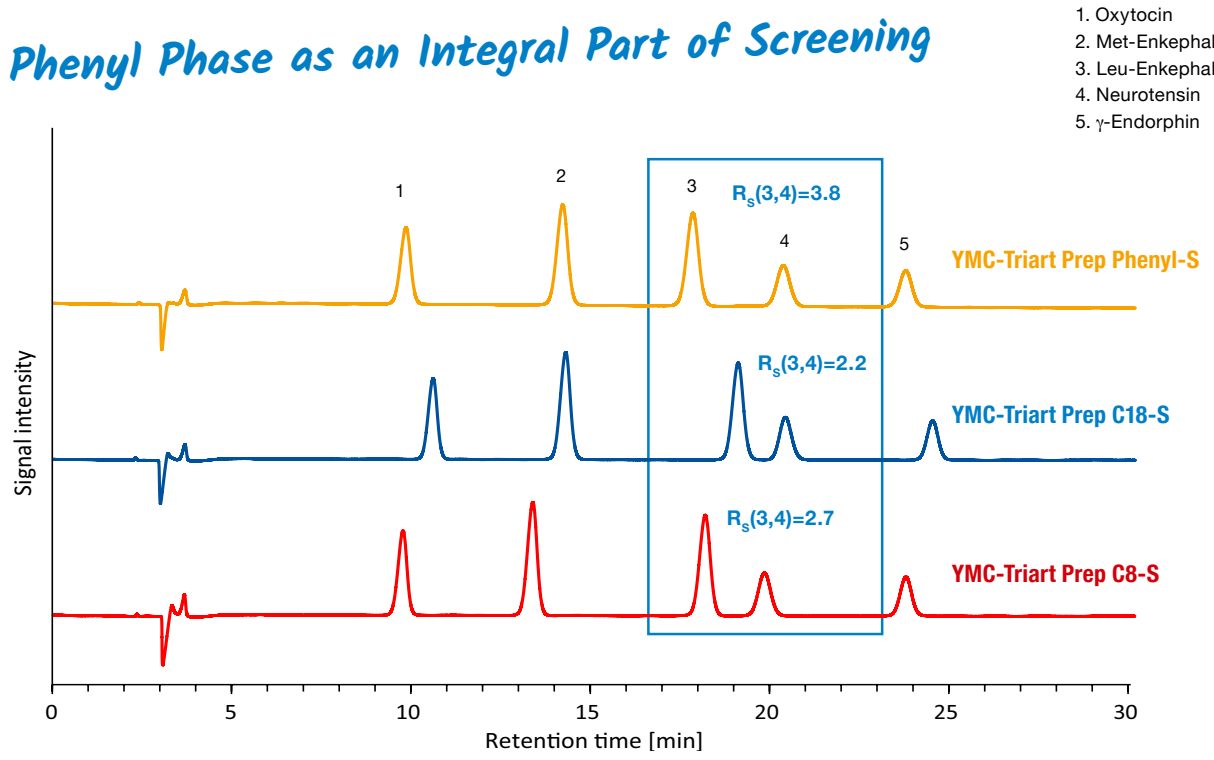
Same but Different:
About the Selectivities of Phenyl Stationary Phases

The most common RP phases have C18 or C8 modifications. But sometimes there are those challenging separations where it is not possible to improve the resolution further by method optimisation. This is the time to consider a different selectivity – such as a phenyl phase. Due to additional π-π interactions phenyl phases offer a unique selectivity and provide a useful alternative to aliphatic straight chain RP stationary phases.

In the following example, five peptides were separated using three different stationary phases: YMC-Triart Prep Phenyl-S, YMC-Triart Prep C18-S and YMC-Triart Prep C8-S. Figure 1 demonstrates that all three phases can be used for the separation of the selected peptides. Nevertheless, the phenyl phase provides higher resolution between the critical peak pair 3 and 4.

The π-electrons of the phenyl groups interact with aromatic residues of the peptide in addition to hydrophobic interactions to increase retention relative to non-aromatic species.



