

HyperChrom Butyl 4FF Agarose

Product description

HyperChrom Butyl 4FF Agarose is a hydrophobic interaction chromatography medium that takes advantage of differences in the hydrophobic properties and the amount of different molecules under specific conditions. This series of chromatography media can be well used for the isolation and purification of a variety of biomolecules, such as recombinant proteins, antibodies, viral vaccines, etc.

HyperChrom Butyl 4FF Agarose has excellent scale-up performance: (1) Highly crosslinked agarose base frame with excellent rigidity, so high process flow rates and improved process efficiency at low backpressure. (2) Hydrophilic base frame to minimize the influence on the hydrophobic role of the ligand. (3) Through chemical modification, it has excellent chemical compatibility and is resistant to CIP cleaning such as sodium hydroxide.

Components and storage conditions

Components	PC2020-25 mL	PC2020-100 mL
HyperChrom Butyl 4FF Agarose	25 mL	100 mL
Store the components at 4°C for 5 years.		

Product parameters

HyperChrom Butyl 4FF Agarose chromatography media parameters

Name	Description
Chromatography media type	Hydrophobic interactions
Ligation	$\text{R-O-CH}_2\text{-CH(OH)-CH}_2\text{-O-(CH}_2\text{)}_3\text{-CH}_3$
Scaffolding	Highly cross-linked agarose
Average particle size	90 μm
Ligand density	40 μmol Butyl group/mL chromatography medium
Flow rates are recommended	150-250 cm/h
Maximum flow rate	400 cm/h
Withstand pressure	0.3 MPa

Use temperature	4-30°C
pH stability*	2-14
Solvent resistant	Common aqueous solution, 3 M ammonium sulfate, 30% isopropanol**, 75% ethanol**, 1 M NaOH, 6 M guanidine hydrochloride
Intolerant to solvents	oxidant
<p>* After 7 days of storage of chromatography medium at 40°C and pH 2-14 environment, its physicochemical properties and functions did not change significantly.</p> <p>**30% and 75% are v/v, volume ratio.</p>	

Experimental manipulation

1. Preparation of buffers

Buffer selection: Buffer salts that do not interact with the chromatography medium should be selected.

- If the binding elution mode is used: a high-salt buffer (such as a buffer containing 1.5 M ammonium sulfate) should be used for the balance buffer to facilitate the binding of the target molecule, and the stability of the sample in the buffer should be considered; The elution buffer is usually the buffer with high salt removed from the equilibration buffer. Equilibrium/binding/washing buffer: 50 mM phosphate buffer with 1.7 M ammonium sulfate at pH 7.0; elution buffer: 50 mM phosphate buffer at pH 7.0.
- If the flow mode is used: the equilibration buffer should be treated under conditions conducive to impurity binding, and rinsed directly with a low concentration salt after the target molecule has completely flowed through.

2. Sample preparation

Prepare samples for purification.

3. Chromatographic conditions

- Flow rate selection: Linear flow rate of 150-250 cm/h is generally selected according to the height of the column bed.
- Sample preparation: To prevent the sample from clogging the column, the sample needs to be filtered with a 0.2/0.45 µm (after inclusion body disruption) microporous membrane before loading, and it is recommended that the pH and conductivity of the sample be adjusted to be consistent with the equilibrium buffer (the pH and conductivity of the sample can be adjusted by dilution, ultrafiltration, and desalting) .

4. Loading columns

The following column loading methods are suitable for filling laboratory-scale chromatography

columns:

4.1 Supplies required for column mounting

- (1) Chromatographic medium: HyperChrom Butyl 4FF Agarose
- (2) Chromatographic empty column: laboratory-scale chromatography empty column and column loader
- (3) Solution required:
 - a) Column loading solution: 20% ethanol.
 - b) Exhaust solution: 20% ethanol.
- (4) Column loading tools: sand core funnel, stirring rod, measuring cylinder, etc.

4.2 Preparation before column loading

- (1) Calculate the volume of chromatography medium V_m required for column loading (volume of the chromatography medium part after sufficient sedimentation), and calculate the formula:

V_m = cross-sectional area of the chromatography column X height of the column bed where the column is planned to be loaded x compression ratio of the chromatography medium.

