

GL Sciences' Newest and Most Advanced ODS Phase-New For 2009

Inertsil® ODS-4

State-of-the-art C18 HPLC Columns



Improved Peak Shapes and Heights
Enhancing Sensitivity
High Resolution
Fast Equilibration
Compatible with 100% Aqueous Eluents

Ultimate deactivation techniques enabling the highest inertness with the silica base HPLC column allow analyses of trace amount of most demanding basic and acidic compounds.

Enhanced deactivation has made the column feature much easier to use!

Inertsil® ODS-4

Enhancing Sensitivity and High Separation Efficiency

Strictly classified particle size with narrow distribution width and ideally designed carbon loading and its procedure allow us to guarantee the high plate count of +100,000/m. Combined with synergistic effect from the improved peak shapes based on the highest inertness of packing material, Inertsil ODS-4 can be used as a tool for enhancing sensitivity and high separation efficiency.



Excellent peak shapes for both strong acidic and basic compounds

Our newly-developed endcapping technique ideally deactivates the silanol groups, suppressing the adsorption of common basic compounds as well as strong ones, which leads to sharper peaks.

Moreover, the new endcapping technique prevents the adsorption of strong acidic compounds as a surface of the packing material becomes neutral.



Excellent analysis stability of strong metal chelating compounds

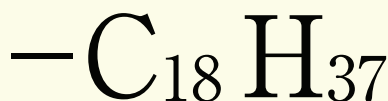
In order to stably analyze strong metal chelating compounds, samples were injected repeatedly before the analysis to mask the adsorption active sites on the surface of the packing material or addition of EDTA to the eluent were required. Column equilibration was also time-consuming. Since the trace amount of metals has been eliminated from the surface of the packing material, it allows a stable analysis from the 1st injection requiring no masking process.



Excellent analysis stability under 100% aqueous eluents

Inertsil ODS-4 minimizes the dewetting phenomenon while maintaining the same retention characteristics to that of common ODS columns. Therefore, Inertsil ODS-4 can be used at ease under 100% aqueous eluents. Furthermore, the packing material that achieves a stable analysis using 100% aqueous eluents provides another advantage: which reduces the column equilibration time returning to an initial eluent condition in gradient.

Bonded Phase Structure



Silica gel	: Highly-pure spherical silica gel
Purity	: 99.999%
Particle size	: 3 µm, 5 µm
Surface area	: 450 m ² /g
Pore size	: 100 Å (10 nm)

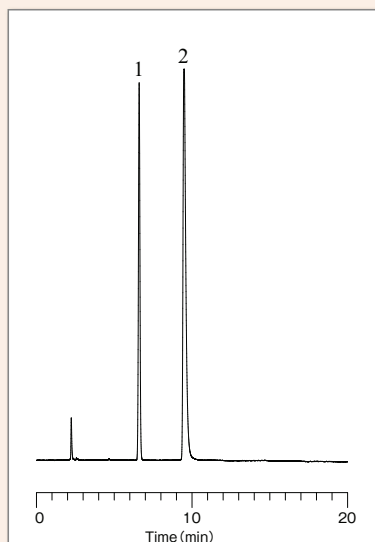
Pore volume	: 1.05 mL/g
Bonded phase	: Octadecyl group
Endcapped	: Yes
Carbon loading	: 11%
USP Code	: L1



Comparison of inertness to Dextromethorphan between Inertsil® ODS-4 and commercially available ODS columns

Dextromethorphan, a strong basic compound, can be adsorbed by trace amount of residual silanols on the surface of the packing material, resulting in poor peak shapes with the traditional endcapping technique.

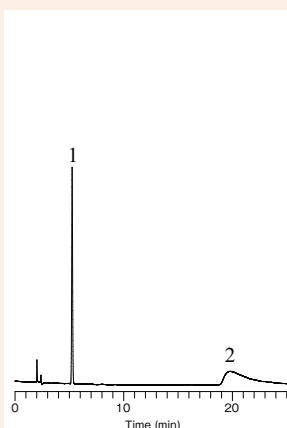
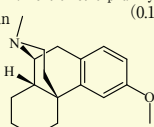
Due to its newly-developed powerful deactivation, adsorption of compounds are much less and thus enables highly qualitative analysis of strong basic compounds.



