

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

# Inertsil<sup>®</sup> ODS-4

State-of-the-art C18 HPLC Columns



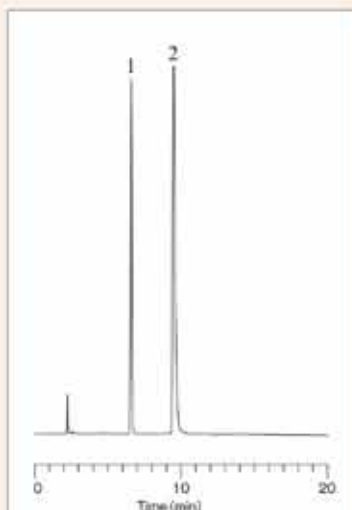
Improved Peak Shapes and Heights  
Enhancing Sensitivity  
High Resolution  
Fast Equilibration  
Compatible with 100% Aqueous Eluents

 **GL Sciences Inc.**



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

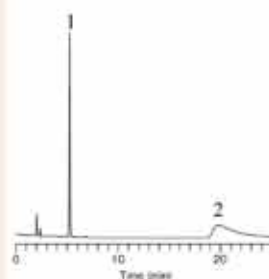
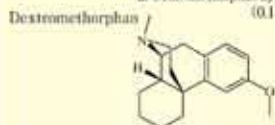
Dextromethorphan, a strong basic compound, can be adsorbed by trace amount of residual silanols on the surface of the packing material, resulting in poor peak shapes with the traditional endcapping technique. Due to its newly-developed powerful deactivation, adsorption of compounds are much less and thus enables highly qualitative analysis of strong basic compounds.



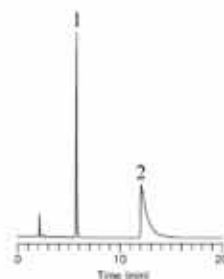
**Inertsil® ODS-4**

System : GL-7400 HPLC system  
 Column : 5  $\mu$ m, 250 $\times$ 4.6 mm I.D.  
 Eluent : A) CH<sub>3</sub>CN  
 B) 25 mM KH<sub>2</sub>PO<sub>4</sub>  
 (pH 7.0 ; 25mM KH<sub>2</sub>PO<sub>4</sub>)  
 A/B = 40/60, v/v  
 Flow Rate : 1.0 mL/min  
 Col. Temp. : 40 °C  
 Detection : UV 220 nm  
 Injection Vol. : 1.0  $\mu$ L

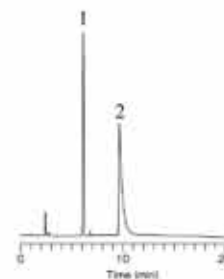
Sample : 1. Phenol (0.015 mg/mL)  
 2. Dextromethorphan hydrobromide (0.1 mg/mL)



