

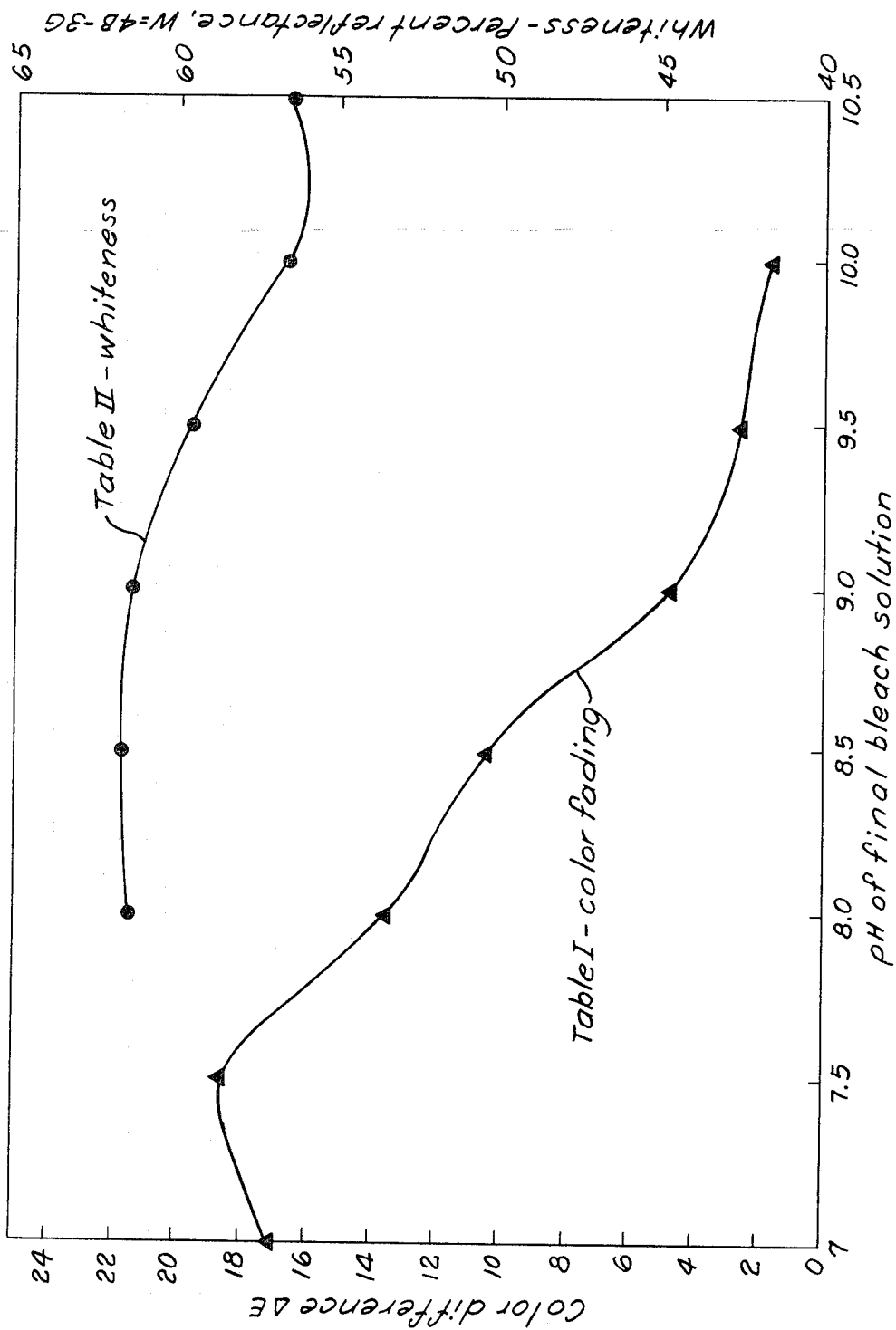
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BLEACHING COMPOUNDS AND METHOD

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BLEACHING COMPOUNDS AND METHOD

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ABSTRACT OF THE DISCLOSURE

In oxidizing and bleaching solutions containing organic monoperacids and/or salts thereof, the improvement which comprises providing a pH of at least about 9.0 in said bleaching solution thereby to substantially prevent the fading of color dyes in textile materials. In dry solid bleaching compositions containing at least one peroxygen compound and at least one organic acid anhydride and which when dissolved in an aqueous solution, yields an organic monoperacid and/or salt thereof as a bleaching and oxidizing agent, the improvement which comprises: including in said composition a sufficient quantity of a solid base compound to provide a pH of at least about 9.0 in said aqueous solution to assure a color-safe bleaching solution.

