RADIOGRAFTING OF PHOSPHORUS FLAME RETARDANTS ON FLAX FABRICS: COMPETITION BETWEEN HOMOPOLYMERIZATION AND GRAFTING

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ABSTRACT

Many natural fibers have been used for a long time in textile industry as cotton and flax [1]. Moreover, natural fibers are getting more importance in composites industry as a substitute for glass, carbon, or aramid fibers [2, 3]. However, they must be modified to overcome some disadvantages such as flammability [4]. In previous studies [4, 5], phosphorus flame retardants (FR) were grafted on flax fabrics by e-beam radiation. In the present study, the reactivity of the double bond C=C of the P-monomers under e-beam radiation was investigated to control the grafting yield of various FR. Two phenomena are competitive during radiation step. The P-monomers can be grafted directly on the flax components or can homopolymerize inside the fibers. Phosphorus content reached 1.4 wt% using vinyl phosphonic acid. Grafting efficiency was assessed by X-ray fluorescence, Energy Dispersive X-Ray Analysis (EDX) / Scanning Electron Microscopy (SEM) and 1H nuclear magnetic resonance analysis. Fire behavior of the modified fabrics was studied using thermogravimetric analysis, pyrolysis combustion flow calorimetry and a preliminary fire test. Self-extinguishing and non-flammable fabrics were obtained for phosphorus content of 0.5 wt% and 1.2 wt% respectively.

References:

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