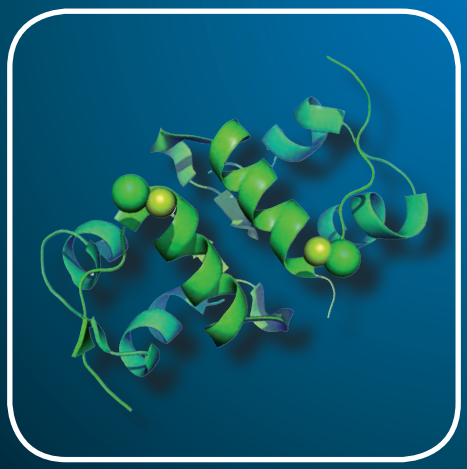
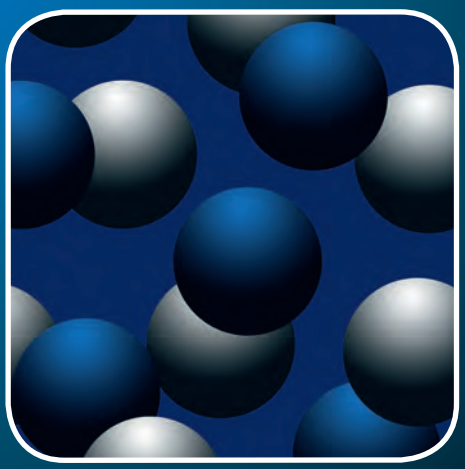
YMC
EUROPE GMBH
The Selectivity Company

Versatile hybrid silica-based **Stationary phases for prep LC**

YMC-Triart Prep

Stability
Reliability
pH stable





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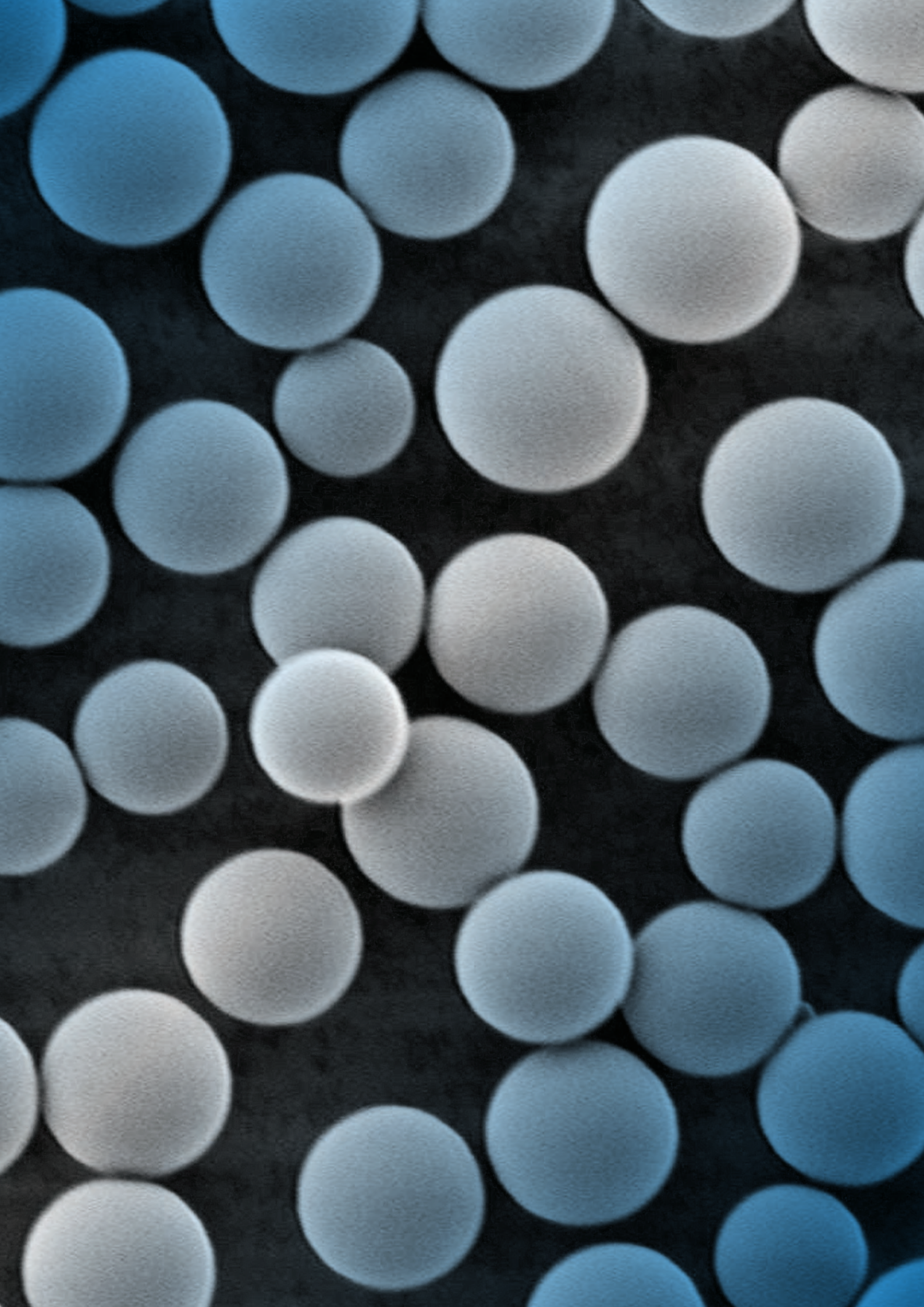

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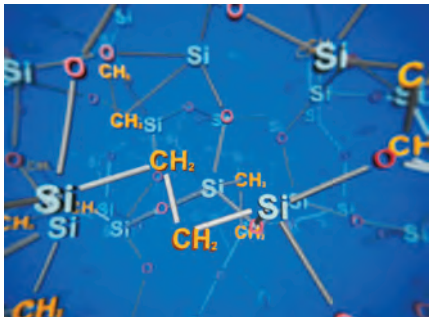
Robust Stationary Phase for Prep LC

With YMC-Triart Prep, a pH stable preparative grade of HPLC stationary phase is available. It is produced in batch sizes of up to several hundred kg. This innovative hybrid material sets a new benchmark for reversed phase (RP) HPLC phases. It is well suited for production scale applications, as it is available up to the multi-ton scale.

- **mechanical stability**
- **high loadability**
- **extended pH range of application**
- **CIP with NaOH solutions possible**
- **up to 4-fold longer lifetimes**
- **multi-ton production batches**



Improve Your Process

YMC-Triart Prep is chemically stable up to pH 10.0. This provides more flexibility for method development and allows for more efficient cleaning-in-place (CIP) procedures. From real life process development work YMC-Triart Prep has been shown to outperform traditional silica-based materials 2- to 4-fold in terms of stability. Longer column lifetimes lead to higher output (kilogram of product produced per kilogram of stationary phase).

Why not choose the best media?

YMC-Triart Prep materials provide improved particle and pore size distributions which result in reductions in backpressures and increases in sample loading during preparative operations.
With YMC-Triart Prep previously challenging pH and high temperature conditions can be used for demanding applications even for day-to-day work in laboratories or processes. Most importantly, due to its unique particle composition, a balanced hydrophobicity and silanol activity is achieved which makes YMC-Triart Prep a **First Choice** material in method development!

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How to Make the Correct Choice?

Chromatographic processes need to be productive and cost-efficient. The efficiency of a preparative purification via HPLC, SMB or SFC depends on the selectivity of the stationary phase.
The optimum selectivity guarantees the highest productivity for the lowest process costs. Furthermore, a long lifetime of the stationary phase secures profitability and process control.

In order to meet increasing demands for reliable preparative phases, YMC, with over 35 years of experience in manufacturing high quality chromatographic phases, set strict quality control procedures to ensure the highest product quality with the greatest reproducibility.
Furthermore, YMC will never knowingly change or modify an existing product which has any active customer base. Any product improvements will result in an entirely new YMC product.

Availability

- All-round selectivities
- Multi-ton scale
- Worldwide support

Reliability

- Lot to lot
- Year to year
- Lab to lab and site to site

Robustness

- Mechanical stability
- Chemical stability
- 100% aqueous applications

Cost-Efficiency

- Stability
- Lifetime
- Loadability

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YMC's Quality Assurance

YMC provides separation technology for the entire lifecycle of pharmaceutical compounds.

YMC will never knowingly change any product that is being used in a validated production process or validated analytical method.

