

2023

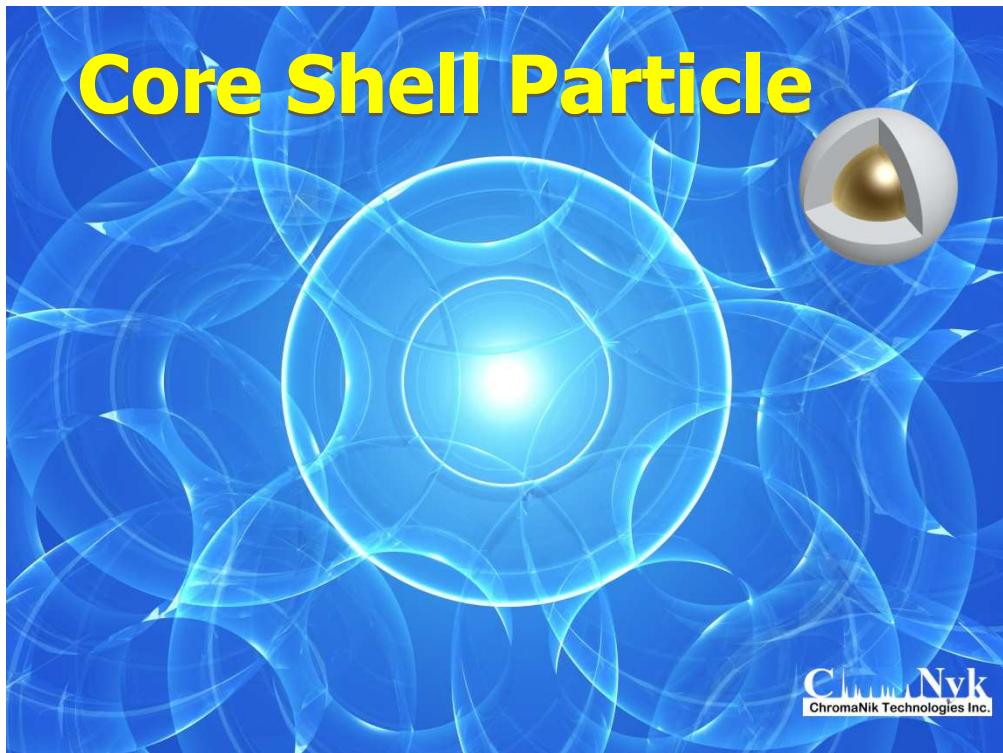


C18, C18-WP, HFC18-16, RP-AQUA, C8, C30, PFP, PFP&C18, Phenyl, Biphenyl, Cyano, C8-30HT, C4-100, HILIC-Amide, HILIC-S and 2-EP

SunShell

2 µm, 2.6 µm, 3.4 µm, 3.5 µm and 5 µm HPLC column

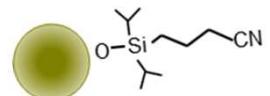
Core Shell Particle



ChromaNik
ChromaNik Technologies Inc.

New Product
SunShell Cyano

Diisopropylcyanopropyl group

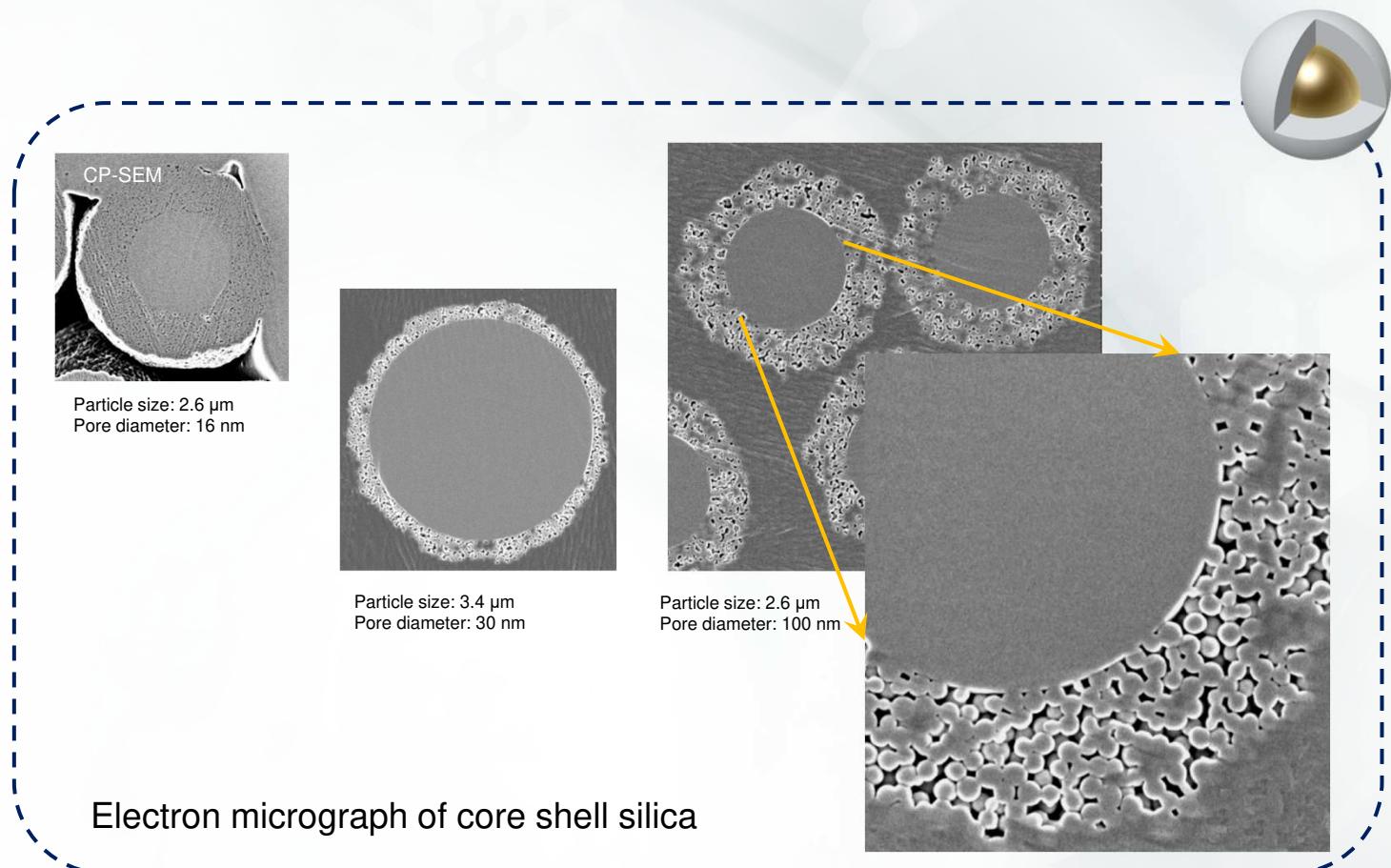


ChromaNik Technologies Inc.

HROMalytic +61(0)3 9762 2034
ECHnology Pty Ltd

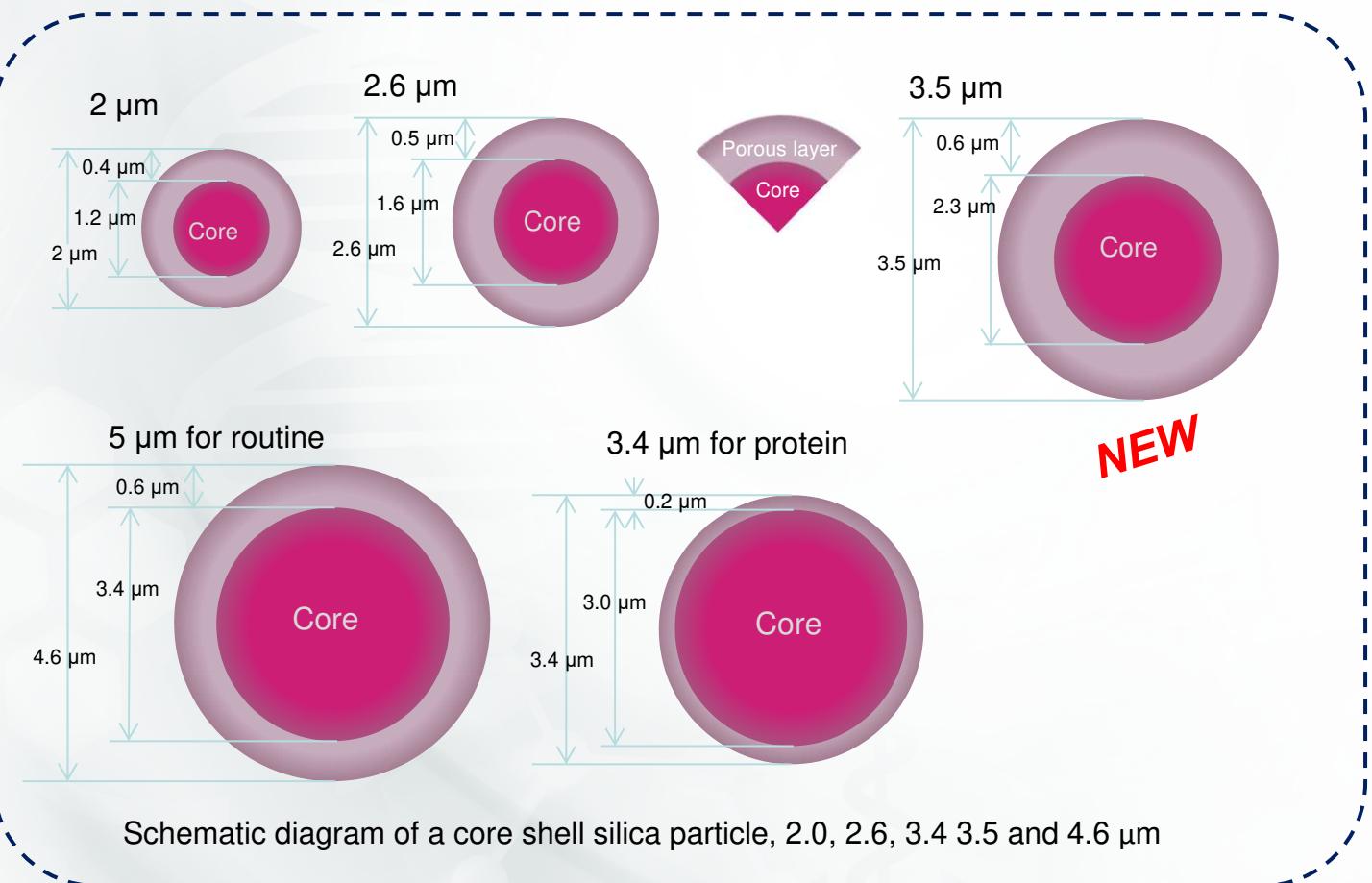
Website NEW : www.chromalytic.net.au E-mail : info@chromtech.net.au Tel: 03 9762 2034 . . . in AUSTRALIA

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Electron micrograph of core shell silica

Core shell silica particles were embedded in resin, cross-section processed by Ar ion milling, Os (osmium) vapor deposited for conduction treatment, and observation. You can see the core (fused silica) and the porous layer around it.



Schematic diagram of a core shell silica particle, 2.0, 2.6, 3.4 3.5 and 4.6 μm

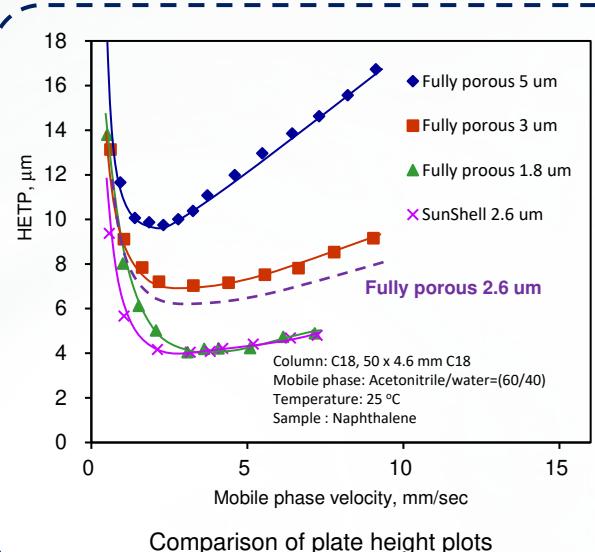
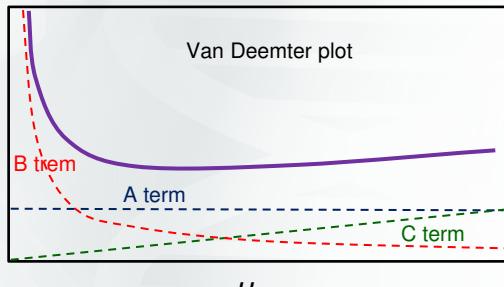
Why does a 2.6 μm core shell particle show the same performance as a sub 2 μm particle?



Van Deemter Equation

$$H = Ad_p + B \frac{D_m}{u} + C \frac{d_p^2}{D_m} u$$

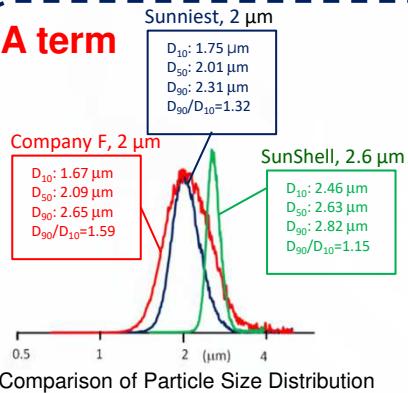
A term : Eddy diffusion(d_p is particle diameter)
 B term : Longitudinal diffusion
 (D_m is diffusion coefficient)
 C term : Mass transfer



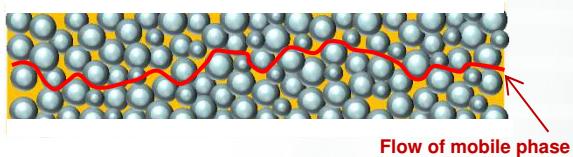
SunShell C18 shows same efficiency as a sub 2 μm C18. In comparison between fully porous 2.6 μm and core shell 2.6 μm (SunShell), SunShell shows lower values for A term, B term and C term of Van Deemter equation. The core shell structure leads higher performance to compare with the fully porous structure.

All terms in Van Deemter Equation reduce.

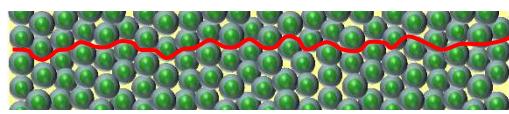
A term



Wide particle distribution (Conventional silica gel $D_{90}/D_{10}=1.50$)



Narrow particle distribution (core shell silica $D_{90}/D_{10}=1.15$)

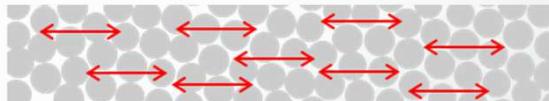


Diffusion of a solute is blocked by the existence of a core, so that a solute diffuses less in a core shell silica column than in a totally porous silica column. Consequently B term in Van Deemter Equation reduces in the core shell silica column.

The size distribution of a core shell (SunShell) particle is much narrower than that of a conventional totally porous particle, so that the space among particles in the column reduces and efficiency increases by reducing Eddy Diffusion (multi-path diffusion) as the A term in Van Deemter Equation.

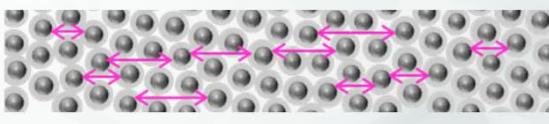
B term

Totally porous silica A solute diffuses in a pore as well as outside of particles.

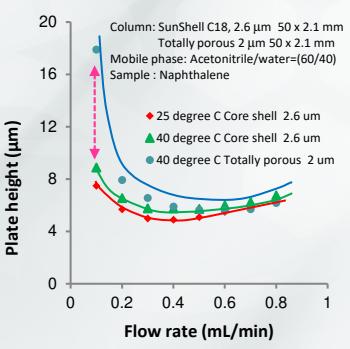


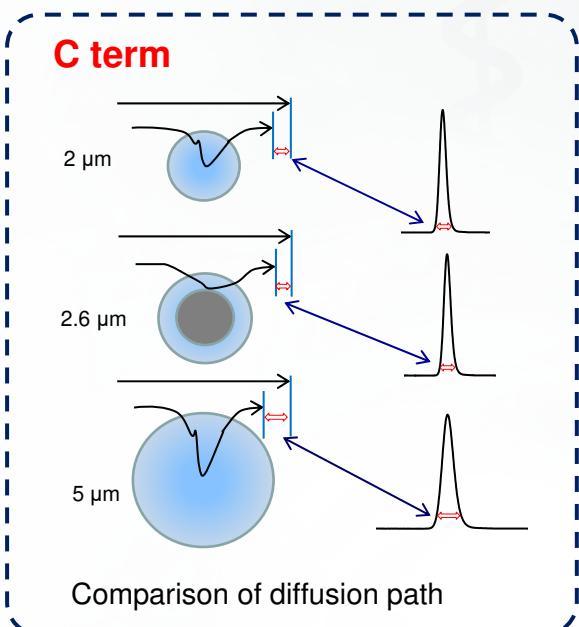
Core shell silica

A core without pores blocks diffusion of a solute.



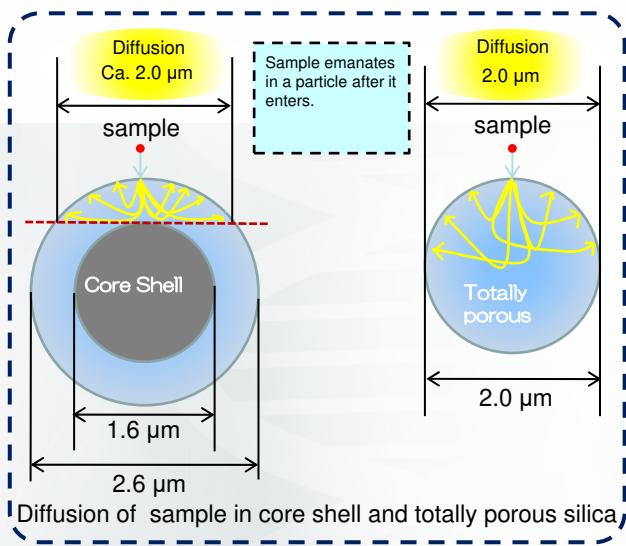
Difference of longitudinal diffusion





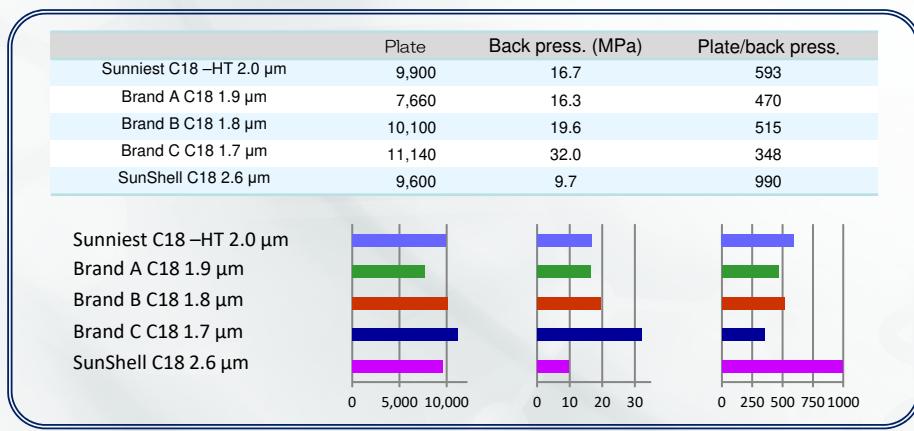
As shown in the left figure, a core shell particle has a core so that the diffusion path of samples shortens and mass transfer becomes fast. This means that the C term in Van Deemter Equation reduces. In other words, HETP (theoretical plate) is kept even if flow rate increases. A 2.6 μm core shell particle shows as same column efficiency as a totally porous sub-2 μm particle.

Considering diffusion of solute within pore



The left figure shows that a diffusion width of a sample in a 2.6 μm core shell particle and a 2 μm fully porous particle. Samples or solutes enter into the particle and move by diffusion, then they go out of a particle. In this moment, sample peak width is broadened. This broadening width is statistically same for 2.6 μm core shell particle and 2 μm fully porous particle. The 2.6 μm core shell particle is superficially porous, so that the diffusion width becomes narrower than particle size. Same diffusion means same efficiency.

Comparison of Performance by Plate/Pressure



Column: 50 x 2.1 mm C18, Mobile phase: Acetonitrile/water=(70/30), Temperature: 25 °C

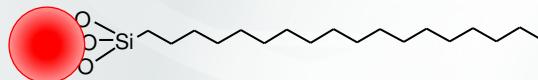
Back pressure and theoretical plate were compared for 2 μm and sub 2 μm C18 and 2.6 μm SunShell C18. All columns showed almost the same theoretical plate except for brand A C18 1.9 μm . However back pressure was not same. Especially Brand C C18 1.7 μm showed the highest back pressure. And SunShell C18 2.6 μm showed the lowest back pressure. On the comparison of theoretical plate per back pressure, SunShell indicated the largest value. This is a big advantage.

SUNHELL STATIONARY PHASE

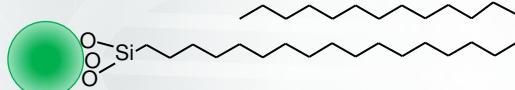


Reversed phase

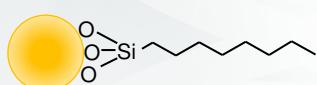
C18, C18-WP (7 page, 16 page, 20 page, SunShell Bio)



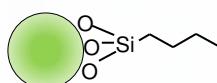
RP-AQUA, C30 (16 page, 19 page)



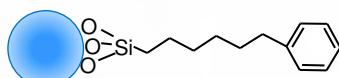
C8, C8-30HT (16 page, 20 page, 21 page)



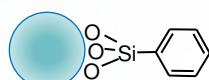
C4-100 (20 page, 21 page, SunShell Bio)



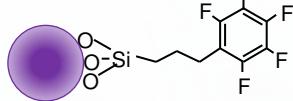
Phenyl (16 page)



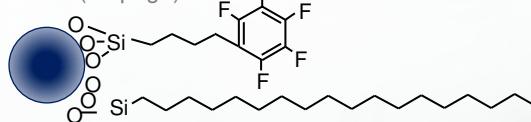
Phenyl (SunShell Bio)



PFP (16 page)

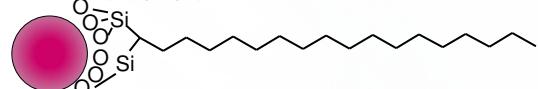


PFP&C18 (16 page)

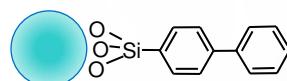


**All reversed phases except for PFP and PFP&C18 was end-capped at high temperature using Sunniest Endcapping technique.

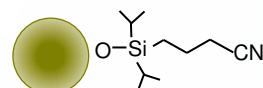
HFC18-16 (20 page)



Biphenyl (16 page)

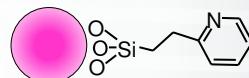


Cyano (16 page)

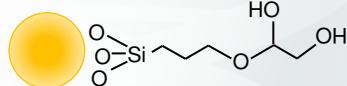


HILIC and SFC

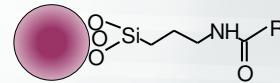
2EP (SunShell SFC)



Diol (SunShell SFC, SunShell HILIC)



HILIC-Amide (23 page, SunShell HILIC)



HILIC-Silica (23 page, SunShell SFC, SunShell HILIC)



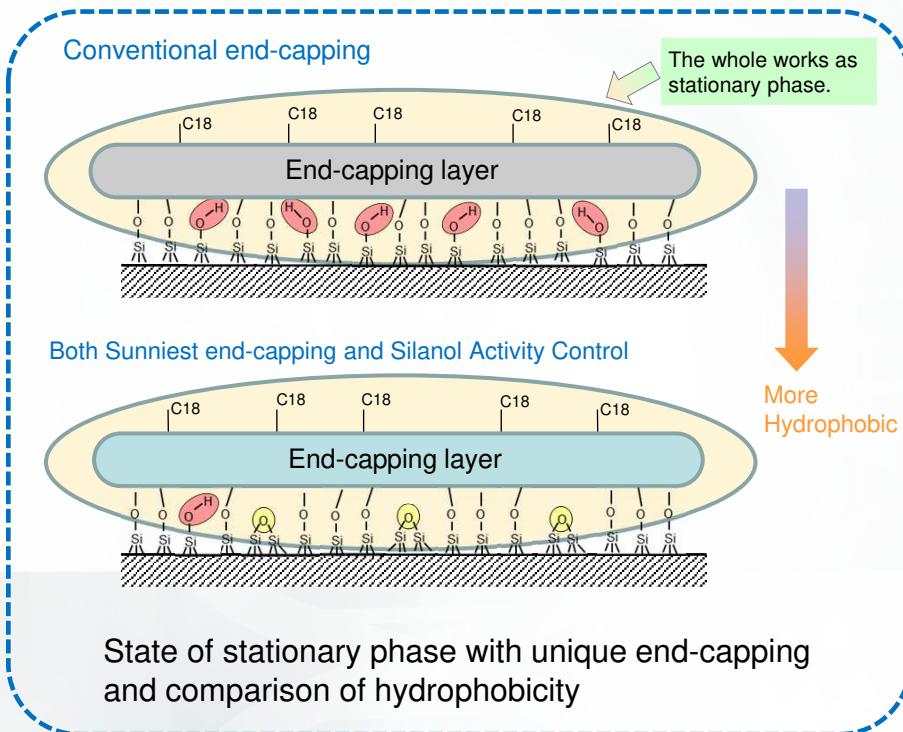
*Stationary phase for both SFC and HILIC was not end-capped.

SunShell Bio (1000Å), SunShell SFC and SunShell HILIC see individual catalogue.



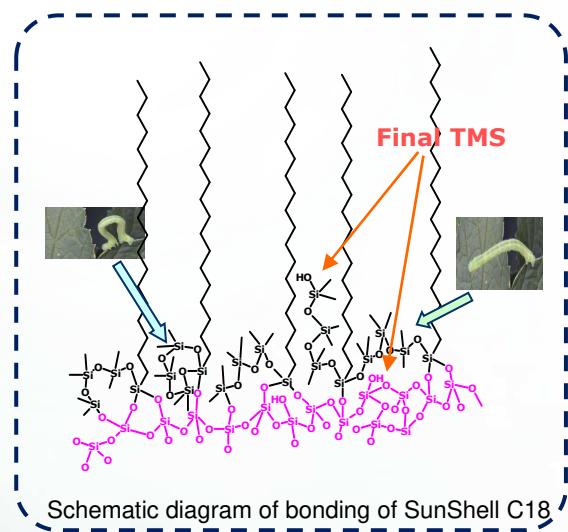
Unique end-capping by new concept

This figure shows comparison of hydrophobicity between two C18 stationary phases. We developed silanol activity control technique which was a reaction at extremely high temperature. This technique makes residual silanol groups change to siloxane bond. The upper one is a C18 phase with conventional end-capping and the lower one is a C18 phase with both Sunniest end-capping and silanol activity control. A residual silanol group contributes as a polar site and makes hydrophobicity of stationary phase decrease. On the other hand siloxane bond in the lower one doesn't make hydrophobicity decrease. Consequently the lower one is more hydrophobic than the upper one.



End-capping method

- 1) Unique end-capping reagent
<<Hexamethyltrisiloxane>>
- 2) Secondly TMS end-capping



An end-capping of hexamethyltrisiloxane works as an arm. This arm moves like a Geometrid caterpillar, so that a functional group on the tip of the arm can bond with a silanol group which is located anywhere. Finally TMS reagent is bonded to a remaining silanol group.

SunShell C18, 2 µm, 2.6 µm, 3.5 µm, 5 µm



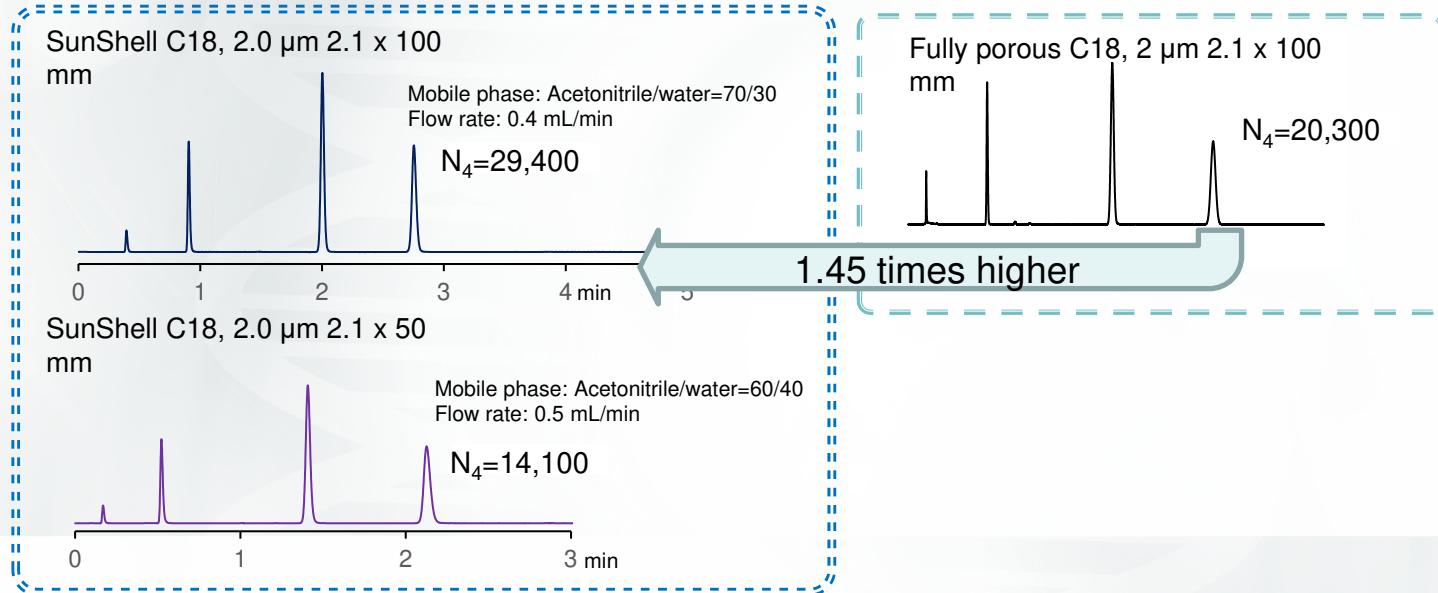
Characteristics of SunShell C18

NEW

	Core shell silica			C18 (USP L1)				
	Particle size	Pore diameter	Specific surface area	Carbon content	Bonded phase	End-capping	Maximum operating pressure ^a	Available pH range
SunShell C18	2.0 µm	9 nm	120 m ² /g	6.5%	C18	Sunniest endcapping	100 MPa or 14504 psi	1.5 - 10
SunShell C18	2.6 µm	9 nm	150 m ² /g	7%	C18	Sunniest endcapping	60 MPa or 8,570 psi	1.5 - 10
SunShell C18	3.5 µm	9 nm	120 m ² /g	6.5%	C18	Sunniest endcapping	60 MPa or 8,570 psi	1.5 - 10
SunShell C18	4.6 µm	9 nm	90 m ² /g	5.5%	C18	Sunniest endcapping	50 MPa or 7,141 psi	1.5 - 10

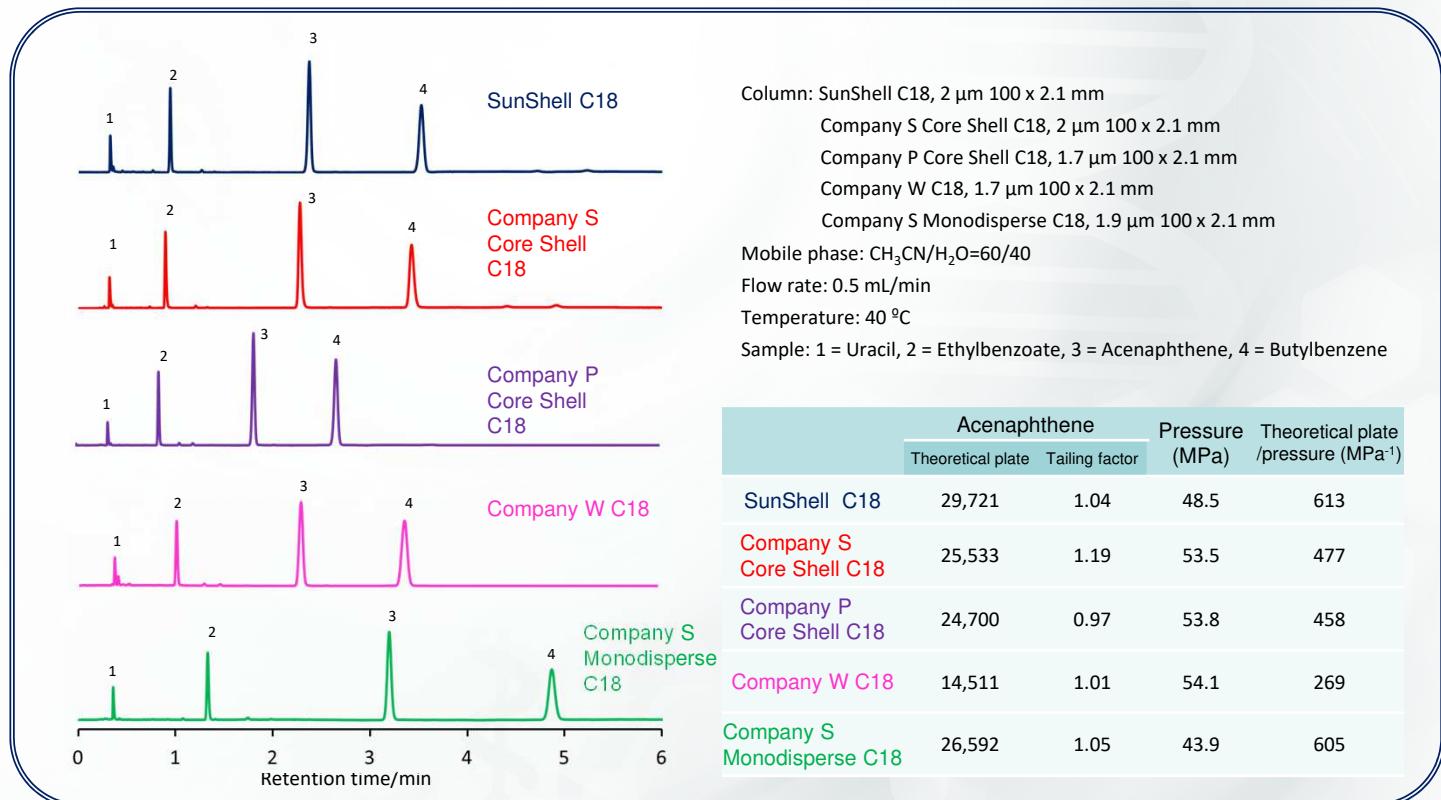
a) Unless otherwise specified in the column test report

Core Shell particle shows 1.4 to 1.5 times higher plate than fully porous particle.



Theoretical plate and tailing factor

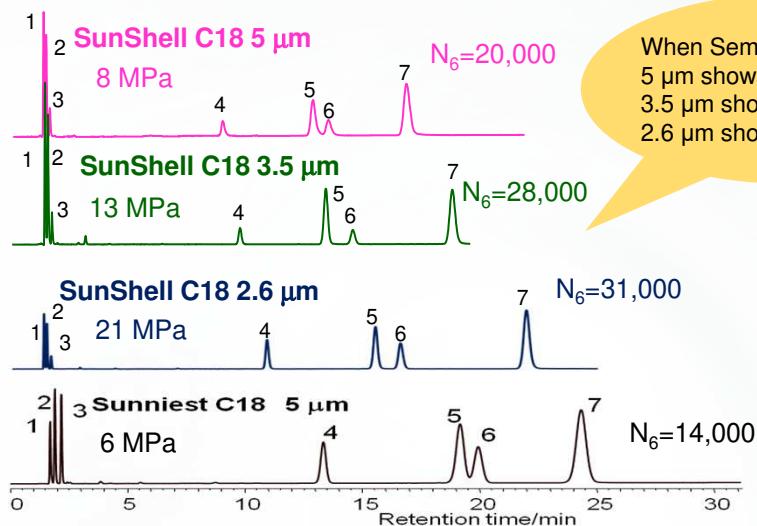
Used columns: SunShell C18 2 µm, Ascentis Express C18 2 µm, Kinetex C18 1.7 µm, Acquity BEH C18 1.7 µm, Titan C18 1.9 µm



*Ascentis Express is a registered trade mark of Sigma Aldrich. Titan is a registered trade mark of Sigma Aldrich.
Comparative separations may not be representative of all applications.



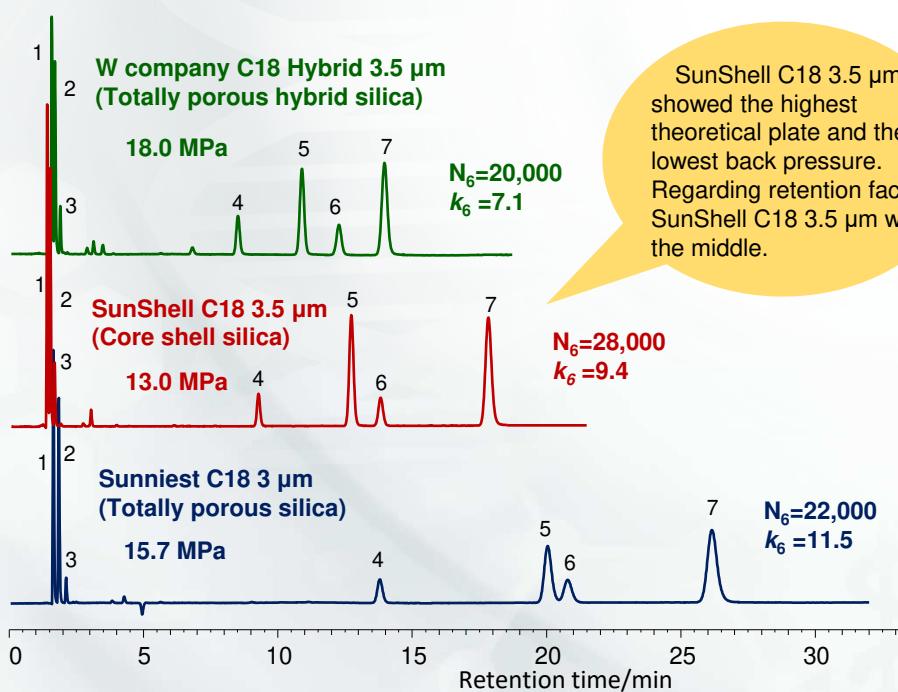
Comparison of retention and plate using HPLC



Column size: 150 x 4.6 mm
 Mobile phase: $\text{CH}_3\text{OH}/\text{H}_2\text{O}=75/25$
 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 Sunniest C18, 5 μm	Core shell silica SunShell C18, 2.6 μm		Core shell silica SunShell C18, 3.5 μm		Core shell silica SunShell C18, 5 μm	
Specific surface area	340 m ² /g	150 m ² /g		120 m ² /g		90 m ² /g	
Packings weight (150x4.6mm)	1.5 g	2.7 g		2.7 g		3.2 g	
Surface area in a column	510 m ² /g (100%)	405 m ² /g (79%)		324 m ² /g (64%)		288 m ² /g (56%)	
	Retention time (t_R)	Retention factor (k)	Retention time (t_R)	Retention factor (k)	Retention time (t_R)	Retention factor (k)	Retention time (t_R)
1) Uracil	1.70	0	1.34	0	1.33	0	1.30
6) Amylbenzene	19.96	10.74	16.56	11.36	13.90	9.45	12.43
Relative value of Amylbenzene	100%	100%	83%	106%	70%	88%	63%
							80%

Comparison between porous C18 and SunShell C18 3.5 μm column

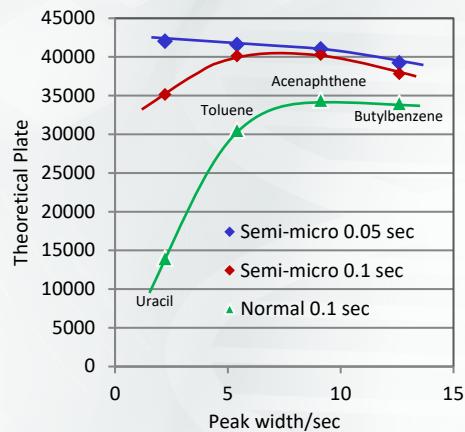
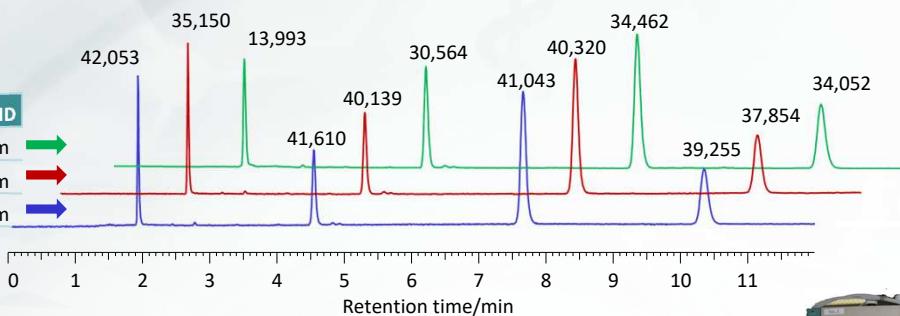


Column size: 150 x 4.6 mm
 Mobile phase: $\text{CH}_3\text{OH}/\text{H}_2\text{O}=75/25$
 Flow rate: 1.0 mL/min
 Temperature: 40 °C
 Sample: 1 = Uracil
 2 = Caffeine
 3 = Phenol
 4 = Butylbenzene
 5 = o-Terphenyl
 6 = Amylbenzene
 7 = Triphenylene
 HPLC: Conventional HPLC instrument (Tubing, 0.25 mm i.d.)



