Chromatography Resins Product Manual (2023 Edition)

COMPANY PROFILE

VDO Biotech Co., Ltd. is a high-tech enterprise dedicated to innovative microsphere technologies and the production of a variety of high-quality microsphere products for global customers. VDO was founded in 2014, and is headquartered in the BioBAY of Suzhou Industrial Park, China, with a total facility area of over 10,000 square meters. Committed to R&D and innovation, VDO hold 6 authorized patents and 17 pending patents, and have successfully acquired high-tech enterprise certification.

VDO Biotech is deeply engaged in the microsphere innovative development and large-scale production and application. VDO provide microspheres and technical services for both IVD and pharmaceutical applications. The IVD microspheres include magnetic microspheres, latex microspheres, color-dyed microspheres, fluorescent microspheres, flow cytometry microspheres, and standard microspheres; while the chromatography resins cover size exclusion resins, affinity resins, ion exchange resins , hydrophobic interaction resins and multimodal resins. Products can be widely used in molecular diagnosis, immunodiagnosis, and large-scale purification of biological drugs and vaccines. VDO also provide customized services of various types of microspheres, large-scale microsphere conjugation services with antibodies or nucleic acid probes, OEM services for microspheres and intermediates, and complete solutions for microsphere applications.

Led by senior scientists from world-renowned universities, VDO's microsphere scientific team has established an advanced technology platform and a continuously innovative R&D system. VDO have always adhered to high standards of production management, and manufacturing facilities have acquired ISO 9001:2015 certification. VDO has been endorsed by users all over the world for our high-quality products and services, and constantly creating new legends of core suppliers in the IVD field with higher-quality microsphere products.

To better support partners in the IVD and pharmaceutical fields, VDO has also expanded service scope, introduced the product line of protein raw materials, added IVD antibody raw materials, bulk package and resins. With the mission of inspiring and enabling life science innovation, VDO will continue to move forward, innovate constantly, and strive to become the world's leading supplier of life science solutions and diagnostic raw materials. VDO's dedicated staff is your reliable partner for the solution of life science applications!

Enterprise Cultures

Vision

To be a world-class biotech company

Mission

Healthy life starts here

Values

Preciseness Innovation Collaboration Openness

Microsphere Overall Solutions

- Microsphere OEM services for global customers
- Large scale protein-microsphere conjugation services
- OEM services of microsphere intermediates
- High quality microspheres of nanometer and micrometer level
- Customized microsphere services
- Overall solution for microsphere applications
- Biomacromolecule separation and purification services
- Development of separation and purification process for biological macromolecules
- Optimization of separation and purification process for biological macromolecules
- Overall solution for separation and purification of biological macromolecules

CATALOGUE |

Overall Solution for Separation and Purification of Bioproducts

VDO has provided a complete solution for the separation and purification of bioproducts for multiple clients, including the selection and customization of separation and purification resins, the selection and configuration of chromatography equipment and columns, purification processes from small-scale trials to production line amplification, personnel training, and technical guidance services, to provide customers with the highest quality products and services.

Provide sample information

Target substance molecular weight
pI, pH stability
Heat resistance, concentration
Source, upstream and downstream processes
Existing and attempted processes, etc.

Define purification

Purity requirements
Recovery requirements
Batch processing volume, etc.

Purification process development

Chromatography resins screening
Customized chromatography resins
Chromatography conditions mapping
Optimization of chromatographic conditions

Post-purification sample

User confirmation through retesting

Pilot test

Complete pilot test process determination and small-scale preparation

Determine the final process scheme

Equipment configuration, medium configuration
Process parameters, personnel training

Delivery

Guidelines for Selection of Purification Resins for Biomolecules

Guiding Principles for Biomolecule Purification:

1. Before starting purification, establish a fast and effective evaluation method: determine the concentration and activity of the target protein, define yield and measure major impurities.
2. Define the purification objective, determine the purity, specific activity, yield requirements, and batch processing volume of the final target protein.
3. Clearly define the physical and chemical properties of the target protein in pre-experiments and resin screening, and explore the greatest differences between the properties of the target protein and impurities.
4. Make trade-offs between purity and yield, and design purification steps and detection methods reasonably.
5. Understand the commonly used additives in protein preparation processes and their effects on the activity of the target protein, and add them appropriately.

Biomacromolecule Purification Resins

01 Coarse purification

Quickly remove large amount of impurities and substances that affect the stability of the target protein, capture the concentrated target protein, and reduce the sample volume. Choose a purification method with high throughput and large capacity, such as salt precipitation and various high-flow-rate and high -capacity resins.

02 Medium purification

Remove most impurities, further concentrate and purify the sample. Choose high-capacity and high-resolution purification methods, such as various high-flow-rate and high-resolution chromatography resins.

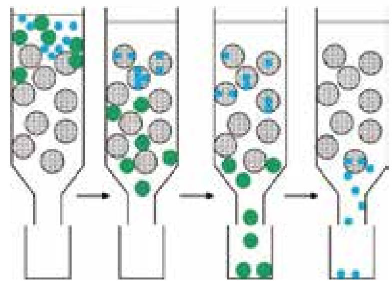
03 Fine purification

Remove the small amount of remaining impurities to achieve the desired purification purpose. As the value of samples increases, purification methods with high recovery and high resolution are recommended at this stage, such as various high-recovery, high-resolution chromatography resins.

Recombinant protein	Ni Focurose FF(IDA/IMAC/TED),GST Focurose 4FF , SP/Q/CM/DEAE/MMA/MMC Focurose FF/HP/HF/HPR/XL, Phenyl Focurose FF,Focurose 75PG/200PG
Natural protein	SP/Q/CM/DEAE/MMA/MMC Focurose FF/HP/HF/HPR/XL Phenyl Focurose FF, Focurose 75PG/200PG
Vaccine,virus	Focurose 4FF, Focurose 30PG/75PG/200PG, SP/Q/CM/DEAE/MMA/MMC Focurose FF/HP/HF/HPR/XL, Focore 400/700
Diagnostic antibody antigen	arProtein A Focurose HR, Protein G Focurose 4FF, SP/Q/CM/DEAE/MMA/MMC Focurose FF/HP/HF/HPR/XL
Therapeutic antibody	arProtein A Focurose HR, Protein G Focurose 4FF, SP/Q/CM/DEAE/MMA/MMC Focurose FF/HP/HF/HPR/XL
Plasmid DNA purification	Focurose 6FF, Plasmid Focurose HPR, Q Focurose HPR, Phenyl Focurose FF, Focore 700
Desalination	Focurose 30PG

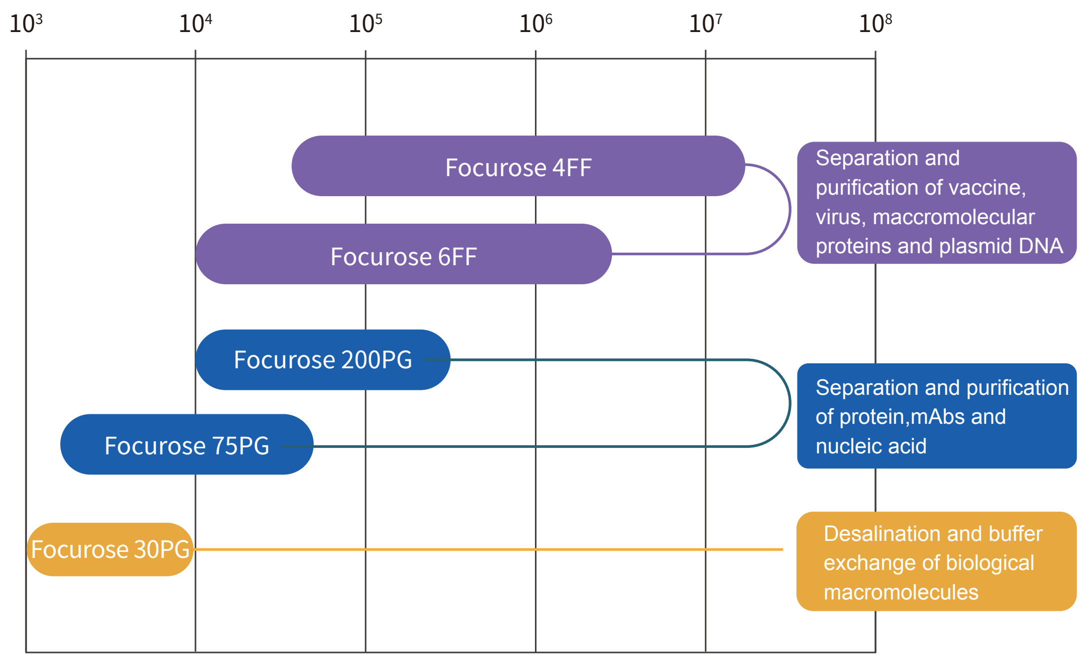
Size Exclusion Resins

Size exclusion resins are based on the size of the target molecules, from the largest to the smallest peak in order to achieve the purpose of separation.



★ Size exclusion resins are often used in the subsequent purification stage with less impurities.
★ Size exclusion resins are used for the purification of smaller samples.
★ In group separation (such as desalination) can also be used in the coarse purification stage.
★ The addition of 150 mM NaCl to the buffer can effectively reduce the non-specific adsorption of the target protein.

