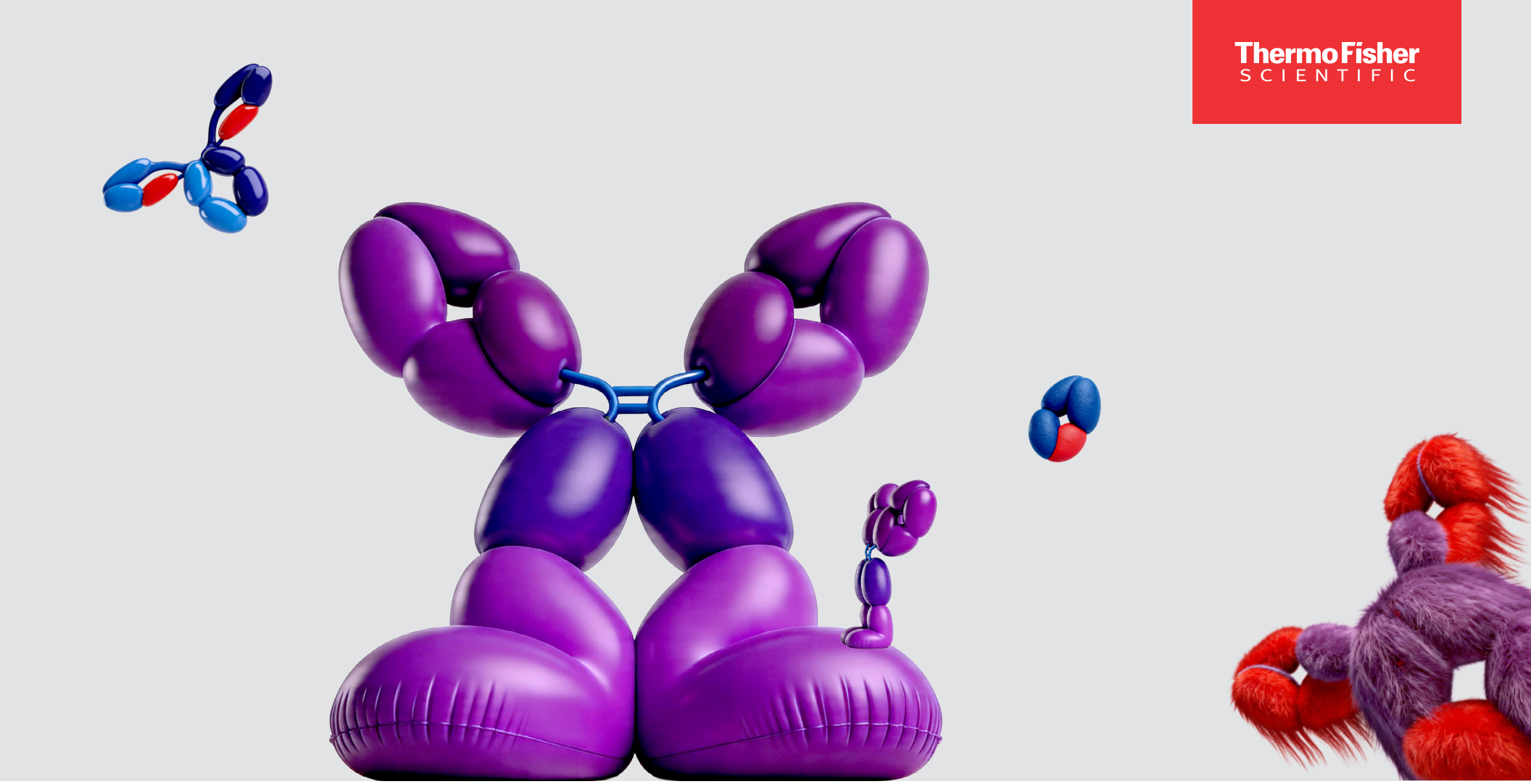


Increase productivity in downstream purification of novel monoclonal antibodies

Selective, specific, and robust CaptureSelect affinity and POROS polish resins

Challenges of novel mAb purification

Novel formats—including antibody-drug conjugates (ADCs), fragments, and bispecific or multispecific antibodies—can introduce distinct physicochemical properties and new process or product-related impurities that may reduce the effectiveness of protein A capture and polishing steps.