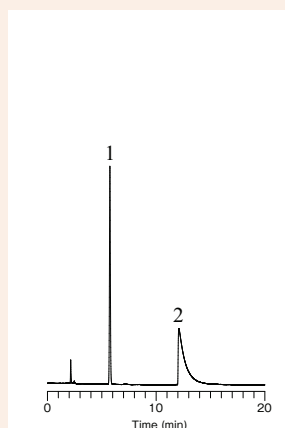
Inertsil® ODS-4

System : GL- 7400 HPLC system
Column : 5 μ m, 250 $\times$ 4.6 mm I.D.
Eluent : A) CH₃CN
B) 25 mM KH₂PO₄ (pH 7.0 ; 25mM K₂HPO₄)
A/B = 40/60 , v/v
Flow Rate : 1.0 mL/min
Col. Temp. : 40 $^{\circ}$ C
Detection : UV 220 nm
Injection Vol. : 1.0 μ L
Sample : 1. Phenol (0.015 mg/mL)
2. Dextromethorphan hydrobromide (0.1 mg/mL)

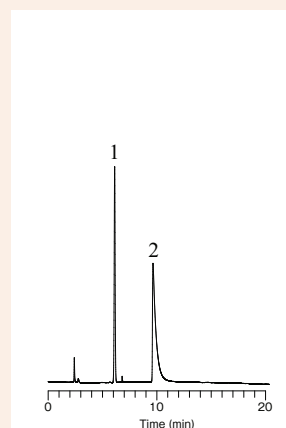
Dextromethorphan



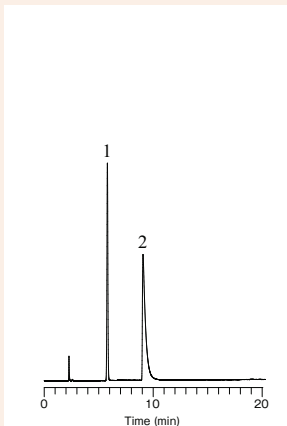
Symmetry® C₁₈



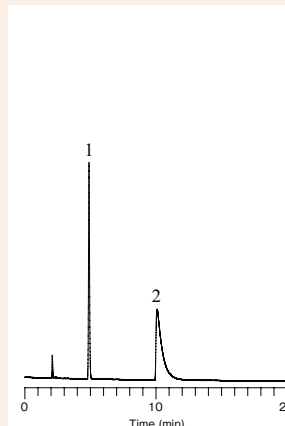
SunFire™ C₁₈



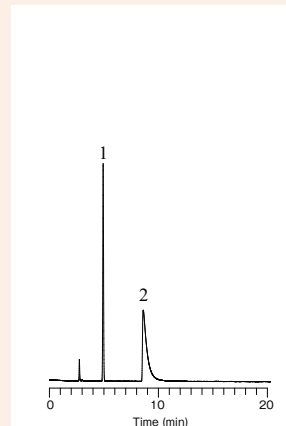
Atlantis® T3



Luna® C₁₈ (2)

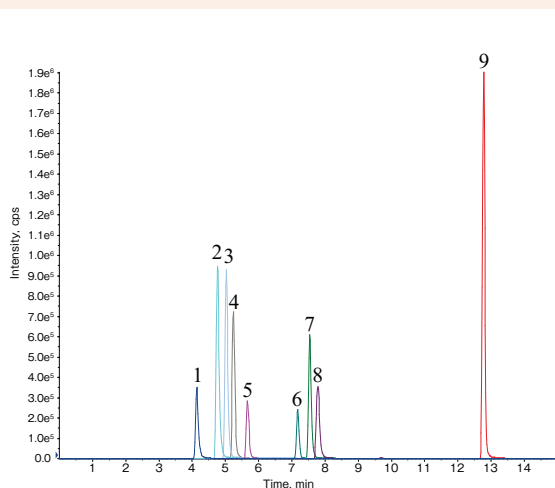


ZORBAX Eclipse Plus C₁₈



Hypersil™ GOLD

Analysis of Antihistamines by LC/MS/MS



Antihistamines are strongly basic and therefore will easily be adsorbed to the residual silanols on the packing material, resulting in deterioration of peak shapes. Generally, in HPLC analysis of strong basic compounds, highly-concentrated buffer or ion-pair reagents are introduced to the eluent to prevent adsorption of strong basic samples on the packing material. However, in LC/MS (MS), such eluent conditions are not recommended and a packing material with superb inertness is required.

Inertsil ODS-4 prevents the adsorption of strong basic compounds without using the above mentioned eluents. This feature also makes Inertsil ODS-4 an ideal column for LC/MS (MS) as well.

