

# YMC-Triart C18

Versatile hybrid silica based HPLC Column

**YMC**  
EUROPE GMBH  
The Selectivity Company

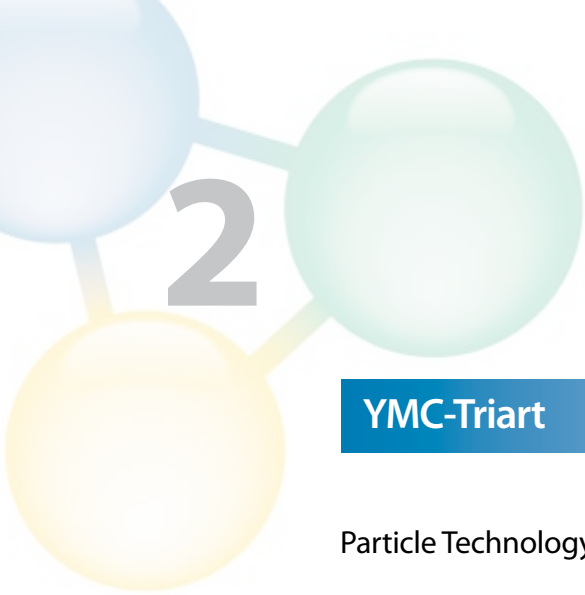


Multi-layer  
hybrid material  
for HPLC

pH and  
temperature  
stability

Innovative  
micro-reactor  
technology

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## YMC-Triart

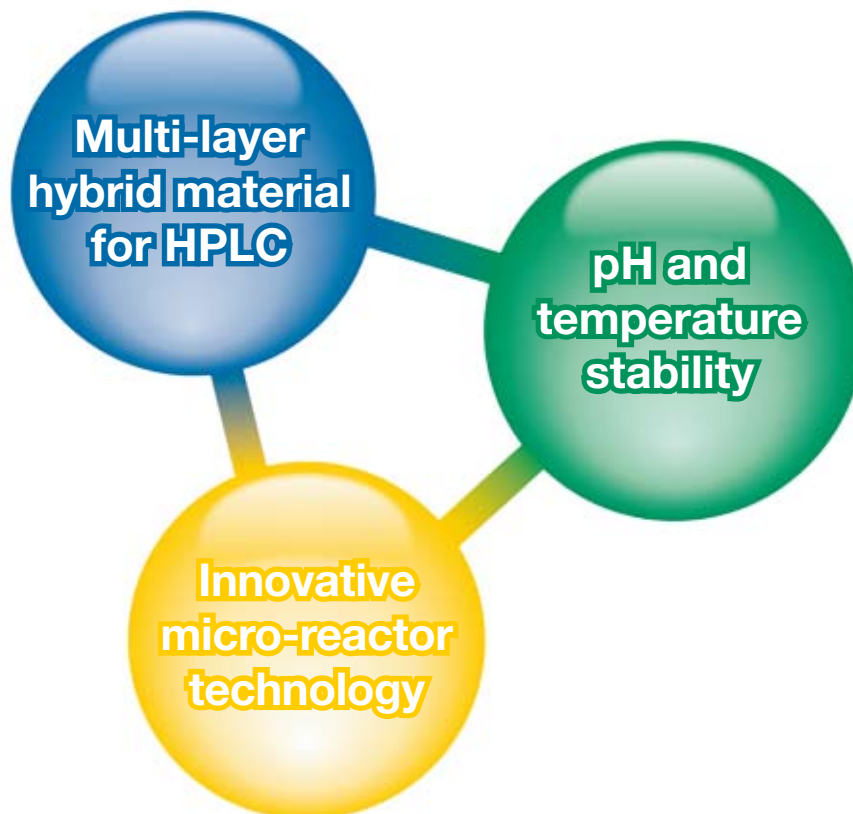
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## YMC-Triart

Chromatographers are seeking versatile HPLC columns which will perform day-to-day with ever-changing pH, buffers and temperature conditions. In order to meet these challenging demands we need HPLC columns that are able to cope with extreme conditions.

Where can one find a column suitable for harsh pH conditions in combination with high temperature ranges without sacrificing selectivity?

YMC-Triart: the versatile multi-layered hybrid silica material!



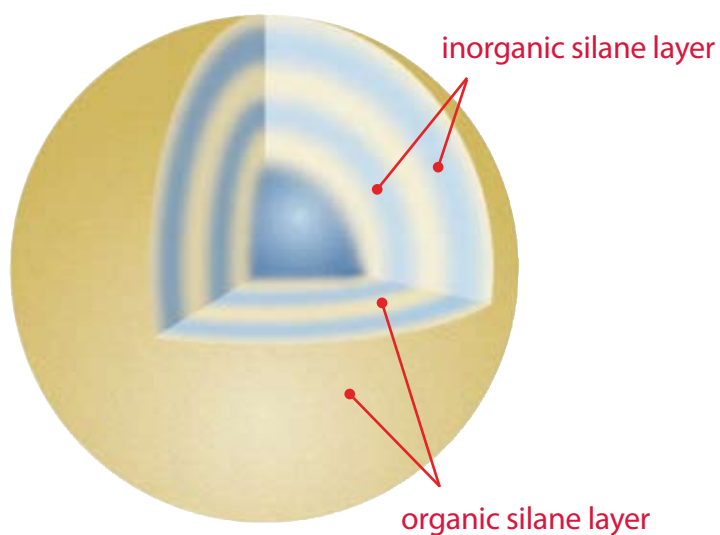
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## Particle technology

YMC-Triart is a multi-layered material prepared from well-controlled particle formation technology which is adapted from micro-reactor technology. The recently developed production step results in truly narrow particle and pore size distributions!

