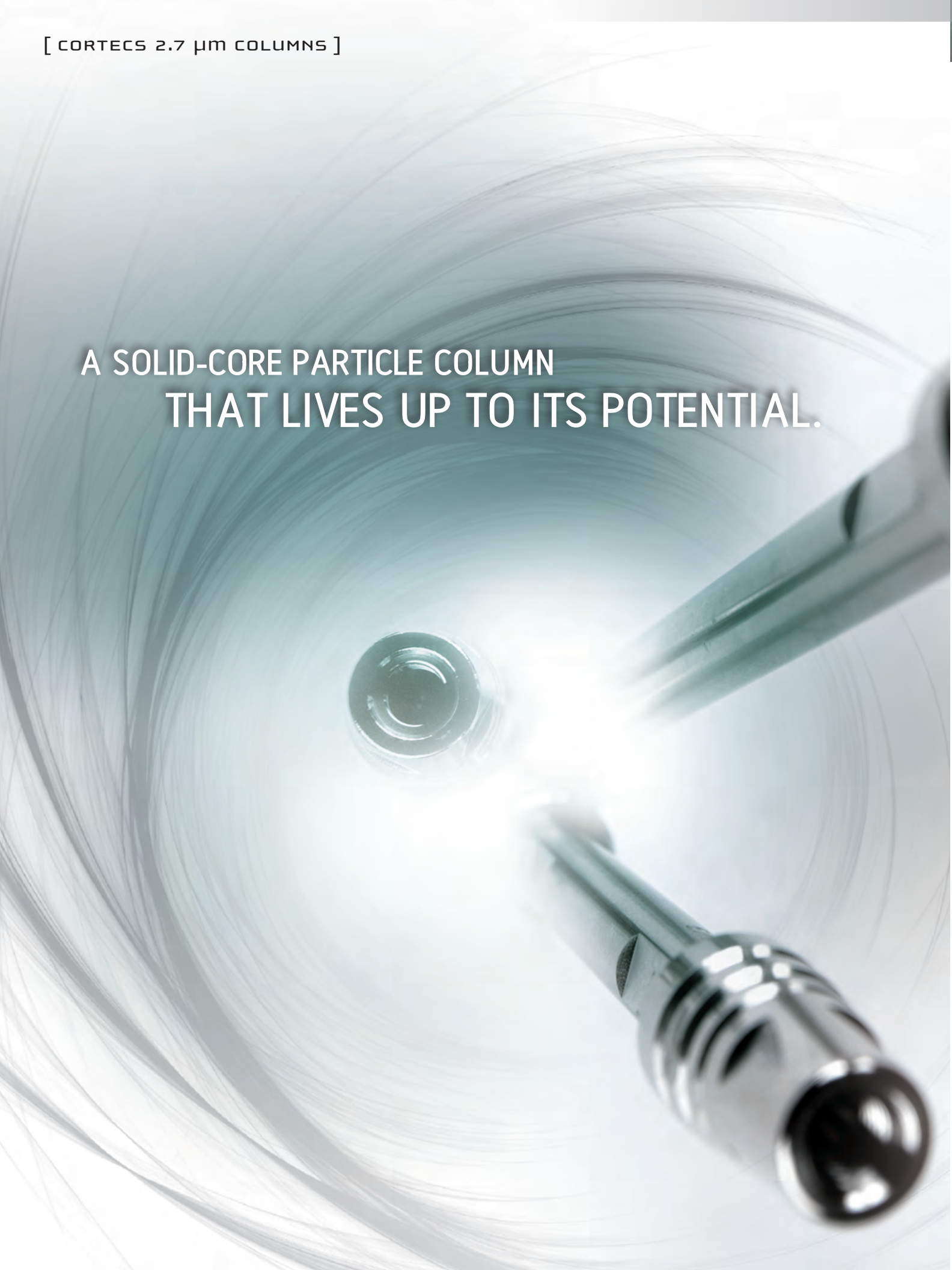
[CORTECS 2.7 µm COLUMNS]

surpass all

possibilities

CORTECS®
COLUMNS

Waters
THE SCIENCE OF WHAT'S POSSIBLE.®



A SOLID-CORE PARTICLE COLUMN
THAT LIVES UP TO ITS POTENTIAL.

2.7 µm SOLID-CORE PARTICLE COLUMNS FOR HPLC AND UHPLC SEPARATIONS

Unleash the power of your laboratory's instrumentation. CORTECS® 2.7 µm Solid-Core Particle Columns are designed to maximize performance of HPLC or UHPLC systems by maximizing efficiency, resulting in enhanced resolution and peak capacity—at HPLC- and UHPLC-optimized pressures. Whether you are developing a quality control method or transferring an LC separation, CORTECS Columns will exceed your LC column expectations.

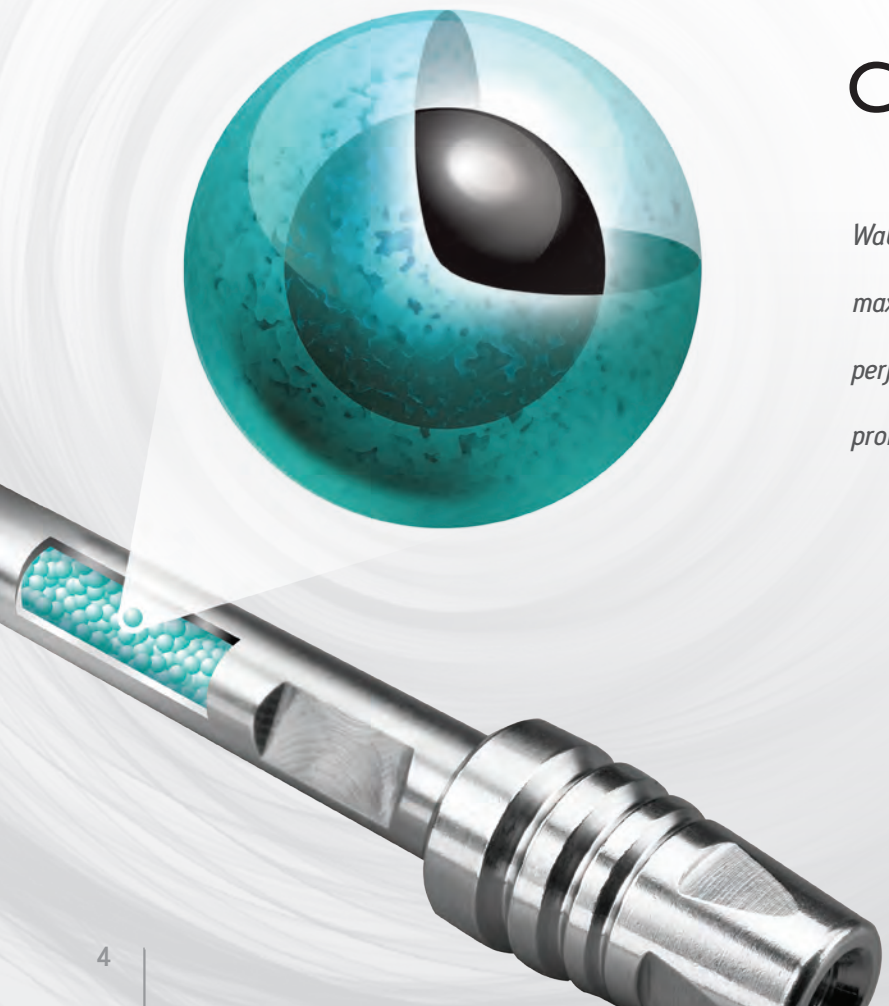
TRUTH BEHIND INCREASED EFFICIENCY WITH SOLID-CORE PARTICLES

Efficiency gains of solid-core particle columns were previously credited to the shorter diffusion path in solid-core particles versus fully-porous particles. This shorter diffusion path resulted in faster mass transfer kinetics. However, for analytes of low molecular weight which have high diffusion rates, mass transfer kinetics have been found to play a minimal role in efficiency improvement. Recent research suggests that solid-core particles demonstrate improved performance by lowering the three terms of the van Deemter equation:

- Solid-core particles may pack more uniformly—lowering the *A* term
- Their lower particle porosity reduces axial diffusion—lowering the *B* term
- Their solid core may improve heat transfer, diminishing radial temperature gradients—lowering the *C* term

$$HETP = A + \frac{B}{v} + C \cdot v$$

G. Guiochon and F. Gritti, J. Chrom. A ***1218****, 2011, 1915 - 1938.*



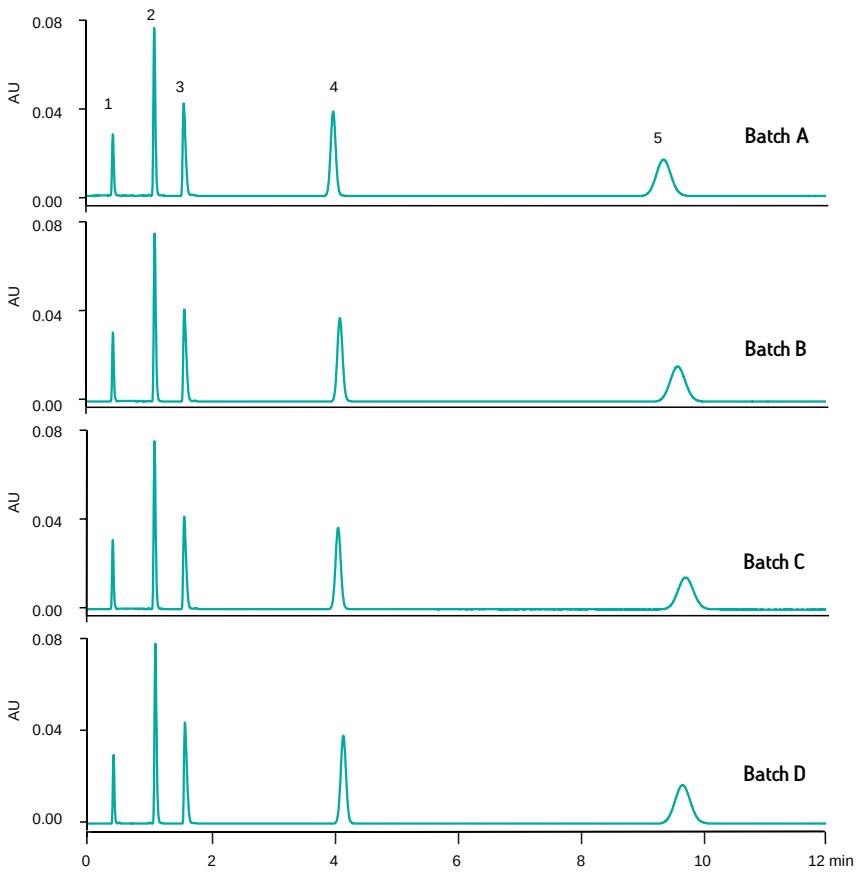
CORTECS® COLUMNS

Waters CORTECS Columns are designed to maximize efficiency, throughput, and performance. Additionally, they fulfill the promise of solid-core particle columns.

SETTING THE STANDARD FOR REPRODUCIBILITY

Waters' cutting-edge manufacturing facilities are dedicated to producing columns that maximize laboratory performance. As a primary manufacturer of silica and hybrid particles, we are able to continually monitor and control the manufacturing process over the lifetime of a product. Controlled manufacturing processes ensure you receive the best, most reliable column possible for consistent performance year after year. CORTECS Columns are created using state-of-the-art column packing techniques and bonding and endcapping processes. The result is consistent, reproducible performance, and long column lifetimes.

Excellent Batch-to-Batch Reproducibility for CORTECS C_{18}, 2.7 µm Columns



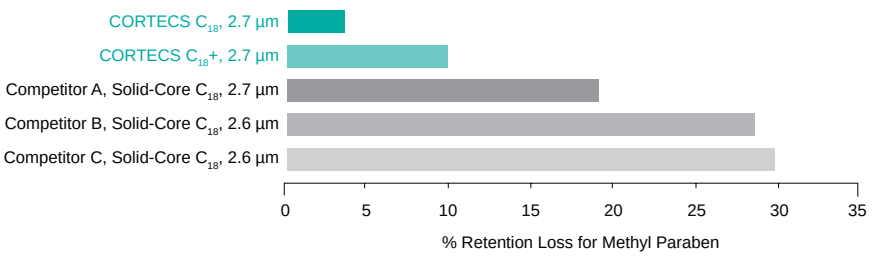
System:	ACQUITY UPLC® H-Class System with ACQUITY PDA
Column:	CORTECS C_{18}, 2.7 µm, 2.1 x 50 mm (p/n 186007365)
Mobile phase:	Acetonitrile/15.4 mM ammonium formate, pH 3 (35/65, v/v)
Flow rate:	0.25 mL/min
Injection volume:	3 µL
Column temp.:	30 ˚C
Detection:	UV at 254 nm
Sample diluent:	Mobile phase

Compounds:

1. Uracil (1 µg/mL)
2. Promethazine (3.0 µg/mL)
3. Amitriptyline (8.0 µg/mL)
4. Butylparaben (3.5 µg/mL)
5. Naphthalene (20 µg/mL)

Separations obtained using columns containing four different batches of bonded material demonstrate the excellent reproducibility that can be expected from CORTECS Columns, assuring the long-term reproducibility of your analytical method.

Stability at Low pH: 21 Hour Exposure to 0.5% TFA at 60 °C

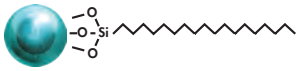
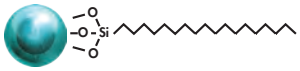


In this test, the loss in retention of the neutral marker methyl paraben indicates bonded phase loss due to acid hydrolysis. CORTECS Columns resist bonded phase loss due to novel bonding and endcapping processes resulting in good column lifetimes.