(Note: HyperChrom Butyl 4FF Agarose has a compression ratio of 1.15).

- (2) The chromatography medium was transferred to the sand core funnel, and the column loading solution was cleaned and filtered with about 3 times the volume of the chromatography medium, and the column chromatography medium to be loaded was replaced with the column loading solution.
- (3) For the preparation of the gel suspension of the column chromatography medium to be loaded, the suitable column loading gel suspension ratio of HyperChrom Butyl 4FF Agarose chromatography medium is 50%-60%. In order to obtain an accurate chromatography medium volume, the chromatography medium can be placed in a graduated cylinder and settled overnight or centrifuged at low speed (3000 rpm, 5 min) to simulate the natural sedimentation effect of the chromatography medium, and then measured.
- (4) Check the empty column to be used to ensure it is clean and leak-free.

4.3 Column mounting

- (1) Vent the column bottom membrane (screen) with 20% ethanol.
- (2) After sufficient exhaust, screw the plug or close the column bottom valve at the bottom interface of the column, and continue to inject a small amount of 20% ethanol until the bottom of the column is covered.
- (3) Adjust the chromatography column to vertical.
- (4) The column head is connected to the chromatography system, through which a low flow rate of 5 m

L/min is provided, and the column head filter membrane (screen) is vented with 20% ethanol.

- (5) Thoroughly stir the prepared chromatography medium suspension with a stir bar, and then slowly pour into the prepared chromatography empty column at one time.

Note: If the volume of the glue suspension exceeds the empty column volume, it should be extended by using a column loader or connecting another empty column tube with a connector.

- (6) Place the gaseated stigma into the chromatography column, fully fit the glue suspension level, and remove all air bubbles. Then tighten the column head seal.
- (7) Start the system pump, adjust the flow rate to 300 cm/h, and use the liquid flow to press the column bed. During this period, the pressure should not exceed 0.3 MPa. If the pressure is over, the flow rate needs to be reduced.

	CID				
	V/FR	10 mm	16 mm	26 mm	50 mm
LFR					
60 cm/h		0.8 mL/min	2.0 mL/min	5.3 mL/min	19.6 mL/min
100 cm/h		1.3 mL/min	3.3 mL/min	8.8 mL/min	32.7 mL/min
150 cm/h		2.0 mL/min	5.0 mL/min	13.3 mL/min	49.1 mL/min
200 cm/h		2.6 mL/min	6.7 mL/min	17.7 mL/min	65.4 mL/min
300 cm/h		3.9 mL/min	10.0 mL/min	26.5 mL/min	98.1 mL/min
600 cm/h		7.9 mL/min	20.1 mL/min	53.1 mL/min	196.3 mL/min

Note:

CID: Chromatographic inner diameter

V/FR: Volumetric flow rate

LFR: Linear flow rate

Table 1 Flow rate conversion table of different specifications of chromatography columns

- (8) After the column bed is stabilized (the glue surface no longer falls), mark the position of the glue surface at this time. Stop the pump and press the column head down to 2-3 mm below the marked position.
- (9) Re-apply the flow rate of 300 cm/h, if the glue surface no longer drops, that is, the column loading is completed. If the glue surface falls, repeat steps 8-9.

Note: The recommended workflow speed does not exceed 75% of the flow rate of the loading column.

5. Column efficiency determination (optional).

Select one of the two test methods shown in the table below for column effectiveness testing. Use the mobile phase equilibrium chromatography column to the baseline to be stable, load the sample into the chromatography column, continue to use the mobile phase for rinsing, and after the chromatographic peak is completed to return to the baseline, end the run, integrate the chromatographic peak, and evaluate the loading effect.

