



IP-RP



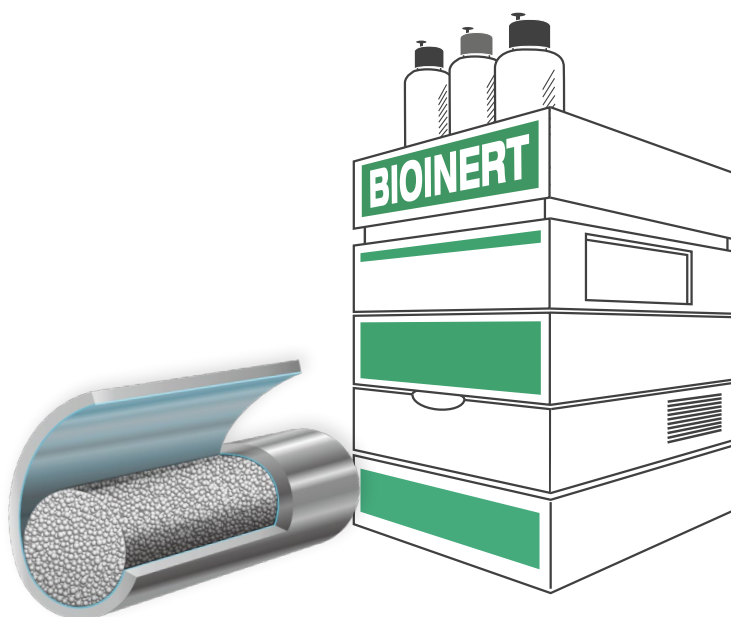
IP-RP – UHPLC/HPLC Selectivities

Features

- Selection of C18, C8 and C4 columns
- For ion-pairing (IP-RP) UHPLC and HPLC
- pH- and temperature stable phases
- Superior reproducibility
- Bioinert hardware

Selectivities for oligonucleotides

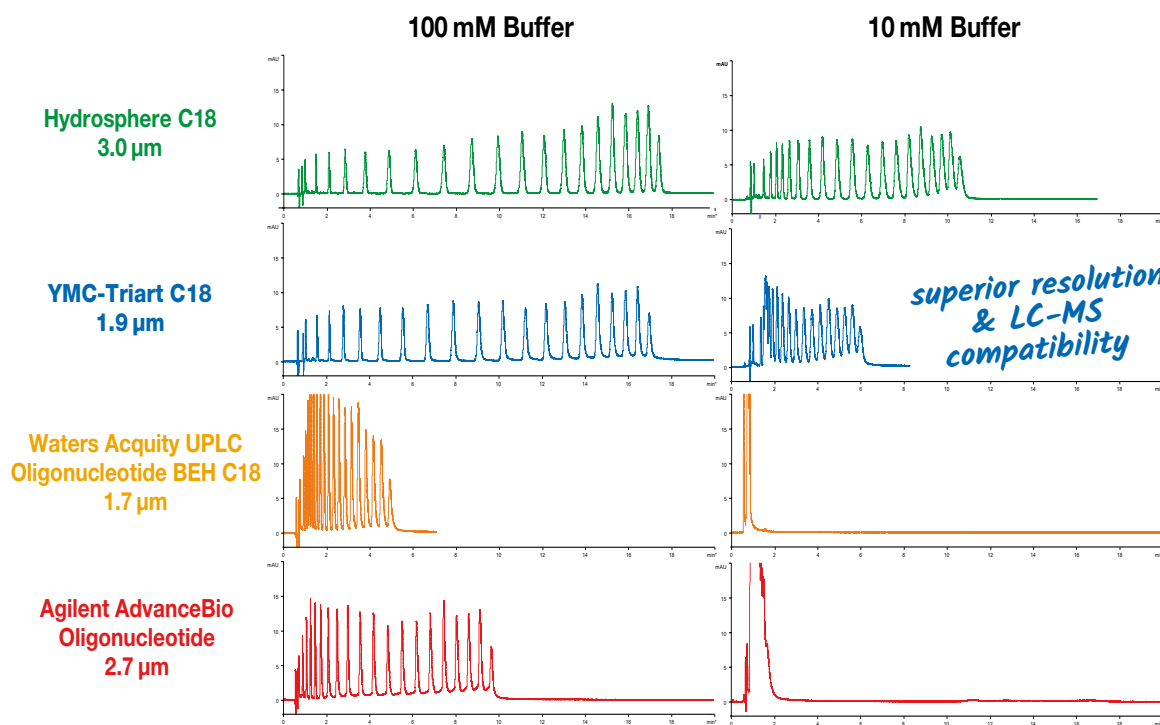
	YMC-Triart C18	YMC-Triart Bio C18	YMC-Triart C8	YMC-Triart Bio C4	Hydrosphere C18
Base particle	organic/inorganic hybrid silica				silica
Modification	C18 (USP L1)	C18 (USP L1)	C8 (USP L7)	C4 (USP L26)	C18 (USP L1)
Particle Size / μm	1.9, 3, 5	1.9, 3, 5	1.9, 3, 5	1.9, 3, 5	2, 3, 5
Pore Size / nm	12	30	12	30	12
pH range	1.0 – 12.0	1.0–12.0	1.0–12.0	1.0–10.0	2.0–8.0
Temperature range	pH < 7: 90°C pH > 7: 50°C	pH < 9: 90°C pH > 9: 50°C	pH < 7: 90°C pH > 7: 50°C	pH < 7: 90°C pH > 7: 50°C	50°C



Bioinert hardware available!