Comparison between normal and semi-micro HPLC

Flow cell	Response	Sampling	Tubing ID
Normal	0.1 sec	0.4 sec	0.25 mm
Semi-micro	0.1 sec	0.4 sec	0.13 mm
Semi-micro	0.05 sec	0.05 sec	0.13 mm



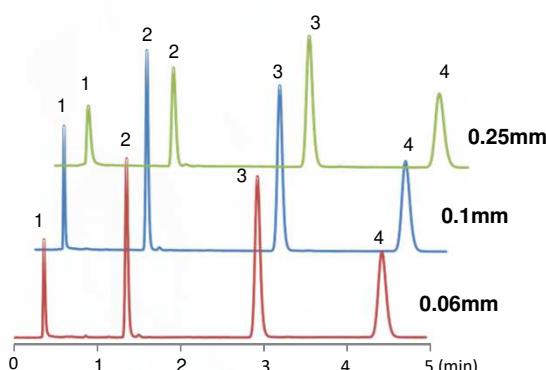
Comparison of chromatograms

Column:
SunShell C18, 5 μ m 250 x 4.6 mm
Mobile phase:
 $\text{CH}_3\text{CN}/\text{H}_2\text{O} = 70/30$
Flow rate: 1.0 mL/min
Temperature: 40 °C
Pressure: 6.7 MPa
Detection: UV@250 nm
Sample: 1 = Uracil
2 = Toluene
3 = Acenaphthene
4 = Butylbenzene
HPLC: Hitachi LaChrom ELITE



Semi-micro HPLC derives near 100% performance of a core shell column. Even if normal HPLC is used, it derives 80% performance except for a narrow peak whose width is less than 5 second

Effect of inner diameter of tubing



Average of theoretical plate (n=3)

Inner diameter of tubing	0.06mm	0.1mm	0.25mm
Peak (1)	792	785	246
Peak (2)	7790	7652	3535
Peak (3)	10704	10345	7998
Peak (4)	10113	9772	7689

Column: SunShell C18, 2.6 μ m 50 x 2.1 mm

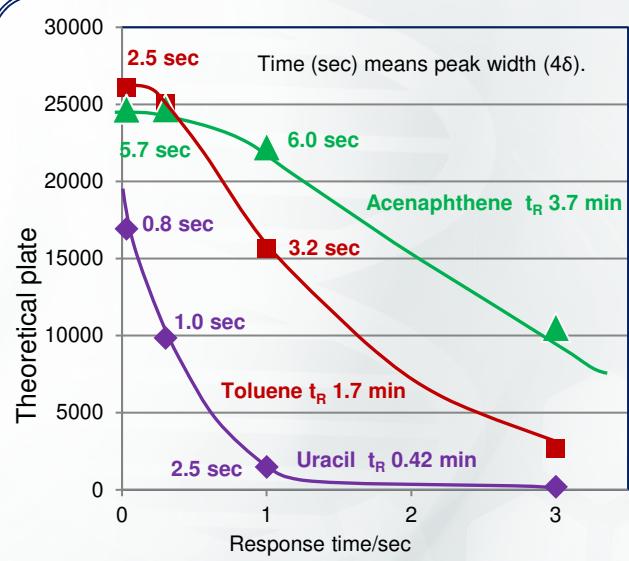
Mobile phase: $\text{CH}_3\text{CN}/\text{H}_2\text{O}=60/40$

Flow rate: 0.3 mL/min Temperature: Ambient

Tube length: 30 cm (Peak, from the column to the flow cell)

Instrument: X-LC(JASCO) Response time: 0.01 sec

Effect of response time of detector



Column: SunShell C18, 2.6 μ m 100 x 4.6 mm

Mobile phase: $\text{CH}_3\text{CN}/\text{H}_2\text{O}=60/40$

Flow rate: 1.8 mL/min Temperature: Ambient

Sample: Toluene Tube: i.d.0.1mm x 20 cm Peeksil

Instrument: X-LC(JASCO)

The above theoretical plate was compared changing the inner diameter of tubing between a column and a flow cell of the detector. A tubing with a large inner diameter has a large dead volume, so that it makes the peak width be wide. As a result, theoretical plate decreases. I recommend to use the tubing with 0.1 mm or less than 0.1 mm inner diameter for core shell columns.

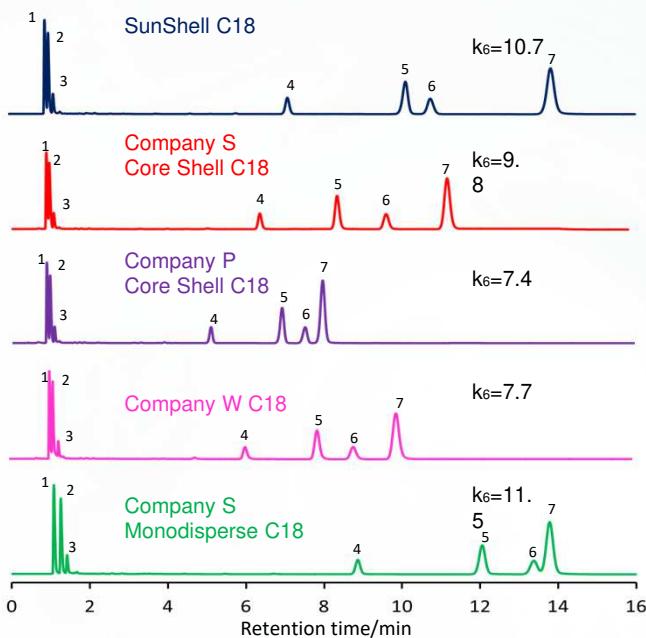
The response time of a detector is important. Regarding uracil, the real peak width is less than 0.8 sec. When the peak width is less than 1 sec, 0.03 sec of response time is needed. Furthermore, the sampling rate of an integrator should be set to be 0.1 sec.

SunShell C18 2 µm

Comparison of core shell 2 µm and totally porous sub 2 µm

Used columns: SunShell C18 2 µm, Ascentis Express C18 2 µm, Kinetex C18 1.7 µm, Acquity BEH C18 1.7 µm, Titan C18 1.9 µm

Separation of standard samples



Column: SunShell C18, 2 µm 100 x 2.1 mm
 Company S Core Shell C18, 2 µm 100 x 2.1 mm
 Company P Core Shell C18, 1.7 µm 100 x 2.1 mm
 Company W C18, 1.7 µm 100 x 2.1 mm
 Company S Monodisperse C18, 1.9 µm 100 x 2.1 mm

Mobile phase: CH₃OH/H₂O=75/25

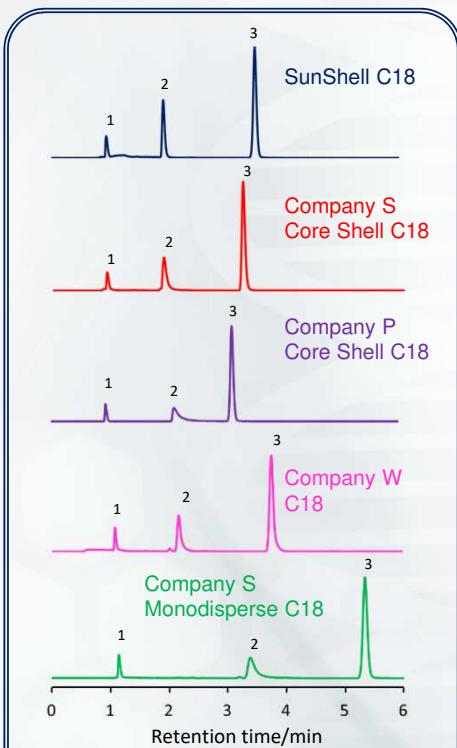
Flow rate: 0.2 mL/min

Temperature: 40 °C

Sample: 1 = Uracil, 2 = Caffeine, 3 = Phenol, 4 = Butylbenzene
 5 = o-Terphenyl, 6 = Amylbenzene, 7 = Triphenylene

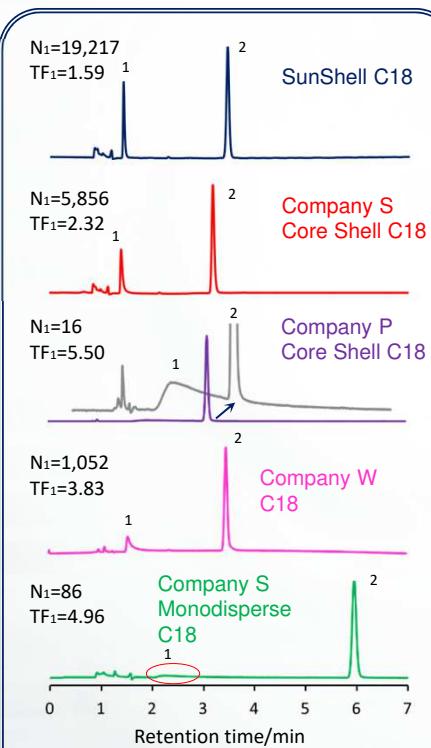
	Hydrogen bonding (Caffeine/Phenol)	Hydrophobicity (Ammelbenze/Butylbenzene)	Steric selectivity (Triphenylene/o-Terphenyl)
SunShell C18	0.43	1.59	1.41
Company S Core Shell C18	0.37	1.59	1.38
Company P Core Shell C18	0.45	1.57	1.17
Company W C18	0.35	1.55	1.30
Company S Monodisperse C18	0.53	1.58	1.16

Comparison of Pyridine (2) as a basic compound



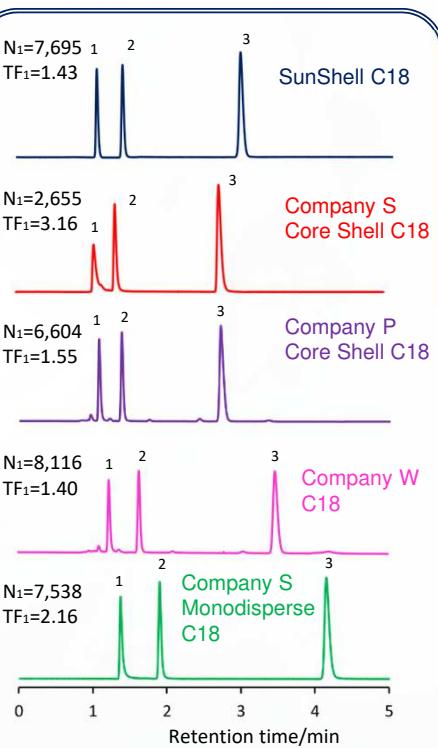
Column dimension: 100 x 2.1 mm
 Mobile phase: CH₃OH/H₂O=30/70
 Flow rate: 0.2 mL/min
 Temperature: 40 °C
 Detection: UV@250nm
 Sample: 1 = Uracil
 2 = Pyridine
 3 = Phenol

Comparison of Oxine (1) as a metal chelating compound



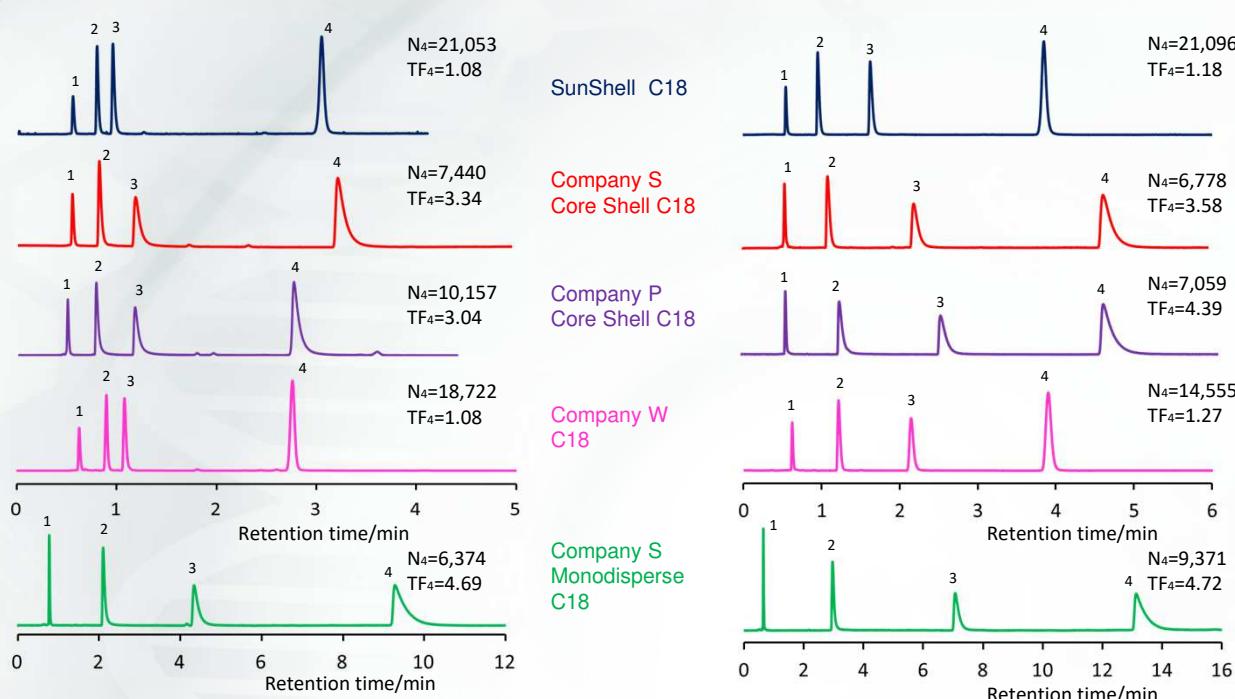
Column dimension: 100 x 2.1 mm
 Mobile phase: CH₃CN/20mM H₃PO₄=10/90
 Flow rate: 0.2 mL/min
 Temperature: 40 °C
 Detection: UV@250nm
 Sample: 1 = 8-Quinolinol (Oxine)
 2 = Caffeine

Comparison of Formic acid (1) as an acidic compound



Column dimension: 100 x 2.1 mm
 Mobile phase: CH₃CN/0.1% H₃PO₄=2/98
 Flow rate: 0.2 mL/min
 Temperature: 40 °C
 Detection: UV@210nm
 Sample: 1 = Formic acid
 2 = Acetic acid
 3 = Propionic Acid

Comparison of Amitriptyline (4) as a strong basic compound



Column dimension: 100 x 2.1 mm

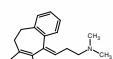
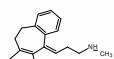
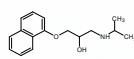
Mobile phase: CH₃CN/20 mM Phosphate buffer pH 7.0=60/40

Flow rate: 0.3 mL/min

Temperature: 40 °C

Detection: UV@250 nm

Sample: 1 = Uracil, 2 = Propranolol, 3 = Nortriptyline, 4 = Amitriptyline



Column dimension: 100 x 2.1 mm

Mobile phase: CH₃CN/10 mM ammonium acetate pH 6.8=40/60

Flow rate: 0.3 mL/min

Temperature: 40 °C

Detection: UV@250 nm

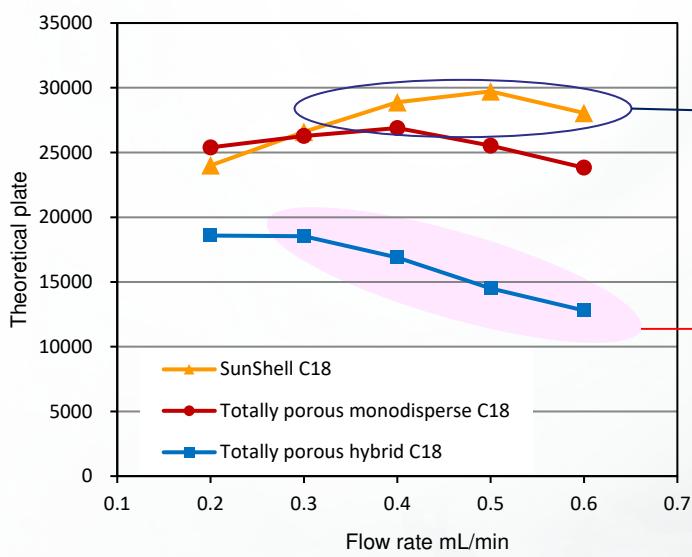
Sample: 1 = Uracil

2 = Propranolol

3 = Nortriptyline

4 = Amitriptyline

Decreasing of theoretical plate due to frictional heating effect



Core shell silica has a solid core (non-porous silica), so that thermal conductivity is high in the column. There is no influence of reducing theoretical plate by frictional heating.

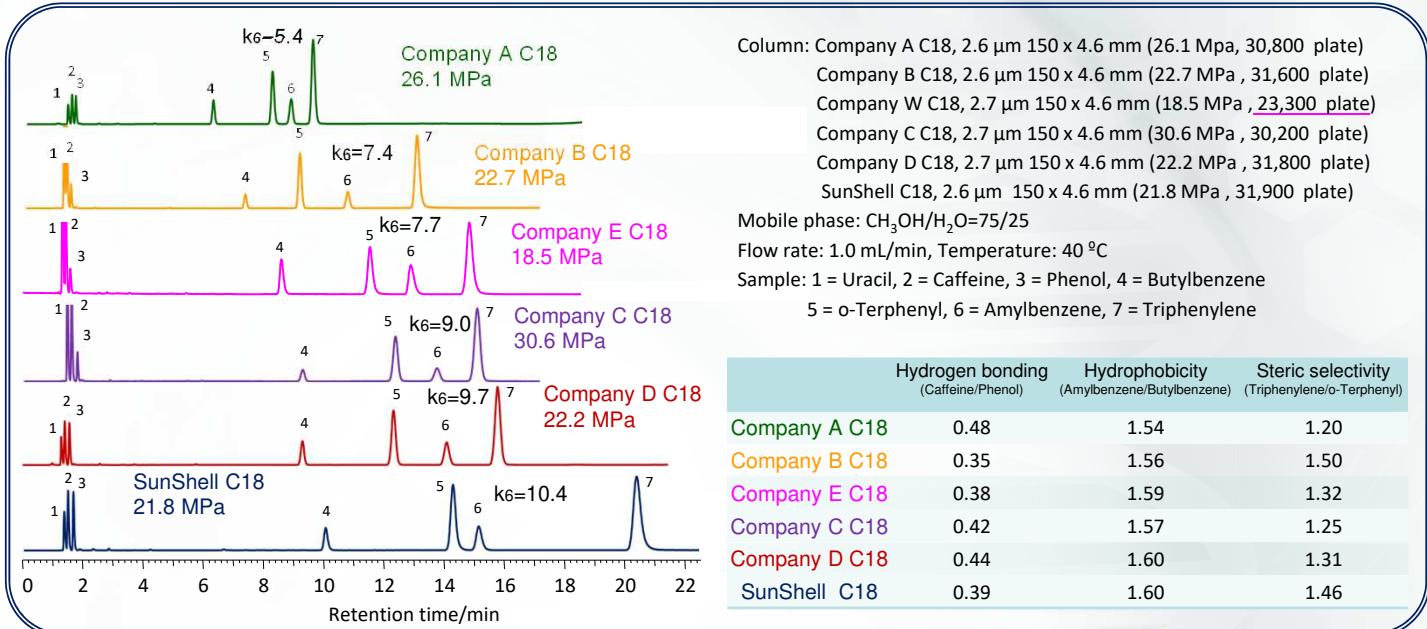
Regarding totally porous hybrid silica, not only totally porous structure but also including ethylene groups make thermal conductivity be low in the column. It is considered that frictional heating deflects thermal distribution in the column and theoretical plate decreases..

Column: 100 x 2.1 mm
Mobile phase: CH₃CN/H₂O=60/40
Temperature: 40 °C
Sample: Acenaphthene,



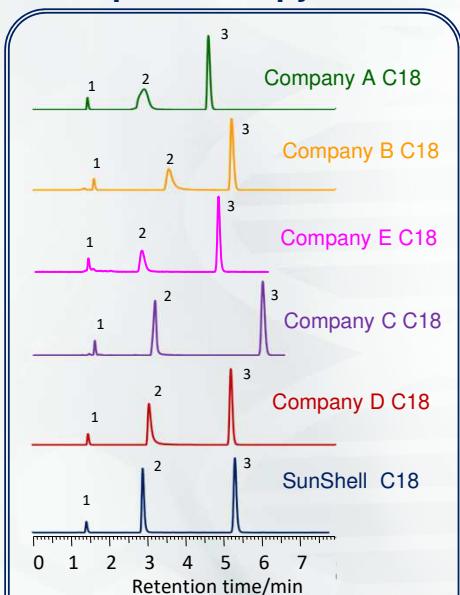
Comparison of core shell 2.6 μm columns

Comparison of standard samples among core shell C18s

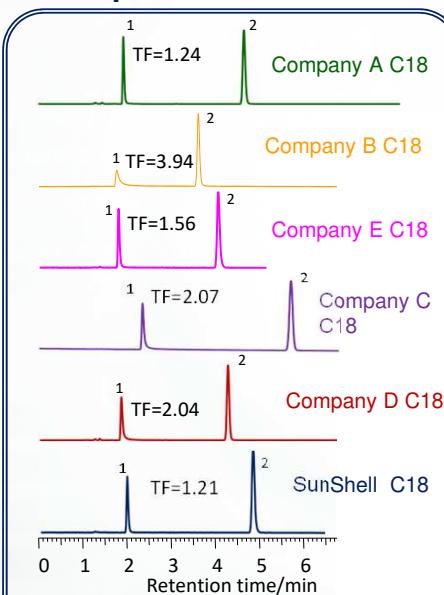


Retention of standard samples and back pressure were compared for six kinds of core shell type C18s. Company A C18 showed only a half retention to compare with SunShell C18. Steric selectivity becomes large when ligand density on the surface is high. SunShell C18 has the largest steric selectivity so that it has the highest ligand density. This leads the longest retention time.

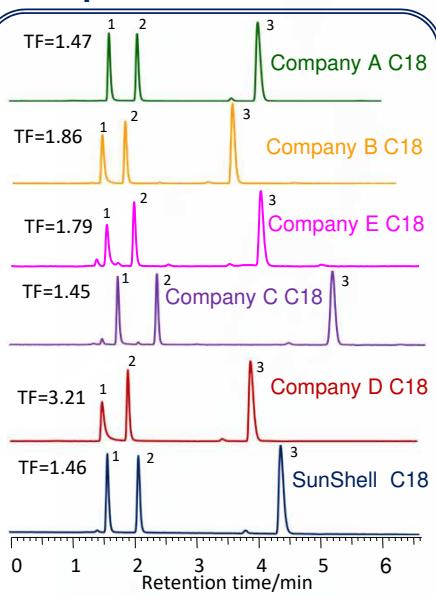
Comparison of pyridine



Comparison of Oxine



Comparison of formic acid



Residual silanol groups make pyridine be tailing under methanol/water mobile phase condition. SunShell C18 shows a sharp peak for pyridine.

8-Quinolinol (Oxine) is a metal chelating compound. Metal impurities in the core shell particle leads the tailing for oxine peak

Formic acid is used as an indicator for acidic inertness. SunShell and Company A and C C18 show a sharp peak.

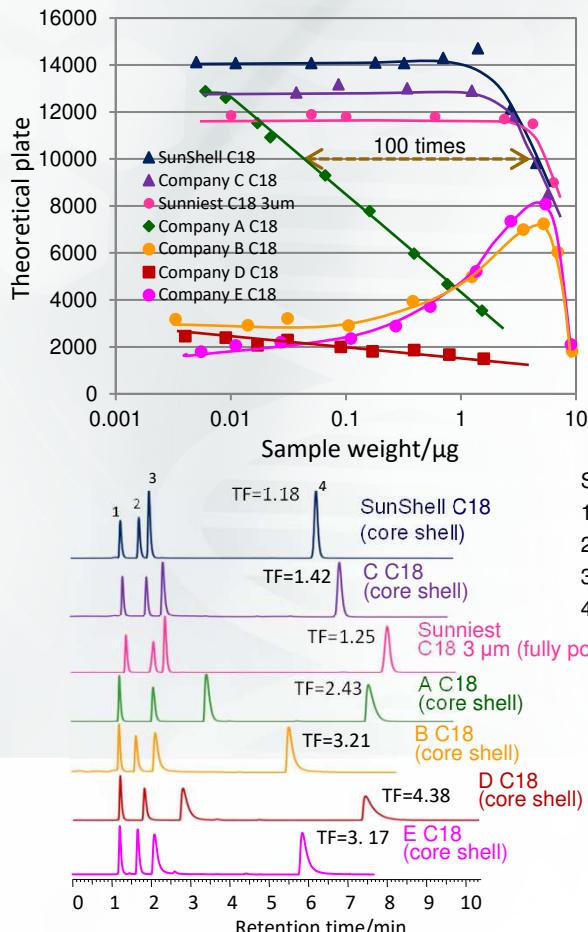


Loading capacity of amitriptyline as a basic compound

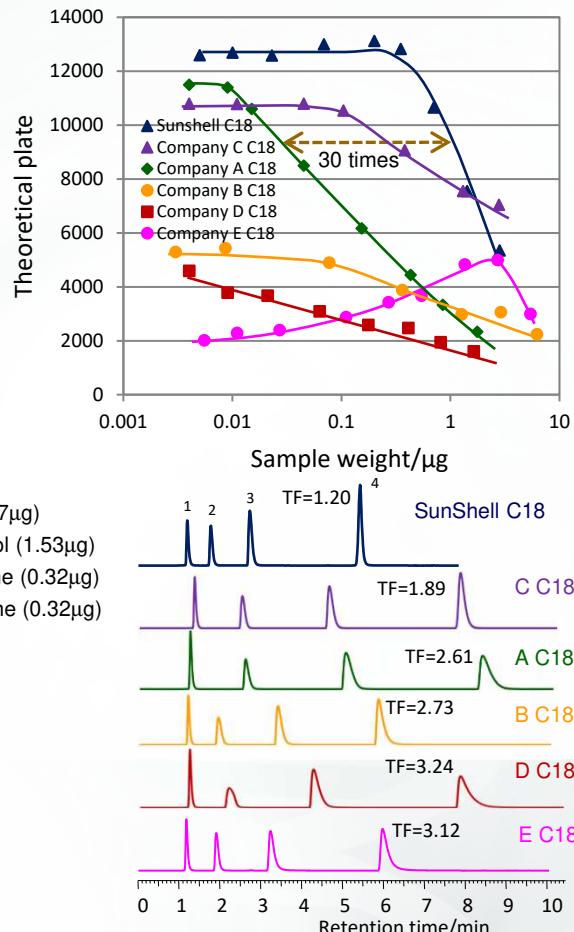
Amitriptyline overloads much more at acetonitrile/buffer mobile phase than methanol/buffer. Three kinds of core shell C18s were compared loading capacity of amitriptyline at three different mobile phases.

Common condition: Column dimension, 150 x 4.6 mm, flow rate; 1.0 mL/min, temperature; 40 °C

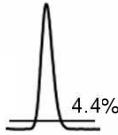
Mobile phase: Acetonitrile/**20mM phosphate buffer pH7.0=**(60:40)



Mobile phase: Acetonitrile/**10mM acetate ammonium pH6.8=**(40:60)



Theoretical plate was calculated by 5σ method using peak width at 4.4% of peak height.



Physical properties

	Carbon loading (%)	Specific surface area ^a (m ² /g)	Pore volume ^a (mL)	Pore diameter ^a (nm)
SunShell C18	7.3 (7) ^b	125 (150) ^b	0.261	8.34 (9) ^b
Ascentis Express C18	8.0	133 (150) ^b	0.278	8.20 (9) ^b
PoroShell C18 EC	8.5 (8) ^b	135 (130) ^b	0.414	12.3 (12) ^b
Accucore C18	8.8 (9) ^b	130 (130) ^b	0.273	8.39 (8) ^b
Cortecs C18	7.3 (6.6) ^b	113	0.264	9.32
Kinetex C18	4.9 (12 effective) ^b	102 (200 effective) ^b	0.237	9.25 (10) ^b

a. Measured after sintered at 600 degree Celsius for 8 hours.

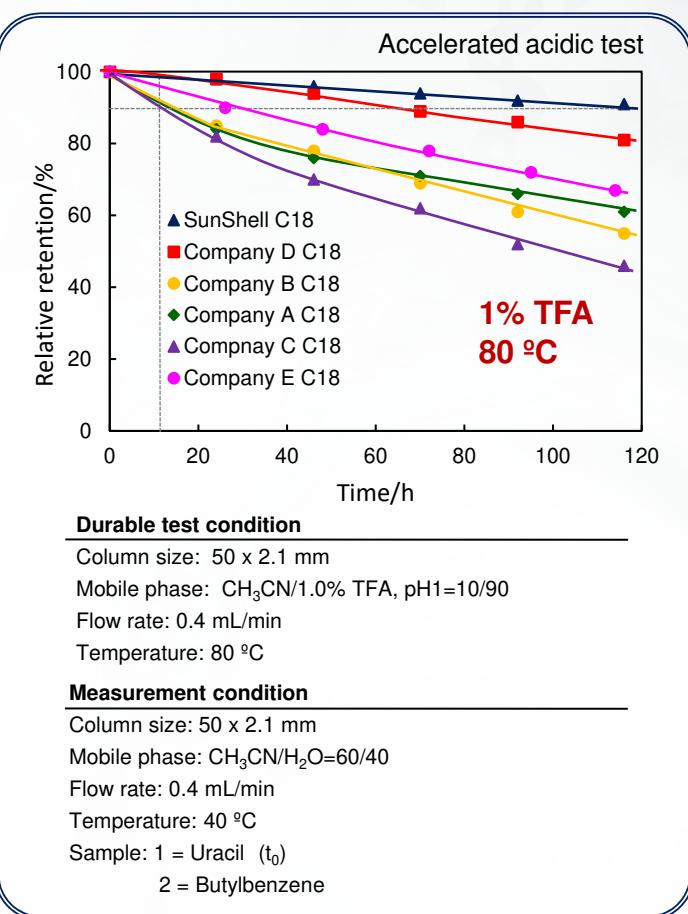
b. Value cited in company brochure or literature.

Comparison column
 1. Kinetex C18, 2.6 μm
 2. Accucore C18, 2.6 μm
 3. PoroShell C18 EC, 2.7 μm
 4. Ascentis Express C18, 2.7 μm
 5. Cortecs C18 2.7 μm
 6. SunShell C18, 2.6 μm



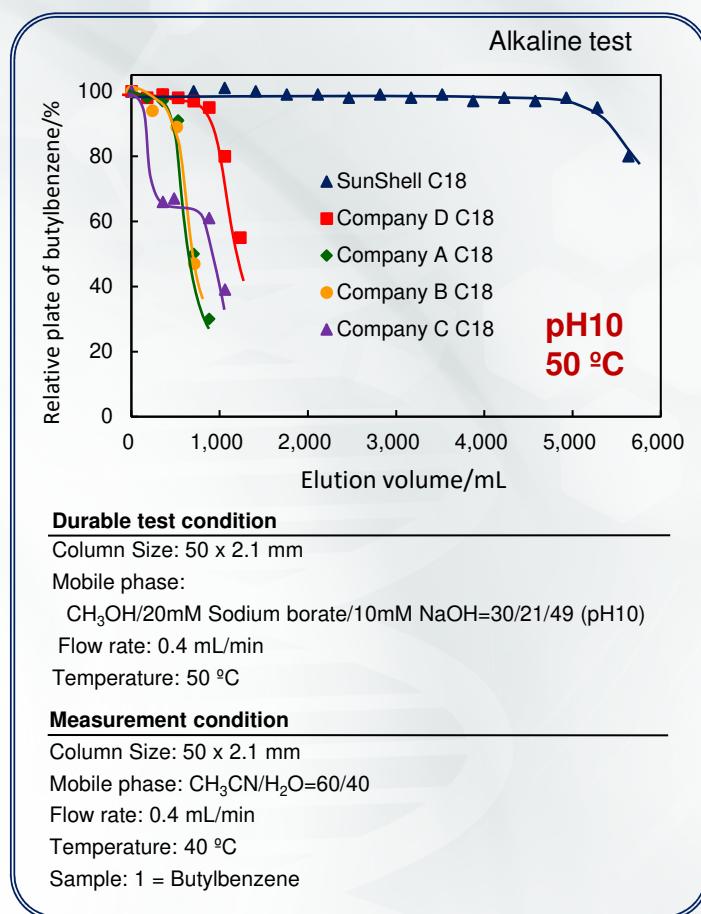
All columns are core shell type. All columns sized 150 x 4.6 mm except for company E show 38,000 to 40,000 plates for a neutral compound. However regarding a basic compound like amitriptyline, SunShell C18 and company C C18 showed a good peak, while Company A, B and D C18 showed a poor peak. Company A C18 overloaded at more than 0.01 μg of amitriptyline while SunShell C18 overloaded at more than from 0.3 to 1 μg of amitriptyline. Surprisingly loading capacity of company A C18 was only one hundredth to compare with SunShell C18 under acetonitrile/20mM phosphate buffer pH7.0=(60:40) mobile phase. Company D C18 always showed poor peak of amitriptyline.

◆Evaluation of Stability



Stability under acidic pH condition was evaluated at 80 °C using acetonitrile/1% trifluoroacetic acid solution (10:90).

★ Sunshell C18 has kept 90% retention for 100 hours under such a severe condition. SunShell C18 is 5 to 10 times more stable than the other core shell C18.

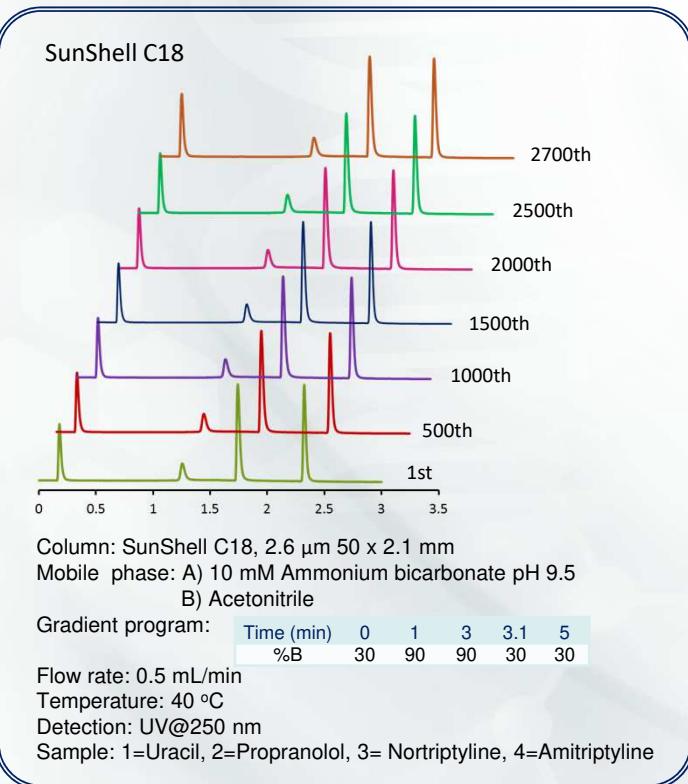


Stability under basic pH condition was evaluated at 50 °C using methanol/Sodium borate buffer pH 10 (30:70) as a mobile phase. Sodium borate is used as a alkaline standard solution for pH meter, so that its buffer capacity is high.

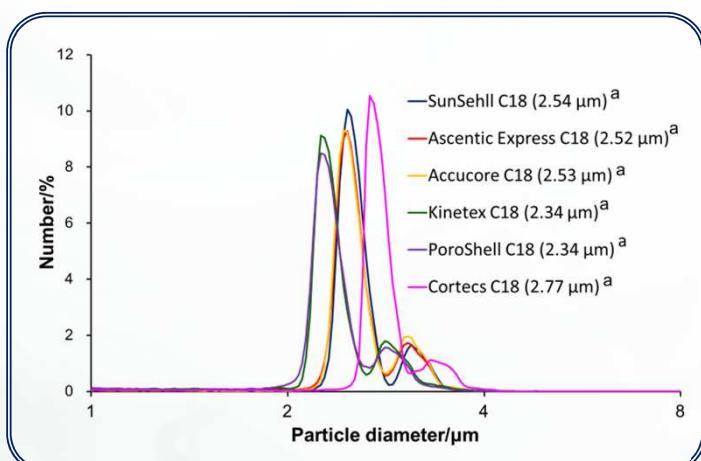
Elevated temperature of 10 °C makes column life be one third. The other company shows stability test at ambient (room temperature). If room temperature is 25 °C, column life at room temperature (25 °C) is sixteen times longer than that at 50 °C.

★ SunShell C18 is enough stable even if it is used under pH 10 condition. Regarding stability under basic pH condition, there is little C18 column like SunShell C18 except for hybrid type C18. It is considered that our end-capping technique leads high stability.

◆Continuous analysis under pH9.5 condition



◆Comparison of particle size

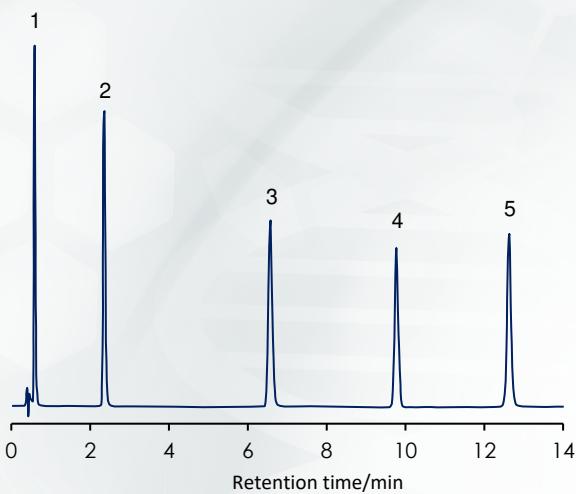


^aMeasured using Beckman Coulter Multisizer 3 after C18 materials were sintered at 600 degree Celsius for 8 hours. The measured value of each sintered core shell silica is considered to be different from that of the original core shell silica.

