

High Performance Liquid Chromatography Columns

Shim-pack HPLC Columns for Bioseparation

CoreFocus





Ion Exchange Chromatography Columns

Shim-pack™ Bio IEX P. 7

Hydrophobic Interaction Chromatography Columns

Shim-pack Bio HIC P. 7

Size Exclusion Chromatography Columns

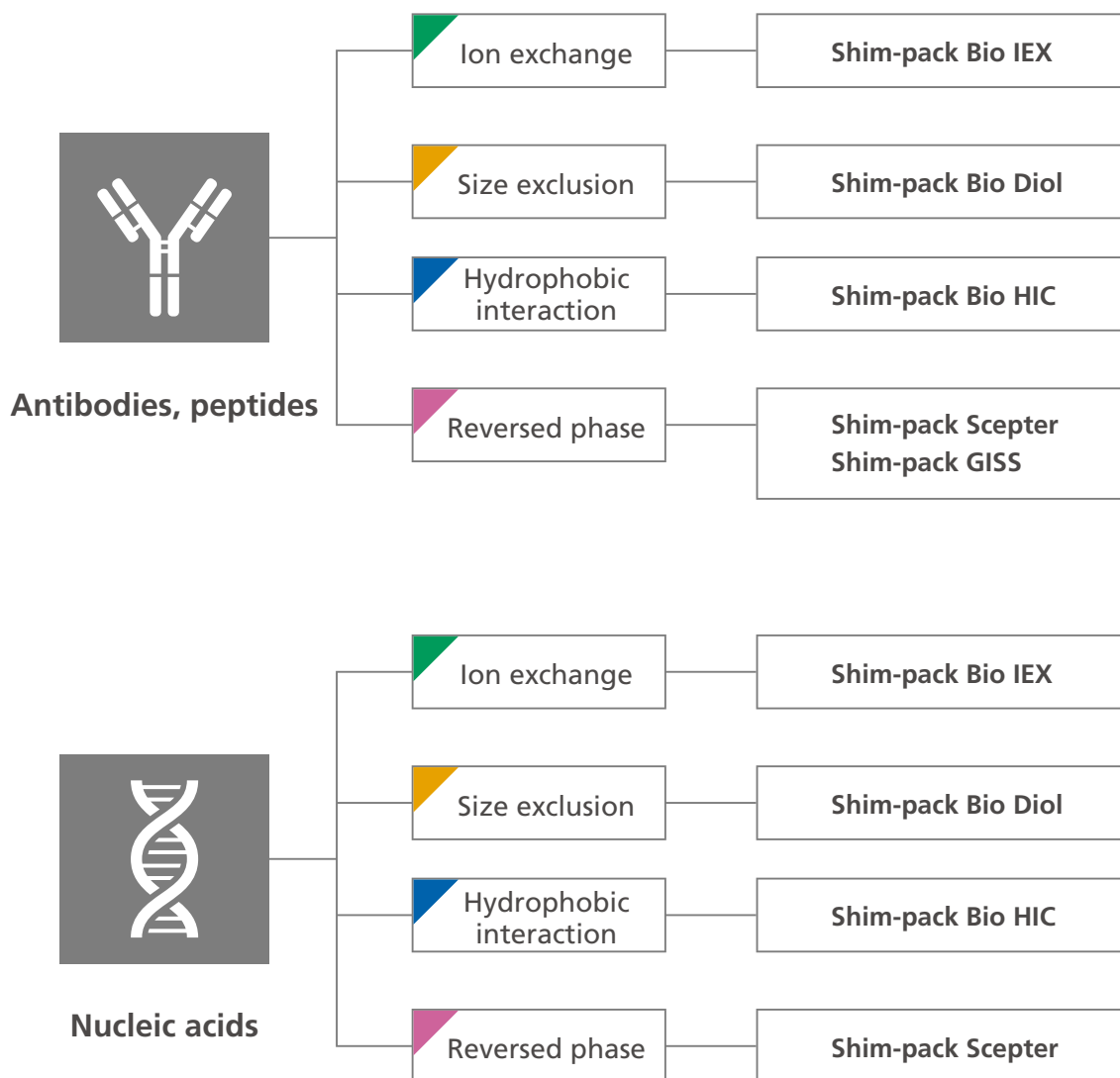
Shim-pack Bio Diol P. 8

Reversed Phase Chromatography Columns

Shim-pack GISS P. 9

Shim-pack Scepter™ P. 10

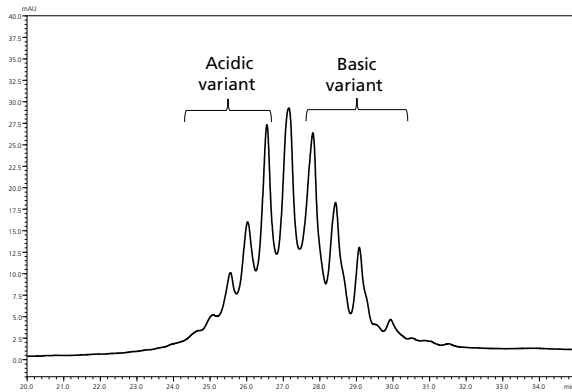
Selection by Target Analytes





Antibody and Peptide Analysis Examples

Charge Variant Analysis of Monoclonal Antibodies –Shim-pack Bio IEX SP-NP –



Conditions

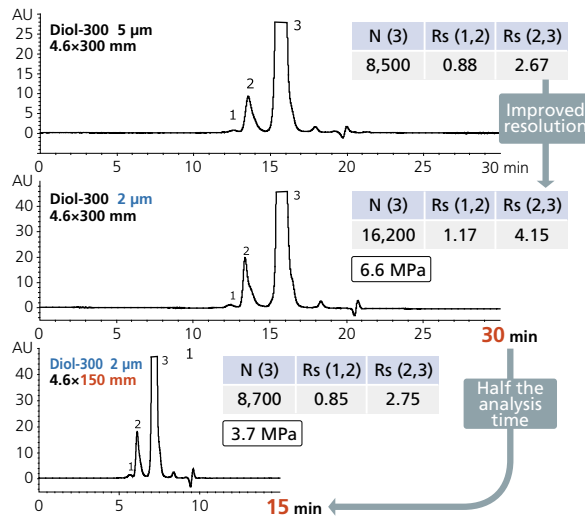
Column : Shim-pack Bio IEX SP-NP
(100 mm × 4.6 mm I.D., 3 μm)
P/N: 227-31005-03

Mobile phase : A) 20 mmol/L MES-HEPES-Sodium Acetate (pH 5.0)
