

## Resin used in Biopharming and Pharmaceutical Processing

Resin	Main Use
001×7	For extraction and purification of amino acid and citric and lactic acid
001×2.5	For extraction of oxytetracycline, kasugamycin and other antibiotics
001×12	For removal of salt and purification of gentamicin, streptomycin and other antibiotics, penicillin converted into salt
001×14	
001×16	
D001AM	For extraction of L-tryptophan and other amino acid
D001SD	For extraction of antibiotics, amino acid and alkaloids
D001SE	For extraction of lactic acid, citric acid and vitamin C
122	For decoloration of streptomycin, colistin, oxytetracycline, tetracycline, MSG, recycle Vitamin B12
D150	For extraction and refine of vitamin B <sub>12</sub> (aerobic process), enzyme, cytochrome C, amino a
D151	For extraction of tobramycin, sisomicin, bleomycin
110	For extraction of streptomycin, spectinomycin, colistin sulfate, phenylalanine and hydroxyl salt
D152	
D156	
LKC150	
201×4	For extraction of antibiotics, separation of organic acid and amino acid
201×7	For separation of L-arginine and extraction of biochemical products and organic acid
D201	For extraction of biochemical products, amino acid and vitamin E
D918	For extraction of biochemical products and organics
D980	For extraction of biochemical products such as chondroitin sulfate and heparin sodium,
LKA98CL	decoloration of erythromycin and sugar, remove salt and protein from solution
330	For neutralization in streptomycin and other antibiotics, extraction of organic acid such as malic acid and tartaric acid
D315	For refinement and decoloration of organic acid such as citric acid, lactic acid and vitamin C, remove inorganic acid, CL and SO <sub>4</sub>
D316	
D318	
P386	For refinement of streptomycin, remove color from silica sol and aluminum hydroxide
P390	
DM1180	For decoloration and removing protein and pigment from cephalosporin C and biochemical products
DM1180S	
DM825	
DM700	
LKA53/D316	
DM16	For extraction of fat-soluble antibiotics such as vancomycin

CAD40	For extraction and decoloration of vitamin B <sub>12</sub> ( aerobic and anaerobic process)
CAD45	
D900	
DM1180N	
DM2	For refinement of vitamin B <sub>12</sub> (anaerobic process), replace aluminum oxide
CA180	For extraction of amikacin and other aminoglycosides
860021	For extraction and purification of clindamycin phosphate
DM2	
D312	For extraction of clindamycin phosphate
DM12	For the extraction of ivermectin and avermectin
LKA958	For refinement and decoloration of micronomicin, erythromycin
DM5	For extraction and refinement of natural food preservatives natamycin
LK207	For extraction and purification of glutathione
LK70	
LK20	For chromatography and purification of biochemicals
LK761	
XCG18	For removal of impurities from biochemicals or extraction and decoloration of macromolecular actives
XCG168	
LK20SS	
LK110	For removal trace amounts of antibiotics from blood products
LK815	
LK706	
DM28	
LK500	For purification blood and remove total bilirubin
LK500A	
LK108	For adsorption and recycle of 7-ACA
LK108B	
LKC158	For extraction of vitamin B <sub>12</sub>
LK900CL	For decoloration of vitamin B <sub>12</sub>
LK650	For removal bilirubin from blood