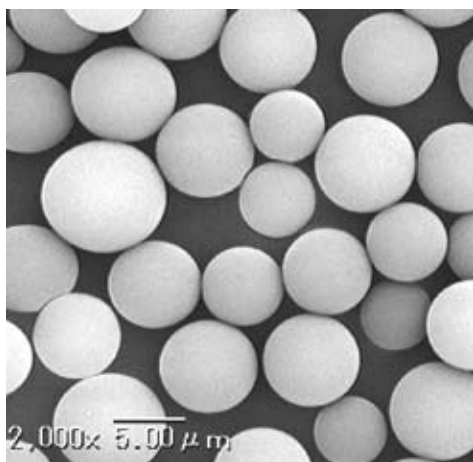
With YMC-Triart, challenging pH and high temperature conditions are no longer a limitation to the day-to-day work in laboratories. Most importantly, due to its unique particle composition, a balanced hydrophobicity and silanol activity are achieved which makes YMC-Triart a "First Choice" column in method development!

### YMC-Triart hybrid structure

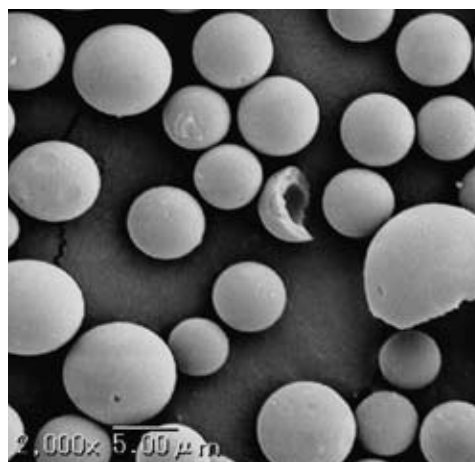


## Uniform spherical particles

YMC-Triart C18

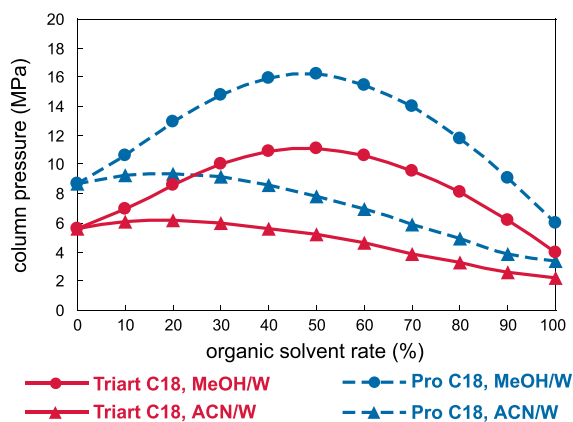


X-Bridge HILIC



The new uniform spherical particle support is adopted for YMC-Triart C18. The particle is produced using **micro-reactor** technology in granulation process. This results in reduction of the back-pressure and leads to more reproducibility in surface modification.

## Low column back-pressure



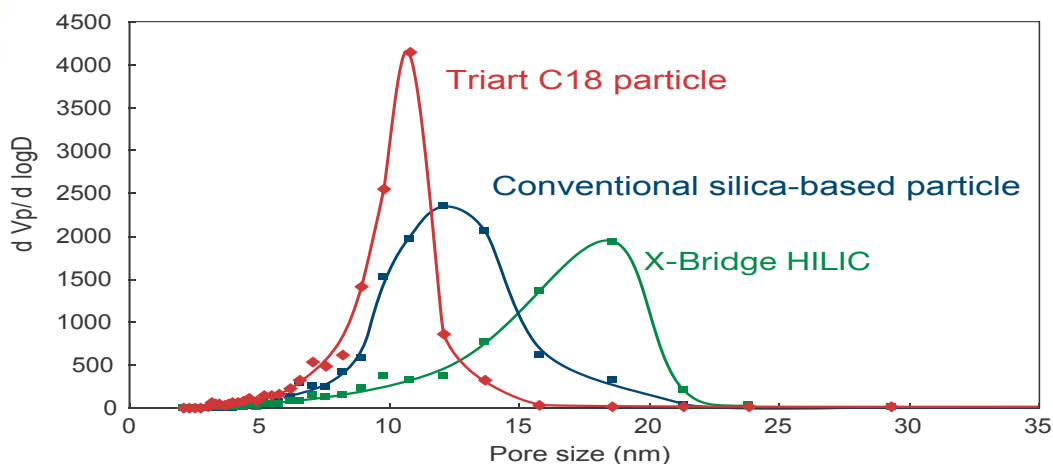
Column: 5  $\mu$ m, 150 x 4.6 mm ID  
 Eluent: acetonitrile/water or methanol/water  
 Flow rate: 1.0 ml/min  
 Temperature: 25  $^{\circ}$ C

The revolutionary production technique, adapted from micro-reactor flow technology, produces a multi-layered silica/organic hybrid stationary phase, with outstanding narrow pore size and particle size distributions which result in low back pressures.

YMC-Triart C18 is designed for use under many conditions. Elution with higher viscosity methanol (compared with acetonitrile), YMC-Triart C18 generates lower pressure (approx 30% lower than with conventional phases).

Application courtesy of YMC Co., Ltd.

