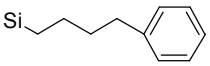
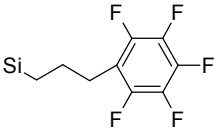
Comparison of separation selectivity among YMC-Triart series

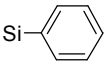
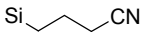
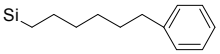
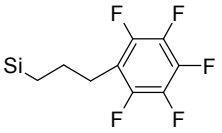
Separation of structural isomers by utilizing unique separation characteristics of Triart Phenyl/PFP

(F130201AE)

Specifications of Triart series for reversed phase chromatography

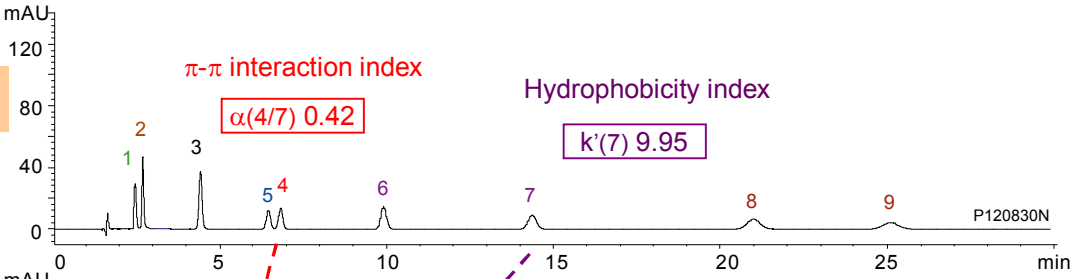
Functional group	Triart C18	Triart C8	Triart Phenyl	Triart PFP
	$Si-C_{18}H_{37}$	$Si-C_8H_{17}$		
Base	organic/inorganic hybrid silica			
Particle	5 μm, 3 μm, 1.9 μm			
Pore	12 nm			
Endcapping	Multi-stage endcapping			No
pH range	1~12		1~10	1~8
Upper limit of temperature	70℃ for pH 1~7, 50℃ for pH 7~12		50℃	

Specifications of other columns

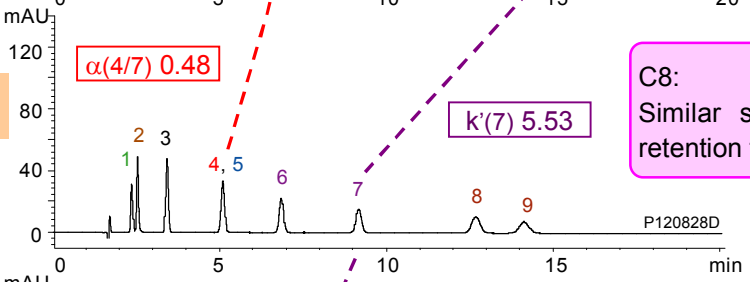
Functional group	YMC-Pack Ph	YMC-Pack CN	Conventional Phenyl-Hexyl	Conventional PFP
				
Base	Silica	Silica	Silica	Silica
Particle	5 μm, 3 μm	5 μm, 3 μm	5 μm, 3.5 μm, 1.8 μm	5 μm, 3 μm
Pore	12 nm	12 nm	9.5 nm	12 nm
Endcapping	Yes	Yes	Yes	Yes
pH range	2~7.5	2~7.5	2~8	2~7.5
Upper limit of temperature	50℃	50℃	60℃	75℃

Comparison of Separation Selectivity Among YMC Reversed Phase Columns

Triart C18

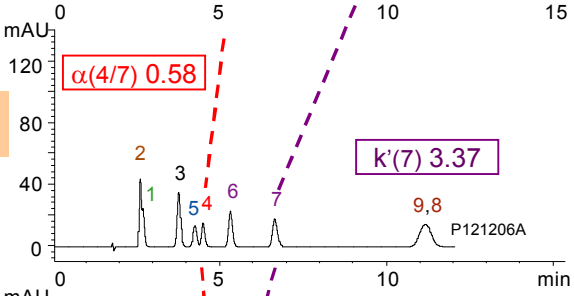


Triart C8



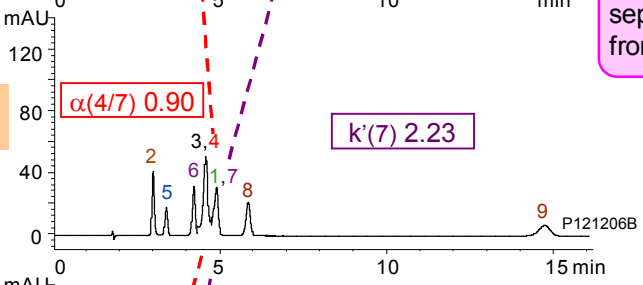
C8:
Similar selectivity to C18 and shorter retention times than C18

Triart Phenyl

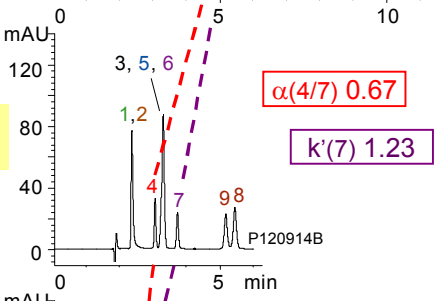


Phenyl and PFP:
π–π interaction and polar interaction as well as hydrophobic interaction contribute to separation. Different separation selectivity from Triart C18/C8.

