THE EFFECT OF β-GLUCAN ON THE SURFACE MORPHOLOGY AND ROUGHNESS PARAMETERS OF FISH ORIGIN COLLAGEN MATERIALS

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Introduction

The main sources of collagen for industrial applications are pork and beef skins and bones [1]. However, their application has been restricted because of the possibility to transfer some animal diseases (e.g. foot and mouth disease, bovine spongiform encephalopathy) to humans [2]. In connection with the above, more and more popular become fish collagen. Fish origin collagen may be extracted from fish skin, scale, spines, dorsal strings, and swim bladders. Therefore, this protein extracted from fish by-products has a great interest in the cosmetics, pharmaceutical, and medical industries. Using by-products from the local fish industry may decrease collagen cost and allows it to mitigate environmental problems [3]. However, the properties of collagen may not full fill all requirements of materials for medical use. Therefore, to improve the properties of collagen material β-glucan was added. It is known that β-glucan may stimulate wound healing. In addition to improving the biological properties of the material is able to form a crosslinking network by hydrogen bonds and improve physicochemical properties [4]. The aim of this work was to evaluate the influence of β-glucan addition on the surface morphology and roughness parameters of collagen materials.

Materials and Methods

Collagen was obtained in our laboratory from *Aristichthys nobilis* skin. 1% (w/v) collagen solution was prepared with 0.1M acetic acid as a solvent. 5% β-glucan was prepared in deionized water and heat in a water bath without boiling. Solutions were mixed together in collagen/β-glucan ratio: 100/0; 90/10; 70/30; 50/50 (w/w). Materials were obtained by the solvent casting method.
The topographic structure of the polymeric film was observed using an atomic force microscope. Images were obtained using a multimode scanning probe microscope with a Nanoscope IIIa controller (Digital Instruments, Santa Barbara, CA) operating in the tapping mode, in air, at room temperature.

Results and Discussion

AFM picture of Coll70/30BG material is presented on FIG. 1. and complementary data about all roughness parameter are presented in TABLE 1. Can be seen, that prepared material was compact and non-porous. On surface of Coll70/30BG one can see microfolds formation. Rq and Ra parameters increases with incising amount of β-glucan into materials. Both parameters increase almost 4 times for Coll50/50BG compared to pure collagen. The average height of material with 50% β-glucan content amounted 100 nm.

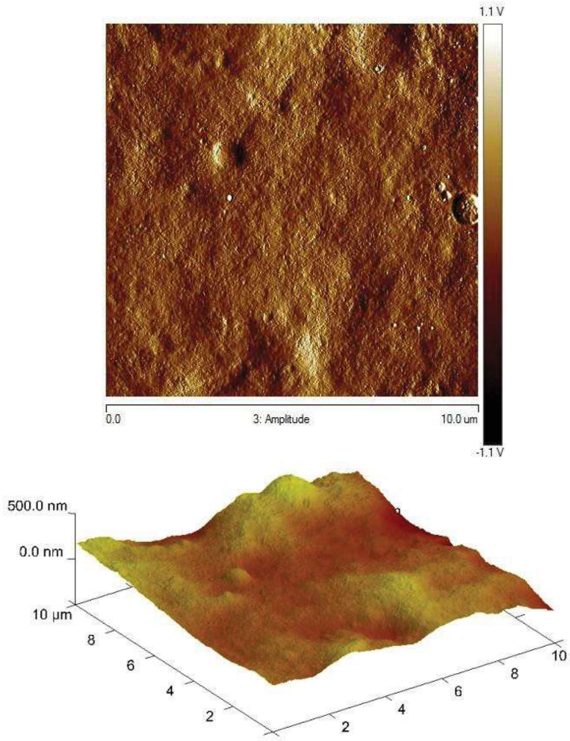

FIG. 1. Example pictures of structure morphology of Coll70/30BG films.

TABLE 1. Surface roughness parameters for different kinds of films.

Specimen	Rq [nm]	Ra [nm]
Coll	33.4	26.2
Coll90/10BG	36.5	29.2
Coll70/30BG	59.0	47.8
Coll50/50BG	125	100

A film composed of β-glucan from Sacharomyces cerevisiae origin was a non-porous and characterized granular-like structure with 100 nm high [5]. The thermal method used for prepared β-glucan films resulted in a smooth surface. However, materials prepared by the dialysis method were characterized by randomly distribute precipitates [6].

Conclusions

Fish skin from Aristichthys nobilis may be used as collagen source and material based on this protein and β-glucan may be obtained by the solvent evaporation method. The addition of β-glucan to collagen material increases the surface roughness without visible precipitates. The method used for materials preparation influence on the surface structure.

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