Column for reversed phase

ODS Series

Develosil ODS
Develosil ODS-K
Develosil ODS-N
Develosil ODS-P
Develosil ODS-A
Develosil ODS-T

The origin of Develosil ODS Column!!

Six kinds of ODS columns released it approximately 30 years ago. "**Developing new ideas based on study of the past.**" All began in here.

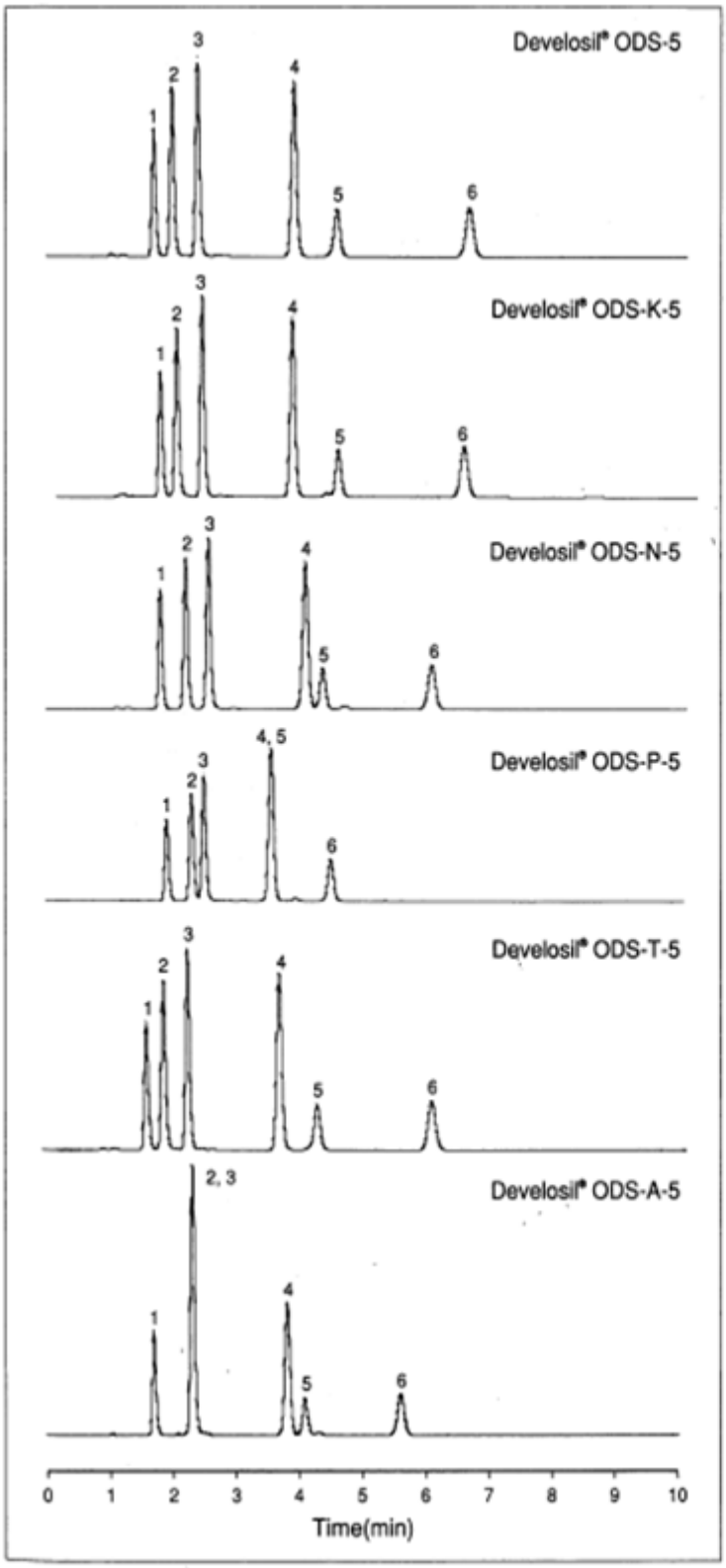
Physical properties of Develosil OD S Series

Column name	Ligand	Carbon	End Capping	Surface area	Pore diameter	Pore volume	Range of pH
ODS	Octadecyl (Monfunctional)	20%	Yes (Single)	350m^2/g	12nm	1.05mL/g	pH2-7.5
ODS-K	Octadecyl (Monfunctional)	19%	Yes (Single)				
ODS-N	Octadecyl (Monfunctional)	17%	Yes (Single)				
ODS-P	Octadecyl (Monfunctional)	11%	Yes (Single)				
ODS-T	Octadecyl (Trifunctional)	20%	Yes (Single)				
ODS-A	Octadecyl (Trifunctional)	19%	No				

The width of the selection to its maximum !!

Six kinds of ODS is used to a purpose. As for it, the choice of the column which is most suitable by the action of hydrophobicity and a left silanol group is possible.

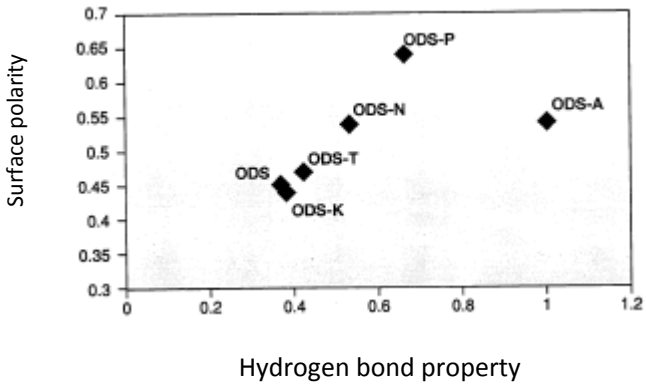
Comparison of standard chromatograms on the same condition



Conditions:	
Column	: Develosil® ODS-5 Develosil® ODS-K-5 Develosil® ODS-N-5 Develosil® ODS-P-5 Develosil® ODS-T-5 Develosil® ODS-A-5
Mobile phase	: MeOH/Water=70/30
Flow rate	: 1.0ml/min
Temperature	: 40℃
Detection	: UV254nm
Sample	: 1.Uracil / 2.Caffeine / 3.Phenol / 4.Methy Benzoate / 5.Benzene / 6.Toluene

When the column is selected, it is necessary to know the performance of the column enough. I will compare it from hydrogen bonding, hydrophobicity, plane recognition characteristics what kind of performance six kinds of columns have here.