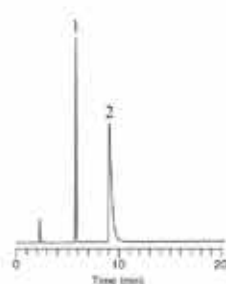
**Symmetry® C<sub>18</sub>**



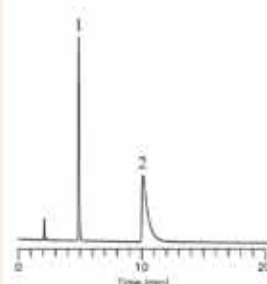
**SunFire™ C<sub>18</sub>**



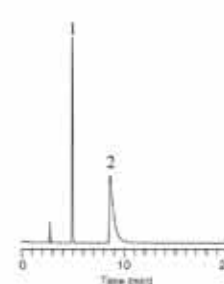
**Atlantis® T3**



**Luna® C<sub>18</sub> (2)**

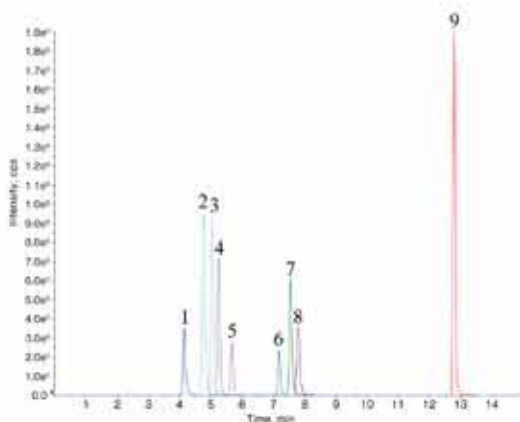


**ZORBAX Eclipse Plus C<sub>18</sub>**



**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.

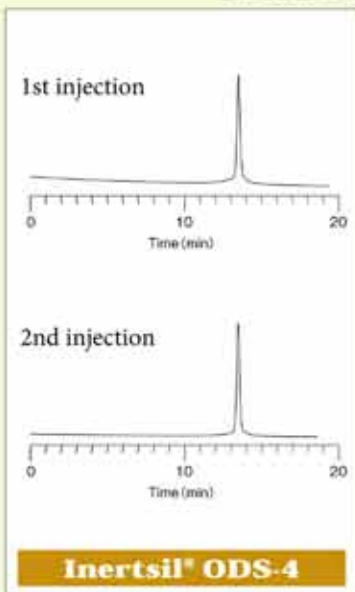
Sample:  
 1. Chlorpheniramine (0.1 mg/L)  
 2. Cimetidine (0.1 mg/L)  
 3. Clemastine (0.1 mg/L)  
 4. Difenedol (0.1 mg/L)  
 5. Diphenhydramine (0.1 mg/L)  
 6. Diphenylpyridine (0.1 mg/L)  
 7. Hydroxyzine (0.1 mg/L)  
 8. Promethazine (0.1 mg/L)  
 9. Triprolidine (0.1 mg/L)

System : LC800 HPLC system  
 4000 Q TRAP<sup>®</sup>  
 Column : Inertsil ODS-4 (3  $\mu$ m, 150  $\times$  2.1 mm I.D.)  
 Eluent : A) CH<sub>3</sub>OH  
 B) 2 mM CH<sub>3</sub>COONH<sub>4</sub>  
 A/B = 40/60 - 10 min - 95/5 - 5 min - 95/5  
 Flow Rate : 0.2 mL/min  
 Col. Temp. : 40 °C  
 Detection : LC/MS-MS (ESI Positive, MRM)  
 Injection Vol. : 10  $\mu$ L

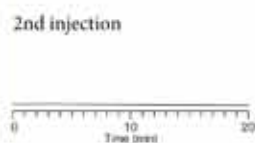
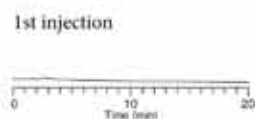
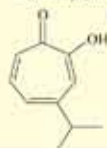


## Comparison of inertness to Hinokitiol between Inertsil® ODS-4 and commercially available ODS columns

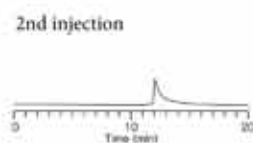
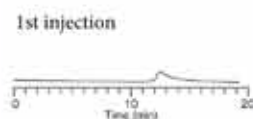
Hinokitiol having very strong chelating characteristics, is easily adsorbed with trace metal remaining on a packing material surface. SunFire C<sub>18</sub> in the figure below tend to show a better peak shape every time a new injection is provided, since each new injection covers up more of the adsorption 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.



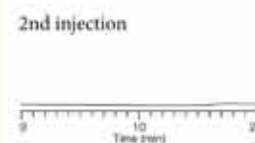
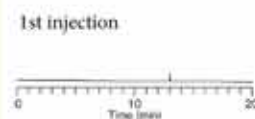
System : GL-7400 HPLC system  
 Column : 5 µm, 250 × 4.6 mm I.D.  
 Eluent : A) CH<sub>3</sub>CN  
 B) 0.1% H<sub>3</sub>PO<sub>4</sub>  
 A/B = 40/60, v/v  
 Flow Rate : 1.0 mL/min  
 Col. Temp. : 40 °C  
 Detection : UV 254 nm  
 Injection Vol. : 1.0 µL  
 Sample : β-Thujaplicin (Hinokitiol)  
 (0.1 mg/mL)



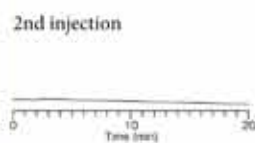
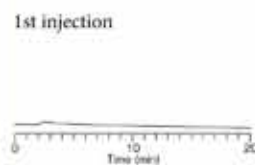
Symmetry® C<sub>18</sub>