B) 20 mmol/L MES-HEPES-Sodium Acetate (pH 10.6)

Gradient : 0-100 % (0-15 min)→100 % (15-20 min)→
0 % (20.1-30 min)

Flow rate : 0.3 mL/min
Column temp.: Ambient
Detection : UV 280 nm
Sample : Cetuximab bio-similar

Analysis of Antibody and Antibody-Drug Conjugate Aggregates by Size Exclusion Chromatography –Shim-pack Bio Diol-300 –

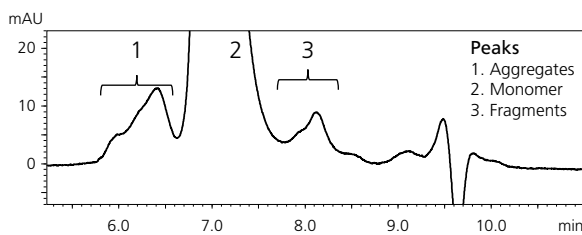


Conditions

Column : Shim-pack Bio Diol-300

Mobile phase : 0.1 M KH₂PO₄-K₂HPO₄ (pH 7.0) with 0.2 M NaCl

Flow rate : 0.2 mL/min
Column temp.: Ambient
Detection : UV 280 nm
Sample : Humanized monoclonal IgG1



Conditions

Column : Shim-pack Bio Diol-300

Mobile phase : 15 % acetonitrile in
100 mmol/L (sodium) phosphate buffer (pH 6.9)

Flow rate : 0.2 mL/min
Column temp.: 25 °C
Detection : UV 280 nm
Sample : Antibody-drug conjugate standard (1 mg/mL)

