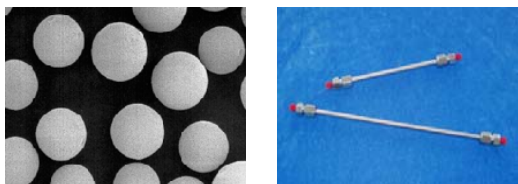


# Advance in HPLC columns through Nanotechnology



## Venusil™ HPLC Columns

*The Queen of Beauty in Chromatography*



### A Major Advance in HPLC Columns through Nanotechnology

Venusil™ HPLC columns are made of spherical silica particles manufactured of the highest purity (>99.999%) in the market. The highest quality silica, an innovative surface nano-modification and unique bonding processes result in exceptional C18 phases with outstanding properties. One of the most remarkable properties of every Venusil™ column is that *all types of organic compounds (neutral, basic or acidic) will have near perfect peak symmetry and excellent efficiency across the whole applicable pH range.* The proprietary nano-surface modification generates a very smooth and non-reactive surface, reducing the interaction between the silica surface and polar compounds, especially the basic compounds. Lot-to-lot reproducibility is ensured by a stable bonding/end-capping process that is extremely rugged. The uniform, spherical particles have a nominal surface area of 360 m<sup>2</sup>/g with a controlled pore size of 100Å. All columns are packed using a consistent slurry packing process to achieve uniform and stable bed for maximum column efficiency, lifetime and column-to-column reproducibility.

### The Most Beautiful Experience in Chromatography

With the Venusil™ columns, you will have the most beautiful experience in HPLC separation.

**Best peak symmetry and efficiency.** This is one of the most remarkable features of our columns, they just outperform competitors products. Across the whole applicable pH range; peak shape and column efficiency are independent of pH. This provides maximum flexibility for method development and optimum ruggedness for the methods developed.

**Tightest specification.** All our columns have tighter specification (see Table 2) than those of brand name manufacturers. This ensures that each column has great performance and identical selectivity.

**Best value.** Because of our unique business structure and well-controlled processes, we are able to provide products of the highest quality at very competitive price; we are also able to customize any of our products based on customer requirements.

**Broad selection on prices and features.** We offer a full line of products for a wide variety of applications and are willing to assist customers in optimizing their particular applications

Characteristics of Venusil™ columns	Benefit to the columns' users
Perfect peak symmetry, independent of pH and mobile phase	Highest flexibility for any application, Better sensitivity, Greater confidence on HPLC results
Broad pH range (1.5-10.5)	Flexibility for method development
Compatible with 100% aqueous mobile phase	Maximum versatility
Highest surface coverage	Tolerance of large volume and mass injection
A wide variety of chemistries	Broad selection of polarity and Maximum versatility
Minimum buffer concentration needed	Better sensitivity for LC/MS, extended column lifetime
Tightest specification	Better reproducibility, Greater confidence on the HPLC results
Excellent column efficiency	Better and faster separation
Great column lifetime	Lower cost; greater convenience