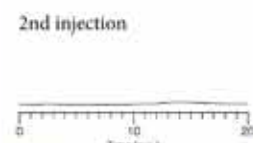
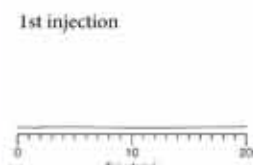
SunFire™ C<sub>18</sub>



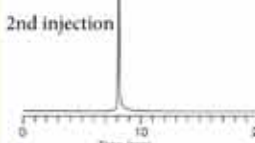
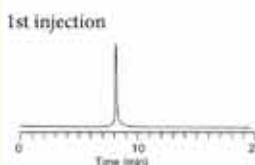
Atlantis® T3



Luna® C<sub>18</sub> (2)

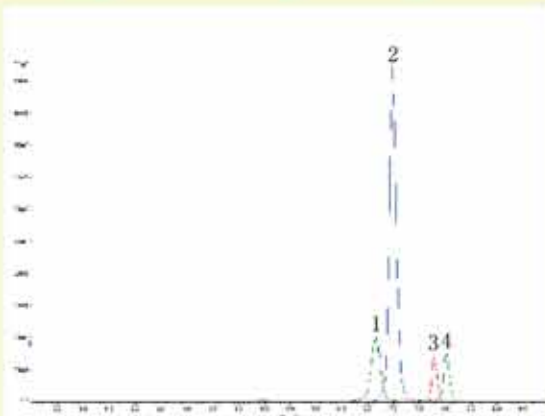


ZORBAX Eclipse Plus C<sub>18</sub>



Hypersil GOLD™

## 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<sup>®</sup>  
 Column : Inertsil ODS-4 (3 µm, 75 × 2.1 mm I.D.)  
 Eluent : A) 0.1% CH<sub>3</sub>COOH  
 B) 0.1% HCOOH  
 A/B = 30/70 - 4.5 min - 20/80 - 2 min - 95/5 - 3.5 min - 95/5  
 Flow Rate : 0.2 mL/min  
 Col. Temp. : 40 °C  
 Detection : LC/MS/MS (ESI, Positive, MRM)  
 Injection Vol. : 10 µL  
 Sample : 1. Tetracycline (TC) (100 µg/L)  
 2. Oxytetracycline (OTC) (100 µg/L)  
 3. Chlorotetracycline (CTC) (100 µg/L)  
 4. Doxycycline (DC) (100 µg/L)

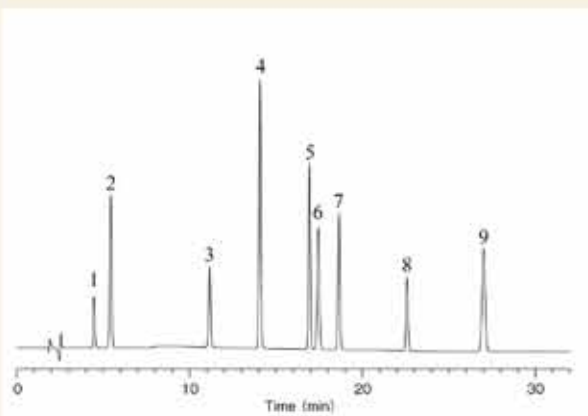


## Applications

### Food additives

System : GL-7400 HPLC system  
 Column : Inertsil ODS-4 (5  $\mu$ m, 150  $\times$  4.6 mm I.D.)  
 Eluent : A) CH<sub>3</sub>CN  
 B) 25 mM CH<sub>3</sub>COONa (pH4.6, CH<sub>3</sub>COOH)  
 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  $\mu$ L  
 Sample : Food additives

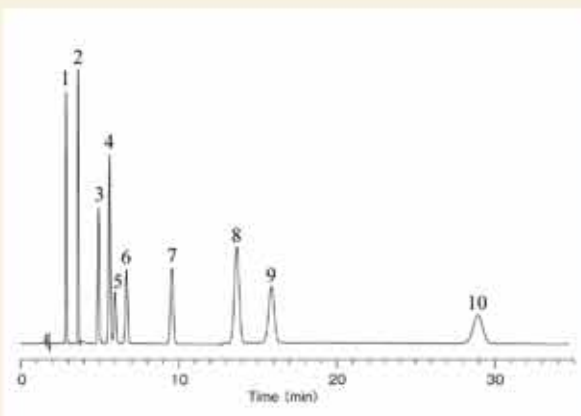
1. Sodium Saccharin	(50 mg/L)
2. p-Hydroxy benzoic acid	(50 mg/L)
3. Sorbic acid	(50 mg/L)
4. Benzoic acid	(50 mg/L)
5. p-Hydroxy benzoic acid methyl ester	(50 mg/L)
6. Dehydroacetic Acid	(50 mg/L)
7. p-Toluic acid	(50 mg/L)
8. p-Hydroxy benzoic acid ethyl ester	(50 mg/L)
9. p-Hydroxy benzoic acid n-propyl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



