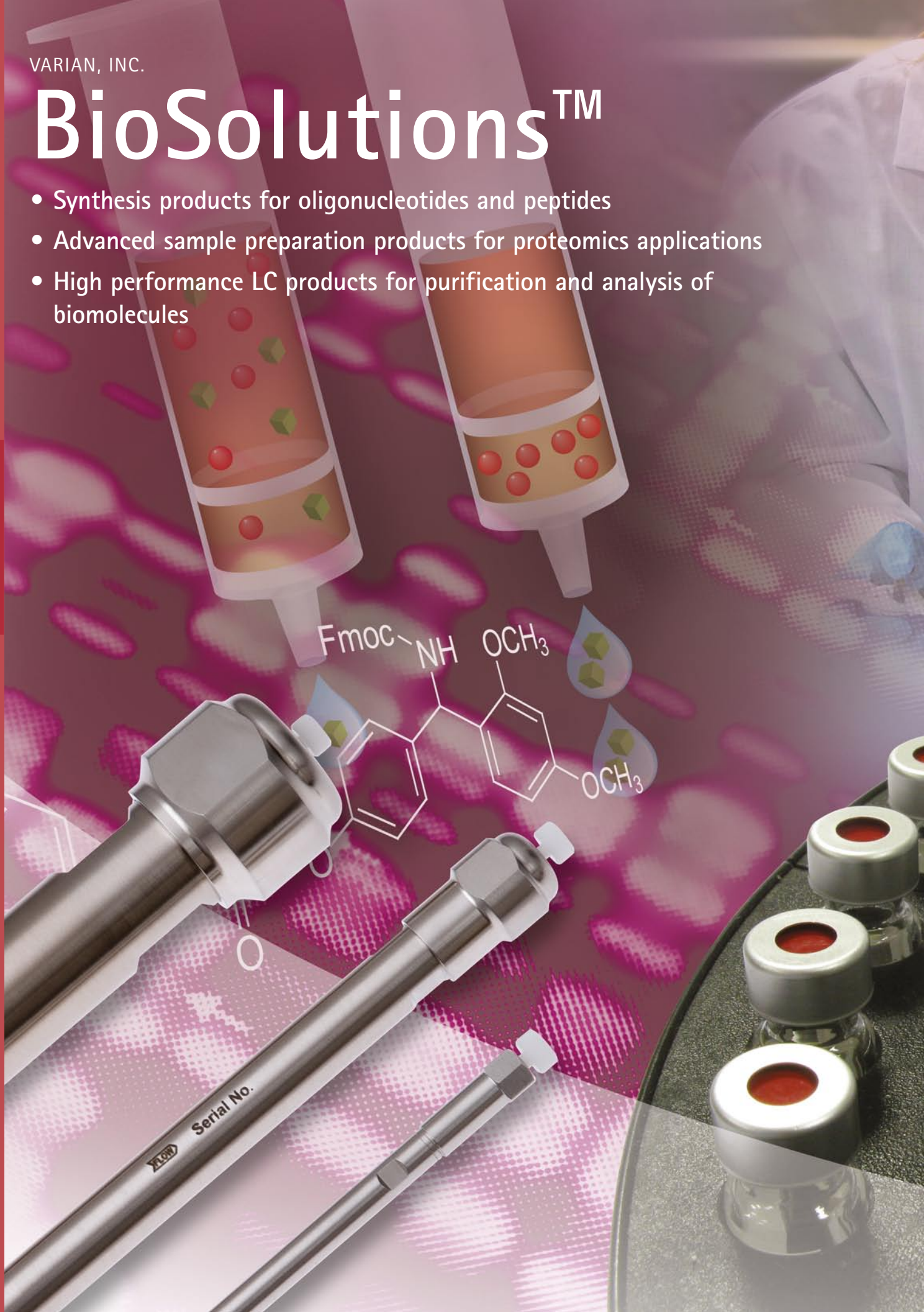
VARIAN, INC.

BioSolutions™

- Synthesis products for oligonucleotides and peptides
- Advanced sample preparation products for proteomics applications
- High performance LC products for purification and analysis of biomolecules



Contents

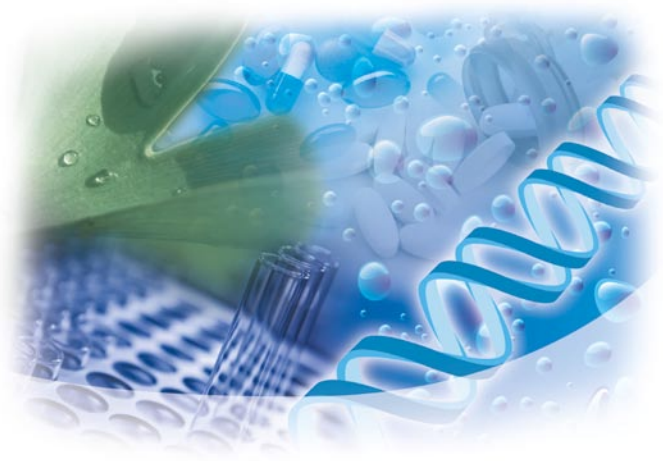
From oligonucleotide and peptide synthesis and purification to protein analysis and characterization, Varian BioSolutions™ provide you with simple and reliable tools to deliver results quickly and efficiently.

Improved precision and flow characteristics of OMIX tips make these products ideal for protein digest sample prep.

BioSolutions™

Synthesis, Analysis and Purification

Looking for a solution to meet your biomolecular challenge? BioSolutions products provide you with simple and reliable tools to deliver results quickly and efficiently. Through close cooperation with scientists, Varian has created all-inclusive packages with integrated hardware, software and reagents that guarantee the best results in a fast, user-friendly format.



Products for BioSolutions:

Oligo Solutions

- StratoSpheres™ DNA high throughput synthesis cartridges
- TOP™, TOP-DNA and TOP-RNA oligonucleotide purification cartridges
- Reverse phase HPLC with PLRP-S for oligonucleotide purification
- Ion exchange HPLC with PL-SAX for oligonucleotide analysis

Peptide Solutions

- StratoSpheres and AmphiSpheres resins for solid phase synthesis
- VariPure™ IPE for ion pair extraction (TFA removal)
- VariTide™ RPC
- Reverse phase HPLC with PLRP-S for GMP peptide production

Protein Solutions

- OMIX™ Tips for proteomics applications
- Capillary LC Columns for proteomics applications
- Wide pore reverse phase HPLC for large biomolecule analysis
- Wide pore ion exchange HPLC for large biomolecule analysis
- Aqueous size exclusion with ProSEC™ 300S for protein characterization

Varian manufactures a wide range of chromatography sorbents and stationary phases to cover a wealth of applications. With so many to choose from, finding the most suitable technology for a given application may seem a daunting task. The table opposite covers many of the key factors for consideration in the biomolecule application area. It has been divided into sections covering polymeric and silica-based phases and reverse phase (RP) and ion exchange (IEX) mechanisms.

Select the Right HPLC Column for Your Application

Silica RP

Sorbent	Small molecules	Peptides 5-40 amino acids	Peptide digests	Proteins >5 kDa <70 kDa	Proteins >70 kDa	Sugars	Oligos	DNA fragments
Polaris™ 180Å	Yes	Yes	Yes			NH_2		
Pursuit™ 200Å	Yes (speed)	Yes	Yes					
Pursuit XRs 100Å	Yes (Rs)							

Polymer RP

Sorbent	Small molecules	Peptides 5-40 amino acids	Peptide digests	Proteins >5 kDa <70 kDa	Proteins >70 kDa	Sugars	Oligos	DNA fragments
VariTide™		Yes (synthetic)						
PLRP-S 100Å	Yes (temp.)	Yes	Yes			Yes		
PLRP-S 300Å				Yes			Yes	
PLRP-S 1000Å	USP L21 methods				Yes			
PLRP-S 4000Å								Yes

Polymer IEX

Sorbent	Small molecules	Peptides 5-40 amino acids	Peptide digests	Proteins >5 kDa <70 kDa	Proteins >70 kDa	Sugars	Oligos	DNA fragments
PL-SAX 1000Å - 4000Å		Yes	Yes	Yes	Yes		Yes	Yes (4000Å)
PL-SCX 1000Å - 4000Å		Yes	Yes	Yes	Yes			
PL-WAX 1000Å - 4000Å		Yes	Yes	Yes	Yes			
PL-WCX 1000Å - 4000Å		Yes	Yes	Yes	Yes			
Hi-Plex	Organic Acids					Yes		

SEC

Sorbent	Small molecules	Peptides 5-40 amino acids	Peptide digests	Proteins >5 kDa <70 kDa	Proteins >70 kDa	Sugars	Oligos	DNA fragments
ProSEC 300S				Yes	Yes			

Tip

In the subsequent pages further factors are considered, particularly column dimensions. If you are unsure please call your local Varian representative who will be happy to discuss your requirements in more detail.

