

## APPLICATION INFORMATION

# Surface Treatment of Medical Products with Openair-Plasma® Systems

## Applications in medical technology device production

Medical technology demands the highest production standards, typically going far beyond the requirements of most other industries. Material surfaces used in this sector are required to be free of contaminants, almost flawless. Sterility often plays a key role as well, even the slightest presence of a microorganism or contaminant can have adverse effects on device users that have received the implants. Furthermore, the materials used must be biocompatible to prevent dangerous interactions with the human body. Reliability is another particularly important aspect, material bonding must be strong, tight and durable.

Plasma treatments have been used for several decades as a method to functionalize surfaces. However, the processes could only be carried out in a vacuum chamber before the invention of the Openair Plasma technology. Vacuum processes are often slow, expensive, and not compatible with all materials. Also, products containing electronic components cannot be treated under a vacuum plasma process. With the Openair Plasma® systems from Plasmatreat, manufacturers can overcome these hurdles. The systems offer the advantages of being able to work in an open atmosphere using compressed air as a process gas, and make inline integration into existing production processes feasible.

## Openair-Plasma®: A key technology

- **Flawless surfaces:** Selectively eliminates the finest organic contamination, **dust and static charges**.
- **Functionalization:** Even non-polar plastic surfaces can be effectively functionalized with polar chemical groups.
- **High surface energy:** if required, materials can be modified to high levels of surface energy (>72 mN/m) ensuring complete wetting by water.
- **Reliable bonding:** Plasma treating of plastics results in a significant increase in surface energy – a prerequisite for both outstanding wetting with printing inks and high adhesive strength.
- **PlasmaPlus® technology:** expanded selective functionalization of surfaces by depositing organosilicon layers using plasma.
- **Improved haptics:** Add grip or soft-touch properties to your products via the 2-component injection molding of components in conjunction with Openair Plasma® systems.
- **Reduces the need for primers:** Bonding agents (chemical primers) are seldom required for plasmatreated plastics and metals.
- **Combination of intrinsically incompatible materials** that would not establish reliable bonding to each other without plasma treatment.
- **Replaces mechanical assembly:** Overmolded components can replace work- and cost-intensive assembly. Combinations such as TPU on PP or LSR on PC (both medical-grade type) are possible with plasma treatment in 2-component injection molding, even without geometrical undercuts.
- **Environmentally friendly sustainability:** Replaces solvent-based adhesives or lacquers by water-based systems and works with compressed air as the process gas: Uses renewable resources only and does not produce ozone.

# Surface treatment for medical products

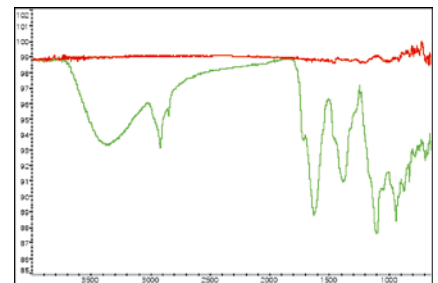
Easy integration into existing production processes

- **Simple installation:** Standard voltage and compressed air are required.
- **Continuous process:** Direct, inline Openair Plasma® treatment of products; no need to buffer intermediate products.
- **High speed:** Up to 300 m/min production speeds can be achieved in pre-treatment applications.
- **Flexible:** Effectively used for a wide range of geometric forms, from flat surfaces to complex 3D forms.
- **Large process window:** The plasma jet speed traveling over the surface and the distance between them are the only two critical parameters of the process.
- **Versatile:** Openair Plasma® can be applied to metallic and non-metallic surfaces, as well as sensitive electronic components.
- **Cost-effective:** Openair Plasma® offers comparatively low investment costs and low variable costs as well. Return on investment in most cases within a year.



## How Openair-Plasma® functions

- Careful surface **cleaning** to remove organic contamination and dust particles.
- Chemical and physical surface **modification**.
- Electrostatic **neutralization** of the component surface.
- Surface **functionalization** by attaching polar oxygen compounds in surfaces that are often nonpolar. The result is **high surface energy** and in most cases, high **fluid wettability** (> 72 mN/m).

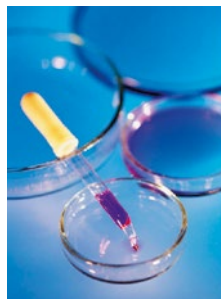


IR spectroscopy of an aluminum surface before (green) and after (red) surface preparation with the Openair Plasma® system (representation of transmission dependent on wavelength (cm<sup>-1</sup>)).

## Typical applications



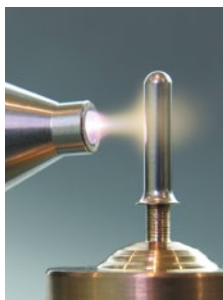
For heat sealing glass ampoules: the combustion by-products caused by flame sealing are a thing of the past.



Systematic, selective functionalization of petri dishes to support cell growth.



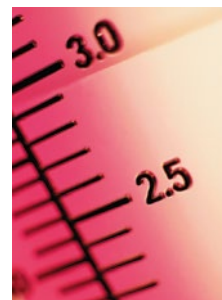
Bonding of stainless steel needles and syringe bodies made of polypropylene. Improved wettability of syringe interiors with silicone oil.



Injection molding application: metal temperature sensor plasma-treated before dense overmolding with polycarbonate.



Adhesive strength of standard silicone on polycarbonate.



Printing. Plasma-treating polyolefins enables clear, scratch-resistant printing.