

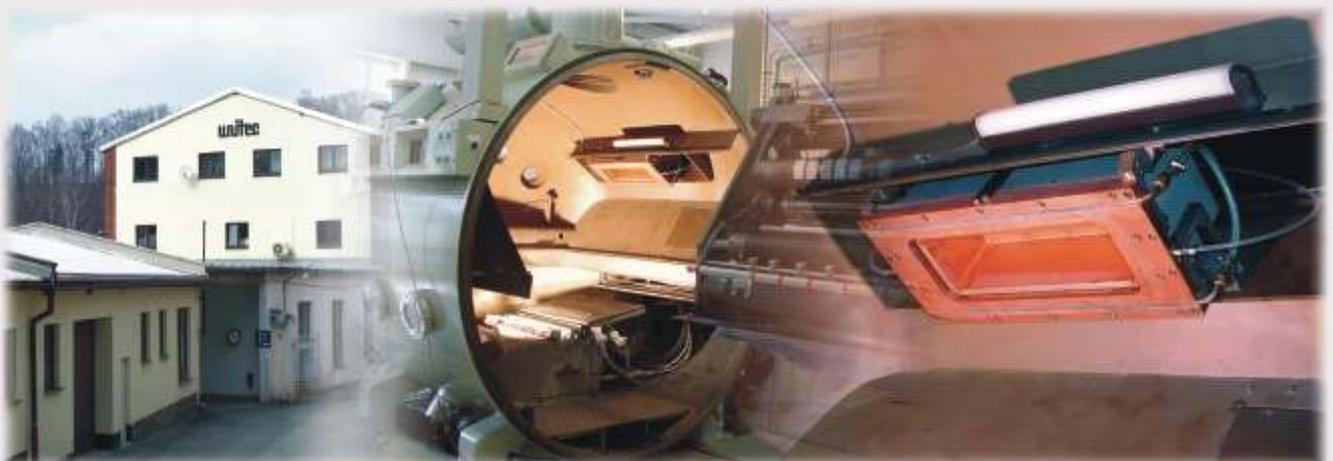


Fraunhofer Institut
Elektronenstrahl- und
Plasmatechnik

Linear plasma source for inline pre-treatment of vacuum- based roll-to-roll coating

Inline pre-treatment of plastic films

... is significantly becoming more important in industrial roll-to-roll coating. On the one hand many new polymers are used as substrates during the development of new products based on coating technologies. On the other hand economic reasons too lead to a quest for alternative, cheaper materials. They often have very bad surface conditions especially for coating processes, resulting in bad layer performance. So for vacuum based coating technologies modifications of the polymer surface is needed which can be achieved using plasma technologies to obtain good adhesion of the layers on the polymer substrates.



