrument: Agilent 1200
Backpressure: 190 bar
Sample:

1. Pyridine
2. Acetaminophen
3. Pindolol
4. Quinine
5. Acebutolol
6. Chlorpheniramine
7. Triprolidine
8. Prednisolone
9. Nortriptyline
10. 4-Chlorobenzoic acid
11. 5-Methyl-2-hydroxy benzaldehyde
12. 4-Chlorocinnamic acid
13. Diazepam
14. Diflunisal
15. Niflumic acid
16. Hexanophenone

Kinetex™ 2.6 µm C18



Dimensions: 150 x 4.6 mm
Part No.: 00F-4462-E0
Mobile Phase: A: Water
B: Acetonitrile
Gradient: (95:5) A/B for 1.16 min, then to (5:95) A/B
Flow Rate: 1.5 mL/min
Temperature: 45 ºC
Detection: UV @ 254 nm
Instrument: Agilent 1200
Backpressure: 300 bar
Sample:

1. Pyridine
2. Acetaminophen
3. Pindolol
4. Quinine
5. Acebutolol
6. Chlorpheniramine
7. Triprolidine
8. Prednisolone
9. Nortriptyline
10. 4-Chlorobenzoic acid
11. 5-Methyl-2-hydroxy benzaldehyde
12. 4-Chlorocinnamic acid
13. Diazepam
14. Diflunisal
15. Niflumic acid
16. Hexanophenone

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Longer
Column Lifetime

Have you experienced short lifetime with your sub-2 µm columns?

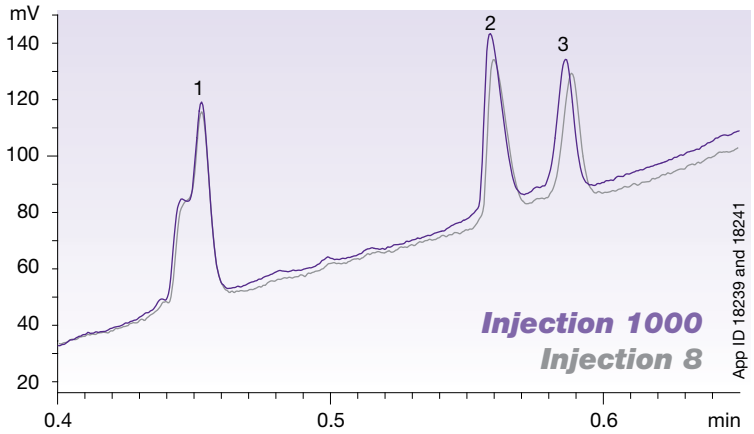
Even with complex sample mixtures, Kinetex™ columns maintain consistent results over normal use. In this example, β-blockers in human plasma were extracted after protein crash over the course of 1000 injections in both a Kinetex™ 2.6 µm core-shell column and a traditional sub-2 µm fully porous column intended for UHPLC performance. Virtually no degradation of the column performance is seen with the Kinetex™ column.

Conditions for both columns:

Dimensions: 50 x 2.1 mm
Mobile Phase: A: 0.1 % Formic acid in Water
B: 0.1 % Formic acid in Acetonitrile
Gradient: A/B (95:5) for 1.2 min to (0:100) for 0.01 min, hold at (95:5)
Flow Rate: 0.6 mL/min
Temperature: 25 °C
Instrument: Waters® ACQUITY® UPLC®
Detection: UV @ 254 nm
Sample: 1. Metoprolol
2. Alprenolol
3. Endogenous

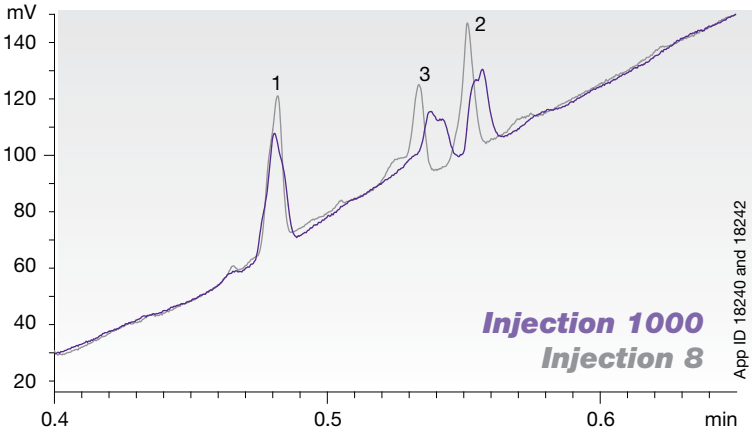
No Column Degradation

Kinetex™ 2.6 µm Core-Shell C18



Loss of Resolution and Peak Shape

*Waters® ACQUITY® BEH 1.7 µm C18



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Further Extend Kinetex™
Column Lifetime

KrudKatcher™ Ultra In-line Filter

Protect your valuable UHPLC/HPLC column with a reliable and easy-to-use, disposable KrudKatcher™ Ultra pre-column filter. Pressure-rated to 20,000 psi (1,375 bar), the stainless steel filter body houses an integrated 0.5 µm 316 stainless steel filter element that efficiently removes microparticulates from the flow stream without contributing to system backpressure or dead volume (< 0.2 µL).

Reproducible Performance with KrudKatcher™ Ultra In-Line Filter

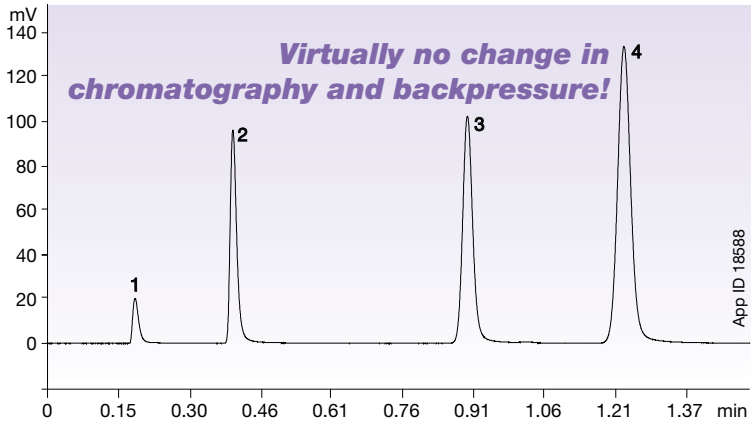
	Change in t_R (%)
Uracil	0.2
Acetophenone	0.5
Toluene	0.7
Naphthalene	0.8

n=15

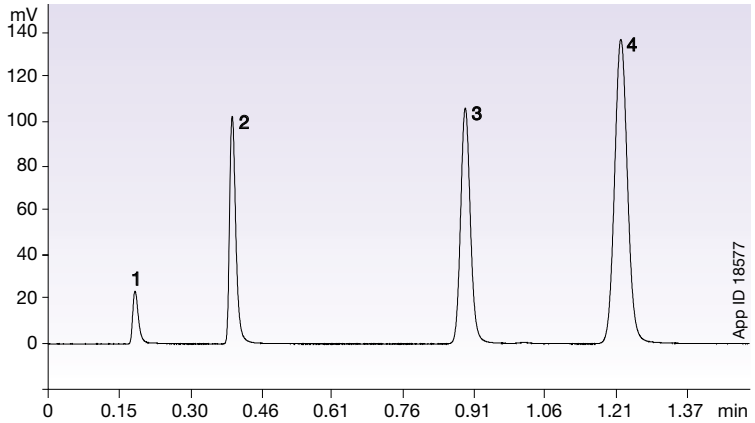
Column: Kinetex 2.6 µm C18 100 Å
with and without KrudKatcher Ultra In-Line filter as noted
Dimensions: 50 x 2.1 mm
Part No.: 00B-4462-AN
AF0-8497
Mobile Phase: Acetonitrile / Water (65:35)
Flow Rate: 0.5 mL/min
Temperature: 22 °C
Injection Volume: 0.2 µL
Detection: UV @ 254 nm
Backpressure: approx. 248 bar
Sample: Prodigy Test Mix (AL0-3045)
1. Uracil
2. Acetophenone
3. Toluene
4. Naphthalene

For more details on the test methodology and results, contact Phenomenex.
* See p. 39 for KrudKatcher ordering information.

WITH KrudKatcher™ Ultra In-line Filter



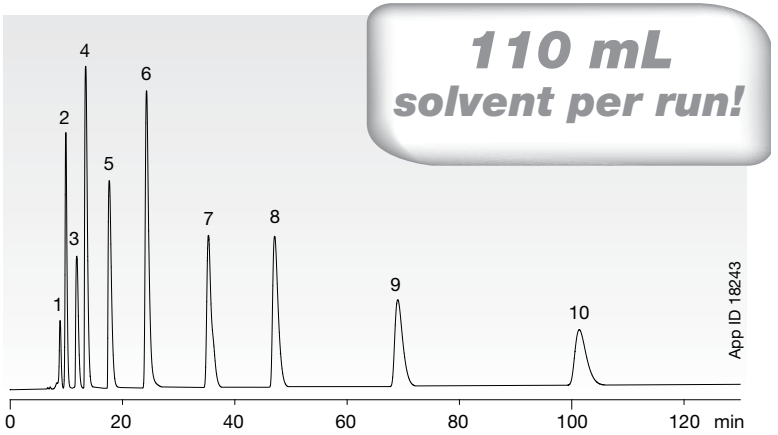
WITHOUT KrudKatcher™ Ultra In-line Filter



Improve Performance
Save Solvent

When chromatographic column performance improves you can not only decrease your analysis time but also decrease your overall solvent consumption without compromising your separations. Use Kinetex™ core-shell technology to dramatically decrease the solvent consumption in your laboratory and increase sample throughput.

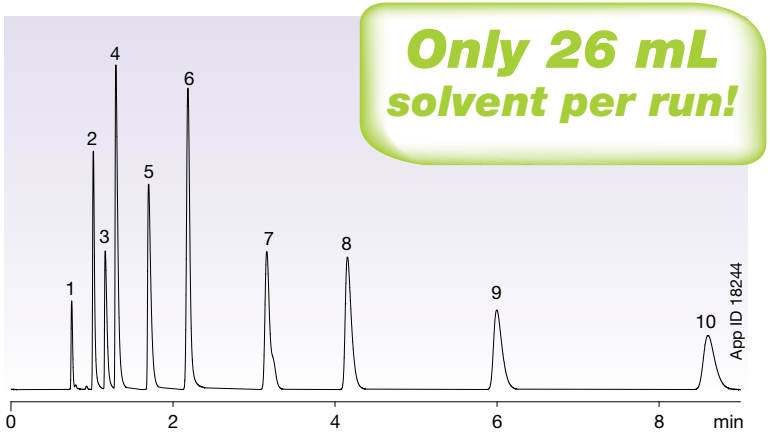
Typical Method Consumption



Column: Traditional 5 µm C18
Dimension: 250 x 4.6 mm
Mobile Phase: A: 20 mM Potassium phosphate pH 7
B: Methanol / Acetonitrile (50:50)
A/B (48:52)
Flow Rate: 1.0 mL/min
Temperature: 40 ºC
Detection: UV @ 254 nm
Sample:

1. Tianeptine
2. Desmethyldoxepin
3. Protriptyline
4. Desipramine
5. Imipramine
6. Amoxapine
7. Doxepin
8. Nortriptyline
9. Amitriptyline
10. Clomipramine

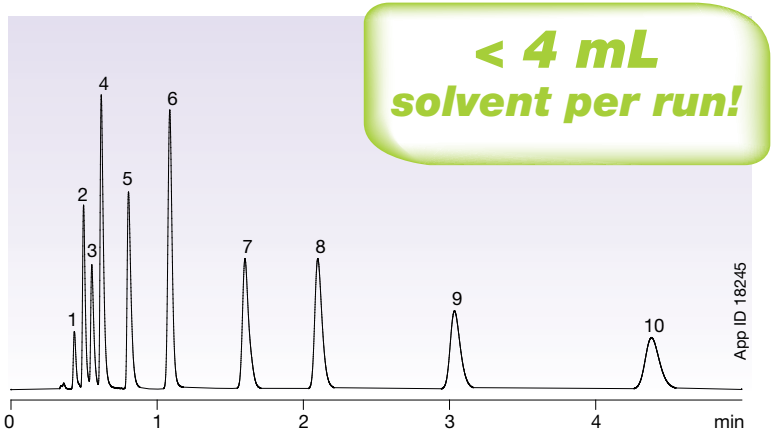
Substitute specified column with Kinetex™ column to reduce solvent consumption



Column: Kinetex 2.6 µm C18
Dimensions: 100 x 4.6 mm
Part No.: 00D-4462-E0
Mobile Phase: A: 20 mM Potassium phosphate pH 7
B: Methanol / Acetonitrile (50:50)
A/B (48:52)
Flow Rate: 2.9 mL/min
Temperature: 40 ºC
Detection: UV @ 254 nm
Sample:

1. Tianeptine
2. Desmethyldoxepin
3. Protriptyline
4. Desipramine
5. Imipramine
6. Amoxapine
7. Doxepin
8. Nortriptyline
9. Amitriptyline
10. Clomipramine

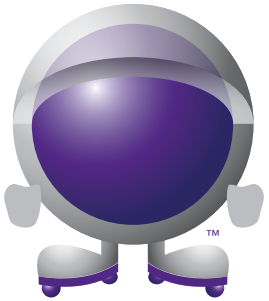
Further reduce column ID for even greater solvent savings!



Column: Kinetex 2.6 µm C18
Dimensions: 50 x 2.1 mm
Part No.: 00B-4462-AN
Mobile Phase: A: 20 mM Potassium phosphate pH 7
B: Methanol / Acetonitrile (50:50)
A/B (48:52)
Flow Rate: 0.6 mL/min
Temperature: 40 ºC
Detection: UV @ 254 nm
Sample:

1. Tianeptine
2. Desmethyldoxepin
3. Protriptyline
4. Desipramine
5. Imipramine
6. Amoxapine
7. Doxepin
8. Nortriptyline
9. Amitriptyline
10. Clomipramine

How much could this save you...annually?