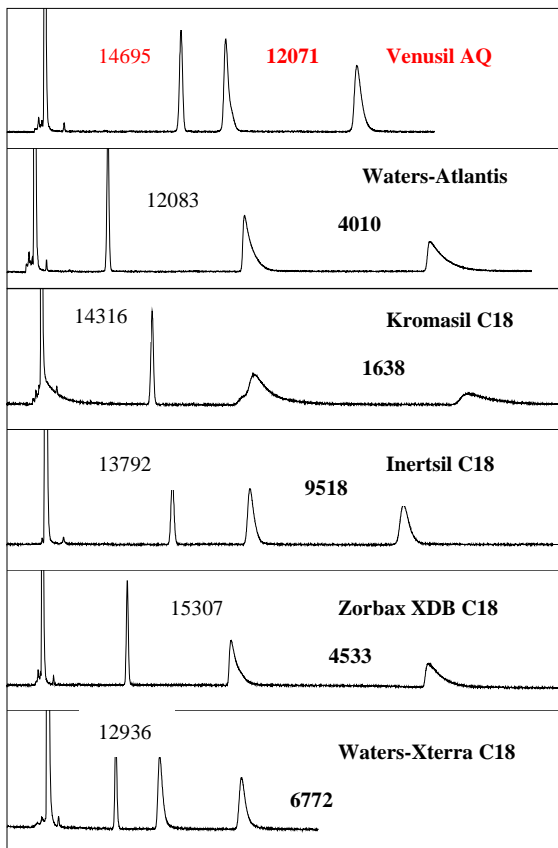


Agela Technologies Inc

### Comparison of features and specification

	Waters Symmetry-C18 4.6 x 150 mm, 5um	Zorbax XDB-C18 4.6 x 150 mm, 5um	Venusil XBP-C18 4.6 x 150 mm, 5um
Spec. on efficiency	na	8000	<b>11000</b>
Spec. on tailing factor (toluene)	na	0.98-1.25	<b>0.96-1.10</b>
Spec. on tailing factor-amitriptyline	1.45	na (typically 1.5-2.0)	<b>1.25</b>
Spec. on selectivity (amitriptyline/acenaphthene)	+/- 10%	na	<b>+/- 7%</b>
pH range	2-8	2-9	<b>1.5-10.5</b>
Specific Surface	300	180	<b>400</b>
Carbon%	16%	12%	<b>22%</b>

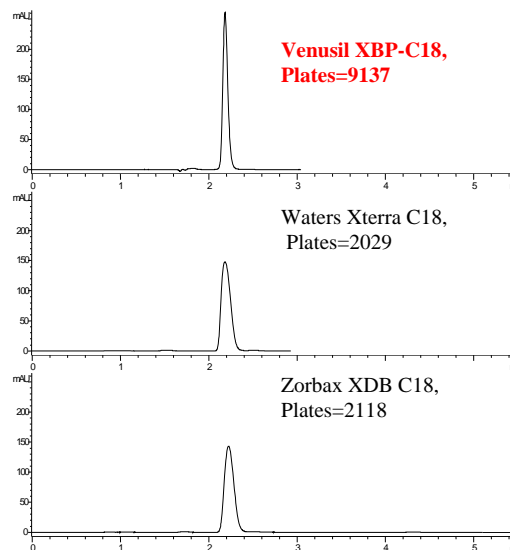
### Inertness and efficiency comparison



Sample: uracil, toluene, doxepin, amitriptyline  
 Column: 4.6 x 150, 5 um  
 Mobile phase: 10 mM sodium phosphate (pH=7) in 60% ACN.  
 Temperature: 30 °C;  
 Flow: 1 mL/min.

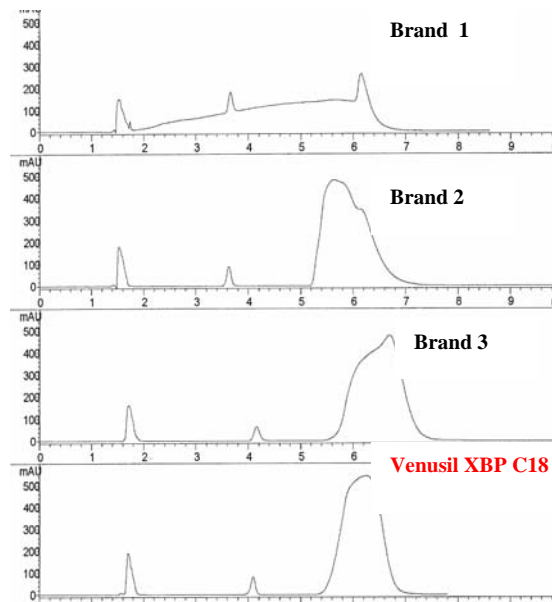
\* Standard type values are for toluene, the values in **bold** are for amitriptyline

### Volume Loading Capacity Comparison



Large Volume Injection (injection volume =100 uL, )  
 Sample: 4-methoxybenzenesulfonamide, 10 ug/mL in MeOH/Water (1:1)  
 Column: 4.6 x 150 mm, 5um particle size  
 Mobile phase: MeOH/Water  
 Temperature: 30 °C  
 Flow: 1mL/min.

