

EFFECT OF OPTICAL BRIGHTENING AGENT ON DIFFERENT TYPES OF FABRICS

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Abstract: *The knitted fabrics (single jersey, lycra single jersey, rib interlock, polo pique) were dyed with Optical Brightening Agent. From the overall comparison for different Shade% of different fabrics of Optical Brightening Agent, It was found that Color Index & Shade% of Optical Brightening Agent is the most suitable dyeing used in industrial production. Optical Brightening Agent dyeing is probably the best described as an industrial art, having an assured future.*

Keywords: *color, radiation, Fluorescence, Optical Brightener, Reduction cleaning, Whiteness.*

1. Introduction

Optical brighteners, optical brightening agents (OBAs), fluorescent brightening agents (FBAs) or fluorescent whitening agents (FWAs) are dyes that absorb light in the ultraviolet and violet region (usually 340-370 nm) of the electromagnetic spectrum, and re-emit light in the blue region (typically 420-470 nm). These additives are often used to enhance the appearance of color of fabric and paper, causing a "whitening" effect, making materials look less yellow by increasing the overall amount of blue light reflected. [1] An optical brightener or fluorescent whitening agent is a compound which, when applied to a textile material, absorbs the short wavelength electromagnetic radiation (300-400nm) which is invisible to the human eye, and converts it into visible light of longer wavelength between 400 and 500 nm, which is emitted either as violet, pure blue or greenish blue. When this radiation is combined with the more yellowish self-colour of a textile material, a brilliant white is produced. [2]

Textile materials like cotton or cotton/polyester blends are almost always pre-brightened when manufactured. This is because the printing and colors will be brighter and more attractive if applied to bright fabric. Moreover, the washing agents and commercial detergents available nowadays commonly have optical brighteners combined in them [3] Jersey is a knit fabric used predominantly for clothing manufacture. It was originally made of wool, but is now made of wool, cotton, and synthetic fibres. Since medieval times Jersey, Channel Islands, where the material was first produced, had been an important exporter of knitted goods and the fabric in wool from Jersey became well known. The fabric can be a very stretchy single knitting, usually light-weight, jersey with one flat side and one piled side. [4] On the basis of good fabric UV protection it is clear that clothing has the ability to protect the skin from incident solar energy. This protection depends on fiber composition and moisture content, type and concentration of dye, optical brighteners and UV-B protective agents. Optical bleached textiles absorb the UV light and remit it as the blues, redness and greenness light resulting in the textile that appears Whiter. [5] Fabric can reflect, absorb and scatter solar wavelengths that reach the earth's surface in the range of 280 nm to 3000 nm, consisting of UV, VIS and IR radiation [6]. THE dyeing of textiles is usually understood to mean giving them a color which is of comparative permanence [7]. The main use of these dyes in laundry detergents and Textile finishing, Optical Brightener are generally found in domestic

waste waters that have a component of laundry effluent. There is hardly a white textile, or a white paper or hardly a household detergent which does not contain a brightener. The development, thus has led to continually increasing demand made on these products both by processors and consumers. Near about 80% of all OBAs produced are derived from stilbene derivatives, All the OBAs are dyestuffs, but in place of the chromophoric system which is the characteristic for dyes, it contains a fluorescing system and like a normal dye certain substituent's which promote the affinity depending on the type of fiber on which it is applied. This stilbene derivative can be present in two isomeric forms, i.e. in the Cis configuration and in the Trans configuration. Optical brighteners in the Trans form can be made both in the powder and Liquid form. The Cis form, which is rapidly formed under the action of light from the Trans form will not go on cotton and for this reason, the solution of this whitener is protected against light. Many of the optical brighteners are derived from the heterocyclic compounds containing nitrogen atoms. Fluorescence is produced by the absorption of radiation having a high energy on the part of the molecule, which re-emits this radiation of lower energy i.e. of longer wave length, the difference in energy being transformed in to kinetic energy. To enable a molecule to fulfill this function, it must be built according to certain structure principles. For example Anthranilic acid has very strong blue violet fluorescence in the aqueous solution, but nevertheless unsuitable as a brightener. Most of the brightener will hardly fluoresce in powder form; their fluorescence will only appear in solution. There are some types, which will not fluoresce in solution and will only show this property after they have been applied on the fiber. Thus, it can be concluded that fluorescence is not only depended on the structure of the molecule but also on its condition. Whether a fluorescent substance is suitable as brightener can only be determined after it has been applied to the textile fiber. Apart from this the product must meet certain demands in respect of properties such as fastness to washing and light etc. On compare ring different textile fabrics