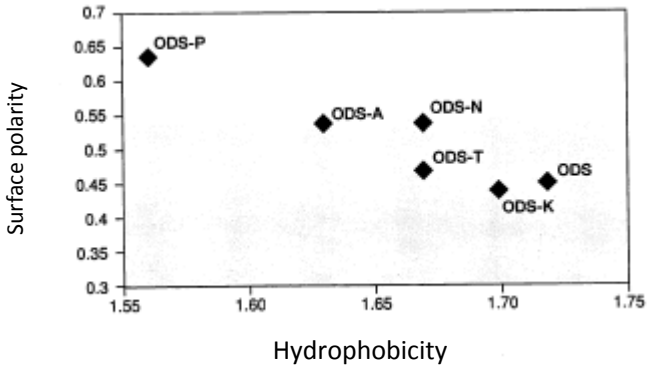
Comparison of six-kind ODS column hydrogen bonding



Hydrogen bond property

When prescribed our company examines the performance, the hydrogen bond is evaluated by using the separation coefficient of the phenol as caffeine. It becomes a high value when there are a lot of silanol groups that remain, and when it is few, this hydrogen bond indicates a low value. That is, the column by which the end cap is fully processed is in the tendency for the value of this hydrogen bond nature to be small. Although it is not only influence of a residual silanol, it is certain that it is one of the indices.

Comparison of six-kind ODS column Hydrophobicity

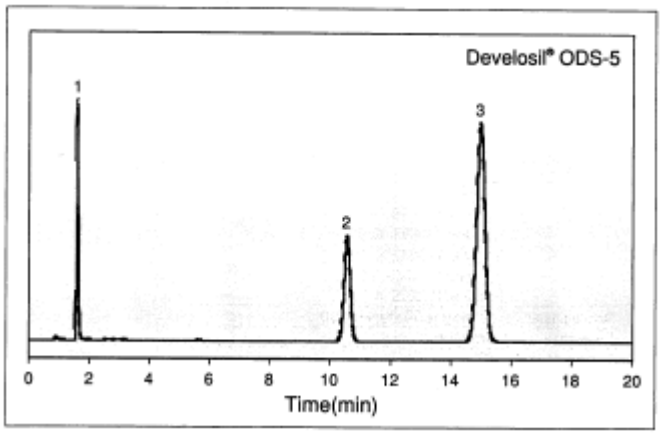


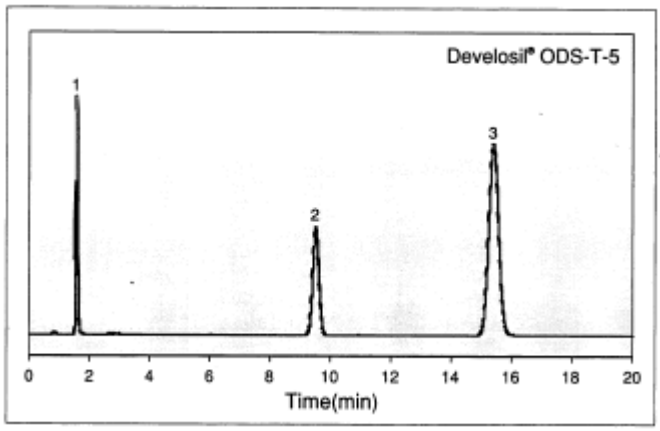
Hydrophobicity

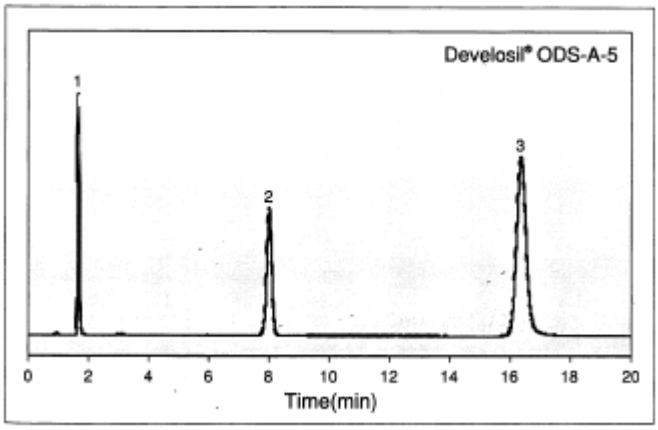
I evaluate the hydrophobicity using a separation coefficient of benzene and toluene in our predetermined performance test. Indicating the price that is high so that this hydrophobicity has much carbon content show a tendency, but various factor is piled up, and cannot compare the presence of the end cap only with carbon content unconditionally.

It is known that the residual silanol group affects the shape of the peak in the analysis of the basic compound greatly. To evade this, the carbon content such as ODS, ODS-k, and ODS-T selects the one that the end cap processing is done high. Hydrophobicity is a high column in ODS, ODS-K, and ODS-T for this. It can be said that it is a standard so-called column.

Plane recognition-related comparison







Conditions:	
Column	: Develosil® ODS-5 Develosil® ODS-T-5 Develosil® ODS-A-5
Mobile phase	: MeOH/Water=80/20
Flow rate	: 1.0ml/min
Temperature	: 40℃
Detection	: UV254nm
Sample	: 1.Uracil / 2.o-Terphenyl 3.Triphenylene

3D selectivity

I estimate the plane recognition characteristics as o- terphenyl using a separation coefficient of triphenylene in our predetermined performance test. If it is a polymeric model, this plane recognition characteristics show a high price, but plane recognition characteristics may not be high because they are low are high and can control it by a state of combination reagent introduction quantity and the combination because it is a polymeric model. Be superior to the analysis of the compound having a tertiary structure, and this effect may be improved when I do not succeed in the column of the monofunctional model

Comparison between ODS-5 and ODS-T-5

It is set to ODS-5 and ODS-T-5 with the difference between monofunctional type ODS or polymeric type ODS.
The separation level α;
ODS-5 α= 1.49
ODS-T-5 α=1.74
A difference comes out by ODS reagent to couple.

