PO1076

Atmospheric-Pressure Plasma Treatment of Polymeric Surfaces Using Diffuse Coplanar Surface Barrier Discharge

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Nowadays there is a tendency to apply surface treatment methods based on the use of non-isothermic plasma at atmospheric pressure, which have been developed for the treatment of materials with high added value e.g. in the field of microelectronics, but also for common polymeric materials e.g. textiles, wrappage foils or automotive products [1]. The most common of these methods is the so-called „activation“ or „hydrophylisation“, by which polar functional groups are created on the considerably inert surface of common synthetic polymers, e.g. polypropylene (PP) and polyester (PET). This process leads to the increase in the free surface energy of the polymer and its adhesion to subsequently created layers, e.g. by means of printing, lamination, bonding, grafting of different type of polymer etc. One of the leading workplaces in the EU in the field of the development of high-pressure non-isothermic plasma sources is situated at Comenius university, Bratislava, where a revolutionary type of plasma source has been developed. The so-called Diffuse Coplanar Surface Barrier Discharge (DCSBD) is capable of the generation of highly non-isothermic plasma with a record high energy density of 100 W/cm^3, even in strongly electronegative working gases without the use of He or other inert gases. In our contribution we present results on surface treament of diffent types of polymeric materials that were treated by DCSBD. The quality and permanency of surface modification was tested by contact angle measurement and common strike-through time measurement to observe the wicking of liquids. For detailed examination of morphological changes, the samples were investigated by means of AFM analyses. The efficiency of the plasma surface modification was also compared to low-pressure plasma treatments as carried out at Empa, St.Gallen. [1] J. R. Roth, Industrial Plasma Engineering, Vol. 2: Applications to Nonthermal Plasma Processing, Indt. of Phys. Publishing, Bristol and Philadelphia, 2001

Keywords
atmospheric-pressure plasma
coplanar discharge
surface modification of polymers