The International Conference on Dyeing and Finishing
EXCO, Daegu, Korea, March 13, 2009

Dyeing properties of *meta*-Aramid fiber

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1. INTRODUCTION

In recent, intensive investigations in field of extreme environment fibers have resulted in the development of numerous 'Super-fiber'. Aramid fiber, one of them, has good performance of high strength and fire protection properties. Due to the compact structure by the hydrogen bonding of amide groups, poor dyeing properties of Aramid fibers resulted [1, 2].

In this study, the dyeing characteristics and fastness of *meta*-Aramid fiber were assessed with some commercial cationic dyes on various dyeing conditions.

2. EXPERIMENT

2.1. Materials

100% *meta*-Aramid fabric was provided by Onechang Trade Co. (Korea). The commercial dyes employed in this study are listed in Table 1.

Table 1. List of cationic dyes used for this study

Manufacture	Dye
M. Dohmen	Doracry Yellow X7GLS 100% Red XGRLS 200% Blue X3GLS 300%

2.2. Dyeing conditions

Dyeing conditions are as followed; liquor ratio 10:1, dyeing pH 4(except test of pH effect). Starting temperature of 50 C, which was heated up to the maximum dyeing temperature at a rate of 2 C/min. After holding at the maximum temperature(110 , 120 and 130) for 60min, then the dyebath was cooled back to 70 C.

2.3. Swelling agent and salt

ARA(M.Dohmen), DH-09(NiccaKorea), RX-11 (NiccaKorea) were used as swelling agent. As a salt, $NaNO_3$, Na_2SO_4 and NaCl were used in this study. The swelling agent and salt were contained in the dyebath as amount of 4% o.w.f..

2.4. Exhaustion and K/S values

Dye exhaustion(%E) was calculated through the measurement of absorbance at λ_{max} using a UV-Vis spectrophotometer. Depth of shade was assessed in terms of the color yield (K/S) values, which was measured by CCM after hot water wash.

3. RESULT AND DISCUSSION

High exhaustion was achieved at 130 . Except red dye, all dyeings were found to exhibit maximum exhaustion above 90%(figure 1).

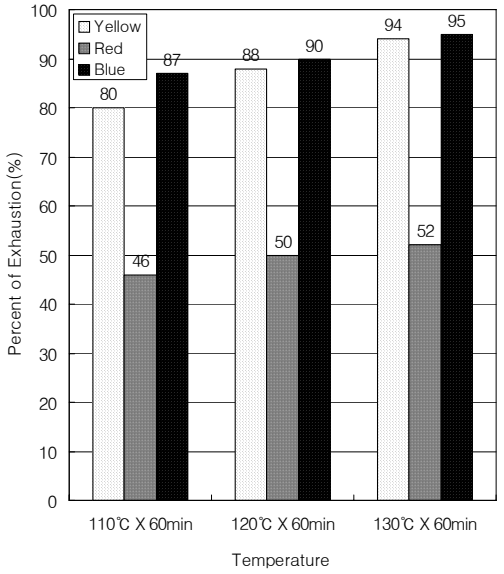

Figure 1. Exhaustion yield of cationic dyes on m-Aramid fiber(2% o.w.f) depending on the dyeing temperature.

According to dyebath pH test, acidic condition was optimum for *m*-Aramid dyeing(figure 2). Dyeing at pH 10, the color was dramatically changed due to the change of dye structure.

Among the swelling agents, ARA showed comparatively good performance for the dyeing of *m*-Aramid. Compact structure of ARA based on propylene glycol phenyl ether maybe led to easier to be absorbed on fiber than other agents having bulky structure. K/S values depending on swelling agent were given in figure 3.

