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PROCESS FOR SHEENING PILE FABRICS

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This invention relates to an improved process for sheening pile fabrics, and more particularly to a method for sheening the pile of wool rugs, carpets, and fabrics of a like nature, all of which will be referred to herein as wool rugs.

The process commonly known as "rug sheening" has come to be of increasing importance in the manufacture of pile fabrics. The methods of treatment known to and used by the art, most of which have involved treatments with solutions containing bleaching powder or sodium hypochlorite, have not, in spite of attempts at rigid control, produced completely satisfactory results.

Operators employing the methods of the art or variations of them have encountered numerous difficulties and found that they possess many serious disadvantages. Outstanding among these have been the inability of such methods to give reproducible results. This is a particular disadvantage in the manufacture of carpets where a certain pattern and finish must remain substantially uniform throughout a large quantity of material which is manufactured over a long period of time. For various reasons which are more fully discussed below, it has been very difficult if not impossible to obtain a constant sheen and a uniform shade of color by the use of the methods of sheening known to the art. In many cases it has been found that a treatment appropriate to produce the desired sheen also causes a loss or fading of the color in the pile and thus in the fabric itself, or sometimes introduces an entirely different tint in the starting color. A further outstanding difficulty has been that a serious loss of tensile strength of the pile often accompanies the sheening process. This, of course, greatly reduces the life of the fabric by lowering its resistance to wear. Certain of the known methods have also been found to possess a tendency to remove the twist from the yarn, thus making sheening difficult and causing the finished product to have an undesirable fuzzy appearance. This tends to disturb the original demarkations in the patterns. Further disadvantages which the proposed methods of sheening have failed to overcome are the running together of colors in pattern fabrics; uneven or streaky sheening, and variations in color or degree of sheen from the top of the pile to the bottom.

It is the primary object of the present invention to provide a chemical method of pile fabric sheening which will eliminate or minimize the above recited difficulties and disadvantages which attend the use of the methods known to the art. The process of the present invention accomplishes this by providing a chemical treatment which produces a minimum loss of fiber strength and at the same time produces a uniform maximum sheen without altering or destroying the color or the texture of the fabric. This invention, furthermore, provides a process which is easily operated and controlled.

We have found that a high degree of sheen may be attained and the disadvantages hitherto involved either eliminated or minimized by subjecting the pile of the rug to treatment in an aqueous solution containing hydroxyl ions and peroxide in concentrations within the limits prescribed below, the presence of the peroxide and of the hydroxyl ions within the prescribed limits of concentrations being the prerequisites for the effectiveness of the sheening solution.

The peroxide may be supplied to the solution by dissolving therein a peroxide forming material which may be organic or inorganic in character. Inorganic peroxide forming materials include the peroxides such as hydrogen peroxide, alkali metal peroxides (sodium peroxide for example), alkaline earth metal peroxides (barium peroxide for example) and persalts which in aqueous solutions form hydrogen peroxide, sodium perphosphate, sodium perborate, sodium percarbonate, and the like, being examples of such persalts. Organic peracids and their salts also serve as sources of hydrogen peroxide, peracetic acid, perbenzoic acid, sodium peracetate and sodium perbenzoate being examples of such organic materials. Organic and organo-metallic salts of hydrogen peroxide, such as tetramethyl ammonium peroxide and triethyltin peroxide may also be used for this purpose.