## Resin used in Plant Extraction and Food Additives

Resin	Main Use
DM18	
DM30	For extraction of stevioside
860021	
LK001	For extraction of rebaudioside A
D285	For refinement and decoloration of stevioside, replace activated carbon
DM21	For extraction of water-soluble anthocyanin such as sweet potato red, carthamin yellow
DM28	and other lyochromes
DM10	
CAD40	For extraction of gardenia yellow
DM18G	
DM130	For extraction of curcumin
330	
D301	For refinement and decoloration of sorbitol and xylitol etc.
LKS68	For decoloration of soybean sauce and vinegar
D941	
D945	For refinement, decoloration, desalting, removal of organic impurities from plant
D285	effective components such as steviosides, ginsenoside, notoginsenoside, soy isoflavone,
330	hawthorn flavone and other natural products
LK318	
LK007	For decoloration and desalting of cichorium intybus and jerusalem artichoke
LKA98	For decoloration of sucrose
D001Series	For extraction of tubocurarine, quinine, ergotone, scopolamine, lycorine, caffeine, securinine and other alkaloid
DM2	For extraction of buckwheat flavonoids and breviscapinun
DM-8	
AB-8	For extraction of grape seed proanthocyanidin, oleuropein and breviscapinun
DM132	
DM16X	For extraction and refinement of tea polyphenols etc.
DM130	For separation and purification of chlorogenic acid, glycyrrhizic acid and salvianolic acid
D312	
DM131	For extraction and refinement of soy isoflavone, hawthorn flavone, pueraria flavone
DM130	
DM131	For extraction and refinement of G-ginkgo flavonoids, notoginsenoside and ginsenoside
D101	
LK17	For chromatography separation of ginkgo biloba extraction, especially for low content ginkgo leaf, can meet the quality control requirements without special treatment
LK02	For removal of ginkgoic acid from ginkgo biloba extraction

DM-7HP	For removal of low-pole compound from nonpolarity solvent, removal of ester, ketone, enzyme, protein or other aliphatic kinds compounds from water solution, plant extracts, biochemistry products. For removal organic contamination from water. For immobilization of enzyme
LK27	For extraction of ginkgetin, low ginkgolic acid
LK37	For extraction of notoginsenoside and stevioside, high selectivity and adsorption capacity
LK1300S	For refinement of notoginsenoside and stevioside
LK2MG	For adsorption strong polarity compound contains carboxyl group, ester group, amino group, amide group. Also used to remove salt
LK20	For separate saponin, isoflavone, macrolide, ginsenoside, nucleoside, rhubarb lactone, flavone, spices composition, polyphenol
LK30	Decolorizing resin, especially used to remove pigment from ethanol solutions. Refine stevioside and notoginsenoside
LKP-69	Pharmaceutical resin, used as masking agent, stabilizer, carrier of cationic drugs

## Resin used in Fruit Juice, Vegetable Juice and Liquor

Resin	Main Use
LKS01	For removal of naringin and limonin from juice, have no effect on other ingredient and flavor
LKS01A	
LKS03	For decoloration of the concentrated juice, improve the juice chromaticity value, transmittance and stability for storage
LKS04	
LKS05	
LKS06	For decoloration of concentrated Chinese date juice and pear juice, improve the juice chromaticity value, transmittance and stability for storage
LKS07	
LKS11	For removal of pesticides residue form juice to increasing the amino acid content
LKS13	
LKS02	For removal of patulin and hydroxymethylfurfural from juice
LKS10	
LKS08	For removal of heavy metal ions and harmful anion from juice
LKS09	
LKS16	For desalination in fructose purification
LKS18	For deacidification and decoloration in fructose purification
LKS11	For removal of pesticides residue from pomegranate juice and strawberry juice
LKS19	For removal of solid matter from wine, improving mouth feel and stability
LKS20	For removal of solid matter from beer, improve color, luster and stability

## Chelate Resin

Resin	Main Use
LKC100	Used for refinement of secondary brine of ion film caustic soda industry
LKC500	Used for refinement of secondary brine of ion film caustic soda industry
LKC418	
LKC200	Used for extraction of gallium from solution when produce aluminum oxide by Bayer Process
LKC800	Used for removal of Boron

## Immobilized Enzyme Carriers

Resin	Main Use
LKZ116	For the immobilization of 6-APA acylase
LKZ126	For the immobilization of 7-ACA acylase
LKZ218	For immobilization enzyme by covalent bond
LKZ518	For immobilization enzyme by adsorption
LKZ618	For the immobilization of lipase, high activity, excellent abrasive resistance

