
InertSustainSwift™
GL Sciences

# Introduction for a new HPLC column

## InertSustainSwift™ C18

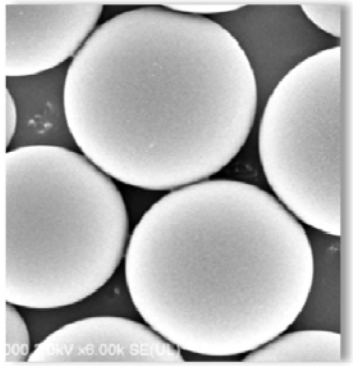
**Evolutional high performance for high throughput analysis . . .**

InertSustainSwift C18 is an optimal column for high throughput analysis designed for elution time to be faster and shorten an equilibration time also in gradient analysis. Moreover, it has the inactive processing technology acquired by InertSustain C18, and has become a column which combines high durability and low bleeding.

# Physical Properties

## InertSustainSwift™ C18

- Silica : Newly Developed ES Silica Gel
- Particle Size : 1.9 µm, 3 µm, 5 µm
- Surface Area : 200 $m^2/g$
- Pore Size : 200 Å (20 nm)
- Pore Volume : 1.00 mL/g
- Bonded Phase : Octadecyl Groups
- End-capping : Complete
- Carbon Loading : 9.0 %
- USP Code : L1
- pH Range : 1.0～10.0

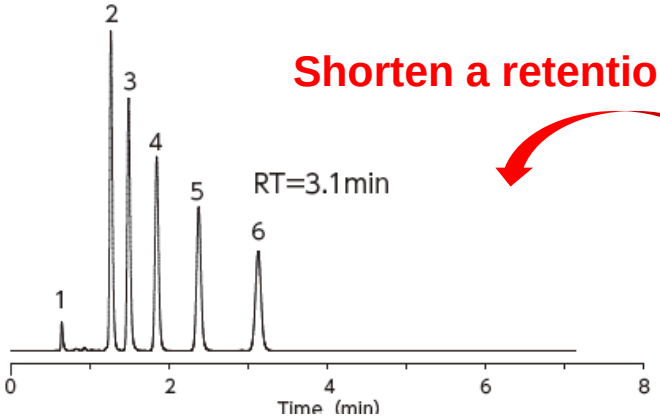



**Evolved Surface Silica**

# Features

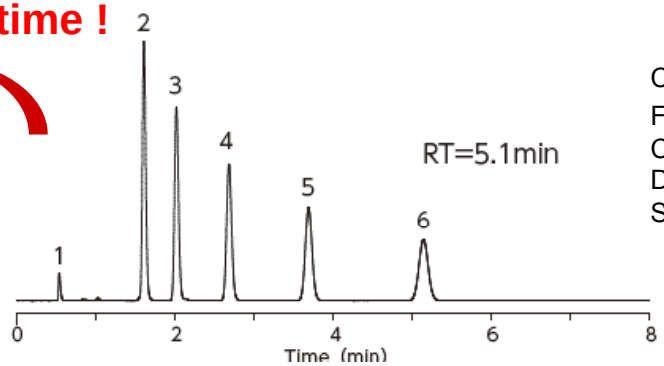
- **Wide pH range (pH1 to10)**
  Evolved Surface Silica
- **Shorten an equilibration time**
  Optimized Surface Area (200 $m^2/g$) and Pore size (200 Å)
- **Suitable retentivity**
  Perfect Controlled Carbon Loading (9.0 %)
- **High inertness and Lower bleeding**
  Latest Production Process
- **Lower pressure**
  Traditional GL Sciences' Silica Production Technology
- **Appropriate performance for LC/MS/MS**
  High theoretical plate number and Lower bleeding

# Superior Features




InertSustainSwift C18（3 μm）

**Shorten a retention time !**



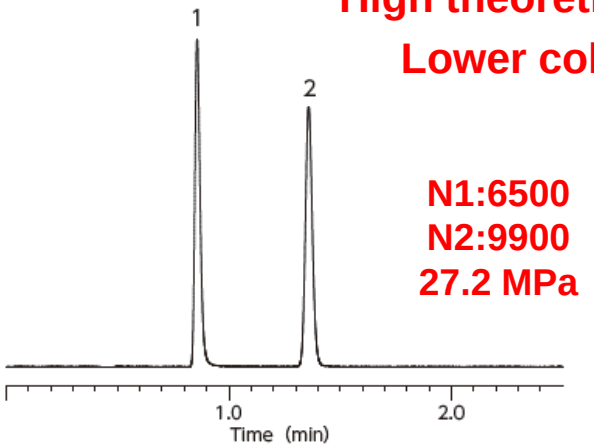

InertSustain C18（3 μm）

Conditions

Eluent : A) $CH_3OH$
B) $H_2O$
A/B = 80/20, v/v
Column Size : 3 μm, 150 × 2.1mm I.D.
Flow Rate : 0.3 mL/min
Col. Temp. : 40 ℃
Detection : UV 254 nm
Sample : 1. Uracil
2. Toluene
3. Ethylbenzene
4. Propylbenzene
5. *n*-Butylbenzene
6. *n*-Amylbenzene

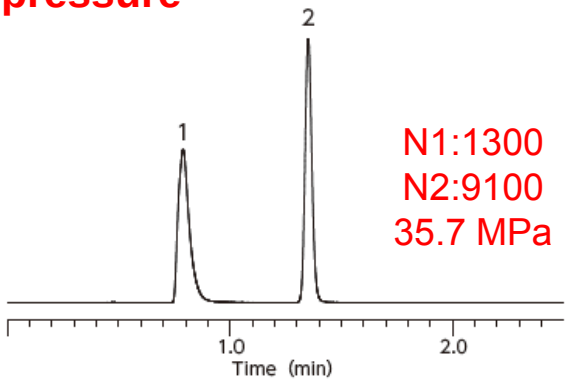
**High theoretical plate number**

**Lower column pressure**




**N1:6500**
**N2:9900**
**27.2 MPa**

InertSustainSwift C18 (1.9 μm)




N1:1300
N2:9100
35.7 MPa

Acquity BEH (1.7 μm)

Conditions

Eluent : A) $CH_3OH$
B) $H_2O$
A/B = 30/70, v/v
Column Size : 50 × 2.1 mm I.D.
Flow Rate : 0.4 mL/min
Col. Temp. : 40 ℃
Detection : UV 254 nm
Sample : 1. Pyridine
2. Phenol

# Important contents for High Throughput Analysis

**Rapid equilibration**

**Suitably retentivity**

**High inertness and Lower bleeding**

# Incomplete Equilibration

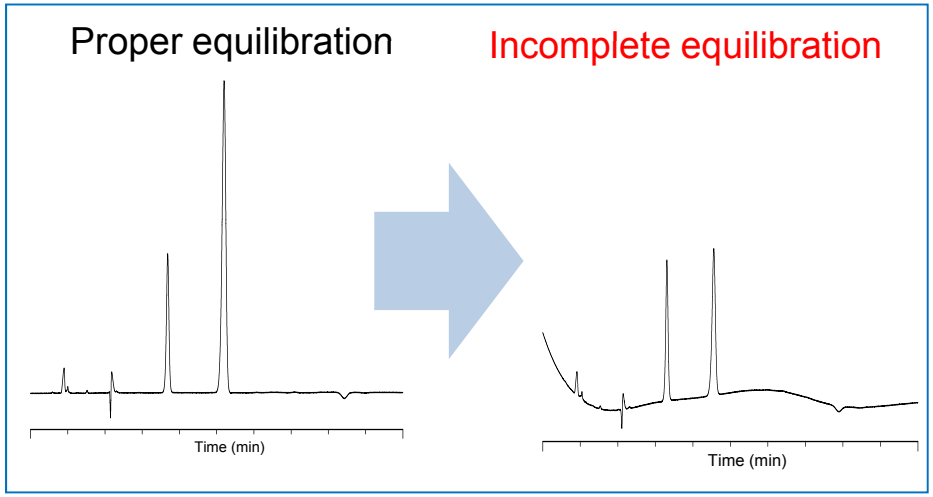
If equilibration time is not enough in gradient analysis . . .

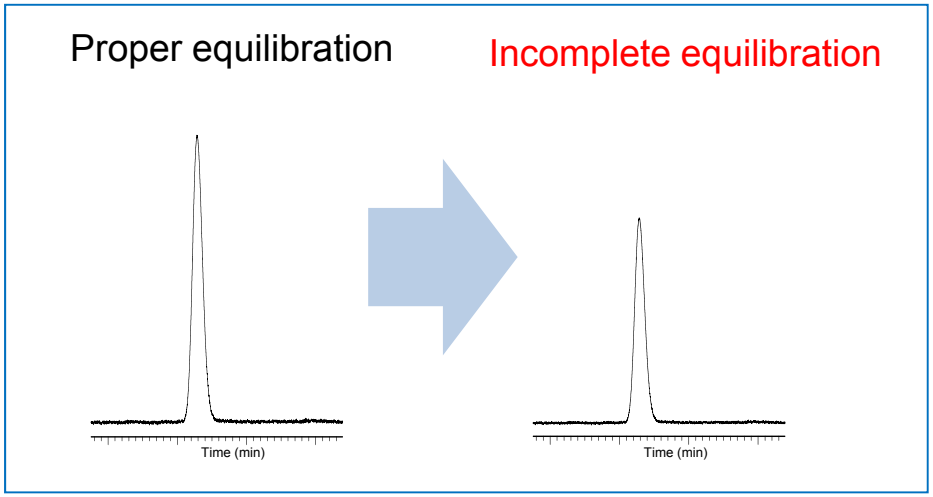
**(Possible symptoms)**

Bad reproducibility in high water solubilty components especially

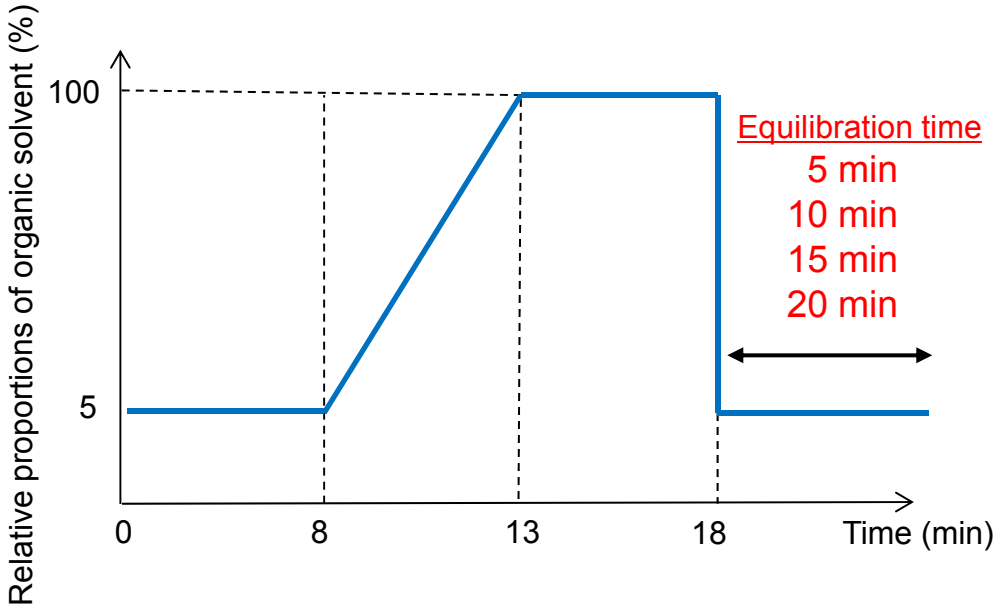
Wave of base line

Unstable sensitivity in LC/MS/MS



# Comparison Test for Equilibration time (Conditions)




Conditions

Column Size : 3 µm, 150 × 2.1 mm I.D.

Eluent : A) $H_2O$ B) $CH_3CN$

A/B = 95/5 (8 min hold) – 5 min - 0/100 –

5 min- 0/100 - 0.1min - 95/5 – Equilibration time , v / v

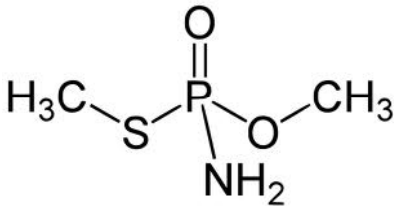
Flow Rate : 0.2 mL/min

Col. Temp. : 40 ℃

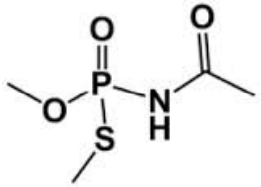
Detection : UV 215 nm

Sample : Water-soluble components (Pesticides)

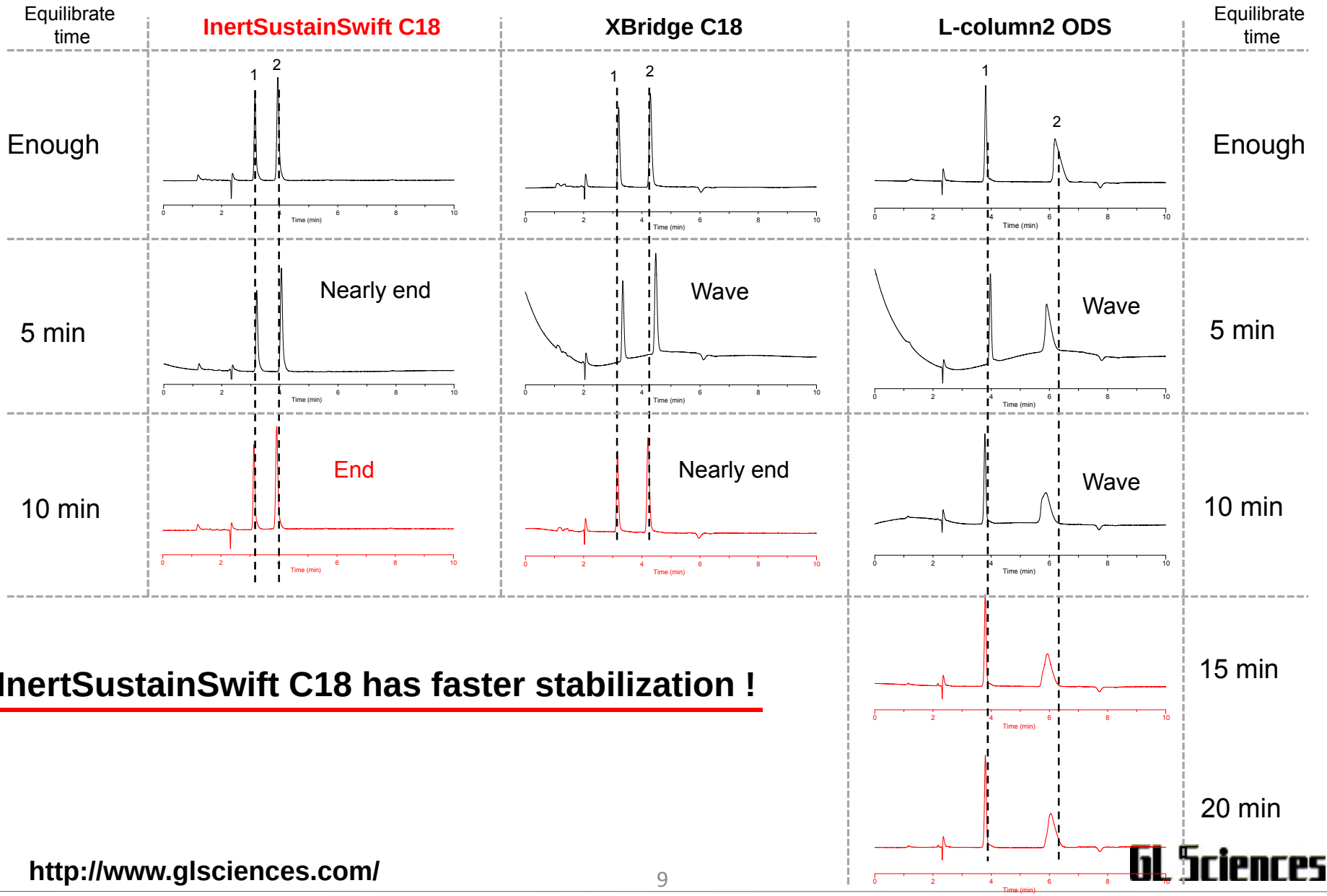
1. Methamidophos



2. Acephate



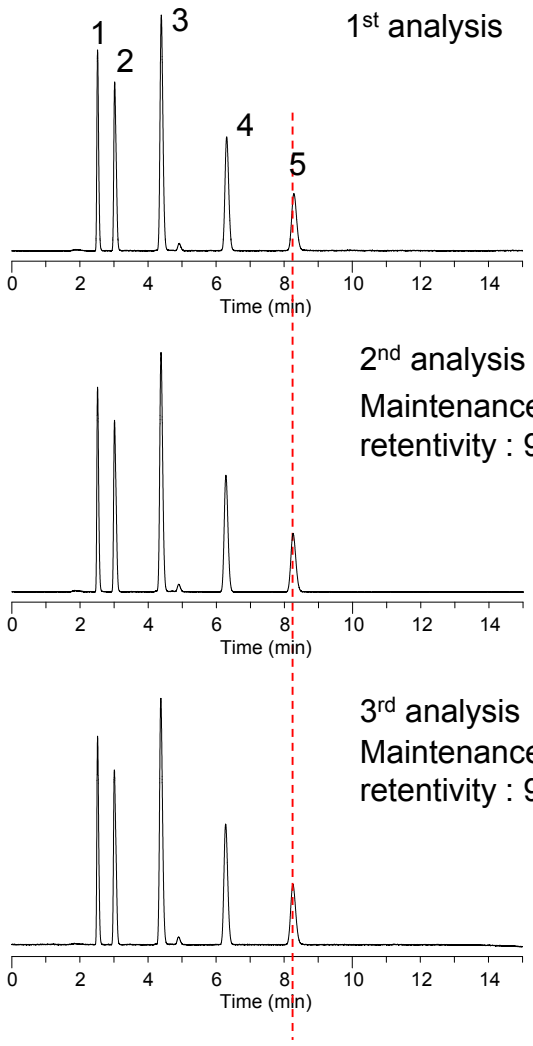
# Comparison Testing for Equilibration time (Results)




**InertSustainSwift C18 has faster stabilization !**

# 100% Water Condition

InertSustainSwift C18 can meet with 100% water condition easily.




