Technical Report No.35

Tips for finding equivalent columns

1. First

What criteria do you use when looking for equivalent columns? It is no exaggeration to say that “no two products are the same," as the silica gel base material, chemical reagents, bonding methods, and end-capping methods vary depending on the manufacturer. Also, since you need to know a lot of information, it can be quite a time-consuming task.

As we are a column manufacturer, we receive many inquiries like this, so we find and propose the most suitable columns. Naturally, we will be starting from scratch at our company, so what we do will not be that different from everyone else.

Now, I would like to introduce some of the things we focus on when selecting columns.

2. Parameters you should know

The following four pieces of information are required when searching for equivalent products.

A. Specific surface area

B. Pore diameter

C. Carbon content

D. With or without end cap

A. Specific surface area

The larger the specific surface area, the more chemistry can be incorporated. This greatly affects the carbon content. It is important because it is highly related to other parameters.

B. Pore diameter

It should be selected according to the size of the compound. In general, it is thought that low molecular weight compounds are mainly around 100 Å and polymers are 300 Å.

C. Carbon content

This parameter mainly determines the retention of hydrophobic compounds. The higher the content, the stronger the retention.

D. With or without end cap

Affects the strength of residual silanol groups. End-capping is often applied to reduce this effect as much as possible, but depending on the compound, choosing no end-capping may be effective.

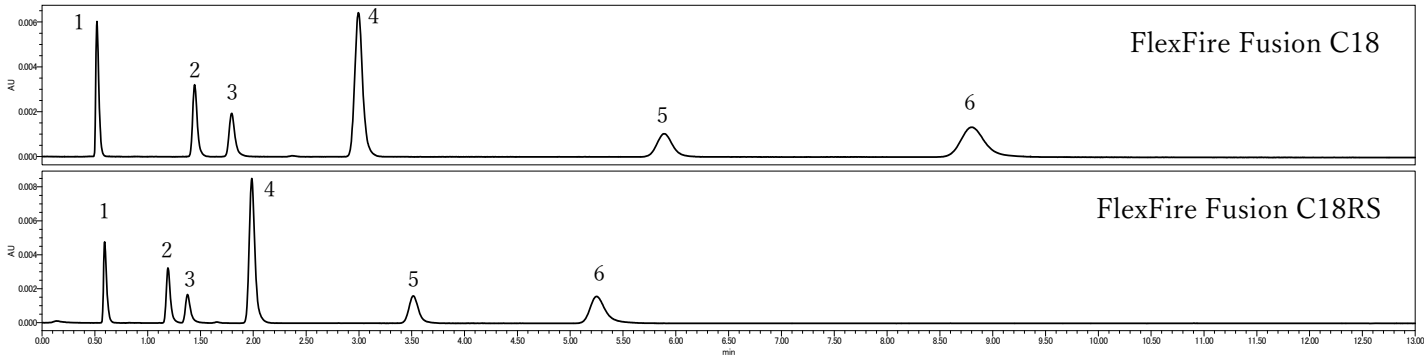
It is not possible to be certain because the handling of parameters differs depending on the silica gel manufacturing method, but I think it is sufficient as a guideline for exploration.

3. How to read parameters with actual values

Now, let's check the parameters using our column as an example.

	Fusion C18	Fusion C18RS
Surface Area	300m^2/g	200m^2/g
Pore Size	100 Å	150 Å
Carbon	18%	12%
End-cap	○	○

Although these two types of columns are the same C18 column, it can be seen that the parameters of the silica gel base material are different. Since both are full and have C18 groups bonded to them, Fusion C18 has a higher carbon content depending on the specific surface area. Let's see how these parameters affect the analysis results.