Size exclusion resins graded separation range (globulin Da)



The process of graded separation by size exclusion resins

Selection of size exclusion resins
Select the appropriate resin according to the sample properties and the graded separation range of size exclusion resins

Loading column
- Column bed height control to 30-60cm
- Loading diameter to height ratio 1:15-1:100
- The filling should be uniform and appropriate density

Loading samples
- Sample flow rate should be slow, not too fast
- Sample volume affects the separation effect
- Group separation (such as desalination) can be on the sample 30%, component separation on the sample volume control below 10%, 5% or less is appropriate

Separation
- After the sample enters the column bed, the substances larger than the upper limit of resin rejection flow out of the column bed first
- In the range of resin resistance, according to the size of the molecules in descending order of flow

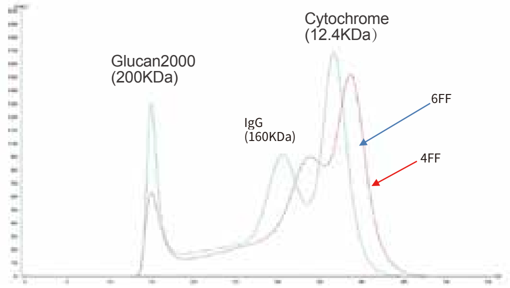
Size Exclusion Resins

Product number	Product name	Spec	Separation range (globulin)	Particle size range μm	Average particle size μm	Average particle size MPa	Flow rate cm/h	pH stability Long-term [short-term]	Application
HN030303005M	Focurose 4FF	5mL	6×10^{4}-2×10^{7}	45-165	90±5	≤0.1	250	2-12 [2-14]	Isolation of biological macromolecules such as vaccines, viruses, etc.
HN030303025M		25mL							
HN030303100M		100mL							
HN030303500M		500mL							
HN030303001L		1L							
HN030303005L		5L							
HN030303020L		20L							
HN060307005M	Focurose 6FF	5mL	1×10^{4}-4×10^{6}	45-165	90±5	≤0.1	300	2-12 [2-14]	Isolation of biological macromolecules such as plasmid DNA, viruses, vaccines, etc.
HN060307025M		25mL							
HN060307100M		100mL							
HN060307500M		500mL							
HN060307001L		1L							
HN060307005L		5L							
HN060307020L		20L							
HN120208025M	Focurose 30PG	25mL	$\leqslant1\times10^{4}$	25-45	35±5	≤0.3	90	3-12 [1-14]	Biomolecule desalination, peptide isolation
HN120208100M		100mL							
HN120208500M		500mL							
HN120208001L		1L							
HN120208005L		5L							
HN120208020L		20L							
HN120209005M	Focurose 75PG	5mL	3×10^{3}-7×10^{4}	25-45	35±5	≤0.3	90	3-12 [1-14]	Isolation and purification of peptides and low molecular proteins
HN120209025M		25mL							
HN120209100M		100mL							
HN120209500M		500mL							
HN120209001L		1L							
HN120209005L		5L							
HN120209020L		20L							
HN120210005M	Focurose 200PG	5mL	1×10^{4}-6×10^{5}	25-45	35±5	≤0.3	90	3-12 [1-14]	Isolation and purification of monoclonal antibodies and proteins
HN120210025M		25mL							
HN120210100M		100mL							
HN120210500M		500mL							
HN120210001L		1L							
HN120210005L		5L							
HN120210020L		20L							

Application Cases

Focurose 4FF/6FF for the separation of substances with different molecular weights

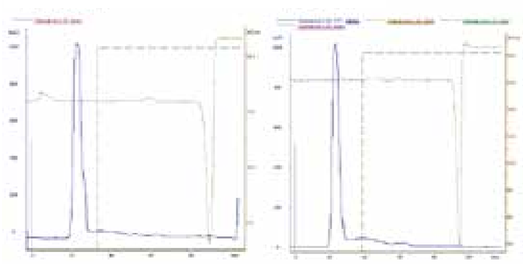
Focurose 4FF and 6FF were compared using the same column volume and sample volume.The separation of IgG (160 KDa) and cytochrome C (12.4 KDa) was better with 6FF than 4FF.



Comparison of Focurose 4FF purified influenza vaccine with imported brands

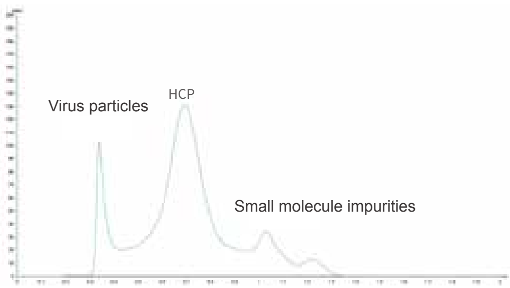
The purification profiles of Focurose 4FF and imported brand influenza vaccine were compared using the same column volume, sample volume and purification method.

Fig a.Focurose 4FF Fig b.Imported brands



Focurose 4FF purified rabies virus

The molecular weight of rabies virus was larger than that of HCP and impurities, and the peaks were preferential. The spectrum reflected that rabies virus was effectively separated from HCP and small molecule impurities.



Tips

★ The diameter-to-height ratio of the loaded column is 1:15 to 1:100, and the backpressure increases if the loading is too high.

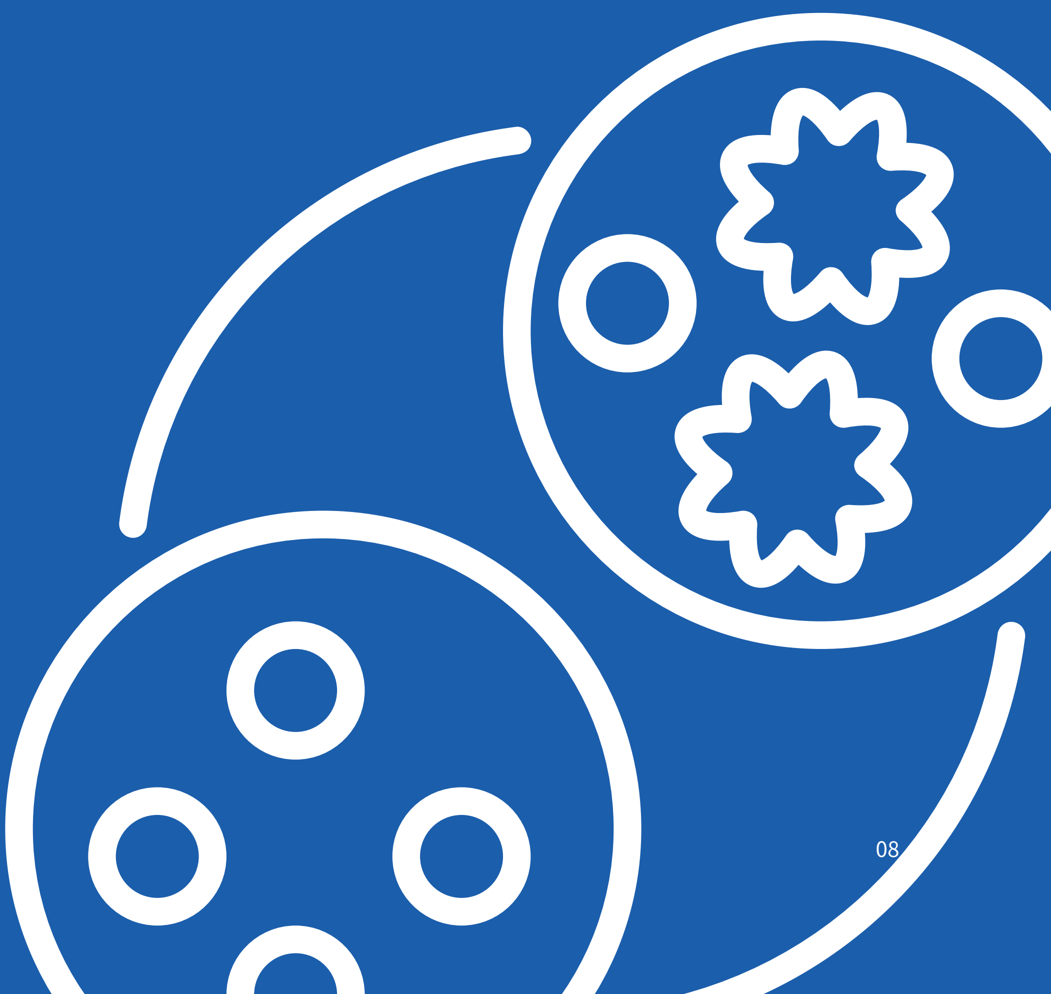
★ The sample volume should be less than 10% of the column bed volume during chromatography, and try to control within 5%.

★ When using size exclusion resins, the molecular weights of the substances to be separated differ by a factor of 2 or more.

★ Minimize the viscosity of the sample when size exclusion resins is performed.

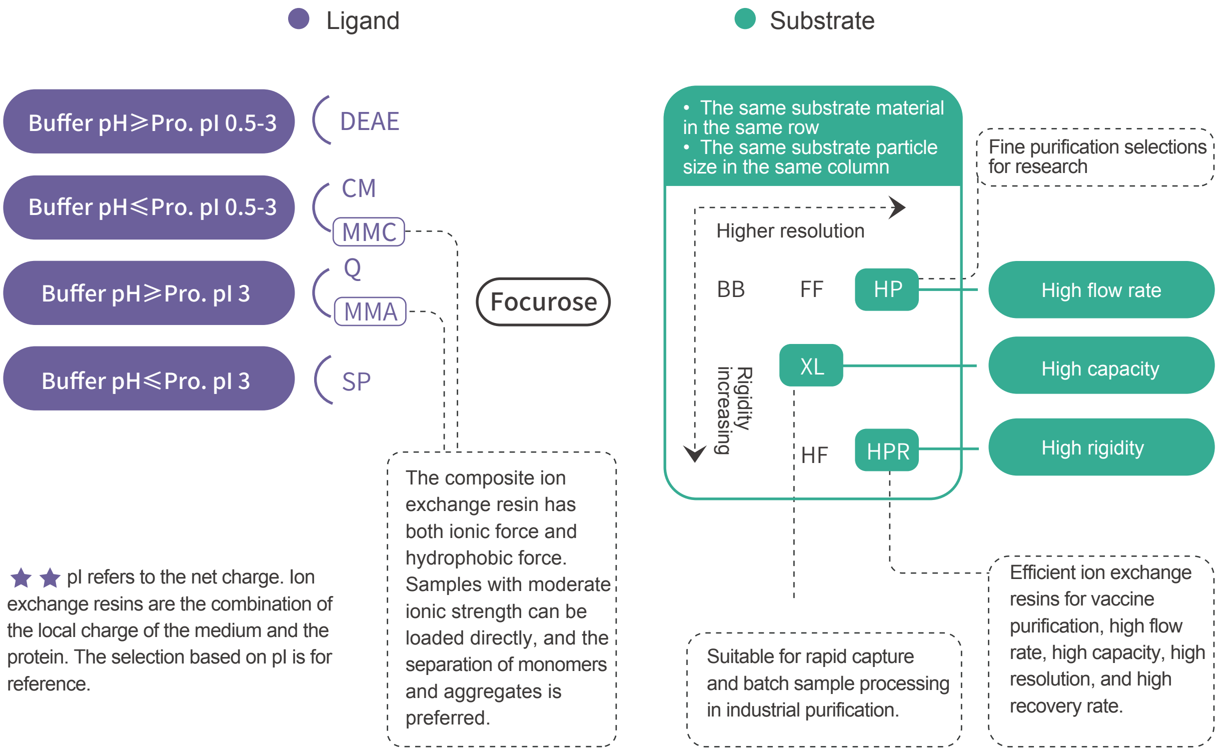
★ The presence of solids in the chromatographic sample should be avoided.

Ion Exchange Resins



Ion exchange resins is one of the most widely used methods for protein separation and purification. Different proteins have different isoelectric points, different molecular sizes, different charge density distributions in the same mobile phase, different charge amounts, different binding strengths to ion exchange resin with opposite charges, and different retention times when eluting in the mobile phase, thus allowing separation.

VDO supplies 6 types of ligands, which are DEAE, CM, Q, SP, MMC, MMA . Focurose BB, Focurose FF, Focurose HP, Focurose XL, Focurose HF, Focurose HPR and Focurose HPL, which are a combination of 7 substrates and a variety of ion exchange resin to precisely match the downstream technology of bioprocesses.