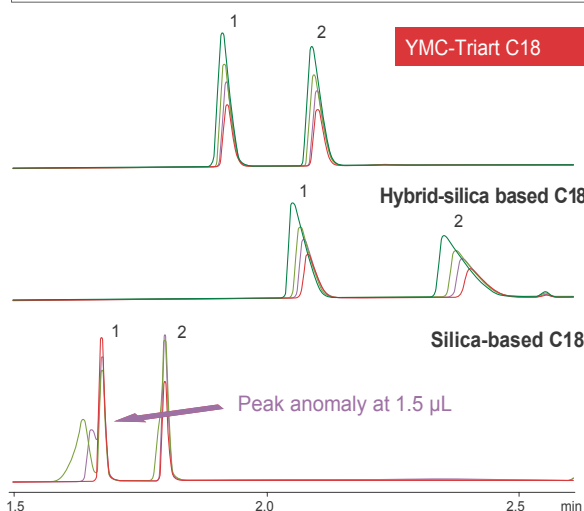
## Narrow pore distribution



This figure shows the pore size distributions of some competitive materials. Compared with other products on the market, YMC-Triart C18 shows a narrower distribution which results in sharper peak shapes.

## Improved loadability

### Influence of injection volume on peak shapes



solvent for sample

acetonitrile

injection volume

1.0 µL

1.5 µL

2.0 µL

3.0 µL

Column: 5 µm, 50 x 2.0 or 2.1 mm ID

Eluent: A) water / formic acid (100/0.1)

B) acetonitrile / formic acid (100/0.1)

5% B (0-0.5 min), 5-100% B

(0.5-2.5 min)

Flow rate: 0.4 ml/min

Temperature: 40 °C

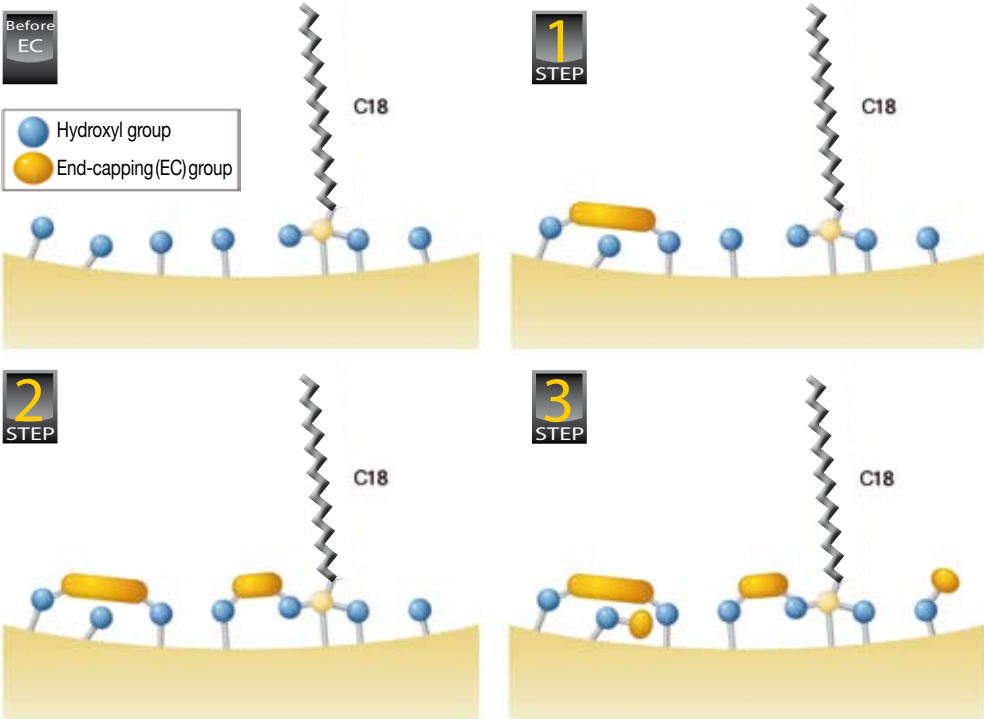
Detection: UV at 275 nm

In order to prevent peak errors, there is the limit to the injection volume when the sample is injected in high elution solvents (such as acetonitrile). Compared with traditional columns, more than double the injection volume can be injected into YMC-Triart C18 as a result of the extremely narrow particle size distribution.

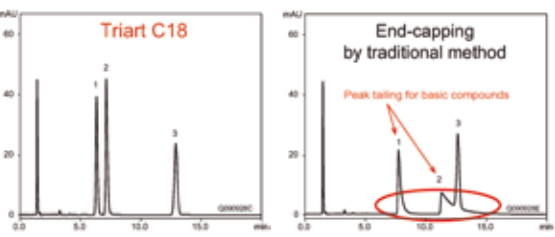
Application courtesy of YMC Co., Ltd.

## Multi-stage endcapping

After bonding the alkyl chain, there are highly reactive and less reactive silanols on the surface. In traditional bonding processes, these reacted with a single capping-compound in one step. However, the highly reactive silanols can be hydrolysed easily which contributes to the poor durability. The less reactive silanols are hard to endcap which results in poor resolution due to peak tailing.



YMC-Triart C18 uses a new innovation in end capping called "multistage end-capping" for its surface modification process. By using a number of compounds with the different reactivities in successive steps, all silanols can be capped to the maximum extent.