Bioinert YMC-Triart columns are available for improved sensitivity and peak shape of coordinating compounds such as nucleotides or oligonucleotides.

Enhanced retention and resolution even at low buffer concentrations

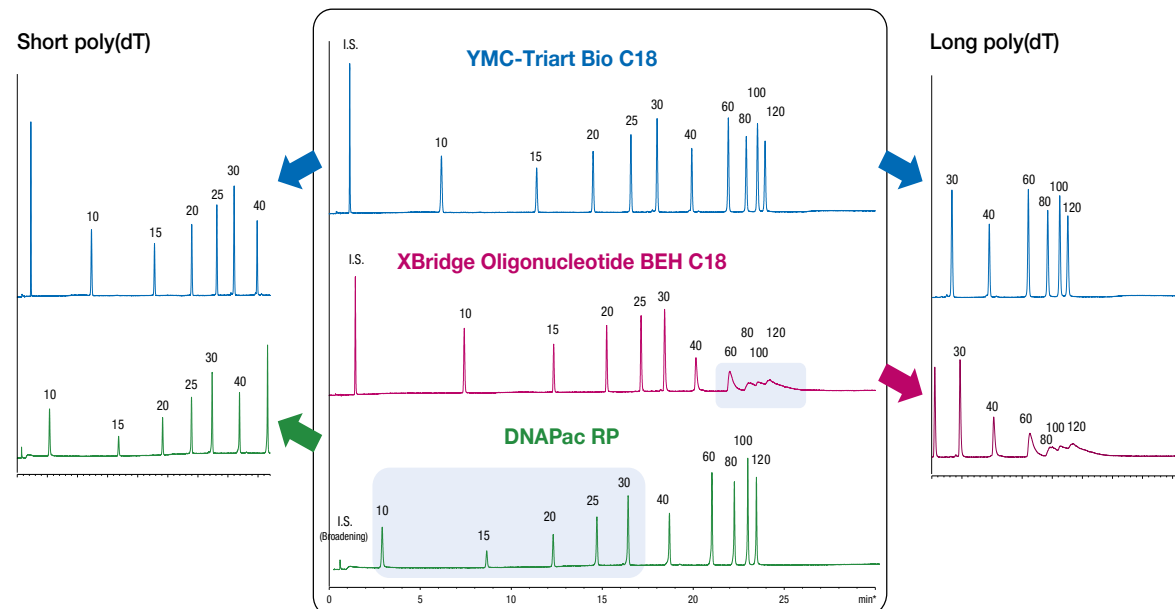


Column: 50 x 2.1 mm ID
 Eluent: A) 100 mM or 10 mM triethylamine-acetic acid (pH 6)
 B) A/acetonitrile (80/20)
 Gradient: 50–65%B (0–20 min)
 Flow rate: 0.21 mL/min
 Temperature: 35 °C
 Detection: UV at 260 nm
 Injection: 2 μL (5 nmol/mL)
 Sample: Oligodeoxythymidylic acid [d(pT)2-20]

The separation of oligo(deoxythymidylic acids), d(pT)2-20, was compared using 100 mM or 10 mM triethylammonium acetate (TEAA) buffer, under the same gradient conditions. Both Hydrosphere C18 and YMC-Triart C18 showed enhanced retention and resolution compared to other commercially available C18 phases designed for oligonucleotide analysis, even at the low ion-pairing buffer concentration such as 10 mM. The higher concentration provides stronger retention and superior resolution of oligonucleotides, although a lower concentration has the advantages of increasing the signal intensity and reducing system contamination in HPLC-MS analysis.