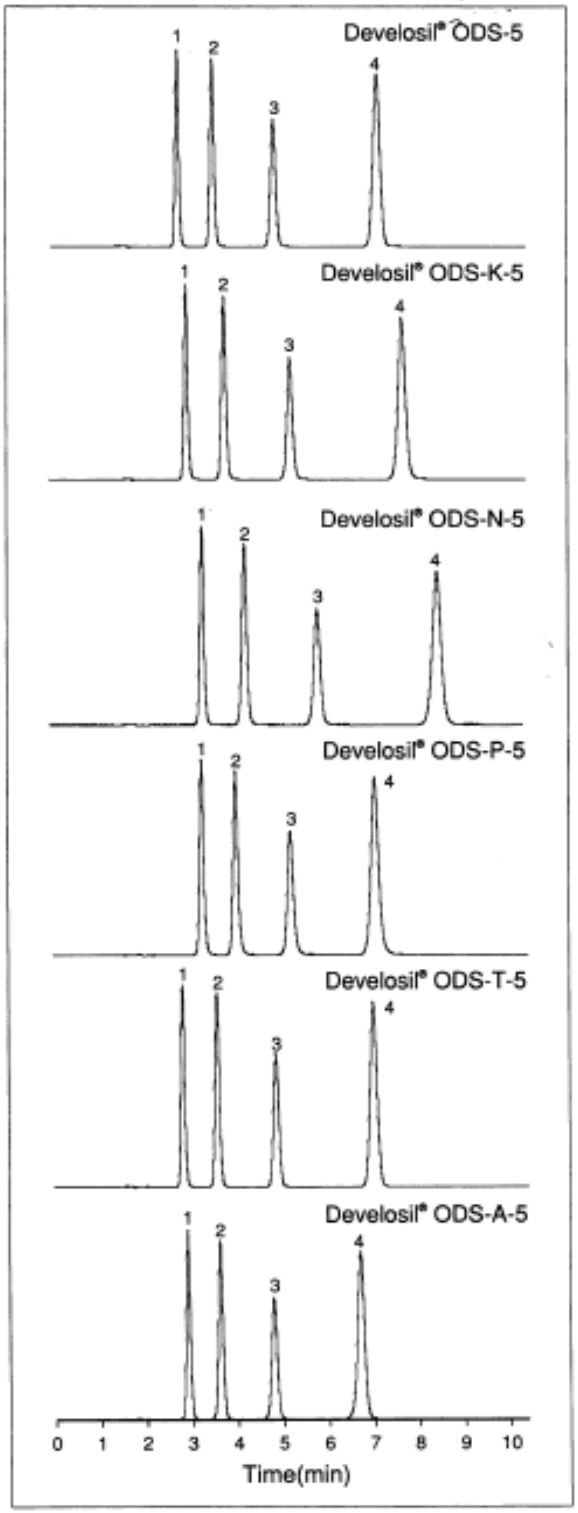
Comparison between ODS-T-5 and ODS-A-5

It is the difference in the existence of an end cap ODS-T-5 and ODS-A-5.
The separation level α;
ODS-T-5 α=1.74
ODS-A-5 α=2.32
The effect of the end cap understands that there are more effects than the form of the ODS reagent.

Analysis example of the preservative

An analysis example of the preservative using six kinds of ODS. Retention tends to rise in ODS, ODS-K, ODS-N so that carbon content is low. When a high place does shortening at time because all separates all columns well, ODS-P and ODS-T, ODS-A are suitable.

Analysis example of the preservative

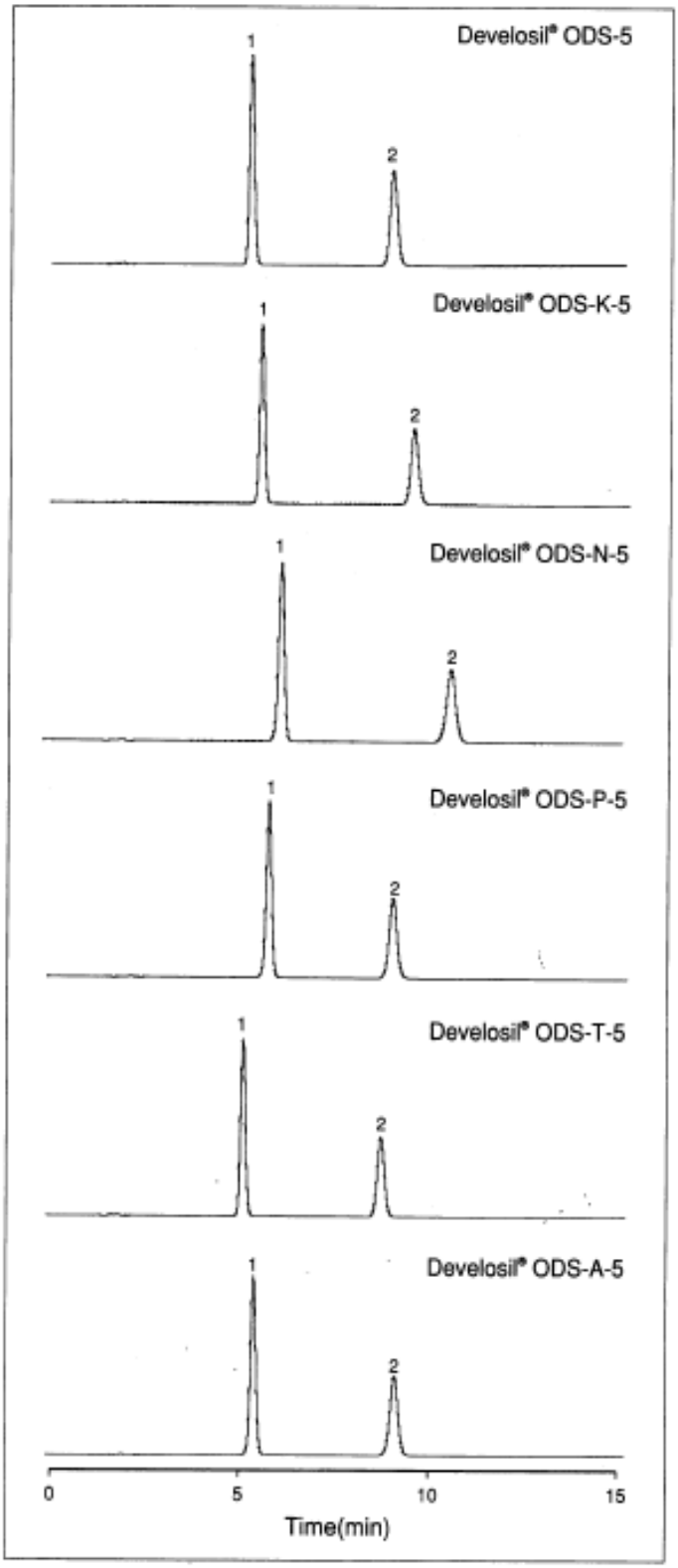


Conditions:	
Column	: Develosil® ODS-5 Develosil® ODS-K-5 Develosil® ODS-N-5 Develosil® ODS-P-5 Develosil® ODS-T-5 Develosil® ODS-A-5
Mobile phase	: Acetonitrile/Water=50/50
Flow rate	: 1.0ml/min
Temperature	: 40℃
Detection	: UV235nm
Sample	: 1.Methyl p-Hydroxybenzene 2.Ethyl p-Hydroxybenzene 3.Propyl p-Hydroxybenzene 4.Butyl p-Hydroxybenzene

