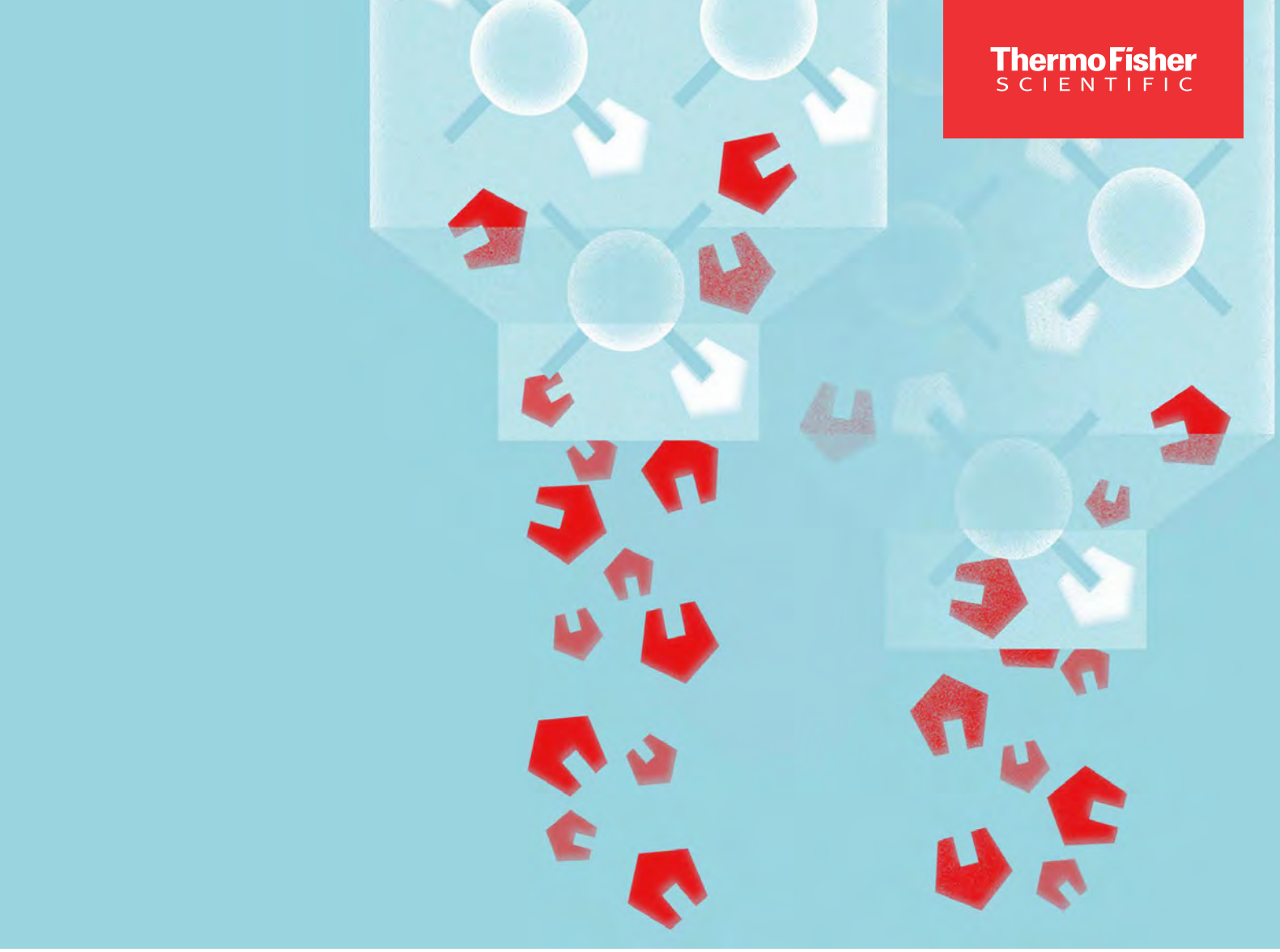


ThermoFisher SCIENTIFIC

Purification bioprocessing solutions

Helping accelerate biotherapeutic commercialization from drug development through commercial production

thermo scientific

CaptureSelect and POROS purification products

Purifying next-generation biotherapeutics

To meet your downstream processing needs, we offer a variety of commercialized resins for affinity, ion exchange (IEX), and hydrophobic interaction chromatography (HIC) applications. From large-scale bioprocess resins and small-scale purification solutions to prepacked columns and analytical tools for characterization, we have you covered. Thermo Scientific™ CaptureSelect™ and POROS™ resin technologies address today's challenges in the purification workflow.

Thermo Scientific™ POROS™ chromatography resins are used throughout the industry, offering high-performance, high-throughput bioseparations at process scale.

Thermo Scientific™ CaptureSelect™ affinity products are available for process-scale or analytical bioseparations for a wide variety of biotherapeutic compounds including antibodies and antibody fragments, recombinant and plasma proteins, and viral vectors.

Our custom ligand and resin discovery platforms enable the development of innovative purification resins, providing a solution for challenging downstream processes. We can design a custom ligand or develop a resin for your unique separation needs.

CaptureSelect technology

Maximize efficiency of your capture chromatography step with CaptureSelect affinity resins

Affinity chromatography helps to:

- Reduce the number of steps in your downstream purification process
- Increase product yield in a single step
- Reduce bioprocess development time
- Reduce time to market

Thermo Scientific™ CaptureSelect™ ligands offer a unique affinity purification solution based on single-domain V_HH antibody fragments. Through their tunable specificity and easy formatting, these small 14 kDa affinity ligands are the solution for complex biomolecule purification challenges. Proven CaptureSelect affinity technology enables the purification of antibodies, antibody fragments, recombinant and plasma proteins, and viral vectors. These products enable increased purity and yield in a single purification step and are designed to simplify workflows and reduce time and cost in biopharmaceutical drug development. CaptureSelect affinity resins are manufactured in an animal origin–free production process, making these resins suitable for process-scale bioseparations for a wide variety of biotherapeutic compounds.

CaptureSelect leakage ELISAs

Products incorporating CaptureSelect technology can be used for clinical and commercial manufacturing. To complement each affinity resin, we offer product-specific ELISAs to measure any ligand potentially leaching from the column.

Conjugated affinity ligands

CaptureSelect biotinylated ligands are available for use in a range of analytical assays, and available for each matching resin. The affinity ligand is chemically conjugated to biotin via an appropriate spacer that retains binding reactivity of the ligand when immobilized onto streptavidin-functionalized surfaces.

Applications for CaptureSelect biotinylated ligands include sandwich ELISA, western blot, Gyros' Gyrolab™-based immunoassays, and label-free detection platforms such as those based on surface plasmon resonance (Biacore™ and IBIS-MX96 systems) and biolayer interferometry (ForteBio™ Octet™ systems).

