ChromaNik Technologies Inc.

Sunrise C30

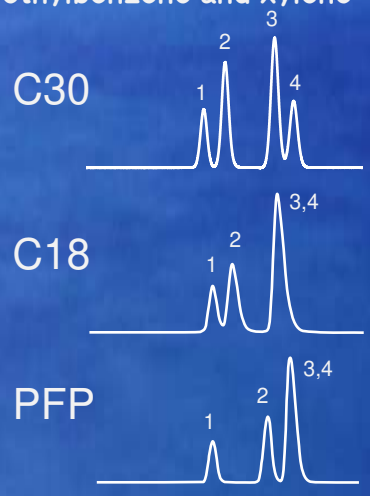
Sunrise C28

RP C18 column with a feature of a silanol group

Sunrise C18-SAC

Silanol Activity Controlled C18 Column

Comparison of separation for ethylbenzene and xylene



1 = Ethylbenzene
2 = o-Xylene
3 = m-Xylene
4 = p-Xylene

Sunrise Triacontyl (C30)

Sunrise Octacosyl (C28)

Sunrise Octadecyl-SAC (C18-SAC) has an interaction of silanol groups

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Sunrise C30, C28
Sunrise C18-SAC

HPLC column

Name	Stationary phase	Carbon content	Ligand density	Particle size
C30 Triacontyl		18%	1.7 μmol/m²	3 μm, 5 μm
C28 Octacosyl		18%	1.7 μmol/m²	3 μm, 5 μm
C18-SAC Octadecyl		14%	2.1 μmol/m²	3 μm, 5 μm

pH range of C30 and C28: pH2～pH8, C18-SAC: pH2～pH7.5

Silica support
Surface area : 340 m²/g
Pore volume : 1.0 mL/g
Pore diameter : 12 nm

End-capping
Trimethylsilyl group (TMS)

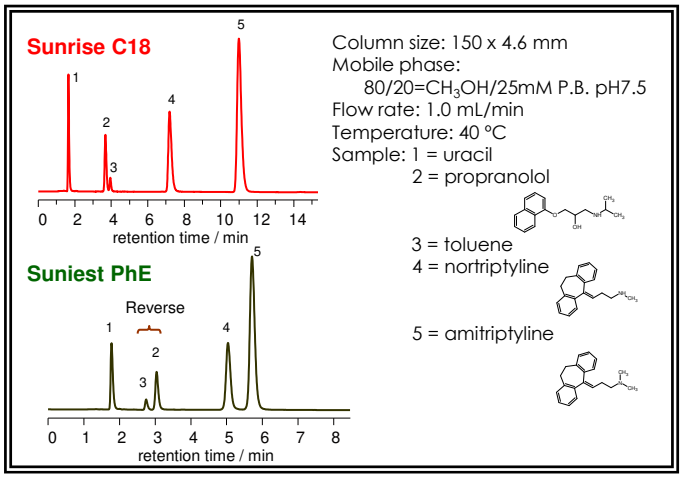
◆ Characteristics of end-capping type Sunrise series

C30, C28: (C30 and C28 shows the same separation.)
■ A long alkyl chain improves both separation of fat-soluble compounds to compare with C18 phase and an excellent reproducibility in retention under high aqueous conditions.
■ Furthermore, a suitable ligand density of C28 allows to be obtained a shape peak shape even if more than 50% aqueous mobile phase is used.
■ Different selectivity

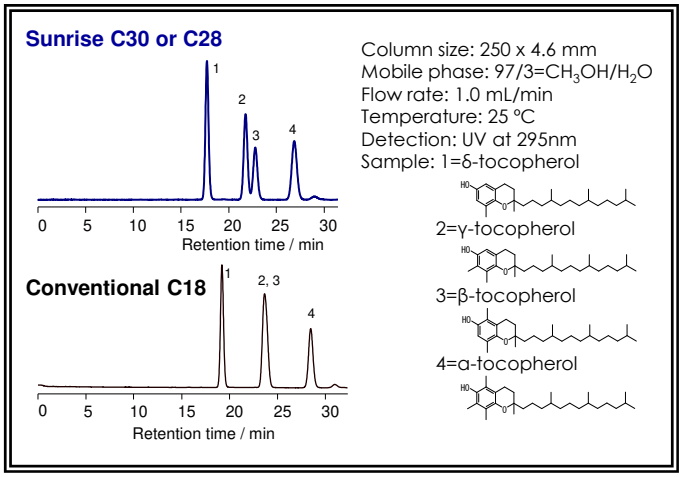
C18 : (C18 has stopped production. Sunniest C18 is recommended as a replacement.)
■ Conventional C18 phase with full end-capping

PhE :
(Sunrise PhE has stopped production. Sunniest PhE is recommended as a replacement)
■ Interaction based with p-electron such as p-p interaction
■ p-electron also interacts with a polar site of a compound, so that phenyl phase improves separation of polar compounds. Ethylene chain between silica surface and phenyl group allows a movable sphere of a phenyl group to be wide. A chain with more than three carbons shows more hydrophobic interaction, so that p-electron interaction decreases relatively.
■ Phenethyl (PhE) group is a suitable phenyl phase.

