Millipore®
Preparation, Separation,
Filtration & Monitoring Products

Data Sheet

Fractogel® Chromatography Resin

Fractogel® resins consist of synthetic methacrylate based polymeric beads providing excellent pressure stability resulting in high flow rates. Depending on your purification application, we can offer resin sized M-type beads with a particle size of 40–90 µm and small S-type beads with a particle size in the range of 20–40 µm.

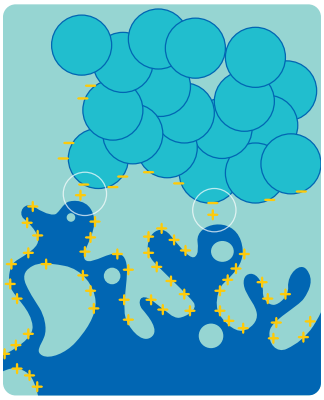
Tentacle technology for high binding capacity

The unique composition of Fractogel® resin creates a powerful tool for your purification strategy. Tentacles are long, linear polymer chains that carry the functional ligands. All tentacles are covalently attached to hydroxyl groups of the Fractogel® matrix. This configuration provides a high surface area for biomolecules to bind accessible ligands without steric hindrance. A variety of ligands is available for different chromatography applications, including ion exchange, affinity, and size exclusion.

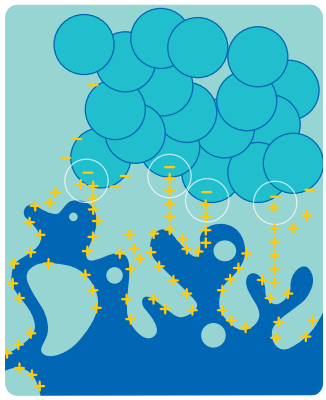
Benefits

- Reliable purification of macromolecules
- Efficient capture of target protein, and removal of viruses, DNA and endotoxins
- Excellent yield and high throughput
- Superior stability and quality
- Allowing multiple cycles of column regeneration and sanitization
- Tangible time and cost savings

Conventional ion exchanger



Tentacle ion exchanger



Properties of Fractogel® resin types

Particle size	S-type: 20–40 µm
	M-type: 40–90 µm
Pore size	about 800 Å
Matrix	crosslinked polymethacrylate
Working range	pH 2–12
Pressure limit	8 bar
Storage	20% ethanol, 150 mM NaCl

One of the main advantages of tentacle resin is their greater accessibility and minimized steric hindrance between the functional group and the target molecule. Tentacle resins provide higher binding capacities compared to conventional methods, especially for large proteins, antibodies, viruses, and plasmids. Target biomolecules are more tightly bound, but during the elution phase the reversible interaction can be neutralized.

Better production yields

A result of the unique surface modification technique is the high binding capacity of all Fractogel® resin. Due to the tighter binding of the target molecule, very often the capture step using Fractogel® ion exchange resins is more efficient than other resins. This more efficient capture results in greater overall yield than with other types of chromatography media.

Safer product

In contrast to carbohydrate based resin, Fractogel® resin are resistant to microbial degradation. Reducing the risk of endotoxin contamination. In addition, the ability to clean Fractogel® resin multiple times extends its lifetime. This is an important feature especially when recombinant proteins, produced from micro-organisms, are purified.

Lower operating costs

Due to the chemical resistance of Fractogel® resin, a high number of cycles can be achieved. Resin lifetime is extremely long and replacement frequency is minimized, resulting in lower operating costs.

Choosing the right Fractogel® Resin

We offer a variety of Fractogel® resin for different chromatographic techniques. All Fractogel® resin are designed for manufacturing of biomolecules. For example, native or recombinant proteins like blood plasma factors and monoclonal antibodies are processed on different Fractogel® ion exchangers with high throughput rates. For capture steps, M-type Fractogel® ion exchange resin are widely used, whereas final polishing can be achieved using S-type ion exchange resin. Final polishing can also be achieved with Fractogel® EMD BioSEC size exclusion resin. For certain application areas, Fractogel® EMD Chelate affinity resin can be used efficiently.