Table 2 Statistical table of two column efficiency measurement methods

	Acetone method	NaCl method
Sample	1% (v/v) acetone in water	2 M NaCl in water
Sample volume	1% column volume	1% column volume
Mobile phase	water	0.2 M NaCl in water
Velocity of flow	30 cm/h	30 cm/h
Detector	UV 280 nm	electrical conductivity

The main evaluation criteria for the effect of column loading are N/m (number of plates per meter) and As (symmetry factor), which are calculated as follows:

$$\frac{N}{m} = 5.54x\left(\frac{V_R}{W_h}\right)^2 \times \frac{1}{L}$$

$$As = b/a$$

Column efficiency qualification standards: $N/m > 3000$, $0.8 < As < 1.5$

*Parameter Notes:

L = column height, V_R = reserved volume, W_h = half-peak width, a = left half-peak width at 10% peak height, b = right half-peak width at 10% peak height

6. Chromatographic steps

- (1) Equilibrium: Adequately equilibrate the column to pH and conductivity stable using equilibration buffer and is essentially the same as the equilibration buffer, which typically requires 3-5 times the column volume.
- (2) Sample loading*: Determine the volume and amount of sample loading on the HyperChrom Butyl 4FF Agarose based on the binding load measured in the pilot experiment.
- (3) Washing*: Rinse the column with equilibration buffer or other suitable buffer until UV stable and return to baseline.
- (4) Elution*: Elution is achieved by reducing the concentration of salt ions, which can gradually reduce the concentration of salt ions in the eluate through linear gradients or step gradients, and elute molecules with different binding strengths. Fractional collection is performed on the eluted sample.
- (5) Regeneration: Rinse the chromatography column with buffer containing low salt.
- (6) Re-equilibration: Re-equilibrate the chromatography column with equilibration buffer.

*Note: * If the flow-through mode is used, the "sample loading" step should be set up for collection; The "washing" step ensures that after all the target molecules have flowed through, the collection can be stopped; In the "elute" step, the impurities are directly eluted with a high-salt buffer.*

7. Cleaning and recycling

As the number of uses of the chromatography medium increases, contaminants (e.g., lipids, endotoxins,

proteins, etc.) accumulate on the chromatography column. Regular in-place cleaning is essential to keep the column in stable working condition. Determine the frequency of in-place cleaning according to the degree of contamination of the chromatography medium (if the contamination is serious, it is recommended that in-place cleaning should be carried out after each use to ensure repeatable results and extend the working life of the chromatography medium).

For different types of impurities and contaminants, cleaning can be carried out under the following conditions:

- Removal of strongly binding proteins: Wash with 5x column volume of purified water.
- Removal of strong hydrophobic proteins and precipitated proteins: first wash with 1 M NaOH solution in 5 column volumes, and then clean the lye with 5-10 column volumes of purified water.
- Removal of lipoproteins and lipids: Wash first with 5x column volume of 70% ethanol or 30% isopropanol, then rinse with 5-10x column volume of purified water.

Note: 70% ethanol or 30% isopropanol should be degassed before use; The flow rate during the cleaning process can be selected from 30-60 cm/h; When the blockage is severe, reverse cleaning can be used.

8. Sterilization

In order to reduce the microbial load, it is recommended to use 0.5~1 M NaOH solution to treat the chromatography medium with a processing time of 15~30 min.

9. Stockpile

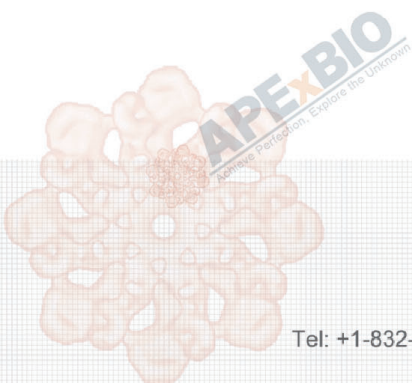
Unopened chromatography media, please keep in the original container; The completed chromatography column is first soaked with 20% ethanol solution and then the upper and lower column heads are closed. The storage environment is 4~30 °C.

10. Destruction and recycling

- Since HyperChrom Butyl 4FF Agarose chromatography media is difficult to degrade in nature, incineration of discarded chromatography media is recommended to protect the environment.
- For chromatography media exposed to bioactive samples such as viruses and blood, please follow local biosafety requirements before destroying or disposing of them.

Notes

1. It is recommended that the buffer and protein solution used for purification be filtered through a 0.22 µm or 0.45 µm membrane and then used on the column.
2. All chromatography media are kept in 20% ethanol solution with a glue suspension ratio of approximately 75%.
3. This product is for scientific purposes only.



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