Ingredients in cough/cold medication:  
 1. Chlorpheniramine; 2. Dextromethorphan;  
 3. Propyl *p*-hydroxybenzoate

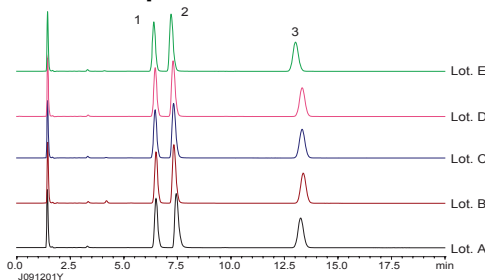
Column: 5  $\mu$ m, 150 x 3.0 mm ID  
 Eluent: 20 mM  $\text{KH}_2\text{PO}_4$ - $\text{K}_2\text{HPO}_4$  (pH 6.9) / acetonitrile (65/35)  
 Flow rate: 0.425 ml/min  
 Temperature: 40  $^\circ\text{C}$   
 Detection: UV at 235 nm

Application courtesy of YMC Co., Ltd.

## Batch-to-Batch reproducibility

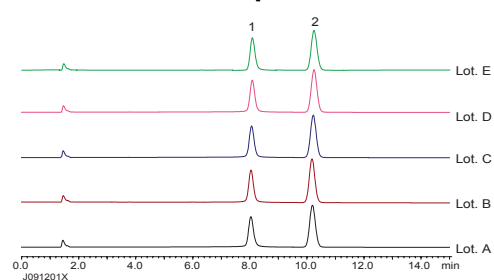
Excellent reproducibility of YMC-Triart C18 is shown even for the analysis for basic and coordination compounds which normally exhibit tailing and adsorption effects.

### Basic compounds



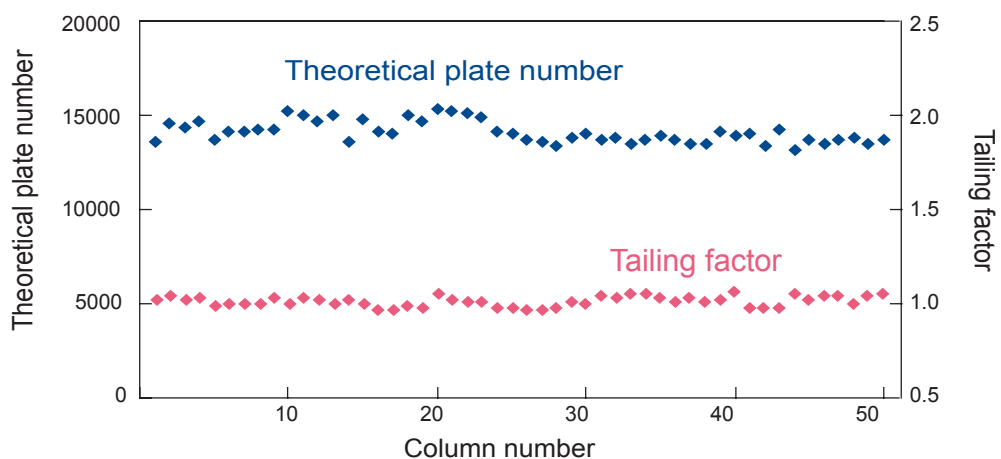
Column: 5  $\mu\text{m}$ , 150 x 3.0 mm ID  
 Eluent: 20mM  $\text{KH}_2\text{PO}_4$  (pH 6.9) / acetonitrile (65/35)  
 Flow rate: 0.425 ml/min  
 Temperature: 40  $^\circ\text{C}$   
 Detection: UV at 235 nm

### Coordination compounds



Column: 5  $\mu\text{m}$ , 150 x 3.0 mm ID  
 Eluent: acetonitrile / 0.1%  $\text{H}_3\text{PO}_4$  (40/60)  
 Flow rate: 0.425 ml/min  
 Temperature: 40  $^\circ\text{C}$   
 Detection: UV at 254 nm

The reproducibility of packed columns is shown below in terms of theoretical plate number (N) and tailing factor (Tf). YMC Triart C18 packed columns exhibit a very narrow range of variation.

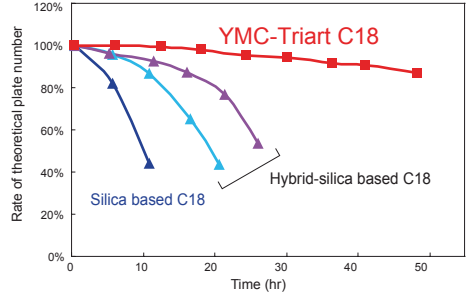


Column: 5  $\mu\text{m}$ , 150 x 4.6 mm ID  
 Eluent: acetonitrile / water (40/60)  
 Flow rate: 1.0 ml/min  
 Temperature: ambient  
 Sample: butyl benzoate

Application courtesy of YMC Co., Ltd.