	1 **Target mAb** has an absent or altered Fc region	**2** **mAb** has low pH sensitivity	**3** **Harvest fluid** contains mAb high molecular weight species (HMWs) and aggregates	**4** **Harvest fluid** contains elevated levels of process related impurities (HCP or resDNA)	**5** **Harvest fluid** contains mispaired or unpaired species
Impact on purification process					
mAb decrease binding affinity	●		●		●
Competes with target mAb for interaction			●	●	●
Aggregation or degradation of target mAb	●	●			●
Low elution recovery	●	●	●	●	●
Introduces workflow issues	●	●	●	●	●

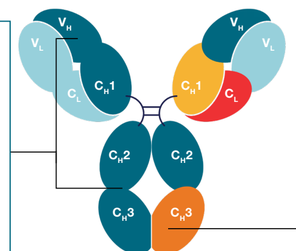
Contents

Boost mAb purification productivity with high-affinity capture resins

Thermo Scientific™ MabCaptureC and CaptureSelect™ affinity chromatography resins help enable efficient capture of therapeutic mAbs from most feed streams. Affinity resins help reduce the number of process steps and increase yield to maximize purification productivity. Thermo Scientific™ CaptureSelect™ products are designed with specificity for a range of antibody subdomain regions to purify different types of antibody therapeutics, including conventional IgG mAbs, multi-specific mAbs, Fab fragments, and Fc-fusion proteins. Thermo Scientific™ CaptureSelect™ affinity ligands are produced in baker's yeast, which is an animal origin–free ligand production process.

Conventional IgG mAbs

Protein A is a common and effective approach to purify IgG mAbs. However, CaptureSelect resins can provide options when conditions such as aggregation, fragmentation, pH sensitivity, or closely related isoforms interfere with Protein A binding.



Thermo Scientific™ MabCaptureC Affinity Matrix
Target: CH2-CH3 interface and cross-binds to a **subpopulation of VH3** domains

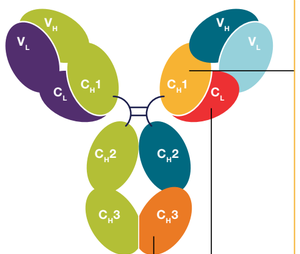
- Alkali-stable to support common CIP conditions

Thermo Scientific™ CaptureSelect™ FcXP Affinity Matrix
Target: CH3

- Binds all four IgG subclasses
- Mild elution

Bi-specific and multi-specific mAbs

The inherent heterogeneity of multi-specific mAbs is supported by CaptureSelect resins spanning a range of affinity options.



Thermo Scientific™ CaptureSelect™ CH1-XL Affinity Matrix
Target: CH1

- Binds all four IgG subclasses
- Does not bind to light chains or light chain dimers
- Mild elution

Thermo Scientific™ CaptureSelect™ LambdaXP Affinity Matrix
Target: Constant domain lambda light chain

- Not cross-reactive with kappa light chains
- Binds all human lambda light chains

Thermo Scientific™ CaptureSelect™ KappaXP Affinity Matrix
Target: Constant domain kappa light chain

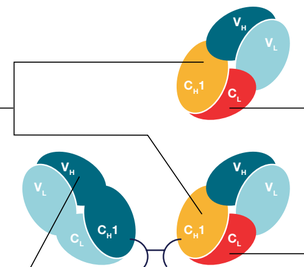
- Not cross-reactive with lambda light chains
- Binds all human kappa light chains

Fab fragments

CaptureSelect CH1-XL Affinity Matrix
Target: CH1

- Binds all four IgG subclasses
- Does not bind to light chains or light chain dimers
- Mild elution

Fabs are small and lack a Fc:Protein A binding region. CaptureSelect resins with very high affinity and specificity for regions within the antigen-binding subunits can be excellent options for Fab purification.