IP-RP – UHPLC/HPLC Selectivities

Optimum resolution for short and long poly(dT) oligonucleotides

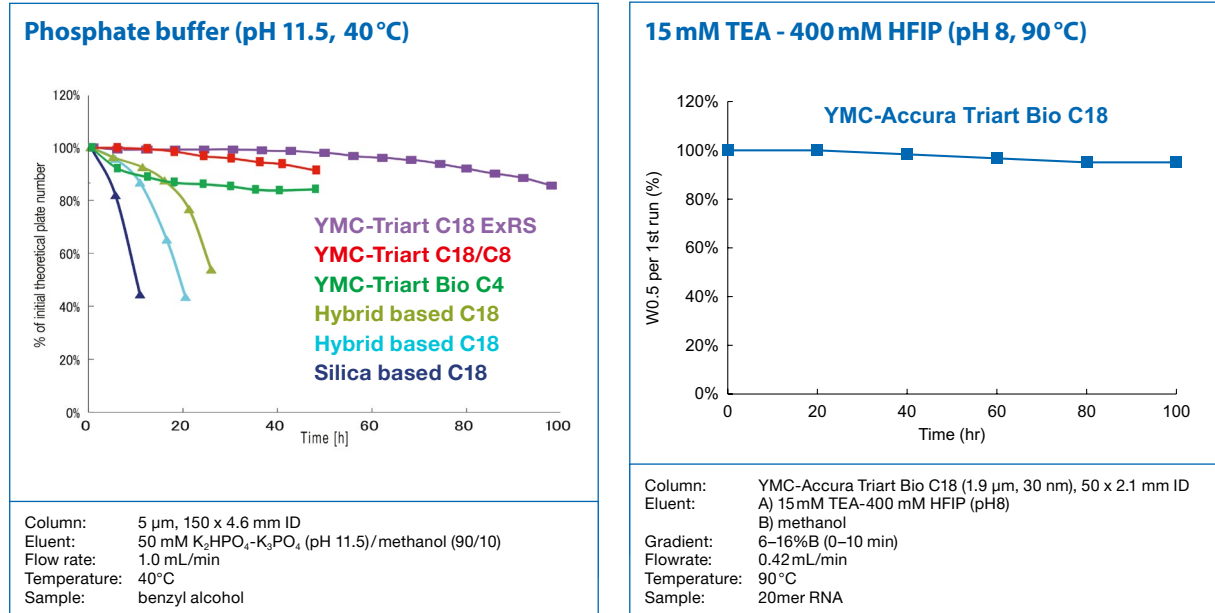


Columns: YMC-Triart Bio C18 (3 μ m, 30 nm) 50 x 2.1 mm ID
 XBridge Oligonucleotide BEH C18 (2.5 μ m, 13 nm) 50 x 2.1 mm ID
 DNAPac RP (4 μ m, proprietary) 50 x 2.1 mm ID
 Part No.: TA30S03-05Q1PTH
 Eluent: A) 4 mM TEA⁺ - 100 mM HFIP**
 B) methanol
 Gradient: 0.5%B/min, initial %B=5
 Flow rate: 0.42 mL/min
 Detection: UV at 260nm
 Temperature: 65 °C
 Injection: 1.0 μ L
 Sample: Poly(dT) oligonucleotides

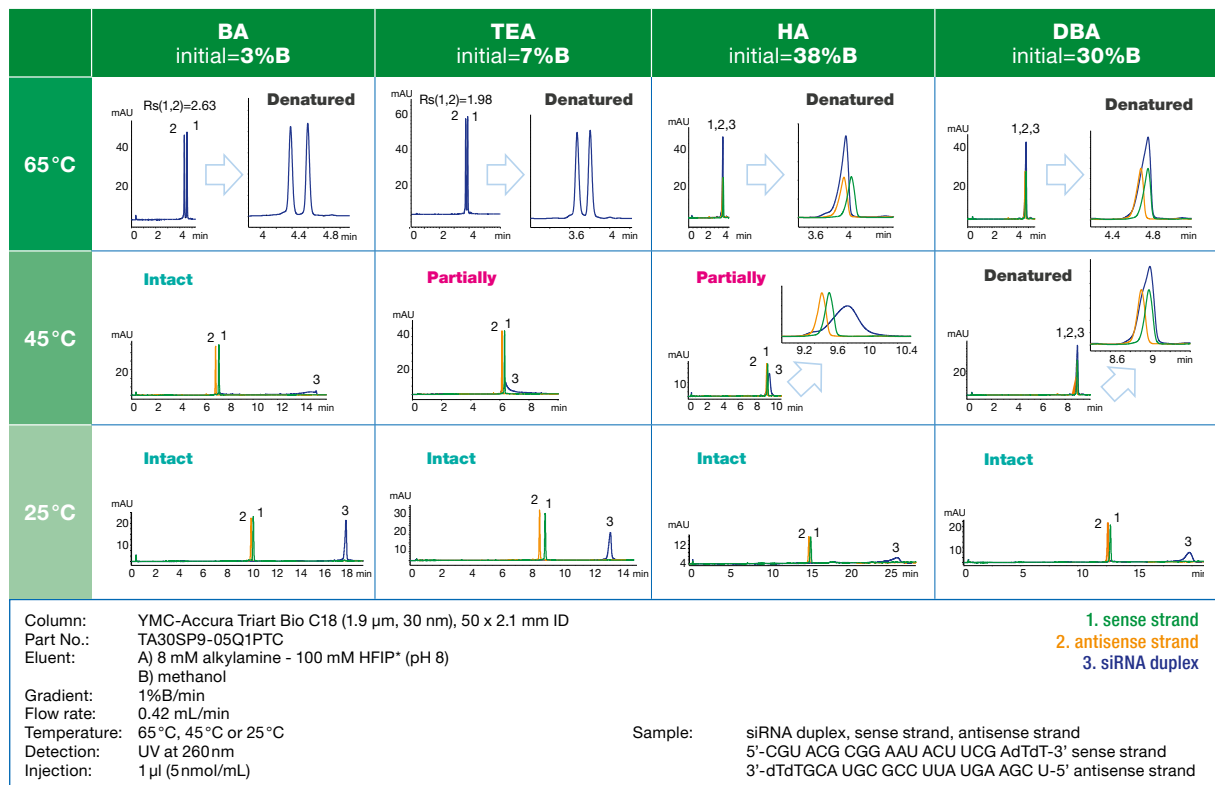
**triethylamine, **1,1,1,3,3,3-hexafluoro-2-propanol

The YMC-Triart Bio C18 column demonstrates a better resolution, higher recovery and reproducibility of poly(dT) oligonucleotides compared to the other two competitor columns. Longer poly(dT) oligonucleotides (60–120mer) were separated poorly by the competitor hybrid silica based column, whereas YMC-Triart showed high resolution for oligonucleotides of all sizes. Peak areas and therefore recoveries of shorter poly(dT) oligonucleotides (10–40mer) were much smaller when separated using the dedicated DNA competitor column. In addition, YMC-Triart Bio C18 showed reproducible behaviour such as consistent peak areas. This makes YMC-Triart Bio C18 an ideal tool for analysis of poly(dT) oligonucleotides.