### Mass Load Comparison



Sample: diphenhydramine, 100 mg/mL in DMSO, 800uL  
 Mobile phase: 65% 10 mM ammonia: 35% ACN

## A Wide Selection of Venusil™ Columns

To meet differing application needs with-in the corresponding pH requirements, we have the following offerings available in our reverse phase line-up:

**Venusil™ XBP** series, XBP-C18 and XBP-C8, are bonded to the maximum density to have the highest hydrophobicity (the lowest polarity), the lowest interaction of analytes with silanols, high stability at high pH and the broadest pH range.

**Venusil™ AQ-C18** columns are more polar than XBP and have more separation power for polar compounds. Due to special silica treatment, they are true C18 columns that are compatible with 100% aqueous mobile phase. Like XBP columns, they are still very friendly towards those very basic analytes. Although their upper pH limit is not as high as XBP, it is comparable to many popular brand name columns.

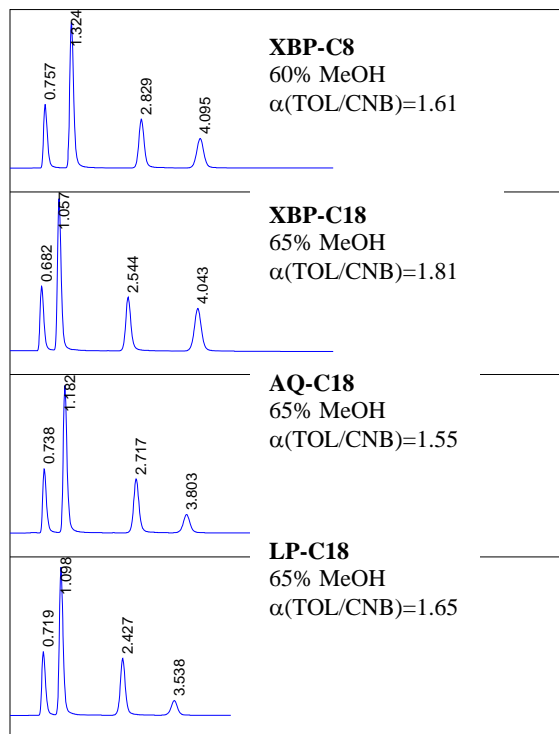
**Venusil™ LP-C18** columns are the most polar among C18 columns due to a polar end-cap and are preferred replacement for Waters Atlantis and Zorbax SB-C18. They are extremely stable at low pH and may also be used at mid-pH. Unlike Atlantis and SB-C18, LP-C18 columns can still maintain perfect peak symmetry even for very basic analytes and are compatible with 100% aqueous mobile phases.

### Comparison of Venusil™ -C18 Phases

	XBP-C18	AQ-C18	LP-C18
Surface area (m <sup>2</sup> /g)	360	360	360
C%	22%	18%	16%
End-cap	double	single	polar
Polarity	Increase →		
pH stability*	1.5-10.5	1.5-9	1-7
100% water compatibility	no	yes	yes
Peak shape of bases at any pH	excellent	excellent	excellent
Replaced columns	Zorbax XDB Symmetry Waters Xterra Luna Discovery	Symmetry Luna (2) Inertsil ODS-3 AQ phases	Zorbax SB-C18 Zorbax SB-AQ Waters Atlantis AQ phases

\* Use of organic base for pH > 9 is recommended .

