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Research Paper :

Effect of chemicals on the colour shade and fastness properties of pigment printed silk and silk blend fabrics

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ABSTRACT

The effect of chemical treatments on the pigment printed silk and silk blend has been analyzed in term of colour shade and fastness properties. Both the fabrics showed improvement in colour shade, but the better result was obtained with EDA treatment than PEG and EG. The fastness properties of the print were ranged between good to excellent. Result also showed that silk blend fabric can be easily printed with pigment dye.

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Key words : Ethylene diamine (EDA), Ethylene glycol (EG), Polyethylene glycol (PEG), Pigment emulsion

Colour can be added to textiles objects by either dyes or pigments. Pigments are insoluble colour particles that are held on the surface of a fabric by a binding agent. In recent year, there has been tendency towards an increased use of pigment in textile printing. Pigment colour printing was the most popular means of textile printing in the U.S.A. more than 80% of all printed textile yardage contained pigments colour (Khanna, 1999). Pigment printing which was earlier restricted only to cotton is now virtually used on all fibers and fiber combinations. Silk has a good receptivity for a large number of dyes such as acid, direct and indigo. But the demand for washable prints has kindled a new interest in the use of pigment dyes for printing (Chattopadhyay and Bhadra, 1997)

Permanent printing of pigment is very important from practical point of view for the manufacturer as well as consumer. Pigment emulsion colours are known for their brilliant shades but the achievement of optimum colour fastness to washing, dry cleaning and crocking is still a matter of dispute (Bishnoi, 1999).

Keeping this thing in mind the different chemicals were used as treatment for the pigment printing and their effects on the shade and fastness properties was studied.

METHODOLOGY

Study was carried out on two fabrics viz, 100% silk and silk blend (50:50 silk and cotton). The fabrics were scoured before printing. Preliminary data of the fabrics such as thread count, weight, thickness and weave was determined.

The assisting agents which used in the study were 30% ethylene diamine (EDA), 20% ethylene glycol (EG) and 20% polyethylene glycol (PEG). The fabric samples were pretreated with these chemicals. After the pretreatments, the samples were washed thoroughly, air dried and printed with the pigment emulsion (Acron Brilliant Red- FJC) at 3% shade. Printing paste was prepared by using 3 parts of pigment emulsion, 2.25 parts of diammonium phosphate, and 2.25 parts of water and rest of SLN Binder to make the 100 parts. Samples were screen printed. After printing, the samples were dried at room temperature and then cured at 150^0C for 5 minutes.

The degree of colour yield was evaluated in the form of shade obtained and sharpness of print. Subjective analysis was done by a panel of textile experts. Three point rating scale was used. Obtained results were calculated in form of Weighted Mean Scores. Besides, visual assessments of the laundered, rubbed and ironed samples were carried out using geometric grey scale having rating 1-5.

FINDINGS AND DISCUSSION

Table 1 shows the preliminary data of the silk and silk blend fabrics. The weight of the silk and silk blend was 1.5g and 3.32g, while the thickness of samples was 0.16mm and 0.23 mm respectively. Both samples were woven in plain weave.

Table 2 indicates the effect of chemical treatments

Table 1 : Preliminary data of silk and silk blend fabric

Sr. No.	Fabric types	Weight (g)	Thickness (mm.)	Thread count	Weave
1.	Silk	1.5	0.16	40 x 51	Plain
2.	Silk cotton 50:50	3.32	0.23	39 x 52	Plain

on the depth of shade and firmness of print. It is clear from the table that both the fabric samples show the increase in depth of the shade in comparison to the control or untreated samples. The depth of shade was rated best when treated with 30% EDA is comparison to 20% EG and 20% PEG. The sharpness of print was also obtained by EDA treatment. Similar trend was also observed in the blended sample. But the difference between the shade of EDA and PEG treated samples is negligible. It is also clear from the table that the blended samples rated best than pure silk. This can be attributed to the fact that cotton fibre swell more and absorbed more pigment than silk fibre. The increase in colour yield can be due to more opening of fibre structure of cotton and making the pigment accessible to the blend fabric. This result can be also supported by (Tabba, 1999).

Table 3 shows the washing fastness test of the controlled and treated samples. It is clear from the table that both the controlled samples showed poor to fair wash fastness whereas all the treated samples showed good to excellent wash fastness. Table also reveals that both the samples when treated with EDA and EG showed very good to excellent fastness than PEG treatment. Thus, it can be concluded that washing fastness of both the printed samples were improved after the chemicals pretreatments.

The effect of treatments on the fastness properties of the printed samples are given in the Table 4.The crocking fastness of the controlled samples was ranged between fairly good to very good, while crocking fastness of the treated samples indicated that the colour change values of the pigment showed excellent fastness means that all the treated samples showed slight to negligible colour change and colour stain on the respective fabric.

Table 2 : Effect of chemicals on the quality of pigment print

Sr. No.	Treatments	Silk		Silk blend	
		Shade of color (in W.M.S.)	Fineness of print (in WMS)	Shade of colour (in W.M.S.)	Fineness of print (in WMS)
1.	T_0 (Control)	1.14	2.29	2.75	2.50
2.	T_1 (30% EDA)	3.53	3.37	3.62	3.58
3.	T_2 (20% EG)	3.33	3.29	3.42	3.54
4.	T_3 (20% PEG)	3.29	3.08	3.59	3.60

Table 3 : Comparison of wash fastness of controlled and treated samples

Sr. No.	Samples	Silk		Silk blend	
		Wash fastness		Wash fastness	
		Colour change	Staining	Colour change	Staining
1.	Control	2/3	3	2/3	3
2.	T_1	5	5	4/5	5
3.	T_2	4/5	5	4	5
4.	T_3	3/4	4/5	4	5

Table 4 : Effect of treatments on the fastness properties of samples

Sr. No.	Samples	Silk							Silk blend						
		Crocking		Ironing				Light fastness	Crocking		Ironing				Light fastness
				Dry		Wet					Dry		Wet		
		CC	SC	CC	SC	CC	SC		CC	SC	CC	SC	CC	SC	
1.	Control	3/4	4	3/4	4	2/3	3	2/3	4	4	4	4	3/4	4	3/4
2.	T_1	4	4	4/5	5	4/5	5	5	5	5	5	5	5	5	5
3.	T_2	4	5	5	5	4	5	4/5	4/5	4/5	5	5	4/5	4	4/5
4.	T_3	4	4/5	5	5	4/5	5	4/5	4/5	4/5	5	5	4/5	5	4/5

When all the pigment printed samples subjected to the dry and wet ironing they showed very good to excellent fastness. Same trend was also observed in the treated samples. It is said to be that pigment printing is fast to iron. Only some precaution is taken that samples were ironed from the wrong side and at the appropriate temperature.

Light fastness of the controlled silk sample was seen poor to fair, while in blended sample it was ranged between good to very good. The light fastness of all the treated samples whether it was silk or blended showed very good to excellent fastness.

Conclusion:

Thus it can be concluded that pigment printing can be easily done on the silk and silk blend fabrics to enhance its beauty. The present study also revealed that pretreatment of the fabric with EDA, EG and PEG improved the colour yield and fineness of the print. The fastness properties of the print were also improved.

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