Spectra/Por®

Biotech Dialysis Membranes

Cellulose Ester (CE)

Regenerated Cellulose (RC)

Product Information & Operating Instructions

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Leading the Way in Bioseparation

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Introduction

Spectra/Por® Biotech Membranes are the newest generation of Spectra/Por® dialysis membranes. The principle benefit of Spectrum's Biotech membranes over traditional membranes is the manufacturing process which eliminates the use of metal salts. This process provides high purity membranes and eliminates the need for special cleaning treatments. Spectra/Por® Biotech membranes require only minimal rinsing to remove the preservative if present. Biotech Regenerated Cellulose (RC) membranes are used when resistance to various organic solvents is required. Biotech Cellulose Ester (CE) membranes provide a wide selection of rigidly controlled MWCO's ranging from 100 to 1,000,000 Daltons.

Applications

Spectra/Por Biotech membranes are ideal for many applications such as:

- Removal of salts, surfactants and solvents
- Buffer and pH adjustment of sample solutions
- Concentration of protein, peptides or antibodies
- DNA electroelution
- Preparation of diluted proteins prior to electrophoresis
- Removal of contamination micromolecules
- Binding studies
- Tissue culture extract purification

Spectra/Por® Biotech CE & RC Membranes

Specifications

Specification	Biotech RC	Biotech CE
Membrane Type:	Symmetric Regenerated Cellulose	Symmetric Cellulose Ester
MWCO:	3.5k, 8k, 10k, 15k, 25k Daltons	100-500, 500-1000, 3.5-5k, 8-10k, 20k, 50k, 100k, 300k, 1000k Daltons
Physical Appearance:	Opaque, Flexible	Opaque, Rigid
Organic Solvent Tolerance:	Good	Fair
Packaging:	Dry with glycerine (humectant)	Wet with 0.05% Sodium Azide
Flat width	10 and 16 mm	10, 16, 24 and 31 mm
Sample volume range	0.5 ml to 30 ml	0.5 ml to 60 ml
pH limits:	2 to 12	2 to 9
Suggested Temperature Limit:	60 °C	37 °C

Selecting Membrane Type (CE and RC)

The membrane compatibility table (page 12) is intended for use as a guide for selecting the proper membrane type. Variables in temperature, concentrations, duration of exposure and other factors may affect the performance of the membranes. Generally, the Regenerated Cellulose (RC) membranes have a better resistance to most chemical solutions than Cellulose Ester (CE) membranes.

Spectra/Por® Biotech Cellulose Ester (CE) membrane tubing is extruded from a polymeric mixture composed of cellulose acetate. CE is sensitive to organic solvents. Strong polar solvents such as acetone, Methyl Ethyl Ketone (MEK) or dioxane will irreparably damage the membranes. Lower alcohols such as methanol, ethanol, and isopropanol can be used with CE membranes at short exposure times or low concentrations.

Spectra/Por® Biotech Regenerated Cellulose (RC) membrane is manufactured by regenerating the synthetic cellulose polymer of the CE Tubing. RC has a good chemical resistance to the following groups: hydrocarbons, halogenated hydrocarbons, alcohol, ketones, esters, oxides, solvents containing nitrogen. RC membranes are not recommended for use with hydrochloric acid > 25%, nitric acid > 25%, 96% sulfuric acid, 25% perchloric acid, 1N potassium hydroxide, and 10% aqueous phenol.

Spectra/Por® Biotech CE & RC Membranes

MWCO and Membrane Permeability

The primary variable characterizing a dialysis membrane is its molecular weight cut off (MWCO). Spectrum determines the MWCO of a membrane by conducting a 17 hour dialysis test with standards of known molecular weight. The MWCO of the membrane is ascribed as the molecular weight of the smallest solute which is at least 90% retained during this test. Every lot of Spectra/Por® Biotech membrane is characterized with this test to verify the MWCO.