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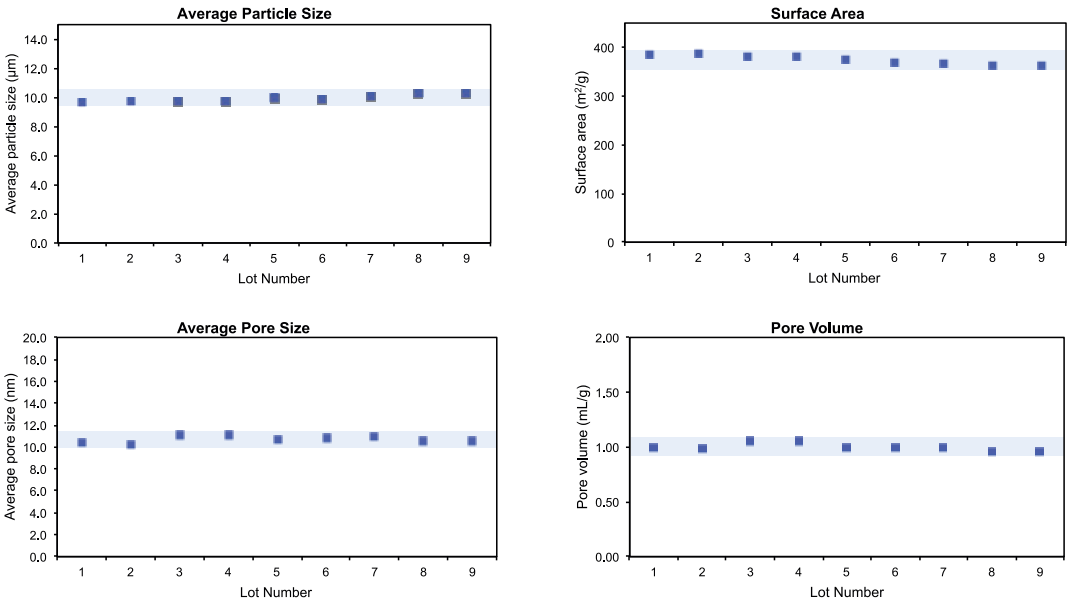
Quality Control

Quality control of the hybrid silica-based material

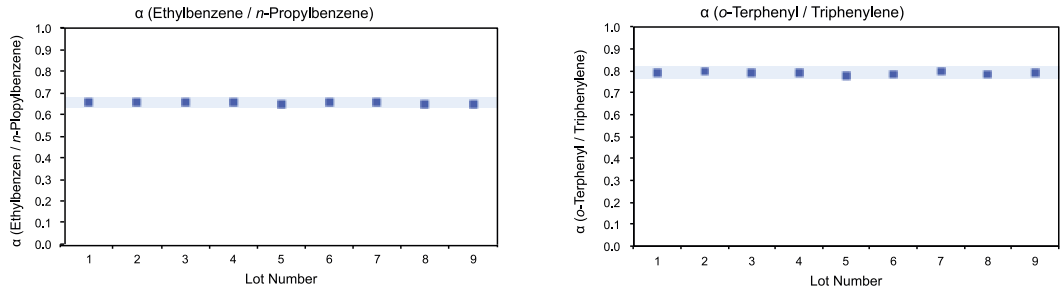
The rigorous quality control procedures set by YMC starts with the hybrid base material. The hybrid base material is tested against demanding specifications, which include particle size and distribution, pore size distribution, surface area, pore volume, pH and metal content, etc. Only when the base material satisfies the strict criteria for each parameter can the lot can be allowed to proceed to the bonding processes.



Quality control of the bonded media

YMC's rigorous quality control is reflected in the reproducible separations obtained by the chromatographer. Every batch of bonded material is evaluated for reproducibility to ensure consistent performance with chromatographic tests for:

- **hydrophobicity**
- **performance with acidic compounds**
- **performance with basic compounds**
- **performance with coordination compounds**



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Pioneering

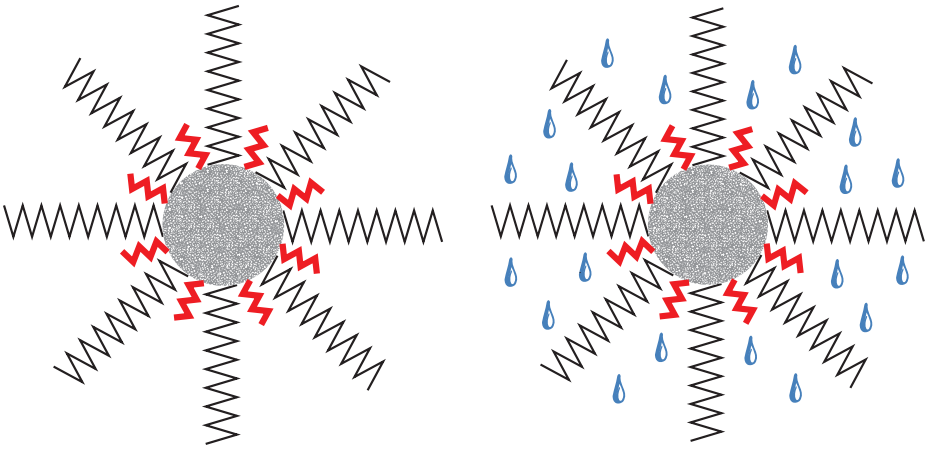
The use of 100% water as an eluent has been a challenge in HPLC analysis for decades. Even today, many C18 materials suffer from unacceptable short lifetimes, as a result of ligands collapsing which drastically reduces the separation performance.
As a pioneer in this field, YMC offered a product as early as the 1980's, which presents a synonym for stability under aqueous conditions: YMC*Gel ODS-AQ.

"AQ"-type phases are particularly suitable for the separation of polar substances, metabolites, pesticides, degradation products and peptides including protein digests.

YMC-Triart Prep

The latest YMC technology platform consists of a "hybrid-style" substrate with enhanced stability towards

- pH 2-10
- 100% H_2O



YMC provided the "original" silica-based reversed phase media stable in 100% aqueous conditions. Benefit from one of many YMC developments and enjoy boundless freedom for process development.

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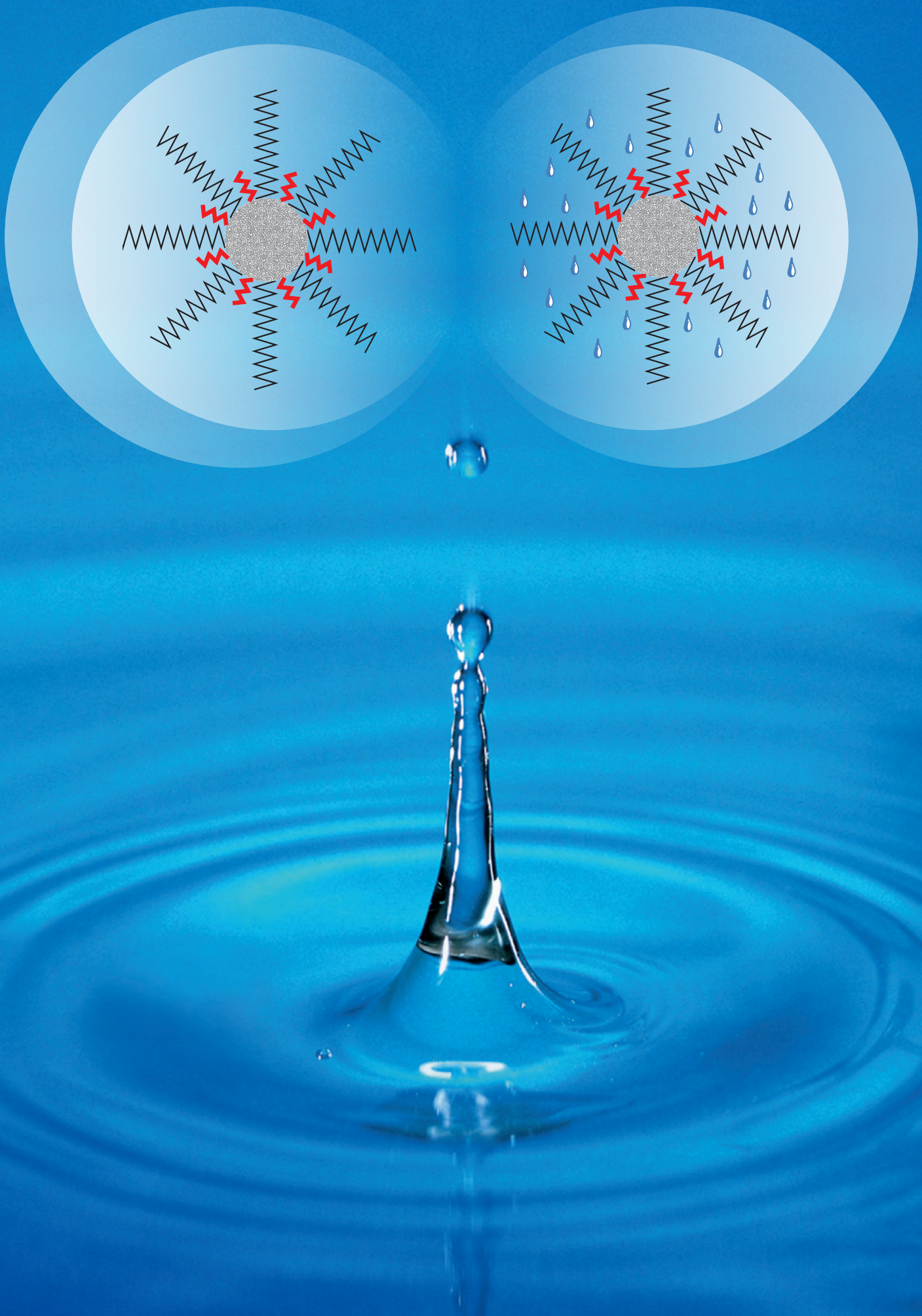


Specifications

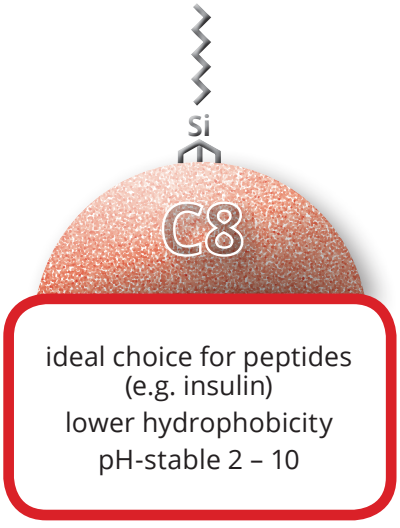
	YMC-Triart Prep C18-S	YMC-Triart Prep C8-S
Base material	inorganic/organic hybrid	
Particle size [µm]	10, 15, 20	10, 15, 20
Pore size [nm]	12	20
Specific surface area [m²/g]	360	220
Bonding	trifunctional C18	trifunctional C8
End-capping	yes	yes
Flexible pH range	2.0 ~ 10.0	2.0 ~ 10.0
Column cleaning	common procedures up to pH 12	common procedures up to pH 12

Phases Overview

YMC-Triart C18

versatile selectivity
first choice for process development
pH-stable 2 – 10
100% aqueous eluents