Versatile wide pH and temperature stability



Effect of four different ion pair reagents on the denaturation of a siRNA duplex at different temperatures

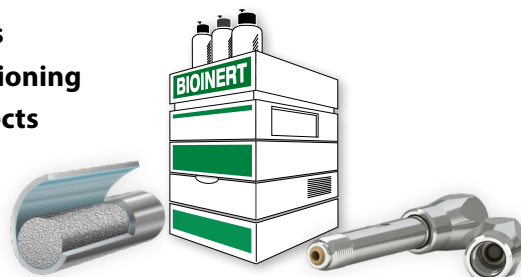


*1,1,1,3,3,3-hexafluoro-2-propanol

IP-RP – YMC-Triart: Bioinert hardware

Bioinert columns for bioseparations and coordinating compounds

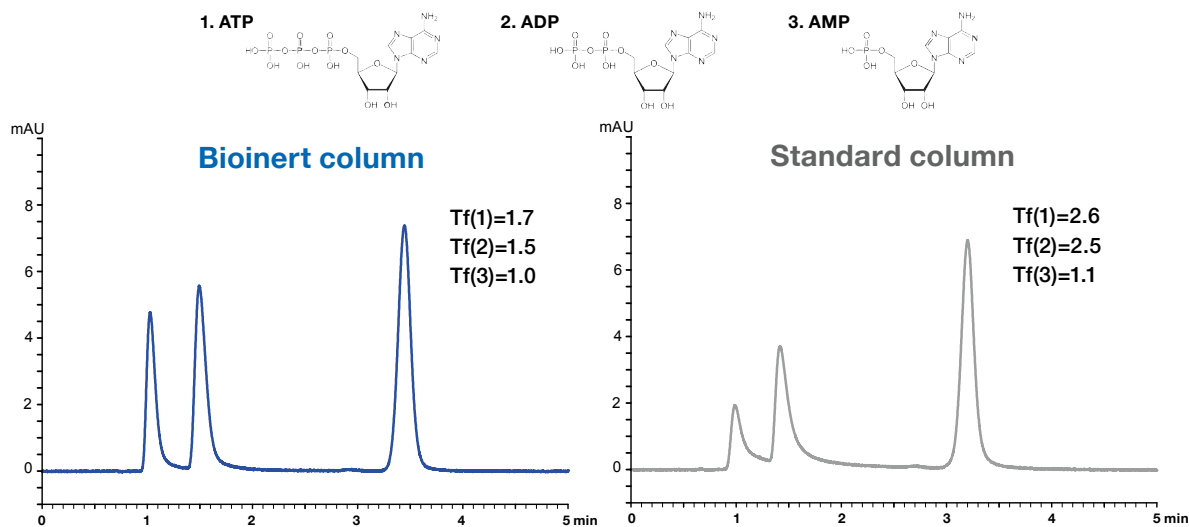
- Exceptional peak shapes with high sensitivities
- Excellent recoveries without column preconditioning
- Superior reproducibility and no carry-over effects
- Ideal for highly sensitive LC/MS analyses
- Different bioinert hardware options



Specifications

	YMC-Accura Triart	YMC-Triart metal-free PEEK-lined
YMC-Triart modifications	C18, C18 ExRS, Bio C18, C8, Bio C4, Phenyl, PFP, Diol-HILIC	
Particle Size	1.9, 3 and 5 µm	
Column hardware	Stainless steel with bioinert coating	PEEK-lined stainless steel
Frit hardware	Stainless steel with bioinert coating	PEEK
Hardware properties	Less hydrophobic	More hydrophobic
Pressure limit	1.9 µm: 100 MPa (15,000 psi) 3/5 µm: 45 MPa (6,525 psi)	
Column connection	No special connections required	Selected universal connectors such as MarvelXACT™

Improved sensitivity for coordination compounds



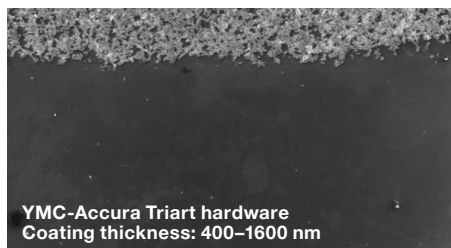
Column: YMC-Triart C18 (3 µm, 12nm) 50 x 2.1 mm ID
 Part Nos.: TA12S03-05Q1PTP (metal-free PEEK-lined) or TA12S03-05Q1PTH (standard hardware)
 Eluent: 5 mM HCOONH₄
 Flow rate: 0.21 mL/min

Temperature: 25 °C
 Detection: UV at 265 nm
 Injection: 1 µL (10 µg/mL)
 System: bioinert/"metal-free" HPLC system

Metal coordinating compounds, which have a phosphate group in their structure, tend to show poor peak shape due to interactions with metals, such as the stainless steel in column bodies and frits. By using a bioinert column hardware, better peak shapes can be expected.

Nucleotides with phosphate groups also show better peak shapes when compared to the regular column hardware. The applied YMC-Triart metal-free PEEK-lined as well as the YMC-Accura Triart column hardware are ideal for highly sensitive analyses using LC/MS.

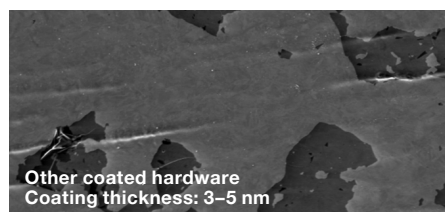
YMC-Accura Triart: durable bioinert coating



The robust bioinert coating used on YMC-Accura hardware is 130 to 320-fold thicker, making it more durable than other similar hardware concepts. A long-term inertness against sensitive substances is ensured. In order to demonstrate its robustness, a YMC-Accura column was packed multiple times. Even though this process is hard on the column surface, the coating remains unaffected (SEM* picture: top area is bare steel for comparison).