EMPOWERING METHOD DEVELOPMENT

There are several factors to consider when developing a method. Parameters that influence your separation include mobile phase composition, temperature, and column chemistry. With three phases to choose from, CORTECS 2.7 µm Columns offer both reversed-phase and orthogonal HILIC selectivity, giving you flexibility and the power to develop methods for challenging separations. With different particle characteristics and innovative charged surface modifications, CORTECS 2.7 µm Columns are suitable for use in a wide variety of applications.

CORTECS CHEMISTRY CHARACTERISTICS

	C_{18}+	C_{18}	HILIC
Chemistry			
Intended Use	General purpose, high-efficiency, reversed-phase column. A positively charged surface delivers excellent peak shape for basic compounds at low ionic strength acidic mobile phases.	General purpose, high-efficiency, reversed-phase column. Balanced retention of acids, bases, and neutrals at low- and mid-range pH.	High-efficiency column designed for retention of extremely polar analytes. Offers orthogonal selectivity vs. C_{18} columns.
Ligand Type	Trifunctional C_{18}	Trifunctional C_{18}	None
Surface Charge Modification	+	None	None
Endcap Style	Proprietary	Proprietary	None
Carbon Load	5.7%	6.6%	Unbonded
Ligand Density	2.4 µmol/m^2	2.7 µmol/m^2	N/A
pH Range	2-8	2-8	1-5
Temperature Limits*	Low pH = 45 °C High pH = 45 °C	Low pH = 45 °C High pH = 45 °C	Low pH = 45 °C High pH = 45 °C
Performance Standard	Neutrals QCRM	Neutrals QCRM	HILIC QCRM
Application Standard	Reversed-Phase QCRM	Reversed-Phase QCRM	HILIC QCRM

**Recommended temperature limits when operating at the extremes of the pH range. Higher temperatures may be used when the pH is not near the limits.*

Implement the appropriate Waters Quality Control Reference Material (QCRM) into your workflow to benchmark system performance and gain confidence in your results.

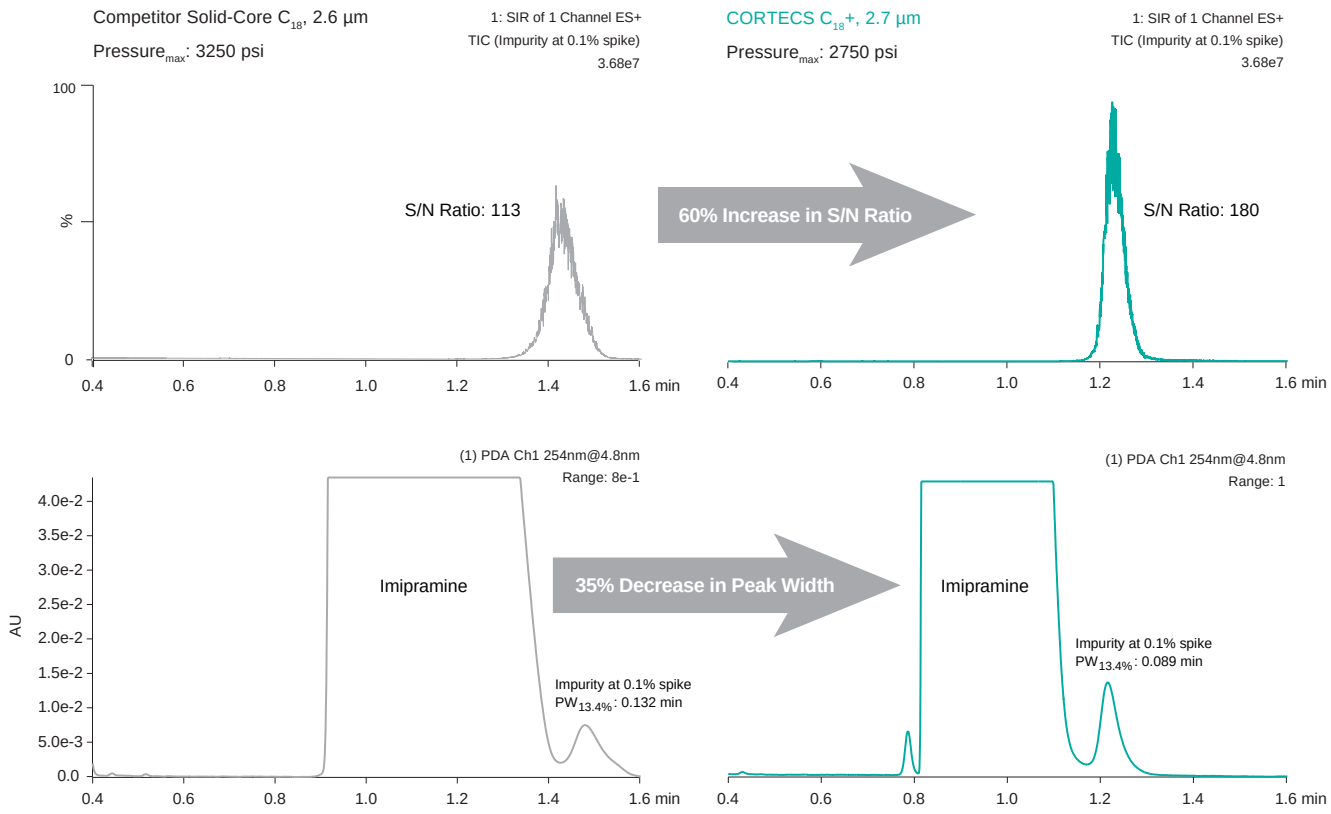
For more information, visit **www.waters.com/QCRM**

IMPROVED PEAK SHAPE AND INCREASED MS SENSITIVITY FOR BASIC ANALYTES

C_{18}+

CORTECS C_{18}+ is a general purpose, high-efficiency, reversed-phase column which features a positively charged surface modification. Charged surface technology utilizes a controlled, low-level surface charge for enhanced selectivity and exceptional peak shape for basic compounds when using acidic, low-ionic strength mobile phases such as formic acid. Benefits of CORTECS C_{18}+ Columns include unique column selectivity with industry-leading reproducibility, exceptional peak shape and loading capacity without the need for ion-pair reagents, and improved signal-to-noise performance in LC and LC-MS applications.

Superior Peak Shape for Low Level Impurity Analysis



Comparative separations may not be representative in all applications.

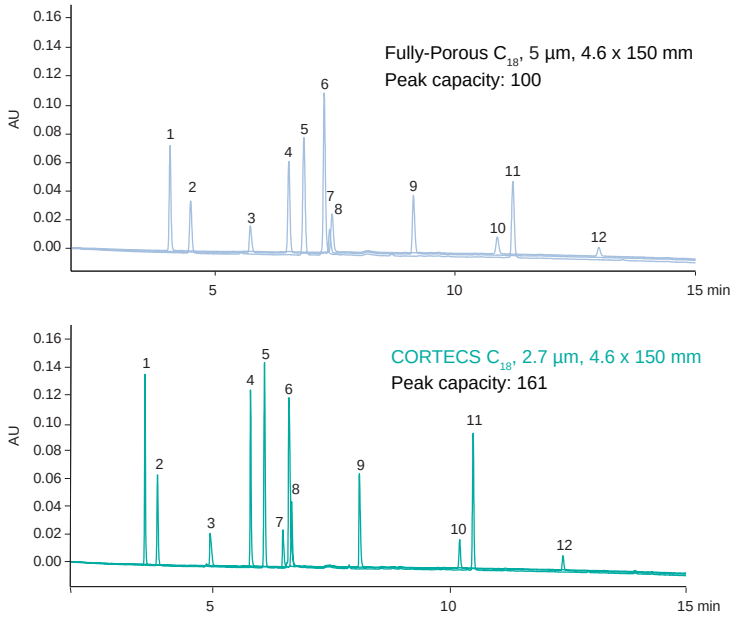
HPLC-UV/MS analysis of the low-ionic basic antidepressant imipramine reveals a low level impurity. Using a CORTECS C_{18}+, 2.7 µm Column designed for use with low ionic strength acidic mobile phases results in narrower peaks and improved signal-to-noise. Data conditions— Columns: 3.0 x 50 mm; Mobile phase A: 0.1% formic acid in water; Mobile phase B: 0.1% formic acid in acetonitrile; Gradient: 25 to 35%B in 4.6 minutes; Flow rate: 0.8 mL/min; Column temperature: 30 °C; Detection: UV@254 nm and ESI+ MS; Injection volume: 10 µL; Compounds: imipramine (0.5 mg/mL), impurity at 0.1% spike (0.5 µg/mL).

EXCELLENT RESOLUTION OF ACIDS, BASES, AND NEUTRALS

C_{18}

The C_{18} ligand is the most popular choice in method development because of its stability and ability to retain a variety of analytes. CORTECS C_{18} is a traditional C_{18}-bonded phase which exhibits balanced retention of acids, bases, and neutrals at low- and mid-range pH. It provides superb resolution and retention for complex mixtures.

Analysis of Acids, Bases, and Neutrals



Comparative separations may not be representative in all applications.

System:	ACQUITY UPLC H-Class System with ACQUITY PDA Detector
Column:	CORTECS C_{18}, 2.7 µm, 4.6 x 150 mm (p/n 186007378)
Mobile phase A:	15.4 mM ammonium formate pH 3
Mobile phase B:	Acetonitrile

Gradient:

Time (min)	%A	%B	Curve
Initial	95	5	–
15.6	5	95	6
16.6	5	95	6
16.7	95	5	11
20.0	95	5	11

Flow rate:	1.0 mL/min
Injection volume:	10 µL
Column temp.:	30 °C
Detection:	UV at 254 nm
Sample diluent:	15.4 mM ammonium formate pH 3/acetonitrile (95/5, v/v)

Compounds:

1. Caffeine (10 µg/mL)
2. 2-Nitrobenzoic Acid (5 µg/mL)
3. Metoprolol (100 µg/mL)
4. Papaverine (2 µg/mL)
5. 2-Chlorobenzoic Acid (125 µg/mL)
6. Pyrenesulfonic Acid (19 µg/mL)
7. Propranolol (20 µg/mL)
8. 4-Nitrophenol (20 µg/mL)
9. Amitriptyline (10 µg/mL)
10. Diethylphthalate (25 µg/mL)
11. Fenoprofen (100 µg/mL)
12. Dipropylphthalate (25 µg/mL)

Analysis of a column characterization mix of acids, bases, and neutrals, using a CORTECS C_{18}, 2.7 µm, 4.6 x 150 mm Column on an ACQUITY UPLC® H-Class System. The improved efficiencies of CORTECS 2.7 µm Columns versus fully-porous particle columns produce sharper, narrower peaks resulting in higher peak capacity and increased sensitivity.

SUPERIOR RESOLUTION AND RETENTION OF POLAR ANALYTES

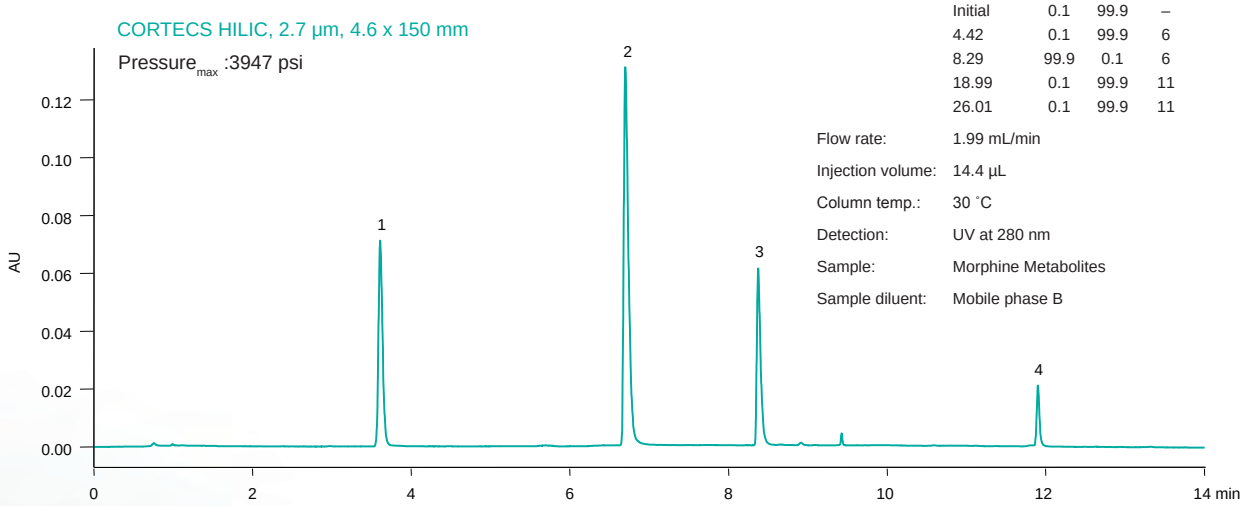
HILIC

CORTECS HILIC, 2.7 µm Columns are designed specifically for the retention of very polar compounds using hydrophilic-interaction chromatography (HILIC). HILIC is a complementary chromatographic technique to reversed-phase that can provide an orthogonal separation mode for mixtures of ionizable and very polar compounds. The combination of acetonitrile-rich mobile phase and polar, unbonded CORTECS HILIC stationary phase offers additional chromatographic benefits such as increased mass spectrometry response and direct injection of organic extracts from common sample preparation techniques, such as solid-phase extraction (SPE), liquid-liquid extraction (LLE), and protein precipitation (PPT).