treated with different brighteners and processing approximately the same brightness difference in hue can be deleted, since the human eye is particularly sensitive to difference in whiteness. If an optically brightened fabric with radish white shade is compared with another fabric having a greenish white shade both of which appear to be equally brilliant if viewed in daylight which is incident from a northerly direction, it will be seen that the greenish shade will appear more brilliant than the radish one in bright sunlight.

2. Materials and Methods

2.1 Fabrics

Single jersey, lycra single jersey, rib interlock, polo pique fabric

2.2 Collection of Dyes and Chemicals

Chemicals were collected from Matex Internationals Ltd.

2.3 Experimental Procedure

At first, a paste of OBA (4BK) is prepared and then water is added to it. Bath is kept at 60°C temperature and all the chemicals along with the material are added to it. Then the bath is kept for 15 min without raising the temperature. P^{II} of bath is controlled by acetic acid at 4-5.5. Now temperature of dye bath is raised to 90°C and at that temperature the bath is kept for 60 min. Then temperature is lowered to 60°C and resist and reduction cleaning is done if required. Reduction cleaning is done only to improve the wash fastness. Material is again rinsed well after reduction cleaning and then dried.

2.4 Procedure of after treatment

At first a paste of dye & dispersing agent is prepared & water is added to it, P^{II} is controlled by adding acetic acid, This condition is kept for 15 minutes at temperature 60°C, Then dye bath temperature is raised to 130°C & this temperature is maintained for 1 hour. Within this time dye is diffused in dye bath, adsorbed by the fibre & thus required shade is obtained. The dye bath is cooled as early as possible after dyeing at 60°C. The fabric is hot rinsed & reduction cleaning is done if required. Then the fabric is finally rinsed & dried.

2.5 Recipe

Typical Recipe:	Typical Recipe:
OBA(4BK) - For Shade=0.5%	OBA(4BK) - For Shade=1%
Detergent Agent :2.5 gm/L	Detergent Agent :2.5 gm/L
Acetic acid : 1cc/lit	Acetic acid : 1cc/lit
Sequestering agent : 2.5 gm/L	Sequestering agent : 2.5 gm/L
Ant creasing agent : 1 cc/lit	Ant creasing agent : 1 cc/lit
Caustic:2gm/L	Caustic:2gm/L
H2O2 :3gm/L	H2O2 :3gm/L
PH : 10 - 11	PH : 10 - 11
M:L : 1:10	M:L : 1:10
Time : 60 min	Time : 60 min
Temperature : 90°C	Temperature : 90°C

Typical Recipe:	Typical Recipe:
OBA(4BK) - For Shade=1.5%	OBA(4BK) - For Shade=2%
Detergent Agent :2.5 gm/L	Detergent Agent :2.5 gm/L
Acetic acid : 1cc/lit	Acetic acid : 1cc/lit
Sequestering agent : 2.5 gm/L	Sequestering agent : 2.5 gm/L

Ant creasing agent : 1 cc/lit	Ant creasing agent : 1 cc/lit
Caustic:2gm/L	Caustic:2gm/L
H2O2 :3gm/L	H2O2 :3gm/L
PH : 10 - 11	PH : 10 - 11
M:L : 1:10	M:L : 1:10
Time : 60 min	Time : 60 min
Temperature : 90°C	Temperature : 90°C