Resin selection principles

★ Select ion exchange resin with fast flow rate and high loading capacity such as resin of XL matrix in the initial capture stage.

★ Moderate purification stage select ion exchange resin with high loading capacity and high resolution such as FF/XL matrix resin.

★ Fine purification stage select ion exchange resin with high resolution and high recovery rate such as HP/FF/HPR matrix resin.

★ Ion exchange resin with large particle size such as BB matrix are selected for viscous samples.

★ Select MMC or MMA resin if the sample is unstable in low salt or the sample contains polymers and monomers inside.

Ion exchange resins

High flow rate, high resolution

High flow rate agarose matrix ion exchange resins are made of high strength cross-linked 4% or 6% agarose microspheres with ligand DEAE/CM/Q/SP as substrate. Focurose BB/FF/HP particle size from BB to FF to HP in decreasing order. The same substrate and base resin resolution and flow rate is mainly determined by the particle size, so the HP series is also known as high resolution resin, BB series is also known as ultra-high flow rate resin.

Product Advantages

★ Quick, simple and convenient.
★ Wide range of use, suitable for the separation or fine purification of all components of charged biomolecules.
★ High loading capacity (compared to other types of chromatography resins).
★ High flexibility of purification process, can improve sample purity by pre-purification process condition screening.

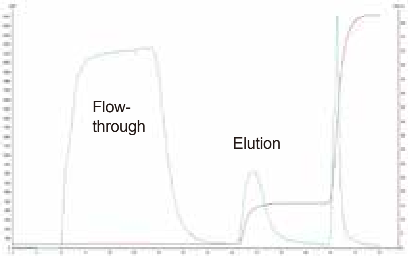
Product number	Product name	Spec	Ion loading μmol/mL	Particle size range (μm)	Maximum flow rate (cm/h)	Withstand pressure MPa	pH stability long-term [short-term]	Application characteristics
HL060501025M	SP Focurose BB	25mL	180-250 H^+	100-300	1800	≤0.3	4-13 [3-14]	High flow rate, high viscosity resistance
HL060501100M		100mL						
HL060501500M		500mL						
HL060501001L		1L						
HL060501005L		5L						
HL060501020L		20L						
HL060301025M	SP Focurose FF	25mL	180-250 H^+	45-165	700	≤0.3	4-13 [3-14]	Fast, high throughput purification
HL060301100M		100mL						
HL060301500M		500mL						
HL060301001L		1L						
HL060301005L		5L						
HL060301020L		20L						
HL060201025M	SP Focurose HP	25mL	150-200 H^+	25-45	150	≤0.3	4-13 [3-14]	High resolution
HL060201100M		100mL						
HL060201500M		500mL						
HL060201001L		1L						
HL060201005L		5L						
HL060201020L		20L						

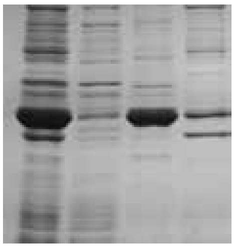
Product number	Product name	Spec	Ion loading μmol/mL	Particle size range (μm)	Maximum flow rate (cm/h)	Withstand pressure MPa	pH stability long-term [short-term]	Application characteristics
HL060303025M	CM Focurose FF	25mL	90-130 H^+	45-165	700	⩽0.3	4-13 [2-14]	Fast, high throughput purification
HL060303100M		100mL						
HL060303500M		500mL						
HL060303001L		1L						
HL060303005L		5L						
HL060303020L		20L						
HL060506025M	Q Focurose BB	25mL	180-250 Cl^-	100-300	1800	⩽0.3	2-12 [2-14]	High flow rate, high viscosity resistance
HL060506100M		100mL						
HL060506500M		500mL						
HL060506001L		1L						
HL060506005L		5L						
HL060506020L		20L						
HL060306025M	Q Focurose FF	25mL	180-250 Cl^-	45-165	700	⩽0.3	2-12 [2-14]	Fast, high-throughput purification
HL060306100M		100mL						
HL060306500M		500mL						
HL060306001L		1L						
HL060306005L		5L						
HL060306020L		20L						
HL060206025M	Q Focurose HP	25mL	140-200 Cl^-	25-45	150	⩽0.3	2-12 [2-14]	High resolution
HL060206100M		100mL						
HL060206500M		500mL						
HL060206001L		1L						
HL060206005L		5L						
HL060206020L		20L						
HL060307025M	DEAE Focurose FF	25mL	110-160 Cl^-	45-165	700	⩽0.3	2-12 [2-14]	Fast, high throughput purification
HL060307100M		100mL						
HL060307500M		500mL						
HL060307001L		1L						
HL060307005L		5L						
HL060307020L		20L						

Application Cases

DEAE Focurose FF isolated recombinant protein

- Sample: 20mL (recombinant protein expressed by E. coli)
- Column:HT01,1.0mL
- Buffer:Liquid A(20mM PB,pH7.5)
- Liquid B (20mM PB, 1.0M NaCl, pH7.5)
- Flow rate: Sample jection 0.6mL/min, other 1 mL/min

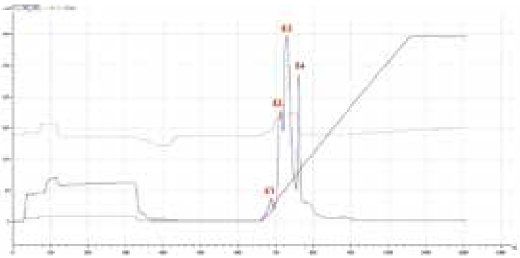




Purification process for Porcine Reproductive and Respiratory Syndrome Virus (PRRSV) (high purity/high recovery two options)

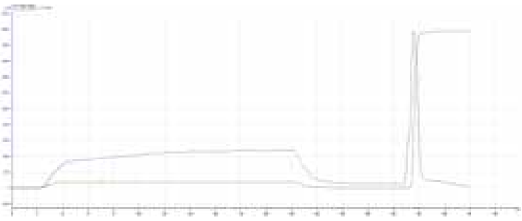
1. DEAE weak anion elution mode - high purity

The virus is adsorbed in the eluate in this purification process,and the protein removal rate≈98% and recovery rate is >60%.



2. Q Focurose FF elution mode - high recovery rate

In this purification process, PRRSV is adsorbed in the eluate, protein removal rate ≈ 75%, recovery rate ＞70%.



Pre-assembled column ordering information

Product name	Spec	Product number	Product name	Spec	Product number
SP Focurose BB	1mL	HL060501001E	SP Focurose FF	1mL	HL060301001E
	5mL	HL060501005E		5mL	HL060301005E
SP Focurose HP	1mL	HL060201001E	CM Focurose FF	1mL	HL060303001E
	5mL	HL060201005E		5mL	HL060303005E
Q Focurose BB	1mL	HL060506001E	Q Focurose FF	1mL	HL060306001E
	5mL	HL060506005E		5mL	HL060306005E
Q Focurose HP	1mL	HL060206001E	DEAE Focurose FF	1mL	HL060307001E
	5mL	HL060206005E		5mL	HL060307005E

Ultra High Loading

Focurose XL is an ion-exchange resin consisting of a high strength 6% agarose inserted into a linear dextran molecule, which reduces the spatial resistance to protein binding and increases the density of the ion-exchange ligand DEAE/CM/Q/SP, resulting in a significant increase in binding capacity.

Product Advantages

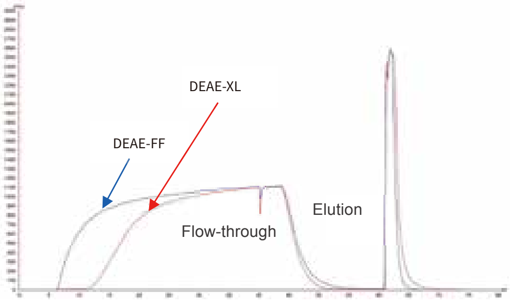
★ High dynamic binding load even at high flow rates.
★ Ultra-high loading capacity can capture more target material from the sample, which is very cost-effective.
★ Suitable for rapid purification of all biomolecules (vaccines, viruses, proteins, polysaccharides).

Product number	Product name	Spec	Ion loading μmol/mL	Particle size range (μm)	Maximum flow rate (cm/h)	Withstand pressure MPa	pH stability long-term [short-term]	Application characteristics
HL120301025M	SP Focurose XL	25mL	180-250 H^+	45-165	500	⩽0.3	4-13 [3-14]	High load capacity, high flow rate
HL120301100M		100mL						
HL120301500M		500mL						
HL120301001L		1L						
HL120301005L		5L						
HL120301020L		20L						
HL120306025M	Q Focurose XL	25mL	180-250 Cl^-	45-165	500	⩽0.3	2-12 [2-14]	High load capacity, high flow rate
HL120306100M		100mL						
HL120306500M		500mL						
HL120306001L		1L						
HL120306005L		5L						
HL120306020L		20L						
HL120307025M	DEAE Focurose XL	25mL	200-400 Cl^-	45-165	500	⩽0.3	2-12 [2-14]	High load capacity, high flow rate
HL120307100M		100mL						
HL120307500M		500mL						
HL120307001L		1L						
HL120307005L		5L						
HL120307020L		20L						

Application Cases

High flow rate agarose matrix ion exchange resin (DEAE Focurose FF) and ultra-high loading capacity agarose matrix ion exchange resin (DEAE Focurose XL) combined load comparison

Sample: 10mg/mL BSA, sample loading 40mL (saturation loading)
Column: HT01, 1.0mL
Equilibrium solution: 0.02M Tris-HCl, pH8.5
Eluent: 0.02M Tris-HCl, 1.0M NaCl, pH8.5
Flow rate: 1mL/min



Pre-assembled column ordering information

Product name	Spec	Product number	Product name	Spec	Product number
SP Focurose XL	1mL	HL120301001E	Q Focurose XL	1mL	HL120306001E
	5mL	HL120301005E		5mL	HL120306005E
DEAE Focurose XL	1mL	HL120307001E			
	5mL	HL120307005E			

High rigidity

Highly rigid agarose matrix ion exchange resins are ion exchange resin consisting of a high strength cross-linked agarose cross-linked cellulose matrix, coupled with different ligands. It has higher rigidity than high flow rate agarose matrix resin, faster mass transfer rate, better tolerance, linear cellulose molecules inserted into agarose, and increased loading capacity. Highly rigid agarose matrix ion exchange resins are subdivided into high loading high flow rate resin (HF) and high loading high flow rate high resolution resin (HPR) according to the size of the matrix particle size.

Agarose and cellulose cross-linked matrices have good biocompatibility, which allows them to have high recovery rates and maintain the activity of biomolecules when purifying biomolecules such as vaccines. The high rigidity also allows for high flow rates, which can be effective in industrial production to improve quality and reduce costs.