Retention of Polar Morphine Metabolites

Compounds:

1. 6-Acetylmorphine (0.2 mg/mL)
2. Morphine (0.2 mg/mL)
3. Morphine-N-Oxide (0.1 mg/mL)
4. Morphine-3β-glucuronide (0.2 mg/mL)



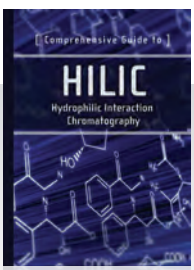
System:	Alliance® HPLC with 2998 Photodiode Array Detector
Column:	CORTECS HILIC, 2.7 µm, 4.6 x 150 mm (p/n 186007393)
Mobile phase A:	10 mM ammonium formate in 50% acetonitrile/49.875% water/0.125% formic acid
Mobile phase B:	10 mM ammonium formate in 90% acetonitrile/9.875% water/0.125% formic acid

Gradient:

Time (min)	%A	%B	Curve
Initial	0.1	99.9	–
4.42	0.1	99.9	6
8.29	99.9	0.1	6
18.99	0.1	99.9	11
26.01	0.1	99.9	11

Flow rate:	1.99 mL/min
Injection volume:	14.4 µL
Column temp.:	30 ˚C
Detection:	UV at 280 nm
Sample:	Morphine Metabolites
Sample diluent:	Mobile phase B

Using HILIC gradient test conditions and an Alliance HPLC System, a mix of morphine and its polar metabolites were analyzed using a CORTECS HILIC, 2.7 µm, 4.6 x 150 mm Column.



To learn more about Waters Comprehensive Guide to HILIC (Hydrophilic Interaction Chromatography), visit **www.waters.com/HILIC**

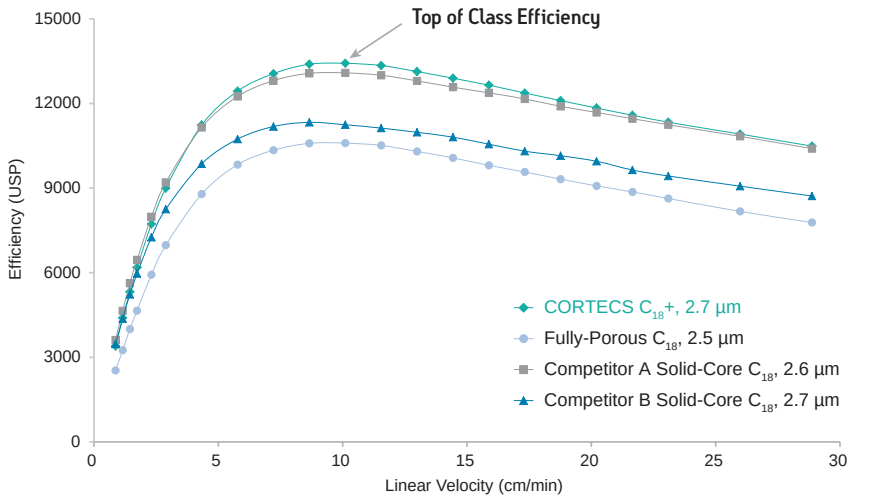
REDUCE BACKPRESSURE WITHOUT SACRIFICING EFFICIENCY

CORTECS 2.7 µm Columns offer the unique advantage of operating at lower backpressure without sacrificing efficiency or resolution. Additionally, CORTECS 2.7 µm Columns are more efficient than columns packed with fully-porous particles of equivalent size.

Advantages of combining lower operating backpressure and high efficiency include:

- Increased resolution using longer columns
- Improved utilization and performance of existing HPLC and UHPLC equipment
- Faster flow rate operation for improved throughput

Efficiency Advantages of CORTECS 2.7 µm Columns

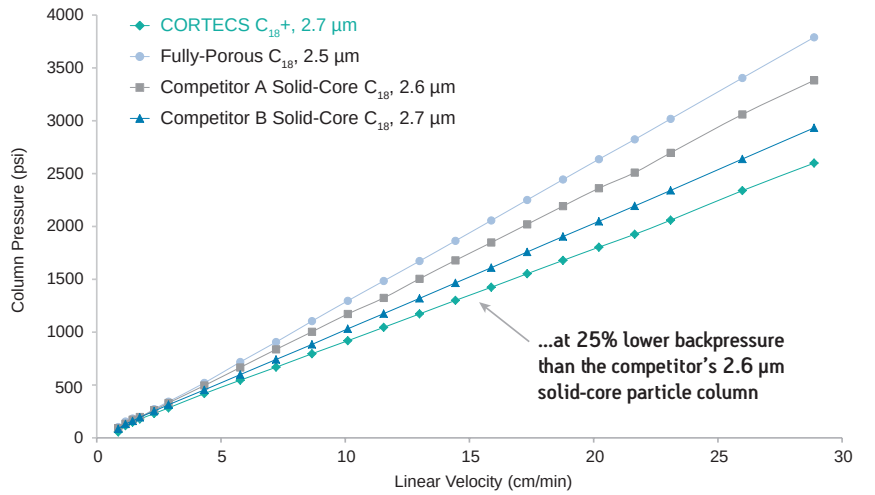


Flow Rate (mL/min)							
	2.1 x 50 mm	0.17	0.35	0.52	0.69	0.87	1.04
	3.0 x 50 mm	0.35	0.71	1.06	1.41	1.77	2.12
	4.6 x 50 mm	0.83	1.66	2.49	3.32	4.15	4.99

CORTECS 2.7 µm Columns exhibit excellent efficiency compared to similarly-sized, fully-porous and solid-core particle columns. Data conditions—Columns: 2.1 x 50 mm; Mobile phase: water/acetonitrile (25/75, v/v); Column temperature: 30 °C; Detection: UV@254 nm; Injection volume: 0.5 µL; Compounds: acenaphthene (200 µg/mL), octanophenone (100 µg/mL).

Comparative separations may not be representative in all applications.

Backpressure Advantages of CORTECS 2.7 µm Columns



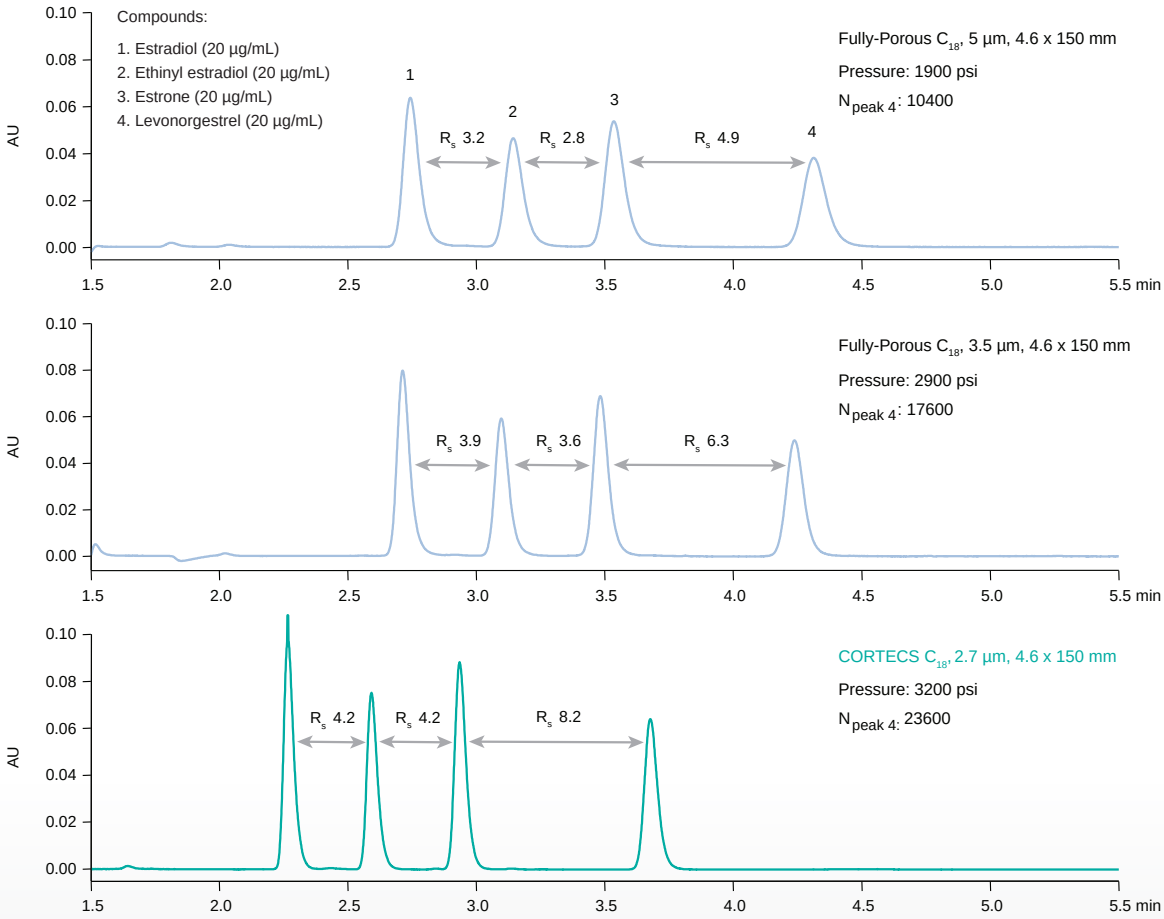
Flow Rate (mL/min)							
	2.1 x 50 mm	0.17	0.35	0.52	0.69	0.87	1.04
	3.0 x 50 mm	0.35	0.71	1.06	1.41	1.77	2.12
	4.6 x 50 mm	0.83	1.66	2.49	3.32	4.15	4.99

CORTECS 2.7 µm Columns offer a 25% reduction in operating backpressure—without sacrificing efficiency. Data conditions—Columns: 2.1 x 50 mm; Mobile phase: water/acetonitrile (25/75, v/v); Column temperature: 30 °C; Detection: UV@254 nm; Injection volume: 0.5 µL; Compounds: acenaphthene (200 µg/mL), octanophenone (100 µg/mL).

Comparative separations may not be representative in all applications.

The combination of higher efficiency with lower backpressure culminates in the flexibility to run methods at HPLC- and UHPLC-optimized backpressures, using longer column lengths and higher flow rates to further improve efficiency, resolution, and throughput.

Increased Efficiency and Resolution for Estradiols with CORTECS C_{18}, 2.7 µm Columns



Comparative separations may not be representative in all applications.

Increased efficiency (N) and resolution (R_s) of estradiols can be achieved using a CORTECS C_{18}, 2.7 µm Column at HPLC- and UHPLC-optimized backpressures. Data conditions—Column: CORTECS C_{18}, 2.7 µm, 4.6 x 150 mm (p/n 186007378); Mobile phase: 0.1% formic acid in water/acetonitrile (45/55); Flow rate: 1.0 mL/min; Column temperature: 30 °C; Detection: UV@220 nm; Injection volume: 10 µL.

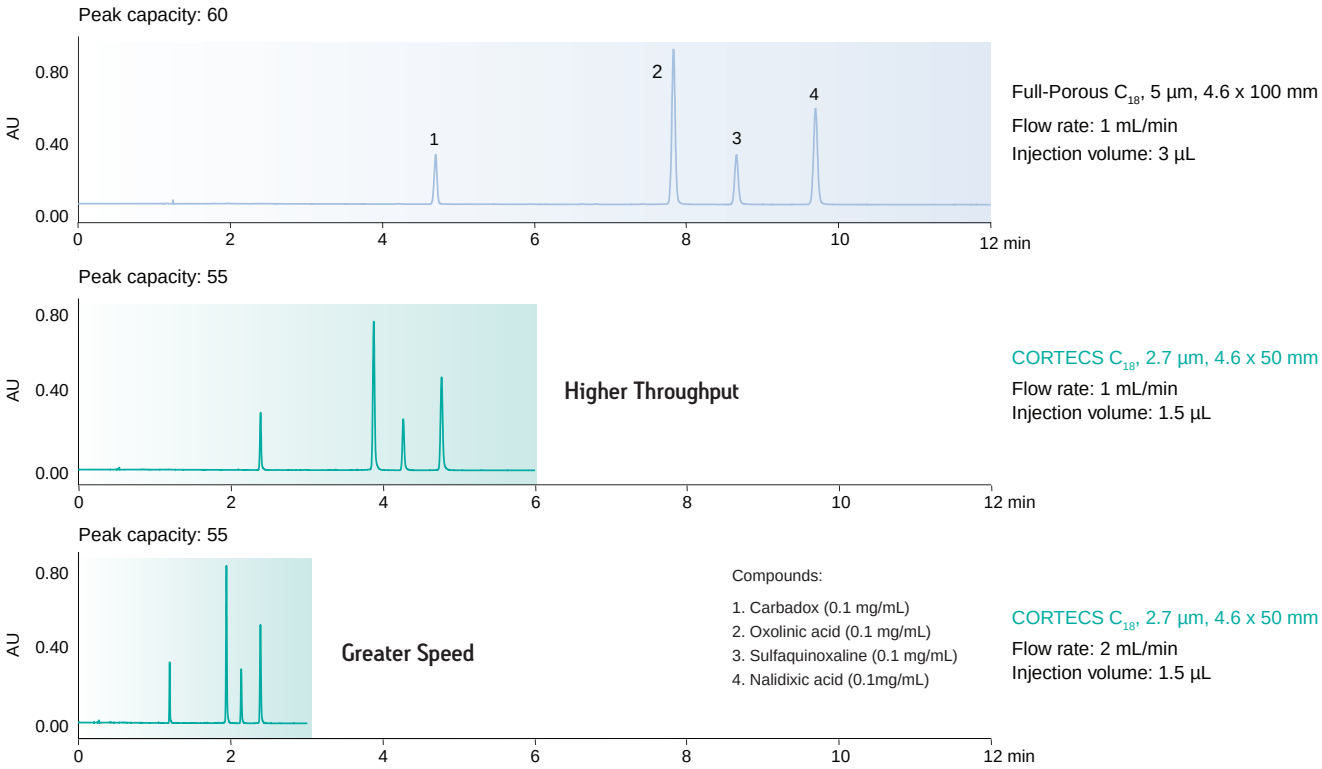
Waters Column Advisor recommends the most appropriate columns for your specific application requirements.