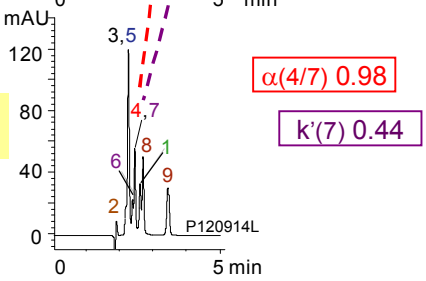
Triart PFP



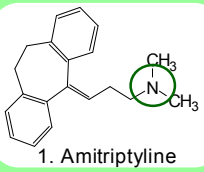
YMC-Pack Ph



YMC-Pack CN

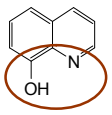


Basic



1. Amitriptyline

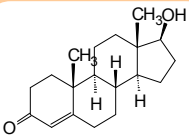
Coordination



2. 8-Quinolinol

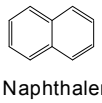
Neutral

Polar



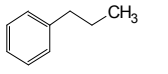
3. Testosterone

π-π interaction

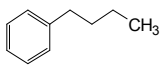


4. Naphthalene

Non-polar

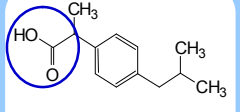


6. Propylbenzene



7. *n*-Butylbenzene

Acidic



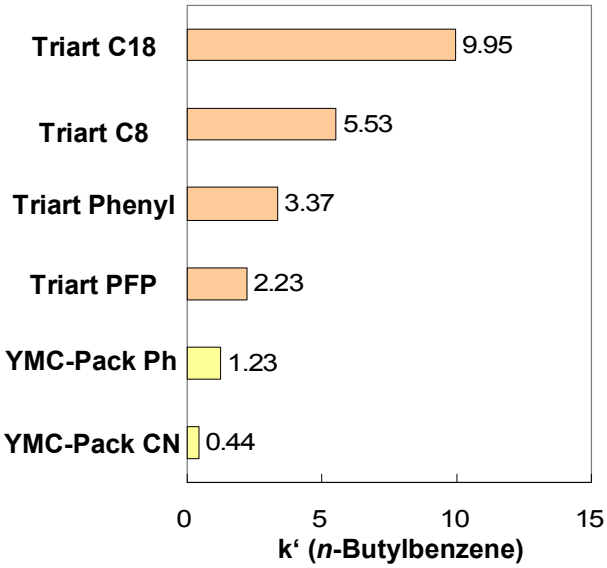
5. Ibuprofen

Planar recognition ability

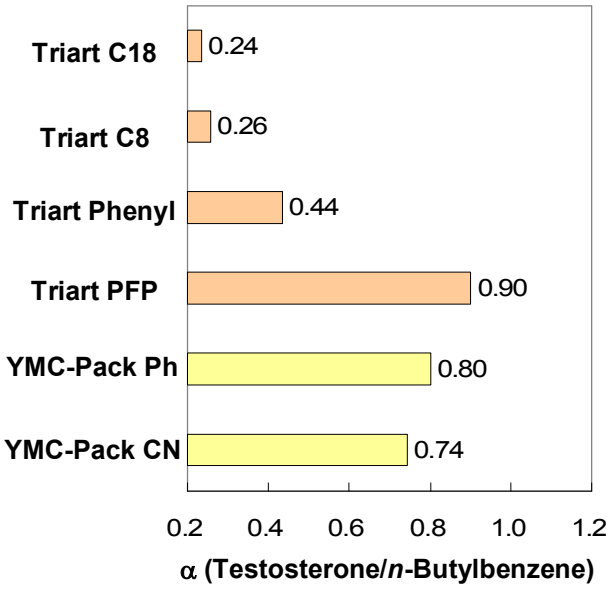
8. *o*-Terphenyl (Steric) 9. Triphenylene (Planar)

Column	: 5 µm, 150 X 3.0 mmI.D.
Eluent	: 20 mM KH_2PO_4-H_3PO_4 (pH3.1)/methanol (25/75)
Flow rate	: 0.425 mL/min
Temperature	: 40℃
Detection	: UV at 265 nm
Injection	: 4 µL