Oligo Solutions

StratoSpheres™ DNA: For High Quality Synthetic DNA Oligonucleotides

- **Greater yields of full length products than controlled-pore glass**
- **Inert support prevents side reactions and improves the quality of the end product**
- **1000Å pore size permits synthesis of longer oligonucleotide sequences, up to 70-mer**

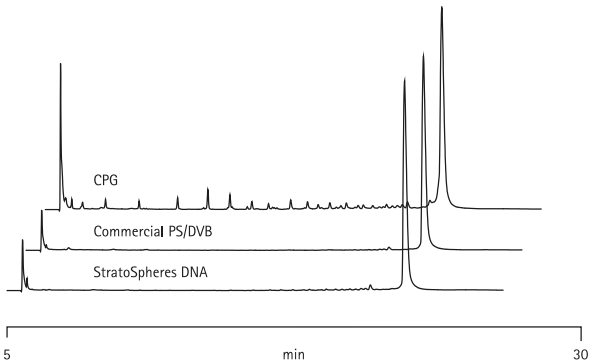
StratoSpheres DNA Synthesis Cartridges make it easy to obtain high quality synthetic DNA oligonucleotides. The high yielding polystyrene packing delivers more full-length product than conventional controlled-pore glass supports. In addition, the hydrophobic nature of the polystyrene promotes coupling and minimizes non-specific binding to maximize production efficiency. These high throughput cartridges deliver very economical oligonucleotide synthesis, and provide the high performance expected from macroporous polystyrene supports. StratoSpheres DNA synthesis cartridges deliver maximum flexibility in high throughput environments.

StratoSpheres DNA is made by Varian, Inc. for excellent consistency. A Certificate of Analysis is offered for every batch.

Typical Applications

High throughput environments

Synthesis of ampR1 primer using StratoSpheres DNA



Column:	Pellicular SAX, 250 x 4 mm
Eluent A:	25 mM Tris-HCl, 0.5% ACN, pH 8.0
Eluent B:	25 mM Tris-HCl, 0.8 M ammonium chloride, 0.5% ACN, pH 8.0
Gradient:	0 -100% B in 26 min
Flow Rate:	1.5 mL/min
Temp:	60 °C
Detector:	UV, 260 nm

References

Summer, EJ, Gonzalez, CF, Carlisle, T, Mebane, LM, Cass, AM, Savva, CG, LiPuma, JJ and Young, R (2004) Burkholderia cenocepacia phage BcepMu and a family of Mu-like phages encoding potential pathogenesis factors. J. Mol. Biol., 340 (1), 49-65.

Ordering Information

(200/pk)

Description	Size (nmol)	Part No.
StratoSpheres DNA DMT bz dA	40	PL3554-1602dAbz
StratoSpheres DNA DMT bz dA	200	PL3554-4602dAbz
StratoSpheres DNA DMT bz dC	40	PL3554-1602dCbz
StratoSpheres DNA DMT bz dC	200	PL3554-4602dCbz
StratoSpheres DNA DMT ac dC	40	PL3554-1602dCac
StratoSpheres DNA DMT ac dC	200	PL3554-4602dCac
StratoSpheres DNA DMT ibu dG	40	PL3554-1602dGibu
StratoSpheres DNA DMT ibu dG	200	PL3554-4602dGibu
StratoSpheres DNA DMT dmf dG	40	PL3554-1602dGdmf
StratoSpheres DNA DMT dmf dG	200	PL3554-4602dGdmf
StratoSpheres DNA DMT dT	40	PL3554-1602dT
StratoSpheres DNA DMT dT	200	PL3554-4602dT

For more information, please visit www.varianinc.com/sps_dna.html or visit www.varianinc.com/products.html to place an order.

Oligo Solutions

TOP™ Cartridges: For DNA, RNA and Trityl-on Oligonucleotide Purification

TOP, TOP-DNA and TOP-RNA cartridges provide a high throughput, simple, cost effective solution for DNA and RNA oligonucleotide purification. The TOP product range incorporates a unique 96-well plate with removable tubes, streamlined gravity flow or vacuum procedure, and proprietary polymeric resin. Varian's innovative technology delivers superior yield and purity for standard oligos up to 1 µmol synthesis scale and up to 150-mer in length. Flexibility is assured from a choice of simple gravity flow (for walk-away and low initial set up cost) or vacuum procedure (for fast turn around - less than 15 minutes for the whole purification process). Up to 10 minutes drying time between each step is permissible with no effect on the purification results (drying time after the acetonitrile conditioning step should be kept to a minimum).

Superior yield and purity come from the proprietary polymeric resins and optimized buffers. Typical yield is more than 85%, typical purity is over 90%, with no need for multiple sample loading steps. Varian TOP cartridges also use up to two thirds less reagent than products from other vendors.

TOP and TOP-DNA Cartridges: For DNA Oligo Purification

- **Fast throughput improves production efficiency**
- **Pre-HPLC "sample prep" ability maximizes utility**
- **Gravity (TOP) or vacuum flow (TOP-DNA) ensures flexibility**

One product fits all your needs for DNA oligo purification. TOP-DNA is a high throughput, simple, fast, cost effective solution that purifies oligos up to 150-mer in length. Its high binding capacity can purify DNA oligos from 200 nmol to 1 µmol synthesis scales. TOP-DNA can also be used for "sample prep" before HPLC purification for very high quality oligos in large-scale analysis. The proprietary polymeric resin is compatible with direct loading of AMA deprotected oligo solutions.

TOP-RNA Cartridges: For RNA Oligo Purification

- **A complete solution for RNA oligo purification to enhance productivity**
- **High throughput and automation friendly, freeing up operator time**
- **Less reagent use to reduce operating costs**

With TOP-RNA you can purify short and long RNA oligos, siRNA to 21-mer and long RNA to 60-80 mer. The high binding capacity purifies RNA oligos up to 1 µmol. The proprietary polymeric resin, quenching buffer, and validated protocol allow deprotection of 2' hydroxyl group without removal of the 5' trityl group.

Ordering Information

Description	Sorbent Mass (mg)	Volume (mL)	Part No.
TOP-RNA Well Plate Tubes for 1 µmol Scale (96/pk)	100	1.8	7573915C
TOP-DNA Well Plate Tubes for 1 µmol Scale (96/pk)	150	1.8	7572915C
TOP-DNA Well Plate Tubes for 1 µmol Scale (20 x 96/pk)	150	1.8	7572915B
TOP Well Plate Tubes for 50 nmol Scale (96/pk)	25	1.8	75719025
TOP Well Plate Tubes for 200 nmol Scale (96/pk)	50	1.8	75719050
TOP Well Plate Tubes - High Capacity for 200 nmol Scale (96/pk)	100	1.8	7571901C
TOP 96-well Plate - Vacuum Compatible for 200 nmol Scale	150	1.8	7561915C
TOP Tubes (15 x 96/pk)	150	1.8	7571915B
96-well Collection Plate (25/pk)		2.0	WA77015200
96-well Collection Plate (25/pk)		750 µL	WA77015750
96-well Plate Sealing Mat (50/pk)			5133005
Disposable Waste Tray (25/pk)			5133001
TOP BufferPak, 1 x 950 mL Binding Solution, 3 x 950 mL 0.1M TEAA			79100000
TOP Reusable Base Plate			75400001

For more information, please visit www.varianinc.com/top.html or visit www.varianinc.com/products.html to place an order.