### Nucleic acid bases

System : GL-7400 HPLC system  
 Column : Inertsil ODS-4 (5  $\mu$ m, 150  $\times$  4.6 mm I.D.)  
 Eluent : 0.1M KH<sub>2</sub>PO<sub>4</sub>, 0.2M NaClO<sub>4</sub> (pH 2.0, H<sub>3</sub>PO<sub>4</sub>)  
 Flow Rate : 1.0 mL/min  
 Col. Temp. : 40  $^{\circ}$ C  
 Detection : UV 254 nm  
 Injection Vol. : 1  $\mu$ L  
 Sample : Nucleobase

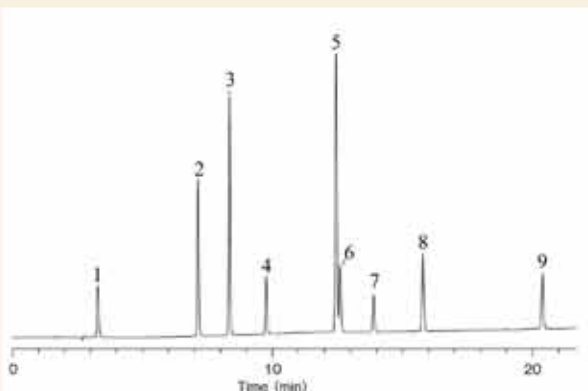
1. Cytosine	(25 mg/L)
2. Uracil	(25 mg/L)
3. Guanine	(25 mg/L)
4. Adenine	(25 mg/L)
5. Cytidine	(25 mg/L)
6. Uridine	(25 mg/L)
7. Thymine	(25 mg/L)
8. Adenosine	(50 mg/L)
9. Guanosine	(50 mg/L)
10. Thyaidine	(50 mg/L)



### Efficient ingredients in a cold medicine

System : GL-7400 HPLC system  
 Column : Inertsil ODS-4 (5  $\mu$ m, 150  $\times$  4.6 mm I.D.)  
 Eluent : A) CH<sub>3</sub>CN  
 B) 0.1% H<sub>3</sub>PO<sub>4</sub>  
 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  $\mu$ L  
 Sample : Anti-Cold medicine

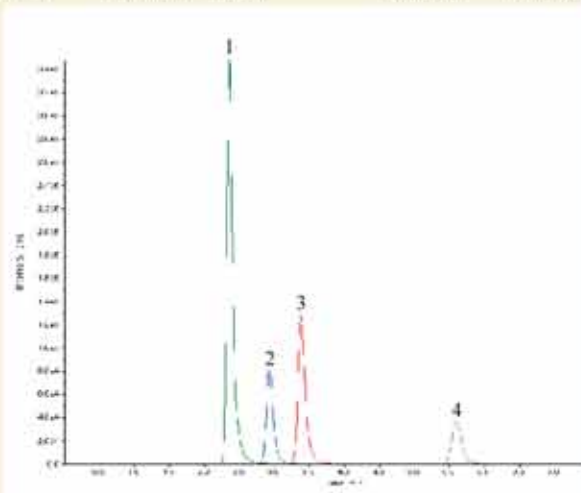
1. Maleic acid	(50 mg/L)
(Derived chlorpheniramine maleate)	
2. Acetaminophen	(50 mg/L)
3. Caffein	(50 mg/L)
4. Chlorpheniramine	(50 mg/L)
(Derived chlorpheniramine maleate)	
5. Ethenzamide	(50 mg/L)
6. Bromovalerylurea	(50 mg/L)
7. Apronalide	(50 mg/L)
8. Isopropylantipyrim	(50 mg/L)
9. Ibuprofen	(50 mg/L)



### Tricyclic antidepressant

System : LC800 HPLC system  
 Column : API 3000  
 Inertsil ODS-4 (5  $\mu$ m, 100  $\times$  2.1 mm I.D.)  
 Eluent : A) CH<sub>3</sub>CN  
 B) 10 mM CH<sub>3</sub>COONH<sub>4</sub> (pH 7.8, CH<sub>3</sub>COOH)  
 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  $\mu$ L  
 Sample : Antidepressant agent