### Selectivity Comparison of the Venusil™ phases



#### Test conditions:

columns: 2.1 x 50 mm, 5µm;  
mobile phase: 60% or 65% MeOH in water;  
flow: 0.2 mL/min  
temperature: 30 °C  
injection: 1µL  
sample: uracil, phenol, chloronitrobenzene (CNB), toluene (TOL)  
detection: UV 254 nm



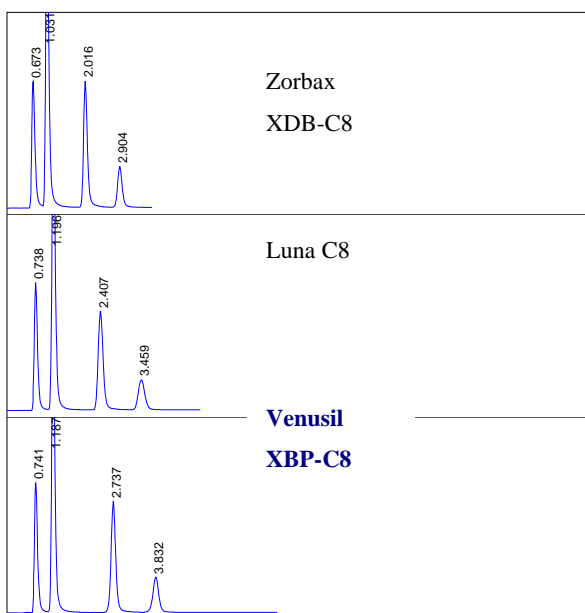
# Venusil XBP Columns

**Venusil™ XBP** columns, XBP-C18 and XBP-C8, are bonded to the maximum density to have the highest hydrophobicity (the lowest polarity), the lowest interaction of analytes with silanol, high stability at high pH and the broadest pH range.

Pore size: 100 Å; Specific surface: 360 m<sup>2</sup>/g; Purity > 99.999%;

- 1) **Inertness:** one of most base-friendly columns.
- 2) **Efficiency:** the best for basic compounds at any applicable pH.
- 3) **Large volume injection:** maintain very high efficiency even if the injection volume is exceptional large.
- 4) **Broad pH range (1.5 – 10.5\*):** Low pH, 0.2 % TFA; High pH, 0.010 M triethylamine.

## Column packing quality



**Sample:** uracil, phenol, chloronitrobenzene, toluene (in methanol/water=50/50)

**Columns:** 5 µm, 2.1 x 50 mm

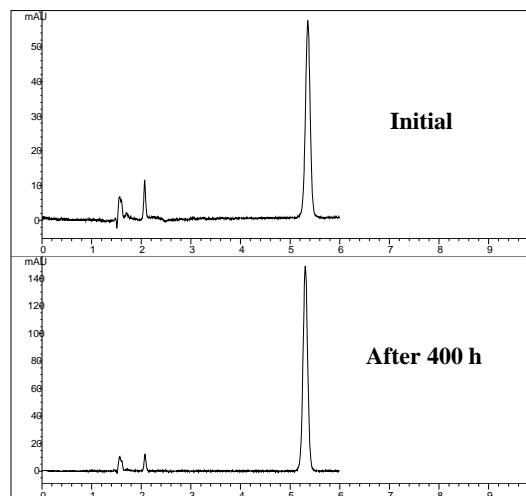
**Mobile phase:** methanol/water (65/35)