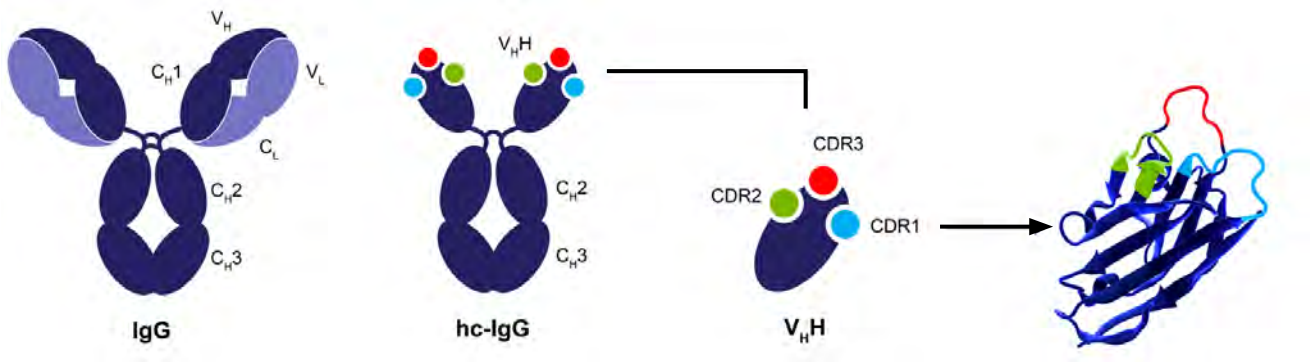


Figure 1. CaptureSelect technology. The small size of the V_HH fragments allows binding to epitopes that are difficult to access.

POROS technology

Simplify your downstream process with POROS chromatography resins

POROS resins exhibit high-capacity, high-resolution, and flow-rate-independent performance, built to deliver exceptional separation capability and to meet the increasing demands of process intensification. High-performance resins, like POROS products, can simplify the development process, balance all the purification requirements, and help develop more efficient and cost-effective downstream processes.

Unique features of POROS chromatography:

- **Poly(styrene-divinylbenzene) backbone**—resulting in linear and scalable performance. The beads are rigid and have a high mechanical strength, enabling easy and reproducible scale-up. The polymer backbone is chemically stable, allowing for stringent cleaning when needed.
- **Large throughpores**—leading to a reduced mass transfer resistance compared to other resins. Capacity and resolution are maintained over a wide range of linear velocities, thereby establishing a more efficient purification process.
- **50 µm bead size**—providing superior resolution. The smaller particle size results in tighter peaks and smaller elution volumes, helping to overcome tank size limitations at larger scales.

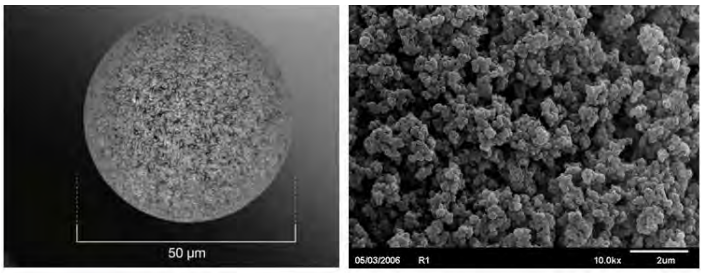


Figure 2. Scanning electron microscope images showing the POROS bead (left) and the large throughpore structure of the bead (right).

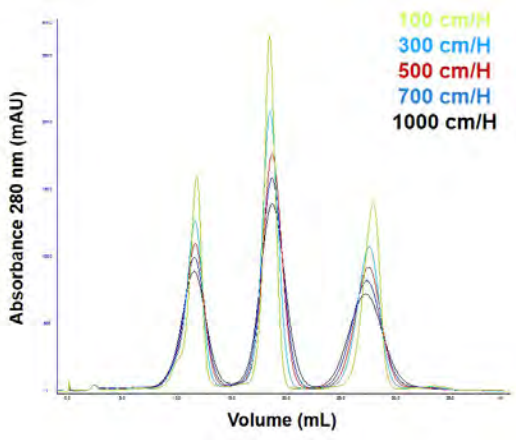


Figure 3. The graph shows the excellent resolution characteristics of the POROS resins and demonstrates resolution is well maintained when flow rates increase.

Quality you can count on

Our products and services are specifically designed to enable proven performance through innovative, efficient, and highly selective downstream applications. By selecting from our portfolio as a single supplier, you can optimize production, improve process efficiency, add flexibility, and fast-track product development and market introduction.

Thermo Fisher Scientific owns the production process of the resins, from qualified raw materials to released finished goods. We do not utilize chromatography media intermediates from other suppliers. This gives us complete traceability and control over the entire process. Also, because we control the entire manufacturing process, our customers are better protected from supply shortages and disruptions. The base material is polymerized, coated, functionalized, sized, and exchanged into shipping solvent prior to packaging.

POROS chromatography resins are produced in validated, state-of-the-art manufacturing facilities in Bedford and Chelmsford, Massachusetts. Both facilities are ISO 13485 certified.

The CaptureSelect affinity products are manufactured at our production site in Naarden, Netherlands. The facility is ISO 9001:2015 certified, and includes two lines of 15,000 L (15 cbm) fermentation reactors, micro- and ultrafiltration systems for biomass removal and product concentration, and a separate purification suite for efficient industrial production of the affinity ligands.

Second-site sourcing for the CaptureSelect affinity ligands is assured by manufacturing capabilities at the Thermo Fisher Scientific site in Vilnius, Lithuania, operating under ISO 9001:2015 and ISO 13485 certification.

Bedford, Massachusetts, USA facility

Certification status: ISO 13485:2016

Chelmsford, Massachusetts, USA facility

Certification status: ISO 13485:2022

- **Key capabilities:**
  - POROS bulk chromatography resin manufacturing, including QC analysis
  - Production of customized process-scale resin

Naarden, Netherlands facility

Certification status: ISO 9001:2015

- **Key capabilities:**
  - Production of CaptureSelect affinity ligands and process-scale affinity resins, including QC analysis
  - Production of customized process-scale affinity resins

Vilnius, Lithuania facility

Certification status: ISO 9001:2015 and ISO 13485

- **Key capabilities:**
  - Production of CaptureSelect affinity ligands

Affinity chromatography

Protein A purification solutions

Thermo Scientific™ MabCaptureC™ Affinity Matrix is a high-performance Protein A chromatography resin, specifically designed to help improve the productivity and efficiency of your antibody purification process. Featuring high capacity and a highly crosslinked agarose backbone, the MabCaptureC resin is your Protein A resin of choice for efficient process-scale purification of monoclonal antibodies.