For help with choosing a column, visit **www.waters.com/columnadvisor**

BOOST YOUR LABORATORY'S PRODUCTIVITY

CORTECS 2.7 µm Columns enable you to achieve faster separations without sacrificing performance. Shorter-length columns can be used to reduce analysis time of the original method and increase the number of samples analyzed. With higher flow rates, gradient times can be further reduced, increasing the speed of analysis.

Increased Throughput and Speed using CORTECS C_{18}, 2.7 µm Columns



Comparative separations may not be representative in all applications.

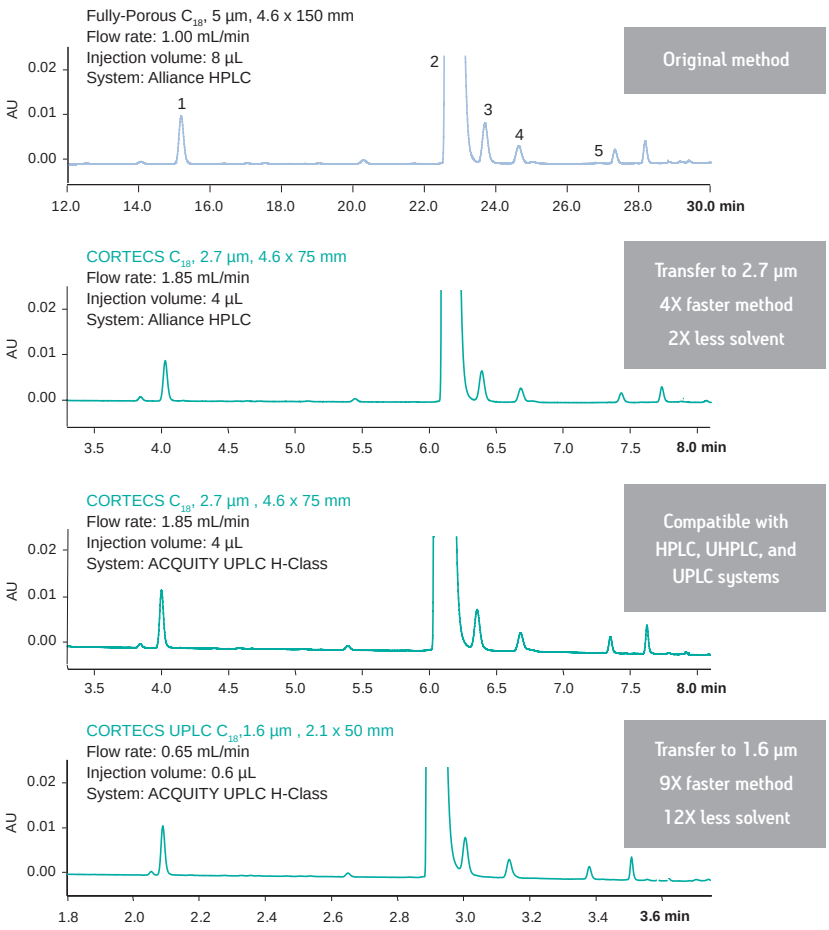
Throughput was increased 2x by replacing a fully-porous, 5 µm, 100 mm length column with a shorter length CORTECS Column. A further 2x time savings was then achieved by doubling the flow rate without sacrificing peak capacity. Data conditions— Columns: CORTECS C_{18}, 2.7 µm, 4.6 x 50 mm (p/n 186007375); Fully-Porous C_{18}, 5 µm, 4.6 x 100 mm; Mobile phase A: 0.1% formic acid in water; Mobile phase B: 0.1% formic acid in acetonitrile; Gradients: 5 to 50%B in 12, 6, or 3 minutes; Column temperature: 30 °C; Detection: UV@254 nm.

The CORTECS Family of 1.6 µm and 2.7 µm Solid-Core Particle Columns improves the performance of your laboratory's LC systems by increasing resolution while improving sample throughput.

SIMPLE METHOD TRANSFER

In the contemporary world of multi-national and multi-site laboratories whose LC platforms may be sourced from different vendors, Waters recognizes the need for versatility and ease of method transfer. It is essential that robust methods be created quickly and easily while being compatible with a wide range of chromatographic systems. With particle sizes ideal for HPLC, UHPLC, and UPLC® platforms, you can be assured a simple, and seamless transfer with consistent results across different particle sizes and column configurations.

USP Method Transfer of Abacavir with Time and Solvent Savings



Compounds:

1. Descycleopropylabacavir
2. Abacavir
3. 1R,4R Trans abacavir
4. O-(4-Chloro-2,5-diaminopyimidnyl)-abacavir
5. O-t-Butyl-abacavir

Comparative separations may not be representative in all applications.

Methods developed on 5 µm fully-porous columns can be scaled and transferred to shorter 2.7 µm columns. For further efficiency gains and productivity improvements, sub-2-µm UPLC columns can be used, enabling greater flexibility in method consistency when transitioning between laboratories within an organization or to contract partners. Data conditions—Mobile phase A: 0.1% trifluoroacetic acid in water; Mobile phase B: 85% methanol in water; Geometrically-scaled gradients (i.e., same column volumes per gradient step): Fully-Porous C_{18}, 5 µm, 4.6 x 150 mm column: 5 to 30%B in 23.6 minutes and 30 to 90%B in 14.8 min; CORTECS C_{18}, 2.7 µm, 4.6 x 75 mm column (p/n 186007376): 5 to 30%B in 6.4 minutes and 30 to 90%B in 4.0 minutes; CORTECS C_{18}, 1.6 µm, 2.1 x 50 mm column: 5 to 30%B in 2.5 minutes and 30 to 90%B in 1.6 minutes; Column temperature: 30 °C; Detection: UV@254 nm.

VANGUARD COLUMN PROTECTION

The often complex sample matrices encountered in pharmaceutical, natural product, environmental, and industrial chemical analysis prematurely shorten analytical column lifetime and degrade chromatographic performance. Waters' VanGuard Column Protection Products help improve analytical column performance by removing particulate and chemical contamination that may be present in the mobile-phase stream.

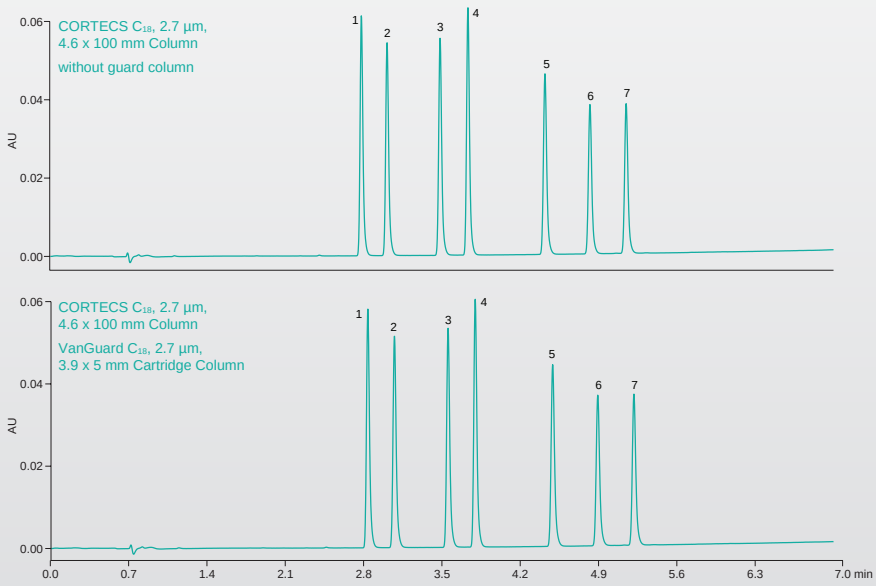
VanGuard Pre-columns and VanGuard Cartridges are uniquely designed and optimized to protect and prolong analytical column lifetimes without compromising chromatographic performance. Each available CORTECS VanGuard configuration is ideally suited for the physical and chemical protection for CORTECS UPLC and HPLC Columns.

VANGUARD™ COLUMN PROTECTION

KEY FEATURES AND BENEFITS:

Feature	Benefit
First guard column for UPLC and UHPLC applications	Guaranteed compatibility with pressures up to 18,000 psi
Patent-pending, ultra-low volume design	Minimal chromatographic effects
Manufactured using Waters column hardware, particles, and sorbent chemistries	Superior HPLC, UHPLC, and UPLC column protection and performance
Connects directly to Waters HPLC, ***XP***, and UPLC columns	Leaks and connection voids are eliminated

Minimal Chromatographic Effects with VanGuard Cartridges



Economical VanGuard Cartridge Columns can be used to extend analytical column lifetime without compromise to separation performance.

	Peak Capacity	
Peak I.D.	Without Vanguard Cartridge	With VanGuard Cartridge
1. Sulfathiazole	142	135
2. Sulfamerazine	135	128
3. Sulfamethazine	135	130
4. Sulfamethoxypyrizadine	138	132
5. Sulfachloropyrizadine	124	119
6. Sulfamethoxazole	122	117
7. Sulfafurazole	122	117

System: Alliance e2695 with e2489 Detector @254 nm

Mobile phase A: 0.1 % formic acid in water

Mobile phase B: 0.1 % formic acid in acetonitrile

Gradient:

Time (min)	Flow rate (mL/min)	%A	%B
0.00	1.44	95	5
7.00	1.44	56.5	43.5

Column temp.: 30 °C

Concentration: 10 µg/mL

Injection volume: 5 µL

ORDERING INFORMATION

CORTECS 2.7 µm Columns

Chemistry	Particle Size	Dimension	Part No. 1 Pack	Part No. 3 Pack
CORTECS C_{18}+	2.7 µm	2.1 x 30 mm	186007394	176003289
CORTECS C_{18}+	2.7 µm	2.1 x 50 mm	186007395	176003290
CORTECS C_{18}+	2.7 µm	2.1 x 75 mm	186007396	176003291
CORTECS C_{18}+	2.7 µm	2.1 x 100 mm	186007397	176003292
CORTECS C_{18}+	2.7 µm	2.1 x 150 mm	186007398	176003293
CORTECS C_{18}+	2.7 µm	3.0 x 30 mm	186007399	176003294
CORTECS C_{18}+	2.7 µm	3.0 x 50 mm	186007400	176003295
CORTECS C_{18}+	2.7 µm	3.0 x 75 mm	186007401	176003296
CORTECS C_{18}+	2.7 µm	3.0 x 100 mm	186007402	176003297
CORTECS C_{18}+	2.7 µm	3.0 x 150 mm	186007403	176003298
CORTECS C_{18}+	2.7 µm	4.6 x 30 mm	186007404	176003322
CORTECS C_{18}+	2.7 µm	4.6 x 50 mm	186007405	176003323
CORTECS C_{18}+	2.7 µm	4.6 x 75 mm	186007406	176003324
CORTECS C_{18}+	2.7 µm	4.6 x 100 mm	186007407	176003325
CORTECS C_{18}+	2.7 µm	4.6 x 150 mm	186007408	176003326
CORTECS C_{18}	2.7 µm	2.1 x 30 mm	186007364	176003269
CORTECS C_{18}	2.7 µm	2.1 x 50 mm	186007365	176003270
CORTECS C_{18}	2.7 µm	2.1 x 75 mm	186007366	176003271
CORTECS C_{18}	2.7 µm	2.1 x 100 mm	186007367	176003272
CORTECS C_{18}	2.7 µm	2.1 x 150 mm	186007368	176003273
CORTECS C_{18}	2.7 µm	3.0 x 30 mm	186007369	176003274
CORTECS C_{18}	2.7 µm	3.0 x 50 mm	186007370	176003275
CORTECS C_{18}	2.7 µm	3.0 x 75 mm	186007371	176003276
CORTECS C_{18}	2.7 µm	3.0 x 100 mm	186007372	176003277
CORTECS C_{18}	2.7 µm	3.0 x 150 mm	186007373	176003278
CORTECS C_{18}	2.7 µm	4.6 x 30 mm	186007374	176003312
CORTECS C_{18}	2.7 µm	4.6 x 50 mm	186007375	176003313
CORTECS C_{18}	2.7 µm	4.6 x 75 mm	186007376	176003314
CORTECS C_{18}	2.7 µm	4.6 x 100 mm	186007377	176003315
CORTECS C_{18}	2.7 µm	4.6 x 150 mm	186007378	176003316
CORTECS HILIC	2.7 µm	2.1 x 30 mm	186007379	176003279
CORTECS HILIC	2.7 µm	2.1 x 50 mm	186007380	176003280
CORTECS HILIC	2.7 µm	2.1 x 75 mm	186007381	176003281
CORTECS HILIC	2.7 µm	2.1 x 100 mm	186007382	176003282
CORTECS HILIC	2.7 µm	2.1 x 150 mm	186007383	176003283
CORTECS HILIC	2.7 µm	3.0 x 30 mm	186007384	176003284
CORTECS HILIC	2.7 µm	3.0 x 50 mm	186007385	176003285
CORTECS HILIC	2.7 µm	3.0 x 75 mm	186007386	176003286
CORTECS HILIC	2.7 µm	3.0 x 100 mm	186007387	176003287
CORTECS HILIC	2.7 µm	3.0 x 150 mm	186007388	176003288
CORTECS HILIC	2.7 µm	4.6 x 30 mm	186007389	176003317
CORTECS HILIC	2.7 µm	4.6 x 50 mm	186007390	176003318
CORTECS HILIC	2.7 µm	4.6 x 75 mm	186007391	176003319
CORTECS HILIC	2.7 µm	4.6 x 100 mm	186007392	176003320
CORTECS HILIC	2.7 µm	4.6 x 150 mm	186007393	176003321

