Surface treatment with atmospheric plasma

System engineering and industrial applications

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Inocon Technologie

Services

1. R&D – Test Laboratory
2. Product/Process Design
3. Automation
4. Manufacturing
5. Implementing

Located: Attnang - Puchheim

Founded: 1994

Employees: 52

Turnover 2017: 9.5 Mio €
<table>
<thead>
<tr>
<th></th>
<th><strong>Micro Cold Plasma Activation</strong></th>
<th><strong>InoCoat Mikrolayers</strong></th>
<th><strong>InoCoat Nanolayers</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>process output</strong></td>
<td>Activation</td>
<td>coating - µm range</td>
<td>coating nm-Beschichtungen</td>
</tr>
<tr>
<td><strong>plasma characteristics</strong></td>
<td><strong>Plasmagas</strong>: Air, N₂, forming gas „cold“ arc - non thermal plasma</td>
<td><strong>Plasmagas</strong>: Argon „hot“ arc - thermal plasma Aggregate condition of coating material: solid, powdery</td>
<td><strong>Plasmagas</strong>: Argon „hot“ arc - thermal plasma Aggregate condition of coating material: steamy</td>
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<tr>
<td><strong>substrate materials</strong></td>
<td>plastics metal glass composite materials</td>
<td>plastics metal glass ceramics paper composite materials</td>
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</tr>
</tbody>
</table>

### Übersicht Oberflächentechnologien

**InoCoat** ist eine führende Anbieter von Oberflächenbehandlungen.
Advantages

- surface pre-treatment
- higher surface tension

For better

- glueing processes
- printing processes
- painting processes
- coating processes
The Coating Technology can be used for various applications

The core of the process is the targeted feeding of powder and precursor into the plasma jet, which is up to several 1,000 degrees hot. This makes it possible to achieve at atmospheric pressure extremely dense and compact coatings without solvent at unprecedented speed.

**Micro layers**
Several powders like Zinc, Tin, Copper etc. can be deposited on almost every substrate. The layer thickness is between 10-500µm

**Nano layers**
The precursors are being evaporised and then deposited on the substrate. The layer thickness is between 10-300nm

**Activation**
Cleaning and activation of substrates via plasma
Unique Selling Propositions

**Full Inline Automation**

The inline capability - and the resulting scalability - is provided by the atmospheric process. In other words no batch processes are needed.

**Highly Efficient Process**

Powder and precursor coating on the most sensitive substrates such as paper, wood, textiles or polymer is unproblematic. At the same time metals can be coated with brilliant results too.

**Elaborate Maintainability**

The technology is designed for easy handling, fast maintenance and safe operation. Furthermore the usability is simple and transparent.

**Environmentally friendly**

In comparison to other coating processes, the plasma coating process has no negative impact on the environment.
Applications microlayers

- Conductive press board (Cu coated)
- Conductive business card (Cu coated)
- Flexmetal f.e. LED-Wallpaper, area lighting

Layer thickness 10-500µm
Layer thickness 10-300nm

Applications nanolayers

Hydrophilic plastics (SiOx coated)

Hydrophic wound pad
Potential Applications

The technology covers a wide range of functional coatings. The deposition of high melting materials on highly sensitive substrates like paper, textiles, polymer and many more is highly successful.

Conductive layers

Anti-corrosive layers

Nano-meter layers

Biocidal layers

Tribological layers
Machinery

Items 1&2 different for each version while positions, 3-8 are similar for each assembly, only the execution type might change

1. Control panel
2. Plasma torch
3. Coating chamber
4. Powder feeder
5. Evaporator
6. Cooling system
7. Power source
8. Aspiration system
The APS Technology enables several manufacturing processes:

- Prototyping & small series
- Serial production
- Mass fabrication

Air Plasma Spraying as an „Inline“ argument
Various Substrate Handling-Systems

„Standard“

Design: The „Standard´s“ movement space is designed to fulfil a wide range of research applications and surface development operations.

„Volume“

Design: As this flexible handling can move substrates 360°, no shape seems to be too complex.

„3D“

Design: This version is well suited for surface developing processes, as well as automatic in-line coating operations.
Well thought out concept

“Plug and Play” Coating Cell – The PlasmaPlotter

The PlasmaPlotter is a complete coating cell for a wide variety of challenges. The cell was designed as a plug&play solution and offers added value for both complex research projects as well as production-based applications. There is a wide variety of workpiece carrier systems available due to the diversified application options. For this either the compact plasma torch or the substrate is moved.

- Movable operating desk with touchscreen
- Visualisation of all machine components
- Parameter memory function
- Interfaces for data import and data export
- Process monitoring (voltage, current, torch cooling, powder sensor, flow speed monitoring extraction system,
- Simple movement control (G-code)
- CE Certification
Applications

Solutions for **small series and serial production** are currently used. Our subsidiary Plasma Innovations is producing **flexible printed circuits** for LED applications together with Forster.
Applications

Research facilities like Joanneum Research, Fraunhofer etc. are developing new functional layers.
INOCON is developing new layers and surface properties together with external partners. To generate value added, the company is part of national and international funding programmes.

**Research Fields**

- **Biocidal surfaces**
  - Biozide APS
  - protectedTOUCH
  - E.Lyse
  - allergyFREE

- **Material, production**
  - JOIN
  - AutoScan
  - i!Tool

- **Additive manufacturing**
  - APKOLE
  - smart 3D
Innocon got awarded in the region of Upper Austria

Innovationsaward 2017 - Plasmatechnologie

The atmospheric plasma technology won the first price for Innovation in the category of medium sized enterprises
Nominated for the State Award of Innovation

As one out of six top nominees INOCON´S coating technology overtopped over 400 other innovative technologies.

Source: http://www.staatspreis.at/Projekte/Projektarchiv/5576.html/
PlasmaPlotter References

Dipl. Ing. Wolfgang Hackl BSC
New Business Development Printing technology

Dr. Ulrich-Andreas Hirth
Global Head of Business Development

„The plasma coating process enables entire new manufacturing and R&D opportunities for us. The well designed and user friendly atmospheric coating cell perfectly paves our way to gain competitive advantages as well as increase productivity."

„INOCON – a highly innovative, competent, flexible and reliable partner.“
Thanks for your Attention?

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