Key features:

- High dynamic binding capacity: >50 g/L at 4.8 min residence time
- A highly crosslinked and uniformly sized agarose bead (75 ± 10 µm) delivering excellent performance characteristics*
- Excellent alkaline stability, allowing for efficient cleaning and sanitization
- A scalable Protein A resin, suitable for use in cGMP manufacturing processes
- An in-house manufactured Protein A ligand, recombinantly expressed in yeast

Ordering information

Description	Quantity	Cat. No.
MabCaptureC Affinity Matrix	250 mL	1963662250
	1 L	196366201L
	5 L	196366205L
	10 L	196366210L

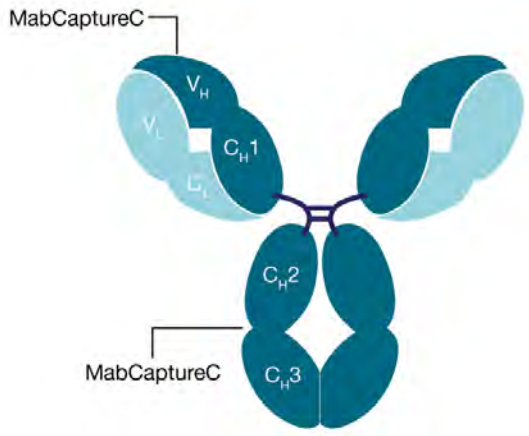


Figure 4. MabCaptureC ligand binds antibodies at the Fc-region of the IgG molecule (C_H2-C_H3 interface). Binding at the V_H3 region of the IgG's variable heavy domain (V_H) can occur but will be molecule-dependent.

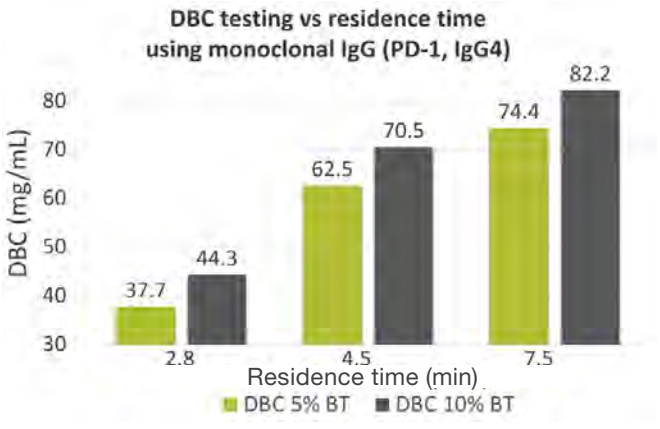


Figure 5. MabCaptureC Affinity Matrix dynamic binding capacity (DBC) at 5 and 10% breakthrough (BT) using a monoclonal antibody (IgG4) feedstock and three increasing residence times.

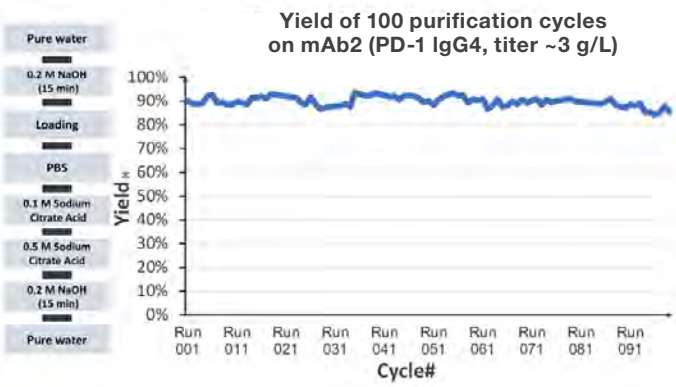


Figure 6. MabCaptureC Affinity Matrix alkaline stability. Determined in a life cycle study using a monoclonal antibody (IgG4) feedstock, over 100 purification cycles and cleaning in place using 2X 0.2 M NaOH for 15 min during each cycle (before and after loading).

* Using Praesto Jetted Technology.

Check out our other resins and additional sizes at **thermofisher.com/mabcapturec**

Purification of antibody-derived therapeutics

We have developed a unique portfolio of affinity resins, helping you to develop next-generation antibody therapeutics. CaptureSelect affinity chromatography resins, specifically developed to bind antibody-subdomain regions, are a key solution for the purification of novel antibody therapeutics, such as bi-specific monoclonal antibodies, Fab fragments, and Fc-fusion proteins. These affinity resins can be used for clinical and commercial production, and offer:

- High capacity, addressing process demand and high-titer feedstocks
- Mild elution conditions for successful purification of pH-sensitive modalities
- Efficient antibody fragment purification, without co-purification of light chains
- Alternative purification solutions when Protein A doesn't yield desired results

Due to the unique selectivity of each resin, a broad range of antibody modalities can be captured. The antibody-subdomain-specific resins help to improve downstream processing of monoclonal antibodies and antibody fragments, and serve as an alternative solution when Protein A does not yield optimal results.

Ordering information

Description	Quantity	Cat. No.
CaptureSelect CH1-XL Affinity Matrix	250 mL	1943462250
	1 L	194346201L
	5 L	194346205L
CaptureSelect KappaXP Affinity Matrix	250 mL	1943212250
	1 L	194321201L
	5 L	194321205L
CaptureSelect LambdaXP Affinity Matrix	250 mL	1943752250
	1 L	194375201L
	5 L	194375205L
CaptureSelect FcXP Affinity Matrix	250 mL	1943712250
	1 L	194371201L
	5 L	194371205L
CaptureSelect IgE Affinity Matrix	250 mL	1943542250
	1 L	194354201L
	5 L	194354205L

Check out our other resins and additional sizes at **thermofisher.com/antibody-therapeutics**

Purification of recombinant proteins, biosimilars, and vaccines

Biosimilars and recombinant proteins

CaptureSelect affinity resins help you to develop biosimilars, biobetters, and other types of recombinant proteins. These affinity resins can be used for clinical and commercial production. CaptureSelect protein purification products exhibit affinity and specificity for their target proteins, for efficient single-step purification of non-antibody biomolecules.

Key features

- **Selectivity**—high purity in single step; feedstock-independent
- **Mild elution conditions**—retention of biological activity of target
- **Reduction of process steps**—helps reduce costs, allows higher yields
- **Efficient clearance of host cell protein (HCP), DNA, virus**—high selectivity in one capture step

Protein vaccine development with C-tag and C-tagXL affinity resin

One of the major bottlenecks in protein vaccine development is obtaining sufficient quantities of high-quality and pure protein. The C-tag affinity tag allows for recombinant protein production through the addition of a small tag (4 amino acids) to the protein of interest. The Thermo Scientific™ CaptureSelect™ C-tagXL Affinity Resin combines the unique selectivity of the C-tag with the benefits of a robust and high-quality affinity matrix, allowing for high yield and purity in a single purification step.