The hydroxyl ions essential for the effectiveness of the peroxide solution may be supplied by any suitable hydroxyl forming compound capable of producing hydroxyl ions in such concentrations as to provide a pH within the range prescribed hereinafter. Thus, inorganic bases such as the alkali and alkaline earth hydroxides (sodium hydroxide, calcium hydroxide, etc., for example) may be used as the source of hydroxyl ions. Organic bases and organo-metallic bases which are sufficiently soluble in water also may be used as a source of the hydroxyl ions. Tetramethyl ammonium hydroxide and triethyltin hydroxide are illustrative examples of such compounds. In general, salts of strong bases and weak acids, whether organic or inorganic, hydrolyze in water to form free hydroxyl ions and these salts may also be used as a source of hydroxyl ions. Trisodium phosphate, sodium carbonate, sodium

tetraborate, sodium acetate, and the like, are appropriate examples of such salts. Hydroxyl ions may also be supplied by hydrolysis of the peroxide forming material where such material hydrolyzes in water to form hydroxyl ions. Thus, in an operation employing hydrogen peroxide, H_2O_2, as the source of peroxide, the hydroxyl ion concentration may be supplied for example by an alkali metal hydroxide, supch as sodium hydroxide. In operations in which alkaline peroxides or persalts are employed, sodium peroxide, Na_2O_2, for example, a sufficient hydroxyl ion concentration may result from the hydrolysis of the peroxide or salt in aqueous solution. In some cases, an additional quantity of hydroxyl ion may be added with advantage.

It has been found that in most cases best results are obtained when the solution is maintained at a temperature between about 50° and 120° F., and when the period of treatment is from about 15 minutes to about one hour. The treatment in an alkaline solution containing peroxide may be followed by rinsing and "souring" steps in accordance with known methods.

Wool fiber is composed of a cortex covered with epithelial scales. While we are unable to state definitely the course of the chemical reaction occurring between a substance such as bleaching powder and a wool fiber, it appears that the imbricated or serrated surface of the fiber is first attacked and the protecting scales removed. This exposes the fibrous material itself to the destructive action of the chemicals in the treating solution and the resulting damaged fiber is unsatisfactory for many purposes, including use in pile fabrics. Treatment of a pile rug with an aqueous solution containing hydroxyl ions and peroxide as herein described on the other hand apparently does not destroy the epithelial scales or attack the fiber directly, thus eliminating the disadvantages attending the destructive action on the pile itself. We are unable to state definitely the reasons for the improved results obtained by the use of the herein described process, but it would appear that the reaction taking place is a very limited one which tends to change the imbricated surface of the fiber to a relatively smooth surface which has an increased tendency to reflect directly rather than scatter light rays. In this way the desired sheen is imparted to the fabric. It is to be understood, however, that our invention is not limited to any particular hypothesis as to the mechanism of the process.

As indicated above the difficulties encountered in producing or enhancing the sheen on wool rugs are more pronounced with certain weights of rug and colors than with others. An improved process for sheening the pile of wool rugs which involves a two-stage treatment comprising treating the fabric for a limited period of time with a dilute caustic solution and thereafter with an aqueous solution of calcium hypochlorite is described and claimed in Patent No. 2,185,210, granted to ourselves and Varton M. Kalusdian. The present process may be used alternatively with the said two-stage process with equal advantage for most rugs, and in certain instances with superior results. The present process may be used to better advantage on (1) rugs having a natural wool (undyed) background because of the fact that any hypochlorite treatment tends to some extent to discolor the undyed wool, thereby altering slightly the color of the rug; (2) rugs dyed to a very light shade of color in which even a very slight discoloration of the wool by the hypochlorite is objectionable; and (3) on rugs having colors unusually difficult to maintain in the presence of any hypochlorite treatment, for example certain greens containing varying amounts of yellow. In these instances the peroxide treatment of the present invention does not produce the discolorations encountered in the use of a hypochlorite.

In the improved sheening process of the present invention, optimum results with respect to the attainment of a maximum sheen concurrently with a minimum effect on the color and pile are attained by the proper proportioning of hydroxyl ion and peroxide concentrations within the limits given below and by the choice of the most advantageous time and temperature for carrying out the reaction in each individual instance. The exact concentration used must be determined by experiment on the particular rug to be sheened. As above indicated, an advantageous treating solution for carrying out the present invention is prepared by dissolving hydrogen peroxide in an aqueous solution of an alkali metal hydroxide, such as sodium hydroxide. We have found that a hydroxyl ion concentration within a certain upper and lower limit should be employed in the practice of the invention. The aqueous solution employed should have as its lower limit a pH of about 7.5 and as its upper limit a pH of about 13. While the foregoing represents the lower and upper limits of hydroxyl ion concentrations to be employed, we have found that in the practice of the invention there appears to be an optimum inner range, having as its lower limit a pH of about 10 and as its upper limit a pH of about 12.5.