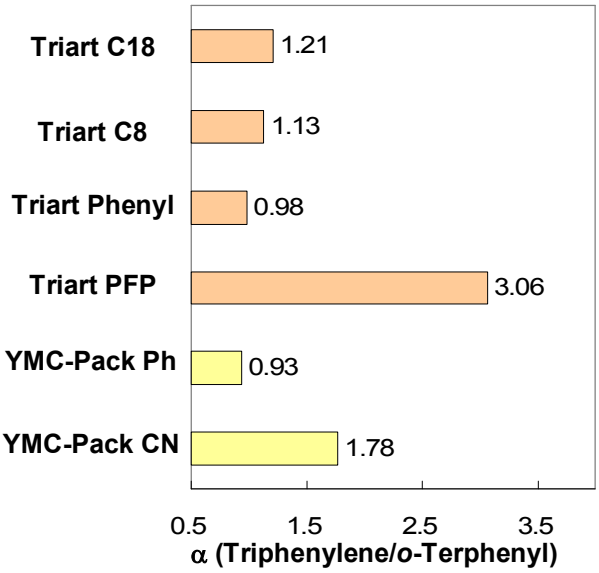
① Hydrophobicity



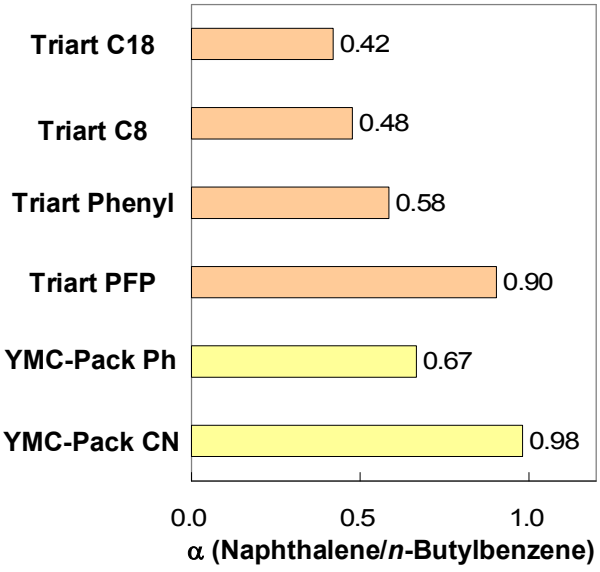
② Polarity



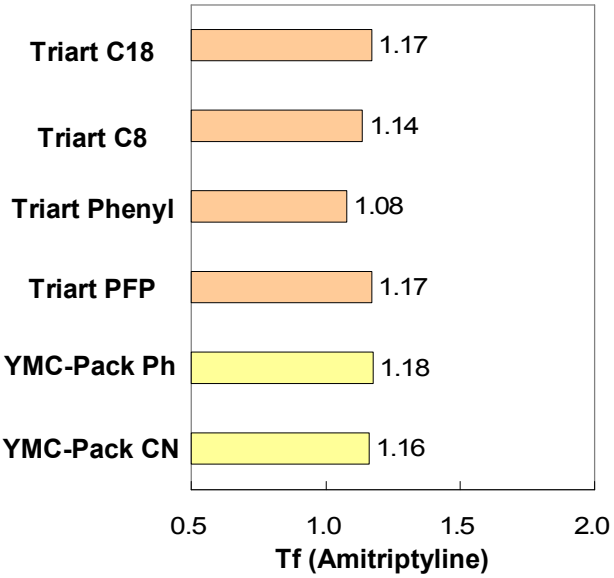
③ Planar recognition ability



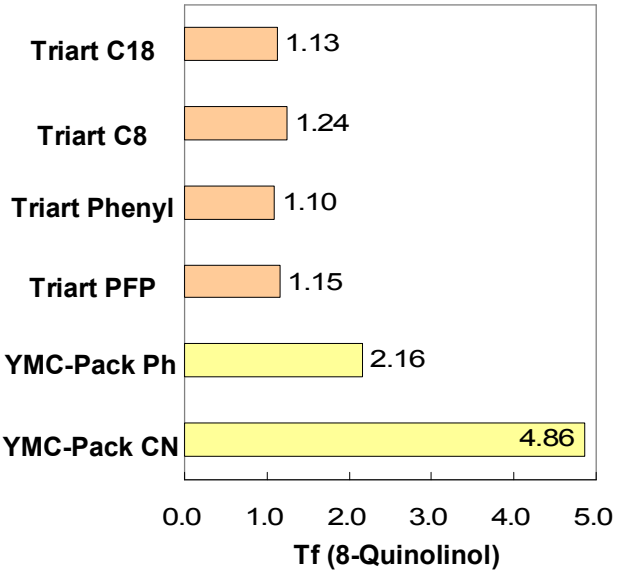
④ π–π interaction



⑤ Basic compound



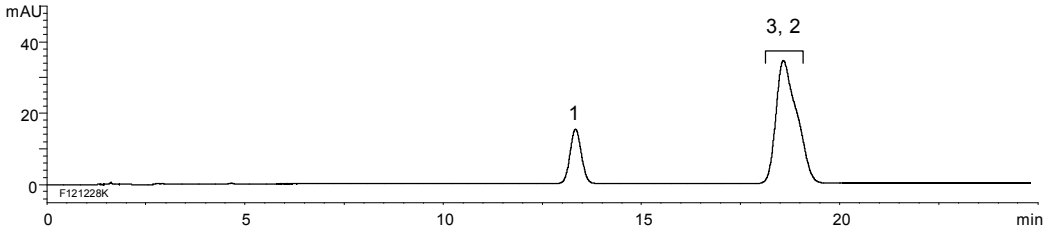
⑥ Coordination compound



Separation Comparison of Terphenyl Positional Isomers

Triart C18

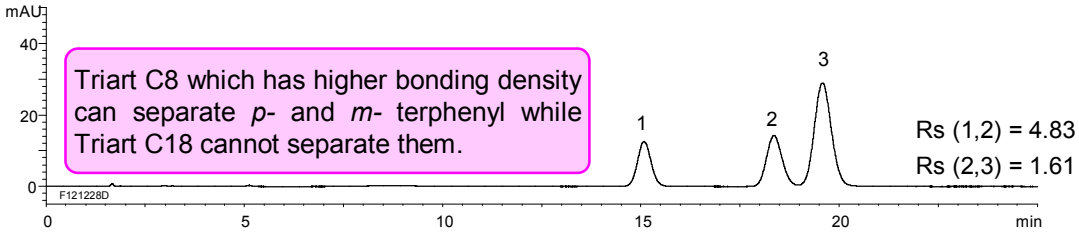
80% methanol



Triart C8

75% methanol

Triart C8 which has higher bonding density can separate *p*- and *m*- terphenyl while Triart C18 cannot separate them.