VanGuard Column Protection (Guard Columns)

Chemistry	Particle Size	Part No.[1]	Part No.[2]
		2.1 x 5 mm, 3/pk	3.9 x 5 mm, 3/pk
CORTECS C_{18} VanGuard Cartridge	2.7 µm	186007682	186007684
CORTECS C_{18}+ VanGuard Cartridge	2.7 µm	186007685	186007687
CORTECS HILIC VanGuard Cartridge	2.7 µm	186007688	186007690
Universal VanGuard Cartridge Holder	—	186007949	186007949

[1] Recommended for 2.1 mm and 3.0 mm i.d. columns
[2] Recommended for 4.6 mm i.d. columns

CORTECS 2.7 µm Columns Method Validation Kits (MVK)*

Chemistry	Particle Size	Dimension	Part No.
CORTECS C_{18}+	2.7 µm	2.1 x 30 mm	186007439
CORTECS C_{18}+	2.7 µm	2.1 x 50 mm	186007440
CORTECS C_{18}+	2.7 µm	2.1 x 75 mm	186007441
CORTECS C_{18}+	2.7 µm	2.1 x 100 mm	186007442
CORTECS C_{18}+	2.7 µm	2.1 x 150 mm	186007443
CORTECS C_{18}+	2.7 µm	3.0 x 30 mm	186007444
CORTECS C_{18}+	2.7 µm	3.0 x 50 mm	186007445
CORTECS C_{18}+	2.7 µm	3.0 x 75 mm	186007446
CORTECS C_{18}+	2.7 µm	3.0 x 100 mm	186007447
CORTECS C_{18}+	2.7 µm	3.0 x 150 mm	186007448
CORTECS C_{18}+	2.7 µm	4.6 x 30 mm	186007449
CORTECS C_{18}+	2.7 µm	4.6 x 50 mm	186007450
CORTECS C_{18}+	2.7 µm	4.6 x 75 mm	186007451
CORTECS C_{18}+	2.7 µm	4.6 x 100 mm	186007452
CORTECS C_{18}+	2.7 µm	4.6 x 150 mm	186007453
CORTECS C_{18}	2.7 µm	2.1 x 30 mm	186007409
CORTECS C_{18}	2.7 µm	2.1 x 50 mm	186007410
CORTECS C_{18}	2.7 µm	2.1 x 75 mm	186007411
CORTECS C_{18}	2.7 µm	2.1 x 100 mm	186007412
CORTECS C_{18}	2.7 µm	2.1 x 150 mm	186007413
CORTECS C_{18}	2.7 µm	3.0 x 30 mm	186007414
CORTECS C_{18}	2.7 µm	3.0 x 50 mm	186007415
CORTECS C_{18}	2.7 µm	3.0 x 75 mm	186007416
CORTECS C_{18}	2.7 µm	3.0 x 100 mm	186007417
CORTECS C_{18}	2.7 µm	3.0 x 150 mm	186007418
CORTECS C_{18}	2.7 µm	4.6 x 30 mm	186007419
CORTECS C_{18}	2.7 µm	4.6 x 50 mm	186007420
CORTECS C_{18}	2.7 µm	4.6 x 75 mm	186007421
CORTECS C_{18}	2.7 µm	4.6 x 100 mm	186007422
CORTECS C_{18}	2.7 µm	4.6 x 150 mm	186007423
CORTECS HILIC	2.7 µm	2.1 x 30 mm	186007424
CORTECS HILIC	2.7 µm	2.1 x 50 mm	186007425
CORTECS HILIC	2.7 µm	2.1 x 75 mm	186007426
CORTECS HILIC	2.7 µm	2.1 x 100 mm	186007427
CORTECS HILIC	2.7 µm	2.1 x 150 mm	186007428
CORTECS HILIC	2.7 µm	3.0 x 30 mm	186007429
CORTECS HILIC	2.7 µm	3.0 x 50 mm	186007430
CORTECS HILIC	2.7 µm	3.0 x 75 mm	186007431
CORTECS HILIC	2.7 µm	3.0 x 100 mm	186007432
CORTECS HILIC	2.7 µm	3.0 x 150 mm	186007433
CORTECS HILIC	2.7 µm	4.6 x 30 mm	186007434
CORTECS HILIC	2.7 µm	4.6 x 50 mm	186007435
CORTECS HILIC	2.7 µm	4.6 x 75 mm	186007436
CORTECS HILIC	2.7 µm	4.6 x 100 mm	186007437
CORTECS HILIC	2.7 µm	4.6 x 150 mm	186007438

*Each kit contains three columns from three batches of material.

Quality Control Reference Materials (QCRM)

Description	Part No.
Reversed-Phase QCRM	186006363
Neutrals QCRM	186006360
HILIC QCRM	186007226
QDa QCRM	186007345
LCMS QCRM	186006963

For a full list of Waters Analytical Standards and Reagents, visit www.waters.com/standards

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Singapore 65 6593 7100

Spain 34 93 600 9300

Sweden 46 8 555 115 00

Switzerland 41 56 676 7000

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UAE 971 4 214 62 38

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February 2015 720004675EN Rev C SC-SIG

[CORTECS 1.6 µm COLUMNS]

ultimate efficiency unleashed

CORTECS® COLUMNS

Waters

THE SCIENCE OF WHAT'S POSSIBLE.®

A SUB-2-µm SOLID-CORE PARTICLE COLUMN THAT LIVES UP TO ITS POTENTIAL.

C_{18}+ | C_{18} | HILIC

SOLID-CORE PARTICLE COLUMNS THAT DELIVER ULTIMATE EFFICIENCY AND PERFORMANCE

With our unique understanding of how to harness the power of sub-2-µm particles, Waters brings you the latest addition to our family of sub-2-µm UltraPerformance LC® Columns. Based on 1.6 µm solid-core particle technology, CORTECS® Columns enable you to achieve new levels of efficiency and performance. Whether you're trying to resolve complex mixtures or maintain resolution while increasing throughput, CORTECS Columns will surpass ALL expectations.

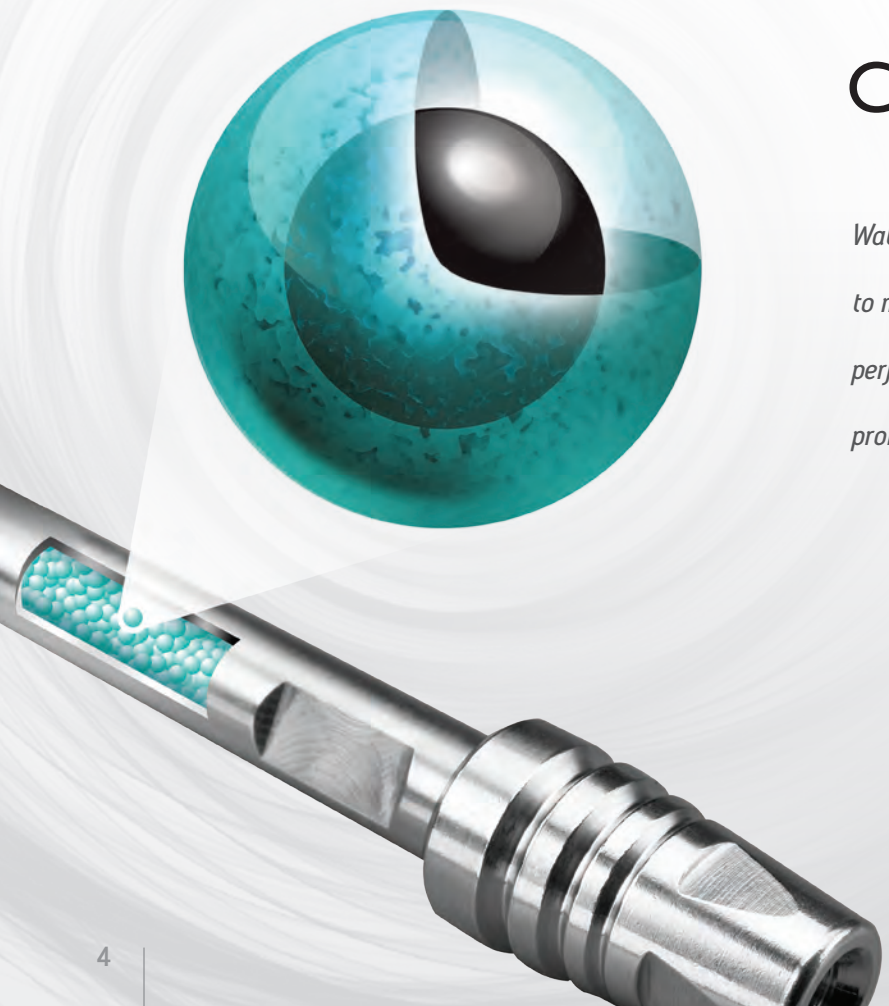
TRUTH BEHIND INCREASED EFFICIENCY WITH SOLID-CORE PARTICLES

Why do solid-core particles achieve higher column efficiency? Initial explanation previously credited the shorter diffusion path in solid-core particles versus fully-porous particles. A shorter diffusion path results in faster mass transfer kinetics. However, for analytes of low molecular weight which have high diffusion rates, mass transfer kinetics have been found to play a minimal role in efficiency improvement. Modern findings suggest that solid-core particles improve performance by lowering each of the three terms of the van Deemter equation:

- Solid-core particles may pack more uniformly—lowering the *A* term
- Their lower particle porosity reduces axial diffusion—lowering the *B* term
- Their solid core may improve heat transfer, diminishing radial temperature gradients—lowering the *C* term

$$HETP = A + \frac{B}{v} + C \cdot v$$

G. Guiochon and F. Gritti, J. Chrom. A ***1218****, 2011, 1915 - 1938.*



CORTECS® COLUMNS

Waters CORTECS Columns are designed to maximize efficiency, throughput, and performance as well as to fulfill the promise of solid-core particle columns.

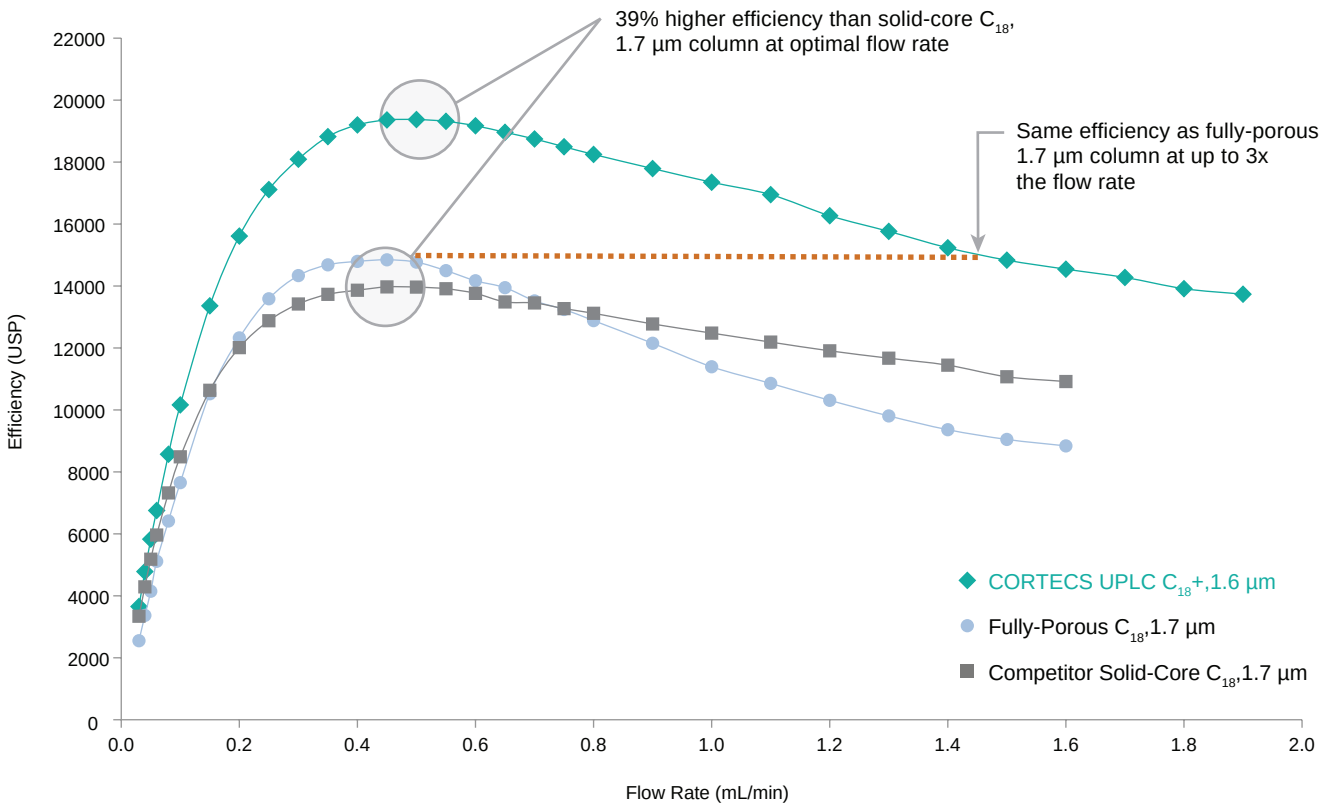
ACHIEVE A NEW EFFICIENCY STANDARD

Due to the characteristic duality of their morphology, solid-core particles hold the potential for higher efficiency when compared to fully-porous particles of a similar size. However, achievement of this theoretical potential requires the use of ultra-low dispersion column hardware and optimal packing techniques. By using unique column hardware and proprietary packing equipment and methodologies, Waters has set the efficiency standard for UPLC® Columns.