**Temperature:** 30 °C

**Flow:** 0.20 mL/min

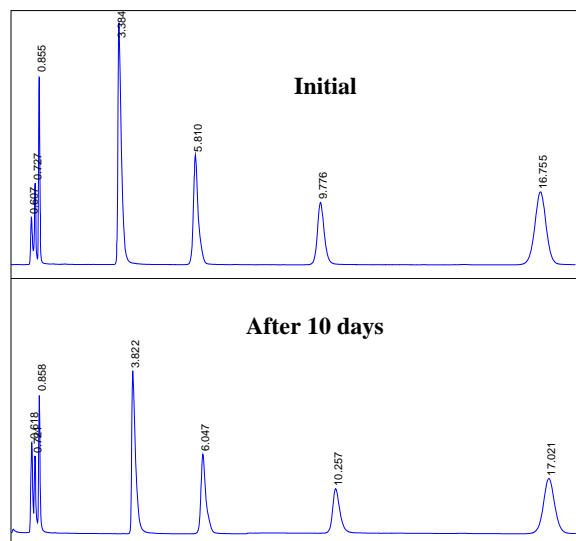
	Plates (toluene)	Tailing Factor
Zorbax XDB-C8	3605	1.18
Luna C8	2546	1.15
<b>Venusil XBP-C8</b>	<b>4012</b>	<b>1.03</b>

## Great stability at low pH



Column: Venusil XBP-C18, 4.6 x 150 mm, 5 µm  
 Aging: 40 °C, pH=1.0, TFA in 80 % Methanol, 400 hours,  
 Flow= 1.0 mL/min  
 Testing: 30 °C, pH=1.5, TFA in 80% methanol, 5 µL inj. of naphthlene

## Perfect peak symmetry and great lifetime of the column for basic compounds at mid-pH



Sample: Uracil, Doxepin, Nortriptyline, Amitriptyline, Trimipramine

Column: Venusil XBP-C18, 4.6 x 150 mm,  
 Mobile phase: 0.01 M sodium phosphate/ACN (50/50),  
 pH=7.6

Flow: 1.5 mL/min

Temperature: 45°C

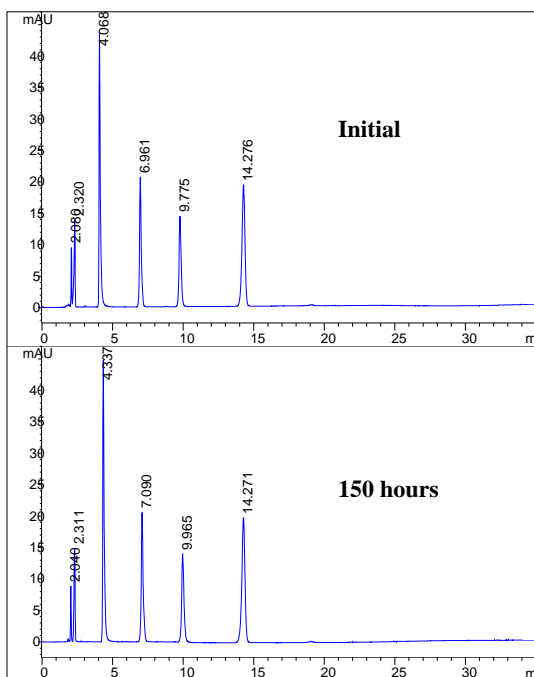
## Venusil AQ C18 Columns

**Venusil™ AQ-C18** columns are designed for separation of polar and semi-polar compounds at low to medium pH. They are more polar than XBP-C18 and less polar than LP-C18. They are true C18 columns. However, due to a special surface treatment, they are compatible with 100% aqueous mobile phase. They are stable at low pH 1.5 – 9.0 and are preferred replacement for Waters Symmetry, Inertsil C18, Zorbax SB, and many AQ columns.

Pore size: 100 Å; Specific surface: 360 m<sup>2</sup>/g; Purity > 99.999%;

- 1) **Inertness:** One of most base-friendly columns, excellent peak symmetry of basic compounds.
- 1) **Efficiency:** best for polar compounds at any pH.
- 1) **Large volume injection:** Maintains very high efficiency even if the injection volume is exceptional large.
- 1) **100% water compatible:** Very unique for a universal C18 column; far better peak shape, retention and efficiency than those so-called high aqueous “AQ” columns.
- 1) **Low pH Stability ( pH=1.5 ):** Better stability than most of popular brand columns on the market and much more stable than most of AQ columns .

