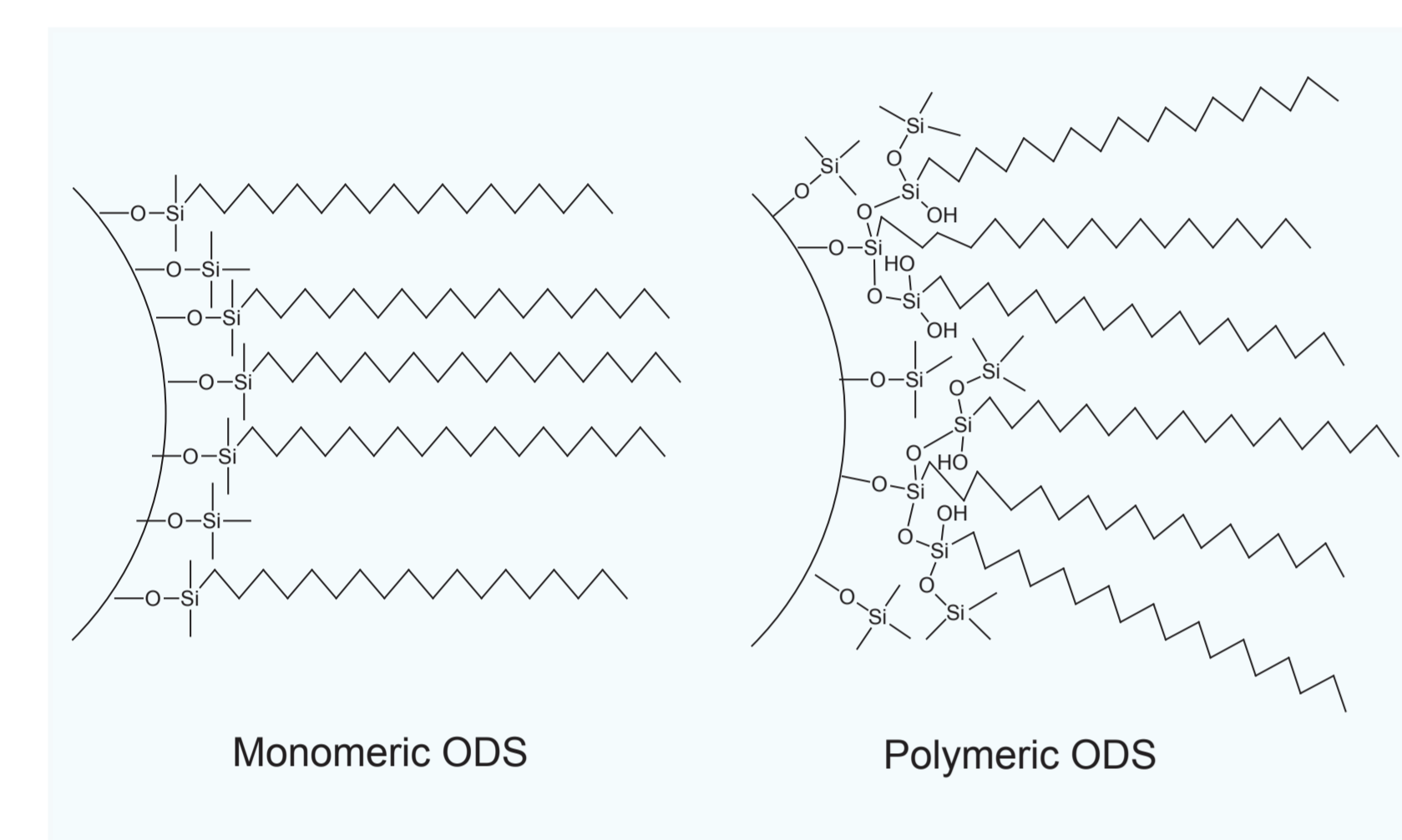


## 1. Introduction

The C18-modified silica gel packing materials are roughly classified in terms of three major categories of polymeric / monomeric bonding mode, endcapped / non-endcapped status and extent of coverage by carbon chains.

