Pall Corporation

SDR HyperD® Solvent-Detergent Removal Chromatography Resin

Description

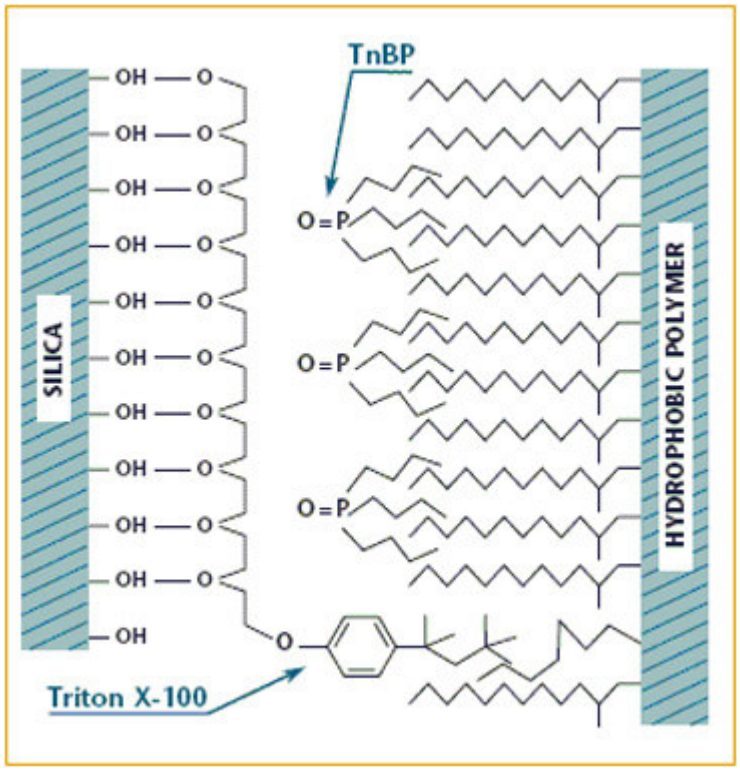
Chromatography resin for detergent removal

- Binds detergent and solvent used in viral inactivation processes (TnBP and Triton® X-100).
- High dynamic binding capacity for many different detergents.
- High recovery of proteins (exclusion limit 10 kDa).
- High adsorption capacity for small hydrophobic molecules.
- Stable in acidic, polar organic and oxidizing solutions.

SDR HyperD is a composite sorbent that combines a silica-bead moiety filled with a three-dimensional cross-linked hydrophobic polymer. The SDR HyperD sorbent structure has been engineered for optimal solvent/detergent retention. Due to the degree of three-dimensional polymer cross-linking, an exclusion limit of 10 kDa means that target proteins are "excluded" from the sorbent, and are found unretained in the column void volume. Conversely, the high specific surface area (200 m^2/g) of the porous silica translates into a high capacity for detergent and solvents. The particle size distribution (40-100 µm), the silica bead pore size, and the polymer have all been optimized for retention of solvents and detergents used in viral inactivation processes (i.e., Tri-n-Butyl Phosphate (TnBP) and Triton® X-100).[1] SDR HyperD sorbent is also very effective at removing detergents typically used in protein solubilization for other applications (i.e., ASB-14, CHAPS and SDS).

The suggested mechanism of action for adsorption of Triton X-100 is illustrated in Figure 1. Triton X-100 interacts both with the silica surface (formation of hydrogen bonds between the silanols and the polyoxyethylene chain) and with the hydrophobic polymer moiety. TnBP interacts only with the hydrophobic polymer. The adsorption mechanism can utilize either or both the silica moiety and the hydrophobic polymer. The adsorption of Triton X-100 is proportional to the silica surface area, whereas the adsorption of TnBP is linked to binding to the organic polymer moiety. In addition to the chemical interaction of the detergent with the surface, the bead itself has small pores such that only molecules >10 kD will enter the bead. This means that some peptides might also bind to this resin. SDR has proven useful for rapid detergent removal even when the detergent concentration is above the CMC and micelles are present. This is probably related to the equilibrium between micelle and free detergent molecules and/or a disruption of micelle structure on contact with the bead. The properties of SDR HyperD sorbent are summarized in Specifications and the adsorption mechanism is represented below in Figure 1.