Recommended: pHM-40 for mobile phase pH monitoring



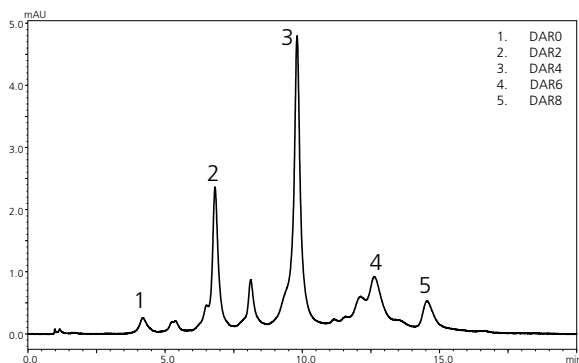
Product Introduction Page



Analysis of ADC Drug Antibody Ratio

–Shim-pack Bio HIC –

ADC DAR Analysis using Shim-pack BIO HIC Column



Conditions

Column : Shim-pack Bio HIC (100 mm. x 4.6 mm I.D., 4 μm)
 P/N: 227-31174-01
 Mobile phase : A) 50 mM NaH₂PO₄-Na₂HPO₄ (pH 7.0)
 containing 1.5 M (NH₄)₂SO₄/2-propanol (95/5)
 B) 50 mM NaH₂PO₄-Na₂HPO₄ (pH 7.0)
 /2-propanol (80/20)
 Gradient : 0 %B (0-1 min), 0-100 %B (1-18 min),
 100 %B (18-23 min)
 Flow rate : 1.0 mL/min
 Column temp. : 25 °C
 Detection : 280 nm (PDA)
 Sample : Cysteine-like ADC Mimic (5 mg/mL)

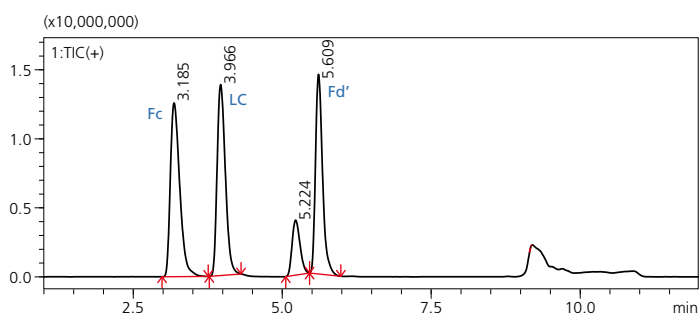
Peak area reproducibility (n = 6)

	%RSD
DAR0	5.98
DAR2	2.57
DAR4	1.62
DAR6	2.23
DAR8	2.87

Note: Peaks integrated automatically using i-PeakFinder™
 (unique peak processing algorithm for LabSolutions)

Analysis of Antibody Digests

–Shim-pack Scepter C4 –



Conditions

Column : Shim-pack Scepter C4-300
 (50 mm L. x 2.1 mm I.D., 3 μm)
 P/N: 227-31176-01
 Mobile phases : A) 0.1 % formic acid in water
 B) 0.1 % formic acid in acetonitrile
 Gradient program : 1 %B (1 min) → 25 %B (1.1 min)
 → 40 %B (8 min)
 → 95 %B (8.1 min-10min)
 → 1 %B (10.1-15 min)
 Flow rate : 0.3 mL/min
 Column temp. : 50 °C
 Sample : IdeZ digested + DTT treated
 Adalimumab 0.2 mg/mL

► Recommended: LCMS-9050 liquid chromatograph
 mass spectrometer for analysis of biologics



Product Introduction Page

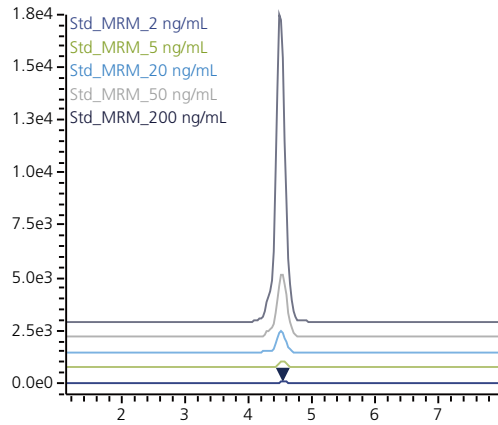




Nucleic Acid Analysis Examples

■ LC-MS/MS Quantitative Analysis of an Oligonucleotide –Shim-pack Scepter C18-120 [metal free] –