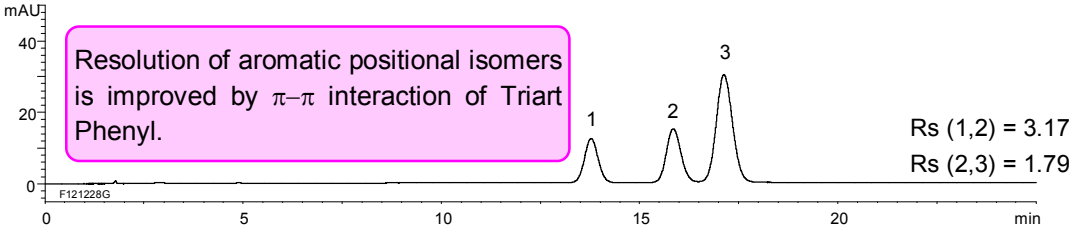


Rs (1,2) = 4.83
Rs (2,3) = 1.61

Triart Phenyl

75% methanol

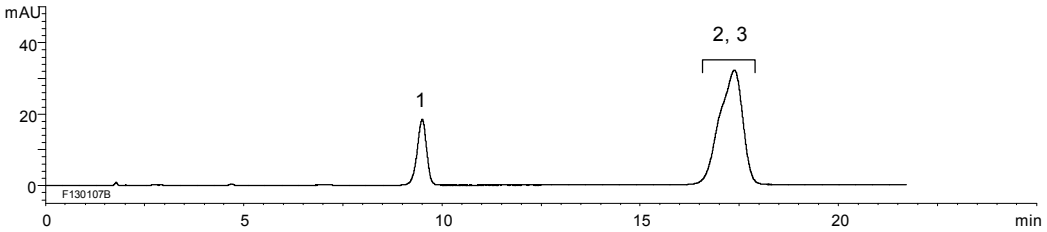
Resolution of aromatic positional isomers is improved by π–π interaction of Triart Phenyl.



Rs (1,2) = 3.17
Rs (2,3) = 1.79

Triart PFP

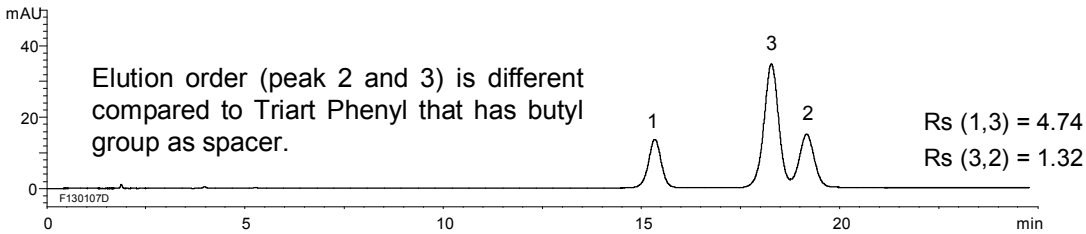
70% methanol



YMC-Pack Ph

65% methanol

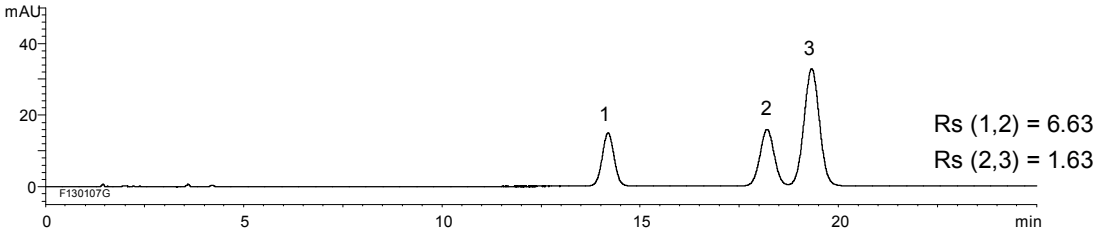
Elution order (peak 2 and 3) is different compared to Triart Phenyl that has butyl group as spacer.



