

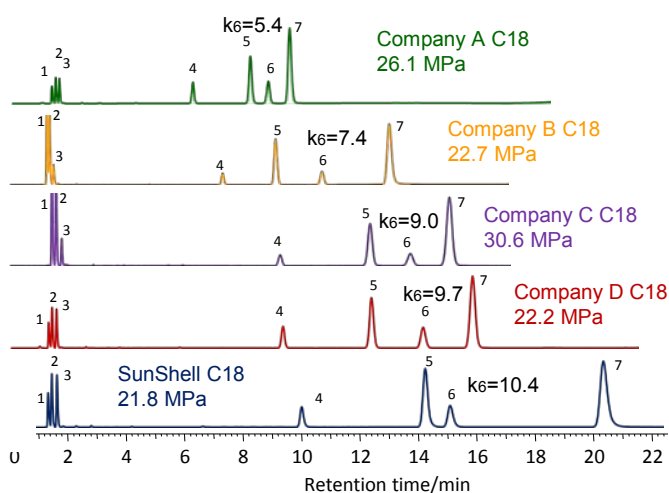


C18 - 2.6 μm

HIGHEST RETENTION / LARGEST STERIC SELECTIVITY / LOWEST BACKPRESSURE

Retention of standard samples and back pressure were compared for five kinds of core shell type C18s. Company A C18 showed only a half retention in comparison with SunShell C18. Steric selectivity becomes large when ligand density on the surface is high. SunShell C18 has the largest steric selectivity as well as the highest ligand density leading to the longest retention time.

SUNSHELL C18 COMPARISON



Mobile phase: CH₃OH/H₂O=75/25
 Flow rate: 1.0 mL/min, Temperature: 40° C
 Sample: 1 = Uracil, 2 = Caffeine, 3 = Phenol,
 4 = Butylbenzene, 5 = o-Terphenyl,
 6 = Amylbenzene, 7 = Triphenylene

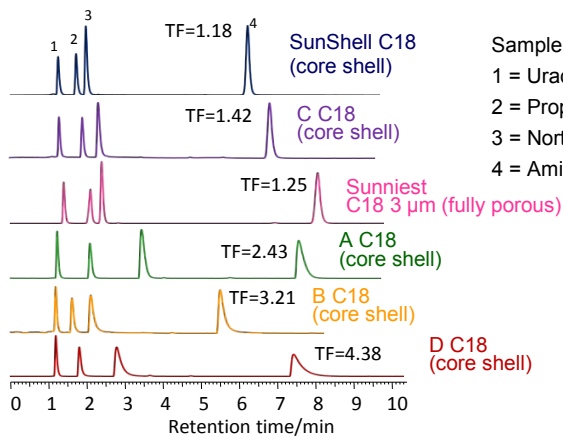
| | Hydrogen bonding | Hydrophobicity | Steric selectivity |
|---------------|------------------|----------------|--------------------|
| Company A C18 | 0.48 | 1.54 | 1.20 |
| Company B C18 | 0.35 | 1.56 | 1.50 |
| Company C C18 | 0.42 | 1.57 | 1.25 |
| Company D C18 | 0.44 | 1.60 | 1.31 |
| Sunshell C18 | 0.39 | 1.60 | 1.46 |

BEST PEAK SHAPE AVAILABLE

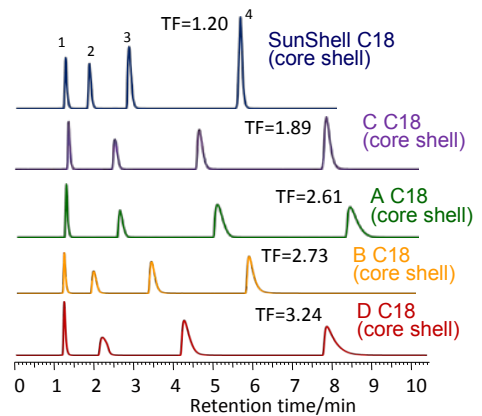
Amitriptyline overloads much more at acetonitrile/buffer mobile phase than methanol/buffer which causes tailing. Five kinds of core shell C18s were

compared as refers to loading capacity of amitriptyline. Thanks to the unique bonding technology Sunshell gives extraordinary peak shape, which means

better sensitivity and accuracy of the method.