Oligo Solutions

Trityl On/Trityl Off (Ion Pair) Reverse Phase PLRP-S

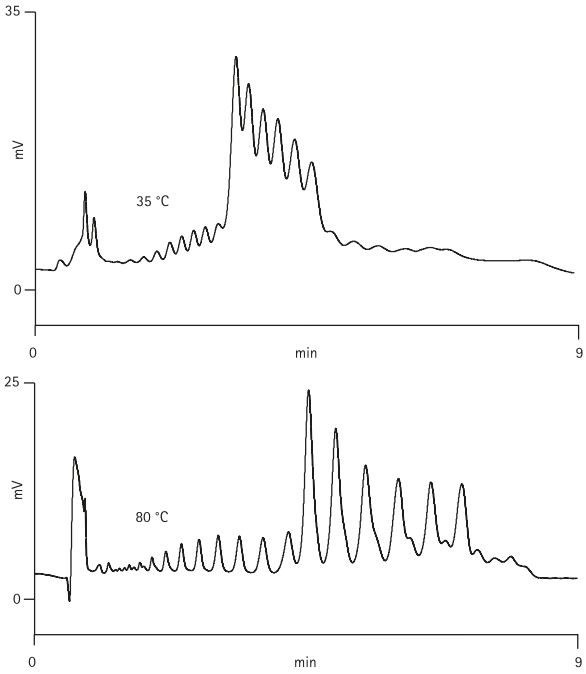
- **High surface area gives good capacity for oligonucleotides**
- **Thermal stability permits elevated temperature to improve resolution**
- **Range of pore sizes for analysis of small synthetic oligonucleotides up to plasmids, with the same selectivity**

PLRP-S is a high performance polystyrene reverse phase matrix. The range of pore sizes and particle sizes makes it ideal for synthetic oligonucleotide analysis and purification. With excellent physical, chemical and thermal stability, PLRP-S can be used for both "Trityl On" purification or, with the use of appropriate ion pair reagents, "Trityl Off" purification.

Typical Applications

Synthetic oligonucleotide analysis and purification

Reverse phase separation of Poly(dT) 19–24 ladder at 35 °C and 80 °C



Column: Poly(dT) 19-24 ladder, PLRP-S 100Å, 3 µm, 4.6 mm ID x 50 mm column
Eluent A: 100 mM triethylammonium acetate (TEAA)
Eluent B: 100 mM TEAA in 25:75 acetonitrile:water
Flow Rate: 1.0 mL/min

Ordering Information

Description	Dimensions (mm)	Part No.
PLRP-S 100Å 3 µm	50 x 2.1	PL1912-1300
	150 x 2.1	PL1912-3300
	50 x 4.6	PL1512-1300
	150 x 4.6	PL1512-2300
PLRP-S 100Å 5 µm	50 x 2.1	PL1912-1500
	150 x 2.1	PL1912-3500
	50 x 4.6	PL1512-1500
	150 x 4.6	PL1111-3500
PLRP-S 300Å 3 µm	50 x 2.1	PL1912-1301
	150 x 2.1	PL1912-3301
	50 x 4.6	PL1512-2301
	150 x 4.6	PL1512-3301
PLRP-S 300Å 5 µm	50 x 2.1	PL1912-1501
	150 x 2.1	PL1912-3501
	50 x 4.6	PL1512-1501
	150 x 4.6	PL1512-3501
PLRP-S 1000Å 5 µm	50 x 2.1	PL1912-1502
PLRP-S 1000Å 8 µm	50 x 2.1	PL1912-1802
	150 x 2.1	PL1912-3802
	50 x 4.6	PL1512-1802
	150 x 4.6	PL1512-3802
PLRP-S 4000Å 5 µm	50 x 4.6	PL1912-1503
PLRP-S 4000Å 8 µm	50 x 2.1	PL1912-1803
	150 x 2.1	PL1912-3803
	50 x 4.6	PL1512-1803
	150 x 4.6	PL1512-3803

See also

- PLRP-S capillary columns, page 241
- PLRP-S prep to process columns, page 265

For more information, please visit www.varianinc.com/plrp-s.html or visit www.varianinc.com/products.html to place an order.

Oligo Solutions

PL-SAX: Anion Exchange HPLC

- **Small particle sizes deliver high efficiency separations**
- **Wide range of particle and column dimensions for productive scale-up**
- **Exceptional stability prolongs column lifetimes**

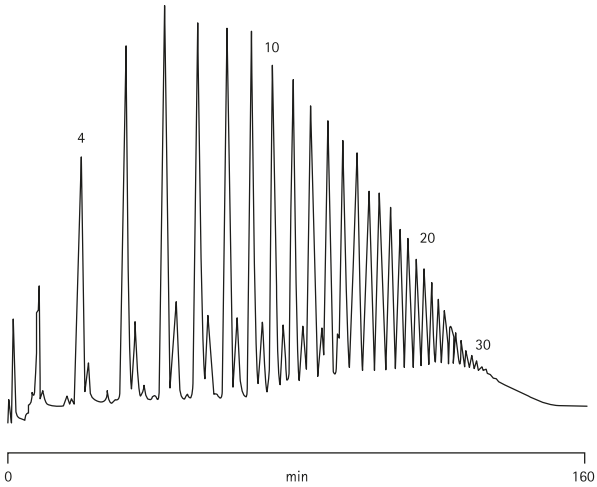
PL-SAX is a robust material that delivers separations even under denaturing conditions of elevated temperature, organic solvent, and high pH. It provides improved chromatography for self-complimentary or G-rich sequences that may associate to form aggregates or hairpin structures.

Excellent chromatographic performance results from small 5 µm particles, for high efficiency separations of n and n-1 sequences. Flexibility is delivered by a broad array of particle sizes, 5 µm to 30 µm, and column geometries, 2.1 to 100 mm ID, for analysis and scale-up to purification. The strong anion exchange functionality, quaternary amine, covalently linked to a polymeric particle, provides a material with exceptional chemical and thermal stability, even with sodium hydroxide eluents, leading to long column lifetimes.

Typical Applications

Synthetic peptides and recombinant peptides and proteins

Separation of oligoribonucleotides-oligo(rA)n



Column:	PL-SAX 4000Å 8 µm, 150 x 4.6 mm
Eluent A:	20mM KH_2PO_4 pH 5.5, 5M urea
Eluent B:	A+1.0M KCl
Gradient:	0-100% B in 200 min
Flow Rate:	2.0 mL/min
Detector:	UV, 260 nm

Ordering Information

Description	Dimensions (mm)	Part No.
PL-SAX 1000Å 5 µm	50 x 2.1	PL1951-1502
	50 x 4.6	PL1551-1502
PL-SAX 1000Å 8 µm	50 x 2.1	PL1951-1802
	150 x 2.1	PL1951-3802
	50 x 4.6	PL1551-1082
	150 x 4.6	PL1551-3802
PL-SAX 4000Å 5 µm	50 x 2.1	PL1951-1503
	50 x 4.6	PL1551-1503
PL-SAX 4000Å 8 µm	50 x 2.1	PL1951-1803
	150 x 2.1	PL1951-3803
	50 x 4.6	PL1551-1803
	150 x 4.6	PL1551-3803

See also

- PL-SAX, high performance HPLC columns, page 79

Peptide Solutions

VariPep™ Peptide Solutions: For Peptide Synthesis, Analysis and Purification

StratoSpheres™

Highest quality supports for peptide synthesis

VariTide™ RPC

A "universal" RP-HPLC column for synthetic peptides purification

VariPure™ IPE

Ion pair extraction

PLRP-S 100Å

For peptide analysis and GMP production

VariPep is the cost-effective solution for the production of synthetic peptides. The portfolio of products lets you manage the cost and efficiency of high volume synthetic peptide production, from µg to g scale. These products provide the solution for peptide houses that manufacture small quantities of hundreds/thousands of peptides where manufacturing time is the economic driving force. VariPep includes StratoSpheres, very high quality supports for peptide synthesis, VariTide RPC, "universal" RP-HPLC columns and media for synthetic peptide analysis and purification, and VariPure IPE, a unique material for ion pair extraction.

The VariPep solution for synthetic peptide production thus brings together proven and reliable technologies in a convenient format that simplifies the manufacturing process, so reducing production time and improving economics.

StratoSpheres: Highest Quality Supports for Peptide Synthesis

- **Very high yields maximize productivity**
- **Reduced cost of raw materials**
- **High reproducibility, batch after batch**

From the extensive range of Varian StratoSpheres resins, those designed specifically for solid phase synthesis of peptides have been selected for inclusion in the VariPep product portfolio. StratoSpheres particles are manufactured using a proprietary manufacturing technique, which ensures exceptional control and reproducibility of the loading. This has the benefit of giving exceptional yields of peptide product and reducing raw material costs.

Resins are available for producing both peptide acids and peptide amides using Fmoc- and Boc- strategies and, to simplify the synthesis, some can be purchased with the first amino acid pre-attached.