# Resin used in Purified Water and Waste Water Treatment, Recovery of Heavy Metal

## Cation Exchange Resin

Kind		Resin	Main Use
Strong Acid	Gel	001×7	For purified and highly purified water, used as catalyst
		001×7FC	For fluidized bed, preparation of purified and purified water
		001×7MB	For mixed bed, preparation of highly purified water
		001×4	For purified and highly purified water
	Macro-Porous	D001	For purified water, separation and recycle of rare elements
		D001 series	For fluidized bed and bunk bed, preparation of purified water and condensate water. Used as catalyst for organic reactions
		LKC36	Immobilized acid catalyst (catalyze and synthesize esters)
Weak Acid	Gel	110	Preparation of purified water
	Macro-Porous	D113	Remove alkaline salts in water together with 001x7
		D152	Softening of industrial water, salt removal, recycle and separation of heavy metals
		D111	For purified water

## Anion Exchange Resin

Kind		Resin	Main Use
Strong Base	Gel	201×4	For purified and highly purified water
		201×7	For purified and highly purified water, purification of wastewater
		201×7FC	For mixed bed, preparation of purified and highly purified water
		201×7MB	For mixed bed, preparation of purified and highly purified water

	Macro-Porous	D201	Water treatment of high-speed mixed bed, waste water treatment, recycle heavy metals
		D2004	For fluidized bed, preparation of purified water and highly purified water, separation of rare elements.
		D2006	For purified and highly purified water in anion double-layer
		D918	For purified and highly purified water, waste water treatment
Weak Base	Gel	330	For purified and highly purified water
	Macro-Porous	D301	For water treatment in fluidized bed and double-layer bed system, containing chromium galvanization waste water
		D301SC	For removing organic material from industrial water

## Waste Water Treatment and Recycle Active Ingredient

Resin	Main Use
LK100	For recycle of 6-APA and phenylacetic acid from 6-APA mother liquid, recycle phenylacetic acid from high-salt wastewater, harmless disposal of drain water
LK103	
LK13	
LK27	
LKC01	For recycle of hydroxy phenylglycine from amoxicillin lateral-chain mother liquid
LK73	For recycle and harmless disposal of organic amine from chemical wastewater
LK04	For recycle of aromatic organic acid, phenols and aromatic alcohol
LK30G	For recycle of poor solubility alkane and organic alcohol
HCH-m01	Waste water treatment in coal gasification, recovery of effective components
HCH-m02	
HCH-m03	
HCH-m04	
HCH-j01	Waste water treatment in coking industry, recovery of effective components
HCH-j02	
HCH-j03	
HCH-j04	

# Regular use (regeneration) method of resins

## Cation exchange resin

- A. Washing with clean water: After feeding the new resin, wash with normal temperature flowing clean water (hot water with the temperature of 50-60°C will be better) or immerse washing till outlet water is clean without color or with few bubbles.
- B. Process with the diluted sodium hydroxide solution: concentration:4-6%, dosage: 2-3 BV, flow rate:1-1.5 BV/h, washing with clean water till PH value under 9.
- C. Process with diluted hydrochloride acid: concentration:4-6%, dosage:2-3BV, flow rate:1-1.5BV/h, washing with clean water till PH value over 5.
- D. Ion forms transformation: according to requirements of the processing techniques, follow the operating step from B to C when using the form of hydrogen ion, and follow the step from C to B when using the form of sodium.

## Anion exchange resin

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- C. Process with diluted hydrochloride acid: concentration:4-6%, dosage:2-3BV, flow rate:1-1.5BV/h, washing with clean water till PH value over 5.
- D. Ion forms transformation: according to requirements of the processing techniques, follow the operating step from B to C when using the form of chloridion form, and follow the step from C to B when using the free alkali form. Generally the new resins can be used after being processed twice according to these two steps described above.