YMC-Triart C8



ideal choice for peptides (e.g. insulin)
lower hydrophobicity
pH-stable 2 – 10

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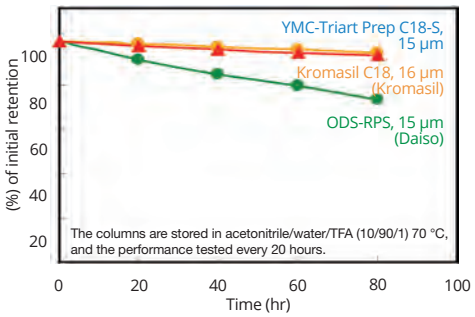
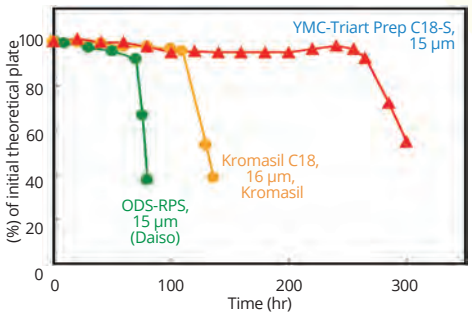
Excellent pH Stability

Acidic condition (pH 1, 70 °C)



Column:	250 x 6.0 mm ID
Eluent:	acetonitrile / water (60/40)
Flow rate:	1.7 ml/min
Temperature:	37 °C
Detection:	UV at 254 nm
Sample:	butyl benzoate

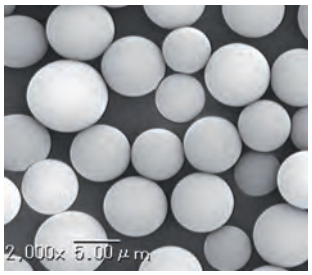
Alkaline condition (pH 11.5, 50 °C)



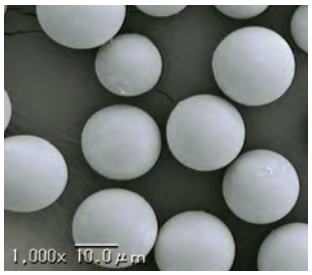
Column:	150 x 4.6 mm ID
Eluent:	50 mM TEA in methanol / 50 mM TEA in water (pH 11.5) (20/80, v/v)
Flow rate:	1.0 ml/min
Detection:	UV at 254 nm
Sample:	caffeine

At high pH YMC-Triart Prep C18-S shows lifetimes of up to four times greater than compared to conventional silica materials. This enables new separations at high pH which are not possible with silica-based materials.
In addition, these materials can endure more CIP-cycles than conventional phases used in industrial processes (see page 14/15).

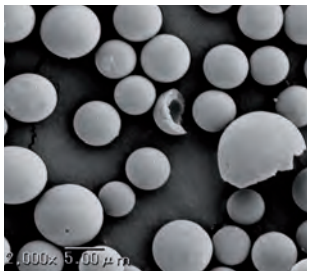
Homogeneous and Uniform Particles*



YMC-Triart
(12 nm, 5 µm)



YMC-Triart Prep
(20 nm, 15 µm)



XBridge HILIC
(TM of Waters Corp.)
(13.5 nm, 5 µm)

YMC-Triart Prep is produced using micro-reactor technology for the granulation process. This results in spherical particles with high uniform particle and pore size distributions. This results in a reduction in the back-pressure and to more reproducibility in surface modification.

* courtesy of YMC Co., Ltd.

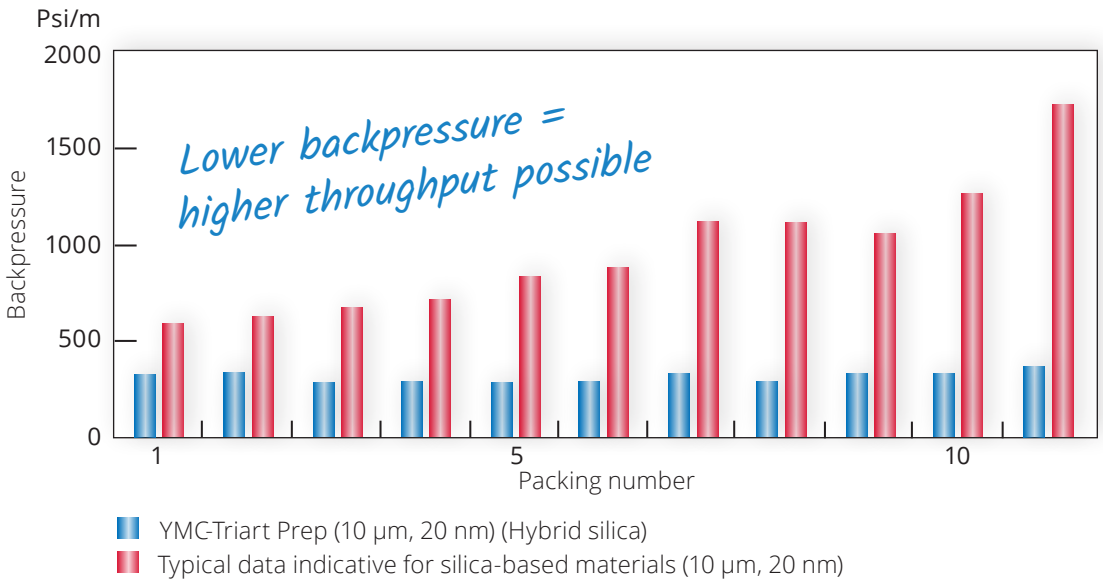
Mechanical Stability Test

Test procedure

1. Column packing
Column: DAU-50-1000
Bed length: 100 x 50 mm ID
Pressure: 6.5 MPa

2. Pressure measurement
Eluent: methanol / water (85/15)
Flow rate: 50 ml/min
Temperature: ambient

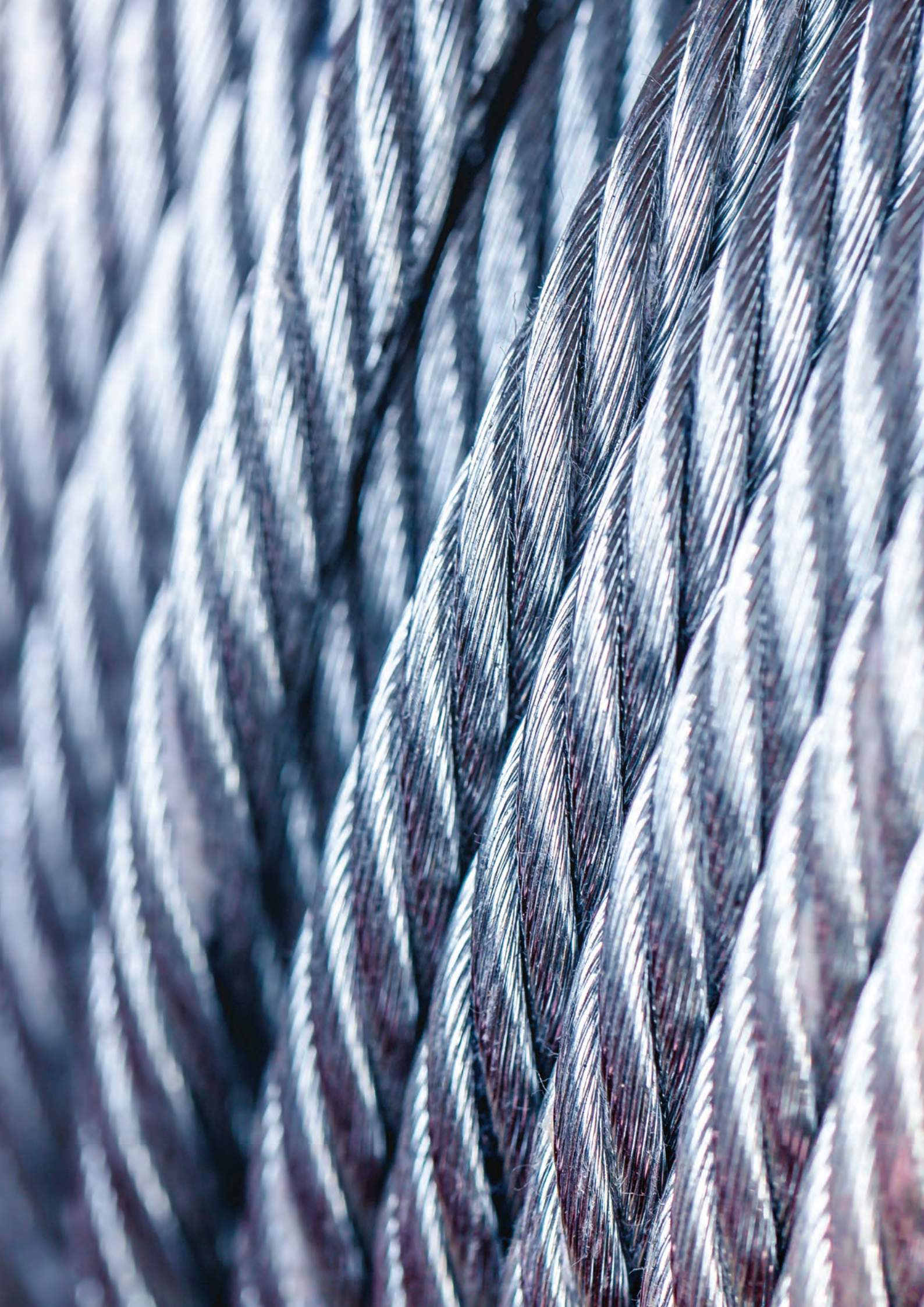
3. Unpacking



YMC-Triart Prep (10 µm, 20 nm) (Hybrid silica)
Typical data indicative for silica-based materials (10 µm, 20 nm)

Shearing and crushing of silica particles leads to the formation of fines, which results in an increase in backpressure. By using mechanically stable, spherical particles, the formation of fines can be reduced. The high mechanical stability of YMC-Triart Prep is demonstrated by means of repeated packing of a DAC column.
Even after more than 10 repacking cycles using the same sample of packing material, the pressure does not increase. The absence of fines is shown by the constant back-pressure.

