

Sulfate-modified Cellulose Affinity Resin

Cat. No.: S1523014 | Pack size: 5 mL / 25 mL / 100 mL | Storage: 2-8 °C, do not freeze

Overview

This product is an affinity chromatography resin prepared by direct sulfate esterification of cellulose microspheres. Like agarose matrix microspheres, it belongs to natural polymer-derived "soft gels". Compared with agarose, cellulose microspheres use raw materials with standard grades, and the cellulose backbone contains no anionic groups. The non-specific adsorption of cellulose microspheres is 1/10 to 1/3 of that of agarose microspheres. For example, the non-specific adsorption of cytochrome C on the cellulose base matrix of this product can be as low as 2 µg/mL.

After sulfate esterification, the resin exhibits affinity for a variety of live viruses, inactivated or split viruses, viral or microbial antigens, and heparin-binding proteins.

Meanwhile, sulfate ester is an excellent salt-tolerant cation exchange ligand. It can also be used as a cation exchange medium, with a binding capacity for lysozyme up to 180 mg/mL, and remains well-bound at NaCl concentrations of 50-200 mM.

Aladdin Sulfate-modified Cellulose Affinity Resin is stored in 20% ethanol with a gel-to-storage solution volume ratio of 1:1. The product specification indicates the actual gel volume.

Product Parameters

Parameter	Specification
Matrix	Highly cross-linked cellulose
Ligand	Sulfate ester, 160-200 µmol H ⁺ /mL
Particle size range ①	45-165 µm
Mean particle size	~90 µm
Binding capacity ②	≥120 mg/mL
Recommended operating flow rate	60-150 cm/h
Maximum flow rate and pressure ③	300 cm/h, 0.3 MPa

Parameter	Specification
Working pH	4-8.5 (recommended); 3-12 (long-term stable); 2-14 (short-term stable)
Chemical stability	Stable in common aqueous buffers, 0.5 mol/L NaOH, etc.
Storage	20% ethanol, 2-8 °C
Shelf life	5 years

Notes

- ① More than 90% of microspheres by volume fall within this range;
- ② Test method: 2-hour incubation; result is close to DBC₁₀%;
- ③ Maximum tested flow rate at 10 cm bed height.

Instructions for Use

1. Column Packing

The following describes column packing for connection to a chromatography system.

- (1) Equilibrate all materials to chromatography temperature; degas liquids if possible.
- (2) Calculate medium volume: Settled medium volume = Column volume × Compression factor. Settled volume is the stable volume after full sedimentation in 20% ethanol storage solution. Compression factor of sulfate-modified cellulose affinity chromatography medium: ~1.15. Achieve compression by lowering the adapter or high-flow packing.
- (3) Wash medium: Mix medium suspension thoroughly, measure required volume, remove liquid, and wash with 3× medium volume of purified water (repeat 3 times) to remove storage solution.
- (4) Prepare packing suspension: Transfer medium to a suitable container, add packing buffer to make 50-75 v% suspension; mix well before use.
- (5) Pre-pack preparation: Add packing buffer to the bottom of clean column to eliminate air under the bottom frit; leave a small volume of distilled water, tighten bottom plug, and set column vertically.
- (6) Packing: Pour mixed suspension slowly and in one batch into the column (use a packing reservoir if needed), running down the inner wall to avoid bubbles. Fill reservoir with packing buffer, seal top, and connect to system.
- (7) Compaction: Let medium settle naturally (or at 50-150 cm/h). After complete settling (clear gel-liquid interface), remove reservoir, install top adapter, and lower adapter to interface. Compact at high flow (see table below; do not exceed 0.3 MPa) until interface is stable; mark bed height. Stop

pump, open top vent/plug, close bottom valve/plug, lower adapter to marked position corresponding to compression factor, tighten adapter. Equilibrate column at high flow after packing.

Packing condition	Sulfate-modified Cellulose Affinity Resin
Compression factor	1.15
Packing flow rate	150-300 cm/h

2. Column Efficiency Test & Evaluation

Column efficiency can be measured and evaluated to confirm the packing quality after packing and before use. Column efficiency is usually evaluated by Height Equivalent to a Theoretical Plate (HETP) and Asymmetry factor (As).

Column efficiency can be determined using acetone or NaCl as samples. Prepare sample solutions and mobile phases according to the table below.

Item	1.0% Acetone	0.8-1.0 M NaCl
Sample volume	1.0% column volume	1.0% column volume
Mobile phase	Pure water	0.4 M NaCl
Flow rate	30 cm/h	30 cm/h
Detector	UV-280 nm	Conductivity

Calculate HETP, Number of theoretical plates (N) and As based on UV or conductivity curves using the following formulas:

$$\text{HETP} = L / N$$

$$N = 5.54 \times (V_r / W_h)^2$$

$$A_s = a / b$$

Where: L = column height; V_r = retention volume; W_h = peak width at half height; a = first half-peak width at 10% peak height; b = second half-peak width at 10% peak height. Generally, HETP should be less than three times the mean particle size of the resin (i.e., $\text{HETP}/D_{50} < 3$, D_{50} = mean particle size of the resin), and A_s should be between 0.8 and 1.5.

3. Equilibration & Loading

Equilibrate column with starting buffer A at operating flow rate until conductivity, pH, etc., are stable. Common buffers: phosphate, citrate, Tris-HCl, pH 4-9 (e.g., 10 mM PB + 50-150 mM NaCl, pH 7.5).

4. Elution

Elute target protein by increasing salt concentration in buffer A, typically with 0.5-2 M NaCl.

Process screening: linear gradient elution to determine optimal salt concentration.

Process optimization: step gradient elution to save buffer and improve efficiency.

5. Regeneration & Cleaning-in-Place (CIP)

Standard regeneration cleans medium thoroughly. For elevated backpressure or cross-contamination prevention, use: 1-2 mol/L NaCl, 0.5 mol/L NaOH, 70% ethanol, or 30% isopropanol. CIP removes impurities effectively; reverse flow is preferred. Wash with 3-5 column volumes (CV) of pure water after cleaning.

CIP procedure	Purpose
1-2 mol/L NaCl, 0.5-2 CV; water, 3-5 CV	Remove ionically bound impurities
0.5 mol/L NaOH, 1-2 h contact time (longer for endotoxin); buffer A, 5-10 CV; water, 3-5 CV	Remove protein precipitates, hydrophobic proteins, or pyrogens
30% isopropanol or 70% ethanol, 5-10 CV; water, 3-5 CV	Remove tightly bound lipoproteins and liposomes

6. Resin Storage

The initial storage solution for the resin is 20% ethanol. After use, it can still be stored in 20% ethanol. The suitable storage temperature is 2-8 °C; do not freeze.

Specifications

Parameter	Specification
Specifications & Purity	BioReagent, 50% v/v; 45-165 µm
Stability And Storage	Store at 2-8 °C long term (60 months). Do not freeze.
Storage Conditions	Store at 2-8 °C, do not freeze
Shipped In	Wet ice, do not freeze. This product requires cold chain shipping. Ground and other economy services are not available.

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NORTH AMERICAN SALES, SUPPORT & GENERAL INQUIRIES

Aladdin Scientific Corporation

14078 Meridian Parkway, Riverside, CA 92518, USA

Phone: 1-833-552-7181

Sales: sales@aladdinsci.com

Customer Service: custserv@aladdinsci.com

EU SALES, LOGISTICS & LOCALIZED SUPPORT

Aladdin Biochem Deutschland GmbH

Westring 2, 33142 Büren, Germany

Phone: +02951 9383958

Support: support.eu@aladdinsci.com

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