

Fused-Core® Milestones - Pioneering the Particles

(2007) *First 2.7 µm particles*- achieve efficiencies >250,000 N/m (1)

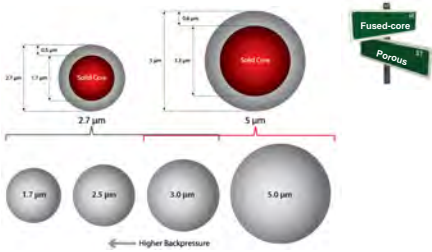
- Ruggedness proven to hold up extremely well in use
- Efficiencies comparable to sub-2 µm particles
- Pressure drop (flow resistance) comparable to 3 µm particle columns
- Allows use of traditional 400 bar instruments
- Narrow UHPLC peaks reveal limitations of instrument dispersion
- Both 90 Å for small molecules and 160 Å for larger molecules available

(2012) *First 5 µm particles*- achieve efficiencies >150,000 N/m (2)

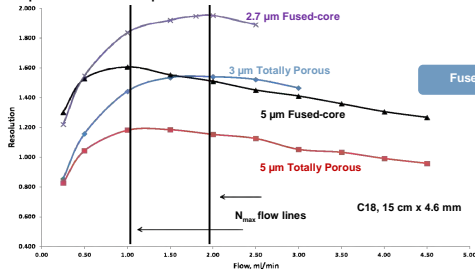
- Operate at low pressures with unsurpassed ruggedness
- Efficiencies exceed most 3 µm particles (150,000 N/m observed routinely at low pressure)
- Pressure drop of 5 µm particle columns
- Designed for traditional instruments & routine methods.
- C18 & F5 available now; all standard phases available by November 2012

Faster HPLC on any System

- More plates with less backpressure
- 2.7 µm replaces 1.7-3 µm
- 5 µm replaces 3-5 µm

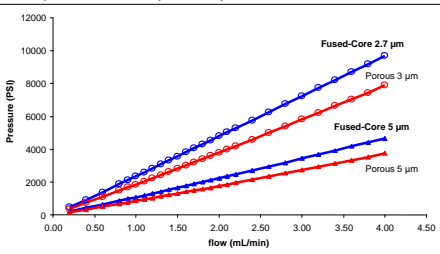


Achieve 3 µm Resolution with 5 µm Fused-Core



Fused-Core Outperforms Porous Particles

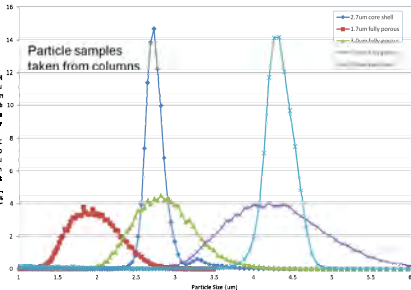
Pressure Drop* with Ascentis® Express Compares to Same Size Porous Columns



Dionex UHPLC
 column: 15 cm x 4.6 mm
 mobile phase: 60% acetonitrile
 temp.: 35 °C
 sample: 10 µL toluene

* Pressure includes instrument flow resistance

Narrower Particle Distribution of Fused-Core



- Fused-Core forms efficient, uniform beds
- Stable bed resists voiding

Particle Properties and Performance (15 cm x 4.6 mm)

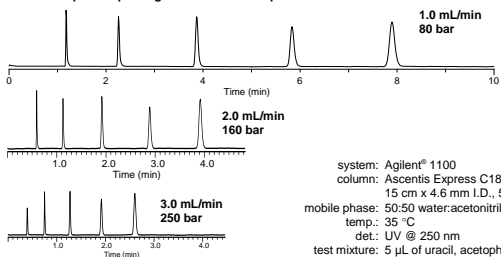
Particle Type	Shell thickness (µm)	BET Surface Area (m ² /g)	Average Pore Diameter (Å)	Plates*	Pressure* (bar)
2.7 µm Ascentis Express Fused-Core	0.5	135	90	38300	284
2.7 µm Ascentis Express Peptide Fused-Core	0.5	80	160	38300	284
5 µm Ascentis Express Fused-Core	0.6	90	90	28300	78
3 µm porous	N/A	300	100	24200	309
5 µm porous A	N/A	300	100	14600	100
5 µm porous B	N/A	170	120	14400	63
5 µm porous C	N/A	450	100	15300	120