Substantially no sheening occurs at pH values below about 7.5 even with large concentrations of peroxide. Considerable quantities of peroxide, near the upper limit of peroxide concentration as defined hereinbelow, are required when the pH of the treating solution is at least 7.5 but below about 10. It is more economical to use a treating solution having a pH of at least 10 or higher because more reasonable concentrations of peroxide are effective at such pH values. The alkalinity of the treating solution produces deleterious effects on the pile when pH values substantially exceed the upper limit of about 13. Thus, at such high pH values the pile tends to become untwisted and the rug is rendered fuzzy and difficult to shear. The color of a rug is also adversely affected by too high an alkalinity, green rugs for example becoming increasingly yellow. It is advantageous, however, to use as high a pH as is consistent with the texture and color of the rug being treated because the required effective concentration of peroxide, which is relatively expensive with respect to the hydroxyl ion forming material, is lower at relatively high pH values. With a given quantity of peroxide, sheening is more pronounced as the pH increases to about 12.5. We prefer, therefore, to operate in a pH range between about 10 and about 12.5 in order to attain the most effective and economical results.

The alkalinity of the treating solution generally decreases during the sheening operation so that an initial pH of about 7.5 to 10 may decrease to a value below 7.5 and even decrease to the acid side during the sheening operation, under which latter conditions little or no sheening takes place. We have found it to be advantageous to buffer the treating solution where its initial pH is be-

tween about 7.5 and 10 in order to obtain maximum sheening effectiveness. We have found in actual practice that a buffered treating solution having an initial pH of 8.0 drifted only to a pH of 7.55 during the treatment and that wholly effective sheening was thus obtained. Any compound capable of acting as a buffer in an alkaline solution and inert with respect to peroxide may be used. Acetic acid and a Na_2HPO_4-KH_2PO_4 mixture are examples of buffers which may be used with advantage in accordance with our invention.

We shall herein and in the appended claims define the concentration or proportions of the peroxide and other peroxygen compounds used in the preparation of the treating solution of the invention in terms of the equivalent weight of the peroxygen group, —O_2—, contained in the amount of the peroxygen compound used. By reference herein and in the appended claims to the concentration of the peroxygen compound in terms of the equivalent of the peroxygen group, or to the peroxygen group concentration, we do not intend to indicate that either the particular peroxygen compound or the peroxygen group is present, as such, in the solution in the specified concentration. It will be understood that in thus defining the concentration of the peroxygen compound in the solution, we include all of the peroxygen group present and capable of reaction whether at any given instance it be in the form of the peroxygen compound, peroxide ion, hydrogen peroxide, or in any other form. By thus defining the concentration of the peroxygen compound in terms of the equivalent of the peroxygen group, we wish to avoid any academic question such as whether the peroxygen compound is present, as such, or reacts in the form of an ion or, in the case of a salt, the extent of hydrolysis at any given time or the degree of ionization of hydrogen peroxide which may be produced by such hydrolysis.