Q 803.4626>94.9358 (-)



Conditions

Column : Shim-pack Scepter C18
(75 mmL. × 2.0 mm I.D., 1.9 μm)
P/N: 227-31011-04

Mobile phases : A) 50 mM HFIP
B) MeCN

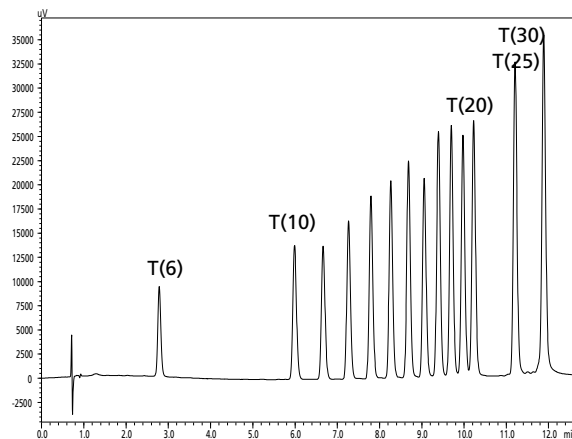
Gradient program : 5 %B (0-0.5 min)→15 %B (0.5-6 min)

Flow rate : 0.2 mL/min

Column temp. : 50 °C

Sample : Mipomersen-2' -deoxy:
5'-mG-mC*-mC*-mU*-mC*-dA-dG-dT-dC*-
dT-dG-dC*-dT-dT-dC*-mG-mC*-mA-mC*-mC*-3

■ Analysis of Oligonucleotides of Different Chain Length by Ion Pair Reversed Phase Chromatography –Shim-pack Scepter C18-120 [metal free] –



Conditions

Column : Shim-pack Scepter C18-120 [metal-free]
(100 mmL. × 2.1 mm I.D., 3 μm)
P/N: 227-31073-02

Mobile phases : A) 20 mmol/L DBAA pH 6.0
B) 20 mmol/L DBAA pH 6.0 / Methanol = 20/80 (v/v)

Gradient program : 48 %B(0 min) – 68 %B (12 min) →
100 %B (12.01-15 min)→48 %B (15.01-20 min)

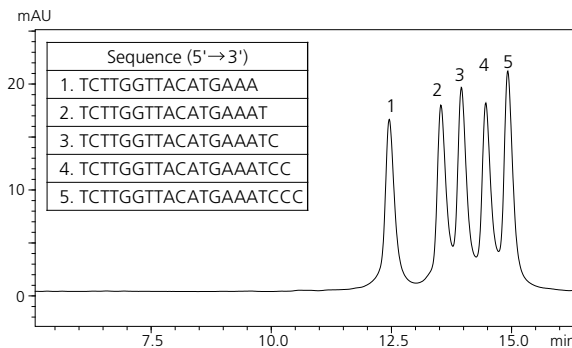
Flow rate : 0.35 mL/min

Column temp. : 50 °C

Detection : 265 nm (PDA)

Sample : poly T (6, 10 – 20, 25, 30)

■ Ion Exchange Chromatography of Oligonucleotides –Shim-pack Bio IEX –



Conditions

Column : Shim-pack Bio IEX Q-NP
(100 mmL. × 4.6 mm I.D., 5 μm)
P/N: 227-31003-03

Mobile phases : A) 10 mmol/L NaOH
B) 10 mmol/L NaOH containing 1mol/L NaClO₄

Gradient program : 25 %B (0 min)→32.5 %B (-15 min)→
100 %B (15.1-20 min)→ 25 % (20.1-25 min)

Flow rate : 0.8 mL/min

Column temp. : 30 °C

Detection : 265 nm (PDA)

Sample : Described in the chromatogram

Column Recommendations for Compound Type

Ion Exchange Chromatography Columns for Protein and Nucleic Acid Analysis

Shim-pack Bio IEX Columns

The Shim-pack Bio IEX columns are available in the following chemistries.

- Anion exchange quaternary ammonium (Q)
- Cation exchange sulfopropyl (SP)

Porous particles and non-porous particles are available, both using hydrophilic polymer packing.

- Hydrophilic porous polymer (Q and SP columns)
- Hydrophilic non-porous polymer (Q-NP and SP-NP columns)

The porous packing materials offer highly efficient and excellent binding capacity, and the non-porous packing materials offer high recovery rates and excellent resolution.

