

contents

Page

Acknowledgment

Chapter I

Cotton

1- Introduction.....	1
2- Types of cotton.....	1
3- Structure of cotton fiber.....	4
4- Constituents of raw cotton.....	6
5- Chemical structure of cellulose.....	7
6- Physical Properties.....	7
7- Thermal Properties.....	10
8- chemical Properties.....	10
9- Biological Properties.....	13

Wool

1- Introduction.....	15
2- Structure of wool fiber.....	15
3- Composition of raw wool.....	17
4- Chemical Structure of Keratin.....	18
5- Physical Properties.....	20
6- thermal Properties.....	23
7- Chemical Properties.....	23
8- Biological Properties.....	25

Wool / Cotton Blended Fabrics

1- Introduction	26
2- General Properties of wool/ cotton blended fabrics	26

Acid Dyes

1- Introduction	29
2- Chemical Classification of acid dyes	29
3- Theory of dyeing with acid dyes	31
4- Solubility	32
5- Types of acid dyes	32

Back ground information

1- Dyeing Processes	37
2- Conventional methods for dyeing wool/cotton blended Fabrics	38
3- Aminization of cellulose.....	39
4- Dyeing of cross linked cotton	41
5- Dyeing of cationised cotton with direct dyes	42
6- Dyeing of cationised cotton with reactive dyes.....	44
7- Dyeing of cationised cotton with Acid dye.....	46
8- Application of cationised cotton in union dyeing of Wool/cotton blended fabrics.....	47

Chapter II

Aim of the work	52
-----------------------	----

Experimental work

1- Materials and chemicals	53
2- Modification and dyeing procedure	55
3- Measurements and analysis	57

Chapter III

Results and discussion

1- Chemical modification of wool/cotton blended fabric....	62
1-1- Effect of cationising agent concentration	62
1-2- Effect of cross – linking agent concentration	66
1-3- Effect of citric acid concentration	68
1-4- Effect of magnesium chloride hexahydrate concentration	70
1-5- Effect of curing temperature	72
1-6- Infrared spectroscopy (IR)	75
2- Optimization dyeing procedures of modified wool/cotton blend with acid dye.....	77
2-1- Effect of dyeing temperature	77
2-2- Effect of dyeing time	79
2-3- Effect of salt concentration	81
2-4- Effect of acid concentration	83
2-5- Effect of dye concentration	86
2-5-1 Effect of dye concentration on the color space of the blended fabrics	91
3- Fastness properties	93
4- Microscopic appearance of the cross – section wool/cotton blended yarn	94

Summary

References

Arabic Summary

Summary

Dyeing formulations for wool/cotton blends are cumbersome and can involve a different dye class for each component in one or two baths. The dyeing process is complicated by the difference in reactivities of these two fibers. When dyeing wool and cotton in the same bath there is a preferential dye uptake by wool, in the final, color correction may be required for union shades. This difficulties in wet processing of wool/cotton blends including dyeing to union shades impeded their constant market share many investigations are achieved to concede the cotton chemically modifying with amino or quaternary ammonium groups functionality which make the cotton dye similarly to wool in a wool dye bath. This system suggests easy processing with one dye in one bath provided wool and cotton an equally competitive for the anionic wool dyes under acidic condition and with wool reactive dyes at nearly neutral pH.

The implementation of union dyeing should help promote wool/ cotton and lead ultimately to more favorable market position.

In this work union dyeing for wool/cotton blend fabric was achieved using one dye (acid dye) and one bath through a chemical modification of the cotton via a one of the cationising agent.

I- Chemical modification of wool / cotton blended fabric:

When the blended fabric wool/ cotton [50%, 50%] pretreated using the quaternary ammonium compound (Quat 188) through the pad – dry – cure technique via a cross linking agent which act as a bridge attach the cationising compound with the cellulose molecule. Thus cotton have gained a cationic characteristics, and it could be dye the wool/cotton blend with acid dye (which have no affinity for cotton) in the same bath to union shades.

The parameters of the wool/cotton pretreatment were studied to achieve the optimum conditions which give the color strength and lower color difference between the wool and the cotton in the blend. The results obtained were as the following:

- 1- When wool / cotton blended fabrics pretreated with different concentration of the cationising agent. It was found enhancement in the color strength and nitrogen content of cotton by increasing the cationising agent concentration, while the k/S of wool was not affected by the presence or absence of cationising agent, that's indicate union shades achieved through a selectively modifying cotton, and the problem of preferential dye uptake by wool was overcome, the lower color difference value was obtained when the cationisation carried out with 15% Quat 188.
- 2- When the blended fabric wool/cotton pretreated with different concentration of Arkofix NFL, It was found an increase in color strength for cotton by increasing Arkofix NFL concentration to 8%, increasing the cross – linking concentration above 8% was accompanied by a decrease in k/S of cotton and wool, the lower color difference value was obtained when the pretreatment carried out with 6% Arkofix NFL.
- 3- The effect of various concentrations of citric acid and magnesium chloride hexa hydrate was studied and it was found an increase in k/s of cotton with increasing the concentration of these compounds even 12g/l for citric acid and 10 g/l MgCl₂ 6H₂O, However the varies in color strength of wool by varies of the concentration of these compounds were inconsiderable.
- 4- The variation of curing temperature was studied and the best results in union shades were obtained when the curing achieved at 170°C for 90 second.

5- Therefore, the optimum conditions obtained to achieve the pretreatment of wool/cotton with Quat 188 were: 15% Quat 188, 6% Arkofix NFL, 12g/l citric acid, and 10g/l $MgCl_2 \cdot 6H_2O$ at 85°C drying temperature for 5 minutes and 170°C curing temperature for 90 second.

II- Optimization dyeing procedures of modified wool/cotton blend with acid dye.

- 1- There is an enhancement in the color strength of cotton, wool, and blend by increasing the dyeing temperature from 60-100°C, the lower color difference value was obtained when the dyeing carried out at 80°C, which saving the consumptive energy in dyeing wool/cotton blends.
- 2- There is an enhancement in color strength of cotton, wool, and blend by increasing the dyeing duration, the lower color difference was obtained when the dyeing carried out for 75 min.
- 3- When the modified wool/cotton blended samples dyed with acid dye with different concentration of Glauber's salt, it was found a depression in color strength of cotton by increasing the salt concentration the lower color difference value was obtained when the dyeing carried out with 6% Glauber's salt.
- 4- The variation in acid concentration of the modified wool/cotton dyeing bath was not affect on the color strength of cotton, while the k/S of wool was deeply affected by the absence of acid. The best result obtained when the dyeing carried out with 4% HCl (30%).
- 5- Studying of varies of the dye concentration on the dyeing of modified wool/cotton blend exhibited an improvement in color strength by increasing the dye concentration on account the color difference value which increase by increasing the dye concentration.