Variation of retention time may be occurred by that ODS column is not equilibrated with high polar solvents easily such as water in gradient analysis.

**However . . .**

InertSustainSwift C18 can be used for 100% Water condition and equilibrated faster in gradient analysis by optimal carbon loading and pore size.

**Testing Procedure:**

1) 100 % water is introduced into column over 20 minutes.
2) Conduct Analysis
3) Stop flow for 15 minutes.
4) 100 % water is introduced again into column over 30 minutes.
5) Stop flow for 15 minutes again.
6) Conduct Analysis

Conditions

| | |
|---|---|
| Column | : InertSustainSwift C18 (5 µm, 4.6 × 250) |
| Eluent | : 100 % $H_2O$ |
| Flow rate | : 1.0 mL/min |
| Col. Temp. | : 40 ℃ |
| Detection | : UV 254 nm |
| Sample | : 1.Cytosine 2.Uracil 3.Guanine 4.Thymine 5.Adenine |

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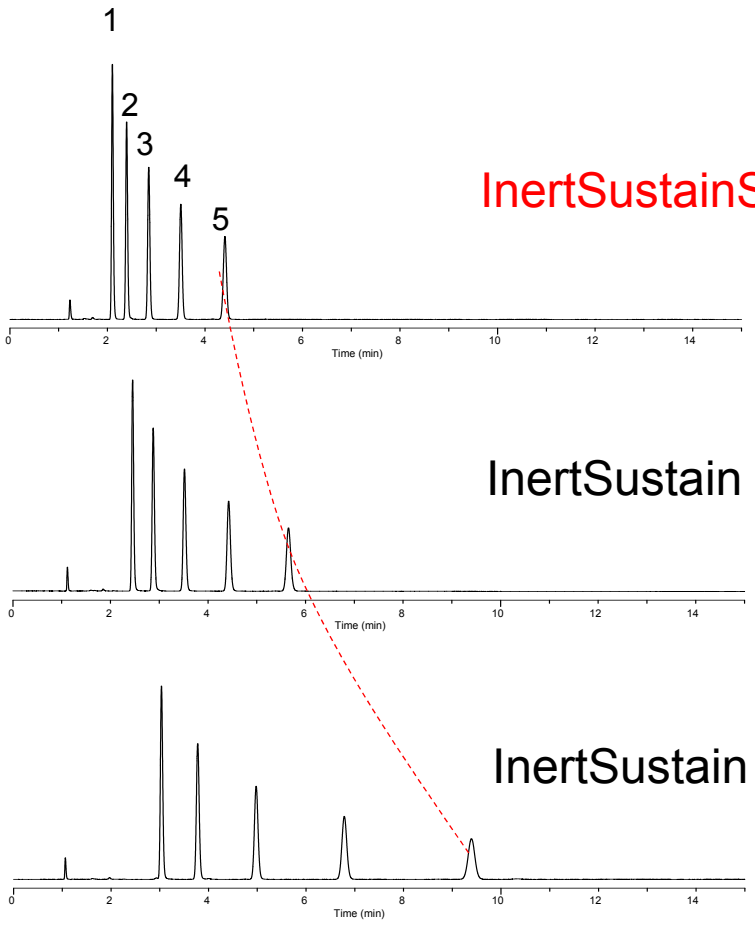
# Suitable Retentivity

● Comparison data InertSustainSwift C18 with InertSustain C18 and C8



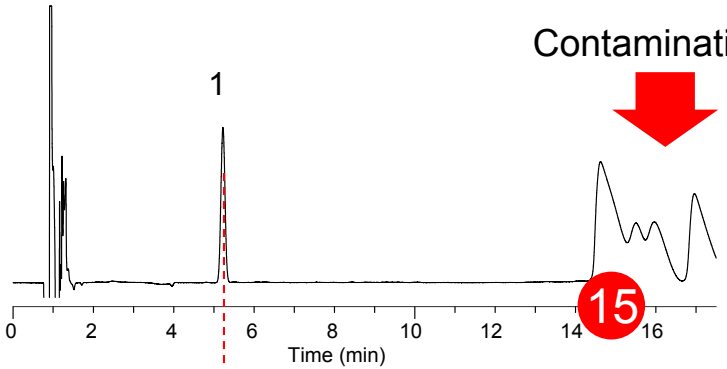

Conditions

| | |
|---|---|
| Column Size | : 3 µm, 150 × 2.1 mm I.D. |
| Eluent | : $CH_3OH/H_2O$ = 80/20, v/v |
| Flow Rate | : 0.3 mL/min |
| Col. Temp. | : 40 ℃ |
| Detection | : UV 254 nm |
| Sample | : 1: Uracil |
| | 2: Toluene |
| | 3: Ethylbenzene |
| | 4: Propylbenzene |
| | 5: *n*-Butylbenzene |
| | 6: *n*-Amylbenzene |

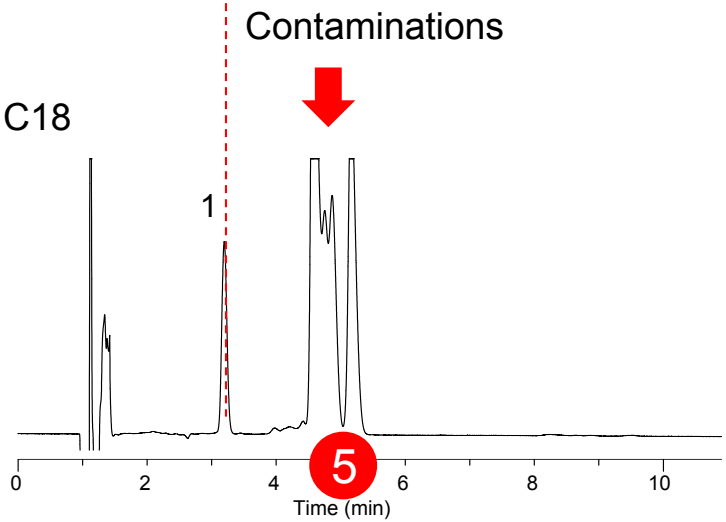
# Suitable Retentivity

● Hydrophobic contaminations also are eluted faster !

High hydrophobic ODS column



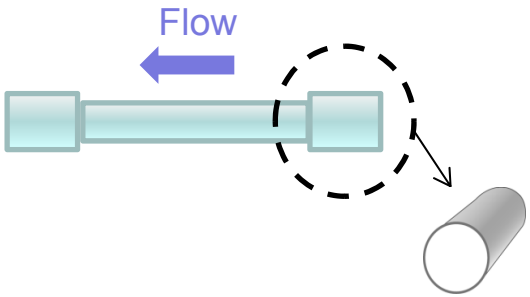

InertSustainSwift C18




Conditions

| | |
|---|---|
| Column Size | : 3 µm, 150 × 2.1mm I.D. |
| Eluent | : A) $CH_3CN$<br>B) 0.1 % HCOOH,50 mM $HCOONH_4$ in $H_2O$<br>A/B = 65/35 , v/v |
| Flow Rate | : 0.3 mL/min |
| Col. Temp. | : 40 ℃ |
| Detection | : UV 225 nm |
| Injection Vol | : 5 µL |
| Sample | : 1. Etylbenzene |

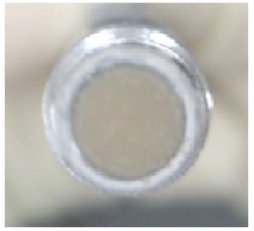
# Adsorption of Analytes




After disconnect the column joints,
confirm to the packing of inlet !

**Conditions**

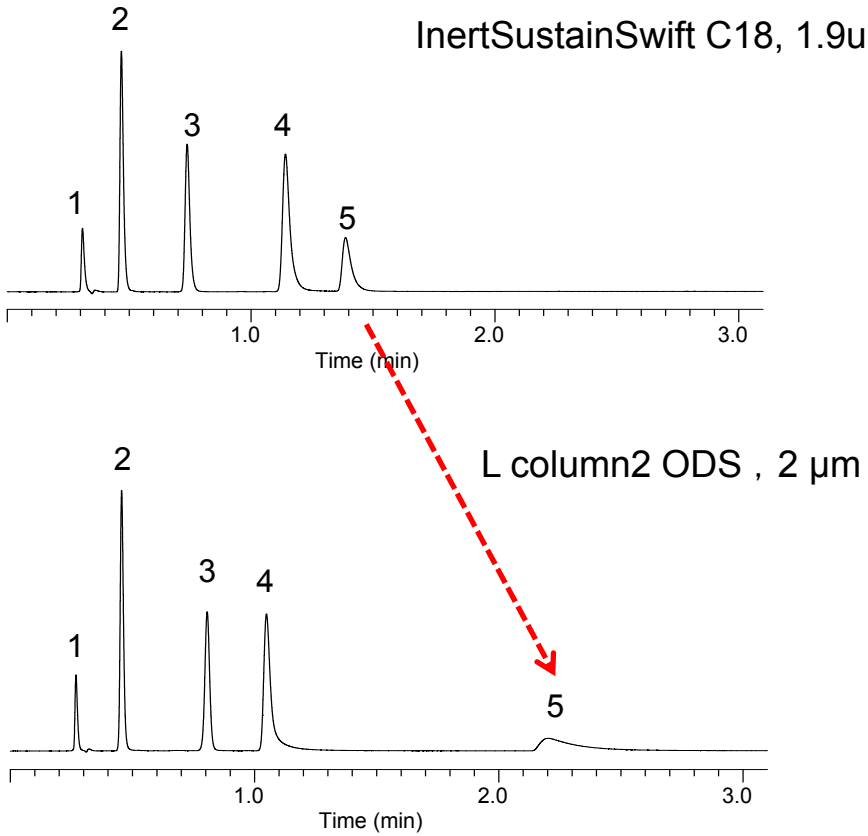
| | |
|---|---|
| Eluent | : $CH_3CN$ |
| Flow late | : 1 mL/min |
| Col. Temp | : Room temperature |
| Injection Vol. | : 100 uL |
| Sample | : Coffee sample |

| | Existing C18 column | InertSustainSwift C18 |
|---|---|---|
| Before injecting |  |  |
| After injecting |  |  |
| After washing by CH3CN for 10min |  |  |

Clean

# Highly Inertness

Column size: 50 mm × 2.1 mm I.D.




Conditions

| | |
|---|---|
| Eluent | : A) $CH_3CN$ |
| | B) 25mM $K_2HPO_4$ (pH 7.0, $KH_2PO_4$) |
| | A/B = 30/70,v/v |
| Flow Rate | : 0.4 mL/min |
| Col. Temp. | : 40 ℃ |
| Detection | : UV 230 nm |
| Injection Vol | : 0.5 μL |
| Sample | : 1:Uracil |
| | 2:Pyridine |
| | 3:Phenol |
| | 4:Berberine chloride |
| | 5:Dextromethorphan |

# Highly Inertness

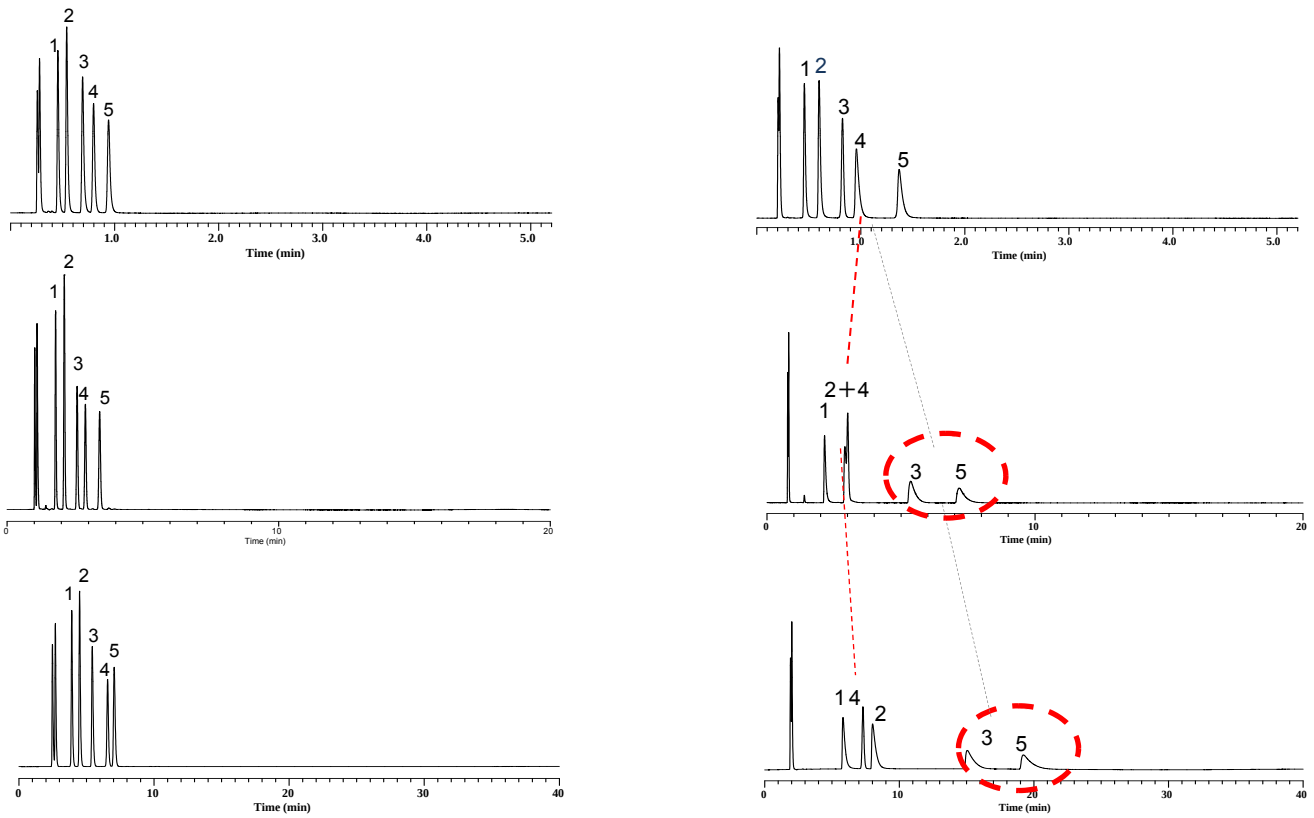
InertSustainSwift C18

Zorbax Eclipse Plus C18

Sub 2 µm

3 µm

5 µm




Conditions

| | |
|---|---|
| Eluent | : A) $CH_3CN$ |
| | B) 25mM $K_2HPO_4$ (pH 7.0, $KH_2PO_4$) |
| | A/B = 60/40,v/v |
| Flow Rate | : ※1 |
| Col. Temp. | : 40 ℃ |
| Detection | : UV 220 nm |
| Injection Vol | : ※2 |

Sub 2 µm (2.1×50)
※1：0.4 mL/min ※2：0.5 µL
3 µm (2.1 ×150)
※1：0.3 mL/min ※2：1 µL
5 µm (4.6 ×250)
※1：1.0 mL/min ※2：2 µL

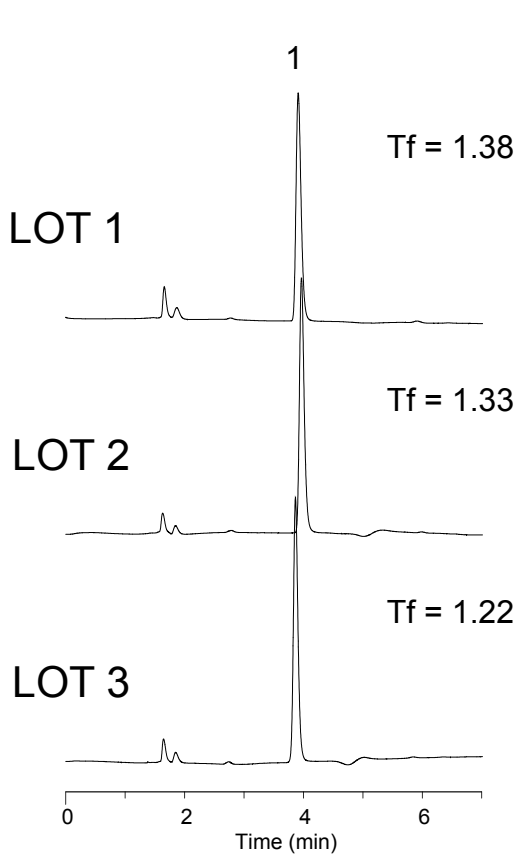
Sample:
1. Chlorpheniramine
2. Triprolidine
3. Homochlorcyclizine
4. Hydroxyzine
5. Clemastine

# Reliable Reproducibility

Column Size : InertSustainSwift C18 3 µm, 150×4.6 mm I.D.