Product number	Product name	Spec	Ion loading μmol/mL	Particle size range (μm)	Maximum flow rate (cm/h)	Withstand pressure MPa	pH stability long-term [short-term]	Application characteristics
HL280301025M	SP Focurose HF	25mL	120-160 H^+	45-165	700	⩽0.3	4-12 [3-14]	High flow rate, high throughput; increased efficiency for mass production
HL280301100M		100mL						
HL280301500M		500mL						
HL280301001L		1L						
HL280301005L		5L						
HL280301020L		20L						
HL190201025M	SP Focurose HR	25mL	120-160 H^+	25-45	400	⩽0.3	4-12 [3-14]	High flow rate, high throughput; increased efficiency for mass production
HL190201100M		100mL						
HL190201500M		500mL						
HL190201001L		1L						
HL190201005L		5L						
HL190201020L		20L						
HL190801025M	SP Focurose HPR	25mL	100-140 H^+	45-165	400	⩽0.3	4-12 [3-14]	High flow rate, high throughput, high resolution, high recovery
HL190801100M		100mL						
HL190801500M		500mL						
HL190801001L		1L						
HL190801005L		5L						
HL190801020L		20L						

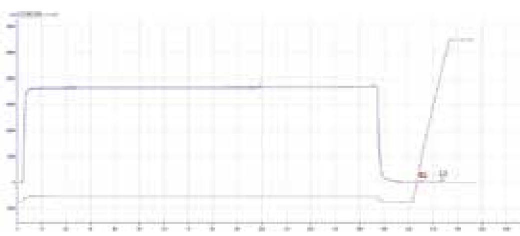
Product number	Product name	Spec	Ion loading μmol/mL	Particle size range (μm)	Maximum flow rate (cm/h)	Withstand pressure MPa	pH stability long-term [short-term]	Application characteristics
HL280306025M	Q Focurose HF	25mL	160-220 Cl^-	45-165	700	≤0.3	2-12 [2-14]	High flow rate, high throughput; increased efficiency for mass production
HL280306100M		100mL						
HL280306500M		500mL						
HL280306001L		1L						
HL280306005L		5L						
HL280306020L		20L						
HL190206025M	Q Focurose HPR	25mL	130-160 Cl^-	25-45	400	≤0.3	2-12 [2-14]	High flow rate, high throughput, high resolution, high recovery
HL190206100M		100mL						
HL190206500M		500mL						
HL190206001L		1L						
HL190206005L		5L						
HL190206020L		20L						
HL280307025M	DEAE Focurose HF	25mL	290-350 Cl^-	45-165	700	≤0.3	2-12 [2-14]	High flow rate, high throughput; increased efficiency for mass production
HL280307100M		100mL						
HL280307500M		500mL						
HL280307001L		1L						
HL280307005L		5L						
HL280307020L		20L						

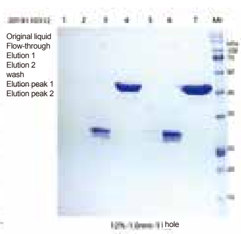
Application Cases

SP Focurose HPR purified recombinant certain kinase supernatant

Equilibrium solution: 50mM PB, pH6.5

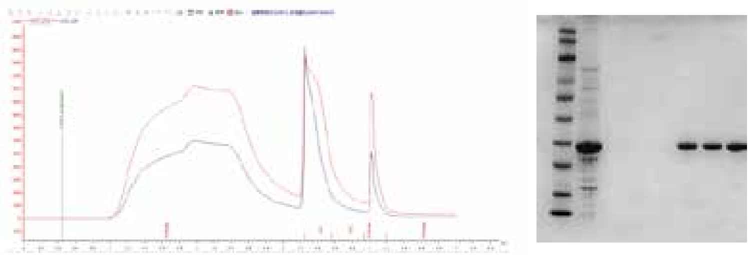
Elution solution: 50mM PB, 1M NaCl, pH6.5





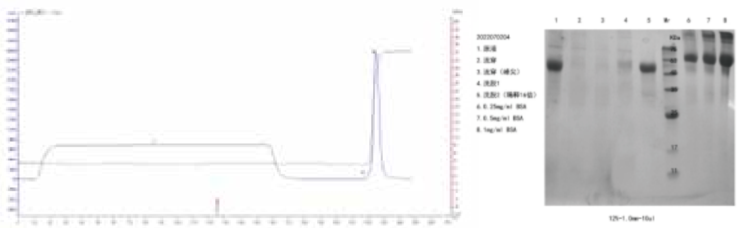
SP Focurose HPR Purified Recombinant Type III Collagen

Equilibrium solution: 20mM PB, pH6.0
Elution solution: 20mM PB, pH6.0
The first step of purification was performed in strong cation binding mode with 80% purity.



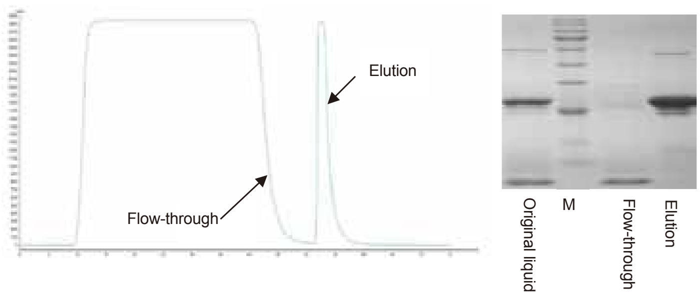
SP Focurose HR purified pseudorabies virus GD protein

Equilibrium solution: 20mM PB, pH7.5
Elution solution: 20mM PB,1M NaCl, pH7.5



SP Focurose HPR purified circlet vaccine

Equilibrium solution: 0.05M NaAc, pH5.0
Elution solution: 0.02M PB,0.5M NaCl, pH8.0



Pre-assembled column ordering information

Product name	Spec	Product number	Product name	Spec	Product number
SP Focurose HF	1mL	HL280301001E	SP Focurose HR	1mL	HL190201001E
	5mL	HL280301005E		5mL	HL190201005E
Q Focurose HF	1mL	HL280306001E	Q Focurose HPR	1mL	HL190206001E
	5mL	HL280306005E		5mL	HL190206005E
SP Focurose HPR	1mL	HL190801001E			
	5mL	HL190801005E			

Large pore highly rigid

The macroporous highly rigid agarose matrix ion exchange resins are suitable for the separation and purification of biological macromolecules, such as PEG-proteins, viruses, etc.

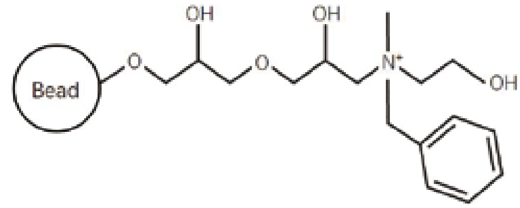
Product number	Product name	Spec	Ion loading μmol/mL	Particle size range (μm)	Maximum flow rate (cm/h)	Withstand pressure MPa	pH stability long-term [short-term]	Application characteristics
HL220301025M	SP Focurose HPL	25mL	70-120 H^+	45-165	300	⩽0.3	4-11 [2-13]	Isolation and purification of biomolecules, such as PEG-proteins, VLPs and viruses.
HL220301100M		100mL						
HL220301500M		500mL						
HL220301001L		1L						
HL220301005L		5L						
HL220301020L		20L						
HL220306025M	Q Focurose HPL	25mL	70-100 Cl^-	45-165	300	⩽0.3	3-10 [1-12]	Isolation and purification of biomolecules, such as PEG-proteins, VLPs and viruses.
HL220306100M		100mL						
HL220306500M		500mL						
HL220306001L		1L						
HL220306005L		5L						
HL220306020L		20L						
HL220307025M	DEAE Focurose HPL	25mL	70-110 Cl^-	45-165	300	⩽0.3	2-13 [1-14]	Isolation and purification of biomolecules, such as PEG-proteins, VLPs and viruses.
HL220307100M		100mL						
HL220307500M		500mL						
HL220307001L		1L						
HL220307005L		5L						
HL220307020L		20L						

Pre-assembled column ordering information

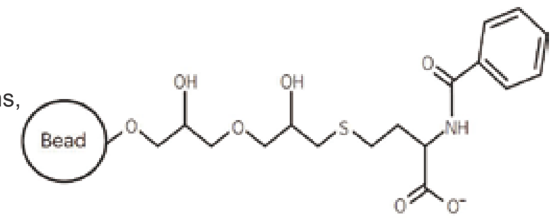
Product name	Spec	Product number	Product name	Spec	Product number
SP Focurose HPL	1mL	HL220301001E	Q Focurose HPL	1mL	HL220306001E
	5mL	HL220301005E		5mL	HL220306005E

Multimodal Resins

MMA ligand is a multimodal ligand that has many types of interactions with the target molecule, mainly ionic interactions (strong anionic interactions), followed by hydrogen bonding and hydrophobic interactions, etc. (As shown in the figure on the right)



MMC ligand is a multimodal ligand which has many types of interactions with the target molecule, mainly ionic interactions, followed by hydrogen bonding and hydrophobic interactions, etc. (As shown in the figure on the right)



Product Advantages

★ With both ion exchange and hydrophobic effect, it is more widely used.

★ Highly rigid matrix makes it more stable and has a long service life.

★ Multi-site, used for antibody penetration, one-step removal of HCP, DNA and other impurities.

Product number	Product name	Spec	Ion loading µmol/mL	Average particle size (µm)	Maximum flow rate (cm/h)	Withstand pressure MPa	pH stability long-term [short-term]	Application characteristics
HF190309025M	MMA Focurose HF	25mL	45-165	90±5	700	≤0.5	4-12 [2-14]	Medium/fine purification, removal of dimers, multimers, host cell proteins, nucleic acids, etc.
HF190309100M		100mL						
HF190309500M		500mL						
HF190309001L		1L						
HF190309005L		5L						
HF190309020L		20L						
HF190809025M	MMA Focurose HR	25mL	45-165	75±5	600	≤0.5	4-12 [2-14]	Medium/fine purification, removal of dimers, multimers, host cell proteins, nucleic acids, etc.
HF190809100M		100mL						
HF190809500M		500mL						
HF190809001L		1L						
HF190809005L		5L						
HF190809020L		20L						

Product number	Product name	Spec	Ion loading μmol/mL	Average particle size (μm)	Maximum flow rate (cm/h)	Withstand pressure MPa	pH stability long-term [short-term]	Application characteristics
HF190305025M	MMC Focurose HF	25mL	45-165	90±5	700	⩽0.5	4-12 [2-14]	Medium purification and fine purification of all charged biomolecules such as proteins, peptides, nucleic acids, etc.
HF190305100M		100mL						
HF190305500M		500mL						
HF190305001L		1L						
HF190305005L		5L						
HF190305020L		20L						

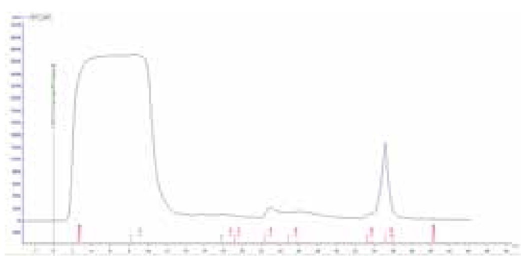
Focore700/400 is the bonded octylamine functional group on the internal nucleus sphere of high rigid agarose, the external nucleus sphere of high rigid agarose is inert shell layer, the limit of exclusion is 700KDa/400KDa. The impurities less than 700KDa/400KDa enter the inner nucleus of the microsphere and are combined by adsorption through the octylamine complex functional group inside the microsphere, which belongs to ion exchange and hydrophobic multimodal action, and can remove the impurities such as small molecule proteins in the target, thus achieving the purification purpose.