Rs (1,3) = 4.74
Rs (3,2) = 1.32

Conventional Phenyl-Hexyl

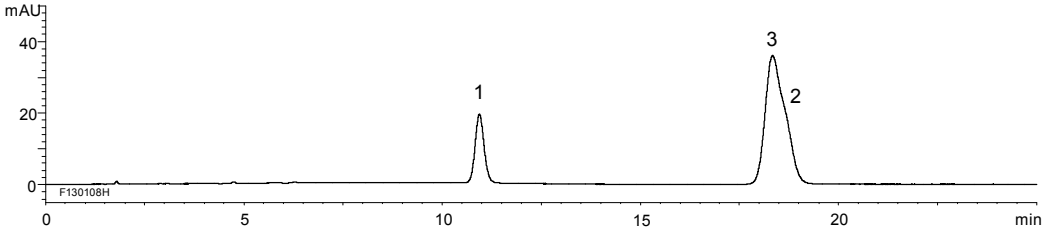
75% methanol



Rs (1,2) = 6.63
Rs (2,3) = 1.63

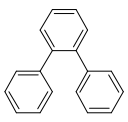
Conventional PFP

70% methanol

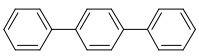


Terphenyl positional isomers

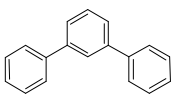
1 *o*-Terphenyl



2 *p*-Terphenyl



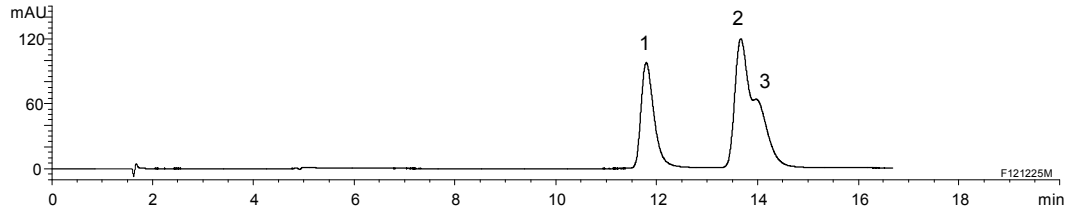
3 *m*-Terphenyl



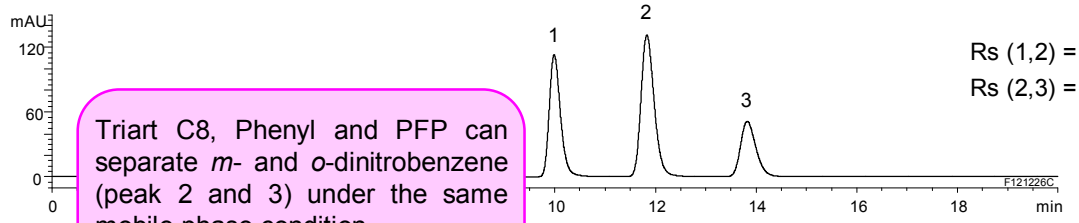
Column	: 5 µm, 150 X 3.0 or 4.6 mmI.D.
Eluent	: methanol/water
Flow rate	: 0.425 mL/min for 3.0 mmI.D. 1.0 mL/min for 4.6 mmI.D.
Temperature	: 30℃
Detection	: UV at 254 nm
Injection	: 2.0 µL for 3.0 mmI.D. 4.7 µL for 4.6 mmI.D.

Separation Comparison of Dinitrobenzene Positional Isomers

Triart C18



Triart C8

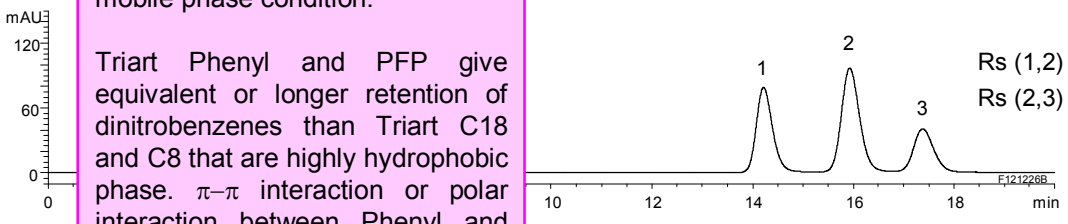


Rs (1,2) = 4.29
Rs (2,3) = 3.93

Triart C8, Phenyl and PFP can separate *m*- and *o*-dinitrobenzene (peak 2 and 3) under the same mobile phase condition.

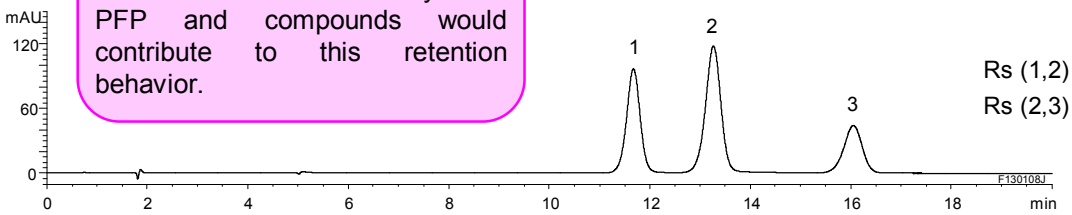
Triart Phenyl and PFP give equivalent or longer retention of dinitrobenzenes than Triart C18 and C8 that are highly hydrophobic phase. π–π interaction or polar interaction between Phenyl and PFP and compounds would contribute to this retention behavior.

