PO4081

Energy influx measurements on an atmospheric pressure surface barrier discharge

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The energy balance of diffuse coplanar surface barrier discharge (DCSBD, Roplass) [1] was investigated by passive calorimetric probe measurements [2] to characterize the discharge and the interplay between energy influx and surface activation. Surface activation of polymers is a well-studied field [3], however, most experiments were done under vacuum conditions, while often atmospheric pressure discharges are desired by industry due to easier integration into process lines.
Energy influx measurements at atmospheric pressure discharges always come with some challenges and necessity to adapt the probe design due to high energy and gas fluxes [4]. After successful adaptation, measurements at different distances from the surface showed similar trends as surface activation measurements on polymeric material by contact angle analysis. These observations indicate a strong correlation between the energy influx from DCSBD plasma to the substrate and the resulting surface properties due to plasma modification.
Furthermore, energy influx measurements were performed in different atmospheres (air, nitrogen, oxygen and argon) and additional cooling effects which appeared inside the plasma have been studied, indicating gas transport within the discharge.
[1] DCSBD 400, Roplass, Czech Republic, http://www.roplass.cz
[2] S. Bornholdt et al., in: M. Bonitz et al. (eds.), “Complex Plasmas”, Springer Series on Atomic, Optical, and Plasma Physics 82 (2014) 197-234
[3] J. Friedrich, “The Plasma Chemistry of Polymer Surfaces”, Wiley-VCH (2012)
[4] T. Kewitz, M. Fröhlich, J. von Frieling, H. Kersten, „Investigation of a commercial atmospheric pressure plasma jet by a newly designed calorimetric probe“, IEEE TPS 43(2015), 1769

Keywords
atmospheric pressure plasma
DBD
energy influx
surface activation