Fractogel® Resin for Ion Exchange Chromatography

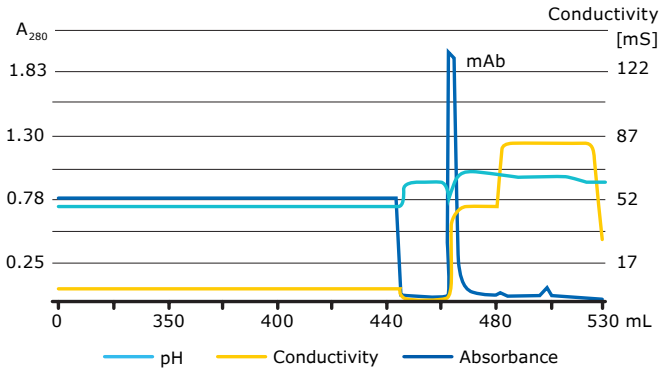


Figure 1. Capture of a monoclonal antibody on Fractogel® EMD SO_3 resin

After equilibration (25 mM Sodium Phosphate buffer, pH 5.5) the sample containing 415 mg of protein (corresponding to 30 mg mAb) was loaded onto the column. Subsequently, the column was washed with equilibration buffer, the elution of 94% purified antibody was achieved using a salt gradient (25 mM Sodium Phosphate buffer/0.5 M NaCl, pH 7)

Ion exchange chromatography (IEX) is a robust, efficient technique for separating molecules based on charge. Two exchange types are differentiated: basic (positively charged, or cationic) and acidic (negatively charged, or anionic). They in turn can be divided into those with weakly basic or acidic or strongly basic or acidic functional groups. With the latter, the functional groups are always present in ionized form, independent from the pH value in the specified operating range. Ion exchange chromatography can be operated in either binding or flow-through mode.

Main application areas for Fractogel® ion exchange resin

- Isolation of native and recombinant proteins from different sources (e.g. cell culture supernatant, microbial expression systems, inclusion bodies, plasma, plants, tissue, etc.)
- Efficient purification of peptides and low molecule weight substances (e.g. NADP, ATP, gangliosides, etc.)
- Excellent log reduction of DNA, endotoxins and host cell proteins
- Safe removal of viruses
- Well suited for efficient purification of monoclonal antibodies

Fractogel® Resin for Metal Chelate Affinity Chromatography

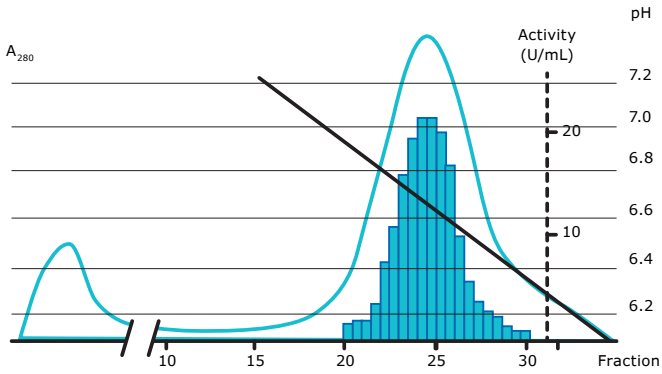


Figure 2. Purification of glucokinase from yeast using Fractogel® EMD Chelate resin.

The metal chelate chromatography was performed on immobilized cobalt ions. The purified enzyme can be eluted in a peak during a decreasing pH-gradient. 20 mM phosphate buffer with 1 M KCI and 10 mM glucose at pH 7.5 was used as buffer A. Buffer A, which was adjusted to a pH value of 6.0, was used for elution.

For Fractogel® EMD Chelate resin, iminodiacetic acid has been chosen as the functional affinity ligand. This ligand is very suitable for the coordination of metal ions. Free coordination sites of the metal ions are used to bind different proteins and peptides.

Main application areas for Fractogel® EMD Metal Chelate Affinity Resin

- Ideal for separation of recombinant, histidine-tagged proteins
- Separation of peptides
- On-column re-folding

Fractogel® Resin for Size Exclusion Chromatography

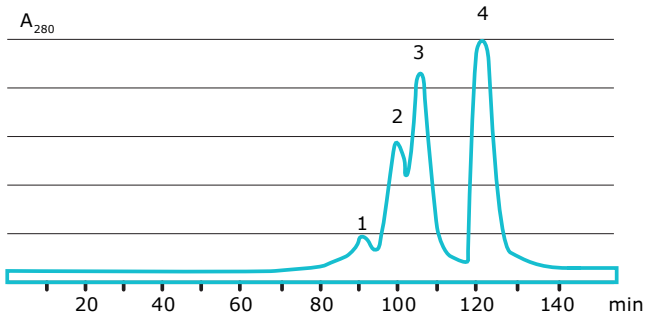


Figure 3. Separation of a standard protein mixture on Fractogel® EMD BioSEC resin.