Analysis example of phenytoin

Analysis example of phenytoin by six kinds of ODS columns.
Phenytoin is one kind of the antiepileptic drug of the hydantoin system. I enable simple analysis in a mobile phase only for acetonitrile and water.

Analysis example of phenytoin

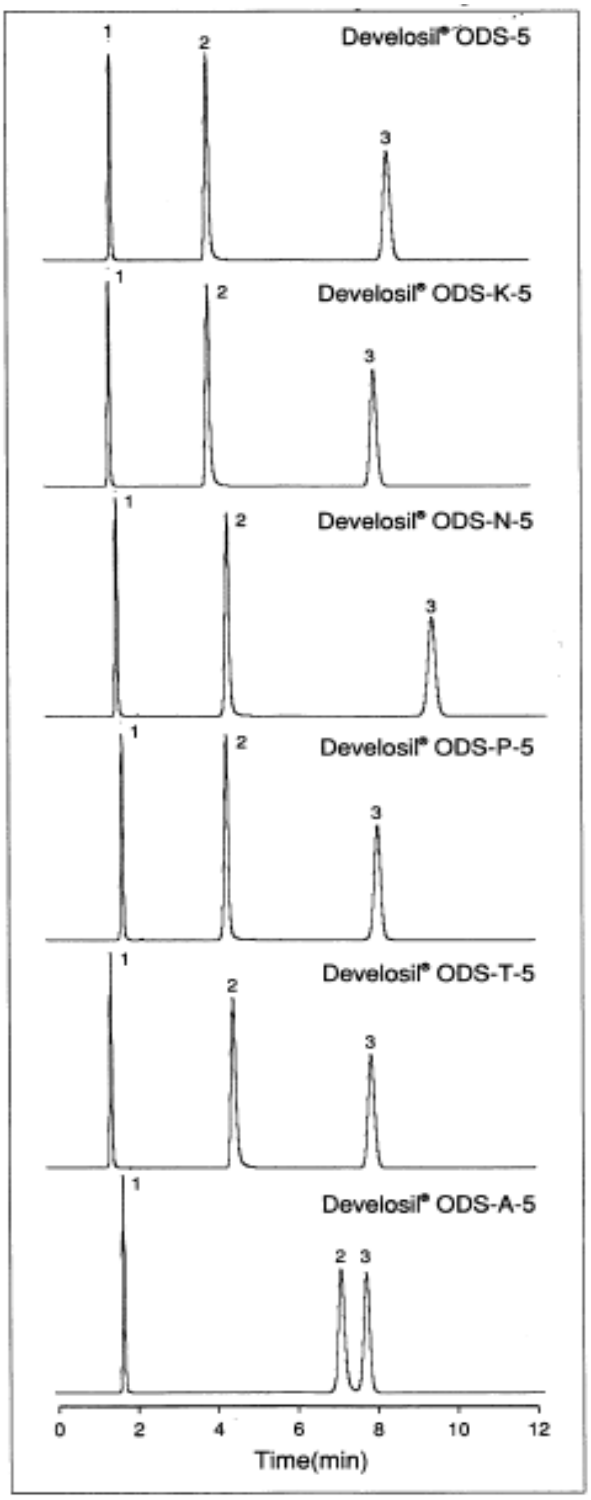


Conditions:	
Column	: Develosil® ODS-5 Develosil® ODS-K-5 Develosil® ODS-N-5 Develosil® ODS-P-5 Develosil® ODS-T-5 Develosil® ODS-A-5
Mobile phase	: Acetonitrile/Water=55/45
Flow rate	: 1.0ml/min
Temperature	: 40℃
Detection	: UV235nm
Sample	: 1.Phenytoin 2.Propyl *p*-Hydroxybenzene (i.s.)

The example of analysis of a basic compound

An analysis example of the basic compound by six kinds of ODS columns. I use pyridine for a object for comparison. The basic compound is affected by the silanol group, and retention changes. While carbon content is approximately equal, a big difference comes out to ODS-T and ODS-A-5 by having end cap or not.

The example of analysis of a basic compound



Conditions;	
Column	: Develosil® ODS-5 Develosil® ODS-K-5 Develosil® ODS-N-5 Develosil® ODS-P-5 Develosil® ODS-T-5 Develosil® ODS-A-5
Mobile phase	: ACN/50mM Phosphate buffer=20/80
Flow rate	: 1.0ml/min
Temperature	: 40℃
Detection	: UV254nm
Sample	: 1.Uracil / 2.Pyridine / 3.Phenol

Develosil®

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Column for reversed phase

ODS-UG,HG,MG,SR columns

Develosil

Develosil ODS-HG
Develosil ODS-UG
Develosil ODS-MG
Develosil ODS-SR

The 2nd generation of Develosil series, very standard column

This series is the column in which residual silanol by high-grade-ize and double end cap treatment of the silica gel which is a base material was reduced compared with ODS. The peak tailing of a basic compound is suppressed and it has become very user-friendly specification.