Figure 1
Schematic Interaction Mechanism of Triton X-100 and TnBP on SDR HyperD Sorbent



Specifications

Sorbent Structure

Spherical silica beads filled with a three-dimensional hydrophobic polymer

Average Particle Size

40 - 100 µm

Nature of Polymer

Hydrophobic, long aliphatic chains bind solvents; 10 kDa limit prevents proteins from being retained

Typical Sample Load

2 - 3 times the column volume with residence times of 5 min using IgG or ATIII treated solutions

Recommended Residence Time

5 - 15 min

Binding Capacity for Triton X-100

60 - 80 mg/mL
(Determined using 5 mg/mL Triton X-100 in PBS, pH 7.4, 10% breakthrough, 300 cm/h.)

Adsorption Buffer

PBS

Solvent/Detergent Elution Buffer

PBS/Ethanol (50/50) and EtOH or/and isopropanol

Operating pH Range

Sorbent Pressure Resistance

70 bar (1000 psi)

Applications

- Ideal for the removal of various detergents from samples where it is necessary to eliminate detergent.

Performance

Removal of Detergents from Protein Solutions: Packed Column Format

Detergent	Protein Solutions		
Triton (DBC = 60 - 80 mg/mL)	IgG	AT-III	Bovine Serum
Initial Conc. (ppm)	10,000	10,000	10,000
Final Conc. (ppm)	<10	<10	340
Removal Efficiency	> 99.9%	> 99.9%	95.2%

- SDR HyperD resin binds detergents used in viral inactivation processes (TnBP and Triton® X-100).
- High recovery of proteins (exclusion limit 10 kDa).
- High adsorption capacity for small hydrophobic molecules.
- Stable in acid, polar organic and oxidizing solutions.

SDR HyperD Detergent Removal: Dynamic Binding in a Gravity Flow Column (0.5 - 2.0 mL Volume)

Detergent	Binding Capacity* (mg/mL)
ASB-14 in PBS	60.0
ASB-14 + 6M Urea / 2M Thiourea	70.0
CHAPS in PBS	75.0
SDS in Water	15.0
SDS + 0.1 M NaCl	28.0

> 99% protein recovery.

- SDR HyperD has a high dynamic binding capacity for many different detergents.
- High protein recovery in all cases.
- High binding in the presence of urea/thiourea and NaCl.
- Binding of both ionic and zwitterionic detergents.

SDR HyperD Detergent Removal: Spin Column Format (< 0.2 mL Volume)

Detergent	Removal Efficiency from a Protein Sample*		
	+ 1%**	+ 5%	+ 10%
ASB-14	> 99%	> 99%	80-90%
ASB-14 + 6M urea	> 99%	80-90%	NR
CHAPS	> 99%	> 99%	> 99%
CHAPS + 6M urea	> 99%	> 99%	80-90%
SDS	> 99%	> 99%	> 99%
SDS + 0.1 M NaCl	> 99%	> 99%	> 99%

0.2 mL of 5 mg/mL BSA in ** the presence of detergents (Wt./v). Bio-Rad dye binding assay used to follow removal of detergents. NR denotes not recommended as this detergent loading would exceed the column capacity.

- Using a rapid spin column format, the binding capacity of SDR for detergents is still very high
- In all cases, > 99% of detergent removed from 0.2 mL of a 1% solution
- High protein recovery
- Fast processing in < 5 min
- Single or multiwell formats

Additional Information

- Q, S, DEAE, CM Ceramic HyperD® Ion Exchange Sorbents, Laboratory Scale Volumes
- Nanosep® & Nanosep MF Centrifugal Devices
- Nanosep® MF Centrifugal Devices with GHP Membrane
- AcroPrep™ 384 Filter Plates, 100 µL, for Sample Preparation and Detection
- AcroPrep™ 96 Filter Plates, 1 mL, for Sample Preparation and Detection
- AcroPrep™ 96 Filter Plates, 350 µL, for Sample Preparation and Detection
- AcroWell™ 96 Membrane-bottom Plates with Binding Membranes for Detection and Screening
- AcroWell™ 96 Membrane-bottom Plates with GHP Membrane for Detection and Screening
- Protocols for SDR HyperD Solvent-Detergent Removal Chromatography Resins
- PII: SDR HyperD® Solvent-Detergent Removal Sorbent

Ordering Information

AcroSep Chromatography Columns for Mixed-Mode

Part Number	Description	Pkg
20033-C001	SDR HyperD, 1 mL, Natural	5/pkg

SDR HyperD Solvent-Detergent Removal Chromatography Resin

Part Number	Description	Pkg
20033-065	SDR HyperD	5 mL
20033-031	SDR HyperD	25 mL
20033-023	SDR HyperD	100 mL

Contact Information

Visit us on the Web at www.pall.com

This information is accurate as of the revision date indicated.