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## Large area fabrication of stochastic nanostructures on polymer webs using ion- and plasma-treatment

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Self-organized nanostructures can be created on polymer substrates by applying a plasma or ion treatment. This technology may be used for anti-reflection (AR) applications in plastic optical devices as e.g. aspheric lenses in mobile phone cameras. Compared to conventional AR-coatings, the nano-structures have a high potential for cost reduction. First results of these coatings showed no delamination at all as well as new properties like super-hydrophobicity of the surface.

In this paper the transfer of this technology from a batch coater to an in-line machine is described. The process was implemented in a pilot-scale reel-to-reel coating machine with a process width of 600 mm. Stochastic nanostructures were created on polyethylene terephthalate (PET), cellulose triacetate (TAC) and ethylene tetrafluoroethylene (ETFE) substrates. Two ion sources were tested and compared: a dual magnetron system and a linear ion source (LIS, Advanced Energy). A distinct relationship between plasma parameters and ion beam efficiency could be found. The paper will discuss process parameters for plasma treatment and properties of modified polymers. Using a one-side treatment on PET, an optical transmission of 93,5% at a wavelength of 550 nm has been achieved.

Additionally, the technology transfer to a production line was tested. The laboratory results could be reproduced on a production machine with a process width of two meters. The highly efficient industrial process was demonstrated by parallel operation of four rotatable magnetron stations.

### Keywords

anti-reflection  
nanostructures  
plastic webs  
self organized  
roll-to-roll