Dialysis membranes may also be characterized by the rate at which a permeable species passes through the membrane. A rate test may be carried out by placing a solution of a permeable species on one side of a membrane and pure solvent on the other. If both the solution and the solvent are well stirred and the pure solvent is constantly changed (so that it never contains an appreciable concentration of solute), a first-order rate will be observed.

A very important variable in the rate of dialysis is the molecular weight of the solute. As the molecular weight of a permeable solute increases, the rate of dialysis decreases. As the solute's molecular weight nears the MWCO the rate will slow dramatically, until finally, the molecules become too large to pass through the membrane.

Selecting MWCO

The effective size of many molecules is affected by the pH and ionic strength of the solution in which they are dissolved. Therefore, the listed MWCO values should be used merely as typical and not absolute values. To establish the optimal MWCO for any application, it may be necessary to test several MWCO's. To maximize the rate of dialysis, the membrane with the largest MWCO without excessive product loss should be used.

Although the pore size of Spectra/Por Biotech membranes is controlled to give the sharpest MWCO available, dialysis cannot be expected to effect an efficient separation of two molecular species with relatively similar molecular weights.

The MWCO selection is based on the molecular weight (MW) of the macromolecules that is going to be retained inside the membrane and the MW of the micromolecule contaminants to be removed. For reasonably efficient separation by means of dialysis with Spectra/Por membranes, the ratio of molecular weights of the two species to be separated should be at least 25. A rule of thumb in choosing a MWCO is to select a MWCO value about half of the MW of the macromolecules to be retained in order to assure a minimum 90% retention.

Spectra/Por® Biotech CE & RC Membranes

Selecting Tubing Flat Width

The selection of the tubing flat width depends on the size of the sample volume and the dialysis reservoir. The narrower tubing (which has a higher surface area to volume ratio) will dialyze more quickly than the wider tubing due to the longer diffusion distances involved. For easy handling of the membrane tubing, the suggested total length including closures and 10% head space should be approximately 10 to 15 cm. The “Volume/Length” ratio (ml/cm) is provided in the catalog and packaging label.

HELPFUL TIP: Use our on-line Tubing Calculator at *www.spectrumlabs.com* to help determine the most appropriate Flat Width and tubing length for your sample.

Selecting Tubing Closures

Universal Closures (Nylon)

Universal Closures must be used for rigid membranes such as CE and PVDF (Polyvinylidene Difluoride). and can also be used for RC membrane. Made from nylon, Universal Closures naturally sink and tether one end of the membrane down in a vertical floating position. They are not autoclavable.

Spectra/Por® Closures (Polypropylene)

Spectra/Por® closures are ONLY used for RC membranes. DO NOT USE WITH CE OR PVDF, will cause leaks. Made from polypropylene, Spectra/Por Closures are naturally buoyant and autoclavable.

Three types of Spectra/Por Closures are available:

- **Standard Closures** float on their own. The standard closures should be used to seal the top of the tubing.
- **Weighted Closures** contain a stainless steel bar which is embedded in the standard closures. The weighted closures are applied at the bottom of the membrane tubing to maintain a vertical floating orientation.
- **Magnetic Weighted Closures** contain a magnet to replace the magnetic stir bar. When the buffer tank is placed on a magnetic stir plate, the magnetic closure is used to rotate the tubing during dialysis.

Spectrum recommends a closure width of 4 to 10 mm longer than the tubing flat width to assure a secure seal and prevent leakage.

Sterilization

The following methods are approved for sterilizing Biotech CE and RC dialysis membrane:

Gamma Irradiation at 20 KG

Ethylene Oxide Gas exposure

Autoclaving is not recommended since it will likely have adverse affects on the membrane porosity and MWCO.

Spectra/Por® Biotech CE & RC Membranes

Membrane Preparation and Storage

Spectra/Por® Biotech membranes must not be allowed to dry if previously wetted. Drying causes irrecoverable collapse of the pore structure.

