Steinhagen, April 8th, 2025

**For Reliable Power Electronics: Plasma Technology in Action** Plasmatreat presents live processes for oxide layer reduction and improved adhesion at PCIM

**Power modules are at the heart of many modern power electronics applications, from e-mobility and renewable energy to industrial automation and medical technology. Their production places high demands on material quality, reliability and long-term stability. At PCIM Europe 2025 in Nuremberg, May 6-8, Plasmatreat GmbH will demonstrate how Openair-Plasma, PlasmaPlus and the new REDOX application solve key challenges in power module production—even under cleanroom conditions. At Plasmatreat's booth 169 in hall 7, the focus will be on automated and inline oxide reduction and plasma coating to prevent EMC delamination in the overmolding process.**

**Challenges for Power Modules: Robust, Compact, Reliable—but Extremely Demanding**

Modern power modules perform key functions in power electronics, whether in e-mobility, renewable energy, industrial drives or medical technology. They must be able to withstand high voltages and currents for years, while at the same time being compact and highly reliable. In practice, this means transition temperatures of more than 175 °C, electrical voltages in the kilovolt range and power throughputs of several hundred kilowatts. In addition, there are complex requirements for the material connections within the modules - especially at the so-called "triple points", where different materials such as copper, ceramics and sealing compounds come together. This is where stresses, air inclusions, or adhesion problems often occur, which can significantly reduce the lifetime of the modules.

Particularly critical is the formation of oxide layers on copper surfaces, resulting in increased contact resistance or poor solderability. Delamination of epoxy resins in the injection molding process is also a known risk that promotes mechanical failure. To meet these challenges, stable, process-reliable joining technologies and targeted surface treatment are essential.

**Innovative Solutions with Openair-Plasma and PlasmaPlus - live at PCIM Europe** With its atmospheric pressure plasma solutions, Plasmatreat offers powerful technologies for surface modification that effectively address the weak points just mentioned with a combination of Openair-Plasma, PlasmaPlus and the new REDOX technology. The dry, chemical-free and VOC-free plasma solutions can be easily integrated in-line with existing production processes for reliable pretreatment, improved adhesion and durable electrical and mechanical joints. Plasmatreat's systems and equipment are clean room compatible and meet the requirements of the electronics industry.

Oxide layer reduction with the innovative REDOX-Tool enables selective inline plasma treatment to remove oxide films from metallic surfaces without the use of flux. This optimizes electrical conductivity and significantly improves the adhesion of interconnect layers. This technology will be demonstrated live at the show.

The targeted oxide reduction with REDOX in the inline process is followed by the functional coating with PlasmaPlus. An adhesion-promoting nanocoating (PT-Bond) is applied, which optimally prepares the power module for the subsequent overmolding process. The improved adhesion prevents delamination and increases the mechanical stability of the assembly. At the same time, the plasma-cleaned and activated surfaces provide ideal conditions for the sintering and bonding processes. The result is particularly stable bonding layers - a decisive contribution to the durability and reliability of modern power modules.

Another highlight at the booth is the Plasma Treatment Unit (PTU), which demonstrates surface treatment with Openair-Plasma and PlasmaPlus under robot control. The system has a modular design and can be flexibly configured with different static or rotating nozzles, generators, plasma control units (PCUs) and different handling options - ideal for integration into automated production processes.

The plasma live table will allow visitors to experience the effects of plasma treatment up close. It will clearly demonstrate that the technology is absolutely material-friendly, even for sensitive technical components, and - if the process parameters are set correctly - does not impair functionality. Trade visitors will have the opportunity to talk directly to the Plasmatreat experts and develop individual solutions for their specific requirements.

