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Multifunctional coatings on fabrics by application of a low-pressure plasma processJoelle Levalois-Grützmacher¹, Marie-Jérôme Tsafack², Kanchit Kamlangkla²,
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Nowadays, there is an increased demand to produce highly-performant fabrics combining multiple properties such as flame retardancy, hydrophilicity/hydrophobicity, antibacterial, UV resistance, etc. In order to produce a wash-resistant-flame-retardant-water-repellent-dyed multifunctional coating on natural fabrics like cotton and silk, various protocols involving the Ar plasma-induced graft-polymerization (PIGP) process of monomers were investigated. This process has proved already to be an efficient way to achieve a permanent grafting of a thin polymer film on the surface of various substrates^[1]. For this process, the monomers should contain a polymerizable function (acryloyl or methacryloyl) and a flame retardant (phosphoramidate derivatives) or a water repellent functionality (perfluorinated moiety). The combination of a flame retardant treatment with a fluorinated gas plasma treatment (CF₄, SF₆) was as well investigated. The burning behaviour of treated fabrics is discussed using Microscale Combustion Calorimetry (MCC) and Limiting Oxygen Index (LOI) measurements. The water repellent behaviour is evaluated by means of Schmerber pressures ($P_{Sch.}$) and the wash-fastness properties of the fabrics were tested by using the accelerated method proposed by Mc Sherry and coll^[2].

The obtained results have shown that for each protocol, the flame retardant monomer is compatible with a water repellent or a dyeing treatment.

[1] M.J. Tsafack, J. Levalois-Grutzmacher, Surf. Coat. Technol., 200 (2006) 3503.

[2] W. F. McSherry, G.L. Drake, A. B. Cooper, A.R. Markezich, Am; Dyest. Report., 63 (1974) 52.

Keywords

PIGP

Flame retardant

Water repellent

Dye

Natural fabric