For maximum shelf life of wet membranes, the preservative solution should be changed periodically.

Spectra/Por® Biotech Regenerated Cellulose (RC)

Membrane Preparation: Soak the membranes in water for 15-30 minutes at room temperature to remove glycerine. Then, rinse the membrane thoroughly in deionized water.

Storage: Store dry membrane at room temperature or at 4°C in a polyethylene bag. Once wet, membranes should be immersed in a solution of one of the following: 0.05% sodium azide, 1% sodium benzoate or 1% formaldehyde and stored at 4°C.

Spectra/Por® Biotech Cellulose Ester (CE)

Membrane Preparation: Soak the membrane in water for 15 minutes at room temperature to remove the sodium azide preservative agent. Then rinse the membrane thoroughly in deionized water.

Storage: Immerse in a solution of one of the following: 0.05% sodium azide, 1% sodium benzoate or 1% formaldehyde and store at 4°C.

Instructions for Use

The following dialysis procedure is a general protocol for basic dialysis. There are many variables that should be taken into consideration before starting the dialysis of your sample. Some of the variables that will affect the rate of dialysis are sample solvent, membrane compatibility, membrane MWCO, dialysate solvent, dialysate volume, temperature, etc. Therefore, some application specific changes to the following dialysis procedure may be necessary.

1. Fill a Spectra/Por Dialysis Reservoir with a large volume of appropriate dialysate (buffer). The dialysate volume should be about 100X the sample volume. (Example: dialyze 10 ml of sample in one liter of dialysate.)
2. Cut dialysis tubing into appropriate lengths. Allow extra tubing length (about 10% of total sample volume) for a small head space. This insures that the sack will float and not be damaged by the rotating stir bar. Prepare the tubing according to the directions for use.
3. Open the closure by releasing the security lock. Insert dialysis tubing into the opened Closure and reclamp with approximately 3 to 5 mm of tubing extending from the closure. Do not fold Cellulose Ester (CE) membranes.
4. Load the sample into dialysis tubing through the open end. Adjust the length for a head space and clamp the tubing closed with a second closure.
5. Place the dialysis sample in appropriate dialysis buffer.
6. Drop a clean magnetic stir bar into the dialysis reservoir. Make sure that the stir bar is large enough to stir the entire dialysate volume but not too large that it can not freely rotate. Place the dialysis reservoir on a stirrer. Adjust the control for the maximum speed such that the vortex does not pull the sample down.
7. Dialyze according to specific application requirements. Typically, the samples are dialyzed at room temperature, over-night (12-20 hours) and with 3-4 complete buffer changes (after 2-4, 6-8 and 10-14 hours).
8. Grasp the tubing extending from Closure and unclamp Closure. Decant the dialyzed sample or remove it with a Pasteur Pipette or syringe. Very small samples may also be recovered by carefully puncturing the tubing and drawing the sample into a syringe using a 24 gauge hypodermic needle.
9. Typically, dialysis is allowed to run overnight. During the duration of dialysis, the entire dialysate volume should be changed for fresh dialysate solution at least three times. Recommended dialysate changes are at 2-4 hours, 6-8 hours, and 10-14 hours (next morning). Dialysis should be allowed to continue for at least 2 hours after the last dialysate change. **Note:** For highly concentrated contaminants, sample may need to dialyze for a longer duration with more frequent dialysate changes.

The temperature of dialysis primarily depends on the sample. There are temperature limits depending on the membrane type being used. CE can withstand temperatures up to 37°C. RC can withstand temperatures up to 60°C.

Spectra/Por® Biotech CE & RC Membranes

Membrane Compatibility Table

This chemical resistance chart is intended for use as a guide, not as a guarantee of chemical compatibility. Variables in temperature, concentrations, durations of exposure and other factors may affect the use of the product. It is recommended to test under your own conditions.