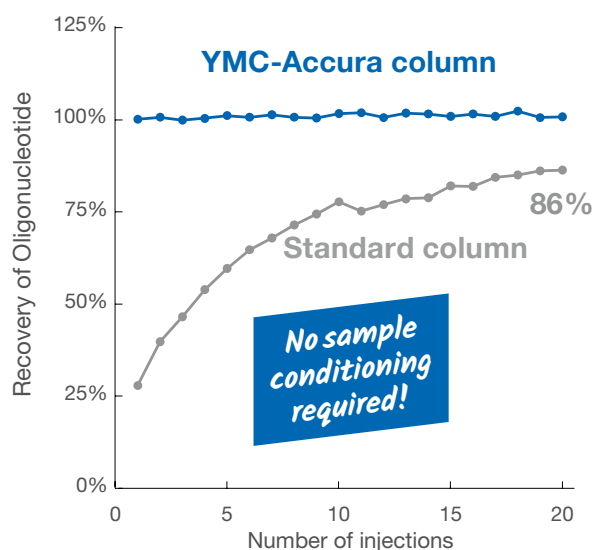
*Scanning Electron Microscope

Other coated columns can lose their inertness over time. This will again lead to adsorption of sensitive compounds on the uncovered metallic surfaces. Peak tailing, loss of recovery and sample carry-over are typical results of the delamination of the coating. On a competitor's column, most of the coating was already delaminated after merely unpacking the column. (The dark spots in this picture are the remaining coating.)



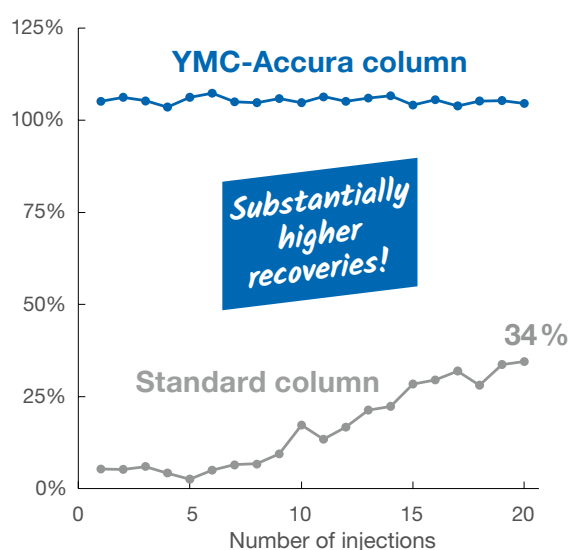
High surface inertness without any adsorption

1. TEA-HFIP/methanol



No sample conditioning required!

2. TEAA/methanol



Substantially higher recoveries!

Column: Empty YMC-Accura (without stationary phase)
 Eluent: 1) 8 mM TEA 200 mM HFIP/methanol (82/18)
 2) 100 mM TEAA/methanol (82/18)
 Flow rate: 0.42 mL/min
 Detection: UV at 260 nm
 Temperature: 65 °C
 Injection: 1 µL
 Sample: All PS RNA 20mer (1) (5'-U[^]C[^]A[^]U[^]C[^]A[^]C[^]A[^]C[^]U[^]G[^]A[^]A[^]U[^]A[^]C[^]C[^]A[^]A[^]U[^]-3')

^=Phosphorothioate

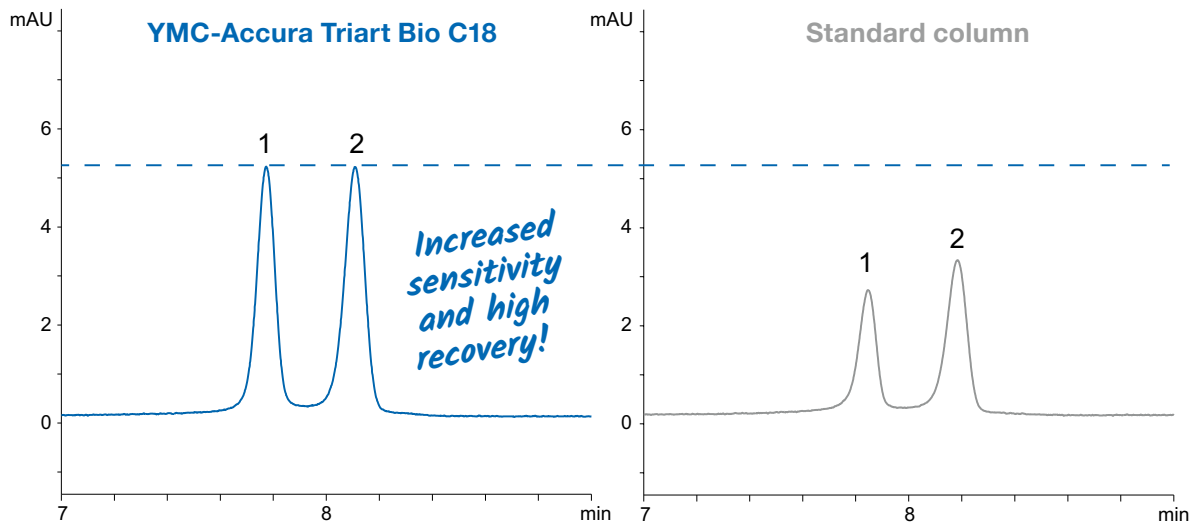
The YMC-Accura hardware with its inert surface area prevents adsorption of oligonucleotides using a range of different buffers. No sample conditioning is required.