BACKGROUND

It is well known in the art that aqueous solutions of organic monoperacids and/or salts thereof possess bleaching and oxidizing properties which are superior to peroxide solutions. Also, there exist stable dry solid compositions which, when dissolved in aqueous solutions, yield these organic monoperacids and/or salts thereof in situ. These dry bleaching compositions usually consist of a mixture of at least one solid dry peroxygen compound and at least one solid dry organic acid anhydride. The dry compositions are also usually substantially anhydrous so as to prevent chemical reactions between the components of the mixture prior to their use for bleaching or oxidizing purposes. Other constituents are also sometimes employed in the dry solid bleaching compositions to modify the properties of the monoperacid and/or salt solutions which are produced. For instance, the pH of the final bleaching solutions may be controlled to some extent by incorporating certain alkaline or acid materials in the solid compositions. It has been thought that the bleaching and oxidizing properties of the monoperacid solutions are usually most effective when the pH of the solutions range between about 6.5 and 9.0. However, certain dyes are badly faded by these monoperacid solutions, thus limiting the utility of such bleaching solutions to white fabrics. It has now been found that color-fading by monoperacid solutions can be substantially eliminated by employing a pH of at least 9.0 in such bleaching solutions while unexpectedly maintaining the bleaching and whitening effect of said solutions.

SUMMARY

The present invention concerns an improvement in oxidizing and bleaching conditions containing an organic monoperacid and/or its salt as the major oxidizing agent. Specifically, the improvement comprises maintaining a pH of at least about 9.0 in said solutions to substantially prevent the fading of color dyes in fabrics. Also, the invention includes an improvement in solid dry bleaching compositions which when dissolved in aqueous solutions yield monoperacid and/or salts thereof which comprises, including in said solid bleaching composition a sufficient amount of a solid base material to provide a pH of at least about 9.0 in said aqueous solution.

DRAWING

The figure represents a comparison of the pH of a peroxybenzoic acid bleaching solution to color safeness and bleaching effectiveness.

PREFERRED EMBODIMENT

Usually in the practice of the present invention the pH of organic monoperacid bleaching solutions, in which colored fabrics are to be treated, is adjusted to at least about 9.0 and preferably at least about 9.5 by the addition of a sufficient quantity of suitable base material, such as, for example, alkali and alkaline earth metal salts, such as the salts of the weak inorganic and organic acids including, for example, sodium carbonate, trisodium phosphate, sodium orthosilicate, sodium meta-silicate, sodium tetraborate, tetrasodium pyrophosphate and the like. The actual base employed is usually not critical. The base should, however, be one which will give a pH of at least about 10 when dissolved in water and should be easily dried to an anhydrous form when it is to be employed in a bleaching composition as defined herein. The amount of base required is readily apparent to those skilled in the art and will depend on the concentration of the monoperacid, the monoperacid employed, amount of aqueous solution, and the like.

In dry solid bleaching compositions which yield monoperacids when dissolved in aqueous solutions, a sufficient amount of solid base material, as defined hereinbefore, is employed so as to provide a pH of at least about 9.0 and preferably at least about 9.5 in the resulting bleaching solution. The amount of base employed will depend on the particular base selected and on the particular constituents of the solid bleaching compositions, the amount of solution and the like.

As indicated, the present invention concerns an improvement in dry solid bleach compositions which yield organic monoperacids and/or salts thereof when dissolved in an aqueous medium. These dry bleach compositions usually consist of a dry stable particulate mixture of at least one solid inorganic peroxygen compound and at least one solid organic acid anhydride. Examples of operable inorganic peroxygen compounds include, the inorganic perborates, peroxides, percarbonates, perphosphates and the like. Sodium perborate monohydrate has been widely used because of its low cost and availability. Potassium perborate and ammonium perborate are especially desirable because of their stability for sustained periods of time. Among other specific peroxygen compounds which may be included are urea peroxide, zinc peroxide, magnesium peroxide, and calcium peroxide. These peroxygen compounds may be either anhydrous or in the hydrated form as long as they are sufficiently free of uncombined water so as to be unreactive toward the organic acid anhydride in a dry mix prior to use.

Also included in the commonly used dry bleach composition is an organic acid anhydride. Examples of suitable anhydrides include succinic anhydride, maleic anhydride, phthalic anhydride, glutaric anhydride and benzoic anhydride. Mixed anhydrides or derivatives of the aforementioned organic anhydrides are also included. Generally non-toxic organic acid anhydrides are employed; however, anhydrides of a toxic nature may be employed if desired.

Other ingredients may also be employed in the dry solid bleach compositions to modify the properties of the peracid solutions which are produced. For example, desirable properties may be imparted to the peracid solutions by incorporating into the dry composition other substances such as soaps, perfumes and other materials which are not detrimental to the bleaching and oxidizing properties of the compositions.