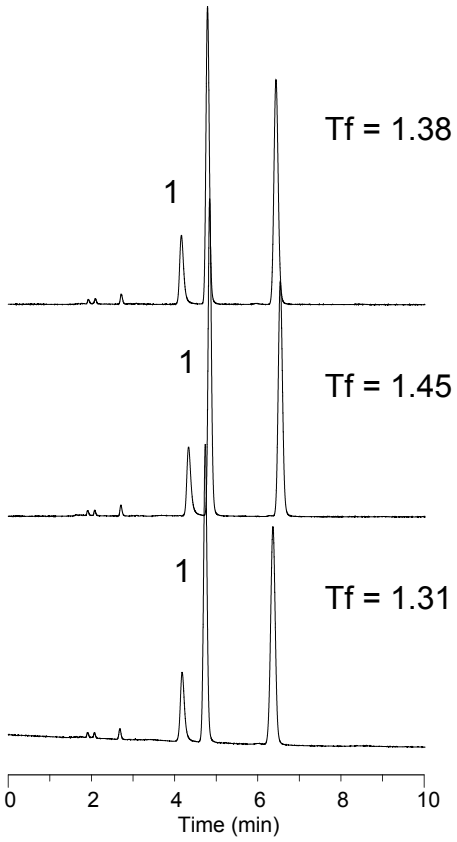
## Strong Basic Compound Test

1. Dextromethorphan



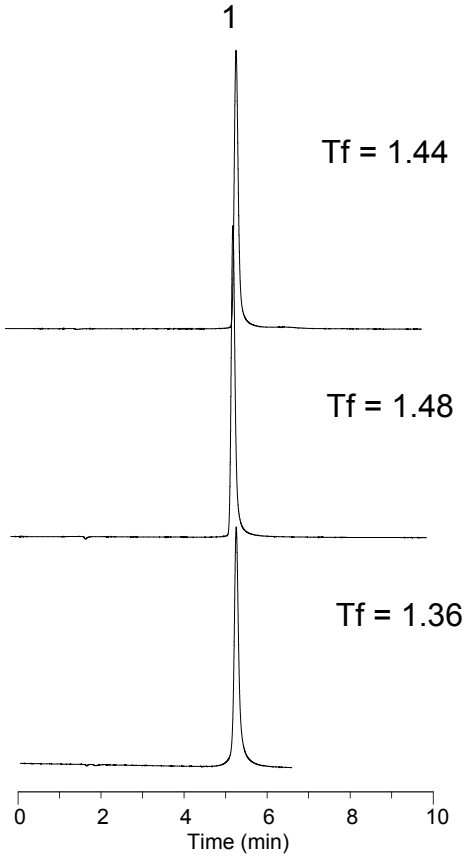

## Strong Acidic Compound Test

1. Brilliant Blue FCF




## Strong Chelating Compound Test

1. Hinokitiol



# Ion Suppression in LC/MS(/MS) analysis

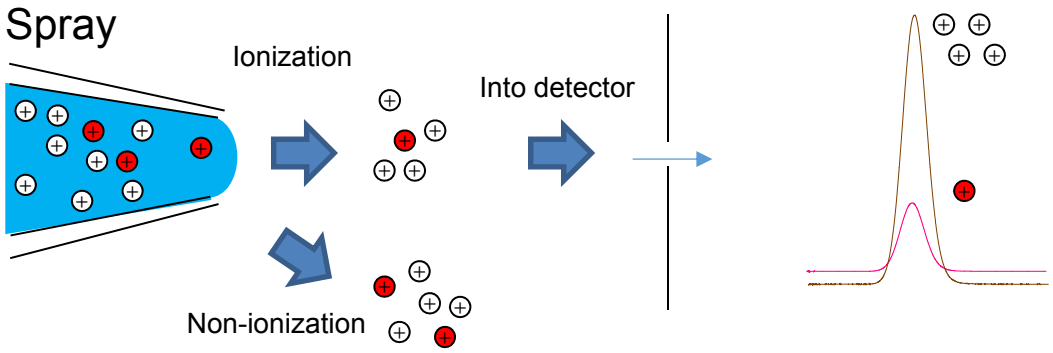
## What is Ion Suppression ?

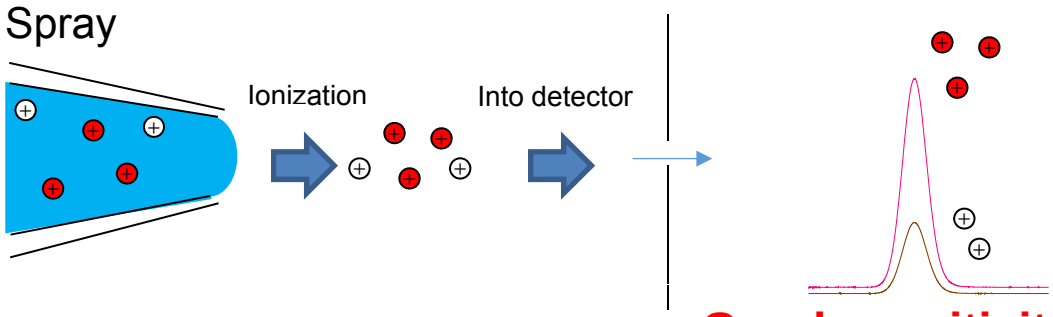
Ionized mass number at the same time has the limit in LC/MS(/MS) analysis.

If foreign substances were included in sample and the retention time was same with a target component, the sensitivity for target component will be decreased due to foreign substances.

⊕ : Foreign substances

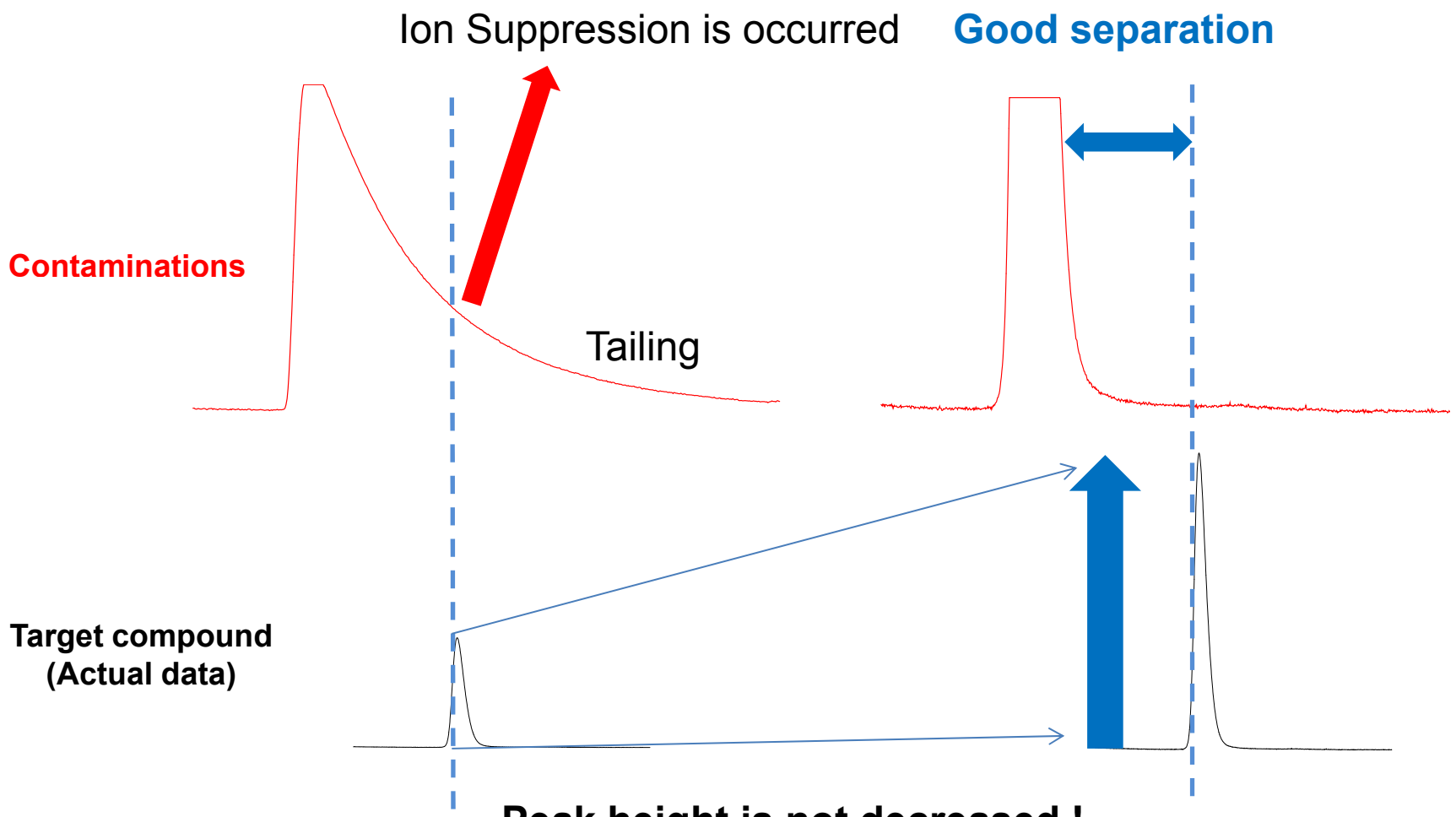
⊕ : Target component




**Good sensitivity for target component**

# Preventing Ion Suppression

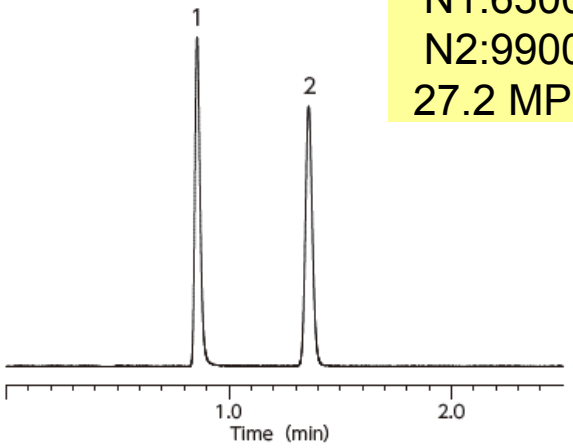



**High adsorptive C18 column**

**InertSustainSwift C18**

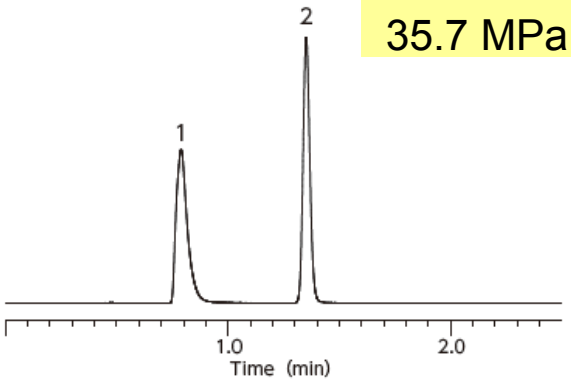
# Offer Good Peak Shapes (1)

InertSustainSwift C18 can offer good peak shapes without adsorption due to high inertness. And also, high theoretical plate number will be achieved at low column back pressure due to 1.9 um particle size.




N1:6500
N2:9900
27.2 MPa

InertSustainSwift C18 (1.9 µm)




N1:1300
N2:9100
35.7 MPa

Acquity BEH (1.7 µm)

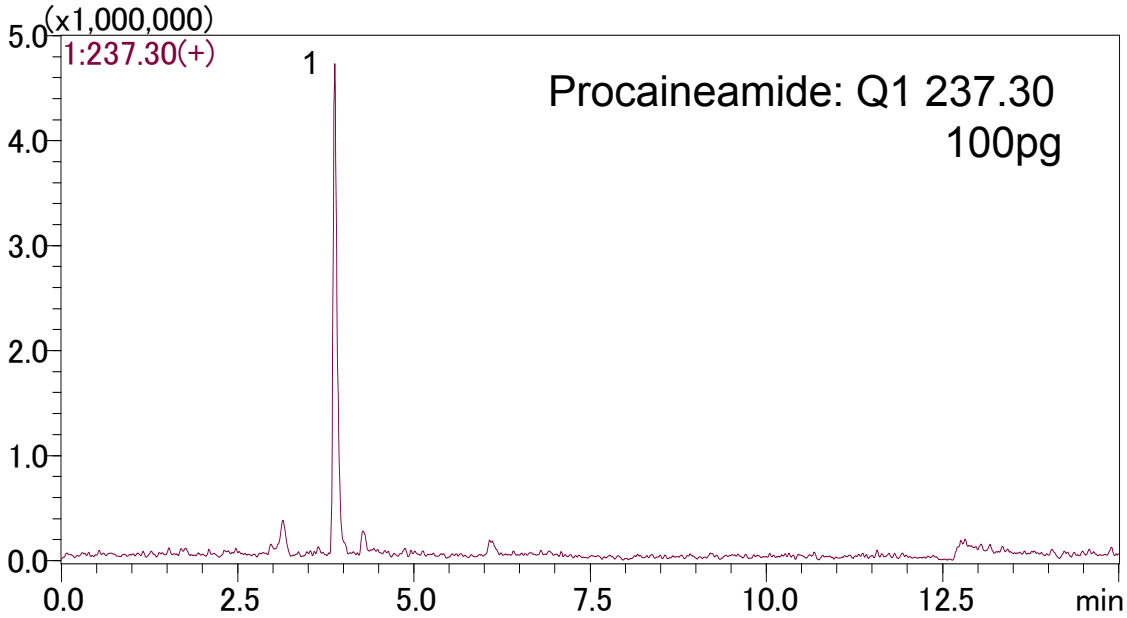
Conditions

| | |
|---|---|
| Eluent | : A) $CH_3OH$ |
| | B) $H_2O$ |
| | A/B = 30/70, v/v |
| Column Size | : 50 × 2.1 mm I.D. |
| Flow Rate | : 0.4 mL/min |
| Col. Temp. | : 40 ℃ |
| Detection | : UV 254 nm |
| Sample | : 1. Pyridine |
| | 2. Phenol |

# Offer Good Peak Shapes (2)

Basic compound adsorbed with remained silanol can be analyzed easily without any tailing due to highly inertness.

● Application for basic drag under formic acid mobile phase condition

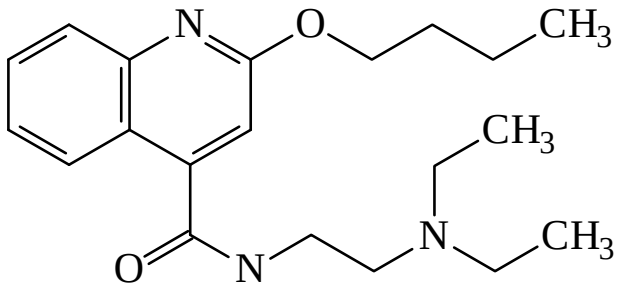



Conditions

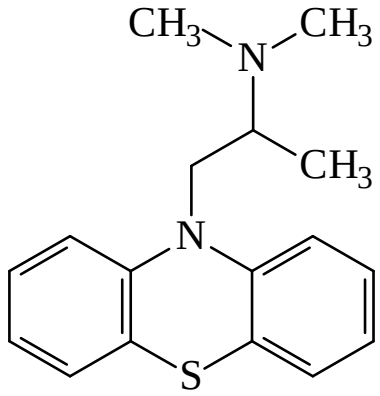
| | |
|---|---|
| System | : Nexera LCMS-8030 plus |
| Column | : InertSustainSwift C18 (3 µm, 150 × 2.1 mm I.D.) |
| Eluent | : A) 0.1% HCOOH in $H_2O$<br>B) 0.1% HCOOH in $CH_3CN$<br>A/B = 95/5 - 5 min - 0/100 - 5min - 0/100 – 0.1min - 95/5 - 5min - 95/5 -,v/v |
| Flow Rate | : 0.2 mL/min |
| Col. Temp. | : 40 ℃ |
| Detection | : LC/MS (ESI) |

# Confirmation Testing for Influence of Buffer (Conditions)

Concentration of ammonium acetate was changed in stages and then, peak shapes of each stage was confirmed if adsorption was occurred.



