

PARYLENE SYSTEMS



MADE
IN
GERMANY

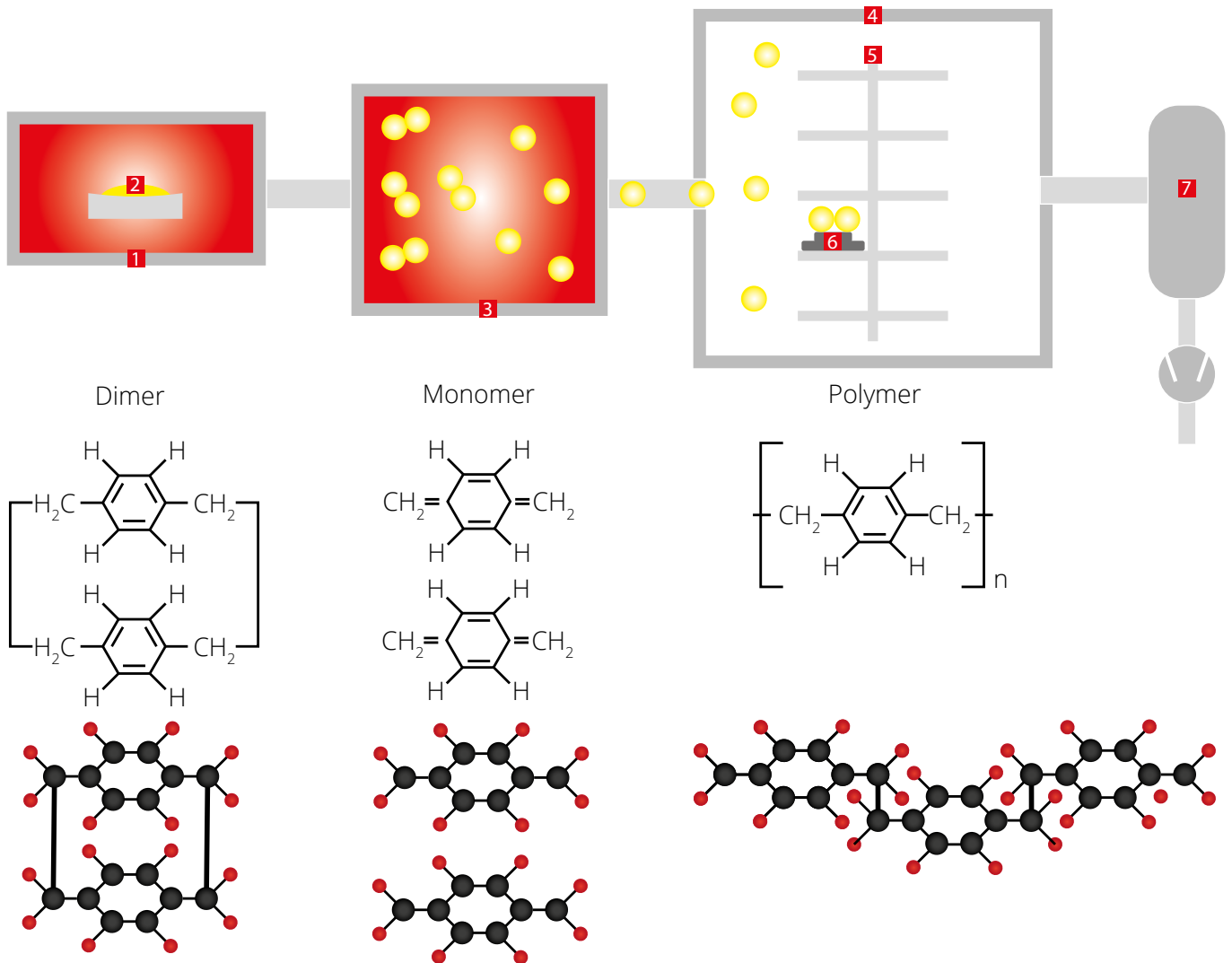


WHAT IS PARYLENE?

Parylene coating is the ideal solution for protecting high-quality components, assemblies or devices.

Parylenes are a group of polymers whose chemically exact name is poly-para-xylylene.

In a process technology that can only be used for this material class, almost transparent protective layers can be produced.



Vakuumpumpe / Vacuum pump **1** Verdampfer (130 - 180°C) / Vaporzier (130 - 180 °C) **2** Dimer-Pulver / Dimer powder

3 Pyrolyserohr (550 - 650°C) / Pyrolysis tube (550 - 650 °C) **4** Vakuumkammer (ca. 25°C) / Vacuum chamber (ca. 25°C)

5 Karussell / Carousel **6** Bauteil / Component **7** Kühlfalle (-196°C) / Cold trap (-196 °C)

ADVANTAGES OF OUR PARYLENE SYSTEMS

Amongst the different thin organic layers which are generated and deposited in the vacuum by means of plasma polymerisation, the so-called "Parylene" coating has gained particular importance as a corrosion protection layer for its high chemical resistance to almost all acids, alkaline solutions and organic solvents, as well as for its

high resistance to vapour diffusion. The name "Parylene" is the commonly used short form of the full and chemically correct designation poly-para-xylylene, a substance that stands out among other plastic and paint coats for its excellent properties.

