https://doi.org/10.53230/tgm.1310-912X.2025.1001.09

INFLUENCE OF HEAT TREATMENT ON THE SURFACE AND ANTIBACTERIAL PROPERTIES OF COTTON FABRIC MODIFIED WITH CHITOSAN

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Introduction

Cotton fabrics have good mechanical properties, a large surface area, and biodegradability, and are widely used for medical and biomedical purposes. Their main disadvantage for medical applications is their porous hydrophilic structure, which creates favorable conditions for moisture retention and the growth of microorganisms on the surface of the cellulose fibers. This disadvantage can be overcome by modifying cotton fabric with biopolymers such as chitosan, which has proven antibacterial properties. It is suitable for the production of a polymer coating on textile material due to its biodegradability and biocompatibility.

Experimental part

The present study aims to compare the properties of cellulose fibers treated with chitosan crosslinked with citric acid at room temperature and after moderate heat treatment (80°C, 180 min). The resulting materials were characterized using gravimetric, colorimetric, and thermogravimetric analysis. The relationship between the components was investigated by infrared spectroscopy, and the surface morphology (contact angle) and antimicrobial activity of the composite materials against Pseudomonas aeruginosa and Bacillus cereus were also investigated.

Results and discussion

Cotton fabric was surface-modified with chitosan, cross-linked with citric acid at room temperature and by heat treatment. The results show that the modification improves the properties of the cellulose fibers, especially those obtained at moderate temperature (CHHT), which show a higher gel fraction, greater material weight, high hydrophobicity, and thermal stability compared to the sample treated at room temperature (CHRT). Infrared spectroscopy analysis shows that in the cotton fabric coating, the interactions between chitosan and citric acid are ionic at room temperature and covalently bonded with heat. The newly obtained materials (CHRT and CHHT) exhibit antimicrobial activity, with CHHT being more effective, probably due to its increased hydrophobicity. This highlights the potential of the treatment method, especially at moderate temperatures, as a promising approach in the development of functional textile materials in the field of hygiene and biomedical applications.

Keywords: *cotton fabric, chitosan, modification, hydrophobicity, antibacterial properties*

Acknowledgments: This research is supported by the Bulgarian Ministry of Education and Science under the National Program "Young Scientists and Postdoctoral Students-2".