Biocompatible Chitosan/Carboxymethyl Cellulose Nanofilms: Enhancing Surface and Optical Properties via Salt Annealing

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Polyelectrolyte multilayers (PEMs) are well-established surface coatings that can be built-up by alternately depositing positively and negatively charged polyelectrolytes onto a solid surface. These coatings are assembled from pairs of oppositely charged polyelectrolytes through electrostatic interactions or, when their molecular structures permit, hydrogen bonding. A key advantage of polyelectrolyte multilayers is their highly tunable properties, which can be tailored by adjusting adsorption conditions such as deposition time, polyelectrolyte concentration, ionic strength, as well as the type and concentration of added salt and pH. In recent years, we have developed advanced PEM strategies that offer strong potential for designing soft nanomaterials with finely tunable properties, allowing adaptation to the specific requirements of a wide range of applications, particularly in biomedicine and food science [1,2] . In this study [3] , we prepared films from two biocompatible polysaccharides, chitosan and carboxymethyl cellulose. Such thin films, when prepared on model surfaces such as silicon or glass, change the optical properties of the surface. For this reason, we modified the films post-adsorption by immersing them in sodium chloride solution, a process known as salt annealing. By varying the salt concentration and duration of annealing, both surface and optical properties of the multilayer can be tuned and improved. The untreated films made the substrate reflect light more diffusely, leading to a clouded appearance of the surface. This effect was reduced via salt annealing, resulting in a film which does not affect the optical properties of the surface. In addition to the changes in optical properties, the wetting behaviour of the films was also studied. This study successfully correlates film roughness and the changes in the diffuse reflectance. Furthermore, as a proof of concept for application, the chitosan/carboxymethyl cellulose film was successfully prepared on a cherry tomato where salt annealing successfully diminished the influence of the film on its reflective properties.

References:

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