HF270311025M	Focore 700	25mL	45-165	90±5	500	⩽0.2	3-13 [2-14]	Isolation and purification of viruses, virus-like particles, viral vectors, etc. in flow-through mode
HF270311100M		100mL						
HF270311500M		500mL						
HF270311001L		1L						
HF270311005L		5L						
HF270311020L		20L						
HF280312025M	Focore 400	25mL	45-165	90±5	700	⩽0.2	3-13 [3-14]	Isolation and purification of viruses, virus-like particles, viral vectors, etc. in flow-through mode
HF280312100M		100mL						
HF280312500M		500mL						
HF280312001L		1L						
HF280312005L		5L						
HF280312020L		20L						

Application Cases

MMC composite mode resin purification of albumin

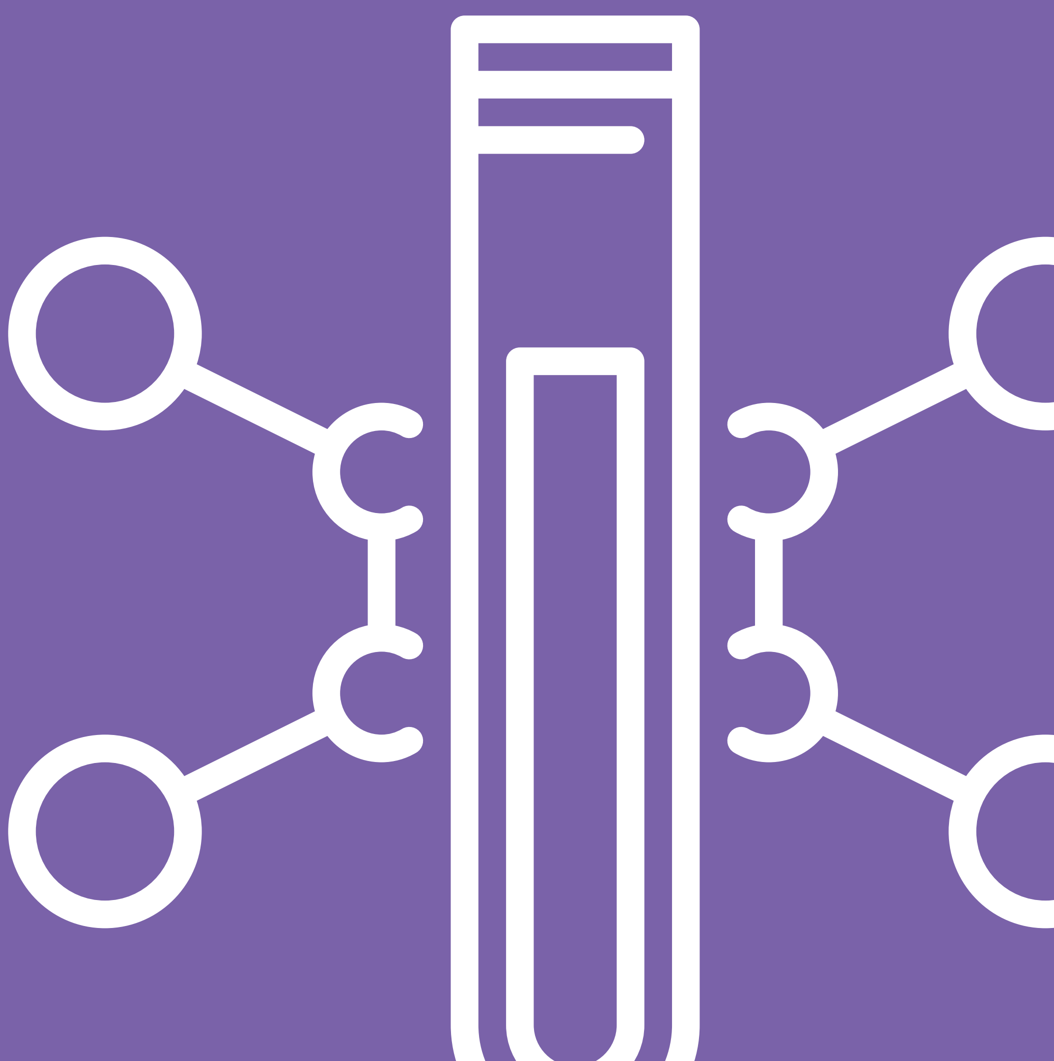
One-step purification can achieve more than 90% purity of the sample, and the separation of target protein and heteroprotein is remarkable.



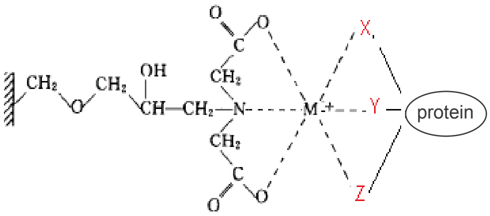
Pre-assembled column ordering information

Product name	Spec	Product number	Product name	Spec	Product number
MMA Focurose HF	1mL	HF190309001E	MMA Focurose HR	1mL	HF190809001E
	5mL	HF190309005E		5mL	HF190809005E
MMC Focurose HF	1mL	HF190305001E			
	5mL	HF190305005E			

Affinity Resins

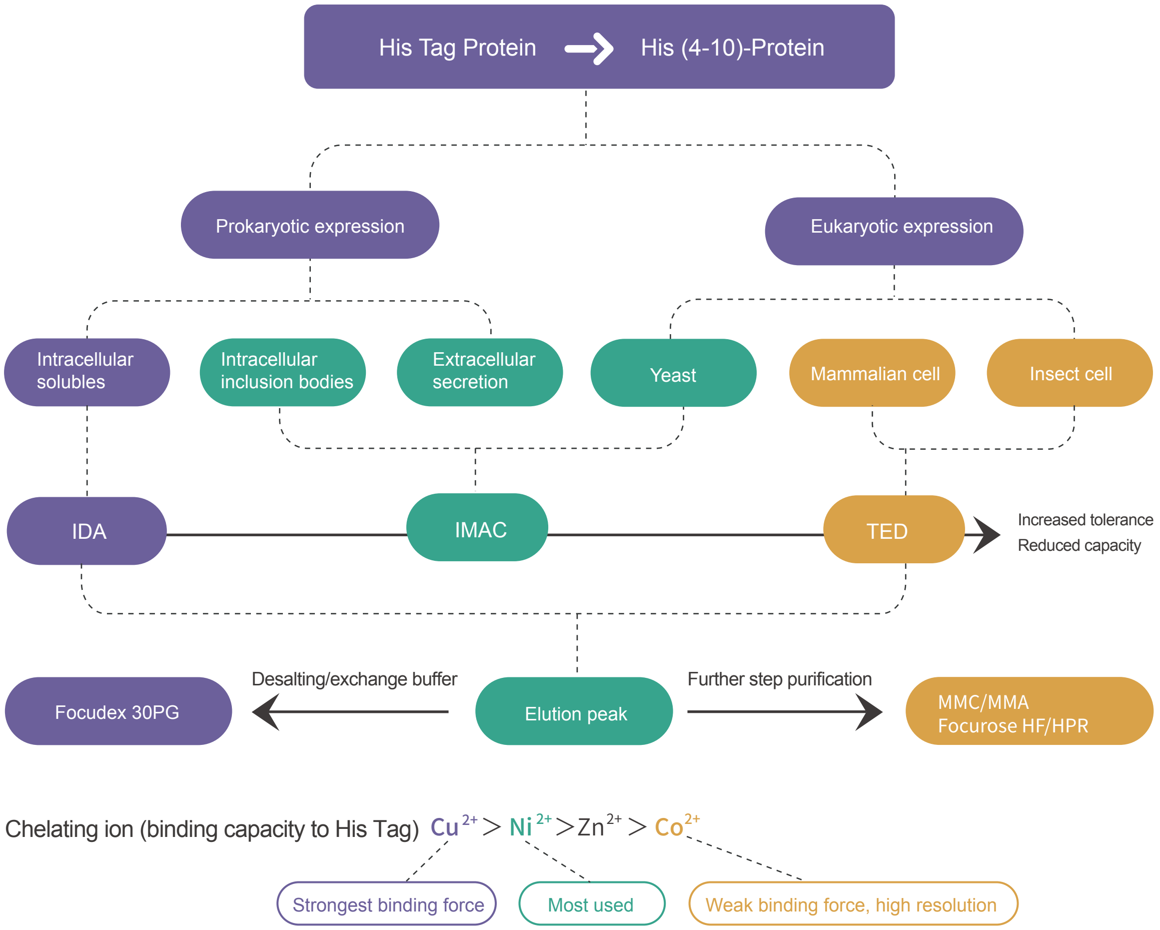


Affinity resins were established and developed based on the principle of specific adsorption between biomolecules and other ligand molecules (e.g. antigen and antibody, enzyme and substrate, hormone and receptor, complementary chain in nucleicacid, polysaccharide and protein complex, etc.). The purification of target molecules is achieved by specific adsorption between the ligand on the medium and the target molecule. Due to this specific force, affinity resins are characterized by high selectivity and high activity recovery.



His tag protein purification

Transition state metal ions (Cu^{2+}>Ni^{2+} >Zn^{2+} >Co^{2+}) can bind to electron donors, such as N, S, O and other atoms with coordination bonds. The remaining empty orbitals on the metal ions are ligand sites for electron donors, which will be occupied by water molecules or anions in solution. When the amino acid residues (His) on the protein surface are strongly bound to metal ions, the powered atoms of the amino acid residues will bind to the metal ions to form a complex, replacing the previously bound water molecules or anions, thus enabling the protein molecules to bind to the solid surface. His-tagged proteins with His and mediator binding are purified by selecting different metal ligands depending on the affinity of the metal ligands due to the different types, numbers, positions and spatial conformations of the amino acids on the protein surface.