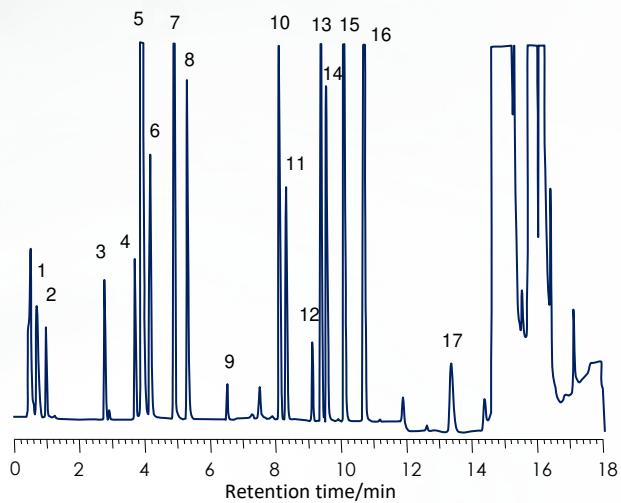
a. Median particle size

SunShell

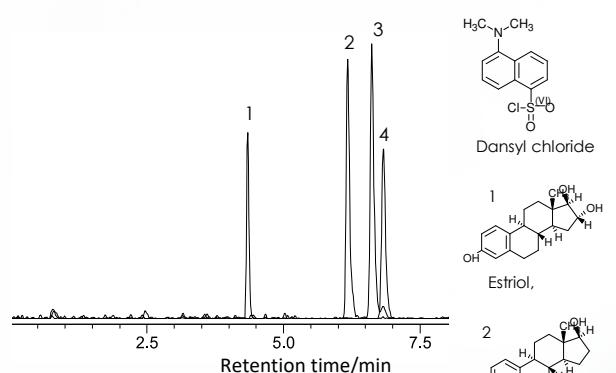
Peptides (using the 1.0 mm i.d. column)



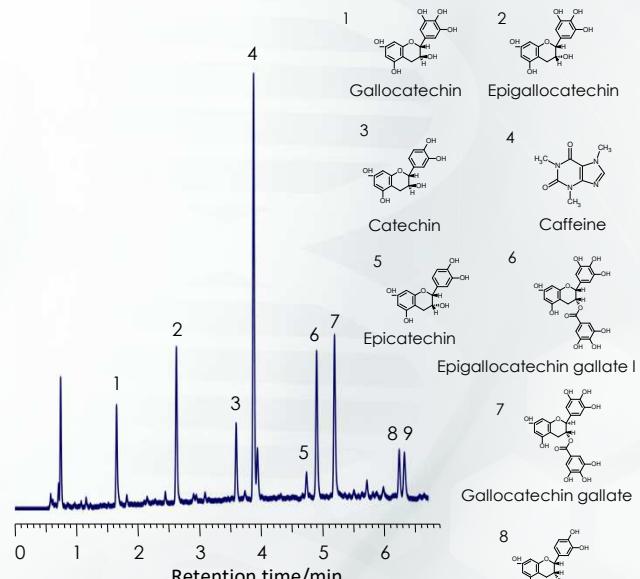
Amino Acids derivatized with OPA and FMOC



Dansylated estrogen hormones



Oolong tea



Courtesy of Department of Chemistry & Biochemistry, The University of Texas at Arlington

SunShell C18-WP, RP-AQUA, C8, Phenyl, PFP, PFP&C18, Cyano, 2.6 μm

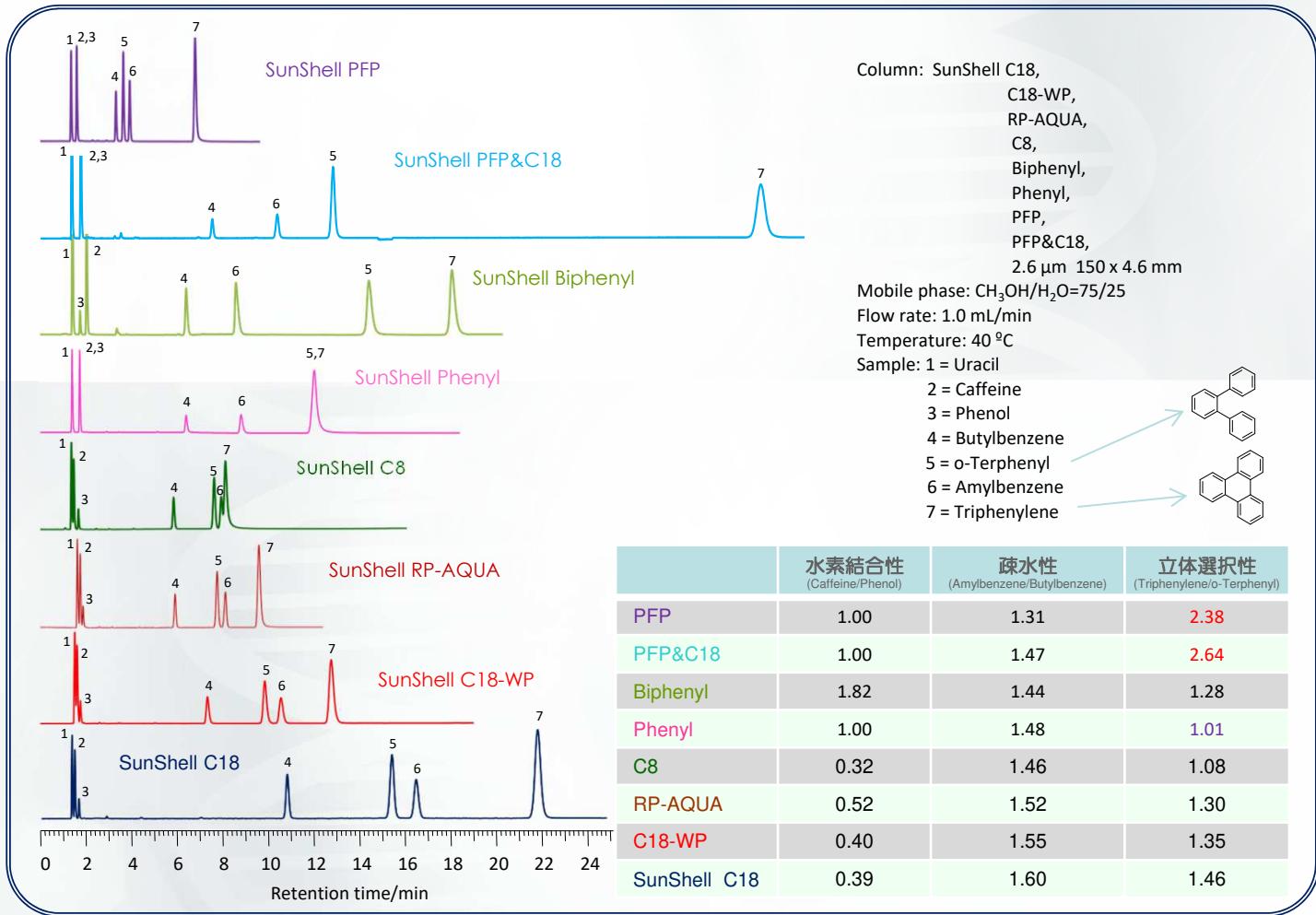
(Pentafluorophenyl)

◆ Characteristics of SunShell

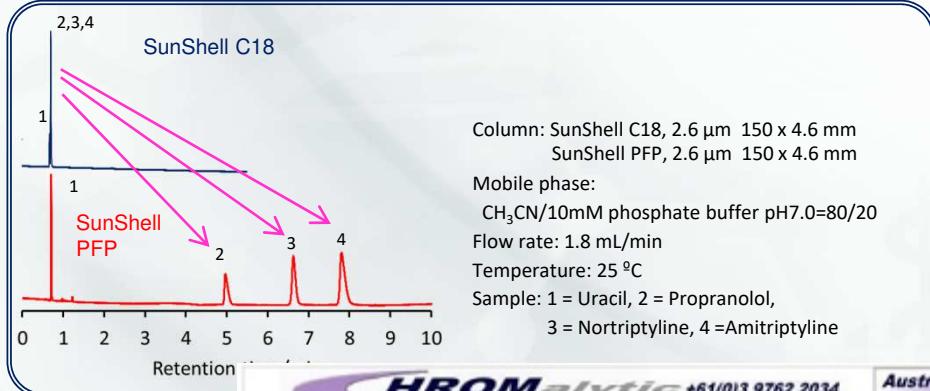
	Core shell silica			Bonding phase					
	Particle size	Pore diameter	Specific surface area	Carbon content	Bonded phase	USP L code	End-capping	Maximum operating pressure ^a	Available pH range
SunShell C18	2.6 μm	9 nm	150 m ² /g	7%	C18	L1	Sunniest endcapping	60 MPa	1.5 - 10
SunShell C18-WP	2.6 μm	16 nm	90 m ² /g	5%	C18	L1	Sunniest endcapping	60 MPa	1.5 - 10
SunShell RP-AQUA	2.6 μm	16 nm	90 m ² /g	4%	C30	L62	Sunniest endcapping	60 MPa	2 - 8 ^b
SunShell C8	2.6 μm	9 nm	150 m ² /g	4.5%	C8	L7	Sunniest endcapping	60 MPa	1.5 - 9
SunShell Phenyl	2.6 μm	9 nm	150 m ² /g	5%	Phenylhexyl	L11	Sunniest endcapping	60 MPa	1.5 - 9
SunShell Biphenyl	2.6 μm	9 nm	150 m ² /g	5%	Biphenyl	L11	Sunniest endcapping	60 MPa	1.5 - 9
SunShell PFP	2.6 μm	9 nm	150 m ² /g	4.5%	Pentafluorophenyl	L43	TMS endcapping	60 MPa	2 - 8
SunShell PFP&C18	2.6 μm	9 nm	150 m ² /g	6%	Pentafluorophenyl + C18	L43	TMS endcapping	60 MPa	2 - 8
NEW SunShell Cyano	2.6 μm	9 nm	150 m ² /g	2.5%	Diisopropylcyanopropyl	L10	No	60 MPa	2 - 8

a) Unless otherwise specified in the column test report b) Under 100% aqueous condition

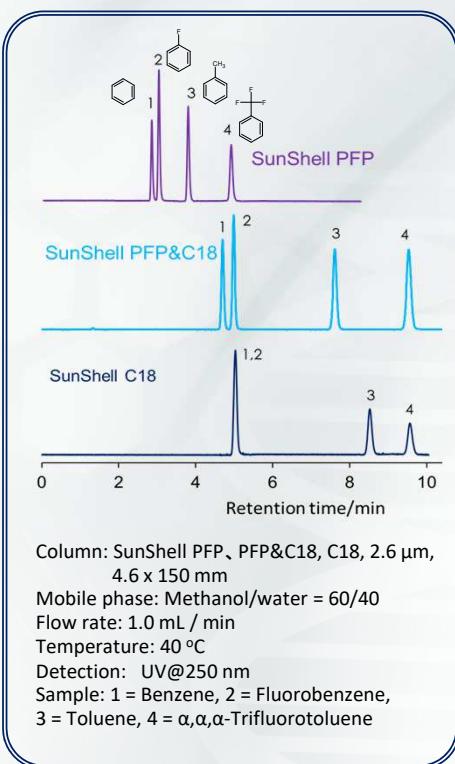
◆ Separation of standard samples



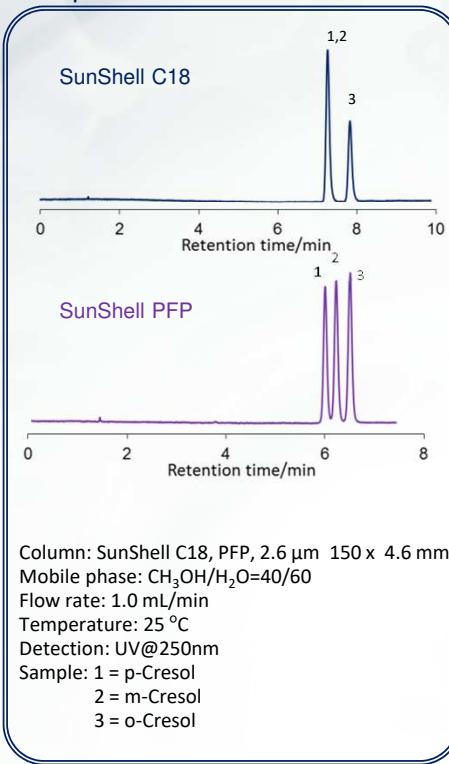
Separation of basic compounds



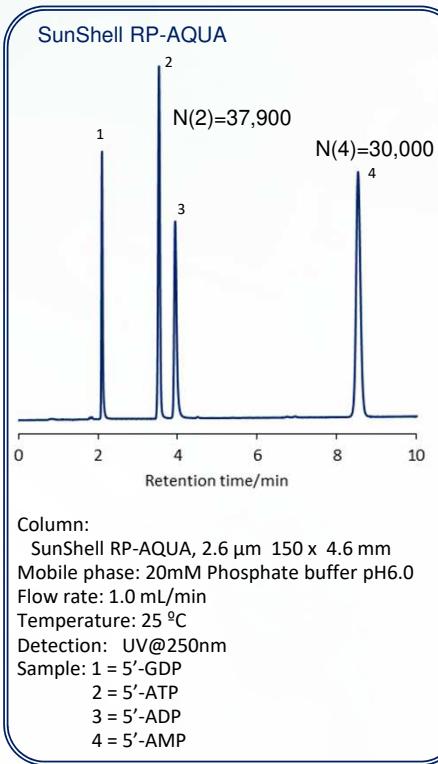
Separation of fluorobenzene



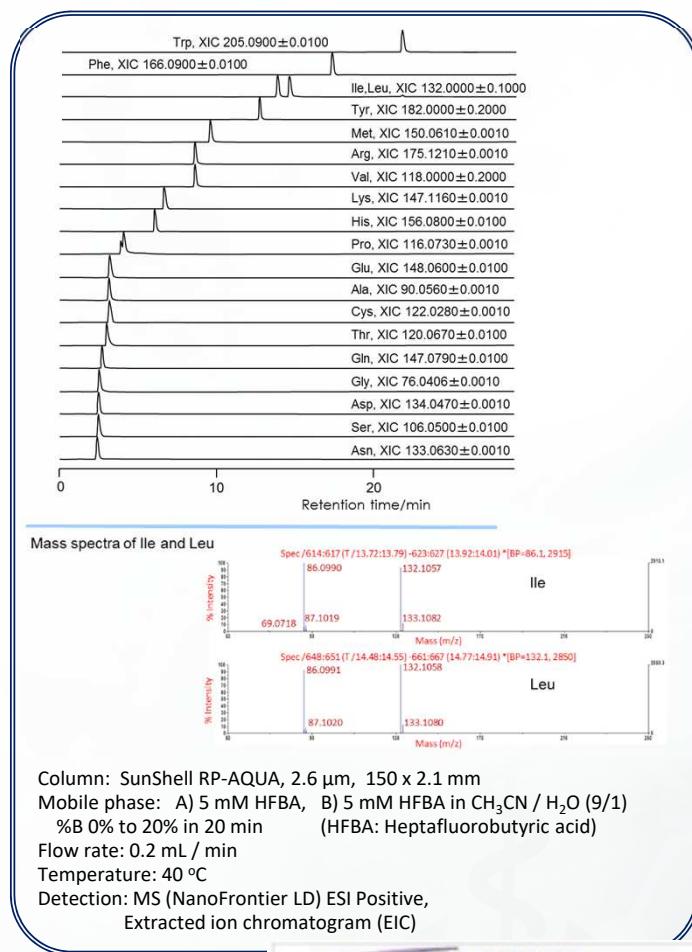
Separation of cresol isomers



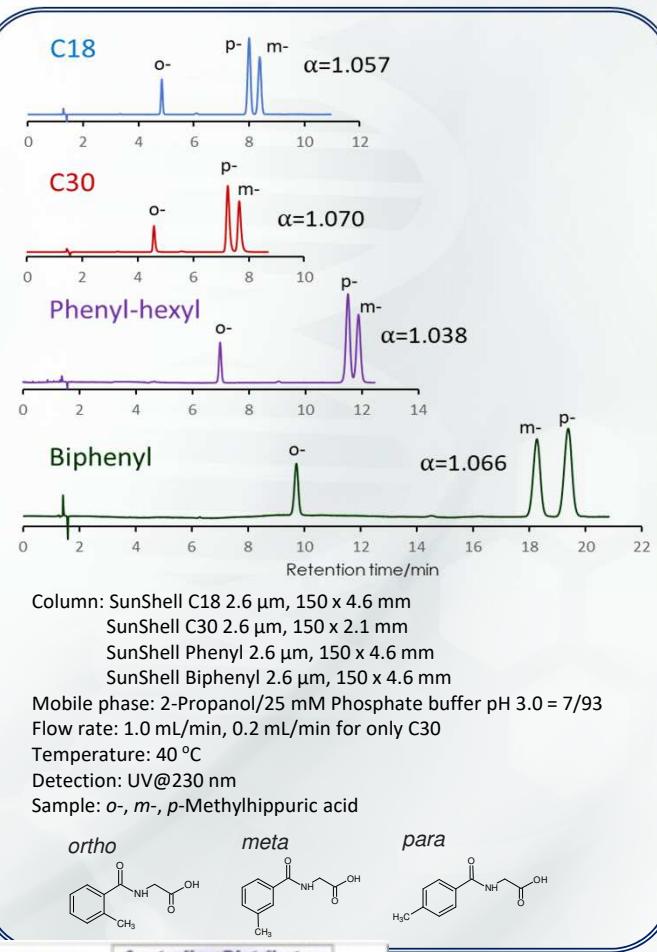
Separation of nucleotides



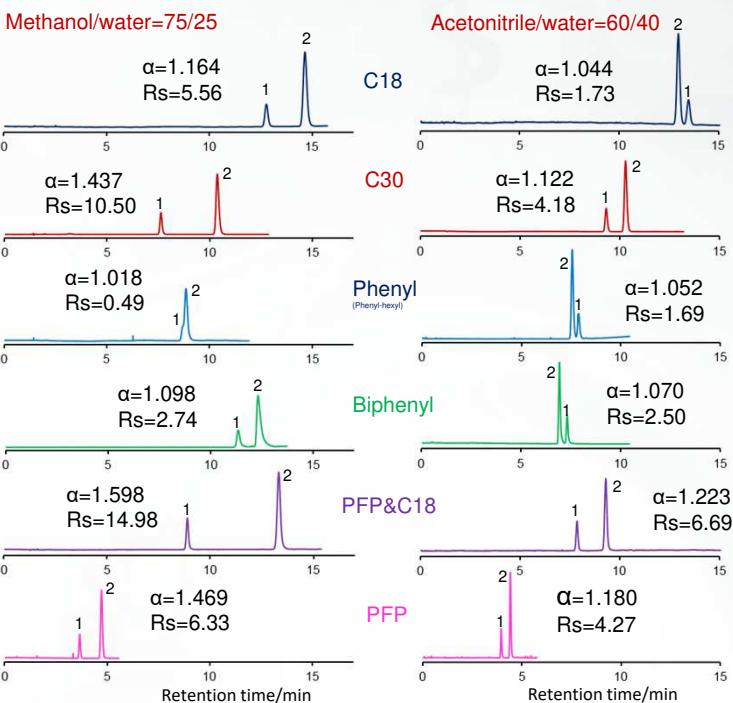
Separation of amino acids (LC/MS)



Separation of methylhippuric acid isomers

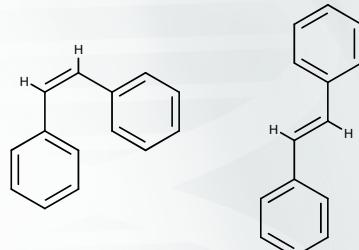


Separation of cis, trans-stilbene

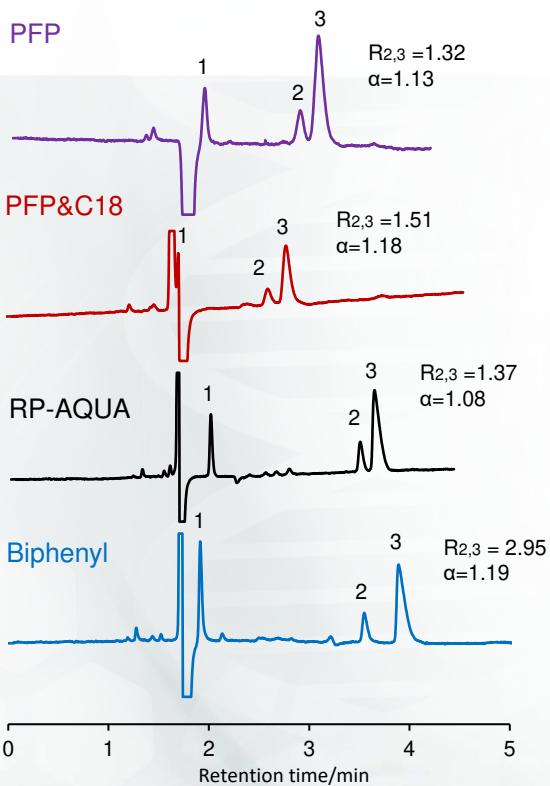


Column: SunShell C18 2.6 μ m, 150 x 4.6 mm i.d.
 SunShell C30 2.6 μ m, 150 x 2.1 mm i.d.
 SunShell Phenyl 2.6 μ m, 150 x 4.6 mm i.d.
 SunShell Biphenyl 2.6 μ m, 150 x 4.6 mm i.d.
 SunShell PFP&C18 2.6 μ m, 150 x 4.6 mm i.d.
 SunShell PFP 2.6 μ m, 150 x 4.6 mm i.d.

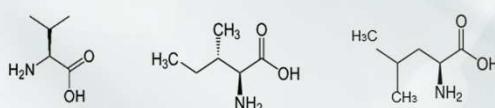
Mobile phase: Methanol/water = 75/25
 Acetonitrile/water = 60/40
 Flow rate: 1.0 mL/min and 0.2 mL/min for only C30
 Temperature: 40 °C
 Detection: UV@230 nm
 Sample: 1 = cis-Stilbene, 2 = trans-Stilbene



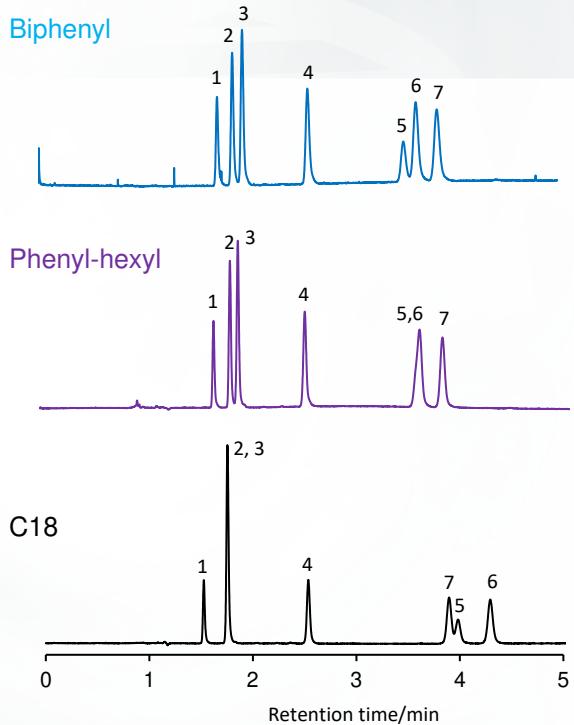
Separation of branched-chain amino acids



Column: SunShell PFP, PFP&C18, RP-AQUA, Biphenyl 2.6 μ m, 150 x 4.6 mm
 Mobile phase: 0.1% formic acid
 Flow rate: 1.0 mL/min
 Temperature: 40 °C
 Detection: UV@205 nm
 Sample: 1 = L-Valine 2 = L-Isoleucine 3 = L-Leucine



Separation of steroids



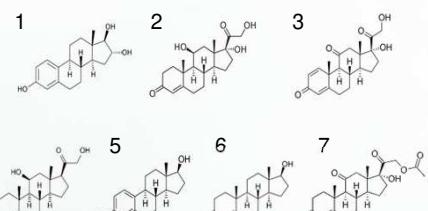
Column: SunShell Biphenyl, Phenyl and C18 2.6 μ m, 150 x 4.6 mm
 Mobile phase: Acetonitrile/water = 45/55

Flow rate: 1 mL/min

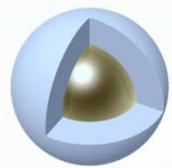
Temperature: 25 °C

Detection: UV@230 nm

Peak



SunShell C30, 2.6 μm

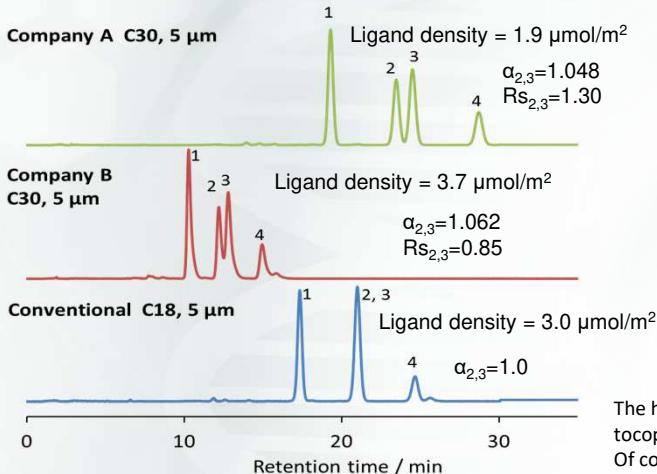


Specification of SunShell C30

	Core shell silica				Bonding phase					
	Particle size (μm)	Core size (μm)	Pore size (nm)	Specific surface area (m^2/g)	Carbon loading (%)	Ligand	USP L category	End-capping	Maximum pressure ^{a)}	
SunShell C30	2.6	1.6	12	95	7	C30	L62	TMS	60 MPa	1.5 - 9

a) Unless otherwise specified in the column test report

Problem of C30 column



Column dimension: 250 x 4.6 mm

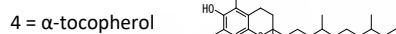
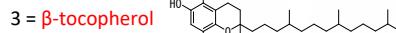
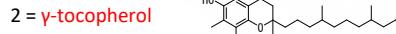
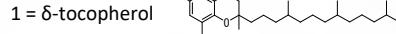
Mobile phase: methanol/water = 97/3

Flow rate: 1.0 mL/min

Temperature: 30 °C

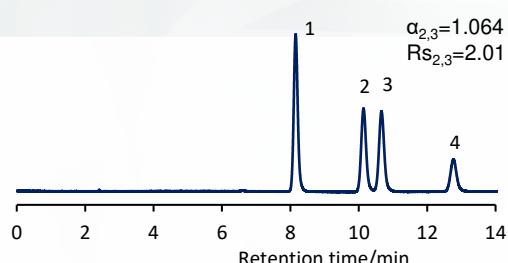
Detection: UV@295 nm

Sample,



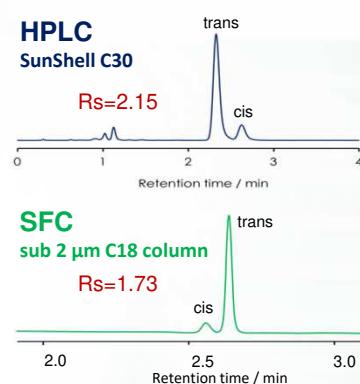
The higher a ligand density, the larger a separation factor of β -tocopherol and γ -tocopherol. Too high ligand density causes low theoretical plate and large tailing of a peak. Of course C18 columns can't separate β -tocopherol and γ -tocopherol.

Separation of tocopherols

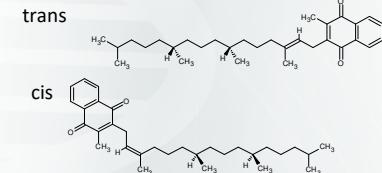


Column: SunShell C30, 2.6 μm 150 x 3.0 mm
Mobile phase: Methanol/water = 97/3
Flow rate: 0.43 mL/min
Temperature: 25 °C
Detection: UV@295 nm
Sample: 1 = δ -tocopherol, 2 = γ -tocopherol, 3 = β -tocopherol, 4 = α -tocopherol

Fast separation of vitamin K1 isomers

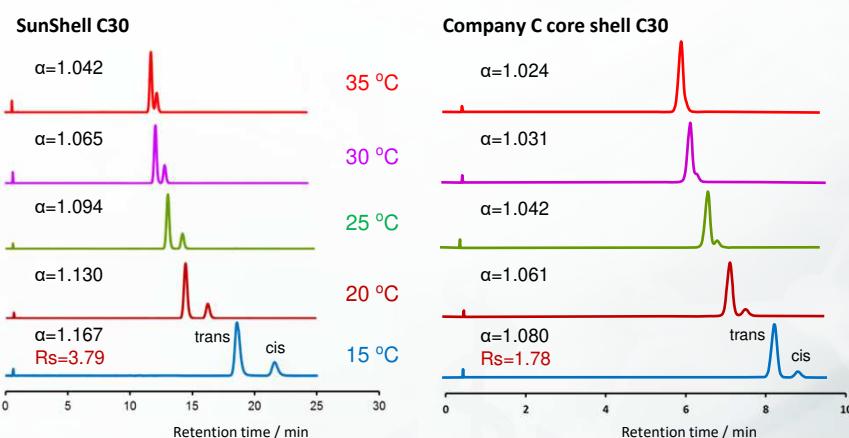


HPLC condition
Column: SunShell C30, 2.6 μm 50 x 3.0 mm
Mobile phase: Methanol
Flow rate: 0.80 mL/min
Temperature: 15 °C
Detection: UV@250 nm
Sample: Vitamin K1 isomers (trans and cis)

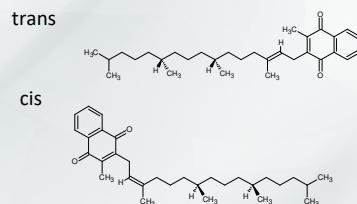


Both HPLC and SFC separations were finished within 3 minute.
Regarding resolution of isomers, HPLC won SFC.

Comparison of isomers separation of Vitamin k1



Column: SunShell C30, 2.6 μm 100 x 2.1 mm
Company C core shell C30, 2.6 μm 100 x 2.1 mm
Mobile phase: methanol/water = 96/4
Flow rate: 0.35 mL/min
Detection: UV@250 nm
Sample: vitamin K1 isomers (trans and cis).



SunShell 2.6 µm C18-WP, HFC18-16, C8-30HT, C4-100



For separation of peptides and proteins

Characteristics of SunShell

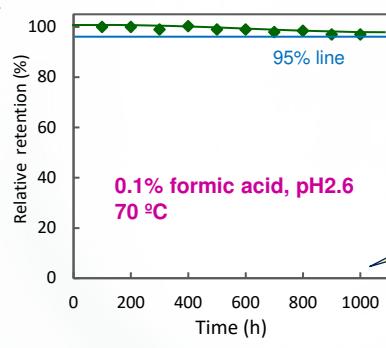
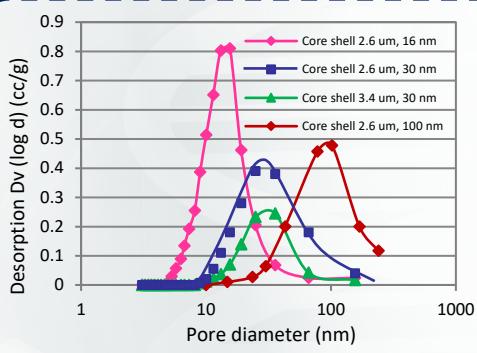
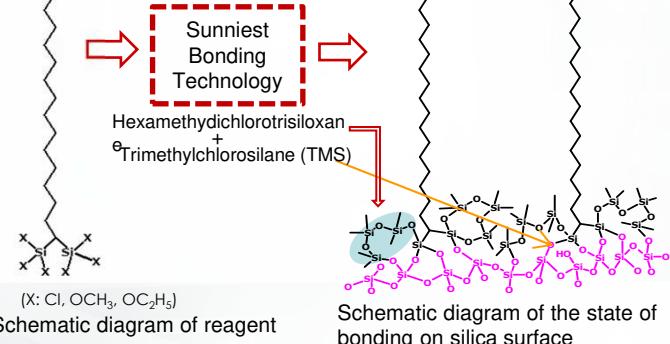
	Core shell silica			Bonding phase						
	Particle size	Pore diameter	Specific surface area	Stationary phase	Carbon content	Ligand density	End-capping	Maximum operating pressure ^a	Available pH range	USP L line
SunShell C18-WP	2.6 µm	16 nm	90 m ² /g	C18	5 %	2.5 µmol/m ²	Sunniest endcapping	60 MPa or 8,570 psi	1.5 - 10	L1
SunShell HFC18-16	2.6 µm	16 nm	90 m ² /g	C18	2.5%	1.2 µmol/m ²	Sunniest endcapping	60 MPa or 8,570 psi	1.5 - 9	L1
SunShell C8-30HT	3.4 µm	30 nm	15 m ² /g	C8	0.5%	2.5 µmol/m ²	Sunniest endcapping	60 MPa ^a or 8,570 psi ^a	1.5 - 9	L7
SunShell C4-100	2.6 µm	100 nm	22 m ² /g	C4	0.6%	3 µmol/m ²	Sunniest endcapping	60 MPa ^a or 8,570 psi ^a	1.5 - 8	L26

Note: The SunShell HFC18-30, C8-30, and C4-30 columns will be discontinued once the packaging materials are out of stock.

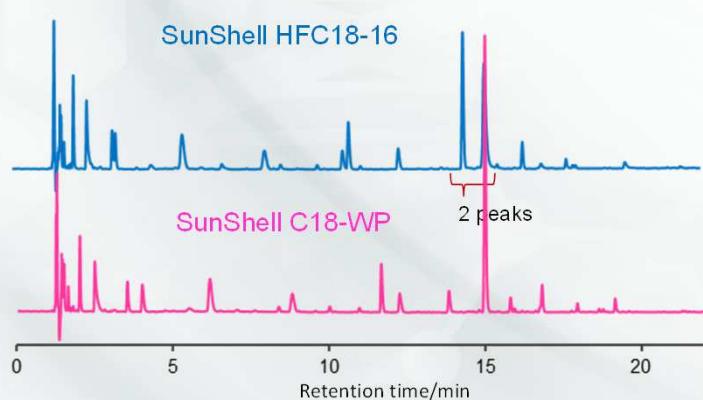
a) Unless otherwise specified in the column test report

b) 50MPa, 7141psi for 4.6 mm i.d. column

What is HFC18? Hexa-Functional C18 has six functional groups. This HFC18 is much more stable under acidic condition.



Separation of peptides



Column: SunShell HFC18-16, 2.6 µm (16 nm) 150 x 4.6 mm
SunShell C18-WP, 2.6 µm (16 nm) 150 x 4.6 mm

Mobile phase: A) 0.1% TFA in Acetonitrile/water(10:90)
B) 0.1 % TFA in Acetonitrile

Gradient program:

Time	0 min	5 min	40 min
%B	5%	5%	50%

Flow rate: 1.0 mL/min

Temperature: 25 °C

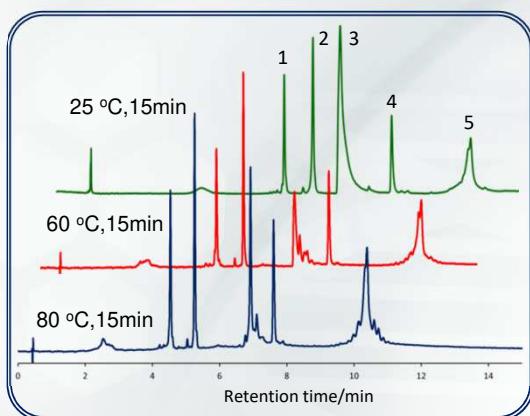
Detection: UV@210 nm

Sample: Tryptic digest of cytochrome C

SunShell 2.6 μm C8-30HT, C4-100

For separation of peptides and proteins

Comparison of column temperature



Column: SunShell C8-30, 2.6 μm (30 nm) 100 x 2.1 mm
Mobile phase: A) 0.1% TFA in water

B) 0.08% TFA in acetonitrile

Gradient program: Time 0 min 15 min
%B 20% 65%

Flow rate: 0.5 mL/min,

Temperature: 25 °C 60 °C or 80 °C

Detection: UV@215 nm,

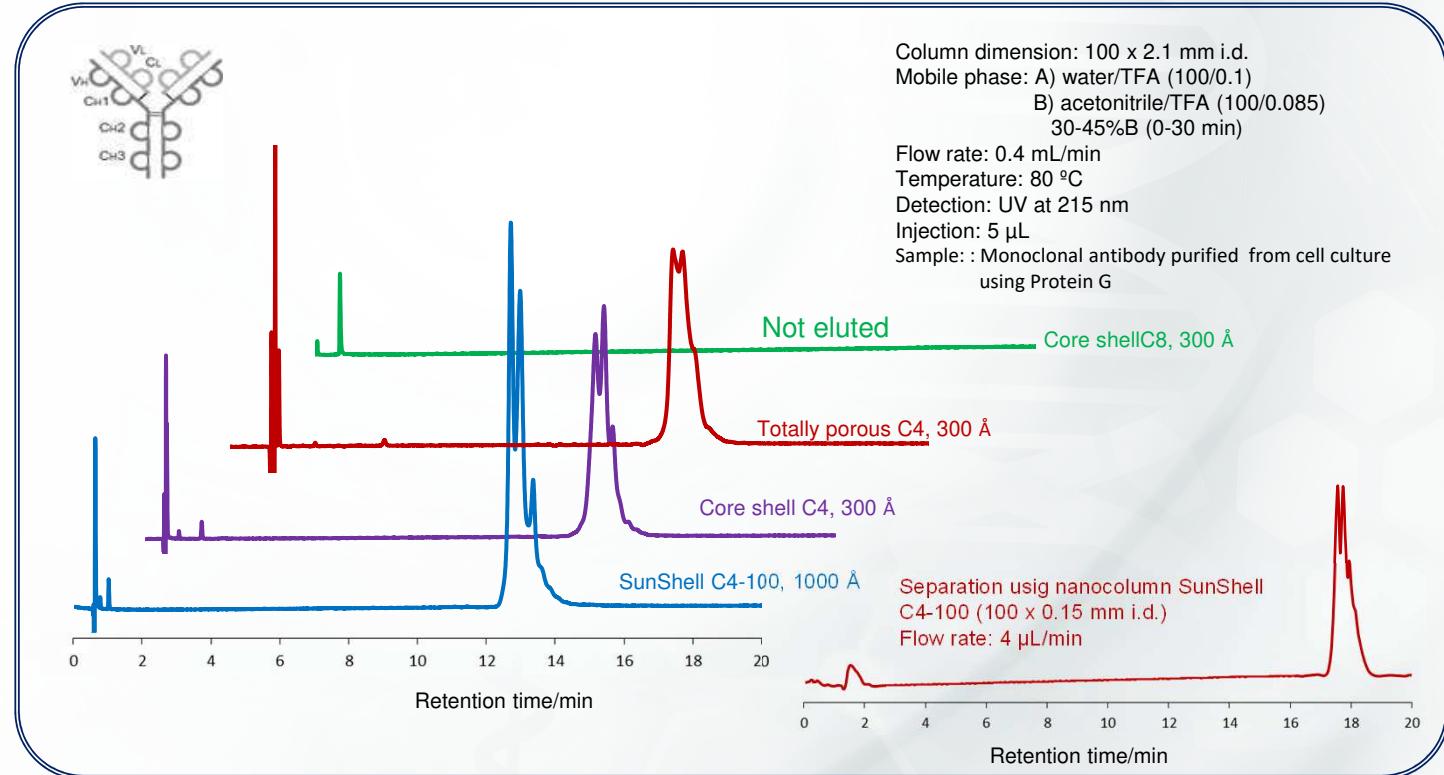
Sample: 1 = Cytochrome C, 2 = Lysozyme, 3 = BSA,

4 = Myoglobin, 5 = Ovalbumin

A macromolecule compound like a protein diffuses very slowly, so that an elevated temperature makes a peak be sharper and improves separation. BSA peak seemed to be tailing at 25 degree Celsius. BSA, however, was separated several peaks at 80 degree Celsius.



Separation of monoclonal antibody



Regarding reversed phase separation of monoclonal antibody (IgG), not only core shell C4 with 30 nm pore showed the better separation than totally porous C4, but also 100 nm of pore leaded the best separation. Nano column showed almost the same separation of IgG as semi-micro column.

SunShell HILIC-Amide, HILIC-S, 2.6 μm

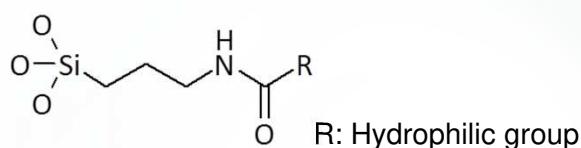
For Hydrophilic Interaction Chromatography

Characteristics of SunShell HILIC-Amide

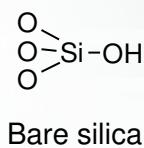
	Particle size	Core shell silica			Bonded phase					
		Core size	Pore diameter	Specific surface area	Carbon content	Bonded phase	End-capping	Maximum operating pressure ^a	USP category	Available pH range
SunShell HILIC-Amide	2.6 μm	1.6 μm	9 nm	150 m ² /g	3%	Amide	No	60 MPa or 8,570 psi	L68	2 - 8
SunShell HILIC-S	2.6 μm	1.6 μm	9 nm	150 m ² /g	0%	Bare silica	No	60 MPa or 8,570 psi	L3	1 - 5

a) Unless otherwise specified in the column test report

Stationary phase of HILIC-Amide

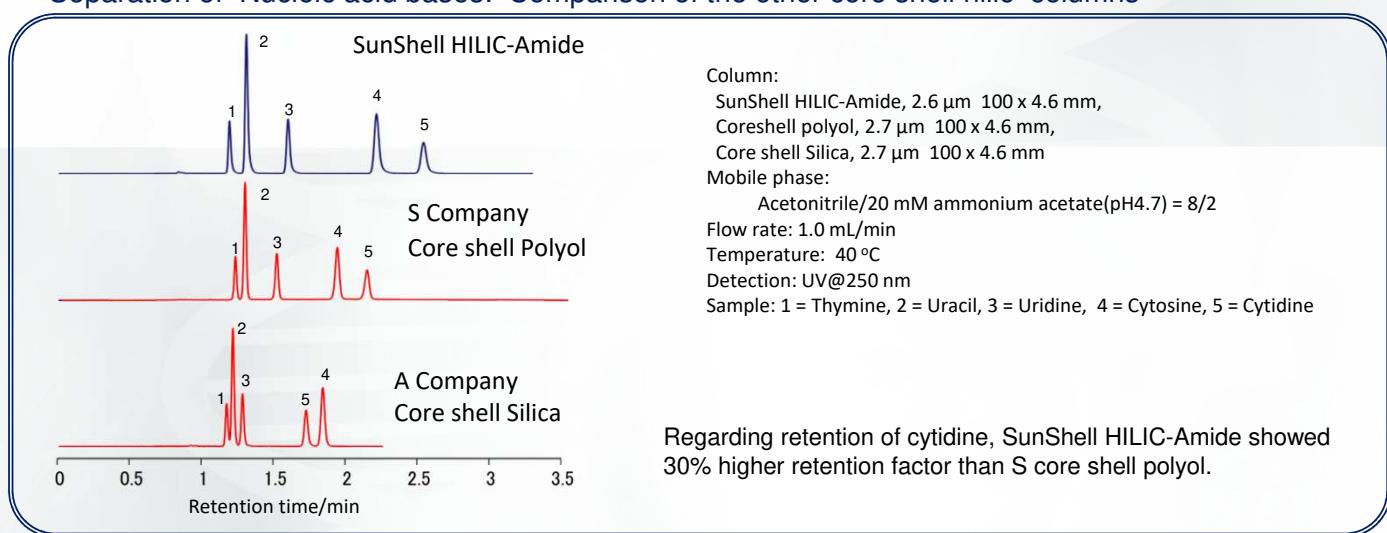


Stationary phase of HILIC-S

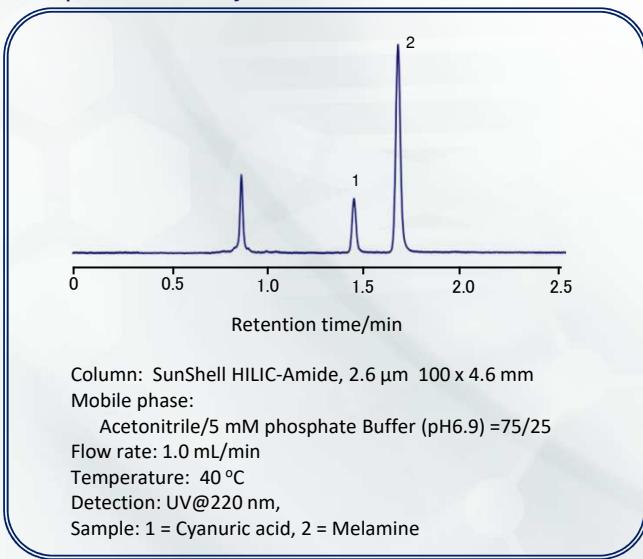


Stationary phase of SunShell HILIC-Amide consists of AMIDE and HYDROPHILIC GROUP, so that this stationary phase is more polar than an individual group. High speed separation is leaded by core shell structure that derives high efficiency and fast equilibration. HILIC-S is recommended for separation using LC/MS.

