

# Dyeing characteristics of reactive dyes on nylon and wool fibers

HaeJung Lee, MoonJung Kim, YoungHwan Park, HeeCheol Cha

Textile fusion technology R&D Department, Korea Institute of Industrial Technology,  
Ansan-si, Gyeonggi-do, 425-791, South Korea  
E-mail: [hjlee@kitech.re.kr](mailto:hjlee@kitech.re.kr)

## 1. INTRODUCTION

To confirm concentrated color and excellent color fastness, metal complex dyes are used when dyeing fiber of nylon and wool. Of them, however, metal complex dye that contains Cr causes not only environmental problem but also serious damage to user's health. This study adopted Nylon and Wool dyeing by applying reactive dyestuff, and attempted to find out its absorption rate and dyeing characteristic.

## 2. EXPERIMENTALS

### 2.1 Sample and Reagent

Nylon(230T) and wool(60's,100g/yds) were used as sample. As for dye, four kinds of nylon reactive dye(NR), four kinds of wool reactive dye(WR) and four kinds of improved wool reactive dye(MWR) were used. As for retardant which is necessary for dyeing, the agents available at market were used, while for acetic acid the first class reagents were used.

### 2.2 Dyeing Process

Each dye was set at 2%o.w.f concentration. Then, leveling agent 1.0g/l and acetic acid 0.5g/l (PH4.5-5.5) were used to dilute 1L water, thereby setting bath rate at 1:20. Dyeing process is as shown at Fig.1 below.

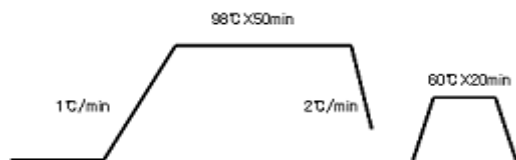


Fig.1 Process of dyeing

### 2.3 Measurement of Absorption Rate

Absorption rate of dye for the sample was confirmed by using Dye-O-meter (Dye Max-L/Korea).

### 2.4 Assessment of Color Fastness and Comparison of Color

Color fastness to washing(ISO 105-C01) and light(ISO 105-B02) for fabrics dyed with 12 kinds of dyestuff was confirmed. Also in order to confirm color variety in color matching, L\*a\*b\* value was computed from color gamut of dyes by using spectrophotometer(Gretag MacbethTM 7000a-Color iControl), thereby comparing color tones.

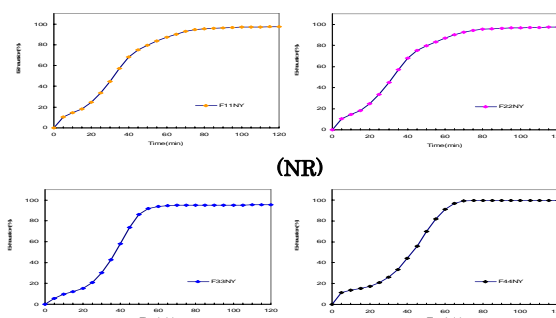
## 3. RESULTS AND DISCUSSION

### 3.1 Absorption Rate per Dyestuff

The absorption rate of wool and nylon (to which reactive dyestuff had been applied) showed high result of above 95%, and improved wool reactive dye showed about 2% higher dust absorption rate than before improvement. Half-dyeing time of improved wool reactive dye appeared the longest, which is expected to diminish the problem of non-level dyeing that may arise at initial stage of dyeing.

