EFFECT OF DC DISCHARGE PLASMA ON CHITOSAN-BASED FILMS: SURFACE PROPERTIES AND *IN VITRO* EVALUATION

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This work was aimed at studying the effect of DC discharge plasma modification of films casted from various chitosan samples and chitosan/poly(L,L-lactide)/gelatin graft-copolymers on their surface properties, chemical structure and cell response. Contact angle measurements, XPS and SEM showed that in spite of the similarity of the observed processes, such as surface hydrophilization and etching, the contribution of each process significantly depended on the initial polymer films characteristics.

Chitosan (Chit), a deacetylated derivative of naturally occurring chitin, is a promising material for a wide range of applications from biotechnology to packaging industry. Plasma modification of Chit-based films was proposed to control their hydrophilic-hydrophobic balance, permeability as well as cell adhesion and proliferation.

This study deals with evaluation of DC discharge treatment effect on chemical structure, surface properties and cell response to the plasma modified films casted either from Chit with various macromolecular characteristics or chitosan/poly(L,L-lactide)/gelatin graft-copolymers (CGP). The films were treated at the cathode or anode by DC discharge using residual air at pressure of 10-15 Pa and current of 50 mA for 60 s. Contact angle and surface charge measurements showed that plasma modification led to hydrophilization and surface energy increase of all the studied films. SEM and XPS observations demonstrated that plasma treatment of Chit films led to etching and oxidation of the surface layers. However, particular features of each process significantly depend on the Chit characteristics, as well as plasma treatment conditions. XPS data confirmed that a surface layer of the CGP films was enriched with a polyester component. The use of CGP for film fabrication markedly affected the surface chemical structure and properties and, therefore led to specific modification effects, namely decrease of oxygen-containing groups.

A number of mouse fibroblasts (L929) were shown to decrease on the plasma treated CGP and Chit films as compared to those on non-treated films (control). Plasma treatment at the cathode led to more pronounced cell viability decrease than at the anode and control. Thus, plasma surface modification could be proposed as a tool to control cell response on the material surface.