Benefits of C-tag:

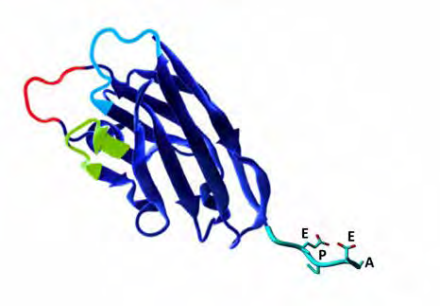
- Small inert tag, limiting effect on protein functionality
- Highly selective when fused at the C-terminus of a protein
- Limits drawbacks of conventional tags such as lack of selectivity, heavy metal waste, or limited reusability
- Enables high target yield and purity from complex mixtures (compared to His6 tag)

Benefits of the CaptureSelect C-tagXL affinity matrix:

- Enables high target purity and yield from complex mixtures
- Mild elution, protecting the protein of interest
- Scalable

Ordering information

Description	Qty	Cat. No.
CaptureSelect FSH Affinity Matrix	250 mL	1943180250
	1 L	19431801L
	5 L	19431805L
CaptureSelect Human Albumin Affinity Matrix	250 mL	1912970250
	1 L	19129701L
	5 L	19129705L
CaptureSelect hCG Affinity Matrix	250 mL	1943410250
	1 L	19434101L
	5 L	19434105L
CaptureSelect tPA Affinity Matrix	250 mL	1943430250
	1 L	19434301L
	5 L	19434305L
CaptureSelect TSH Affinity Matrix	250 mL	1943562250
	1 L	194356201L
	5 L	194356205L
CaptureSelect Human Growth Hormone Affinity Matrix	250 mL	1943160250
	1 L	194316001L
	5 L	194316005L
CaptureSelect Factor X Affinity Matrix	250 mL	1943702250
	1 L	194370201L
	5 L	194370205L
CaptureSelect C-tagXL Affinity Matrix	250 mL	1943072250
	500 mL	1943072500
	1 L	194307201L
	5 L	194307205L



Check out additional sizes at **thermofisher.com/captureselect**

Purification of viral vectors

AAV purification

Our proven CaptureSelect ligand technology, combined with the large pore structure of the POROS beads, enables efficient purification of large biomolecules such as viral vectors. These unique affinity resins are developed to significantly improve downstream processing of viral vectors by reducing the number of purification steps and offering scalability, thus maximizing process consistency, efficiency and productivity.

POROS CaptureSelect AAV affinity resins

The utilization of Thermo Scientific™ POROS™ CaptureSelect™ AAV affinity resins represents a significant improvement to the downstream processing of AAV vectors.

The use of AAV affinity resins helps to:

- Limit the number of steps and maximize productivity in the AAV purification process
- Increase purity and yield in a single capture step
- Increase process flexibility and throughput
- Scale up the AAV manufacturing process
- Establish a single purification platform for multiple AAV serotypes

Viral clearance contribution of affinity capture step

Viral clearance results using AAVX affinity resin for the purification of AAV8:

- Model viruses are listed in the top row and experimental conditions are listed in the left column
- Manufacturing processing conditions mimic the typical load volumes and chromatographic settings
- The high load ratio plus high residence time run is performed to create a worst-case scenario allowing maximum virus-resin contact

Ordering information

Description	Quantity	Cat. No.
POROS CaptureSelect AAV8 Affinity Resin	250 mL	A30792
	1 L	A30793
	5 L	A30794
	10 L	A30795
POROS CaptureSelect AAV9 Affinity Resin	250 mL	A27355
	1 L	A27359
	5 L	A27358
	10 L	A27357
POROS CaptureSelect AAVX Affinity Resin	250 mL	A36742
	1 L	A36743
	5 L	A36744
	10 L	A36745

Resin	Binding capacity (vg/mL)*	Serotype affinity
POROS CaptureSelect AAV8	$>10^{13}$	AAV8
POROS CaptureSelect AAV9	$>10^{14}$	AAV9
POROS CaptureSelect AAVX	$>10^{14}$	AAV1, AAV2, AAV3, AAV4, AAV5, AAV6, AAV7, AAV8, recombinant and chimeric vectors

* Viral genomes per milliliter; binding capacity will vary based on serotype, feed stream, additives, and mutations to parent serotypes.

- Viral clearance levels are depicted in LRV (Log reduction value) where ≥4 LRV is an effective clearance, 1–3 LRV is defined as contributing viral clearance, and <1 LRV is negligible clearance

Run description	xMuLV	MVM	Reo-3	HAV	PRV	HSV-1
Virus type	RNA env	DNA non env	RNA nonenveloped		DNA enveloped	
Manufacturing process conditions	>6.4	4.4	2.7	>4.9	4.0	3.1
High load ratio and residence time	4.6	3.6	2.5	5.0	3.8	3.6
Clearance level	Effective	Effective	Contributing	Effective	Effective	Contributing

Check out our other resins and additional sizes at **thermofisher.com/cgt-purification**

Purification of mRNA

Supporting mRNA-based therapies and vaccines

The Thermo Scientific™ POROS™ Oligo (dT)25 Affinity Resin is designed for the purification and isolation of mRNA from *in vitro* transcription (IVT) manufacturing processes. The use of affinity chromatography offers high selectivity and ease of use. Through the AT-base pairing mechanism, the resin effectively separates mRNA from components of the transcription reaction process, such as enzymes, unreacted nucleotides, partial transcripts, and plasmid DNA.

The POROS Oligo (dT)25 Affinity Resin helps to simplify the mRNA purification workflow by reducing the complexity of subsequent polish steps.

Why choose the POROS Oligo (dT)25 Affinity Resin?

- Easy mRNA purification from crude transcription mix
- High dynamic binding capacity and high recovery
- Simplified workflow helps to maximize efficiency
- Excellent scalability, allowing purification from benchtop to commercial manufacturing

Ordering information

Description	Quantity	Cat. No.
POROS Oligo (dT)25 Affinity Resin	50 mL	A47382
	250 mL	A47383
	1,000 mL	A47384
	5,000 mL	A47385
	10,000 mL	A47386

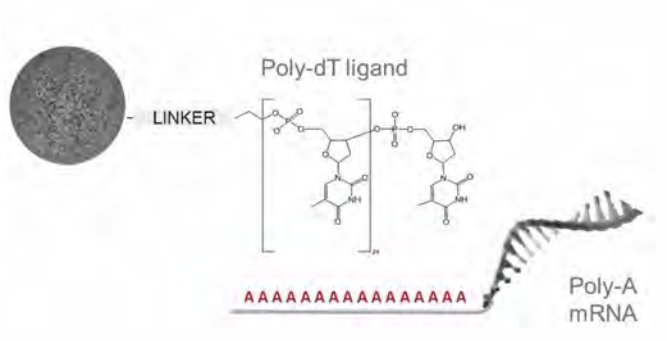


Figure 7. Mechanism of action of POROS Oligo dT(25) Affinity Resin. The poly-dT ligand allows binding with poly-A tailed mRNA molecules through AT-base pairing.

Find out more at **thermofisher.com/captureselect-conjugates**

Ion exchange chromatography

POROS ion exchange resins

Thermo Scientific™ POROS™ ion exchange (IEX) resins are the industry standard for large-scale polish chromatography applications. POROS IEX resins allows target molecule binding and impurity removal over a broad range of process conditions, thereby increasing process flexibility and manufacturing throughput.

Selecting the right resin

Choosing the right ion exchange resin will help to ensure quality, productivity, and effectiveness of the purification process. Biomolecules vary in their net charge depending on the solution pH. Select either an anion exchange or cation exchange resin according the purification step and charged properties of the target molecule.