CaptureSelect LambdaXP Affinity Matrix
Target: Constant domain lambda light chain

- No cross-reactivity to kappa light chains
- Binds all human lambda light chains

CaptureSelect KappaXP Affinity Matrix
Target: Constant domain kappa light chain

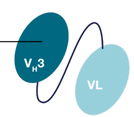
- No cross-reactivity to lambda light chains
- Binds all human kappa light chains

Thermo Scientiifc™ MabCaptureC Resin
Target: CH2-CH3 interface and cross-binds to a **subpopulation of VH3** domains

- Alkali-stable to support common CIP conditions

scFv fragments

The VH3 cross-binding site of MabCaptureC together with Thermo Scientific™ POROS™ multi-modal polish resins provide an affinity purification option for scFv fragments.



All CaptureSelect affinity resins offer these key features:

- **High DBC optimizes throughput and helps minimize resin volume needs**
- **Batch consistency and robust performance across a range of conditions offer scalability**

Thermo Scientific™ CaptureSelect™ technology harnesses multiple features of antibodies from the camel family that make them especially valuable in monoclonal antibody purification. Camelid antibodies consist of two heavy chains, each of them with 2 constant and 1 variable domain without any light chains. The CaptureSelect technology utilizes the variable domain of these molecules (VHH), which retains the specificity for the target. These VHH ligands have several advantages such as a smaller size (approximately 12–15kDa) when compared to standard antibodies (approcimately 150 kDa), which enables them to reach epitopes such as those in hidden or concave regions on target molecules that may be inaccesible to larger antibodies. Due to their compact structure, camelid antibodies are very robust and can withstand the various conditions used in chromatography [1].

Reference

1. Harmsen MM, De Haard HJ (2007). Properties, production, and applications of camelid single-domain antibody fragments. *Appl Microbiol Biotechnol* 77(1):13-22.

Download the white paper

To learn more about choosing chromatography resins, download our white paper

Enhance purity with flexible polish options

Optimize scalability in downstream mAb purification with POROS chromatography polish resins

Help maximize the potential for effective mAb purification with various approaches to fine-tune polishing protocols. POROS polish resins are available with functional groups for ion exchange, hydrophobic interaction (HIC), and mixed-mode chromatography. The robust structure and excellent separation capability of Thermo Scientific™ POROS™ beads allow confidence in reliable performance throughout scale-up from development to large-scale purification.

Polish resins*	Characteristics		
Ion exchange resins (Flow-through & bind-elute modes)	**High DBC**	**Salt tolerance**	**High flow rate range**
POROS XS Strong Cation Exchange Resin	++	yes	+
POROS 50 HS Strong Cation Exchange Resin	+		+
POROS XQ Strong Anion Exchange Resin	++	yes	+
POROS 50 HQ Strong Anion Exchange Resin	+		+
POROS 50 D Weak Anion Exchange Resin	+		+
POROS 50 PI Weak Anion Exchange Resin	+		+
HIC resins (Flow-through & bind-elute modes)	Target molecule hydrophobicity separation range		
	Low to moderate	**Moderate to high**	**High**
POROS Ethyl HIC Resin	●		
POROS Benzyl HIC Resin		●	
POROS Benzyl Ultra HIC Resin (typically used under low salt concentrations)			●
Mixed-mode resin			
POROS Caprylate Mixed-Mode Cation Exchange Resin	Designed for aggregate removal (flow-through mode)		

*POROS polish resins are available in a wide variety of bulk and pre-packed column formats.

POROS beads

The foundation for all POROS polish resins

POROS beads are polymeric, consistently sized beads designed with features that enable rigorous and consistent performance even with stringent cleaning and repeated use.