Triart Phenyl



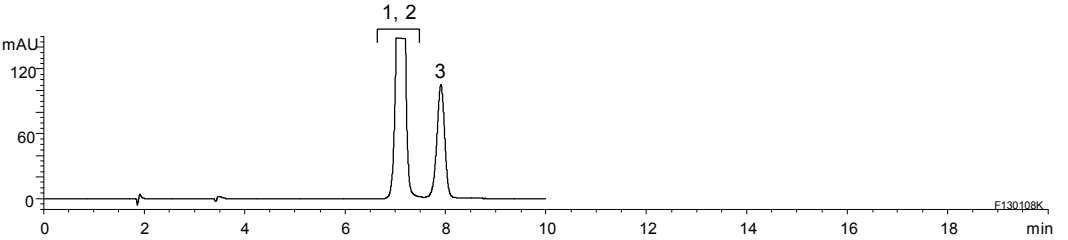
Rs (1,2) = 2.79
Rs (2,3) = 2.11

Triart PFP

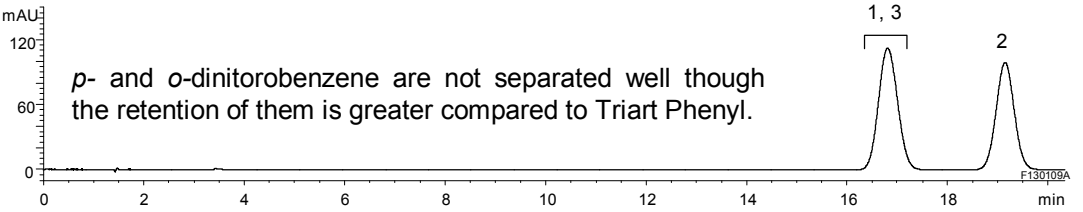


Rs (1,2) = 3.11
Rs (2,3) = 4.62

YMC-Pack Ph

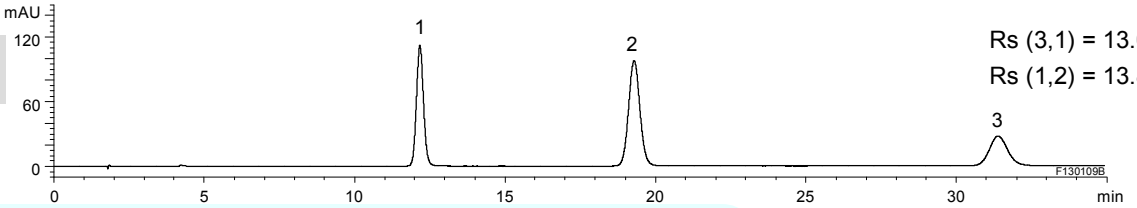


Conventional Phenyl-Hexyl



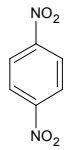
p- and *o*-dinitorobenzene are not separated well though the retention of them is greater compared to Triart Phenyl.

Conventional PFP

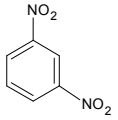


Rs (3,1) = 13.09
Rs (1,2) = 13.80

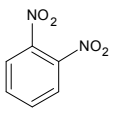
Dinitrobenznene positional isomers

1 

p-Dinitrobenzene

2 

m-Dinitrobenzene

3 

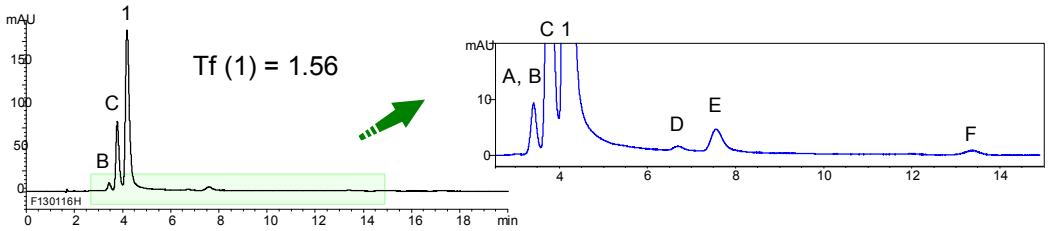
o-Dinitrobenzene

Column	: 5 µm, 150 X 3.0 or 4.6 mmI.D.
Eluent	: methanol/water (40/60)
Flow rate	: 0.425 mL/min for 3.0 mmI.D. 1.0 mL/min for 4.6 mmI.D.
Temperature	: 30℃
Detection	: UV at 254 nm
Injection	: 2.1 µL for 3.0 mmI.D. 5.0 µL for 4.6 mmI.D.