As above defined, the concentration of the peroxygen compound in the treating solution of the invention should be equivalent to a concentration of the peroxygen group, —O_2—, falling within an outer range of about 0.14 gram per liter to not more than about 2.8 grams per liter. We have found that there is a preferred inner range adapted to give a maximum sheen with minimum color change and pile degradation in the case of a number of types of rugs when treated in solutions in which the peroxygen group concentration range is from about 0.55 gram per liter to about 2.2 grams per liter. The outer range corresponds to about 0.5 to 10 grams per liter of "100 volume hydrogen peroxide" solution, while the inner range corresponds to about 2 to 8 grams per liter of "100 volume hydrogen peroxide" solution. The designation "100 volume peroxide" is used in the trade to indicate that one volume of the aqueous solution employed is capable of liberating 100 volumes of oxygen. Such a solution is approximately 27–28% hydrogen peroxide, H_2O_2, by weight. In cases where per salts or other sources of peroxide are used directly, the limits of hydroxyl and peroxygen group concentrations should also be within the limits just stated. In certain instances, it is desirable to maintain a hydroxyl ion concentration in excess of that provided by hydrolysis of an alkaline peroxide or per salt where such material is used as the source of the peroxygen group. This may be accomplished by adding the necessary quantity of an alkali metal hydroxide, but the total hydroxyl ion concentration, including that produced by hydrolysis (i. e. the pH), should nevertheless be within the above stated limits in order to produce best results.

We have found that no sheening occurs when using a treating solution having a peroxygen group concentration below about 0.14 gram per liter (about 0.5 gram per liter of 100-volume hydrogen peroxide). With treating solutions having a peroxygen group concentration below about 0.55 gram per liter (about 2 grams per liter of 100-volume hydrogen peroxide) it is necessary to use a relatively high concentration of hydroxyl ions in order to obtain satisfactory results. Hence, we prefer to use a minimum of about 0.55 gram per liter of the peroxygen group even though in some cases a peroxygen group concentration as low as 0.14 gram per liter may serve. Relatively large concentrations of the peroxygen compound are required, to obtain good sheening, in treating solutions having a pH value within the lower portion of the permissible pH range. However, concentrations of the peroxygen group higher than about 2.8 grams per liter (about 10 grams per liter of 100-volume hydrogen peroxide) tend to affect adversely the texture and color of some rugs. We prefer to use treating solutions containing not more than about 2.2 grams per liter of the peroxygen group (about 8 grams per liter of 100-volume hydrogen peroxide), peroxygen group concentrations approximating this preferred upper limit being capable of effecting satisfactory sheening without adverse action on sensitive colors in treating solutions having pH values approaching the lower limit of the permissible pH range.

The temperature of the solution during treatment is advantageously maintained between about 50° and about 120° F., but as in the case of the concentrations of the reactants the temperature value giving the maximum sheen with the minimum of harmful effects must be determined for each particular type and color of rug. In general it may be said that best results are obtained by operating at approximately room temperature, i. e. within the range 60° to 95° F. With certain types and colors, however, variations within this restricted range produce undesirable results. For example, one sample of green rug tested acquired an excellent sheen without harm to the color or pile when treated for 45 minutes in a solution at 65° F., whereas a similar sample when treated at 95° F. suffered a color change. In the case of a blue rug treated at the same two temperatures, however, the sample had a better pile after the 95° F. treatment than that subjected to the 65° F. treatment. In general treatments at elevated temperatures, and particularly above about 120° F., tend to destroy color, damage the pile and promote shrinkage.

The most desirable time of treatment must also be determined with respect to the rug being treated and the solutions used. In general, a treating time within the range 15 minutes to 90 minutes is sufficient to effect sheening and treating time up to 60 minutes is usually sufficient. In tests performed to determine the effect of varying the time of treatment, it was found that on one specific type of rug, and using a solution having a sodium hydroxide concentration of 2.5 g. p. l. and a peroxygen group concentration (supplied by H_2O_2) of 0.75 g. p. l., a change in reaction time from 30 minutes to 60 minutes had no visible effect on the results. When, however, solutions having a sodium hy-

droxide concentration of 3.5 g. p. l. were used on the same rug, an increase in treating time from 30 minutes to 60 minutes improved both the sheen and the pile.