YMC-Accura columns further provide significantly higher recoveries and sensitivities that cannot be achieved with regular stainless-steel columns – even after conditioning with 20 sample injections. These ready-to-use columns ensure high recovery and reproducibility from the very first use.

IP-RP – YMC-Triart: Bioinert hardware

Significantly higher sensitivity and recovery

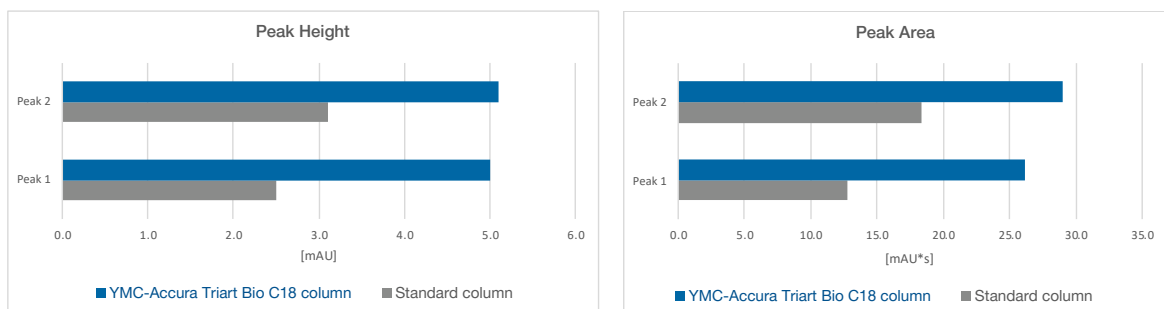
Ideal choice for challenging analytes such as phosphorothioate oligonucleotides



Column: YMC-Accura Triart Bio C18 (1.9µm, 30nm) 50 x 2.1 mm ID
 Part No.: TA30SP9-05Q1PTC
 Eluent: A) 15mM triethylamine - 400mM HFIP*
 B) methanol
 Gradient: 8–18%B (0–10 min)
 Flow rate: 0.42 mL/min
 Temperature: 65°C
 Detection: UV at 260nm
 Injection: 1 µL
 Sample: All PS RNA 20mer (1) (5'-U[^]C[^]A[^]U[^]C[^]A[^]A[^]C[^]A[^]C[^]U[^]G[^]A[^]A[^]U[^]A[^]C[^]C[^]A[^]A[^]U[^]-3')
 All PS RNA 21mer (2) (5'-G[^]U[^]C[^]A[^]U[^]C[^]A[^]C[^]A[^]C[^]U[^]G[^]A[^]A[^]U[^]A[^]C[^]C[^]A[^]A[^]U[^]-3')
 ^=Phosphorothioate

*1,1,1,3,3,3-hexafluoro-2-propanol

High sensitivity and recovery

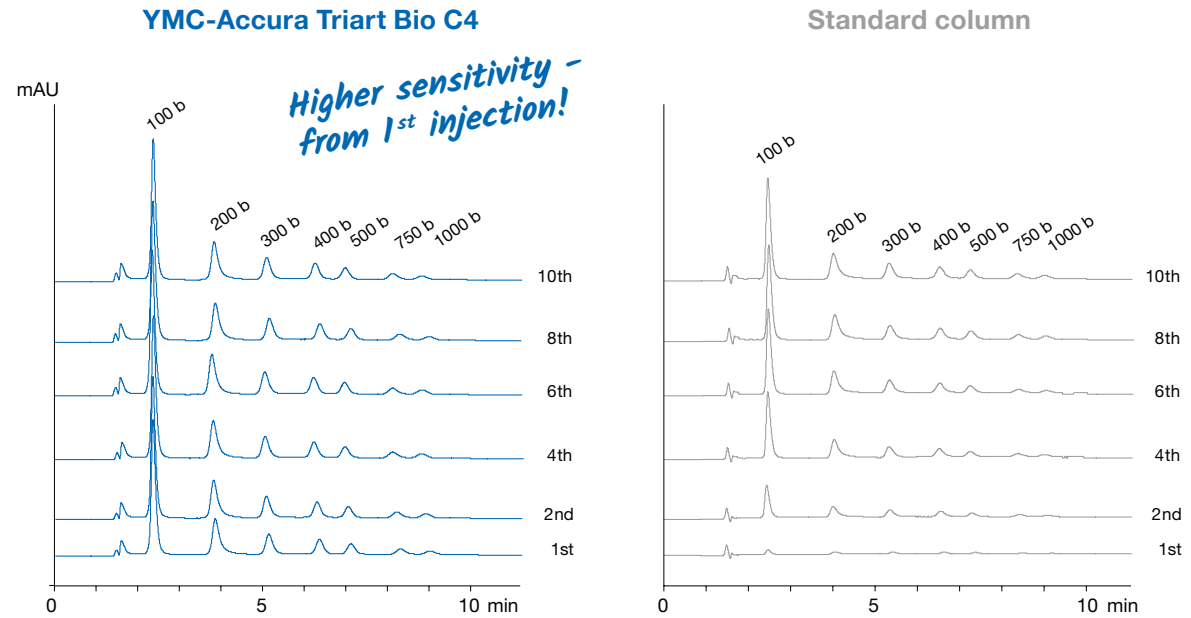


Doubled peak height and area!