Dibucaine (pKa 8.5)



Promethazine (pKa 9.1)

Conditions

| | |
|---|---|
| System | : Nexera LCMS-8030 plus |
| Column size | : (3 µm, 150 × 2.1 mm I.D.) |
| Eluent | : A) Ammonium Acetate in $H_2O$<br>B) Ammonium Acetate in $CH_3OH$<br>A/B = 30/70 ,v/v |
| Flow Rate | : 0.2 mL/min |
| Col. Temp. | : 40 ℃ |
| Detection | : LC/MS/MS (ESI, Positive, MRM) |

Sample:each 0.1 (mg / mL)

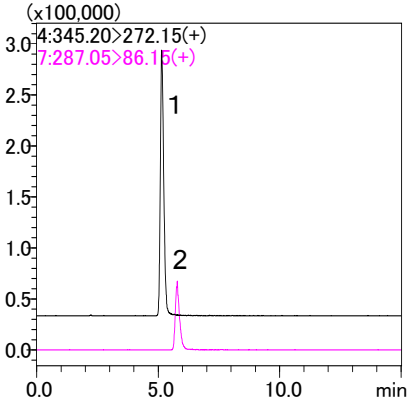
| | Q1 > Q3 |
|---|---|
| 1. Dibcaine | : 345.20 > 272.15 (+) |
| 2. Promethazine | : 287.05 > 86.15 (+) |

# Confirmation Test for Influence of Buffer (Results)

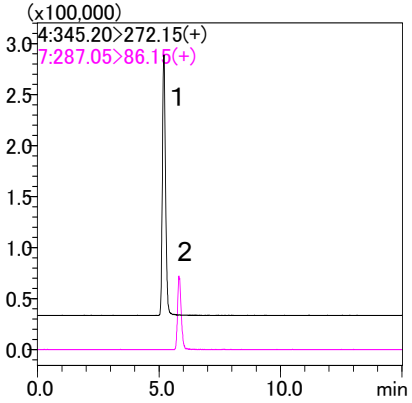
1. Dibucaine (pKa 8.5)
2. Promethazine (pKa 9.1)

## InertSustainSwift C18

1mM Ammonium acetate




5mM Ammonium acetate

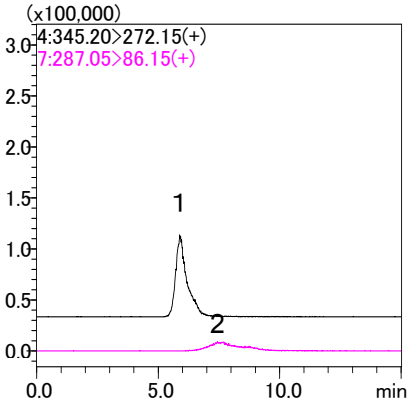



(Results)

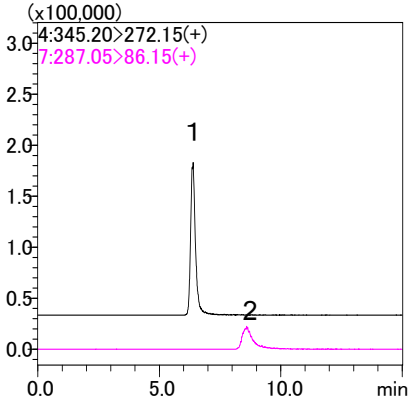
Good result !
Peak shapes were not changed

## CAPCELLPAK MG Ⅲ C18

1mM Ammonium acetate




5mM Ammonium acetate




Peak shapes were improved from 1mM to 5mM, however the sensitivity were low due to adsorption.

**(Possible symptoms)**

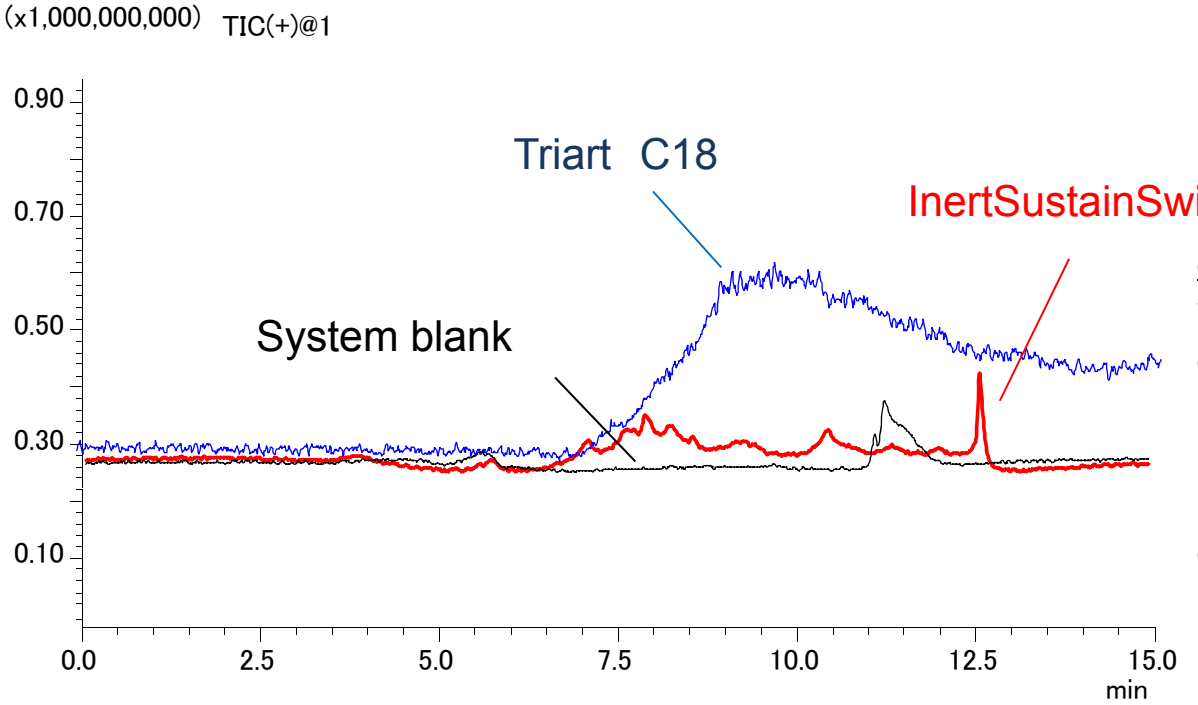
**Incorrect calibration curve**

**Decreasing sensitivity**

# Extremely Low Bleeding (1)

It is known that an unreacted reagents and an product of the reagents from chemical modification in the production process of ODS provide a column bleeding.
These causes of the column bleeding are possible to be eluted in the gradient analysis and make a ion suppression.

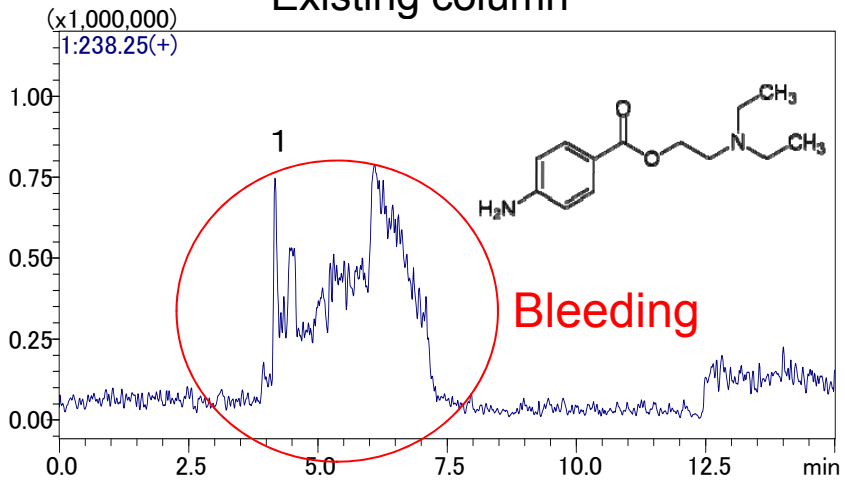
However, InertSustainSwift C18 offer **“High inertness”** and **“Low bleeding”**.

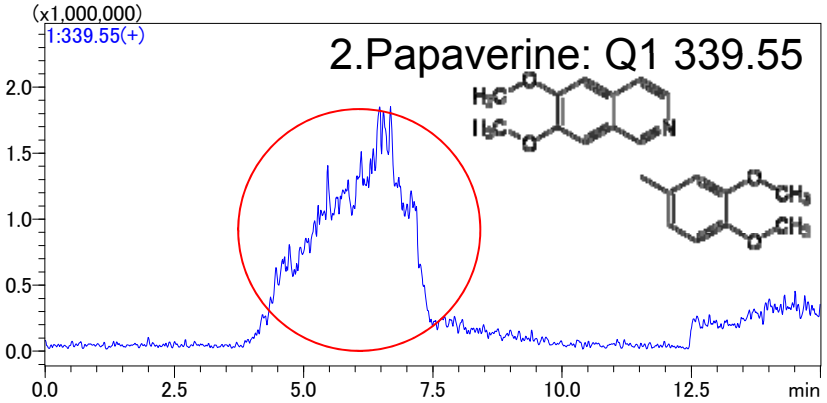



Conditions
System : Nexera LCMS-8030 plus
Column Size : 3 µm, 150 × 2.1 mm I.D.)
Eluent : A) 0.1 % HCOOH in $H_2O$
B) 0.1 % HCOOH in $CH_3CN$
A/B = 95/5 - 5 min - 0/100 – 5 min - 0/100 – 0.1 min - 95/5 – 5 min - 95/5 ,v/v
Flow Rate : 0.2 mL/min
Col. Temp. : 40 ℃
Detection : LC/MS (ESI, Positive, Mass Range: 50-1000)
Q1 SCAN : m/z 50 - 1000

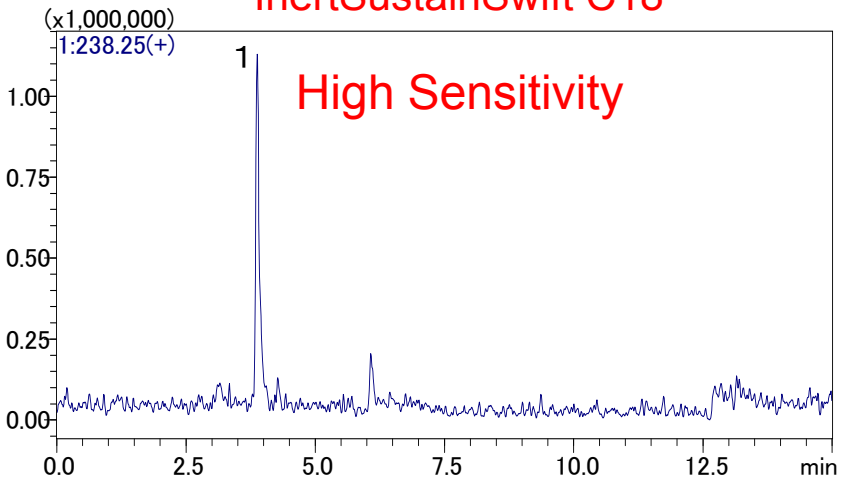
# Extremely Low Bleeding (2)

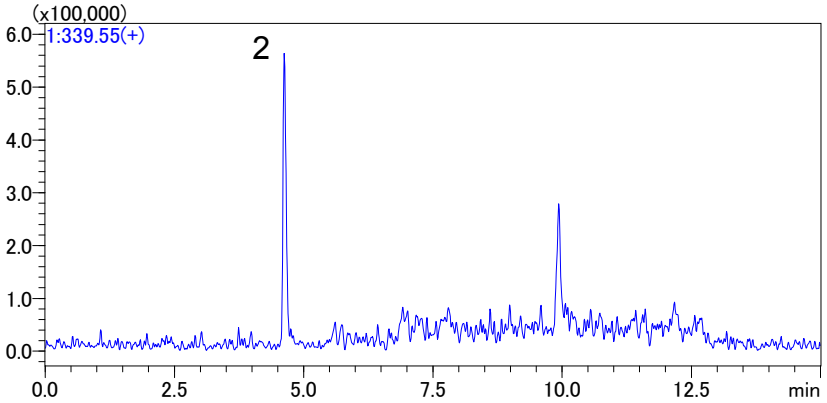
Existing column




InertSustainSwift C18




Conditions
System : Nexera
LCMS-8030 plus
Column Size : 3 µm, 150 × 2.1 mm I.D.)
Eluent : A) 0.1 % HCOOH in $H_2O$
B) 0.1 % HCOOH in $CH_3CN$
A/B = 95/5 - 5 min - 0/100 – 5 min - 0/100
–
0.1 min 95/5 – 5 min - 95/5 ,v/v

Flow Rate : 0.2 mL/min
Col. Temp. : 40 ℃
Detection : LC/MS (ESI, Positive,
Mass Range: 50-1000)
Q1 SCAN : m/z 50 - 1000

# Application (1)

## ● Analysis of β- adrenergic blocking agent (β-blocker)

Conditions

System : Nexera
LCMS-8030 plus

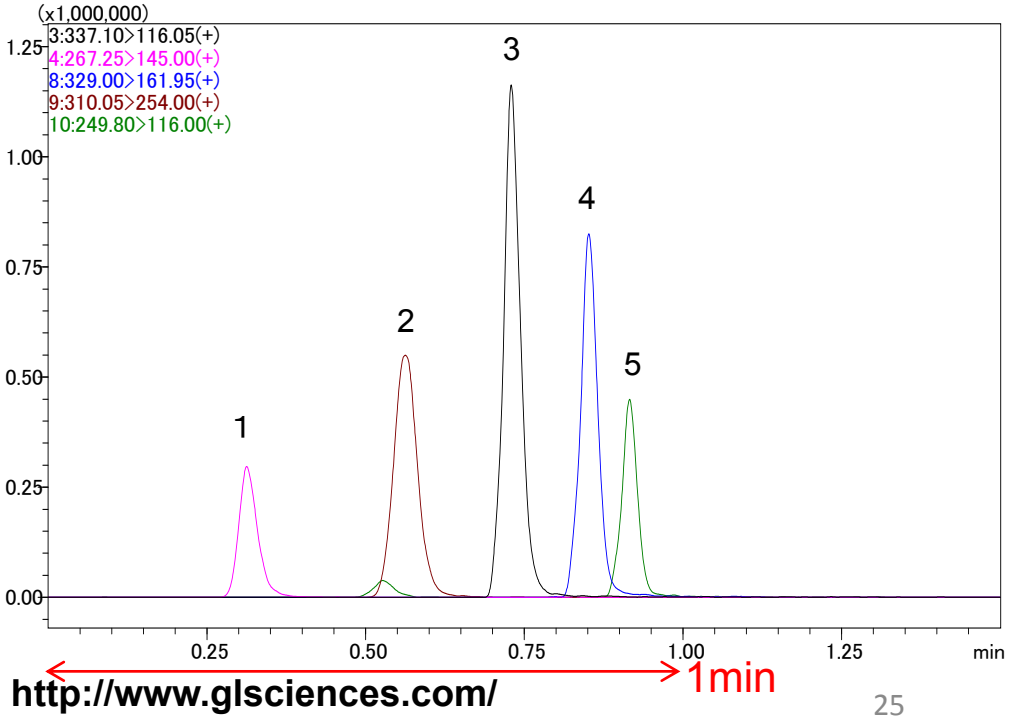
Column : 1.9 µm, 2.1 x 50 mm

Eluent : A) 10 mM Ammonium Formate in $H_2O$
B) 10 mM Ammonium Formate in $CH_3OH$
A/B = 70/30 – 0.3 min - 40/60 – 0.5min - 0/100 – 0.1min – 0/100 – 0.01min -70/30 – 0.5min - 70/30 ,v/v

Flow Rate : 0.6 mL/min

Col. Temp. : 40 ℃

Detection : LC/MS/MS (ESI, Positive, Negative MRM)




Sample: each 100 (µg/L)

| | Q1 > Q3 |
|---|---|
| 1. Acebutolol | : 337.10 > 116.05 (+) |
| 2. Atenolol | : 267.25 > 145.00 (+) |
| 3. Labetalol | : 329.00 > 161.95 (+) |
| 4. Nadolol | : 310.05 > 254.00 (+) |
| 5. Pindolol | : 249.80 > 116.00 (+) |