Complementary and Orthogonal Selectivities

C18, PFP, and HILIC

Even more than efficiency, selectivity is the most important parameter for obtaining high performance separations. Notice in the resolution equation below that selectivity (α) is more influential than efficiency (N).

R_s, defined as the amount of separation between two adjacent peaks, is given by:

$$\mathbf{R_s} = \frac{\sqrt{N}}{4}\left(\frac{\alpha-1}{\alpha}\right)\left(\frac{k}{k+1}\right)$$

where **k** is the average value for the two peaks.

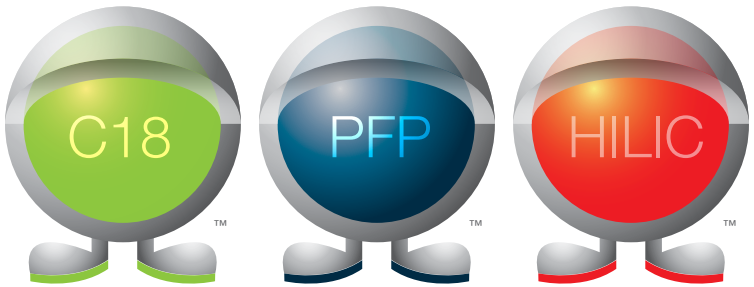
The selectivity parameter, α, is a measure of the spacing between two peaks and is expressed as:

$$\alpha = k_2/k_1$$

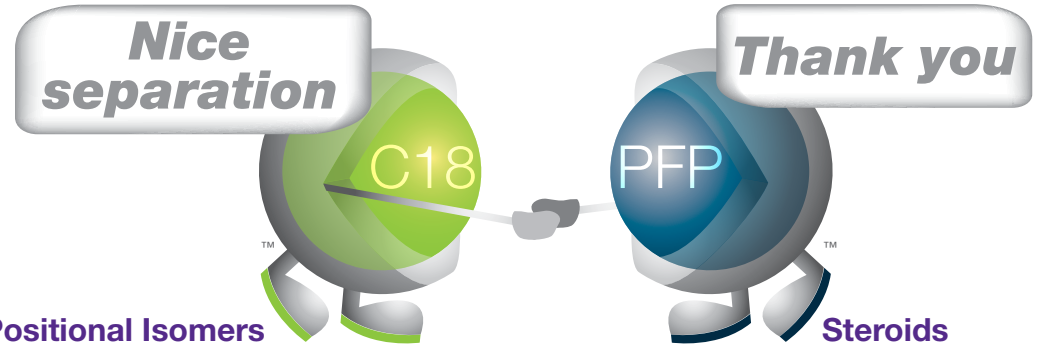
To provide alternative and orthogonal selectivity phases, Kinetex™ columns are available in 3 selectivities: C18, PFP (Pentafluorophenyl), and HILIC* (Hydrophilic Interaction Liquid Chromatography), for resolution of a wide range of compounds from polar to hydrophobic, aromatic, and isomers.

Kinetex™ Phase Selectivities

Phase	Mechanism	Recommended for
C18	Hydrophobic	L1 methods Most reversed phase applications
PFP	Hydrogen bonding Dipole-dipole Aromatic pi-pi Hydrophobic	Positional isomers Aromatic compounds Conjugated compounds L43 methods
HILIC*	Hydrophilic	Very polar compounds Improved MS sensitivity

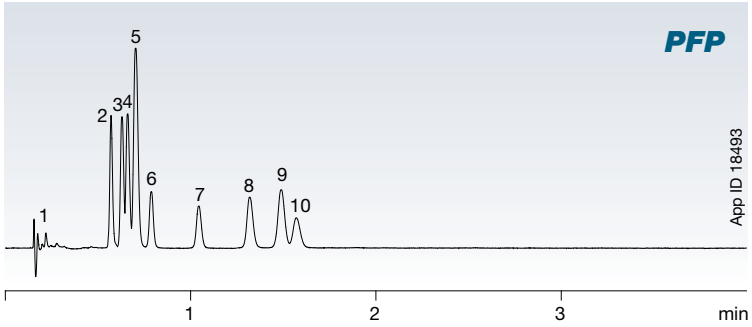


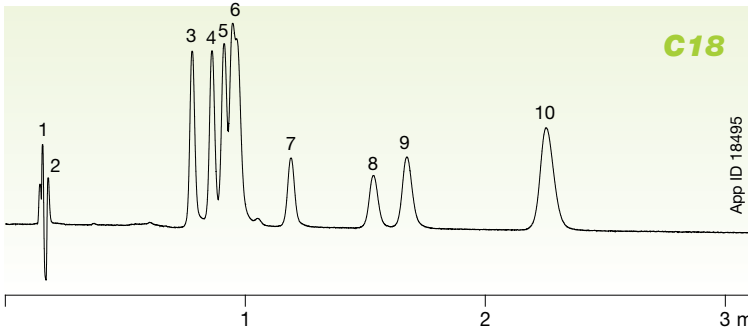
* HILIC available October 2009.



KINETEX™

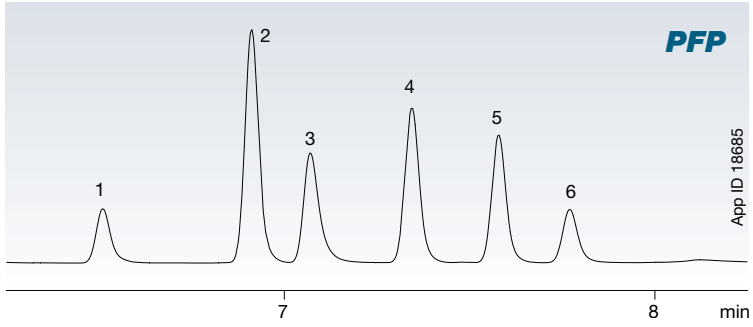
Positional Isomers

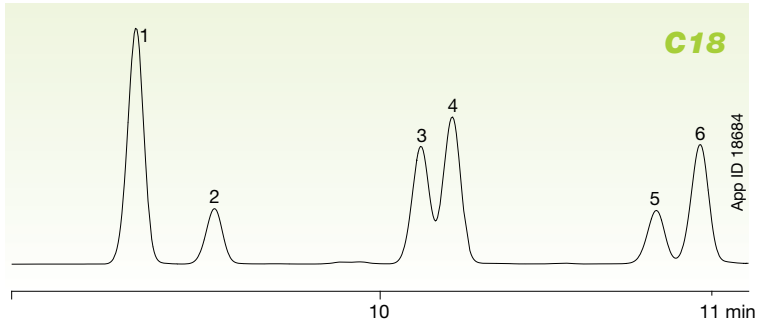




Columns: Kinetex 2.6 µm PFP
Kinetex 2.6 µm C18
Dimensions: 50 x 2.1 mm
Mobile Phase: 0.1 % Formic acid in Water
0.1 % Formic acid in Acetonitrile (70:30)
Flow Rate: 0.8 mL/min
Temperature: 25 °C
Detection: UV @ 254 nm
Sample:
1. 2,3-dimethylphenol
2. 2,5-dimethylphenol
3. 2,6-dimethylphenol
4. 3,4-dimethylphenol
5. 3,5-dimethylphenol
6. 2,5-dimethylphenol
7. 2,6-dimethylphenol
8. 3,4-dimethylphenol
9. 3,5-dimethylphenol
10. 2,4-dibromophenol

Steroids

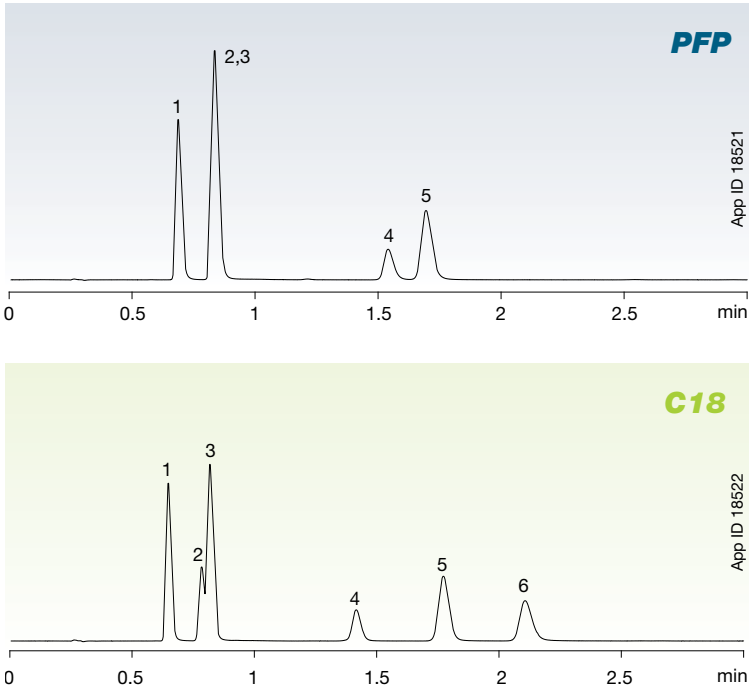




Columns: Kinetex 2.6 µm PFP
Kinetex 2.6 µm C18
Dimensions: 150 x 4.6 mm
Mobile Phase: A: Water
B: Acetonitrile
Gradient: A/B (75:25) to (35:65) in 12 min to (75:25) in 0.01 min, hold for 4 min
Flow Rate: 1.2 mL/min
Temperature: 22 °C
Detection: UV @ 230 nm
Sample:
1. 11-α-Hydroxyprogesterone
2. Cortisone Acetate
3. Estradiol
4. 21-Hydroxyprogesterone
5. 11-Ketoprogesterone
6. Estrone

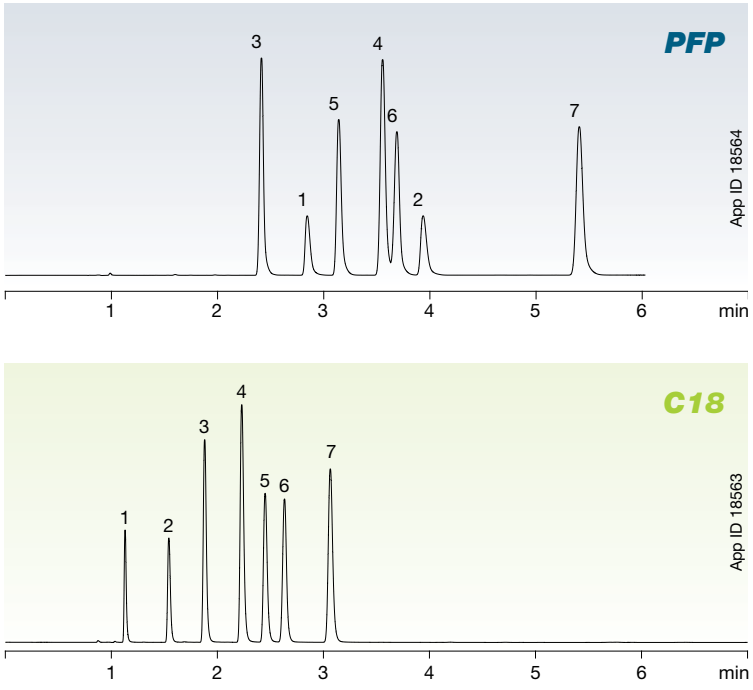
Complementary Selectivities
C18 and PFP

Resorcinol



Columns: Kinetex 2.6 µm PFP
Kinetex 2.6 µm C18
Dimensions: 50 x 2.1 mm
Mobile Phase: 0.1 % Formic acid in Water /
0.1 % Formic acid in Acetonitrile (85:15)
Flow Rate: 0.5 mL/min
Temperature: 25 °C
Detection: UV @ 270 nm
Sample:
1. Resorcinol
2. 2-Methylresorcinol
3. Catechol
4. 2,5-Dimethylresorcinol
5. 4-Methylcatechol
6. 4-Nitrocatechol

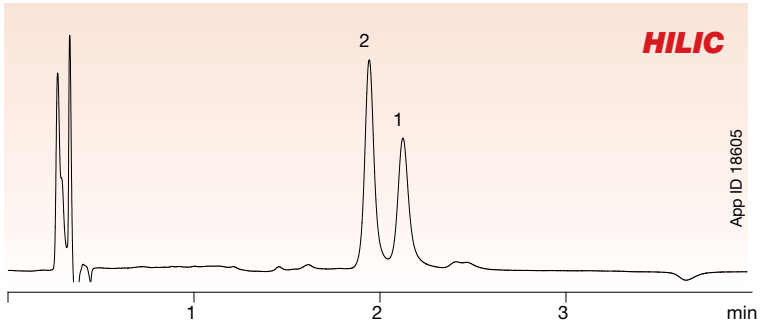
Explosives



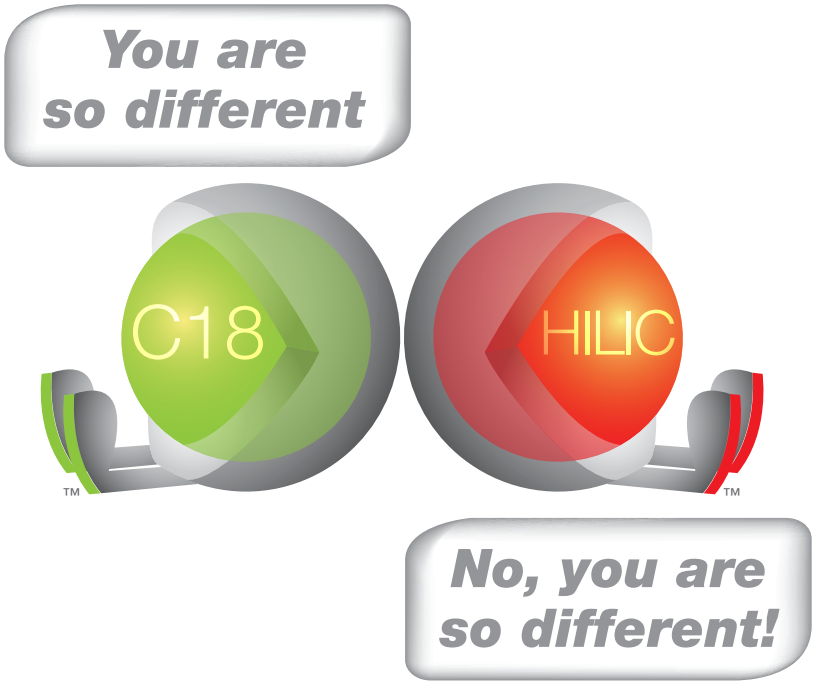
Columns: Kinetex 2.6 µm PFP
Kinetex 2.6 µm C18
Dimensions: 100 x 4.6mm
Mobile Phase: A: Water
B: Methanol
Gradient: (45:55) A/B to (35:65) A/B over 6 min
Flow Rate: 1.2 mL/min
Temperature: 22 ºC
Detection: UV @ 254 nm
Sample:
1. HMX
2. RDX
3. 1,3,5-Trinitrobenzene
4. 1,3-Dinitrobenzene
5. Nitrobenzene
6. 2,4,6-Trinitrotoluene
7. 2,4-Dinitrotoluene