The YMC-Accura Triart Bio C18 column provides double peak heights and peak areas for the oligonucleotides compared to those for regular stainless-steel columns. YMC-Accura Triart columns enhance the analytical sensitivity significantly, thereby avoiding the loss of high-value samples.

Reliable results from the first injection

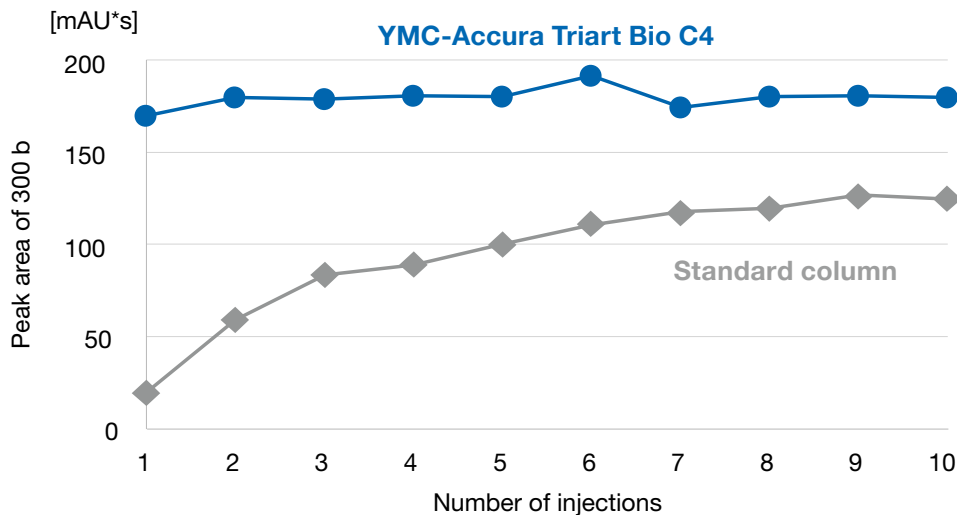
No preconditioning required for reliable results



Column:	YMC-Accura Triart Bio C4 (3µm, 30 nm) 100 x 2.1 mm ID	Flow rate:	0.2 mL/min
Part No.:	TA30S03-10Q1PTC	Temperature:	80°C
Eluent:	A) 50 mM TEAA* (pH 7.0)/acetonitrile (95/5) B) 50 mM TEAA (pH 7.0)/acetonitrile (50/50)	Detection:	UV at 254 nm
Gradient:	9–14%B (0–10 min), 80%B (10–15 min)	Injection:	1 µL (0.25 mg/mL)
		Sample:	100–1,000 bases (Century™-Plus RNA Markers)

* Triethylammonium acetate

Constantly higher peak areas and therefore recoveries

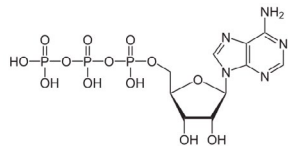


The YMC-Accura Triart Bio C4 column shows stable peak areas from the first injection, while the standard stainless-steel column provides only 10% of the peak area (for the 300 base marker) with the first injection. Even after the tenth injection, the peak areas of the stainless-steel column are considerably less than those of the YMC-Accura Triart column.

