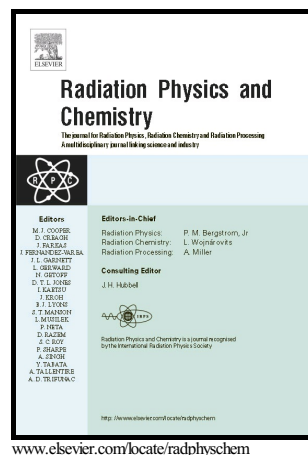


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The influence of gamma irradiation on natural dyeing properties of cotton and flax fabrics

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Abstract

Fabrics made of 100% cotton and 100% flax respectively were exposed at ambient temperature to gamma radiation doses, from 5 to 40 kGy, using a Co-60 research irradiator. After the irradiation treatment the fabrics were subjected to dyeing process with Itodye Nat Pomegranate commercial natural dye. The influence of gamma irradiation treatment on the physical-mechanical properties, dyeing and surface morphology of natural fibres were investigated. Gamma ray treatment of 40 kGy was the most effective in the case of fabrics made from 100% cotton, enhancing the colour strength as evidenced by K/S value. The results obtained from the mechanical properties of fabrics made of 100% flax indicated that the dose of 40 kGy leads to a decrease of tensile strength up of to 41.5%. Infrared spectroscopy was used to monitor chemical and structural changes in cellulosic fibres induced during processing. Crystallinity indices calculated from various bands ratio showed insignificant variations for cotton and small variations in the case of flax. The surface morphology of irradiated cotton fabrics did not show significant changes even at the highest dose of 40 kGy, while the low doses applied on flax fabrics led to an appearance of small changes of surface morphology. The gamma irradiation increased the uptake of natural dyes on natural cellulosic fibres.

Keywords: gamma irradiation; cotton; flax, natural dyeing; colour strength; colour fastness

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