Orthogonal Selectivities
C18 and HILIC

Norepinephrine and Epinephrine



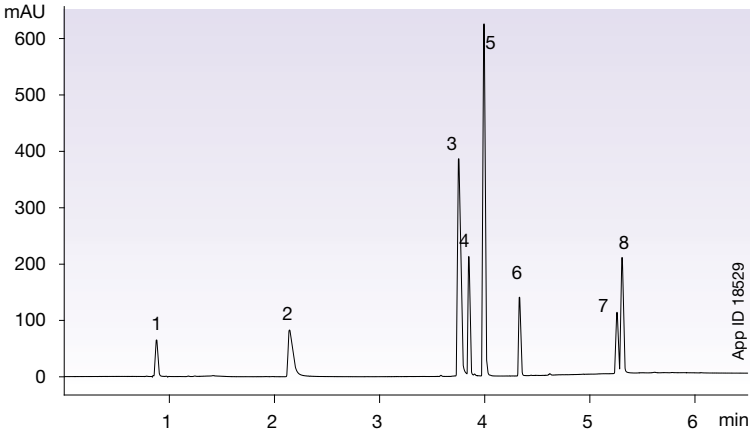
Columns Kinetex 2.6 µm HILIC
Kinetex 2.6 µm C18
Dimensions: 50 x 2.1 mm
Mobile Phase (HILIC): Acetonitrile / 100 mM Ammonium formate pH 3.2 (92:8)
Mobile Phase (C18): 5 mM Ammonium formate pH 3.2 / Methanol (97:3)
Flow Rate: 0.4 mL/min
Temperature: 30 °C
Detection: UV @ 210 nm
Sample: 1. Norepinephrine
2. Epinephrine



Wide Applicability Across Many Industries
For Food and Beverage

From complex applications such as carbamate pesticides to applications requiring low level detection such as pharmaceutical impurity profiling, Kinetex™ core-shell technology delivers exceptionally high performance results. For a comprehensive list of Kinetex™ applications, please visit: *www.phenomenex.com/kinetex*

Soft Drink Additives



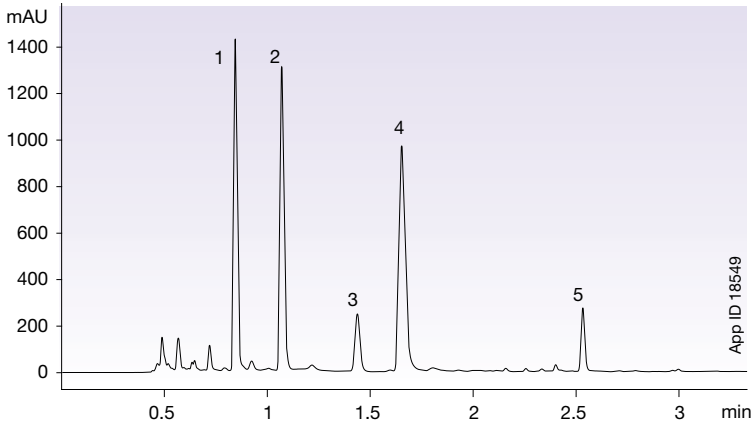
Column: Kinetex 2.6 µm C18
Dimensions: 100 x 4.6 mm
Part No.: 00D-4462-E0
Mobile Phase: A: 0.1 % Phosphoric acid in Water
B: 0.1 % Phosphoric acid in Acetonitrile

Gradient:

Time (min)	% B	Time (min)	% B
0	5	4.33	40
0.67	5	5	95
2.67	40	5.01	5
		7	5

Flow Rate: 1.8 mL/min
Temperature: 30 °C
Detection: UV @ 215 nm
Instrument: Agilent 1100
Sample:
1. Ascorbic acid
2. Acesulfame K
3. Saccharin
4. Quinine
5. Caffeine
6. Aspartame
7. Sorbic acid
8. Benzoic acid

Green Tea



Column: Kinetex 2.6 µm C18
Dimensions: 100 x 4.6 mm
Part No.: 00D-4462-E0
Mobile Phase: A: 0.1 % Phosphoric acid in Water
B: 0.1 % Phosphoric acid in Acetonitrile

Gradient:

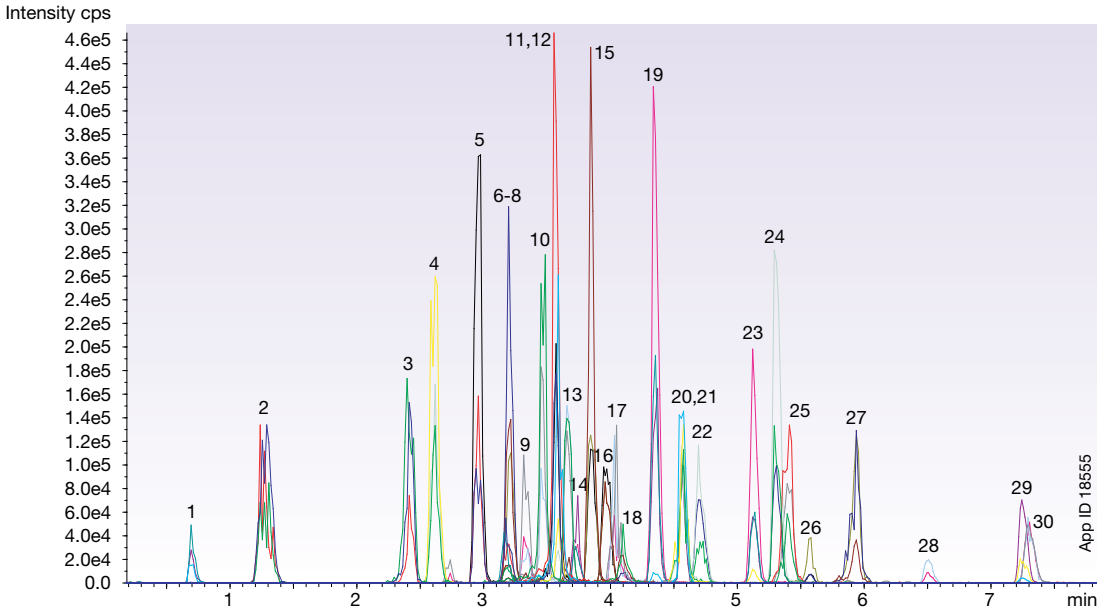
Time (min)	% B	Time (min)	% B
0	15	3.33	90
0.44	15	3.34	15
2.67	35	5.33	15

Flow Rate: 1.8 mL/min
Temperature: 30 °C
Detection: UV @ 215 nm
Instrument: Agilent 1100
Backpressure: 240 Bar
Sample:
1. Epigallocatechin
2. Catechin
3. Epicatechin
4. Epigallocatechin gallate
5. Epicatechin gallate

Wide Applicability Across Many Industries

For Food Safety

Antibiotics from Meat



Column: Kinetex 2.6 µm C18
Dimensions: 50 x 2.1 mm
Part No.: 00B-4462-AN
Mobile Phase: A: 0.1 % Formic acid in Water
B: 0.1 % Formic acid in Methanol

Gradient:

Time (min)	% B	Time (min)	% B
0	2	7.37	99
0.3	2	8.27	99
7.27	80	13	2

Flow Rate: 0.5 mL/min
Temperature: 40 °C
Detection: MS (22 °C)
Instrument: Agilent 1100
Backpressure: 240 Bar

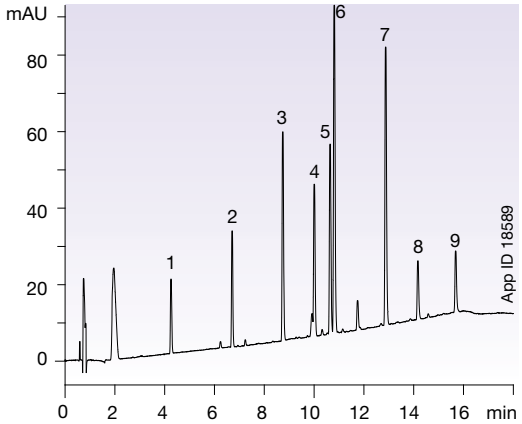
Sample:

1.	Sulfanilamide	Positive 173.1 to 92.1
2.	Amoxicillin	Positive 366.1 to 349.1
3.	Lincomycin	Positive 407.4 to 126.1
4.	Sulfadiazine	Positive 251.1 to 156
5.	Sulfathiazole	Positive 256.1 to 156.1
6.	Ampicillin	Negative 348 to 207
7.	Thiamphenicol	Negative 354 to 289.9
8.	Sulfamerazine	Positive 265.1 to 92.2
9.	Tetracycline	Positive 445.2 to 410.1
10.	Ciprofloxacin	Positive 332.2 to 314.2
11.	Enrofloxacin	Positive 360.3 to 342.2
12.	Danofloxacin	Positive 358.2 to 340.2
13.	Sulfamethazine	Positive 279.2 to 92.1
14.	Sarafloxacin	Positive 386.3 to 368.1
15.	Sulfamethoxypyridazine	Positive 281.1 to 155.9
16.	Florfenicol	Negative 356.1 to 185
17.	Spiramycin	Positive 422.5 to 174.1
18.	Chlorotetracycline	Positive 479.3 to 444
19.	Sulfadoxine	Positive 311.2 to 156.2
20.	Clindamycin	Positive 425.4 to 126.1
21.	Tilmicosin	Positive 435.6 to 695.7
22.	Chloramphenicol	Negative 321.1 to 152
23.	Sulfadimethoxine	Positive 311.1 to 156.2
24.	Sulfaquinoloxaline	Positive 301.1 to 156.1
25.	Erythomycin	Positive 734.6 to 158.2
26.	Tylosin	Positive 916.7 to 174.3
27.	Josamycin	Positive 828.7 to 109.1
28.	Penicillin G	Negative 333 to 192.4
29.	Cloxacillin	Negative 434.1 to 292.9
30.	Flunixin	Negative 295.1 to 191

Wide Applicability Across Many Industries

For Food Safety

Azo Dyes

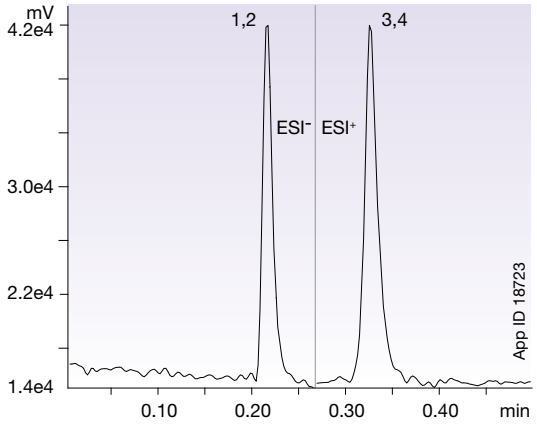


Column: Kinetex 2.6 µm C18
Dimensions: 150 x 4.6 mm
Part No.: 00F-4462-E0
Mobile Phase: A: 0.1% Phosphoric acid in Water
B: 0.1% Phosporic acid in Acetonitrile

Gradient:	Time (min)	% B	Time (min)	% B
	0	25	17.01	25
	15	95	20	25
	17	95		

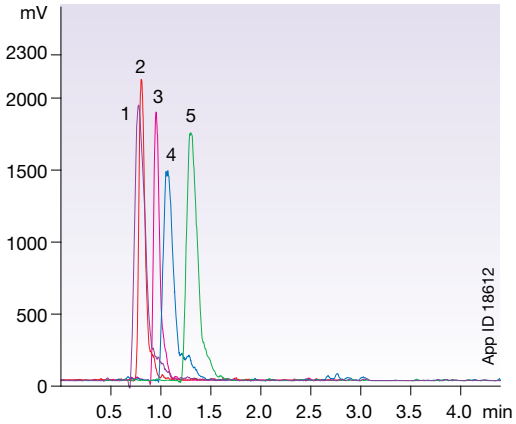
Flow Rate: 1.8 mL/min
Temperature: 50 ºC
Detection: UV @ 215 nm
Backpressure: 380 bar
Sample:
1. Orange II
2. Sudan Orange G
3. Fast Garnet GBC
4. Dimethyl yellow
5. Sudan Red G
6. Sudan I
7. Sudan II
8. Sudan III
9. Sudan IV

Melamine and Cyanuric Acid



Column: Kinetex 2.6 µm HILIC
Dimensions: 50 x 2.1 mm
Mobile Phase: Acetonitrile / 100 mM Ammonium acetate, pH 5.8 (90:10)
Flow Rate: 1.0 mL/min
Temperature: 25 ºC
Detection: MS
Backpressure: 190 bar
Instrument: Waters® ACQUITY® UPLC® MS/MS
Sample :
1. Cyanuric acid 128-85.0 (quant ion),128.0-42.0 (qualifier ion)
2. Cyanuric acid-13C3 ISTD 131.1-87.0
3. Melamine 127.1-85 (quant ion), 127.1-68 (qualifier ion)
4. Melamine-13C3.15N3 ISTD 133.2-89.1

