

SELF-ARRANGEMENT OF SURFACE CHEMICAL GROUPS GENERATED ON AIR PLASMA TREATED WOOL

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Abstract

Keratin fibers, like wool or human hair, are hydrophobic in nature due to the presence of an outermost monolayer of fatty acids covalently bonded to the protein matrix of the epicuticle membrane of the fiber [1]. This characteristic exerts a considerable influence on the shrinkage of wool fabrics submitted to aqueous washing process, on the adhesion to polymers and on the dye diffusion into the fiber bulk. Low temperature plasma (LTP) treatments provide hydrophilic properties to the fiber surface and consequently the shrinkage is reduced and the polymer adhesion and dye diffusion are improved [2,3]. XPS analysis of air plasma treated wool evidences the formation of carbon-oxygen functionalized hydrophilic groups (Figure 1).

However, wetting properties of plasma treated wool decreases with the time elapsed after the treatment [2], suggesting a progressive change in the chemical surface composition. In order to correlate the ageing effect on the wetting properties with the surface composition, XPS analysis on plasma treated wool was carried out at different ageing times. The results obtained point to that the hydrophilic groups promoted by the plasma treatment decrease with the time elapsed after the treatment, and this effect is faster for low treatment times (Figure 2). It is suggested that the hydrophilic groups generated on the plasma treated keratin fiber have a self-arrangement manifested by a reorientation of the hydrophilic groups towards the bulk phase and the hydrophobic groups towards the surface, thus decreasing the hydrophilic character of the surface [3,4].

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Figures

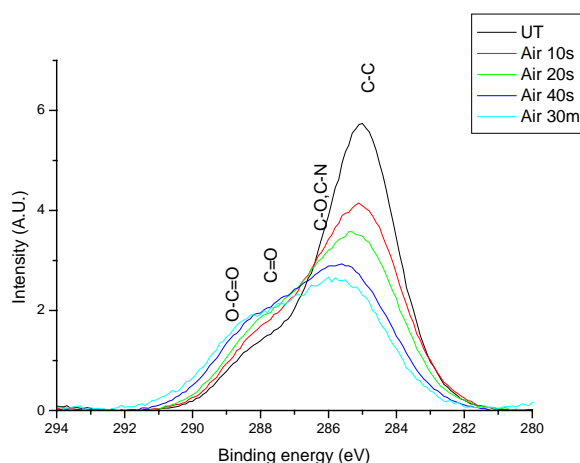


Figure 1.- XPS analysis of air plasma treated wool showing the increase in the surface carbon-oxygen functionalities as a function of the plasma treatment time.

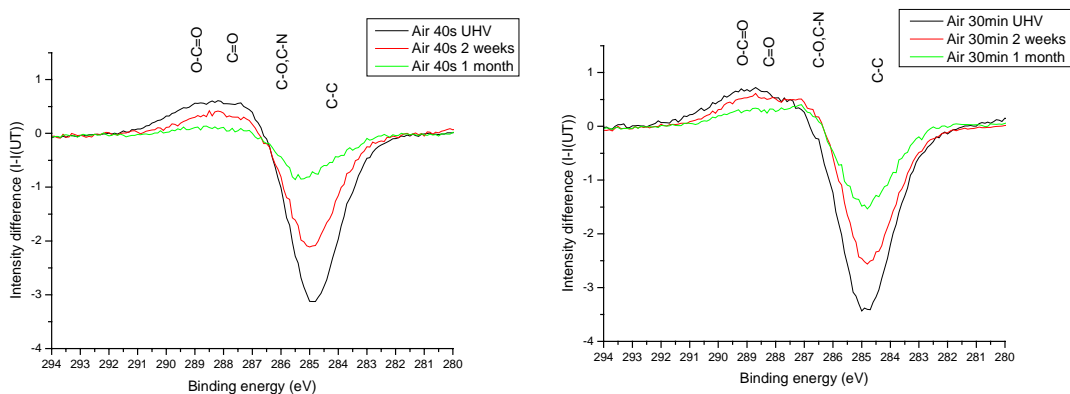


Figure 2.- Intensity differences (respect to the untreated wool) corresponding to XPS analysis of air plasma treated wool at different times (40 s and 30 minutes) and for different ageing periods, showing a decrease in the hydrophilic surface groups and an increase in the hydrophobic surface groups.