

# ZORBAX Rapid Resolution HT Columns —A Breakthrough in High-Throughput HPLC Column Technology Application

William E. Barber and Maureen Joseph

## Introduction

The demand for shorter HPLC run times continues to increase for High-Throughput (HT) HPLC, liquid chromatography/mass spectrometry (LC/MS), and LC/MS/MS, as well as for conventional LC applications. By choosing shorter column lengths packed with smaller particles, analysis time can be reduced dramatically while simultaneously maintaining column efficiency and resolution. Until recently, the smallest, totally porous particles commonly available were either 3.5 or 3.0  $\mu\text{m}$  in diameter. Now, Agilent Technologies manufactures 1.8- $\mu\text{m}$  totally porous particles, which deliver the resolving power and efficiency expected from a 150-mm, 5- $\mu\text{m}$  column in a 30-mm configuration. For this investigation, the ZORBAX Eclipse XDB-C18 and ZORBAX StableBond SB-C18 bonded phases are used to demonstrate the outstanding performance of this breakthrough in HT chromatography.

### Rapid Resolution HT HPLC Columns Provide Ultrafast, High Efficiency Separations

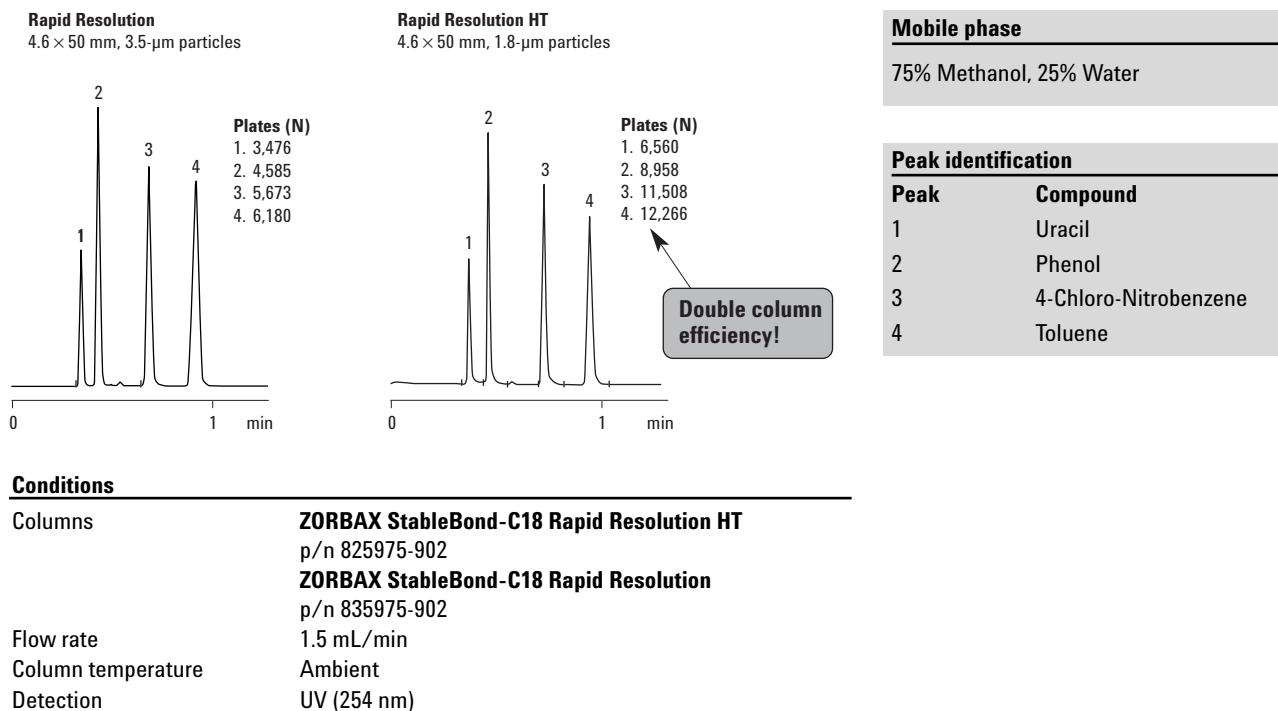
The chromatograms in Figure 1 compare the performance of 3.5 and 1.8- $\mu\text{m}$  StableBond SB-C18 columns, each having the identical dimensions of  $4.6 \times 50$  mm. Since particle size is the only variable in this experiment, these data demonstrate real differences in column efficiency. Both columns easily resolve this four-component mixture in less than 1 minute; however, the efficiency of the Rapid Resolution HT, 1.8- $\mu\text{m}$  column is impressively superior. With 2x the efficiency of the 3.5- $\mu\text{m}$  column, the Rapid Resolution HT, 1.8- $\mu\text{m}$  column consistently provides 40% more resolving power. Moreover, a 5- $\mu\text{m}$  column would require a length of 150 mm to provide the same efficiency with a corresponding three-fold increase in analysis time.