Sample:
 1 = Uracil (0.07 μ g)
 2 = Propranolol (1.53 μ g)
 3 = Nortriptyline (0.32 μ g)
 4 = Amitriptyline (0.32 μ g)



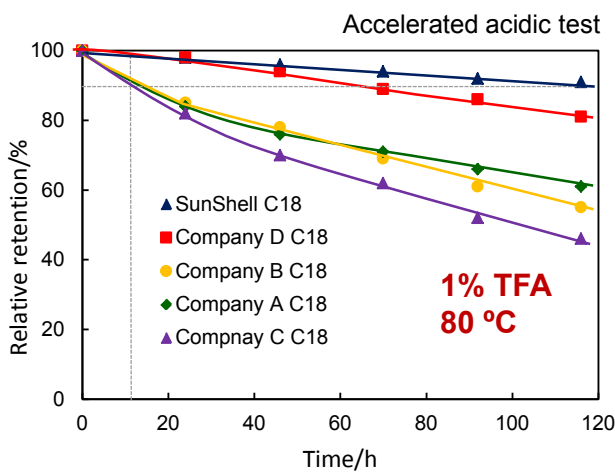
Mobile Phase:
 • Acetonitrile/20 mM phosphate buffer pH 7.0 (60/40)

Mobile Phase:
 • Acetonitrile/10 mM ammonium acetate pH 6.8 (40/60)

- Company A C18:** Kinetex C18
- Company B C18:** Accucore C18
- Company C C18:** PoroShell C18 EC
- Company D C18:** Ascentis Express C18

EXPANDED pH RANGE DUE TO THE SUNSHELL BONDING TECHNOLOGY

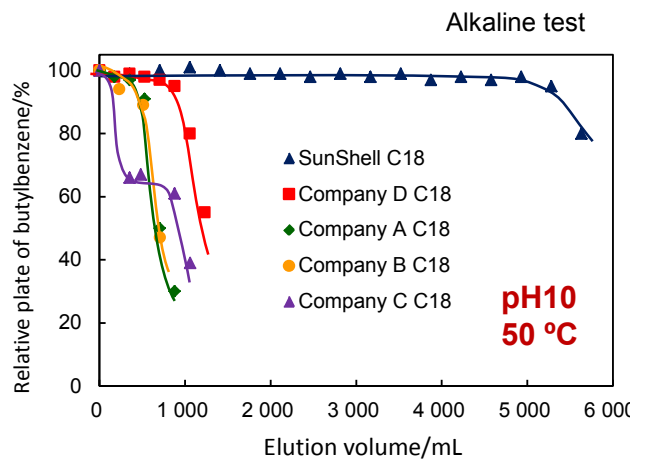
SUNSHELL C18 STABILITY



Durable test condition

Column size: 50 x 2.1 mm
 Mobile phase: CH₃CN/1.0% TFA, pH1=10/90
 Flow rate: 0.4 mL/min
 Temperature: 80 °C

Stability under acidic pH condition was evaluated at 80°C using acetonitrile/1% trifluoroacetic acid solution (10:90) as mobile phase. 100% aqueous mobile phase expels from the pores of C18 packing materials by capillarity and packing materials do not deteriorate. Adding 10% acetonitrile to the mobile phase enables accurate evaluation.



