DYEING BEHAVIOR OF NEW DISPERSE-REACTIVE DYES

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Abstract

The Dyestuff is fixed to the fiber to color it in a unique way depending on the chemistry between them. Whenever there arose problems in coloring fibers, the chemistry of dyestuff could be adjusted to solve them. That manner new concept dye classes, e.g., reactive dyes, disperse dyes, cationic dyes, have arrived along with the introduction of new fibers. The attempt has made to introduce the new reactive dye to solve this problem.

1. Introduction

Conventionally, protein fiber(wool, silk), polyamide(nylon) and polyurethane fiber have been dyed by the water soluble acid dyes, premetalized dyes with heavy metals and reactive dyes.[1] Those acid dyes and premetalized dyes are azo dyes and it has been known that the azo dyes can be reduced to amine *in vivo*.
Germany bans the import of the daily necessities colored with these dyes which derived from the 20 carcinogenic amines since 1995.

Also, the preservation of clean environment has been a matter of great concern, the regulation against the use of materials containing heavy metal becomes very strict. Those acid dyes and premetalized dyes generate high dye concentration in dyeing waste water and have poor washing fastness.

Reactive dyes comprise a chromophore and a reactive group and owe their excellent wet washing fastness to the formation of covalent bonds with the fibers. But the alkaline dyeing conditions of reactive dyes give damage effects to protein fibers. The water insoluble Procinyl dye which has reactive chlorine group has been introduced by ICI in 1960, but mostly not in use now.

The textile goods of colored synthetic fiber of superfine denier or blended fiber, conventional dyes have shown poor washing fastness .
The object of this study is to examine the dyes containing reactive groups (acetoxyethylsulfone, vinyl sulfone group, sulfatoethylsulfone) to solve some of the problems. To study the effect of new reactive groups, the dyeing behavior of new dyes was investigated.

2. Experiment

2.1 Material

2.1.1 Instruments

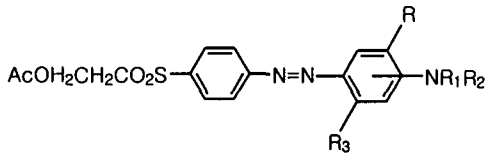
texomat(Ahiba) dyeing machine, polymat (Ahiba) dyeing machine
spectrophotometer(Shimazu)

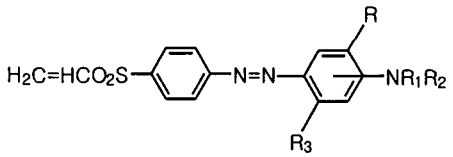
2.1.2 Fabric substrates

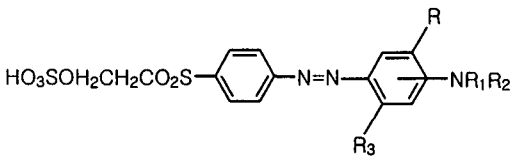
scoured and bleached nylon

2.2 Dyes

Dye 1 : acetoxyethylsulfone system
Dye 2 : vinyl sulfone group system
Dye 3 : sulfatoethylsulfone system







R= H,
R_1= CH_2CH_3 R_2= CH_2CH_3
R_3= CH_3

2.3 Dyeing Method

The reactive dyes prepared by the above method are used for exhaust-dyeing of the fabrics such as nylon.

2.3.1 Dyeing method of nylon fabric

To 0.01g(1.0% o.w.f.), 0.03g(3.0% o.w.f.) of dyes prepared in the above was dissolved in 20ml of buffer solution of pH 5.0~7.0 1g of nylon fabric is introduced to this solution and dyed for 60minutes at 80℃~100℃. The fabric is then rinsed with cold water, soaped off at 98℃ for 20minutes, is rinsed once more and is dried.

2.4 Measurement

2.4.1 Measurement of surface optical density[7]

K/S was measured by Kubelka-Munk equation at CCM(datacolor)

$$K/S = (1-R)^2 /2R$$

K: coefficient of absorption S: coefficient of scatter

R: Reflectance of the sample at a given wavelength

2.4.3 Measurement of fastness

Various fastness properties of dyeing samples were measured. Light fastness was evaluated according to KS K 0218 direct-illumination method, washing fastness according to KS K 030 A-4.

3. Result and Discussion

Table 1. Dyeing fastness of the disperse-reactive dyes (nylon dyeing)

Acetoxyethyl sulfone system Dye	Light fastness		Washing fastness staining(3%owf)					
	1%	3%	acetate	cotton	nylon	PET	acryl	wool
Dye 1	4-5	5	5	5	5	5	5	5
Dye 2	4-5	5	5	5	4-5	5	5	4
Dye 3	4-5	5	5	5	5	5	5	4-5

As described in the above, the reactive dyes containing reactive group show excellent levelness of dyeing and reproducibillity as well as several fastness, which is well applicable to dyeing of polyamide fabrics.

References

1. Zollinger, H., *Color chemistry*,Chapter 7 VCH, New York, 1991
2. Venkataraman, K., *The Chemistry of Synthetic Dyes, Vol. VI*:New York and London, **1974,** 475.
3. Beech, W.F., *Fiber-Reactive Dyes*, SAF International, Inc., New York, 1970
4. David R. Waring; Geoffrey Hallas, *The Chemistry and Application of Dyes*, Plenum Press, **1990,** 351.