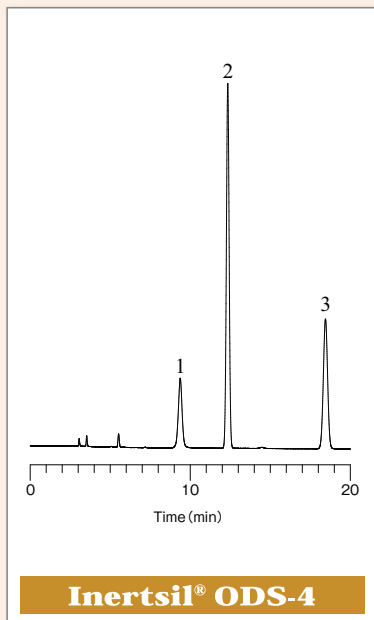
Sample:
1. Chlorpheniramine (0.1 mg/L)
2. Cinnarizin (0.1 mg/L)
3. Clemastine (0.1 mg/L)
4. Difenedol (0.1 mg/L)
5. Diphenhydramine (0.1 mg/L)
6. Diphenylpyraline (0.1 mg/L)
7. Hydroxyzine (0.1 mg/L)
8. Promethazine (0.1 mg/L)
9. Triprolidine (0.1 mg/L)

System : LC800 HPLC system
4000 Q TRAP®
Column : Inertsil ODS-4 (3 μ m, 150 $\times$ 2.1 mm I.D.)
Eluent : A) CH₃OH
B) 2 mM CH₃COONH₄
A/B = 40/60 - 10 min- 95/5 - 5 min - 95/5
Flow Rate : 0.2 mL/min
Col. Temp. : 40 $^{\circ}$ C
Detection : LC/MS/MS (ESI, Positive, MRM)
Injection Vol. : 10 μ L

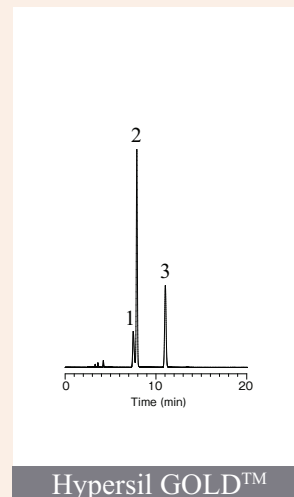
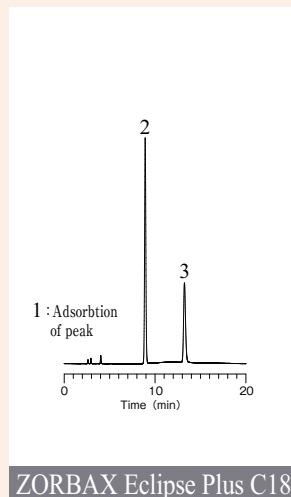
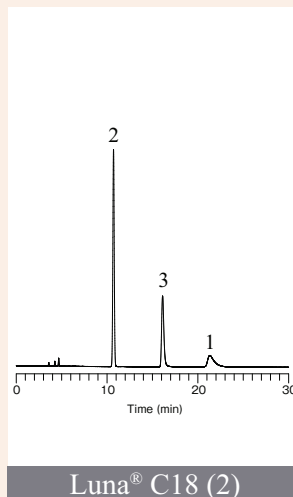
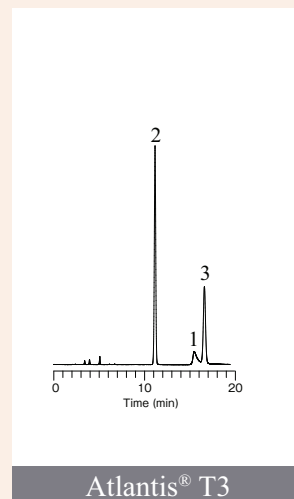
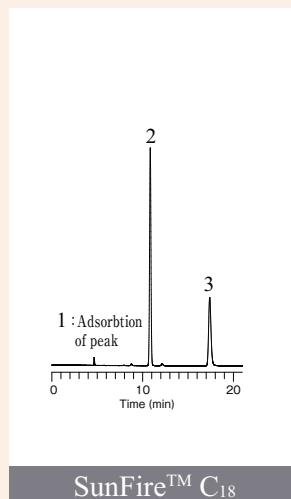
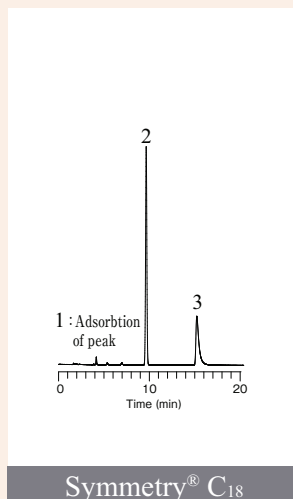
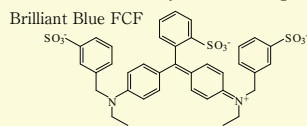


Comparison of inertness to Brilliant Blue FCF between Inertsil® ODS-4 and commercially available ODS columns