Conditions:

Column: FlexFire Fusion C18, 3um (4.6x50mm)

FlexFire Fusion C18RS, 3um (4.6x50mm)

Mobile phase: Methanol/10mM Phosphate buffer, pH7.0=70/30

Flow rate: 1.0mL/min

Temperature: 40℃

Detection: UV254nm

Sample: 1.Uracil 2.Butylparaben 3.Propranolol 4.Naphthalene 5.Acenaphthene 6.Amitriptyline

Injection volume: 1.0uL

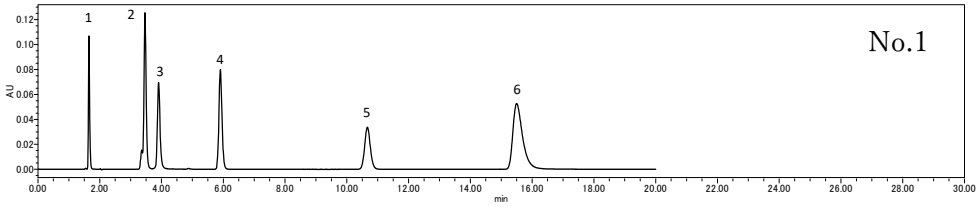
System: Waters Arc HPLC

As shown in the results above, there is a large difference in retention time between the two columns. As mentioned above, the theory of "large surface area → high carbon content → strong retention" is true, but this is not the whole story. For example, compound number 6 is a basic compound. If a column without an end cap is used under the above analysis conditions, results showing large retention and peak tailing are expected. Additionally, if Fusion C18 were not fully bound but only half bound, retention would be reduced by half, but the behavior of basic compounds would likely be the same as above. . In this way, the silica gel and bonding state can be adjusted at the manufacturing stage, making it possible to offer a wide variety of derivative products. Therefore, it is extremely difficult to make decisions based only on the parameter values listed in the catalog, and it takes a lot of time to select equivalent products.

4. Introducing Fusion C18RS

The newly developed Fusion C18RS is a silica gel base material with a specific surface area of 200m²/g, and is our first specification. In Japan, I think the mainstream is a specific surface area of around 300m²/g like Fusion C18, but columns made overseas are manufactured based on silica gel with a specific surface area of around 200m²/g. There tends to be a lot of In reality, we receive a large number of inquiries regarding similar products. With the release of Fusion C18RS, which has a lower bond density, we are now able to propose a more suitable column. Therefore, we verified whether our Fusion C18RS could be equivalent to other companies' columns.