Durable test condition

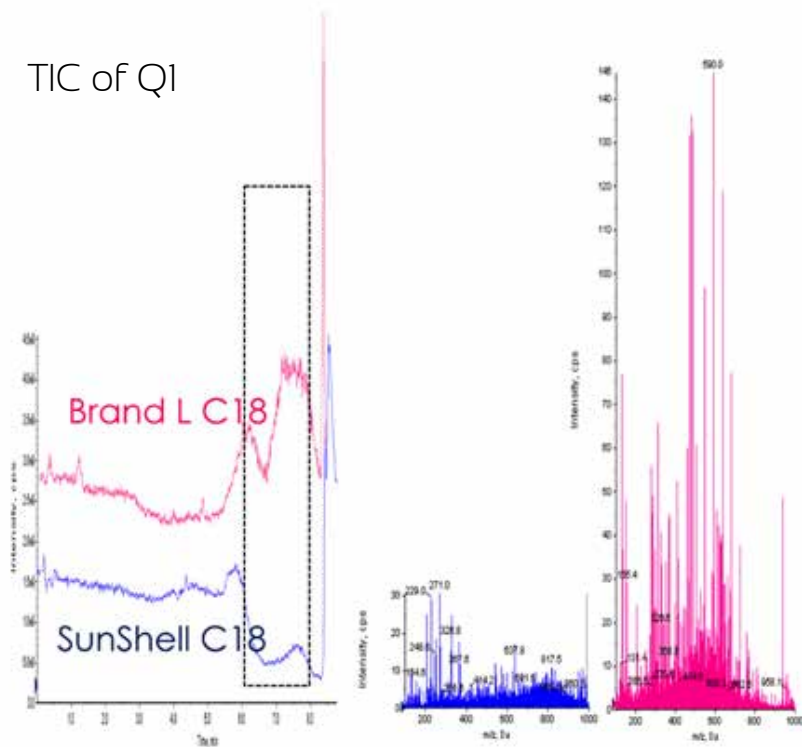
Column Size: 50 x 2.1 mm
 Mobile phase:
 CH₃OH/20mM Sodium borate/10mM NaOH=30/21/49 (pH10)
 Flow rate: 0.4 mL/min
 Temperature: 50 °C

Stability under basic pH condition was evaluated at 50°C using methanol/Sodium borate buffer pH 10 (30:70) as mobile phase. Sodium borate is used as an alkaline standard solution for pH meters, which allows for a high buffer capacity. Elevated temperature of 10°C reduces column life to one third. The other company shows stability when tested at ambient (room) temperature. If room temperature is 25°C, column life is sixteen times longer than at 50°C.

BLEEDING TEST USING LC/MS

The high stability of the SunShell columns also means low bleeding in LC/MS analysis as shown here.

TIC of Q1



Column size: 50 x 2.1 mm

Mobile phase:

A) 0.1% Acetic acid

B) CH₃CN

Gradient:

Time: 0min 1min 5min 7min

%B: 5% 5% 100% 100%

Flow rate: 0.4 mL/min

Temperature: 40 °C

MS: ABI API-4000 Ionization:

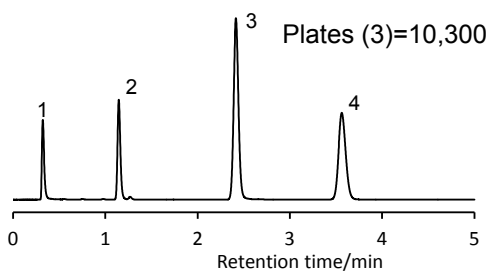
Turboionspray (cation)

Measurement mode:

Q1 Scan m/z 100-1000

SUNSHELL C18 EFFICIENCY

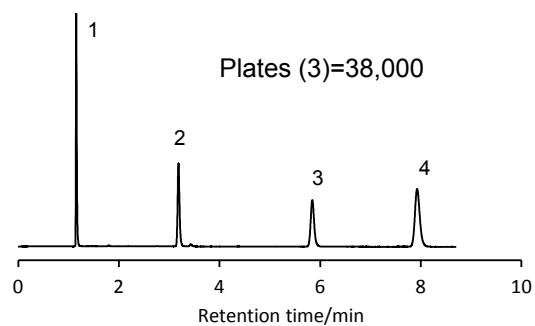
Column: SunShell C18, 2.6 μm 50 x 2.1 mm



Column: SunShell C18, 2.6 μm 50 x 2.1 mm
 Mobile phase: $\text{CH}_3\text{CN}/\text{H}_2\text{O}=60/40$
 Flow rate: 0.3 mL/min
 Pressure: 7 MPa
 Temperature: 23 °C
 UHPLC: Jasco X-LC

