Environmental-friendly PVD-Metallization and advanced functionalities for plastic surfaces

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Themes:

1. hartec – the company
2. Equipment and components
3. PVD Physical Vapor Deposition
4. Application fields for PVD-metallization
5. Environmental-friendly processing
6. References
The Company

**hartec Anlagenbau GmbH**
- Initial 2000
- Development & construction of PVD coating equipment
- Process development

**hartec GmbH**
- Initial 1986
- Job coating
- PVD metallization for plastics & metals
- Product development
The Company

hartec Asia

2005  Foundation of the Joint Venture *hartec Asia* in Singapore with a *production plant in Kunshan/ China* and a *sales office in Taipei/ Taiwan*.

Kunshan / China:

Focus of the production are functional PVD-layers like EMI-shielding for laptop housings.
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Equipment and components worldwide PVD competence

- PVD equipment & technology
- Batch and Inline systems
- Decorative PVD metallization for plastics and metals
Equipment and components

Ultrasonic cleaning

Prototype systems for plasma and PVD processes
Equipment and components

Batch system HD-550-550-MK3
for mass production, plasma treatment and metallization
Equipment and components

Batch system HD-550-1250-MK3
for mass production, plasma treatment and metallization
Equipment and components

ion beam source

pre-vacuum pumps

sputtering cathode
Equipment and components

Inline system ProLine B19 for high volume production
Equipment and components

part fastening
Equipment and components

Components of a PVD equipment:

- vacuum chamber
- pumping system
- ion beam sources
- sputtering cathodes
- rotational system and piece holders
- fully automatic computer control
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PVD –
Physical Vapor Deposition

Technological processes

Processes in the vacuum chamber

► vacuum production
  - high vacuum $10^{-4}$ mbar / $10^{-5}$ mbar
  - ► plasma creation (electrical discharge)
  - ion beam sources with high energetic density
  - polarization: electrons / ions
► surface treatment
  - polymer modification / plasma etching
  - ► metallization by magnetron sputtering
PVD – Physical Vapor Deposition
Technological processes / Plasma processes

functional aspects of plasma creation
PVD – Physical Vapor Deposition
Technological processes surface treatment

surface modification:
increase of the surface tension
PVD – Physical Vapor Deposition

- Magnetron Sputtering (cathode sputtering with magnetic field enhancement)
PVD –
Physical Vapor Deposition

Technological processes
Basics for high-end PVD surfaces

- mirror polished surfaces or use of high glossy primer system

- substrates: nearly all kind of plastics, glass, electroplated surfaces and real metals.
  Not recommended are plastic types of Polyolefin's, POM and PTFE

- low water content plastics
  (perhaps pre-heated substrates)
PVD – Physical Vapor Deposition

Technological processes / Coating system

high polished surface
PC uncoated

cross section
thickness: 0.3 µm

high polished surface
PC + PVD metallization
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Application fields for PVD metallization

► decorative coatings (~50°C)
  - decorative polymer metallization with topcoating
  - multiple color and effect innovations due to the combination of coating technology and lacquer
  - effects like glossy or silk colors, chrome look, depth effect, translux®, etc.

► decorative hard coatings (metal ceramics) (80–160°C)
  - Metal ceramics on real metals, galvanic surfaces or glass
  - No additional protection layer, e.g. lacquer needed

► functional coatings (<250°C)
  - development of customer-specific application, e.g. EMI-shielding, anti-friction, wear-resistance or anti-adhesive layers

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nearly all kind of plastics are suitable for hartec PVD.
Application fields for PVD metallization: decorative coatings

- NO change of *breaking strength*
- NO *splitter* effects
- NO *outcoming metal particles* in the breaking area
- NO *sharp edges* in the breaking area

**Application fields:**
- airbag emblems
- overhead components
- body security parts
Application fields for PVD metallization: decorative coatings

A wider range of substrates is now suitable for interior parts: hard plastics, ceramics, die cast and metals, flexible materials like Silicone, TPE, TPU etc.

- emblems
- decorative parts
- steering wheel components
Application fields for PVD metallization: decorative coatings

Decorative coatings for flexible substrates

- wristlet
- multifunctional switch
Application fields for PVD metallization: decorative coatings

Realization of advanced functionalities:

translux® technology: light-transparent decorative
PVD layers

to bring functionality to deco-components
„hidden“ display inside a metal looking panel
ambient light
Application fields for PVD metallization: decorative coatings

Realization of advanced functionalities:

- day/night-design in metal look by laser etching
- keys, buttons switches
- etc.

unlimited suitability for pad or screen printing
Application fields for PVD metallization: advanced material processing

Additional features of PVD coatings:

► suitable for gluing

► realization of filigree surface structure, e.g. brushed effects on plastic as well as on metal substrates

► no oxidation effects: no time limit for topcoating

► suitable for ultrasonic plastic welding

► guaranteed form stability of plastic parts during metallization process
Application fields for PVD metallization: decorative hard coatings (metal ceramics)

Decorative hard coatings (metal ceramics) on electroplated and real metal surfaces

decorative hard coatings

electroplating + PVD

PA + GF / PC
Application fields for PVD metallization: decorative coatings

electromagnetic shielding (EMI-Shielding)

- conductive nano layers
- inside of housings for electronic components
- corrosion stable
Application fields for PVD metallization: decorative PVD-Lacquer coatings

Multi color show: unlimited color effects realized by 2-component PU and UV-Lacquer
Application fields for PVD metallization: advanced material processing

- in-house lacquer competence based on Berlac® coating systems
- Primer and Topcoat systems
- Transparent and colorized lacquers, based on pigments and dyestuff-solutions
- 2-component Polyurethane and UV coatings
- Tampon-print lacquers
Design and product development

- material
- production parameters
- surface structure

- metallization
- painting, printing
- laser etching

- form
- color
- glossy

- function
- look + feel
- light effects
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Environmental-friendly processing

► PVD process is 100% environmental friendly
► no waste or air pollution, because of vacuum process
► chromium-VI and nickel-free
► use of elementary metals only
► conform to RoHS and EU-ELV Regulation
► PVD metallized plastic parts are fully recyclable due to layer thickness in nanometer scale
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Get on board with PVD –
the strongest growing surface technology!

We are looking for partners
to build up market capacity!

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