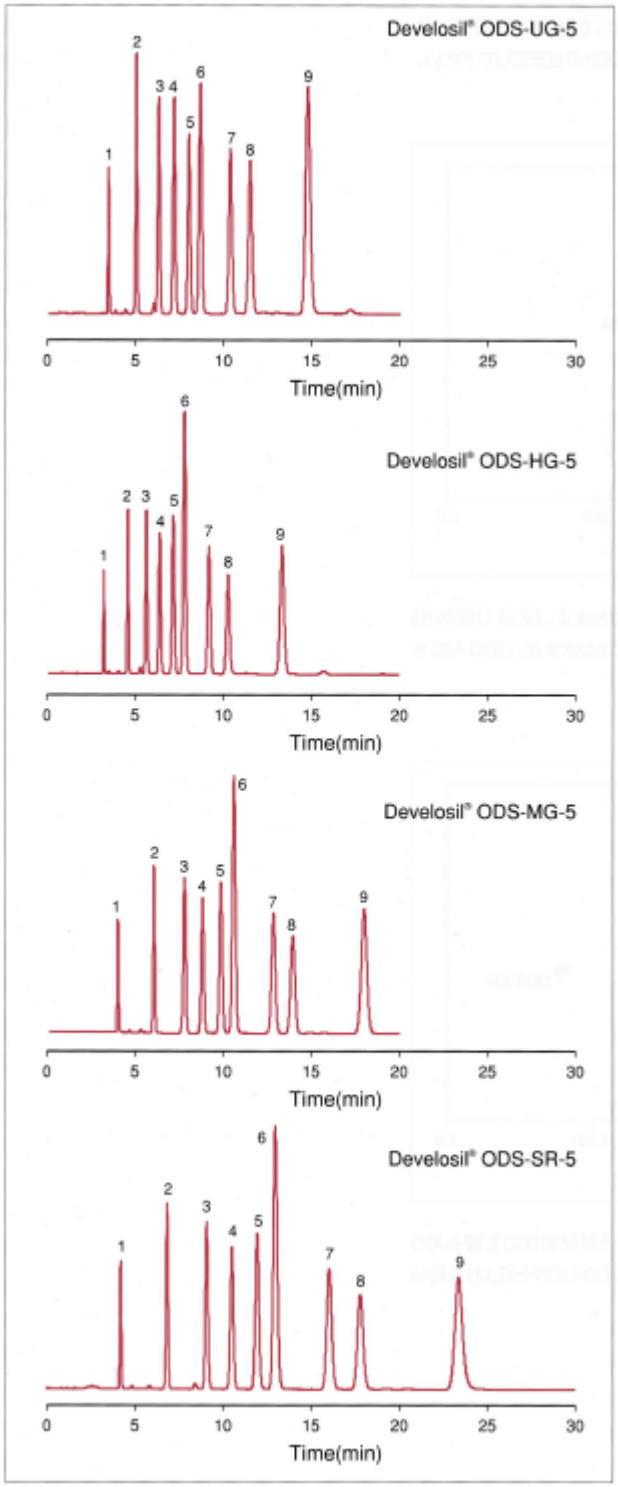
Physical properties of Develosil ODS-HG, ODS-UG, ODS-MG, ODS-SR

Column name	Ligand	Carbon	End Capping	Surface area	Pore diameter	Pore volume	Range of pH
ODS-UG	Octadecyl (Monfunctional)	18%	Yes (Double)	300m^2/g	14nm	1.05mL/ g	pH2-10
ODS-HG	Octadecyl (Trifunctional)	18%	Yes (Double)				pH1-9
ODS-MG	Octadecyl (Difunctional)	15%	Yes (Double)	400m^2/g	10nm	1.15mL/ g	pH2-7.5
ODS-SR	Octadecyl (Difunctional)	18%	Yes (Double)	560m^2/g	8nm		

The combination and the theoretical plate number of a piping inside diameter

Column name	Use
ODS-UG	It is used when using an alkaline mobile phase. It ranks with ODS-HG and is a standard existence.
ODS-HG	It is used when using an acid mobile phase. Although separation almost equivalent to ODS-UG is shown, ODS-HG of solid recognition ability is higher.
ODS-MG	2 reaction type ODS. Compared with ODS-UG or HG, retention is a column for a separation improvement strongly. It can be used also for a mobile phase with much water composition.
ODS-SR	The column which is proud of the retention greatest in a Develosi column The optimal column for earning retention. Loading dose increase of preparative isolation can be aimed at.

The example of analysis of an aromatic compound



Conditions;	
Column	: Develosil® ODS-UG-5 Develosil® ODS-HG-5 Develosil® ODS-MG-5 Develosil® ODS-SR-5
Size	: 4.6x150mm
Mobile phase	: Acetonitrile/Water=70/30
Flow rate	: 1.0ml/min
Temperature	: 30℃
Detection	: UV254nm
Sample	: 1.Benzene (0.31uL/ml) 2.Naphthalene (0.32mg/ml) 3.Biphenyl (0.08mg/ml) 4.Fluorene (0.08mg/ml) 5.Phenanthrene (0.04mg/ml) 6.Anthracene (0.04mg/ml) 7.Fluoranthene (0.16mg/ml) 8.Pyrene (0.16mg/ml) 9.Chrysene (0.16mg/ml)
Injection volume	: 2.0uL

Nine kinds of aromatic compounds are measured on the terms.
Although there is a difference of time in ODS-UG and HG, the almost same separation is shown.
Because ODS-MG and SR can obtain quite strong retention compared with this, it becomes the means of a separation improvement.

About an improvement of separation

〈For improving separation〉

- The length of a column is changed.
- It changes into the strong column of retention.
- Particle diameter is made small.
- Composition is changed.

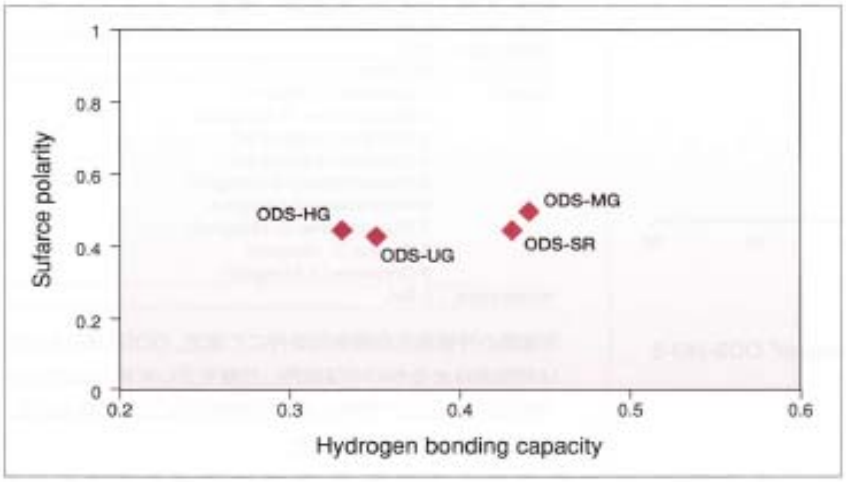
etc.