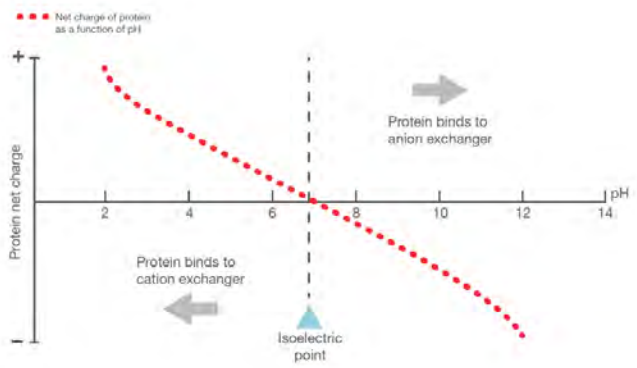


Figure 8. Isoelectric point (pI). The point along the pH scale at which the molecule or surface carries a zero-net charge. When the pH falls above the pI, the protein will bind to anion exchange resin. When the pH falls below the pI, the protein will bind to cation exchange resin.

POROS ion exchange resin applications

POROS IEX resin	Bind/elute (B/E) application	Flow-through application
Cation exchange	Polish of many biomolecules such as: • Monoclonal antibodies (mAbs) • Virus-like particles (VLPs) • Viruses • Fusion and recombinant proteins with alkaline pI	Polish for mAbs by binding impurities under normal B/E conditions such as: • Viruses • HCP • Aggregates
Anion exchange	Capture of: • Proteins/mAbs • Viruses • Plasmid DNA Polish of: • Viral vectors—separation of empty particles	Trace impurity removal by binding impurities such as: • DNA • Viruses • HCP • Aggregates • Endotoxin

POROS anion exchange resins

POROS anion exchange resins

The Thermo Scientific™ POROS™ anion exchange (AEX) resin portfolio offers four unique chemistries (table below). These strong and weak AEX resins possess distinctive selectivity in bind/elute as well as flow-through operation to produce the highest-purity elution.

POROS anion exchange applications

- **Bind/elute:** Capture of mAbs, proteins, virus, plasmid DNA purification; polish of viral vectors (empty vs. full)
- **Flow-through:** Trace impurity removal by binding impurities (DNA, viruses, HCP, aggregates, endotoxin)

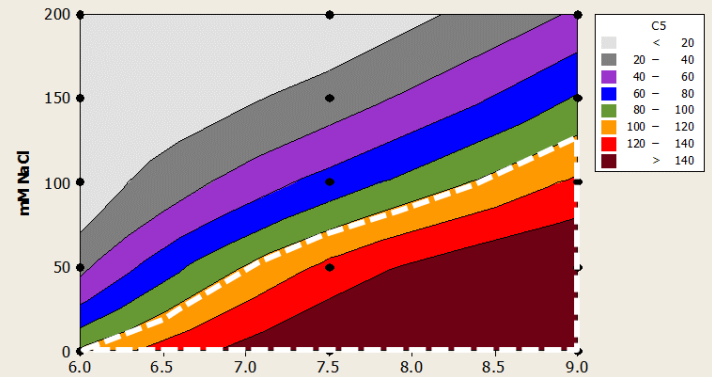


Figure 9. The dynamic binding capacity of POROS XQ resin with BSA at 5% breakthrough as a function of pH and salt concentration. High capacity is obtained under a wide range of process conditions. The orange, red, and dark red areas indicate the conditions in which greater than 100 mg/mL binding capacity of BSA can be obtained. Column: 0.46 cm (D) x 20 cm (L); load: 10 mg/mL BSA; base buffer: 20 mM Bis-Tris propane; flow rate: 300 cm/hr.

Ordering information

Description	Quantity	Cat. No.
POROS XQ resin, strong AEX	250 mL	4467820
	1 L	4467818
	5 L	4467817
	10 L	4467816
POROS 50 HQ resin, strong AEX	250 mL	1255911
	1 L	1255907
	5 L	1255909
	10 L	1255908
POROS 50 PI resin, weak AEX	250 mL	1245911
	1 L	1245907
	5 L	1245909
	10 L	1245908
POROS 50 D resin, weak AEX	250 mL	1365911
	1 L	1365907
	5 L	1365909
	10 L	1365908

POROS anion exchange resins

Resin	XQ	50 HQ	50 PI	50 D
Type of AEX resin	Strong	Strong	Weak	Weak
Surface chemistry	Fully quaternized amine	Quaternized polyethyleneimine (mixed amine)	Polyethyleneimine (mixed amine)	Dimethylaminopropyl
BSA binding capacity	>140 mg/mL	75 mg/mL	80 mg/mL	90 mg/mL
pH range	1–14	1–14	1–9	1–9

Viral clearance results for two common model viruses, XmuLV and MMV

- POROS 50 HQ and XQ resin provides excellent viral clearance for both model viruses under typical FT/wash conditions as well as increased conductivity
- Viral clearance with higher salt concentrations allows for increased flexibility when designing a purification scheme

		POROS 50 HQ		POROS XQ	
Conductivity	**Loading**	**XmuLV log_{10} reduction**	**MMV log_{10} reduction**	**XmuLV log_{10} reduction**	**MMV log_{10} reduction**
5 mS/cm	500 g/L	>4.31 ± 0.12	>5.10 ± 0.09	>4.31 ± 0.12	>5.10 ± 0.09
10 mS/cm	500 g/L	>4.39 ± 0.14	2.49 ± 0.20	>4.39 ± 0.14	1.61 ± 0.23
15 mS/cm	500 g/L	4.13 ± 0.33	1.03 ± 0.13	3.46 ± 0.29	0.19 ± 0.28

POROS cation exchange resins

POROS cation exchange resins

Thermo Scientific™ POROS™ 50 HS and XS resins are 50 µm strong cation exchange (CEX) resins based on a sulfopropyl functionalization and can be used over a wide range of pH (1–14) and conductivity conditions. These CEX resins have a high dynamic-binding capacity for more basic biomolecules and provide superior resolution for unprecedented impurity clearance independent of scale and flow rate.

POROS cation exchange applications

- **Bind/elute:** Polish of many biomolecules (mAbs, VLP/viruses, fusion proteins, high pI rProteins)
- **Flow-through:** Polish for mAbs by binding impurities under normal B/E conditions: impurity removal (aggregates, HCP, DNA, viruses)

Ordering information

Description	Quantity	Cat. No.
POROS XS resin, strong CEX	250 mL	4404337
	1 L	4404336
	5 L	4404335
	10 L	4404334
POROS 50 HS resin, strong CEX	250 mL	1335911
	1 L	1335907
	5 L	1335909
	10 L	1335908

POROS resin	50 HS	XS
Type of CEX resin	Strong	Strong
Surface chemistry	Sulfopropyl	Sulfopropyl
IgG binding capacity (mg/mL)	70	115
pH range	1–14	1–14