- **Maximize efficiency and scalability.** A poly(styrene-divinylbenzene) backbone provides rigidity, high mechanical strength, and chemical stability to support stringent cleaning protocols and consistent operation over a broad range of linear velocities.
- **Enable more efficient purification.** Large through pores enable optimized bead porosity, which enhances resolution and is minimally affected by flow rate.
- **Achieve high-resolution separation and impurity removal.** A 50-micron bead diameter results in narrower peaks and smaller elution volumes.

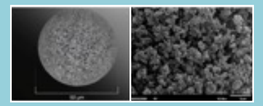


Figure 1. Scanned electron microscope images show the POROS bead (left) and the large throughpore structure of the bead surface (right).

Rely on custom mAb purification resin development services

If off-the-shelf purification resins are not optimal for your mAb therapeutic, rely on our custom resin development service to help design a resin that is better suited to your needs.

Custom services include:

- Development of product-specific or process-specific affinity solutions
- Immobilization of the custom ligand on a variety of backbones, including POROS resins, and development into an affinity resin
- POROS resin development based on design-of-experiments (DOE)-based screening to optimize pore size, ligand density, and coupling chemistry for your polishing application

Our ligand and resin manufacturing facilities support the production of prototype affinity resins and scale-up to commercial lot sizes of 250 L.

Contact us

To discuss custom ligand and chromatography resin services

We're here to help

For the past three decades, Thermo Fisher Scientific bioproduction technology professionals, products, and solutions have enabled purification scientists to maximize their productivity with a wide range of chromatography solutions. Thermo Scientific™ MabCaptureC™ affinity resin, Thermo Scientific™ CaptureSelect™ affinity resins, and Thermo Scientific™ POROS™ polishing resins are designed to address the unique challenges of novel mAb purification, helping to enable ample yield, high purity, and scalable mAb production.

Request a sample

Find scalable and robust purification solutions designed for your process.

Develop your strategy

Help simplify your downstream purification strategy with easy-to-use calculators.

Expand your knowledge

Explore digital resources curated to advance your bioprocess chromatography knowledge.

Trusted bioprocess liquids and buffer solutions

Thermo Fisher Scientific can help streamline your downstream mAb purification operations beyond resins with a broad range of Gibco™ Process Liquid and Buffer Solutions. Our offering includes made-to-stock (MTS), made-to-order (MTO), and custom formulations comprised of balanced salts, sugars, process buffers, and concentrates. High quality, reliable Gibco™ solutions reduce downtime and help enable consistent supply to support your needs to meet increasing demand without compromising quality.

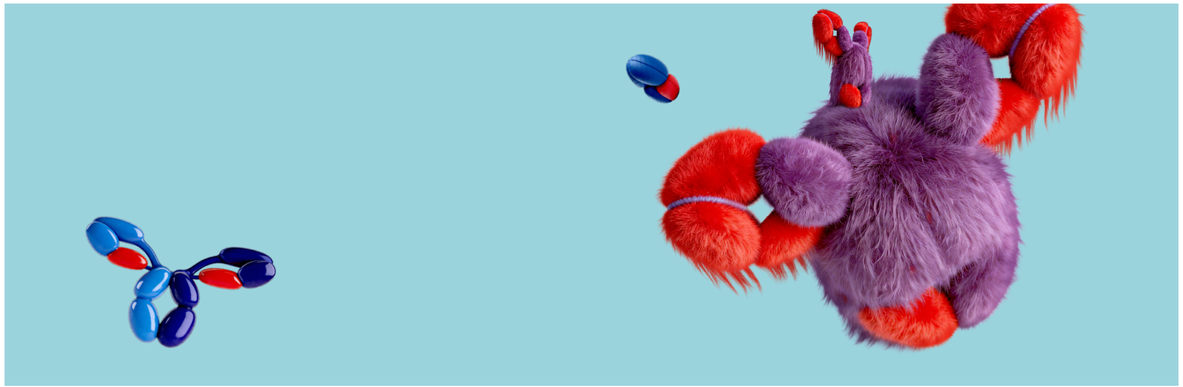
Figure 2. Gibco Process Liquid and Buffer Solutions are available in multiple pack sizes and formats.