After treatment with an aqueous solution containing hydroxyl ions and a peroxygen compound, the rug is with advantage drained and then rinsed with water at approximately room temperature. One or two water rinses may be desirable. The rug may then be given a "sour" treatment for about 10 minutes with any appropriate acid solution such as a solution containing 2 cc. per liter formic acid. The rug should then be dried at a moderate temperature, for example at 140° F.

We have also found that with many types of rug marked advantages result from the additional incorporation in the treating solutions of a synthetic organic water-soluble detergent or wetting agent, referred to herein as "detergents," selected from the class consisting of higher organic sulfates, sulfonates and quaternary ammonium compounds free of fatty acid ester substituents. With certain types of rug, for example, a treatment with an alkaline peroxide solution containing such a synthetic organic detergent results in an increased sheen compared to that obtained with the same solution not containing the detergent without materially affecting the pile or color. In several instances, we have found that the sheen is not only better but the condition of the pile is also much better. The presence of such a synthetic organic detergent in the alkaline peroxide treating solutions also gives markedly improved results over the treating solutions without the detergent when applied to rugs having a weak pile, and particularly when the treatment is carried out in a washwheel.

The detergent or wetting agent to be employed is preferably a sulfated, sulfonated or quaternary ammonium higher organic compound and must be one which is not affected by alkali within the concentration range and under the conditions of the process. It must be free of fatty acid ester substituents which in an alkaline solution such as is here used would undergo reaction to form ordinary alkali soaps which are difficult to remove from the fabric and would be deposited in the pile as fatty acids during the usually employed acid souring treatment. As examples of satisfactory higher organic sulfates, sulfonates and quaternary ammonium compounds may be mentioned the primary aliphatic sulfates (alcohol esters) such as sodium lauryl sulfate, sodium oleyl sulfate and sodium stearyl sulfate, sulfonates of alkylated benzene such as sodium decyl benzene sulfonate and sodium dodecyl benzene sulfonate, the dialkyl esters, diamyl and dioctyl for example, of sodium sulfosuccinic acid, sulfonates of higher aliphatic hydrocarbons such as sodium hexadecyl sulfonate, the secondary aliphatic sulfates (alcohol esters) such as sodium-2 methyl pentane-4 sulfate, and related compounds known to the industry under the trade name of "Tergitols," and quaternary ammonium compounds such as trimethyl octyl ammonium chloride, for example. It is to be understood that other compounds than those just mentioned are suitable provided they are higher organic sulfates, sulfonates or quaternary ammonium compounds free of fatty acid ester substituents. Other detergents or wetting agents such as sodium boro cetyl sulfate, sodium dimethyl dodecyl sulfate, sodium sulfoethyl methyl oleylamide and sodium amyl naphthalene sulfonate may also be used advantageously. It will also be apparent that mixtures of such detergents or wetting agents or compositions consisting essentially of one or more of such detergents or wetting agents may also be used in the process. Sodium lauryl sulfate, sodium oleyl sulfate and sodium sulfonates of alkylated benzenes including sodium decyl benzene sulfonate and sodium dodecyl benzene sulfonate have been found to be of particular advantage.

The requirements as to peroxygen compound concentration, pH, temperature and time of treatment set forth hereinabove apply also to the treating solutions further containing the detergent. The concentration of detergent giving best results will vary depending upon the rug treated, but the concentration may advantageously be within the range 0.1 to 1.0 gram per liter. More is generally not deleterious. In most cases a detergent concentration within the range 0.1 to 0.5 gram per liter will serve to produce the aforementioned improved results. Any variation in the pH of the treating solution caused by the addition of the detergent should be compensated for to produce a treating solution having a pH within the specified range in accordance with our invention.

The following specific examples will serve to illustrate the process of the invention, but are not to be considered as in any way limiting the scope of the invention. The rugs used in these examples were manufactured by a commercial rug manufacturer, and were cut into 6-inch square pieces for testing under varying conditions.