Backed by over a decade of knowledge and expertise in manufacturing sub-2-µm particle columns, CORTECS UPLC Columns deliver the full benefit of solid-core particle technology.

DESIGNED AND CONSTRUCTED FOR MAXIMUM EFFICIENCY AND THROUGHPUT

Efficiency Advantage of CORTECS UPLC Columns



Comparative separations may not be representative in all applications.

CORTECS UPLC Columns offer higher efficiency than columns containing sub-2-µm fully-porous particles as well as those containing 1.7 µm competitor solid-core particles. They also give chromatographers the option to more than double the throughput of their current sub-2-µm column separation while maintaining a similar efficiency. Data conditions—Columns: 2.1 x 50 mm; Analyte: acenaphthene; Mobile phase: 75:25 (v/v) acetonitrile/water; Temperature: 30 °C.

MAXIMUM EFFICIENCY FOR MAXIMUM RESOLUTION

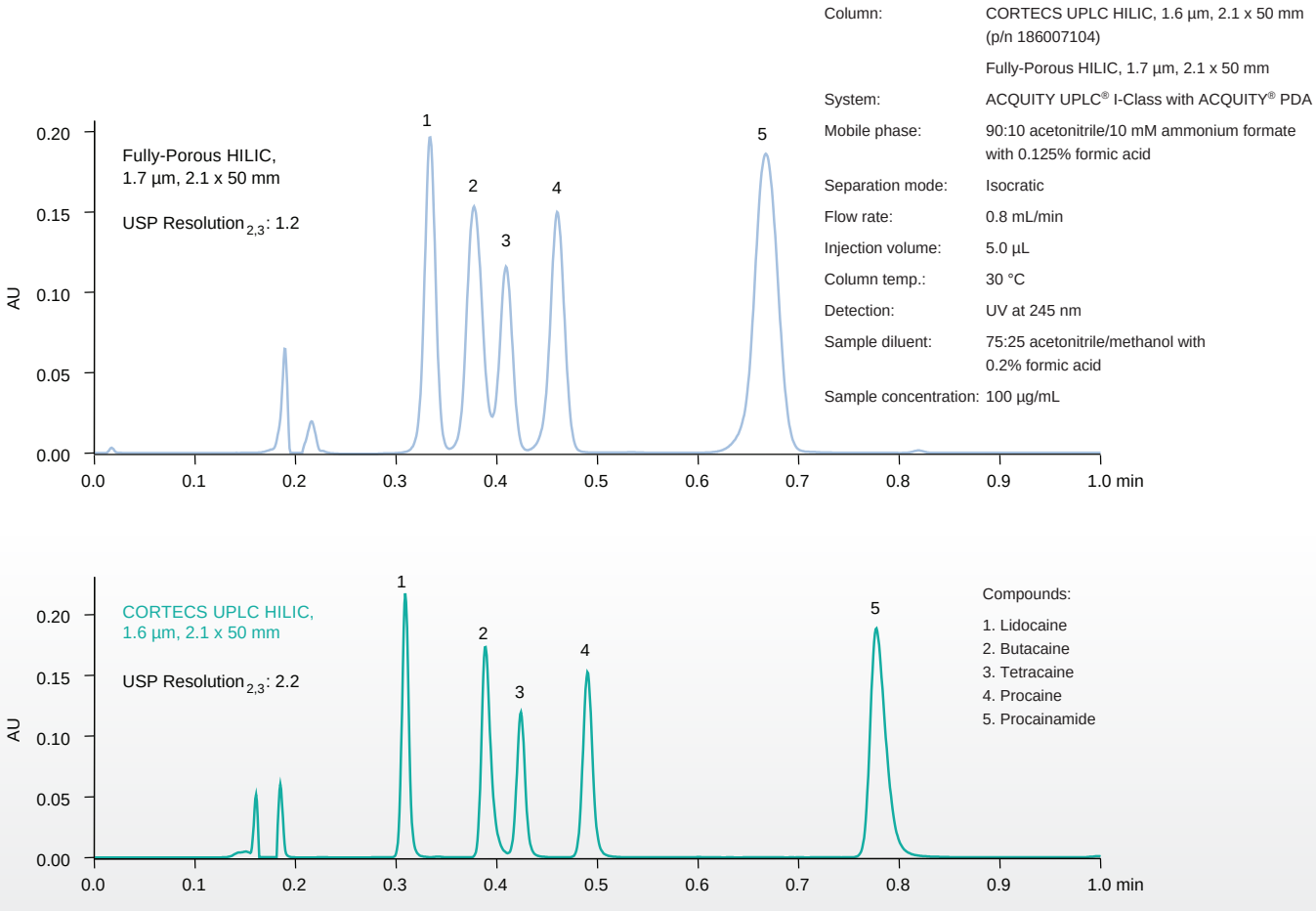
As described in this equation, resolution depends on three variables:

- the efficiency of the column/system (*N*),
- the selectivity between compounds (α), and
- the retention factor (*k*) of the analyte.

$$R_S = \frac{\sqrt{N}}{4} \frac{(\alpha\text{-}1)}{\alpha} \frac{k}{(k+1)}$$

Resolution increases in proportion to the square root of efficiency. So, the higher efficiency of CORTECS UPLC Columns gives you increased resolution when analyzing complex samples compared to fully-porous columns.

Improved Resolution of Local Anesthetics on CORTECS UPLC HILIC, 1.6 µm Columns



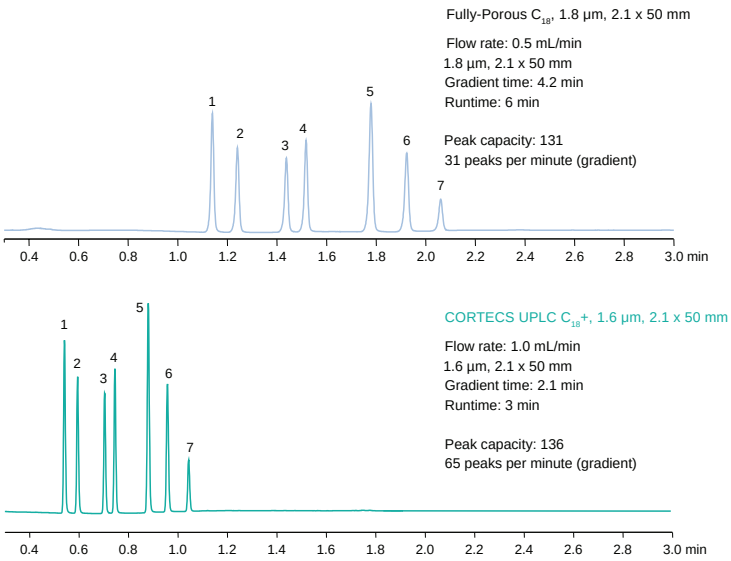
Comparative separations may not be representative in all applications.

Improved resolution for a separation of local anesthetics using a CORTECS UPLC HILIC Column compared to a fully-porous column, using the same method conditions.

FASTER SEPARATIONS FOR GREATER THROUGHPUT

Another benefit of CORTECS UPLC Columns is that they enable you to increase sample throughput with comparable or better peak capacities, simply by raising the flow rate of the method. Alternatively, the high efficiency of CORTECS UPLC Columns can enable the use of a shorter column length compared to the original separation, while maintaining similar peak capacities and providing faster re-equilibration time. This increased speed of analysis without sacrificing separation performance gives you the ability to run more samples in the same amount of time and obtain results faster—while decreasing the costs of analysis and lab operation.

Faster Separation and Similar Peak Capacity at Double the Flow Rate



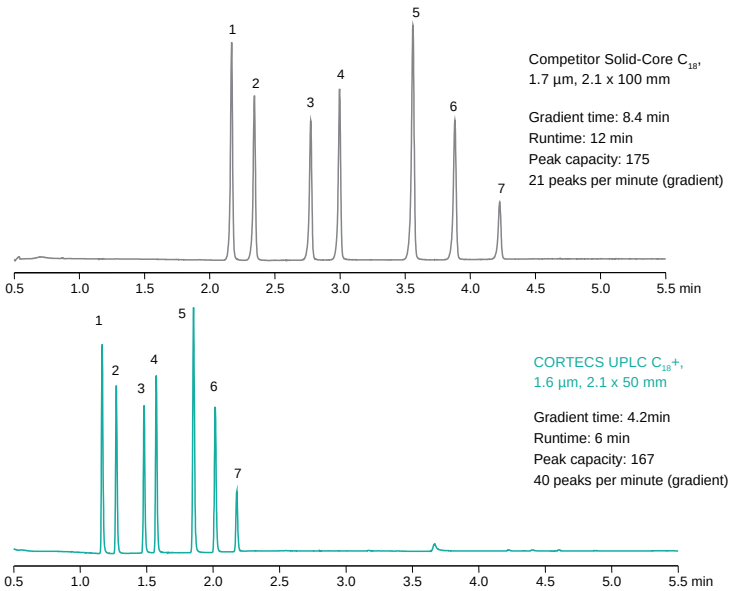
Comparative separations may not be representative in all applications.

Faster separation with similar peak capacity for sulfa drugs using a CORTECS UPLC C_{18}+ Column (p/n: 186007114) at double the flow rate, compared to a fully-porous column. Data conditions—System: ACQUITY UPLC H-Class; UV detection: 254 nm, scaling the gradient to account for the change in flow rate; Sample concentration: 10 µg/mL.

Compounds:

1. Sulfathiazole
2. Sulfamerazine
3. Sulfamethazine
4. Sulfamethoxypyridazine
5. Sulfachloropyridazine
6. Sulfamethoxazole
7. Sulfasoxazole

Higher Throughput With Shorter Column Length



Comparative separations may not be representative in all applications.

Higher throughput with similar peak capacity for sulfa drugs using a 50 mm length CORTECS UPLC C_{18}+ Column (p/n: 186007114), compared to a 100 mm length competitor solid-core particle column. Data conditions—System: ACQUITY UPLC H-Class; UV detection: 254 nm, scaling the method to account for the change in column length; Sample concentration: 10 µg/mL.

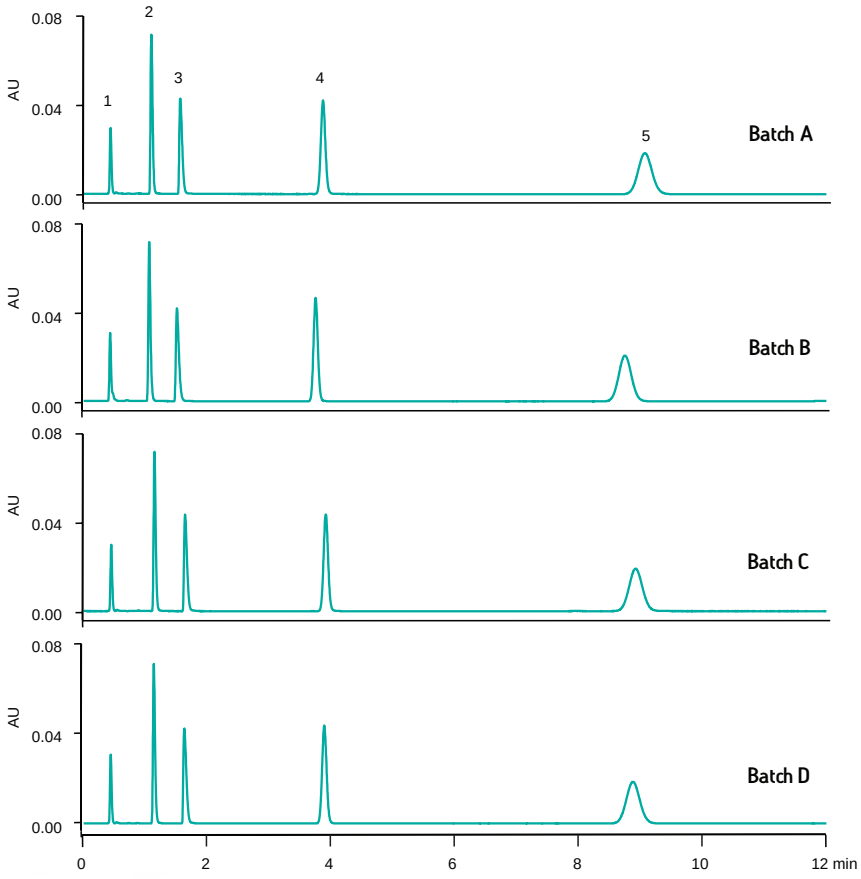
Compounds:

1. Sulfathiazole
2. Sulfamerazine
3. Sulfamethazine
4. Sulfamethoxypyridazine
5. Sulfachloropyridazine
6. Sulfamethoxazole
7. Sulfasoxazole

REPRODUCIBILITY YOU CAN DEPEND ON

With more than fifty years of experience in the separation sciences, Waters' chromatographic media sets the standard for quality. As a primary manufacturer of chromatographic media, Waters monitors and controls each step of the manufacturing process to maintain unparalleled reproducibility. The result is consistent performance year-after-year—the hallmark of reliability.