It is necessary to choose the column appropriate for the purposes, such as solubility, analytical time, etc. of a sample.

The means at the time of choosing a column

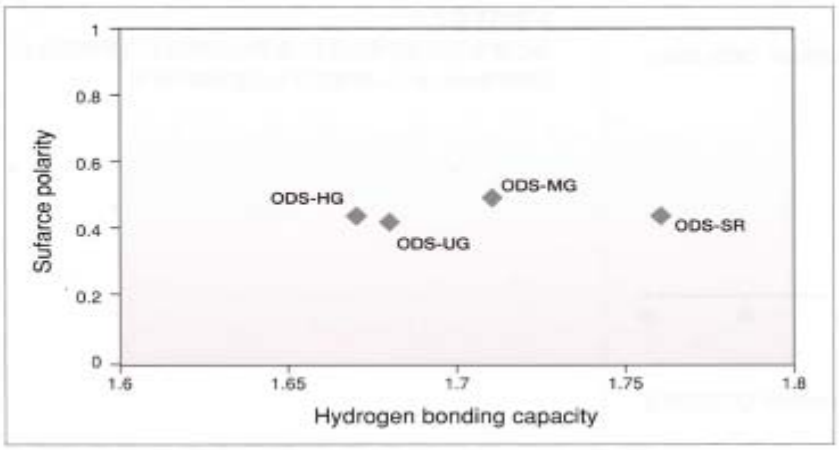
The data in which hydrogen bond property and hydrophobic surface polarity were shown is in below.
It has respectively different performance in ODS-UG, HG, and ODS-MG and ODS-SR.
Please follow it as the guide of column selection.

Hydrogen associativity



Hydrogen associativity becomes a parameter for seeing the influence of residual silanol.
Compared with ODS-UG or HG, ODS-MG and SR tend to be subject to the influence of residual silanol.
But there is also much analysis which is possible only in ODS-MG or SR, and there is.

Hydrophobicity

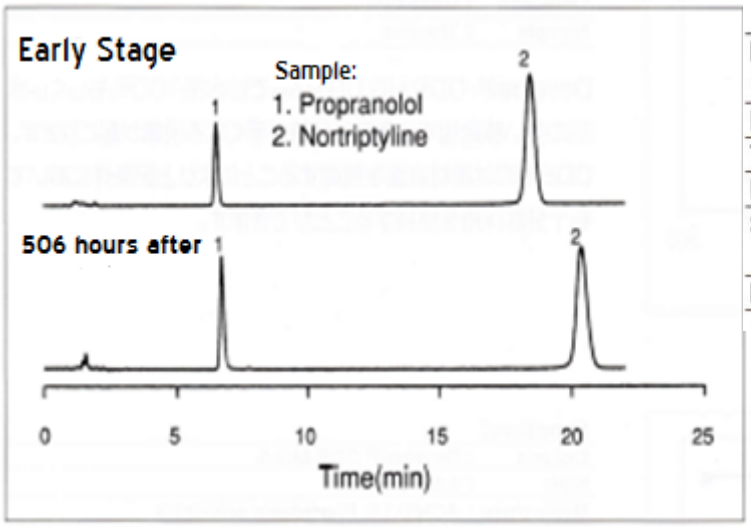


Hydrophobicity is a parameter influenced by the carbon content.
ODS-MG which has influence of the base material physical properties to be used, and has 15% of carbon content shows hydrophobicity higher than ODS-UG and HG from the size of the surface area.

Durability of a column

ODS-UG, HG, MG, and SR as which the new end cap method is adopted are the column excellent also in the durability of liquefaction.

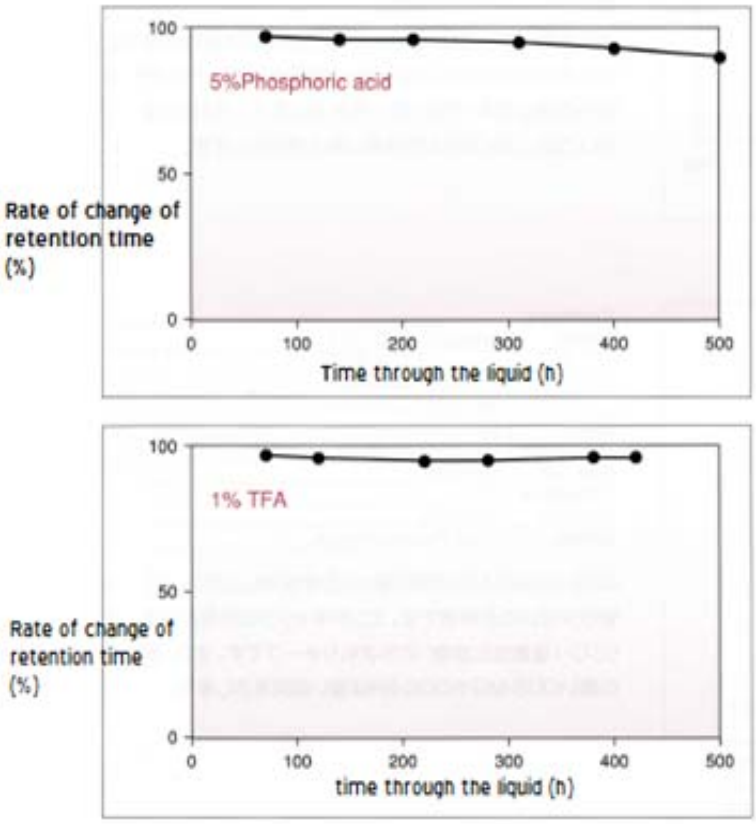
Alkali durability of Develosil ODS-UG



Conditions;	
Column	: Develosil® ODS-UG-5 (4.6x150mm) + Guard Column (4.0x20mm)
Mobile phase	: cetonitrile/0.05M Hydrochloric acid pyrrolidine (pH 11.5) =50/50
Flow rate	: 1.0ml/min
Temperature	: 30℃
Detection	: UV215nm
Sample	: 1.Propranolol 2.Nortriptyline
Injection volume	: 2.0uL

Peak add up is maintained also 506 hours after setting on the above terms.
If the terms from which deterioration does not arise easily are constructed, sufficient durability is shown also on a high pH condition.