See also

- PL-SAX, high performance HPLC columns, page 250

Ordering Information

Peptide acids

Description	Loading (mmol/g: µm)	Quantity (g)	Part No.
Boc-chemistry PL-CMS*	1.0: 75-150	5 25	PL1461-1799 PL1461-3799
Fmoc-chemistry PL-Wang*	0.9: 75-150	5 25	PL1463-1799 PL1463-3799
Fmoc-chemistry (mild cleavage) PL Cl-Trt-Cl	1.4: 75-150	5 25	PL3473-1799 PL3473-3799

Peptide amides

Description	Loading (mmol/g: µm)	Quantity (g)	Part No.
Boc-chemistry PL-MBHA*	1.1: 75-150	5 25	PL3484-1799 PL3484-3799
Fmoc-chemistry PL Rink*	0.7: 75-150	5 25	PL1467-1799 PL1467-3799
Fmoc-chemistry (mild cleavage) PL-Sieber	0.6: 75-150	5 25	PL3483-1799 PL3483-3799

* Also available with the first amino acid attached

Other StratoSpheres loadings and particle sizes are available. Please refer to our Web site at www.varianinc.com and the catalog *StratoSpheres Consumables for High Throughput Chemistry.*

For more information, please visit www.varianinc.com/varipep.html or visit www.varianinc.com/products.html to place an order.

Peptide Solutions

VariTide™ RPC: 'Universal' Solution for Analysis and Purification of Synthetic Peptides

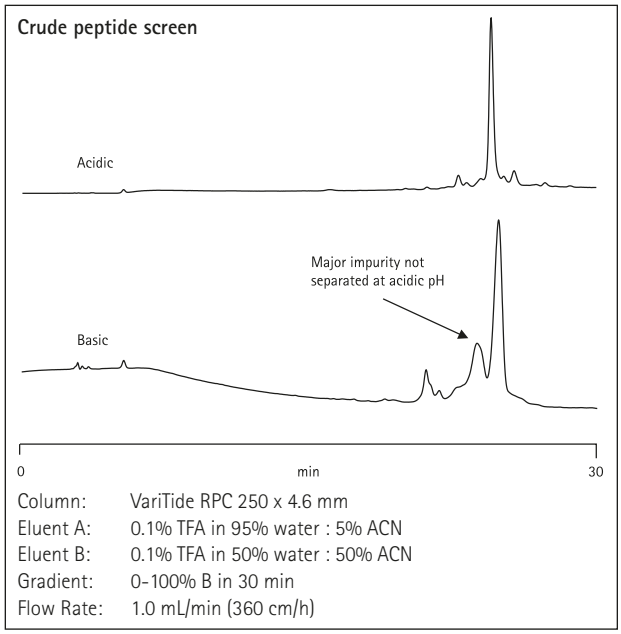
- **Improved efficiency and resolution give higher purity product in a single run**
- **Long column lifetimes provide more purification cycles per column for improved economics**
- **Fewer columns required, increasing peptide production rate**

Varian has introduced a single 'universal' column for the analysis and purification of synthetic peptides to maximize sample throughput and improve the economics of the purification. This one column replaces a number of columns that would previously have been required for separations of different peptide sizes and eluents, simplifying column choice and minimizing column inventory.

VariTide RPC is a high efficiency, small particle packing, with a pore size optimized for high capacity across the peptide size range, from 5 to 60 amino acids. The column is designed to cover the pH range making it suitable for the analysis and purification of acid or basic and hydrophilic or hydrophobic peptides using acid/neutral/basic eluents.

Typical Applications

Peptide analysis and purification at high pH



Column: VariTide RPC 250 x 4.6 mm
Eluent A: 0.1% TFA in 95% water : 5% ACN
Eluent B: 0.1% TFA in 50% water : 50% ACN
Gradient: 0-100% B in 30 min
Flow Rate: 1.0 mL/min (360 cm/h)

Ordering Information

Description	Dimensions	Part No.
VariTide RPC Columns	250 x 4.6 mm	PL1512-5A05
	250 x 10 mm	PL1012-5A05
	250 x 21.2 mm	PL1E12-5A05
VariTide Bulk Media	100 g	PL1412-4A05
	1 kg	PL1412-6A05

See also

- PLRP-S bulk media, rigid polymeric materials for reverse phase prep to process, page 265
- SepTech™ bulk media, high throughput and high yield purification of synthetic peptides, page 270

Peptide Solutions

VariPure™ IPE: A Unique Material for Ion-pair Extraction

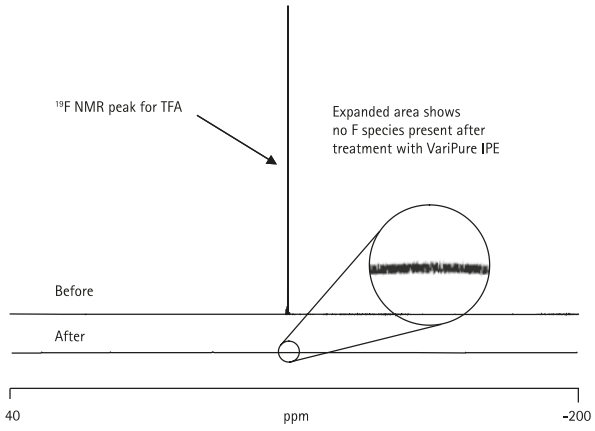
- **Pre-packed for convenience**
- **Removal of ion-pairing agents for improved productivity**
- **High performance and economy for excellent efficiency**

VariPure IPE is a polymer supported quaternary amine resin with a bicarbonate counter ion. It is designed for removing acidic ion pair reagents such as trifluoroacetic acid (TFA), formic acid or acetic acid. It is a high performance and economical acid removal material conveniently supplied as pre-packed SPE type devices. The particle size, capacity and device geometry are matched to provide sufficient residence time to achieve effective ion pair extraction under gravity flow. For acid labile peptides, removal of the ion-pairing agent prevents acid degradation of the peptide during post-HPLC work up, and increases the yield of purified product.

Typical Applications

Removal of TFA

^{19}F NMR spectra of H-Lys-Ala-Pro-OH before and after TFA removal



Ordering Information

VariPure IPE

Loading	Counter-ion Removal Capacity	Part No.
100 mg per 3 mL Tube (50 pk)	~ 5 mL 0.1% TFA	PL3540-D603VP
500 mg per 6 mL Tube (50 pk)	~ 25 mL 0.1% TFA	PL3540-C603VP
1 g per 20 mL Tube (25 pk)	~ 50 mL 0.1% TFA	PL3540-P603VP
25 g		PL3549-3603VP

For more information, please visit www.varianinc.com/varipep.html or visit www.varianinc.com/products.html to place an order.

PLRP-S 100Å: Peptide Analysis and GMP Production

- **Improved resolution and selectivity**
- **High purity levels**
- **Increased column lifetime**

PLRP-S easily accommodates high temperatures for better selectivity and resolution between impurities and the target oligo. With PLRP-S stable polymeric reverse phase material, oligos can be purified at temperatures up to 80 °C while maintaining packed bed integrity. The media is temperature stable up to 80 °C and chemically stable across the pH range. As a result, column lifetime is significantly improved, making PLRP-S the cost effective choice.

Typical Applications

High temperature separation of target oligonucleotides from impurities

Ordering Information

Description	Dimensions (mm)	Part No.
PLRP-S 100Å 8 µm	150 x 25	PL1212-3800
	300 x 25	PL1212-6800
	150 x 50	PL1712-3800
	300 x 50	PL1712-6800
	300 x 100	PL1812-6800
PLRP-S 100Å 10 µm	150 x 25	PL1212-3100
	300 x 25	PL1212-6100
	150 x 50	PL1712-3100
	300 x 50	PL1712-6100
	300 x 100	PL1812-6100
PLRP-S 100Å 10-15 µm	300 x 25	PL1212-6400
	150 x 50	PL1712-3400
	300 x 50	PL1712-6400
	300 x 100	PL1812-6400
PLRP-S 100Å 15-20 µm	300 x 25	PL1212-6200
	150 x 50	PL1712-3200
	300 x 50	PL1712-6200
	300 x 100	PL1812-6200

Description	Quantity (g)	Part No.
PLRP-S 8 µm	1000	PL1412-6800
PLRP-S 10 µm	10	PL1412-2100
	100	PL1412-4100
	1000	PL1412-6100
PLRP-S 10-15 µm	100	PL1412-4400
	1000	PL1412-6400
PLRP-S 15-20 µm	100	PL1412-4200
	1000	PL1412-6200

See also

- PLRP-S bulk media, rigid polymeric materials for reverse phase prep to process, page 265
- SepTech™ bulk media, high throughput and high yield purification of synthetic peptides, page 270

Proteomics

Capillary LC Columns: For Peptide/Protein Separations

- **Small particle diameters improve sensitivity**
- **Reversible solvent path improves column lifetimes**
- **Broad array of sorbents, pore sizes and column dimensions for wide flexibility**

Varian capillary and nano-LC columns provide outstanding resolution and sensitivity for proteomics applications. The small diameters (75 µm and 320 µm) of our nano- and 1.0 mL capillary LC columns ensure the sensitivity you need for your LC/MS applications. A 75 µm column provides a 4000-fold increase in sensitivity relative to a 4.6 mm analytical column (assuming the same mass is injected).