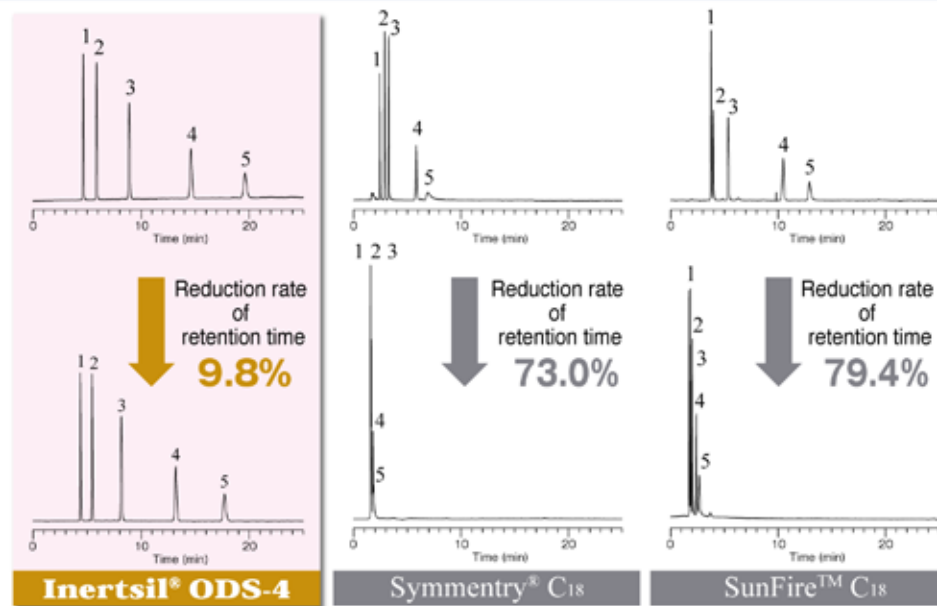
1. Imipramine	(100 mg/L)
2. Clomipramine	(100 mg/L)
3. Amitriptyline	(100 mg/L)
4. Mianserin	(100 mg/L)