## Macroporous adsorption resin

Pre-treatment before using, the methods are as following:

- A. Process with 1-2BV industrial grade ethanol (acetone or isopropanol) (assay above 95%), 1-2BV/h of the flow rate will be appropriate, and then wash with purified water till odorless.
- B. Feeding sodium hydroxide solution (2BV 4-6%) with rate 1-2BV/h into the column, dip with a lower liquid level over 2 hours, after that wash with purified water till PH value reach 7-8.
- C. Feeding hydrochloric acid or sulphuric acid solution (2 BV, 4-6%) with flow rate of 1-2BV/h into the column, then dip with lower liquid level over 2 hours, after that wash with the purified water till PH value meet the technological requirements.

## Storage items

It is suitable to storage in wet, sealing the container, the appropriate storage temperature is 5-25°C; if the storage temperature is lower than 0°C, the resin should be soaked in clear saturated salt water, in order to avoid crack and break of the resin beads caused by the freezing temperature; high storage temperature will lead to dehydrolysis of the resin and accelerate to reduce performance of the functional group of cation resin.

# Enzyme

## Pharmaceutical Immobilized Enzyme (固定化药用酶)

Product	Name	Application
Cephalosporin C acylase	AMG118	7-ACA production from CPC
Amoxicillin acylase	AMK218	Amoxicillin production from 6-APA and HPGM
Cephalexin acylase	AMK318	Cephalexin production from 7-ADCA and PGM
Cefaclor acylase	AMK328	Cefaclor production from PGM and 7-ACCA
Cefprozil acylase	AMK418	Cefprozil production from 7-APRA and HPGM
Cefradine acylase	AMK518	Cefradine production from 7-ADCA and DHME
Cefadroxil acylase	AMK618	Cefadroxil production from 7-ADCA and HPGM
Cefazolin acylase	AMK718	Cefazolin production from TDA and TzAAMe
Cefotiam acylase	AMK818	Cefotiam production from ATAA and 7-DMTA
Cephalosporin C	AMK-EX	D-CPC production from CPC D-7ACA production from 7-ACA
Penicillin G acylase	AMK-GX	6-APA production from penicillin G 7-ADCA from cephalosporin G 7-ACCA and 7-AVCA

Patents: CN103937764B, KR10-1728906, KR10-1677755, CN201810254795.7

## Compound K-synthesizing Enzyme (人参皂苷酶)

Product	Name	Application
Gensenosidase	Ckzyme	Production of compound K from protopanaxadiol (PPT) gensenosides (Rb1, Rb2, Rc, Rd, etc)

Patent: KR10-1855280

## Food Processing and Feed Enzyme (食品用酶)

Product	Name	Application
Endo-& Exo-Chitinase	Chimax-N	Chitin hydrolysis, production of NAG(N-acetyl glucosamine)
Endo-Chitosanase	Chimax-O	Chitosan hydrolysis, production of chitosan oligosaccharide
Endo-&Exo-Chitosanase	Chimax-G	Chitosan hydrolysis, produce glucosamine from chitosan

Protease	Pearlzyme	Feed additive for domestic livestock (cow, pig, chicken)
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Patents: KR10-0523528, KR10-0488813, KR10-0664582, KR10-0834518

## Immobilized Lipase (固定化脂肪酶)

Product	Name	Application
Immobilized Lipase	CalB-10X	Food, biodiesel, pharmaceutical & chemical industries
	CalB-10Xup	CalB-10X (candida antarctica lipase B)
	TL-10X	Cal-B-10Xup (upgraded CalB-10X)
		TL-10X (thermomyces lanuginosus lipase)

