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Dissertation abstract

Multifunctional coating based on chitosan derivatives

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The main objective of the present PhD thesis was to develop a several coatings from chitosan derivatives obtained as a result of its *N,O*-acylation with three fatty acids (at different weight ratios), i.e. linoleic, α -linolenic and dilinoleic. Two thermoplastic elastomers were selected as substrates; a polyester based on polyethylene terephthalate and linoleic acid dimer, and a poly (amide-*b*-ether).

Spectroscopic methods were used in order to establish the chemical structure of the obtained derivatives as well as to determine the place and substitution degree of chitosan. The presence of fatty acid molecules was demonstrated to directly affect the macromolecules structure and conformation thus, changing the derivatives thermal and rheological properties. Changes in the hydrolytic and enzymatic degradation as well as in the antimicrobial properties of the derivatives were observed depending on the fatty acid content.

Two methods for the preparation of chitosan derivatives based coatings were developed in order to obtain different final properties depending on their potential applications. It was shown that the amphiphilic character of derivatives, due to the presence of fatty acids, imposed strong self-assembling properties that significantly affected the properties of the coatings formed. Depending on the surface characteristics of the coated substrate, the created amphiphilic coatings provided different hydrophilic-hydrophobic properties. This fact was a result of the different organization of macromolecules in the coating evidenced by changes in the coefficient of friction. In addition, a depth analysis of the coating elemental composition by X-ray Photoelectron Spectroscopy (XPS) confirmed this specific organization of derivatives macromolecules.

The results of biological (cytotoxicity and hemocompatibility tests) and microbiological properties (bacterial cells adhesion test), confirmed the high potential of the synthesized derivatives to serve as coatings for biomedical applications, especially as a catheters protective coatings.

