

CytoPel 100LC-F TECHNICAL DATA SHEET

OVERVIEW

CytoPel® 100LC-F is the polymer resin in CytoPel 500 liquid nano coating. CytoPel is used for protecting electronics and fluidic devices from water, biofluids, oils, and similar exposures. The PFOS/PFOA-free fluoropolymer provides hydrophobic and oleophobic properties to electronic, microfluidic, and other devices. The solution is easily applied by dip, spray, spin, flow, or syringe coating. The solvent is a non-toxic, non-flammable, hydrofluoroether solvent that is compatible with a variety of materials. Masking is not required when CytoPel concentrations less than 4% are used. CytoPel dries in seconds to a thin, transparent film with excellent anti-wetting properties against liquids including water, oil, and a variety of chemicals such as heptane, toluene, and acetone. CytoPel is an excellent product for electronics manufacturers, assemblers, and contract coating facilities to provide an effective solution.

USES

- Fluidic Devices
- Biomedical Devices
- Pipette Tips
- Printed Circuit Boards
- Smart phones and watches
- Micro Motors
- Ball Bearing Tracks
- MEMS
- Inkjet Print Heads
- Hard Disk Drive Components
- Headphones and Earphones
- Hearing Aids
- Films
- Oleophobic Membranes
- Metal Mesh

FEATURES

- Adheres to plastic, metal, glass, ceramic, PTFE, etc.
- Repels oil and water
- Chemically resistant
- No VOCs
- Lead free
- TSCA, RoHS, REACH, WEEE complaint
- Easy-to-apply
- Excellent wetting for coating applications
- Short processing times
- Heat cure optional
- Easily reworkable
- Solder through repairable
- Cost effective alternative to traditional conformal coatings
- Not limited to electronic applications
- Masking optional

Properties of CytoPel

Chemistry	C6
Color and clarity	White gummy solid at 25°C
Concentration	>95% polymer
Odor	Light ether-like odor
Flammability	Non-Flammable
Viscosity	0.41 cP at 4% polymer concentration in HFE347
Solubility	AE3000, HFE347, HT110, HT170
Shelf Life	2 years stored in original unopened container at 1°F
Environmental	Low in toxicity, non-ozone depleting
One Part System	Yes
Application Options	Dipping, spraying, brushing, syringe-dispensing
Dry Time	5 - 30 seconds at 4% polymer concentration in HFE347
Cure Time	No Cure or room temperature for 24 hours or 10 minutes at 60°C

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Melting Temperature	>100°C
Flashpoint	N/A
Available as concentrate	Yes
Available as solid	Yes
Appearance	Transparent
Thickness	0.1 - 0.6 μm (depending on percent solids and application method/speed)

Properties of CytoPel films

Appearance	Clear, odorless, and colorless film
Contact Angle to Water	~115°
Contact Angle to Oil	>55°
Oleophobicity grade	7
Surface Tension	8-12 dynes/cm
Hardness	>2B pencil
Flammability	Non-burning
UV-Tracer	UV tracer for quality control available at request
Heat stability continuous	150°C
Max heat stability one hour	250°C
Refractive index Surface	~1.34
Toxicity	HMIS Rating Health = 1
Ease of Application	Excellent
Solvent/Chemical Resistance	Excellent after curing
Transparent	Yes
Electric conductivity	Yes (at <0.5 μm film thickness with \leq 4% concentration)
Ease of Dry	Dries at room temperature in <5 minutes
Low Labor	Yes
Removable Yes	Yes
Solder-through Repairable	Yes
Nonflammability	Meets UL 94 V-0
Glass Transition Temperature (T_g)	75°C
Dielectric Constant (30% RH)	3.0 (1kHz)
Dissipation Factor (30% RH)	0.02 (1kHz)
Dielectric Breakdown Strength @ 35% RH	3000 V/mil

CytoPel concentration and film thickness guide

	Thickness
Film thickness at 0.2% polymer	~0.05 μm
Film thickness at 2% polymer	~0.1 μm
Film thickness at 5% polymer	~0.5 μm
Film thickness at 10% polymer	~1.0 μm
Film thickness at 20% polymer	~2.0 μm

Heptane contact angles of 0.5 μm CytoPel films

	Contact Angle*
Air dried for 5 hours	26.7°



* Numbers shown are an average of over 4 readings.