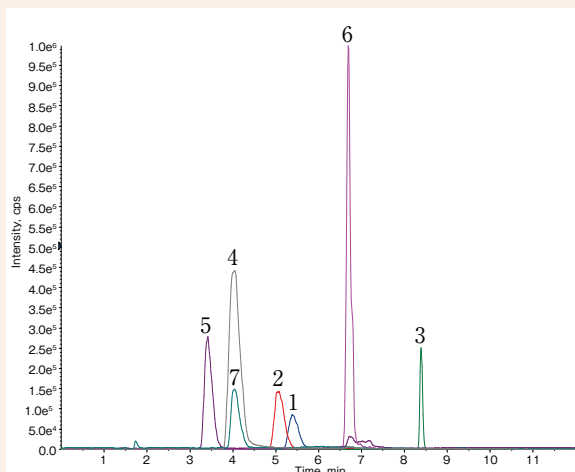
Brilliant Blue FCF, a strong acidic compound, will easily be absorbed if the surface of the packing material shows slightly basic. Symmetry C₁₈, SunFire C₁₈, and Atlantis T3 shown in the figures below, which completely elute weak acids, still have compounds remain uneluted and produce poor peak shapes, due to the adsorption to the packing material. Inertsil ODS-4, as the surface of the packing material is neutral, does not adsorb even strong acid and produce good peak shapes.



System : GL-7400 HPLC system
 Column : 5 μ m, 250 $\times$ 4.6 mm I.D.
 Eluent : A) CH₃CN
 B) 0.1% H₃PO₄
 A/B = 25/75, v/v
 Flow Rate : 1.0 mL/min
 Col. Temp. : 40 $^{\circ}$ C
 Detection : UV 254 nm
 Injection Vol. : 3.0 μ L
 Sample : 1. Brilliant Blue FCF (0.05 mg/mL)
 2. Phenol (0.3 mg/mL)
 3. Salicylic acid (0.2 mg/mL)



Analysis of Haloacetic Acids by LC/MS/MS



Haloacetic acid is a harmful substance generated when tap water is chlorinated. With its strong acidity, it is easily adsorbed at basic sites on the surface of the packing material. High-sensitivity analysis by LC/MS (/MS) have received attention in these years. In accordance with the popularity, a column free of adsorption has been greatly required since the adsorption of even a very small amount can adversely affect the precision of such highly sensitive quantitative analyses.

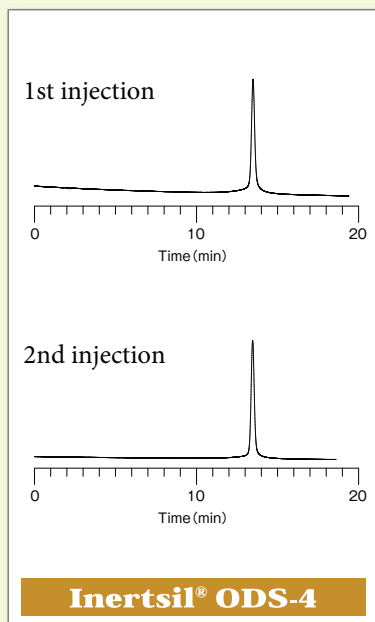
Inertsil ODS-4, featuring a neutral packing material surface, is also ideal for LC/MS (/MS) analyses of strong acids.

Sample:	System :	LC800 HPLC system
1. Bromoacetic acid	Column :	4000 Q TRAP®
2. Dibromoacetic acid	Eluent :	Inertsil ODS-4 (3 μ m, 150 $\times$ 2.1 mm I.D.)
3. Tribromoacetic acid	Eluent :	A) CH ₃ OH
4. Chloroacetic acid	B) 0.1% HCOOH	
5. Dichloroacetic acid	A/B =	5/95 - 2.5 min - 5/95 - 2.5 min - 95/5 - 5 min - 95/5
6. Trichloroacetic acid	Flow Rate :	0.2 mL/min
7. Bromochloroacetic acid	Col. Temp. :	40 $^{\circ}$ C
	Detection :	LC/MS/MS (ESI, Negative, MRM)
	Injection Vol. :	10 μ L