■ Separation of Basic compounds

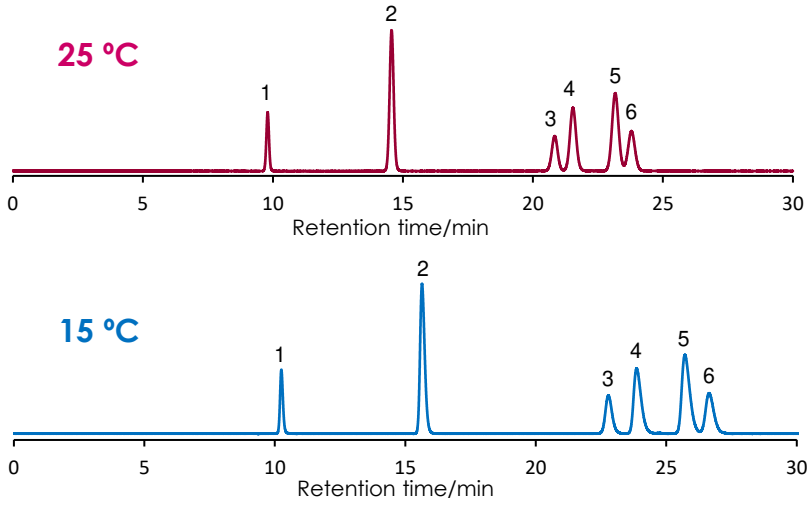


■ Separation of Vitamin E Isomer can be separated by C28

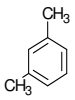


Sunrise C30, C28

■ Separation of xylene isomers

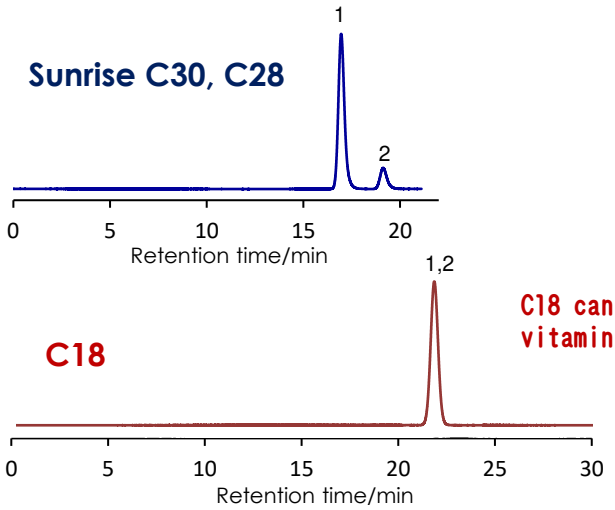


Column: Sunrise C30 or C28, 3 µm 4.6 x 250 mm
Mobile phase: CH_3OH/H_2O=70:30
Flow rate: 0.7 mL/min
Temperature: 25 °C and 15 °C
Detection: UV@250nm
Sample: BTEX
1 = Benzene
2 = Toluene
3 = Ethylbenzene
4 = o-Xylene
5 = m-Xylene
6 = p-Xylene



Sunrise C30 or C28 can separate xylene isomers although conventional C18 can't. The lower a temperature, the better a separation of isomers.

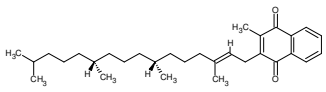
■ Separation of vitamin K1 isomers



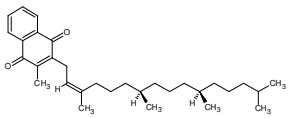
C18 can not eparate vitamin K1 isomers.

