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DYEING OF POLYVINYL HALIDE-ACETATE
COPOLYMER FIBERS AND FABRICS

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This invention relates to the dyeing of polyvinyl halide-acetate copolymer fibers and fabrics with vat or sulfur colors from an alkaline dye-bath or baths in which the color is present in a reduced solution form.

The new fibers produced from polyvinyl halide-acetate copolymers have obtained importance and are sold on the market under the trade name of "Vinyon." These new textile materials possess important advantages but have been subject to certain drawbacks, chiefly the difficulty of dyeing the fibers or fabrics due to the fact that polyvinyl halide-acetate copolymers do not have ready affinity for most dyes. Attempts to dye "Vinyon" by means of vat dyes or sulfur dyes in the ordinary manner from an alkaline bath or baths proved to be unsuccessful. The color did not adhere and it was impossible to obtain satisfactory results.

According to the present invention we have found that if vat or sulfur dyebaths are prepared using an alkali metal free nitrogen base, for example an organic base, or under proper conditions ammonia, as an alkali, it is possible to obtain very satisfactory level dyeings of "Vinyon" with either vat dyes or sulfur dyes. The strong organic bases are for the most part amines, such as ethylene diamine, quaternary ammonium compounds, and the like. There may also be practically present non-solvent dyeing assistants which produce a swelling of the "Vinyon." These materials are amines, esters, ethers, phenols, and are described and claimed in connection with oil-soluble colors in the copending application of Kienle and Petke, Ser. No. 309,608, filed December 16, 1939. It should be noted that the organic base in itself is an assistant and it may be the only one, or other assistants may be present.

It is important not only to have present an assistant but also to assure good dispersion of the colors and assistants in the dyebath. This can be accomplished by using emulsifying agents such as ammonium caseinate, ammonium linoleate and other ammonium salts of organic acids. Wetting agents of the dioctyl sodium succinate type may also be present to advantage.

Material dyed by the present invention is preferably oxidized chemically rather than by means of the atmosphere as air oxidation does not appear to give as good and as even results.

The present invention is generally applicable to those colors or dyes which can be obtained in a reduced form using hydrosulfite and an organic base. The process of the present invention may also be used for union dyeing as, for example,

cellulosic material, and under other suitable circumstances either wool or silk may be dyed from the same bath.

While the present invention broadly includes the use of any strong organic base or ammonia, we have found that particularly good results are obtained using aliphatic polyamines such as ethylene diamine, and these aliphatic polyamines are included as a specific feature of the present invention. Broadly, however, any strong organic bases can be employed such as tetramethyl ammonium hydroxide, trimethyl benzyl ammonium hydroxide, amino amidine carbonates such as guanidine carbonates, (when used with a small amount of ammonia) and the like.

The dyeing technique is not materially changed over that normally used in vat dyeing or sulfur dyeing of cellulose material except that the temperature preferably should not be above 65° C. The oxidation of the dye is also somewhat different from general practice in that chemical oxidation only is used. The present invention is not limited to any particular oxidizing treatment and any common materials can be used such as dichromates, perborates, and the like. It is an advantage of the present invention that it is not sensitive and the dyeing procedure can be effected without special chemical control.

The invention will be described in greater detail in conjunction with the following specific examples which are typical illustrations but are not intended to limit the invention to the details set forth.

Example 1

5 parts of "Vinyon" yarn is dyed in the following way: 0.05 part Indigo (C. I. 1177) is reduced with 0.5 part ethylene diamine and 1.5 parts of sodium hydrosulfite at 58° C. 0.15 part of o-toluidine and 0.5 part of a 10% solution of ammonium linoleate are added and finally 150 parts of water are added. The "Vinyon" is dyed in the bath for one hour at 65° C. The color exhausts well. The skein is then oxidized in a bath containing acetic acid and sodium perborate, finally rinsed and dried. A fast blue dyeing results.

Example 2

5 parts of "Vinyon" yarn is dyed in the following way: 0.10 part of a sulfur blue (C. I. 961) are reduced with 0.5 part ethylene diamine and 1.5 parts sodium hydrosulfite at 58° C. 0.10 part dibutyl phthalate, 0.30 part of a 10% solution of ammonium linoleate are added and finally 150 parts of water are added. The skein is dyed for

one hour at 65° C. The dyed skein is oxidized in a bath containing sodium perborate and dioctyl sodium sulfosuccinate, rinsed and dried. This procedure gives a level blue dyeing.