	Q-NP	SP-NP	Q	SP
Particle Material	Hydrophilic non-porous polymer		Hydrophilic porous polymer	
Particle Size	3 μm, 5 μm		5 μm	
Ion Exchange Group	- CH ₂ N ⁺ (CH ₃) ₃	-(CH ₂) ₂ SO ₃ ⁻	- CH ₂ N ⁺ (CH ₃) ₃	-(CH ₂) ₂ SO ₃ ⁻
Operating pH Range	2 - 12			
Operating Temp. Range	4-60°C			
Column Material	PEEK			

Product Name	P/N	Particle Size	I.D.	Length	Maximum Pressure (MPa)	Specification
Shim-pack Bio IEX Q-NP	227-31002-01	3 μm	4.6 mm	30 mm	25.0	Non-porous anion exchange
	227-31002-02		4.6 mm	50 mm		
	227-31002-03		4.6 mm	100 mm		
	227-31003-01	5 μm	4.6 mm	30 mm	6.0	
	227-31003-02		4.6 mm	50 mm	10.0	
	227-31003-03		4.6 mm	100 mm	12.0	
Shim-pack Bio IEX SP-NP	227-31005-01	3 μm	4.6 mm	30 mm	25.0	Non-porous cation exchange
	227-31005-02		4.6 mm	50 mm		
	227-31005-03		4.6 mm	100 mm		
	227-31006-01	5 μm	4.6 mm	30 mm	6.0	
	227-31006-02		4.6 mm	50 mm	10.0	
	227-31006-03		4.6 mm	100 mm	12.0	
Shim-pack Bio IEX Q	227-31001-01	5 μm	4.6 mm	30 mm	2.5	Porous anion exchange
	227-31001-02		4.6 mm	50 mm	3.0	
	227-31001-03		4.6 mm	100 mm	3.5	
Shim-pack Bio IEX SP	227-31004-01	5 μm	4.6 mm	30 mm	2.5	Porous cation exchange
	227-31004-02		4.6 mm	50 mm	3.0	
	227-31004-03		4.6 mm	100 mm	3.5	

For Analysis of Antibody-Drug Conjugates and Isomers Not Separated by Ion Exchange Chromatography

Shim-pack Bio HIC Columns

The Shim-pack Bio HIC column is a hydrophobic interaction chromatography (HIC) column packed with butyl bonded hydrophilic non-porous polymer particles (4 μm). HIC is suitable for the separation of analytes with slight differences in hydrophobicity, such as antibody-drug conjugates (ADCs) with different drug-antibody ratios (DARs). Shim-pack Bio HIC can be used to analyze the DAR of ADCs at low back pressures with high resolution.

Product Name	P/N	Particle Size	I.D.	Length	Maximum pressure
Shim-pack Bio HIC Butyl	227-31174-01	4 μm	4.6 mm	100 mm	20 MPa

- **Recommended: Nexera™ lite inert/Nexera XS inert for analysis of antibodies, proteins, and nucleic acids, with the FRC-40 for purification.**



Product Introduction Page



For Analysis of Protein Aggregates and Nucleic Acids of Different Sizes

Shim-pack Bio Diol Columns

Shim-pack Bio Diol columns are size exclusion chromatography columns with packing particles of various pore sizes for analyzing aggregates and fragments of antibodies, oligonucleotides, carbohydrates, and other analytes. The lineup includes 2 µm particle high-speed analysis columns that enable rapid characterization in addition to purification of trace amounts of substances at the laboratory scale.

	Diol-60	Diol-120	Diol-200	Diol-300
Particle Material	Silica gel			
Functional Group	Dihydroxypropyl (Diol)			
Particle Size	3 µm, 5 µm		2 µm, 3 µm, 5 µm	
Pore Size	6 nm (60Å)	12 nm (120Å)	20 nm (200Å)	30 nm (300Å)
Operating pH Range	5.0 - 7.5			
Molecular Weight Range	10,000 or less	1,000 - 100,000	5,000 - 300,000	20,000 - 1,000,000
Maximum pressure	2 µm : 45 MPa (Usually at 30 MPa or less)		3, 5 µm : 20 MPa	