### Perfect peak symmetry and good stability at med-pH for basic compounds



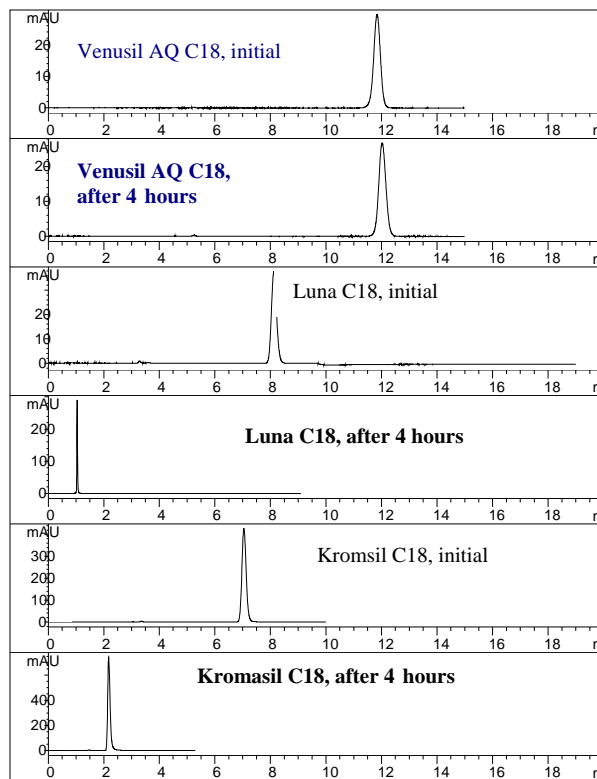
Sample: Uracil, Doxepin, Nortriptyline, Amitriptyline, Trimipramine

Column: Venusil AQ-C18, 4.6 x 250 mm,

Mobile phase: 0.01 M sodium phosphate/ACN (25/75), pH=7.0

Flow: 1.3 mL/min. Temperature: 30°C

### Compatibility with 100% aqueous mobile phase



Sample: Uridine

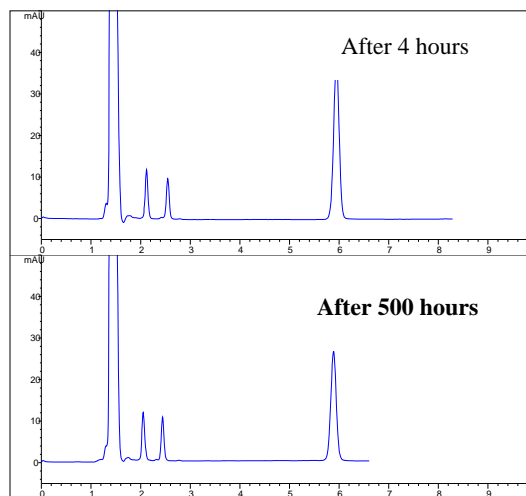
Column: 4.6 x 150 mm

Mobile phase: 100% water

Flow: 1mL/min.; the flow was stopped for 5 minutes during the testing period for each column.

Temperature: 30 °C

### Stability of Venusil AQ-C18 at pH=1.5



Sample: Uracil, Doxepin, Amitriptyline, Toluene.

Column: Venusil AQ C18, 4.6 x 150 mm, 5 µm

Mobile phase: TFA (0.25%, pH=1.5) in 60% acetonitrile

Flow: 1 mL/ min.;

Temp: 40 °C

## Venutil LP Columns

**Venutil LP columns** are specially designed for separation of polar compounds at very low to medium pH. They are end-capped with polar groups and have the highest polarity among Venutil columns. They are extremely stable at low pH (pH= 1) and are preferred replacement for Waters Atlantis, Zorbax SB, and many AQ columns.