Gibco Process Liquid and Buffer Solutions help optimize your mAb purification productivity with solutions for most affinity resins throughout downstream purification.

Resin	EQ buffer*	Wash buffer*	Elution	Strip	Cleaning	Storage**
CH1-XL	50 mM Tris, 125 mM NaCl (pH 7.0–7.5) PBS (pH 7.0–7.5)	25–50 mM Tris (pH 7–8)	20 mM Acetate (pH 3–4)	150 mM Acetate (pH 3), 2% benzyl alcohol	10–20 mM NaOH	18–20% v/v ethanol 100 mM Acetate (pH 5), 2% benzyl alcohol
FcXP	50 mM Tris, 125 mM NaCl (pH 7.0–7.5) PBS (pH 7.0–7.5)	25–50 mM Tris (pH 7–8)	20 mM Acetate (pH 3–4)	150 mM Acetate (pH 3), 2% benzyl alcohol	50 mM NaOH	18–20% ethanol
LambdaXP	20 mM Tris, 125 mM NaCl (pH 7.0–7.5) PBS (pH 7.0–7.5)	25 mM Tris (pH 7–8)	20 mM Acetate (pH 3–4)	150 mM Acetate (pH 3), 2% benzyl alcohol	50 mM NaOH	18–20% ethanol
KappaXP	20 mM Tris, 125 mM NaCl (pH 7.0–7.5) PBS (pH 7.0–7.5)	25 mM Tris (pH 7–8)	20 mM Acetate (pH 3–4)	150 mM Acetate (pH 3), 2% benzyl alcohol	50 mM NaOH	18–20% ethanol
MabCaptureC (Protein A	50 mM Tris, 125 mM NaCl (pH 7.0–7.5) PBS (pH 7.0–7.5)	**Wash 1:** 25–50mM Tris pH 7.5, 100 mM NaCl **Wash 2:** 25–50mM Tris pH 7.5, 1 M NaCl **Wash 3:** 25–50mM Tris pH 7.5, 100 mM NaCl	20 mM–100 mM Acetate (pH 3–4)	150 mM Acetate (pH 3)	100–200 mM NaOH	18–20% ethanol 100 mM Acetate (pH 5), 2% benzyl alcohol 2% benzyl alcohol

* NaCl can be added to the buffer.
** Resin storage temperature: 2–8°C

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



Optimize efficiency with an automated single-use chromatography system

Streamline downstream purification from pilot to production with the robust and versatile Thermo Scientific™ DynaChrom™ Single-Use Chromatography System. Reduce operational burden and optimize results with straightforward integration across your workflow.

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

Figure 3. The DynaChrom Single-Use Chromatography System provides advanced automation designed to streamline your downstream purification operations.

Enable consistency and scalability across downstream processes

We further support downstream processes with a comprehensive portfolio of high-quality raw materials, including chemicals, process liquids, and buffers aligned to global pharmacopeia standards. These GMP-manufactured materials can help reduce variability and enable reliable performance from development through commercial manufacturing. Supported by a global supply network, flexible volumes, and integrated quality systems, we can help mitigate risk, simplify sourcing, and maintain regulatory readiness.

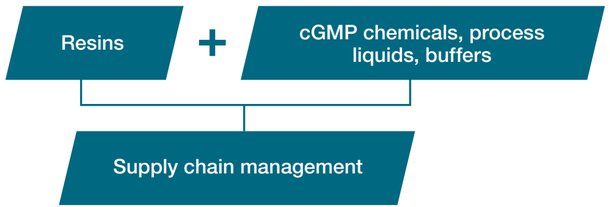
Manufacturers and suppliers	Categories	Grades	Compendia	Documentation
Ajinomoto Group	**Acid solutions**	ACS	BP	COA
Avantor	**Amino acids**	**GMP**	ChP	COO
BASF	**Base solutions**	**Pharma**	Ph. Eur.	DMF*
BioSpectra	Biological buffers	Reagent	FCC	Regulatory certificates
BIOVECTRA	Biological reagents	Technical	JP	SDS
DFE Pharma	Carbohydrates		NF	TDS
Dr. Paul Lohmann	Cleaning agents and disinfectants		USP	
Gibco™ feeds and supplements	Denaturants			
Gibco Process Liquids and Buffers	Minerals and vitamins			
Greenfield Global	**Salts**			
Hawkins	**Solvents**			
Macco Organiques	Supplements			
Quality Chemicals	Surfactants and emulsifiers			
Spectrum Chemical	**Water**			
STERIS				
Veltek				