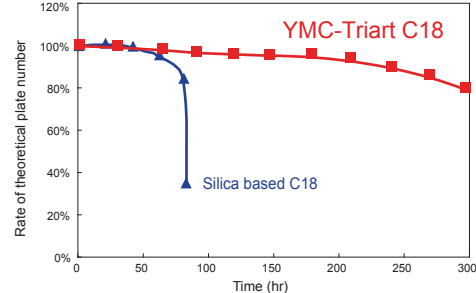
## Versatile wide pH stability

### Phosphate buffer (pH 11.5, 40 °C)



Column: 5 μm, 150 x 4.6 mm ID  
 Eluent: 50 mM K<sub>2</sub>HPO<sub>4</sub>-K<sub>2</sub>HPO<sub>4</sub> (pH 11.5) / methanol (90/10)  
 Flow rate: 1.0 ml/min  
 Temperature: 40 °C  
 Sample: benzyl alcohol

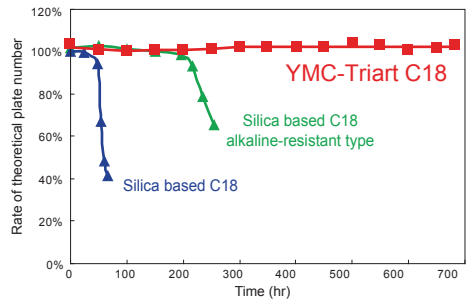
### Triethylamine (pH 11.5, 40 °C)



Column: 5 μm, 150 x 4.6 mm ID  
 Eluent: 50 mM triethylamine (pH 11.5) / methanol (90/10)  
 Flow rate: 1.0 ml/min  
 Temperature: 40 °C  
 Sample: benzyl alcohol

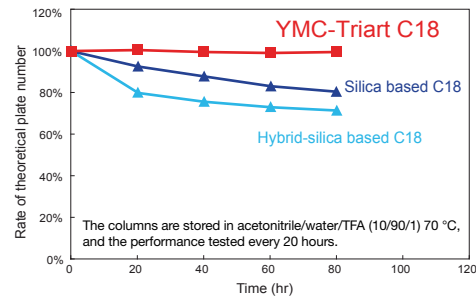
## Durability at high temperature

### pH 6.9, 70 °C



Column: 5 μm, 50 x 2.0 mm ID  
 Eluent: 20 mM KH<sub>2</sub>PO<sub>4</sub>-K<sub>2</sub>HPO<sub>4</sub> (pH 6.9) / acetonitrile (90/10)  
 Flow rate: 0.2 ml/min  
 Temperature: 70 °C  
 Sample: phenol

### pH 1, 70 °C



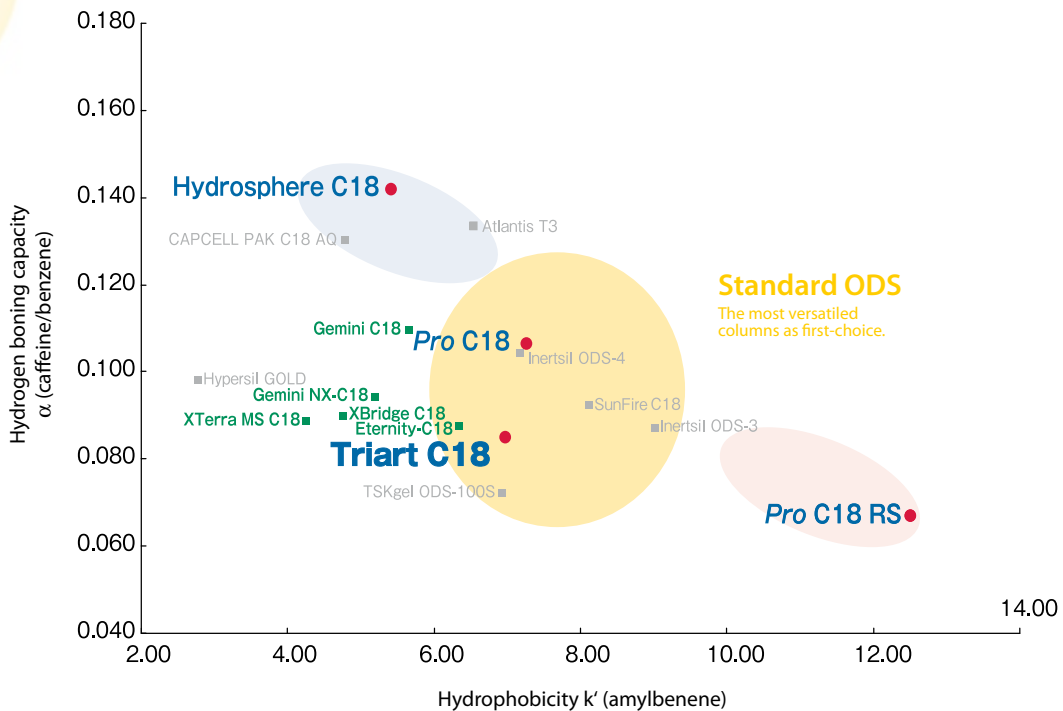
Test conditions  
 Column: 5 μm, 50 x 2.0 mm ID  
 Eluent: acetonitrile / water (60/40)  
 Flow rate: 0.2 ml/min  
 Temperature: 70 °C  
 Sample: butyl benzoate

The columns are stored in acetonitrile/water/TFA (10/90/1) 70 °C, and the performance tested every 20 hours.

YMC-Triart C18 shows great chemical stability provided by newly developed hybrid-silica. Even in high-pH or high-temperature conditions, the lifetime of YMC-Triart C18 is more than 10x greater than conventional ODS columns.

Application courtesy of YMC Co., Ltd.

## First choice column for method development



Conventional hybrid silica-based ODS columns tend to be less hydrophobic than silica-based columns. YMC-Triart C18 has a higher carbon load, making its hydrophobicity comparable to standard ODS columns, making it a "versatile first-choice" column for method development.

