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Synthesis and Characterization of Cationized Wool Fabrics to Acquire New Properties

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Abstract

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Modification of woolen fabrics were achieved by several methods such as grafting β-cyclodextrin, β-cyclodextrin derivatives (monochlorotriazinyl β-cyclodextrin) and low molecular weight deacetylated chitosan in the presence of citric acid (CA) as a crosslinking agent using the pad-dry-cure technique at different conditions (times and temperatures). Wool fabrics were also modified with some quaternary ammonium salts. The improved properties of the modified wool fabrics were evaluated using urea bisuphfite solubility test, tensile strength, elongation and crease recovery angle. Yellowness index and scanning electron microscopy (SEM) were performed. Dyeing properties of the modified wool fabrics were studied using acid and reactive dyes. The biocidal activity of the modified and unmodified (control) wool samples was evaluated against moth larvae and some species of bacteria (*Escherichia coli G-* and *Staphylococcus aureus G+* and fungi (*Candida albicans* and *Aspergillus flavus*).

Plasma treatment was used to modify the surface properties of wool fibres for partial removal of the scales and the lipid layer. The effect of low pressure pseudo discharge plasma in oxygen as a working gas, on the dyeing properties of untreated and pretreated woolen fabrics were investigated. Different exposure times (1-5 minutes) of oxygen plasma were effected to improve the dyeability, the washing and light fastness properties of the dyed woolen fabrics. The plasma treatment improved the hydrophilicity and the performance of wool fabrics. The wettability of the treated specimens was increased by increasing the exposure time to plasma.

Key words: woolen fabric, grafting, citric acid, β-cyclodextrin, monochlorotriazinyl β-cyclodextrin, chitosan, phosphorous salts, pseudo oxygen plasma, exposure time, dyeing, antimicrobial activity, SEM.

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Aim of the Work

The present research aims to produce some modified cationic woolen fabrics of enhanced biocidal, insecticidal resistance, hydrophilicity (increase in wettability, the water absorption) and dyeing properties. Grafting of wool was done by chemical means, plasma alone and plasma / grafting. Analyses and characterization of the modified wool fabric, compared to the unmodified one were performed. These analyses include chemical, physical and biological analyses such as urea bisulphite solubility test, crease recovery angle, fabric resistance to moth and some species of microorganisms (*Escherichia coli G-, Staphylococcus aureus G+, Candida albicans, Aspergillus flavus*), Also, fastness to wash, SEM as well as the mechanical properties of the fabric were studied.

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