



Fast HPLC Utilizing Fused-Core™ Particles

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Increasing throughput of HPLC analyses is a driver for innovation in both HPLC column and hardware design. Monolithic columns, for example, were introduced for their potential for use at high mobile phase velocities due to improved mass transfer over conventional fully porous particles. More recently, ultra-high performance chromatography on sub-2 μm particles has provided increased speed and efficiencies over conventional particles at the expense of high backpressures and, at times, column ruggedness. Fused-Core technology is the next significant breakthrough in column technology aimed at reducing analysis time through increased efficiencies.

The Fused-Core technology is based on a 0.5 μm outer shell of porous silica fused to a uniform, solid 1.7 μm core particle. Uniform flow channels and reduced intra-particle flow path result in significantly less dispersion within the confines of the analytical column. The result is similar column efficiencies to columns packed with sub-2- μm particles at about half the backpressure. Consequently, sub-2- μm like efficiencies can be realized using conventional HPLC instrumentation. In addition to the kinetic advantages of the Fused-Core particle, the larger overall particle size and narrow particle size distribution lead to improved packing methods and hardware configurations. These improvements then lead to exceptional column ruggedness.

In this report, a comparison is shown between a conventional 15 cm length column packed with 5 μm particles and a 5 cm length Ascentis Express HPLC column.

Experimental Conditions

Shown in Figure 1 are HPLC chromatograms for the conventional C18 and Ascentis Express C18 columns.

Conditions for Figure 1a

Column: Conventional C18, 15 cm \times 3.0 mm I.D. 5 μm
 Flow: 0.4 mL/min
 Mobile Phase: 80% acetonitrile
 Temp.: 35 °C
 Run Time: 4 min
 Pressure: 885 psi

Conditions for Figure 1b:

Column: Ascentis Express C18, 5 cm \times 3.0 mm I.D., 2.7 μm particle
 Flow: 1.2 mL/min
 Mobile Phase: 69% acetonitrile
 Run Time: 30 sec
 Temp.: 35 °C

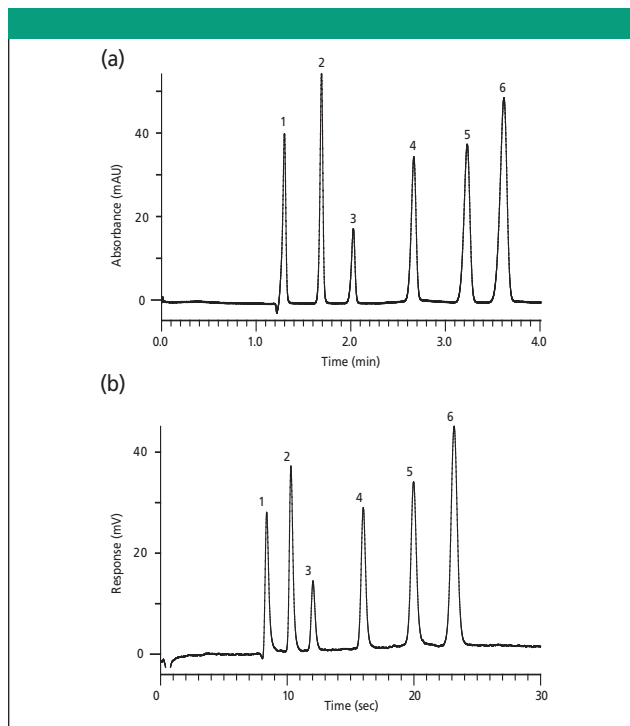


Figure 1: 1. Uracil. 2. Phenol. 3. Acetophenone. 4. Benzene 5. Toluene. 6. Naphthalene

Pressure: 3700 psi

The chromatograms illustrate the high-speed capabilities of the Ascentis Express HPLC columns at backpressures manageable by all HPLC systems. High flow rates (>2 mL/min @ 4.6 mm I.D. and > 0.6 mL/min @ 2.1 mm I.D.) are quite amenable to Ascentis Express HPLC Columns due to the Fused-Core particle. Table I provides a summary of the performance parameters of Figure 1.

Conclusion

Ascentis Express with Fused-Core particles is an excellent choice for fast HPLC on any HPLC system. The combination of low backpressures and high efficiencies allows for greater column length and flow rate flexibility than offered by sub-2- μm columns under any given pressure limitation.

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Table I. Summary of Performance for Figure 1

Column	Efficiency (N) Naphthalene	Resolution (peaks 5 & 6)	k (peak 6)	Backpressure (psi)	Runtime
Conventional C18, 15 cm x 3.0 mm, 5 μm	11,000	3	1.78	900	4 minutes
Ascentis Express C18, 5 cm x 3.0 mm	10,000	3.6	1.75	3,700	30 seconds