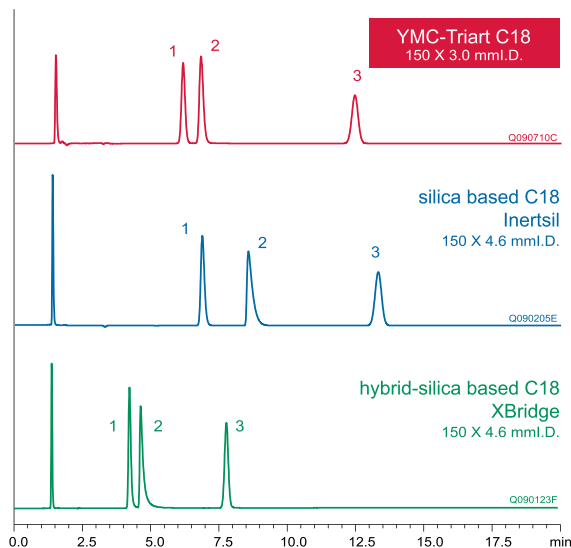
## Specification

Base	organic/inorganic silica
Stationary phase	C18 (as USP L1)
Particle size	3 and 5 $\mu\text{m}$
Pore size	12 nm
Carbon load	20%
Bonding	polymeric type
End-capping	multi-stage hybrid groups
pH range	1 ~ 12
Temperature range	pH 1-7: 70 °C, pH 7-12: 50 °C

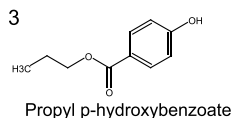
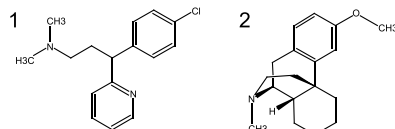


Application courtesy of YMC Co., Ltd.

## Basic compounds



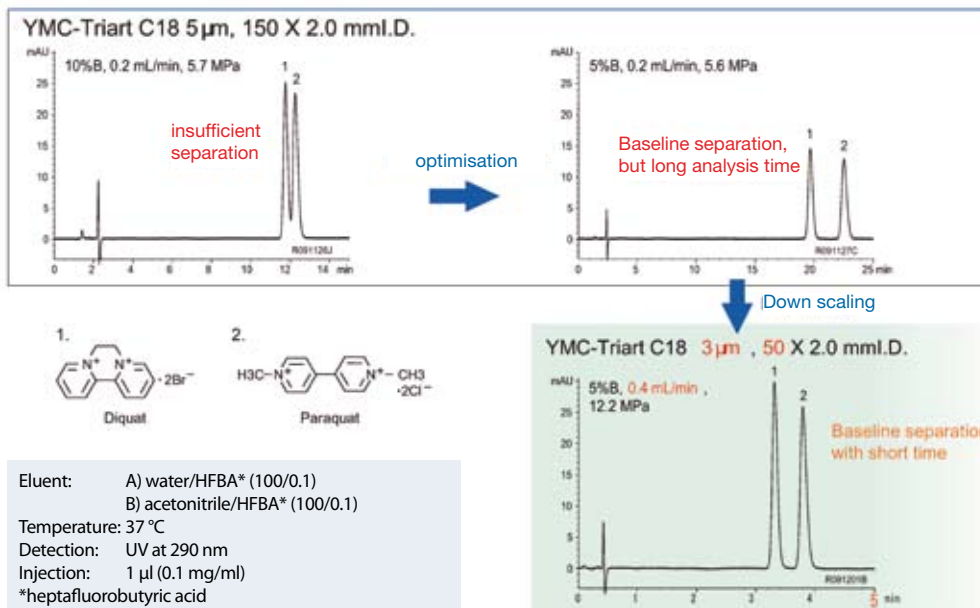
### Ingredients in a cough/cold medication



Column: 5  $\mu$ m, 150 x 3.0 or 150 x 4.6 mm ID  
 Eluent: 20 mM  $\text{KH}_2\text{PO}_4$ - $\text{K}_2\text{HPO}_4$  (pH 6.9) / acetonitrile (65/35)  
 Flow rate: 0.425 ml/min for 3.0 mm ID  
 1.0 ml/min for 4.6 mm ID  
 Temperature: 40 °C  
 Detection: UV at 235 nm

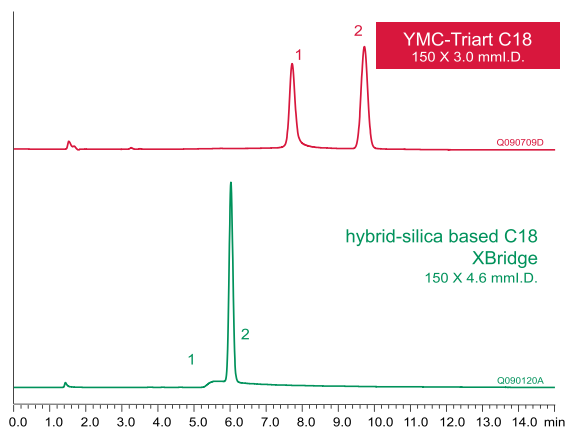
The innovative surface modification technology results in excellent peak shapes even for basic compounds that often exhibit peak tailing with conventional silica- and hybrid silica-based ODS columns.

## Fast LC for conventional HPLC

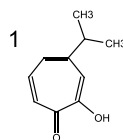


Application courtesy of YMC Co., Ltd.