Pore size: 100 Å; Specific surface: 360 m<sup>2</sup>/g; Purity > 99.999%;

- 1 Low pH Stability ( pH=1):** it has the best stability at low pH
- 2 Peak shape and efficiency:** Unlike many polar phase columns, it has excellent peak symmetry of basic compounds.
- 3 Polar C18 phase** very strong separating power for polar compounds
- 4 Large volume injection:** maintain very high efficiency even if the injection volume is exceptional large.
- 5 100% water compatible:** better peak shape, retention and efficiency than those so-called high aqueous "AQ" columns.



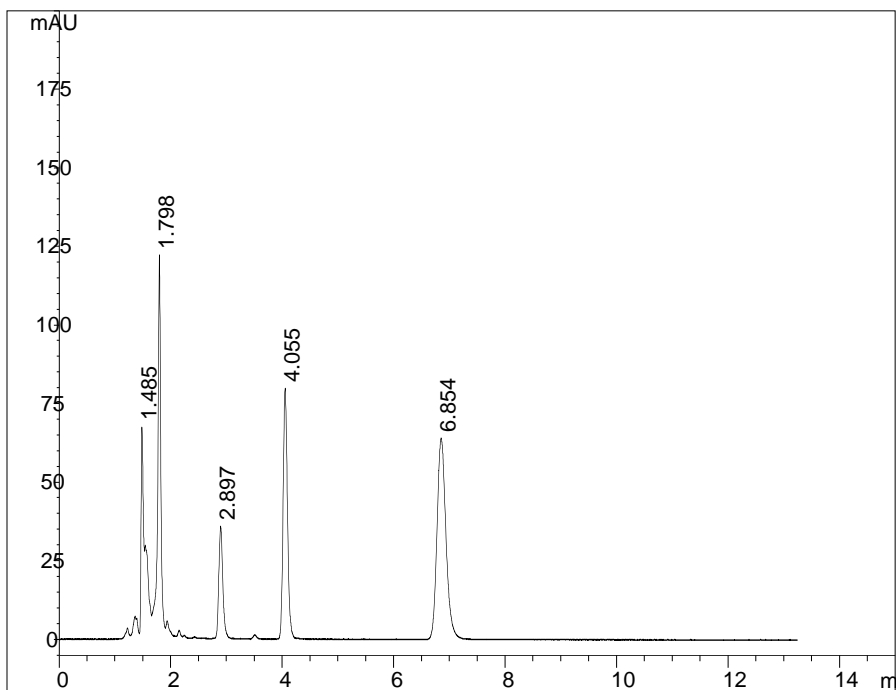
## BonChrom HPLC Columns

### High Quality, Reliable and Low Cost!

BonChrom HPLC column products are also made from silica of the highest purity and through Agela Technologies' well-controlled bonding and packing process. As a result, the columns are of high quality and highly reproducible. Unlike Venusil columns, our premium product, the BonChrom columns are not subject to a nano-surface modification process before bonding.

Although their specifications are not as tight as Venusil columns, they have comparable quality, performance, and specifications to many brand name columns on the market. However, you will get them at a fraction of their cost! These columns are good choices for expense control without sacrificing quality.

**BonChrom C18:** Spherical, 5  $\mu\text{m}$ , surface area = 360  $\text{m}^2/\text{g}$ ; C%= 22%; metal<10 ppm; pH= 1.5-9.0, plate N>80000/m



*Sample:* 1. Uracil, 2. 2,3 dihydroxy naphthlene,  
3. Propanolol, 4. Naphthlene, 5. Amitritypline

*Injection:* 5  $\mu\text{L}$

*Column:* 4.6 mm x 150 mm, 5  $\mu\text{m}$

*Mobile phase:* 10 mmol sodium phosphate buffer  
(pH=7)/Methanol = 15:85

*Flow:* 1 mL/min

*Temperature:* 30  $^{\circ}\text{C}$

*Detection:* UV 254 nm