Sample: 1 = Uracil
 2 = Toluene
 3 = Acenaphthene
 4 = Butylbenzene

Column: SunShell C18, 2.6 μm 150 x 4.6 mm



Column: SunShell C18, 2.6 μm 150 x 4.6 mm
 Mobile phase: $\text{CH}_3\text{CN}/\text{H}_2\text{O}=70/30$
 Flow rate: 1.0 mL/min
 Pressure: 15.5MPa
 Temperature: 25 °C
 UHPLC: Jasco X-LC

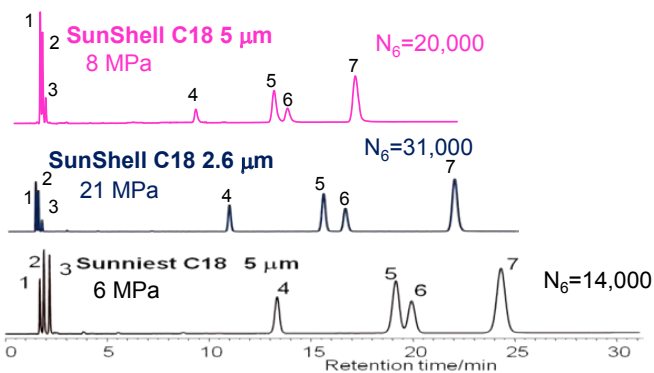
EFFICIENCY = 253,000 plates/m

| ORDERING INFO OF SUNSHELL | Inner diameter (mm) | 1.0 | 2.1 | 3.0 | 4.6 | USP category |
|---------------------------------|---------------------|------------|------------|------------|------------|--------------|
| | Length (mm) | Catalog no | Catalog no | Catalog no | Catalog no | Catalog no |
| Sunshell C18, 2.6 μm | 30 | --- | CB6931 | CB6331 | CB6431 | L1 |
| | 50 | CB6141 | CB6941 | CB6341 | CB6441 | |
| | 75 | --- | CB6951 | CB6351 | CB6451 | |
| | 100 | CB6161 | CB6961 | CB6361 | CB6461 | |
| | 150 | CB6171 | CB6971 | CB6371 | CB6471 | |
| | 250 | --- | --- | CB6381 | CB6481 | |



C18 - 5 μm

Can be used in any LI method - but with improved performance.



Column size: 150 x 4.6 mm
 Mobile phase: CH₃OH/H₂O=75/25
 Flow rate: 1.0 mL/min
 Temperature: 40° C
 Sample: 1 = Uracil
 2 = Caffeine
 3 = Phenol
 4 = Butylbenzene
 5 = o-Terphenyl
 6 = Amylbenzene
 7 = Triphenylene



HPLC: Hitachi LaChrom ELITE (Tubing, 0.25 mm i.d.)

| | Totally porous silica SunShell C18, 5 μm | | Core shell silica SunShell C18, 2.6 μm | | Core shell silica SunShell C18, 5 μm | |
|-------------------------------|--|----------------------|--|----------------------|--|----------------------|
| | Retention time (t_R) | Retention factor (k) | Retention time (t_R) | Retention factor (k) | Retention time (t_R) | Retention factor (k) |
| Specific surface area | 340 m ² /g | | 150 m ² /g | | 90 m ² /g | |
| 1) Uracil | 1.70 | 0 | 1.34 | 0 | 1.30 | 0 |
| 6) Amylbenzene | 19.96 | 10.74 | 16.56 | 11.36 | 13.43 | 9.33 |
| Relative value of Amylbenzene | 100% | 100% | 83% | 106% | 67% | 87% |

There is a small difference of k between totally porous and core shell particles.

| ORDERING INFO OF SUNSHELL | Inner diameter (mm) | 1.0 | 2.1 | 3.0 | 4.6 | USP category |
|-------------------------------|---------------------|------------|------------|------------|------------|--------------|
| | Length (mm) | Catalog no | Catalog no | Catalog no | Catalog no | Catalog no |
| Sunshell C18, 5 μm | 150 | --- | --- | CB3371 | CB3471 | L1 |
| | 250 | --- | --- | CB3381 | CB3481 | |