Product Name	P/N	Particle Size	I.D.	Length
Shim-pack Bio Diol-60	227-31007-01	3 µm	4.6 mm	300 mm
	227-31007-02	5 µm	4.6 mm	300 mm
	227-31007-03	5 µm	8.0 mm	300 mm
	227-31097-01	5 µm	20 mm	300 mm
	227-31097-02	5 µm	20 mm	500 mm
Shim-pack Bio Diol-120	227-31008-01	3 µm	4.6 mm	300 mm
	227-31008-02	5 µm	4.6 mm	300 mm
	227-31008-03	5 µm	8.0 mm	300 mm
	227-31098-01	5 µm	20 mm	300 mm
	227-31098-02	5 µm	20 mm	500 mm
Shim-pack Bio Diol-200	227-31009-01	2 µm	4.6 mm	150 mm
	227-31009-02	2 µm	4.6 mm	300 mm
	227-31009-03	3 µm	4.6 mm	300 mm
	227-31009-04	5 µm	4.6 mm	300 mm
	227-31009-05	5 µm	8.0 mm	300 mm
	227-31099-01	5 µm	20 mm	300 mm
Shim-pack Bio Diol-300	227-31010-01	2 µm	4.6 mm	150 mm
	227-31010-02	2 µm	4.6 mm	300 mm
	227-31010-03	3 µm	4.6 mm	300 mm
	227-31010-04	5 µm	4.6 mm	300 mm
	227-31010-05	5 µm	8.0 mm	300 mm
	227-31100-01	5 µm	20 mm	300 mm
	227-31100-02	5 µm	20 mm	500 mm

Product Name	P/N	Particle Size	I.D.	Length
Shim-pack Bio Diol-60 Guard Column	227-31007-04	5 µm	8.0 mm	30 mm
	227-31116-01		20 mm	50 mm
Shim-pack Bio Diol-120 Guard Column	227-31008-04		8.0 mm	30 mm
	227-31117-01		20 mm	50 mm
Shim-pack Bio Diol-200 Guard Column	227-31009-06		8.0 mm	30 mm
	227-31118-01		20 mm	50 mm
Shim-pack Bio Diol-300 Guard Column	227-31010-06		8.0 mm	30 mm
	227-31119-01		20 mm	50 mm
	227-31202-01		2 µm	4.0 mm

200Å Pore Size and High Inertness that Are Ideal for Peptide Analysis

Shim-pack GISS Columns

Shim-pack GISS C18 offers rapid separation with symmetrical peaks while maintaining ultra-high inertness and a wide operating pH range. Excellent peak shapes are achieved through optimized surface areas, pore sizes, and chemical bonding. The use of highly inert silica gel makes Shim-pack GISS C18 columns ideal for LC/MS/MS analysis of peptides with MS-friendly mobile phases.

Solid Phase	C18
Particle Size	1.9 µm, 3 µm, 5 µm
Pore Size	20 nm (200Å)
Specific Surface Area	200 m ² /g
Carbon Content	9 %
End Capping	Yes
pH Range	1 - 10
USP Code	L1




Product Name	P/N	Particle Size	I.D.	Length	Maximum Pressure (MPa)	Specification
Shim-pack GISS-HP C18 [Metal free]	227-30922-01	1.9 µm	2.1 mm	50 mm	80	Fully Porous Silica
	227-30922-02	1.9 µm	2.1 mm	100 mm		
	227-30923-01	1.9 µm	4.6 mm	50 mm		
	227-30923-02	1.9 µm	4.6 mm	100 mm		
	227-30923-03	1.9 µm	4.6 mm	150 mm		
	227-30924-01	3 µm	2.1 mm	50 mm	50	
	227-30924-02	3 µm	2.1 mm	100 mm		
	227-30924-03	3 µm	2.1 mm	150 mm		
	227-30924-04	3 µm	2.1 mm	250 mm		
	227-30925-01	3 µm	4.6 mm	50 mm		
	227-30925-02	3 µm	4.6 mm	100 mm		
	227-30925-03	3 µm	4.6 mm	150 mm		
	227-30925-04	3 µm	4.6 mm	250 mm		