## Highlights

- Reduce analysis time to seconds with highest efficiency using commercially available Rapid Resolution HT HPLC columns
- Obtain twice the efficiency of 3.5- $\mu\text{m}$  columns with equivalent length 1.8- $\mu\text{m}$ , Rapid Resolution HT columns
- Eclipse XDB-C18 is an excellent first column choice as it provides excellent performance over a broad range of mobile phase conditions for a wide variety of sample types. Select StableBond-C18 for an alternate selectivity and exceptional stability at low pH



Agilent Technologies



**Figure 1. Effect of particle size on column efficiency using ZORBAX Rapid Resolution columns.**

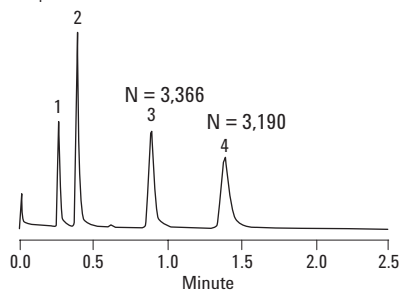
## Rapid Resolution HT Provides Unmatched Performance

Several other manufacturers have introduced HPLC columns packed with particles smaller than 3.0 μm, and a limited number of suppliers promote a 2-μm product. With Agilent Technologies' breakthrough sub-2-μm particle technology, ZORBAX leads the field with the highest performance HT columns in the industry. In fact, Rapid Resolution HT columns provide up to 30% more efficiency compared to commercially available 2.5 and 2.0-μm columns, as illustrated in Figure 2.

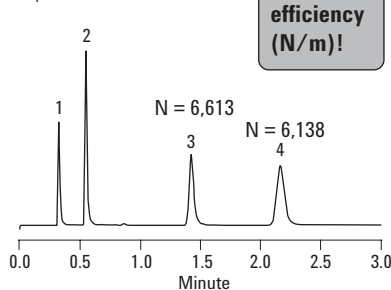
The Rapid Resolution HT Eclipse XDB-C18 column used here is the perfect first choice for your everyday separation challenges, providing high resolution, rapid throughput, as well as excellent peak shape, column lifetime, and column-to-column reproducibility.

ZORBAX StableBond columns are an excellent option for alternate selectivity, and are designed to provide outstanding stability at low pH, even at elevated temperatures.

**2A Competitor A: C18**  
 4.6 · 20 mm, 2.5 µm  
 Avg N = 163,900 N/m  
 Tf<sub>4</sub> = 1.55



**2B ZORBAX Rapid Resolution HT StableBond-C18**  
 4.6 · 30 mm, 1.8 µm  
 Avg N = 212,516 N/m  
 Tf<sub>4</sub> = 1.12



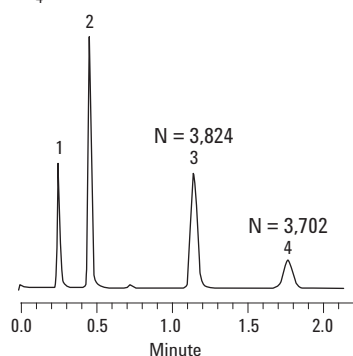
#### Mobile phase

60% Methanol, 40 % Water

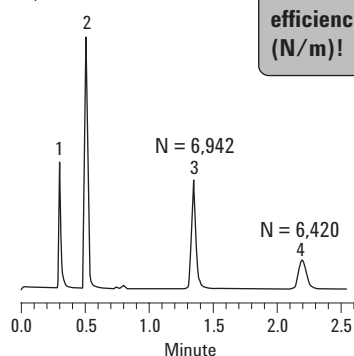
#### Peak identification

Peak	Compound
1	Uracil
2	Phenol
3	4-Chloro-Nitrobenzene
4	Toluene

**2C Competitor B: C12**  
 4.0 · 20 mm, 2.0 µm  
 0.8 mL/min  
 Avg N = 188,150 N/m  
 Tf<sub>4</sub> = 1.08



**2D ZORBAX Rapid Resolution HT Eclipse XDB-C18**  
 4.6 · 30 mm, 1.8 µm  
 1.0 mL/min  
 Avg N = 222,700 N/m  
 Tf<sub>4</sub> = 1.08



#### Conditions

##### Columns

**2A: Competitor A: C18**

**2B: ZORBAX Rapid Resolution HT StableBond-C18**

p/n 823975-902

**2C: Competitor B: C12**

**2D: ZORBAX Rapid Resolution HT Eclipse XDB-C18**

p/n 923975-902

Injection volume

1.0 µL

Flow rate

1.0 mL/min

Column temperature

Ambient

Detection

UV (254 nm)

**Figure 2. Effect of using 1.8-µm particle ZORBAX columns on relative column efficiencies vs. competitive columns.**

## For More Information

For more information on our products and services, visit our Web site at [www.agilent.com/chem](http://www.agilent.com/chem).

Authors William E. Barber (Applications Specialist) and Maureen Joseph (LC Columns Product Manager) are based at Agilent Technologies, Wilmington, Delaware.

Agilent shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

Information, descriptions, and specifications in this publication are subject to change without notice.

© Agilent Technologies, Inc. 2004

Printed in the USA  
January 21, 2004  
5989-0599EN



**Agilent Technologies**