Column: Sunrise C30 or C28 3 µm, 150 x 4.6 mm
Company A C18 3 µm, 150 x 4.6mm
Mobile phase: Methanol
Flow rate: 1.0 mL/min
Temperature: 15 °C
Detection: UV@250 nm
Sample: Vitamin K1 isomers (trans and cis)

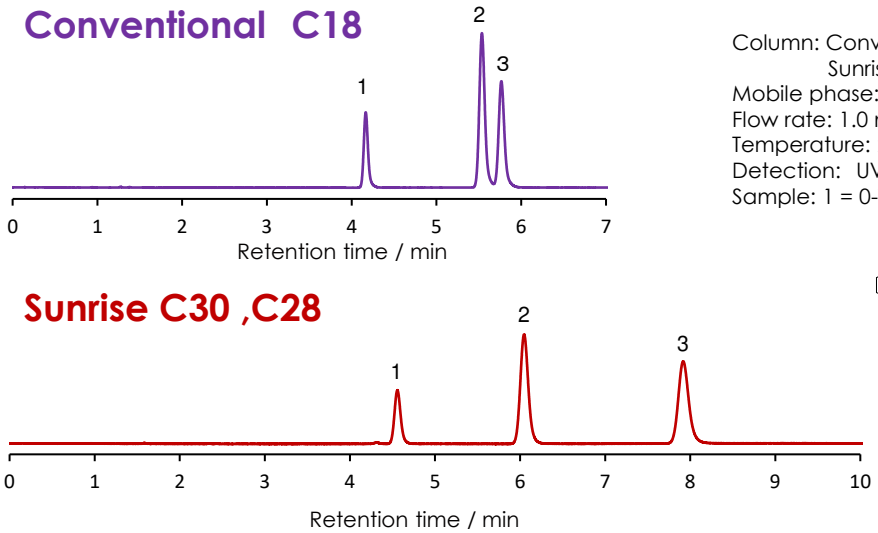
1 = trans



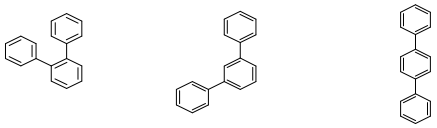
2 = cis



■ Separation of ter-phenyl isomers



Column: Conventional C18 150 x 4.6 mm
Sunrise C30, or C28, 3 µm 150 x 4.6 mm
Mobile phase: Methanol/water=90:10
Flow rate: 1.0 mL / min
Temperature: 25 °C
Detection: UV@250 nm
Sample: 1 = 0-Terphenyl, 2 = m-Terphenyl, 3 = p- Terphenyl