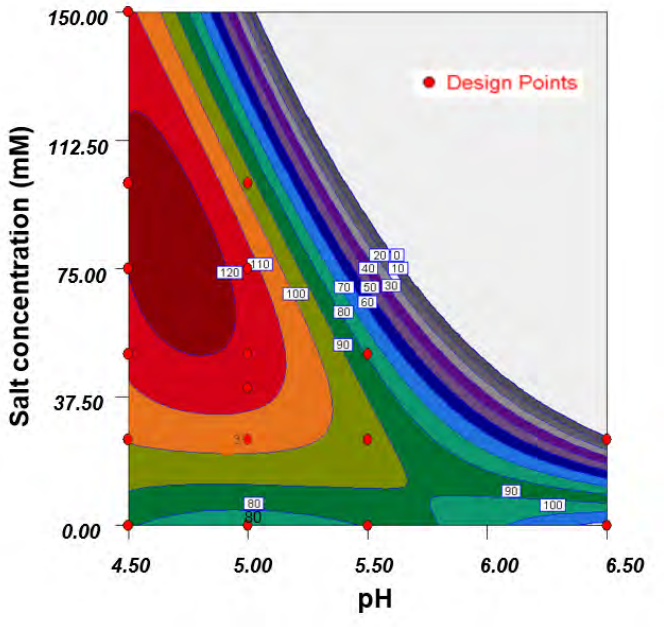


Figure 10. Binding capacity of POROS XS resin with IgG at 5% breakthrough. High binding capacity is obtained under a wide range of process conditions. Column: 0.46 cm (D) x 20 cm (L); buffer: 20 mM MES; load: 5 mg/mL IgG; flow rate: 300 cm/hr.

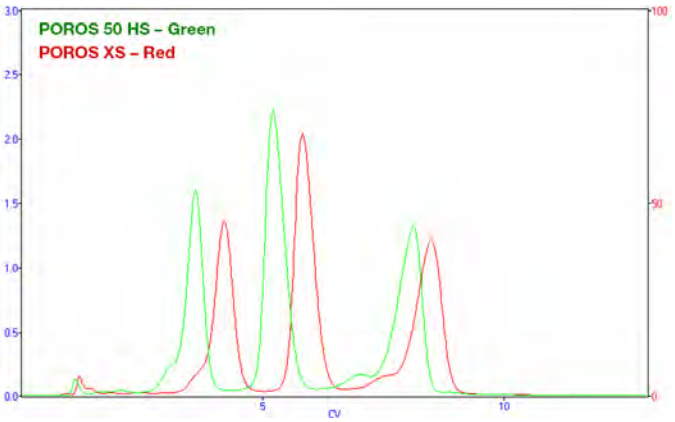


Figure 11. POROS XS and 50 HS resins present with similar, high-resolution properties. Column: 1 cm (D) x 20 cm (L); buffer A: 20 mM MES, 25 mM NaCl pH 6.2, buffer B: 20 mM MES, 1 M NaCl pH 6.2; Elution: gradient 10%–50% buffer B, 7.5 CV; flow rate: 300 cm/hr; protein mix: chymotrypsinogen A, cytochrome C, and lysozyme.

Hydrophobic interaction chromatography

POROS hydrophobic interaction resins

Thermo Scientific™ POROS™ hydrophobic interaction chromatography (HIC) resins are based on the 50 µm POROS base bead, utilizing a novel coating procedure to enable functionalization with unique hydrophobic ligands. These resins are suitable for bind/elute and flow-through applications at lower salt concentrations and have higher binding capacity and resolution than classical HIC resins, thereby providing more flexibility around process operating conditions.

Key features

- 3 unique resins covering a wide range of hydrophobicity
- High resolution, even with lower conductivity conditions
- High dynamic binding capacity and superior pressure-flow characteristics

Key applications

- Monoclonal antibodies, bispecific antibodies, and antibody–drug conjugates (ADCs)
- Product-related impurities and aggregate removal
- Plasmids, RNAi, and oligonucleotides

Ordering information

Description	Quantity	Cat. No.
POROS Ethyl HIC resin	250 mL	A32555
	1 L	A32554
	5 L	A32553
	10 L	A32552
POROS Benzyl HIC resin	250 mL	A32561
	1 L	A32560
	5 L	A32559
	10 L	A32558
POROS Benzyl Ultra HIC resin	250 mL	A32567
	1 L	A32566
	5 L	A32565
	10 L	A32564

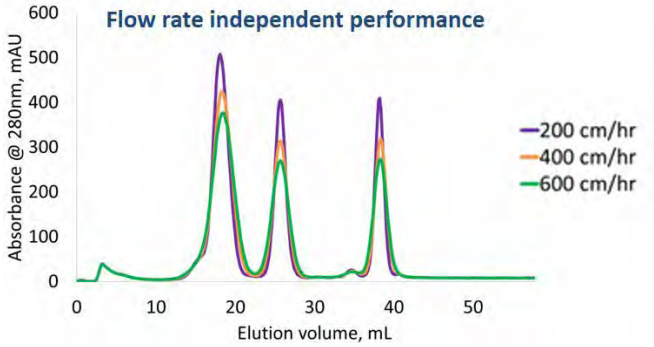


Figure 12. Separation comparison of POROS Benzyl resin at different flow rates showing good resolution and flow rate independent performance. Experimental details: a load buffer: 1.7 M ammonium sulfate in 50 mM sodium phosphate, pH 7; buffer gradient: load buffer to 50 mM sodium phosphate, pH 7, in 10 CVs; format: 0.46 cm D x 20 cm L; flow rate: 200, 400, 600 cm/hr. Protein mixture: ribonuclease A, lysozyme, and chymotrypsinogen A.

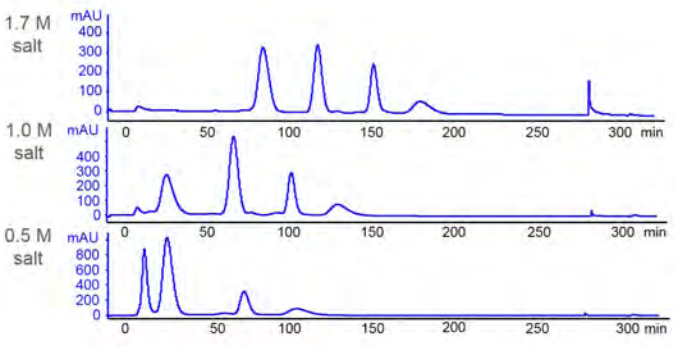


Figure 13. High performance and resolution of POROS Benzyl Ultra resin with lower-conductivity buffers. POROS Benzyl and Benzyl Ultra resins are designed for use in low-salt applications without compromising performance. Protein mixture: ribonuclease A, lysozyme, chymotrypsin, and chymotrypsinogen A.

Resin	Surface chemistry	Key application
POROS Ethyl	Novel ethyl	Bind-elute mode of moderately to considerably hydrophobic molecules
POROS Benzyl	Low-density benzyl/aromatic	Bind-elute or flow-through mode depending on molecule
POROS Benzyl Ultra	High-density benzyl/aromatic	Flow-through mode in lower salt to bind impurities such as aggregates

Increasing hydrophobicity

Process screening and optimization

Prepacked chromatography columns

To support resin screening, process development, and optimization, we offer a selection of columns prepacked with our bioprocess chromatography resins. Our prepacked columns come in a variety of formats, suitable for high-throughput screening, process development, and bench-scale screening.