Both ends of the column incorporate frits to ensure reproducibility and packed bed stability. The reversible solvent path alleviates plugged columns for extended usability. The column hardware for polymeric media use either PEEK™ or glass lined stainless steel and 0.5 µm titanium frits to ensure biocompatibility for protein separations. Standard 1/16 in. fittings provide flexible, universal and robust connections to most capillary/nano-LC systems.

Our capillary and nano-LC columns deliver excellent chromatographic performance and are available packed with unique HPLC media for bottom-up and top-down proteomics applications.

Sorbent Selection Guide for Proteomics Applications

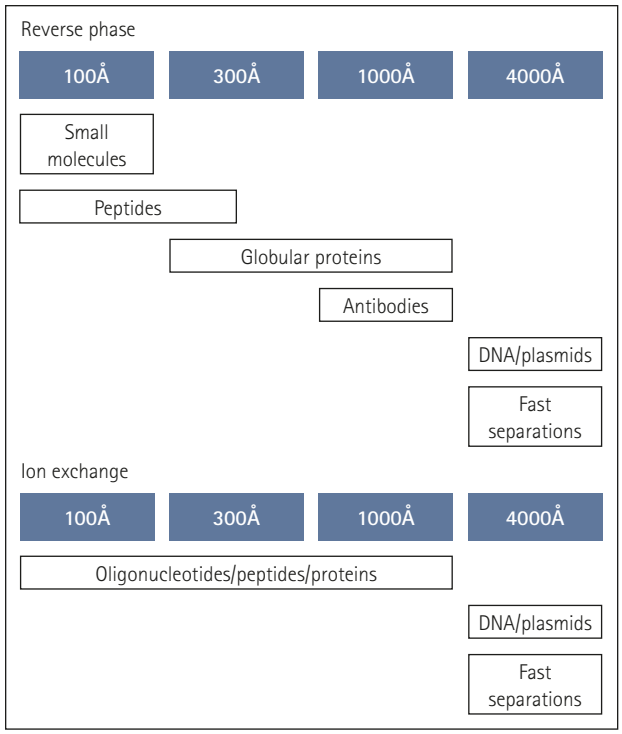
Reverse phase

Description	Sorbent	Application
Pursuit™	Alkyl and diphenyl silica	Peptide mapping
Polaris™	Polar modified alkyl-bonded silica	Peptide mapping
PLRP-S	Wide pore polymer	Peptide mapping and protein analysis

Ion exchange

Description	Sorbent	Application
PL-WAX, PL-WCX, PL-SAX, PL-SCX	Wide pore polymer	Peptide mapping and protein analysis

Pore Size Selection Guide for Proteomics Applications



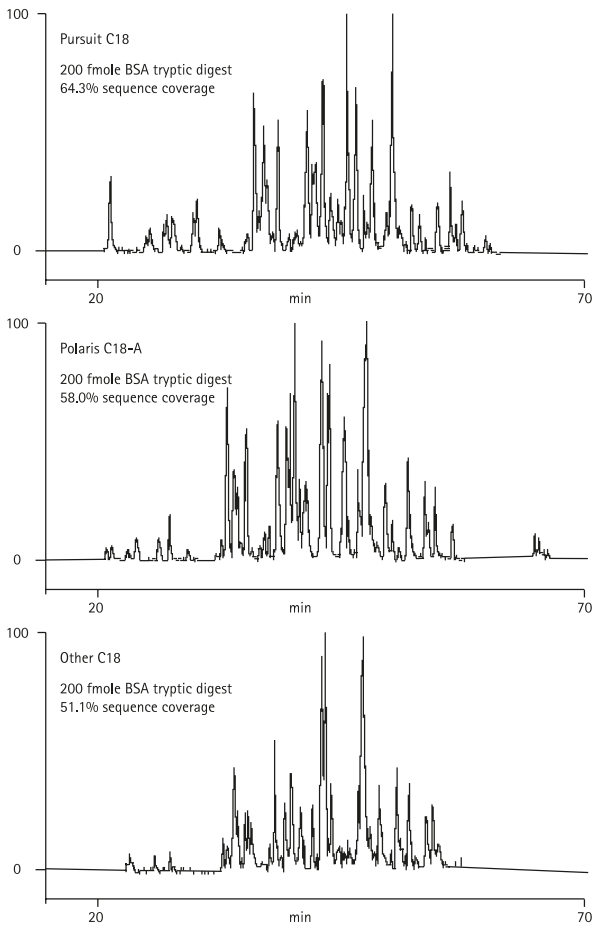
For more information, please visit www.varianinc.com/capillary_lc.html or visit www.varianinc.com/products.html to place an order.

Proteomics

Typical Applications

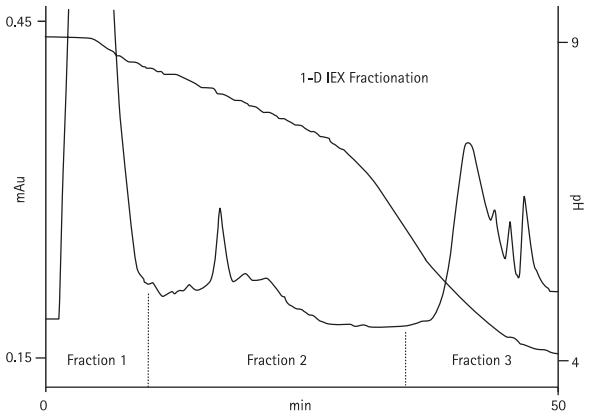
Protein digestion, peptide mapping, peptide fingerprinting

Base peak chromatograms of BSA digested by trypsin

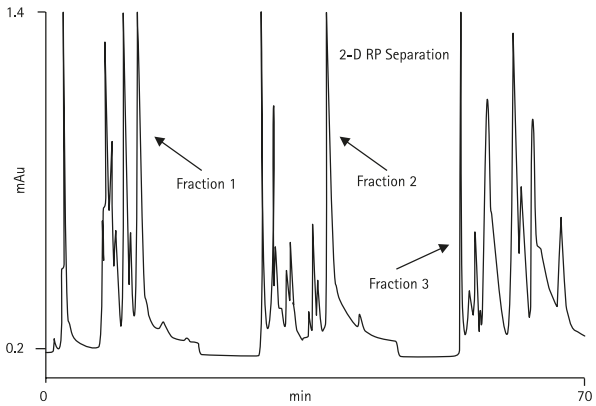


Column: Pursuit™ C18 3 µm 180Å 150 x 0.075 mm
Polaris™ C18-A 3 µm 180Å 150 x 0.075 mm
Other C18 5 µm 100Å 150 x 0.075 mm
Eluent A: 0.1% formic acid in 100% H_2O
Eluent B: 0.1% formic acid in 10% H_2O/90% ACN
Gradient: 5-60% B in 58 mins
Courtesy: Dr. T. Lee from City of Hope, Duarte CA, USA.

Fractionation and separation of human salivary proteins by pH-gradient ion exchange and reverse phase chromatography coupled to mass spectrometry



Column: PL-SAX 10 µm 1000Å, 150 x 1.0 mm
Eluent A: 90% 10 mM Tris pH 9.0:10% EtOH
Eluent B: 90% 10 mM Tris pH 3.5:10% EtOH
Gradient: 0-100% B in 45 min
Flow Rate: 50 µL/min



Column: PLRP-S 5 µm 4000Å, 150 x 0.3 mm
Eluent A: 0.1% TFA in 95% H_2O:5% ACN
Eluent B: 0.1% TFA in 5% H_2O:95% ACN
Gradient: 0-30% B in 3 min, 30-50% B in 10 min, 50-80% B in 2 min
Flow Rate: 15 µL/min
Courtesy: Pepaj *et al.* 2006. Copyright Wiley-VCH Verlag GmbH & Co. KGaA. Reproduced with permission.