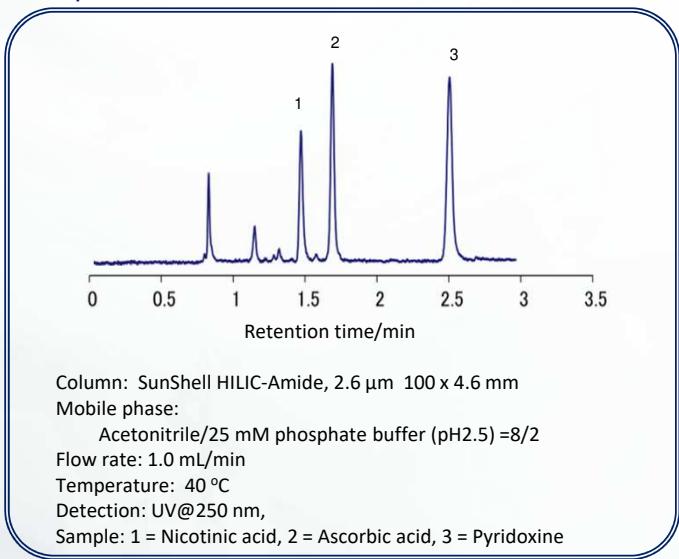
Separation of Nucleic acid bases: Comparison of the other core shell hilic columns



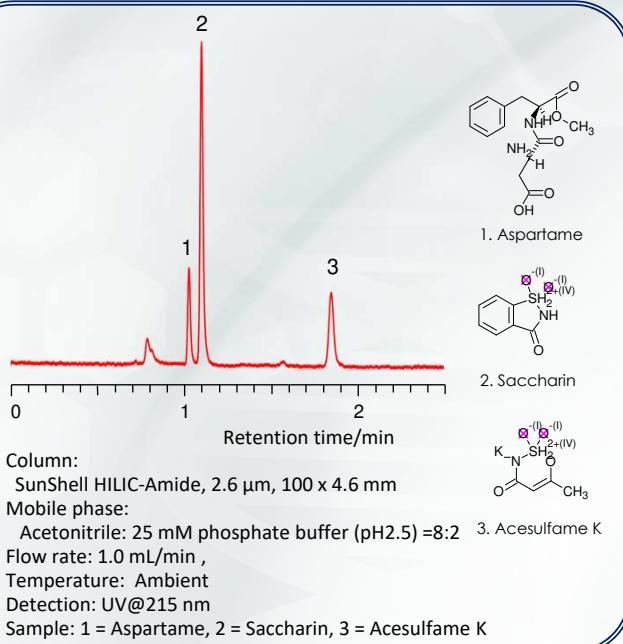
Separation of Cyanuric acid and Melamine



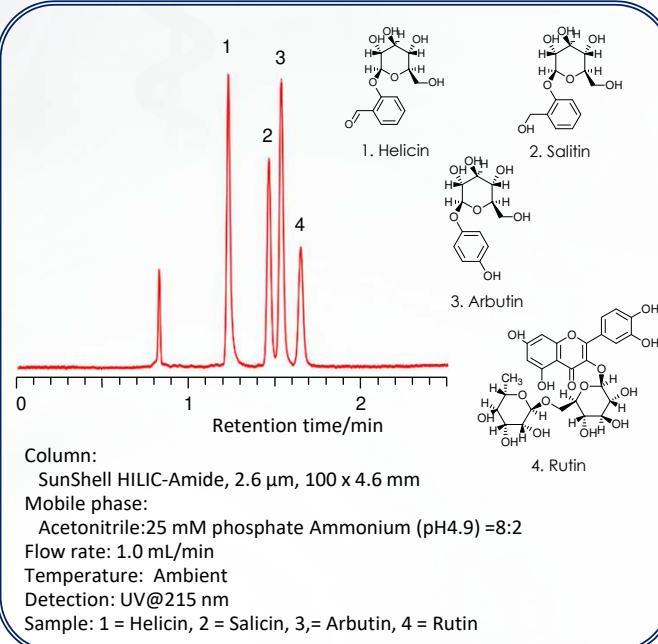
Separation of water- soluble vitamins



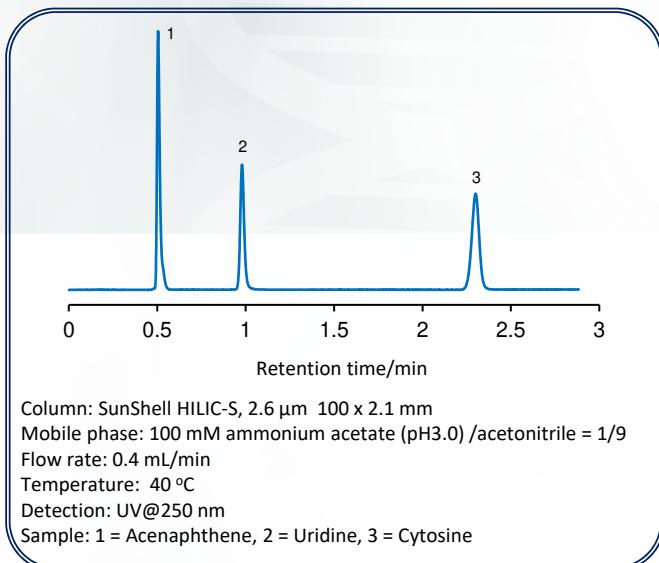
Artificial sweeteners



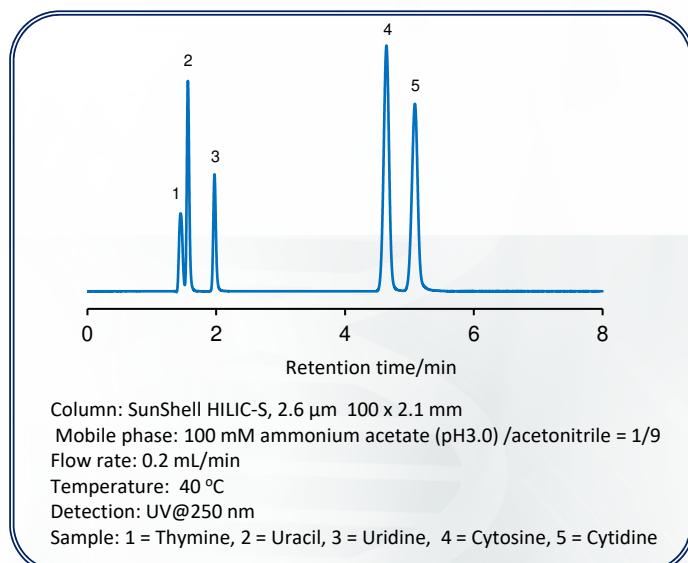
Glycoside



Nucleic acid base



Nucleic acid bases



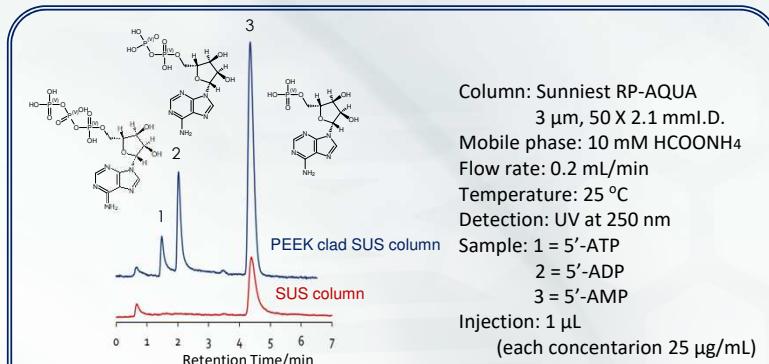
Metal Free Column

Metal-free column

- Standard metal-free columns with high chemical stability.
- Column hardware has a pressure resistance of 100 MPa.
- Metal-free columns supplied by two companies.
- Can be packed with all SunShell packing materials.



PEEK clad SUS column



High pressure-resistant PEEK columns manufactured by Tomoe

*I.D. 2.1 mm, length 50 mm, 100 mm, 150 mm

*The catalog number, change the last digit "1" to "MTF".

For example, for SunShell C18 2.6 µm, 100 x 2.1 mm columns, the model number CB6961 for the standard columns becomes CB696MTF.

PEEK clad SUS Column



INDEX Bioinert System Column

*2.1 and 4.6 mm i.d., lengths 50 mm, 100 mm and 150 mm.

*The catalog number, change the last digit "1" to "M".

For example, for a SunShell C18 2.6 µm, 150 x 4.6 mm column, the catalog number CB6371 of the normal column becomes CB637M.

Bioinert System Column



Nanocolumn, Microcolumn

Nano column: 0.075 mm i.d., 0.1 mm i.d., 0.15 mm i.d.

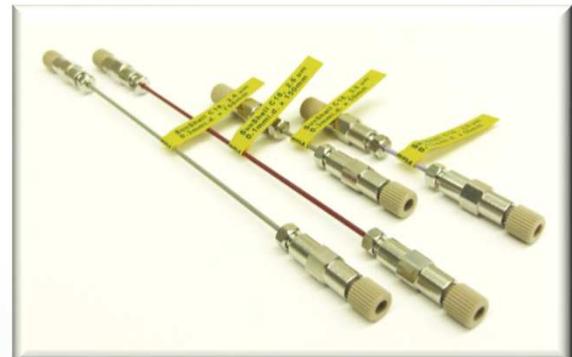
Micro column: 0.3 mm i.d., 0.5 mm i.d.

Column length: 50 mm, 150 mm

Column tube material:

0.075mm i.d., 0.10 mm i.d., 0.15 mm i.d.; PEEKSIL

0.3 mm i.d., 0.5 mm i.d.; Glass Lined SUS Tubing



Example of prices

	Inner diameter (mm)	0.075	0.1	0.15	0.3	0.5	USP L code
SunShell C18, 2 µm	Length (mm)	Catalog number	L1				
	50	CB1J4P	CB1H4P	CB1K4P	CB1G48	CB1F48	
SunShell C18, 2.6 µm	150	CB1J7P	CB1H7P	CB1K7P	CB1G78	CB1F78	L1
	50	CB6J4P	CB6H4P	CB6K4P	CB6G48	CB6F48	
SunShell C18, 5 µm	150	CB6J7P	CB6H7P	CB6K7P	CB6G78	CB6F78	L1
	50	-----	-----	-----	CB3G4L	CB3F4L	
SunShell Phenyl, 2.6 µm	150	-----	-----	-----	CB3G7L	CB3F7L	L11
	50	CP6J4P	CP6H4P	CP6K4P	CP6G48	CP6F48	
SunShell C8-30HT, 3.4 µm	150	CP6J7P	CP6H7P	CP6K7P	CP6G78	CP6F78	L7
	50	C56J4P	C56H4P	C56K4P	C56G48	C56F48	
SunShell C4-100, 2.6 µm	150	C56J7P	C56H7P	C56K7P	C56G78	C56F78	L26
	50	C66J4P	C66H4P	C66K4P	C66G48	C66F48	
	150	C66J7P	C66H7P	C66K7P	C66G78	C66F78	

※ Packings (stationary phase) and column sizes other than those listed above can also be manufactured. For details, please contact ChromaNik Technologies.

※ The end-fitting of the column is Parker type.

※ The P, L or 8 at the end of the catalog number indicates the material of the column tubing: P is PEEKSIL, L and 8 are glass-lined tubing. Only L has an upper limit of back pressure of 45 MPa, but the others have an upper limit of back pressure of 80 MPa.

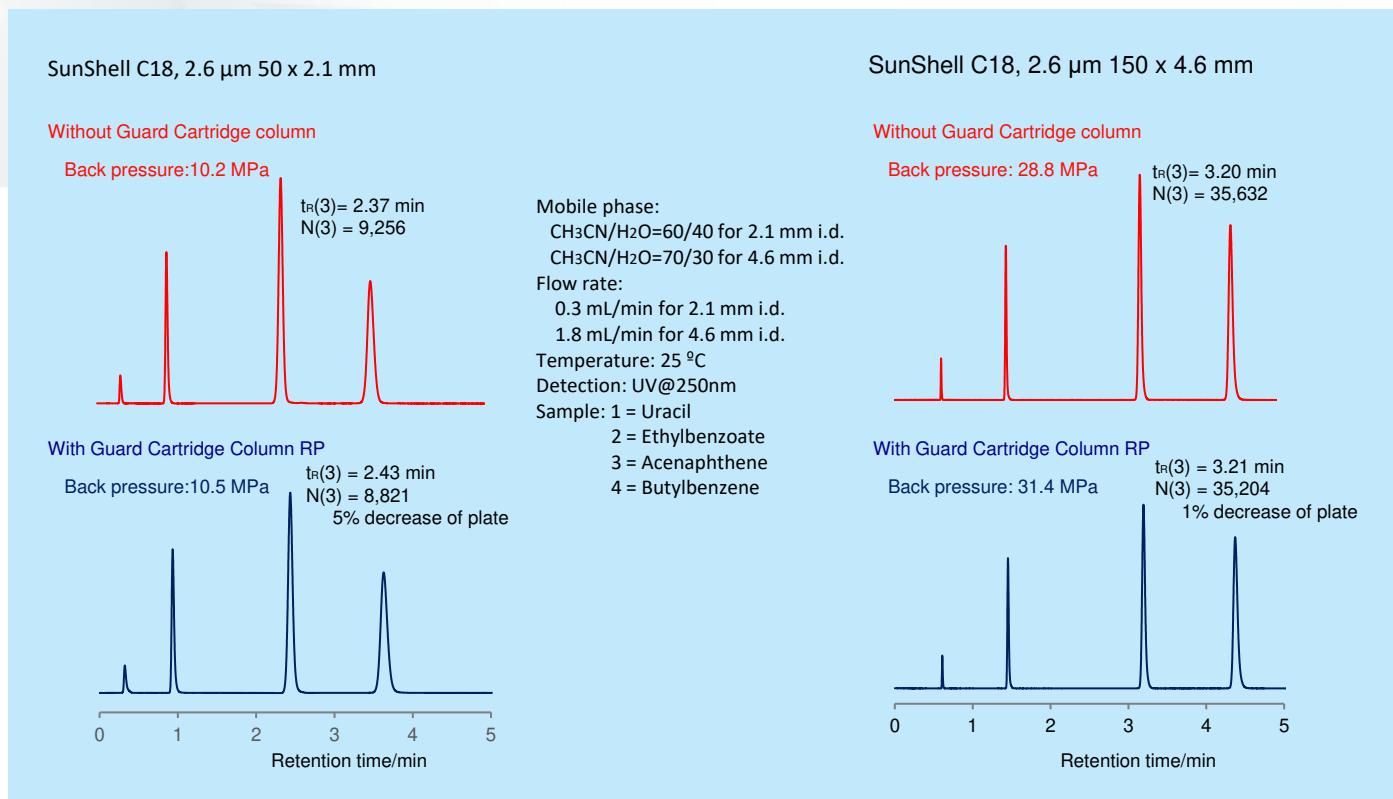
SunShell Guard Cartridge Column



RP & S GUARD CARTRIDGE COLUMN



- ★ The cartridge column is packed with SunShell C18 (RP) and Core shell silica (S) into a cartridge sized 3 x 2 mm i.d.
- ★ RP guard cartridge is used for all reversed phases and S guard cartridge for hilic phases.
- ★ Low dead volume structure
- ★ Upper pressure limit is more than 60 Mpa
- ★ Available for 2.1 mm i.d. to 4.6 mm i.d. columns



Ordering Information of SunShell Guard Cartridge Column

Description	Part number
SunShell Guard Cartridge RP Starter Kit (holder, cartridge, tubing)	CB32CK
SunShell Guard Cartridge RP for exchange (2 PCS)	CB32CC
SunShell Guard Cartridge S Starter Kit (holder, cartridge, tubing)	CS32CK
SunShell Guard Cartridge S for exchange (2 PCS)	CS32CC
SunShell Guard Cartridge holder	HOL2CC

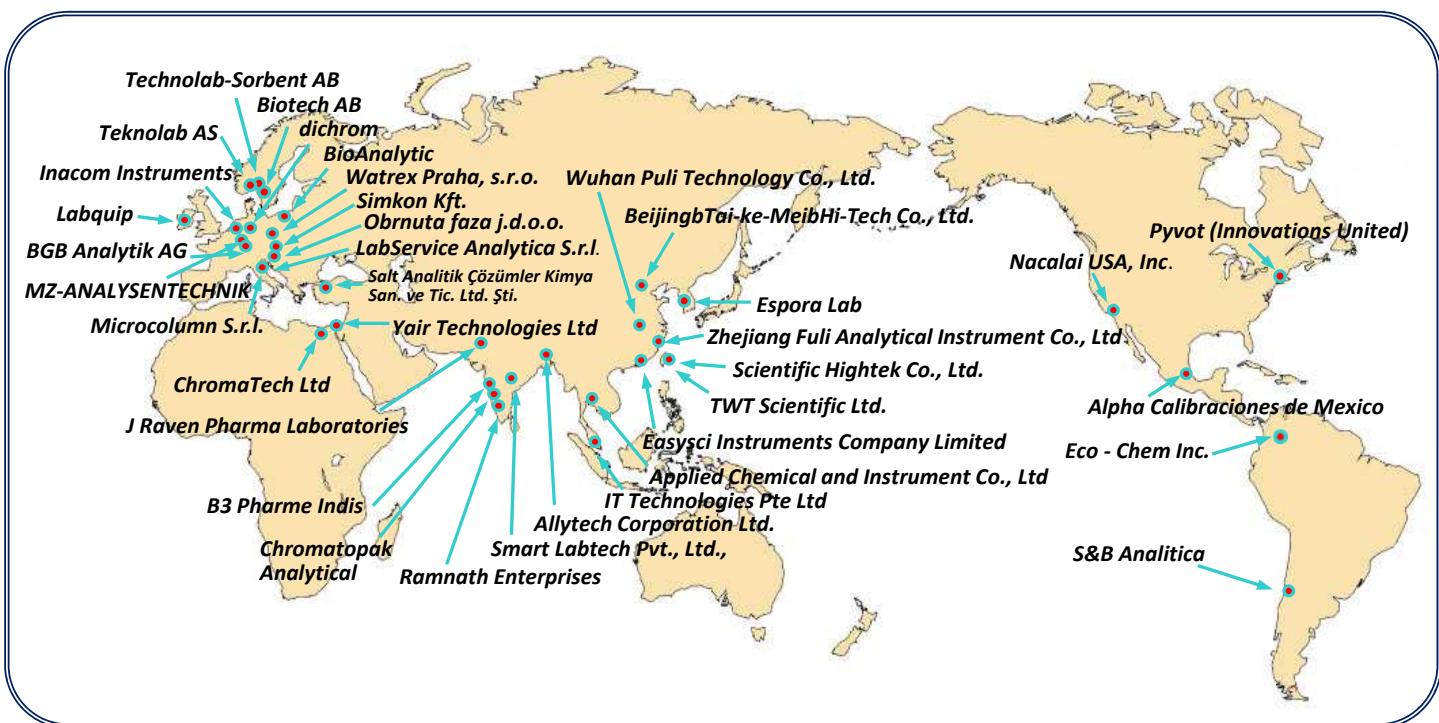
Ordering information of SunShell

	Inner diameter (mm)	1.0	2.1	3.0	4.6	USP category
	Length (mm)	Catalog number	Catalog number	Catalog number	Catalog number	
SunShell C18, 2 µm	50	-----	CB1941	-----	-----	L1
	100	-----	CB1961	-----	-----	
	150	-----	CB1971	-----	-----	
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	
SunShell C18 3.5 µm	50	-----	CB9941	-----	-----	L1
	100	-----	CB9961	CB9361	CB9461	
	150	-----	CB9971	CB9371	CB9471	
	250	-----	-----	CB9381	CB9481	
SunShell C18, 5 µm	150	-----	-----	CB3371	CB3471	L1
	250	-----	-----	CB3381	CB3481	
SunShell C8, 2.6 µm	30	-----	CC6931	CC6331	CC6431	L7
	50	-----	CC6941	CC6341	CC6441	
	75	-----	CC6951	CC6351	CC6451	
	100	-----	CC6961	CC6361	CC6461	
	150	-----	CC6971	CC6371	CC6471	
SunShell PFP, 2.6 µm	30	-----	CF6931	CF6331	CF6431	L43
	50	-----	CF6941	CF6341	CF6441	
	75	-----	CF6951	CF6351	CF6451	
	100	-----	CF6961	CF6361	CF6461	
	150	-----	CF6971	CF6371	CF6471	
SunShell C18-WP, 2.6 µm	30	-----	CW6931	CW6331	CW6431	L1
	50	-----	CW6941	CW6341	CW6441	
	75	-----	CW6951	CW6351	CW6451	
	100	-----	CW6961	CW6361	CW6461	
	150	-----	CW6971	CW6371	CW6471	
SunShell RP-AQUA, 2.6 µm	30	-----	CR6931	CR6331	CR6431	L62
	50	CR6141	CR6941	CR6341	CR6441	
	75	-----	CR6951	CR6351	CR6451	
	100	CR6161	CR6961	CR6361	CR6461	
	150	CR6171	CR6971	CR6371	CR6471	
SunShell Phenyl, 2.6 µm	30	-----	CP6931	CP6331	CP6431	L11
	50	-----	CP6941	CP6341	CP6441	
	75	-----	CP6951	CP6351	CP6451	
	100	-----	CP6961	CP6361	CP6461	
	150	-----	CP6971	CP6371	CP6471	
SunShell Biphenyl, 2.6 µm	30	-----	C86931	C86331	C86431	L11
	50	-----	C86941	C86341	C86441	
	75	-----	C86951	C86351	C86451	
	100	-----	C86961	C86361	C86461	
	150	-----	C86971	C86371	C86471	
SunShell C30, 2.6 µm	30	-----	CT6931	CT6331	-----	L62
	50	-----	CT6941	CT6341	CT6441	
	75	-----	CT6951	CT6351	-----	
	100	-----	CT6961	CT6361	CT6461	
	150	-----	CT6971	CT6371	CT6471	
SunShell PFP&C18, 2.6 µm	30	-----	CV6931	CV6331	CV6431	L43
	50	-----	CV6941	CV6341	CV6441	
	75	-----	CV6951	CV6351	CV6451	
	100	-----	CV6961	CV6361	CV6461	
	150	-----	CV6971	CV6371	CV6471	
SunShell Cyano, 2.6 µm	50	-----	CJ6941	CJ6341	CJ6441	L10
	100	-----	CJ6961	CJ6361	CJ6461	
	150	-----	CJ6971	CJ6371	CJ6471	

Added 4.6 mm i.d.
for C30 phase

	Inner diameter (mm)	1.0	2.1	3.0	4.6	USP category
	Length (mm)	Catalog number	Catalog number	Catalog number	Catalog number	
SunShell HILIC-Amide, 2.6 µm	30	-----	CH6931	CH6331	CH6431	L68
	50	-----	CH6941	CH6341	CH6441	
	75	-----	CH6951	CH6351	CH6451	
	100	-----	CH6961	CH6361	CH6461	
	150	-----	CH6971	CH6371	CH6471	
SunShell HILIC-S, 2.6 µm	50	-----	CU6941	-----	-----	L3
	100	-----	CU6961	-----	-----	
	150	-----	CU6971	-----	-----	
SunShell HFC18-16, 2.6 µm	50	-----	CG6941	CG6341	CG6441	L1
	100	-----	CG6961	CG6361	CG6461	
	150	-----	CG6971	CG6371	CG6471	
SunShell C8-30HT, 3.4 µm	50	-----	C55941	-----	-----	L7
	100	-----	C55961	-----	-----	
	150	-----	C55971	-----	-----	
SunShell C4-100, 2.6 µm	50	-----	C66941	-----	-----	L26
	100	-----	C66961	-----	-----	
	150	-----	C66971	-----	-----	

*Distributor



Manufacturer
ChromaNik Technologies Inc.

2307

"SunShell" is a core shell silica column made by ChromaNik Technologies.

The next generation to Core Shell particle



SUNSHELL

Superficially porous silica

Features of SunShell

- * 1.2 µm, 1.6 µm, 2.3 µm, 3.0 µm and 3.4 µm of core and 0.4 µm, 0.5 µm, 0.2 µm and 0.6 µm of superficially porous silica layer
- * Higher efficiency and higher throughput to compare with totally porous silica with same size
- * Same chemistry as Sunniest technology (reference page 6)
- * Good peak shape for all compounds such as basic, acidic and chelating compounds
- * High stability (pH range for SunShell C18, 1.5 to 10)
- * Low bleeding

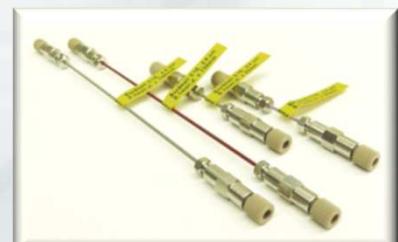
SUS column hardware is used in parallel by two companies.



MetalTouch made by Tomoe

IsoBar made by IDEX

※ Metal free columns and nano- and microcolumns are listed on page 24



※ SunShell guard cartridge columns are listed on page 25



Chromalytic
specialists in chromatography

Chromalytic
ChromaNik Technologies Inc.

Chromalytic Technology Pty Ltd A.B.N. 14 643 445 058
T : +61 3 9762 2034 E : sales@chromtech.net.au W : www.chromtech.net.au

HPLC column

Sunniest



Sunniest

C18, C18-HT, RP-AQUA, C8, PhE, PFP

CHROMalytic +61(0)3 9762 2034
ECHnology Pty Ltd
Website NEW : www.chromalytic.net.au E-mail : info@chromtech.net.au Tel: 03 9762 2034 . . . in AUSTRALIA

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ChromaNik Technologies Inc.

Chromalytic in partnership with ChromaNik Technologies (Biotech AB)

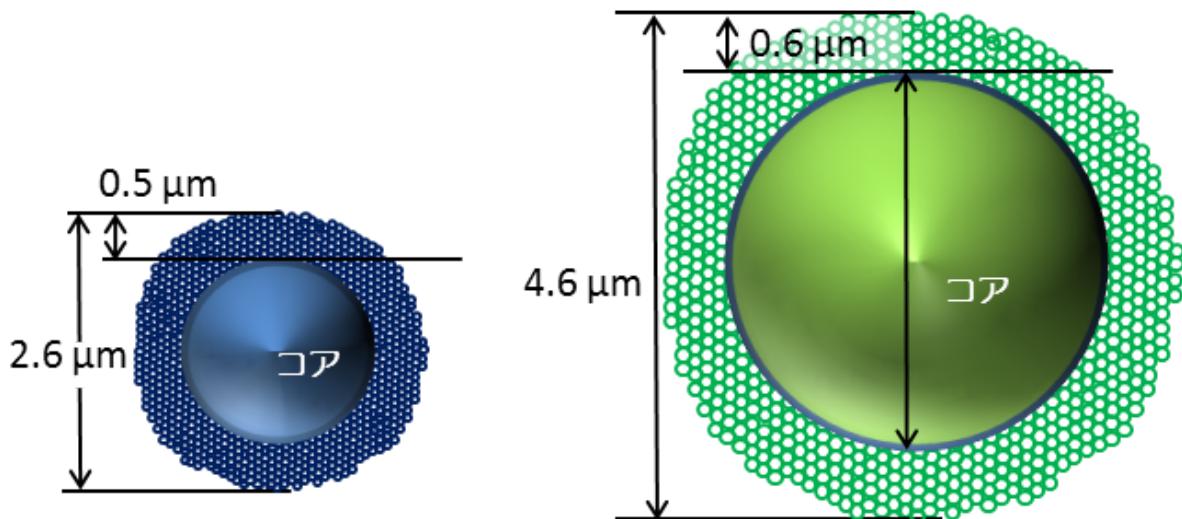
Products

[Home \(..../index_en.html\)](#) / [Products \(..../product_en.html\)](#) / [What is CoreShell?](#)

What is CoreShell?

A **core shell particle** consists of a non-porous core in the center and a porous layer outside of the core.

A core-shell structure makes theoretical plate increase 50%, so that a 2.6 μm core shell particle column shows the same theoretical plate as a 1.8 μm totally porous particle column.

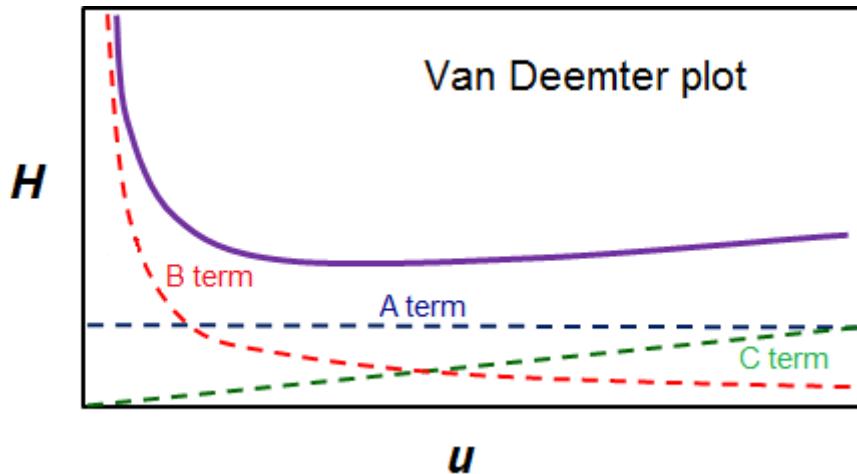


Schematic view of a core-shell silica

Why core-shell particles, the better performance?

Van Deemter

$$H = Ad_p + B \frac{D_m}{u} + C \frac{d_p^2}{D_m} u$$

**A term**

Eddy diffusion (d_p is particle diameter)

B term

Longitudinal diffusion (D_m is diffusion coefficient)

C term

Mass transfer

H(height equivalent of one theoretical plate) represents the column length per one theoretical plate. The lower the **H**, the higher the performance.

Van Deemter plot is a curve using the value derived from the above equation as a function of the theoretical plate height and **u** (mobile phase linear velocity). Van Deemter Equation contributes A, B and C term individually.

A core-shell particles can be reduced all the values of these three terms.

- ✓ Reason why the A term reduces
- ✓ Reason why the B term reduces
- ✓ Reason why the C term reduces

SunShell series is here using the core-shell particles!

SunShell series (./SunShell_en.html)

about site (./about_site_en.html) | privacy policy (./privacy_policy_en.html) |
old site (../../old/englishindex.html)

✉ **info@chromanik.co.jp**

📞 **TEL:+81-6-6581-0885**

📠 **FAX:+81-6-6581-0890** (any time reception) FAX sheet (../../pdf/FAX_sheet_en.pdf)

chromanik.co.jp/en/product/CoreShell_en.html



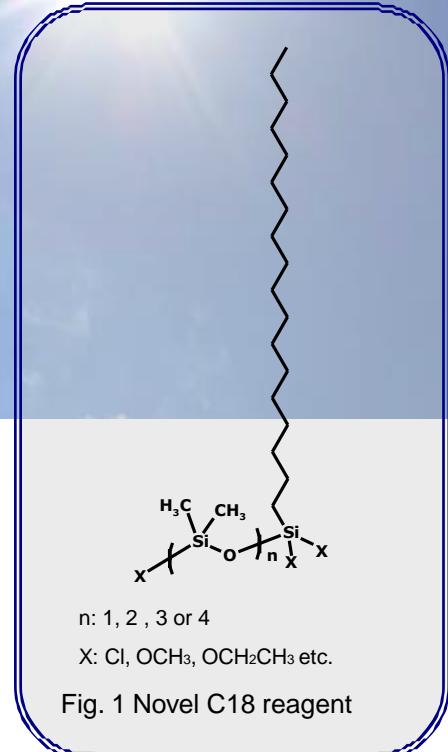
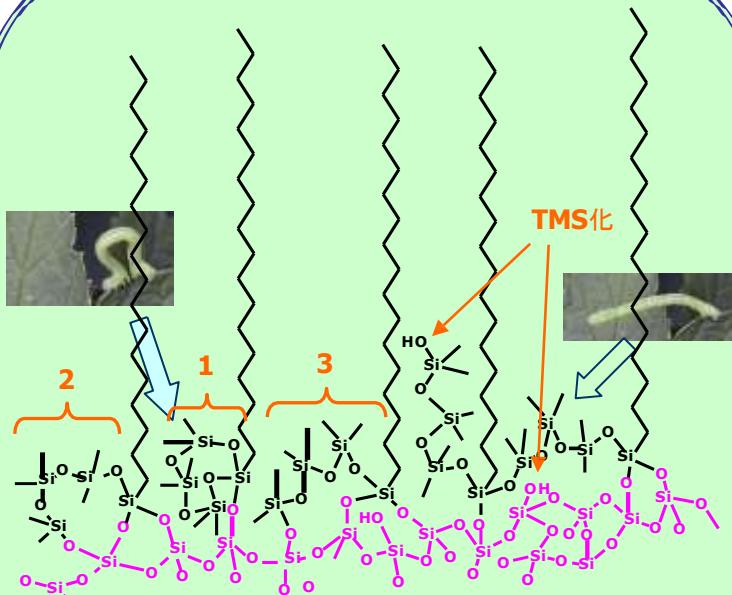
Sunniest C18, C18-HT, RP-AQUA, C8, PhE, PFP

A Novel Bonding Technique

(patent pending)

The "State of Art" trifunctional silyl-reagent was developed as shown in Fig.1. This Unique silyl-bonded reagent (HMODTS) can bond with any silanol groups on Silica Sorbent surface as shown in Fig.2. It can expand and contract by itself in Caterpillar manner. This technique can substantially minimise the contribution of residual silanol groups on Reverses phase stationary phase.

Finally an end-capping was done with trimethylsilyl-reagent (TMS).



Features

- ★ Little residual silanol groups by an unique bonding technique
- ★ Excellent stability, especially under acidic pH conditions
- ★ Sharp peak shape for acidic, basic and chelating compounds
- ★ RP-AQUA with C28 bonding offers Performance in 100% aqueous conditions, and shows enhanced retention of polar compounds.

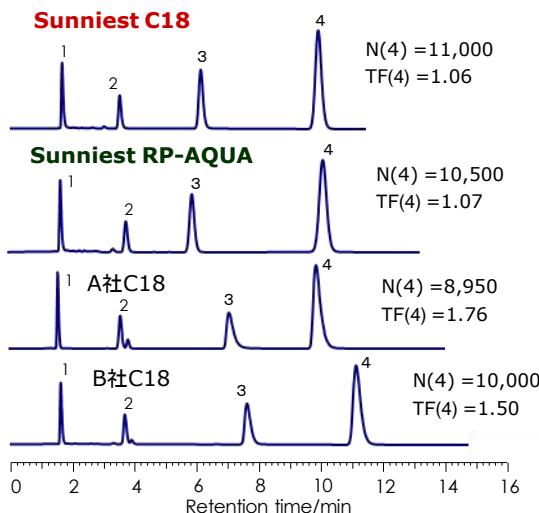
Characteristics of Sunniest

	Particle size (μm)	Pore diameter (nm)	Specific surface area (m^2/g)	Carbon content (%)	Bonded phase	pH range
Sunniest C18	3 and 5	12	340	16	C18	1.5 - 10
Sunniest C18-HT	2	10	340	16	C18	1.5 - 10
Sunniest RP-AQUA	3 and 5	12	340	16	C28	2 - 8
Sunniest C8	3 and 5	12	340	10	C8	1.5 - 9
Sunniest PhE	3 and 5	12	340	10	Phenylethyl	1.5 - 8
Sunniest PFP	5	12	340	10	Pentafluorophenyl	2 - 8

◆ Evaluation of End-capping

Comparison of plates number (N) and USP tailing factor (TF) of amitriptyline

メタノール CH₃OH, pH7.5, 40 °C



Column size: 4.6 x 150 mm

Particle size: 5 μm

Mobile phase:

CH₃OH/20mM Phosphate buffer pH7.5 or 6.0 =80/20

CH₃CN/20mM Phosphate buffer pH7.0 =60/40

Flow rate: 1.0 mL/min

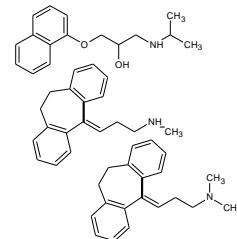
Temperature: 40 °C or 22 °C

Sample: 1 = Uracil

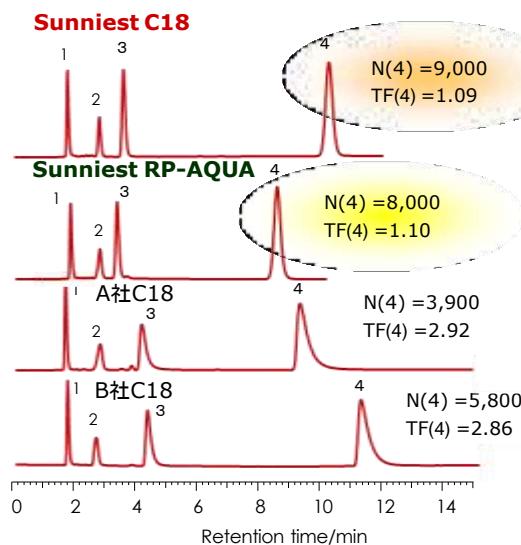
2 = Propranolol

3 = Nortriptyline

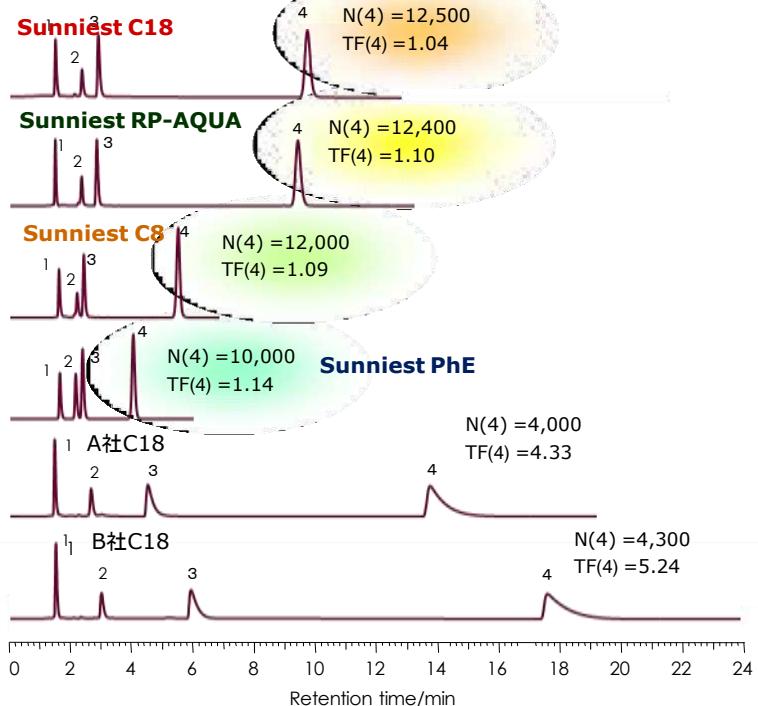
4 = Amitriptyline



メタノール CH₃OH, pH6.0, 22 °C



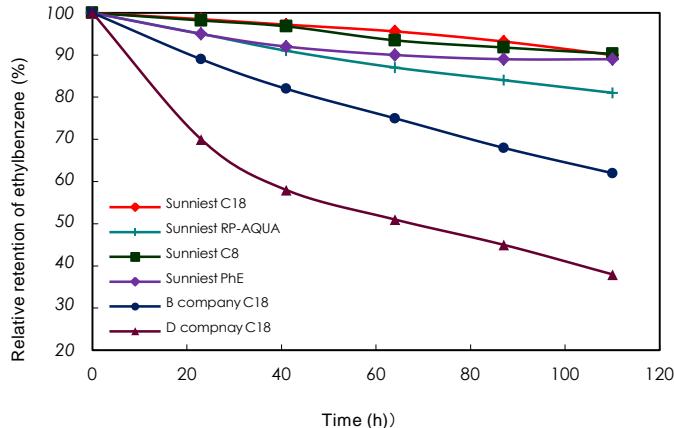
アセトニトリル CH₃CN, pH7.0, 40 °C



Amitriptyline is widely used to evaluate residual silanol groups on the C18 stationary phase. Peak shape of Amitriptyline was compared under 3 kinds of conditions such as methanol/phosphate buffer/40 °C, methanol/phosphate buffer/22 °C and acetonitrile/phosphate buffer/40 °C. Majority of the HPLC columns offered good peak shapes under methanol/phosphate buffer/40 °C conditions. However using Mobile phase of acetonitrile/phosphate buffer/40 °C, most of the columns(Refer column A and B) offered high extent of Tailing unlike Sunniest columns offering a symmetrical peak.

