

1-Transfer Printing of Polyester Fabrics with Natural Dyes

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Summary:

This study attempts to highlight the possibility of using natural dyes in transfer printing of polyester fabrics. The used dyes were Turmeric, Alkanet, and Rhubarb. To obtain optimum conditions for transfer printed polyester fabrics, different factors were investigated such as concentration of dyes, the pH of printing paste and both the transfer time and temperature of printing. The types of thickening agents were also studied.

Both natural and synthetic thickeners (sodium alginate and Dicothick) were used, and their mixtures with different ratios were examined. Colour strength, percentage of dye penetration and fastness properties were also assessed.

The investigation indicates that varying transfer printing conditions, temperature and time has a marked impact on the colour strength of polyester prints and hence optimum conditions for transfer printing can be established. Results of the studies conducted for different types of thickeners show that Dicothick gave the highest colour strength values while sodium alginate prints had the lowest values, and their mixture lied in between, fastness properties values varied from very good to excellent for three natural dyes.

2- Optimizing the Dyeing Process of Alkali-Treated Polyester Fabric with Dolu Natural Dye

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Summary:

An attempt has been made to optimize the process of dyeing polyester (PET) fabric with natural dyes. Polyester has been first treated with NaOH solution in order to study its impact on the dyeability to the natural dye. The required and used colour component was extracted from a natural plant, namely: Rhubarb; *Rheum officinale*.

The chemical structure of the used colouring matter is observed to have all the characteristics of a typical disperse dye. The colour strength of PET fabric was noticed to increase as a result of alkali treatment which may be attributed to the alteration in the hydrophobicity of polyester fibre. The most effective parameters that may affect the dye uptake of the natural dye on alkali-treated PET fabric and the final dyeing properties including dye bath pH, dyeing temperature and time were studied in details.

The behaviour of the selected and used natural dye was found to be similar to that of disperse dyes. Addition of salicylic acid to the dye bath accelerated the rate of dyeing and subsequently higher colour strength was attained. Non- ionic dispersing agent was also used to ensure better dyeing uniformity and higher dispersion stability of dye liquor.

It is obvious from this study that natural dyes can produce bright colour hues and colour fastness properties equivalent to those of synthetic disperse dyes. Thus, natural dyes may be considered as an eco- friendly alternative to the synthetic ones.

3- One bath cationization and dyeing of cotton fabric with Brazilwood natural dye

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Summary:

Cotton fabrics were cationized with a cationic agent (Chromatech9414) then dyed with Brazilwood natural dye using ferric chloride as a mordant in one bath at three stages by exhaustion method.

This process succeeds to impart cationic sites on cotton fabrics surface which improve its substantivity to natural dye beside save energy and water. The effect of (Chromatech9414) concentration on the nitrogen content was studied. Factors affected the dyeing stage such as dye conc., pH value, temperature and time of dyeing were investigated. The effect of cationic agent concentration and ferric chloride conc. on the colour strength of dyed cotton fabric with Brazilwood natural dye were observed. The best results were obtained at 8% Brazilwood natural dye, pH6 , 60 min., 60°C for dyeing stage at 6% (Chromatech9414) and 8g/l ferric chloride.

The effect of mordant, dyeing pH and cationic agent concn. on the colour hue were also investigated .The wettability and the fastness properties of dyed samples were assessed. The changes in the fiber surface, by cationization , were evaluated using scanning electron microscopy (SEM).

4-The Influence of Cationization on the Dyeing Performance of Cotton Fabrics with Direct Dyes

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Summary:

The effect of cationic modification of cotton fabrics, using cationic agent (Chromatech 9414) on direct dyeing characteristics was studied in this work. Cationization of cotton fabric at different conditions (pH, cationic agent concentration, temperature and time) was investigated and the optimum conditions were determined . Nitrogen content of cotton samples pretreated with cationic agent was indicated.

The results showed that increasing cationic agent concentration lead to higher nitrogen content on cotton fabric. The cationized cotton fabrics were dyed with two direct dyes (C.I. Direct Yellow 142 - C.I. Direct red 224) and the results were compared to untreated cotton fabrics. The parameters which may affect the dyeing process such as dye concn., addition of salt, time and temperature of dyeing were studied.