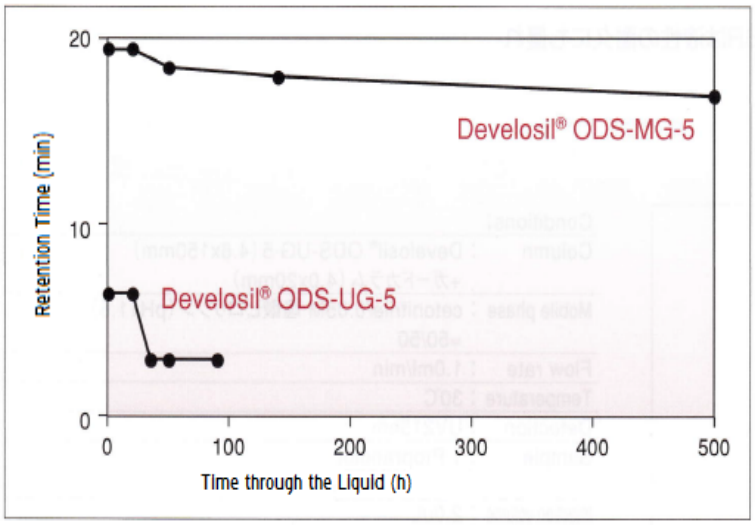
Acid durability of Develosil ODS-HG



Conditions;	
Column	: Develosil® ODS-HG-5
Size	: 4.6x150mm
Mobile phase	: MeOH/5% Phosphoric acid (pH1.1) =70/30 MeOH/1% TFA (pH1.3) =70/30
Flow rate	: 1.0ml/min
Temperature	: 30℃
Detection	: UV254nm
Sample	: Napthalene

When the case where phosphoric acid is used on the above terms, and TFA are used. The change of the later maintenance through the liquid is held in check for 500 hours by several percent of decrease. Therefore, sufficient durability is shown also to an acid mobile phase.

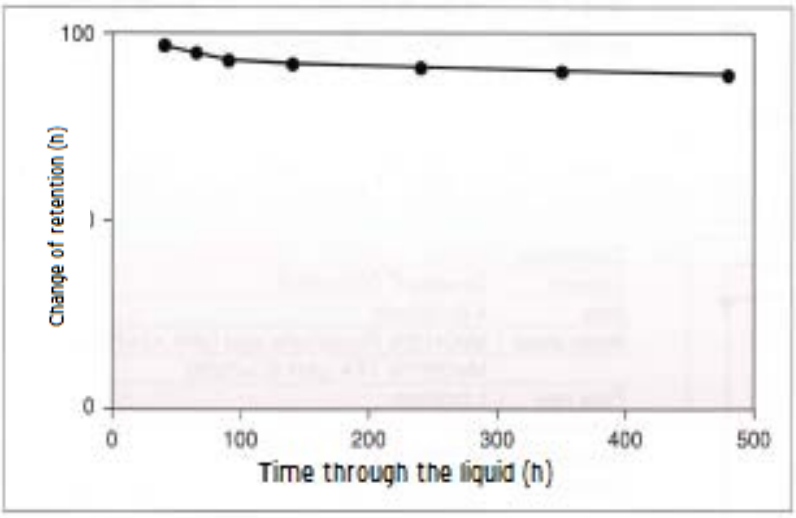
Develosil ODS-MG
Maintenance of the retention in many mobile phases in water



Conditions;	
Column	: Develosil® ODS-MG-5
Size	: 4.6x150mm
Mobile phase	: Water
Flow rate	: 1.0ml/min
Temperature	: 40℃
Detection	: UV254nm
Sample	: Thymine

The phenomenon that maintenance becomes suddenly early is generated in Develosil ODS-HG, UG and the SR in the mobile phase with many 100% of water systems or water systems. ODS-MG can maintain enough maintenance in the above agreement by controlling the matrix surface.

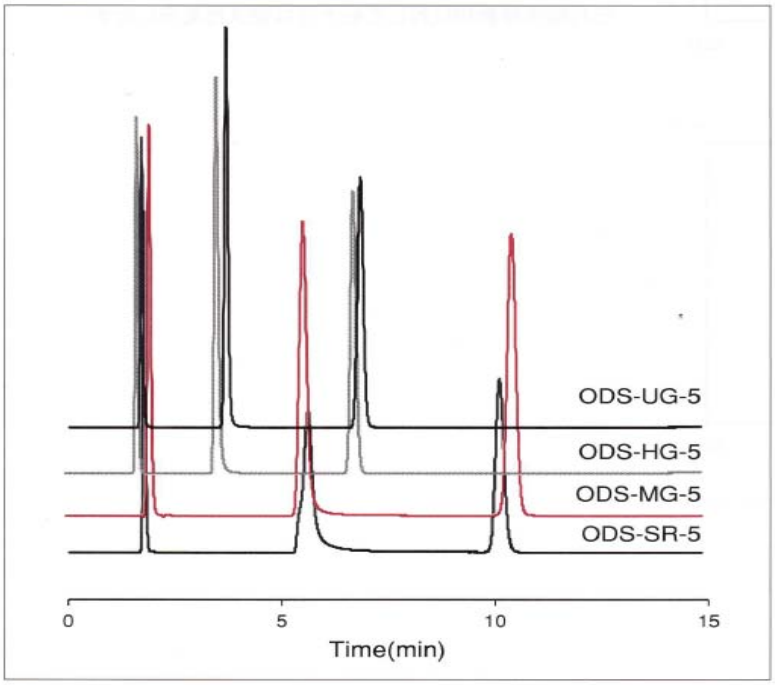
Acid durability of Develosl ODS-MG



Conditions;	
Column	: Develosil® ODS-MG-5
Size	: 4.6x150mm
Mobile phase	: ACN/0.1% Phosphoric acid=2/98
Flow rate	: 1.0ml/min
Temperature	: 40℃
Detection	: UV210nm
Sample	: Propionic acid

The durability on the acid terms of Develosil ODS-MG on terms is shown. Even if 500 hours pass, retention shows high durability only by reduction of several percent.
In operating pH range, ODS-MG shows high durability.