The result is an increased lifetime for a packed column combined with significantly lower backpressures. This provides more productive and efficient processes.



Cleaning-In-Place (CIP)

Test procedure

Sample injection
(insulin in human serum)

injected 20 times

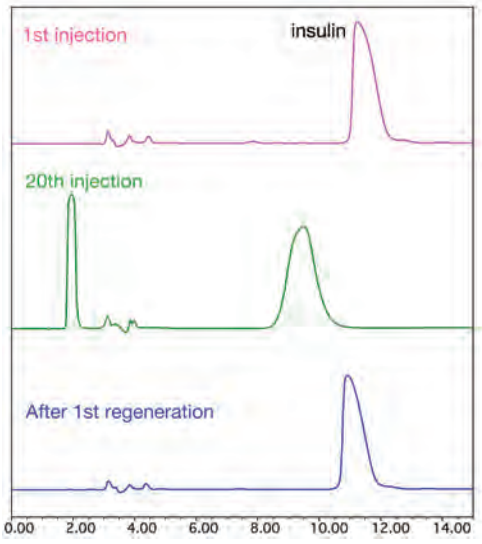
Regeneration with alkaline solution

Wash with alkaline solution
0.1 M NaOH / acetonitrile (50/50) 10 CV

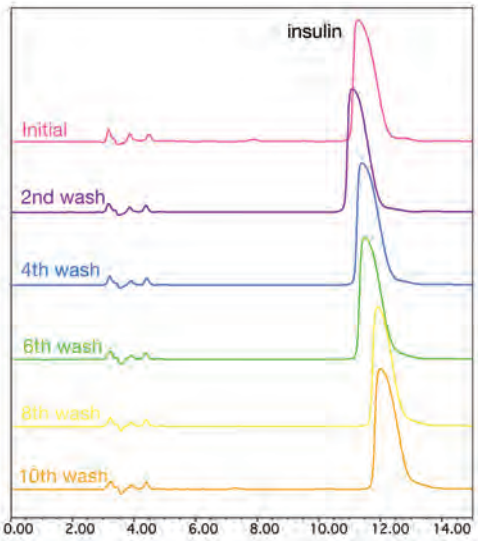
Neutralisation and wash with organic solvent
1. acetonitrile / water (20/80)
2. acetonitrile / water (90/10)

CIP Performance of YMC-Triart Prep C8-S

Effect of CIP with alkaline solution



Stability under repeated CIP

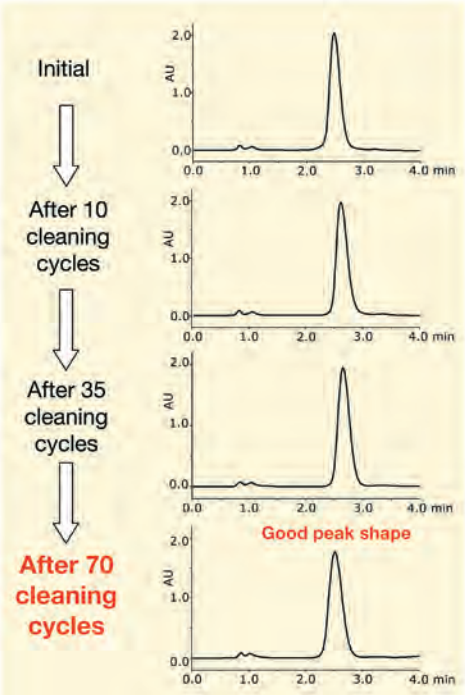


Column:	YMC-Triart Prep C8-S (20 nm, 10 µm) 250 x 4.6 mm ID
Eluent:	A) water / TFA (100/0.1) B) acetonitrile / TFA (100/0.1)
Gradient:	28-35% B (0-15 min)
Flow rate:	1.0 ml/min
Temperature:	25 °C
Detection:	UV at 220 nm
Injection:	30 µl
Sample:	10 mg/ml insulin bovine + human serum (2:1)

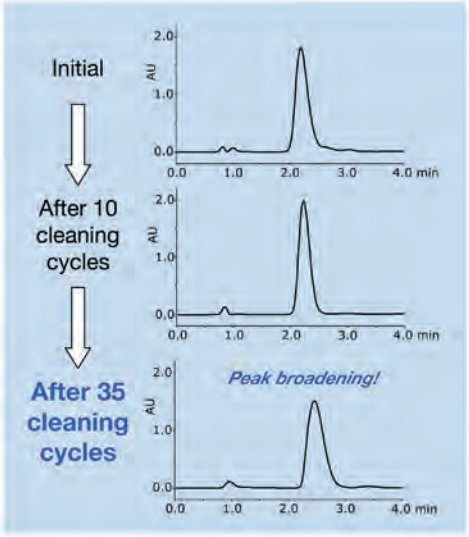
* courtesy of YMC Co., Ltd.

CIP Performance of YMC-Triart Prep C8-S

YMC-Triart Prep C8-S (10 µm, 20 nm)



Silica based C8 material (10 µm, 20 nm)



Column lifetime extended by factor >2

Column:	50 x 4.6 mm ID
Eluent:	A) water / TFA (100/0.1) B) acetonitrile / TFA (100/0.1)
Gradient:	29-36% B (0-2 min), 36% B (2-3 min), 29% B (3-6 min)
Flow rate:	1.0 ml/min
Temperature:	25 °C
Detection:	UV at 220 nm
Injection:	6 µl
Sample:	10 mg/ml insulin bovine + human serum (2:1)

As usual, the downstream process for the production of insulin requires consecutive injections of the feed stock. Consequently, absorption of impurities on the surface of the packing material reduces the retention capacity of the column.

Methodology: At this point a wash step with an alkaline solution (e.g. 0.1 M NaOH) removes the impurities and restores the full capacity of the column.

Challenge: Silica materials are unsuitable for alkaline wash conditions, because of their limited stability at high pH.

Solution: Hybrid silica-based YMC-Triart Prep has excellent stability at high pH. It is amenable to alkaline wash conditions giving and longer column lifetimes.
This in turn reduces production costs: Lower consumption of packing material and less downtime due to column repacking. An extension of column lifetime by a factor of more than two has been achieved!

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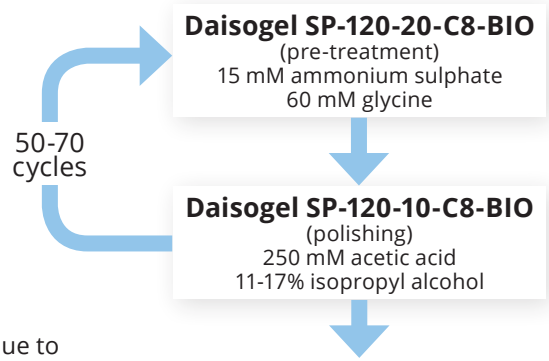
Purification of Insulin with YMC-Triart

The efficiency of a preparative purification depends on the selectivity of the stationary phase and its ability to separate possible impurities from the main product. An increase in selectivity improves the degree of separation of the peaks and reduces the cleaning costs by increasing the load on the column. Furthermore, the amount of sorbent and consumption of mobile phase could be reduced to increase the yield for a given capacity or to improve the product quality.
YMC bulk material together with phases from Daiso and Kromasil were used in a study by a major peptide manufacturer. The aim of the study was to determine whether their existing process of insulin purification by HPLC could be improved.

Previous method

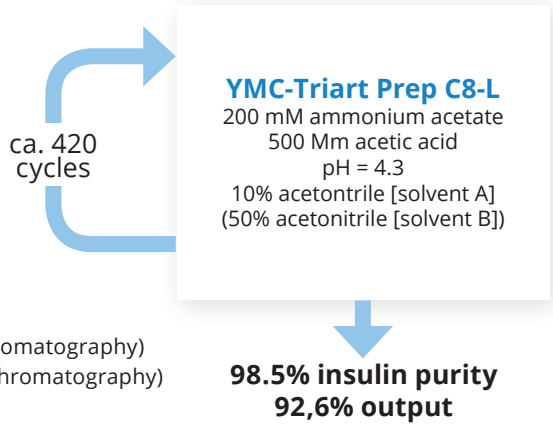


These process figures are **not acceptable** due to

- low insulin output of only 70.0 % (without re-chromatography)
- high loss of insulin because of low sorption reversibility
- very short operation lifetime of the sorbent
- high sorbent and overall costs

With YMC-Triart the output could be increased at the same time as reducing costs.

Optimised method



Using YMC-Triart Prep C8-L results in

- highest insulin output of **92.6%** (without re-chromatography)
- increase in insulin output by **23%** (without re-chromatography)
- superior phase stability
- constant backpressure
- less stationary phase replacement
- one step method instead of two step method
- **reduction of costs by 19%**

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Lowest Sorbent and Overall Costs

Considering the overall costs, the proposed costs to obtain 1 kg insulin (purity ≥ 98.5% with YMC-Triart Prep C8-L and appropriate solvents are 19% lower than with Daisogel SP-120-10-C8-BIO.

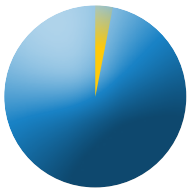
In terms of process economy YMC Triart Prep C8-L achieves the lowest overall purification costs and lowest absolute costs of the stationary phase. The amount of sorbent costs represents only about 1.7% of the overall costs.

1 kg insulin, purity ≥ 98.5%

Daisogel
SP-120-10-C8-BIO

total cost
35,000 €

sorbent cost
2,310 €



YMC-Triart Prep C8-L

total cost 28,900 €

sorbent cost 490 €

19% cost reduction!

