



Multifunctional cotton Impregnated with Multilayer Chitosan/Lignin Nanocoating and Ag Nanoparticles

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The demand for clothes with antimicrobial and UV protective properties is continually growing. In an attempt to develop a simple and efficient treatment for cotton fabrics, layer-by-layer deposition of chitosan and magnesium lignosulfonate followed by in situ synthesis of Ag nanoparticles (NPs) was performed. Magnesium lignosulfonate acts as a stabilizing agent and UV blocker while NaBH₄ is applied as a reducing agent. The influence of the number of bilayers (4 and 12) and the initial concentration of AgNO₃ solution (10 mM and 20 mM) on UV protection factor (UPF) and antimicrobial activity against Gram-negative bacteria *Escherichia coli*, Gram-positive bacteria *Staphylococcus aureus* and yeast *Candida albicans* was studied. The presence of nanocoating on the surface of cotton fabric is confirmed by FTIR and XPS analyses. XPS and FESEM analyses reveal a successful synthesis of Ag NPs on the surface of cotton fibers with an average dimension of 35 nm. A four bilayer coating is sufficient to reach maximum 50+ UV protection. Maximum reduction of all investigated microorganisms is achieved with 12 bilayers and application of 20 mM AgNO₃ solution.

Keywords: cotton, chitosan/lignin nanocoatings, Ag nanoparticles, antimicrobial activity, UV protection

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