The polymeric / monomeric bonding mode mainly influences the planarity-cognitive capacity, the endcapped / non-endcapped status is associated with hydrogen bonding capacity and the extent of coverage by carbon chains gives rise to differences in hydrophobicity.

The purpose of this study is to obtain information for selecting preferable combination of these categories on the substrate- by-substrate basis.



## 2. Experiments

The following 12 kinds of modified silica gel packing materials were prepared starting from silica gel with the same surface area, pore size, and pore volume.

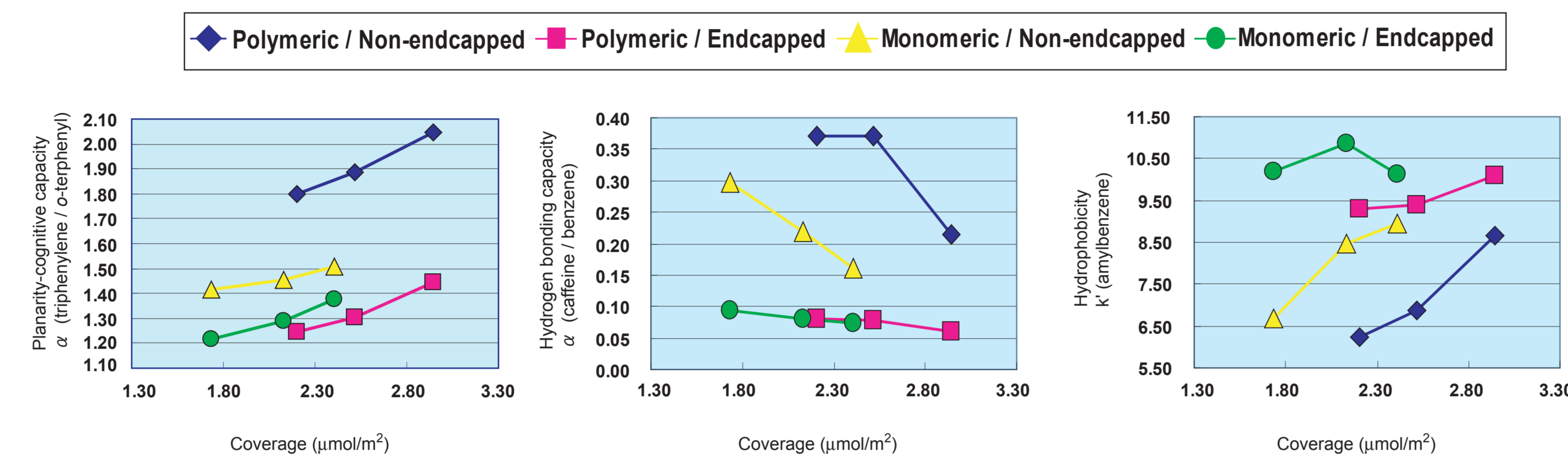
Bonding Mode	Endcapping	Carbon coverage
Polymeric	Non-endcapped	High
		Moderate
	Endcapped	High
		Moderate
Monomeric	Non-endcapped	High
		Moderate
	Endcapped	High
		Moderate

The following fundamental properties of these packing materials were investigated :

- Planarity-cognitive capacity ( $\alpha$  (triphenylene / *o*-terphenyl))
- Hydrogen bonding capacity ( $\alpha$  (caffeine / benzene))
- Hydrophobicity ( $k'$  (amylbenzene))

