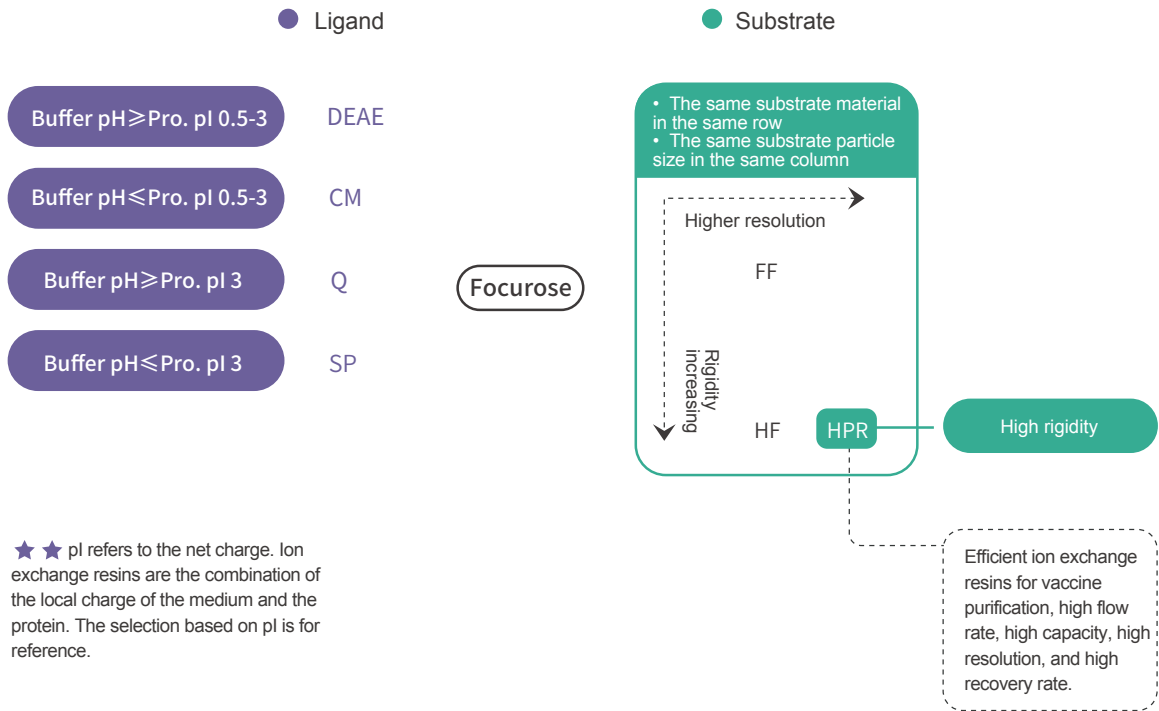


Ion exchange resins is one of the most widely used methods for protein separation and purification. Different proteins have different isoelectric points, different molecular sizes, different charge density distributions in the same mobile phase, different charge amounts, different binding strengths to 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, Focurose FF, Focurose HF and Focurose HPR, which are a combination of 3 substrates and a variety of ion exchange resin to precisely match the downstream technology of bioprocesses.



★★ pI refers to the net charge. Ion exchange resins are the combination of the local charge of the medium and the protein. The selection based on pI is for reference.

## Resin selection principles

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

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

## 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. 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.



- ★ 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.

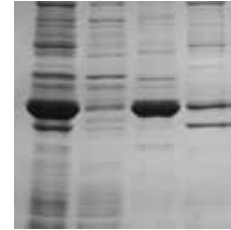
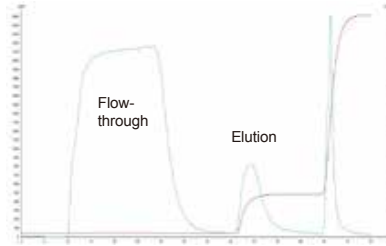
Product number	Product name	Spec	Ion loading $\mu\text{mol/mL}$	Particle size range ( $\mu\text{m}$ )	Maximum flow rate (cm/h)	Withstand pressure MPa	pH stability long-term [short-term]	Application characteristics
HL060301025M		25mL						
HL060301100M		100mL						
HL060301500M		500mL						
HL060301001L	SP Focurose FF	1L	180-250 H <sup>+</sup>	45-165	700	$\leq 0.3$	4-13 [3-14]	Fast, high throughput purification
HL060301005L		5L						
HL060301020L		20L						
HL060303025M		25mL						
HL060303100M		100mL						
HL060303500M		500mL						
HL060303001L	CM Focurose FF	1L	90-130 H <sup>+</sup>	45-165	700	$\leq 0.3$	4-13 [2-14]	Fast, high throughput purification
HL060303005L		5L						
HL060303020L		20L						
HL060306025M		25mL						
HL060306100M		100mL						
HL060306500M		500mL						
HL060306001L	Q Focurose FF	1L	180-250 Cl <sup>-</sup>	45-165	700	$\leq 0.3$	2-12 [2-14]	Fast, high-throughput purification
HL060306005L		5L						
HL060306020L		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
HL060307025M		25mL						
HL060307100M		100mL						
HL060307500M	DEAE Focurose FF	500mL	110-160 Cl <sup>-</sup>	45-165	700	≤0.3	2-12 [2-14]	Fast, high throughput purification
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 jecton 0.6mL/min, other 1 mL/min

