

**Spectra/Por®**

# Biotech Grade Dialysis Membranes

Cellulose Ester (CE)  
Regenerated Cellulose (RC)



Product Information & Operating Instructions

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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 with a higher molecular selectivity.

## 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

## Specifications

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

### Selecting Membrane Type (CE and RC)

The membrane compatibility table (page 12) is intended as a guide for selecting the proper membrane type. Variability 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 and 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.

### MWCO and Membrane Permeability

The widely used method to characterize dialysis membranes is the 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 that is retained by at least 90% 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 conducted 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 transfer 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 which will not cause excess loss of the desired species 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, there should be a 25 fold difference between the molecular weights of the two species. For optimal retention yield, select a MWCO that is 50-80% of the MW of the macromolecule to be retained. For optimal retention purity, select a MWCO that is 50-100 times larger than the MW of the solutes to be eliminated.

## 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 efficiently 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](http://www.spectrumlabs.com) to help determine the most appropriate Flat Width and tubing length for your sample.

## Selecting Tubing Closures

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

Closures are available in two types of material: polypropylene (Spectra/Por) or nylon (Universal).

### Universal Closures (Nylon)

Universal Closures can be used for all membrane types but are required for use with rigid membranes like CE. Made from nylon, Universal Closures naturally sink and anchor one end of the membrane down in a vertical floating position. A head-space (20% air by volume) should be permitted to assure sample buoyancy. Universal Closures are not autoclavable.

### Spectra/Por® Closures (Polypropylene)

Spectra/Por® closures are ONLY used for RC membranes. DO NOT USE WITH CE; 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 PTFE coated stainless steel bar 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 PTFE coated magnet to replace the magnetic stir bar. When the buffer reservoir is placed on a magnetic stir plate, the magnetic closure is used to rotate the tubing during dialysis.

### Sterilization

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

E-Beam at 20 KG

Ethylene Oxide Gas exposure

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

### 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 20% of total sample volume) for a small head space. This insures that the loaded tubing will float and not be damaged by the rotating stir bar. Prepare the tubing according to the directions for use on page 9.
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 clamp over folds or creases.
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 magnetic stirrer and adjust the stirring speed such that the dialysate rotates creating just enough vortex to center the sample without pulling it down.
7. Dialyze according to specific application requirements. Typically, dialysis is allowed to run overnight. During the course 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.
8. Grasp the tubing extending from the upper Closure and then unclamp the upper Closure. Decant the dialyzed sample or remove it with a Pasteur Pipette or syringe.

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.

## Membrane Compatibility Table

This chemical resistance chart is intended for use as a guide, not as a guarantee of chemical compatibility. Variability 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:

<b>R</b>	Recommended
<b>L</b>	Limited Exposure
<b>NR</b>	Not Recommended
<b>U</b>	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
Butylaldehyde	NR	R	Ethylene glycol	L	R
Carbon tetrachloride	NR	R	Ethylene oxide	NR	L
			Formaldehyde (2%)	L	R

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	NR
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

**Biotech Cellulose Ester (CE) Membrane** wet in 0.05% sodium azide

- Dialysis Tubing - 10 m/roll
- Dialysis Trial Kit - 1 m/roll, 2 closures, 5 picks

	MWCO	FW:	10 mm	16 mm	24 mm	31 mm
		Dia:	6.4 mm	10 mm	16 mm	20 mm
		Vol:	0.32 mL/cm	0.79 mL/cm	1.8 mL/cm	3.1 mL/cm
Biotech CE Tubing (10 m/roll)	0.1-0.5 kD	131048	131054	131057	131060	
	0.5-1.0 kD	131084	131090	131093	131096	
	3.5-5 kD	131192	131198	131201	131204	
	8-10 kD	131264	131270	131273	131276	
	20 kD	131336	131342	131345	131348	
	50 kD	131372	131378	131381	131384	
	100 kD	131408	131414	131417	131420	
	300 kD	-	131450	-	131456	
	1000 kD	-	131486	-	131492	
Biotech CE Trial Kits (1 m/roll)	0.1-0.5 kD	131048T	131054T	131057T	131060T	
	0.5-1.0 kD	131084T	131090T	131093T	131096T	
	3.5-5 kD	131192T	131198T	131201T	131204T	
	8-10 kD	131264T	131270T	131273T	131276T	
	20 kD	131336T	131342T	131345T	131348T	
	50 kD	131372T	131378T	131381T	131384T	
	100 kD	131408T	131414T	131417T	131420T	
	300 kD	-	131450T	-	131456T	
	1000 kD	-	131486T	-	131492T	

## Ordering Information

**Biotech Regenerated Cellulose (RC) Membrane** dry with glycerin

- Dialysis Tubing - 5 m/roll
- Dialysis Trial Kit - 0.5 m/roll, 2 closures, 5 picks

	MWCO	FW:	10 mm	16 mm
		Dia:	6.4 mm	10 mm
		Vol:	0.32 mL/cm	0.79 mL/cm
Biotech RC Tubing (5 m/roll)	3.5-5 kD	133192	133198	
	8-10 kD	133264	133270	
	20 kD	133336	133342	
	50 kD	133410	133416	
Biotech RC Trial Kits (0.5 m/roll)	3.5-5 kD	133192T	133198T	
	8-10 kD	133264T	133270T	
	20 kD	133336T	133342T	
	50 kD	133410T	133416T	

**Ready-to-Use Dialysis Devices:****Float-A-Lyzer® G2 for Ultimate Convenience**

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 (disposable pipette included)

**Ordering Information for Float-A-Lyzer G2®**

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

**Micro Float-A-Lyzer®  
for Easy Dialysis of Very Small Volumes**

Ready-to-Use and disposable, the Micro Float-A-Lyzer® is designed for the convenient dialysis of sample volumes less than 500 µl. This Microdialysis Device incorporates Spectrum's Biotech CE membrane in 7 MWCO's providing the best selectivity and requiring no pre-cleaning preparation. Self-standing and self-floating, these pre-assembled devices are available in 2 volume sizes: 100-200 µl and 400-500 µl. The included 1 ml syringe provides easy loading and total sample recovery while the color-coded (MWCO) Luer-Lok® cap assures a tight seal and permits access for in-process testing.

- Biotech CE Membrane
- Supplied dry with glycerin (humectant)
- 12/package (syringes included)

**Ordering Information for Micro Float-A-Lyzer®**

MWCO	Cap Color	Part No.	
		100-200 µl	400-500 µl
0.1-0.5 kD	Green	F235049	F235061
0.5-1.0 kD	Orange	F235051	F235063
3.5-5 kD	Black	F235053	F235065
8-10 kD	Yellow	F235055	F235067
20 kD	Red	F235057	F235069
50 kD	White	F235058	F235070
100 kD	Blue	F235059	F235071