The blue bolded font denotes suppliers, categories, and grades most applicable to downstream purification processes.
*Drug Master Files are available for select products.

Learn more at thermofisher.com/downstreamchemicals

Streamline downstream operations with integrated supply chain support

We also offer supply chain management services that connect chromatography resins, process liquids, and critical raw materials into a unified purification strategy. This alignment can help improve process consistency, reduce bottlenecks, and simplify supplier management to support scalable, reproducible downstream workflows.

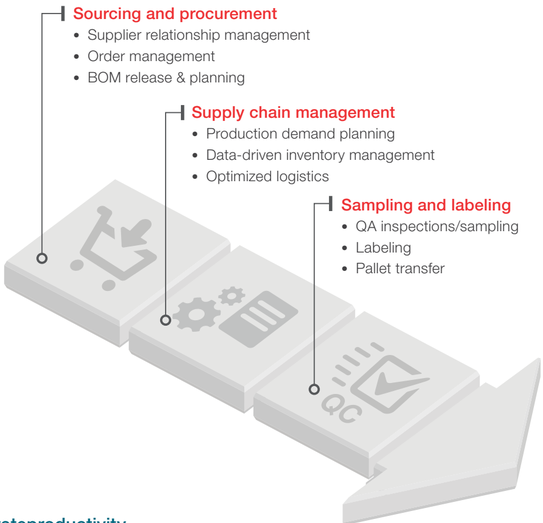


Supply chain services

Procurement and sourcing
Reduce sourcing delays

Vendor managed supply chain
Build supply continuity

Sampling and labeling
Expedite QC release



Learn more at thermofisher.com/innovateproductivity

Bioprocess affinity resins

Bioprocess affinity resins ordering information

Product	Quantity	Cat. No.
Antibody-based therapeutics		
MabCaptureC Affinity Matrix	250 mL	1963662250
	1 L	196366201L
	5 L	196366205L
	10 L	196366210L
CaptureSelect CH1-XL Affinity Matrix	5 mL	1943462005
	10 mL	1943462010
	50 mL	1943462050
	250 mL	1943462250
	1 L	194346201L
	5 L	194346205L
	10 L	194346210L
CaptureSelect FcXP Affinity Matrix	5 mL	1943712005
	10 mL	1943712010
	50 mL	1943712050
	250 mL	1943712250
	1 L	194371201L
	5 L	194371205L
CaptureSelect KappaXP Affinity Matrix	5 mL	2943212005
	10 mL	2943212010
	50 mL	2943212050
	250 mL	1943212250
	1 L	194321201L
	5 L	194321205L

Description	Quantity	Cat. No.
Antibody-based therapeutics, continued		
CaptureSelect LambdaXP Affinity Matrix	5 mL	2943752005
	10 mL	2943752010
	50 mL	2943752050
	250 mL	1943752250
	1 L	194375201L
	5 L	194375205L
	10 L	194375210L
POROS CaptureSelect FcXP Affinity Resin	50 mL	A56249
	250 mL	A56251
	1 L	A56252
	5 L	A56253
	10 L	A56254
CaptureSelect IgE Affinity Matrix	5 mL	2943542005
	10 mL	2943542010
	50 mL	2943542050
	250 mL	1943542250
	1 L	194354201L
	5 L	194354205L