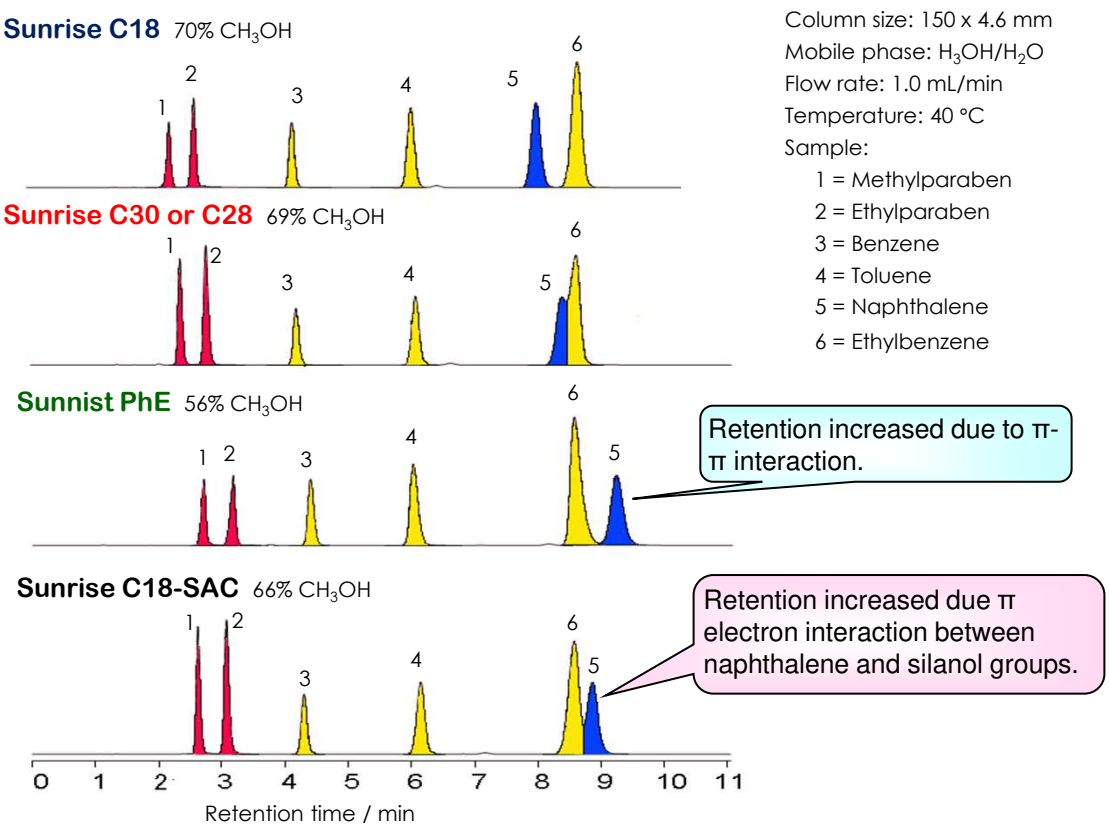


HPLC column

Sunrise C28

Sunrise C18-SAC

■ Comparison of stationary phases

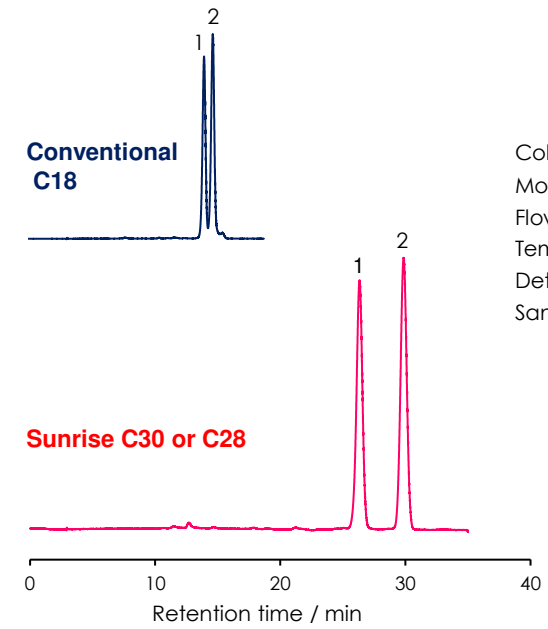


Column size: 150 x 4.6 mm
Mobile phase: H_3OH/H_2O
Flow rate: 1.0 mL/min
Temperature: 40 °C
Sample:
1 = Methylparaben
2 = Ethylparaben
3 = Benzene
4 = Toluene
5 = Naphthalene
6 = Ethylbenzene

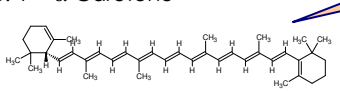
Retention increased due to π-π interaction.

Retention increased due π electron interaction between naphthalene and silanol groups.

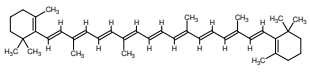
■ Comparison of separation of α, β - carotene



Column size: 250 x 4.6 mm
Mobile phase: $CH_3CN/CHCl_3$ = 80:20
Flow rate: 1.0 mL/min
Temperature: 30 °C
Detection: UV at 450nm
Sample: 1 = α-Carotene



2 = β-Carotene



The mobile phase including chloroform makes alkyl chains brash up because chloroform can enter among alkyl chains. Consequently retention times of C30 or C28 became 2 times longer than C18.

ChromaNik Technologies Inc.

