The application of Synthetic tanning agents on nylon fibers

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Introduction

Nylon fiber, one of the most widely used synthetic textile materials, has enjoyed great success in many areas due to its excellent physical property, good dyeability, pleasant aesthetic and so on. Of the many ranges of anionic dye that are substantive to nylon substrates, acid dyes are most widely considered. Whereas nylon fiber is dyed predominantly with acid dyes, the level of wash fastness properties displayed by members of this class on nylon fiber often leaves much to be desired. As a consequence, a consecutive aftertreatment of dyeings is usually required to secure satisfactory wash fastness properties. In this context, anionic synthetic tanning agent could provide a satisfactory result in improving wash fastness properties. Another attempt could be considered to the dyed/syntanned nylon fibers using successive cationic compounds that could enhance the effects of syntan treatments [1-3].

Another issue is raised that one drawback of nylon fiber has been its lack of resistance to staining caused by other anionic colorants or dyes during washings of daily life. In this context, staining resist application [4] to nylon fibers have focused on the use of synthetic tanning agents due to their anionic blocking effects, by operating ion-ion repulsion, which inhibit anionic dyes from staining to nylon fibers.

Thus, the experiments herein comprise an investigation of synthetic tanning agents treatments to nylon fibers to determine the properties in terms of their wash fastness and staining resistance.

Experimental

Dyeings

Scoured, nylon 6.6 was dyed with the chosen acid dyes. All dyeings were carried out in a laboratory scale dyeing machine. Levelling agents were not used. A buffer was used to insure the ranges of pH 4-6 for the acid dyes baths. Samples were placed in a 40°C solution of 25:1 liquor ratio. After 10min, the temperature was raised at a rate of 2°C/min until reaching 98°C. Dyeing continued for one hour at this temperature.

Application

Synthetic tanning agent

Dyed samples were aftertreated using a commercial syntan employing a liquor ratio 20:1. The 2% omf syntan solution was adjusted to a pH of 3.5-4 by acetic acid. The temperature was raised to 80°C and sustained for 30min.

Cationic agent

The dyed and syntanned nylon fibers were consequently placed with a cationic agent using liquor ratio 20:1. Samples were treated with solution of 2% omf a cationic agent at pH 6. The treatment was carried out for 20min at 40°C.

Color measurement

All measurement was carried out using an *X-rite* spectrophotometer interfaced to a PC using D65 illumination, 10° standard observer with specular component excluded and UV component included. Each fabric was folded once to give two thickness and an average of four readings was taken each time.

Wash fastness test

The ISO 105:C06/C02 wash test method [5] using SDC multifiber strip fabric as an adjacent material was used. The reduction in depth of shade that occurred as a result of washing was calculated.

Results and Discussion

Figure 1 and Figure 2 show the reduction in color strength that occurred for dyeing of acid dyes, as a consequence of the extended wash tests. It is evident that the reduction in color strength achieved for the untreated acid dyed samples increased with increasing number of washes thus showing that color loss observed in a progressive way. Cleary, each of the anionic synthetic tanning agent minimised the extent of dye loss during washings. In addition, the results represent from the Figures 1 to 2 that successive cationic compound treatments to the syntanned nylon fiber enhanced the wash fastness properties due to the formation of complex between anionic and cationic agents.

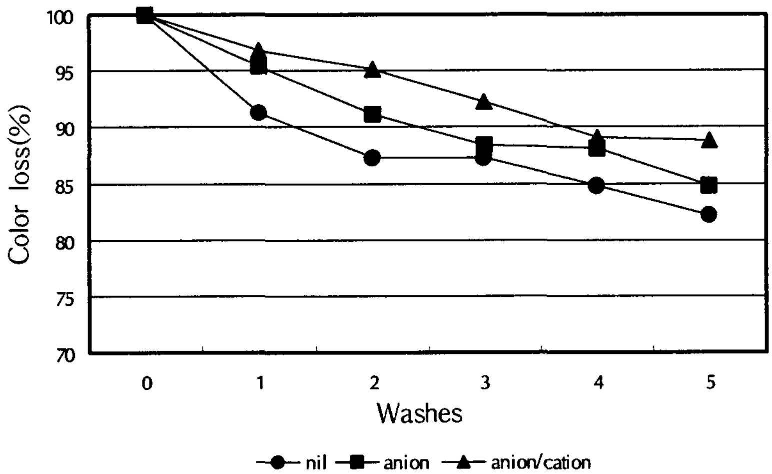

Figure 1. Color loss for acid dyeings over extended wash tests (C.I. Acid Red 182)