Available in pre-packed chromatography columns

Learn more at thermofisher.com/purification

Bioprocess polishing resins

Bioprocess polishing resins ordering information

Product	Quantity	Cat. No.
Anion exchange		
POROS XQ Strong Anion Exchange Resin	250 mL	4467820
	1 L	4467818
	5 L	4467817
	10 L	4467816
POROS 50 HQ Strong Anion Exchange Resin	250 mL	1255911
	1 L	1255907
	5 L	1255909
	10 L	1255908
POROS 50 D Weak Anion Exchange Resin	50 mL	1365906
	250 mL	1365911
	1 L	1365907
	5 L	1365909
	10 L	1365908
POROS 50 PI Weak Anion Exchange Resin	50 mL	1245906
	250 mL	1245911
	1 L	1245907
	5 L	1245909
	10 L	1245908
Mixed-mode		
POROS Caprylate Mixed-Mode Cation Exchange Chromatography Resin	50 mL	A51049
	250 mL	A51050
	1 L	A51051
	5 L	A51052
	10 L	A51053

Available in pre-packed chromatography columns

Learn more at thermofisher.com/purification

Product	Quantity	Cat. No.
Cation exchange		
POROS XS Strong Cation Exchange Resin	50 mL	4404338
	250 mL	4404337
	1 L	4404336
	5 L	4404335
	10 L	4404334
POROS 50 HS Strong Cation Exchange Resin	50 mL	1335906
	250 mL	1335911
	1 L	1335907
	5 L	1335909
	10 L	1335908
Hydrophobic interaction chromatography (HIC)		
POROS Ethyl HIC Resin	25 mL	A32557
	50 mL	A32556
	250 mL	A32555
	1 L	A32554
	5 L	A32553
	10 L	A32552
POROS Benzyl HIC Resin	25 mL	A32563
	50 mL	A32562
	250 mL	A32561
	1 L	A32560
	5 L	A32559
	10 L	A32558
POROS Benzyl Ultra HIC Resin	25 mL	A32569
	50 mL	A32568
	250 mL	A32567
	1 L	A32566
	5 L	A32565
	10 L	A32564

Process liquids and buffers

ThermoFisher SCIENTIFIC

Gibco Process Liquid and Buffer Solutions ordering information

Product	Quantity	Cat. No.
Made-to-stock (MTS)		
NaOH		
NaOH 0.1 M	20 L	A4782601
	200 L	A4782602
NaOH 0.5 M	20 L	A4782801
	200 L	A4782802
NaOH 1.0 M	20 L	A4782901
	200 L	A4782902
EtOH		
20% EtOH	5 L	A5803201
	20 L	A5803202
	200 L	A5803203
Made-to-order (MTO)		
Balanced salts		
PBS (1X), pH 7.4	5 L	A58313BA
	20 L	A58313BB
	50 L	A58313BD
	100 L	A58313BE
	200 L	A58313BC
Process buffers		
Sodium acetate 20 mM	5 L	A59148BA
	20 L	A59148BB
	50 L	A59148BC

Product	Quantity	Cat. No.
Made-to-order (MTO)		
Process buffers, continued		
Glycine 100 mM	5 L	A59151BA
	20 L	A59151BB
	50 L	A59151BC
	100 L	A59151BD
	200 L	A59151BE
Tris 20 mM, NaCl 1.5 M	5 L	A59168BA
	20 L	A59168BB
	50 L	A59168BC
	100 L	A59168BD
	200 L	A59168BE
Concentrates		
Acetic acid 2 M	5 L	A59771BA
	20 L	A59771BB
	200 L	A59771BC
Citric acid 2 M	5 L	A44667BA
	20 L	A44667BC
	50 L	A44667BD
	100 L	A44667BE
	200 L	A44667BF
Custom buffers		
If the exact formulation or configuration that is required in your workflow is not currently included in list above, you may order made-to-suit buffers through our customization service.		

Learn more at thermofisher.com/simplifybufferprep

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