Patents: KR10-1460228, WO2015/016587

# Chromatography Medium

## Biophdex - Dextran Gel Filtration Chromatography Medium

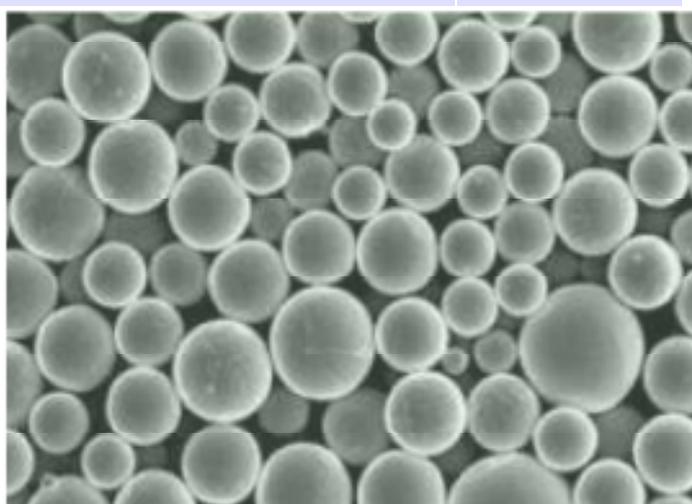
Biophdex is a kind of gel bead crosslinked dextran, the most widely used separation and purify medium on protein, peptides, amino acid and polysaccharide. The molecular weights range from hundreds to million. The product of G series is based on different aperture.



Product	Particle Size /um	Separation Range	Mark	Similar Product
Biophdex G-10	40-120 dry	<700	Used for desalt, very low nonspecific adsorption	Sephadex G-10
Biophdex G-15	40-120 dry	<1500	Used for desalt, very low nonspecific adsorption	Sephadex G-15
Biophdex G-25	100-300 wet	$1 \times 10^3 - 5 \times 10^3$	Desalt and exchange buffer solution, remove small molecular impurity	Sephadex G-25
	50-150 wet			
	20-80 wet			
	20-50 wet			
Biophdex G-50	100-300 wet	$1.5 \times 10^3 - 3 \times 10^4$	Desalt and exchange buffer solution, remove small molecular impurity	Sephadex G-50
	50-150 wet			
	20-80 wet			
	20-50 wet			

high selectivity, a variety of sizes, different separation range and high resolution, stable physical and chemical properties and good mechanical strength.

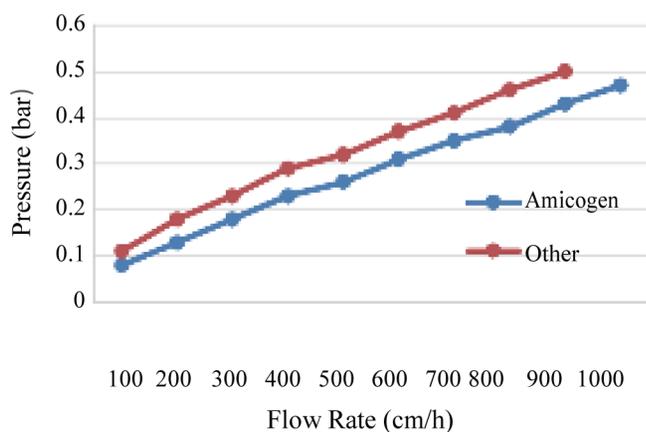
G-10, G-15, G-25, G-50 are small pore sizes, they are most widely used, mainly used for desalination or separation of peptides from other small molecules.



# Biophdex - Dextran Gel Ion Exchange Chromatography Medium

Ion exchange chromatography: joined functional groups on the basis of G-25 and G-50 gel filtration chromatography

Product	Function Group	Exchange Ability	Particle Size	PH	Separation Range/Da	Similar Product
DEAE Biophdex A-25	Mixed strong and weak base	3-4	dry 40 -125 um	2-9	≤30000	DEAE Sephadex A-25
DEAE Biophdex A-25	Mixed strong and weak base	3-4	dry 40 -125 um	2-9	30000-100000	DEAE Sephadex A-50
CM Biophdex C-25	Weak acid cation ions	4-5	dry 40 -125 um	6-10	≤30000	CM Sephadex C-25
CM Biophdex C-50	Weak acid cation ions	4-5	dry 40 -125 um	6-10	30000-100000	CM Sephadex C-50



Resin: 25ml Column: xk15/21 (i.d.15nm) Bed high: 10cm

The Biophdex ion exchange chromatography series has high exchange capacity and stable physical and chemical properties. The beaded shape gives it a good fluidity function. Due to its advantages of low hydrophilic and non-selective adsorption, proteins, nucleic acids and other unstable biomolecules will not be adsorbed or denatured by the gel.