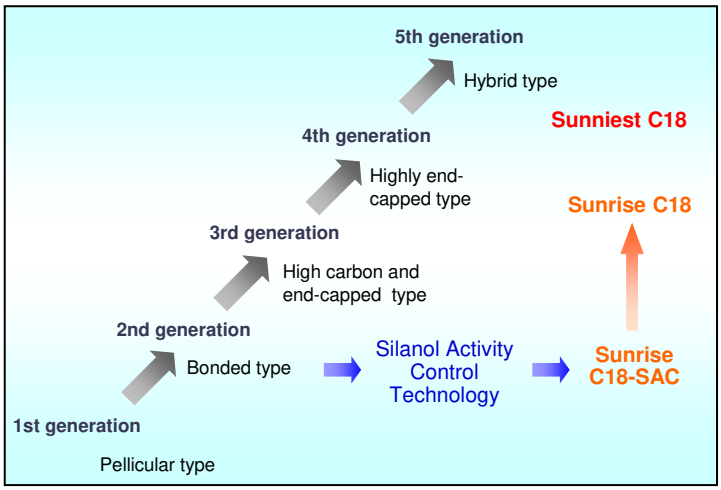
Sunrise C18-SAC

Silanol Activity Controlled C18 HPLC Column

◆ New generation reversed-phase utilized silanol groups

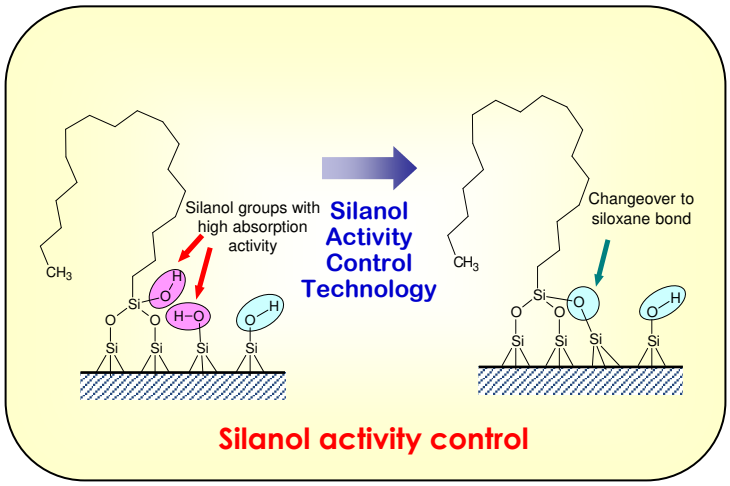
■ Silanol group and peak tailing

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

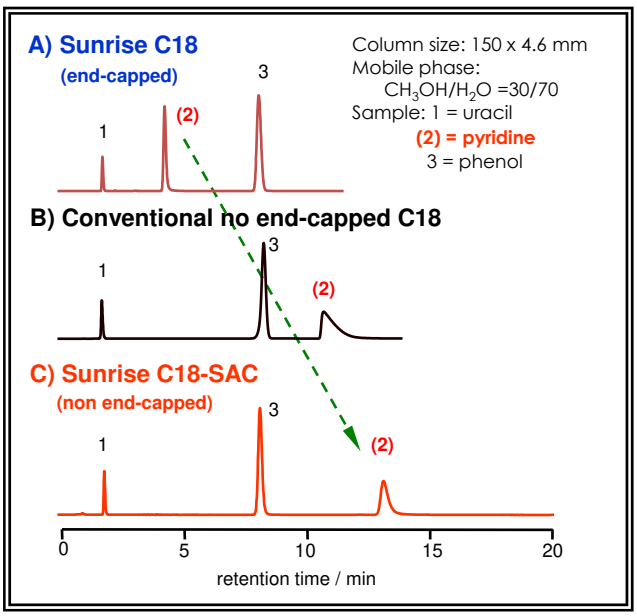
Sunrise C18

- 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-SAC

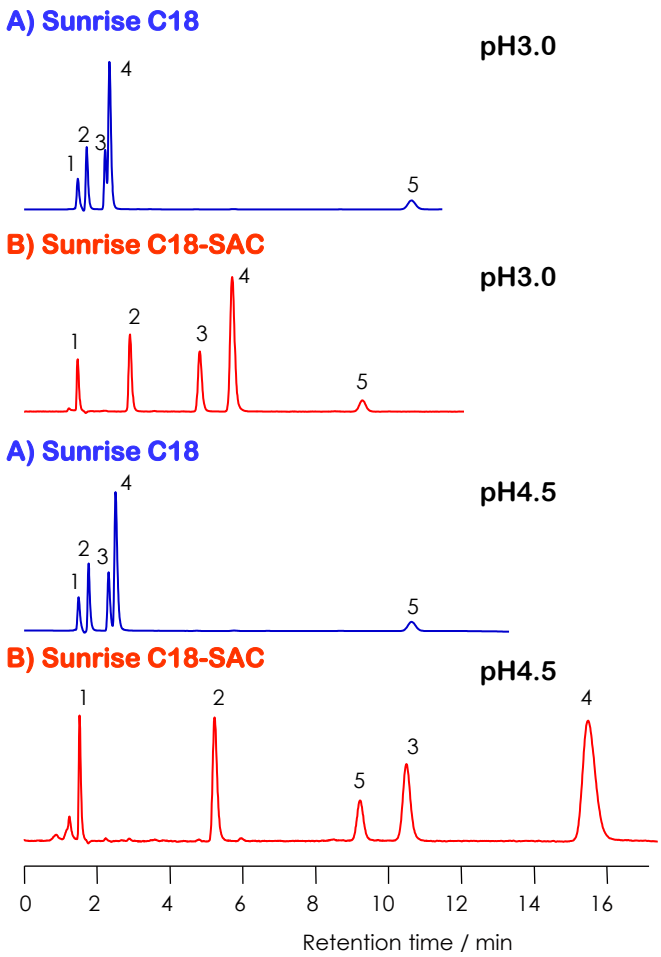
Silanol Activity Controlled C18 HPLC Column