Aflatoxin from Peanut Butter



Column: Kinetex 2.6 µm PFP
Dimensions: 50 x 2.1 mm
Part No.: 00B-4477-AN
Mobile Phase: A: 0.1 % Formic acid and 5 mM Ammonium Acetate in Water
B: 0.1 % Formic acid and 5 mM Ammonium Acetate in Methanol

Gradient:	Time (min)	% B	Time (min)	% B
	0	50	2.5	95
	0.25	50	2.51	50
	2	70	4.4	50
	2.01	95		

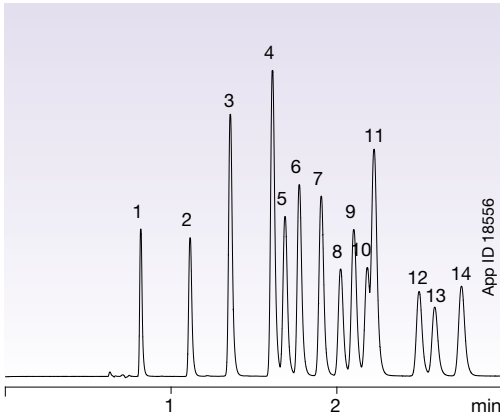
Flow Rate: 400 µL/min
Temperature: 25 ºC
Detection: MS
Sample:
1. Aflatoxin IS
2. Aflatoxin G2
3. Aflatoxin G1
4. Aflatoxin B2
5. Aflatoxin B1

SPE Method: Strata® Florisil® (FL-PR) cartridge, 500 mg/3 mL, (Part No.: 8B-S013-HBJ)
Matrix: Peanut Butter
Condition: 3 mL of Methanol twice for conditioning, vacuuming at any rate.
Load: Sample loaded at 1-2 drops per second
Wash: 3 mL of Methanol/Water (80:20) twice at 1-2 drops per second
3 mL of 100 % Methanol twice at 1-2 drops per second
Elute: 3 mL Acetone / Water / Formic acid (96:3.5:0.5) twice at 1 drop per second
Blow all elution fractions down under nitrogen to dryness and reconstitute in 1 mL mobile phase

Wide Applicability Across Many Industries

For Environmental

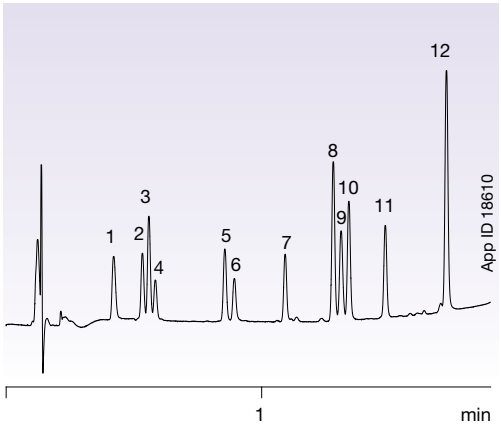
Explosives: EPA Method 8330



Column: Kinetex 2.6 µm C18
Dimensions: 100 x 4.6 mm
Part No.: 00D-4462-E0
Mobile Phase: A:Water B:Methanol
Gradient: (45:55) A/B to (35:65) A/B over 5 min
Flow Rate: 1.4 mL/min
Temperature: 22 ºC
Detection: UV @ 254 nm
Sample:
1. HMX
2. RDX
3. 1,3,5-Trinitrobenzene
4. 1,3-Dinitrobenzene
5. Tetryl
6. Nitrobenzene
7. 2,4,6-Trinitrotoluene
8. 2-Amino-2,4-Dinitrotoluene
9. 2-Amino-2,6-Dinitrotoluene
10. 2,6-Dinitrotoluene
11. 2,4-Dinitrotoluene
12. 2-Nitrotoluene
13. 4-Nitrotoluene
14. 3-Nitrotoluene

SPE Method: Strata™-XL 100 µm Polymeric Reversed Phase Cartridge, 500 mg / 6 mL (Part No.: 8B-S043-HCH)
Condition: 10 mL of Acetonitrile conditioning at any speed rate
30 mL of DI Water conditioning at any speed rate
Load: Sample loaded at 5-10 mL/min; do not let the cartridge go dry
Wash: 1-2 column volume of 5:95 Methanol / Water
Dry: 3-5 minutes at 10 mm Hg vacuum
Elute: Elute with 5 mL of 85:15 Acetonitrile / Water at 1-2 drops per second

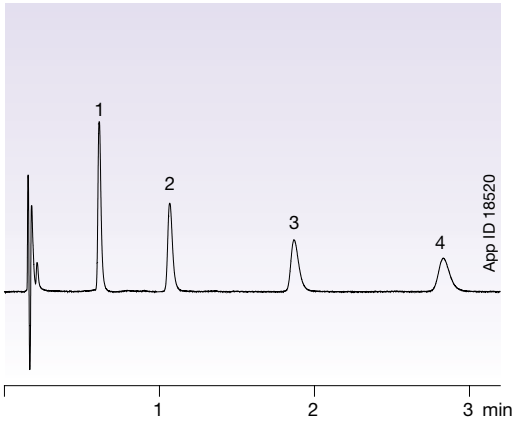
Carbamate Pesticides: EPA Method 531.1



Column: Kinetex 2.6 µm C18
Dimensions: 50 x 2.1 mm
Part No.: 00B-4462-AN
Mobile Phase: A: 0.1 % Phosphoric acid in Water
B: 0.1 % Phosphoric acid in Acetonitrile
Gradient: (95:5) A/B to (5:95) A/B over 3 min
Flow Rate: 1.0 mL/min
Temperature: 40 ºC
Detection: UV @ 210 nm
Sample :
1. Aldicarb sulfoxide
2. Oxamyl
3. Aldicarb sulfone
4. Methomyl
5. 3-OH-Carbofuran
6. Aldicarb sulfone-related impurity
7. Aldicarb
8. Baygon (Propoxur)
9. Carbofuran
10. Carbaryl
11. 1-Napthol
12. Methiocarb

SPE Method: Strata™-X 33 µm Polymeric Reversed Phase cartridge, 30 mg/3 mL, (Part No.: 8B-S100-TBJ)
Condition: 1 mL of Methanol for conditioning at any speed rate
1 mL sample load buffer for equilibration at any speed rate
Load: Sample loaded at 1-2 drops per second
Wash: 1 mL of sample load buffer at 1-2 drops per second
1 mL of 100 % Methanol at 1-2 drops per second
Dry: 2 minutes at 10 mm Hg vacuum
Elute: 0.5 mL 5 % Formic acid / Methanol twice at 1 drop per second

Chlorinated Herbicides

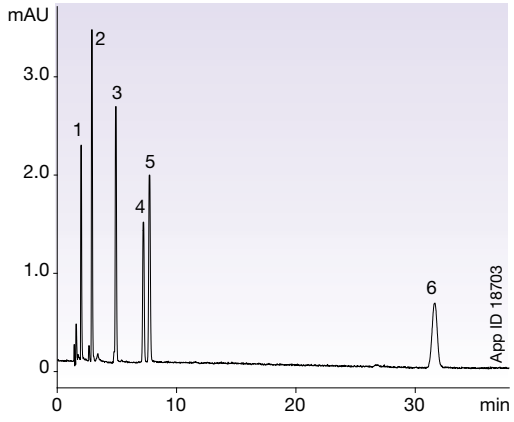


Column: Kinetex 2.6 µm PFP
Dimensions: 50 x 2.1 mm
Part No.: 00B-4477-AN
Mobile Phase: 0.1 % Formic acid in Water /
0.1 % Formic acid in Acetonitrile (70:30)
Flow Rate: 0.8 mL/min
Temperature: 25 °C
Detection: UV @ 280 nm
Sample:
1. 4-Chlorophenoxyacetic acid
2. 2,4-Dichlorophenoxyacetic acid
3. 2,4,5-Trichlorophenoxyacetic acid
4. 2-(2,4,5-Trichlorophenoxy)propionic acid

Wide Applicability Across Many Industries

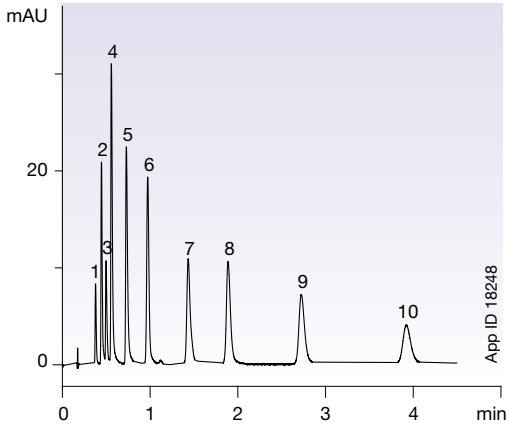
For Pharmaceutical

Paracetamol Impurity Profile



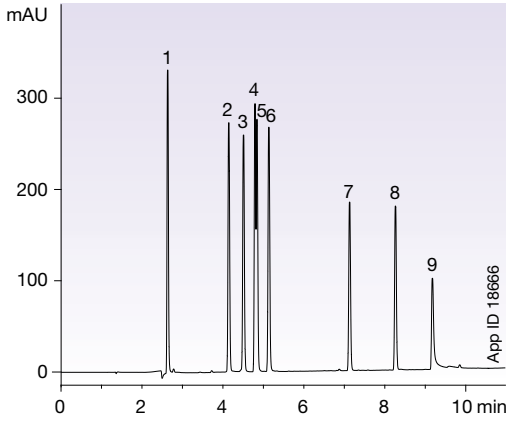
Column: Kinetex 2.6 µm C18
Dimensions: 150 x 4.6 mm
Part No.: 00F-4462-E0
Mobile Phase: 100 mM Na_2HPO_4 / 50 mM NaH_2PO_4 / 4 g/L $(Bu)_4NOH$ (37.5 : 37.5 : 25)
Flow Rate: 0.9 mL/min
Temperature: 35 ºC
Detection: UV @ 245 nm (22 ºC)
Sample:
1. Impurity K
2. Paracetamol
3. Impurity A
4. Impurity I
5. Impurity F
6. Impurity J

Tricyclic Antidepressants



Column: Kinetex 2.6 µm C18
Dimensions: 50 x 4.6 mm
Part No.: 00B-4462-E0
Mobile Phase: A: 20 mM Potassium Phosphate pH 7.0
B: Methanol / Acetonitrile (50:50)
A/B (48:52)
Flow Rate: 2.9 mL/min
Temperature: 40 ºC
Detection: UV @ 254 nm (22 ºC)
Sample:
1. Tianeptine
2. Desmethyldoxepin
3. Protriptyline
4. Desipramine
5. Imipramine
6. Amoxapine
7. Doxepin
8. Nortriptyline
9. Amitriptyline
10. Clomipramine

Sulfa Drugs



Column: Kinetex 2.6 µm C18
Dimensions: 150 x 4.6 mm
Part No.: 00F-4462-E0
Mobile Phase: A: 0.1 % Formic acid in Water
B: 0.1 % Formic acid in Acetonitrile
Gradient:

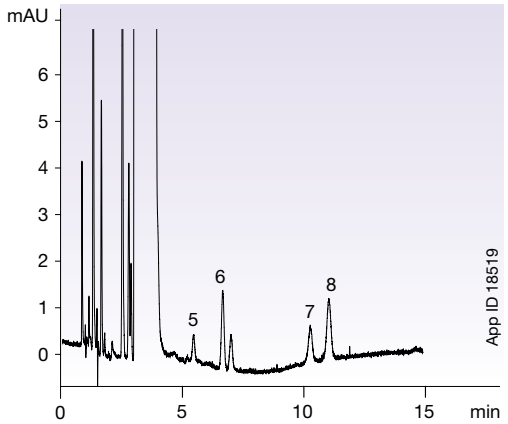
Time (min)	% B
0	5
12	65
12.01	5
17	5

Flow Rate: 1.2 mL/min
Temperature: 30 ºC
Detection: UV @ 254 nm (ambient)
Backpressure: 236 bar
Sample:
1. Sulfanilamide
2. Sulfacetamide
3. Sulfadiazine
4. Sulfathiazole
5. Sulfapyridine
6. Sulfamerazine
7. Sulfamethoxazole
8. Sulfaquinoxaline
9. Sulfasalaxine

Wide Applicability Across Many Industries

For Pharmaceutical

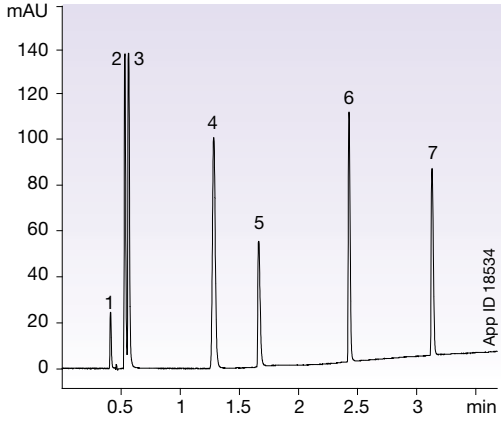
Atenolol



Column: Kinetex 2.6 µm C18
Dimensions: 100 x 4.6 mm
Part No.: 00D-4462-E0
Mobile Phase: 12.5 mM Phosphoric acid in Water, pH 3.0 + 2.0 g Sodium Octanesulfonate + 0.8 g Tetrabutyl Ammonium Hydrogen Sulfate / Methanol / THF (80:18:2)
Flow Rate: 1.0 mL/min
Temperature: 22 ºC
Detection: UV @ 226 nm
Sample: Atenolol Related Substance