Separation Comparison of Brilliant Blue FCF and Its Impurities

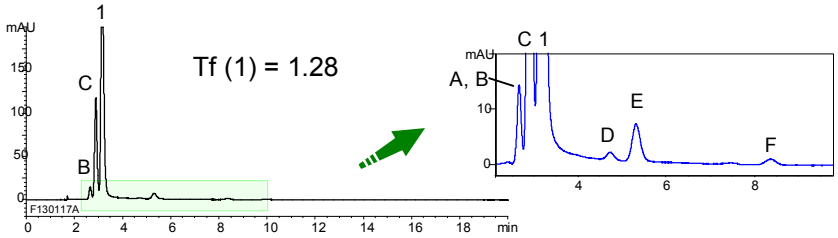
Triart C18

45% methanol



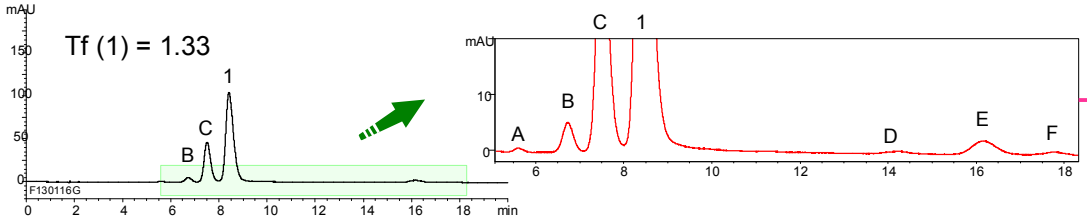
Triart C8

45% methanol



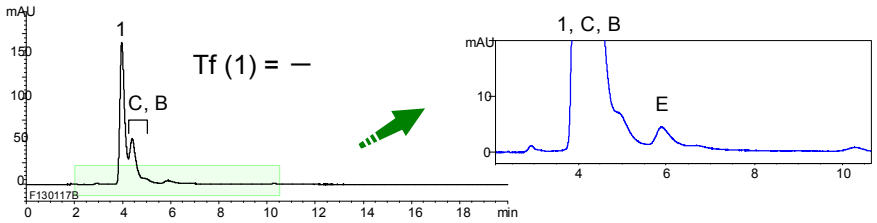
Triart Phenyl

45% methanol



Triart PFP

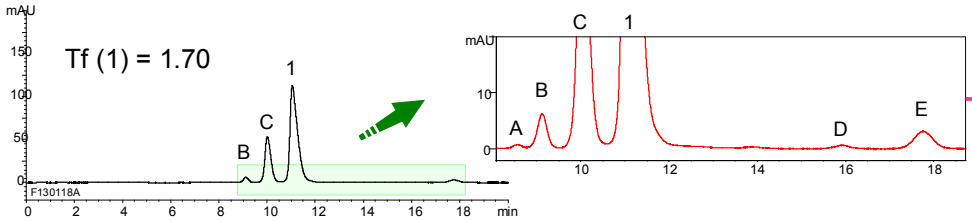
45% methanol



Elution order is different from that on phenyl or alkyl type stationary phase.

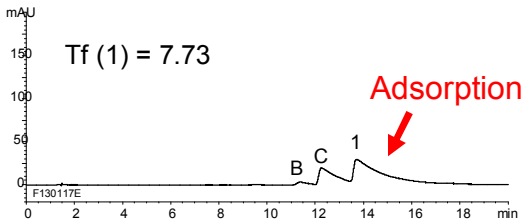
YMC-Pack Ph

55% methanol



Conventional Phenyl-Hexyl

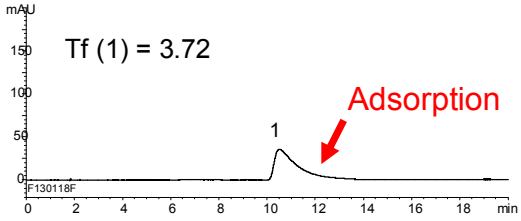
45% methanol



Phenyl type phases provide preferable retention and separation on brilliant blue FCF, acidic triphenylmethane dye, and its impurities.

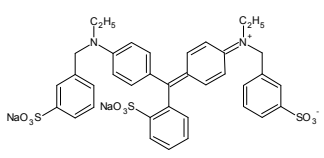
Conventional PFP

45% methanol



Brilliant blue FCF

1



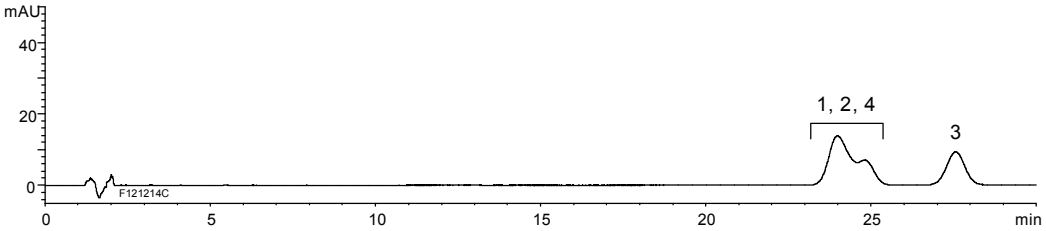
Brilliant blue FCF

A – E
: Impurities in Brilliant blue FCF reagent

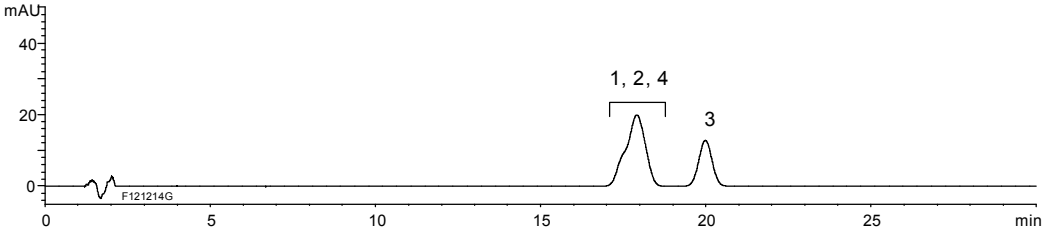
Column	: 5 µm, 150 X 3.0 or 4.6 mmI.D.
Eluent	: 0.1% phosphoric acid/methanol
Flow rate	: 0.425 mL/min for 3.0 mmI.D. 1.0 mL/min for 4.6 mmI.D.
Temperature	: 40℃
Detection	: UV at 630 nm
Injection	: 2.0 µL for 3.0 mmI.D. 4.7 µL for 4.6 mmI.D.