## 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.

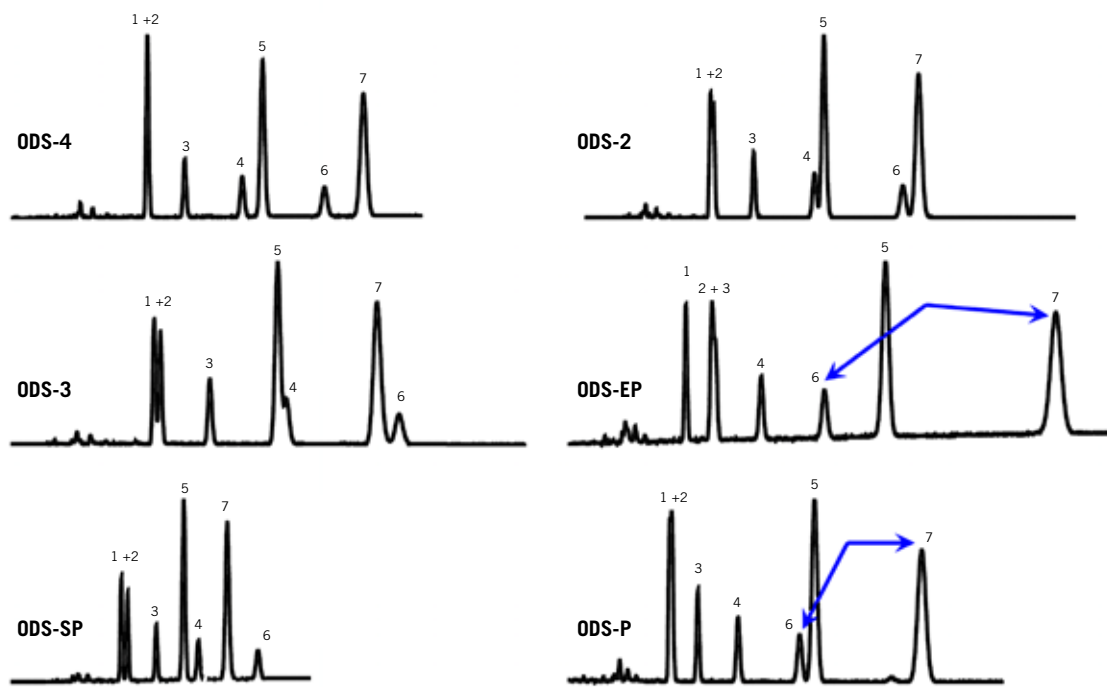


### Testing procedure

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 μm, 250×4.6 mm LD.  
 Eluent : H<sub>2</sub>O  
 Flow Rate : 1.0 mL/min  
 Col. Temp. : 40 °C  
 Detection : UV 254 nm  
 Sample : 1. Cytosine  
 2. Uracil  
 3. Guanine  
 4. Thymine  
 5. Adenine

## Selectivity Differences between GL Sciences ODS Phases



### Tanaka Test for Selectivity Comparing Inertsil ODS Phases

**Columns:** As indicated, 250 x 4.6mm; **Eluent:** MeCN: 25mM Phosphate Buffer, pH 7.0, 40:60; **Flow Rate:** 1.0 mL/min **Temp:** 40C;  
**Detection:** 210nm; **Sample:** 1. Uracil, 2. Caffeine, 3. Phenol, 4. n-Butylbenzene, 5. o-Terphenyl, 6. n-Amylbenzene, 7. Triphenylene

Column Name	Particle Size ( $\mu$ )	Surface Area ( $m^2/g$ )	Pore Size ( $\text{\AA}$ )	Silica Purity (%)	Carbon Load (%)	ODS Phase Type / Structure	Degree of End-Capping
Inertsil ODS-4	2,3,5	450	100	99.999	11	Monomeric	Extreme
Inertsil ODS-3	2,3,4,5	450	100	99.999	15	Monomeric	Well
Inertsil ODS-EP	5	450	100	99.999	9	Polar Embedded	None
Inertsil ODS-SP	5	450	100	99.999	8.5	Monomeric	Well
Inertsil ODS-P	5	450	100	99.999	29	Polymeric	None
Inertsil ODS-2	5	320	150	99.999	18.5	Oligomeric	Well

#### Ordering Information

USA Part No.	Phase	Particle Size	Column Dimensions	Japan Part No.
1502L030W021	Inertsil ODS-4	2 micron	30 x 2.1mm	5020-
1502L030W046	Inertsil ODS-4	2 micron	30 x 4.6mm	5020-
1502L050W021	Inertsil ODS-4	2 micron	50 x 2.1mm	5020-
1502L050W046	Inertsil ODS-4	2 micron	50 x 4.6mm	5020-
1502L100W021	Inertsil ODS-4	2 micron	100 x 2.1mm	5020-
1505L100W030	Inertsil ODS-4	2 micron	100 x 3.0mm	5020-
1503L030W021	Inertsil ODS-4	3 micron	30 x 2.1mm	5020-04011
1503L030W046	Inertsil ODS-4	3 micron	30 x 4.6mm	5020-04041
1503L050W021	Inertsil ODS-4	3 micron	50 x 2.1mm	5020-04012
1503L050W046	Inertsil ODS-4	3 micron	50 x 4.6mm	5020-04042
1503L100W046	Inertsil ODS-4	3 micron	100 x 4.6mm	5020-04044
1503L150W046	Inertsil ODS-4	3 micron	150 x 4.6mm	5020-04045
1503L250W046	Inertsil ODS-4	3 micron	250 x 4.6mm	5020-04046
1505L030W021	Inertsil ODS-4	5 micron	30 x 2.1mm	5020-03911
1505L030W046	Inertsil ODS-4	5 micron	30 x 4.6mm	5020-03941
1505L050W021	Inertsil ODS-4	5 micron	50 x 2.1mm	5020-03912
1505L050W046	Inertsil ODS-4	5 micron	50 x 4.6mm	5020-03942
1505L100W046	Inertsil ODS-4	5 micron	100 x 4.6mm	5020-03944
1505L150W046	Inertsil ODS-4	5 micron	150 x 4.6mm	5020-03945
1505L250W046	Inertsil ODS-4	5 micron	250 x 4.6mm	5020-03946

This is only a partial listing of available column configurations. Please visit [www.inertsil.com](http://www.inertsil.com) for a complete listing or inquire by phone at the number shown below.



**GL Sciences, Inc. USA**

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