The benefits with Parylene:

- are completely conformal, i.e. they adapt even to complex substrate contours such as sharp edges, bore holes or blind holes
- are pinhole-free already from coating thicknesses of approx. 0.5 μm
- are chemically insoluble and resistant to a large number of chemicals
- have very good barrier properties against moisture and chemicals and a high dielectric strength
- have dry lubricating properties (low coefficient of friction)
- are hydrophobic: wetting angle for H_2O between 92° and 98°
- are transparent between 90 % and 96 % in the visible wavelength range
- Type C and N Parylenes are biocompatible and can be certified according to USP Class VI and ISO 10993 and can be approved by the FDA.



■ Parylene ■ Other coats (e.g. urethane, acrylic etc.)



DISCOVER THE POSSIBILITIES

There are almost no limits to parylene applications. The application options of parylene coatings range from simple gaskets, pipes and vessels in industry over sensitive electric components such as printed circuit boards and sensors up to aircraft control systems etc. Thanks to its biocompatibility, Parylene is also used in medical engineering to coat hearing aids, cannulas, implants, probes and endoscopes.

In suitable vacuum coating systems, Parylene coatings of a thickness of 1 to approx. 50 μm can be deposited on practically any type of material such as plastics, metals, glass, ceramics, fabric, and paper. Parylene is particularly common in anti-corrosion-coating of printed circuit boards (PCB), magnets and electric motors, pressure and temperature sensors, and level sensors for foodstuffs and chemicals, as well as in medical devices (biocompatible), in watch making and in safety engineering. It is a special characteristic of the coating that already from a thickness of 0.5 μm and up, they are practically free of small "pinholes", i.e. free of faulty spots, which creates a hermetically sealed layer that can be penetrated by diffusion only.

Other highly advantageous properties of these coatings are their high dielectric strength (approx. 5,000 Volt at a coating thickness of 20 μm) and the high temperature resistance of -150 °C to +300 °C (F-type). Important to know: The thermal load on the substrate during the coating process is very low, since coating takes place at around ambient temperature, roughly between 20 °C and maximum 60 °C. Thus, also temperature sensitive substrate materials can be coated.

Thanks to its resistance to chemicals, Parylene coating is the method of choice for medical devices which come into contact with body fluids, such as injection needles, catheters, implants and cardiac pacemakers etc. In view of its physiological harmlessness, Parylene coating is also suitable for the coating of possibly allergenic parts of spectacles, watches and jewellery that could cause skin irritation.

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Parylene P6

TECHNICAL DATA

Version	Tabletop
Width	700 mm
Height	700 mm
Depth	500 mm
Parylene-Chamber	Ø 200 mm, Height 200 mm Volume 6 litres Other chamber sizes available on request
Product support	Rotating table Ø 170 mm Height 170 mm
Coating substance	Parylene N, C, D, F-VT 4
Possible coating thicknesses	0.05 up to 30 micrometers
Pyrolysis	1.6 kW / max. 790 °C
Cold trap	Liquid nitrogen Alternative: electro-mechanical cooler
Pump system	Two-stage rotary vane pump Suction capacity 16 m ³ / h End pressure 1 x 10 ⁻³ mbar
Control	PC Control (Windows 10 IoT / 11 IoT)
Power supply	400 V, 32 A, 50 / 60 Hz

All values approximate

Parylene P17



TECHNICAL DATA

Version	Stand-alone unit
Width	1210 mm
Height	1440 mm
Depth	785 mm
Parylene-Chamber	Ø 300 mm Height 295 mm Volume 21 litres
Product support	Rotating table Ø 248 mm Height 260 mm
Coating substance	Parylene N, C, D, F-VT 4
Possible coating thicknesses	0.05 up to 50 micrometers
Pyrolysis	2 kW / max. 850 °C
Cold trap	Liquid nitrogen Alternative: electro-mechanical cooler
Pump system	Two-stage rotary vane pump alternative: dry pump Suction capacity 25 m ³ / h End pressure 1 x 10 ⁻³ mbar
Control	PC Control (Windows 10 IoT / 11 IoT)
Power supply	400 V, 32 A, 50 / 60 Hz

All values approximate

Parylene P120D



TECHNICAL DATA

Version	Stand-alone unit
Width	2200 mm
Height	1600 mm
Depth	2700 mm
Parylene-Chamber	Ø 500 mm Length 610 mm Volume 120 litres
Product support	Rotating table Ø 445 mm Länge 580 mm
Coating substance	Parylene N, C, D, F-VT 4
Possible coating thicknesses	0.05 up to 50 micrometers
Pyrolysis	4 kW / max. 850 °C
Cold trap	Liquid nitrogen Alternative: electro-mechanical cooler
Pump system	Two-stage rotary vane pump Suction capacity 65 m ³ / h End pressure 1 x 10 ⁻³ mbar
Control	PC Control (Windows 10 IoT / 11 IoT)
Power supply	400 V, 32 A, 50 / 60 Hz