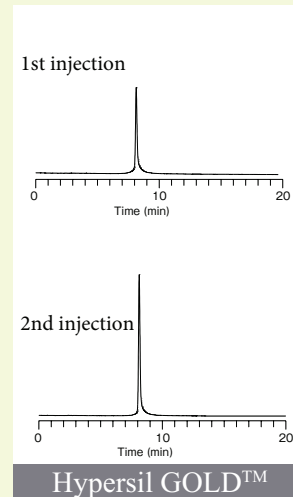
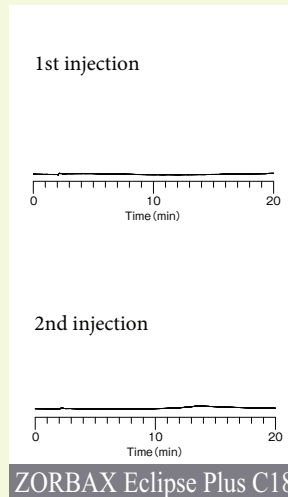
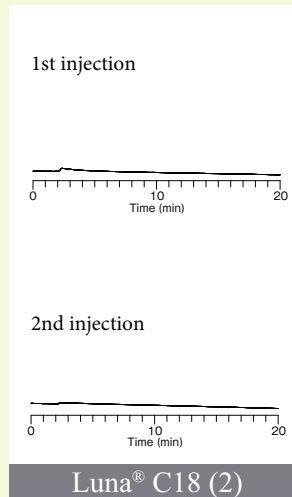
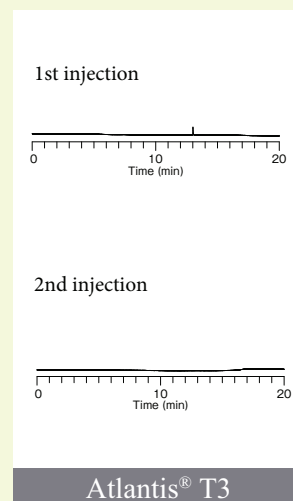
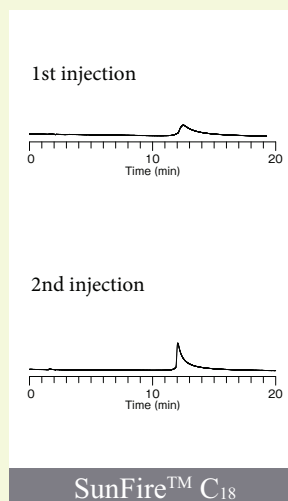
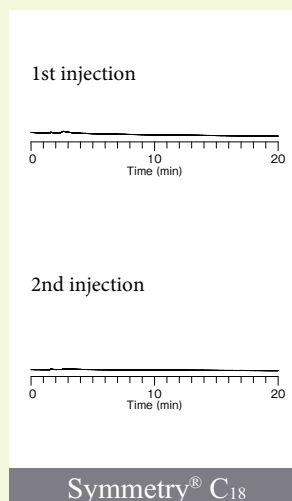
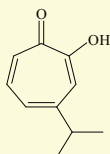


Comparison of inertness to Hinokitiol between Inertsil® ODS-4 and commercially available ODS columns

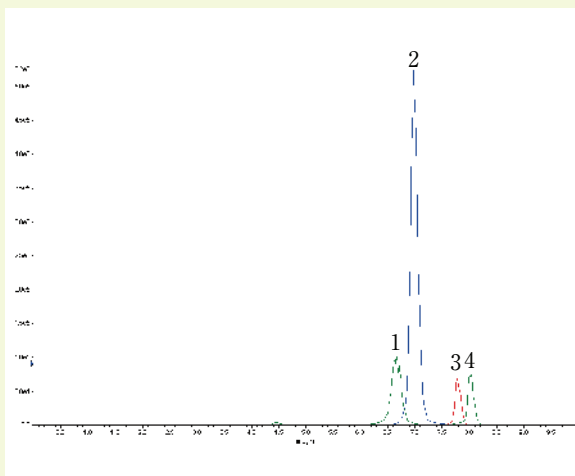
Hinokitiol having very strong chelating characteristics, is easily adsorbed with trace metal remaining on a packing material surface. SunFire C₁₈ in the figure below tend to show a better peak shape every time a new injection is provided, since each new injection covers up more of the adsorption active sites. Inertsil ODS-4 provides very quantitative peaks from the 1st injection since it has completely removed metals from the surface of the packing material.



System : GL-7400 HPLC system
 Column : 5 μ m, 250 $\times$ 4.6 mm I.D.
 Eluent : A) CH₃CN
 B) 0.1% H₃PO₄
 A/B = 40/60, v/v
 Flow Rate : 1.0 mL/min
 Col. Temp. : 40 $^{\circ}$ C
 Detection : UV 254 nm
 Injection Vol. : 1.0 μ L
 Sample : β -Thujaplicin (Hinokitiol)
 (0.1 mg/mL)



Analysis of Tetracyclines by LC/MS/MS



Tetracyclines are antibiotics broadly used as pharmaceuticals for animals, and the residues in livestock and sea product are a major issue today. High-sensitivity analysis by LC/MS (/MS) has received attention in these years. As tetracyclines have a very strong chelating characteristics, it has been anticipated that the adsorption on the column deteriorates quantitative precision.

Inertsil ODS-4 is an ideal column for LC/MS (/MS) analyses of chelating compounds as well since it has completely removed metals from the surface of the packing material.

