ABSTRACT BOOK

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NEW PDMS-B-PCL AND PCL-B-PDMS-B-PCL BLOCK COPOLYMERS FOR SURFACE NANO AND MICRO-PATTERNING

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Polydimethylsiloxane (PDMS) are particularly interesting polymers due to their broad combination of desirable properties as a low glass transition temperature (-120 °C), a high chain flexibility, a high resistance to chemical oxidation, high thermal and UV stability, a very pronounced hydrophobic character, as well as high biocompatibility. However, silicone polymers have so far been little used for the control of chemical modification of surfaces due to a strong dewetting tendency during adsorption on solid surfaces. To increase the chemical compatibility and promote irreversible adsorption, the synthesis of new block copolymers with a viscoelastic PDMS block was investigated. More precisely PDMS was copolymerized with e-caprolactone (e-CL) that is currently reconsidered with particular attention because of its biodegradability when polymerized.

The purpose of this study is to create micro-patterned surfaces with specific and adjustable properties (hydrophobic vs hydrophilic or rigid vs soft). Several block copolymers were synthesized by reacting hydroxy-functional PDMS oligomers with e-caprolactone. The synthesis of block copolymers AB and ABA were made by anionic coordinated polymerization. A wide range of combinations of well-defined diblock PDMS-b-PCL and tribloks PCL-b-PDMS-b-PCL copolymers were obtained. The molecular weights of block copolymers synthesized were determined by 1H NMR and SEC. The thermal and structural properties of copolymers were determined by DSC and FTIR spectroscopy. The structure of copolymers in the adsorbed state was studied by Atomic Force Microscopy (AFM) to reveal the impact of block copolymer microstructure on the micro-patterning properties.

The results show that the surface morphology of the adsorbed copolymer films can be tuned by the copolymer microstructure. In particular, the adsorption on a hydrophobic surface allows obtaining a 2D “porous” surface, for which the size of “cells” is determined by the microstructure of the copolymer.

Keywords: *Block copolymers; Polydimethylsiloxane; Polycaprolactone; Adsorption; Surface patterning;*

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CHITOSAN-BASED LEATHER FUNCTIONAL COATINGS WITH IMPROVED ANTIMICROBIAL PROPERTIES

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Among the interesting biological activities that have been ascribed to chitosan, the antimicrobial activity is probably the one that generates the higher number of applications. Developing antimicrobial coatings for footwear components to be used in direct contact with the feet is of great interest; both at industrial level (reducing the possibility of material deterioration and quality loss) and from the consumer’s point of view (decreasing skin infections and minimizing unpleasant odours). One weakness of this application is addressed to the durability and efficiency of the product antimicrobial activity, since it is directly associated with the availability of the positively charged R–NH_3^+ groups that are depleted during use.

In this work chitosan-based microparticles loaded with limonene as a model core material have been produced using an atomization technique followed by a coagulation step with sodium tripolyphosphate solution and a finishing step with glutaraldehyde. By using microencapsulation it is expected that the loaded essential oil will progressively release, reinforcing the antimicrobial durability and effectiveness of the developed coating. Moreover, the empty chitosan carriers can act as an additional source of chitosan.

The chitosan-based microparticles were applied conjunctly with a chitosan solution (1% w/v in diluted formic acid solution) in a pilot scale drum during 2 hour at 50 ºC. The used leather samples correspond to half a hide arising from the industrial dye fixation stage split in two parts. After the coating process, the leather was dried in industrial conditions and stored in closed plastic bags before testing. The antimicrobial activity was tested using a Standard Test Method under Dynamic Contact Conditions based on the ASTM Standard E 2149-01. Comparatively to the leather impregnated with the base chitosan solution, the coatings reinforced with chitosan microparticles evidenced an improved antimicrobial activity.

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Keywords: *polymers; biological activity; natural products;*