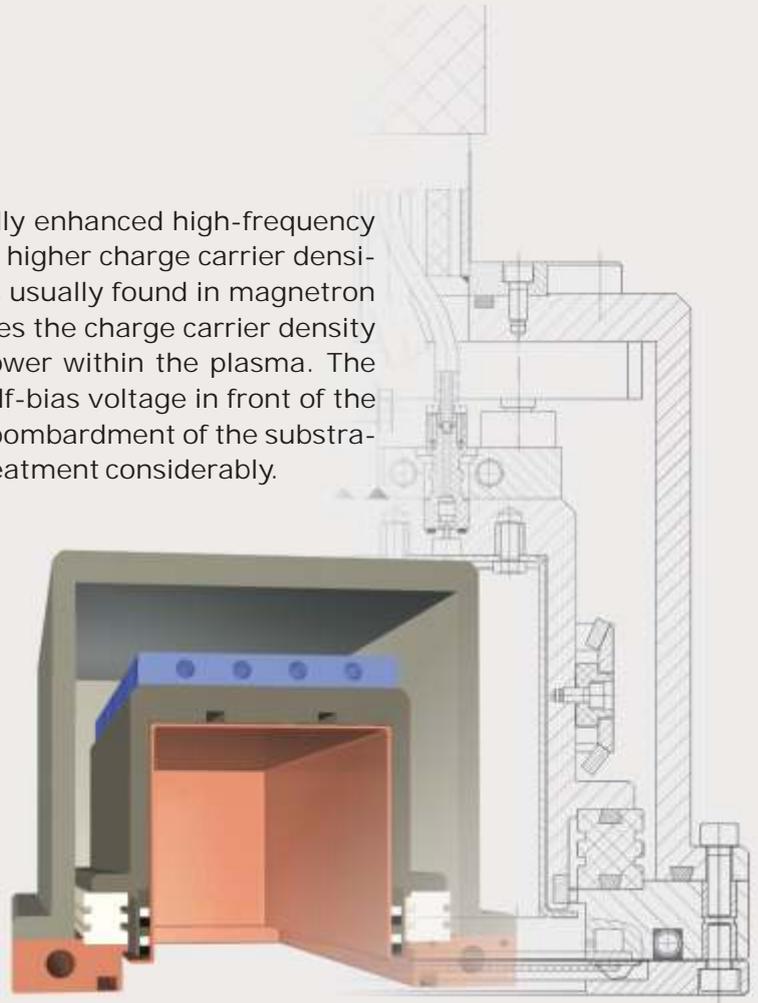
Efficient and reliable plasma sources

... are often not available. Promising principles are partially not fully developed and may be not suitable for rough industrial application. With WEBTREATER - a jointly ventured development^{*)} between Fraunhofer Institute for Electron Beam and Plasma Technology and UNITEC Helmsdorf GmbH - there is a plasma source which has been tested and used extensively in numerous industrial projects.

The WEBTREATER

... is a linear plasma source based on a magnetically enhanced high-frequency (RF-) discharge. The RF plasma is characterized by higher charge carrier densities (plasma densities) compared to DC discharges usually found in magnetron sputter sources. The magnetic field further increases the charge carrier density due to a more efficient conversion of electrical power within the plasma. The specific discharge geometry leads to a so-called self-bias voltage in front of the substrate surface to be treated. The additional ion bombardment of the substrate also increases the overall performance for pre-treatment considerably.

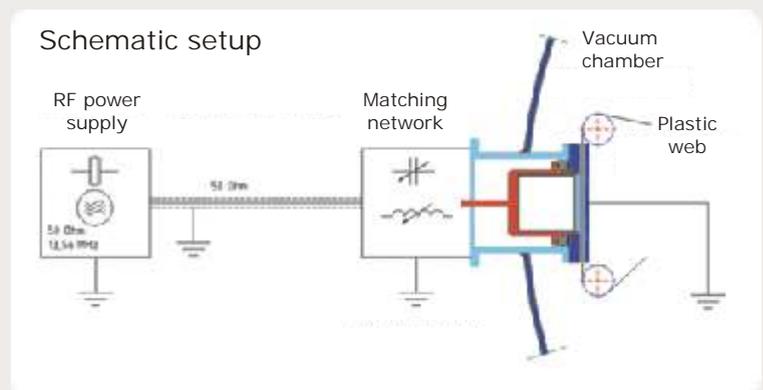
Because the substrate is moved in the immediate vicinity of the bulk plasma, the energetic contributions of the plasma are used in a very efficient way. Therefore, the WEBTREATER is an outstanding tool for pre-treatment at high web conveyance speeds.



Customer-oriented solutions

... is the credo of UNITEC Helmsdorf GmbH. In close contact with the customer a solution is possible, which takes into account the design of the vacuum chamber and the demands of the process as well. Starting with a common set-up the plasma source can be designed to customers needs.

We offer our customers feasibility studies to make sure that plasma source is well suited for their own processing. You will find qualified and professional staff and industrial pilot roll-to-roll equipment as well at Fraunhofer Institut for Electron Beam and Plasma Technology. Test trials can be performed for webs up to 500 mm wide and coating speeds up to 10 m/s.