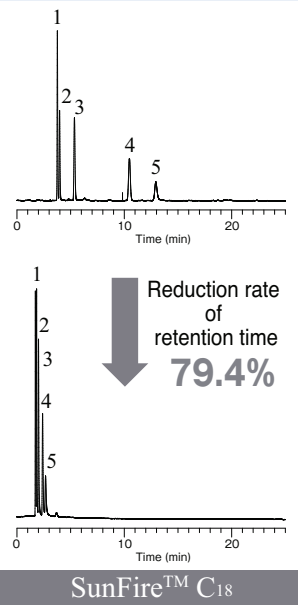
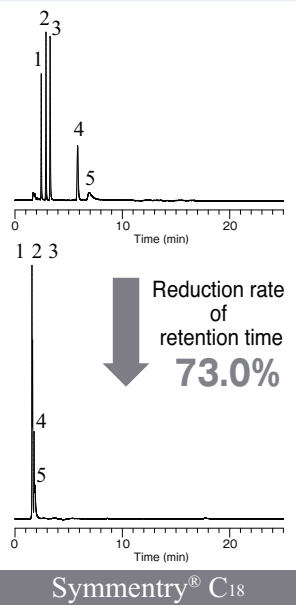
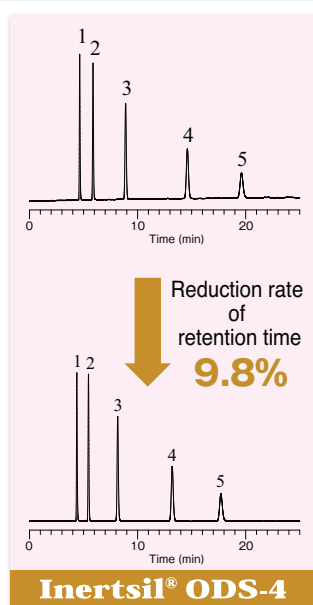
System : LC800 HPLC system
 4000 Q TRAP®
 Column : Inertsil ODS-4 (3 μ m, 75 $\times$ 2.1 mm I.D.)
 Eluent : A) 0.1% CH₃OH
 B) 0.1% HCOOH
 A/B = 20/80 - 45 min - 20/80 - 2 min - 95/5 - 3.5 min - 95/5
 Flow Rate : 0.2 mL/min
 Col. Temp. : 40 $^{\circ}$ C
 Detection : LC/MS/MS (ESI, Positive, MRM)
 Injection Vol. : 10 μ L
 Sample : 1. Tetracycline (TC) (100 μ g/L)
 2. Oxytetracycline (OTC) (100 μ g/L)
 3. Chlortetracycline (CTC) (100 μ g/L)
 4. Doxycycline (DC) (100 μ g/L)

Inertsil® ODS-4



Comparison of analyses under 100% Aqueous Eluents

Under the condition of mobile phase containing very little organic solvent, mobile phase can easily come out from pores in the packing material, resulting in the dewetting phenomenon. As shown in the figures below, such water repellency makes the analysis results unstable over the retention time. Inertsil ODS-4, with an ideal chemical processing, minimizes such dewetting phenomenon, achieving very trustable elution with 100% aqueous eluents.



Testing procedure

Introduce 100% water for 20 minutes.

↓
Analysis (upper chromatograms)

↓
Stop flow for 15 minutes.

↓
Introduce eluent for 30 minutes.

↓
Stop flow for 15 minutes.

↓
Introduce eluent for 15 minutes.

↓
Analysis (lower chromatograms)

System : GL-7400 HPLC system
Column : 5 μ m, 250 $\times$ 4.6 mm I.D.
Eluent : H₂O
Flow Rate : 1.0 mL/min
Col. Temp. : 40 $^{\circ}$ C
Detection : UV 254 nm
Sample : 1. Cytosine
2. Uracil
3. Guanine
4. Thymine
5. Adenine

Analytical Column Ordering Information

Particle size	Diameter (mm)	1.0	1.5	1.0 ~ 1.5	2.1	3.0	4.0	4.6	2.1 ~ 4.6
	Length (mm)	Cat.No.	Cat.No.	Price	Cat.No.	Cat.No.	Cat.No.	Cat.No.	Price
3 μ m	30	5020-81111	5020-81121		5020-04011	5020-04021	5020-04031	5020-04041	
	50	5020-81112	5020-81122		5020-04012	5020-04022	5020-04032	5020-04042	
	75	5020-81113	5020-81123		5020-04013	5020-04023	5020-04033	5020-04043	
	100	5020-81114	5020-81124		5020-04014	5020-04024	5020-04034	5020-04044	
	150	5020-81115	5020-81125		5020-04015	5020-04025	5020-04035	5020-04045	
	250	5020-81116	5020-81126		5020-04016	5020-04026	5020-04036	5020-04046	
5 μ m	30	5020-81011	5020-81021		5020-03911	5020-03921	5020-03931	5020-03941	
	50	5020-81012	5020-81022		5020-03912	5020-03922	5020-03932	5020-03942	
	75	5020-81013	5020-81023		5020-03913	5020-03923	5020-03933	5020-03943	
	100	5020-81014	5020-81024		5020-03914	5020-03924	5020-03934	5020-03944	
	150	5020-81015	5020-81025		5020-03915	5020-03925	5020-03935	5020-03945	
	250	5020-81016	5020-81026		5020-03916	5020-03926	5020-03936	5020-03946	

* The joint is Waters 1/16" type. * For other column sizes, please contact us.