Excellent Batch-to-Batch Reproducibility for CORTECS UPLC C_{18} Columns

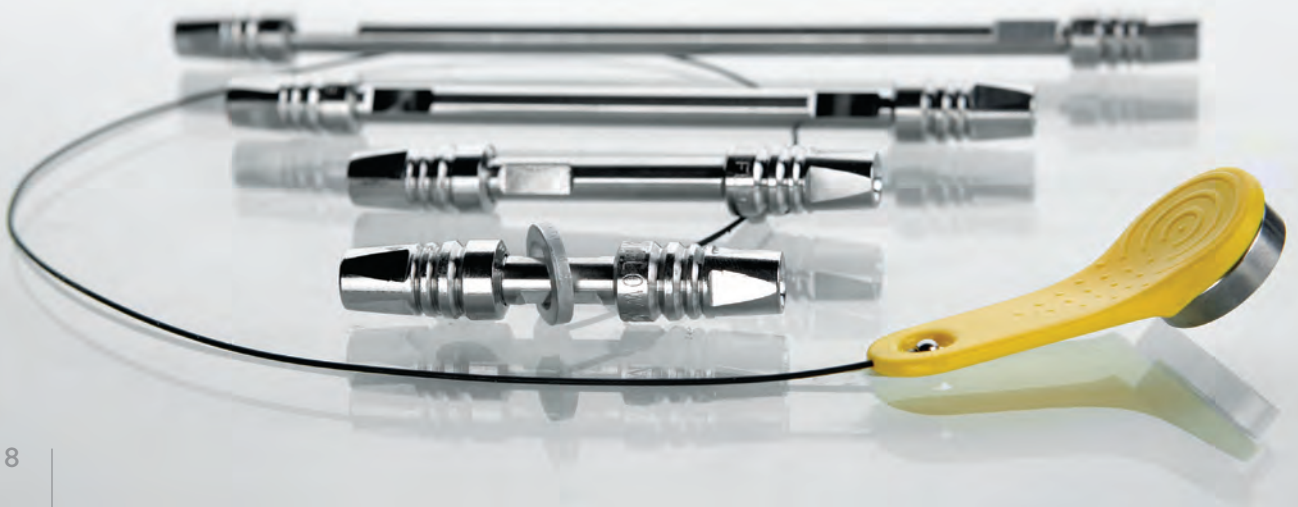


System:	ACQUITY UPLC H-Class System with ACQUITY PDA
Column:	CORTECS UPLC C_{18}, 1.6 µm, 2.1 x 50 mm (p/n 186007093)
Mobile phase:	Acetonitrile/15.4 mM ammonium formate, pH 3 (35/65, v/v)
Flow rate:	0.25 mL/min
Injection volume:	3 µL
Column temp.:	30 °C
Detection:	UV at 254 nm
Sample diluent:	Mobile phase

Compounds:

1. Uracil (1 µg/mL)
2. Promethazine (3.0 µg/mL)
3. Amitriptyline (8.0 µg/mL)
4. Butylparaben (3.5 µg/mL)
5. Naphthalene (20 µg/mL)

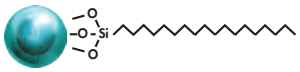
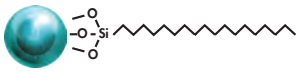
Separations obtained using columns containing four different batches of bonded material demonstrates the solid reproducibility that can be expected from CORTECS UPLC Columns, assuring the long-term reproducibility of your analytical method.



EMPOWERING METHOD DEVELOPMENT

There are several factors to consider when developing a method. Parameters that influence your separation include mobile phase composition, temperature, and column chemistry. With three phases to choose from, CORTECS UPLC Columns offer both complementary and orthogonal selectivity, giving you flexibility and power to develop methods faster. With different particle characteristics including innovative charged surface modifications, CORTECS UPLC Columns are suitable for use in a wide variety of applications.

CORTECS UPLC CHEMISTRY CHARACTERISTICS

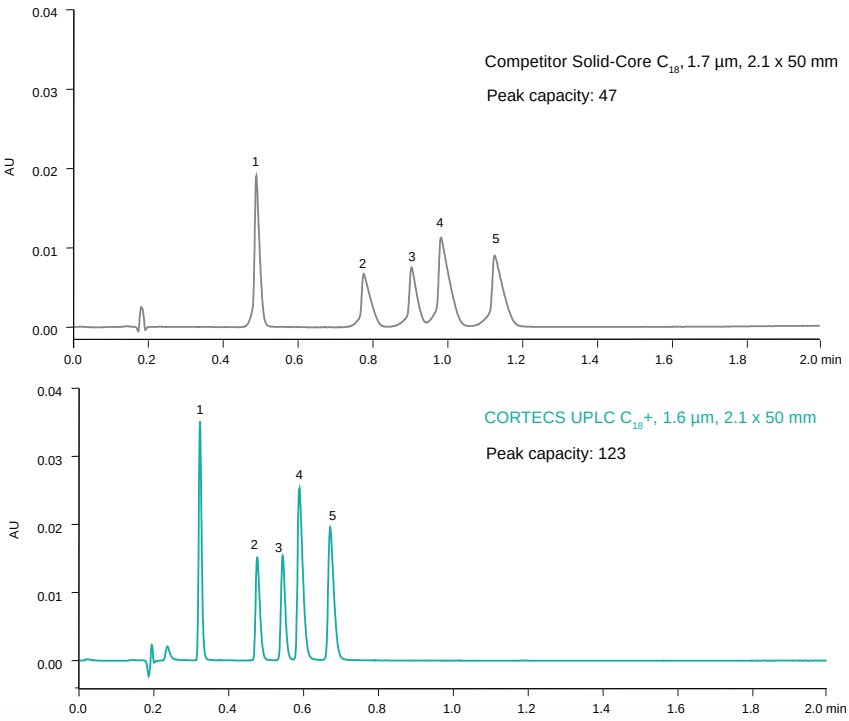
	C_{18}+	C_{18}	HILIC
Chemistry			
Intended Use	General purpose, high-efficiency, reversed-phase column. A positively charged surface delivers excellent peak shape for basic compounds at low ionic strength acidic mobile phases.	General purpose, high-efficiency, reversed-phase column. Balanced retention of acids, bases, and neutrals at low- and mid-range pH.	High-efficiency column designed for retention of extremely polar analytes. Offers orthogonal selectivity vs. C_{18} columns.
Ligand Type	Trifunctional C_{18}	Trifunctional C_{18}	None
Surface Charge Modification	+	None	None
Endcap Style	Proprietary	Proprietary	None
Carbon Load	5.7%	6.6%	Unbonded
Ligand Density	2.4 µmol/m^2	2.7 µmol/m^2	N/A
pH Range	2-8	2-8	1-5
Temperature Limits*	Low pH = 45 °C High pH = 45 °C	Low pH = 45 °C High pH = 45 °C	Low pH = 45 °C High pH = 45 °C
Performance Standard	Neutrals QCRM	Neutrals QCRM	HILIC QCRM
Application Standard	Reversed-Phase QCRM	Reversed-Phase QCRM	HILIC QCRM

**Recommended temperature limits when operating at the extremes of the pH range. Higher temperatures may be used when the pH is not near the limits.*

ENHANCED PEAK SHAPE AND LOADING CAPACITY FOR BASIC ANALYTES

The greatest benefit of CSH™ Technology is improved peak shape and loading capacity for basic analytes using low-ionic strength, acidic-mobile phases. This technology imparts a low-level positive charge to the CORTECS particle surface which enables the use of low-ionic strength formic acid mobiles in place of ion-pairing reagents such as trifluoroacetic acid.

Improved Peak Shape of Basic Analytes with CORTECS UPLC C_{18}+ Columns



Column:	CORTECS UPLC C_{18}+, 1.6 µm, 2.1 x 50 mm (p/n 186007114) Competitor Solid-Core C_{18}, 1.7 µm, 2.1 x 50 mm
System:	ACQUITY UPLC H-Class with ACQUITY PDA
Mobile phase A:	0.1% formic acid in water
Mobile phase B:	0.1% formic acid in acetonitrile
Gradient:	28–35% B over 3 minutes
Flow rate:	0.6 mL/min
Injection volume:	1.0 µL
Column temp.:	40 °C
Detection:	UV at 254 nm
Sample concentration:	10 µg/mL

Compounds:

1. Nordoxepin
2. Protriptyline
3. Nortriptyline
4. Amitriptyline
5. Trimipramine

Comparative separations may not be representative in all applications.

Improved peak shape of basic compounds using a CORTECS UPLC C_{18}+ Column, compared to a competitor C_{18} solid-core particle column results in much higher peak capacity for the CORTECS UPLC Column separation using the same method conditions.

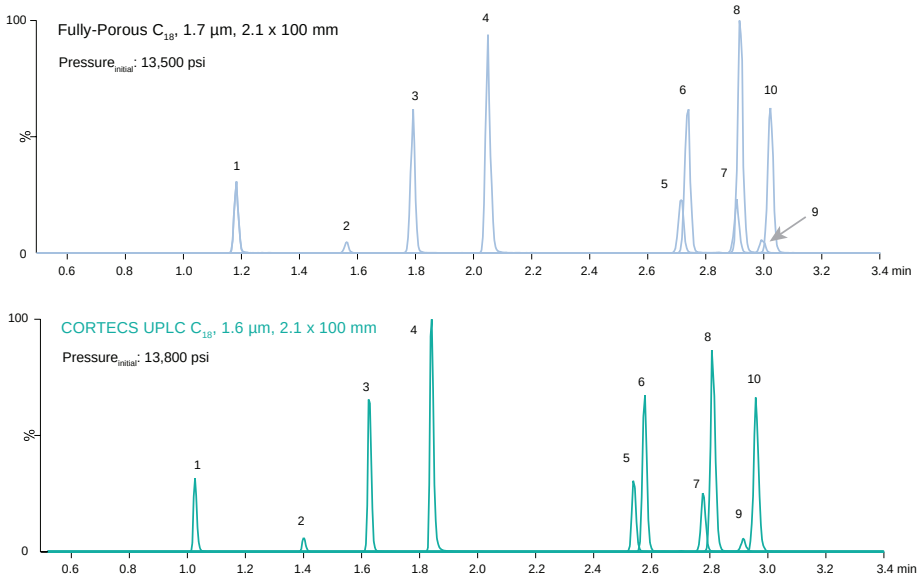
Implement the appropriate Waters Quality Control Reference Material (QCRM) into your workflow to benchmark system performance and gain confidence in your results.

For more information, visit **www.waters.com/QCRM**

EXCELLENT RESOLUTION AND RETENTION WITH CORTECS UPLC C_{18} COLUMNS

Most chromatographers choose C_{18} ligands for their excellent retention and stability. The CORTECS C_{18} material is a traditional C_{18} bonded phase that exhibits balanced retention of acids, bases, and neutrals at low- and mid-range pH, and provide superb efficiency, resolution, and retention for complex analyte mixtures.

Greater Resolution for Synthetic Cannabinoids on a CORTECS UPLC C_{18} Column



Comparative separations may not be representative in all applications.

UPLC-MS/MS analysis of synthetic cannabinoids and metabolites at 10 ng/mL using a CORTECS UPLC C_{18} Column, compared to a Fully-Porous C_{18}, 1.7 µm, 2.1 x 100 mm column at 0.6 mL/min. The analysis was performed on an ACQUITY UPLC System with a Xevo® TQD Mass Spectrometer, using the same method for both columns. Co-elution is evident on the fully-porous column for peaks 5/6, 7/8 and 9/10 (isobaric), but these are sufficiently resolved for quantitation on the CORTECS UPLC C_{18}, 1.6 µm Column.

System:	ACQUITY UPLC
Column:	CORTECS UPLC C_{18}, 1.6 µm, 2.1 x 100 mm (p/n186007095)
Column temp.:	30 °C
Injection volume:	10 µL
Flow rate:	0.6 mL/min
Mobile phase A:	0.1% formic acid in Milli-Q® water
Mobile phase B:	0.1% formic acid in acetonitrile

Gradient:

Time (min)	%A	%B	Curve
Initial	70	30	–
2.0	50	50	6
3.0	50	50	6
7.0	10	90	6
7.2	70	30	6
8.0	70	30	6

Compounds:

1. AM 2223
2. RCS-4, M10
3. RCS-4, M11
4. AM 1248
5. JWH-073 4-butanoic acid metabolite
6. JWH-073 4-hydroxybutyl metabolite
7. JWH-018 5-pentanoic acid metabolite
8. JWH-073 (+/-) 3-hydroxybutyl metabolite
9. JWH--10 50hydroxypentyl metabolite
10. JWH-018 (+/-) 4-hydroxypentyl metabolite

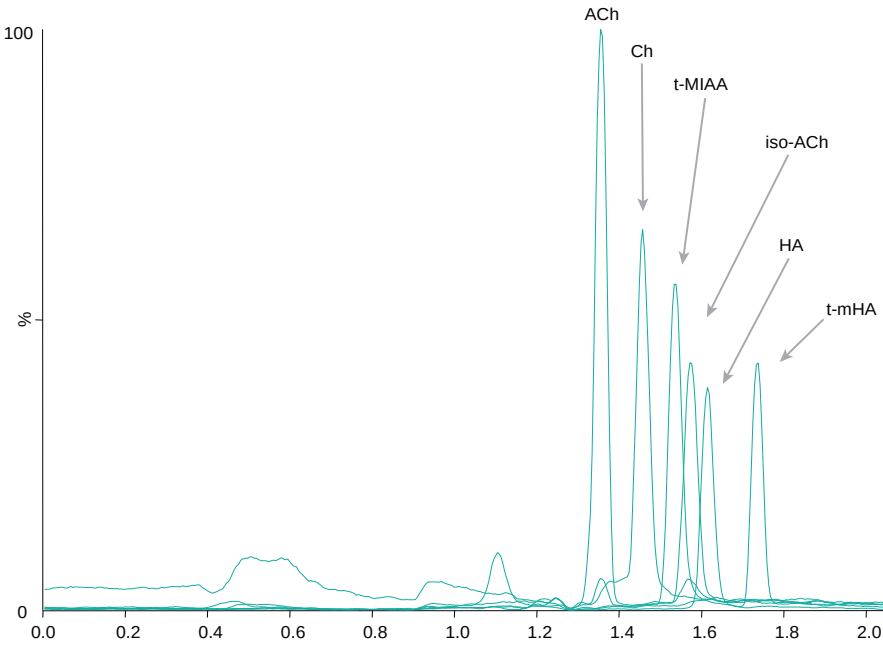
Waters Column Advisor recommends the most appropriate columns for your specific application requirements.

