The present invention relates to processes for enhancing the appearance of colored textile materials, and more particularly to a process for restoring the color of dyed textile materials which have been faded or dulled from excessive use or washing.

In addition, the present invention relates to processes for enhancing the appearance of colored textile materials, and more particularly to a process for restoring the color of dyed textile materials where the original dyestuffs are not quite equal to the dye standard requested.

Textile materials (e.g., fabrics) are said to be faded when they have lost their freshness or brilliance and have become dull and unpleasing to the eye. In other words, the surface of the material has deteriorated in appearance due, for example, to exposure to light or excessive wear. From common experience, it is known that many otherwise useful fabrics such as upholstery slipcovers, wearing apparel, etc. have been discolored because of their faded appearance. Sometimes re-dyeing is possible, but in many cases it fails to restore the original color of the fabric and always presents a question of rematching.

The processes of the present invention eliminate these disadvantages by applying to such surface-deteriorated textile materials, essentially colorless, polymeric film-forming compositions having a refractive index similar to that of the textile substrate being treated.

The color of an opaque object, such as a dyed textile material, is determined by that part of the incident light which the object reflects and scatters. Thus, both the apparent hue and strength of color are mainly governed by the conditions obtaining at the viewed surface of the object, i.e., its surface structure. The opacity of the dyed textile material arises chiefly from the light scattering and multiple light reflection of the assembly of fibers at or near the surface of the material (in a manner analogous to the case of a layer of virgin snowflakes). The more surface structure and/or internal structure of the fibers themselves possess, the greater is the light scattering power of the assembly of fibers, and hence the more dependent is the appearance of the material on the conditions obtaining at the viewed surface. With a textile material such as a dyed cotton fabric the loss or destruction of the dye contained in the fibers at the viewed surface becomes quite noticeable, because the now less colored or uncolored fibers are quite prominent owing to their opacity. Thus, in accordance with this invention a colorless continuous film-forming agent is applied to faded or leached, dyed substrates (e.g., fabrics), which will transparentize the faded or leached surface fibers by minimizing their light scattering tendency, and thereby make more apparent the uncolored or faded color of the fibers beneath the surface coated material. Such agents, which produce a continuous film on the surface of these fibers, and which most closely match the refractive index of these fibers, are most effective in minimizing the light scattering effect and hence the opacity of the fibers. With this reduction in light scattering comes the restoration of the original color, for now the color qualities of the faded or less faded dyestuff beneath the faded surface become apparent. Thus, it is necessary to this invention, in order to minimize the light scattering effect of the deteriorated surface fibers, that the color restorative coating material be capable of forming a reasonably continuous thin film on the surface of the fibers and have a refractive index near that of the dyed textile substrate.

In order to effectuate the desired result, the refractive index of a film-forming agent which spreads readily on the surface of any polymeric substrate should be within ±20% of the refractive index of the textile substrate. With film-forming agents which do not spread readily on the fiber surface and form less continuous film, the refractive index should be within ±10% of the refractive index of the textile substrate.

It has been determined that the refractive index of a dyed textile substrate is virtually equivalent to that of the undyed material and therefore the index of refraction of the textile substrate itself can be used to determine what the index of refraction of the film-forming agent should be. The swatches of cotton cloth used in the following examples when dyed with a direct dye were found to have achieved maximum color deepening when they were wet with liquids having the same index of refraction of the cotton material itself.

A number of suitable film-forming compositions are available for the practice of this invention and include the following organic compounds including also the organosilicones: polyester resins made from polybasic acids such as phthalic, maleic and fumaric, and polyhydric alcohol such as glycols and polyglycols; polyester resins based on rosin acids or alcohol, or their hydrogenated derivatives such as the ethylene glycol ester of rosin, glycerol ester of wood rosin, pentaerythritol ester of hydroxynaproxen; polysiloxanes of such compounds as methyl hydrogen siloxane, ethyl hydrogen siloxane, phenyl hydrogen siloxane, dimethyl siloxane, diethyl siloxane, methyl ethylsiloxane, diphenyl siloxane, di-o-tolylsiloxane, dibenzyl siloxane, methyl phenyl siloxane, ethyl phenyl siloxane, etc.; polysilicones of such compounds as methyl hydrogen siloxane, dimethyl siloxane, methyl phenyl siloxane, etc.; polystyrenylsiloxane and polystyrenylmethylylsiloxane; polystyrene esters such as polystyreneacetate and polystyrene alcohols; and various polycyclic acids and polymethacrylic acids. Mixtures and combinations of the above materials may also be used.

The compositions used should not only have a refractive index close to that of the textile substrate, but should preferably be stable, not readily degraded during storage or in the applied state, colorless, non-toxic, transparent and capable of imparting films of a continuous nature. The film should of course be permanent in order to achieve a lasting effect. Permanent, as that term is employed here, does not necessarily mean permanent to laundering or dry cleaning, although such is not excluded, but rather that the effect is durable, not fleeting, as in the case of a readily vaporizable coating. A suitable composition preferably should not impart other deleterious effects to the fabric such as crocking of dyes, color bleeding, stiffening of hand, or a weakening of the fabric strength.