1. Impurity B
2. Impurity A
3. Impurity J
4. Impurity I
5. Impurities D and E
6. Impurity F
7. Impurity G
8. Impurity H

Cough and Cold Medicine

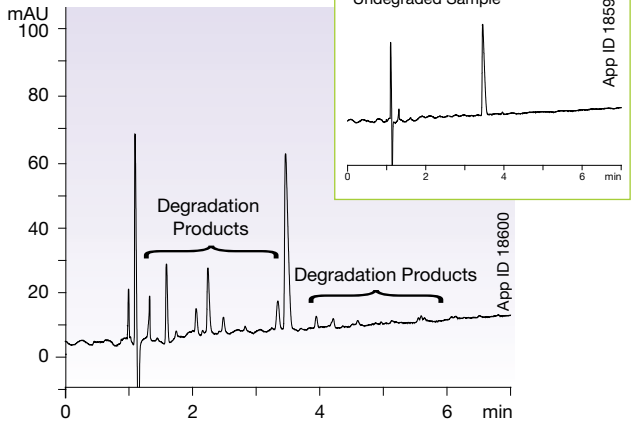


Column: Kinetex 2.6 µm C18
Dimensions: 100 x 4.6 mm
Part No.: 00D-4462-E0
Mobile Phase: A: 0.1 % Phosphoric acid in Water
B: 0.1 % Phosphoric acid in Acetonitrile

Gradient:	Time (min)	% B	Time (min)	% B
	0	5	3.68	90
	0.41	5	3.69	5
	3.27	50	5.32	5

Flow Rate: 2.2 mL/min
Temperature: 50 ºC
Detection: UV @ 215 nm (22 ºC)
Instrument: Agilent 1100
Sample:
1. Impurities from Dextromethorphan
2. Maleate from Chlorpheniramine
3. Phenylephrine
4. Acetaminophen
5. Doxylamine
6. Chlorpheniramine
7. Dextromethorphan

Forced Degradation of Ranitidine

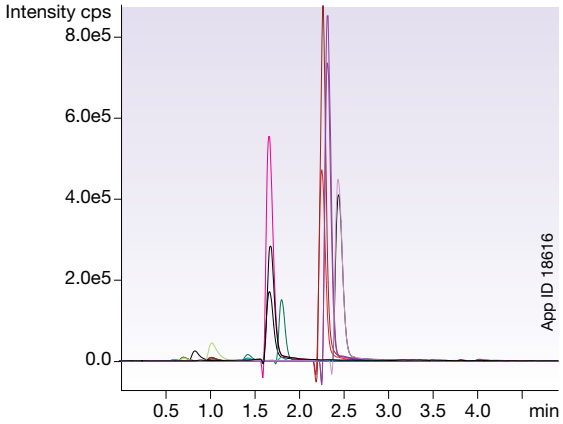


Column: Kinetex 2.6 µm C18
Dimensions: 150 x 4.6 mm
Part No.: 00F-4462-E0
Mobile Phase: A: 0.1 % Formic acid in Water
B: 0.1 % Formic acid in Acetonitrile
Gradient: 5 % to 20 % B in 7 min. 20 % to 95 % in 2 min
Flow Rate: 1.4 mL/min
Temperature: 30 ºC
Detection: UV @ 230 nm (22 ºC)
Sample: Ranitidine 1 mg/mL in Methanol. Heated at 65 ºC for 4 days.

Wide Applicability Across Many Industries

For Toxicology

Opiates



Column: Kinetex 2.6 µm PFP
Dimensions: 50 x 2.1 mm
Part No.: 00B-4477-AN
Mobile Phase: A: 0.1 % Formic acid and 5 mM Ammonium acetate in Water
B: 0.1 % Formic acid and 5 mM Ammonium Acetate in (50:50) Acetonitrile / Methanol

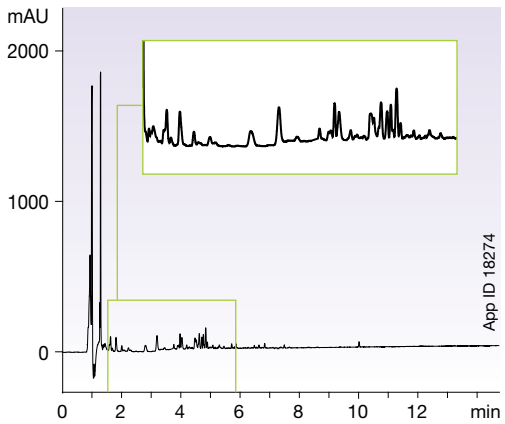
Gradient:

Time (min)	% B
0	20
2.5	95
3	95
3.1	20
4.9	20

Flow Rate: 450 µL/min
Temperature: 25 °C
Detection: MS
Sample:

1. Normorphine
2. Morphine
3. d3-Morphine
4. Oxymorphone
5. Hydromorphone
6. d6-Hydromorphone
7. d6-Codeine
8. Codeine
9. *O*-Desmethyltramadol
10. d6-Oxycodone
11. Oxycodone
12. Hydrocodone
13. N-Desmethyltramadol
14. Tramadol
15. Normeperidine
16. d4-Normeperidine
17. d4-Meperidine
18. Meperidine

Metabolomics



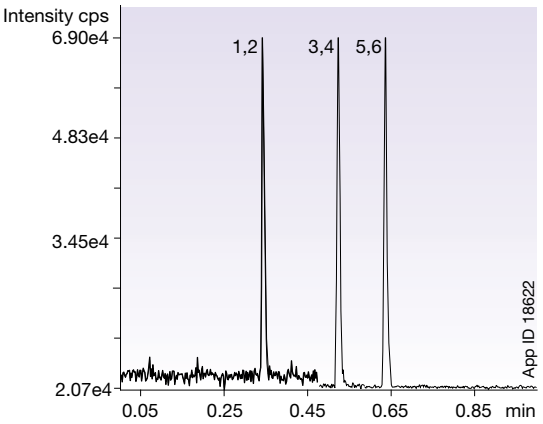
Column: Kinetex 2.6 µm C18
Dimensions: 150 x 4.6 mm
Part No.: 00F-4462-E0
Mobile Phase: A: 0.1% Formic acid in Water
B: 0.1% Formic acid in Acetonitrile

Gradient:

Time (min)	% B
0	5
1.40	5
14.75	95
14.76	5
20.75	5

Flow Rate: 1.5 mL/min
Temperature: 45 °C
Detection: UV @ 220 nm (25 °C)
Backpressure: 380 bar
Instrument: Agilent 1100
Sample: Human urine diluted 1:2 with DI water, filtered with 0.2 µm PVDF syringe filter

Illicit Drugs



Column: Kinetex 2.6 µm C18
Dimensions: 50 x 2.1 mm
Part No.: 00B-4477-AN
Mobile Phase: A: 0.1 % Formic acid in Water
B: 0.1 % Formic acid in Acetonitrile

Gradient:

Time (min)	% B
0	10
1	95
1.4	95
1.41	95
2	10

Flow Rate: 1.0 mL/min
Temperature: 25 °C
Detection: MS, ESI$^+$ (110 °C)
Backpressure: 520 bar
Sample:

1. 6-MAM (328.3-152.3)
2. d3-6-MAM (331.3-211.3)
3. PCP (244.3-91.2)
4. d5-PCP (249.3-164.4)
5. Methadone (310.2-265.2)
6. d9-Methadone (319.2-268.2)

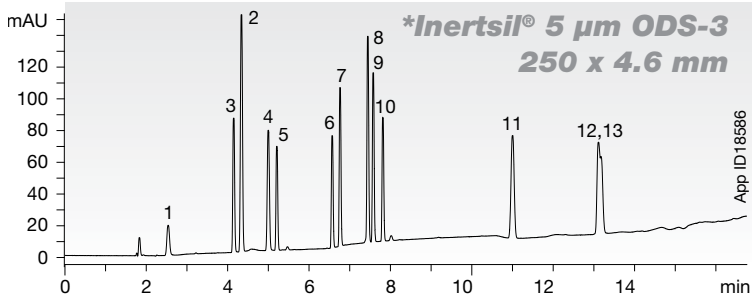
Note: Please request App ID 18621 for method below 400 bar

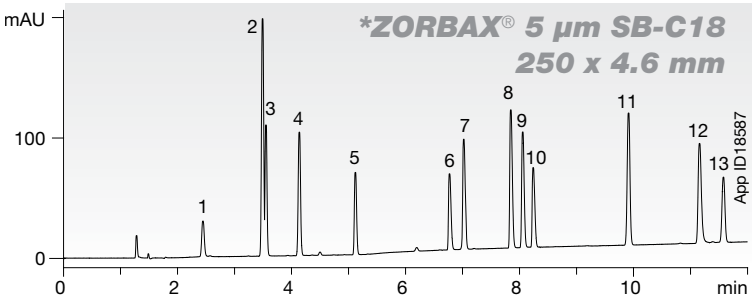
Kinetex™ Core-Shell Particles

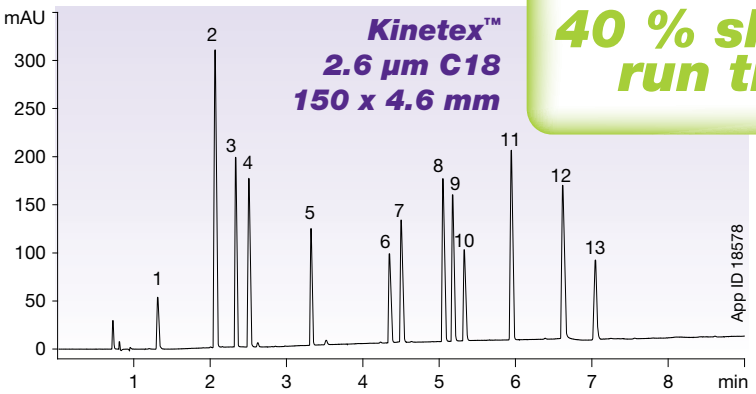
vs. Traditional Fully Porous Particles

In the example outlined below, a Kinetex™ 150 mm length column is compared to 250 mm length traditional 5 µm columns. Notice the improvement in resolution and shorter run time with the Kinetex™ column.

Pharmaceutical Drug Screen







Improved Resolution
40 % shorter run time

Conditions same for all columns except where noted:

Columns: Kinetex 2.6 µm C18 100 Å
*Inertsil® 5 µm ODS-3 100 Å
*ZORBAX® 5 µm SB-C18 300 Å

Dimensions: Kinetex: 150 x 4.6 mm
*Inertsil® and *ZORBAX®: 250 x 4.6 mm

Mobile Phase: A: 0.1 % Phosphoric acid in Water
B: 0.1 % Phosphoric acid in Acetonitrile

Gradient: 5 % to 95 % B in 9 min (150 x 4.6 mm)
5 % to 95 % B in 15 min (250 x 4.6 mm)

Flow Rate: 1.8 mL/min

Temperature: 50 °C

Detection: UV @ 215 nm (22 °C)

Sample:
1. Procainamide
2. Acetaminophen
3. Folic acid
4. Sulfathiazole
5. Acebutolol
6. Dextromethorphan
7. Diphenhydramine
8. Propafenone
9. Amitriptyline
10. Fluoxetine
11. Naproxen
12. Diflunisal
13. Indomethacin

Chromatographic Performance Compared
Kinetex™ Core-Shell vs. Traditional Fully Porous Columns

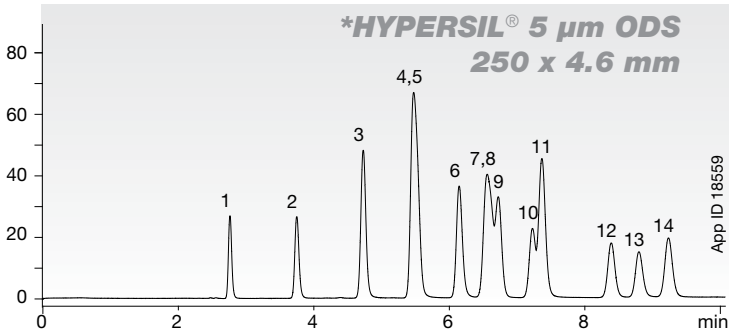
	Dimensions (mm)	Peak Capacity	Average Peak Width	Minimum Resolution	Average Resolution	Back Pressure (bar)
Kinetex™ 2.6 µm C18	150 x 4.6	271.8	0.0211	3.3	14.0	378
***Inertsil® 5 µm ODS-3**	250 x 4.6	238.4	0.0446	0.5	11.4	144
***ZORBAX® 5 µm SB-C18**	250 x 4.6	242.4	0.0376	1.2	12.0	149

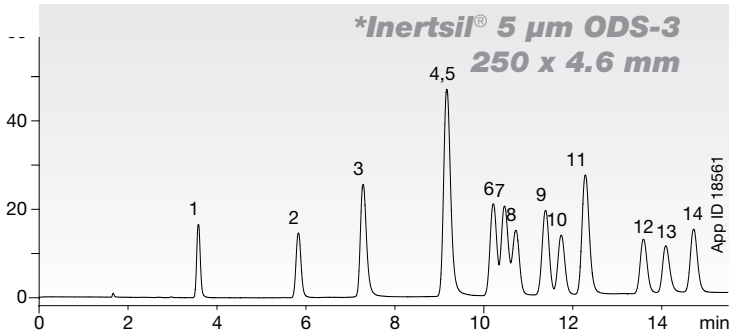
* Inertsil is a registered trademark of G.L. Sciences, Inc., Japan. ZORBAX is a registered trademark of Agilent Technologies. Comparative separations may not be representative of all applications. Phenomenex is not affiliated with the above companies.