◆ Sunrise series create an unique separation

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

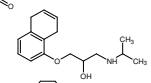
Sunrise C18 is the so-called fully end-capped C18 column. It shows the same separation behavior as a conventional C18 column.
On the other hand, Sunrise C18-SAC shows hydrogen bond and ion-exchange interactions based on a residual silanol on the silica support in addition to reversed-phase separation. 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

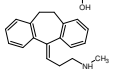


Column size: 150 x 4.6 mm
Mobile phase:
CH_3CN/20mM Phosphate buffer pH3.0 or pH4.5 = 50:50
Flow rate: 1.0 mL/min
Temperature: 40 °C
Sample: 1 = Uracil

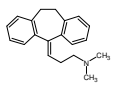
2 = Propranolol



3 = Nortriptyline

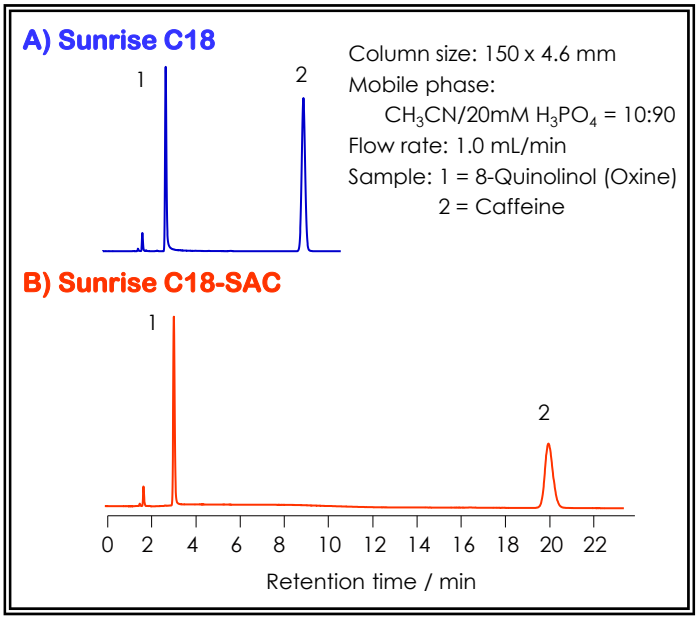


4 = Amitriptyline



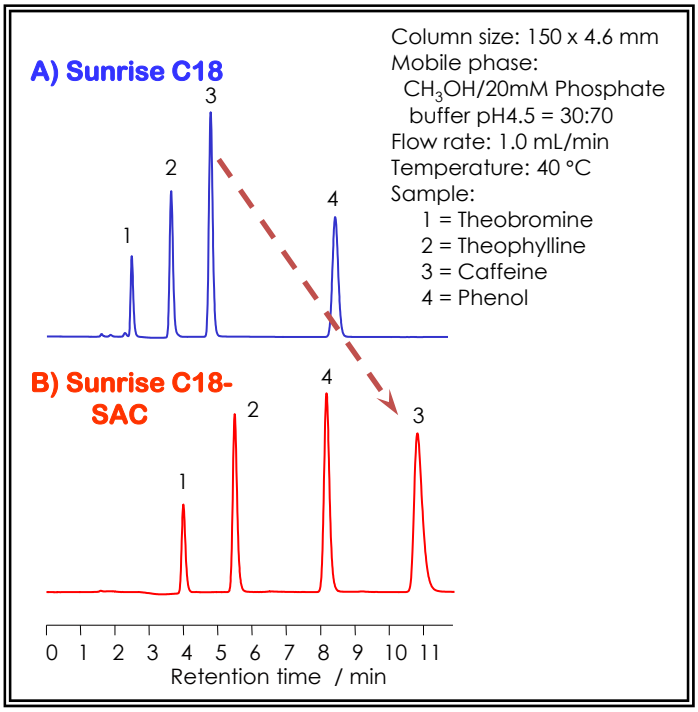
5 = Toluene

■ Comparison of peak shape and retention



Column size: 150 x 4.6 mm
Mobile phase:
CH_3CN/20mM H_3PO_4 = 10:90
Flow rate: 1.0 mL/min
Sample: 1 = 8-Quinolinol (Oxine)
2 = Caffeine

■ Comparison of caffeine



Column size: 150 x 4.6 mm
Mobile phase:
CH_3OH/20mM Phosphate buffer pH4.5 = 30:70
Flow rate: 1.0 mL/min
Temperature: 40 °C
Sample:
1 = Theobromine
2 = Theophylline
3 = Caffeine
4 = Phenol