According to the different chelation methods, there are three kinds of IDA, IMAC and TED.

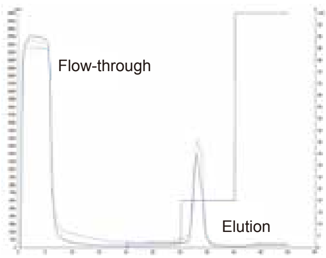
Name	Ni-IDA	Ni-IMAC	Ni-TED
Chelation ratio	3 : 3	4：2	5：1
Reducing agent (mM)	Avoid	1	20
Chelating agent (mM)	Avoid	5	100
pH range	3-12(working) 2-14(cleaning)	3-12 (working) 2-14 (cleaning)	3-12（working） 2-14（cleaning）
Cleaning regeneration	9 steps (nickel removal - cleaning - regeneration)	9 steps (nickel removal - cleaning - regeneration)	5 steps (cleaning)
Application scope	Conventional His-tagged Protein Purification (Active Conditions)	Routine His-tagged protein purification (active and denaturing conditions)	Can be used for high reductant, chelator His-tagged protein samples and eukaryotic His-tagged protein purification (low abundance samples and denaturant samples are less effective)

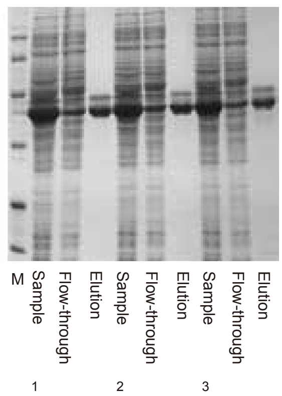
Product number	Product name	Spec	Load per /mL	Particle size range μm	Maximum flow rate (cm/h)	Withstand pressure MPa	pH stability long-term [short-term]	Application characteristics
HQ060311025M	Ni Focurose FF (IDA)	25mL	≥30mg His-tagged proteins	45-165	370	⩽0.3	3-12 [2-14]	Purification of His-tagged proteins
HQ060311100M		100mL						
HQ060311500M		500mL						
HQ060311001L		1L						
HQ060311005L		5L						
HQ060311020L		20L						
HQ060312025M	Ni Focurose FF (IMAC)	25mL	≥40mg His-tagged proteins	45-165	250-400	⩽0.3	3-12 [2-14]	Large-scale purification of His-tagged proteins
HQ060312100M		100mL						
HQ060312500M		500mL						
HQ060312001L		1L						
HQ060312005L		5L						
HQ060312020L		20L						
HQ060212025M	Ni Focurose HP (IMAC)	25mL	≥40mg His-tagged proteins	25-45	＜150	⩽0.3	3-12 [2-14]	Large-scale purification of His-tagged proteins
HQ060212100M		100mL						
HQ060212500M		500mL						
HQ060212001L		1L						
HQ060212005L		5L						
HQ060212020L		20L						

Product number	Product name	Spec	Load per /mL	Particle size range μm	Maximum flow rate (cm/h)	Withstand pressure MPa	pH stability long-term [short-term]	Application characteristics
HQ060313025M	Ni Focurose FF (TED)	25mL	≥10mg His-tagged proteins	45-165	600	⩽0.3	3-12 [2-14]	Resistant to 100mM EDTA and 10mM DTT, direct 1M NaOH thorough cleaning without nickel removal.
HQ060313100M		100mL						
HQ060313500M		500mL						
HQ060313001L		1L						
HQ060313005L		5L						
HQ060313020L		20L						

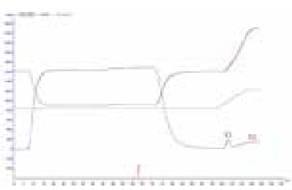
Application Cases

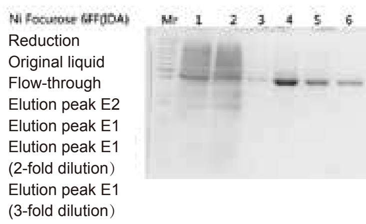
Ni Focurose FF (TED) purification of His-tagged proteins
Sample 1: His-tagged protein
Sample 2: His-tagged protein (containing 0.1M EDTA)
Sample 3: His-tagged protein (containing 0.1M EDTA+ 0.01M DTT)
Column: HT01,1.0mL
Equilibrium solution: 0.05M Tris-HCl, 0.5M NaCl, pH8.0
Elution solution: 0.05M Tris-HCl, 0.5M imidazole, 0.5M NaCl, pH8.0
Sample loading flow rate: 0.5mL/min, other flow rates: 1mL/min.





Ni Focurose FF (IDA) purification of recombinant COVID-19 antigen (His label)
Equilibrium solution: 20mM PB, 0.15 M NaCl, pH7.5
Elution solution: 20mM PB, 0.15 M NaCl, 500 mM Imidazole, pH7.5



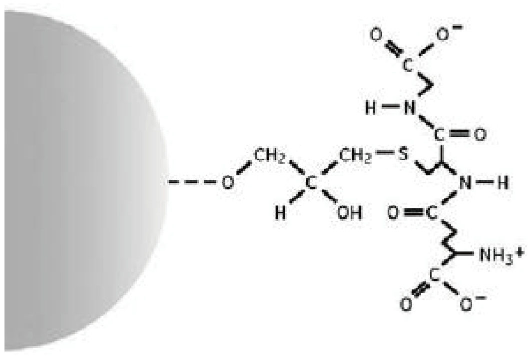


Pre-assembled column ordering information

Product name	Spec	Product number	Product name	Spec	Product number
Ni Focurose FF (IDA)	1mL	HQ060311001E	Ni Focurose FF (IMAC)	1mL	HQ060312001E
	5mL	HQ060311005E		5mL	HQ060312005E
Ni Focurose HP (IMAC)	1mL	HQ060212001E	Ni Focurose FF (TED)	1mL	HQ060313001E
	5mL	HQ060212005E		5mL	HQ060313005E

GST-tagged protein purification

GST (glutathione transferase) can specifically bind to glutathione, exhibiting the principle of enzyme and substrate action. Using this principle, GST is made into a tag to express a fusion protein that binds specifically to the affinity mediator of glutathione ligand, thus purifying the target protein. The characteristics of GST fusion protein purification are: high purity, mild purification conditions to maintain protein activity, promotion of protein soluble expression, etc.



Product number	Product name	Spec	Load per /mL	Particle size range µm	Maximum flow rate (cm/h)	Withstand pressure MPa	pH stability long-term [short-term]	Application characteristics
HQ030307025M		25mL						
HQ030307100M		100mL						
HQ030307500M		500mL						
HQ030307001L	GST Focurose 4FF	1L	≥20mg GST-tagged proteins	45-165	450	⩽0.3	3-12 [3-12]	Purification of GST-tagged proteins
HQ030307005L		5L						
HQ030307020L		20L						

Application Cases

GST Focurose 4FF purified GST-tagged protein

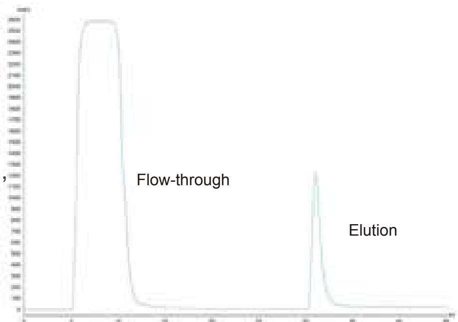
Sample: GST-tagged protein

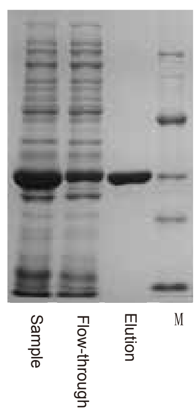
Column: HT01, 1.0mL

Equilibrium solution: 0.05M Tris-HCl, 0.14M NaCl, pH7.3

Eluent: 0.05M Tris-HCl, 0.01M GSH, pH8.0

Sample flow rate 0.5mL/min, other flow rate 1mL/min



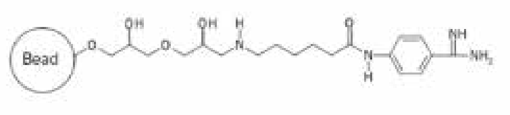


Pre-assembled column ordering information

Product name	Spec	Product number
GST Focurose 4FF	1mL	HQ030307001E
	5mL	HQ030307005E

Serine Protease Purification

The affinity resin for the purification of serine proteases is prepared by coupling a broad-spectrum inhibitor of serine proteases, aminobenzamidine, to agarose microspheres Focurose FF and highly cross-linked agarose Focurose 4FF. This affinity resin is referred to as Benzamidine Focurose FF (LS) and Benzamidine Focurose 4FF (HS).



Product number	Product name	Spec	Load per /mL	Particle size range μm	Maximum flow rate (cm/h)	Withstand pressure MPa	pH stability long-term [short-term]	Application characteristics
HQ060336025M	Benzamidine Focurose FF(LS)	25mL	10～20mg trypsin	45-165	75	≤0.3	2-8 [1-9]	Serine protease inhibitor for the purification of serine proteases, trypsin and trypsin-like proteases, etc.
HQ060336100M		100mL						
HQ060336500M		500mL						
HQ060336001L		1L						
HQ060336005L		5L						
HQ060336020L		20L						
HQ030317025M	Benzamidine Focurose 4FF(HS)	25mL	≥30mg trypsin	45-165	300	≤0.3	2-8 [1-9]	Serine protease inhibitor that binds exclusively to serine proteases, trypsin and trypsin-like proteases.
HQ030317100M		100mL						
HQ030317500M		500mL						
HQ030317001L		1L						
HQ030317005L		5L						
HQ030317020L		20L						

Pre-assembled column ordering information

Product name	Spec	Product number	Product name	Spec	Product number
Benzamidine Focurose FF(LS)	1mL	HQ060336001E	Benzamidine Focurose 4FF(HS)	1mL	HQ030317001E

Antibody purification

Coupling substances such as Protein A and Protein G on high-strength cross-linked agarose is widely used for the purification of antibodies.