# Comparison Test Contents

1) Comparison of Retentivity

2) Comparison of Separation/Selectivity

3) Comparison of InertSustainSwift C18 with the other brand

   a) Hydrophobicity Test

   b) Chelating Compounds Test

   c) Weak Acidic/Basic Compounds Test

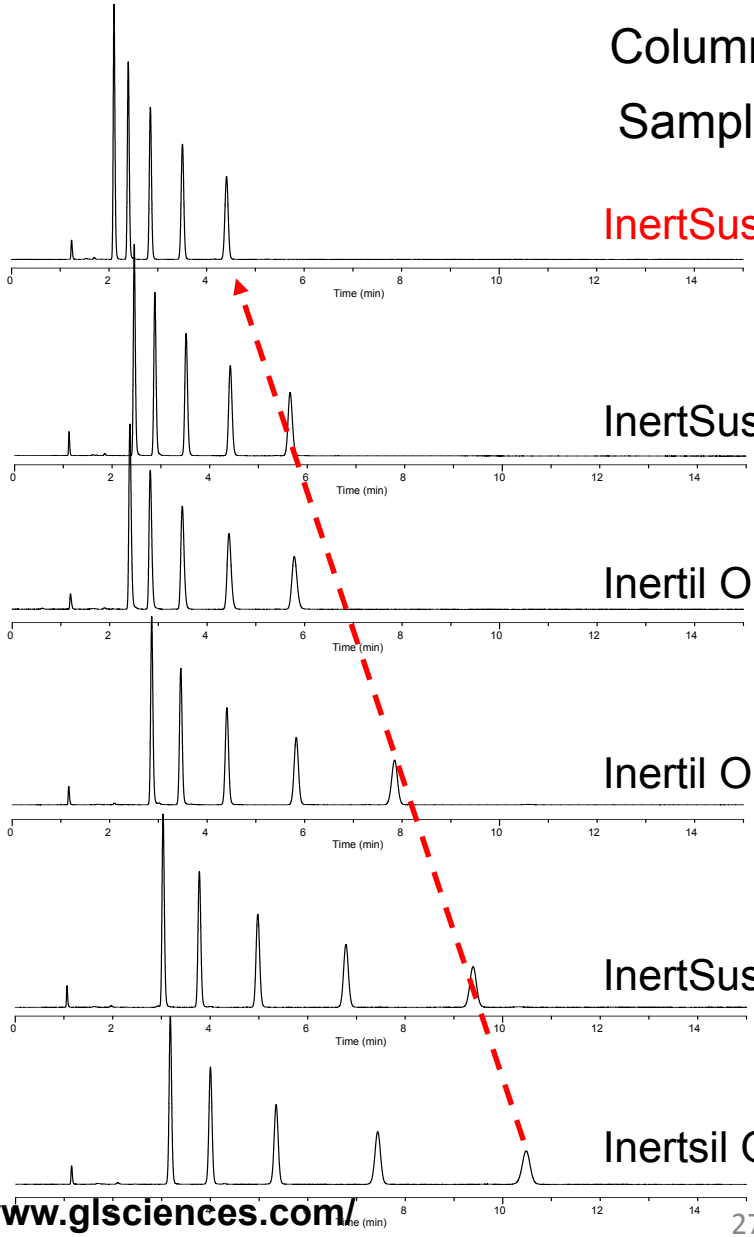
   d) Acidic Compounds Test

   e) Basic Compounds Test

4) Test for Influence of Buffer

5) Durability Test

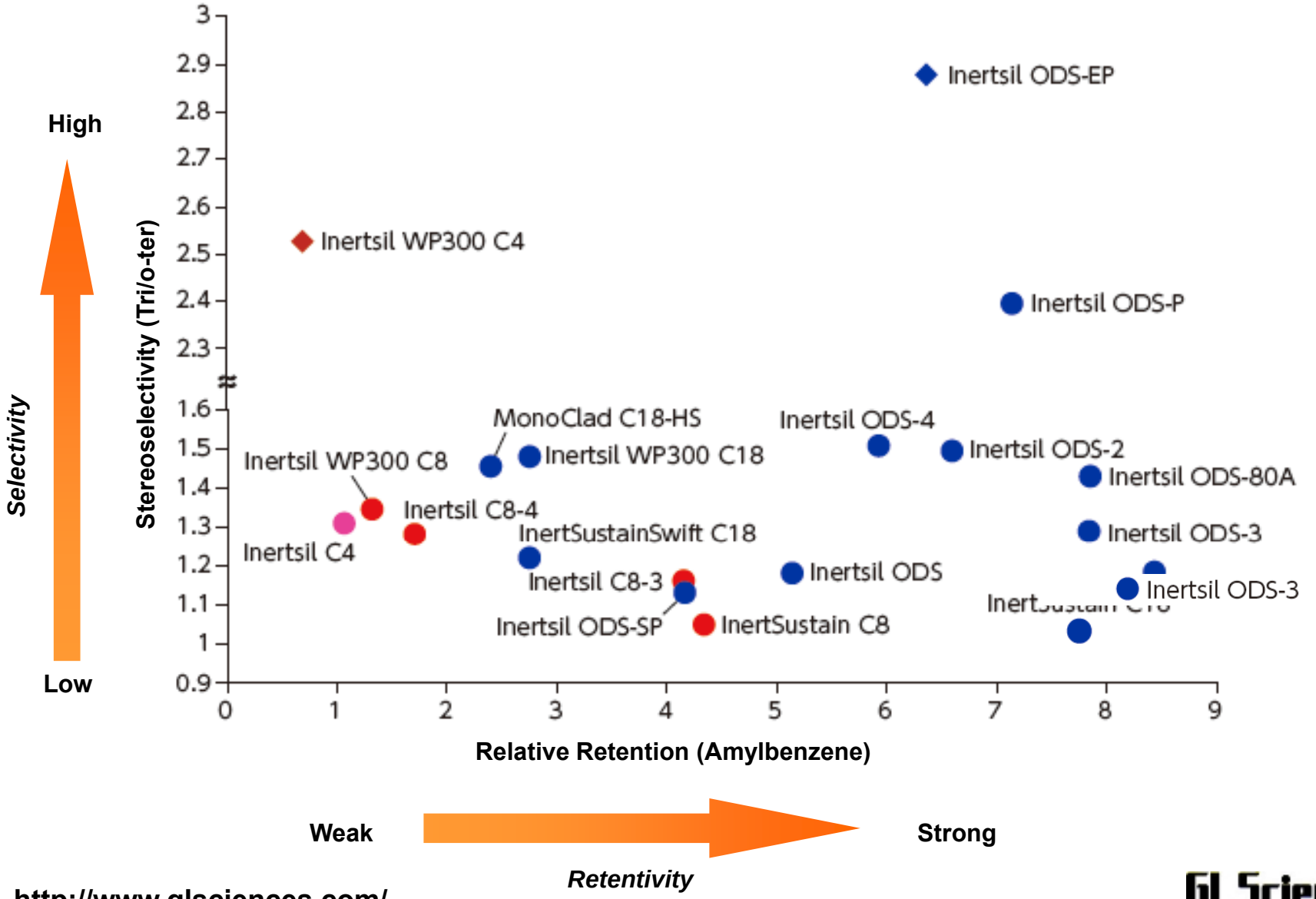
# 1) Comparison of Retentivity




Column dimensions : 3 μm 150 × 2.1 mm I.D.

Sample : Alkyl benzenes

# 2) Comparison of Separation/Selectivity

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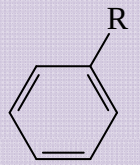
# 3) Comparison of InertSustainSwift C18 with the other brand

## (Test conditions)

### a) Hydrophobicity Test

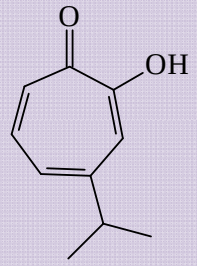



R: 2. Toluene —$CH_3$
3. Ethylbenzene —$CH_2CH_3$
4. Propylbenzene —$CH_2CH_2CH_3$
5. Butylbenzene —$CH_2CH_2CH_2CH_3$
6. Amylbenzene —$CH_2CH_2CH_2CH_2CH_3$

**Conditions**

**Eluent** : $CH_3OH/H_2O$ = 80/20
**Flow Rate** : 5um (4.6 x 250mm) 1.0mL/min, Inj. Vol. 5uL
3um (2.1 x 150mm) 0.3mL/min, Inj. Vol. 1uL
1.9um (2.1 x 50mm) 0.4mL/min, Inj. Vol. 0.5uL
**Col. Temp.** : 40 ℃
**Detection** : UV 254 nm
**Sample** : 1: Uracil 2: Toluene 3: Ethylbenzene
4: Propylbenzene 5: *n*-Butylbenzene
6: *n*-Amylbenzene

### b) Chelating Compounds Test




Hinokitiol

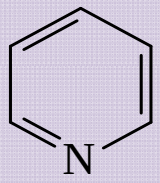
Conditions

Eluent : A) $CH_3CN$
B) 0.1%$H_3PO_4$
A/B = 40/60
Flow Rate : 5um (4.6 x 250mm) 1.0mL/min, Inj. vol. 3uL
3um (2.1 x 150mm) 0.3mL/min, Inj. vol. 1uL
1.9um (2.1 x 50mm) 0.4mL/min, Inj. vol. 0.5uL
Col. Temp. : 40 ℃
Detection : UV 254 nm
Sample : 1: β-Thujaplicin (Hinokitiol)

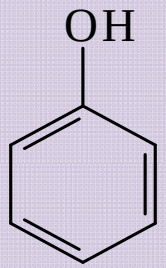
# 3) Comparison of InertSustainSwift C18 with the other brand

## (Test conditions)

### c) Weak Acidic/Basic Compounds Test



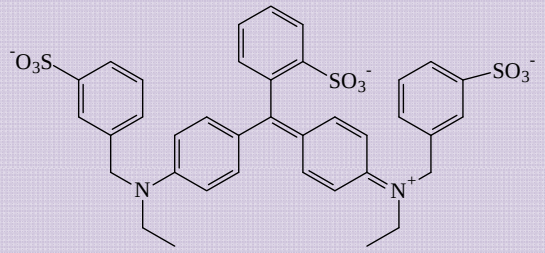

Pyridine




Phenol

Conditions
Eluent : A) $CH_3OH$
B) $H_2O$
A/B = 30/70
Flow Rate : 5um (4.6 x 250mm) 1.0mL/min, Inj. vol. 1uL
3um (2.1 x 150mm) 0.3mL/min, Inj. vol. 1uL
1.9um (2.1 x 50mm) 0.3mL/min, Inj. vol. 0.5uL
Col. Temp. : 40 ℃
Detection : UV 254 nm
Sample : 1: Uracil
2:Pyridine
3:Phenol

### d) Acidic Compounds Test



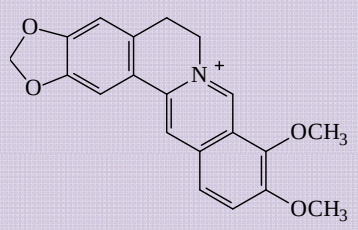

Brilliant Blue FCF

Conditions
Eluent : A) $CH_3CN$
B) 0.1% $H_3PO_4$
A/B = 25/75,v/v
Flow Rate : 5um (4.6 x 250mm) 1.0mL/min, Inj. vol. 3uL
3um (2.1 x 150mm) 0.3mL/min, Inj. vol. 1uL
1.9um (2.1 x 50mm) 0.4mL/min, Inj. vol. 0.5uL
Col. Temp. : 40 ℃
Detection : UV 254 nm
Sample : 1:Brilliant Blue FCF 2:4-Ethylbenzoic acid
3:Salicylic acid

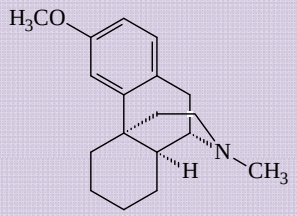
# 3) Comparison of InertSustainSwift C18 with the other brand

## (Testing conditions)

### e) Basic Compounds Test (1)



Berberine chloride



Dextromethorphan

Conditions

Eluent : A) $CH_3CN$
B) 25 mM $K_2HPO_4$ (pH 7.0, $KH_2PO_4$)
A/B = 30/70,v/v

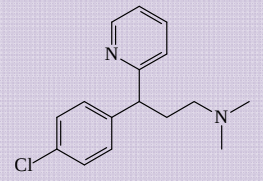
Flow Rate : 5um (4.6 x 250mm) 1.0mL/min, Inj. vol. 2uL
3um (2.1 x 150mm) 0.3mL/min, Inj. vol. 1uL
1.9um (2.1 x 50mm) 0.4mL/min, Inj. vol. 0.5uL

Col. Temp. : 40 ℃

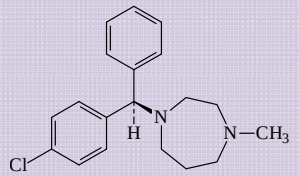
Detection : UV 230 nm

Sample : 1:Uracil 2:Pyridine 3:Phenol
4:Berberine chloride 5:Dextromethorphan

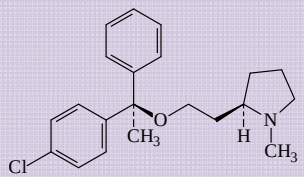
### e) Basic Compounds Test (2)



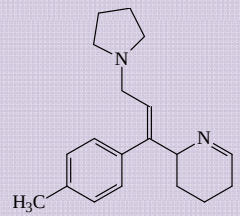
Chlorpheniramine



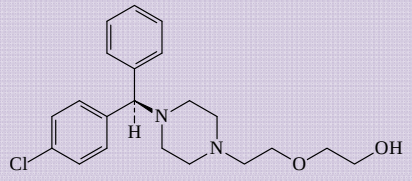
Homochlorcyclizine



Clemastine



Triprolidine



Hydroxyzine

Conditions

Eluent : A) $CH_3CN$
B) 25mM $K_2HPO_4$ (pH 7.0, $KH_2PO_4$)
A/B = 60/40,v/v

Flow Rate : 5um (4.6 x 250mm) 1.0mL/min, Inj. vol. 5uL
3um (2.1 x 150mm) 0.3mL/min, Inj. vol. 1uL
1.9um (2.1 x 50mm) 0.4mL/min, Inj. vol. 0.5uL