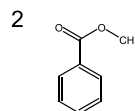
## Coordinating compounds



Hinokitiol



Hinokitiol

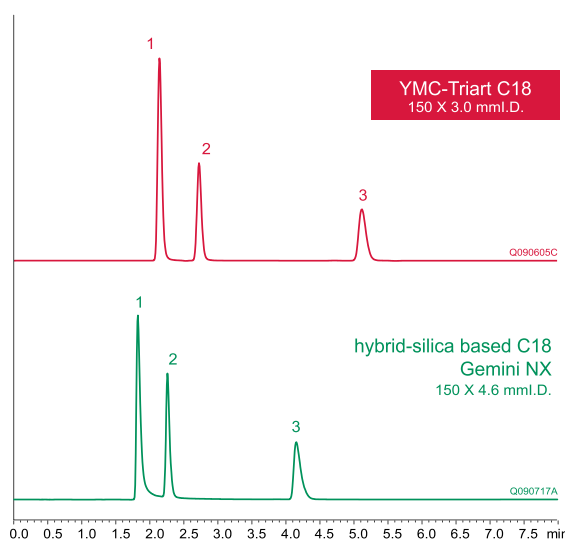


Methyl benzoate

Column: 5  $\mu$ m, 150 x 3.0 or 150 x 4.6 mm ID  
 Eluent: acetonitrile / 0.1% H<sub>3</sub>PO<sub>4</sub> (40/60)  
 Flow rate: 0.425 ml/min for 3.0 mm ID  
 1.0 ml/min for 4.6 mm ID  
 Temperature: 40 °C  
 Detection: UV at 254 nm

YMC-Triart C18 has an extremely low level of metal impurities, much lower than conventional products, enabling to provide excellent peak shape for coordination compounds.

## Acidic compounds



Organic acid

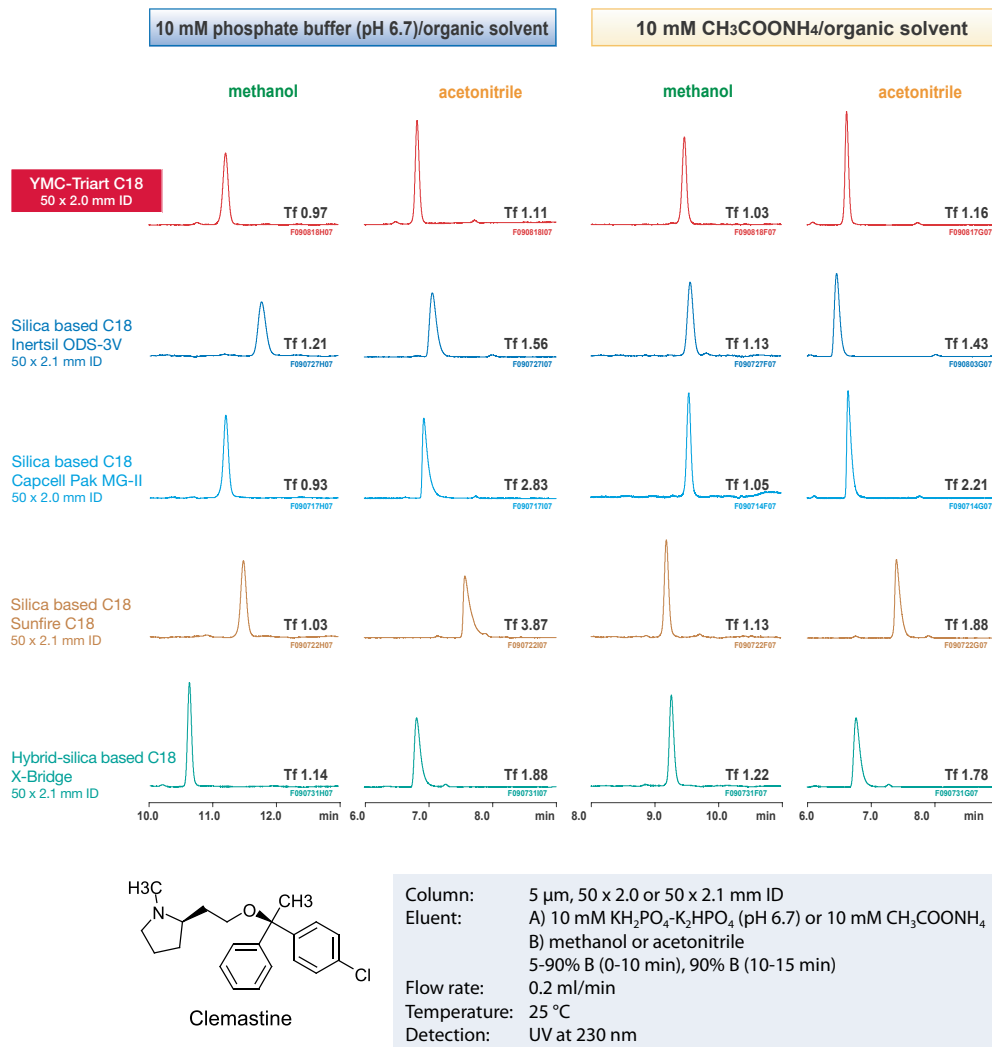
1. Formic acid
2. Acetic acid
3. Propionic acid

Column: 5  $\mu$ m, 150 x 3.0 or 150 x 4.6 mm ID  
 Eluent: methanol / 0.1% H<sub>3</sub>PO<sub>4</sub> (5/95)  
 Flow rate: 0.425 ml/min for 3.0 mm ID  
 1.0 ml/min for 4.6 mm ID  
 Temperature: 37 °C  
 Detection: UV at 210 nm

YMC-Triart C18 is synthesised using methodology adapted from micro-reactor technology. This technique ensures a reduction of impurities that contribute to peak tailing during the analysis of some types acidic compounds.