Ascentis Express 5 µm: 3 µm efficiency with 5 µm pressure

Fused-Core Outperforms Porous Particles

* Plates measured at N_{max}

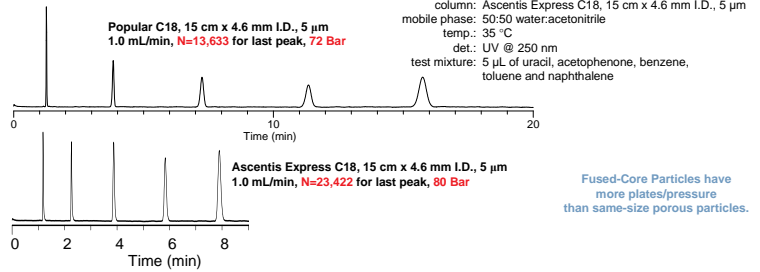
Ascentis Express 5 µm: High Resolution and Speed



system: Agilent® 1100
 column: Ascentis Express C18
 15 cm x 4.6 mm I.D., 5 µm
 mobile phase: 50:50 water:acetonitrile
 temp.: 35 °C
 det.: UV @ 250 nm
 test mixture: 5 µL of uracil, acetophenone, benzene, toluene and naphthalene

Flow mL/min	Plates	Pressure psi
1.0	23,400	1200
1.5	23,500	1825
2.0	22,400	2450
2.5	20,800	3100
3.0	19,500	3750

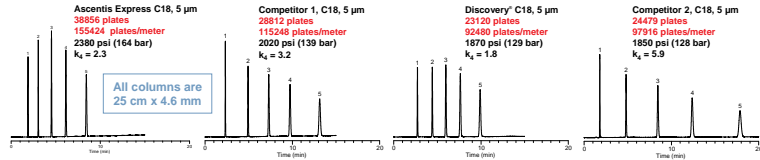
Porous 5 µm vs Ascentis Express 5 µm Columns



system: Agilent 1100
 column: Ascentis Express C18, 15 cm x 4.6 mm I.D., 5 µm
 mobile phase: 50:50 water:acetonitrile
 temp.: 35 °C
 det.: UV @ 250 nm
 test mixture: 5 µL of uracil, acetophenone, benzene, toluene and naphthalene

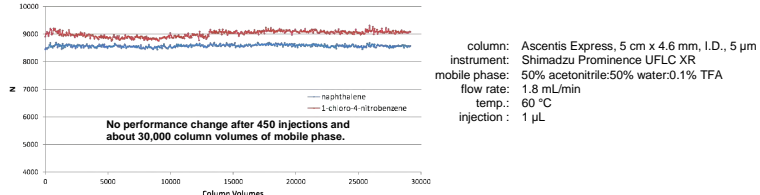
Fused-Core Particles have more plates/pressure than same-size porous particles.