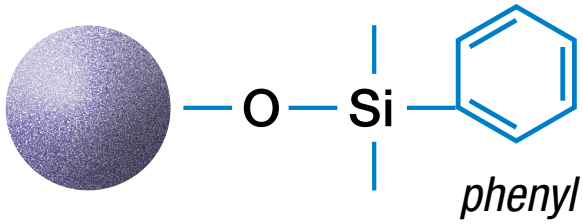
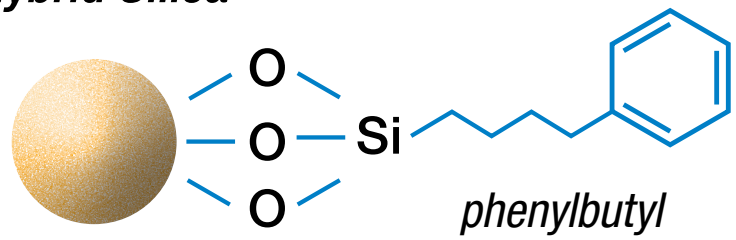
Columns:	YMC-Triart Prep Phenyl-S	(10 µm, 12 nm) 250 x 4.6 mm ID
	YMC-Triart Prep C18-S	(10 µm, 12 nm) 250 x 4.6 mm ID
	YMC-Triart Prep C8-S	(10 µm, 12 nm) 250 x 4.6 mm ID
Eluents:	A) Water + 0.1% TFA	
	B) Acetonitrile + 0.1% TFA	
Gradient:	20–40%B (0–45 min)	
Flow rate:	1.0 mL/min	
Temperature:	25 °C	
Injection:	10 µL	
Sample:	0.167 mg/mL per peptide dissolved in water	
Detection:	UV at 220 nm	

Figure 1: Separation of peptides with different properties using YMC-Triart Prep Phenyl-S, C18-S and C8-S.

YMC*Gel Ph-HG and YMC-Triart Prep Phenyl-S

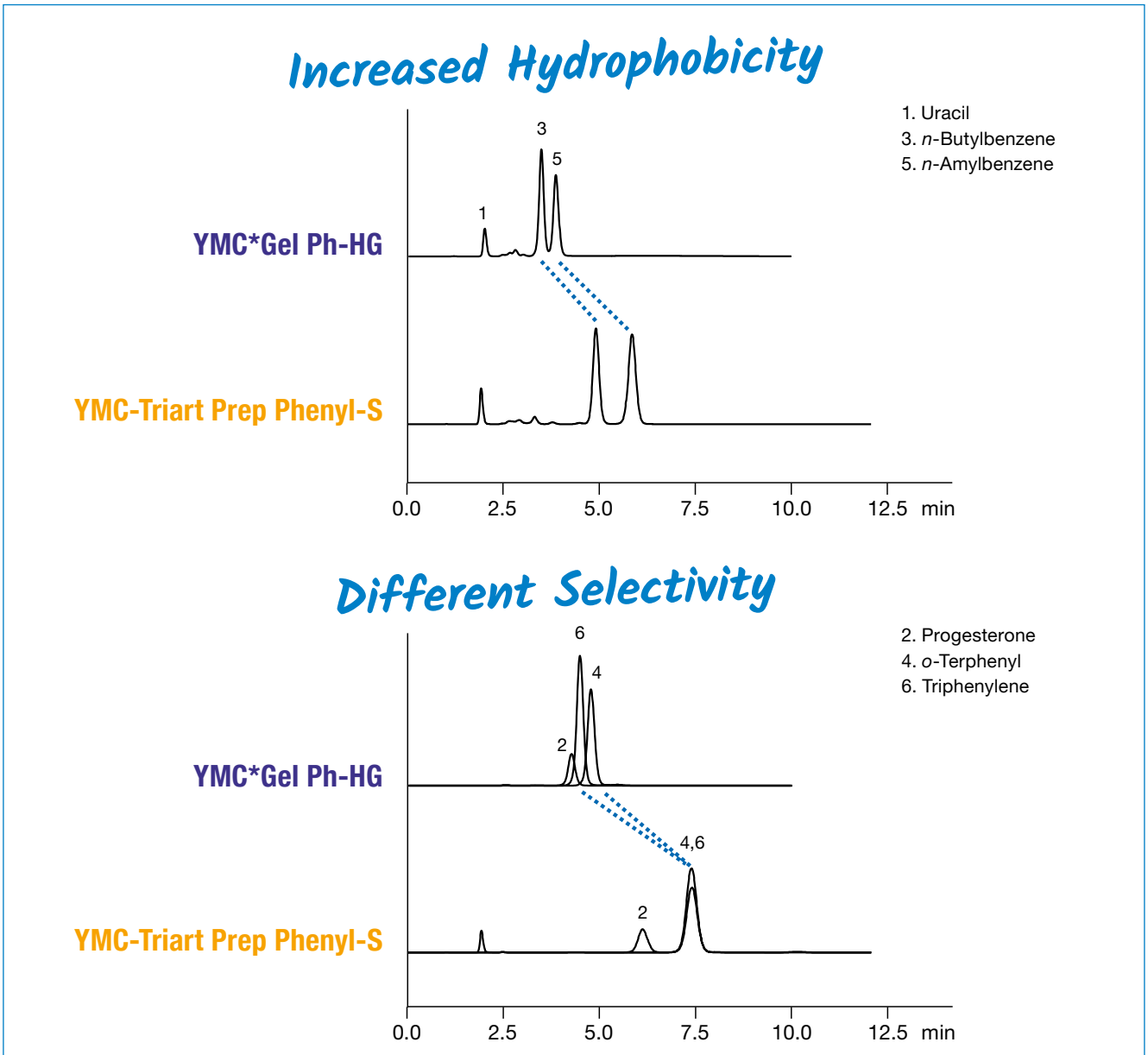
YMC offers two different phenyl stationary phases: each with its own chromatographic properties. YMC*Gel Ph-HG consists of a silica-based particle with a monofunctional phenyl bond. The modification is bound directly and without a linker, so that there is the smallest possible distance between the phase surface and the modification. YMC-Triart Prep Phenyl-S, on the other hand, is based on an organic/inorganic silica hybrid material. Here, ethylene bridges are contained within the silica network. Together with the trifunctional bonding of the phenyl group, this increases the chemical and mechanical robustness. In addition, a linker is used to create more space between the phase surface and the modification. This results in a special chromatographic performance.

