WORKER INTERNSHIP REPORT

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Application of plasma technology in the treatment of textile material

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Engineer Course 2nd year - 2017/2018

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Worker internship report was made under the direction of Sanja ERCEGOVIĆ RAŽIĆ in the Department of Materials, Fibers and Textile Testing of the University of Zagreb Faculty of Textile Technology, in second year of the engineer course.

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Résumé

Le but de ce stage est d’étudier l’influence d’un traitement de surface à partir de plasma sur les propriétés de deux tissus tels que le coton et le lyocell qui est issu de fibres synthétisé par l’homme donc non naturel, notamment l’influence sur l’hydrophilicité du matériau. Le deuxième objectif est de tester alors la tenue de couleurs après une impression digitale sur le tissu et aussi la tenue d’un traitement antimicrobien qui pourrait donc être modifié par les différents traitements plasma effectué. Pour ce faire, des analyses à l’aide d’un spectrophotomètre ont été réalisées pour pouvoir comparer les différentes teintes des couleurs imprimées. De plus, des échantillons ont été soumis à deux différentes bactéries (Escherichia coli et le Staphylocoque doré) pour observer si le traitement antimicrobien était efficace. Ces différentes analyses ont permis de montrer que le prétraitement plasma pouvait améliorer le caractère hydrophile des textiles et avait une influence sur la tenue des couleurs après impression augmentant l’intensité de la couleur synonyme d’une meilleure absorption des pigments. L’analyse antimicrobienne a montré que l’agent antimicrobien semble rester à la surface du textile après prétraitement plasma dans les zones d’impression.

Mots clés : plasma, coton, lyocell, traitement de surface, hydrophilie, traitement antimicrobien (padding process), impression digitale
Summary

The purpose of this internship is to study the influence of a surface treatment with plasma on the properties of two fabrics, cotton, which is a natural cellulose fibers, and Lyocell, as man-made cellulose fibers, especially the influence on the hydrophilicity of the material. The second goal is improving of printing on the fabrics after digital printing, as well as the efficiency of an antimicrobial treatment, which can be modified by plasma pretreatments. In order to do this, analyzes with a spectrophotometer have been realized to compare the different hues of printed color. Besides, samples have been tested against two bacteria (Escherichia coli and Staphylococcus aureus) to observe if the antimicrobial treatment is effective for their inhibition. Plasma pretreatment certainly increase the hydrophilic textile properties and influenced on the colour spectral parameters of printed area. An increase in the color yield and fastness as well as handle of ink jet printed samples was observed on plasma pretreated samples, which means that there is a better absorption of the pigments and better final printed image quality. Antimicrobial analyzes showed that the silver nanoparticles as active compound of antimicrobial agent was partially blocked with polymer which contribute to limiting effect of antimicrobial effectiveness, while the printed area of the sample show better antimicrobial protection and inhibition zone was observed. Such assumed will be analyzed using scanning electron microscope for understanding the influence of the plasma pretreatment on the antimicrobial polymer yielding and quality of color printed area on the material surface.

Key words: plasma, cotton, lyocell, surface pretreatment, hydrophilicity, antimicrobial treatment (padding process), digital ink jet printing