All values approximate

Parylene P260



TECHNICAL DATA

Version	Stand-alone unit
Width	1000 mm
Height	2000 mm
Depth	2600 mm
Parylene-Chamber	Ø 640 mm Height 800 mm Volume 260 litres
Product support	Rotating table Ø 560 mm Height 650 mm
Coating substance	Parylene N, C, D, F-VT 4
Possible coating thicknesses	0.05 up to 50 micrometers
Pyrolysis	4 kW / max. 850 °C
Cold trap	Liquid nitrogen Alternative: electro-mechanical cooler
Pump system	Two-stage rotary vane pump Suction capacity 65 m ³ / h End pressure 1 x 10 ⁻³ mbar
Control	PC Control (Windows 10 IoT / 11 IoT)
Power supply	400 V, 32 A, 50 / 60 Hz

All values approximate

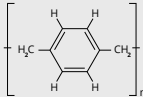
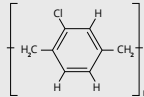
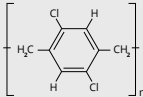
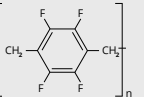


Parylene P300

TECHNICAL DATA

Version	Stand-alone unit
Width	2700 mm
Height	1600 mm
Depth	2200 mm
Parylene-Chamber	Ø 700 mm Height 720 mm Volume 300 litres Other chamber sizes available on request
Product support	Rotating table Ø 600 mm Height 660 mm
Coating substance	Parylene N, C, D, F-VT 4
Possible coating thicknesses	0.05 up to 50 micrometers
Pyrolysis	4 kW / max. 850 °C
Cold trap	Liquid nitrogen Alternative: electro-mechanical cooler
Pump system	Two-stage rotary vane pump Suction capacity 65 m ³ / h End pressure 1 x 10 ⁻³ mbar
Control	PC Control (Windows 10 IoT / 11 IoT)
Power supply	400 V, 32 A, 50 / 60 Hz

All values approximate

					
		Parylene N	Parylene C	Parylene D	Parylene F-VT4
Property	Unit	Poly(paraxylylen) [1, 2, 4]	Poly(monochloro- para-xylylen) [1, 2, 4]	Poly(dichloro- para-xylylen) [1, 2, 4]	Poly(tetrafluoro- para-xylylen) [3]
Density	g/cm ³	1,11	1,29	1,42	~1,6
Refractive index	[]	1,66	1,64	1,67	1,57
Tensile modulus	GPa	2,4	3,2	2,8	3,0
Yield strength	MPa	42	55	60	52
Tensile strength	MPa	45	70	75	55
Hardness, Rockwell	HR	85	80	80	–
Yield elongation	[%]	2,5	2,9	3,0	2,5
Elongation to break	[%]	30	200	10	10-50
Static coefficient of friction	[]	0,25	0,29	0,35	0,39
Dynamic coefficient of friction	[]	0,25	0,29	0,31	0,35
Long time heat resistance	[°C]	60	80	100	200
1000h Continuous	[°C]	95	115	135	250
Melting point	[°C]	420	290	380	–
Dielectric constant (1 MHz)	[]	2,66	2,95	2,80	2,35
Dissipation factor (1 MHz)	[]	0,001	0,013	0,002	0,008
Dielectric strength	[MV/cm]	300	185-220	215	–
Volume resistivity	[23°C, 50% RH, Ω cm]	1,4E+17	8,8E+16	2,0E+16	1,1E+17
Surface resistivity	[23°C, 50% RH, Ω]	1,0E+13	1,0E+14	5,0E+16	4,7E+17
Linear coefficient of expansion	[µm/m °C]	69	35	38	–
Heat capacity	[25°C, J/(g·K)]	1,3	1,0	0,8	–
Thermal conductivity	[W/m·K]	0,13	0,08	–	–

[1] J.B. Fortin, T.-M. Lu, Chemical Vapor Deposition Polymerisation, Kluwer Academic Publishers (2004) ISBN 1-4020-7688-6, p. 58.

[2] J.J. Licari, Coating Materials for Electronic Applications, Noyes Publications (2003) ISBN 0-8155-1492-1, pp. 154-168.

[3] A. Kahouli et al., Materials Chemistry and Physics 143 (2014) 908-914, Structural and dielectric properties of parylene-FT4 thin films.

[4] www.matweb.com

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Diener electronic GmbH & Co. KG | Nagolder Straße 61 | D-72224 Ebhausen

Phone: +49 7458 / 999 31 - 0 | Fax: +49 7458 / 999 31 - 50 | E-Mail: info@plasma.com

www.plasma.com