The dyeing results illustrate that cationization improves the fabric dyeability compared to the uncationized cotton and the magnitude of increase in colour depth depends on the nitrogen content of the cationized cotton fabric .The results also refer to possibility of dyeing cationized cotton fabric with direct dyes without addition of electrolytes to give colour strength higher than that achieved on uncationized cotton using conventional dyeing method .Another important advantage of cationic treatment is in the saving of dye concn., energy ,dyeing time , rinse water and subsequently saving of waste water treatment , and finally minimizes the environmental pollution .

The changes in surface morphology of fibres after cationization were identified by various methods such as wettability and scanning with the electron microscope. Different fastness properties were evaluated.

5- Optimization of Dyeing of Cationized Cotton Fibers with Safflower Extracts

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Summary:

The behaviour and dyeing properties of natural dyes extracted from safflower plant; *Carthamus tinctorius* were studied in details. Cotton fabric was cationized with cationic agent (Tanafix ® SR) to enhance its dyeability to the used natural dye.

Three different methods were used for extracting the various colouring matters from safflower florets, viz., acid, neutral and alkaline methods. Acid method was used to extract the yellow colour species, i.e. safflomin A, B and C, whereas the alkaline method aimed to extract the red colour component, i.e. carthamin quinone along with the neutral extracting method. The obtained extracts were used for dyeing the cationized cotton fabric and the various parameters that may affect the dyeing process were investigated. Maximum colour strength (K/S) was found to be realized by dyeing at pH=7 and 60-70° C for 90 min. for the three used extracts.

Addition of sodium chloride to the dye bath was observed to have a negative effect on the colour strength for the three different safflower extracts. The effect of dyeing pH and temperature on the colour hue was also determined by measuring the coordinate dyeing properties (L*, a*, b*) of the obtained dyeings. The colour fastness properties to washing, perspiration, rubbing and light were also assessed.

6- Enhancing Dyeing of Wool Fabrics with Natural Kamala Dye via Bio- Treatment with Safflower Extract

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Summary:

IN this work an attempt has been made to optimize the process of dyeing wool fabric with Kamala natural dye, firstly by enhancing the colour strength obtained via treating wool with Safflower enzyme extract.

The noticeable increasing in colour strength as a result of bio-treatment with Safflower extract is attributed to the enzyme extract which contains mainly lipase and protease enzymes which improve the dyeability of wool fabrics. All the parameters that may affect the bio-treatment process were studied in details, also the dyeing parameters such as dye concentration, pH value of the dyeing bath; both dyeing temperature and time were studied to determine the optimum conditions for both the treatment and dyeing processes.

In order to develop an eco-friendly natural dyeing process that is compatible with the environment, fixation process was made by using pomegranate as a natural mordant for the Kamala natural dye instead of the artificial ones. The factors affecting the fixation process with pomegranate natural mordant were investigated to conclude the optimum conditions of fixation stage.

It is obvious from this study the possibility of having bright deep colour from Kamala natural dye on the bio-treated wool fabric with good fastness properties that will match with the recent demands of using eco-friendly materials to be attuned with the environment.

7- Effect of Protease Treatment on the Physical Properties and Dyeability of Wool/Nylon Blend to Cutch Natural Dye

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Summary:

The effect of protease enzyme treatment on the morphological structure, wettability and dyeability of wool/nylon blended fabric was studied. The enzymatic treatment and dyeing with cutch (*Acacia catechu*) natural dye was carried out by two different methods, i.e. one-bath two-stages and two- bath processes for comparison.

The effect of enzyme concentration, treatment time and surfactant concentration on the dyeing properties were investigated. This study confirms surface modification of wool and nylon fibers in their blend as a result of protease treatment, by measurements of dyeability (K/S), surface properties (SEM), wettability and fastness properties. Colour strength of dyed fabrics with cutch dye showed higher values on enzyme treated samples compared to the untreated fabrics.

The results of K/S obtained with the two-bath method were better than that obtained with the one- bath method. The fastness properties to washing, perspiration and light were measured according to standard methods. In general the fastness properties were found to be ranged from good to very good.