The sample contains BSA (peak 1, dimer of BSA, peak 2 monomer of BSA), ovalbumin (peak 3) and cytochrome (peak 4). 500 µL of the sample were loaded on a 600 x 16 mm Fractogel® EMD BioSEC column at a flow rate of 1.0 mL/min (30 cm/hr) using 20 mM sodium phosphate buffer containing 0.1 M NaCl (pH 7.2) as the eluent.

Size exclusion chromatography (SEC) is a method for polishing and usually there is no restriction in buffer selection. Native as well as recombinant proteins, viruses and plasma-derived bio-therapeutics can be purified on Fractogel® EMD BioSEC resin. Due to its pressure stability Fractogel® EMD BioSEC resin can easily be packed into high-performing production scale columns. The benefits include a shorter time to market, with simple and straightforward transfer from lab-scale to production-scale columns.

Main application areas for Fractogel® EMD BioSEC resin

- Efficient polishing step of blood plasma factors
- Removal of dimers and high molecular weight aggregates (e.g. monoclonal antibodies)
- Purification of viruses
- Determination of apparent molecular weights of proteins

Fractogel® Resins are supported by the Emprove® Program—The Smart Way to Master Compliance and Control.

Complementing our product portfolio, the Emprove® Program provides convenient access to reliable technical, regulatory and supply information in Emprove® Dossiers to support your risk assessment continuum. A subscription to our Emprove® Suite can help you stay current: In addition to accessing the Emprove® Dossiers, you can also receive notification updates to document changes, as well as generate metrics and reports.

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SigmaAldrich.com/emprove

Fractogel® Resin Ordering Information

Description	Quantity [mL]	Particle Size [µm]	Capacity [per mL gel]	Catalogue No.
Fractogel® IEX resin				
Fractogel® strong anion exchanger				
Fractogel® EMD TMAE (M)	10, 100, 500, 5000	40–90	100 mg BSA	1.16881
Fractogel® EMD TMAE Hicap (M)	10, 100, 500, 5000	40–90	180 mg BSA	1.10316
Fractogel® EMD TMAE Medcap (M)	10, 100, 500, 5000	40–90	150 mg BSA	1.16885
Fractogel® EMD TMAE (S)	10, 100, 500, 5000	20–40	100 mg BSA	1.16887
Fractogel® weak anion exchanger				
Fractogel® EMD DEAE (M)	10, 100, 500, 5000	40–90	100 mg BSA	1.16883
Fractogel® EMD DMAE (M)	10, 100, 500, 5000	40–90	100 mg BSA	1.16884
Fractogel® strong cation exchanger				
Fractogel® EMD SO_3– (M)	10, 100, 500, 5000	40–90	130 mg Lysozyme	1.16882
Fractogel® EMD SE Hicap (M)	10, 100, 500, 5000	40–90	140 mg Lysozyme	1.14894
Fractogel® EMD SO_3– (S)	10, 100, 500, 5000	20–40	150 mg Lysozyme	1.16890
Fractogel® weak cation exchanger				
Fractogel® EMD COO– (M)	10, 100, 500, 5000	40–90	100 mg Lysozyme	1.16886
Fractogel® affinity resin				
Fractogel® EMD Chelate (M)	10, 100, 250, 500, 5000	40–90	60–100 umol Cu	1.10338
Fractogel® SEC resin				
Fractogel® EMD BioSEC	150, 250, 5000	20–40	5–1,000 kDa	1.10317

SEC = size exclusion BSA = bovine serum albumin

Our Fractogel® resin are available in prepacked, ready-to-use, disposable columns for research and lab development scale. The MiniChrom columns and RoboColumns® are the ideal tool for performing initial media screening, scaling and optimization studies. The easy-to-use, economical small-scale columns can be used with any chromatography system.

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For additional information,
please visit **SigmaAldrich.com**

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