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POLYMER SURFACES MODIFIED BY ATMOSPHERIC PLASMA : CHEMICAL CHARACTERIZATION OF FUNCTIONALIZATION AND MULTILAYER COATING

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Ethylene ChloroTriFluoroEthylene (ECTFE) and PolyEthylene Terephthalate (PET) films have been treated by Atmospheric Pressure Plasma in a controlled atmosphere of pure N_2 with addition of monomers or dopants. Treatments have been done on a R2R industrial plasma reactor developed for achieving high performance surface functionalization and coating deposition on flexible organic films. Advanced surface characterization through X-ray Photoelectron Spectroscopy (XPS) and Time of flight – Secondary Ion Mass Spectrometry (Tof-SIMS) coupled with a Gas Cluster Ion Beam (GCIB) have been used to explain the performances obtained for these treatments. Two different types of surface treatment are presented:

- Surface functionalization of a ECTFE film has been performed using different plasma conditions (gas mixture, plasma dosage). The modified surface has been chemically characterized by XPS. Plasma treatments lead to oxygen and nitrogen grafting. The relative proportion of the grafted species is highly dependent on both gas mixture and plasma dosage. These differences in surface chemistries are discussed in relation with surface energy and adhesive properties. It is shown that the adhesion properties are more related to surface chemical composition than to surface energy.

- Mutilayer perfluorocarbon / siloxane coating has been deposited on a polyester film. Tof-SIMS using GCIB for depth profiling has been able to identify the molecular structure of the different layers and their depth localization in the coating, showing no inter-diffusion. This information is used to explain the surface properties of the multilayer coating.

Keywords
atmospheric plasma
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