Sunniest C18, RP-AQUA and C8 columns allow to use a wide range of mobile phase without peak tailing because of extremely low content of residual silanol groups on the stationary phase.

◆ Stability under acidic and basic pH conditions



Durable test condition

Column size: 150 x 4.6 mm

Mobile phase: CH₃CN/1.0% TFA (pH1) = 10/90

Flow rate: 1.0 mL/min

Temperature: 80 °C

Measurement condition

Column size: 150 x 4.6 mm

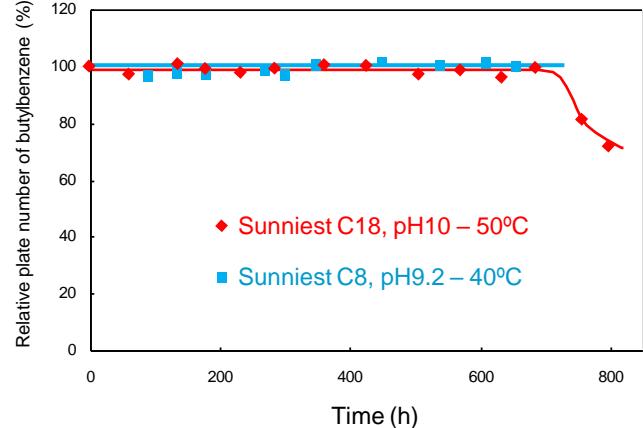
Mobile phase: CH₃CN/H₂O=60/40

Flow rate: 1.0 mL/min

Temperature: 40 °C

Sample: 1 = Uracil

2 = Ethylbenzene



Durable test condition

Column: Sunniest C18, C8, 5 µm 150 x 4.6 mm

Mobile phase:

C18: CH₃OH/20mM Sodium borate/10mM NaOH=30/21/49
(pH10)

C8: CH₃OH/20mM Sodium borate (pH9.2) =30/70

Flow rate: 1.0 mL/min

Temperature: C18 - 50 °C, C8 - 40 °C

Measurement condition

Column: Sunniest C18, C8, 5µm 150 x 4.6 mm

Mobile phase: CH₃OH/H₂O=75/25

Flow rate: 1.0 mL/min

Temperature: 40 °C

Sample: 1 = Butylbenzene

Stability under acidic pH conditions was evaluated at 80 °C using acetonitrile/1% trifluoroacetic acid solution (10:90) as mobile phase. 100% aqueous mobile phase expels from the pore of packing materials by capillarity and packing materials doesn't deteriorate. 10% acetonitrile in a mobile phase allows an accurate evaluation.¹⁻³⁾

★ Sunniest C18 has kept 90% retention for 100 hours under severe conditions of acetonitrile /1% trifluoroacetic acid solution (pH 1)at 80 deg C.

Our Unique HMODTS bonding technique offers significant enhancement of column life,

Considering the Sunniest RP-AQUA C28 ligand length the Sunniest RP-AQUA is less stable than Sunniest C18. However, Sunniest RP-AQUA C28 column with HMODTS bonding along with end capping offers longer column life in comparison to other RP Aqua columns.

1) N. Nagae, T. Enami and S. Doshi, LC/GC North America October 2002.
2) T. Enami and N. Nagae, American Laboratory October 2004.

3) T. Enami and N. Nagae, BUNSEKI KAGAKU, 53 (2004) 1309.

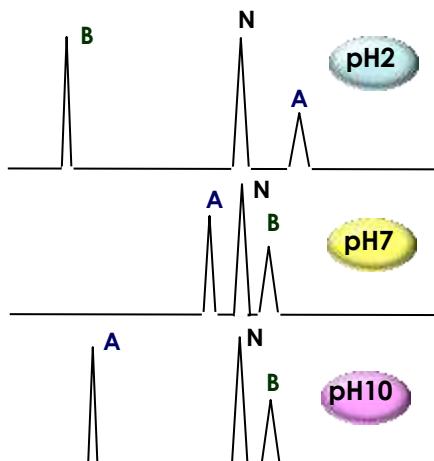
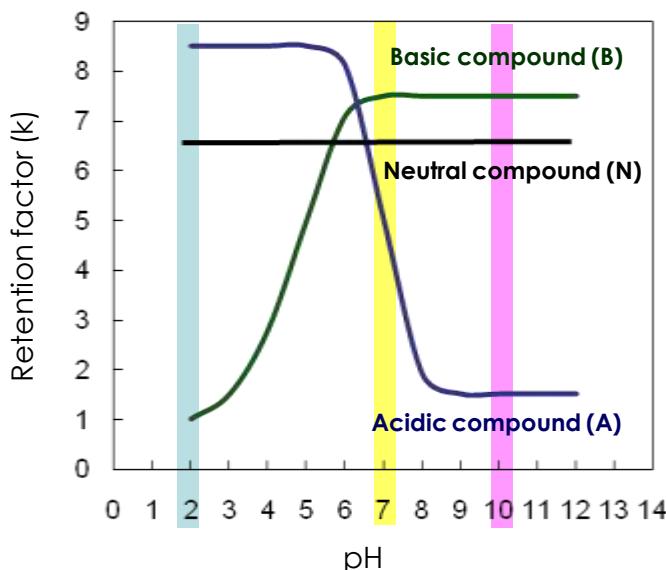
Stability under basic pH conditions was evaluated at 50 °C using methanol/Sodium borate buffer pH 10 (30:70) as mobile phase. Sodium borate is used as a alkaline standard solution for pH meter, so that its buffer capacity is high.

Elevated temperature of 10 °C makes column life be one third. When Sunniest C18 column is used at 40 °C, column life becomes 2,000 hours. Most of the HPLC columns stability data is offered at ambient room temperature alternate 25 °C at pH 1-10 units..At temperature of 25°C, the column life is sixteen times longer than that at 50 °C.

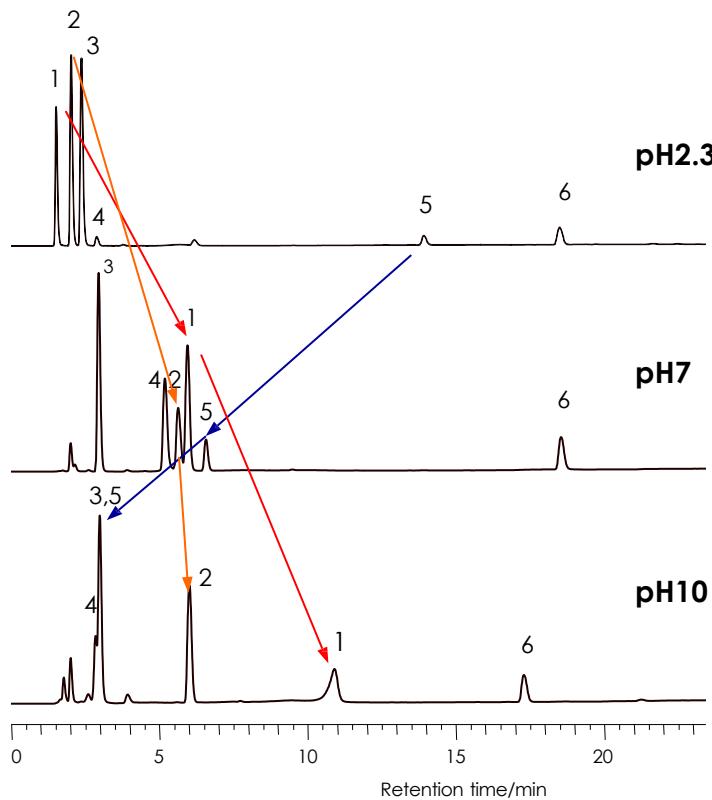
★ Sunniest C18 offers performance at elevated pH and temperature. Regarding stability under basic pH condition, there are very few C18 column like Sunniest C18 & Hybrid type C18 which can sustain and offer performance under such challenging conditions of high temperature and pH. It is considered that our double end-capping & base deactivation technique leads higher stability.

★ Sunniest C18 has operational pH Range from 1.5 to 10. Sunniest C8,Phenyl has operational pH Range 1.5 to 9 and Sunniest RP-Aqua and Pentafluorophenyl (PFP) at pH 2-8..

◆ Relationship between pH and retention of Acidic, Basic and Neutral compounds



◆ pH selectivity



Column: Sunniest C18, 5 μm 150 x 4.6 mm
Mobile phase:

- A1) 20mM Phosphoric acid pH2.3
- A2) 20mM Phosphate buffer pH7
- A3) 20mM Phosphate buffer pH10
- B) Acetonitrile

Time (min)	0	30
%B (%)	2	26

Flow rate: 1.0 mL/min

Temperature: 40 °C

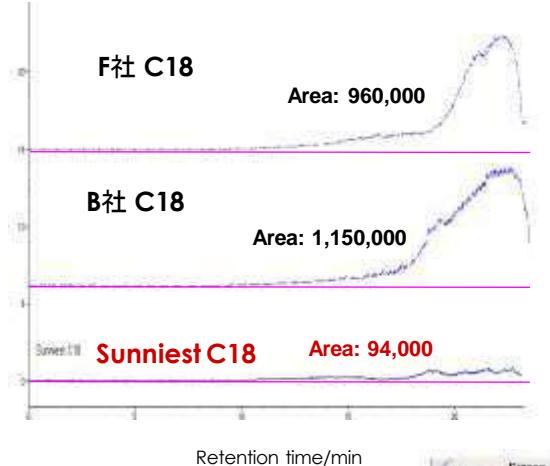
Detection: UV@250 nm

Sample: 1= Thiamine HCl Vitamin B₁
2 = Nicotinamide
3 = Nicotinic acid
4 = Pyridoxine HCl Vitamin B₆
5 = Folic acid
6 = Riboflavin Vitamin B₂

It is interesting to note that the change in pH of mobile phase can offer different selectivity of ionic compounds. Sunniest C18 can be used at the pH range from 1.5 to 10, so that a suitable analytical method can be developed using Sunniest C18 Column..

◆ Comparison data: Bleeding from column

《 Comparison using Corona CAD》



Column size: 150 x 2.0 mm

Mobile phase:

- A) 0.1% acetic acid
- B) CH₃CN

Gradient: Time: 0min 3min 14.4min 18min 19min

%B: 5% 5% 100% 100% 5%

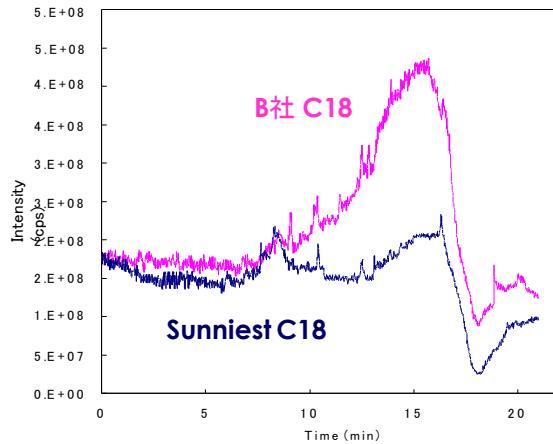
Flow rate: 0.2 mL/min

Temperature: 40 °C

Detection: Corona CAD



《 Comparison using MS》



Column size: 150 x 2.0 mm

Mobile phase:

- A) 0.1% acetic acid
- B) CH₃CN

Gradient: Time: 0min 3min 14.4min 18min 19min
 %B: 5% 5% 100% 100% 5%

Flow rate: 0.2 mL/min

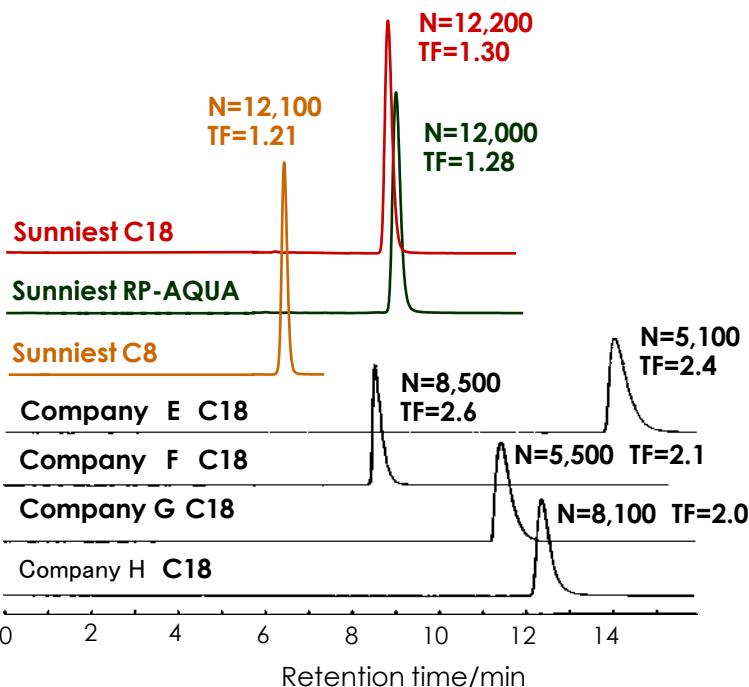
Temperature: 40 °C

MS: ABI API-4000

Ionization: Turboionspray (cation)

Measurement mode: Q1 Scan m/z 100-1000

◆ Separation of antidepressants using Acetonitrile and Ammonium acetate for LC/MS



Column size: 150 x 4.6 mm

Particle size: 5μm

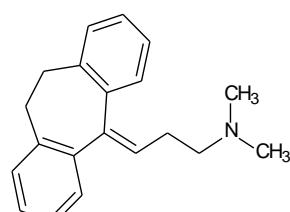
Mobile phase: CH₃CN/10mM

Ammonium acetate pH6.8=40/60

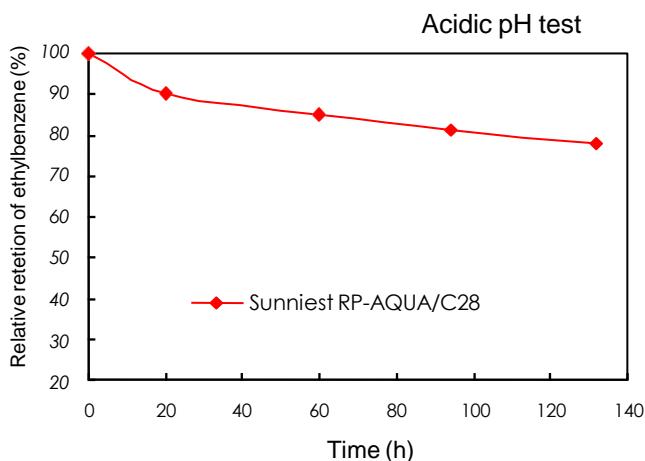
Flow rate: 1.0 mL/min

Temperature: 40 °C

Sample: Amitriptyline



◆ Stability of Sunniest RP-AQUA/ C28 under 100% aqueous conditions

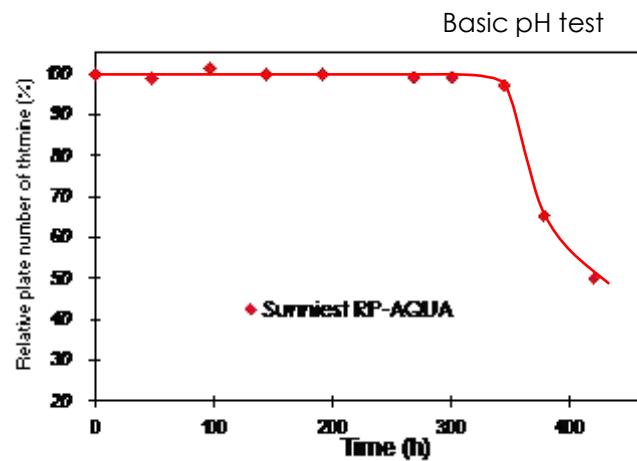


Durable test conditions

Column: Sunniest RP-AQUA, 5µm 150 x 4.6 mm
 Mobile phase: 0.5% TFA
 Flow rate: 1.0 mL/min
 Temperature: 60 °C

Measurement conditions

Column: Sunniest RP-AQUA, 5µm 150 x 4.6 mm
 Mobile phase:
 $\text{CH}_3\text{OH}/\text{H}_2\text{O}=75/25$
 Flow rate: 1.0 mL/min
 Temperature: 40 °C
 Sample: 1 = Uracil
 2 = Amylbenzene



Durable test conditions

Column: Sunniest RP-AQUA, 5µm 150 x 4.6 mm
 Mobile phase: 20mM Phosphate buffer pH8.0
 Flow rate: 1.0 mL/min
 Temperature: 40 °C

Measurement conditions

Column: Sunniest RP-AQUA, 5µm 150 x 4.6 mm
 Mobile phase: 10mM Phosphate buffer pH7.0
 Flow rate: 1.0 mL/min
 Temperature: 40 °C
 Sample: 1 = Thymine

It is important that stability is evaluated for RP Aqua columns under 100% aqueous conditions because RP-Aqua column life becomes longer with incremental contents of organic solvent in a mobile phase. Sunniest RP-AQUA/C28 column can be used under 100% aqueous conditions from pH 2 to pH 8.

★ Sunniest RP-AQUA/ C28 column can be used under 100% aqueous conditions from pH 2 to pH 8. Sunniest RP-AQUA/C28 is one of the most stable aqua type column.

★ Sunniest RP-AQUA/C28 column with HMODTS bonding along with end capping offers longer column life in comparison to other RP Aqua columns



◆ Reproducibility of retention under 100% aqueous conditions

★ C18 and C8 Reversed phases exhibit decreased and poorly reproducible retention under more than 98% aqueous conditions as shown in Fig. 1. This problem traditionally has been explained as being the result of ligand collapse or a matting effect. Nagae¹⁻³ ascertained, however, that the mobile phase was being expelled from the pores of the packing material under 100% aqueous mobile phase conditions, as Fig. 2 shows.

★ When the surface of packing materials isn't wet by water, water used as a mobile phase expels from the pore of the packing material by capillarity. This is a reason why reproducibility in retention is low under 100% aqueous conditions. Reversely pressure around the packing material makes water permeate into the pore of the packing material to overcome a force worked by capillarity.

In other words, the surface of a reversed phase like C18 isn't wet by water anytime even if water permeates into the pore of the packing material or not. So it is wrong that we say "dewetting" when water expels from the pore. Saying "Depermeating" is more appropriate.

★ Sunniest RP-AQUA /C28 is a reversed stationary phase, so that it is not wet with water. However the contact angle of water on the surface of Sunniest RP-AQUA /C28 is less than that of a conventional C18. Expelling force (pressure) acted by capillarity on Sunniest RP-AQUA /C28 is less than atmospheric pressure. So, Sunniest RP-AQUA /C28 shows reproducible retention under 100% aqueous conditions.

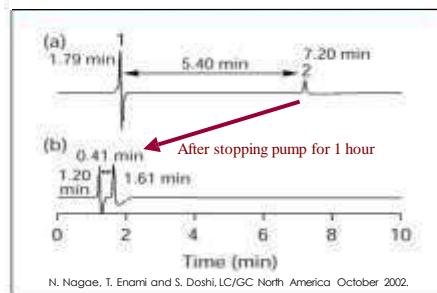


Fig. 1 Retention behavior of a C18 column under 100% aqueous mobile phase conditions

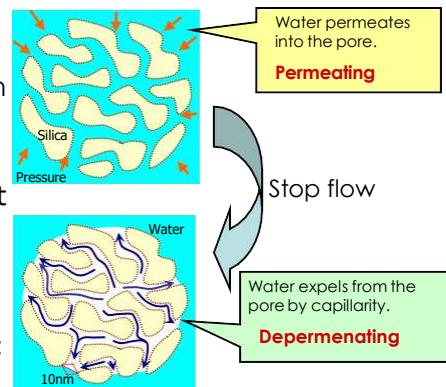
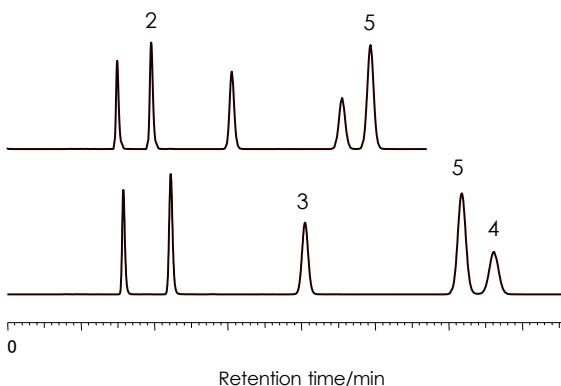


Fig. 2 Schematic diagram of C18 particle

1) N. Nagae, T. Enami and S. Doshi, LC/GC North America October 2002.
 3) T. Enami and N. Nagae, BUNSEKI KAGAKU, 53 (2004) 1309.

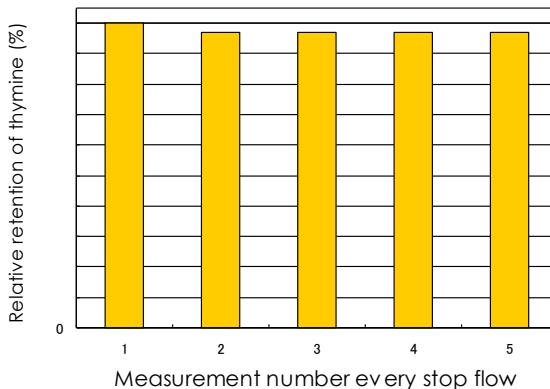
2) T. Enami and N. Nagae, American Laboratory October 2004.

◆ Separation of nucleic acid bases



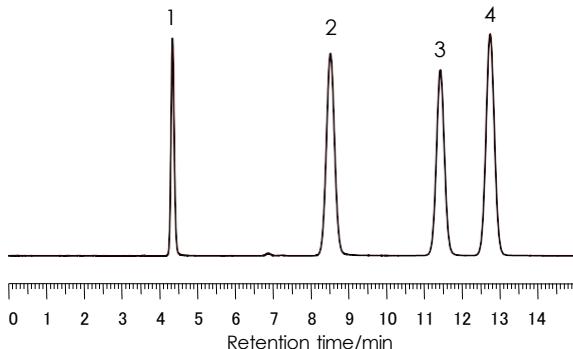
Column: Sunniest RP-AQUA/C28 5μm 150 x 4.6 mm
 Mobile phase: 10mM Phosphate buffer pH7.0
 Flow rate: 1.0 mL/min
 Temperature: 40 °C and 25°C
 Sample: 1 = Cytosine 2 = Uracil
 3 = Thymidine 4 = Uridine
 5 = Thymine

Change of retention of thymine at 40 °C (measurement every stop flow for 1 hour)



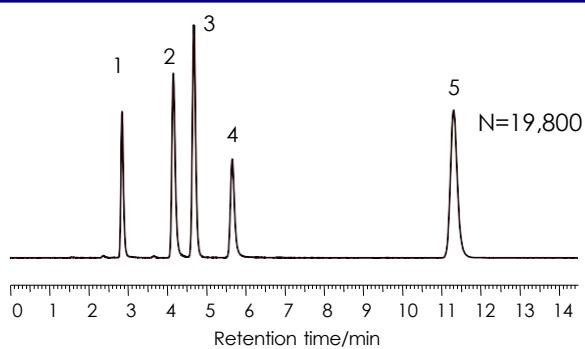
Sunniest RP-AQUA/C28 showed more than 97% of reproducibility in retention using 100% aqueous buffer as a mobile phase.

◆ Separation of water-soluble vitamins



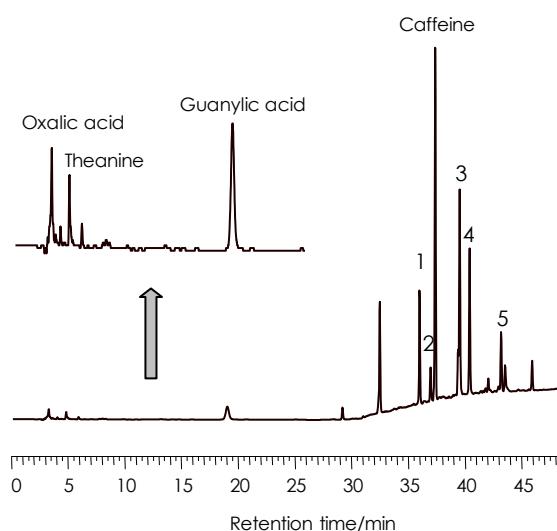
Column: Sunniest RP-AQUA,/C28 5 μ m 150 x 4.6 mm
Mobile phase: 40mM Phosphate buffer pH6.8
Flow rate: 1.0 mL/min
Temperature: 40 °C
Detection: UV@250nm
Sample: 1 = Nicotinic acid, 2 = Pyridoxal
3 = Pyridoxine, 4 = Nicotinamide

◆ Separation of water-soluble vitamins



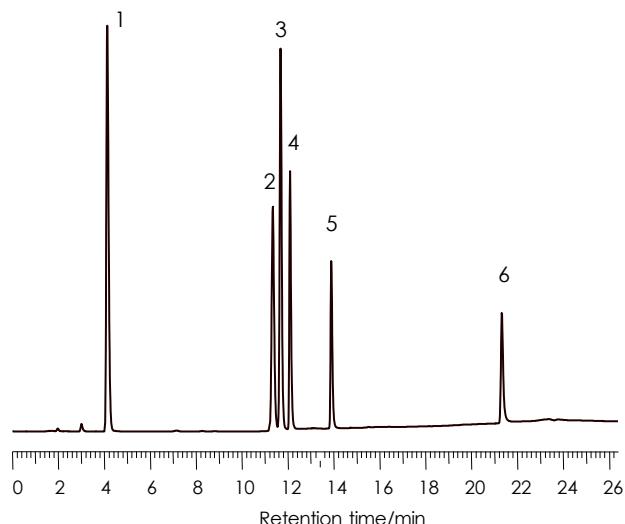
Column: Sunniest RP-AQUA, /C28 3 μ m 150 x 4.6 mm
Mobile phase: 20mM Phosphate buffer pH6.0
Flow rate: 1.0 mL/min
Temperature: 40 °C
Detection: UV@250nm
Sample: 1 = 5'-GDP, 2 = 5'-GMP, 3 = 5'-ATP, 4 = 5'-ADP,
5 = 5'-AMP

◆ separation of Oolong tea

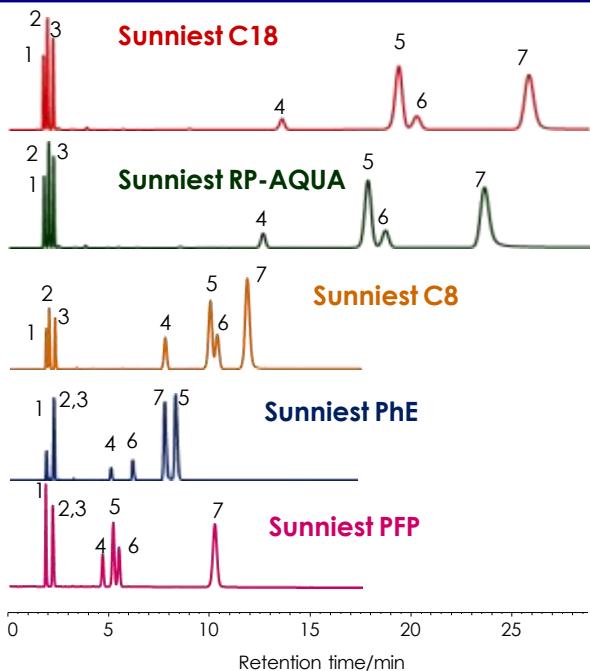


Column: Sunniest RP-AQUA /C28, 5 μ m 250 x 4.6 mm
Mobile phase: A) H₂O/H₃PO₄ (99.9:0.1)
B) CH₃CN
Time (min) 0 20 60
% B (%) 0 0 50
Flow rate: 1.0 mL/min
Temperature: 40 °C
Detection: UV@210 nm
Injection volume: 10 μ L
Sample: Oolong tea 1 = (-)-Epigallocatechin
2 = (+)-Catechin
3 = (-)-Epigallocatechin gallate
4 = (-)-Epicatechin
5 = (-)-Epicatechin gallate

◆ Separation of water-soluble vitamins using mobile phase for LC/MS



Column: Sunniest RP-AQUA/C28i 5 μ m 150 x 4.6 mm
Mobile phase: A) 20mM Ammonium acetate
B) Acetonitrile/ A solution (20:80)
Time (min) 0 5 20 25
% B (%) 0 0 100 100
Flow rate: 1.0 mL/min
Temperature: 40 °C
Detection: UV@250 nm
Sample: 1= Nicotinic acid
2 = Pyridoxine HCl Vitamin B₆
3 = Nicotinamide
4 = Thiamine HCl Vitamin B₁
5 = Folic acid
6 = Riboflavin Vitamin B₂

♦ Separation of standard samples


Column: Sunniest C18, 5 μ m 4.6x150 mm
 Sunniest RP-AQUA, 5 μ m 4.6x150mm
 Sunniest C8, 5 μ m 4.6x150 mm
 Sunniest PhE, 3 μ m 4.6x150 mm
 Sunniest PFP, 5 μ m 4.6x150 mm

Mobile phase: $\text{CH}_3\text{OH}/\text{H}_2\text{O}=75/25$

Flow rate: 1.0 mL/min

Temperature: 40 °C

Pressure: 5.4 MPa

Sample: 1 = Uracil,

2 = Caffeine,

3 = Phenol,

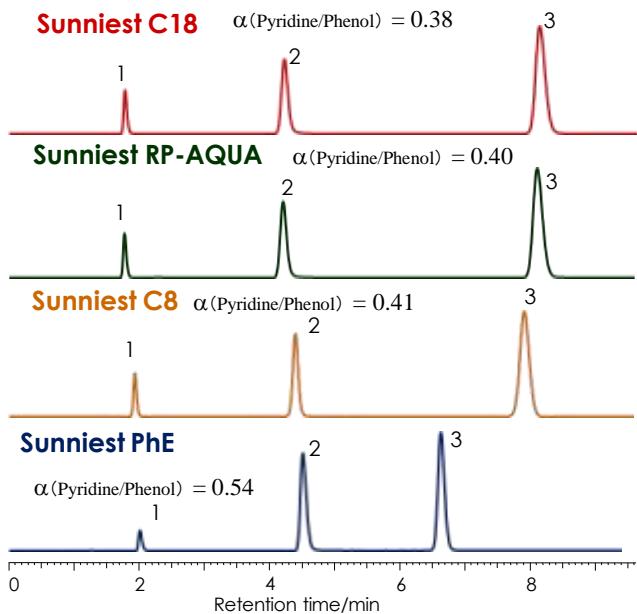
4 = Butylbenzene, (N=15,700)

5 = o-Terphenyl, (N=15,000)

6 = Amylbenzene, (N=15,300)

7 = Triphenylene, (N=14,500)

N is plate number of the above Sunniest C18.

♦ Separation of pyridine and phenol


Column: Sunniest C18, 5 μ m 4.6x150 mm
 Sunniest RP-AQUA, 5 μ m 4.6x150mm
 Sunniest C8, 5 μ m 4.6x150 mm
 Sunniest PhE, 3 μ m 4.6x150 mm

Mobile phase: $\text{CH}_3\text{OH}/\text{H}_2\text{O}=30/70$

Flow rate: 1.0 mL/min

Temperature: 40 °C

Detection: UV@250nm

Sample: 1 = Uracil

2 = Pyridine

3 = Phenol

Separation factor of pyridine and phenol is said to show the amount of residual silanol groups. The lower a value of separation factor, the less an effect of residual silanol groups.

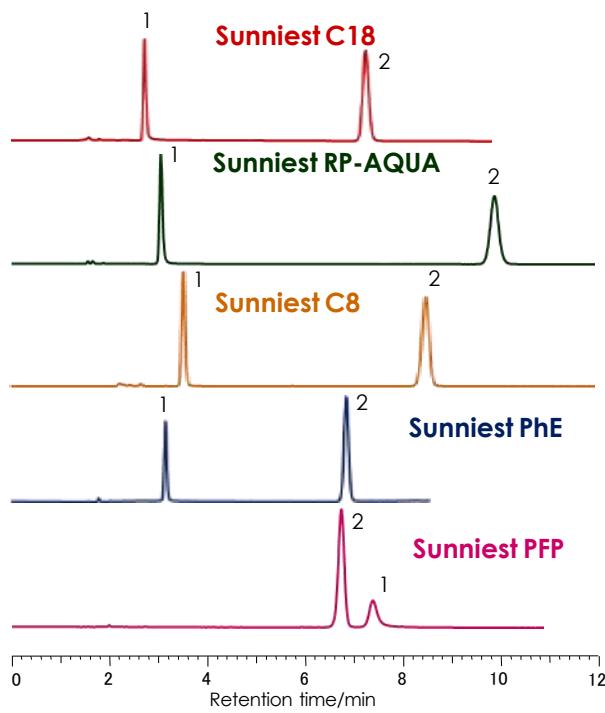
All Sunniest columns show one of the lowest value.

	C18	RP-AQUA	C8	PhE	PFP
Hydrophobicity					
α (Amylbenzene/Butylbenzene)	1.56	1.56	1.43	1.34	1.29
Hydrogen bonding capacity					
α (Caffeine/Phenol)	0.43	0.49	0.33	1.00	1.00
Steric selectivity					
α (Triphenylene/o-Terphenyl)	1.37	1.36	1.23	0.92	2.51
Residual silanol activity					
α (Pyridine/Phenol)	0.38	0.40	0.41	0.54	-----

Sunniest C18 shows not only high efficiency but also low column pressure.



◆ Separation of a chelating compound



Column: Sunniest C18, 5 μ m 4.6x150 mm
Sunniest RP-AQUA, 5 μ m 4.6x150mm
Sunniest C8, 5 μ m 4.6x150 mm
Sunniest PhE, 3 μ m 4.6x150 mm
Sunniest PFP, 5 μ m 4.6x150 mm

Mobile phase: $\text{CH}_3\text{CN}/20\text{mM H}_3\text{PO}_4=10/90$

Flow rate: 1.0 mL/min

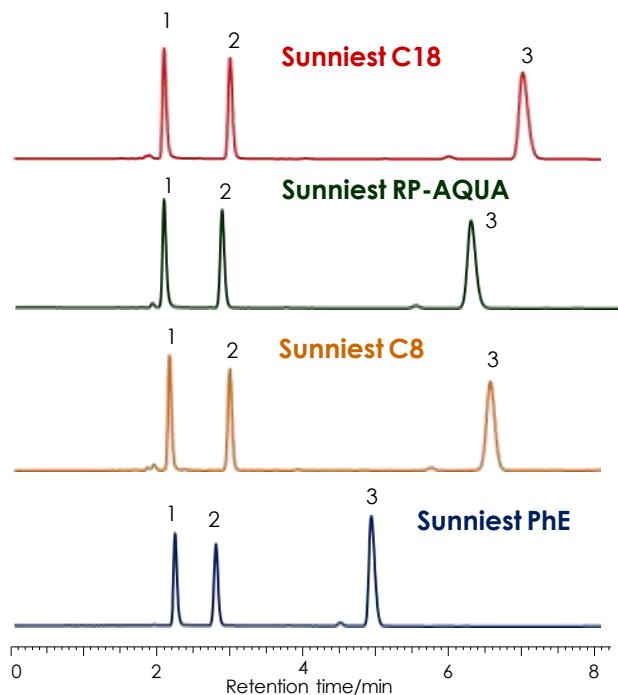
Temperature: 40 °C

Detection: UV@250nm

Sample: 1 = 8-Quinolinol

2 = Caffeine

◆ Separation of acidic compounds



Column: Sunniest C18, 5 μ m 4.6x150 mm
Sunniest RP-AQUA, 5 μ m 4.6x150mm
Sunniest C8, 5 μ m 4.6x150 mm
Sunniest PhE, 3 μ m 4.6x150 mm

Mobile phase: $\text{CH}_3\text{CN}/0.1\% \text{H}_3\text{PO}_4=2/98$

Flow rate: 1.0 mL/min

Temperature: 40 °C

Detection: UV@210nm

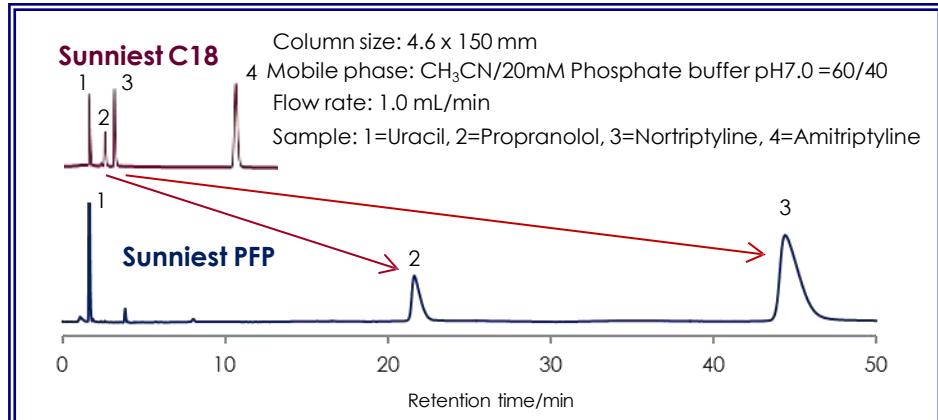
Sample: 1 = Formic acid

2 = Acetic acid

3 = Propionic Acid

★ Sunniest C18, RP-AQUA, C8 ,PhE and PFP are inert for a metal chelating compound and acidic and basic compounds, so that they show symmetrical peaks of each compound.

◆ Retention comparison between C18 and PFP



★ PFP retains a cation such a nortriptyline much longer than a C18.





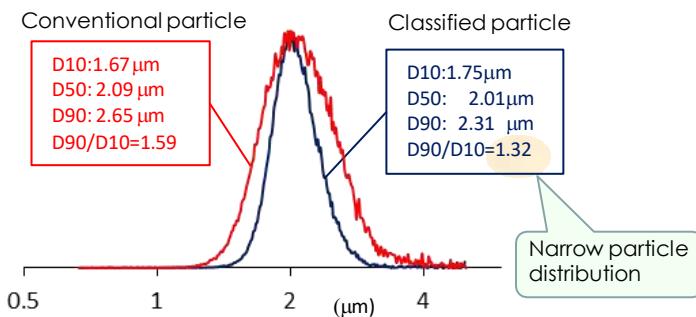
Sunniest C18-HT, 2 µm

Features

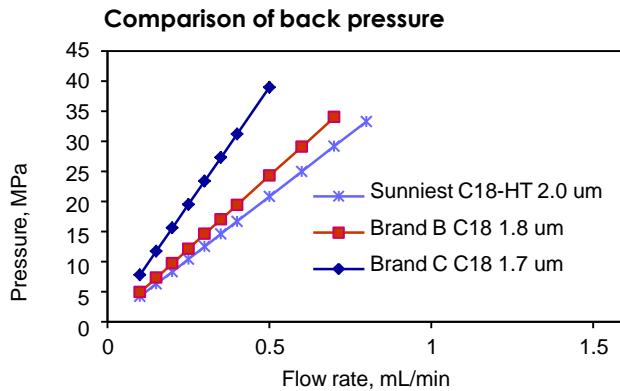
- Low back pressure and high efficiency by precisely classified particle
- High pressure packing (10,000 psi) using hard silica gels with high pressure resistant
- leads long column life without any void.
- Unique bonding technique for Sunniest
- The most suitable inner surface of column by special grinding

• Narrow Particle Distribution and Low Back Pressure

Measured by Coulter Counter method

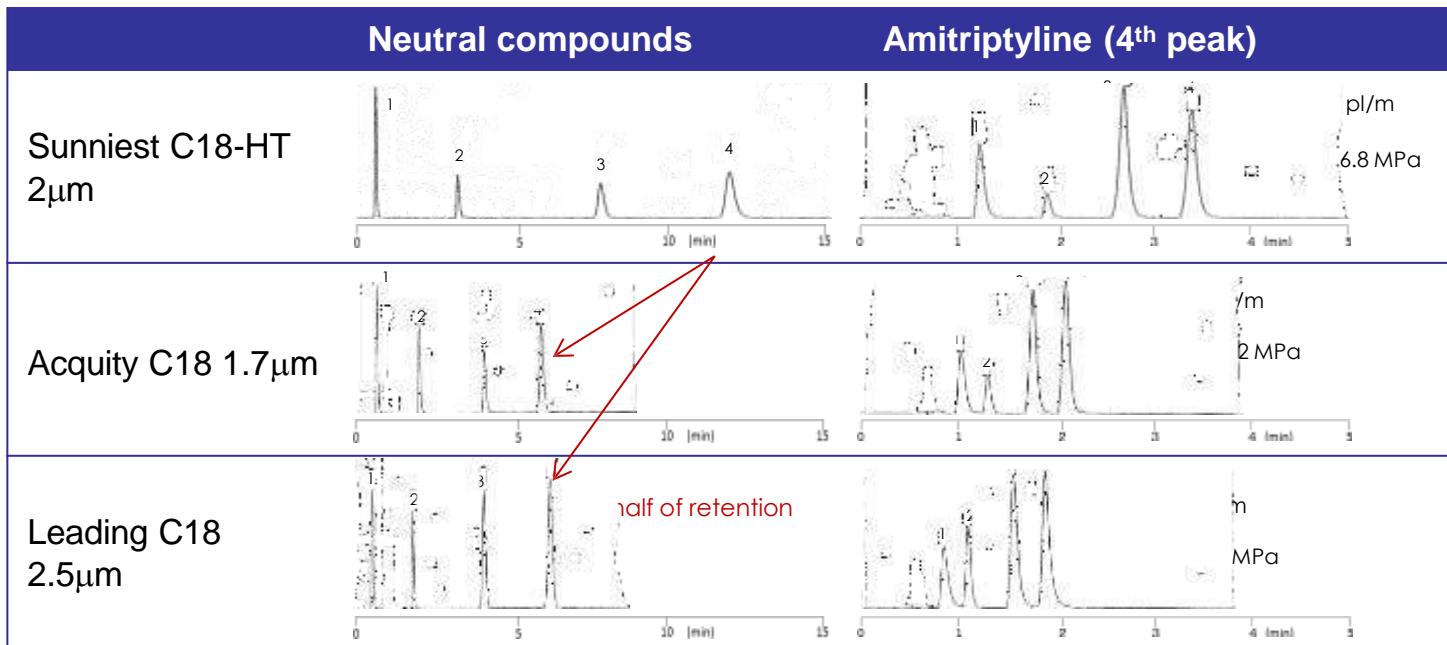


Conventional 2 µm silica gel particle was classified again. 20% volume was cut off from both sides respectively. Consequently column back pressure reduced more than 15%. Our 2 µm silica gel particle shows a half pressure to compare with the other sub-2 µm silica gel particle.