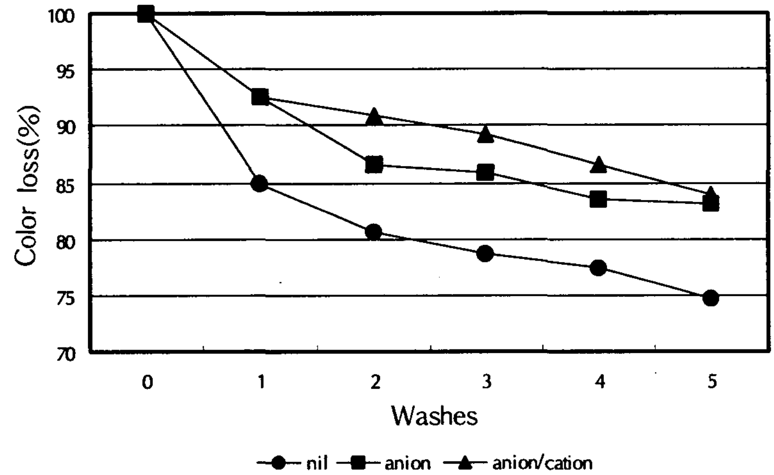

Figure 2. Color loss for acid dyeings over extended wash tests (C.I. Acid Violet 90)

In addition, another approaches using same compounds had been carried out to investigate the effect of staining resistance properties. As mentioned in the aftertreatment to the acid dyed fibers, the treatments using anion and anion/cation combination were conducted to the undyed nylon fibers that used a sole adjacent fabric during wash test. Figure 3 reveals that the untreated adjacent nylon fabric was markedly stained from the dye desorption out of acid dyed samples during wash tests and that the syntan and syntan/cation treated samples showed very good staining resistance effects to the undyed adjacent materials.

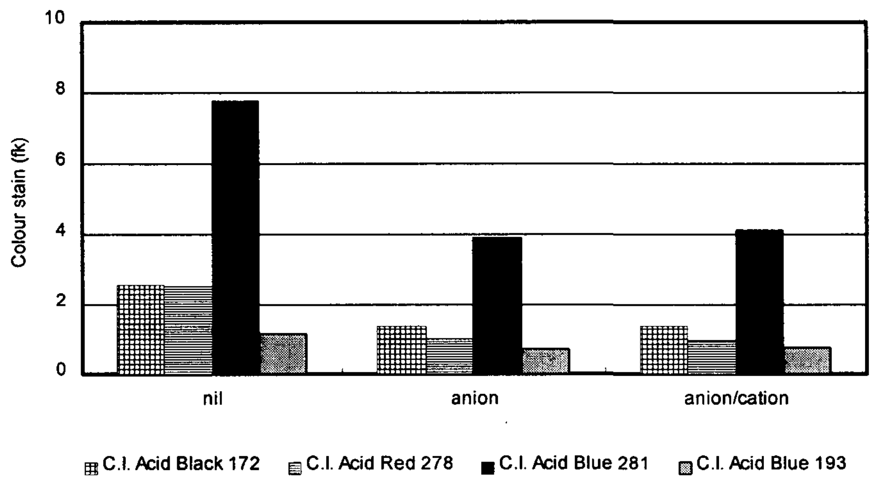

Figure 3. Effect of staining resistance finishes to the sole adjacent nylon material

Conclusions

The results show that the extent of dye loss that occurred during washing generally increased with increasing number of washes. In the case of staining, the untreated adjacent nylon fabric was greatly stained from the desorbed dye molecules during washing. The treatment using these systems was considerably effective to improve wash fastness properties in terms of both reduction in color strength and staining resistance.

References

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