Separation Comparison of Piperine *cis-trans* Isomers

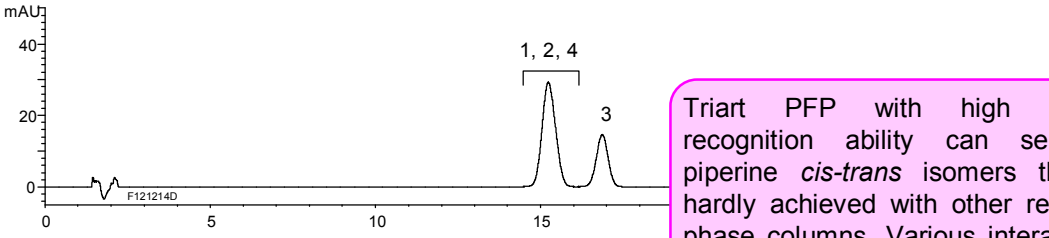
Triart C18



Triart C8

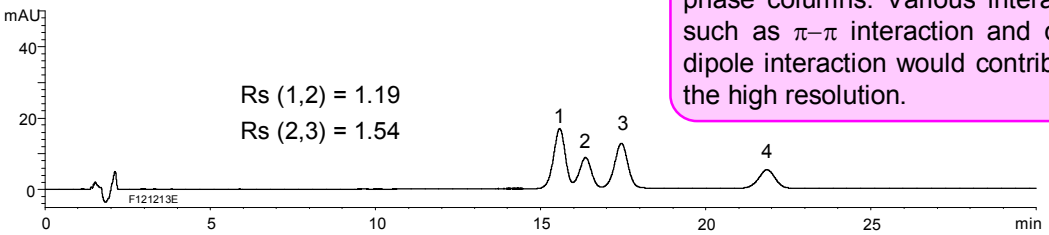


Triart Phenyl

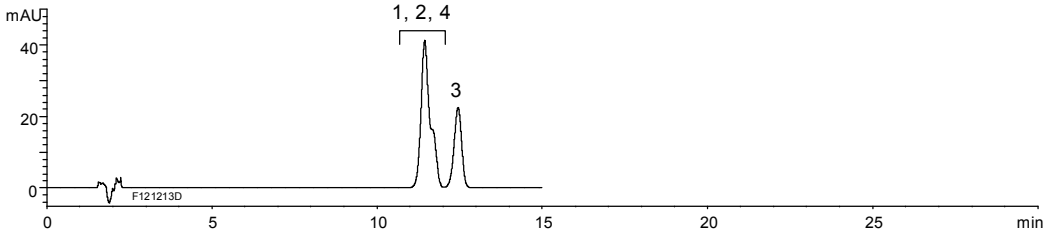


Triart PFP with high planar recognition ability can separate piperine *cis-trans* isomers that is hardly achieved with other reverse-phase columns. Various interactions such as π–π interaction and dipole-dipole interaction would contribute to the high resolution.

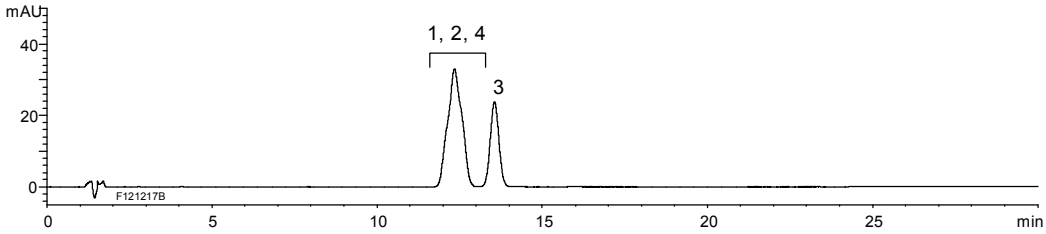
Triart PFP



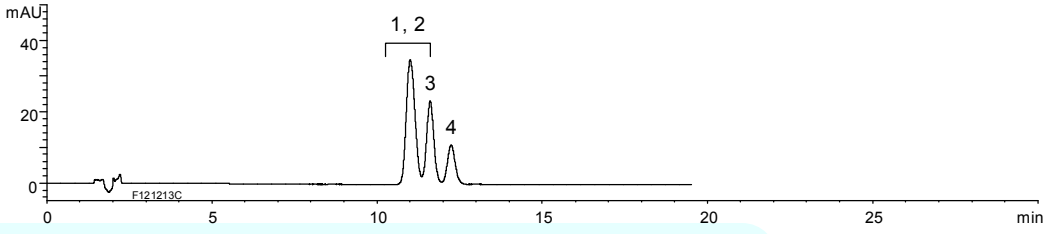
YMC-Pack Ph



Conventional Phenyl-Hexyl



Conventional PFP



Piperine and its isomers

1 **Chavicine**
Z,Z-(*cis-cis*)-piperine

2 **Isopiperine**
Z,E-(*cis-trans*)-piperine

3 **Isochavicine**
E,Z-(*trans-cis*)-piperine

4 **Piperine**
E,E-(*trans-trans*)-piperine

Column	: 5 µm, 150 X 3.0 or 4.6 mmI.D.
Eluent	: 0.1% formic acid/acetonitrile (60/40)
Flow rate	: 0.425 mL/min for 3.0 mmI.D. 1.0 mL/min for 4.6 mmI.D.
Temperature	: 25℃
Detection	: UV at 280 nm
Injection	: 4.25 µL for 3.0 mmI.D. 10.0 µL for 4.6 mmI.D.