

Technologies



Roll-to-Roll Parylene Chemical Vapor Deposition

Fast Facts

- Process and equipment development for gas phase deposition of Parylene
- Process upscaling to roll-to-roll
- Coating of flexible substrates
- Increase of yield and process efficiency
- Utilizing excellent Parylene properties (barrier properties, optical transparency, chemical inertness, thermal stability, biocompatibility) for flexible applications

Process in Development

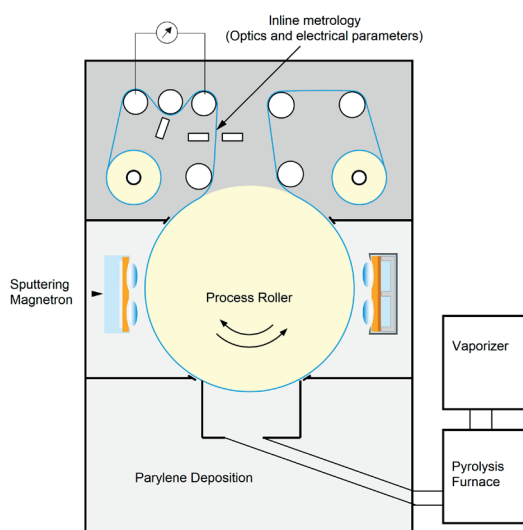
- Roll-to-roll deposition equipment
- Chemical vapor deposition process based on Gorham process
- Feasibility of deposition in semi-closed chamber demonstrated
- Increase of process efficiency by a factor of 5 in pre-test
- Multiple chamber system, easily to be combined with roll-to-roll pre-treatment, coating, patterning or metrology units

Next steps

- Development of lab demonstrator
- Integration in roll-to-roll lab coater with web coating up to 200 mm width
- In-line deposition with magnetron sputtering possible

Suggested Applications

- Roll-to-roll coating of flexible substrates
- Encapsulation and ultra barrier layer deposition for flexible devices such as organic solar cells and organic light emitting diodes (LEDs)
- Substrate and dielectric deposition for ultra-thin flexible Parylene Printed Circuit Board
- Fabrication of smart patches and wearables
- Coating of paper, leather and textiles
- Deposition of Parylene bonding adhesive on flexible substrates



	Parylene				
	N	C	D	F	AF4
Melting point [°C]	410	290	380	> 460	> 500
Continuous temperature [°C]	90	125	160	190	350
Temporary peak temperature [°C]	120	200	300	300	450
Tensile strength [MPa]	45	69	76	52	52
Yield point [MPa]	43	55	62	34	34
Tensile modulus [MPa]	2400	3200	2800	2500	2.500
Strain to rupture [%]	250	200	200	200	200
Yield strain [%]	2,5	2,9	3	2	2,0
Density [g/cm³]	1,11	1,289	1,418	1,32	1,32
Dynamic friction coefficient	0,25	0,29	0,31	0,13	0,13
Refractive index	1,661	1,639	1,669	1,559	1,559
Short-term dielectric strength [V/mil @ 1 mil]	7000	5800	5500	5500	5.500
Dielectric constant @ 1 kHz	2,65	3,1	2,82	2,1	2,20
Dielectric constant @ 1 MHz	2,65	2,95	2,8	2,16	2,17
Gas permeability @ 23 °C [(cm³ x mm)/(m² x 24 h x atm)]					
N ₂	7,7	0,37	1,77	4,85	4,80
O ₂	11,81	2,8	12,6	23,5	23,00
H ₂	212,6	43,31	94,49	n/a	n/a
H ₂ O [(g x mm) / (m² x 24 h)] @ 37 °C 90 %RH	0,59	0,06	0,1	0,23	0,22
Thermal expansion coefficient [ppm/°C]	69	35	38	36	36
Thermal conductivity @ 25 °C [W/(m x K)]	0,12	0,082	n/a	0,096	0,096

Photo acknowledgments

Fraunhofer

All information contained in this datasheet is preliminary and subject to change. Furthermore, the described system is not a commercial product.

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