Comparison of YMC*Gel Ph-HG and YMC-Triart Prep Phenyl-S

YMC*Gel Ph-HG	*Silica*  • **silica-based particles** • **monofunctional phenyl bonding** • **no linker**
YMC-Triart Prep Phenyl-S	*Hybrid Silica*  • **organic/inorganic hybrid silica particle** • **trifunctional bonding** • **butyl linker**

Hydrophobicity and Selectivity

The additional butyl linker in YMC-Triart Prep Phenyl-S is the driving force for stronger hydrophobic interactions between the stationary phase and non-polar substances. This leads to increased retention times for these compounds compared to separation using YMC*Gel Ph-HG.



Column:	150 x 3.0 mm ID
Eluent:	80 % MeOH
Flow rate:	0.425 mL/min
Temperature:	37 °C
Detection:	UV at 254 nm

*Figure 2: Differences between YMC*Gel Ph-HG and YMC-Triart Prep Phenyl-S in hydrophobicity and selectivity for several aromatic compounds.*

Based on their different functional group and bonding, these two phases have different selectivities. For steric recognition between *o*-terphenyl and triphenylene YMC*Gel Ph-HG is a better option. But for the separation of progesterone, YMC-Triart Prep Phenyl-S provides higher resolution. Depending on the chromatographic challenge, a stationary phase with suitable properties should be selected.

Conclusion

Phenyl phases are suitable alternatives to C18 or C8 phases. Their unique selectivities make them part of any screening. The additional hydrophobic and π-π interactions of phenyl stationary phases can positively alter the elution profile of aromatic and conjugated system compounds. The use of phenyl-modified phases is a great addition to any preparative LC screening.
For this purpose, YMC offers two phenyl-modified stationary phases: YMC*Gel Ph-HG and YMC-Triart Prep Phenyl-S. Both offer different selectivities due to their different properties and they are therefore a must-have in any screening set-up.

Specifications

	YMC-Triart Prep Phenyl-S	YMC*Gel Ph-HG
Base Material	organic/inorganic hybrid silica	silica
Functional Group	phenylbutyl	phenyl
Particle Size [µm]	10	10, 15, 20, (50)
Pore Size [nm]	12	12, 20, 30
Carbon Load [%]	17	9 for 12 nm, others on request
Endcapping	yes	
Bonding	trifunctional	monofunctional
pH Range	2.0–10.0 for regular use 2.0–12.0 for column cleaning	2.0–7.5

Ordering Information

YMC*Gel Ph-HG		
Pore Size [nm]	Particle Size [µm]	Product Code
12	10	PHG12S11
	15	PHG12S16
	20	PHG12S21
	50	PHG12S50
20	10	PHG20S11
	15	PHG20S16
	20	PHG20S21
30	10	PHG30S11
	15	PHG30S16
	20	PHG30S21

YMC-Triart Prep Phenyl-S		
Pore Size [nm]	Particle Size [µm]	Product Code
12	10	TPS12S11

*More information on YMC*Gel and YMC-Triart Prep can be found on our website.*