Example I

A Wilton rug having a blue color and of medium weight was treated in a washwheel as follows. The treating solution consisted of 3 liters of solution made up from 10.5 g. NaOH (3.5 g. p. l.) and 6.6 g. of 100 volume H_2O_2 solution (2.2 g. p. l.). This solution had a pH of about 11.5. The rug was treated for 15 minutes at a temperature of 60° F. The rug was then rinsed for 5 minutes in water at 90° F., following which it was treated for 10 minutes in a solution containing 2 cc. per liter formic acid. The rug was removed from the solution and dried at 140° F., after which it possessed a high degree of sheen, unchanged color, and good pile characteristics.

Example II

A rug sample having a green color, but otherwise similar to that used in the preceding example was treated for 60 minutes at 75° F. in a solution made up from 3.5 g. p. l. NaOH and 2.9 g. p. l. 100 volume H_2O_2. The pH of this solution was 12.3. After rinsing, souring and drying, the rug possessed a very good sheen, unchanged color and good pile.

Example III

A similar green rug was treated for 60 minutes at 75° F. in a solution made up from 3.5 g. p. l. Na_2O_2. The pH of the resulting solution was 12.3. After rinsing, souring and drying, the rug possessed a satisfactory sheen, unchanged color and good pile.

Example IV

A rug sample having a green color was treated for 60 minutes at 75° F. in a solution made up from 2.2 g. p. l. NaOH and 3.6 g. p. l. $NaBO_3.4H_2O$. This solution had a pH of 12.2. After rinsing, souring and drying, the rug possessed a good sheen, unchanged color and good pile.

Example V

A solution formed by dissolving 3.6 grams of sodium perborate per liter of water was found to have a pH of 10.2. When used according to the treatment described in Example II, an excellent sheen was obtained on a sand-colored rug.

Example VI

We dissolved 11.3 grams of sodium perborate per liter of water (2.5 grams per liter of the peroxygen group) and adjusted the pH of portions of this solution by the addition of acetic acid. Sheening was obtained with the portions of the solution having initial pH values of 9.5, 9.0, 8.5 and 8.0, but no sheening took place with a portion of the solution having an initial pH of 7.0. A sample of rug similar to that in Example V was used for treatment with each portion of the solution, and each sample of rug was treated at 75° F. for 60 minutes.

Example VII

We found that sheening of a sand-colored rug was obtained with solutions made up from 2.8 grams per liter of 100-volume hydrogen peroxide (0.77 gram per liter of the peroxygen group) and having initial pH values of 10.0 and 11.0 obtained by the addition of sodium hydroxide. Treatment was carried out at 75° F. for a period of 1 hour with each solution.

Example VIII

A solution made up from 8 grams per liter of 100-volume hydrogen peroxide was adjusted to a pH of 8.0 with sodium hydroxide and was buffered by a Na_2HPO_4-KH_2PO_4 mixture. This buffered solution provided a good sheen to a sample of sand-colored rug during a 1 hour treatment at 75° F. A similar solution having the same peroxide concentration and similar initial pH but not buffered was used for the treatment of another sample of the same rug. The pH of the unbuffered solution decreased to about 4 to 5 by the end of the treatment period and resulted in less effective sheening than the buffered solution.

Example IX

A Wilton rug having a green color and of medium weight placed in a treating solution in a washwheel, the solution consisting of 3 liters of aqueous solution made up from 3.5 g. p. l. NaOH, 2.9 g. p. l. of 100 volume H_2O_2 solution, and 0.25 g. p. l. sodium dodecyl benzene sulfonate. The pH of this solution approximated 12.0. The treatment was continued for 30 minutes at a temperature of 75° F. The rug was then rinsed for 5 minutes in water at 90° F., following which it was treated for 10 minutes in a solution containing 2 cc. per liter of formic acid. The rug was removed from the solution and dried at 140° F., after which it possessed a high degree of sheen, unchanged color and good pile characteristics. Amounts of detergent from about 0.1 to 1.0 g. p. l. may be used with advantage, although with some types of rugs best results are obtained when using detergent concentrations ranging from about 0.1 to 0.5 g. p. l.