Typical Recipe:	Typical Recipe:
OBA(4BK) - For Shade=2.5%	OBA(4BK) - For Shade=3%
Detergent Agent :2.5 gm/L	Detergent Agent :2.5 gm/L
Acetic acid : 1cc/lit	Acetic acid : 1cc/lit
Sequestering agent : 2.5 gm/L	Sequestering agent : 2.5 gm/L
Ant creasing agent : 1 cc/lit	Ant creasing agent : 1 cc/lit
Caustic:2gm/L	Caustic:2gm/L
H2O2 :3gm/L	H2O2 :3gm/L
PH : 10 - 11	PH : 10 - 11
M:L : 1:10	M:L : 1:10
Time : 60 min	Time : 60 min
Temperature : 90°C	Temperature : 90°C

3. Results and Discussion

Table 3.1.1 Result of whiteness of different types of fabrics at different shade%

Shade%	Single jersey C.I.	Lycra Single jersey C.I.	Rib C.I.	Interlock C.I.	Polo Pique C.I.
0.5%	151.06	150.26	153.02	153.37	154.08
1%	170.61	169.29	170.09	170.12	171.02
1.5%	173.82	172.02	174.10	173.19	174.14
2%	174.12	173.19	177.01	175.06	176.02
2.5%	176.02	175.32	174.19	173.02	175.02
3%	169.10	170.41	170.39	170.17	173.40

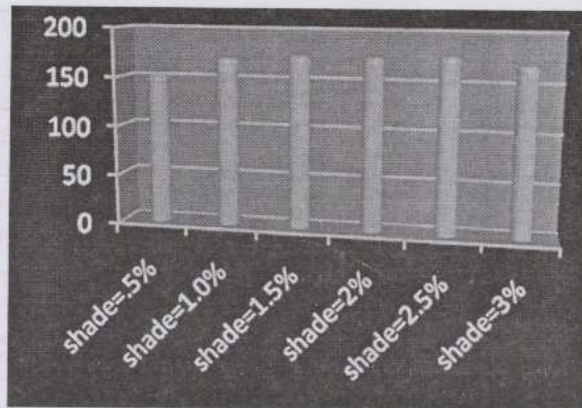


Figure 3.1.1: Effect of whiteness (C.I.) of single jersey at different shade%

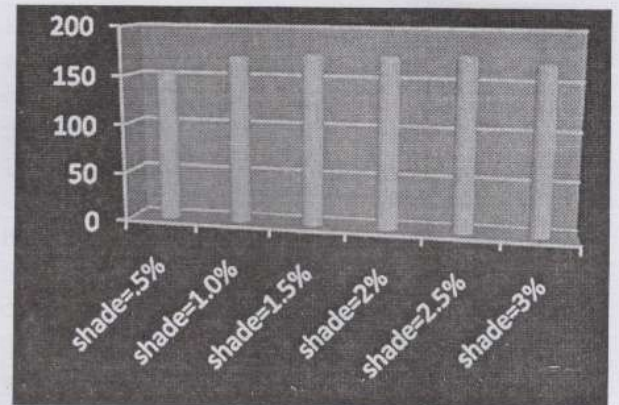


Figure 3.1.4: Effect of whiteness (C.I.) of interlock at different shade%

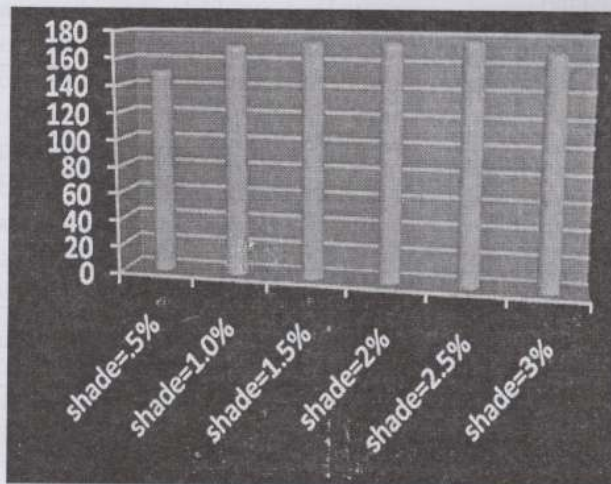


Figure 3.1.2: Effect of whiteness (C.I.) of single jersey lycra at different shade%