Kinetex™ Core-Shell Particles

vs. Traditional Fully Porous Particles

Explosives: EPA Method 8330





Conditions same for all columns except where noted:

Columns: Kinetex 2.6 µm C18 100 Å
*HYPERSIL® 5 µm C18 120 Å
*Inertsil® 5 µm ODS-3 100 Å
*ZORBAX® 5 µm SB-C18 300 Å

Dimensions: Kinetex: 150 x 4.6 mm
Other columns: 250 x 4.6 mm

Mobile Phase: A: Water B: Methanol

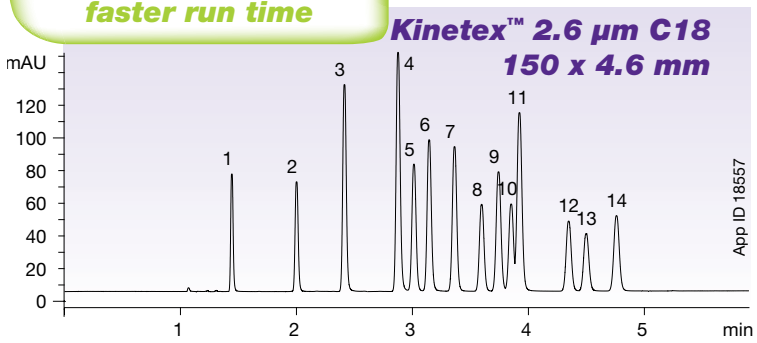
Gradient: A/B (45:55) to (35: 65) in 6 min

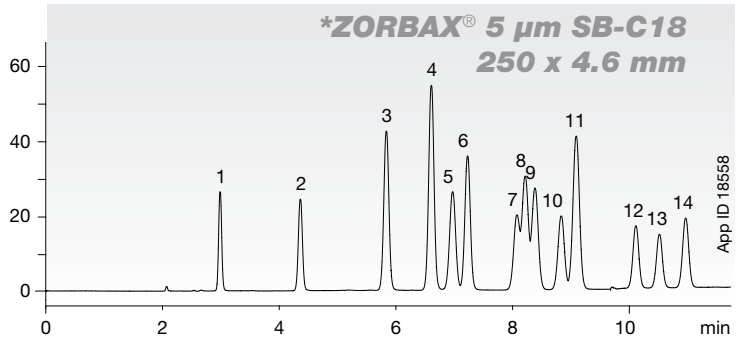
Flow Rate: 1.2 mL/min

Temperature: 22 ºC

Detection: UV @ 254 nm (22 ºC)

5-10 minute faster run time





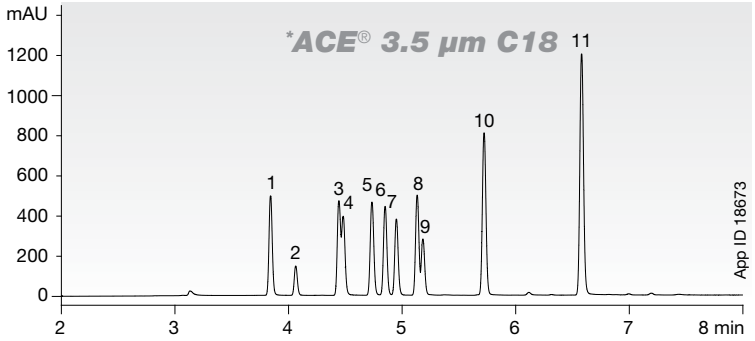
Sample:
1. HMX
2. RDX
3. 1,3,5-Trinitrobenzene
4. 1,3-Dinitrobenzene
5. Tetryl
6. Nitrobenzene
7. 2,4,6-Trinitrotoluene
8. 2-Amino-4,6-Dinitrotoluene
9. 4-Amino-2,6-Dinitrotoluene
10. 2,6-Dinitrotoluene
11. 2,4-Dinitrotoluene
12. 2-Nitrotoluene
13. 4-Nitrotoluene
14. 3-Nitrotoluene

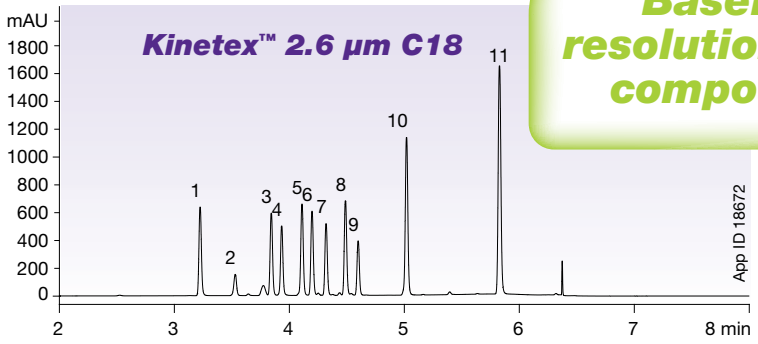
* HYPERSIL is a registered trademark of Thermo Hypersil-Keystone. Inertsil is a registered trademark of G.L. Science, Inc. ZORBAX is a registered trademark of Agilent Technologies. Comparative separations may not be representative of all applications. Phenomenex is not affiliated with the above companies.

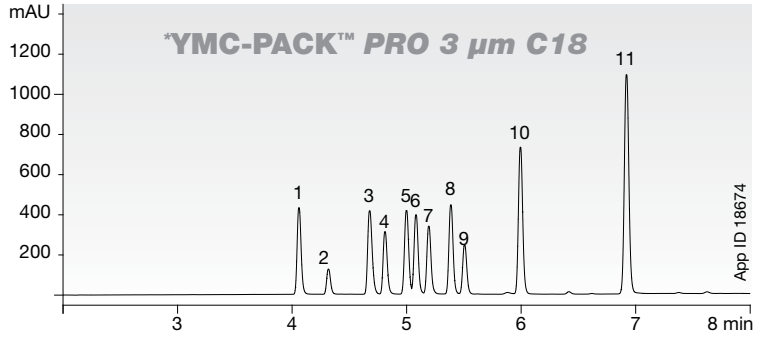
Kinetex™ Core-Shell Particles

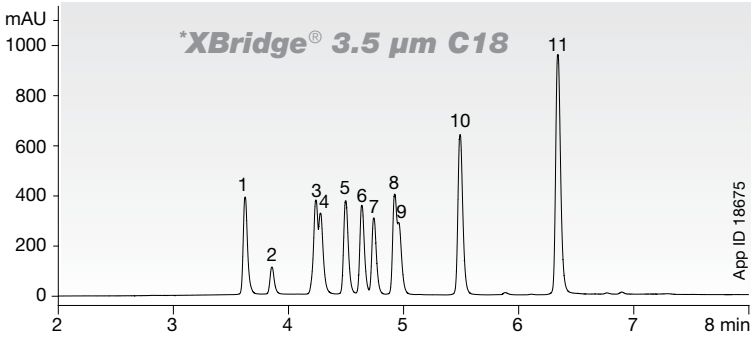
vs. Traditional Fully Porous Particles

Phenols: EPA Method 604









Baseline resolution of all compounds

Conditions same for all columns:

Columns: Kinetex 2.6 µm C18
*ACE® 3 µm C18
*XBridge® 3.5 µm C18
*YMC-Pack™ *Pro* C18

Dimensions: 150 x 4.6 mm

Mobile Phase: A: 0.1 % Phosphoric acid in Water
B: 0.1 % Phosphoric acid in Acetonitrile

Gradient: (80:20) A/B to (5:95) over 5 min

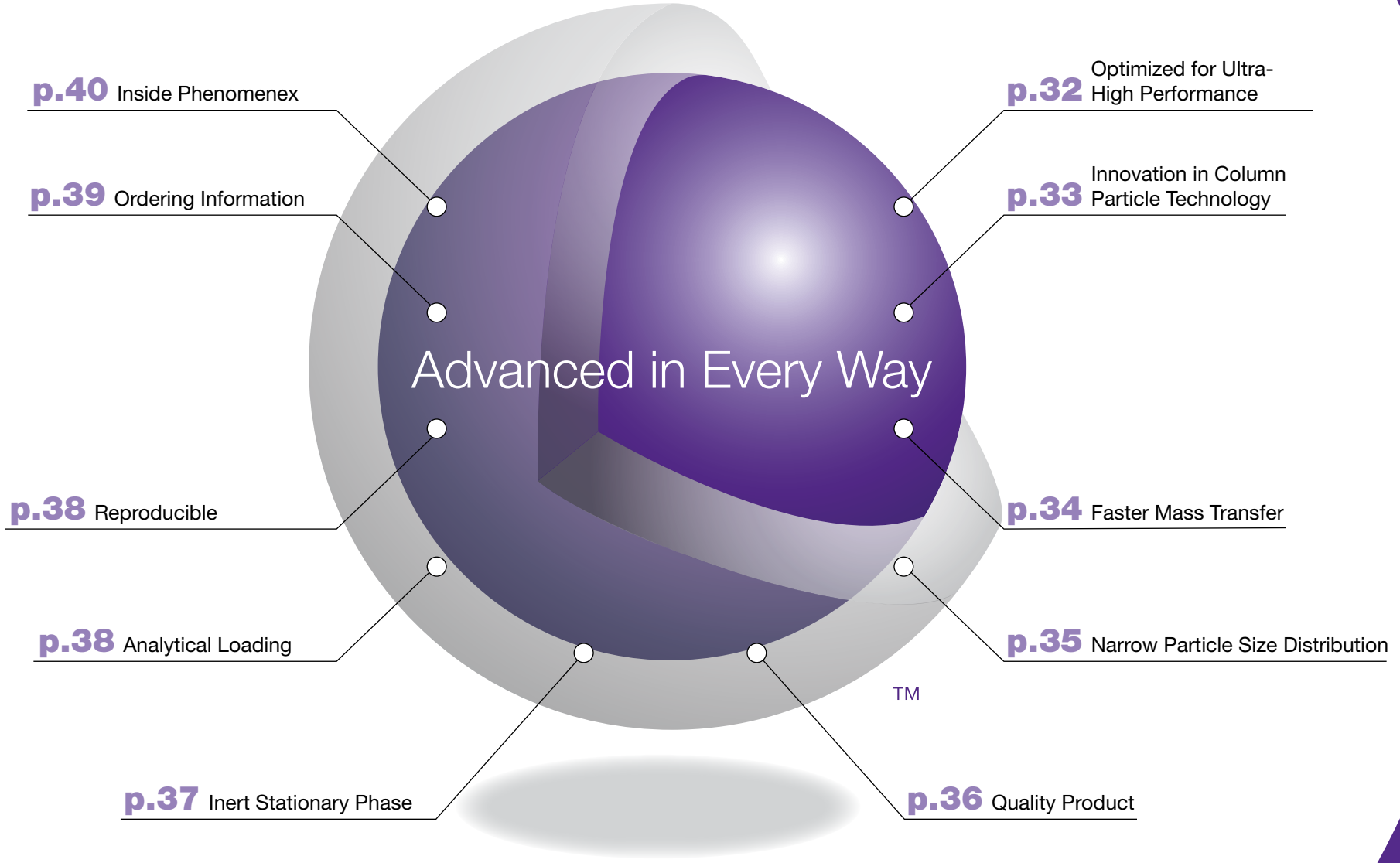
Flow Rate: 1.0 mL/min

Temperature: 22 ºC

Detection: UV @ 254 nm (22 ºC)

Sample:
1. Phenol
2. 4-Nitrophenol
3. 2-Chlorophenol
4. 2-Nitrophenol
5. 2,4-Dimethylphenol
6. 2,4-Dinitrophenol
7. 4-Chloro-3-Methylphenol
8. 2,4-Dichlorophenol
9. 2-Methyl-4,6-Dichlorophenol
10. 2,4,6-Trichlorophenol
11. Pentachlorophenol

* ACE is a registered trademark of Advanced Chromatography Technologies. YMC-Pack, Pro C18, and YMC are trademarks of YMC Co., Ltd. XBridge is a registered trademark of Waters Corp. YMC is trademark of YMC Corp. Comparative separations may not be representative of all applications. Phenomenex is not affiliated with the above companies.



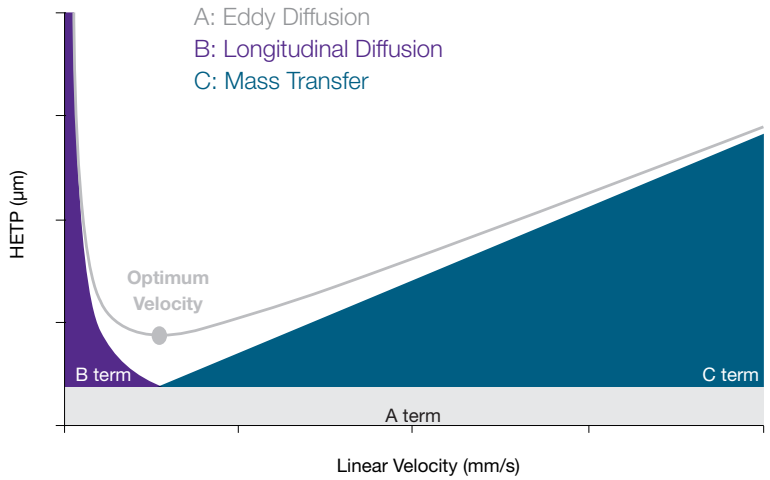
Optimized for
Ultra-High Performance

Innovations in LC particle technology are driven by the demand for better chromatographic performance and higher productivity. To achieve performance improvements of greater sensitivity, higher resolution, and to enable faster analysis times, a column requires lower plate height (higher efficiency) at high linear velocities. With traditional fully porous 3 µm and 5 µm particles, efficiency decreases significantly as flow rate increases. In most cases, loss of resolution and sensitivity prevents faster analysis times. Smaller fully porous particles (< 2 µm) provide faster chromatographic separations at low plate heights (HETP) but require higher pressure capable instrumentation. Kinetex™ core-shell technology offers the ultra-high efficiency of sub-2 µm particles over an extended range of linear velocity without generating excessive column backpressure by reducing Eddy Diffusion (multi-path effect) and allowing for faster mass transfer. As a result of this innovative design, Kinetex™ columns provide roughly 3x the efficiency of 5 µm fully porous particles and 2x the efficiency of 3 µm fully porous particles without the need for specialized high pressure instrumentation.