Product Name	P/N	Particle Size	I.D.	Length	Maximum Pressure (MPa)	Specification
Shim-pack GISS C18 [Metal free]	227-30926-01	5 µm	2.1 mm	50 mm	20	Fully Porous Silica
	227-30926-02	5 µm	2.1 mm	100 mm		
	227-30926-03	5 µm	2.1 mm	150 mm		
	227-30926-04	5 µm	2.1 mm	250 mm		
	227-30927-01	5 µm	4.6 mm	50 mm		
	227-30927-02	5 µm	4.6 mm	100 mm		
	227-30927-03	5 µm	4.6 mm	150 mm		
	227-30927-04	5 µm	4.6 mm	250 mm		

Inert, Durable Organosilane Hybrid Particle Ideal for Ion Pair Reversed Phase Analysis of Nucleic Acids Shim-pack Scepter Columns

Shim-pack Scepter LC columns are next-generation organosilane hybrid columns that offer excellent stability and performance across a wide range of LC conditions. With a lineup that includes a variety of chemical characteristics, Shim-pack Scepter columns are effective for method development/scouting and suited to a range of applications.

C18 columns support high pH levels and are ideal for ion pair reversed phase analysis of nucleic acids. C4 columns with a pore size of 30 nm (300 Å) are suitable for the analysis of large proteins and peptides.

	Reversed Phase		
	C18	C8	C4
Structure			
Packing	Organosilica hybrid		
Particle Size (µm)	1.9, 3, 5		
Pore Size (nm)	12 (120Å)		30 (300Å)
End Capping	Special end capping		
Operating pH Range	1 - 12		1 - 10
100 % Water Mobile Phase	Compatible	Not compatible	Compatible
USP Code	L1	L7	L26

Phase	Product Name	P/N	Particle Size	I.D.	Length	Maximum Pressure (MPa)	Specification
C18	Shim-pack Scepter C18-120	227-31072-01	1.9 µm	2.1 mm	50 mm	100	Metal free
		227-31072-02	1.9 µm	2.1 mm	100 mm		
		227-31073-01	3 µm	2.1 mm	50 mm	45*	
		227-31073-02	3 µm	2.1 mm	100 mm		
		227-31073-03	3 µm	2.1 mm	150 mm		
		227-31074-01	3 µm	4.6 mm	50 mm		
		227-31074-02	3 µm	4.6 mm	100 mm		
		227-31074-03	3 µm	4.6 mm	150 mm		
		227-31075-01	5 µm	2.1 mm	50 mm	100	
		227-31075-02	5 µm	2.1 mm	100 mm		
		227-31076-01	5 µm	4.6 mm	50 mm		
227-31076-02	5 µm	4.6 mm	100 mm				
227-31076-03	5 µm	4.6 mm	150 mm				
C8	Shim-pack Scepter C8-120	227-31166-01	1.9 µm	2.1 mm	50 mm	100	Metal free
		227-31166-02	1.9 µm	2.1 mm	100 mm		
		227-31166-03	1.9 µm	2.1 mm	150 mm		
		227-31081-01	3 µm	2.1 mm	50 mm	45*	
		227-31081-02	3 µm	2.1 mm	100 mm		
		227-31081-03	3 µm	2.1 mm	150 mm		
		227-31082-01	3 µm	4.6 mm	50 mm		
		227-31082-02	3 µm	4.6 mm	100 mm		
		227-31082-03	3 µm	4.6 mm	150 mm		
		227-31083-01	5 µm	2.1 mm	50 mm		
		227-31083-02	5 µm	2.1 mm	100 mm		
		227-31083-03	5 µm	2.1 mm	150 mm		
		227-31084-01	5 µm	4.6 mm	50 mm		
		227-31084-02	5 µm	4.6 mm	100 mm		
227-31084-03	5 µm	4.6 mm	150 mm				
C4	Shim-pack Scepter C4-300	227-31197-01	1.9 µm	2.1 mm	50 mm	100	Metal free
		227-31197-02	1.9 µm	2.1 mm	100 mm		
		227-31197-03	1.9 µm	2.1 mm	150 mm		
		227-31198-01	3 µm	2.1 mm	50 mm	45*	
		227-31198-02	3 µm	2.1 mm	100 mm		
		227-31198-03	3 µm	2.1 mm	150 mm		
		227-31199-01	3 µm	4.6 mm	50 mm		
		227-31199-02	3 µm	4.6 mm	100 mm		
		227-31199-03	3 µm	4.6 mm	150 mm		
		227-31200-01	5 µm	2.1 mm	50 mm		
		227-31200-02	5 µm	2.1 mm	100 mm		
		227-31200-03	5 µm	2.1 mm	150 mm		
		227-31201-01	5 µm	4.6 mm	50 mm		
		227-31201-02	5 µm	4.6 mm	100 mm		
		227-31201-03	5 µm	4.6 mm	150 mm		

*Usually use at 30 Mpa or less.