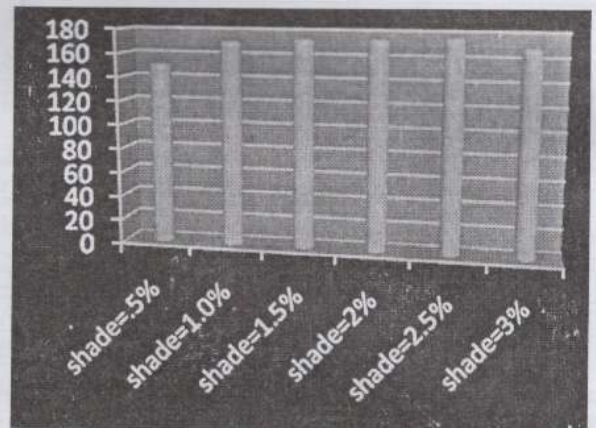


Figure 3.1.5: Effect of whiteness (C.I.) of polo pique at different shade%

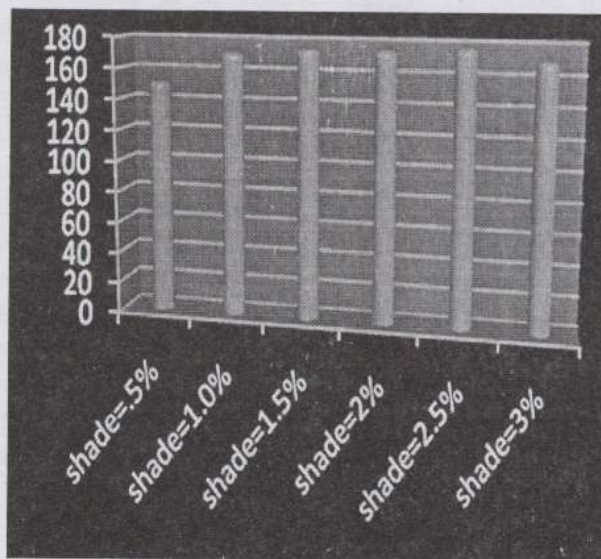


Figure 3.1.3: Effect of whiteness (C.I.) of rib at different shade%

The effect of optical Brightening Agent varies in different fabrics at same shade%. From this comparative study among different knit fabrics dyeing with Optical Brightening Agent we can submit that- Optical Brightening Agent requires very few time for dyeing, no odor problem occurs in dyeing with Optical Brightening Agent. And the cost of dyeing with Optical Brightening Agent is less expensive than dyes.

4. Conclusions

From all the condition, the effect of Optical Brightening Agents is increased with the increased of amount of Optical Brightening Agents. But the effect of Optical Brightening Agents is not increased after shade% 2.5. The effect of Optical Brightening Agents is increased till shade% 2.5. After shade% 2.5, the effect of Optical Brightening Agents is decreased. Such as C.I.176.45 at shade% 2.5 and C.I. 169.45 at

shade% 3 for single jersey. Hence the OBA has lost the whitening effect due to increased amount of Optical Brightening Agents or shade%. Considering all condition, dyeing with Optical Brightening Agent is the most effective for industrial production. Because in dyeing with dyes, dyes are costly, toxic & it may produce odor problem. But in dyeing with Optical Brightening Agent, no carrier & thicker is used. So it is comparatively cheap process. No special machine is required.

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