## 3. Results and Discussion

### Correlation between carbon coverage and each property

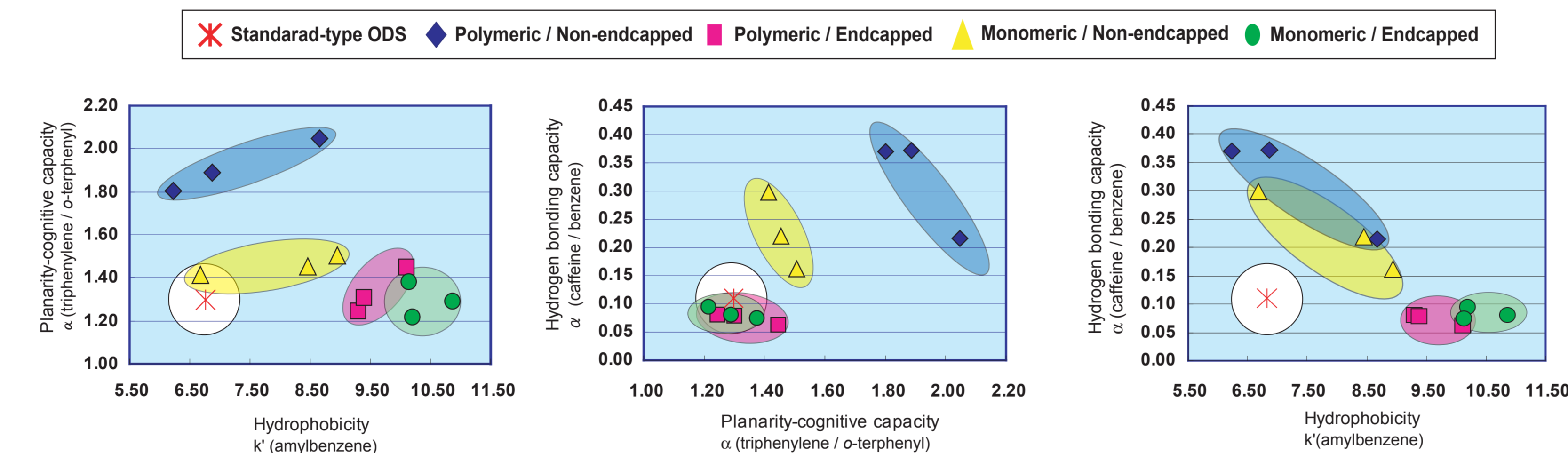


In the non-endcapped materials, the planarity-cognitive capacity is higher with the polymeric type than with the monomeric type, getting higher with increasing carbon coverage. On endcapping, the planarity-cognitive capacity decreases dramatically and the difference between the polymeric and monomeric types also disappears.

In the non-endcapped materials, the hydrogen bonding capacity decreases with increasing carbon coverage but remains high with the polymeric type until a certain level of carbon coverage. On endcapping, as a matter of course, the hydrogen bonding capacity decreases markedly and the difference between the polymeric and monomeric types also disappears.

As a matter of course, the hydrophobicity increase with increasing carbon coverage and also with endcapping. The polymeric and non-endcapped type has the lowest hydrophobicity.