The following codes are used to rate chemical resistance:

R	Recommended
L	Limited Exposure
NR	Not Recommended
U	Unknown

Regenerated Cellulose (RC) Cellulose Ester (CE)			Regenerated Cellulose (RC) Cellulose Ester (CE)		
Acetic acid (diluted-5%)	L	R	Cellosolve	NR	L
Acetic acid (med conc-25%)	NR	R	Chloracetic acid	NR	R
Acetic acid (glacial)	NR	R	Chloroform	L	R
Acetone	NR	R	Chromic acid	NR	NR
Acetonitrile	NR	R	Cresol	NR	R
Ammonium hydroxide (diluted)	NR	R	Cyclohexane	L	R
Ammonium hydroxide (med conc)	NR	L	Cyclohexanone	NR	R
Amyl acetate	NR	R	Diacetone alcohol	NR	R
Amyl alcohol	L	R	Dichloromethane	L	R
Aniline	NR	R	Dimethyl formamide	NR	L
Benzene	NR	R	Dimethylsulfoxide	NR	R
Benzyl alcohol	NR	R	1,4 Dioxane"	NR	L
Boric acid	R	R	Ethers	NR	R
Brine	R	R	Ethyl acetate	NR	R
Bromoform	NR	R	Ethyl Alcohol	L	R
Butyl acetate	NR	R	Ethyl alcohol (15%)	R	R
Butyl alcohol	L	R	Ethyl alcohol (95%)	L	R
Butyl cellosolve	NR	L	Ethylene dichloride	NR	R
Butylraldehyde	NR	R	Ethylene glycol	L	R
Carbon tetrachloride	NR	R	Ethylene oxide	NR	L
			Formaldehyde (2%)	L	R

Spectra/Por® Biotech CE & RC Membranes

Regenerated Cellulose (RC) Cellulose Ester (CE)			Regenerated Cellulose (RC) Cellulose Ester (CE)		
Formaldehyde (30%)	L	R	Nitric acid (concentrated)	NR	NR
Formic acid (25%)	NR	R	Nitrobenzene	NR	L
Formic Acid (50%)	NR	R	Nitropropane	NR	L
Freon®	R	R	Oils, mineral	R	R
Gasoline	R	R	Pentane	R	R
Glycerine	R	R	Perchloric acid (25%)	NR	L
Glycerol	R	R	Perchloroethylene	NR	R
Hexane	R	R	Petroleum based oils	R	R
Hexanol	L	R	Petroleum ether	R	R
Hydrochloric acid (diluted-5%)	R	R	Phenol (0.5%)	R	R
Hydrochloric acid (med conc-25%)	NR	NR	Phenol (10%)	NR	R
Hydrochloric acid (con-37%)	NR	NR	Phosphoric acid (25%)	NR	L
Hydrofluoric acid (25%)	NR	L	Potassium hydroxide (1N)	L	L
Hydrogen peroxide (30%)	NR	NR	Potassium hydroxide (25%)	NR	R
Iodine solutions	NR	NR	Potassium hydroxide (50%)	NR	NR
Isobutyl alcohol	R	R	Propanol	R	R
Isopropanol	L	R	Pyridine	NR	R
Isopropyl acetate	NR	R	Silicone oil	R	R
Isopropyl alcohol	L	R	Sodium hydroxide (0.1N)	L	R
Isopropyl ether	L	R	Sodium hydroxide (diluted-5%)	NR	L
Jet Fuel 640A	R	R	Sodium hydroxide (25%)	NR	L
Kerosene	R	R	Sodium hydroxide (conc-50%)	NR	NR
Lactic acid	R	R	Sodium Hydroxide(Concentrated)	NR	NR
Methyl acetate	NR	R	Sodium Hypochlorite	R	R
Methyl alcohol	L	R	Sulfuric acid (diluted-5%)	L	R
Methyl alcohol (98%)	L	R	Sulfuric acid (med conc-25%)	NR	L
Methyl cellosolve	L	L	Sulfuric acid (6N)	NR	L
Methyl Chloride	NR	R	Sulfuric Acid (concentrated)	NR	NR
Methyl ethyl ketone	NR	R	Tetrahydrofuran	NR	R
Methyl formate	NR	L	Toluene	R	R
Methyl isobutyl ketone	NR	R	Trichloroacetic acid (25%)	NR	NR
Methylene chloride	L	R	Trichlorobenzene	NR	R
N-Methyl-2-Pyrrolidone	NR	R	Trichloroethane	L	R
Mineral spirits	R	R	Trichloroethylene	R	R
Monochlorobenzene	L	R	Triethylamine	NR	R
Nitric acid (diluted-5%)	L	R	Turpentine	NR	R
Nitric acid (med conc-25%)	NR	NR	Urea	R	R
Nitric acid (6N)	NR	N	Urea (6N)	NR	R
Nitric acid (conc-70%)	NR	NR	Water	R	R
			Xylene	NR	R

