

1 *Microwave plasma machine (large area).*

PLASMA COATING OF POLYMERS

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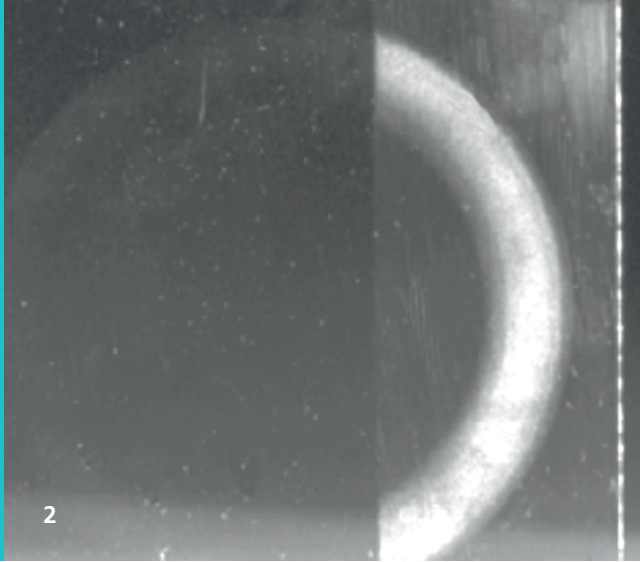
Using PCVD (plasma chemical vapor deposition) coating processes, the surfaces of many different materials can be coated with thin functional layers which significantly improve the characteristics or performance of the parts. Although the coating process has little in common with conventional polymerization processes, as saturated chemical compounds can also be processed, this procedure is called "plasma polymerization". In this process, gases and substances which easily vaporize under vacuum conditions can be excited by a plasma so as to form a thin layer on the substrates. By this means surfaces with new characteristics are created, which can often not be produced by traditional coating processes:

- Hydrophilic to hydrophobic
- Corrosion resistant
- Wipe-resistant and scratch-resistant
- Low friction

- Semi-permeable
- Biocompatible
- Anti-fingerprint
- Barriers (gases, ions)
- Insulators or spike resistant layers
- Tailored refractive index materials

Advantages of plasma processes

- They are environmentally friendly and save resources.
- They combine well with other vacuum processes (evaporation coating, sputtering, plasma pre-treatment, plasma cleaning).
- They enable a selective surface coating of thermoplastics.



Results

- High deposition rates of typically up to 20 $\mu\text{m}/\text{min}$ were shown on our new equipment
- Large area deposition (0.5 sqm) with a good uniformity of coating thickness (~ +/-10 %)
- Strong adhesion to most materials even at extreme exposure
- Thermally stable and dense protective coatings
- The coatings are highly transparent (~ 96 %) and clear (0.5-1 % haze)
- High resistance to chemicals (acids, solvents, cleaning agents, petrol, and foodstuffs)
- Temperature strain of the substrate can be kept low e.g. 50-70 degrees/min
- Control of surface tension

This process can meet the fundamental demand for an economical coating process. A laboratory set-up with a coating surface of approx. 0.5 m² is available for upscaling of the process.

Representative application

Scratch-resistant coatings on transparent plastics (plates, foils and 3D-parts)

An alternative to the lacquering of plastics with siloxane-based lacquers is the gas phase deposition of transparent, hard, quartz-like coatings of siloxanes and oxygen on, for example, polycarbonate, without using any kind of solvents. The layers show stable characteristics as regards transparency and adhesion and also thermal shock resistance in iced and boiling water. The standardized Taber Abraser test produces a 1-2 % change in the haze (1000 rotations of wheel CS 10 F).

Paints in comparison show 5-6 % change in haze. The layer is completely UV- and light stable. The costs of the process are about 10-15 Euro/m². This demonstrates the advantages of this high rate PCVD process for dynamic coating applications of thin plastic foils (roll to roll).

Our service offer

- Development of plasma processes to meet customer specifications
- Investigation of specific product characteristics with relevant test procedures
- Comprehensive analysis, professional consultation, literature and patent research
- Upscaling to construction of demonstrators

- 2 Coated and uncoated polycarbonate after Taber testing.
- 3 Taber abraser test.