Col. Temp. : 40 ℃

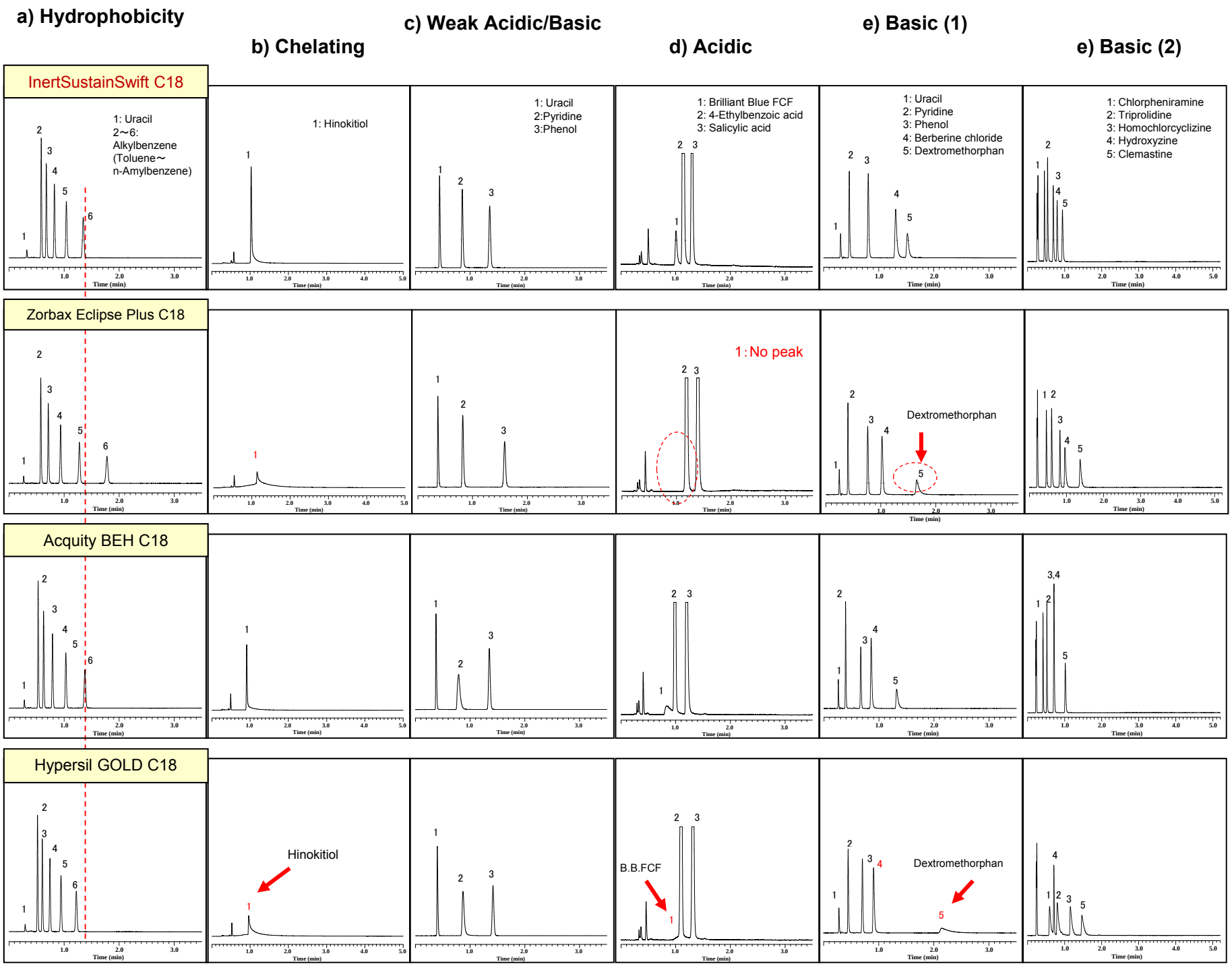
Detection : UV 220 nm

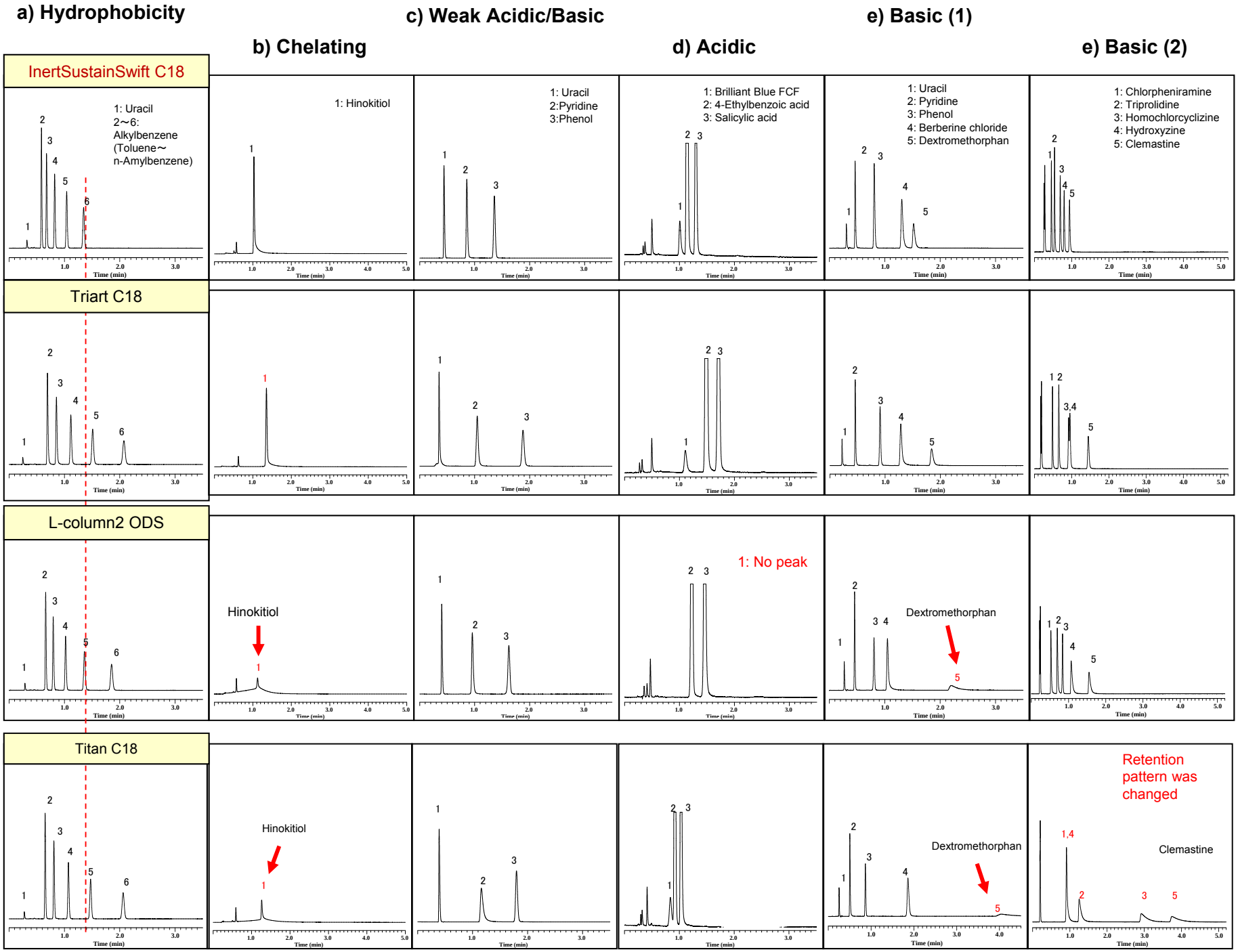
Sample : 1: Chlorpheniramine 2: Triprolidine
3: Homochlorcyclizine 4: Hydroxyzine
5: Clemastine

# 3) Comparison of InertSustainSwift C18 with the other brand

## Comparison List (Sub 2um)

| Description | Particle size (μm) | Surface area (㎡/g) | Pore size (Å) | Pore Volume (mL/g) | Carbon Loading (%) | pH |
|---|---|---|---|---|---|---|
| InertSustainSwift C18 | 1.9 | 200 | 200 | 1 | 9 | 1 to10 |
| Zorbax Eclipse Plus C18 (Agilent) | 1.8 | 160 | 95 | — | 8 | 2 to 9 |
| Acquity BEH C18 (Waters) | 1.7 | 185 | 135 | 0.7 | 18 | 1 to 12 |
| Hypersil GOLD C18 (Thermo Fisher Scientific) | 1.9 | 220 | 175 | — | 10 | 1 to 11 |
| Triart C18 (YMC) | 1.9 | — | 120 | — | 20 | 1 to 12 |
| L-column2 ODS （CERI） | 2 | 340 | 120 | — | 17 | 2 to 9 |
| Titan C18 (Sigma-Aldrich) | 1.9 | 410 | 80 | 0.76 | 13.5 | 2 to 8 |


a) Hydrophobicity
b) Chelating
c) Weak Acidic/Basic
d) Acidic
e) Basic (1)
e) Basic (2)
InertSustainSwift C18
1: Uracil
2~6:
Alkylbenzene
(Toluene~
n-Amylbenzene)
1: Hinokitiol
1: Uracil
2:Pyridine
3:Phenol
1: Brilliant Blue FCF
2: 4-Ethylbenzoic acid
3: Salicylic acid
1: Uracil
2: Pyridine
3: Phenol
4: Berberine chloride
5: Dextromethorphan
1: Chlorpheniramine
2: Triprolidine
3: Homochlorcyclizine
4: Hydroxyzine
5: Clemastine
Zorbax Eclipse Plus C18
1 : No peak
Dextromethorphan
Acquity BEH C18
Hypersil GOLD C18
Hinokitiol
B.B.FCF
Dextromethorphan
Time (min)


a) Hydrophobicity
b) Chelating
c) Weak Acidic/Basic
d) Acidic
e) Basic (1)
e) Basic (2)
InertSustainSwift C18
Triart C18
L-column2 ODS
Titan C18
1: Uracil
2~6:
Alkylbenzene
(Toluene~
n-Amylbenzene)
1: Hinokitiol
1: Uracil
2:Pyridine
3:Phenol
1: Brilliant Blue FCF
2: 4-Ethylbenzoic acid
3: Salicylic acid
1: Uracil
2: Pyridine
3: Phenol
4: Berberine chloride
5: Dextromethorphan
1: Chlorpheniramine
2: Triprolidine
3: Homochlorcyclizine
4: Hydroxyzine
5: Clemastine
Hinokitiol
1: No peak
Dextromethorphan
Retention
pattern was
changed
Clemastine
Time (min)

# 3) Comparison of InertSustainSwift C18 with the other brand

## Comparison List (Sub 2um)

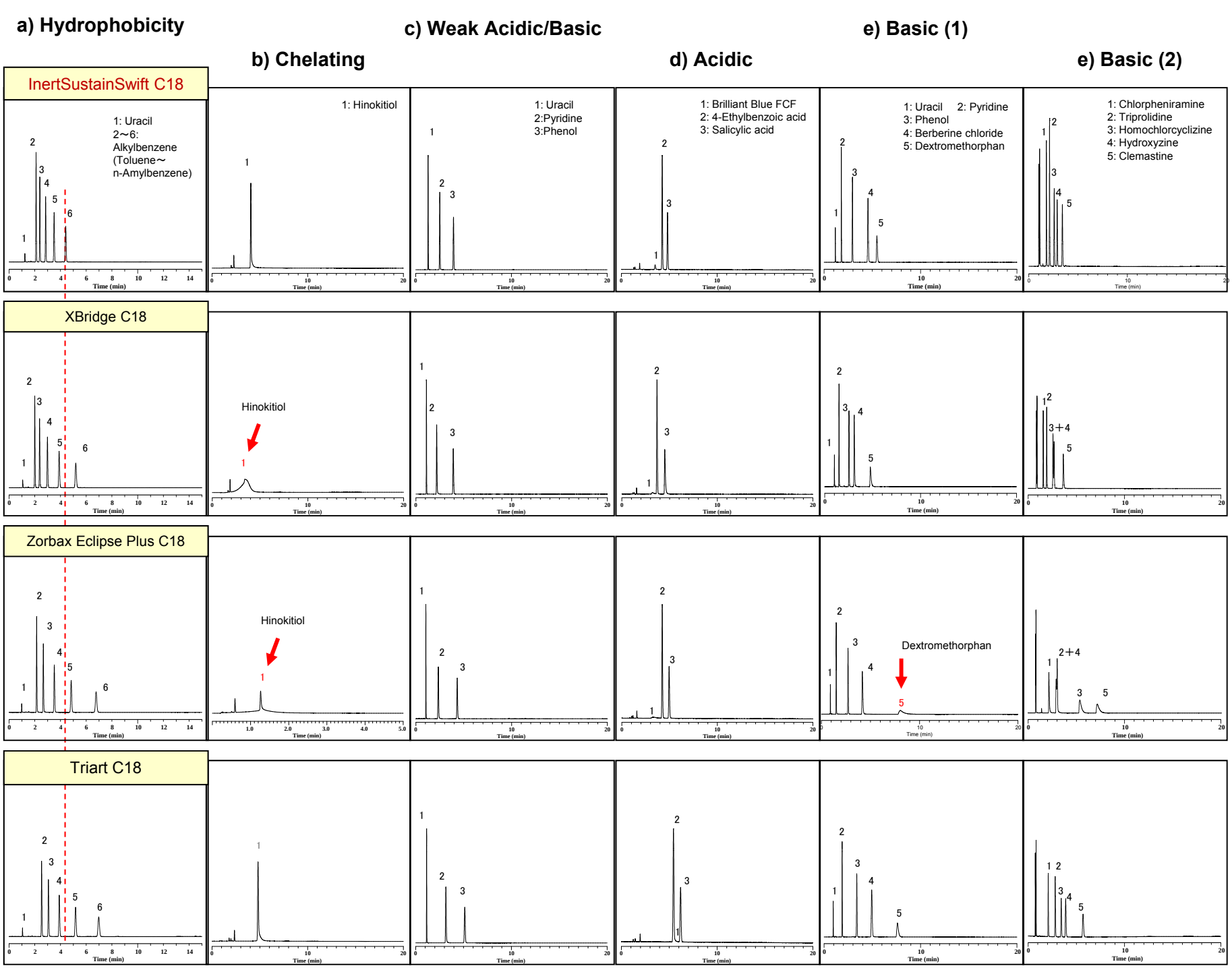
| Description | Inertness | | | Reteintion time | 100% Water | Bleeding |
|---|---|---|---|---|---|---|
| | Chelating | Acidic | Basic | | | |
| InertSustainSwift C18 | Great | Great | Great | 1 | Great | Great |
| Zorbax Eclipse Plus C18 (Agilent) | Poor | Poor | Normal | 2 | Poor | Great |
| Acquity BEH C18 (Waters) | Good | Normal | Normal | 1 | Normal | Great |
| Hypersil GOLD C18 (Thermo Fisher Scientific) | Poor | Normal | Poor | 1 | Good | Great |
| Triart C18 (YMC) | Good | Great | Good | 2 | Great | Good |
| L-column2 ODS (CERI) | Poor | Poor | Normal | 2 | Poor | Normal |
| Titan C18 (Sigma-Aldrich) | Poor | Great | Poor | 2 | Great | Great |

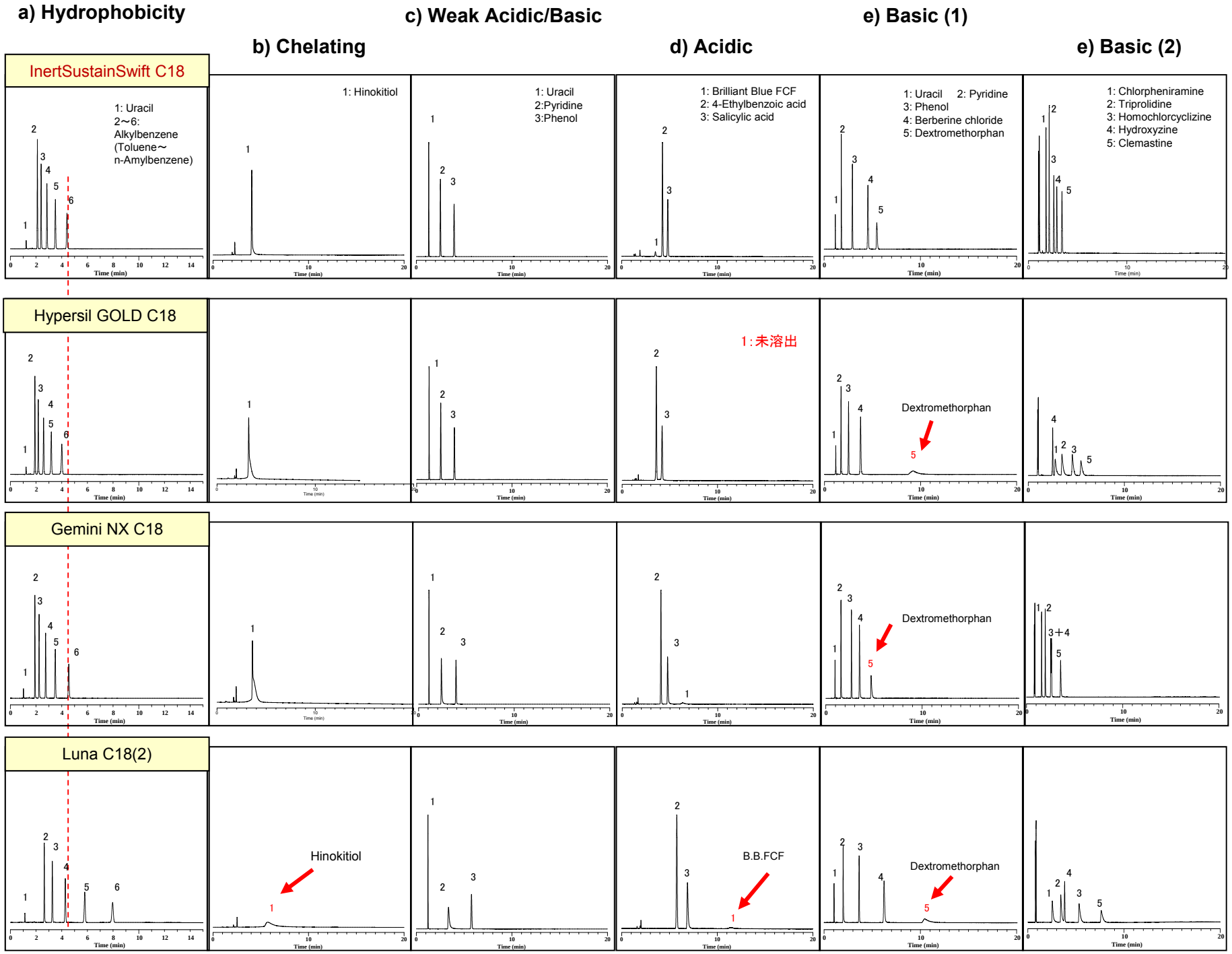
1: Early
2: Middle
3: Late

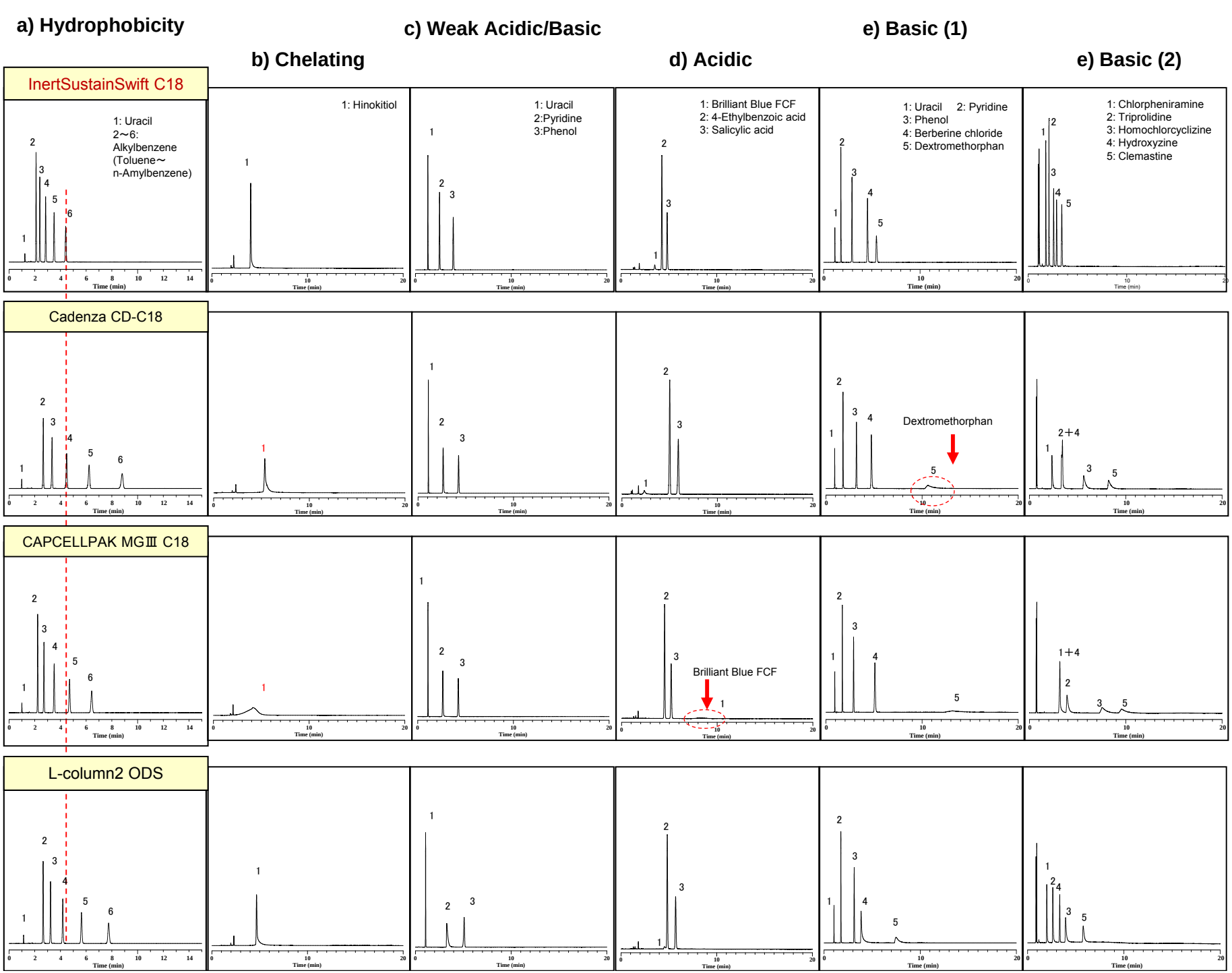
# 3) Comparison of InertSustainSwift C18 with the other brand

