



Micro/Nano-Structured Flexible Foils for Anti-Counterfeiting Purposes

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Session Title Polymer Characterization and Analysis

Abstract Title **Micro/Nano-Structured Flexible Foils for Anti-Counterfeiting Purposes**

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Abstract Text

Up to date there have been found many ways of producing samples with functional nano-patterning, however for mass production of such samples the method of fabrication of the surface structure must be fast and cheap. A recently developed method suggests using extrusion coating of polymer materials in a roll-to roll process, where the functional micro-/nano- surface structures are imprinted directly onto the surface of a polymer foil. This new technology can both answer the requirement for being fast and cheap. The aim of this project is implementation of the technology for mass production and it is carried out in collaboration between technical University of Denmark and Danapak Flexibles A/S. In a roll to roll extrusion coating a molten polymer film is extruded through a flat nozzle, then stretched in air, and finally laminated onto a carrier foil. The lamination process takes place as the melt curtain is squeezed between a structured cooling roller and a rubber counter roller. A force is exerted on the compliant counter roller to form a so-called nip region where the molten polymer solidifies and adheres to the carrier foil. The extrusion coating process is fast, mainly due to the fact that the polymer is molten to begin with, and cools rapidly by contact with the cooling roller. Previously a large area replication at high throughput of patterns both on micrometer- and nanometer scale in thermoplastic foils using standard industrial extrusion coating equipment and standard thermoplastic polymers has been demonstrated. The focus of this study lies on the reproduction of the previous results for nano- or micro-structures and implementation of this technology for mass production of such patterned foils for the use in packaging. An interesting application is production of holograms with build in anti-counterfeiting designs on micro- or nanoscale.

Keywords: Method Development, Nanotechnology, Polymers & Plastics, Process Control

Application Code: Polymers and Plastics

Methodology Code: Surface Analysis/Imaging