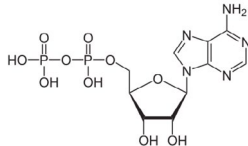
IP-RP – Expert Tips: (Oligo)nucleotides

Influence of system and column hardware on the analysis of nucleotides

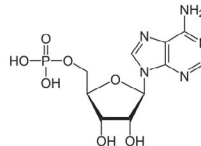
1 ATP



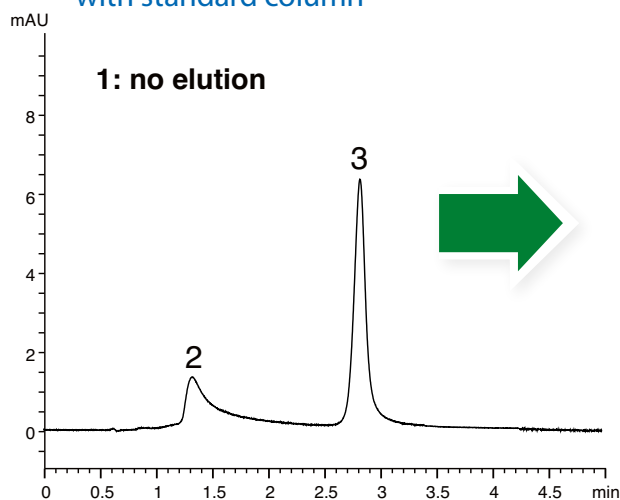
2 ADP



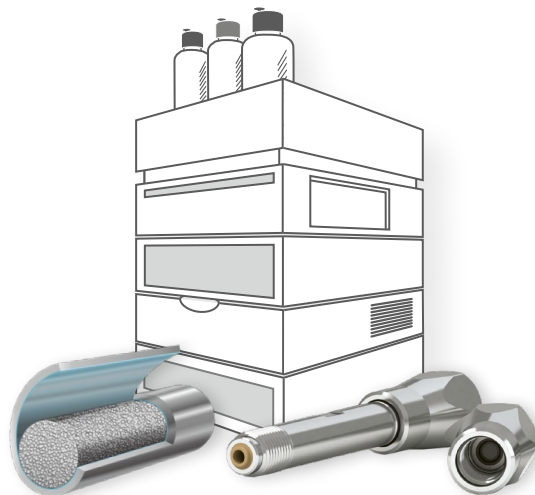
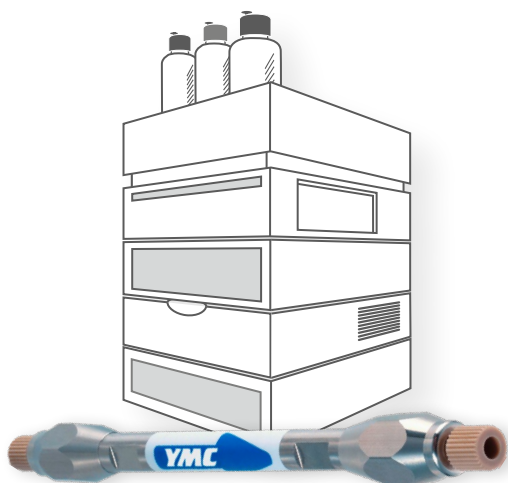
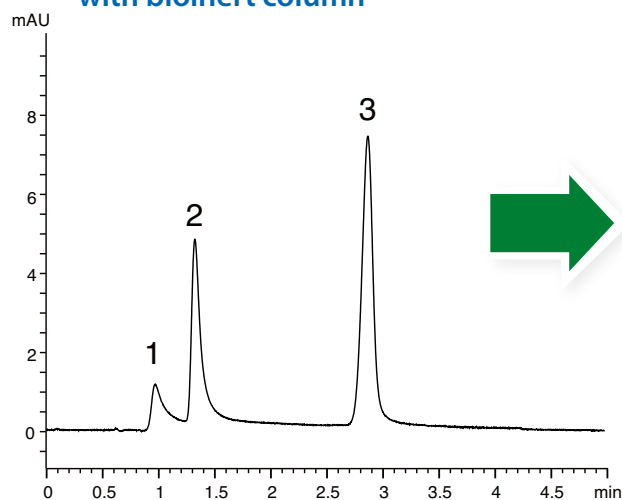
3 AMP



Ordinary HPLC system with standard column



Ordinary HPLC system with bioinert column

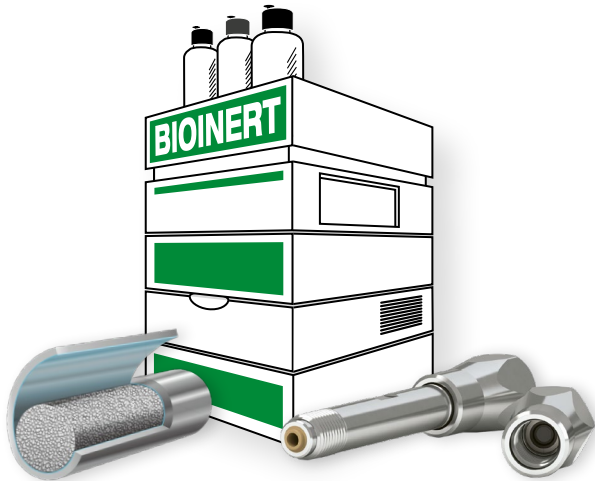
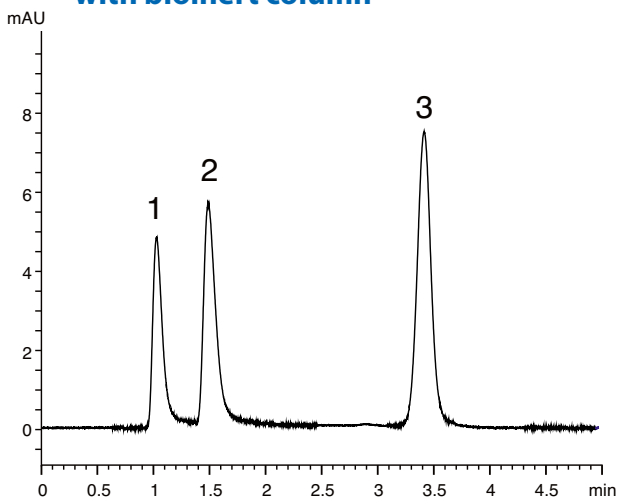


Column: YMC-Triart C18 (3 μ m, 12 nm) 50 x 2.1 mm ID
 Part Nos: TA12S03-05Q1PT (standard hardware)
 TA12S03-05Q1PTP (bioinert hardware)
 Eluent: 5 mM HCOONH₄
 Flow rate: 0.21 mL/min
 Temperature: 25°C
 Detection: UV at 265 nm
 Injection: 1 μ L (10 μ g/mL)

*Bioinert HPLC system: PEEK sample loop, PEEK injector port, and PEEK tubing are used.

ATP peak is detected, and peak shape of ADP is improved as a result of using a bioinert column.

Bioinert HPLC system* with bioinert column



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“Metal-free PEEK-lined YMC columns significantly reduce non-specific adsorption phenomena”

“YMC-Triart C18 metal-free PEEK-lined columns significantly reduce non-specific adsorption phenomena during peptides analysis. We use these columns in our laboratory for a specific application. We obtain very good chromatographic resolution and excellent robustness, which is very appreciable during routine analysis.”

*Cynthia Mongongu, LADF,
Laboratoire AntiDopage Français,
Université Paris-Saclay (FR)*

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Peak shape is greatly improved as a result of using a bioinert HPLC system.