## Comparison List (3um)

| Description | Particle size (μm) | Surface area (㎡/g) | Pore size (Å) | Pore Volume (mL/g) | Carbon Loading (%) | pH |
|---|---|---|---|---|---|---|
| InertSustainSwift C18 | 3 | 200 | 200 | 1 | 9 | 1 to 10 |
| XBridge C18 (Waters) | 3.5 | 185 | 135 | 0.7 | 18 | 1 to 12 |
| Zorbax Eclipse Plus C18 (Agilent) | 3.5 | 160 | 95 | — | 8 | 2 to 9 |
| Triart C18 (YMC) | 3 | — | 120 | — | 20 | 1 to 12 |
| Hypersil GOLD C18 (Thermo Fisher Scientific) | 3 | 220 | 175 | — | 10 | 1 to 11 |
| Gemini NX C18 (Phenomenex) | 3 | 375 | 110 | 1.1 | 14 | 1 to 12 |
| Luna C18(2) (Phenomenex) | 3 | 400 | 100 | — | 17.5 | 1.5 to 10 |
| Cadenza CD-C18 (Imtakt) | 3 | — | 120 | — | — | — |
| CAPCELLPAK MGⅢ C18 (SHISEIDO) | 3 | 300 | 100 | — | 15 | 2 to 10 |
| L-column2 ODS (CERI) | 3 | 340 | 120 | 1.1 | 17 | 2 to 9 |


a) Hydrophobicity
b) Chelating
c) Weak Acidic/Basic
d) Acidic
e) Basic (1)
e) Basic (2)
InertSustainSwift C18
XBridge C18
Zorbax Eclipse Plus C18
Triart C18
1: Uracil
2~6:
Alkylbenzene
(Toluene~
n-Amylbenzene)
1: Hinokitiol
Hinokitiol
1: Uracil
2:Pyridine
3:Phenol
1: Brilliant Blue FCF
2: 4-Ethylbenzoic acid
3: Salicylic acid
1: Uracil 2: Pyridine
3: Phenol
4: Berberine chloride
5: Dextromethorphan
Dextromethorphan
1: Chlorpheniramine
2: Triprolidine
3: Homochlorcyclizine
4: Hydroxyzine
5: Clemastine
Time (min)


a) Hydrophobicity
b) Chelating
c) Weak Acidic/Basic
d) Acidic
e) Basic (1)
e) Basic (2)
InertSustainSwift C18
1: Uracil
2～6:
Alkylbenzene
(Toluene～
n-Amylbenzene)
1: Hinokitiol
1: Uracil
2:Pyridine
3:Phenol
1: Brilliant Blue FCF
2: 4-Ethylbenzoic acid
3: Salicylic acid
1: Uracil 2: Pyridine
3: Phenol
4: Berberine chloride
5: Dextromethorphan
1: Chlorpheniramine
2: Triprolidine
3: Homochlorcyclizine
4: Hydroxyzine
5: Clemastine
Hypersil GOLD C18
1:未溶出
Dextromethorphan
Gemini NX C18
Dextromethorphan
3+4
Luna C18(2)
Hinokitiol
B.B.FCF
Dextromethorphan
Time (min)


a) Hydrophobicity
b) Chelating
c) Weak Acidic/Basic
d) Acidic
e) Basic (1)
e) Basic (2)
InertSustainSwift C18
Cadenza CD-C18
CAPCELLPAK MGⅢ C18
L-column2 ODS
1: Uracil
2～6:
Alkylbenzene
(Toluene～
n-Amylbenzene)
1: Hinokitiol
1: Uracil
2:Pyridine
3:Phenol
1: Brilliant Blue FCF
2: 4-Ethylbenzoic acid
3: Salicylic acid
1: Uracil 2: Pyridine
3: Phenol
4: Berberine chloride
5: Dextromethorphan
1: Chlorpheniramine
2: Triprolidine
3: Homochlorcyclizine
4: Hydroxyzine
5: Clemastine
Dextromethorphan
Brilliant Blue FCF
Time (min)

# 3) Comparison of InertSustainSwift C18 with the other brand

## Comparison List (3um)

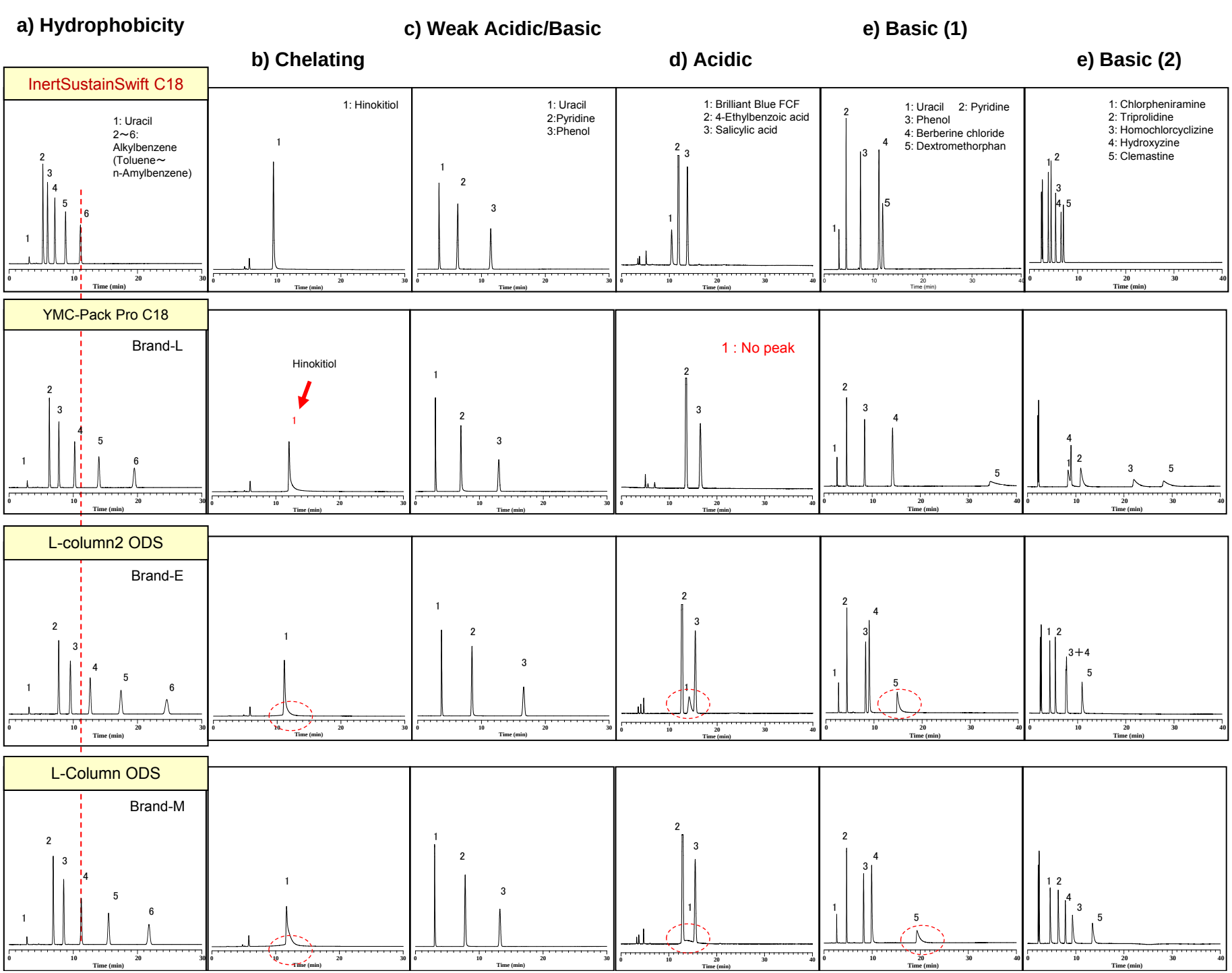
| Description | Inertness | | | Analytical time | 100% Water | Bleeding |
|---|---|---|---|---|---|---|
| | Chelating | Acidic | Basic | | | |
| InertSustainSwift C18 | Great | Great | Great | 1 | Great | Great |
| XBridge C18 (Waters) | Poor | Normal | Great | 2 | Normal | Great |
| Zorbax Eclipse Plus C18 (Agilent) | Poor | Normal | Poor | 3 | Poor | Great |
| Triart C18 (YMC) | Great | Normal | Great | 3 | Great | Good |
| Hypersil GOLD C18 (Thermo Fisher Scientific) | Normal | Poor | Poor | 1 | Good | Great |
| Gemini NX C18 (Phenomenex) | Normal | Poor | Good | 1 | Great | Great |
| Luna C18(2) (Phenomenex) | Poor | Poor | Poor | 3 | Poor | Good |
| Cadenza CD-C18 (Imtakt) | Normal | Good | Poor | 3 | Poor | Good |
| CAPCELLPAK MGⅢ C18 (SHISEIDO) | Poor | Poor | Poor | 2 | Great | Great |
| L-column2 ODS (CERI) | Normal | Normal | Normal | 3 | Poor | Normal |

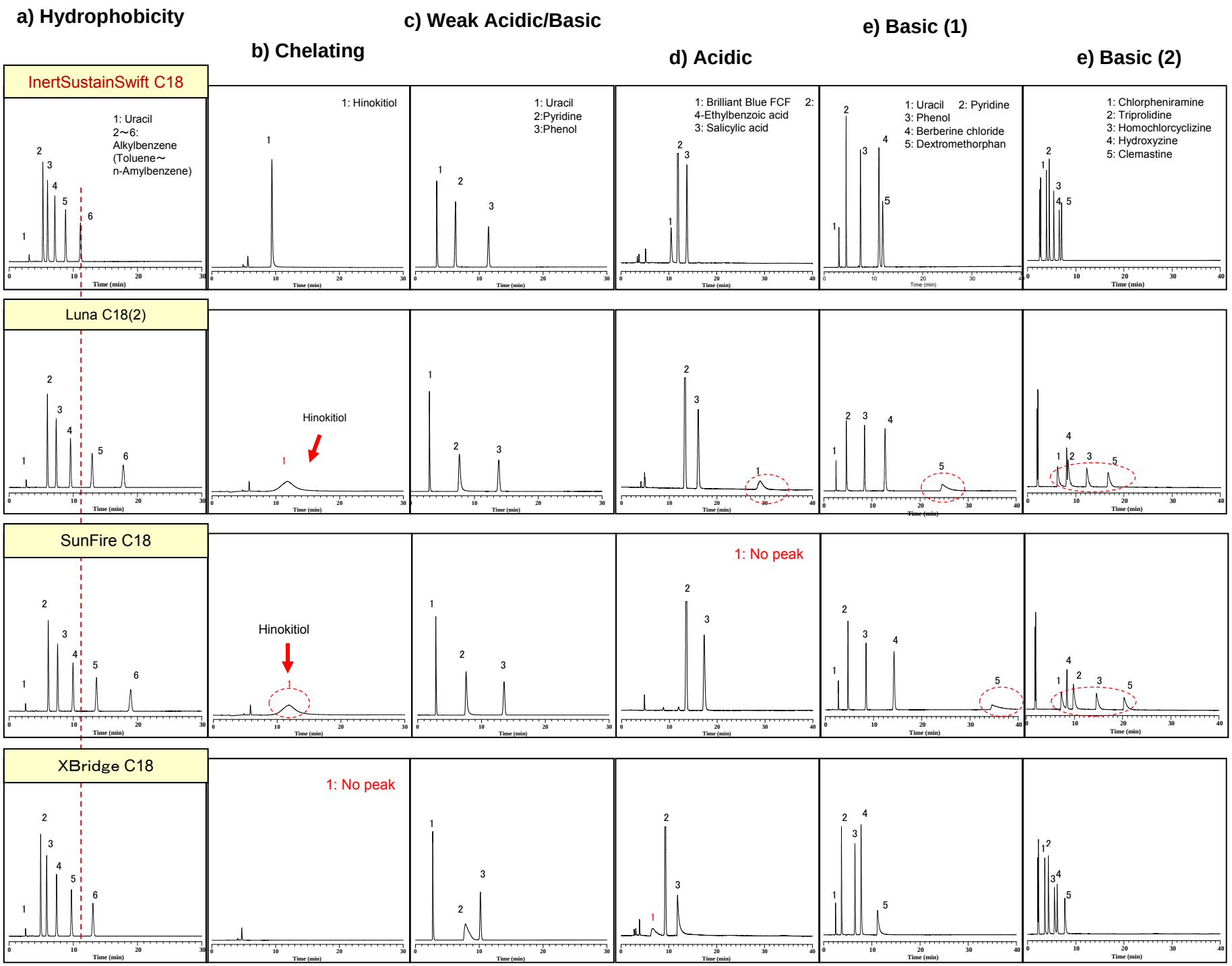
1: Early
2: Middle
3: Late

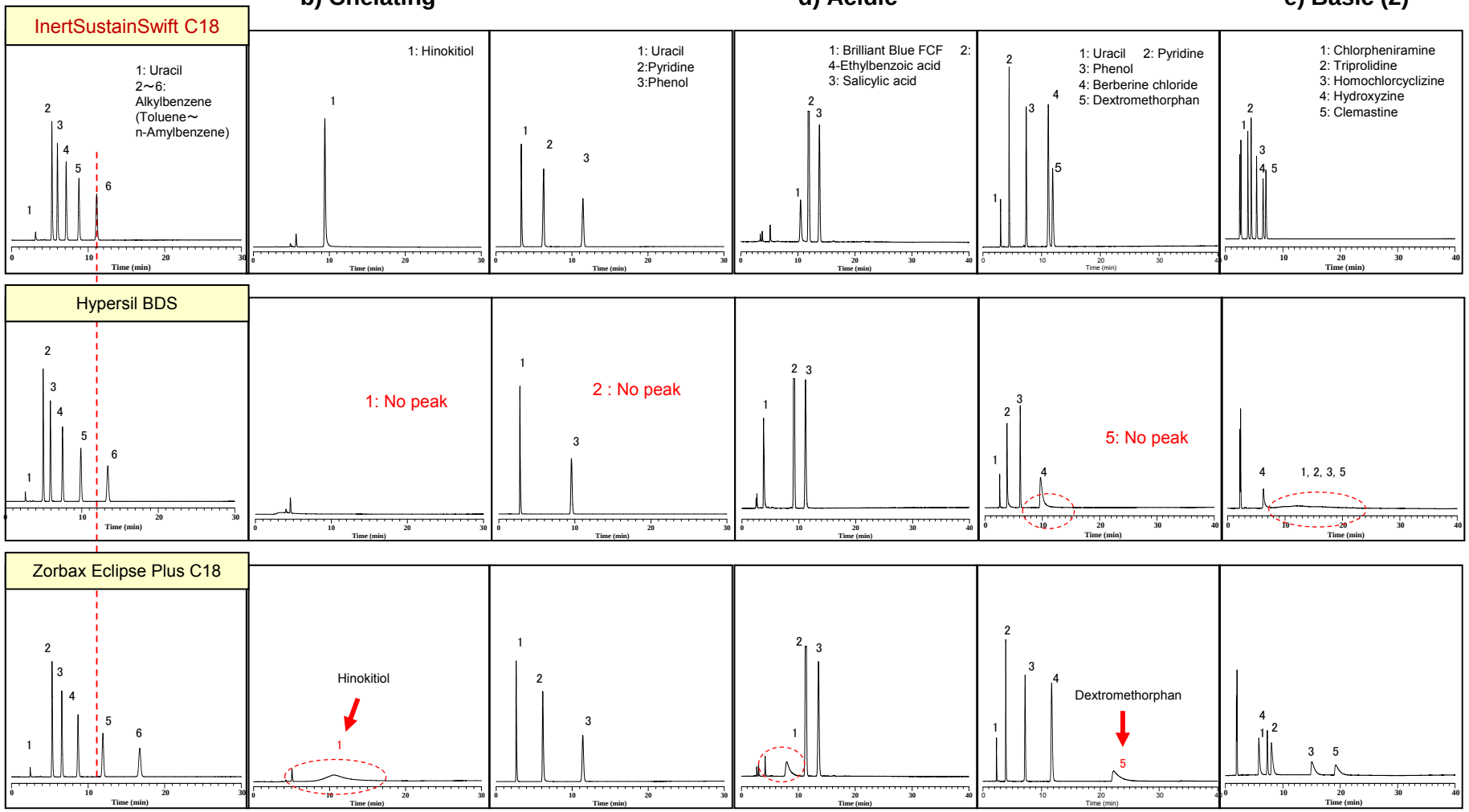
# 3) Comparison of InertSustainSwift C18 with the other brand