References

Colinge, J, Chiappe, D, Lagache, S, Moniatte, M & Bougueleret, L (2005) Differential proteomics via probabilistic peptide identification scores. Anal. Chem., 77(2), 596-606.

Pepaj, M, Holm, A, Fleckenstein, B, Lundanes, E & Greibrokk, T (2006) Fractionation and separation of human salivary proteins by pH-gradient ion exchange and reversed phase chromatography coupled to mass spectrometry. J. Sep. Sci., 29, 519-529.

Proteomics

Ordering Information

Silica reverse phase

Description	Column Diameter	Column length (mm)	Part No.
Pursuit™ C8 200Å 3 µm	75 µm	50	A3031050U075
	75 µm	150	A3031150U075
	320 µm	50	A3031050U320
	320 µm	150	A3031150U320
	1 mm	50	A3031050X010
	1 mm	150	A3031150X010
Pursuit C18 200Å 3 µm	75 µm	50	A3001050U075
	75 µm	150	A3001150U075
	320 µm	50	A3001050U320
	320 µm	150	A3001150U320
	1 mm	50	A3001050X010
	1 mm	150	A3001150X010
Pursuit DP 200Å 3 µm	75 µm	50	A3041050U075
	75 µm	150	A3041150U075
	320 µm	50	A3041050U320
	320 µm	150	A3041150U320
	1 mm	50	A3041050X010
	1 mm	150	A3041150X010
Polaris™ C18-A 180Å 3 µm	75 µm	50	A2001050U075
	75 µm	150	A2001150U075
	320 µm	50	A2001050U320
	320 µm	150	A2001150U320
	1 mm	50	A2001050X010
	1 mm	150	A2001150X010

See also

- For other column dimensions or other sorbents packed in capillary/nano-LC hardware, please refer to the Web site.
- For larger column diameters (narrow bore, analytical, semi-prep and prep) see:
  - Pursuit, fast separations with high resolution for high throughput, page 229
  - Polaris, high density polar modified surface page 234
  - PLRP-S, most complete range of rigid PS/DVB materials, page 241
  - PL-SAX, strong anion exchange resins, page 250
  - PL-SCX, strong cation exchange resins, page 252

Ordering Information

Polymeric reverse phase

Description	Column Diameter	Column length (mm)	Part No.
PLRP-S 100Å 3 µm	75 µm	150	PL1B12-3300
	300 µm	50	PL1A12-1300
	300 µm	150	PL1A12-3300
	1 mm	50	PL1312-1300
	1 mm	150	PL1312-3300
PLRP-S 300Å 3 µm	75 µm	150	PL1B12-3301
	300 µm	50	PL1A12-1301
	300 µm	150	PL1A12-3301
	1 mm	50	PL1312-1301
	1 mm	150	PL1312-3301
PLRP-S 1000Å 5 µm	300 µm	50	PL1A12-1502
	1 mm	50	PL1312-1502
PLRP-S 4000Å 5 µm	300 µm	50	PL1A12-1503
	1 mm	50	PL1312-1503

Polymeric ion exchange

Description	Column Diameter	Column length (mm)	Part No.
PL-SAX 1000Å 5 µm	300 µm	50	PL1A51-1502
	1 mm	50	PL1351-1502
PL-SAX 4000Å 5 µm	300 µm	50	PL1A51-1503
	1 mm	50	PL1351-1503
PL-WAX 1000Å 5 µm	300 µm	50	PL1A52-1502
	1 mm	50	PL1352-1502
PL-WAX 4000Å 5 µm	300 µm	50	PL1A52-1503
	1 mm	50	PL1352-1503
PL-SCX 1000Å 5 µm	300 µm	50	PL1A45-1502
	1 mm	50	PL1345-1502
PL-SCX 4000Å 5 µm	300 µm	50	PL1A45-1503
	1 mm	50	PL1345-1503
PL-WCX 1000Å 5 µm	300 µm	50	PL1A46-1502
	1 mm	50	PL1346-1502
PL-WCX 4000Å 5 µm	300 µm	50	PL1A46-1503
	1 mm	50	PL1346-1503

For more information, please visit www.varianinc.com/capillary_lc.html or visit www.varianinc.com/products.html to place an order.

OMIX™ Tips: For Desalting and Concentrating Peptides and Proteins

- **Fast, uniform flow maximizes productivity and reproducibility**
- **Minimal peptide losses lead to higher recoveries**
- **Available in three phases and sizes to deliver better sequence coverage**

OMIX tips, with monolithic sorbent tip technology, offer dependable purification and superior results in proteomics research. Varian's OMIX pipette tips reliably purify and enrich femtomole and picomole levels of peptides and proteins prior to MALDI-TOF or LC/MS/MS. The unique monolithic sorbent technology used in OMIX consistently outperforms other tips by delivering uniform flow and strong analyte-to-surface interactions. The high binding capacity of OMIX delivers high productivity; the 10 µL tips bind up to 8 µg of peptide – twice as much as tips from other suppliers. OMIX's superior flow and exceptional binding capacity ensure reliable recovery of your peptides. OMIX tips minimize peptide losses that occur during multi-aliquot, multi-tip and evaporation steps.

The tips come in three sizes; 100 µL, 10 µL, and 10 µL mini-bed to better match your sample volume for downstream MALDI or LC/MS analysis. The OMIX standard 10 µL and mini-bed 10 µL formats can be used for directly spotting desalted proteolytic digests onto a MALDI plate. The OMIX 100 µL format easily purifies larger proteolytic digests that have been fractionated by a first dimensional off-line SCX LC column. The 100 µL format also requires fewer loading cycles, so you can avoid "numb thumb".

OMIX is available in four phases; C4 for protein desalting, C18 for peptide desalting, SCX for detergent removal and MP1 mixed mode cation exchange for basic pharmaceutical compounds.

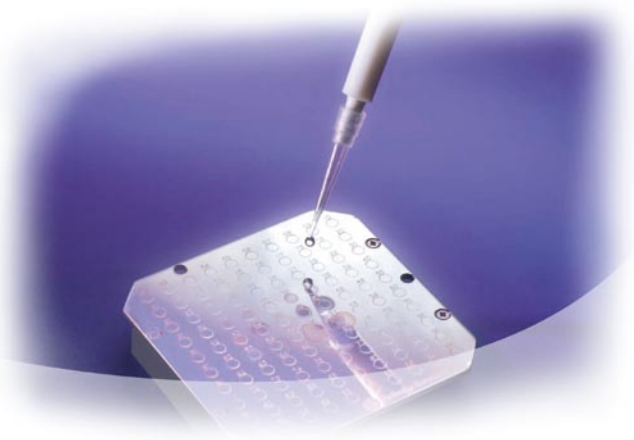
"The most prominent advantage of the OMIX tips over other µC18 tips is a strongly improved flow behavior, which is very important for our viscous samples." Dr. Josef Wissing, Senior Scientist, Technical University of Braunschweig, Department Biochemistry, Germany.

See also

- PL-SAX, strong anion exchange resins, page 250
- PL-SCX, strong cation exchange resins, page 252

Typical Applications

Protein digestion, peptide extraction, peptide desalting, detergent removal



BIOSOLUTIONS

Ordering Information

OMIX for manual pipettors

Mini-Bed	Elution volume 0.5 – 2 µL	Part No.
C4	1 x 96 tips	A50079MB
	6 x 96 tips	A50079MBK
C18	1 x 96 tips	A57003MB
	6 x 96 tips	A57003MBK
SCX	1 x 96 tips	A57004MB

10 µL	Elution volume 2 – 10 µL	Part No.
C4	1 x 96 tips	A5700910
	6 x 96 tips	A5700910K
C18	1 x 96 tips	A5700310
	6 x 96 tips	A5700310K
SCX	1 x 96 tips	A5700410

100 µL	Elution volume 10 – 100µL	Part No.
C4	1 x 96 tips	A57009100
	6 x 96 tips	A57009100K
C18	1 x 96 tips	A57003100
	6 x 96 tips	A57003100K
SCX	1 x 96 tips	A57004100

Proteins and Large Biomolecules

PLRP–S Wide Pore Columns: For All Sizes of Proteins

- **Wide pore sizes deliver high efficiency separations even with large fibrous proteins**
- **Excellent sample recovery and minimal "ghosting" for improved quantification**
- **A gigaporous, 4000Å material, for fast separations**

Wide pore PLRP-S 300Å, 1000Å and 4000Å HPLC columns for biomolecule analysis are suitable for high performance separations of all sizes of protein. The PLRP-S materials exhibit excellent permeability and provide access for even the largest proteins to the internal surface of the porous particles, giving excellent selectivity and capacity.