The agent may be applied to the materials by any of the known methods, such as dipping, spraying or padding. A convenient method of application of the agent is by spraying, using an aerosol spray type applicator. Various types of solvents for the compositions may be used as well as the usual type of propellant so long as they do not interfere with the color enhancing action. Normally, the films will be air dried at room temperature, though elevated temperatures may be employed to expedite the process.

In order to more fully illustrate the present invention, the following examples are given primarily by way of illustration. No specific details or enumerations contained herein should be construed as limitations on the present invention except insofar as they appear in the appended claims. All parts and percentages are by weight unless otherwise specifically designated.
EXAMPLE 1

A swatch of cotton fabric having an index of refraction of 1.54, previously dyed with 1.0% of a direct dye was subjected to ten hours of Fade-Ometer testing. The now faded materials were treated by padding with a film-forming agent of polyvinylpyrrolidone from an isopropanol solvent solution. The agents were applied in an amount of 5% solids based on the weight of the fabric and after being air dried, it formed a film having an index of refraction of 1.52. Upon being visually observed, the faded swatches were found to have been restored to within at least 90% of their original color strength value.

EXAMPLE 2

The procedure of Example 1 is repeated, except that the agent used was a glycerol ester of wood resin in an isopropanol solvent solution. The index of refraction of this film is 1.55. Upon visual observation, the faded swatches were found to have been restored to within at least 90% of their original color strength value.

EXAMPLE 3

The procedure of Example 1 is repeated, except that the agent used was methyl hydrogen siloxane in an isopropanol solvent solution. The index of refraction of this film is 1.43. Upon visual observation, the faded swatches were found to have been restored to within at least 90% of their original color strength value.

EXAMPLE 4

A swatch of cotton having an index of refraction of 1.54 previously dyed with 1.0% of a direct dye was subjected to 10 hours of Fade-Ometer testing. The now faded materials were treated by padding with a polyester resin film-forming agent from a benzene solvent solution. The polyester resin was prepared by reacting 3 moles of diethylene glycol with 2 moles of maleic anhydride and 1 mole of adipic acid to an acid number of about 20 to 30. The polyester resin was applied in an amount of 5% solids based on the weight of the fabric. After being air dried, it formed a film having an index of refraction of 1.48. Upon being visually observed, the faded swatches were found to have been restored to within at least 90% of their original color strength value.

In the above examples, the amount of solids applied may be varied from about 1% to about 10% based on the weight of the fabric, preferably from about 1% to about 5% on the same basis, and the refractive index of the agents may vary from about 1.4 to about 1.6.

The processes of this invention are not only effective on faded cotton materials but also on other fibers and fabrics such as rayon, cellulose acetate, acrylics, polyesters, polypropylenes, etc. The refractive indices of these fibers or fabrics are similar to cotton, and therefore agents having essentially the same range of refractive index (1.43 to 1.60) are also effective on these fabrics.

The agents impart the same beneficial effects to textile substrates which have been previously finished with conventional finishing agents or the like as would be obtained on non-treated textile substrates.

In addition, the processes of this invention can be used to enhance the color of dyed material which has not been faded on its surface. By applying these film-forming agents in the same manner as described above to these materials, the intensity of the original color can be increased by making more apparent the color beneath the surface. The film adds a more continuous medium for the passage of light within the fiber substrate and thereby deepens the color of the fabric in a manner similar to that in which the original color of a faded material is restored.

1 claim:

1. A process for the restoration of the color of a faded, dyed, substantially opaque fibrous textile material which comprises applying to the surface fibers of said faded material a solution of an organic polymeric film forming material, which solution wets the surface fibers and transparentizes the faded fibers to thereby expose unfaded color of the fibers beneath the surface of the faded textile, and drying to yield a textile material coated with from about 1% to about 10% of the weight of said textile material of a permanent, transparent, colorless, organic film having an index of refraction similar to that of the textile fibers.

2. The process according to claim 1 wherein the colorless film has a refractive index of about 1.4 to about 1.6.

3. A process as defined in claim 2 wherein the film comprises a polymer of polyvinylpyrrolidone.

4. A process as defined in claim 2 wherein the film comprises a polymer of methyl hydrogen siloxane.

5. A process as defined in claim 2 wherein the film-forming resin comprises a polyester of diethylene glycol, maleic anhydride and adipic acid.

6. A process as defined in claim 2 wherein the film-forming resin is a glycerol ester of wood resin.

7. A fibrous textile material prepared by treating a faded fibrous textile material by the process of claim 1.

8. A fibrous textile material prepared by treating a faded fibrous textile material according to the process of claim 3.

9. A textile material prepared by treating a faded fibrous textile material according to the process of claim 4.

10. A fibrous textile material prepared by treating a faded fibrous textile material according to the process of claim 5.

11. A fibrous textile material prepared by treating a faded fibrous textile material according to the process of claim 6.

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WILLIAM D. MARTIN, Primary Examiner.

R. HUSSACK, Assistant Examiner.