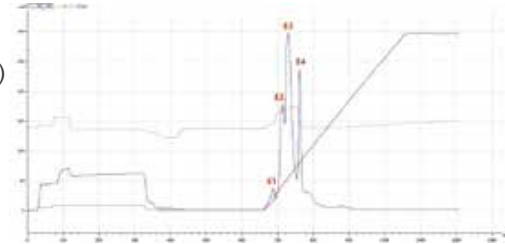


Original liquid Flow-through Elution1 Elution2

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

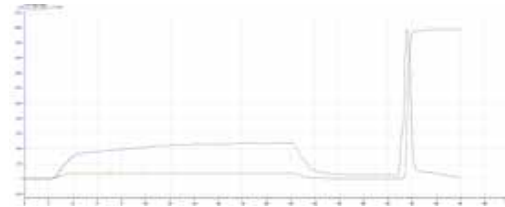
1. DEAE weak anion elution mode - high purity

The virus is adsorbed in the eluate in this purification process, and the protein removal rate  $\approx 98\%$  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  $\approx 75\%$ , recovery rate  $>70\%$ .



## Pre-assembled column ordering information

Product name	Spec	Product number
SP Focurose FF	1mL	HL060301001E
	5mL	HL060301005E
CM Focurose FF	1mL	HL060303001E
	5mL	HL060303005E
Q Focurose FF	1mL	HL060306001E
	5mL	HL060306005E
DEAE Focurose FF	1mL	HL060307001E
	5mL	HL060307005E

## 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.

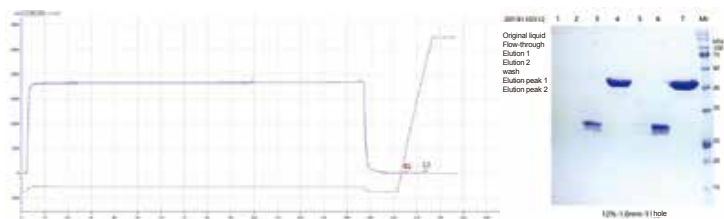
Product number	Product name	Spec	Ion loading $\mu\text{mol/mL}$	Particle size range ( $\mu\text{m}$ )	Maximum flow rate (cm/h)	Withstand pressure MPa	pH stability long-term [short-term]	Application characteristics
HL280301025M		25mL						
HL280301100M		100mL						
HL280301500M	SP Focurose HF	500mL	120-160 H <sup>+</sup>	45-165	700	$\leq 0.3$	4-12 [3-14]	High flow rate, high throughput; increased efficiency for mass production
HL280301001L		1L						
HL280301005L		5L						
HL280301020L		20L						
HL190801025M		25mL						
HL190801100M	100mL							
HL190801500M	SP Focurose HPR	500mL	100-140 H <sup>+</sup>	45-165	400	$\leq 0.3$	4-12 [3-14]	High flow rate, high throughput, high resolution, high recovery
HL190801001L		1L						
HL190801005L		5L						
HL190801020L		20L						
HL190801025M		25mL						

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

## Application Cases

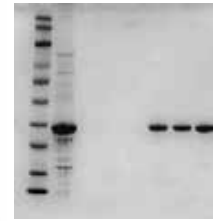
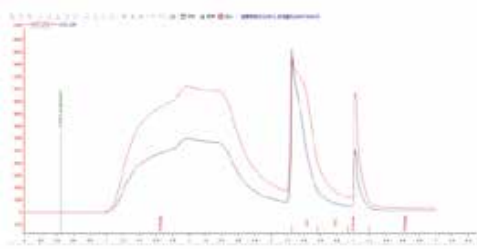
SP Focurose HPR purified recombinant certain kinase supernatant

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



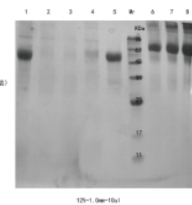
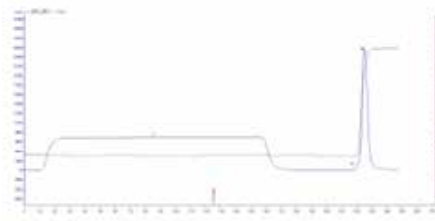
SP Focurose HPR Purified Recombinant Type III Collagen

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.



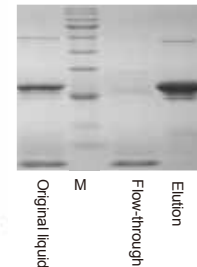
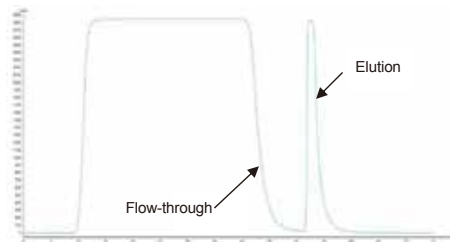
SP Focurose HR purified pseudorabies virus GD protein

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	Q Focurose HPR	1mL	HL190206001E
	5mL	HL280301005E		5mL	HL190206005E
Q Focurose HF	1mL	HL280306001E	SP Focurose HPR	1mL	HL190801001E
	5mL	HL280306005E		5mL	HL190801005E