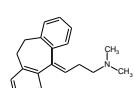


Column: Sunniest, Acquity and Zorbax
Column dimension: 50 x 2.1 mm
Mobile phase: Acetonitrile/water=(70/30)
Temperature: 25 °C

• An Unique Modification Leads Good Peak Shape

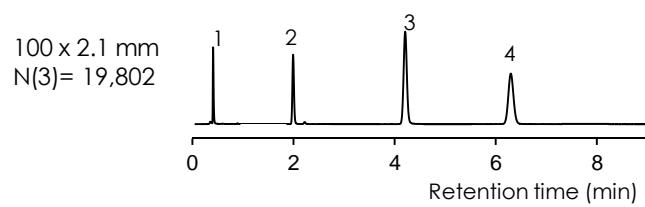
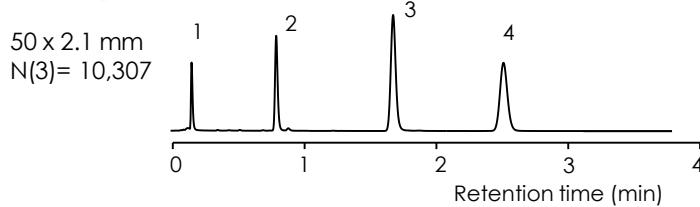


Column dimension: 50 x 2.1 mm
Mobile phase: Methanol/water=70/30 for neutral compounds
Methanol/25mM phosphate buffer (pH6.0)=80/20 for antidepressants
Flow rate: 0.2 mL/min
Temperature: room temperature
Sample: Neutral compounds, 1=Uracil, 2=Toluene, 3=Biphenyl, 4=Penanthrene
Antidepressants, 1=Nortriptyline, 2=Toluene, 3=Imipramine,
4=Amitriptyline



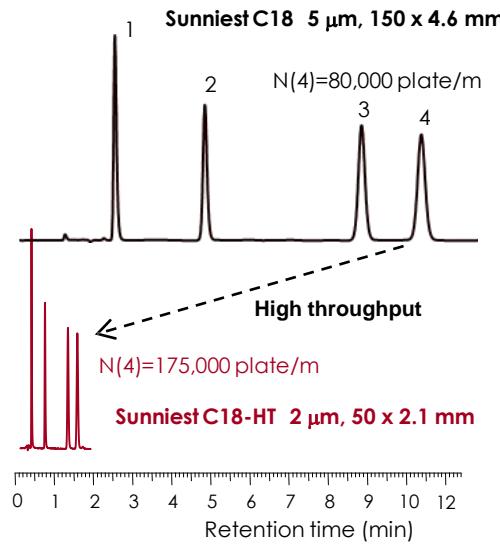
It is difficult to end-cap on sub 2 µm or 2 µm silica gel particle as well as 3 µm or 5 µm silica gel particle. Most sub 2 µm or 2 µm C18 columns show smaller plate number and larger tailing factor for a basic compound than Sunniest C18-HT. Sunniest C18-HT 2 µm shows a good peak shape for amitriptyline under methanol/phosphate buffer mobile phase at room temperature. Furthermore Sunniest C18-HT 2 µm shows 2 times longer retention time than the other brand columns.

• Comparison of Plate Number



Mobile phase: $\text{CH}_3\text{CN}/\text{H}_2\text{O} = 60/40$
Flow rate: 0.6 mL/min for 2.1 x 30 mm and 2.1 x 50 mm, 0.4 mL/min for 2.1 x 75 mm and 2.1 x 100 mm
Temperature: 40 °C Detection: UV@250 nm
Sample: 1=Uracil, 2=Toluene, 3=Acenaphthene, 4=Butylbenzene

• Separation of Analgesics

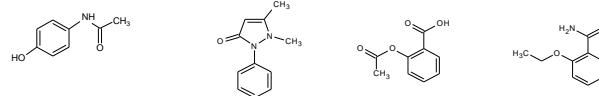


Mobile phase: $\text{CH}_3\text{CN}/0.1\% \text{ Formic acid} = 20/80$
Flow rate: 1.0 mL/min for 150 x 4.6 mm

0.6 mL/min for 50 x 2.1 mm

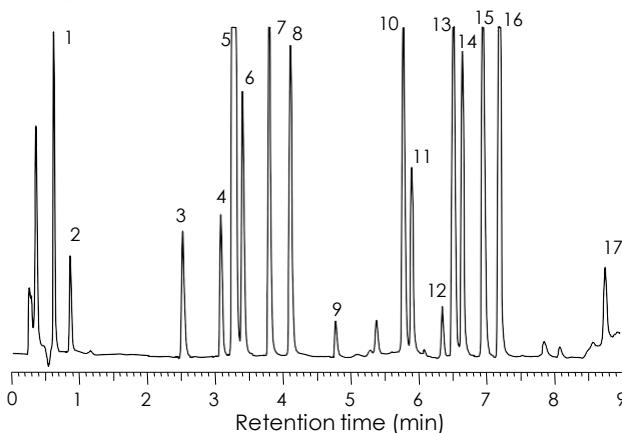
Temperature: 40 °C
Detection: UV@230 nm
Sample:

1=Acetaminophen, 2=Antipyrine, 3=Aspirin, 4=Ethenzamide



2 µm particle allows to reduce retention time because high efficiency is kept under high flow rate conditions. As shown the above chromatograms, analytical time reduced 1/8 without sacrifices of separation by using 2 µm, 50 x 2.1 mm column instead of 5 µm 150 x 4.6 mm column.

• Separation of Amino Acids derivatized with OPA



Column: Sunniest C18-HT 2 µm, 100 x 2.1 mm

Mobile phase: A) 10mM Na₂PO₄ + 10mM Na₂B4O₇ + 0.5mM NaN₃
B) Acetonitrile/Methanol/Water (45/45/10%V)

Time(min)	0	0.2	7.2	7.8
%B	5	5	50	100

Flow rate: 0.72 mL/min

Temperature: 40 °C

Detection: UV@338 nm

Sample: 1=Aspartic acid, 2=Glutamic acid, 3=Serine, 4=Histidine, 5=Glycine, 6=Threonine, 7=Arginine, 8=Alanine, 9=Tyrosine, 10=Valine, 11=Methionine, 12=Tryptophan, 13=Pheylalanine, 14=Isoleucine, 15=Leucine, 16=Lysine, 17=Proline

• Characteristics of Sunniest C18-HT, 2 µm

Packings	Silica gel support			C18			
	Particle size (µm)	Pore diameter nm	Specific surface area (m ² /g)	Carbon content (%)	Bonded phase	Maximum operating pressure	Available pH range
Sunniest C18-HT	2.0 (Coulter counter)	10	340	16	C18	70 MPa or 10,000 psi	1.5 - 10

It is very important for 2 µm particle to have a capacity to resist pressure because of high column back pressure. The larger a pore volume of silica gel, the weaker a capacity to resist pressure. The silica gel with 0.85 ml/g of pore volume is used for Sunniest C18-HT, 2 µm, so that it have a high capacity to resist pressure and a high operating pressure.

Guard Cartridge (10 x 4 mm)

Feature

- *Simple structure
- *Low dead volume
- *Available for not only 5 µm column but also 3 µm column

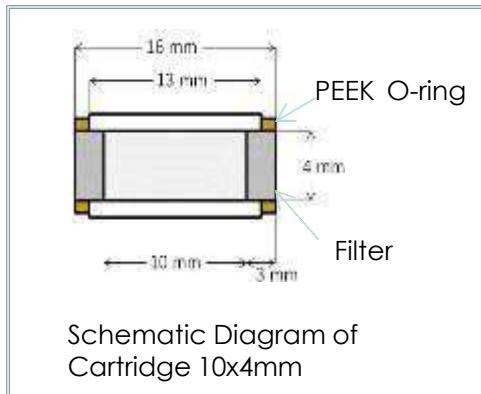
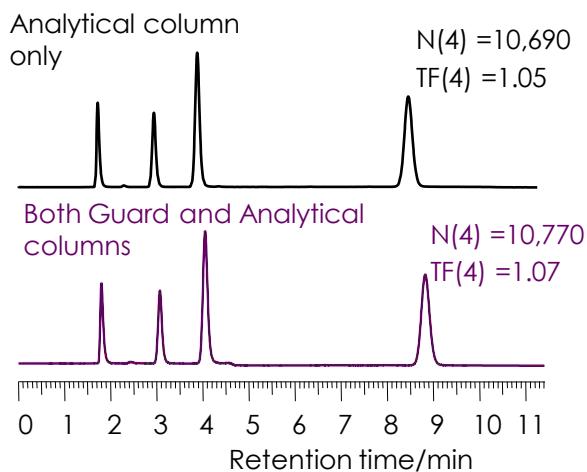


Photo of Cartridge and Holder

Comparison of chromatograms



Column: Sunniest C18, 5 µm 150 x 4.6 mm

Guard cartridge 10 x 4 mm

Mobile phase:

CH₃OH/20mM Phosphate buffer pH7.5 = 80/20

Flow rate: 1.0 mL/min

Temperature: 40 °C

Pressure: 4.8 MPa, 5.6 MPa(+guard)

Sample: 1 = Uracil,

2 = Propranolol,

3 = Nortriptyline,

4 = Amitriptyline,

TF: USP tailing factor



Particle size Catalog No.

Sunniest C18, 5 µm Guard cartridge column (1-pak + Holder) 4 x 10 mm	5 µm	EB3A1H
Sunniest RP-AQUA, 5 µm Guard cartridge column (1-pak + Holder) 4 x 10 mm	5 µm	ER3A1H
Sunniest C8, 5 µm Guard cartridge column (1-pak + Holder) 4 x 10 mm	5 µm	EC3A1H
Sunniest C18, 5 µm Guard cartridge (4-pak) 4 x 10 mm	5 µm	EB3A1C
Sunniest RP-AQUA, 5 µm Guard cartridge (4-pak) 4 x 10 mm	5 µm	ER3A1C
Sunniest C8, 5 µm Guard cartridge (4-pak) 4 x 10 mm	5 µm	EC3A1C
Sunniest Guard cartridge holder 4 x 10 mm	---	HOLA1C

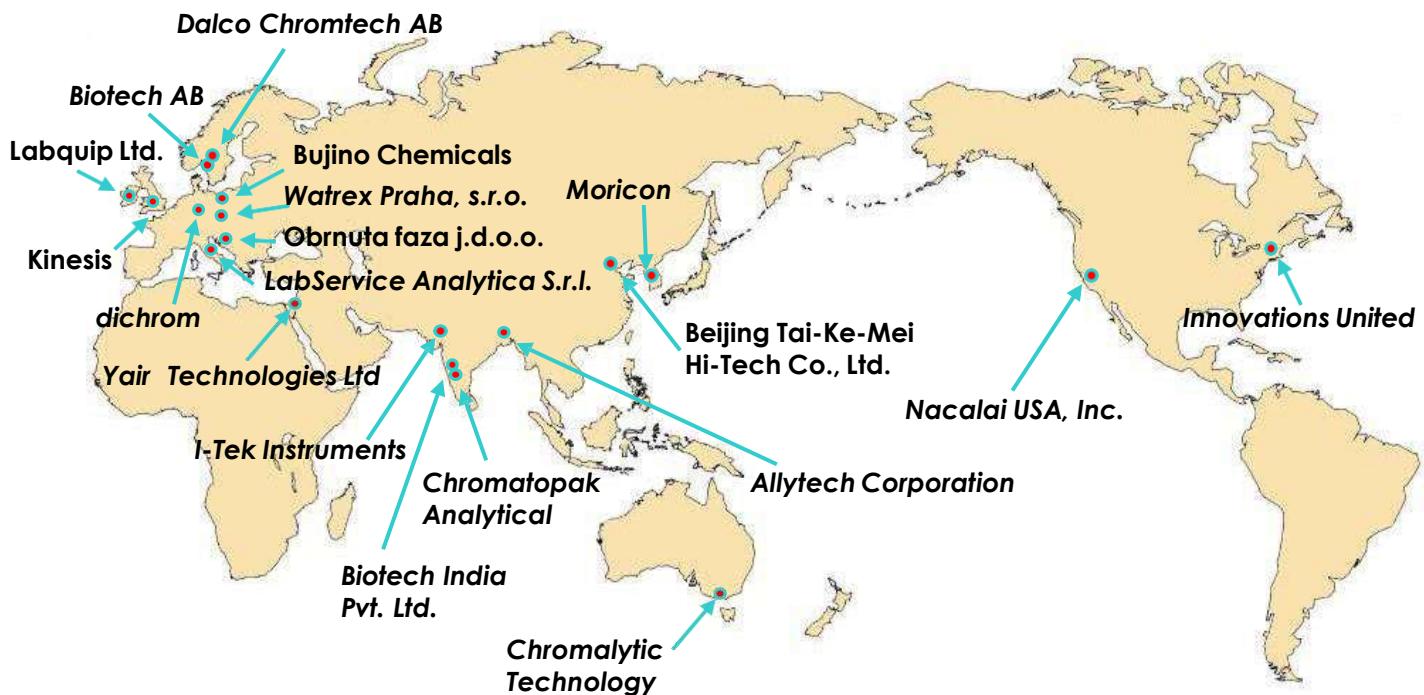
* Sunniest Ordering information

Inner diameter [mm]	Length [mm]	Sunniest C18, 3µm	Sunniest C18, 5µm	Sunniest RP- AQUA, 3µm	Sunniest RP- AQUA, 5µm	Sunniest C8, 3µm	Sunniest C8, 5µm
		Catalog No.	Catalog No.	Catalog No.	Catalog No.	Catalog No.	Catalog No.
2	50	EB2241	EB3241	ER2241	ER3241	EC2241	EC3241
	75	EB2251	—	ER2251	—	EC2251	—
	100	EB2261	EB3261	ER2261	ER3261	EC2261	EC3261
	150	EB2271	EB3271	ER2271	ER3271	EC2271	EC3271
	250	EB2281	EB3281	ER2281	ER3281	EC2281	EC3281
3	50	EB2341	EB3341	ER2341	ER3341	EC2341	EC3341
	100	EB2361	EB3361	ER2361	ER3361	EC2361	EC3361
	150	EB2371	EB3371	ER2371	ER3371	EC2371	EC3371
	250	EB2381	EB3381	ER2381	ER3381	EC2381	EC3381
4.6	10	EB2411	EB3411	ER2411	ER3411	EC2411	EC3411
	50	EB2441	EB3441	ER2441	ER3441	EC2441	EC3441
	75	EB2451	—	ER2451	—	EC2451	—
	100	EB2461	EB3461	ER2461	ER3461	EC2461	EC3461
	150	EB2471	EB3471	ER2471	ER3471	EC2471	EC3471
	250	EB2481	EB3481	ER2481	ER3481	EC2481	EC3481
10	250	—	EB3781	—	ER3781	—	EC3781
20	50	—	EB3841	—	ER3841	—	EC3841
	150	—	EB3871	—	ER3871	—	EC3871
	250	—	EB3881	—	ER3881	—	EC3881

Inner diameter [mm]	Length [mm]	Sunniest PhE, 3µm	Sunniest PhE, 5µm	Sunniest PFP, 5µm
		Catalog No.	Catalog No.	Catalog No.
2.0	50	EP2241	EP3241	—
	75	EP2251	—	—
	100	EP2261	EP3261	—
	150	EP2271	EP3271	—
	250	EP2281	EP3281	—
3.0	50	EP2341	EP3341	—
	100	EP2361	EP3361	—
	150	EP2371	EP3371	—
	250	EP2381	EP3381	—
4.6	10	—	EP3411	—
	50	EP2441	EP3441	EF3441
	75	EP2451	—	—
	100	EP2461	EP3461	EF3461
	150	EP2471	EP3471	EF3471
	250	EP2481	EP3481	EF3481
10.0	250	—	EP3781	—
20.0	50	—	EP3841	—
	150	—	EP3871	—
	250	—	EP3881	—

Inner diameter [mm]	Length [mm]	Sunniest C18-HT, 2µm
		Catalog No.
2.1	20	EB1921
	30	EB1931
	50	EB1941
	75	EB1951
	100	EB1961
3.0	20	EB1321
	30	EB1331
	50	EB1341
	75	EB1351
	100	EB1361

*Our distributors in the world



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specialists in chromatography

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Manufacturer
ChromaNik Technologies Inc.

Products

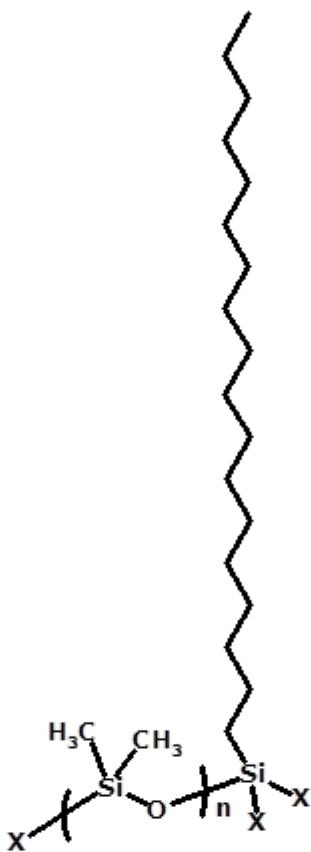
Home / Products (../product_en.html) / Sunniest Overview

Sunniest

Developed a new bonded phase made with unique end capping!

This special C18 reagent consists of C18 chain part and endcapping part like an arm. An arm of this reagent moves like a Geometrid caterpillar, so that a functional group on the tip of the arm can bond with a silanol group which is located anywhere.

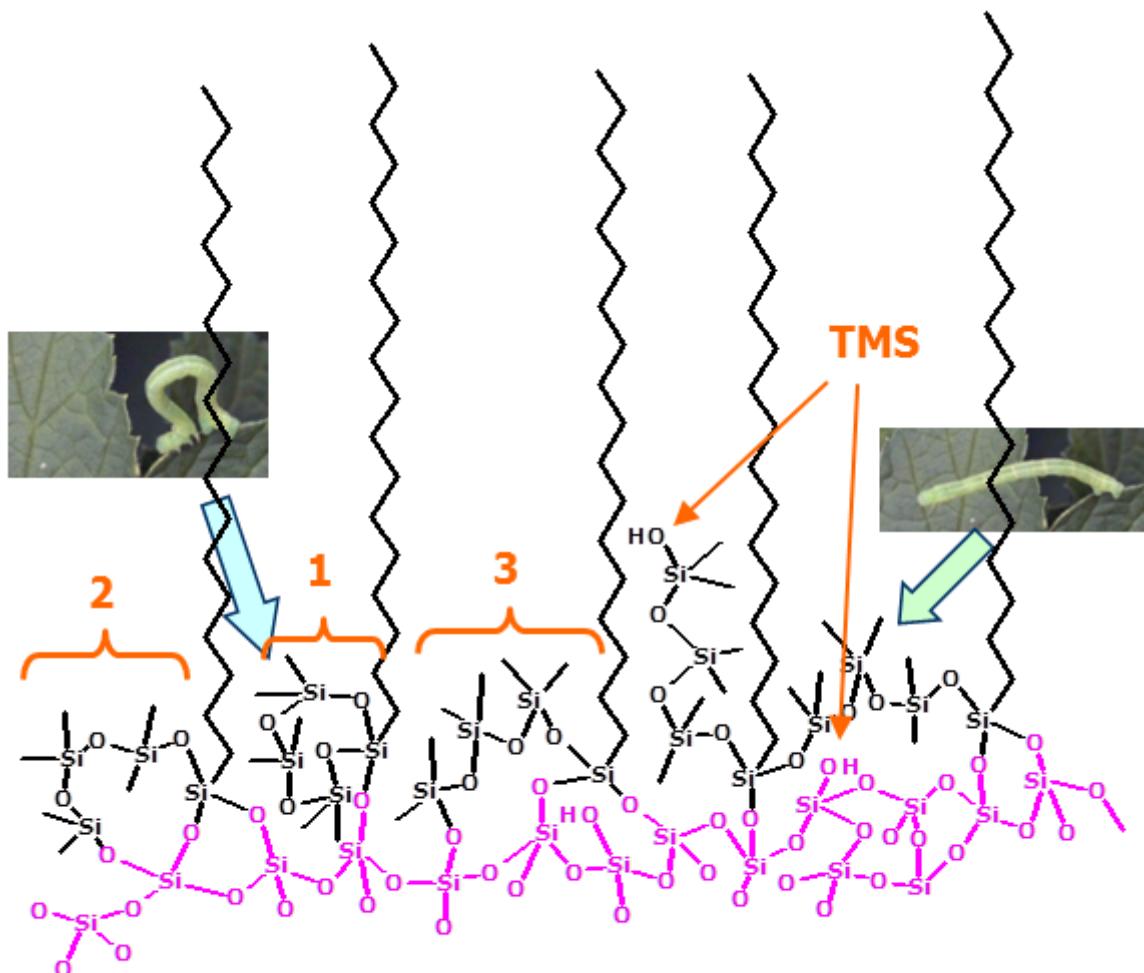
After bonding this unique C18 reagent an end-capping is densely done with trimethylsilane (TMS) using SAC technique.⁽¹⁾



n: 1, 2 , 3 or 4

X: Cl, OCH_3 , OCH_2CH_3 etc.

Novel C18 reagent



Schematic diagram of bonding of novel silyl-reagent on silica surface

⁽¹⁾SAC technique is developed by Chromanik Technologies Inc. for Sunrise C18-SAC is an operation technique that silanol groups are converted into asiloxane bond under high temperature conditions.

Features of Sunniest

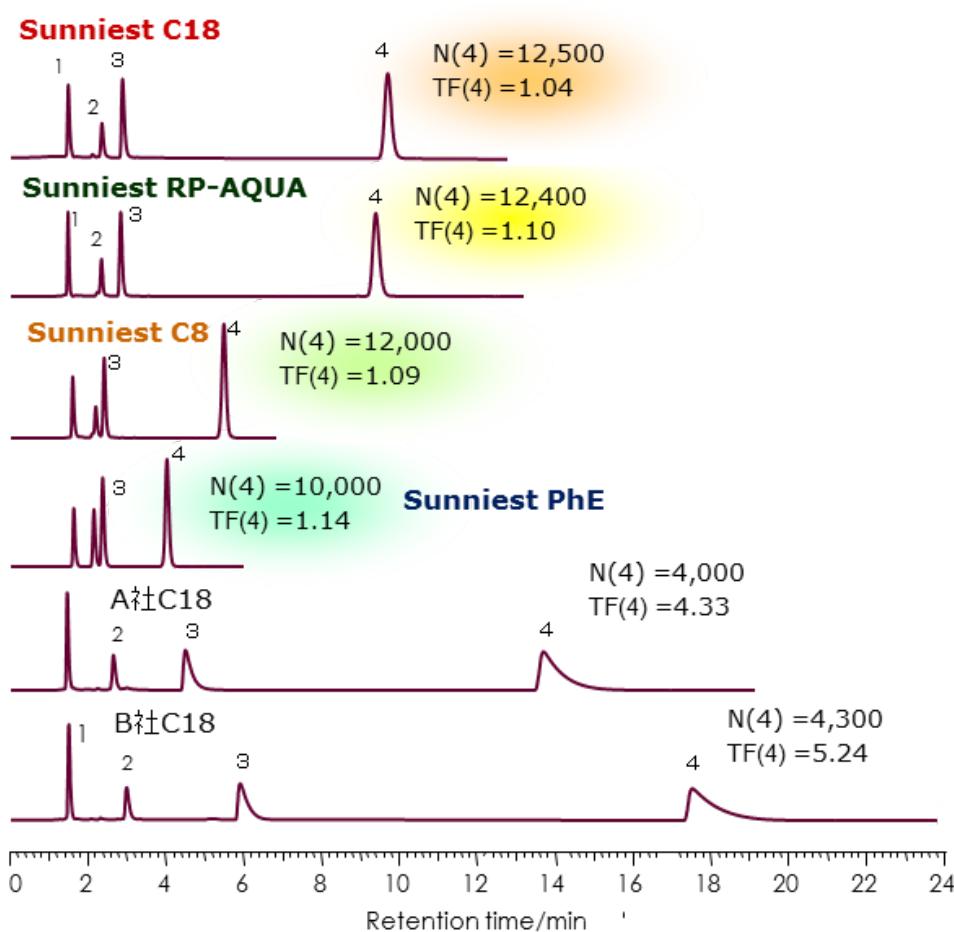
- ▣ Little influence of silanol groups, acidic and basic compounds show a symmetrical peak sharp!
- ▣ Rich lineup! various length and inner diameter of 2 ~ 20mm. (To the list) ([./Sunniest_list_en.html](#))

Lineup

Particle	USP L No.	Particle size (μm)	Bonding	Characteristic
C18	L1	3, 5	C18	First Choice
C18-HT	L1	2	C18	High-throughput analysis
RP-AQUA	L62	3, 5	C28	100% aqueous mobile phase is available

Particle	USP L No.	Particle size (μm)	Bonding	Characteristic
C8	L7	3, 5	C8	For high-speed analysis of low-polar compounds
PhE	L11	3, 5	Phenylethyl	Analysis of separation of aromatic compounds
PFP	L43	5	Pentafluorophenyl	Analysis for structural isomers and halide

Evaluation of the end-capping



Amitriptyline peak becomes a tailing peak by influence of residual silanol groups and many HPLC manufacturers use amitriptyline as an index of the amount of silanol groups. We evaluated the amount of residual using amitriptyline.

It is generally known that a peak tailing for a basic compound occurs more using acetonitrile in the mobile phase than using methanol although methanol has been used as an organic solvent in the mobile phase for separating basic compounds.

Sunniest C18, RP-AQUA, C8 showed sharp peaks without tailing even with acetonitrile. In other words, the Sunniest C18, RP-AQUA, C8 column, without the use of organic solvent is limited, can be set to a wide range of mobile phase conditions, you can construct an optimum separation conditions for all of the components.

[Sunniest Lineup](#)  (.file/Sunniest_list.pdf)

[Catalog](#)  pdf (../pdf/Sunniest_catalog_en.pdf)

[about site](#) (./about_site_en.html) | [privacy policy](#) (./privacy_policy_en.html) |
[old site](#) (../../old/englishindex.html)

 info@chromanik.co.jp

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 **FAX:+81-6-6581-0890** (any time reception) [FAX sheet](#) (../pdf/FAX_sheet_en.pdf)

Products

Home (../index_en.html) / Products (../product_en.html) / SunShell Overview

SunShell Core-shell particle



SunShell column has not only an inert surface but also high stability due to deactivated silanol groups. SunShell 2.6 µm column can be used on both HPLC and UHPLC because it shows 2 times lower back pressure than sub 2 µm column.

SunShell C18 2.6 µm sized 100x4.6mm has the same performance as a totally porous C18 5 µm sized 250x4.6mm, so that the same separation can be achieved by both columns without changing the separation condition consequently analysis time reduces one third.

Features of SunShell

- ▣ Core Shell particle (to What is CoreShell?) (./CoreShell_en.html)
- ▣ High efficiency (1.5 times higher efficiency than totally porous particle)
- ▣ Excellent end-capping

Lineup

SunShell series are not only C18 column which is optional as the first choice column but also the other column of various separation properties. Hydrogen bond capacity, hydrophobicity, steric selectivity and feature are shown in the table.

	hydrogen bond capacity Caffeine / Phenol	Hydrophobicity Amylbenzene / Butylbenzene	Stereoselectivity Triphenylene / o-Terphenyl	Feature
C18	0.39	1.6	1.46	First Choice!
PFP	1	1.31	2.38	Halide, caion and structural isomers!
Phenyl	1	1.48	1.01	Aromatic compound!
C8	0.32	1.46	1.08	High-speed analysis of non-polar compounds!
RP-AQUA	0.52	1.52	1.3	100% aqueous mobile phase is available!
C18-WP	0.4	1.55	1.35	Peptides and protains!

✓The comparison of phase using standard samples

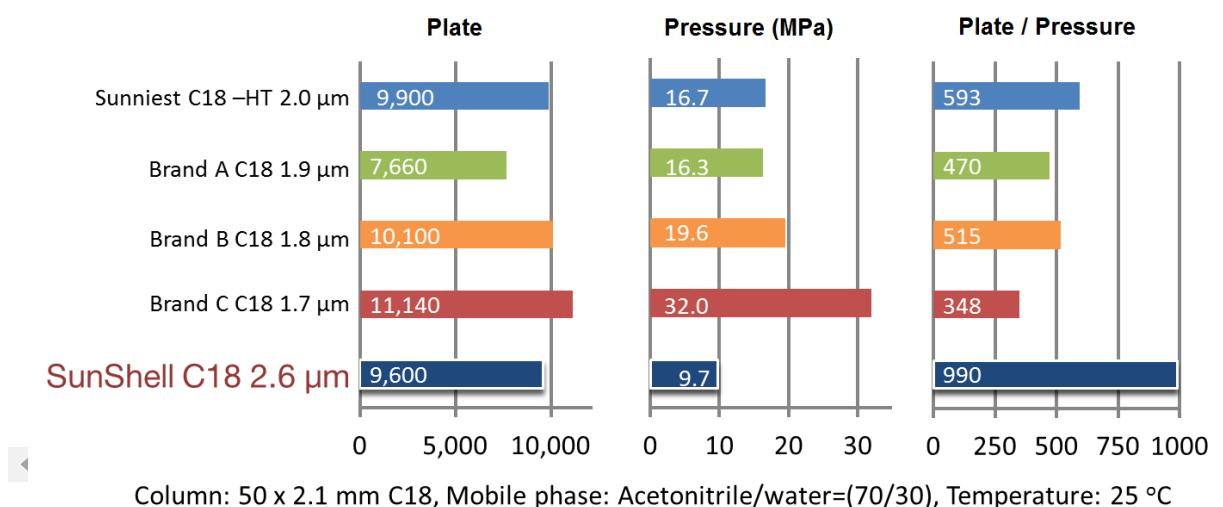
The basic characteristics of the SunShell

	Particle size (μm)	Pore size (nm)	Specific surface area (m²/g)	Bonding	Carbon content (%)	End-capping	Use the highest pressure (MPa)	Us pH ra
C18 2.0 μm	2.0		120		6.5		100	
C18 2.6 μm	2.6	9	150		7			1 1
C18 5.0 μm	4.6		90		5.5	Sunniest endcapping		
C18-WP					5		60	
RP-AQUA		16	150					2
C8	2.6			C28	4			1
Phenyl		9	150	C8	4.5			
PFP				Phenylhexyl	5			2

Comparison of theoretical plate and back pressure

Back pressure and theoretical plate were compared for 2 µm and sun 2 µm C18 and 2.6 µm SunShell C18. All columns showed almost the same theoretical plate except for brand A C18 1.9 µm.

However back pressure was not same. Especially Brand C C18 1.7 µm showed the highest back pressure. And SunShell C18 2.6 µm showed the lowest back pressure. On the comparison of theoretical plate per back pressure, SunShell indicated the largest value. This is a big advantage.

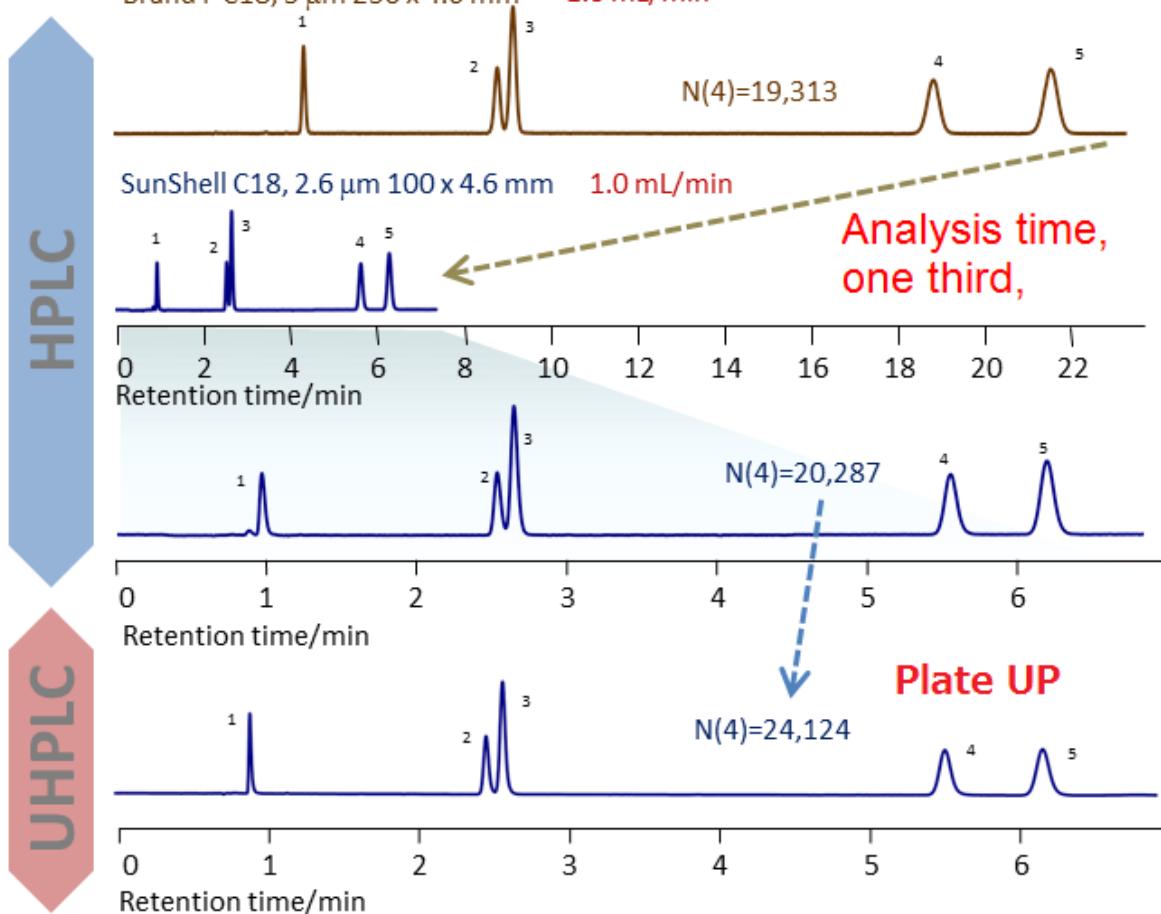


SunShell C18 2.6 µm 100 x 4.6 mm showed the same performance as conventional C18 5 µm 250 x 4.6 mm using HPLC.

An analysis time reduces to one third by only changing from conventional C18 column to SunShell C18 column and no changing the other conditions.

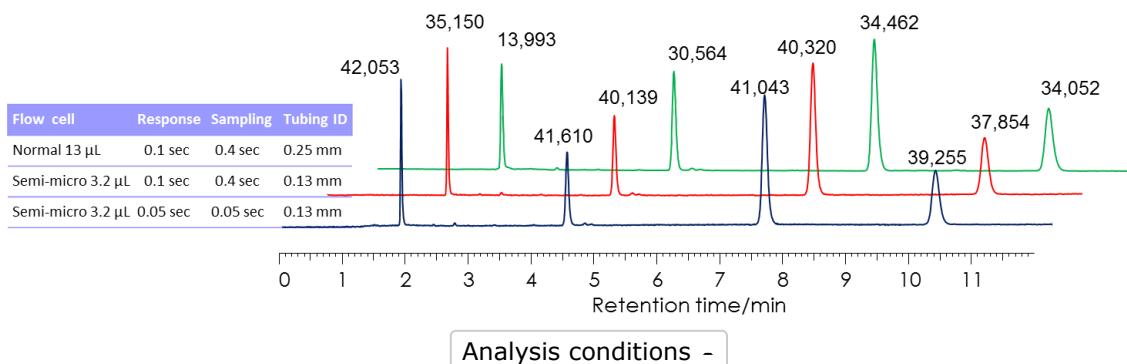
SunShell C18 showed 20% higher performance using UHPC than using HPLC.

Analysis conditions -



✓ Influence of cell capacity

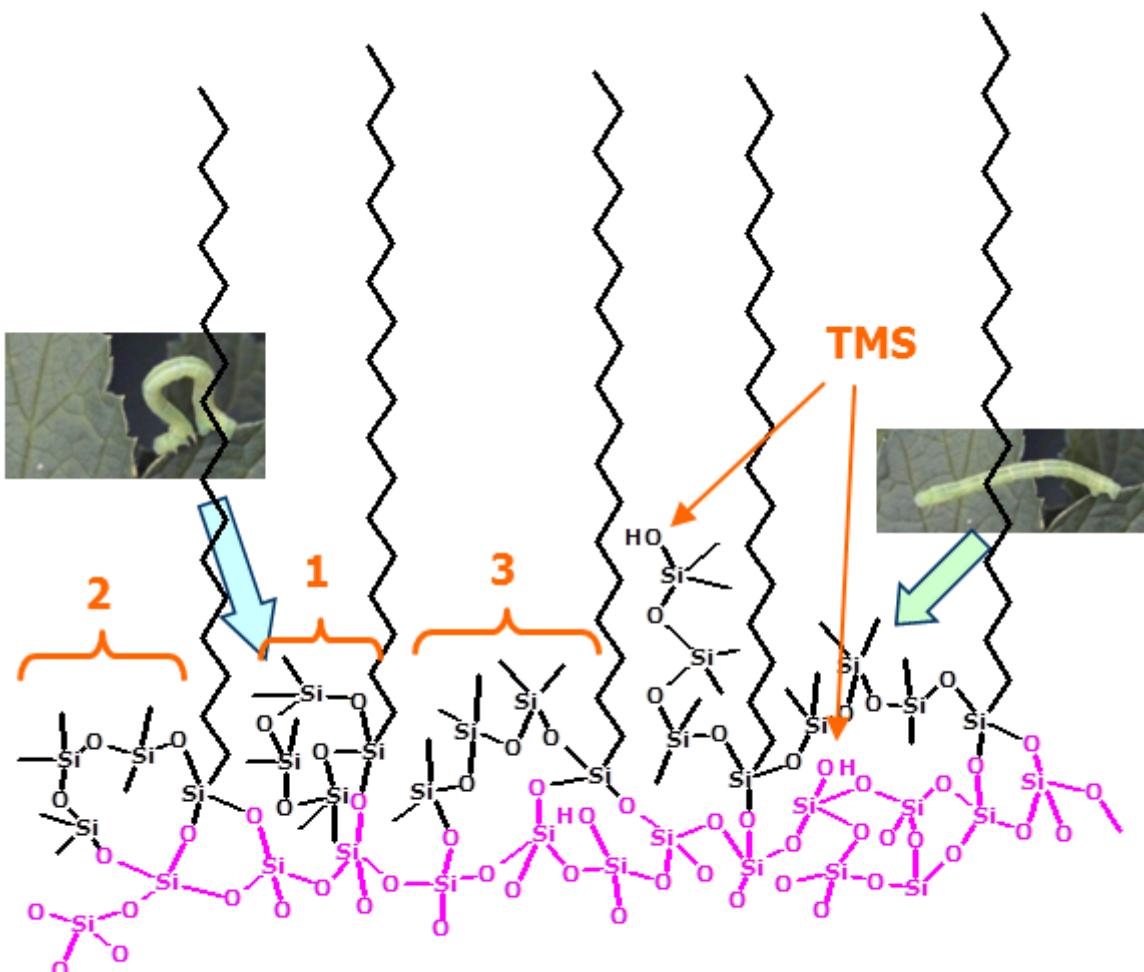
To reduce total system volume of the HPLC using a semi-micro flow cell and 0.1 mm i.d. tubing, efficiency of SunShell C18 5 μm column improved to close true performance. Furthermore, decreasing the response speed and the short sampling time contribute high efficiency.