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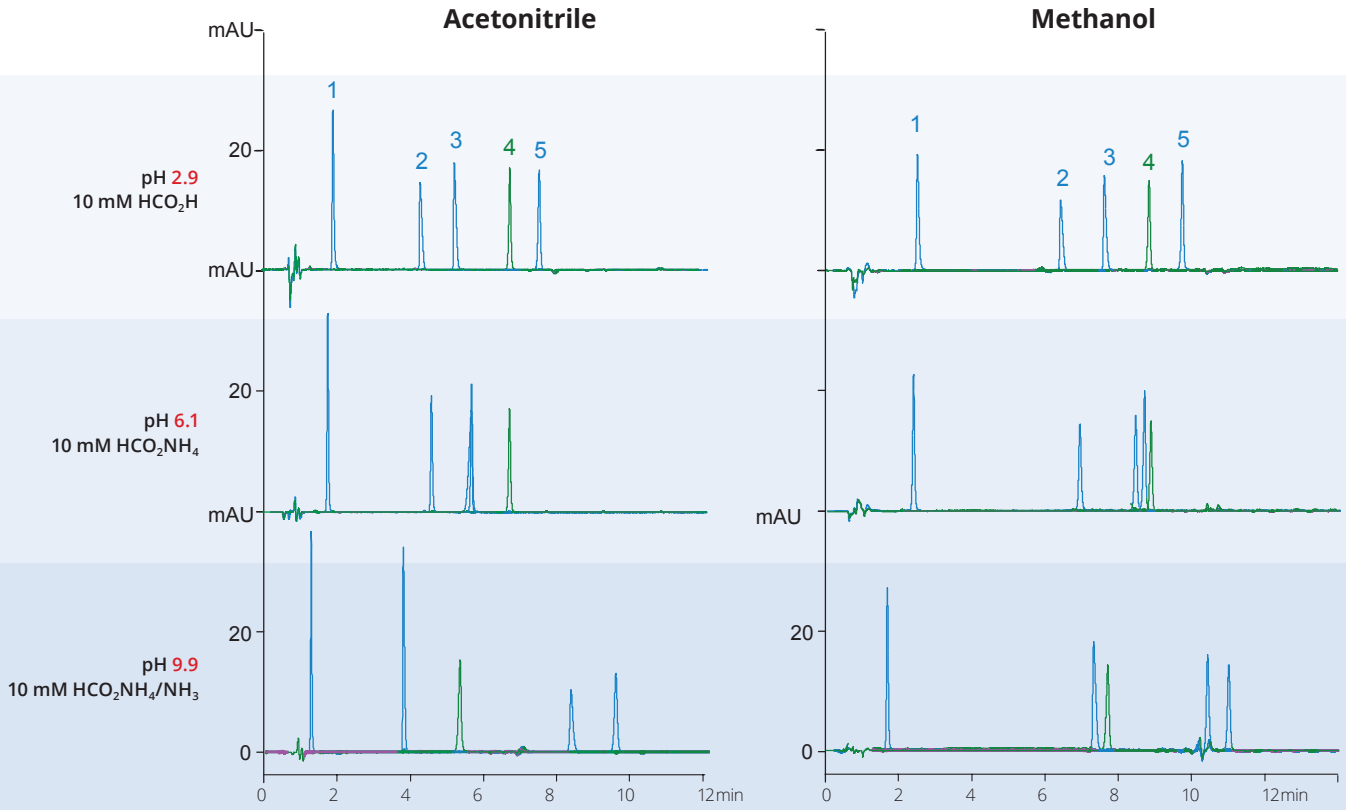
Optimise Your Separation by pH Modification

YMC-Triart C18 may be used over a pH range of 2~10, allowing the method development chemist greater flexibility to adjust the pH of the eluent to provide optimal retention and resolution of analysis.



Column:	**YMC-Triart 18** (5 µm, 50 x 2.0 mm ID)
Eluent:	A) 10 mM ammonium formate buffer B) organic solvent
Gradient:	5-90% B (0-10 min), 90%B (10-15 min)
Flow rate:	0.2 ml/min
Temperature:	25 °C
Detection:	UV at 230 nm

1. Saccharin
2. Dextromethorphan
3. Amitriptyline
4. *n*-Butylparaben
5. Ibuprofen

Adjust pH and/or choice of organic solvent to improve resolution and retention.

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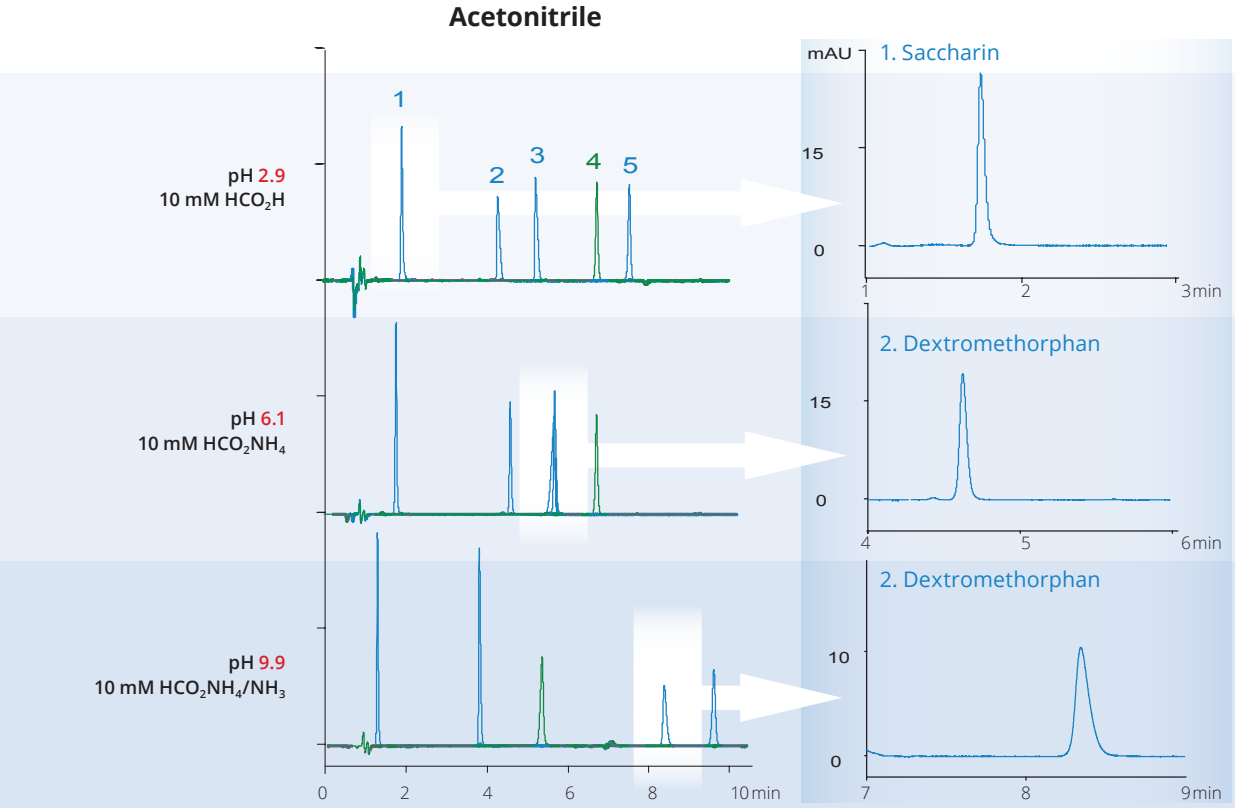
Improved Peak Shape

YMC-Triart C18 delivers excellent peak shapes and superior resolution for acids, bases, and neutral compounds. It also provides the method development chemist with the confidence of batch-to-batch and column-to-column reproducibility and long column lifetimes.



Column:	**YMC-Triart 18** (5 µm, 50 x 2.0 mm ID)
Eluent:	A) 10 mM ammonium formate buffer B) organic solvent
Gradient:	5-90% B (0-10 min), 90%B (10-15 min)
Flow rate:	0.2 ml/min
Temperature:	25 °C
Detection:	UV at 230 nm

1. Saccharin
2. Dextromethorphan
3. Amitriptyline
4. *n*-Butylparaben
5. Ibuprofen

Excellent peak shapes.

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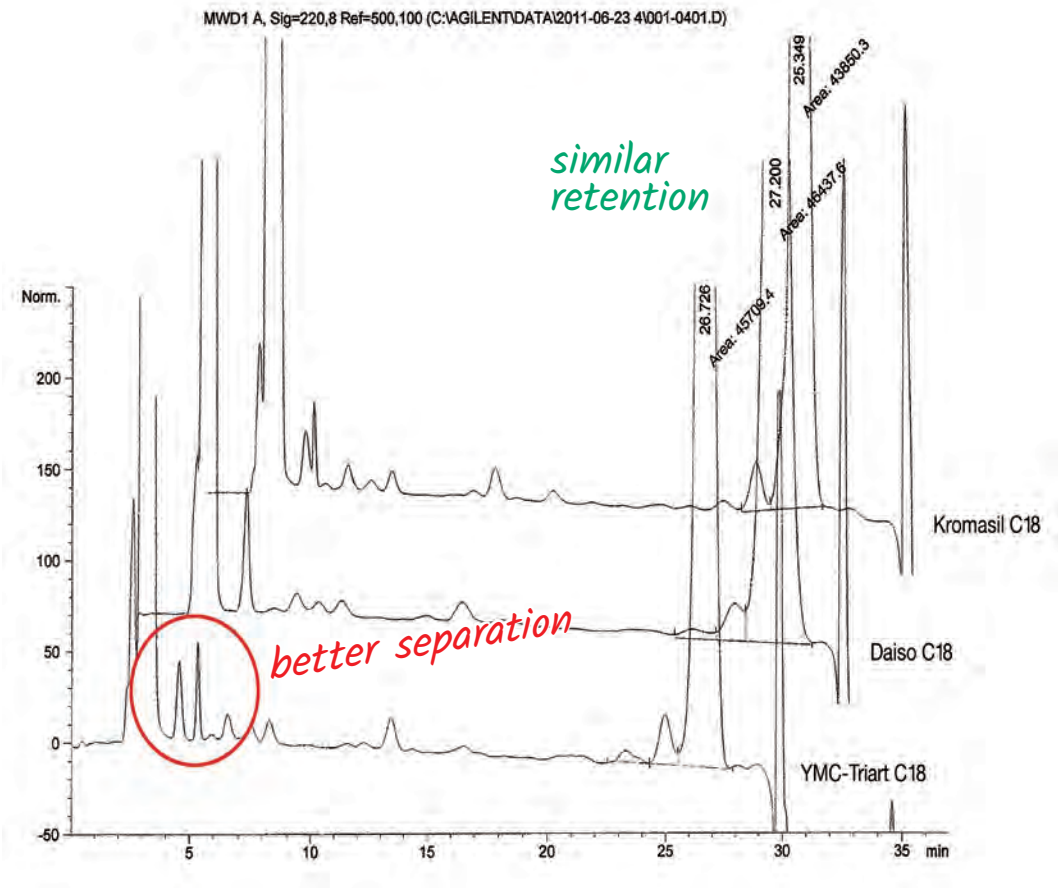
Versatile Selectivity



Client data confirms that YMC-Triart Prep C18-S shows retention for hydrophobic compounds comparable with conventional silica materials. At the same time polar molecules are exceptionally well separated.