Example 3

5 parts of a union fabric composed of 30 parts of "Vinyon" and 70 parts of wool are dyed with a bath prepared in the following manner: 0.1 part of a red vat color (Pr. 89) is reduced with 1 part of a 60% solution of ethylene diamine and 1 part of sodium hydrosulfite. 0.05 part of dibutyl phthalate and 0.3 part of a 10% solution of ammonium linoleate are added, followed by stirring, to give a smooth paste. This paste is then diluted with 150 parts of water and the fabric dyed therein for 1 hour at 65° C. Under these conditions the color exhausts well from the bath. The dyed cloth is then oxidized with any of the usual oxidizing agents, soaped and dried. This procedure gives a level, red union dyeing with good fastness properties.

Example 4

5 parts of a union fabric composed of 23% "Vinyon," 7% wool and 70% cotton are dyed with a bath prepared as follows: 0.2 part of a brown vat dye (Pr. 103) is reduced with 0.5 part ethyl alcohol, 1 part conc. ammonia and 1 part sodium hydrosulfite. 0.05 part dibutyl phthalate and 0.3 part of a 10% ammonium linoleate solution are stirred in, followed by 150 parts of water. The fabric is dyed in this bath for 1 hour at 65° C., oxidized, soaped and dried. This procedure gives a level brown dyeing of good penetration and good fastness properties.

Example 5

5 parts of a "Vinyon" yarn is dyed from a bath prepared in the following manner: 0.10 part of a blue vat dye (C. I. 1184) is reduced with 1 part of 46% tetrahydroxyethyl ammonium hydroxide, 0.5 part ethyl alcohol, and 1 part of sodium hydrosulfite. 0.05 part dibutyl phthalate and 0.30 part 10% ammonium linoleate solution are added and stirred to form an emulsion. The emulsion is diluted with 150 parts of warm water, 38° C. The yarn is then added and dyed for 1½ hours at 65° C., oxidized with hydrogen peroxide, soaped and dried. This yields a level blue dyeing of very good fastness properties.

What we claim is:

1. A method of dyeing polyvinyl halide-acetate copolymer containing material with dyestuffs which form reduced leuco compounds which comprises subjecting the material to the action of an aqueous bath containing the reduced dye, and a strong alkali metal free nitrogen base, followed by oxidation of the color on the material by chemical oxidation.

2. A method of dyeing polyvinyl halide-acetate copolymer containing material with vat dyes which comprises subjecting the material to the action of an aqueous bath containing the vat dye in reduced form and a strong alkali metal free nitrogen base, followed by oxidation of the color on the material by chemical oxidation.

3. A method of dyeing polyvinyl halide-acetate copolymer containing material with sulfur colors

which comprises subjecting the material to the action of an aqueous bath containing the sulfur color in reduced form and a strong alkali metal free nitrogen base, followed by oxidation of the color on the material by chemical oxidation.

4. A method of dyeing polyvinyl halide-acetate copolymer containing material with dyestuffs which form reduced leuco compounds which comprises subjecting the material to the action of an aqueous bath containing the reduced dye and a strong organic base, followed by oxidation of the color on the material by chemical oxidation.

5. A method of dyeing polyvinyl halide-acetate copolymer containing material with vat dyes which comprises subjecting the material to the action of an aqueous bath containing the vat dye in reduced form and a strong organic base, followed by oxidation of the color on the material by chemical oxidation.

6. A method of dyeing polyvinyl halide-acetate copolymer containing material with sulfur colors which comprises subjecting the material to the action of an aqueous bath containing the sulfur color in reduced form and a strong organic base, followed by oxidation of the color on the material by chemical oxidation.

7. A method of dyeing polyvinyl halide-acetate copolymer containing material with dyestuffs which form reduced leuco compounds which comprises subjecting the material to the action of an aqueous bath containing the reduced dye and an aliphatic polyamine followed by oxidation of the color on the material by chemical oxidation.

8. A method of dyeing polyvinyl halide-acetate copolymer containing material with dyestuffs which form leuco compounds which comprises subjecting the material to the action of an aqueous bath containing the reduced dye and ethylene diamine followed by oxidation of the color on the material by chemical oxidation.

9. A method of dyeing polyvinyl halide-acetate copolymer containing material with vat dyes which comprises subjecting the material to the action of an aqueous bath containing the vat dye in reduced form and ethylene diamine followed by oxidation of the color on the material by chemical oxidation.

10. A method of dyeing polyvinyl halide-acetate copolymer containing material with sulfur colors which comprises subjecting the material to the action of an aqueous bath containing the sulfur color in reduced form and ethylene diamine followed by oxidation of the color on the material by chemical oxidation.

11. A method according to claim 1 in which the dyebath contains in addition an amine which is liquid at the temperature of the dyebath and which is a non-solvent assistant for dyeing the copolymer.

12. A method according to claim 1 in which the dyebath contains in addition an ester which is liquid at the temperature of the dyebath and which is a non-solvent assistant for dyeing the copolymer.

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