The biophdex ion exchange chromatography series has been widely used in the production of many drugs, and its biocompatibility and good fluidity make it ideal for large-scale production and application. Its extensive applications

in industrial production include desalination, concentration, heat removal and decolorization, buffer solvent replacement, separation and refining (antibiotics, hormones, enzymes, proteins,

nucleic acids, vitamins and polysaccharides), analytical applications and clinical applications.

# Biophrose - Agarose Gel Molecular Sieve

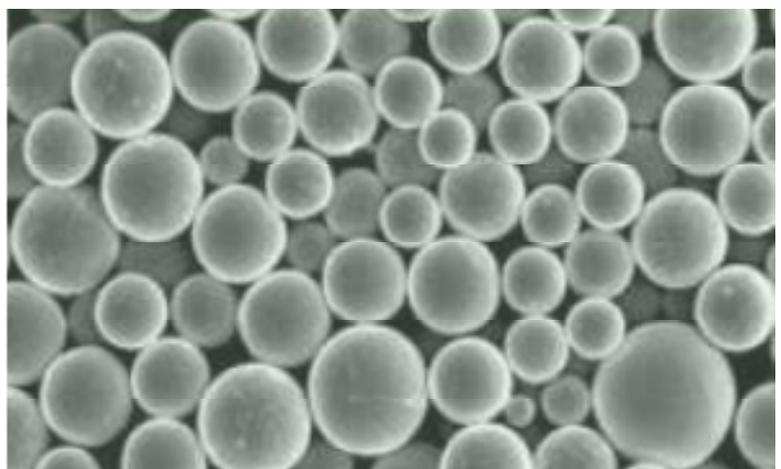
The product is a chromatography medium made from agarose. It has hydrophilic, macroporous, less specific, and a large number of carboxyl groups that can react with other chemical groups. Mainly used to separate biological macromolecules and downstream products of genetic engineering.

Product	Particle Size (um)	Max Flow Rate (cm/h)	Pressure (MPa)	Separation Range		PH	Similar Product
Biophrose 4B	50 -170	30	0.5	$7 \times 10^4$	- $2 \times 10^7$	4-9 (long time) 3-11 (washing)	Sepharose 4B
Biophrose 6B	50 -170	30	0.5	$1 \times 10^4$	- $4 \times 10^7$	4-9 (long time) 3-11 (washing)	Sepharose 4B
Biophrose CL-4B	50 -170	140	0.5	$6 \times 10^4$	- $2 \times 10^7$	3-13 (long time) 2-14 (washing)	Sepharose CL-4B
Biophrose CL-6B	50 -170	200	0.5	$1 \times 10^4$	- $4 \times 10^6$	3-13 (long time) 2-14 (washing)	Sepharose CL-6B
Biophrose 4FF	50 -170	500	0.5	$6 \times 10^4$	- $2 \times 10^7$	2-11 (long time) 1-14 (washing)	Sepharose 4FF
Biophrose 6FF	50 -170	800	0.5	$1 \times 10^4$	- $4 \times 10^7$	2-11 (long time) 1-14 (washing)	Sepharose 4FF

Biophrose are uncross linked agarose spheres, which are not resistant to high temperature and pressure. They are used for gel chromatography purification of samples with large molecular weight difference and low resolution requirements.

Biophrose Cl are the cross-linked products of agarose spheres. The series can withstand high temperature, steam sterilized, and the pressure resistance of substrate is further improved. It can be used for the gels chromatography purification of proteins, nucleic acids, peptides and other downstream products of biopharmaceuticals and bioengineering.