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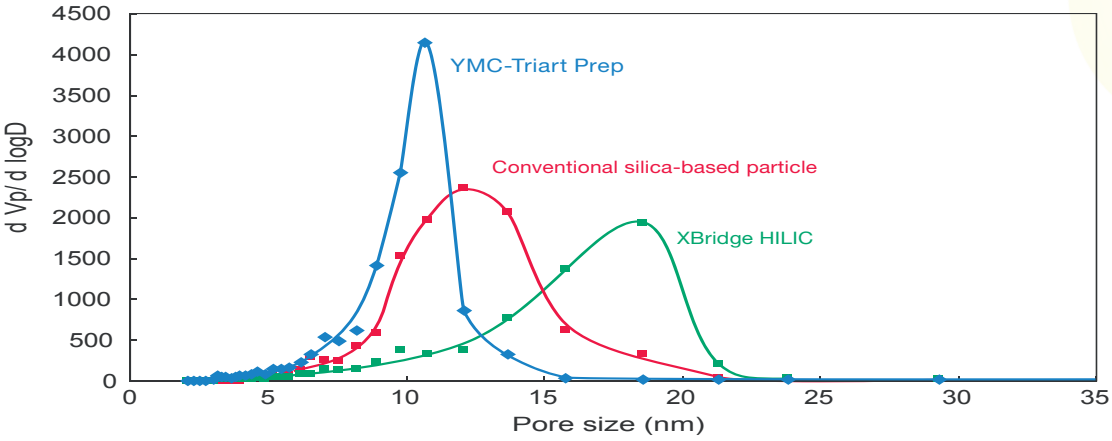
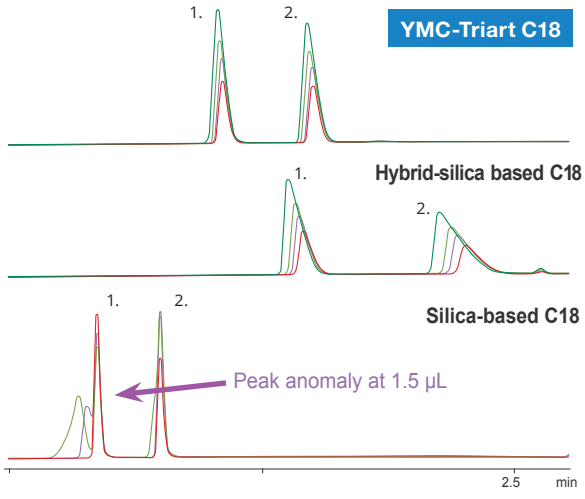
Narrow Pore Size Distribution



A narrow pore size distribution for the stationary phase beneficially affects peak width and sample loading in liquid chromatography. YMC-Triart Prep C18-S exhibits a narrower pore size distribution. This results in improved peak shapes and higher sample loading in your preparative processes.

Improved loadability

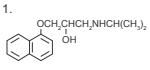
Influence of injection volume on peak shapes

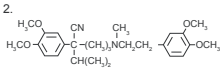


solvent for sample
acetonitrile

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 + 0.1% formic acid
	B) acetonitrile + 0.1% formic acid
Gradient:	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

1. 
Propranolol（50 µg/mL）

2. 
Verapamil （50 µg/mL）

In order to prevent multiple peak errors, there is the limit to the injection volume which can be applied the sample is injected in high eluting solvents (such as 100% acetonitrile). Compared with traditional columns, more than double the injection volume can injected onto YMC-Triart columns as a result of the extremely narrow particle size distribution.

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Purification of Polar Compounds

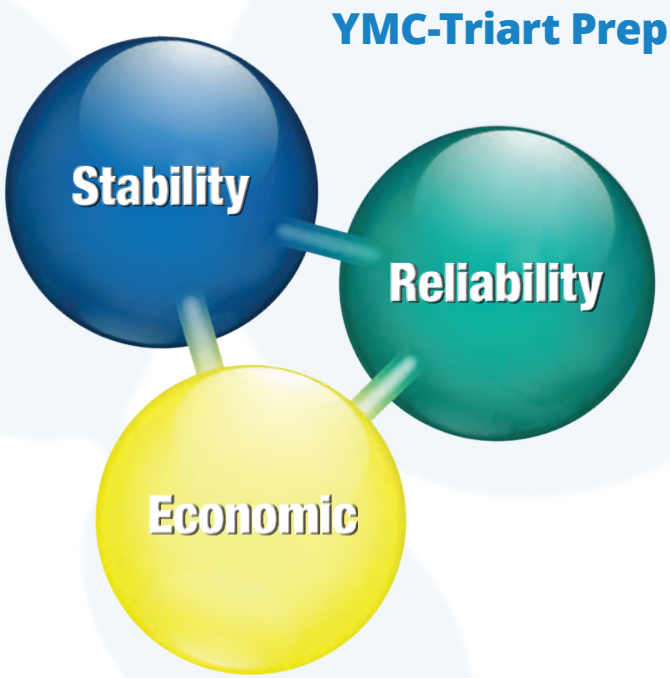
Challenging Task

The use of 100% water as an eluent has been a challenge in HPLC separation for decades. Even today, many C18 materials suffer from unacceptable short lifetimes, as a result of the C18 chains collapsing which drastically reduces the separation performance.
As a pioneer in the field of aqueous compatible phases, YMC has offered suitable products since the 1980's for stable separations under aqueous conditions.

Solution

The ability to work with 100% aqueous conditions opens the door to extend the purification range to include polar compounds efficiently and economically. Due to their equivalent selectivity properties, processes can be easily scaled up from analytical to preparative scale.

In addition, desalting can be performed using a RP-C18 phase to reduce one step within the downstream processing. YMC-Triart Prep combines high mechanical strength with chemical stability to ensure robust, long-lasting and economic purifications.



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Customer Project

Within the YMC laboratories all over the world, specific customer projects are be supported. One major topic for technical support projects is related to polar compounds and the use of 100% aqueous conditions with C18 phases.

For a certain customer project, various conditions, columns dimensions and phases were tested to show the extraordinary stability of YMC-Triart Prep C18-S under aqueous conditions. It started with tests on the analytical scale using polar compounds. Intensive stress tests were performed, followed by repeated tests with different particle sizes (5 µm, 10 µm, 20 µm) in order to check the scalability of the results obtained for the analytical column. Finally, the scale-up was performed on the semi-preparative scale (20 mm ID), again testing the different particle sizes.

Step 1 **Stress tests for polar compounds on the analytical scale with YMC-Triart Prep C18-S**

Step 2 **Repetition of stress tests with different particle sizes (Scalability 5 µm – 20 µm)**

Step 3 **Scale-Up to semi-preparative scale, using all particle sizes**

Based on these results this customer project was successfully developed to an industrial-scale process, using aqueous conditions for the purification and re-salting.

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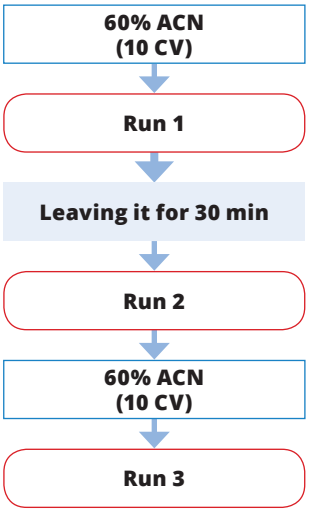
Step 1 Stress test for Polar Compounds

