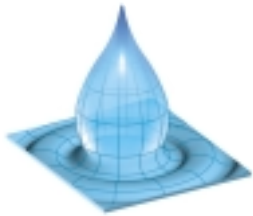


# ParyLAST™

PLASMA ENHANCED PARYLENE COATING



## Medical Coatings Technology

ParyLAST is AST Products' complement to its platform technology, BioLAST, a water based coating technology. Like BioLAST, ParyLAST is environmentally friendly and does not present any of the safety or handling issues associated with organic solvents. Unlike BioLAST, ParyLAST is deposited via vapor deposition techniques while BioLAST is an aqueous system that contains two major components: biocompatible polymers covalently bound to substrate materials and bioactive ingredients that impart valuable characteristics to a surface. BioLAST based coatings can make a surface antimicrobial, lubricious, hydrophilic, anti-thrombogenic, or anti-encrustive and can incorporate drugs for controlled release. Able to be applied to virtually any biomaterial, ParyLAST and BioLAST coatings have been used in a variety of medical devices that have been approved by the FDA and are in use worldwide.

## ParyLAST™ coatings are

### Conformal:

ParyLAST is a tough, pin-hole free coating applicable over any complex geometry.

### Chemically inert:

ParyLAST has superior chemical resistance to nearly all known solvents.

### Tenaciously bonded:

AST's patented parylene processing techniques (U.S. Patent Nos. 5,355,832 and 5,447,799) assure superior bonding to plastics, glasses and metals as compared to that of conventional parylene processing.

### Accepted:

ParyLAST has a long history of use and can be found in a number of FDA approved implantable devices.

### Biocompatible:

ParyLAST has demonstrated biocompatibility in long and short-term tests.

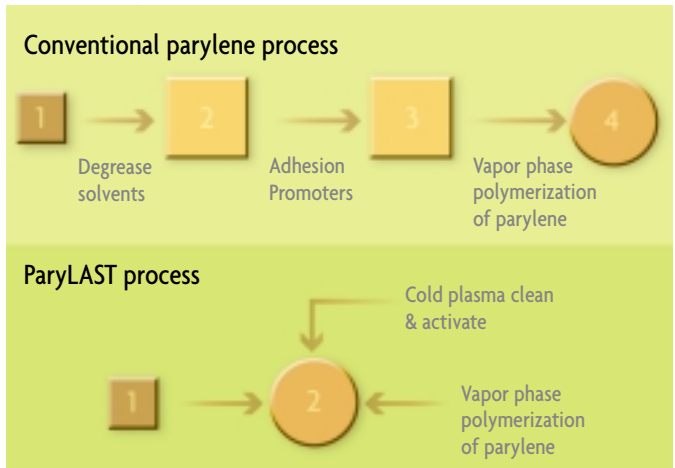
### Environmentally sound:

The ParyLAST process is a dry process with no chemical waste or residual solvent concerns.

### Insulating:

ParyLAST has exceptionally high dielectric strength and is thus suitable as an insulating material in medical products.

## How is ParyLAST™ different from conventional parylene?



In conventional parylene deposition, parts are first cleaned. Often this cleaning is done with a degreasing solvent. Next, they are soaked in adhesion promoters to improve the inherently poor adhesion of parylene. Lastly, the parylene is vapor deposited on the parts in a vacuum chamber.

ParyLAST overcomes parylene's adhesion limitations by creating molecular level binding between the substrate and the parylene coating. This is achieved by the integration of plasma cleaning and vapor deposition. When parts are to be treated with ParyLAST, they are placed into the patented reactor. First, they are cleaned and surface activated via a gas plasma molecular activation surface treatment. Then, without breaking containment, parylene is deposited on the surface via the standard vapor-polymerization process. The resulting ParyLAST coating, while chemically identical to conventionally applied parylene, is unlike it in that it is a coating with a lifetime resistance to delamination and minimized component failure due to liquid propagation into the coating/substrate interface.



### Partnership Approach

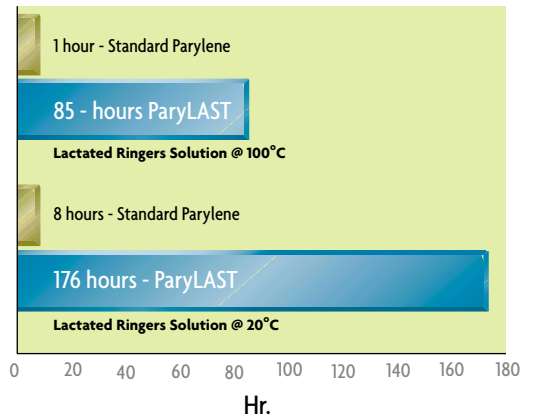
AST partners with its customers from beginning to end. Our customers have complete access to AST's considerable technical expertise throughout the device design and development process. By working with customers every step of the way, small design changes can be made early in the process that prevent huge delays and overruns late in the game. Along with the coating chemistries, a customized, easy-to-use process is developed under strict ISO design control. Our partnership support does not end with the finalization of coating formulation or product design. We work with the customers to ensure smooth and trouble-free implementation at their or at AST's facilities. To accelerate the approval of new devices, AST's experienced staff continues to provide assistance throughout the regulatory approval process and product introduction.

## Chemical Resistance

All values are in cm<sup>3</sup>-mil/100 in<sup>2</sup>-24hr-atm at 23°C

Nitrogen	0.95
Oxygen	7.10
Carbon Dioxide	7.70
Hydrogen Sulfide	13.00
Sulfur Dioxide	11.00
Chlorine	0.35
Moisture	0.14 cm <sup>3</sup> -mil/100 in <sup>2</sup> -24hr-atm at 37°C and 90%RH

## Saline Soak Test



## Tenacious Bonding

**Method:** ASTM D3359-95a "Tape Test"

Coating is cut into an "X" or into a crosshatch pattern per protocol. The coating is covered with #810 Scotch Tape™ and then the tape is pulled off. The degree of coating damage is qualitatively assessed. 0 means removal of the coating beyond the cut area while 5 means no peeling or removal. Intermediate numbers refer to result between these two extremes. From the data, ParyLAST clearly demonstrates superior adhesion.

Cutting pattern	Adhesion Rating	
	Conventional Parylene	ParyLAST™
X-Cut Pattern	0 (10 measurements)	5 (31 measurements)
Cross-Hatch Pattern	0 (16 measurements)	5 (16 measurements)

## Biocompatibility and Sterilization

ParyLAST can be sterilized via ETO, gamma radiation, or e-beam sterilization.

**ParyLAST™ has passed the following biocompatibility tests:**

- Intracutaneous reactivity
- Muscle implantation (14 days and 6 months)
- Systemic toxicity
- Cytotoxicity
- Sub-chronic toxicity
- Hemocompatibility
- Ames mutagenicity

## Electrical Insulation Properties

Dielectric strength, short time (Volts/mil, @ 1 mil)	6800.00
Volume resistivity, 23°C, 50% RH (Ohm-cm)	6.0E+16
Surface resistivity, 23°C, 50% RH (Ohm)	1.0E+15
Dielectric constant, 60 Hz	3.15
Dielectric constant, 1000 Hz	3.10
Dissipation factor, 60 Hz	0.02
Dissipation factor, 1000 Hz	0.02
Dissipation factor, 1,000,000 Hz	0.01