Biophrose FF are obtained after twice crosslink. Compared with CL series products, the pressure resistance is further improved, which enables the feed liquid to pass quickly and suitable for industrial scale production.



# Biophrose - Agarose Gel Ion Exchange

The products are derivative of FF series products after the addition of functional groups.

Product	Functional Group	Exchange Ability	Particle Size	PH	Separation Range	Similar Product
DEAE Biophrose Fast Flow	diethylene ethyl	0.11-0.15	50-170	2-12 (long time) 4-14 (washing)	$4 \times 10^6$	DEAE Sepharose Fast Flow
Butyl Biophrose 4 Fast Flow	butyl	40 $\mu\text{mol/ml}$	50-170	2-12 (long time) 4-14 (washing)	$6 \times 10^4 - 2 \times 10^7$	Butyl Sepharose 4 Fast Flow

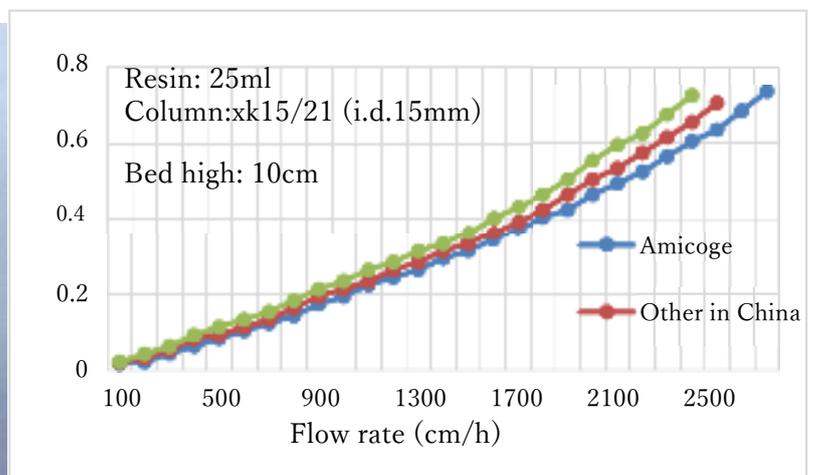
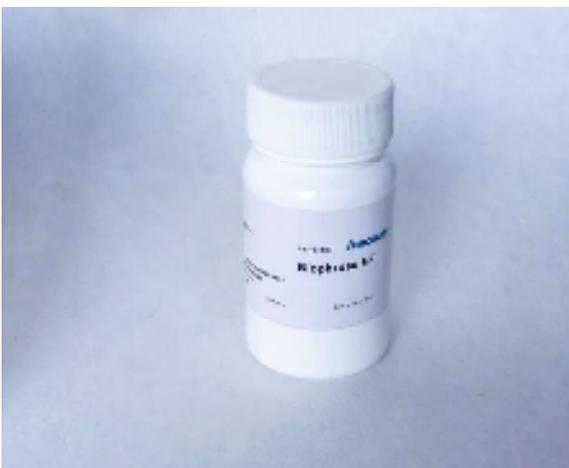
DEAE with weak alkali exchange group, can be used in biopharmaceutical and bioengineering downstream protein, nucleic acid and peptide gel chromatography purification

Butyl, with hydrophobic group, is suitable for purification of more hydrophobic materials and can cooperate perfectly with ammonium sulfate precipitation for sample purification



## Protein A Carrier

Product	Particle Size (um)	Max Flow Rate (cm/h)	Pressure (MPa)	PH	Separation Range	Similar Product
Biophrose HF	50-170	3000	1	2-10 (long time) 1-14 (washing)	$6 \times 10^4 - 2 \times 10^7$	Mabselect Sure base ball



The matrix has strong rigidity (compared with FF series), fast flow rate, anti-depression, high load of protein A, easy linear amplification and more suitable for industrial production.