The superior physical stability, even of the gigaporous 4000Å particles, provides very good column lifetime even with rapid gradients. The chemical stability of the PLRP-S enables column clean-up, even with aggressive protein solubilizing agents, including 1M NaOH, urea and SDS – the limit is the salt solubility in the water/organic eluent.

References

Stumpe, M, Miller, C, Morton, NS, Bell, G & Watson, DG (2006) High performance liquid chromatography of a 1-acid glycoprotein in small volumes of plasma from neonates. J. Chromatogr. B, 831, 81-84.

Farmery, MR, Tjernberg, LO, Pursglove, SE, Bergman, A, Winblad, B & Näslund, J (2003) Partial purification and characterization of gamma-secretase from post-mortem human brain. J. biol. Chem, 278, 2477-2482.

Yang, J, Wang, S, Liu, J & Raghani, A (2007) Determination of tryptophan oxidation of monoclonal antibody by reversed phase high performance liquid chromatography. J. Chromatogr. A, 1156, 174-182.

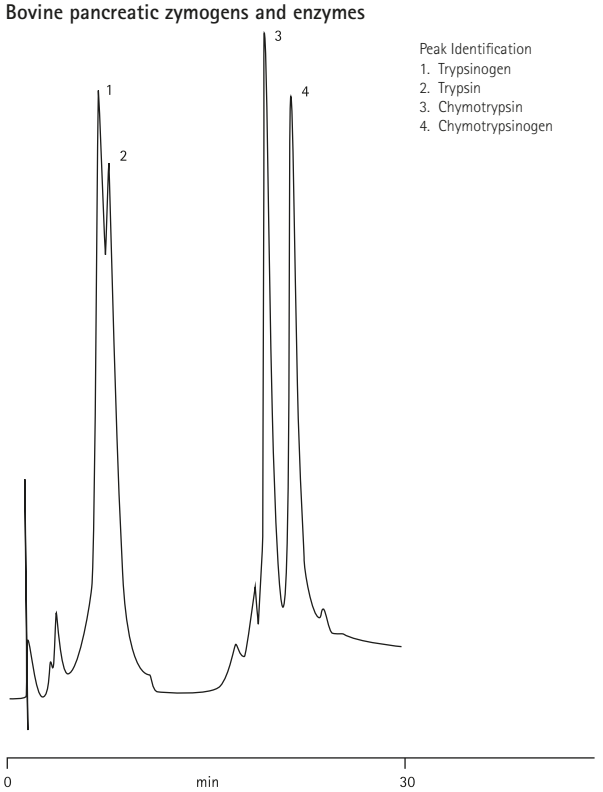
Typical Applications

PLRP-S 300Å globular proteins

PLRP-S 1000Å antibodies

PLRP-S 4000Å very large proteins, fast separations

Bovine pancreatic zymogens and enzymes



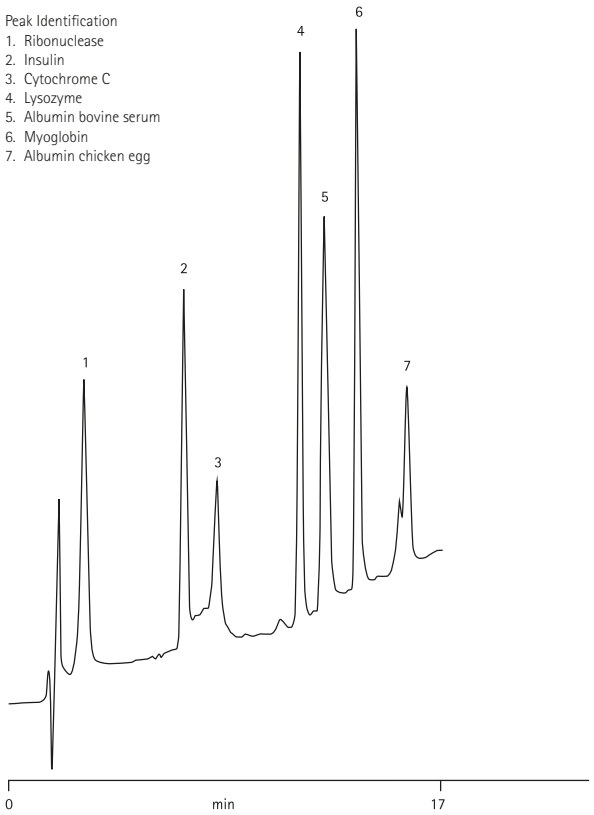
Column:	PLRP-S 300Å 8 µm, 150 x 4.6 mm
Eluent A:	0.1% TFA in water
Eluent B:	0.1% TFA in 95% ACN/5% water
Gradient:	37-40% B in 15 min
	40-45% B in 10 min
Flow Rate:	1.0 mL/min
Detector:	UV, 220 nm

See also

- PLRP-S prep to process media, page 265

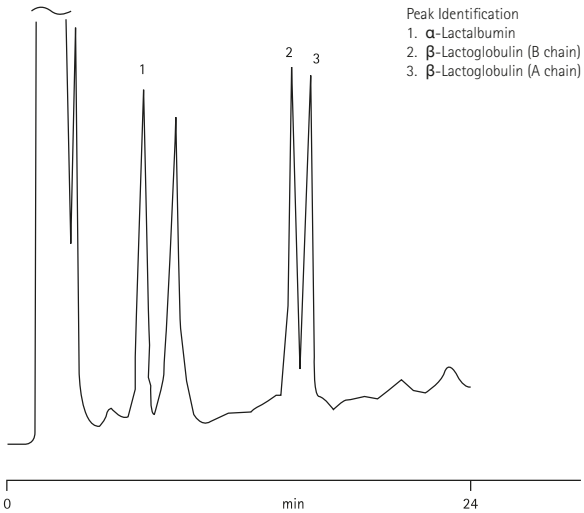
Proteins and Large Biomolecules

Standard proteins by reverse phase



Column:	PLRP-S 300Å 8 µm, 50 x 4.6 mm
Eluent A:	0.1% TFA in water
Eluent B:	0.1% TFA in 95% ACN/5% water
Gradient:	20-60% A in 22 min
Flow Rate:	1.5 mL/min
Detector:	UV, 220 nm

Whey proteins in dairy products – cheese



Column:	PLRP-S 300Å 8 µm, 150 x 4.6 mm
Eluent A:	0.1% TFA in 99% water : 1% ACN
Eluent B:	0.1% TFA in 1% water : 99% ACN
Gradient:	36-48% B, 0-24 min 48-100% B, 24-30 min 100% B, 30-35 min 100-36% B, 35-40 min
Flow Rate:	1.0 mL/min
Inj Vol:	40 µL
Detector:	UV, 220 nm

Ordering Information

Description	Dimensions (mm)	Part No.
PLRP-S 300Å 3 µm	50 x 2.1	PL1912-1301
	150 x 2.1	PL1912-3301
	50 x 4.6	PL1512-2301
	150 x 4.6	PL1512-3301
PLRP-S 300Å 5 µm	50 x 2.1	PL1912-1501
	150 x 2.1	PL1912-3501
	50 x 4.6	PL1512-1501
	150 x 4.6	PL1512-3501
PLRP-S 1000Å 5 µm	50 x 2.1	PL1912-1502
PLRP-S 1000Å 8 µm	50 x 2.1	PL1912-1802
	150 x 2.1	PL1912-3802
	50 x 4.6	PL1512-1802
	150 x 4.6	PL1512-3802
PLRP-S 4000Å 5 µm	50 x 4.6	PL1912-1503
PLRP-S 4000Å 8 µm	50 x 2.1	PL1912-1803
	150 x 2.1	PL1912-3803
	50 x 4.6	PL1512-1803
	150 x 4.6	PL1512-3803

Proteins and Large Biomolecules

PL-SAX, PL-SCX, PL-WAX, PL-WCX: Strong and Weak Ion Exchange Biomolecule Chromatography

- **Robust substrate withstands harsh clean-up procedures giving long column lifetimes**
- **High flow rate capability delivers fast separations**
- **Manufactured to ISO 9001:2000 so users can scale-up with confidence**

Large pore sized polymeric ion exchange resins offer excellent physical and chemical characteristics for the analysis and purification of biomolecules. 1000Å pore sized materials offer maximum capacity for globular proteins whilst gigaporous materials provide a more open structure where high resolution and high throughput are required.