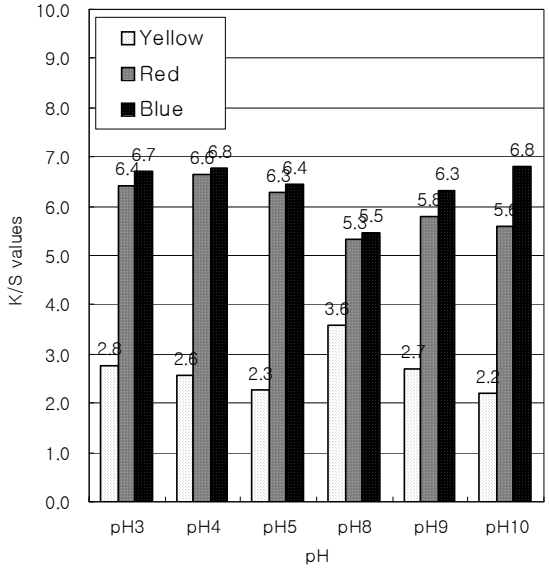

Figure 2. K/S values of *m*-Aramid fiber on 2% o.w.f cationic dyeings depending on dyebath pH.

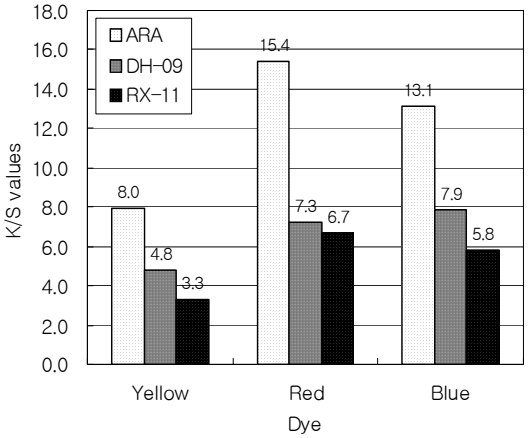

Figure 3. K/S values of *m*-Aramid fiber on 2% o.w.f cationic dyeings compared by various swelling agents.

The K/S values of dyeings using $NaNO_3$ as salt were higher than those of dyeings using other salts (figure 4).

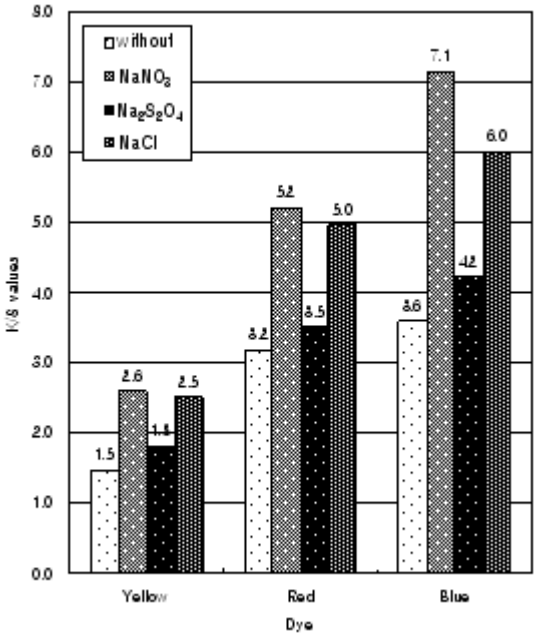

Figure 4. K/S values of *m*-Aramid fiber on 2% o.w.f cationic dyeings by various salts.

4. CONCLUSION

The dyeing characteristics of *m*-Aramid with a range of commercial cationic dyes were examined. High exhaustion yields were achieved at 130 dyeings where it ranged from 52% to 95%. Acidic condition of dyebath was preferred for efficient *m*-Aramid dyeing. ARA as swelling agent and $NaNO_3$ as salt had good performance on *m*-Aramid fiber.

REFERENCE

1. I. S. Han and C. B. Lee, "Extreme Textiles; the characteristic and application of Aramid fiber", The Korean fiber society, Textile technology and industry, 2006, 10(4), 339-349.
2. G. J. Yong, Y. H. Park, H. J. Lee and S. U. Nam, "Dyeing Property of Aramid Spun Yarn with Disperse Dyes in Circulated Supercritical Fluid Dyeing", The Korean fiber society, 2008, 40(5), 463-771.