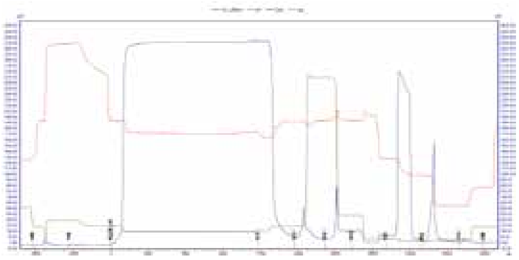
Product number	Product name	Spec	Load per /mL	Particle size range μm	Maximum flow rate (cm/h)	Withstand pressure MPa	pH stability long-term [short-term]	Application characteristics
HQ320827025M	arProtein A Focurose HR	25mL	~60mg human IgG	45-165	500	⩽0.5	3-12 [2-14]	Purified antibodies, immunoglobulin and FC fusion fused proteins. Tolerant to 0.5 M NaOH for CIP
HQ320827100M		100mL						
HQ320827500M		500mL						
HQ320827001L		1L						
HQ320827005L		5L						
HQ320827020L		20L						
HQ030316025M	Protein G Focurose 4FF	25mL	≥20mg human IgG	45-165	400	⩽0.3	3-9 [2-10]	One-step purification multi-species source antibodies
HQ030316100M		100mL						
HQ030316500M		500mL						
HQ030316001L		1L						
HQ030316005L		5L						
HQ030316020L		20L						

Application Cases

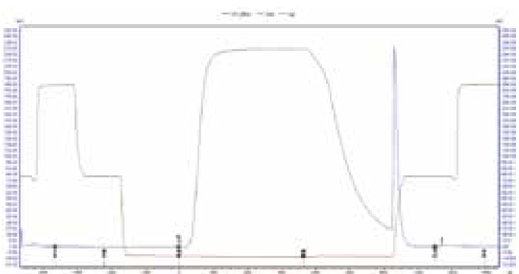
Two-step affinity and ionization purification of murine IgG antibody (pilot test)

arProtein A Focurose HR was used for large-scale sample preparation (chromatographic column size 7.0cm * 24cm) with the pressure maintained below 0.20Mpa. The resin performance was good in three replicate sample preparations with the yield above 93%. The purity of HCP, HCD and endotoxin all met the requirements.

Step 1: arProtein A Focurose HR affinity capture target IgG



Step 2: Q Focurose FF anion purification



Protein G Focurose4FF purification of IgG from human blood

Sample: 5 mL of human serum at 5-fold dilution (with two different buffers)

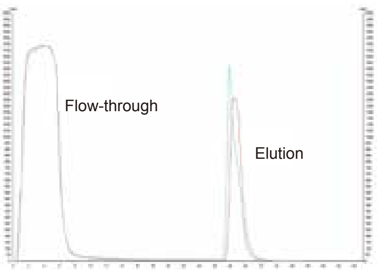
Column: HT01,1.0mL

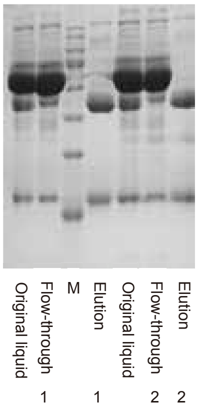
Equilibrium solution: 1#(0.02M PB, pH7.0)

2#(0.02M PB, 0.3M NaCl, pH7.0)

Eluent: 0.1M Glycine-HCl, pH2.7

Sample flow rate 0.25mL/min, others 1 mL/min





Pre-assembled column ordering information

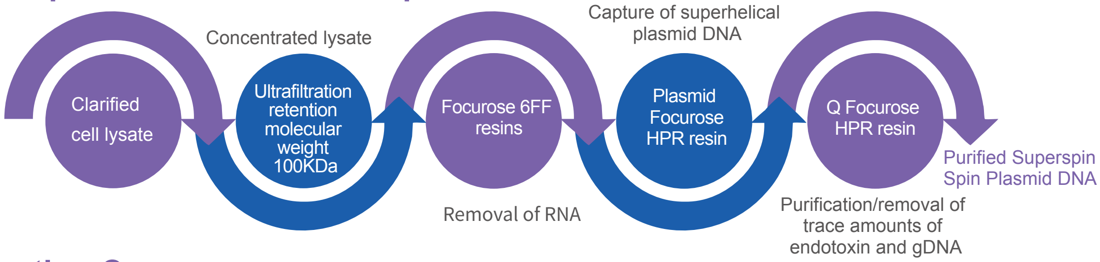
Product name	Spec	Product number	Product name	Spec	Product number
arProtein A Focurose HR	1mL	HQ320827001E	Protein G Focurose 4FF	1mL	HQ030316001E
	5mL	HQ320827005E		5mL	HQ030316005E

Plasmid DNA purification

Plasmid DNA is a class of circular double-stranded DNA molecules that can replicate autonomously outside the bacterial chromosome. The molecular weight of different types of plasmid DNA varies from 105 kDa for the larger ones to 103 kDa for the smaller ones. The conformation of plasmid DNA is generally classified into three types: superhelix, flat-loop or linear, and each of them may also form aggregates. VDO has proven total solutions (3-step and 2-step) and products for plasmid purification. Plasmid purification is based on the principle of sulfur-loving adsorption of ligands, which is suitable for the isolation and purification of closed-loop superhelical plasmid DNA.

Product number	Product name	Spec	Load per /mL	Particle size range μm	Maximum flow rate (cm/h)	Withstand pressure MPa	pH stability long-term [short-term]	Application characteristics
HQ200220025M	Plasmid Focurose HPR	25mL	≥2mg Superhelical plasmid	25-45	200	⩽0.5	3-13 [2-14]	Superhelical plasmid of DNA purification
HQ200220100M		100mL						
HQ200220500M		500mL						
HQ200220001L		1L						
HQ200220005L		5L						
HQ200220020L		20L						

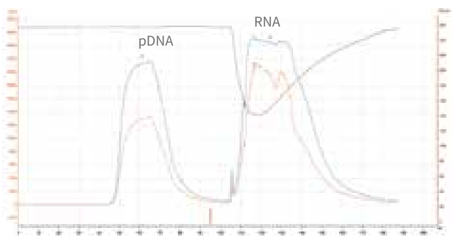
Plasmid purification in three steps



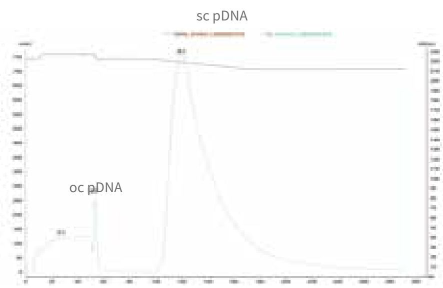
Application Cases

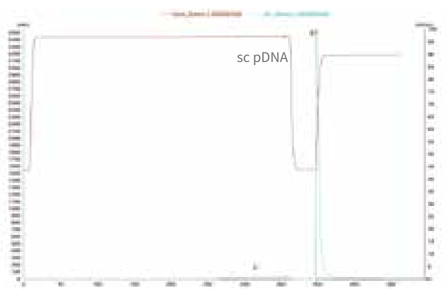
Chromatogram

Step 1: Size exclusion resin Focurose 6FF,separation of pDNA and RNA

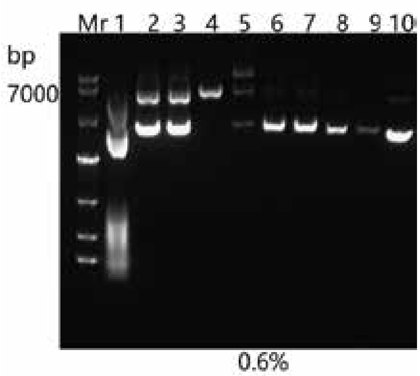


Step 2: Affinity resin of Plasmid Focurose HPR, separation of oc pDNA and sc pDNA.





Step 3: Anion resin Q Focurose HPR, to remove gDNA and endotoxin



SDS-PAGE Diagram
1. After dilution of stock solution
2.Focurose 6FF-elution 1 after dilution
3.Plasmid Focurose HPR - after stock solution dilution
4. Plasmid Focurose HPR - after flow-through 1 dilution
5.Plasmid Focurose HPR-flow-through 2 after dilution
6.Plasmid Focurose HPR-elution 1 after dilution
7.Q Focurose HPR - before sample dilution
8.Q Focurose HPR source solution (sample dilution 3 times) after dilution
9.Q Focurose HPR - after flow-through dilution
10.Q Focurose HPR-elution 1 after dilution

Pre-assembled column ordering information

Product name	Spec	Product number
Plasmid Focurose HPR	1mL	HQ200220001E
	5mL	HQ200220005E

Pre-activation resins

Pre-activation resins, also known as affinity resin activation intermediates, are based on various cross-linked strength agarose, bonded with different active groups (active spacer arms) by different coupling methods. The active groups can be further coupled with various ligands for the preparation of other resins (mainly affinity resins) and fixation of the corresponding substances, and users can easily couple the ligands to be coupled according to their needs, avoiding the tedious process of connecting active groups in the first stage.

Product number	Product name	Spec	Ligand coupling volume /1mL medial	Particle size range μm	Maximum flow rate (cm/h)	Withstand pressure MPa	pH stability long-term [short-term]	Euclidean functional group	Application characteristics
HQ030301005M	CNBr Focurose 4FF	5mL	≥20mg (Trypsin)	45-165	⩽0.3	700	3-11 [2-11]	$-NH_2$	Commonly used for coupling amino-containing macromolecules
HQ030301025M		25mL							
HQ030301100M		100mL							
HQ030301500M		500mL							
HQ030303005M	Epoxy Focurose 4FF	5mL	≥10μmol Epoxy groups	45-165	⩽0.3	75	2-14 [2-14]	$-NH_2$ -OH,-SH	Wide application and mild coupling conditions
HQ030303025M		25mL							
HQ030303100M		100mL							
HQ030303500M		500mL							
HQ030303001L		1L							
HQ030303005L		5L							
HQ030303020L		20L							

Application Cases

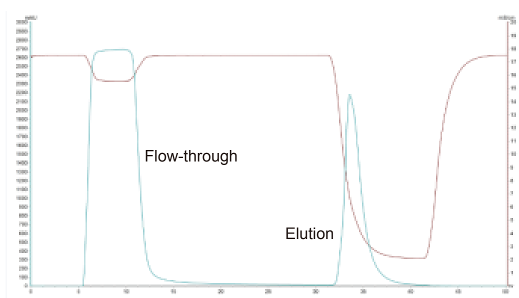
CNBr Focurose 4FF coupled with human IgG purified recombinant Protein G

Sample: recombinant Protein G expressed by E. coli

Column: HT01,1.0mL

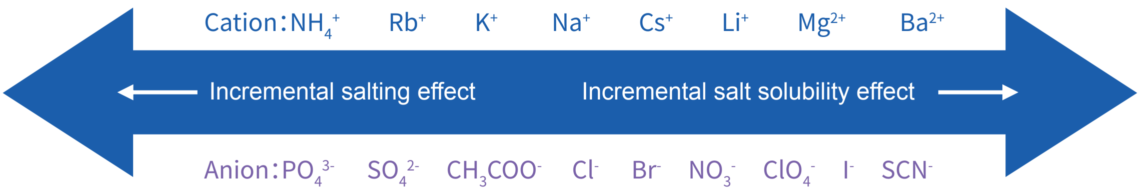
Equilibrium solution: 0.02M PB,0.15M NaCl, pH7.4

Elution solution: 0.05M citrate buffer, pH3.0



Hydrophobic Interaction Resins

Hydrophobic interaction resins separates proteins based on differences in hydrophobicity, i.e., based on reversible interactions between proteins and hydrophobic groups on the surface of hydrophobic interaction resins. Hydrophobicity isenhanced at high ionic strengths and therefore binding in a high ionic strength environment is usually eluted by reducing the ionic strength. The unique adsorption separation mode makes hydrophobic interaction resins an ideal purification method after ammonium sulfate chromatography or after ion exchange high salt elution.