### Distribution of the materials in terms of two properties each

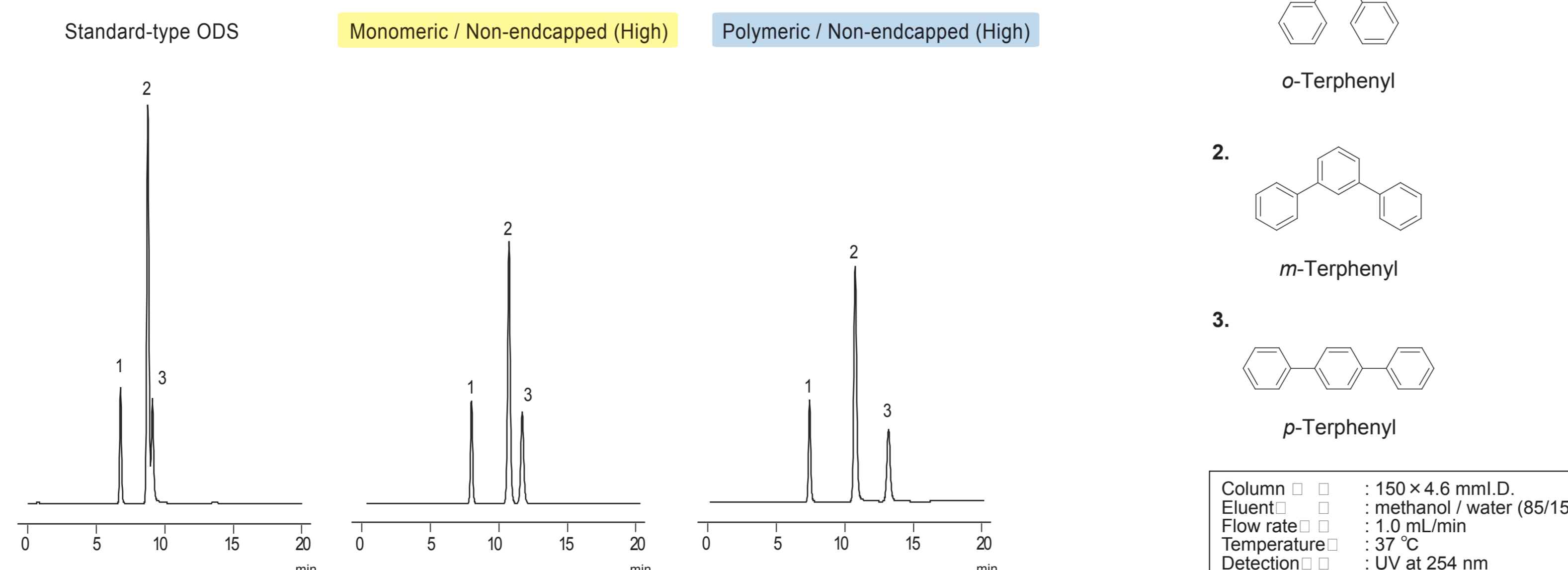


As compared with the standard-type ODS (monomeric / endcapped, marked with ✗ in the figures), the materials used in this study show great differences in the fundamental separation properties. When not endcapped, the differences between the polymeric-type and monomeric-type are particularly significant. These differences suggest a possibility that some compounds hardly separable with the standard-type ODS may be separated favorably with these materials peculiar characteristics.

