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PHYSICAL AND PLASMACHEMICAL ASPECTS OF DIFFUSE COPLANAR BARRIER DISCHARGE AS A NOVEL ATMOSPHERIC-PRESSURE PLASMA SOURCE

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Abstract. Collaborating Czech and Slovakian university teams have recently developed an innovative plasma source, the so-called Diffuse Coplanar Surface Barrier Discharge (DCSBD), which has the potential to move a step closer to the industry requirement for in-line treatment of low-added-value materials using a highly-nonequlibrium ambient air plasma (Šimor et al. 2002,

The idea is to generate a thin (on the order of 0.1 mm) layer of highly-nonequlibrium plasma with a high power density (up to 100 W/cm^3) in the immediate vicinity of the treated surface and bring it into a close contact with the treated surface. Comparing to atmospheric-pressure glow discharge, volume dielectric barrier discharge, and plasma jet plasmas, such a diffuse plasma layer is believed to provide substantial advantages in energy consumption, exposure time, and technical simplicity.

A brief outline of physical mechanism and basic properties of DCSBD will given using the results of emission spectroscopy, high-speed camera, and spatially resolved cross-correlation spectroscopy studies.

The presentation will review also a current state of the art in in-line plasma treatment of low-cost materials and opportunities for the use of the so-called Diffuse Coplanar Surface Dielectric Barrier Discharge (DCSBD). The results obtained on the ambient air plasma treatments of textile, paper, wood, and glass illustrate that DCSBD offers outstanding performance with extremely low energy consumption for large area, uniform surface modifications of materials under continuous process conditions.

References

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