CytoPel films and long-term performance

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CytoPel Coating Date	March 19, 2010	July 1, 2011	October 21, 2014
Contact Angle	>110°	>110°	>110°
Film Quality	Good	Good no-change	Good no-change

Electrical properties of CytoPel films		
Coating Thickness	Surface Resistance (Ω)	Volume Resistance (Ωm)
0.05 μ m film	Conductive	Conductive
0.1 μ m film	Conductive	4 X 10 ²⁰
0.5 μ m film	1 X 10 ⁹	8 X 10 ²⁰
1.0 μ m film	5 X 10 ¹¹	ND
2.0 μ m film	2 X 10 ¹⁴	ND
>100 μ m film	2 X 10 ¹⁷	ND


*Electrical properties determined on aluminum plates. Measures presented are approximate.

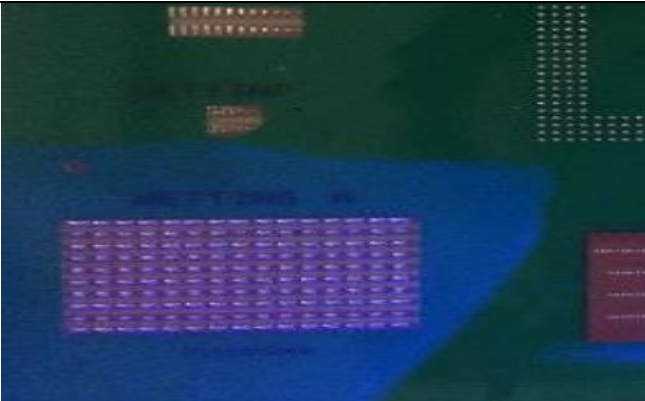
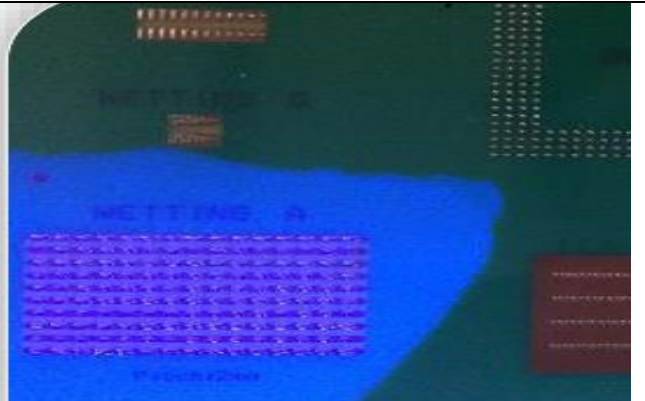
Water contact angles of 0.5 μm CytoPel films	
	Water Contact Angle*
Air dried for 4-5 hours	114.2°
Baked at 90°C for 15 minutes	116.3°

* Numbers shown are an average of over 4 readings.

Solvent and UV-light resistance of 0.5 μm CytoPel films	
Exposure	Water Contact Angle*
Toluene – 2 minutes	112.7°
Acetone – 2 minutes	104.8°
De-icing fluid – 2 minutes	100.6°
FC40 – 2 minutes	117.3°
Perfluoropolyether vacuum oil – 2 minutes	Removes coating
UV light – 10 minutes	88.2°
UV light – 20 minutes	71.9°




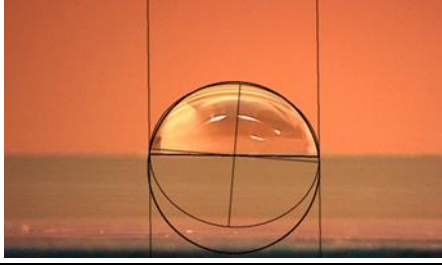
* Numbers shown are an average of two readings.