Application courtesy of YMC Co., Ltd.

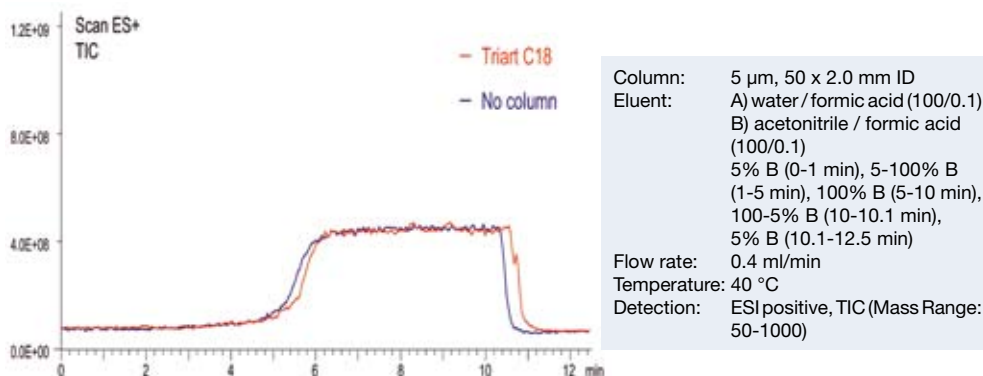
## Comparison of clemastine analysis with conventional columns



Clemastine is a well-known basic compound which readily exhibits peak tailing with conventional ODS columns. YMC-Triart provides sharp separations with many different buffer/solvent compositions.

Application courtesy of YMC Co., Ltd.

## LC/MS compatibility



Column bleeding, caused by the fragments of stationary phase, is the main reason for background noise and limitations on detection limits. No bleed is observed in the test of total ion current (TIC) measured by LC/MS with blank or with YMC-Triart C18. So in terms of the signal-noise ratio (S/N ratio), YMC-Triart C18 can be expected to not only reduce the background noise but to also increase the sensitivity of the analysis.

## Sure-Fit™ Connectors

### Optimise your chromatographic results!

- Easy column installation without tools
- Perfect capillary connection every time
- Optimised resolution and reproducibility
- Self-adjusting to any port depth regardless of column manufacturer



- Fingertight to 6000 psi (425 bar)
- No galling or seizing
- Available with a range of capillary tubing diameters and lengths for optimal resolution

Application courtesy of YMC Co., Ltd.

## Ordering Information

Particle size (µm)	Pore size (nm)	Dimension (mm)	Part number	Particle size (µm)	Pore size (nm)	Dimension (mm)	Part number
3	12	50 x 2.0	TA12S030502	5	12	50 x 2.0	TA12S050502
		75 x 2.0	TA12S03L502			75 x 2.0	TA12S05L502
		100 x 2.0	TA12S031002			100 x 2.0	TA12S051002
		150 x 2.0	TA12S031502			150 x 2.0	TA12S051502
		50 x 3.0	TA12S030503			50 x 3.0	TA12S050503
		75 x 3.0	TA12S03L503			75 x 3.0	TA12S05L503
		100 x 3.0	TA12S031003			100 x 3.0	TA12S051003
		150 x 3.0	TA12S031503			150 x 3.0	TA12S051503
		50 x 4.6	TA12S030546			50 x 4.6	TA12S050546
		75 x 4.6	TA12S03L546			75 x 4.6	TA12S05L546
		100 x 4.6	TA12S031046			100 x 4.6	TA12S051046
		150 x 4.6	TA12S031546			150 x 4.6	TA12S051546
		250 x 4.6	TA12S032546			250 x 4.6	TA12S052546

### Trademarks

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 Inertsil ODS-3V is trademark of GL Sciences  
 Sunfire C18, X-Bridge are trademarks of Waters Corp.  
 Gemini NX is trademark of Phenomenex, Inc.

Your local distributor:



Hichrom Limited  
1 The Markham Centre, Theale,  
Reading, Berkshire, RG7 4PE  
Tel: 0118 930 3660, Fax: 0118 932 3484

**YMC Europe GmbH**

Schöttmannshof 19  
D-46539 Dinslaken  
Germany  
TEL. +49(0)2064/427-0, FAX +49(0)2064/427-222  
[www.ymc.de](http://www.ymc.de)

**YMC Co., Ltd.**

YMC Karasuma-Gojo Bld. 284 Daigo-cho,  
Karasuma Nisuru Gojo-dori Shimogyo-ku,  
Kyoto 600-8106 Japan  
TEL. +81(0)75-342-4515, FAX +81(0)75-342-4550  
[www.ymc.co.jp](http://www.ymc.co.jp)

**YMC America, Inc.**

941 Marcon Boulevard Suite 301  
Allentown, PA18109 USA  
TEL. +1-610-266-8650, FAX +1-610-266-8652  
[www.ymc-america.com](http://www.ymc-america.com)

**YMC India Ltd.**

CX - 07, 3rd Floor, Lobe - 1,  
Tower - A, The Corenthum, Plot No- A-41,  
Sector - 62, Noida - 201301 (UP) India.  
TEL. +91(0)120-4276020 - 25, FAX +91(0)120-4276026  
[www.ymcindia.com](http://www.ymcindia.com)