High-throughput screening

Thermo Scientific™ MabCaptureC™, CaptureSelect™, POROS™ CaptureSelect™, and POROS™ RoboColumns are small chromatography columns that are provided in 8-column strips. These columns are useful for fully automated and parallel chromatographic separations using a robotic liquid-handling platform and are available in 200 µL and 600 µL volumes.

Bench-scale process development screening

Thermo Scientific™ MabCaptureC™, CaptureSelect™, POROS™ CaptureSelect™, and POROS™ GoPure™ columns, and Thermo Scientific™ MabCaptureC™ and CaptureSelect™ MiniChrom columns are designed for bench-scale resin screening, process development, and sample preparation. The 1 mL columns can be used for quick screenings of application feasibility and lab-scale purification on a convenient and easy-to-use prepacked column. The 10 cm bed height of the 5 mL columns allows initial process development on a bench scale.

Ordering information

Resins for antibody and protein purification		RoboColumn 200 µL	RoboColumn 600 µL	MiniChrom 1 mL	MiniChrom 5 mL
MabCaptureC		5943662200	5943662600	5943662001	5943662005
CaptureSelect CH1-XL		5943462200	5943462600	5943462001	5943462005
CaptureSelect FcXP		5943712200	NA	5943712001	5943712005
CaptureSelect KappaXP		5943212200	NA	NA	5943212005
CaptureSelect LambdaXP		NA	NA	5943752001	5943752005
CaptureSelect HSA		5912970200	NA	NA	NA
CaptureSelect C-tagXL		NA	NA	5943072001	5943072005
Resins for viral vector and mRNA purification		**RoboColumn 200 µL**	**RoboColumn 600 µL**	**GoPure 0.2 or 1 mL**	**GoPure 5 mL**
POROS CaptureSelect AAV8		NA	NA	A36648	A36647
POROS CaptureSelect AAV9		NA	NA	A36650	A36649
POROS CaptureSelect AAVX		A37794	A37795	A36652	A36651
POROS Oligo (dT)25		A48349, A48350	A48350	A48351 (0.2 mL), A48352 (1 mL)	A48607
IEX resins	**Product**	**RoboColumn 200 µL**	**RoboColumn 600 µL**	**GoPure 0.2 or 1 mL**	**GoPure 5 mL**
Anion	POROS 50 HQ	A30717	A30718	4481315	A36639
	POROS XQ	A30719	A30720	A25812	A36640
	POROS 50 PI	A30721	A30722	4481318	A36641
	POROS 50 D	A30723	A30724	4481319	A36642
Cation	POROS 50 HS	A30713	A30714	4481316	A36637
	POROS XS	A30715	A30716	4481317	A36638
HIC resins		**RoboColumn 200 µL**	**RoboColumn 600 µL**	**GoPure 0.2 or 1 mL**	**GoPure 5 mL**
POROS Ethyl			A34812	A34983	A36653
POROS Benzyl		A34813	A34814	A34984	A36654
POROS Benzyl Ultra		A34815	A34816	A34985	A36655

Analytical tools

PROS and CaptureSelect analytical columns and conjugated ligands

We offer a range of products to support your analytical needs, including affinity columns, nonaffinity columns, and conjugated ligands for the development of analytical assays.

Analytical chromatography columns

Thermo Scientific™ POROS™ and CaptureSelect™ analytical columns are used throughout the industry to monitor monoclonal antibody titer and product yield from cell culture supernatant. The columns can be operated on any standard high-performance liquid chromatography (HPLC) or medium-pressure chromatography system. POROS analytical chromatography columns, available in 10 and 20 µm particle sizes, enable rapid separation of biomolecules for both analytical and lab-scale preparative applications. POROS Protein A analytical columns are also widely used in the industry for monitoring monoclonal antibody titer and yield from cell culture supernatant. The addition of POROS CaptureSelect analytical columns expands the advantages of high-speed, high-performance quantitation to antibody fragments and isotypes, biosimilars, and fusion proteins.

Affinity columns include:

- Protein A and G columns
- Aldehyde-, epoxide-, or hydroxyl-activated affinity columns
- Antibody isotype and fragment affinity columns
- Biosimilars and recombinant protein columns

Nonaffinity columns include:

- Anion and cation exchange columns
- Reversed-phase columns
- Hydrophobic interaction columns

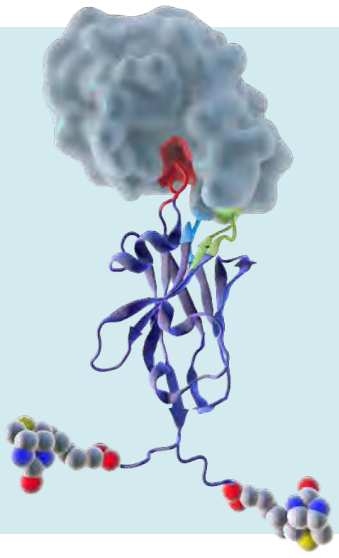
Columns are available in 4 different formats (D x L, volume):

- 2.1 x 30 mm, 0.1 mL
- 4.6 x 50 mm, 0.8 mL
- 4.6 x 100 mm, 1.7 mL
- 10 x 100 mm, 7.9 mL

CaptureSelect ligand conjugates

Thermo Scientific™ CaptureSelect™ biotinylated ligands are available for use in a range of analytical assays and include everything from ligands binding to antibodies and antibody fragments to plasma proteins and non-mAb biosimilars. The affinity ligand is chemically conjugated to biotin via an appropriate spacer that retains binding activity of the ligand when immobilized onto streptavidin-functionalized surfaces.

Applications for CaptureSelect biotinylated ligands include capture ELISA, western blot, and label-free detection platforms such as surface plasmon resonance and bio-layer interferometry.



Find out more at **thermofisher.com/captureselect-conjugates**

Analytical tools

Ordering information

Description	Column size (D x L), volume	Cat. No.
POROS A 20 µm Column	2.1 x 30 mm, 0.1 mL	2100100
	10 x 100 mm, 7.9 mL	1502246
	4.6 x 50 mm, 0.8 mL	1502224
POROS G 20 µm Column	2.1 x 30 mm, 0.1 mL	2100200
	4.6 x 100 mm, 1.7 mL	1512226
	4.6 x 50 mm, 0.8 mL	1512224
POROS Heparin 50 µm Column	2.1 x 30 mm, 0.1 mL	4333411
	4.6 x 50 mm, 0.8 mL	4333412
	4.6 x 100 mm, 1.7 mL	4333413
POROS AL 20 µm Column	2.1 x 30 mm, 0.1 mL	1602212
	4.6 x 100 mm, 1.7 mL	1602226
	4.6 x 50 mm, 0.8 mL	1602224
POROS EP 20 µm Column	4.6 x 100 mm, 1.7 mL	1612226
	4.6 x 50 mm, 0.8 mL	1612224
POROS CaptureSelect LC Lambda Affinity Column	2.1 x 30 mm	4469150
	4.6 x 50 mm	4469163
	4.6 x 100 mm	4469168
POROS CaptureSelect IgM Affinity Column	2.1 x 30 mm	4469152
	4.6 x 50 mm	4469164
	4.6 x 100 mm	4469169
POROS CaptureSelect IgA Affinity Column	2.1 x 30 mm	4485162
	4.6 x 50 mm	4485166
	4.6 x 100 mm	4485170
POROS CaptureSelect CH1-XL Affinity Column	4.6 x 50 mm	A37053
	4.6 x 100 mm	A37054
POROS CaptureSelect FcXL Affinity Column	2.1 x 30 mm	A37058
	4.6 x 50 mm	A37059
	4.6 x 100 mm	A37060