## 4. Applications

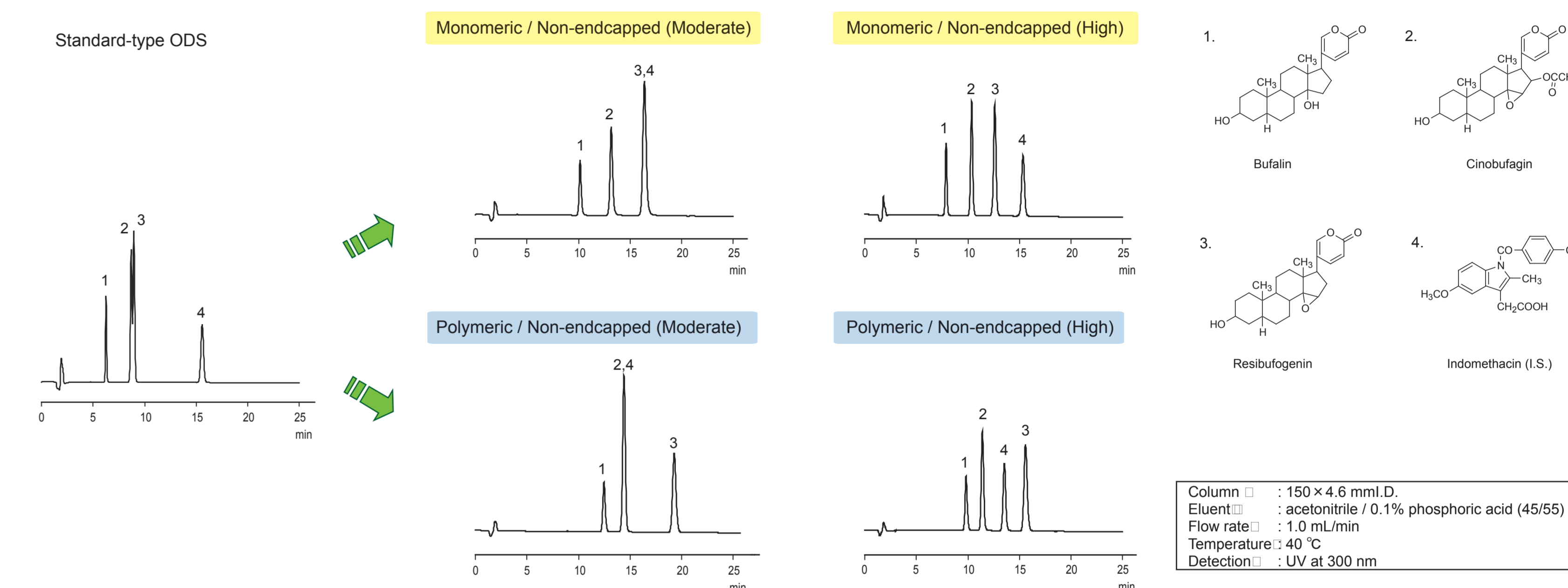
### Terphenyl Isomers

A column with excellent planarity-cognitive capacity may be able to separate structural isomers hardly separable with the standard-type ODS.



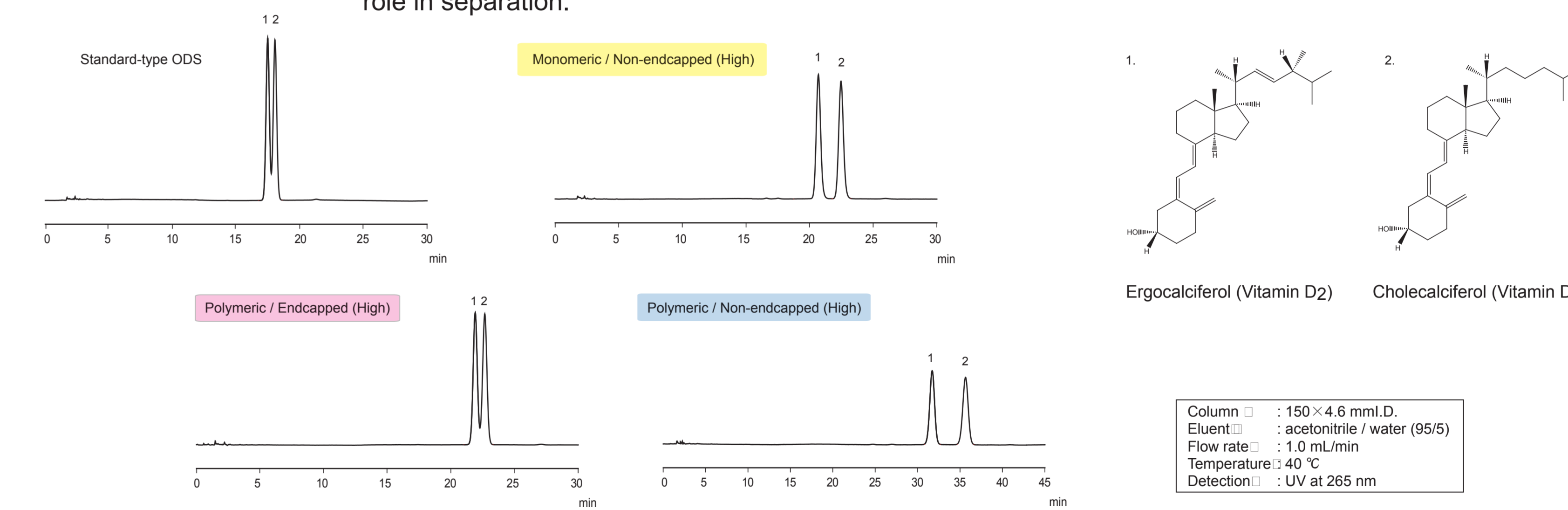
### Steroids from toad venom

Since the hydrogen bonding capacity greatly contributes to retention of hydrophilic compounds, Peak 2 and Peak 3 which are hardly separable with the standard-type ODS can be separated favorably with the non-endcapped ODS, either monomeric or polymeric.



