

Abstract

Calcium Carbonate Enriched-Chitosan Prepared from Shrimp Shell Waste [†]

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Chitosan is a natural, nontoxic, biocompatible, biodegradable, and water-insoluble polymer, obtained by deacetylation of chitin. Chitosan finds a wide range of applications, that may be summarized as follows: medicine, pharmaceuticals, cosmetics, agriculture, and food, where it has various characteristics such as antibacterial, antifungal, antimicrobial, antitumor, anticoagulant, antioxidant, and effects on immunity and wound healing. Chitin is a semi-crystalline homo-polymer, representing the main component of the exoskeleton of crustaceans, invertebrates, insects, arthropods, mollusks and arachnids, but also a component of the cell wall of some species of fungi, being the second most widespread after cellulose [1,2]. The first step involved in the extraction of chitin involves washing and grinding of crustacean shells (most commonly shrimp). The next stage consists of demineralizing the water to remove minerals, particularly calcium carbonate. Deproteinization is aimed at removing a significant number of proteins from the structure. The obtained chitin is deacetylated before being converted to chitosan. The final stage in the procedure consists of washing and drying of the final product [3,4]. The main objective of this research is to obtain calcium carbonate enriched-chitosan starting from raw shrimp waste. A comparison with commercial chitosan and chitosan obtained from commercial chitin was also performed. The first research direction refers to attempts of producing chitosan from commercial chitin by means of a deacetylation process. The second research direction deals with chitin extraction from shrimp shell waste through a deproteinization process. Subsequently, on this particular obtaining process, chitin undergoes deacetylation, to obtain chitosan. In order to fulfill the main objective, consisting of obtaining chitosan from shrimp shell waste, modern characterization techniques were used to determine the Degree of Deacetylation (DD, by pH titration), the textural properties (BET), the structure and composition (by X-Ray Diffraction-XRD and Fourier-Transform Infrared Spectroscopy-FTIR) and viscosity (by Rheometric Analysis). This study is the first step towards developing an innovative technology for the obtaining of an enriched type of chitosan from shrimp waste shells. Bypassing the process of demineralization, leads to a raw chitosan with high content of calcium carbonate, which is further useful to increase the mechanical strength of thereof.

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