Sunrise C18-SAC

Silanol Activity Controlled C18 HPLC Column

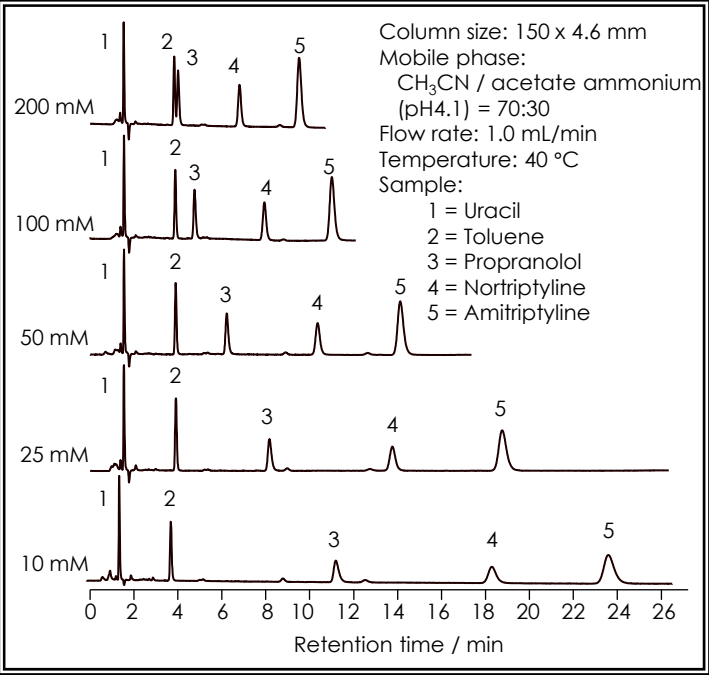
◆ Multiple mode separation is achieved on Sunrise series

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

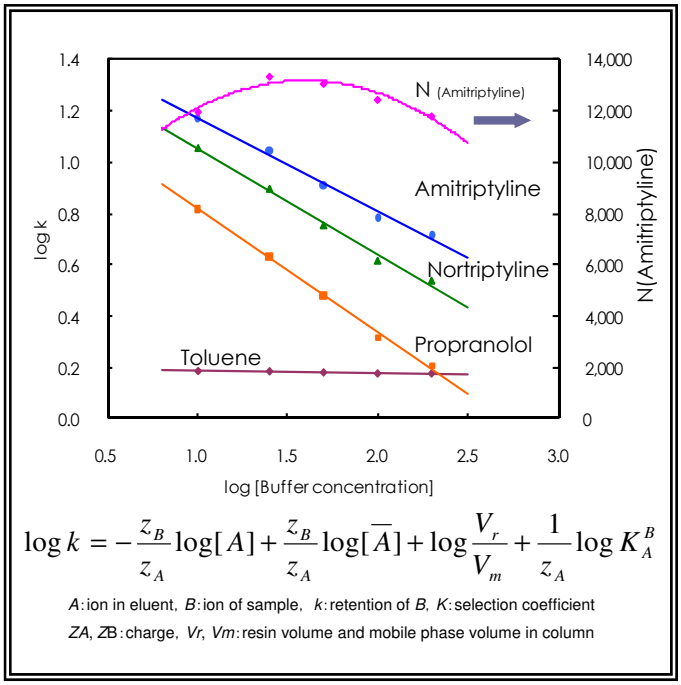
Sunrise C18-SAC is bonded with octadecylsilane on a pure silica gel and controlled its silanol activity without end-capping. Its carbon content is 14%.

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.