Example X

A rug sample similar to that used in Example IX was treated in the same way with a solution made up from 3.5 g. p. l. NaOH, 2.9 g. p. l. of 100 volume H_2O_2 solution, and 0.125 g. p. l. of sodium lauryl sulfate, the pH of the solution being about 12.3. After rinsing, souring and drying, the rug possessed a high degree of sheen, unchanged color and good pile characteristics. Increasing the detergent composition to 0.25 g. p. l. gave identical results, but detergent concentrations upward of about 0.5 g. p. l. were somewhat less desirable though effective.

This application is a continuation-in-part of our applications Serial Nos. 310,574 and 310,576, both filed on December 22, 1939.

We claim:

1. The method of sheening the pile of wool rugs which comprises subjecting the pile to treatment in an aqueous solution containing hydroxyl ions and a peroxygen compound, the concentration of said compound in the solution being equivalent to not less than about 0.14 nor more than about 2.8 grams of the peroxygen group, —O_2—, per liter and the pH of the solution being between about 7.5 and 13.

2. The method of sheening the pile of wool rugs which comprises subjecting the pile to treatment in an aqueous solution containing hydroxyl ions and a peroxygen compound, the concentration of the said compound in the solution being equivalent to not less than about 0.55 nor more than about 2.2 grams of the peroxygen group, —O_2—, per liter and the pH of the solution being between about 10. and 12.5.

3. The method of sheening the pile of wool rugs which comprises subjecting the pile to treatment in an aqueous solution containing hydroxyl ions and a peroxygen compound, the concentration of said compound in the solution being equivalent to approximately 2.2 grams of the peroxygen group, —O_2—, per liter and the pH of the solution being between about 7.5 and 13.

4. The method of sheening the pile of wool rugs which comprises subjecting the pile to treatment in an aqueous solution of an alkali metal hydroxide and hydrogen peroxide, the concentration of the hydrogen peroxide in the solution being equivalent to not less than about 0.14 nor more than about 2.8 grams of the peroxygen group, —O_2—, per liter and the pH of the solution being between about 7.5 and 13.

5. The method of sheening the pile of wool rugs which comprises subjecting the pile to treatment in an aqueous solution of sodium hydroxide and hydrogen peroxide, the concentration of the hydrogen peroxide in the solution being equivalent to not less than about 0.14 nor more than about 2.8 grams of the peroxygen group, —O_2—, per liter and the pH of the solution being between about 7.5 and 13.

6. The method of sheening the pile of wool rugs which comprises subjecting the pile to treatment in an aqueous solution of an alkali metal peroxide, the concentration of the said peroxide in the solution being equivalent to not less than about 0.14 nor more than about 2.8 grams of the peroxygen group, —O_2—, per liter and the pH of the solution being between about 7.5 and 13.

7. The method of sheening the pile of wool rugs which comprises subjecting the pile to treatment in an aqueous solution of sodium perborate, the concentration of the sodium perborate in the solution being equivalent to not less than about 0.14 nor more than about 2.8 grams of the peroxygen group —O_2—, per liter and the pH of the solution being between about 7.5 and 13.

8. The method of sheening the pile of wood rugs which comprises subjecting the pile to treatment in an aqueous solution containing hydroxyl ions and a peroxygen compound, the concentration of said compound in the solution being equivalent to not less than about 0.14 nor more

than about 2.8 grams of the peroxygen group, —O_2—, per liter and the pH of the solution being between about 7.5 and 13, the solution further containing a buffer material adapted to maintain a pH of the solution within said pH range during treatment of the pile.

