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PLASMA ENHANCED CVD AT ATMOSPHERIC PRESSURE FOR PROCESSING 2,5 D ELEMENTS

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The Fraunhofer Institute IWS has been developing the LARGE (long arc generator) plasma source in order to meet the industrial demands (plasma treatment of large surfaces, short process time, integrability in process chain, e.g. by robot handling, variable working distance for processing 2.5 D elements). This plasma source operates at atmospheric pressure. It consists of a 150 to 350 mm long arc stabilised by a magnetic field. The process gases flow around the long arc and are activated by the gas discharge plasma. This plasma-activated gas mixture forms a wide plasma curtain and impinges at the treated surface with variable distances between 2 to 7 cm. By applying a flange in front of the plasma, it is possible to add a precursor to the afterglow plasma (non-destructive). Thus, the LARGE plasma source can be used, e.g., to modify the surface of polymers, to deposit SiO_x films on metals or to clean precision surface.
To modify the polymer surfaces, different gas mixtures (e. g. Ar and N_2, O_2 or CO_2) are used to adjust systematically the surface chemistry. To improve the adhesion of varnish on polymers, e.g., functional groups, such as -C=O and -OH, are necessary. These groups can be generated even at a working distance of up to 7 cm and at a process velocity of 20 m/min during a plasma treatment with the LARGE plasma source.
An appropriate flange enables the deposition of SiO_x films on embossed stainless steel sheets at a working distance of up to 4 cm. The film composition depends on the precursor: SiO_x with TEOS and SiO_xC_y with HMDSO. These 10 to 500 nm thick films are used, e.g., as adhesion promoting films.
The LARGE plasma source is a technological system with enormous potential for a variety of industrial applications. The idea to optimize the plasma source for industrial applications could only be realized due to the Fraunhofer IWS core competencies. The scientists, researching in the fields fluid dynamic simulations, construction, plasma diagnostics or analysis bundled their expertise and worked in close cooperation.

Keywords
AP-PECVD
SiOx deposition
polymer modification