

Surface modification on polyamide 6.6 with double barrier discharge (DBD) plasma to optimize dyeing process by direct dyes

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Abstract

Dyeing of polyamide fibers is normally made with acid dyes, however, it is somewhat difficult to achieve uniformity and control of pH and temperature must be carefully made. The possibility to dye polyamide 6.6 in a larger gamut of colours with good properties may be achieved using other classes of dyes after plasmatic modifications in textile substrates. Polyamide 6.6 fabrics were treated with Double Barrier Discharge (DBD) plasma obtained at atmospheric conditions in a semi-industrial machine and very positive results were obtained when dyeing is made with direct dyes. Surface modifications were evaluated, namely, roughness in terms of Atomic Force Microscopy, changes in chemical composition by X-Ray Photoelectron Spectroscopy (XPS) and microstructural analysis by SEM. In order to optimize dyeing process, different dye concentrations, pH and temperatures were attempted on dyeing with DBD treated fabrics. Important parameters were studied such as exhaustion, colour strength (K/S) and washing fastness. Chemical and physical effects of plasmatic discharge contribute to excellent results obtained in yield, exhaustion and fastness of dyeing of polyamide with direct dyes demonstrating extensive improvement of dye exhaustion from baths, easily achieving 100% in shorter dyeing times. These results mean less dyes in effluents and less time for dyeing processes. The cleanness of the processes and lower cost of direct dyeing are additional advantages when compared to difficulties in acidic dyeing of polyamide.