✓ Influence of the pipe inner diameter

✓ Influence of response time

Excellent end-capping



Schematic diagram of bonding of novel silyl-reagent on silica surface

Hexamethyltri siloxane is used as an end-capping reagent. This reagent can stretch and be bent like a Geometrid caterpillar as shown in the figure, so that a functional group on the tip of the reagent can bond with a silanol group which is located anywhere.

This end-capping made influence of residual silanol groups the lowest. Then not only good peak shape of a basic compound but also excellent stability was achieved by this unique end-capping.

[SunShell Lineup](#) (.file/SunShell_list.pdf)

[Catalog by ChromaNik](#) (.pdf/SunShell_catalog_en.pdf)

✉ **info@chromanik.co.jp**

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HPLC column

SunArmor

**SunArmor C18
RP-AQUA**

New NH2



ChromaNik Technologies Inc.

HROMalytic +61(0)3 9762 2034
ECHnology Pty Ltd

Website NEW : www.chromalytic.net.au E-mail : info@chromtech.net.au Tel: 03 9762 2034 . . . in AUSTRALIA

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The evolution of further surface modification*



Development of a novel silyl-reagent which bonded with multifunctional end-capping reagents

Final TMS treatment



★ C18 phase can be used at pH range from 2 to 12 as well as hybrid C18s.

★ An excellent peak for acidic, basic and metal chelating compounds without effect of residual silanol groups



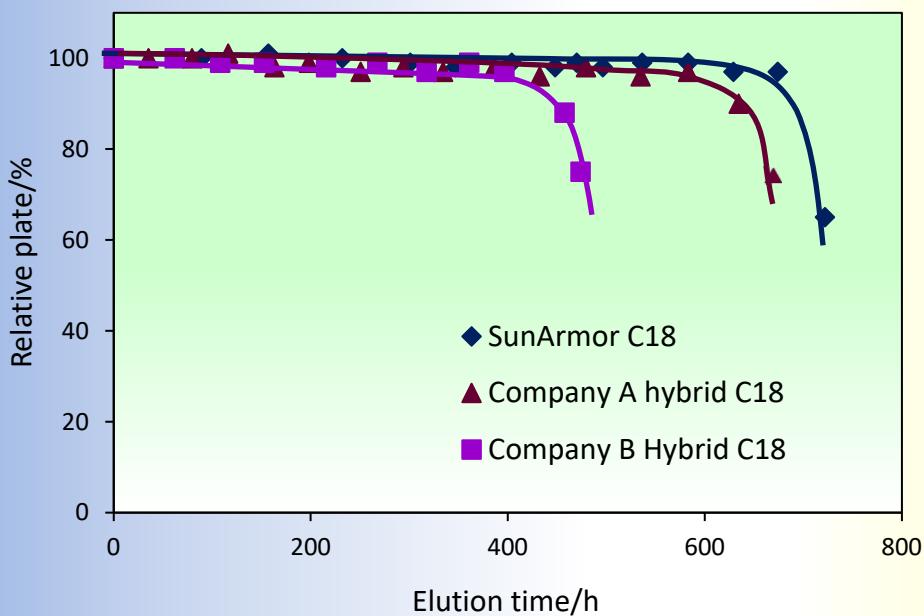
Characteristics of SunArmor

Stationary Phase	Particle size (µm)	Pore diameter (nm)	Specific surface area (m²/g)	Carbon loading (%)	Ligand	pH range for usage	USP Category
SunArmor C18	3 and 5	12	340	17	C18	2 - 12	L1
SunArmor RP-AQUA	3 and 5	12	340	18	C30	2 - 10	L62
SunArmor NH2	3 and 5	12	340	6.5	Aminopropyl	2 - 12	L8

Stability under basic pH condition

SunArmor C18

Almost same stability to compare with the hybrid C18s.

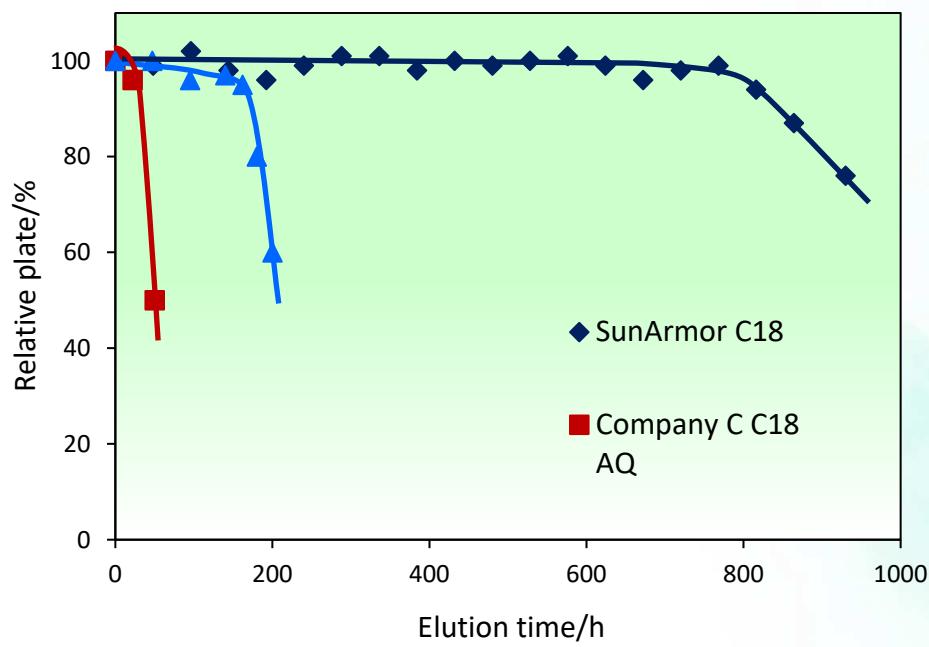


Durable test condition
Column size: 50 x 2.1 mm
Mobile phase: $\text{CH}_3\text{OH}/10\text{mM Ammonium bicarbonate (pH10.5)}=30/70$
Flow rate: 0.8 mL/min
Temperature: 60 °C

Measurement condition
Column size: 50 x 2.1 mm
Mobile phase: $\text{CH}_3\text{CN}/\text{H}_2\text{O}=60/40$
Flow rate: 0.2 mL/min
Temperature: 40 °C
Sample: 1 = Butylbenzene

Stability under neutral pH condition at 80 °C

SunArmor C18



Durable test condition
Column size: 50 x 2.1 mm
Mobile phase: $\text{CH}_3\text{OH}/10\text{mM Ammonium acetate (pH6.8)}=30/70$
Flow rate: 0.2 mL/min
Temperature: 80 °C

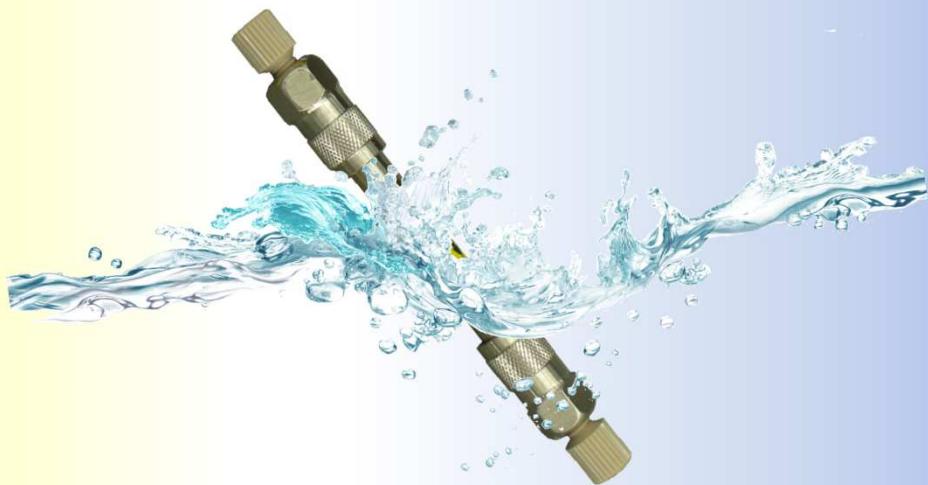
Measurement condition
Column size: 50 x 2.1 mm
Mobile phase: $\text{CH}_3\text{CN}/\text{H}_2\text{O}=60/40$
Flow rate: 0.2 mL/min
Temperature: 40 °C
Sample: 1 = Butylbenzene

The result of the comparison data in this catalog is not the representative example of all application.

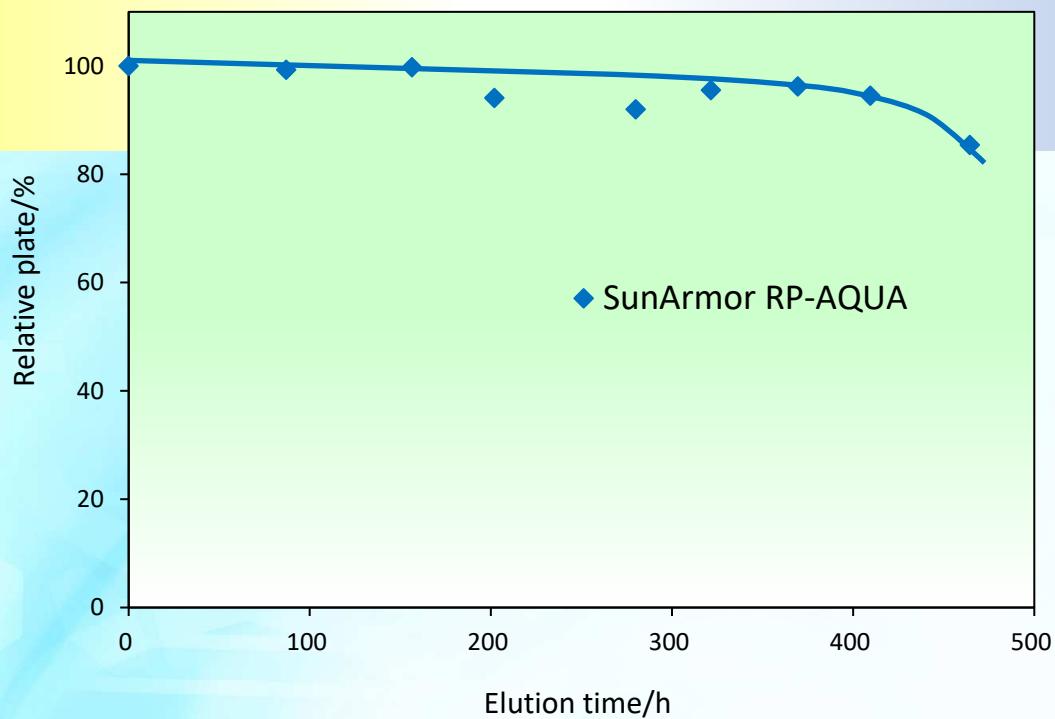
**SunArmor
RP-AQUA**

Stability under basic pH condition

SunArmor RP-AQUA



Stability under 100% aqueous basic pH10 condition



Durable test condition

Column size: 50 x 2.1 mm

Mobile phase:

10mM Ammonium bicarbonate (pH10.0)

Flow rate: 0.2 mL/min

Temperature: 40 °C

Measurement condition

Column size: 50 x 2.1 mm

Mobile phase: CH₃CN/H₂O=70/30

Flow rate: 0.2 mL/min

Temperature: 40 °C

Sample: 1 = Butylbenzene

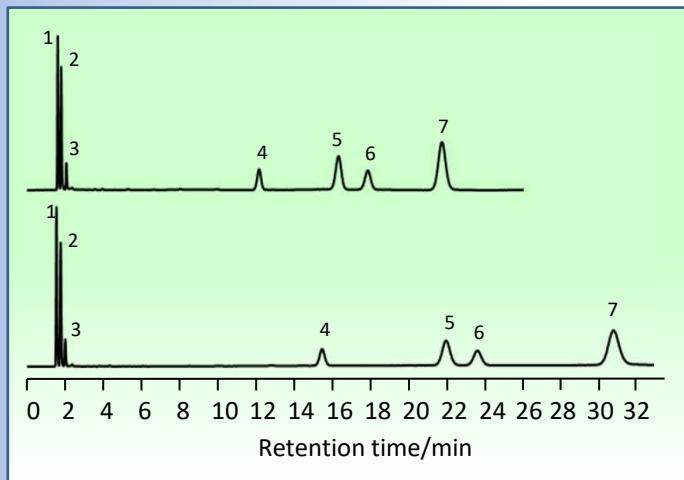
Parameter using standard sample

Evaluation of hydrogen bonding, hydrophobicity and steric selectivity

Reproducibility in retention



Separation of standard sample of SunArmor C18, RP-AQUA



Condition

Column: SunArmor C18, RP-AQUA 5 μ m , 150 x 4.6 mm

Mobile phase: CH₃OH/H₂O=75/25

Flow rate: 1.0 mL/min

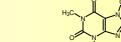
Temperature: 40 °C

Sample:

1 = Uracil



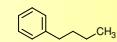
2 = Caffeine



3 = Phenol



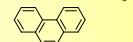
4 = Butylbenzene



5 = o-Terphenyl



6 = Amylbenzene

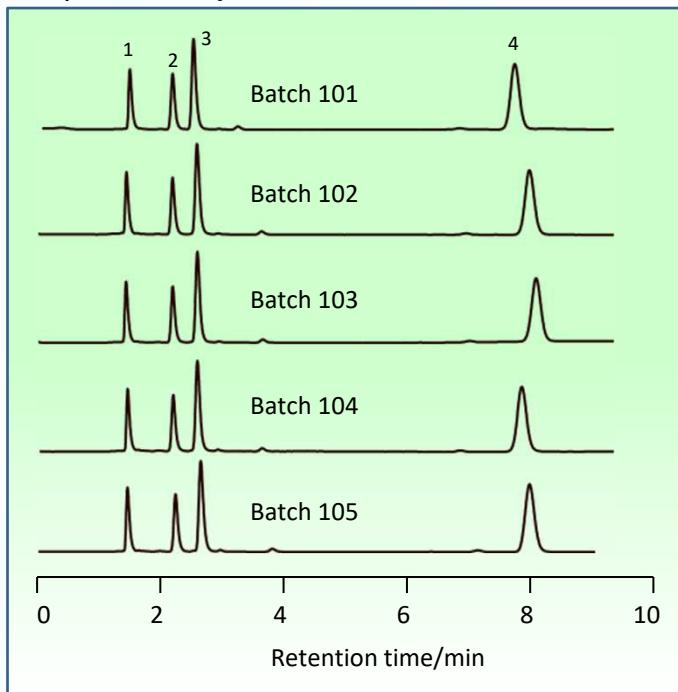


7 = Triphenylene



	Hydrogen bonding (Caffeine/Phenol)	Hydrophobicity (Amylbenzene/Butylbenzene)	Steric selectivity (Triphenylene/o-Terphenyl)
SunArmor C18	0.40	1.54	1.35
SunArmor RP-AQUA	0.48	1.59	1.43

Reproducibility in retention of SunArmor C18



Retention time of amitriptyline

Batch	Retention time
101	7.69 min
102	7.97 min
103	8.12 min
104	7.85 min
105	7.93 min
Average (Av)	7.91 min
Standard deviation (σ)	0.14 min

Condition (amitriptyline)

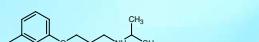
Column dimension: 150 x 4.6 mm

Mobile phase: Acetonitrile/20mM phosphate buffer pH7.0=(60:40)

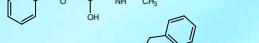
Flow rate: 1.0 mL/min

Temp.: 40°C

Sample: 1=Uracil



2=Propranolol



3=Nortriptyline



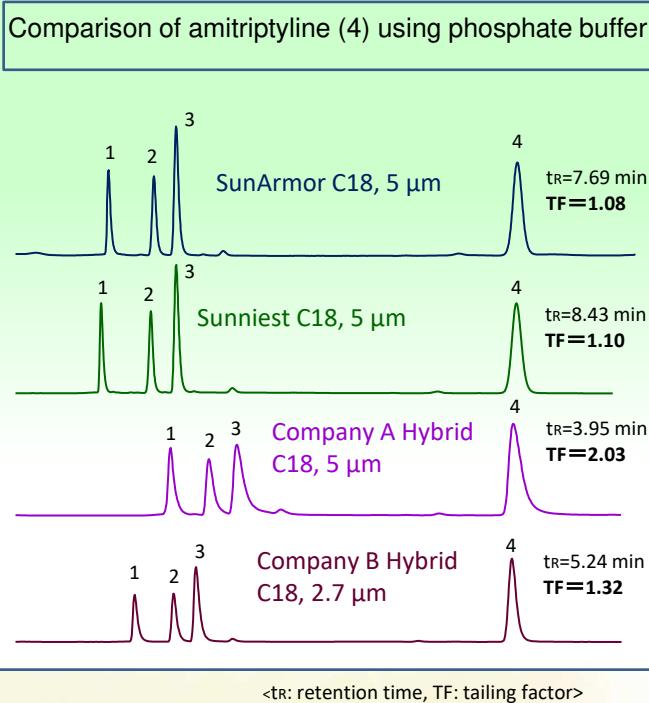
4=Amitriptyline



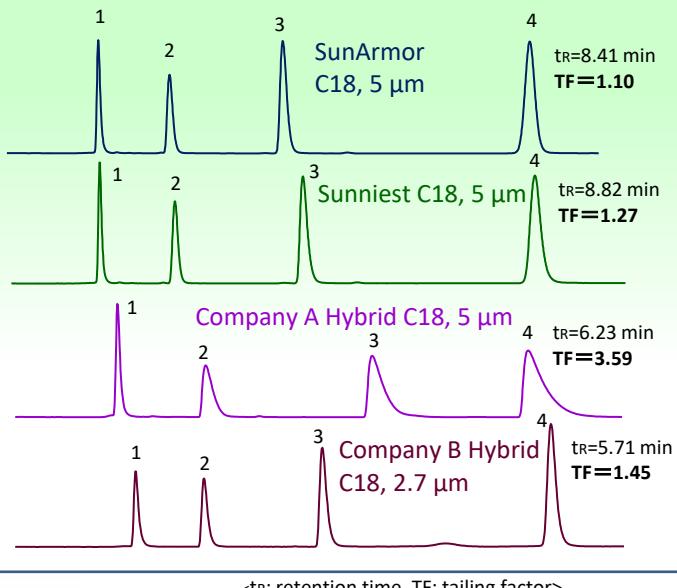
The result of the comparison data in this catalog is not the representative example of all application.

**SunArmor
C18**

Peak Shape of basic compound



Comparison of amitriptyline (4) using ammonium acetate buffer



Condition (amitriptyline)

Column dimension: 150 x 4.6 mm

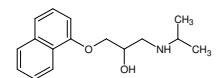
Mobile phase:

- A) Acetonitrile/**20mM phosphate buffer pH7.0**=(60:40)
- B) Acetonitrile/**10mM ammonium acetate pH6.8**=(40:60)

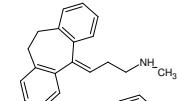
Flow rate: 1.0 mL/min

Temp.: 40°C

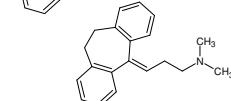
Sample: 1=Uracil



2=Propranolol

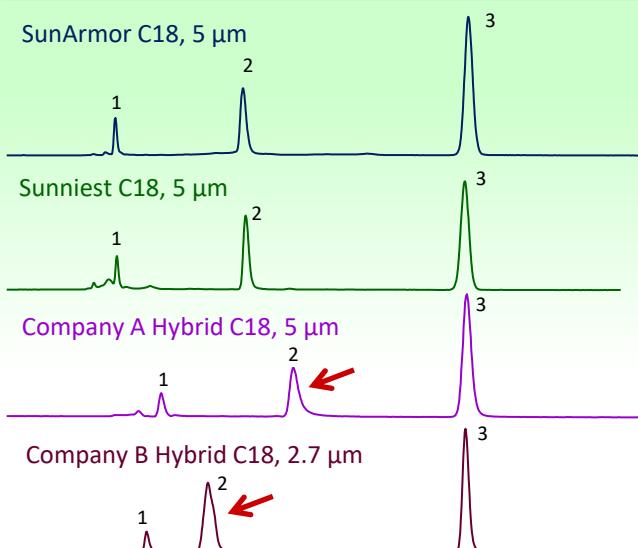


3=Nortriptyline



4=Amitriptyline

Comparison of pyridine (2) using methanol/water mobile phase



Condition (pyridine)

Column dimension: 150 x 4.6 mm

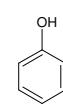
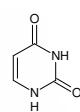
Mobile phase: CH₃OH/H₂O=30/70

Flow rate: 1.0 mL/min

Temperature: 40 °C

Detection: UV@250nm

Sample: 1 = Uracil, 2 = Pyridine, 3 = Phenol



The result of the comparison data in this catalog is not the representative example of all application.

HROMalytic +61(0)3 9762 2034

ECHnology Pty Ltd

Website NEW : www.chromalytic.net.au E-mail : info@chromtech.net.au Tel: 03 9762 2034 . . . in AUSTRALIA

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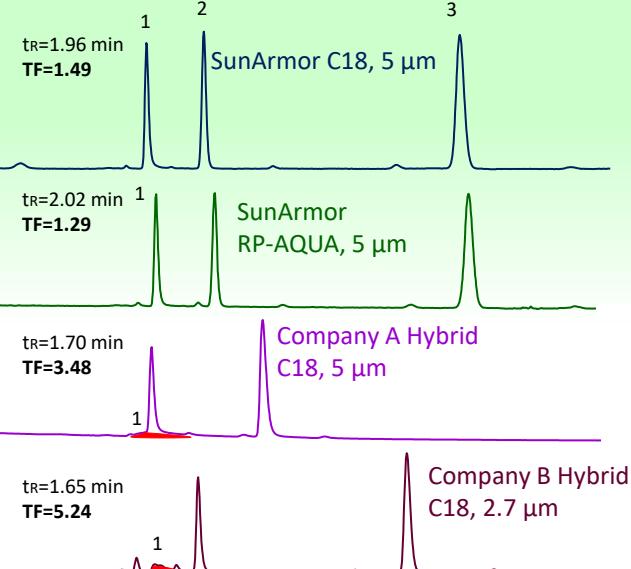
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Peak shape of acidic and metal chelating compounds



Comparison of formic acid (acidic compound)



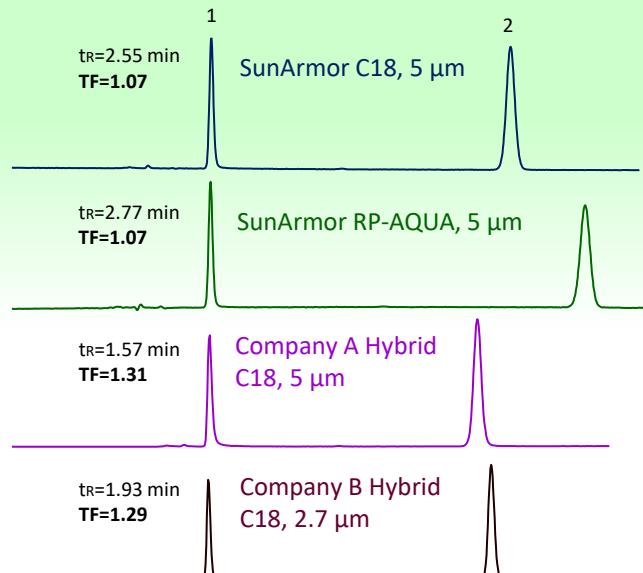
<tr: retention time, TF: tailing factor>

Condition (formic acid)

Column dimension: 150 x 4.6 mm
 Mobile phase: CH₃CN/0.1% H₃PO₄=2/98
 Flow rate: 1.0 mL/min
 Temperature: 40 °C
 Detection: UV@210nm
 Sample: 1 = Formic acid
 2 = Acetic acid
 3 = Propionic Acid

*Hybrid C18s showed a very poor peak shape for formic acid. It is doubted that some amines as a by-product remained on the surface of packing materials.

Comparison of oxine (metal chelating compound)



<tr: retention time, TF: tailing factor>

Condition (oxine)

Column dimension: 150 x 4.6 mm

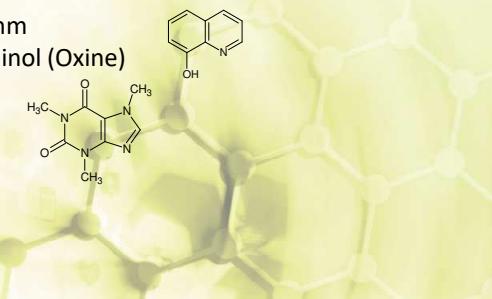
Mobile phase: CH₃CN/20mM H₃PO₄=10/90
 Flow rate: 1.0 mL/min

Temperature: 40 °C

Detection: UV@250nm

Sample: 1 = 8-Quinolinol (Oxine)

2 = Caffeine

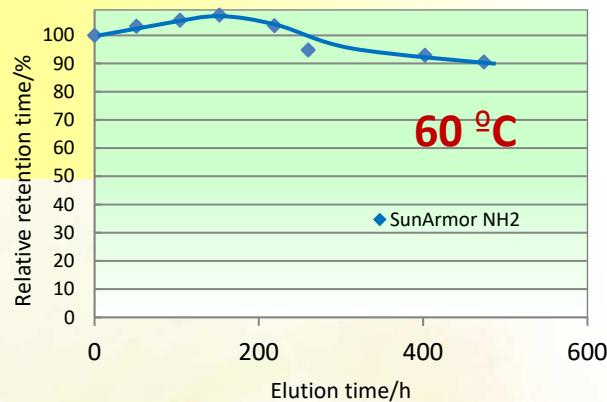
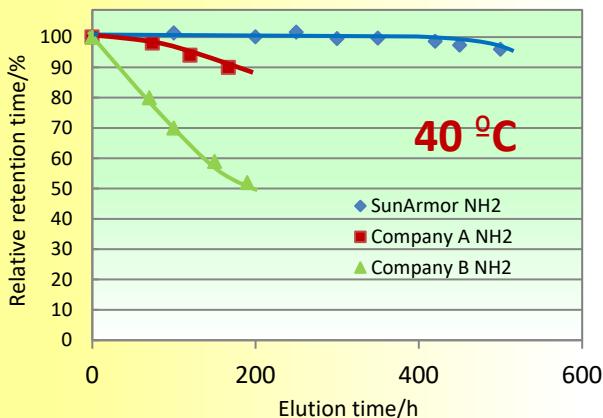


The result of the comparison data in this catalog is not the representative example of all application.



Stability of SunArmor

SunArmor NH2



Duration test condition

Column: SunArmor NH2 5 µm, 250 x 4.6 mm

Other NH2 5 µm, 250 x 4.6 mm

Mobile phase: Acetonitrile/water = 75/25

Flow rate: 1.0 mL/min,

Temperature: 40 °C

Detector: RI

Sample: Sucrose

Duration test condition

Mobile phase: Acetonitrile/water = 75/25

Flow rate: 1.0 mL/min, Temperature: 60 °C

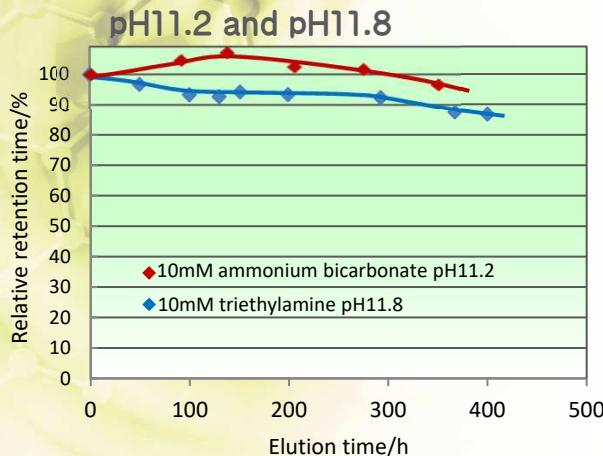
Measurement condition

Mobile phase: Acetonitrile/water = 75/25

Flow rate: 1.0 mL/min, Temperature: 40 °C

Detection: RI, Sample: Sucrose

Stability under basic pH



SunArmor NH2

Duration test condition

Mobile phase:

Acetonitrile/10mM triethylamine pH11.8 = 75/25

Acetonitrile/10mM ammonium bicarbonate pH11.2 = 75/25

Flow rate: 1.0 mL/min, Temperature: 40 °C

Measurement condition

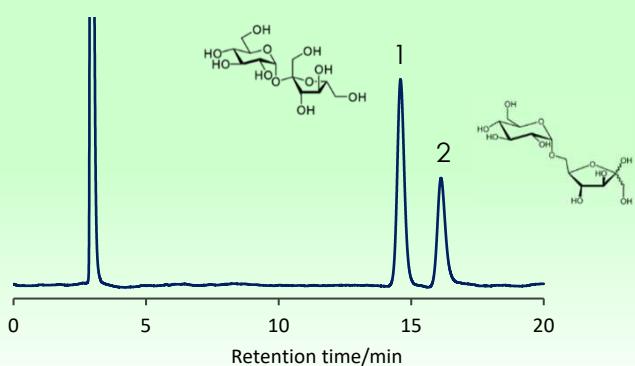
Mobile phase: Acetonitrile/water = 75/25

Flow rate: 1.0 mL/min, Temperature: 40 °C

Detection: RI, Sample: Sucrose

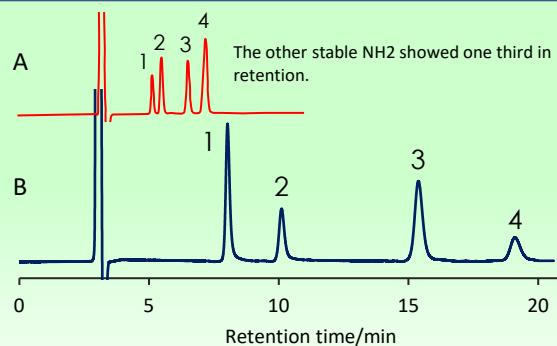
The result of the comparison data in this catalog is not the representative example of all application.

Separation of sucrose and palatinose



Column: SunArmor NH2, 5 μ m 250 x 4.6 mm
 Mobile phase: Acetonitrile/50 mM ammonium acetate=75/25
 Flow rate: 1.0 mL/min, Temperature: 40 °C
 Detection: RI, Sample: 1 = Sucrose, 2 = Palatinose

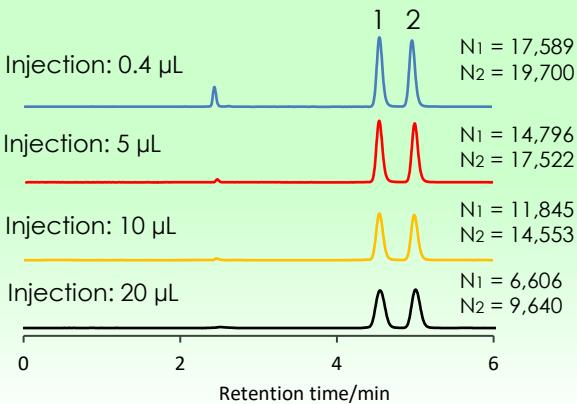
Comparison of retention time



Column: A=Other stable NH2, 5 μ m 250 x 4.6 mm
 B=SunArmor NH2, 5 μ m 250 x 4.6 mm
 Mobile phase: Acetonitrile/Water = 75/25,
 Flow rate: 1.0 mL/min, Temperature: 40 °C,
 Detection: RI,
 Sample: 1= Fructose, 2= Glucose, 3= Sucrose,
 4= Maltose

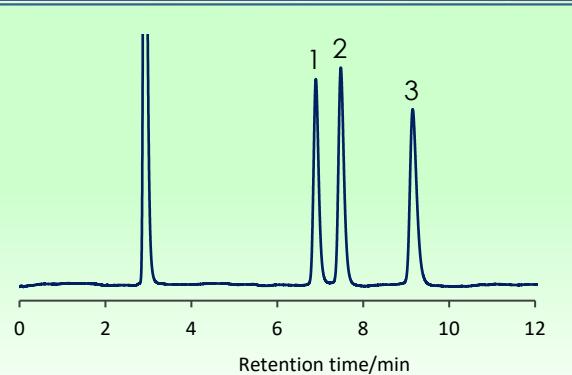
★Hydrophobic end-capping makes retention short while hydrophilic end-capping keeps retention. Furthermore, hydrophilic end-capping makes stability high. SunArmor NH2 shows large retention and high stability.

Comparison of plate using 100% aqueous samples



Column: SunArmor NH2, 5 μ m 250 x 4.6 mm
 Mobile phase: Acetonitrile/10mM ammonium acetate=70/30
 Flow rate: 1.0 mL/min, Temperature: 40 °C
 Detection: UV@250nm, Sample: 1 = Uridine,
 2 = Cytosine

Separation of branched-chain amino acid



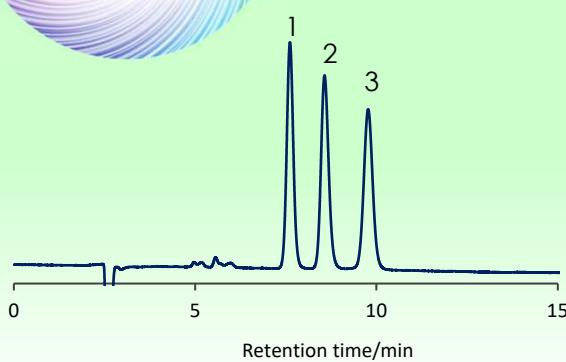
Column: SunArmor NH2, 5 μ m 250 x 4.6 mm
 Mobile phase: Acetonitrile/10mM ammonium acetate=70/30
 Flow rate: 1.0 mL/min, Temperature: 40 °C
 Detection: RI , Sample: 1 = L-Leucine, 2 = L-Isoleucine,
 3 = L-Valine



The result of the comparison data in this catalog is not the representative example of all application.

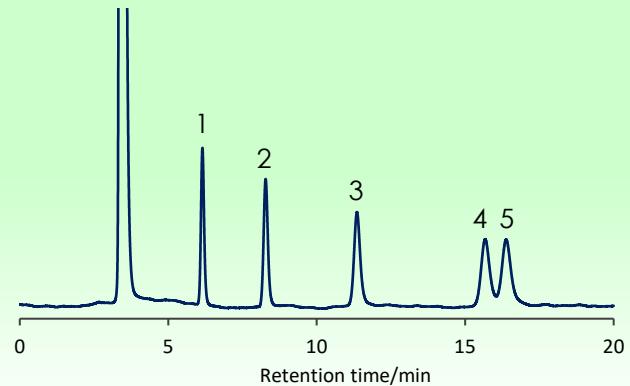
**SunArmor
NH₂**

Separation of cyclodextrin



Column: SunArmor NH₂, 5 µm 250 x 4.6 mm
Mobile phase: Acetonitrile/Water = 60/40
Flow rate: 1.0 mL/min, Temperature: 25 °C
Detection: RI,
Sample: 1= α-Cyclodextrin, 2= β-Cyclodextrin,
3=γ-Cyclodextrin

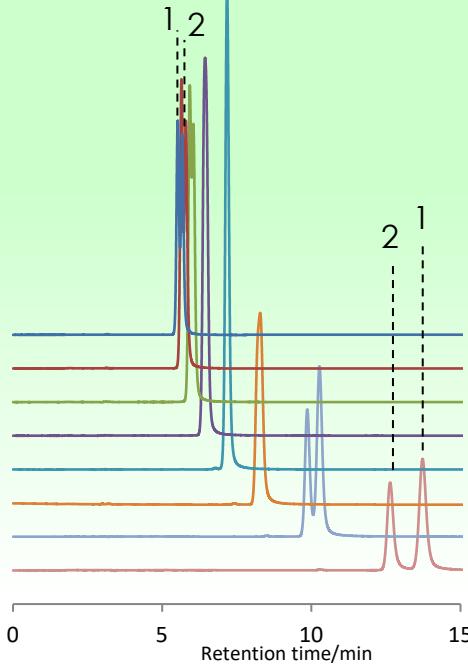
Separation of sugar alcohol



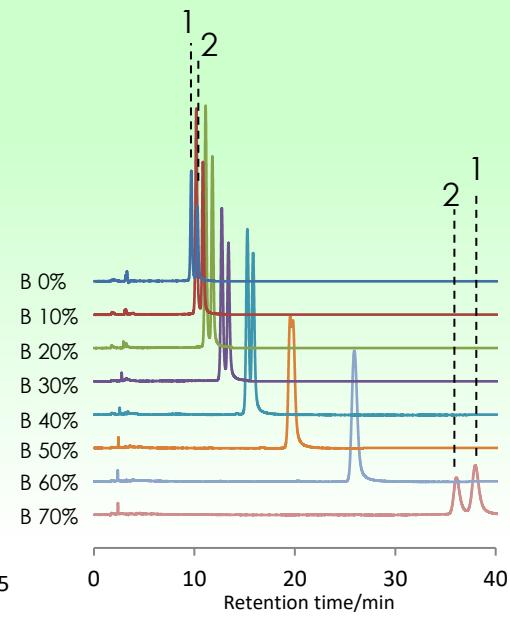
Column: SunArmor NH₂, 5 µm 250 x 4.6 mm
Mobile phase: Acetonitrile/Water = 80/20
Flow rate: 1.0 mL/min, Temperature: 40 °C
Detection: RI, Sample: 1= Glycerine, 2= Erythritol,
3= Xylitol, 4= Sorbitol, 5= Mannitol

Separation under ion exchange mode and normal phase mode

A: 5% Acetic acid in water
B: 5% Acetic acid in acetonitrile



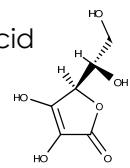
A: 1% Acetic acid in water
B: 1% Acetic acid in acetonitrile



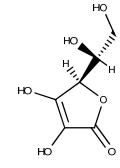
Ion exchange mode
Normal phase mode

Column: SunArmor NH₂ 5µm, 250 x 4.6 mm i.d.
Mobile phase : A) (1% or 5%) Acetic acid in water
B) (1% or 5%) Acetic acid in acetonitrile
Flow rate : 1.0 mL/min, Temperature : 40 °C
Detection : UV@260nm, Injection volume : 1 µL

1. Ascorbic acid

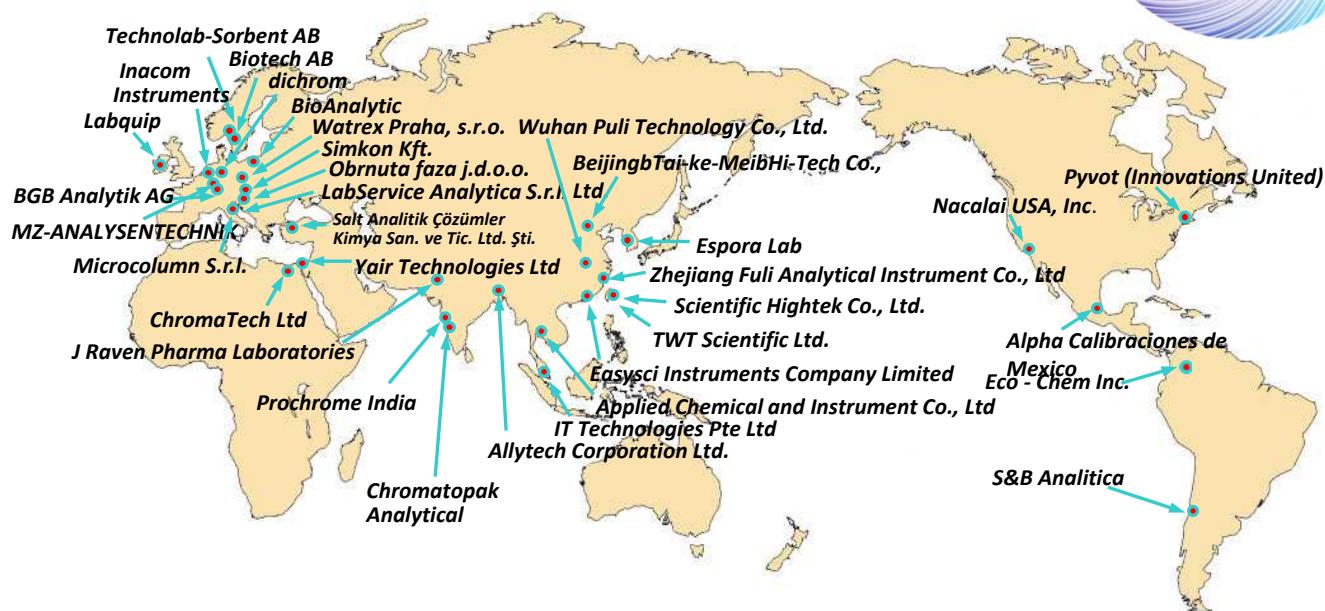


2. Erythorbic acid





*Distributor network



Ordering information of SunArmor

Packings	Inner diameter (mm)	2.0	3.0	4.6	10	20	USP category
	Length (mm)	Catalog No.					
SunArmor C18, 3 µm	30	HB2231	-----	-----	-----	-----	L1
	50	HR2241	HB2341	HB2441	-----	-----	
	75	HB2251	-----	-----	-----	-----	
	100	HB2261	HB2361	HB2461	-----	-----	
	150	HB2271	HB2371	HB2471	-----	-----	
	250	-----	HB2381	HB2481	-----	-----	
SunArmor C18, 5 µm	50	HB3241	HB3341	HB3441	-----	-----	L1
	100	HB3261	HB3361	HB3461	-----	-----	
	150	HB3271	HB3371	HB3471	-----	-----	
	250	HB3281	HB3381	HB3481	HB3781	HB3881	
SunArmor RP-AQUA, 3 µm	30	HR2231	-----	-----	-----	-----	Equivalent to L62
	50	HR2241	HR2341	HR2441	-----	-----	
	75	HR2251	-----	-----	-----	-----	
	100	HR2261	HR2361	HR2461	-----	-----	
	150	HR2271	HR2371	HR2471	-----	-----	
	250	-----	HR2381	HR2481	-----	-----	
SunArmor RP-AQUA , 5 µm	50	HR3241	HR3341	HR3441	-----	-----	Equivalent to L62
	100	HR3261	HR3361	HR3461	-----	-----	
	150	HR3271	HR3371	HR3471	-----	-----	
	250	HR3281	HR3381	HR3481	HR3781	HR3881	
SunArmor NH2, 3 µm	150	HN2271	-----	HN2471	-----	-----	L8
	250	HN2281	-----	HN2481	-----	-----	
SunArmor NH2, 5 µm	150	HN3271	-----	HN3471	-----	-----	L8
	250	HN3281	-----	HN3481	HN3781	HN3881	

Guard Cartridge column of SunArmor

product	Particle size	Catalog No.
SunArmor C18, 5 µm Guard cartridge column (1-pak + Holder) 4 x 10mm	5 µm	HB3A1H
SunArmor RP-AQUA, 5 µm Guard cartridge column (1-pak + Holder) 4 x 10mm	5 µm	HR2A1H
SunArmor C18, 5 µm Guard cartridge (4-pak) 4 x 10mm	5 µm	HB3A1C
SunArmor RP-AQUA, 5 µm Guard cartridge (4-pak) 4 x 10mm	5 µm	HR3A1C
SunArmor Guard cartridge holder	---	HHOA1C



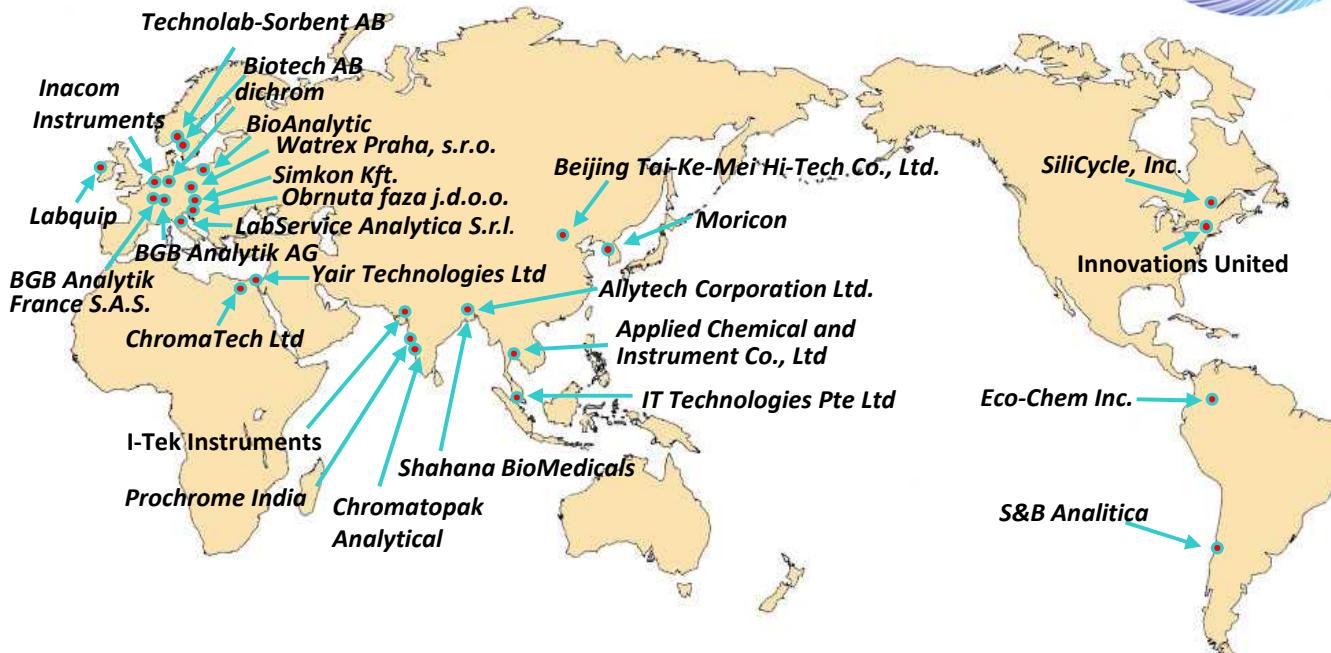
SunArmor

Manufacturer
ChromaNik Technologies Inc.