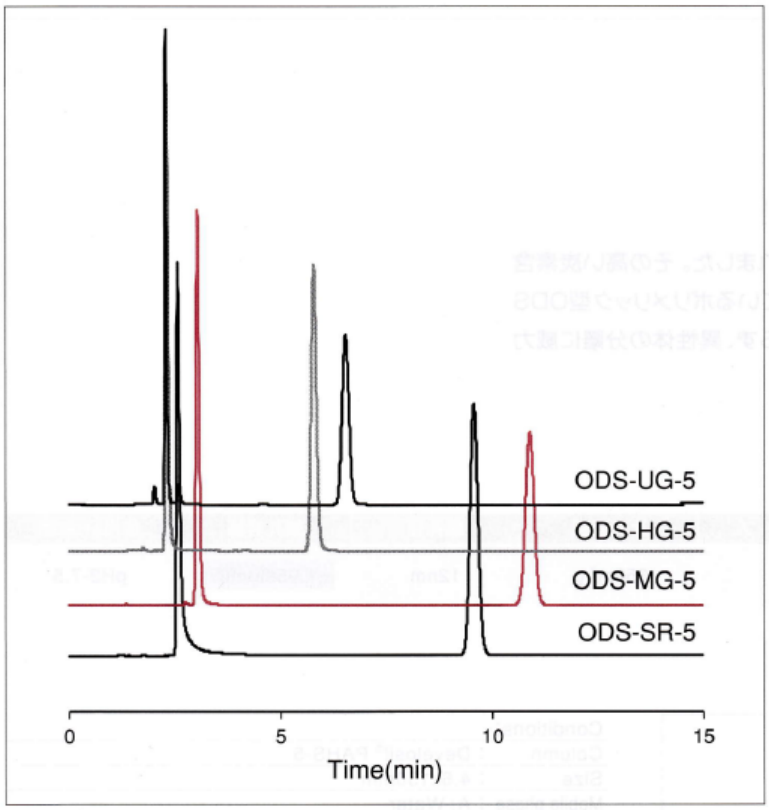
Separation comparison — Hydrochloric acid compound —



Conditions;	
Column	: Develosil® ODS-UG-5
	Develosil® ODS-HG-5
	Develosil® ODS-MG-5
	Develosil® ODS-SR-5
Size	: 4.6x150mm
Mobile phase	: MeOH/Water=30/70
Flow rate	: 1.0ml/min
Temperature	: 40℃
Detection	: UV254nm
Sample	: Uraci, Pyridine, Phenol

As for ODS-UG, HG, and MG, the thing with few impurities which has adopted high purity silica is the feature.
It combines with the effect of an end cap and the form of pyridine (basic compound) is also sharp.
And, ODS-MG and SR with high surface area show strong retention.

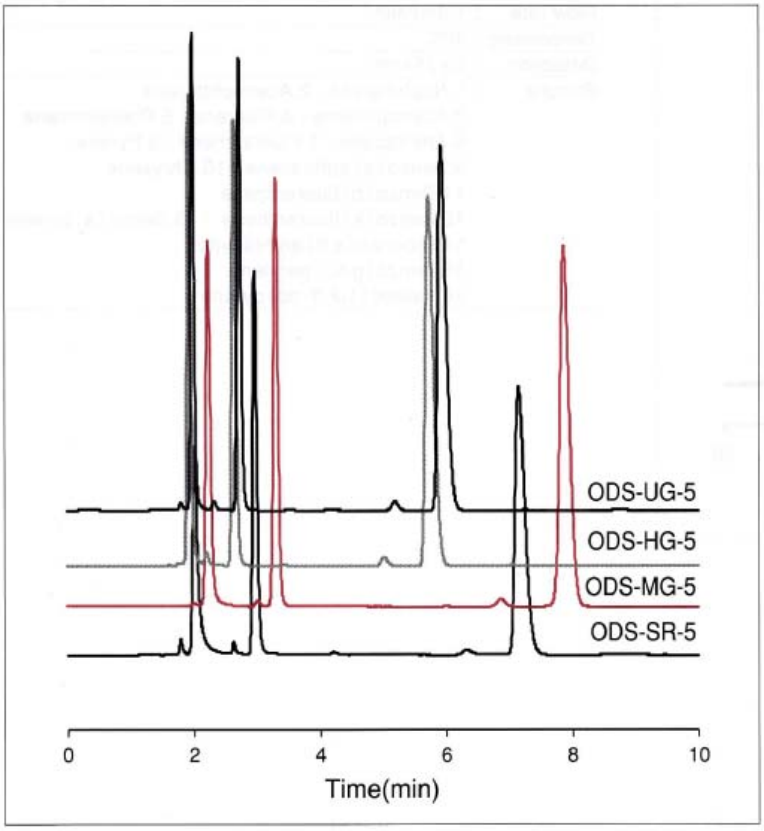
Separation comparison — Metallic compound —



Conditions;	
Column	: Develosil® ODS-UG-5
	Develosil® ODS-HG-5
	Develosil® ODS-MG-5
	Develosil® ODS-SR-5
Size	: 4.6x150mm
Mobile phase	: ACN/0.2%Phosphoric acid=10/90
Flow rate	: 1.0ml/min
Temperature	: 40℃
Detection	: UV254nm
Sample	: Oxine-copper, Caffeine

Metal compounds as well as a basic compound are subject to the effect of a silica gel statement, and ODS-UG, HG, and MG show good peak shape. In particular, ODS-MG has controlled the joint density in low proportion compared with other three sorts. When separation is insufficient in ODS-UG or HG, the width examined since it has reproducibility sufficient also by a mobile phase with much water composition used as the means of a separation improvement can be expanded.

Separation comparison — Acidic compound —



Conditions:	
Column	: Develosil® ODS-UG-5
	Develosil® ODS-HG-5
	Develosil® ODS-MG-5
	Develosil® ODS-SR-5
Size	: 4.6x150mm
Mobile phase	: ACN/0.2%Phosphoric acid=2/98
Flow rate	: 1.0ml/min
Temperature	: 40℃
Detection	: UV210nm
Sample	: Acetic acid, Formic acid, Propionic acid

It has set to comparison of the organic acid and, in a gap, good form is shown. When ODS-HG and UG are made into a standard, ODS-MG and SR have retention in a strong tendency.
Thus, ODS differs in a result greatly in the column to be used.

Develosil®

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