Description	Column size (D x L), volume	Cat. No.
POROS CaptureSelect GCSF Affinity Column	2.1 x 30 mm	4485157
	4.6 x 50 mm	4485164
	4.6 x 100 m	4485168
POROS CaptureSelect hGH Affinity Column	2.1 x 30 mm	4485161
	4.6 x 50 mm	4485165
	4.6 x 100 mm	4485169
	10 x 100 mm	4485173
POROS CaptureSelect hCG Affinity HPLC Column	2.1 x 30 mm	A37055
	4.6 x 50 mm	A37056
	4.6 x 100 mm	A37057
POROS CaptureSelect HSA Affinity Column	2.1 x 30 mm	4469151
	4.6 x 50 mm	4469165
	4.6 x 100 mm	4469170
POROS CaptureSelect FSH Affinity Column	2.1 x 30 mm	4481822
	4.6 x 50 mm	4481824
	4.6 x 100 mm	4481826

Custom chromatography services

Ligand and resin development programs

The manufacture of complex biotherapeutics requires novel purification strategies, which may not always exist. Our custom ligand and resin development platforms enable the development of innovative purification resins, providing a solution for challenging downstream processes.

Custom development services

We have been successfully developing and manufacturing chromatography resins for more than two decades. Our ligand- and resin-manufacturing facilities support the production of prototype affinity resins and scale up to commercial lot sizes of 250 L.

Custom services include:

- **Custom affinity ligand/resin**—CaptureSelect affinity solutions can be developed for your specific product or process
- **Custom resins**—POROS resins can be tailored to your process requirements based on existing ligands

Custom CaptureSelect ligand development

We offer a unique milestone-based service for the development of specific affinity solutions tailored to a target protein and its specific requirements. The custom ligand can be immobilized on a variety of backbones, including POROS resins, and further developed into an affinity resin, which can be used in large-scale processing of biopharmaceuticals.

Custom POROS resins

Through unique product attributes, POROS chromatography resins help maintain performance and add flexibility to your downstream process. Combine high resolution and high capacity in a custom chromatography resin tailored to your specific process requirements.

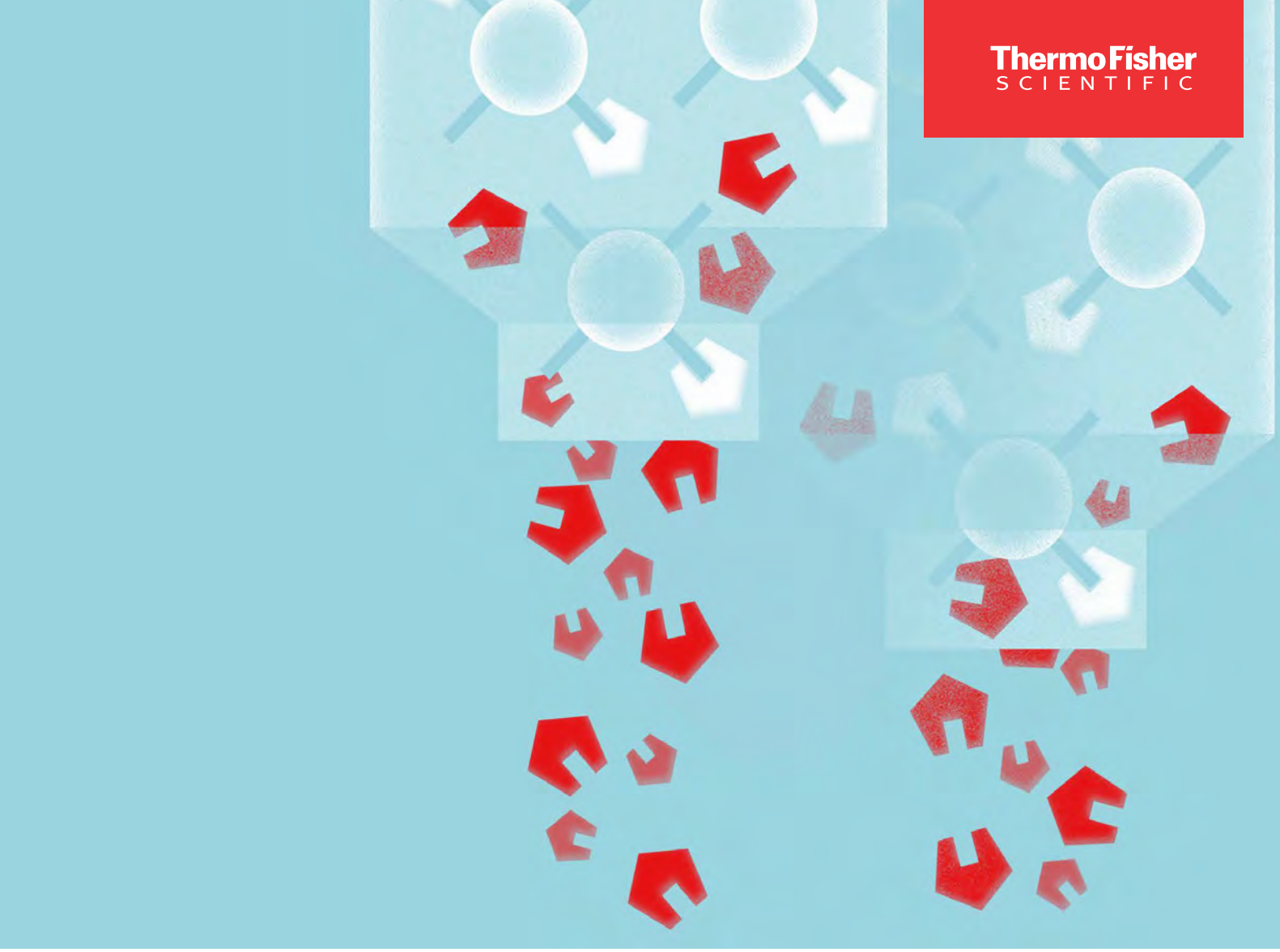
Resin development includes the use of Design of Experiments (DoE) to define the resin-manufacturing process required for your purification needs. DoE screening includes pore size, ligand density, and coupling chemistry to optimize performance for your biotherapeutic. Start the process with your ligand or another commercially available ligand, select from our library of existing CaptureSelect ligands, or generate a custom CaptureSelect ligand for your application.

Service and support

We offer experienced field applications, service, and training support to complement your development process every step of the way. This includes column packing on-site, training, process optimization, cleaning recommendations, stability studies, lifetime approaches, and much more.

For questions and concerns, please contact us at bp@thermofisher.com

Find out more at **thermofisher.com/custom-chromatography-solutions**



Learn more at **thermofisher.com/purification**

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