Polar compounds – Procedure

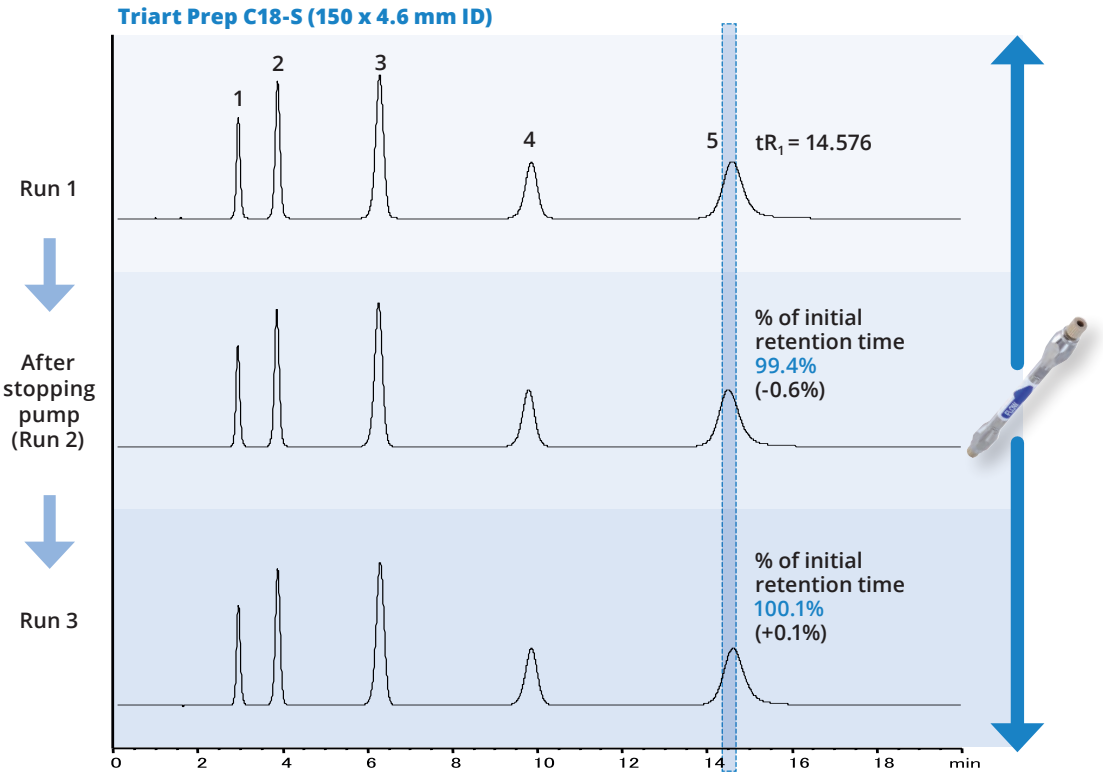
- **Packing material**
- **YMC-Triart Prep C18-S**
  (Product code: TAS12S11, 10 µm, 12 nm)
  Column size: 150 X 4.6 mm ID
- **Procedure**

Polar compounds – Conditions

System:	Agilent 1200
Column:	150 x 4.6 mm ID
Eluent:	1) 20 mM KH_2PO_4-K_2HPO_4 (pH 6.9)
	2) 20 mM KH_2PO_4-K_2HPO_4 (pH 6.9) / acetonitrile = 98/2
Flow rate:	1.0 mL/min
Temperature:	37°C
Detection:	UV at 254 nm
Injection:	8.0 mL
Sample:	1. Cytosine (0.01 mg/mL), 2. Uracil (0.01 mg/mL),
	3. Guanine (0.02 mg/mL), 4. Thymine (0.015 mg/mL),
	5. Adenine (0.015 mg/mL)



Polar compounds – Results



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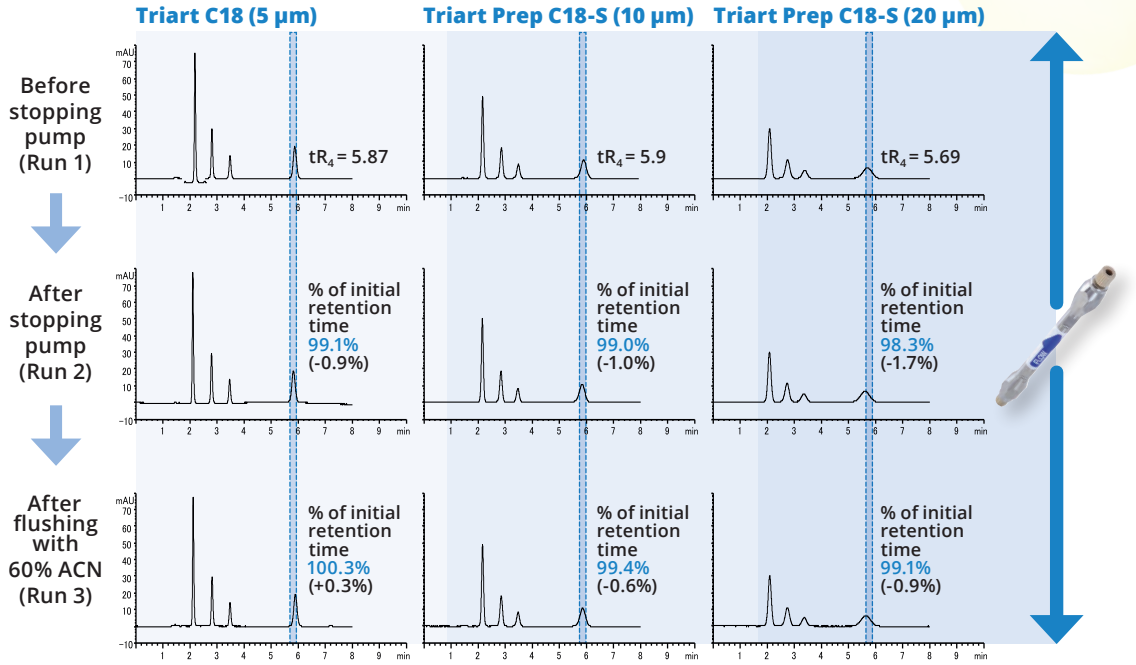
Step 2 Repetition of stress tests

Scalability – Results



Scalability – Procedure & Conditions

HPLC conditions

Column:	**Triart C18 5 µm** **Triart Prep C18-S 10 µm** **Triart Prep C18-S 20 µm** 150 X 4.6 mm ID
Eluent:	20 mM H_3PO_4
Flow rate:	1.0 mL/min
Temperature:	37°C
Detection:	UV at 220 nm
Injection:	10.0 µL
Sample:	1. Tartaric acid (0.5 mg/mL) 2. L-Malic acid (0.5 mg/mL) 3. Lactic acid (0.5 mg/mL) 4. Citric acid (0.5 mg/mL)

Dewetting test conditions

Flushing with 60% ACN (10 CV)

↓

Run 1

↓

Leaving it for 30 min

↓

Run 2

↓

Flushing with 60% ACN (10 CV)

↓

Run 3

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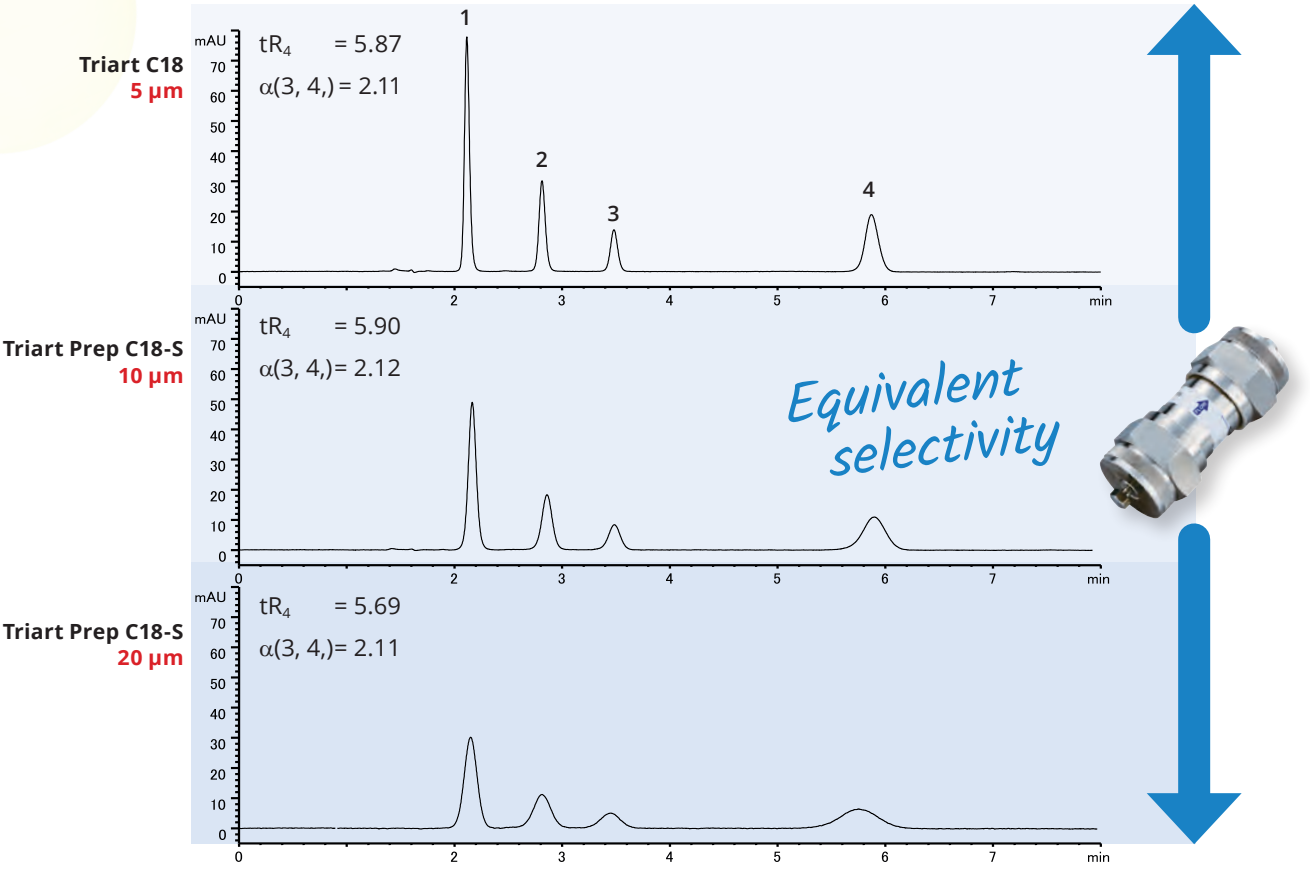
Step 3 Scale-Up to semi-preparative scale



HPLC conditions

Column:	**Triart Prep C18-S 10 µm** 250 X 20 mm ID
Eluent:	20 mM H_3PO_4
Flow rate:	18.9 mL/min
Temperature:	ambient
Detection:	UV at 220 nm
Injection:	400 µL
Sample:	1. Tartaric acid (0.5 mg/mL) 2. L-Malic acid (0.5 mg/mL) 3. Lactic acid (0.5 mg/mL) 4. Citric acid (0.5 mg/mL)

Methods developed on analytical YMC-Triart material are readily transferred to the preparative scale. Therefore, YMC-Triart Prep is equally suitable for industrial scale purifications and in process controls.