Table 1. Final Absorption rate(%) and Half-dyeing time(min)

Dyestuff	NR				WR				MWR			
	Y1	R1	B1	BK	Y1	R1	B1	BK	Y1	R1	B1	BK
T <sup>1/2</sup> (min)	38	29	38	43	27	31	26	24	20	23	17	21
Exhaustion(%)	97	96	95	99	98	95	97	99	99	98	97	98



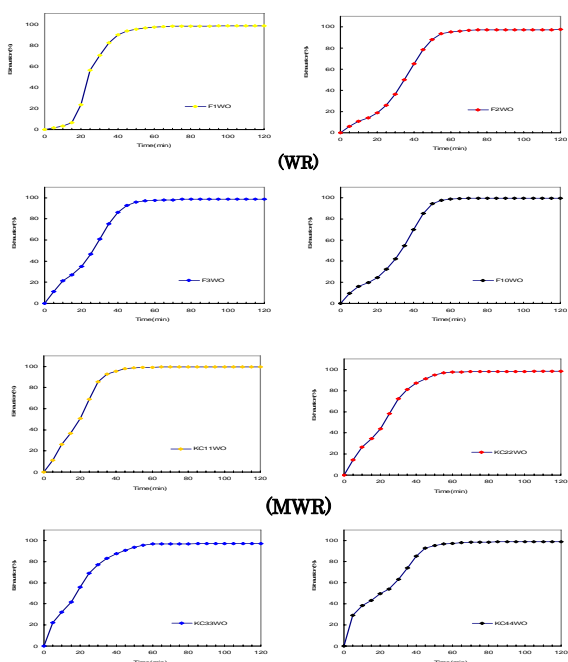


Fig2. Absorption Rate per NR, WR, MWR

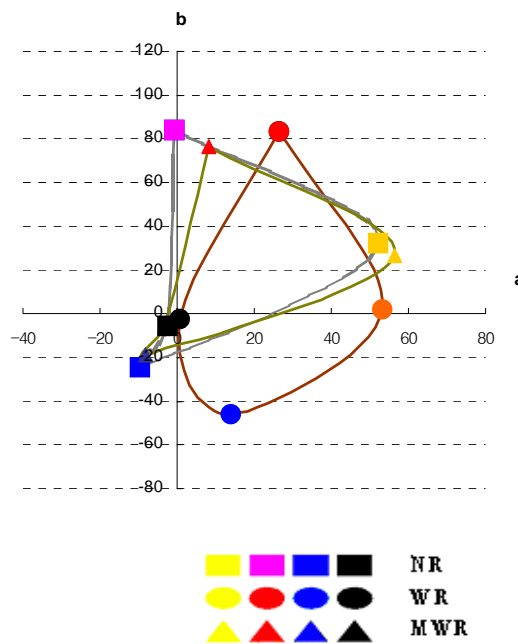


Fig3. Color Range(NR, WR, MWR)

Table 2 . Dyeing fastness of NR, WR, MWR

type	Color Fastness								
	Washing								Lighting
	COL.	C/chang	Acetate	Cotton	Nylon	PET	Acryl	Wool	
NR	Y	4-5	4-5	4	4-5	4	4-5	4-5	5
	R	4-5	4-5	4	4	4-5	4-5	4-5	4-5
	B	4-5	4-5	4-5	4	4-5	4-5	4-5	3-4
	BK	4-5	4-5	4-5	4	4-5	4-5	4-5	5
WR	Y	4-5	4-5	4-5	4-5	4-5	4-5	4	4-5
	R	4-5	4-5	4-5	4	4-5	4	3-4	4-5
	B	4-5	4-5	4-5	4	4-5	4	3-4	4-5
	BK	4-5	4-5	4-5	4	4-5	4	3-4	4
MWR	Y	4-5	4-5	4-5	4-5	4-5	4-5	4-5	4-5
	R	4-5	4-5	4-5	4-5	4-5	4-5	4-5	4-5
	B	4-5	4-5	4-5	4-5	4-5	4-5	4-5	4-5
	BK	4-5	4-5	4-5	4-5	4-5	4-5	4-5	4

#### 4. CONCLUSIONS

Absorption rate and color fastness of dye are excellent when reactive dyestuff was applied to nylon and wool. However, in case of deep Navy or deep Black, it would be required to conduct test on various combination and deep dyeing process additionally, in order to produce deep color tone to such degree as expressed by the existing metal complex dye.