Ascentis Express: Highest Performing 5 µm Column



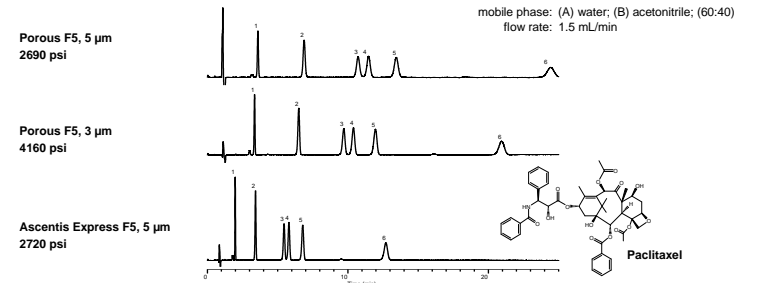
All columns are 25 cm x 4.6 mm

Ascentis Express 5 µm Columns are Highly Stable



column: Ascentis Express, 5 cm x 4.6 mm, I.D., 5 µm
 instrument: Shimadzu Prominence UFLC XR
 mobile phase: 50% acetonitrile:50% water:0.1% TFA
 flow rate: 1.8 mL/min
 temp.: 60 °C
 injection: 1 µL

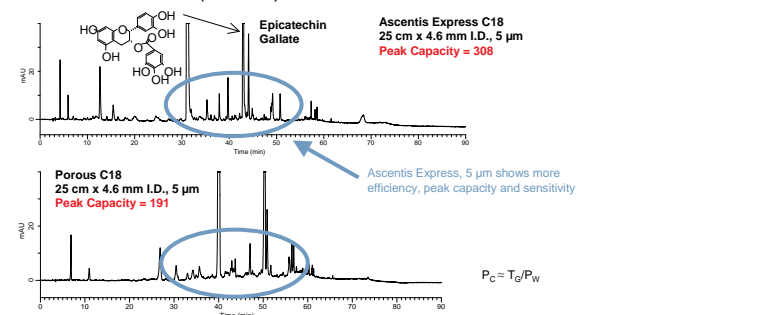
Taxols on F5 Columns with Different Silica



mobile phase: (A) water; (B) acetonitrile; (60:40)
 flow rate: 1.5 mL/min

Paclitaxel

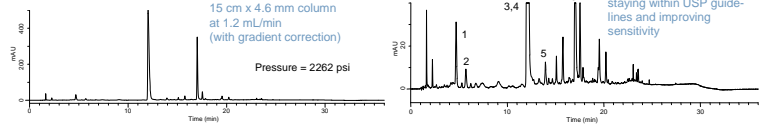
Catechins in Green Tea with C18 (USP Method)



Ascentis Express, 5 µm shows more efficiency, peak capacity and sensitivity

$$P_C = T_G/P_W$$

Faster Catechin Method on Ascentis Express C18, 5 µm



Reduction in run time from 90 min to 30 min while staying within USP guidelines and improving sensitivity

Summary of Fused-Core Particles Features

- 2.7 µm Fused-Core
 - Replace sub-2 µm and 3 µm in fast assays & method development
 - Compatible with optimized HPLC or UHPLC instruments
 - Delivers about 250,000 N/m; uniform, rugged bed
 - Efficiency plot flat like sub-2 µm columns for very fast separations
 - Low pressure drop like 3 µm particles
- 5 µm Fused-Core
 - Replace 3 µm or 5 µm particles in routine assays
 - Compatible with optimized HPLC instruments
 - Delivers about 150,000 N/m; uniform, rugged bed
 - Efficiency plot flat like 3 µm particles for fast separations
 - Low pressure drop like 5 µm particles
 - Offer easy plug and play solution switching from porous 3 & 5 µm columns

Fused-Core Outperforms Porous Particles

Ascentis Express Fused-Core HPLC Phases

5 µm Fused-Core Phases C18	2.7 µm Fused-Core Phases	Equivalency expected between particle phases
C18	C18	3 Nonpolar only (RP)
C8	Peptide ES-C18	
C8	C8	4 Medium to high polarity (enhanced selectivity RP)
RP-Amide	RP-Amide	
Phenyl-Hexyl	Phenyl-Hexyl	
ES-Cyano	ES-Cyano	2 Polar only (NP/ANP/HILIC)
F5	F5	
OH5	OH5	
HILIC (silica)	HILIC (silica)	

Phases in Green available now
 Phase in Blue available soon

Trademarks

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