CytoPel films and long-term performance (>10 years)		
CytoPel Coating Date	June 2, 2005	
Initial Contact Water Angle	>110°	
Initial Film Quality	Good	
Contact angle on Oct 2019	>110°	
Film Quality on Oct 2019	Good no-change	

CytoPel films and quality control inspection	
365 nm UV lamp (blacklight)	254 nm UV lamp
	

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Contact angle analyses of CytoPel on glass

Water		Oil	
			
			
2.0% polymer on glass Water Contact angle: 113.3°		2.0% polymer on glass Oil Contact Angle: 82.0°	

Dip Coating Application Guide

The environment for the coating process needs to be clean. Dust can negatively affect the coating application process resulting in poor adhesion, voids, and reduction of coating performance.

A. Masking (maybe optional):

Microphones, speakers, camera lenses may need masking using Duraseal (applied by manual labor).

B. Cleaning Process:

Device may need to be cleaned using IPA Wipes and/or compressed air to remove dust.

C. Coating Process:

Dip coat manually or using automated system

- Recommended starting test point immersion speed of 15cm/min
- Recommended starting test point withdrawal speed of 15cm/min
- It is important to control immersion speed to avoid excessive air bubbles. Bubbles can result in voids in the coating.
- Withdrawal speed determines the cosmetic appearance and uniformity of the coating. Slow is good.
- Dry by hanging at room temperature or leaving in basket
- Cure by heating at 60°C for 10 minutes (optional)
- Remove from tray or hook and package
- The coating concentration must be monitored during a production run

D. De-masking:

- Remove Duraseal with tweezers

E. Coating during assembly:

- It may be useful to apply a drop of CytoPel using a dropper or syringe to exposed connectors and joints made during device assembly. This will assure that water will be effectively repelled for the life of the device.

F. Safety:

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In Case of a Spill: Evacuate unprotected and untrained personnel. Contain spill. Working from around the edges of the spill inward, cover with bentonite, vermiculite, or commercially available inorganic absorbent material. Clean up residue with an appropriate solvent. Place in a metal container approved for transportation by appropriate authorities. Seal the container. Dispose of collected material as soon as possible.

G. Health:

Eye Contact: Contact with eyes during product use is not expected to result in significant irritation.

Skin Contact: Contact with skin during product use is not expected to result in significant irritation.

Inhalation: Thermal decomposition products may be harmful if inhaled.

Ingestion: No health effects are expected.

First Aid: The following recommendations assume that appropriate personal and industrial hygiene practices are followed:

Eye Contact: Flush eyes with large amounts of water. If signs/symptoms persist, get medical attention.

Skin Contact: Wash affected area with soap and water. If signs/symptoms develop, get medical attention.

Inhalation: If signs/symptoms develop, remove person to fresh air. If signs/symptoms persist, get medical attention.

If Swallowed: If signs/symptoms develop, get medical attention. No need for first aid is anticipated.

Dilution Instructions

1. Freeze CytoPel 100LC resin at 1°F (-20°C)
2. Crush the CytoPel while “frozen and cold” in a plastic bag with a rubber mallet or blender.
3. Add the frozen CytoPel to fluoro solvent slowly with stir bar running at room temperature. After each addition of CytoPel seal the flask to reduce solvent evaporation.
4. Stir till all the solids are completely dissolved (with a final concentration of 0.5 to 20%) and filter with a 20-micrometer pore size paper or nylon filter.
5. After final dilution, add 1% weight for weight CytoPel UV-tracer if needed and stir

Size and packaging options

0.2-20% concentration	- 1 LB bottle - 3 LBS liter bottle - 8 LBS gallon bottle - 40 LBS 5-gallon carboy
100% concentration solid	- 25 gram can - 1 LBS can - 8 LBS gallon can - 40 LBS 5-gallon pail



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