Preparative Column Ordering Information

Diameter (mm)	6.0		7.6		10.0		20.0	
Length (mm)	Cat.No.	Price	Cat.No.	Price	Cat.No.	Price	Cat.No.	Price
Guard 50	5020-03957		5020-03967		5020-81057		5020-81067	
100	5020-03954		5020-		5020-		5020-	
150	5020-03955		5020-		5020-		5020-	
250	5020-03956		5020-03966		5020-81056		5020-81066	

* The joint is Waters 1/16" type. * For other column sizes, please contact us.

Cartridge Guard Column Ordering Information

Diameter of the analytical column applicable (mm)	Diameter of the guard column (mm)	Length of the guard column (mm)	Replacement cartridge guard columns (2/pk)		Holder/Cartridge set (1 holder and 2 cartridges)	
			Cat.No.	Price	Cat.No.	Price
1.0	1.0	10	5020-08517		5020-08527	
1.5, 2.1	1.5	10	5020-08518		5020-08528	
2.1, 3.0	3.0	10	5020-08515		5020-08525	
		20	5020-08565		5020-08575	
4.0, 4.6	4.0	10	5020-08510		5020-08520	
		20	5020-08560		5020-08570	

* The only joint available is Waters 1/16" type. * Please specify the packing material and the particle size in your order.

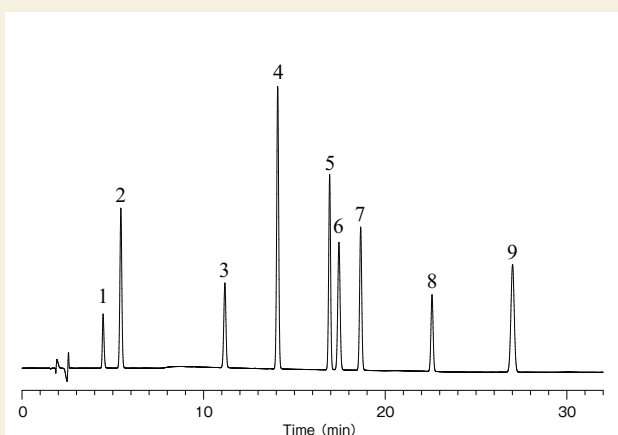
* We also have other guard column (GL-cart) as well. Please inquire for further details.

Applications

Food additives

System : GL-7400 HPLC system
 Column : Inertsil ODS-4 (5 μ m, 150 $\times$ 4.6 mm I.D.)
 Eluent : A) CH₃CN
 B) 25 mM CH₃COONa (pH4.6, CH₃COOH)
 A/B = 10/90 - 4 min - 10/90 - 16 min - 40/60 - 10 min - 40/60
 Flow Rate : 1.0 mL/min
 Col. Temp. : 40 $^{\circ}$ C
 Detection : UV 238 nm
 Injection Vol. : 10 μ L
 Sample : Food additives

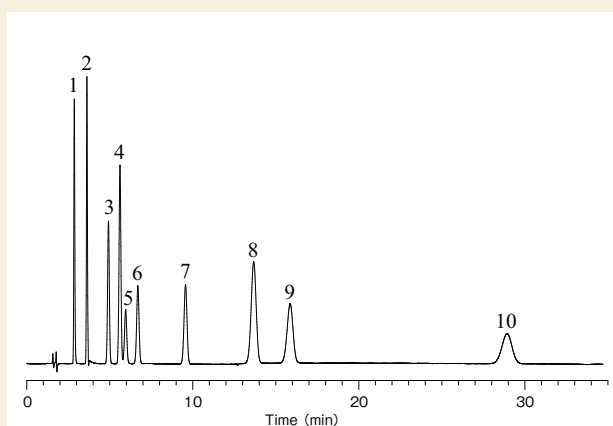
1. Sodium Saccharin	(50 mg/L)
2. p-Hydroxy benzoic acid	(50 mg/L)
3. Sorbic acid	(50 mg/L)
4. Benzoic acid	(50 mg/L)
5. p-Hydroxy benzoic acid methyl ester	(50 mg/L)
6. Dehydroacetic Acid	(50 mg/L)
7. p-Toluic acid	(50 mg/L)
8. p-Hydroxy benzoic acid ethyl ester	(50 mg/L)
9. p-Hydroxy benzoic acid n-propyl ester	(50 mg/L)