It can be seen that Fusion C18RS provides better results overall, including retention and peak shape for basic compounds, compared to other companies' columns. In this way, by narrowing down the columns based on the parameters listed in the catalog and verifying the column using the actual column, you can select a column more accurately and understand the characteristics of the column itself.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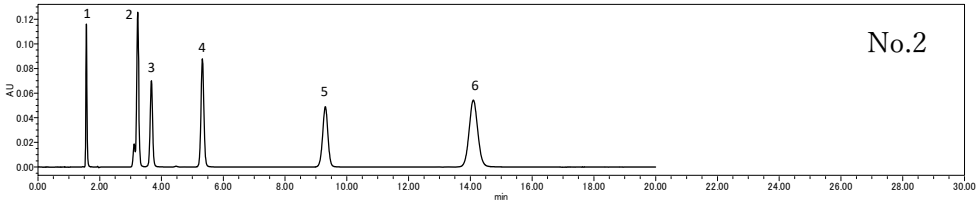
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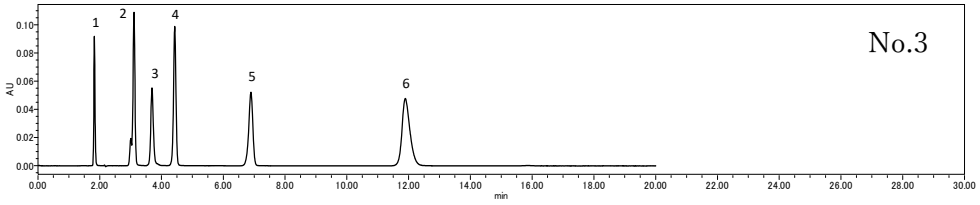
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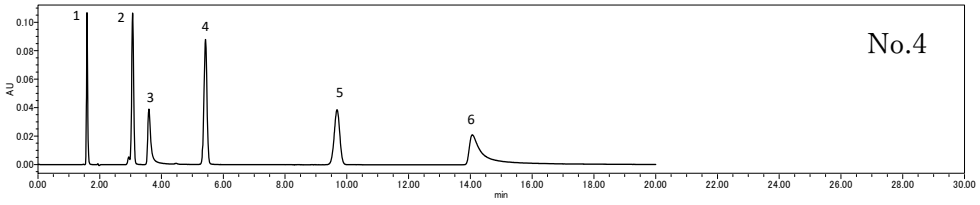
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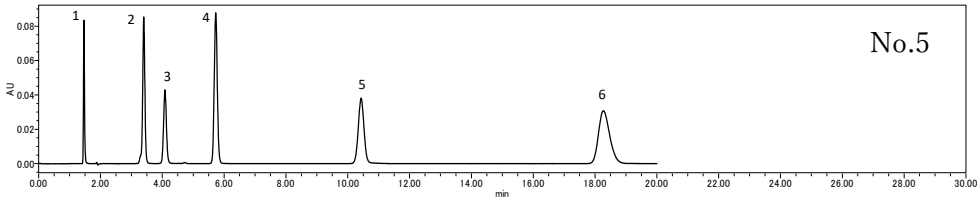
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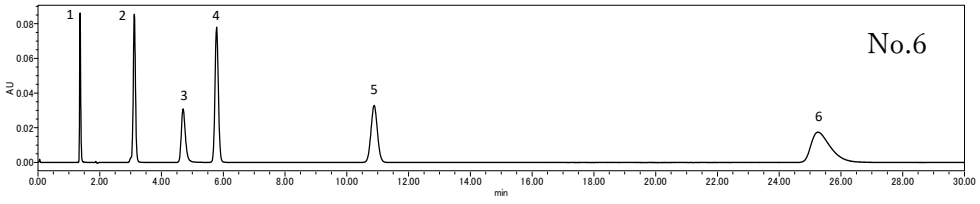
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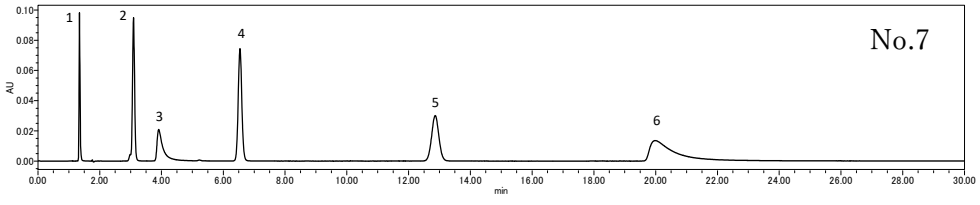
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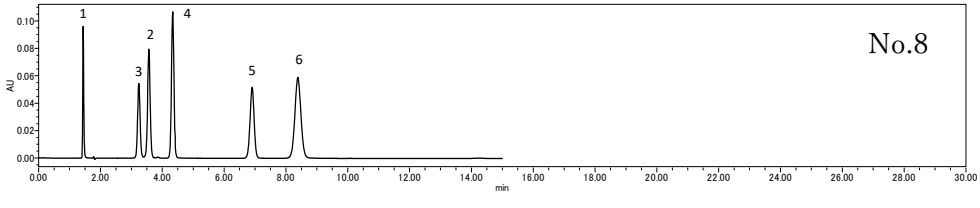
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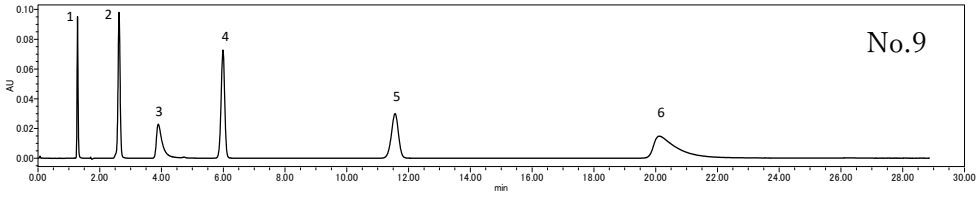
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Columns used for validation

No.	Maker	Product	Sarface area (m^2/g)	Pore size (Å)	Carbon (%)
1	Nomura	FlexFire Fusion C18RS	200	150	12
2	Waters	XBridge C18	185	130	18
3	Thermo	Hypersil GOLD	220	175	10
4	Thermo	BDS Hypersil C18	170	130	11
5	Agilent	Eclipse Plus C18	160	95	9
6	Agilent	ZORBAX SB-C18	180	80	8
7	Agilent	ZORBAX Extend-C18	180	80	12.5
8	Agilent	ZORBAX Bonus-RP	180	80	9.5
9	Agilent	Rx-C18	180	80	12

Conditions:

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NOMURA CHEMICAL

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