## Comparison List (5um)

| Description | Particle size (μm) | Surface area (㎡/g) | Pore size (Å) | Pore Volume (mL/g) | Carbon Loading (%) | pH |
|---|---|---|---|---|---|---|
| InertSustainSwift C18 | 5 | 200 | 200 | 1 | 9 | 1 to 10 |
| YMC-Pack Pro C18 (YMC) | 5 | 330 | 120 | 1.05 | 16 | 2 to 8 |
| L-column2 ODS (CERI) | 5 | 340 | 120 | 1.1 | 17 | 2 to 9 |
| L-column ODS (CERI) | 5 | 340 | 120 | 1.1 | 17 | 2 to 9 |
| Luna C18(2) (Phenomenex) | 5 | 400 | 100 | — | 17.5 | 1.5 to 10 |
| SunFire C18 (Waters) | 5 | 340 | 100 | 1 | 16 | 2 to 8 |
| XBridge C18 (Waters) | 5 | 185 | 130 | — | 18 | 1 to 12 |
| Hypersil BDS （ThermoFisherScientific） | 5 | — | 130 | — | 11 | 2 to 9 |
| Zorbax Eclipse Plus C18 (Agilent) | 5 | 160 | 95 | — | 8 | 2 to 9 |


a) Hydrophobicity
b) Chelating
c) Weak Acidic/Basic
d) Acidic
e) Basic (1)
e) Basic (2)
InertSustainSwift C18
1: Uracil
2～6:
Alkylbenzene
(Toluene～
n-Amylbenzene)
1: Hinokitiol
1: Uracil
2:Pyridine
3:Phenol
1: Brilliant Blue FCF
2: 4-Ethylbenzoic acid
3: Salicylic acid
1: Uracil 2: Pyridine
3: Phenol
4: Berberine chloride
5: Dextromethorphan
1: Chlorpheniramine
2: Triprolidine
3: Homochlorcyclizine
4: Hydroxyzine
5: Clemastine
YMC-Pack Pro C18
Brand-L
Hinokitiol
1 : No peak
L-column2 ODS
Brand-E
L-Column ODS
Brand-M
Time (min)


a) Hydrophobicity
b) Chelating
c) Weak Acidic/Basic
d) Acidic
e) Basic (1)
e) Basic (2)
InertSustainSwift C18
1: Uracil
2～6:
Alkylbenzene
(Toluene～
n-Amylbenzene)
1: Hinokitiol
1: Uracil
2:Pyridine
3:Phenol
1: Brilliant Blue FCF 2:
4-Ethylbenzoic acid
3: Salicylic acid
1: Uracil 2: Pyridine
3: Phenol
4: Berberine chloride
5: Dextromethorphan
1: Chlorpheniramine
2: Triprolidine
3: Homochlorcyclizine
4: Hydroxyzine
5: Clemastine
Luna C18(2)
Hinokitiol
SunFire C18
Hinokitiol
1: No peak
XBridge C18
1: No peak
Time (min)


a) Hydrophobicity
b) Chelating
c) Weak Acidic/Basic
d) Acidic
e) Basic (1)
e) Basic (2)
InertSustainSwift C18
1: Uracil
2～6:
Alkylbenzene
(Toluene～
n-Amylbenzene)
1: Hinokitiol
1: Uracil
2:Pyridine
3:Phenol
1: Brilliant Blue FCF
4-Ethylbenzoic acid
3: Salicylic acid
1: Uracil
3: Phenol
4: Berberine chloride
5: Dextromethorphan
2: Pyridine
1: Chlorpheniramine
2: Triprolidine
3: Homochlorcyclizine
4: Hydroxyzine
5: Clemastine
Hypersil BDS
1: No peak
2 : No peak
5: No peak
1, 2, 3, 5
Zorbax Eclipse Plus C18
Hinokitiol
Dextromethorphan
Time (min)

# 3) Comparison of InertSustainSwift C18 with the other brand

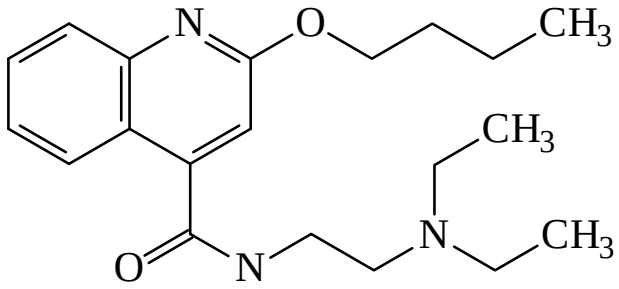
## Comparison List (5um)

| Description | Inertness | | | Analytical time | 100% Water | Bleeding |
|---|---|---|---|---|---|---|
| | Chelating | Acidic | Basic | | | |
| InertSustainSwift C18 | Great | Great | Great | 1 | Great | Great |
| YMC-Pack Pro C18 (YMC) | Normal | Poor | Poor | 3 | Good | - |
| L-column2 ODS (CERI) | Normal | Normal | Good | 3 | Poor | - |
| L-column ODS (CERI) | Normal | Poor | Normal | 3 | Normal | - |
| Luna C18(2) (Phenomenex) | Poor | Normal | Normal | 2 | Poor | - |
| SunFire C18 (Waters) | Poor | Poor | Normal | 2 | Poor | - |
| XBridge C18 (Waters) | Poor | Normal | Good | 1 | Poor | - |
| Hypersil BDS （ThermoFisherScientific） | Poor | Great | Poor | 1 | Poor | - |
| Zorbax Eclipse Plus C18 (Agilent) | Poor | Normal | Poor | 2 | Poor | - |

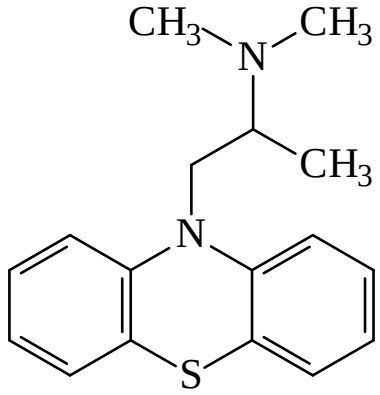
1: Early
2: Middle
3: Late

# 4) Confirmation Test for Influence of Buffer (Conditions)

Concentration of ammonium acetate was changed in stages and then, peak shapes of each stage was confirmed if adsorption was occurred.



Dibucaine (pKa 8.5)



Promethazine (pKa 9.1)

Conditions

System : Nexera
LCMS-8030 plus
Column size : (3 µm, 150 × 2.1 mm I.D.)
Eluent : A) Ammonium Acetate in $H_2O$
B) Ammonium Acetate in $CH_3OH$
A/B = 30/70 ,v/v
Flow Rate : 0.2 mL/min
Col. Temp. : 40 ℃
Detection : LC/MS/MS (ESI, Positive, MRM)

Sample:each 0.1 (mg / mL)

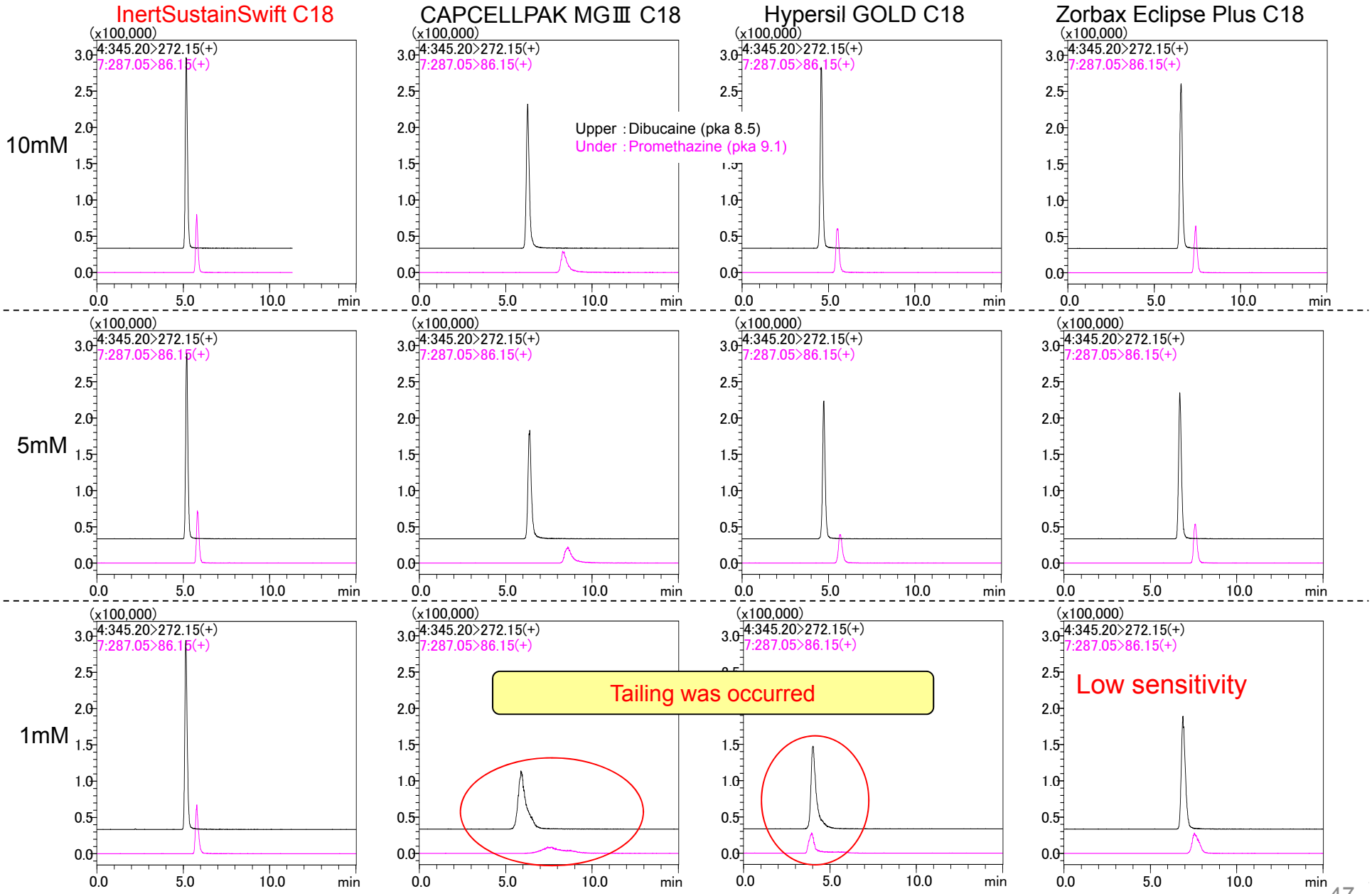
| | Q1 > Q3 |
|---|---|
| 1. Dibcaine | : 345.20 > 272.15 (+) |
| 2. Promethazine | : 287.05 > 86.15 (+) |

Column size: 3µm, 2.1 × 150

Upper : Dibucaine (pka 8.5)

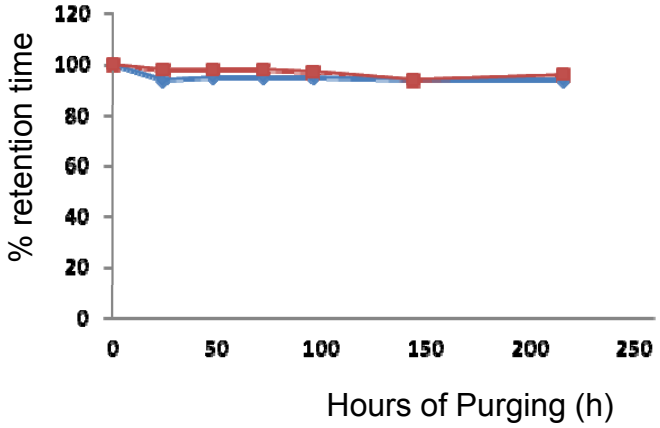
Under : Promethazine (pka 9.1)

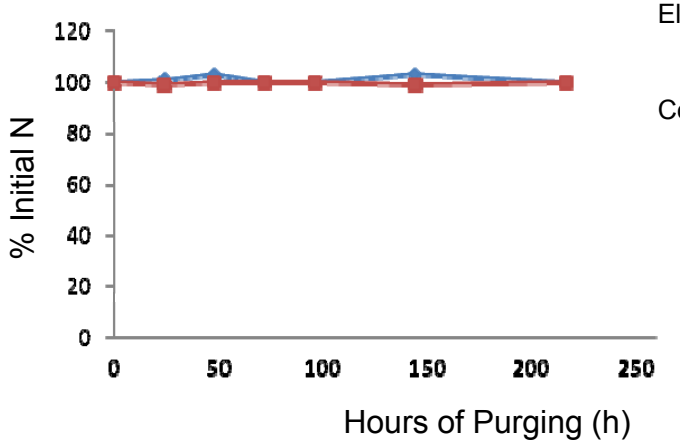
# 4) Confirmation Test for Influence of Buffer (Results)



# 5) Durability Test for Acidic/Basic conditions

● Durability test for Acidic conditions

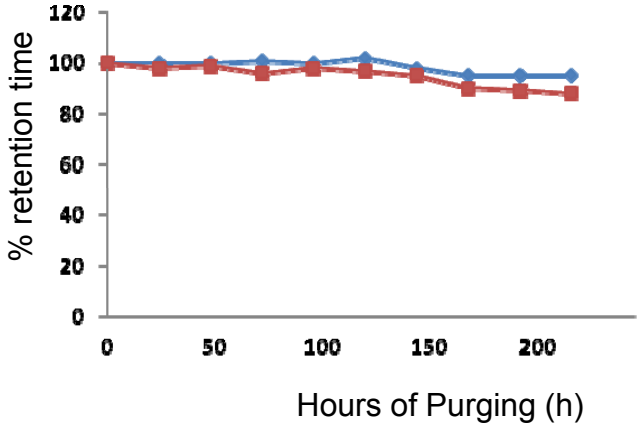


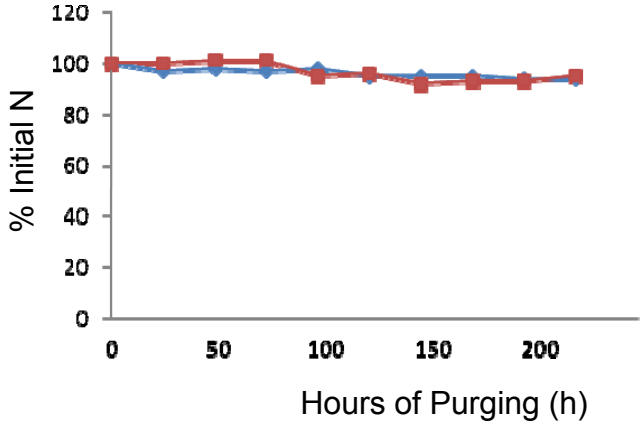




Purging Conditions
Column Size : 3um, 2.1 x 150mm
Eluent : 1% TFE (ph1.0) or
0.1% TFA(2.0) /
CH3CN : 90/10, v / v
Col. Temp : 60℃

pH 1.0
pH 2.0

● Durability test for conditions




Purging Conditions
Column Size : 3um, 2.1 x 150mm
Eluent : ,50mM TEA
(pH 9.0 or pH 10) /
CH3OH : 70 / 30, v / v
Col. Temp : 50℃

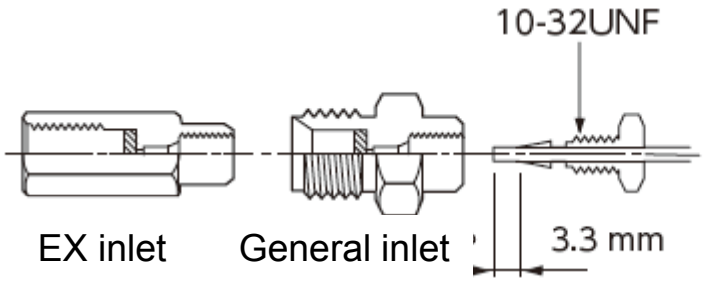
pH 9.0
pH 10.0

# Joint for Inlet

● Waters Type
General type
Lineup of 5um and 3um are used for Waters type

● UP Type (For UHPLC)
Lineup of 1.9um and 3um HP are used for UP type

Waters type




UP type