Nucleic acid bases

System : GL-7400 HPLC system
 Column : Inertsil ODS-4 (5 μ m, 150 $\times$ 4.6 mm I.D.)
 Eluent : 0.1M KH₂PO₄, 0.2M NaClO₄ (pH 2.0, H₃PO₄)
 Flow Rate : 1.0 mL/min
 Col. Temp. : 40 $^{\circ}$ C
 Detection : UV 254 nm
 Injection Vol. : 1 μ L
 Sample : Nucleobase

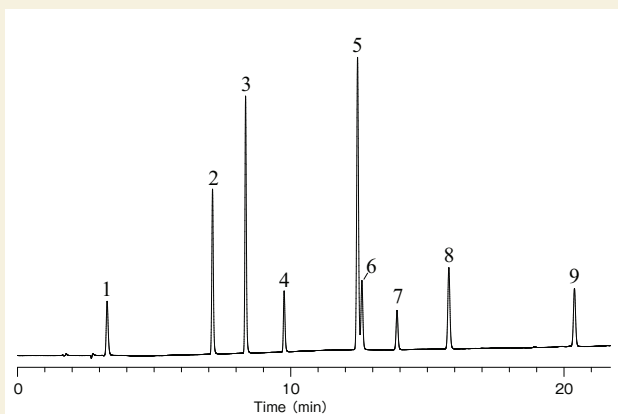
1. Cytosine	(25 mg/L)
2. Uracil	(25 mg/L)
3. Guanine	(25 mg/L)
4. Adenine	(25 mg/L)
5. Cytidine	(25 mg/L)
6. Uridine	(25 mg/L)
7. Thymine	(25 mg/L)
8. Adenosine	(50 mg/L)
9. Guanosine	(50 mg/L)
10. Thymidine	(50 mg/L)



Efficient ingredients in a cold medicine

System : GL-7400 HPLC system
 Column : Inertsil ODS-4 (5 μ m, 150 $\times$ 4.6 mm I.D.)
 Eluent : A) CH₃CN
 B) 0.1% H₃PO₄
 A/B = 3/97 - 20 min - 75/25
 Flow Rate : 1.0 mL/min
 Col. Temp. : 40 $^{\circ}$ C
 Detection : UV 210 nm
 Injection Vol. : 10 μ L
 Sample : Anti-Cold medicine

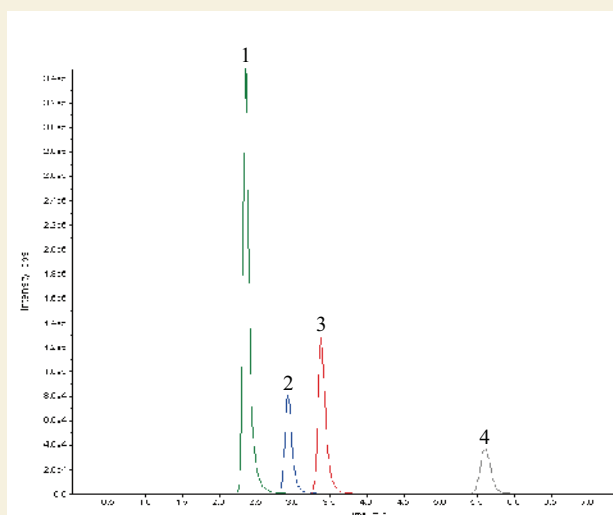
1. Maleic acid	(50 mg/L)
2. Acetaminophen	(50 mg/L)
3. Caffeine	(50 mg/L)
4. Chlorpheniramine	(50 mg/L)
5. Ethenzamide	(50 mg/L)
6. Bromovalerylurea	(50 mg/L)
7. Apronalide	(50 mg/L)
8. Isopropylantipyrine	(50 mg/L)
9. Ibuprofen	(50 mg/L)



Tricyclic antidepressant

System : LC800 HPLC system
 Column : Inertsil ODS-4 (5 μ m, 100 $\times$ 2.1 mm I.D.)
 Eluent : A) CH₃CN
 B) 10 mM CH₃COONH₄ (pH 7.0, CH₃COOH)
 A/B = 60/40, v/v
 Flow Rate : 0.2 mL/min
 Col. Temp. : 40 $^{\circ}$ C
 Detection : LC/MS/MS (ESI, Positive, MRM)
 Injection Vol. : 1 μ L
 Sample : Antidepressant agent

1. Imipramine	(100 mg/L)
2. Clomipramine	(100 mg/L)
3. Amitriptyline	(100 mg/L)
4. Mianserin	(100 mg/L)



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