2103



*Distributor network



Ordering information of SunArmor

Packings	Inner diameter (mm)	2.0	3.0	4.6	10	20	USP category
	Length (mm)	Catalog No.					
SunArmor C18, 3 µm	50	HB2241	HB2341	HB2441	-----	-----	L1
	75	HB2251	-----	-----	-----	-----	
	100	HB2261	HB2361	HB2461	-----	-----	
	150	HB2271	HB2371	HB2471	-----	-----	
	250	-----	HB2381	HB2481	-----	-----	
SunArmor C18, 5 µm	50	HB3241	HB3341	HB3441	-----	-----	L1
	100	HB3261	HB3361	HB3461	-----	-----	
	150	HB3271	HB3371	HB3471	-----	-----	
	250	HB3281	HB3381	HB3481	HB3781	HB3881	
	50	HR2241	HR2341	HR2441	-----	-----	
SunArmor RP-AQUA, 3 µm	75	HR2251	-----	-----	-----	-----	Equivalent to L62
	100	HR2261	HR2361	HR2461	-----	-----	
	150	HR2271	HR2371	HR2471	-----	-----	
	250	-----	HR2381	HR2481	-----	-----	
	50	HR3241	HR3341	HR3441	-----	-----	
SunArmor RP-AQUA, 5 µm	100	HR3261	HR3361	HR3461	-----	-----	Equivalent to L62
	150	HR3271	HR3371	HR3471	-----	-----	
	250	HR3281	HR3381	HR3481	HR3781	HR3881	

Guard Cartridge column of SunArmor

product	Particle size	Catalog No.
SunArmor C18, 5 µm Guard cartridge column (1-pak + Holder) 4 x 10mm	5 µm	HB3A1H
SunArmor RP-AQUA, 5 µm Guard cartridge column (1-pak + Holder) 4 x 10mm	5 µm	HR3A1H
SunArmor C18, 5 µm Guard cartridge (4-pak) 4 x 10mm	5 µm	HB3A1C
SunArmor RP-AQUA, 5 µm Guard cartridge (4-pak) 4 x 10mm	5 µm	HR3A1C
SunArmor Guard cartridge holder	---	HHOA1C

Manufacturer
ChromaNik Technologies Inc.

ChromaNik
ChromaNik Technologies Inc.

1604

Sunniest C18, C18-HT
Sunniest RP-AQUA **Sunniest C8**
Sunniest PhE **Sunniest PFP**

* Sunniest Ordering information

Inner diameter [mm]	Length [mm]	Sunniest C18, 3µm	Sunniest C18, 5µm	Sunniest RP-AQUA, 3µm	Sunniest RP-AQUA, 5µm	Sunniest C8, 3µm	Sunniest C8, 5µm
		Catalog No.	Catalog No.	Catalog No.	Catalog No.	Catalog No.	Catalog No.
2	50	EB2241	EB3241	ER2241	ER3241	EC2241	EC3241
	75	EB2251	—	ER2251	—	EC2251	—
	100	EB2261	EB3261	ER2261	ER3261	EC2261	EC3261
	150	EB2271	EB3271	ER2271	ER3271	EC2271	EC3271
	250	EB2281	EB3281	ER2281	ER3281	EC2281	EC3281
3	50	EB2341	EB3341	ER2341	ER3341	EC2341	EC3341
	100	EB2361	EB3361	ER2361	ER3361	EC2361	EC3361
	150	EB2371	EB3371	ER2371	ER3371	EC2371	EC3371
	250	EB2381	EB3381	ER2381	ER3381	EC2381	EC3381
4.6	10	EB2411	EB3411	ER2411	ER3411	EC2411	EC3411
	50	EB2441	EB3441	ER2441	ER3441	EC2441	EC3441
	75	EB2451	—	ER2451	—	EC2451	—
	100	EB2461	EB3461	ER2461	ER3461	EC2461	EC3461
	150	EB2471	EB3471	ER2471	ER3471	EC2471	EC3471
	250	EB2481	EB3481	ER2481	ER3481	EC2481	EC3481
10	250	—	EB3781	—	ER3781	—	EC3781
20	50	—	EB3841	—	ER3841	—	EC3841
	150	—	EB3871	—	ER3871	—	EC3871
	250	—	EB3881	—	ER3881	—	EC3881

Inner diameter [mm]	Length [mm]	Sunniest PhE, 3µm	Sunniest PhE, 5µm	Sunniest PFP, 5µm
		Catalog No.	Catalog No.	Catalog No.
2.0	50	EP2241	EP3241	—
	75	EP2251	—	—
	100	EP2261	EP3261	—
	150	EP2271	EP3271	—
	250	EP2281	EP3281	—
3.0	50	EP2341	EP3341	—
	100	EP2361	EP3361	—
	150	EP2371	EP3371	—
	250	EP2381	EP3381	—
4.6	10	—	EP3411	—
	50	EP2441	EP3441	EF3441
	75	EP2451	—	—
	100	EP2461	EP3461	EF3461
	150	EP2471	EP3471	EF3471
	250	EP2481	EP3481	EF3481
10.0	250	—	EP3781	—
20.0	50	—	EP3841	—
	150	—	EP3871	—
	250	—	EP3881	—

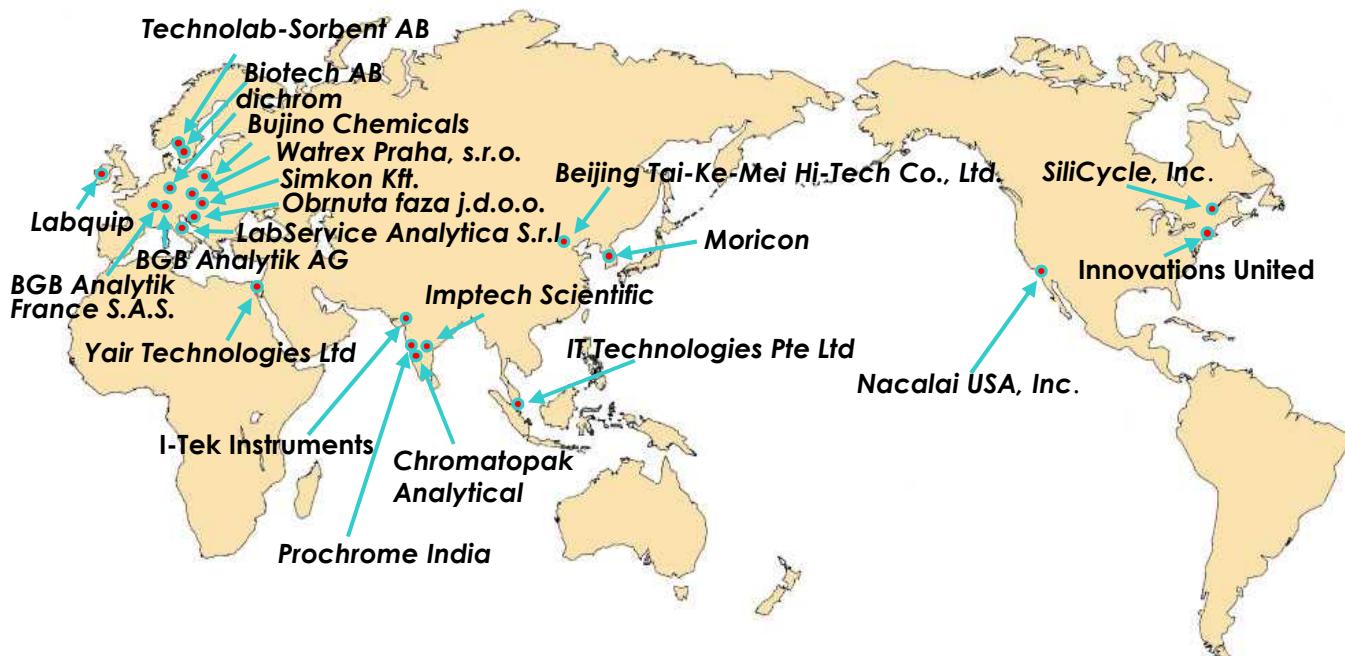
Inner diameter [mm]	Length [mm]	Sunniest C18-HT, 2µm
		Catalog No.
2.1	20	EB1921
	30	EB1931
	50	EB1941
	75	EB1951
	100	EB1961
3.0	20	EB1321
	30	EB1331
	50	EB1341
	75	EB1351
	100	EB1361

Sunniest C18

Sunniest RP-AQUA

Sunniest C8

*Our distributors in the world



Manufacturer
ChromaNik Technologies Inc.

Sunrise C28, C18, C18-SAC



* Sunrise series Analytical and Preparative Columns

Inner diameter [mm]	length [mm]	Sunrise C28, 3µm	
		Cat. No.	Cat. No.
2.0	50	ST2241	ST3241
	75	ST2251	—
	100	ST2261	ST3261
	150	ST2271	ST3271
	250	ST2281	ST3281
4.6	10	ST2411	ST3411
	50	ST2441	ST3441
	75	ST2451	—
	100	ST2461	ST3461
	150	ST2471	ST3471
	250	—	ST3481
10.0	250	—	ST3781
20.0	250	—	ST3881

Inner diameter [mm]	length [mm]	Sunrise C18, 3µm		Sunrise C18-SAC, 3µm		Sunrise C18-SAC, 5µm	
		Cat. No.	Cat. No.	Cat. No.	Cat. No.	Cat. No.	Cat. No.
2.0	50	SB2241	SB3241	SA2241	SA2241	SA3241	SA3241
	75	SB2251	—	SA2251	SA2251	—	—
	100	SB2261	SB3261	SA2261	SA2261	SA3261	SA3261
	150	SB2271	SB3271	SA2271	SA2271	SA3271	SA3271
4.6	10	SB2411	SB3411	SA2411	SA2411	SA3411	SA3411
	50	SB2441	SB3441	SA2441	SA2441	SA3441	SA3441
	75	SB2451	—	SA2451	SA2451	—	—
	100	SB2461	SB3461	SA2461	SA2461	SA3461	SA3461
	150	SB2471	SB3471	SA2471	SA2471	SA3471	SA3471
	250	—	SB3481	—	—	SA3481	SA3481
10.0	250	—	SB3781	—	—	SA3781	SA3781
20.0	250	—	SB3881	—	—	SA3881	SA3881



Are Silanol Groups Bad or Good for Basic Compounds?

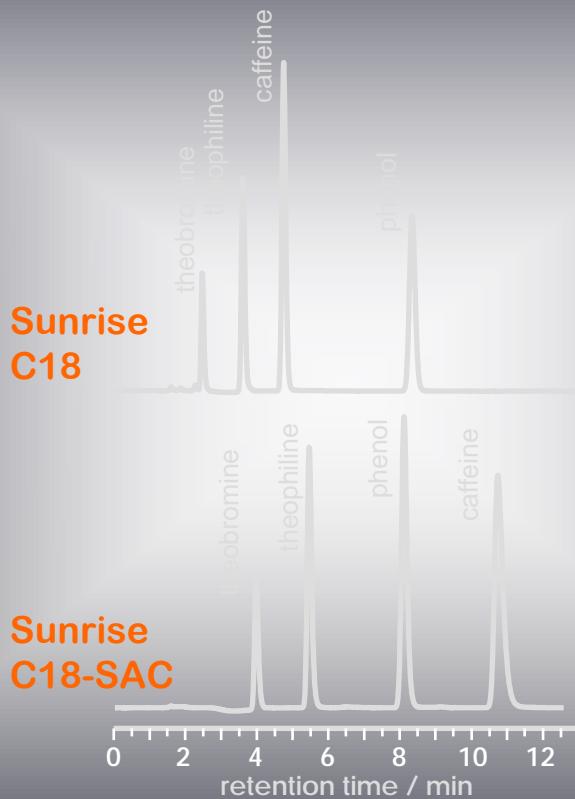
Sunrise C18

Sunrise C18-SAC

Silanol Activity Controlled C18 Column



New-Type RP Column



Sunrise C18 and C18-SAC

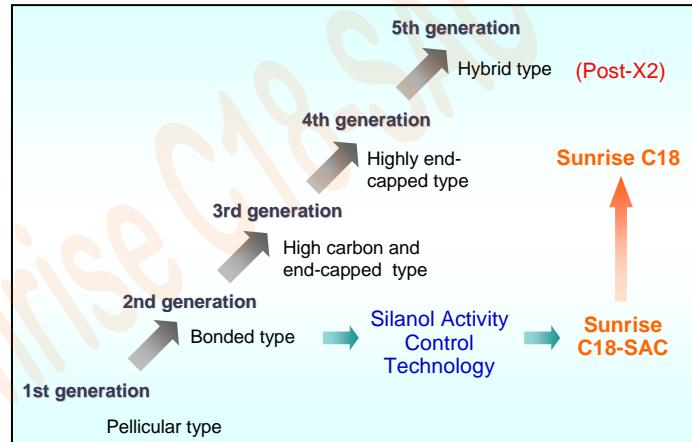
Silanol Activity Controlled C18 HPLC Column



◆ New generation reversed-phase utilized silanol groups

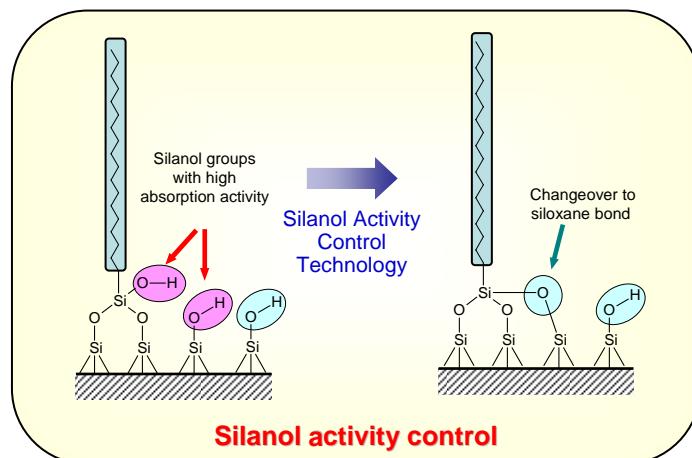
■ Silanol group and peak tailing

It is generally said that residual silanol groups on a stationary phase such as C18 (ODS) causes absorption or peak tailing for a sample. Especially silanol groups near a hydrophobic site don't solvate with water completely, so that they show high absorption for basic compounds. Its peak shows terribly tailing. Several end-capping techniques have been developed to solve these problems for many years.



■ Silanol activity control technology

ChromaNik developed the technique that decreased only silanol groups with high absorption activity to a basic compound and remained effective silanol groups on the stationary phase. Silanol activity control and no end-capping led the existence of silanol groups with high hydration which created a new and unique reversed-phase separation mode including hydrogen bond and ion-exchange interaction. Furthermore, silanol activity controlling, then end-capping technique improved a peak shape of a basic compound exceedingly.



◆ Feature of Sunrise series

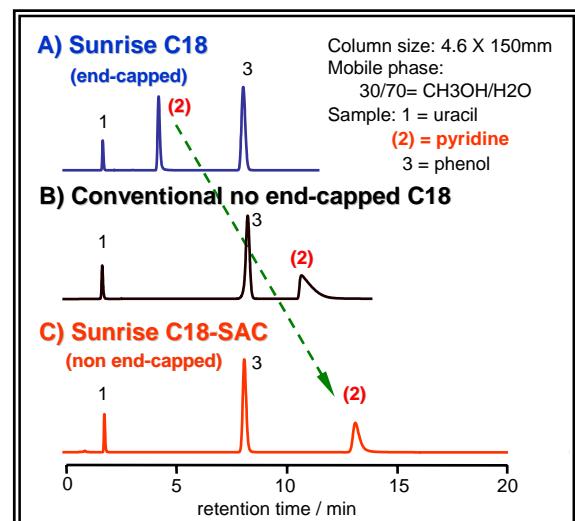
Sunrise C18

- The "1st Choice" column as a fully end-capped C18 column
- Full end-capping after silanol activity control
- Reducing adsorption of a basic compound extremely
- A good peak shape for a metal chelating compound
- Widely available for general reversed-phase separation

Sunrise C18-SAC

- The "2nd Choice" column which takes advantage of effective silanol groups interaction
- Reducing silanol groups with high adsorption activity
- The new separation mechanism including hydrogen bond and ion-exchange interaction
- Effective for separation of a basic compound and a polar compound
- Different selectivity and improvement of separation without changing a mobile phase

■ The elution order of pyridine



Sunrise C18 and C18-SAC

Silanol Activity Controlled C18 HPLC Column



◆ Sunrise series create an unique separation

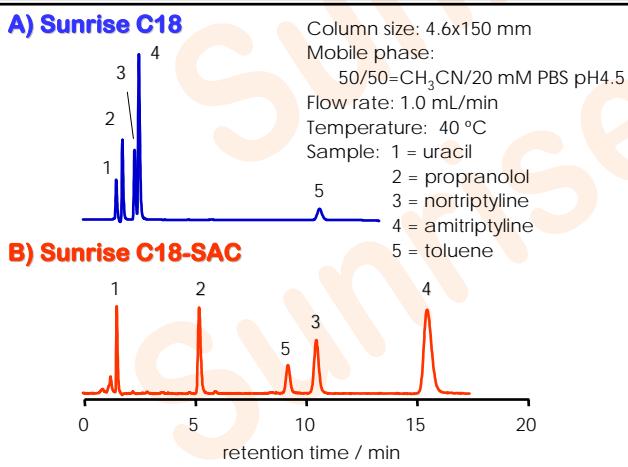
* Effectiveness of silanol activity control: Comparison between Sunrise C18 and C18-SAC

Sunrise C18 is the so-called fully end-capped C18 column. It shows the same separation behavior as a conventional C18 column.

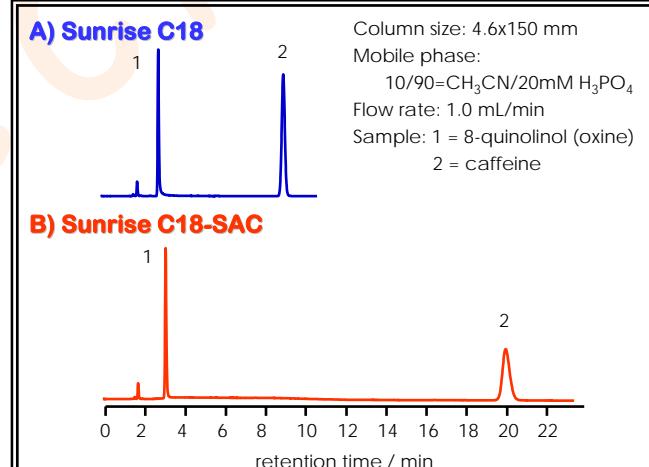
On the other hand, Sunrise C18-SAC shows hydrogen bond and ion-exchange interactions based on a residual silanol on the silica support in addition to reversed-phase separation. For example Sunrise C18 column separates a basic compound

similarly as a conventional C18, while Sunrise C18-SAC makes retention of a basic compound be large because an ion-exchange interaction works although a non-ionic compound shows the almost same retention on both Sunrise C18 and C18-SAC. Furthermore, Sunrise C18-SAC shows large retention for a polar compound such as caffeine.

■ comparison of selectivity for basic compounds



■ comparison of peak shape and retention

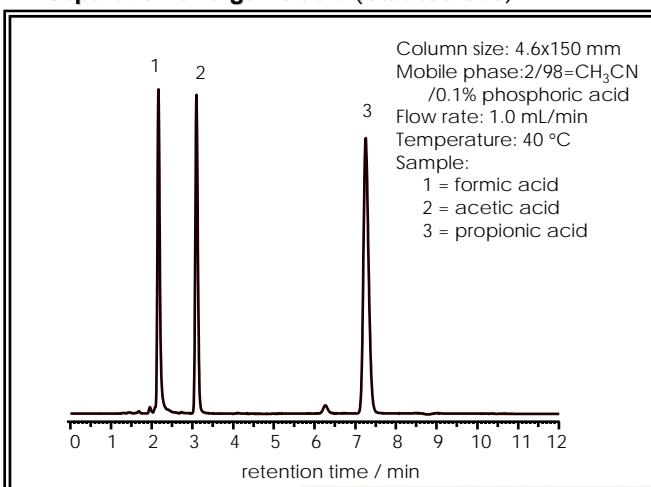


* C18 with both silanol activity control and full end-capping is effective in separation of polar compounds.

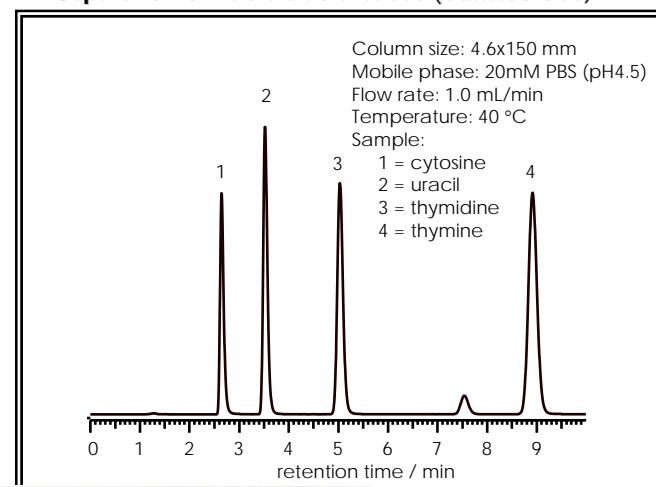
Sunrise C18 is bonded with octadecylsilane on pure silica gel (average pore size: 12nm, specific surface area: 340m²/g), and end-capped after silanol activity control. Final carbon content of Sunrise C18 is 15%.

Ligand density of Sunrise C18 is intentionally rather low and uniformity of ligands is high, so that it shows enough retention, even if a mobile phase with a low organic solvent content is used, and good peak shape for a polar compound.

■ Separation of organic acid (Sunrise C18)



■ Separation of nucleic acid bases (Sunrise C18)



Sunrise C18 and C18-SAC

Silanol Activity Controlled C18 HPLC Column



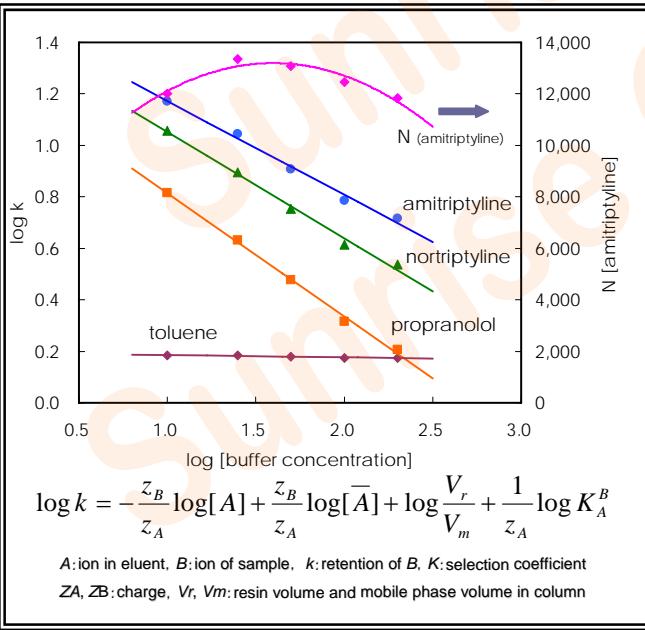
◆ Multiple mode separation is achieved on Sunrise series

* Silanol groups controlled its activity functions as ion-exchange groups

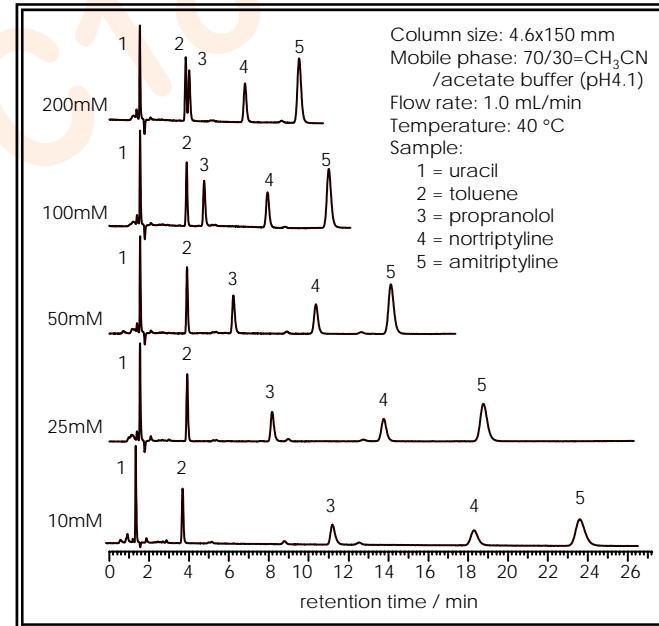
Sunrise C18-SAC is bonded with octadecylsilane on a pure silica gel and controlled its silanol activity without end-capping. Its carbon content is 14%.

Separation on Sunrise C18-SAC is done including hydrogen bond and ion-exchange interaction based on silanol groups except for hydrophobic interaction. Control of pH and salt concentration of a mobile phase can regulate retention.

■ Relationship between buffer concentration and retention (Sunrise C18-SAC)



■ Separation of basic compounds with ammonium acetate: Effect of salt concentration (Sunrise C18-SAC)



Ordering information

Inner diameter [mm]	length [mm]	Sunrise C18, 5μm		Sunrise C18-SAC, 5μm		Sunrise C18-SAC, 3μm	
		Cat. No.	Cat. No.	Cat. No.	Cat. No.	Cat. No.	Cat. No.
2.0	50	SB3241	SB2241	SA3241	—	SA2241	SA2241
	75	—	SB2251	—	—	SA2251	SA2251
	100	SB3261	SB2261	SA3261	—	SA2261	SA2261
	150	SB3271	SB2271	SA3271	—	SA2271	SA2271
4.6	10	SB3411	SB2411	SA3411	—	SA2411	SA2411
	50	SB3441	SB2441	SA3441	—	SA2441	SA2441
	75	—	SB2451	—	—	SA2451	SA2451
	100	SB3461	SB2461	SA3461	—	SA2461	SA2461
	150	SB3471	SB2471	SA3471	—	SA2471	SA2471
	250	SB3481	—	SA3481	—	—	—
10.0	250	SB3781	—	SA3781	—	—	—
20.0	250	SB3881	—	SA3881	—	—	—



SunShell PFP&C18 2.6 μm

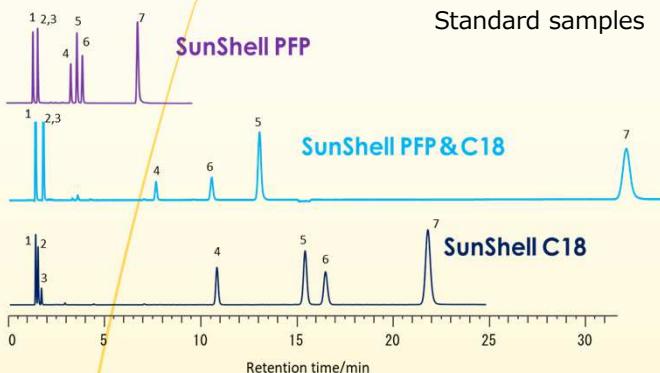
Core Shell Particle

Sunniest PFP&C18 5 μm

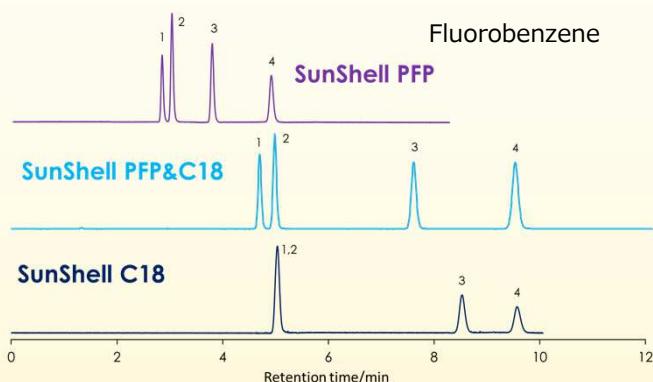
Totally porous particle

**Add C18 hydrophobicity to PFP separation!
Increased retention and improved durability**

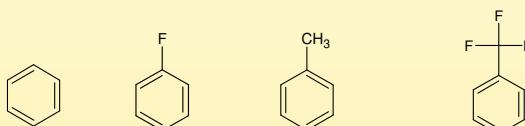
Comparison of separation



Column dimension: 4.6 x 150 mm
Mobile phase: $\text{CH}_3\text{OH}/\text{H}_2\text{O}=75/25$
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

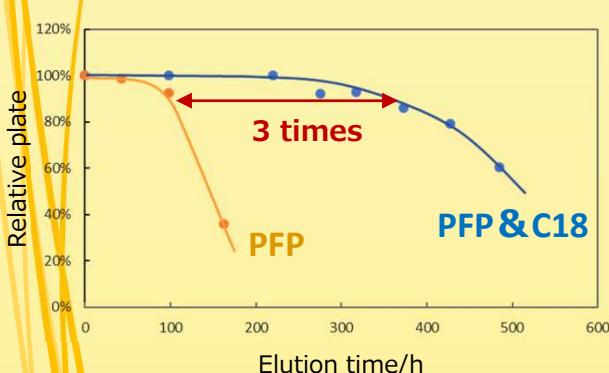


Column: SunShell PFP 2.6 μm , 4.6 x 150 mm
SunShell PFP&C18 2.6 μm , 4.6 x 150 mm
SunShell C18 2.6 μm , 4.6 x 150 mm
Mobile phase: Methanol/water=60/40
Flow rate: 1.0 mL / min
Temperature: 40 °C
Detection: UV@250 nm
Sample:
1 = Benzene, 2 = Fluorobenzene, 3 = Toluene, 4 = α,α,α -Trifluorotoluene



Compared to PFP, PFP & C18 has the same stereoselectivity, but the hydrophobicity is greatly increased and the retention time is extended. PFP & C18 has achieved the same separation as that of PFP, such as the separation of fluorobenzenes.

Stability test



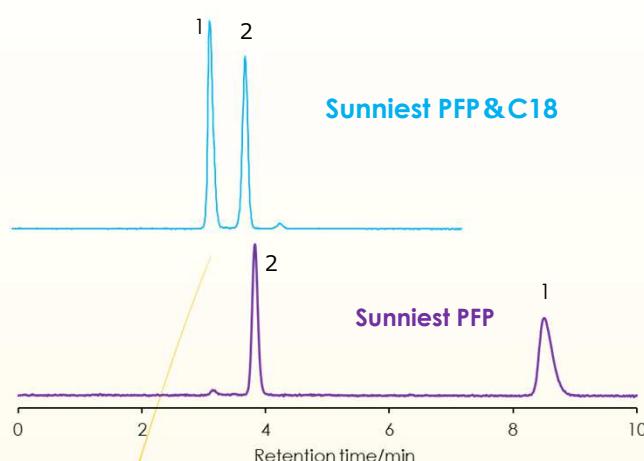
Conditions for durability testing
Column: Sunniest PFP&C18 5 μm , 2.1x150 mm
Suniest PFP 5 μm , 2.1x150 mm
Mobil phase: $\text{CH}_3\text{OH}/20\text{mM PB pH}7.0=70/30$
Flow rate: 0.2 mL/min
Temperature: 40 °C

Conditions for measuring theoretical plates
Column: PFP&C18 5 μm , 2.1x150 mm
PFP 5 μm , 2.1x150 mm
Mobil phase: Acetonitrile/water=70/30
Acetonitrile/water=60/40
Flow rate: 0.2 mL/min
Temperature: 40 °C
Sample: Acenaphthene

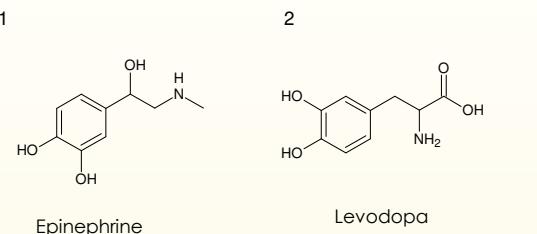
Due to the increased hydrophobicity of the surface, the durability of PFP & C18 is approximately three times that of conventional PFP.

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Comparison of retention times for highly polar compounds



Column: Sunniest PFP&C18, PFP 5 μm , 150 x 4.6 mm
 Mobile phase: 12.5 mM Ammonium Formate (pH3)
 Flow rate: 1.0 mL/min
 Temperature: 25 °C
 Detection: UV@260nm



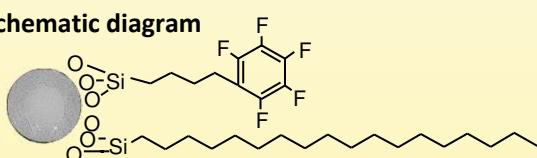
In the separation of highly polar compounds such as catecholamines, the selectivity of PFP and PFP & C18 changes greatly, and PFP tends to be more retained.

◆ Specification of SunShell PFP&C18, Sunniest PFP&C18

	Core shell silica and totally porous silica				Bonded phase				
	Pore size (μm)	Core diameter (μm)	Pore diameter (nm)	Specific surface area (m^2/g)	Carbon loading (%)	Stationary phase	USP L line	End-capping	Maximum pressure
SunShell PFP&C18	2.6 μm	1.6 μm	9 nm	150 m^2/g	6%	Pentafluorophenyl + C18	L43	TMS end-capping	60 MPa
Sunniest PFP&C18	5 μm	0 μm	12 nm	340 m^2/g	14%	Pentafluorophenyl + C18	L43	TMS end-capping	30 MPa

*For the maximum operating pressure, the value described in the test report of each column has priority over the above value.

PFP&C18 stationary phase schematic diagram



◆ Ordering information

	Inner diameter (mm)	2.1	3.0	4.6	10	20	USP category
	Length (mm)	Catalog No.					
SunShell PFP&C18, 2.6 μm	30	CV6931	CV6331	CV6431	-----	-----	L43
	50	CV6941	CV6341	CV6441	-----	-----	
	75	CV6951	CV6351	CV6451	-----	-----	
	100	CV6961	CV6361	CV6461	-----	-----	
	150	CV6971	CV6371	CV6471	-----	-----	
	Inner diameter (mm)	2.1	3.0	4.6	10	20	USP category
Sunniest PFP&C18, 5 μm	Length (mm)	Catalog No.					
	50	EV3241	EV3341	EV3441	-----	-----	L43
	100	EV3261	EV3361	EV3461	-----	-----	
	150	EV3271	EV3371	EV3471	-----	-----	
	250	EV3281	EV3381	EV3481	EV3781	EV3881	

Manufacturer

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 TEL: +81-6-6581-0885 FAX: +81-6-6581-0890

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Application

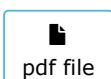
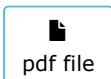
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1162	Glyphosate compounds	Glyphosate – FMOC, [13C,15N] Glyphosate – FMOC, Glufosinate – FMOC, AMPA – FMOC, [13C,15N] AMPA – FMOC, [13C,15N]	Prominert C18 3.5 µm, 150 x 2.1 mm i.d. MTF (Metal free)	 (http://chromanik.co.jp/info/wp-content/uploads/2023/03/application1162.pdf)
1163	Branched-chain amino acids (2)	L-Valine, L-Isoleucine, L-Leucine	SunShell PFP 2.6 µm, 150 x 4.6 mm i.d. SunShell PFP&C18 2.6 µm, 150 x 4.6 mm i.d. SunShell RP-AQUA 2.6 µm, 150 x 4.6 mm i.d. SunShell Biphenyl 2.6µm, 150 x 4.6 mm i.d.	 (http://chromanik.co.jp/info/wp-content/uploads/2023/03/application1163.pdf)

No.	title	sample	colmun	pdf
1164	Sulfonamides	Sulfadiazine, Sulfamethoxazole, Sulfamerazine, Sulfamonomethoxine	SunShell C18 2.6 μm, 150 x 4.6 mm i.d. SunShell Phenyl 2.6 μm, 150 x 4.6 mm i.d. SunShell Biphenyl 2.6μm, 150 x 4.6 mm i.d.	 (http://chromanik.co.jp/info/wp-content/uploads/2023/03/application1164.pdf)
1165	Steroids (1)	Estriol, Hydrocortisone, Prednisone, Corticosterone, β- Estradiol, Testosterone, Cortisonacetate	SunShell C18 2.6 μm, 150 x 4.6 mm i.d. SunShell Phenyl 2.6 μm, 150 x 4.6 mm i.d. SunShell Biphenyl 2.6μm, 150 x 4.6 mm i.d.	 (http://chromanik.co.jp/info/wp-content/uploads/2023/03/application1165.pdf)
1166	Steroids (2)	Estriol, Hydrocortisone, Prednisone, Corticosterone, β- Estradiol, Testosterone, Cortisonacetate	SunShell Biphenyl 2.6 μm, 150 x 4.6 mm i.d. SunShell C18 2.6μm, 150 x 4.6 mm i.d.	 (http://chromanik.co.jp/info/wp-content/uploads/2023/03/application1166.pdf)

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