The inert polymer substrate provides extended operational column lifetimes by allowing the use of harsh clean-up and depyrogenation procedures to clean and regenerate the column surface.

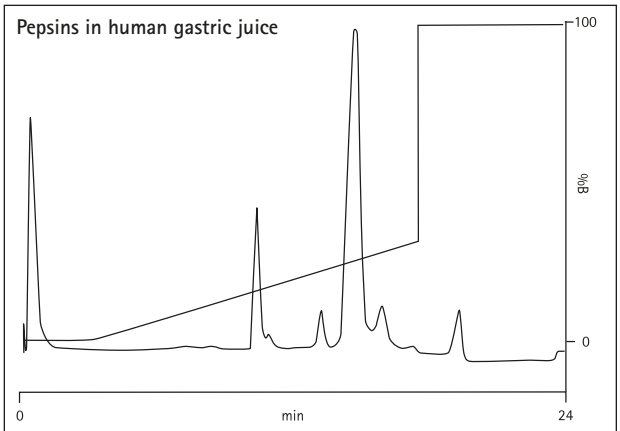
Dynamic Loading Capacities

Protein	Column	1000 Å	4000 Å
BSA	PL-SAX	100 mg/mL	65 mg/mL
	PL-WAX	45 mg/mL	30 mg/mL
Lysozyme	PL-SCX	100 mg/mL	25 mg/mL
	PL-WCX	65 mg/mL	25 mg/mL

Typical Applications

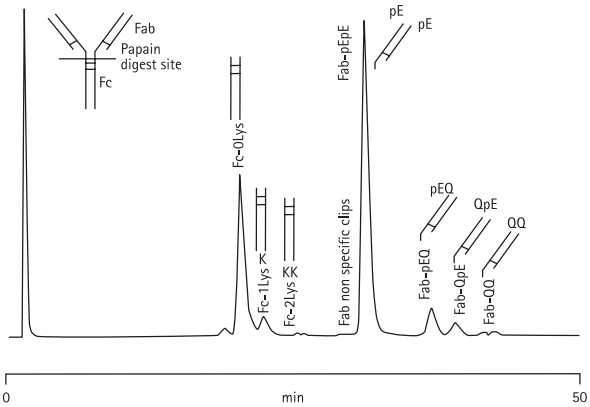
1000Å globular proteins, 4000Å high resolution, high throughput

Pepsins in human gastric juice



Sample: 250 µL human gastric juice dialyzed against 0.05M sodium acetate, pH 4.1. Filtered 0.45 µm
Column: PL-SAX 1000Å 8 µm, 50 x 4.6 mm
Eluent A: 50mM Sodium acetate, pH 4.1
Eluent B: A + 1M NaCl
Flow Rate: 1.0 mL/min
Detector: UV, 280 nm
Courtesy: NB Roberts, Royal Liverpool Hospital, UK.

Typing recombinant monoclonal antibody



Column: PL-SCX 1000Å 8 µm, 150 x 4.6 mm
Eluent A: 10mM MES, pH 6.0
Eluent B: 0.2M NaCl, 10mM MES, pH 6.0
Gradient: 5% B for 5 min followed by linear 5-85% B over 40 min
Flow Rate: 1.0 mL/min
Detector UV, 280 nm
Courtesy: Reprinted from J . Pharma. Biomed. Anal., 16(4), Moorhouse, KG, Nashabeh, W, Deveney, J, Bjork, NS, Mulkerrin, MG & Ryskamp, T, Validation of an HPLC method for the analysis of the charge heterogeneity of the recombinant monoclonal antibody IDEC-C2B8 after papain digestion, 593-603, Copyright 1997 with permission from Elsevier. www.elsevier.com.

For more information, please visit www.varianinc.com/pl-sax.html or visit www.varianinc.com/products.html to place an order.

Ordering Information

Description	Dimensions (mm)	Part No.
PL-SAX 1000Å 5 µm	50 x 2.1	PL1951-1502
	50 x 4.6	PL1551-1502
PL-SAX 1000Å 8 µm	50 x 2.1	PL1951-1802
	150 x 2.1	PL1951-3802
	50 x 4.6	PL1551-1802
	150 x 4.6	PL1551-3802
PL-SAX 4000Å 5 µm	50 x 2.1	PL1951-1503
	50 x 4.6	PL1551-1503
PL-SAX 4000Å 8 µm	50 x 2.1	PL1951-1803
	150 x 2.1	PL1951-3803
	50 x 4.6	PL1551-1803
	150 x 4.6	PL1551-3803
PL-SCX 1000Å 5 µm	50 x 2.1	PL1945-1502
	50 x 4.6	PL1545-1502
PL-SCX 1000Å 8 µm	50 x 2.1	PL1945-1802
	150 x 2.1	PL1945-3802
	50 x 4.6	PL1545-1802
	150 x 4.6	PL1545-3802
PL-SCX 4000Å 5 µm	50 x 2.1	PL1945-1503
PL-SCX 4000Å 8 µm	50 x 2.1	PL1945-1803
	150 x 2.1	PL1945-3803
	50 x 4.6	PL1545-1803
	150 x 4.6	PL1545-3803
PL-WAX 1000Å 5 µm	50 x 2.1	PL1952-1502
	50 x 4.6	PL1552-1502
PL-WAX 4000Å 5 µm	50 x 2.1	PL1952-1503
	50 x 4.6	PL1552-1503
PL-WCX 1000Å 8 µm	50 x 2.1	PL1946-1502
	50 x 4.6	PL1546-1502
PL-WCX 4000Å 8 µm	50 x 2.1	PL1946-1503
	50 x 4.6	PL1546-1503

For other column dimensions please refer to the Web site.

See also

• Prep to process ion exchange columns and media, page 269

ProSEC™ 300S: Protein Size Exclusion Chromatography

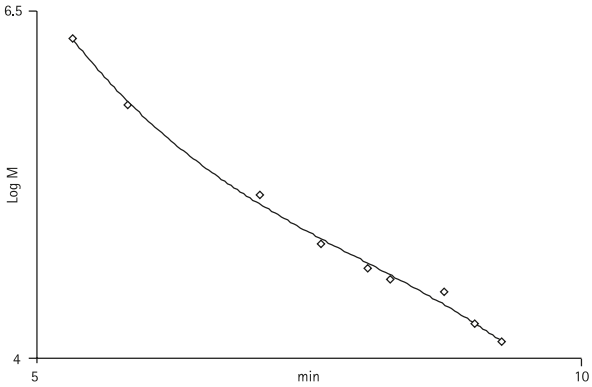
- **High pore volume material delivers excellent resolution across the application range**
- **Surface modified silica for high performance protein SEC with minimal interaction**
- **Single packing material for small to medium sized globular proteins**

The ProSEC 300S column contains a silica-based packing with a surface modified for compatibility with proteins, ensuring that true size exclusion is obtained with minimal unwanted interaction affects. The nominally 300Å pore size and 5 µm particle size have been specifically selected to allow the analysis of a wide range of small to medium sized proteins.

Typical Applications

Protein mix, globular proteins

Typical calibration curve for the standards in the PR-10 Kit on a single ProSEC 300S Column



Column: ProSEC 300S, 300 x 7.5 mm
Sample: Proteins
Sample Conc: 4 mg/mL
Eluent: 0.3M KH_2PO_4, 50mM K_2HPO_4, pH 6.8, containing 0.3M NaCl
Flow Rate: 1.0 mL/min
Inj Vol: 20 µL
Temp: 25 °C
Detector: UV, 280 nm

Ordering Information

ProSEC 300S Columns

Description	Part No.
ProSEC 300S, 250 x 4.6 mm	PL1547-5501
ProSEC 300S, 300 x 7.5 mm	PL1147-6501
ProSEC 300S Guard, 50 x 7.5 mm	PL1147-1501
ProSEC 300S Guard, 50 x 4.6 mm	PL1547-1501