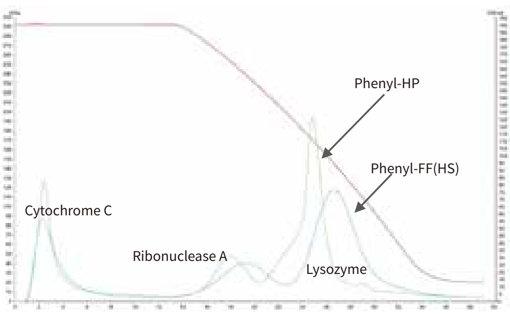
Product number	Product name	Spec	Ligand concentration μmol/mL	Particle size range μm	Maximum flow rate (cm/h)	Withstand pressure MPa	pH stability long-term [short-term]	Application characteristics
HS060301025M	Phenyl Focurose FF (LS)	25mL	20	45-165	400	≤0.3	3-13 [2-14]	Suitable for aromatic-containing aromatic ligands proteins
HS060301100M		100mL						
HS060301500M		500mL						
HS060301001L		1L						
HS060301005L		5L						
HS060301020L		20L						
HS060302025M	Phenyl Focurose FF (HS)	25mL	40	45-165	400	≤0.3	3-13 [2-14]	High hydrophobicity and high loading capacity, suitable for aromatic ligands biomolecules
HS060302100M		100mL						
HS060302500M		500mL						
HS060302001L		1L						
HS060302005L		5L						
HS060302020L		20L						
HS060202025M	Phenyl Focurose HP	25mL	25	25-45	150	≤0.3	3-13 [2-14]	Fine separation
HS060202100M		100mL						
HS060202500M		500mL						
HS060202001L		1L						
HS060202005L		5L						
HS060202020L		20L						

Product number	Product name	Spec	Ligand concentration μmol/mL	Particle size range μm	Maximum flow rate (cm/h)	Withstand pressure MPa	pH stability long-term [short-term]	Application characteristics
HS030306025M	Butyl Focurose 4FF	25mL	40	45-165	400	⩽0.3	3-13 [2-14]	Medium hydrophobicity etc., suitable for lipid-containing ligands biological molecules
HS030306100M		100mL						
HS030306500M		500mL						
HS030306001L		1L						
HS030306005L		5L						
HS030306020L		20L						
HS060206025M	Butyl Focurose HP	25mL	50	25-45	150	⩽0.3	3-13 [2-14]	Fine separation
HS060206100M		100mL						
HS060206500M		500mL						
HS060206001L		1L						
HS060206005L		5L						
HS060206020L		20L						

Application Cases

Phenyl Focurose FF (HS) and Phenyl Focurose HP isolation of different hydrophobic proteins

Sample: 4mg/mL of mixed protein (Cytochrome C: Ribonuclease A:Lysozyme=1:2:1)
Column: HT01,1.0mL
Equilibrium solution: 0.1M Na_2HPO_4, 1.7M $(NH_4)_2SO_4$, pH7.0
Elution solution: 0.1M Na_2HPO_4, pH7.0
Flow rate: 1mL/mim



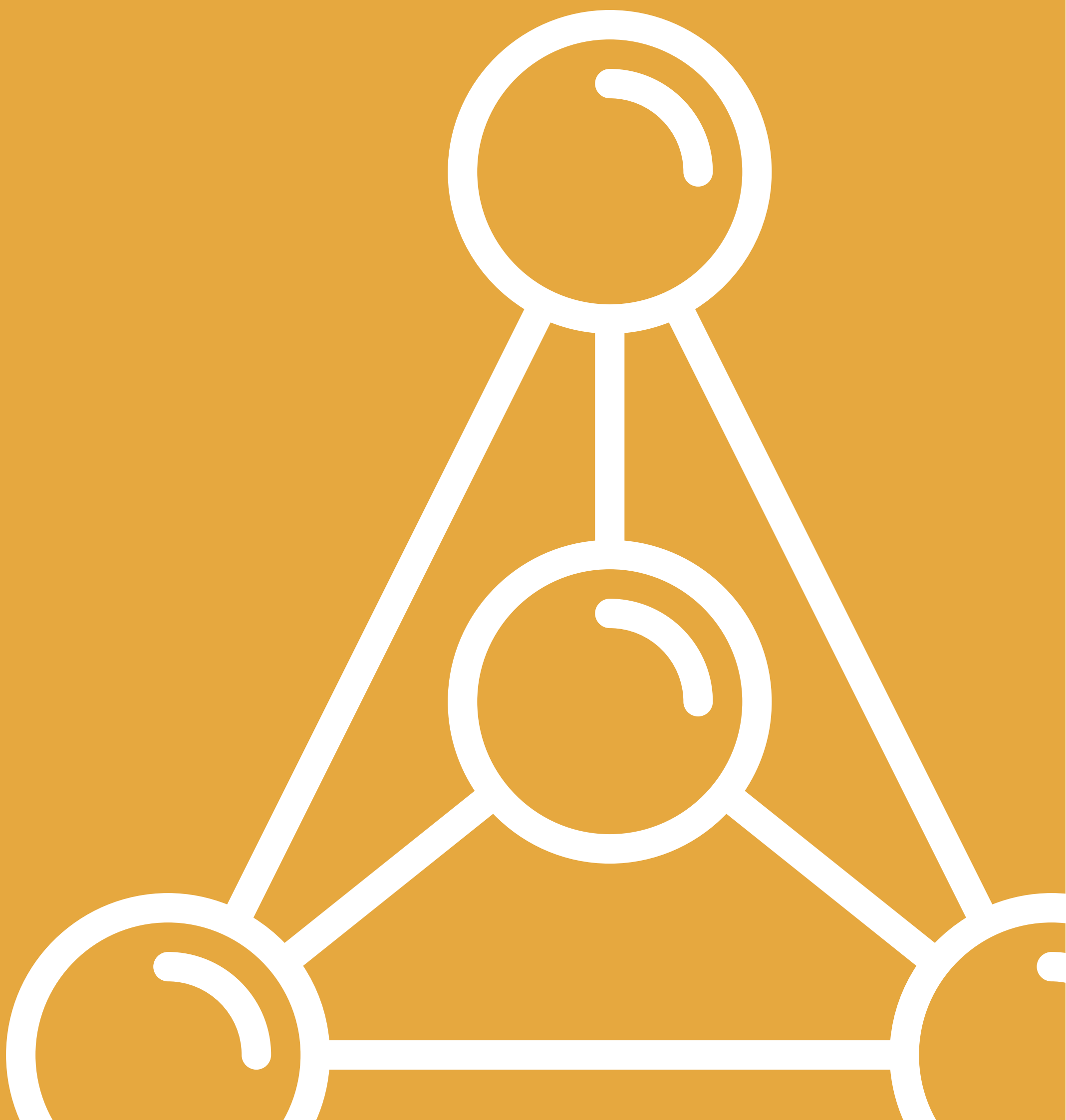
Tips

★ Different ligands and ligand concentration resins have different hydrophobic forces.
★ The salt concentration in the buffer is different for different protein hydrophobic interaction resins, or for purification using different hydrophobic interaction resins.
★ Temperature and pH have a great influence on protein hydrophobicity, and the pH and temperature should be constant during hydrophobic interaction resins.

Pre-assembled column ordering information

Product name	Spec	Product number	Product name	Spec	Product number
Phenyl Focurose FF (LS)	1mL	HS060301001E	Phenyl Focurose FF (HS)	1mL	HS060302001E
	5mL	HS060301005E		5mL	HS060302005E
Butyl Focurose 4FF	1mL	HS030306001E	Butyl Focurose HP	1mL	HS060206001E
	5mL	HS030306005E		5mL	HS060206005E
Phenyl Focurose HP	1mL	HS060202001E			
	5mL	HS060202005E			

Chromatography Empty Columns



Resin screening chromatography columns

Product number	Product name	Filling volume (mL)	Filling medium	Use	Remarks
HT01	1mL Empty column	1	All resins are available	Syringe, pump, AKTA connection use	The material of column tube is polypropylene, and the material of screen plate is polyethylene
HT05	5mL Empty column	5			
HT12	12mL Empty column	1-10		Mainly used for manual purification by affinity resins	Empty column contains upper and lower sieve plate, upper and lower plugs, column tube, outer ring sleeve
HT30	30mL Empty column	5-20			
HT60	60mL Empty column	10-50			SPE empty column contains upper and lower sieve plate, column tube, column tube top cover

Process development chromatography empty columns

Product number	Product name	Specification (Diameter/Length) mm/mm	Filling volume (mL)	Filling height mm	Application characteristics
HT16-20	HK 16/20	16/200	4-34	20-170	For laboratory protein purification and process development, suitable for filling all resin materials for size exclusion, ion exchange, affinity and hydrophobic interaction resins
HT16-40	HK 16/40	16/400	44-76	220-370	
HT16-70	HK 16/70	16/700	104-134	520-670	
HT16-100	HK 16/100	16/1000	164-194	820-970	
HT26-20	HK 26/20	26/200	10-90	20-170	
HT26-40	HK 26/40	26/400	117-193	220-370	
HT26-70	HK 26/70	26/700	276-355	520-670	
HT26-100	HK 26/100	26/1000	435-514	820-970	
HT50-30	HK 50/30	50/300	235-529	120-270	
HT50-70	HK 50/70	50/700	1020-1314	520-670	
HT50-100	HK 50/100	50/1000	1607-1901	820-970	
HP16	HK16 Column loader	-	-	-	HK series column loading
HP26	HK26 Column loader	-	-	-	
HP50	HK50 Column loader	-	-	-	
HS16	HK16 Adapter	-	-	-	
HS26	HK26 Adapter	-	-	-	
HS50	HK50 Adapter	-	-	-	
Remarks	• The HK series chromatography empty columns can be operated at temperatures ranging from 4 to 60°C, and the columns can be used within the pH range of 1 to 14. • The HK series chromatography columns come with a quick-locking adapter to ensure uniform flow rate and minimal dead volume. • The jacket of the column maintains a stable operating temperature. • The accompanying column packing device is used to pack the column, ensuring even packing without air bubbles and guaranteeing good column efficiency. • The material of the empty column exhibits excellent chemical resistance and is suitable for a wide range of applications.				

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