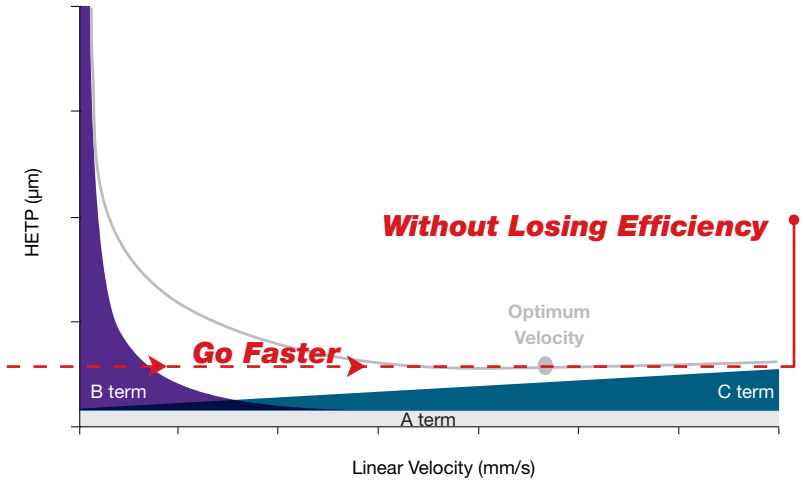
Van Deemter Equation

$$H = 2\lambda d_p + 2GD_m/\mu + w(d_e)^2\mu/D_m + Rd^2_e\mu/D_s \ ^*$$

Traditional Chromatography



Ultra-High Performance



Kinetex™ core-shell technology allows you to go faster without losing efficiency on any LC instrument.

* d_e refers to the effective particle size. For Kinetex 2.6 µm particles, d_e = 1.7 µm. For fully porous particles, $d_e = d_p$.

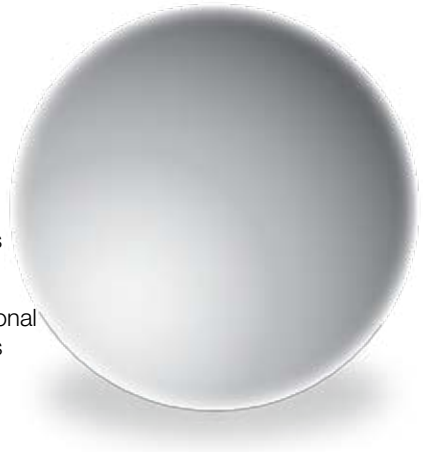
Innovation in
Particle Technology

The Kinetex™ core-shell particle is not fully porous. Using sol-gel processing techniques that incorporate nano structuring technology, a durable, homogenous porous shell is grown on a solid silica core. This highly optimized process combined with uniform particle size distribution produces a column that generates extremely high plate counts. With an overall particle size of 2.6 µm, less column backpressure is generated, allowing Kinetex™ 2.6 µm columns to be used on any LC platform.

Material Characteristics*

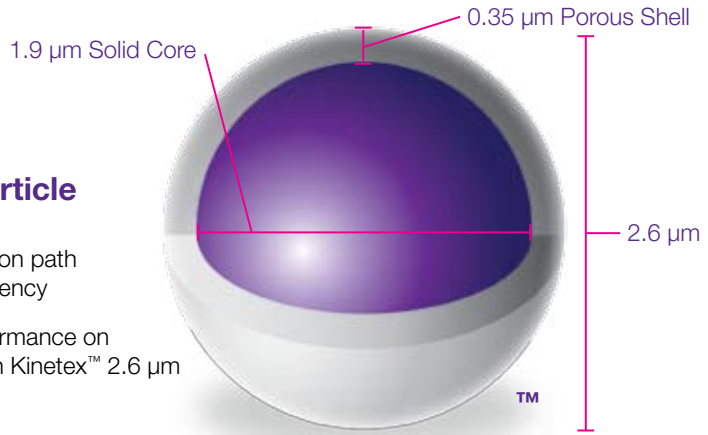
Packing Material	Total Particle Size (µm)	Porous Shell (µm)	Solid Core (µm)	Pore Size (Å)	Effective Surface Area (m^2/g)	Effective Carbon Load %	pH Stability
Kinetex™ C18	2.6	0.35	1.9	100	200	12	1.5 - 10
Kinetex™ PFP	2.6	0.35	1.9	100	200	9	1.5 - 8.0
Kinetex™ HILIC	2.6	0.35	1.9	100	200	0	2.0 - 7.5

Traditional Fully Porous Particle



- Diffusion path limits efficiencies
- Ultra-high performance limited to UHPLC systems with traditional fully porous sub-2 µm columns

Kinetex™ Core-Shell Particle



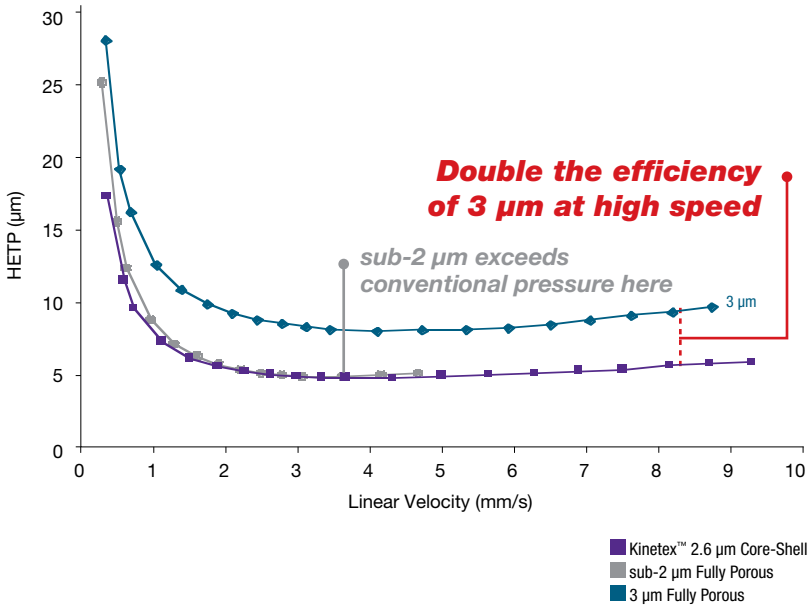
- Reduced diffusion path maximizes efficiency
- Ultra-high performance on any system with Kinetex™ 2.6 µm columns

* For the evaluation of effective surface area and carbon load, please request TN-1064.

Faster
Mass Transfer

Since the Kinetex™ particle is not fully porous, analytes spend less time diffusing into and out of the pores as they travel through the column. This shorter diffusion path allows for faster mass transfer. The result is less band broadening for higher peak efficiency comparable to or better than sub-2 µm fully porous particles.

Performance of Kinetex™ Core-Shell Particles
Compared to Fully Porous Sub-2 µm and 3 µm Particles



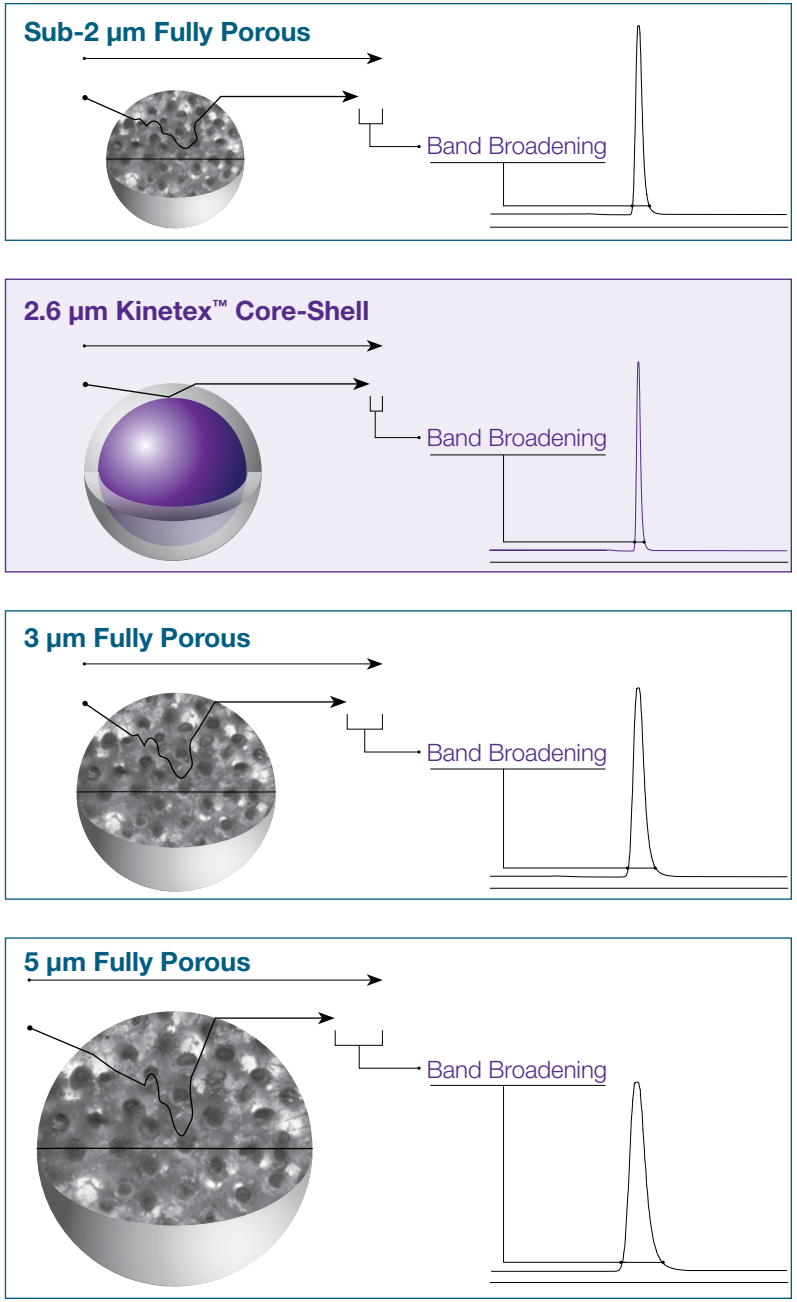


Illustration - not actual test data.

Narrow
Particle Size Distribution

Kinetex™ particles are nearly monodispersed. This extremely narrow particle size distribution reduces the effects of Eddy Diffusion (multi-path effect- the A term of the Van Deemter equation) since the interstitial space between the particles is virtually homogeneous. This results in ultra-high column efficiency and excellent reproducibility.

Uniform Particle Size Distribution

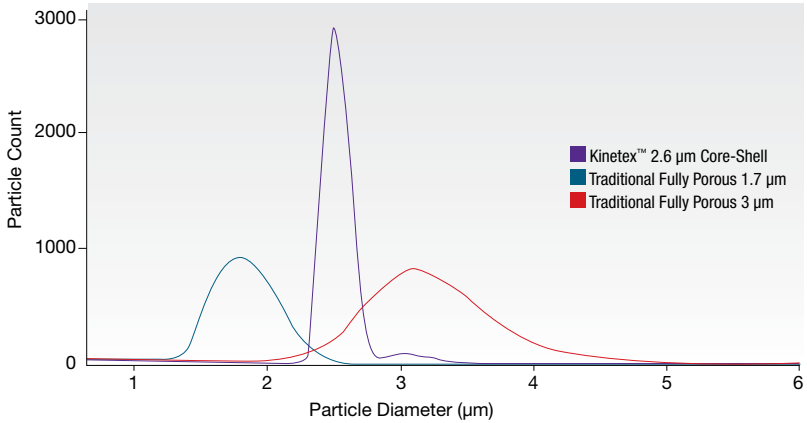
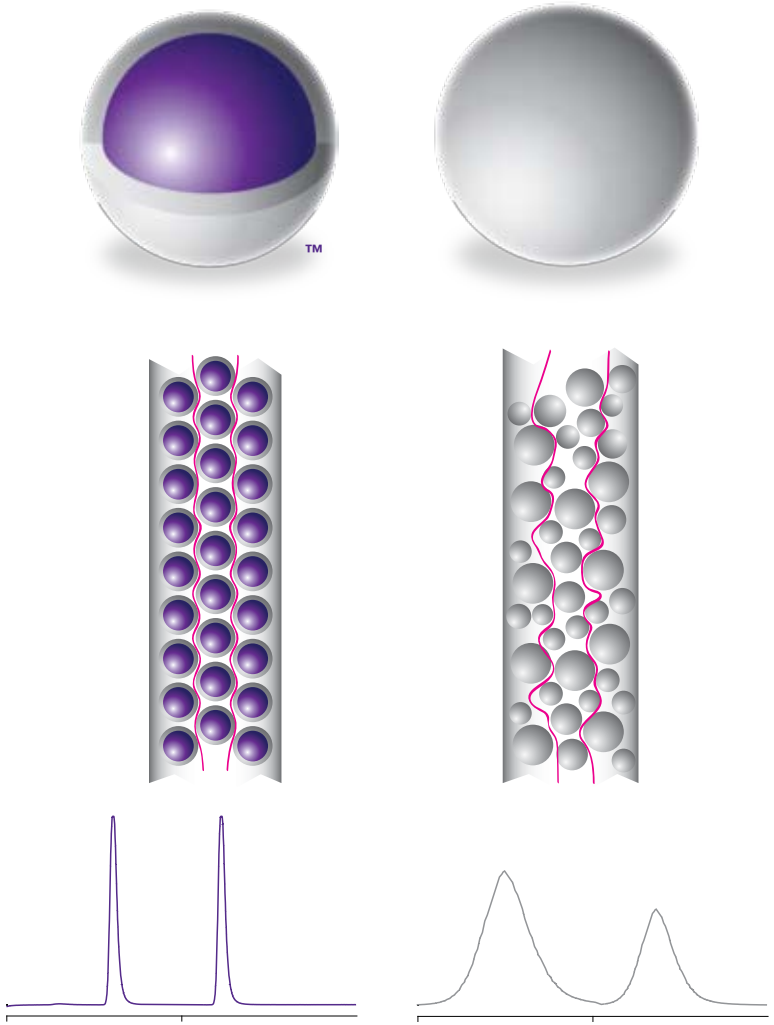


Illustration of Eddy Diffusion Effects

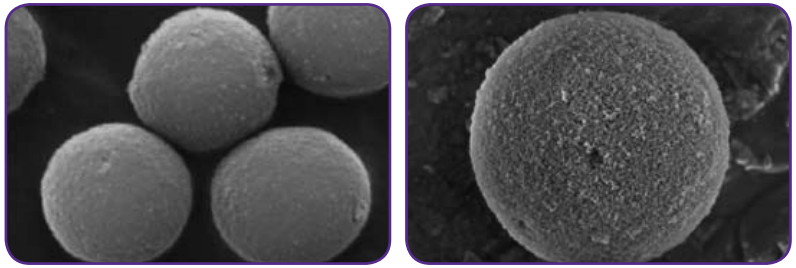


A Superior Quality Product

In order to ensure reproducible, robust, and reliable results, Kinetex™ columns are manufactured with high quality standards. Every step in the manufacturing process of Kinetex™ columns is tightly controlled for:

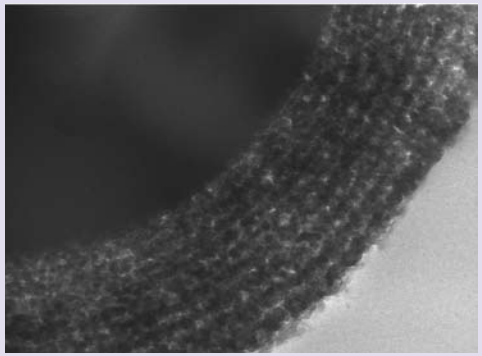
- Particle size distribution
- Surface and bonding homogeneity
- Quality control testing
- Inertness of the base silica
- Packing quality

SEM of Kinetex™ Core-Shell Particles



Surface and Bonding Homogeneity

Using sol-gel processing techniques that incorporate nano-structuring technology, a durable, homogeneous porous shell is grown on a solid silica core. This highly optimized process combined with uniform particle size distribution produces a column that generates extraordinary plate counts.