*) Supported by the European Union (EFRE) and the Free State of Saxony (Germany)

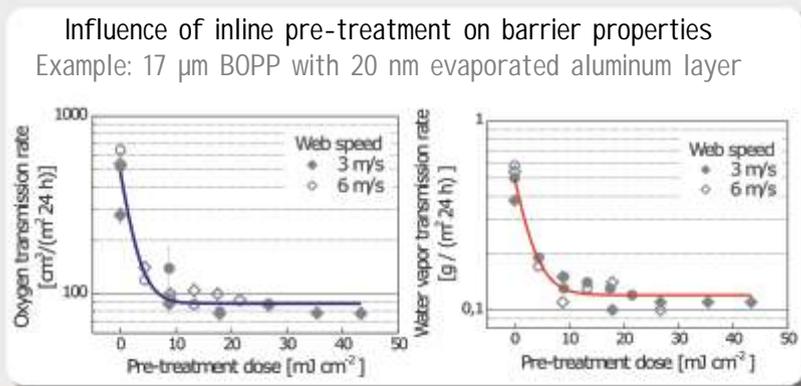
Technical data and parameters

Dimensions	customized ^{*)}
Assembly points	- chamber wall - cooling drum - roller
Working gas	Ar, He, O ₂ , N ₂ . . .
Pressure	0.1 Pa to 1 Pa

*) Typically 250 mm x 250 mm x Width (according to customers request). The final dimensions also depend on the desired assembly position. At present plasma sources up to 650 mm in width can be manufactured. The development for upscaling to more than 1500 mm is in progress.

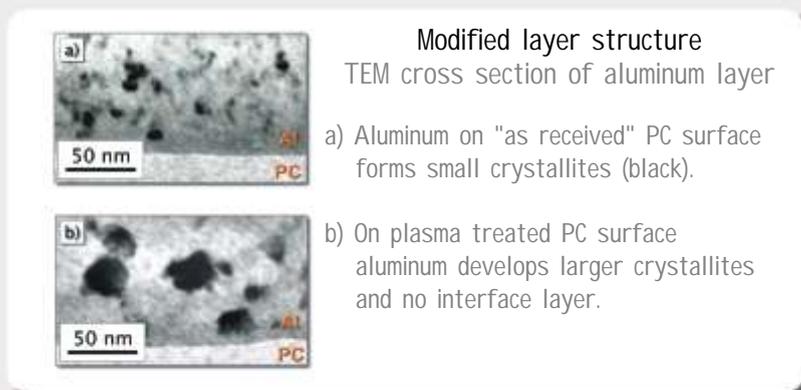
Effects of pre-treatment

Primarily an increase in layer adhesion is aimed at when using pre-treatment. But beyond this the optimized growth conditions on a clean (i.e. adsorbate-free) surface result in best high quality standards. For example aluminum layers processed by evaporation show better functional properties.



Optimized layer growth on clean BOPP surface results in increased permeation barrier due to reduced defects and dense interface.

In the case of BOPP the permeation barrier regarding oxygen is increased by about one order of magnitude at constant layer thickness!



- Enhanced conductivity of metal layers by avoidance of oxidic interfaces.
- Enhanced conductivity due to reduced scattering of electrons at grain boundaries and defects.

The electrical conductivity of aluminum layers increases by about 30 percent at constant layer thickness!

Please contact

for technical advice, manufacturing and sales service



Unitec Helmsdorf GmbH
Fabrikstrasse 21
01833 Stolpen OT Helmsdorf
GERMANY

Dipl. Ing. Torsten Lindner
Tel. +49 (0)35973/28-185
Fax +49 (0)35973/28-151
E-Mail Torsten.Lindner@unitec-helmsdorf.de

for scientific consultations and feasibility studies



Fraunhofer
Institut
Elektronenstrahl- und
Plasmatechnik

Winterbergstrasse 28
01277 Dresden
GERMANY

Dr. rer. nat. Rolf Rank
Tel. +49 (0)351/2586-148
Fax +49 (0)351/2586-55-148
E-Mail Rolf.Rank@fep.fraunhofer.de