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



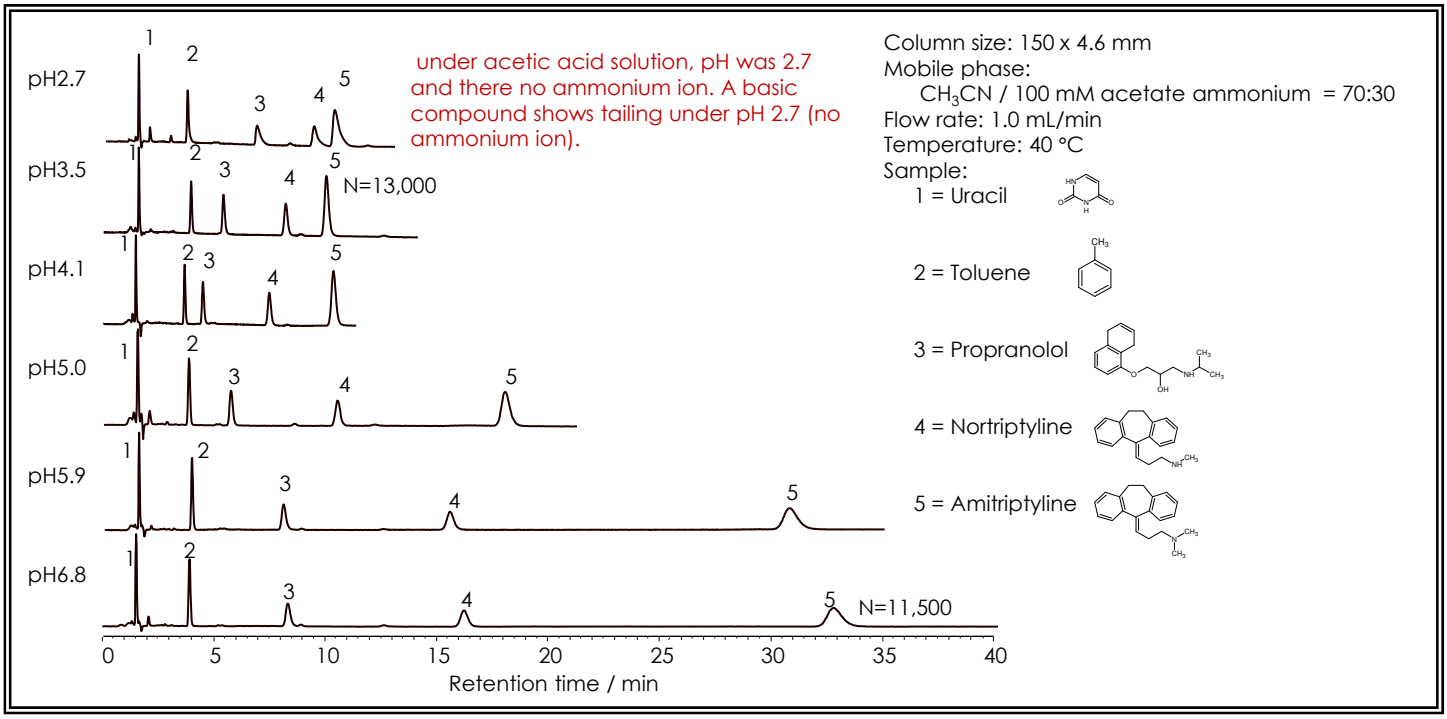
■ Relationship between buffer concentration and retention(Sunrise C18-SAC)



$$\log k = -\frac{z_B}{z_A}\log[A] + \frac{z_B}{z_A}\log[\overline{A}] + \log\frac{V_r}{V_m} + \frac{1}{z_A}\log K_A^B$$

A:ion in eluent, *B*:ion of sample, *k*:retention of *B*, *K*:selection coefficient
ZA, *ZB*:charge, *Vr*, *Vm*:resin volume and mobile phase volume in column

■ Chromatograms under different pH conditions (Sunrise C18-SAC)



ChromaNik Technologies Inc.

Sunrise C30, C28, C18-SAC

✻ Sunrise series Analytical and Preparative Columns

Inner diameter [mm]	length [mm]	Sunrise C30, 3µm Cat. No.	Sunrise C30, 5µm Cat. No.	Sunrise C28, 3µm Cat. No.	Sunrise C28, 5µm Cat. No.
2.0	50	SM2241	SM3241	ST2241	ST3241
	75	SM2251	—	ST2251	—
	100	SM2261	SM3261	ST2261	ST3261
	150	SM2271	SM3271	ST2271	ST3271
	250	SM2281	SM32281	ST2281	ST3281
4.6	10	SM2411	SM3411	ST2411	ST3411
	50	SM2441	SM3441	ST2441	ST3441
	75	SM2451	—	ST2451	—
	100	SM2461	SM3461	ST2461	ST3461
	150	SM2471	SM3471	ST2471	ST3471
	250	SM2481	SM3481	ST2481	ST3481
10.0	250	—	SM3781	—	ST3781
20.0	250	—	SM3881	—	ST3881

Inner diameter [mm]	length [mm]	Sunrise C18-SAC, 3µm Cat. No.	Sunrise C18-SAC, 5µm Cat. No.
2.0	50	SA2241	SA3241
	75	SA2251	—
	100	SA2261	SA3261
	150	SA2271	SA3271
4.6	10	SA2411	SA3411
	50	SA2441	SA3441
	75	SA2451	—
	100	SA2461	SA3461
	150	SA2471	SA3471
	250	—	SA3481
10.0	250	—	SA3781
20.0	250	—	SA3881

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