**Plasma Helps - Even with Specific Challenges in Industry**

In e-mobility, power modules play a key role in the efficiency of inverters, charging infrastructures and battery management systems. The extreme temperature cycles and high current densities place special demands on material quality and interconnection technology. Poor surface quality can lead to increased contact resistance and material fatigue. Wind and solar energy also require durable and reliable power modules to ensure maximum energy conversion and minimum losses. Environmental conditions such as high humidity, temperature fluctuations and UV radiation can affect material stability. Poor adhesion of protective coatings or interconnects can cause performance degradation over time. In industrial automation, power modules must also be rugged and durable. Severe vibration, high mechanical stress and aggressive chemicals can affect electrical connections and surface coatings, resulting in premature module failure.

Plasmatreat combines in-depth expertise in plasma technology with extensive application experience in a wide range of industries. The appropriate components - from static or rotating nozzles to powerful generators and plasma control units (PCUs) - are precisely matched to the process. Combined with intelligent handling solutions and the precise adjustment of plasma parameters by experienced plasma experts, tailor-made system solutions are created: from compact laboratory setups to standard systems and complex special machines. These can be integrated as stand-alone systems or seamlessly automated into existing production lines. Plasmatreat's global sales and service network ensures reliable support - from process development to series production.

For more information, visit: [www.plasmatreat.com](http://www.plasmatreat.com)

(approx. 6,000 characters with spaces)

**Please find images and image caption on the last page of this document.**

***Info box:***

**How Openair-Plasma® and PlasmaPlus® optimize industrial processes.**

When plasma with its high energy level comes into contact with materials, it changes the surface properties, for example from hydrophobic to hydrophilic. Plasma technology requires only compressed air and electricity for operation. Fine cleaning with Openair-Plasma® gently and reliably removes dust, release agents, additives, plasticizers and hydrocarbons from surfaces. Especially with non-polar plastics, plasma treatment achieves surface activation. It supports the increase of surface energy by introducing hydroxyl groups and thus improves adhesion in subsequent processes such as bonding, printing, painting and sealing. Even oxide layers on metal surfaces can be reliably removed inline during the production process using plasma technology. Plasmatreat's PlasmaPlus® technology can also be used to create targeted functionalized surfaces with defined properties by applying (depositing) nanocoatings, e.g. as an additional adhesion promoter layer. Plasmatreat's HydroPlasma® is used to remove stubborn organic and inorganic soils - an innovative cleaning method that uses only water, compressed air and electricity in an environmentally friendly manner.

(1,229 characters with spaces)

**About Plasmatreat**

Plasmatreat is an international leader in the development and manufacture of atmospheric plasma systems for the pretreatment of substrate surfaces. Whether plastic, metal, glass or paper - the industrial use of plasma technology modifies the properties of the surface in favor of the process requirements.

Openair-Plasma® technology is used in automated and continuous manufacturing processes in almost every industrial sector. Examples include the automotive, electronics, transportation, packaging, consumer goods and textile industry, but the technology, cost and environmental advantages of the plasma technology are used in medical technology and in the renewable energy sector as well.

The Plasmatreat Group has technology centers in Germany, USA, Canada, China, and Japan. With its worldwide sales and service network, the company is represented in more than 30 countries by subsidiaries and sales partners.

For more information, visit: [www.plasmatreat.com](http://www.plasmatreat.com)

(968 characters with spaces)

**Pictures and captions:**

**A large machine in a room

AI-generated content may be incorrect.**

Plasma Treatment Units for oxide reduction and plasma coating to prevent EMC delamination. (Copyright: Plasmatreat GmbH)

A machine with a hole in the middle

AI-generated content may be incorrect.

PlasmaPlus coating for applying an environmentally friendly adhesion promoter layer on metal surfaces. (Copyright: Plasmatreat GmbH)

Close-up of a machine with a machine in it

AI-generated content may be incorrect.

Efficient, reliable and long-lasting power modules by using Openair-Plasma for oxide reduction. (Copyright: Plasmatreat GmbH)

A close-up of different colors of metal

AI-generated content may be incorrect.

Left: Oxide-free metal after oxide reduction. Right: Metal with oxide layer before oxide reduction. (Copyright: Plasmatreat GmbH)