9. The method of sheening the pile of wool rugs which comprises subjecting the pile to treatment in an aqueous solution containing hydroxyl ions and a peroxygen compound, the concentration of said compound in the solution being equivalent to not less than about 0.14 nor more than about 2.8 grams of the peroxygen group, —O_2—, per liter and the pH of the solution being between about 10 and 12.5.

10. The method of sheening the pile of wool rugs which comprises subjecting the pile to treatment in an aqueous solution containing hydroxyl ions, a peroxygen compound and a synthetic organic water-soluble detergent selected from the class consisting of higher organic sulfates, sulfonates and quaternary ammonium compounds free of fatty acid ester substituents, the concentration of the said peroxygen compound in the solution being equivalent to not less than about 0.14 nor more than about 2.8 grams of the peroxygen group, —O_2—, per liter, the pH being between about 7.5 and 13, and the detergent concentration being between about 0.1 and 1.0 gram per liter.

11. The method of sheening the pile of wool rugs which comprises subjecting the pile to treatment in an aqueous solution containing hydroxyl ions, a peroxygen compound and a synthetic organic water-soluble detergent selected from the class consisting of higher organic sulfates, sulfonates and quaternary ammonium compounds free of fatty acid ester substituents, the concentration of said peroxygen compound in the solution being equivalent to not less than about 0.55 nor more than about 2.2 grams of the peroxygen group, —O_2—, per liter, the pH of the solution being between about 10 and 12.5, and the detergent concentration being between about 0.1 and 0.5 gram per liter.

12. The method of sheening the pile of wool rugs which comprises subjecting the pile to treatment in an aqueous solution of sodium hydroxide, hydrogen peroxide and a synthetic organic water-soluble detergent selected from the class consisting of higher organic sulfates, sulfonates and quaternary ammonium compounds free of fatty acid ester substituents, the concentration of the hydrogen peroxide in the solution being equivalent to not less than about 0.14 nor more than about 2.8 grams of the peroxygen group, —O_2—, per liter, the pH of the solution being between about 7.5 and 13, and the detergent concentration being between about 0.1 and 1.0 gram per liter.

13. The method of sheening the pile of wool rugs which comprises subjecting the pile to treatment in an aqueous solution of sodium hydroxide, hydrogen peroxide and sodium lauryl sulfate, the concentration of the hydrogen peroxide in the solution being equivalent to approximately 0.75 gram of the peroxygen group, —O_2—, per liter, the pH of the solution approximating 12.3 and the sodium lauryl sulfate concentration being between about 0.1 and 1.0 gram per liter.

14. The method of sheening the pile of wool rugs which comprises subjecting the pile to treatment in an aqueous solution of sodium hydroxide, hydrogen peroxide and a sulfonate of an alkylated benzene free of fatty acid ester substituents, the concentration of the hydrogen peroxide in the solution being equivalent to approximately 0.75 gram of the peroxygen group, —O_2— per liter, the pH of the solution approximating 12.3 and the benzene sulfonate concentration being between about 0.1 and 1.0 gram per liter.

15. The method of sheening the pile of wool rugs which comprises subjecting the pile to treatment in an aqueous solution of sodium peroxide and a synthetic organic water-soluble detergent selected from the class consisting of higher organic sulfates, sulfonates and quaternary ammonium compounds free of fatty acid ester substituents, the concentration of said peroxide in the solution being equivalent to not less than about 0.14 nor more than about 2.8 grams of the peroxygen group, —O_2—, per liter, the pH of the solution being between about 7.5 and 13 and the detergent concentration being between about 0.1 and 1.0 gram per liter.

16. The method of sheening the pile of wool rugs which comprises subjecting the pile to treatment in an aqueous solution containing hydroxyl ions, a peroxygen compound and sodium oleyl sulfate, the concentration of the said compound in the solution being equivalent to not less than about 0.14 nor more than about 2.8 grams of the peroxygen group, —O_2—, per liter, the pH being between about 7.5 and 13 and the sodium oleyl sulfate concentration being between about 0.1 and 1.0 gram per liter.

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