For help with choosing a column, visit **www.waters.com/columnadvisor**

RETENTION OF POLAR ANALYTES WITH CORTECS UPLC HILIC COLUMNS

Hydrophilic-interaction chromatography (HILIC) is a separation mode that can be used to improve the retention of extremely polar analytes. CORTECS UPLC HILIC Columns are unbonded solid-core particles specifically designed for this application. HILIC uses mobile phases with a high concentration of organic solvent which enables effective desolvation of analytes in the MS source, resulting in improved MS response and sensitivity.

Retention and Resolution of Neurotransmitters on CORTECS UPLC HILIC Column



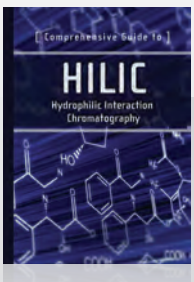
System:	ACQUITY UPLC
Column:	CORTECS UPLC HILIC, 1.6 µm, 2.1 mm x 100 mm (p/n 186007106)
Mobile phase A:	100 mM ammonium formate, pH 3
Mobile phase B:	Acetonitrile

Gradient:

Time (min)	%A	%B	Curve
Initial	10	90	–
0.75	40	60	6
1.00	40	60	6
1.25	70	30	6
1.90	10	90	11

Flow rate:	0.5 mL/min
Column temp.:	45 °C
Sample temp.:	6 °C
Injection volume:	10 µL
Run time:	2.5 min

UPLC-MS/MS analysis of neurotransmitters at 280–1100 pg/mL in artificial cerebrospinal fluid (aCSF) using a CORTECS UPLC HILIC, 1.6 µm, 2.1 x 100 mm Column and a Xevo TQ-S Mass Spectrometer. These compounds are highly polar and will typically be poorly retained in reversed-phase LC.

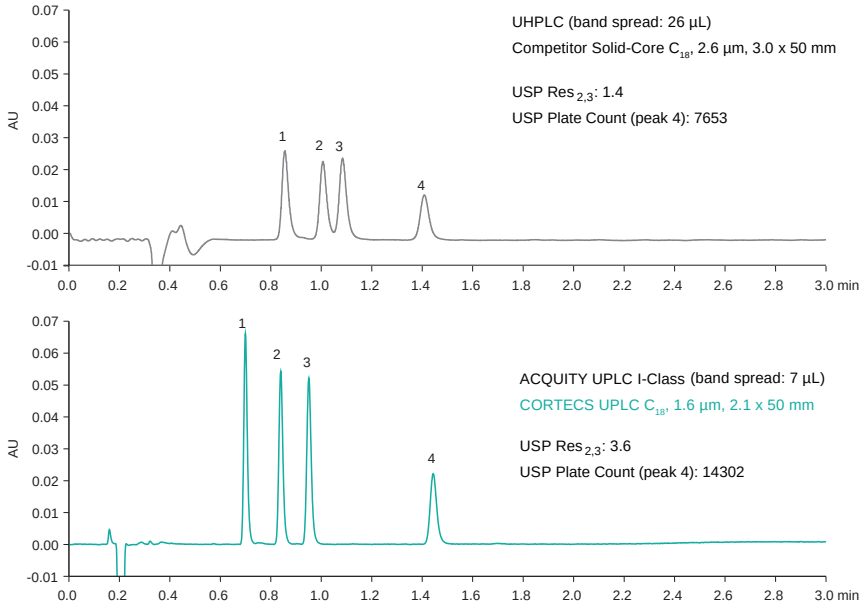


To learn more about Waters Comprehensive Guide to HILIC (Hydrophilic Interaction Chromatography), visit **www.waters.com/HILIC**

MATCHING COLUMN CONFIGURATIONS WITH LC SYSTEMS

Selecting an appropriate column for your system is very important. The dispersion (extra-column band spreading) of the system will have considerable impact on the observed performance of the column, especially for columns of smaller internal diameter. As system dispersion decreases, peaks become narrower and taller and the efficiency of a separation increases. High-efficiency CORTECS Columns can be paired with any LC system, but when paired with an ultra-low dispersion instrument such as the ACQUITY UPLC I-Class Systems, you can experience new levels of performance.

Impact of Particle Size and System Dispersion on Efficiency



System:	ACQUITY UPLC I-Class with ACQUITY PDA;
	Competitor UHPLC
Column:	CORTECS UPLC C_{18}+, 1.6 µm, 2.1 x 50 mm (p/n 186007114)
	Competitor Solid-Core C_{18}, 2.6 µm, 3.0 x 50 mm
Separation mode:	Isocratic
Mobile phase:	55:45 water/acetonitrile with 0.1% formic acid
Flow rate:	0.5 mL/min (1.6 µm, 2.1 x 50 mm)
	0.69 mL/min (2.6 µm, 3.0 x 50 mm)
Injection volume:	1.0 µL (1.6 µm, 2.1 x 50 mm)
	2.0 µL (2.6 µm, 3.0 x 50 mm)
Column temp.:	30 °C
Detection:	UV at 220 nm
Sample concentration:	20 µg/mL

The separation of estradiols on a 2.6 µm competitor solid-core particle column using a UHPLC system with 26 µL system band spread, compared to the same separation on a CORTECS UPLC 1.6 µm Column using an ACQUITY UPLC I-Class System with 7 µL system band spread.

Band Spread Values for Modern Chromatographic Systems and the Recommended Column i.d. for the Best Column Performance

		Column i.d. (mm)	
System	**Band Spread (µL)***	**1st Choice**	**2nd Choice**
HPLC	25–50	4.6	3.0
UHPLC	15–25	3.0	2.1
UPLC	8–15	2.1	3.0

* Determined at flow rate of 0.5 mL/minute using acetonitrile/water (50/50, v/v) as the mobile phase and caffeine (160 µg/mL) (p/n 700002642) as the sample. A 0.5 µL injection was used and the peak was detected at 273 nm using a data rate of 80 Hz or highest available for the system. The peak width was measured at 4.4% of peak height.

VERSATILITY IN SUB-2-µm PARTICLE DESIGN

Scientists are often challenged by the need to analyze mixtures of compounds that vary in their polarity, molecular weight, functionality, and complexity. While screening columns with different ligands is an essential strategy in method development, choosing the particle with the appropriate attributes for the separation is even more crucial. This is why we have added CORTECS Solid-Core Particles to our growing family of innovative particles.

CORTECS SOLID-CORE PARTICLE

- High efficiency
- Increased throughput at similar efficiency*
- Higher performance at same backpressure*
- UPLC to HPLC scalability

** Compared to fully-porous particles*

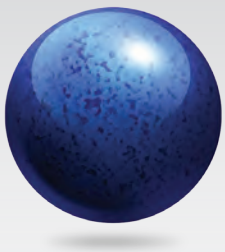
CSH TECHNOLOGY

- Superior peak shape for basic analytes
- Exceptional loading capacity
- UPLC to HPLC scalability

BEH TECHNOLOGY

- Unparalleled pH stability
- Mobile phase and temperature versatility
- UPLC to HPLC scalability

HSS TECHNOLOGY



- Maximum retention
- Enhanced selectivity
- UPLC to HPLC scalability

ORDERING INFORMATION

CORTECS UPLC Columns

Chemistry	Particle Size	Dimension	Part No. 1 Pack	Part No. 3 Pack
CORTECS UPLC C_{18}+	1.6 µm	2.1 x 30 mm	186007113	176003166
CORTECS UPLC C_{18}+	1.6 µm	2.1 x 50 mm	186007114	176003167
CORTECS UPLC C_{18}+	1.6 µm	2.1 x 75 mm	186007115	176003168
CORTECS UPLC C_{18}+	1.6 µm	2.1 x 100 mm	186007116	176003169
CORTECS UPLC C_{18}+	1.6 µm	2.1 x 150 mm	186007117	176003170
CORTECS UPLC C_{18}+	1.6 µm	3.0 x 30 mm	186007118	176003171
CORTECS UPLC C_{18}+	1.6 µm	3.0 x 50 mm	186007119	176003172
CORTECS UPLC C_{18}+	1.6 µm	3.0 x 75 mm	186007120	176003173
CORTECS UPLC C_{18}+	1.6 µm	3.0 x 100 mm	186007121	176003174
CORTECS UPLC C_{18}+	1.6 µm	3.0 x 150 mm	186007122	176003175
CORTECS UPLC C_{18}	1.6 µm	2.1 x 30 mm	186007092	176003146
CORTECS UPLC C_{18}	1.6 µm	2.1 x 50 mm	186007093	176003147
CORTECS UPLC C_{18}	1.6 µm	2.1 x 75 mm	186007094	176003148
CORTECS UPLC C_{18}	1.6 µm	2.1 x 100 mm	186007095	176003149
CORTECS UPLC C_{18}	1.6 µm	2.1 x 150 mm	186007096	176003150
CORTECS UPLC C_{18}	1.6 µm	3.0 x 30 mm	186007097	176003151
CORTECS UPLC C_{18}	1.6 µm	3.0 x 50 mm	186007098	176003152
CORTECS UPLC C_{18}	1.6 µm	3.0 x 75 mm	186007099	176003153
CORTECS UPLC C_{18}	1.6 µm	3.0 x 100 mm	186007100	176003154
CORTECS UPLC C_{18}	1.6 µm	3.0 x 150 mm	186007102	176003155
CORTECS UPLC HILIC	1.6 µm	2.1 x 30 mm	186007103	176003156
CORTECS UPLC HILIC	1.6 µm	2.1 x 50 mm	186007104	176003157
CORTECS UPLC HILIC	1.6 µm	2.1 x 75 mm	186007105	176003158
CORTECS UPLC HILIC	1.6 µm	2.1 x 100 mm	186007106	176003159
CORTECS UPLC HILIC	1.6 µm	2.1 x 150 mm	186007107	176003160
CORTECS UPLC HILIC	1.6 µm	3.0 x 30 mm	186007108	176003161
CORTECS UPLC HILIC	1.6 µm	3.0 x 50 mm	186007109	176003162
CORTECS UPLC HILIC	1.6 µm	3.0 x 75 mm	186007110	176003163
CORTECS UPLC HILIC	1.6 µm	3.0 x 100 mm	186007111	176003164
CORTECS UPLC HILIC	1.6 µm	3.0 x 150 mm	186007112	176003165

CORTECS UPLC Columns Method Validation Kits (MVK)*

Chemistry	Particle Size	Dimension	Part No.
CORTECS UPLC C_{18}+	1.6 µm	2.1 x 30 mm	186007176
CORTECS UPLC C_{18}+	1.6 µm	2.1 x 50 mm	186007177
CORTECS UPLC C_{18}+	1.6 µm	2.1 x 75 mm	186007178
CORTECS UPLC C_{18}+	1.6 µm	2.1 x 100 mm	186007179
CORTECS UPLC C_{18}+	1.6 µm	2.1 x 150 mm	186007180
CORTECS UPLC C_{18}+	1.6 µm	3.0 x 30 mm	186007181
CORTECS UPLC C_{18}+	1.6 µm	3.0 x 50 mm	186007182
CORTECS UPLC C_{18}+	1.6 µm	3.0 x 75 mm	186007183
CORTECS UPLC C_{18}+	1.6 µm	3.0 x 100 mm	186007184
CORTECS UPLC C_{18}+	1.6 µm	3.0 x 150 mm	186007185
CORTECS UPLC C_{18}	1.6 µm	2.1 x 30 mm	186007156
CORTECS UPLC C_{18}	1.6 µm	2.1 x 50 mm	186007157
CORTECS UPLC C_{18}	1.6 µm	2.1 x 75 mm	186007158
CORTECS UPLC C_{18}	1.6 µm	2.1 x 100 mm	186007159
CORTECS UPLC C_{18}	1.6 µm	2.1 x 150 mm	186007160
CORTECS UPLC C_{18}	1.6 µm	3.0 x 30 mm	186007161
CORTECS UPLC C_{18}	1.6 µm	3.0 x 50 mm	186007162
CORTECS UPLC C_{18}	1.6 µm	3.0 x 75 mm	186007163
CORTECS UPLC C_{18}	1.6 µm	3.0 x 100 mm	186007164
CORTECS UPLC C_{18}	1.6 µm	3.0 x 150 mm	186007165
CORTECS UPLC HILIC	1.6 µm	2.1 x 30 mm	186007166
CORTECS UPLC HILIC	1.6 µm	2.1 x 50 mm	186007167
CORTECS UPLC HILIC	1.6 µm	2.1 x 75 mm	186007168
CORTECS UPLC HILIC	1.6 µm	2.1 x 100 mm	186007169
CORTECS UPLC HILIC	1.6 µm	2.1 x 150 mm	186007170
CORTECS UPLC HILIC	1.6 µm	3.0 x 30 mm	186007171
CORTECS UPLC HILIC	1.6 µm	3.0 x 50 mm	186007172
CORTECS UPLC HILIC	1.6 µm	3.0 x 75 mm	186007173
CORTECS UPLC HILIC	1.6 µm	3.0 x 100 mm	186007174
CORTECS UPLC HILIC	1.6 µm	3.0 x 150 mm	186007175

*Each kit contains three columns from three batches of material.

VanGuard Pre-Columns (Guard Columns) 3 Pack

Chemistry	Particle Size	Dimension	Part No.
CORTECS UPLC C_{18}+	1.6 µm	2.1 x 5 mm	186007125
CORTECS UPLC C_{18}	1.6 µm	2.1 x 5 mm	186007123
CORTECS UPLC HILIC	1.6 µm	2.1 x 5 mm	186007124

Quality Control Reference Materials (QCRM)

Description	Part No.
Reversed-Phase QCRM	186006363
Neutrals QCRM	186006360
HILIC QCRM	186007226
QDa QCRM	186007345
LCMS QCRM	186006963

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