Cross section of Kinetex™ Core-Shell Particle

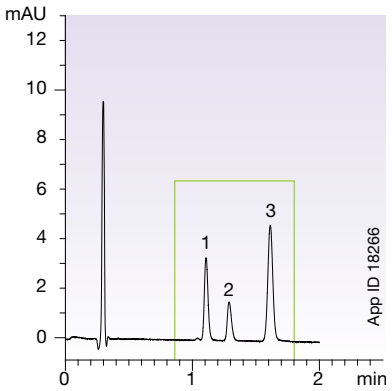
"Kinetex™ core-shell particles are synthesized from first principles using ultra-pure starting materials in a rigorously controlled process at our manufacturing plant in Torrance, CA, USA"

-Phenomenex R&D Scientist

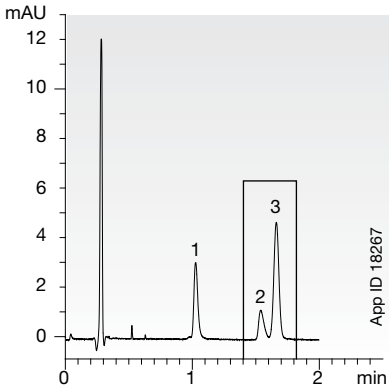
Inert
Stationary Phase

Kinetex™ core-shell particles exhibit virtually no silanol activity as evidenced in the example below. At low pH, nortriptyline is charged and likely to interact with residual silanols available on the surface of the stationary phase after bonding. Less retention of nortriptyline indicates lower silanol activity and less ionic interactions.

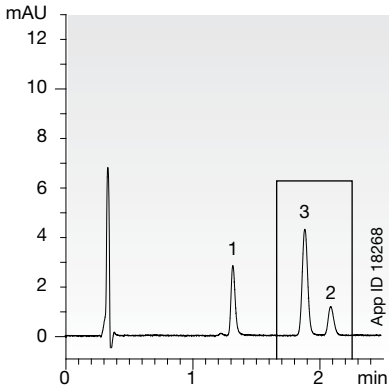
Kinetex™
2.6 µm C18



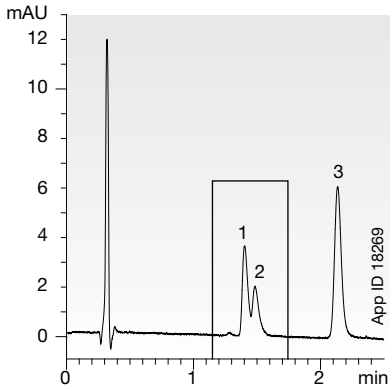
*HALO®
2.7 µm C18



*ACQUITY® BEH
1.7 µm C18



*ZORBAX®
1.8 µm SB-C18



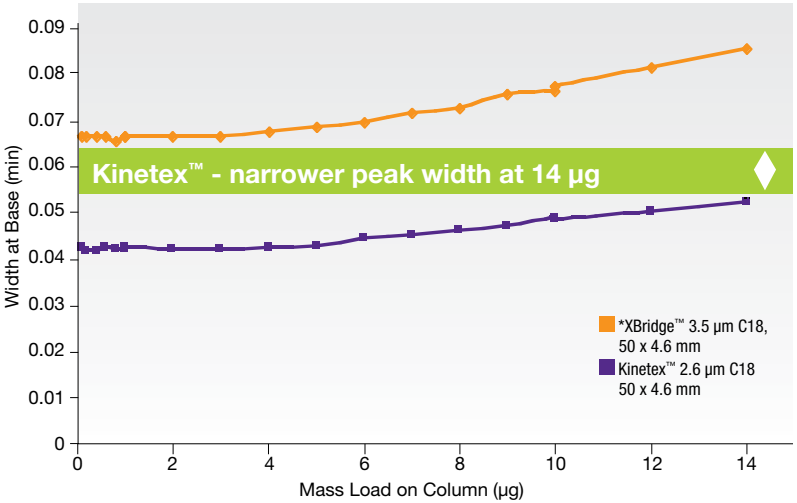
Conditions for all columns:
Dimensions: 50 x 2.1 mm
Mobile Phase: 0.1 % Phosphoric acid in Water / Acetonitrile (70:30)
Flow Rate: 0.42 mL/min
Temperature: 40 °C
Detection: UV @ 254 nm (22 °C)
Instrument: Agilent 1200SL
Sample: 1. 3-Methyl-4-nitrobenzoic acid (acid)
2. Nortriptyline (base)
3. 5-Methylsalicylaldehyde (neutral)

* HALO is a registered trademark of Advanced Materials Technology, Inc. ZORBAX is a registered trademark of Agilent Technologies. ACQUITY is a registered trademark of Waters Corp. Comparative separations may not be representative of all applications. Phenomenex is not affiliated with the above companies.

Analytical
Loading

With Kinetex™ core-shell technology, analytical loading is comparable to or better than competitive columns. In the study below, the change in peak width was measured with increased loading on column. Kinetex™ exhibited excellent analytical loading capacity.

Analytical Loading - Ethyl paraben in formic acid buffer



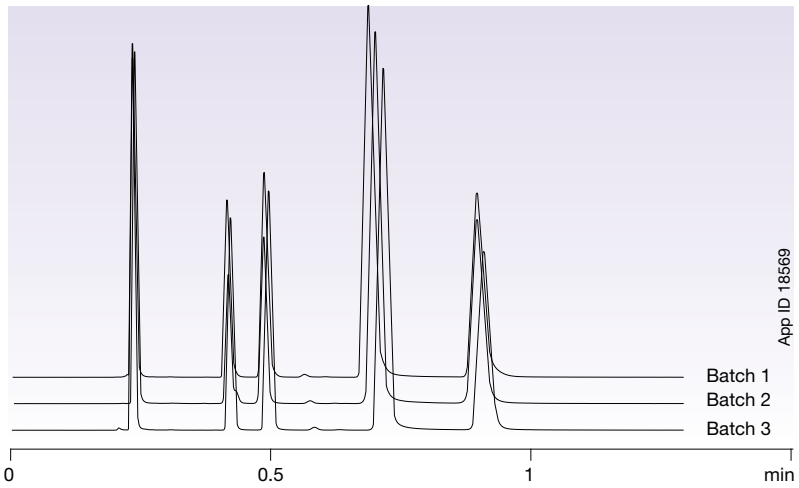
Conditions for both columns:
Mobile Phase: 0.1 % Formic acid in Water / Acetonitrile (65:35)
Flow Rate: 1.85 mL/min
Temperature: 30 °C
Instrument: Agilent 1200SL

* XBridge is a trademark of Waters Corporation. Comparative separations may not be representative of all applications. Phenomenex is not affiliated with Waters Corporation.

Reproducible
Batch-to-Batch

Each individual Kinetex™ column and batch of media undergoes a battery of quality assurance tests for particle size distribution (both solid core and shell thickness), surface coverage, carbon load, pore diameter distribution, and many other parameters to ensure exceptional reproducibility.

Batch-to-Batch Overlay



Conditions same for all batches:
Columns: Kinetex 2.6 µm C18 100 Å
Dimensions: 50 x 4.6 mm
Part No.: 00B-4462-E0
Mobile Phase: 20 mM Potassium phosphate pH 7.0 / Methanol (20:80)
Flow Rate: 2.0 mL/min
Temperature: 22 °C
Detection: UV @ 254 nm (40 °C)
Sample: 1. Uracil
2. Toluene
3. Ethylbenzene
4. Quinizarine
5. Amitriptyline

Ordering Information

Kinetex™ 2.6 µm Minibore Columns (mm)

	50 x 2.1	100 x 2.1	150 x 2.1
C18	00B-4462-AN	00D-4462-AN	00F-4462-AN
PFP	00B-4477-AN	00D-4477-AN	00F-4477-AN
HILIC*	00B-4461-AN	—	00F-4461-AN

Kinetex™ 2.6 µm Solvent Saver Midbore Columns (mm)

	50 x 3.0	100 x 3.0	150 x 3.0
C18	00B-4462-Y0	00D-4462-Y0	00F-4462-Y0
PFP	00B-4477-Y0	00D-4477-Y0	00F-4477-Y0
HILIC*	—	—	—

Kinetex™ 2.6 µm Analytical Columns (mm)

	50 x 4.6	100 x 4.6	150 x 4.6
C18	00B-4462-E0	00D-4462-E0	00F-4462-E0
PFP	00B-4477-E0	00D-4477-E0	00F-4477-E0
HILIC*	00B-4461-E0	—	00F-4461-E0

* HILIC available September 2009.

Selecting the Right Kinetex™ Column and Flow Rate

	Length (mm)	ID (mm)	Flow Rate (mL/min)	Pressure (Bar) **
Maximum Resolving Power	**150**	4.6	0.8 - 2.5	165 - 600
		3.0	0.3 - 1.2	170 - 600
		2.1	0.1 - 0.5	180 - 600
Resolving Power + Speed	**100**	4.6	0.8 - 3.0	< 100 - 600
		3.0	0.3 - 2.0	< 100 - 600
		2.1	0.1 - 0.75	< 100 - 600
Maximum Speed	**50**	4.6	0.8 - 4.5	< 100 - 600
		3.0	0.3 - 2.5	< 100 - 600
		2.1	0.1 - 1.0	< 100 - 600

** Dependent on mobile phase composition and temperature.

KrudKatcher™ Ultra In-line Filter (NEW)

Disposable in-line filter fits all UHPLC / HPLC columns 1.0 to 4.6 mm.

Extremely low dead volume minimizes sample peak dispersion (see p. 13 for more information).

Part No.	Description	Unit	Price
AF0-8497	KrudKatcher Ultra In-Line Filter, 0.5 µm Porosity x 0.004 in. ID	3/pk	

Wrenches not provided. KrudKatcher Ultra requires $^{5}/_{16}$ in. wrench.

UHPLC / HPLC Sure-Lok™ Fingertight PEEK® Male Nut Fittings

Pressure rated to 12,000 psi (827 bar) and stable up to temperatures of 200 °C

Part No.	Description	Unit	Price
AQ0-8503	Sure-Lok Fingertight PEEK 1-Pc Nut, 10-32, for $^{1}/_{16}$ in. Tubing, 12,000 psi (827 bar)	10/pk	
AQ0-8508	Fingertight Nut Tightening Tool, for Standard Nuts, Delrin®	ea	

Column Heater

Part No.	Description	Price
EH0-7057	ThermaSphere™ TS-130 HPLC Column Heater 25-90 °C, 95 to 265 VAC, 50/60 Hz	
EH0-7058	Stand for ThermaSphere TS-130 HPLC Column Heater	

The Story of Kinetex™:

From Project to Phenomenon

Over the past few years we've heard from customers like you, facing the pressure to be more productive while coping with reduced resources. We asked ourselves what it would take to create a true evolution in HPLC – one that would benefit all chromatographers with ultra-high performance.

We recognized the full potential of core-shell technology and evolved our chemistry and manufacturing process to create the most homogeneous porous shell and spherical particle. A team of sol-gel scientists, experienced organic chemists, and production engineers then invested over three years to optimize the surface chemistry and column manufacturing process for the most efficiently packed column bed we've ever seen. The result: Kinetex™ core-shell columns reach speeds and efficiencies previously thought to be impossible.

It seems easy, standing at the end of an elegant solution, yet, it was only possible through the insightful minds and especially determined spirits of our passionate employees. We can't overstate the contributions from all quarters. Long hours, extensive travel, weekend shifts, debates and sometimes even arguments – nothing was spared to bring the industry the breakthrough it needed.

Phenomenex USA Kinetex
Research & Development Team

Global Sales and Marketing Managers Meeting

Everyone at Phenomenex is thrilled to introduce this new technology. We are confident that you will find Kinetex™ core-shell HPLC/UHPLC columns to be the best combination of performance and versatility yet!

phenomenex®

...breaking with tradition℠

www.phenomenex.com

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Ultra-High Performance on
ANY LC System

	Core-Shell Particles	Traditional Fully Porous Particles		
	Kinetex™ 2.6 µm	sub-2 µm	3 µm	5 µm
Multiple Column Selectivities	√	√	√	√
Highest Efficiencies	√	√		
Highest Sensitivity	√	√		
Easy Method Transfer across LC systems	√		√	√
Provides sub-2 µm Performance on:				
400 Bar LC Instruments	√			
600 Bar LC Instruments	√	*		
1000 Bar LC Instruments	√	√		

guarantee

If you are not completely satisfied with Kinetex™ core-shell columns, send in your comparative data to a similar product within 45 days and KEEP THE COLUMN FOR FREE.

*Most traditional fully porous sub-2 µm columns > 50 mm length, operate at pressures higher than 600 bar for optimal linear velocities.

KINETEX™