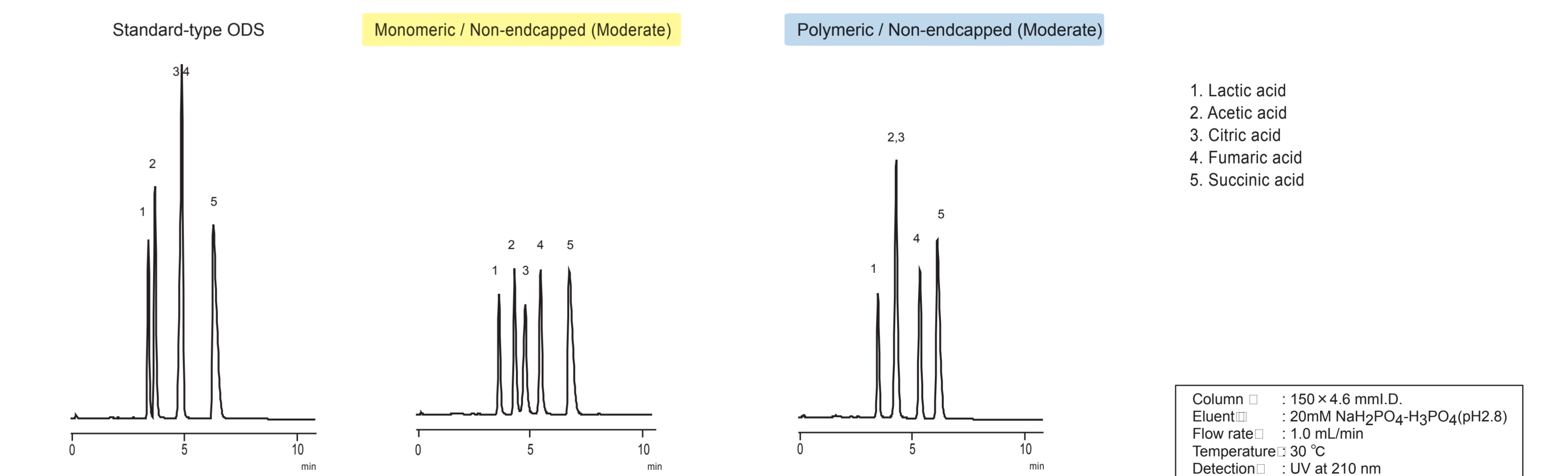
### Vitamin D<sub>2</sub> and Vitamin D<sub>3</sub>

The non-endcapped materials can separate Vitamin D<sub>2</sub> and Vitamin D<sub>3</sub> which are hardly separable with the standard-type ODS. Especially, the polymeric / non-endcapped materials show excellent separation. In this case, the planarity-cognitive capacity and hydrogen bonding capacity seem to play an important role in separation.



### Organic acids

In this case, an eluent free from organic solvent is used. The monomeric / non-endcapped material shows excellent separation. The hydrogen bonding capacity seems to be involved greatly in separation of organic acids, but an optimal degree of hydrogen bonding capacity seems to be necessary for favorable separation.



## 5. Conclusions

In this study, various combinations of the polymeric / monomeric, endcapped / non-endcapped and high coverage / low coverage characters were investigated systematically. As a result, we obtained the packing materials having greatly different properties as compared with the standard-type ODS. Some compounds hardly separable with the standard type could be separated favorably with these materials. The standard-type ODS is used as the all-round player, but the materials obtained in this study may be helpful as specialist players.