Ordering Information

Spectra/Por® Cellulose Ester Membranes

- Supplied wet in 0.05% sodium azide (preservative)
- Package of 33 feet /10 meters

Spectra/Por® Biotech Regenerated Cellulose Membranes

- Supplied dry with glycerine (humectant)
- Package of 33 feet /10 meters
- Trial size (1 m/roll) for 16 mm FW

	MWCO	Biotech Tubing (10m/roll)				Trial Size (1m/roll)
		FW: 10mm Dia: 6.4mm Vol/L: 0.32 ml/cm	16mm 10mm 0.79 ml/cm	24mm 16mm 1.8 ml/cm	31mm 20mm 3.1 ml/cm	16mm 10mm 0.79 ml/cm
Biotech CE	0.1-0.5 kD	131048	131054	131057	131060	131054T
	0.5-1.0 kD	131084	131090	131093	131096	131090T
	3.5-5 kD	131192	131198	131201	131204	131198T
	8-10 kD	131264	131270	131273	131276	131270T
	20 kD	131336	131342	131345	131348	131342T
	50 kD	131372	131378	131381	131384	131378T
	100 kD	131408	131414	131417	131420	131414T
	300 kD	-	131450	-	-	131450T
	1000 kD	-	131486	-	-	131486T
Biotech RC	3.5 kD	133110	133116	-	-	
	8 kD	129015	129020	-	-	
	10 kD	128610	128616	-	-	
	15 kD	129115	129120	-	-	
	25 kD	128620	128626	-	-	

Spectra/Por® Biotech CE & RC Membranes

Spectra/Por® Float-A-Lyzer® G2:

Ready-to-Use Dialysis Device

Designed for convenience and ease-of-use, the Float-A-Lyzer® G2 Dialysis Device is manufactured with Biotech CE membrane and ready-to-use, eliminating the need for membrane preparation and the use of tubing closures. These pre-assembled dialysis devices are available in 3 volume sizes: 1 ml, 5 ml and 10 ml. The leak-proof screw-on cap provides easy access with a pipette for loading and retrieving the sample, while the floatation ring keeps the sample buoyant and vertically oriented.

- Biotech CE Membrane
- Supplied dry with glycerine (humectant)
- 12/package

MWCO	Cap Color	Part No. 1 ml	5 ml	10 ml
0.1 - 0.5 kD	Green	G235025	G235049	G235061
0.5 - 1.0 kD	Orange	G235027	G235051	G235063
3.5 - 5 kD	Black	G235029	G235053	G235065
8 - 10 kD	Yellow	G235031	G235055	G235067
20 kD	Red	G235033	G235057	G235069
50 kD	Violet	G235034	G235058	G235070
100 kD	Blue	G235035	G235059	G235071
300 kD	Amber	G235036	G235060	G235072
1,000 kD	Pink	G235037	G235062	G235073

To place an order go to www.spectrumlabs.com or:

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