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YMC-Triart Prep C18-S			YMC-Triart Prep C8-S		
Pore size [nm]	Particle size [µm]	Product Code	Pore size [nm]	Particle size [µm]	Product Code
12	10	TAS12S11	20	10	TOS20S11
	15	TAS12S16		15	TOS20S16
	20	TAS12S21		20	TOS20S21

Typical pack sizes

Laboratory scale: smallest amount is 100 grams up to 4 kg in PE bottles

Industrial scale: more than 4 kg in double lined PE bags inside metal drums (10 or 25 kg drums)

Regulatory support file available under non-disclosure agreement.
Used in validated cGMP-manufacturing processes.
Customised material available on request. DMF registered with FDA.

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Ordering Information

High stability semi-preparative columns: YMC-Triart Prep C18-S

Packing material	Particle size [µm]	Column size Length x ID [mm]	Product code	Guard cartridges* (10 mm length)/ Guard columns (50 mm ID)
YMC-Triart Prep C18-S 12nm	10	50 x 20	TAS12S11-0520WX	TAS12S11-0120CC
		100 x 20	TAS12S11-1020WX	TAS12S11-0120CC
		150 x 20	TAS12S11-1520WX	TAS12S11-0120CC
		250 x 20	TAS12S11-2520WX	TAS12S11-0120CC
		50 x 30	TAS12S11-0530WX	TAS12S11-0130CC
		75 x 30	TAS12S11-L530WX	TAS12S11-0130CC
		100 x 30	TAS12S11-1030WX	TAS12S11-0130CC
		150 x 30	TAS12S11-1530WX	TAS12S11-0130CC
		100 x 50	TAS12S11-1053DX	TAS12S11-0553DXG
		150 x 50	TAS12S11-1553DX	TAS12S11-0553DXG
		250 x 50	TAS12S11-2553DX	TAS12S11-0553DXG
YMC-Triart Prep C18-S 12nm	15	50 x 20	TAS12S16-0520WX	TAS12S16-0120CC
		100 x 20	TAS12S16-1020WX	TAS12S16-0120CC
		150 x 20	TAS12S16-1520WX	TAS12S16-0120CC
		250 x 20	TAS12S16-2520WX	TAS12S16-0120CC
		50 x 30	TAS12S16-0530WX	TAS12S16-0130CC
		75 x 30	TAS12S16-L530WX	TAS12S16-0130CC
		100 x 30	TAS12S16-1030WX	TAS12S16-0130CC
		150 x 30	TAS12S16-1530WX	TAS12S16-0130CC
		100 x 50	TAS12S16-1053DX	TAS12S16-0553DXG
		150 x 50	TAS12S16-1553DX	TAS12S16-0553DXG
		250 x 50	TAS12S16-2553DX	TAS12S16-0553DXG
YMC-Triart Prep C18-S 12nm	20	50 x 20	TAS12S21-0520WX	TAS12S21-0120CC
		100 x 20	TAS12S21-1020WX	TAS12S21-0120CC
		150 x 20	TAS12S21-1520WX	TAS12S21-0120CC
		250 x 20	TAS12S21-2520WX	TAS12S21-0120CC
		50 x 30	TAS12S21-0530WX	TAS12S21-0130CC
		75 x 30	TAS12S21-L530WX	TAS12S21-0130CC
		100 x 30	TAS12S21-1030WX	TAS12S21-0130CC
		150 x 30	TAS12S21-1530WX	TAS12S21-0130CC
		100 x 50	TAS12S21-1053DX	TAS12S21-0553DXG
		150 x 50	TAS12S21-1553DX	TAS12S21-0553DXG
		250 x 50	TAS12S21-2553DX	TAS12S21-0553DXG

Other dimensions available on request
Other particle and pore size combinations available on request

* Guard cartridge holder required
XPCHSPW2 (20 mm ID)
XPCHSPW3 (30 mm ID)

Ordering Information

High stability semi-preparative columns: YMC-Triart Prep C8-S

Packing material	Particle size [µm]	Column size Length x ID [mm]	Product code	Guard cartridges* (10 mm length)/ Guard columns (50 mm ID)
YMC-Triart Prep C8-S 20 nm	10	50 x 20	TOS20S11-0520WX	TOS20S11-0120CC
		100 x 20	TOS20S11-1020WX	TOS20S11-0120CC
		150 x 20	TOS20S11-1520WX	TOS20S11-0120CC
		250 x 20	TOS20S11-2520WX	TOS20S11-0120CC
		50 x 30	TOS20S11-0530WX	TOS20S11-0130CC
		75 x 30	TOS20S11-L530WX	TOS20S11-0130CC
		100 x 30	TOS20S11-1030WX	TOS20S11-0130CC
		150 x 30	TOS20S11-1530WX	TOS20S11-0130CC
		100 x 50	TOS20S11-1053DX	TOS20S11-0553DXG
		150 x 50	TOS20S11-1553DX	TOS20S11-0553DXG
		250 x 50	TOS20S11-2553DX	TOS20S11-0553DXG
YMC-Triart Prep C8-S 20 nm	15	50 x 20	TOS20S16-0520WX	TOS20S16-0120CC
		100 x 20	TOS20S16-1020WX	TOS20S16-0120CC
		150 x 20	TOS20S16-1520WX	TOS20S16-0120CC
		250 x 20	TOS20S16-2520WX	TOS20S16-0120CC
		50 x 30	TOS20S16-0530WX	TOS20S16-0130CC
		75 x 30	TOS20S16-L530WX	TOS20S16-0130CC
		100 x 30	TOS20S16-1030WX	TOS20S16-0130CC
		150 x 30	TOS20S16-1530WX	TOS20S16-0130CC
		100 x 50	TOS20S16-1053DX	TOS20S16-0553DXG
		150 x 50	TOS20S16-1553DX	TOS20S16-0553DXG
		250 x 50	TOS20S16-2553DX	TOS20S16-0553DXG
YMC-Triart Prep C8-S 20 nm	20	50 x 20	TOS20S21-0520WX	TOS20S21-0120CC
		100 x 20	TOS20S21-1020WX	TOS20S21-0120CC
		150 x 20	TOS20S21-1520WX	TOS20S21-0120CC
		250 x 20	TOS20S21-2520WX	TOS20S21-0120CC
		50 x 30	TOS20S21-0530WX	TOS20S21-0130CC
		75 x 30	TOS20S21-L530WX	TOS20S21-0130CC
		100 x 30	TOS20S21-1030WX	TOS20S21-0130CC
		150 x 30	TOS20S21-1530WX	TOS20S21-0130CC
		100 x 50	TOS20S21-1053DX	TOS20S21-0553DXG
		150 x 50	TOS20S21-1553DX	TOS20S21-0553DXG
		250 x 50	TOS20S21-2553DX	TOS20S21-0553DXG

Other dimensions available on request
Other particle and pore size combinations available on request

* Guard cartridge holder required
XPCHSPW2 (20 mm ID)
XPCHSPW3 (30 mm ID)

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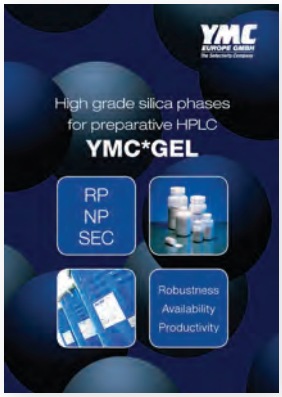
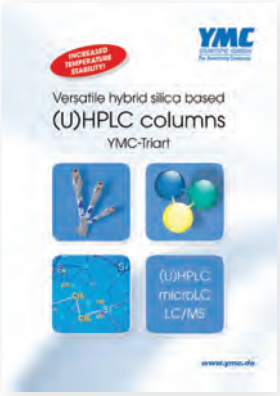
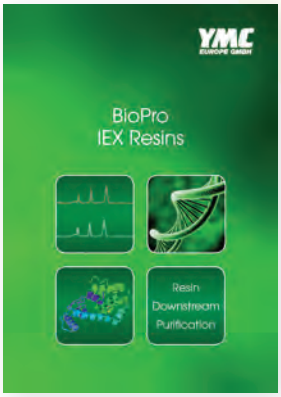
Other Literature Available



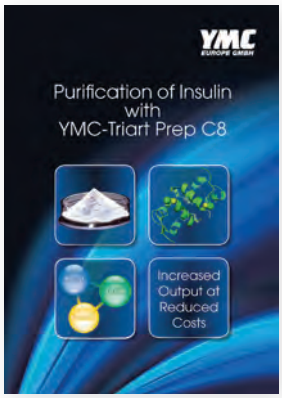
YMC*Gel HG-series



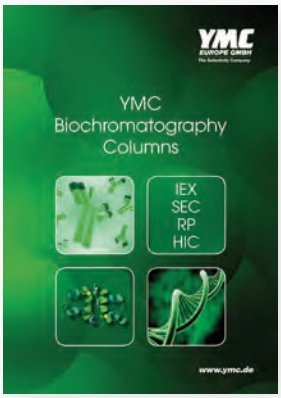
(U)HPLC columns YMC-Triart



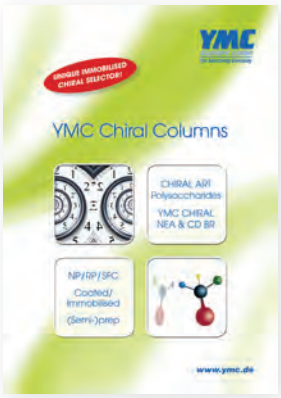
BioPro IEX Resins



Purification of Insulin with YMC-Triart Prep C8



YMC Biochromatography Columns



YMC Chiral Columns

Trademarks

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