► Recommended: Nexera XS inert for structural analysis of antibodies, proteins, and nucleic acids, pharmacokinetic analysis, and other highly sensitive analyses



Product Introduction Page



Low-Adsorption Microtiter Plates

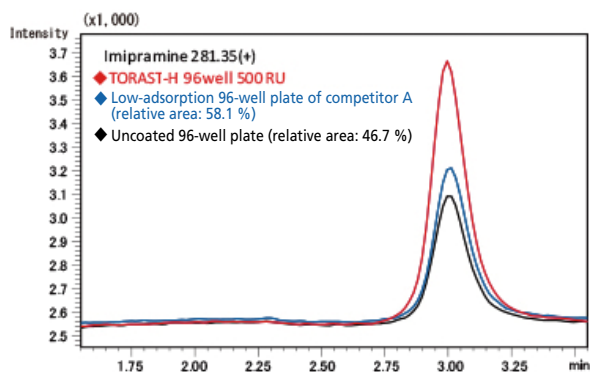
TORAST-H 96-well 500RU

Use a Low-Adsorption Well Plate for Excellent Reproducibility

A low-adsorption 96-well plate with non-ionic hydrophilic groups attached to the inner well surface is available.

Imipramine is a highly hydrophobic basic compound. Shown below are the results from a study of imipramine adsorption to 96-well plates measured by LC/MS. TORAST-H 96-well 500 RU showed a marked reduction in adsorption compared to both an uncoated 96-well plate and the low-adsorption 96-well plate of a competitor.

Comparing variation in adsorption also showed the adsorption by TORAST-H 96-well 500 RU was highly reproducible compared to an uncoated well plate.



Polypropylene Vial with Ultra Low Adsorption

TORAST-H Bio Vial

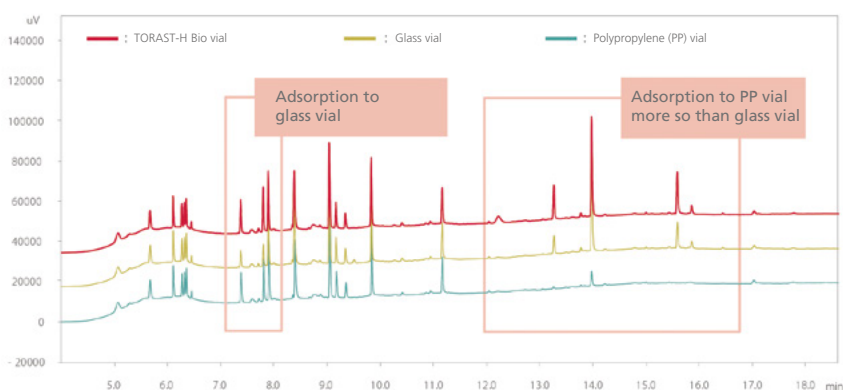
- Very low adsorption of peptides
- Very low adsorption of basic compounds
- Convenient and user-friendly design



Testing the Adsorption of a Trypsin Digest of Myoglobin (approximately 1.9 pmol/mL)

The results showed that highly polar peptides with a retention time of approx. 7 to 8 minutes adsorbed mainly to the glass vial and highly hydrophobic peptides with a retention time of approx. 12 to 16 minutes adsorbed mainly to the polypropylene (PP) vial.

The Torast-H Bio vial showed ultra low adsorption of both highly polar and highly hydrophobic compounds.



Product Name	Specification	Slit	Volume	No. of Pieces	P/N
TORAST-H Bio Vial	PP vial	Yes	300 μ L	100	370-04350-00

Please use the special vial detection plate on the right (P/N: 228-51891-03) when using TORAST-H Bio vials with Shimadzu i-Series LC systems.



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