

## P-3500 NT LCD

Udel P-3500 NT LCD is a very high molecular weight grade of polysulfone, and therefore offers the greatest toughness and chemical resistance of the available grades. It can be fabricated by both solution and melt processes. Solution processing is used to prepare flat sheet and hollow-fiber membranes, coatings, and films. Melt processing techniques include extrusion, thermoforming, injection and blow molding. The relatively low melt flow suggests that components requiring long flow lengths and thin walls may be difficult to mold using this grade, and one of the higher melt flow grades, such as P-1700, may be better suited for them.

The advantages of Udel P-3500 NT LCD are attributed to the lower level of cyclic dimer present in the polymer. Cyclic dimer, normally produced during the manufacturing of polysulfone, can lead to 'scaling' within the vessels and pipes used in the membrane manufacturing process.

Polysulfone is a tough, rigid, and transparent high-strength thermoplastic that is suitable for long-term use up to 300°F (149°C). It is resistant to oxidation and hydrolysis, and withstands pro-

longed exposure to high temperatures and repeated sterilization. Polysulfone is resistant to mineral acids, alkali, salt solutions, detergents, and hydrocarbon oils. Contact with polar solvents such as ketones, chlorinated hydrocarbons, and aromatic hydrocarbons should be avoided as these types of chemical compounds can cause stress cracking or solvate polysulfone resin.

Polysulfone is highly resistant to degradation by gamma or electron beam radiation but can be adversely affected by long term exposure to ultraviolet. Electrical properties of the polymer are very stable over a wide range of temperatures and after immersion in water or exposure to high humidity.

The resin is very safe for food contact uses. It complies with FDA 21 CFR 177, 1655 and may be used in articles intended for repeated use in contact with foods. Additionally, it is approved by the NSF, by the Department of Agriculture for contact with meat and poultry, and the 3-A Sanitary Standards of the Dairy Association.

### Typical Physical Properties of Udel P-3500 NT LCD Resins

Properties	ASTM Test Method	Typical Values <sup>(1)</sup>			
		U.S. Customary units		SI units	
		Value	Units	Value	Units
<b>Mechanical</b>					
Tensile Strength	D 638	10.2	kpsi	70.3	MPa
Tensile Modulus	D 638	360	kpsi	2.48	GPa
Tensile Elongation at Break	D 638	50-100	%	50-100	%
Flexural Strength	D 790	15.4	kpsi	106.2	MPa
Flexural Modulus	D 790	390	kpsi	2.69	GPa
Tensile Impact Strength	D 1822	200	ft-lb/in <sup>2</sup>	420	kJ/m <sup>2</sup>
Impact Strength- Notched Izod	D 256	1.3	ft-lb/in	69	J/m
<b>Thermal</b>					
Deflection Temperature at 264 psi (1.8 MPa)	D 648	345	°F	174	°C
Coefficient of Thermal Expansion	D 696	31	ppm/°F	56	ppm/°C
<b>Electrical</b>					
Dielectric Strength	D 149	425	V/mil	17	kV/mm
Dielectric Constant @ 60 Hz	D 150	3.03		3.03	
Dielectric Constant @ 10 <sup>3</sup> Hz		3.04		3.04	
Dielectric Constant @ 10 <sup>6</sup> Hz		3.02		3.02	
Dissipation Factor @ 60 Hz	D 150	0.0007		0.0007	
Dissipation Factor @ 10 <sup>3</sup> Hz		0.0010		0.0010	
Dissipation Factor @ 10 <sup>6</sup> Hz		0.0060		0.0060	
Volume Resistivity	D 257	3 x 10 <sup>16</sup>	ohm-cm	3 x 10 <sup>16</sup>	ohm-cm
<b>General</b>					
Specific Gravity	D 792	1.24		1.24	
Water Absorption, 24 hours	D 570	0.30	%	0.30	%
Melt Flow, 343°C, 2.16 kg	D 1238	3-5	g/10 min	3-5	g/10 min
Mold Shrinkage	D 955	0.007	in/in	0.007	mm/mm

<sup>(1)</sup> Actual properties of individual batches will vary within specification limits.

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### Drying

Udel P-3500 NT LCD polysulfone must be dried before melt fabrication to avoid streaking, splaying, or bubbling. Pellets can be dried in a circulating hot air oven or in a dehumidified hopper dryer.

To oven dry, spread the pellets on trays to a 1-2 inch depth and dry for 3.5 hours at 275° to 325°F (135° to 163°C). Handle the dried resin carefully to prevent reabsorption of moisture from the atmosphere.

To hopper dry, use inlet air with a dew point of -25°F (-32°C) at a temperature of 275° to 325°F (135° to 163°C) and a residence time of 3.5 hours.

### Extrusion

Udel P-3500 NT LCD resin is easily extrudable into sheet, film, profile, or tubing. Extrusion temperature ranges are broad, depending on the thickness of sheet or profile being extruded.

Actual barrel temperature settings of 575°F (302°C) at the feed end of the extruder to 600 to 640°F (315 to 337°C) at the head are recommended for most operations. These temperature settings along the barrel should yield the required extruded stock temperature if maintained uniformly in the range of 600 to 700°F (315 to 371°C).

A general purpose plasticating screw with a 20 to 24:1 length to diameter ratio and a 2 to 2.5:1 compression ratio have been shown to give acceptable results. Two-stage screws can also be used to allow vacuum venting where optimal compaction of the melt is desired.

### Solution Processing

Udel P-3500 NT LCD resin can be dissolved in dipolar aprotic solvents such as dimethylformamide (DMF), dimethylacetamide (DMAC), and N-methylpyrrolidone (NMP).

The resulting viscous solutions can then be used in the production of coatings, films, and membranes. Additives, such as polyvinyl pyrrolidone, polyethylene glycol, and butanol can be easily incorporated into these solutions.

### Standard Packaging and Labeling

Udel P-3500 NT LCD polysulfone resins are packaged in multiwall paper bags containing 25 kg (55.115 pounds) of material. Special packaging can be supplied upon request. Individual packages will be plainly marked with the product number, the color, the lot number, and the net weight.

### Product Safety and Emergency Service

For product safety information or a Material Safety Data Sheet on a product of Solvay Advanced Polymers

**1 (800) 621-4557**

**1 (770) 772-8880 outside of U.S.**

For information or help in an emergency such as a spill, leak, fire or explosion, call day or night:

Emergency Health Information

**1 (800) 621-4590**

**1 (770) 772-5177 outside of U.S.**

Emergency Spill Information

**CHEMTREC 1 (800) 424-9300**

**1 (703) 527-3887 outside of U.S.  
collect calls accepted**

### For Additional Information

Technical Service

**1 (800) 621-4557**

Customer Service

**1 (800) 848-9744**

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