The dry bleach compositions usually contain equimolar quantities of the peroxygen compound and organic acid anhydride. However, the alkalinity of the prepared solutions may be varied to some degree by employing other than equimolar quantities of the ingredients. Thus, a more alkaline solution can be prepared if greater than an equimolar amount of an inorganic peroxygen compound is employed. For example, a dry bleaching composition containing about 1 gram-mole percent of sodium perborate monohydrate and 1 gram-mole percent of benzoic anhydride will produce an aqueous solution containing peroxybenzoic acid having a pH of about 8.5. The pH is defined as the final pH after complete reaction of the organic acid anhydride and the peroxygen compound in an aqueous solution. Thus, the requisite pH as defined in the present invention may be maintained to some extent by employing other than equimolar amounts of these constituents.

The present invention, therefore, now affords the use of organic monoperacid oxidizing and bleaching solutions for bleaching colored fabrics which heretofore was undesirable because of fading. The whitening and bleaching power of the monoperacid solution is not greatly affected by employing a pH value of the solution within the ranges heretofore described.

The following examples will facilitate a more complete understanding of the present invention but they are not meant to limit the invention to the specific embodiments incorporated therein.

Example 1

A series of bleaching baths with final pH values ranging from 7 to 10 were prepared in 0.5 pH value increments in the following manner. A stainless steel agitating vessel was employed as a test vessel. To 1000 ml. of water at 105° C. was added 2.0 grams of a commercial laundry detergent, 0.277 gram of benzoic anhydride and 0.128 gram of sodium perborate monohydrate. Hydrolysis of the anhydride was allowed to occur during which time the pH of the solutions fell. Either sulfuric acid or trisodium phosphate was then added to the bath to provide a predetermined pH between 7 and 10. The amount of sulfuric acid or trisodium phosphate was noted.

Following the preparation of the initial bleaching solutions a second series of solutions were prepared as test solutions. The solutions were prepared employing the same constituents and amounts as determined from the first series described directly hereinbefore and including the requisite amount of sulfuric acid or trisodium phosphate to provide a predetermined pH in the final bleaching solution. Four pieces of blue cotton cloth about 5 inches square were agitated in each of the so-prepared bleach baths for about 10 minutes at about 100 cycles agitation per minute. The pieces of cloth were then rinsed in water and ironed dry.

The color of each piece of cloth after treatment was measured with a Hunter Model D-40 Color and Color Difference Meter. This color difference was compared to a control standard which consisted of a piece of the same material but not subjected to bleaching. The color difference between each sample was determined and the average color difference of the four pieces of cloth in each bath was calculated and is tabulated in following Table I. Color difference of the treated fabric for each solution is calculated using the following equation:

$$\Delta E = \sqrt{(L_o - L_i)^2 + (a_o - a_i)^2 + (b_o - b_i)^2}$$

where:

ΔE is color difference from a standard;

L_o is lightness of the standard and is calculated from the formula

$$L_o = 0.51Rd \frac{(21 + 0.20Rd)}{(1 + 0.20Rd)}$$

L_i is the lightness of the sample;

Rd , a and b , are readings obtained from the color difference meter, and
Subscripts o and i refer to the standard and the i th sample respectively.

TABLE I

	pH bleaching solution	Rd	a	b	ΔE
10 Run Number:					
Control		7.65	6.35	-38.25	
1	7	9.25	-2.15	-23.85	17.00
2	7.5	9.70	-3.10	-22.75	18.56
3	8	8.80	-0.35	-26.80	13.46
4	8.5	8.85	0.75	-29.75	10.45
5	9.0	8.10	3.75	-34.40	4.74
15 6	9.5	8.00	4.55	-36.35	2.71
7	10.0	8.00	5.00	-37.10	1.91

Example 2

- 20 In this test a series of bleaching baths having predetermined pH values were prepared in a manner similar to that in Example 1. However, in this series of tests, undyed muslin cloth (greige goods) was subjected to the bleaching solutions at a temperature of about 130° C.
- 25 The whiteness of the bleached cloth was determined after bleaching by means of a Hunter lab Model D-40 reflectometer having filters to give both green and blue light. The percentage of light reflected is indicative of the whitening power of the solutions. A whiteness factor was
- 30 calculated employing the equation:

$$W = 4B - 3G$$

wherein:

W =whiteness

- 35 B =percent of blue light reflected

G =percent of green light reflected

This equation is well known in the art as one means of comparing the whitening power of bleach solutions. The pH of the solution and reflectance of the blue and green light as well as the whitening factor is set forth in the following Table II including a control consisting of unbleached muslin cloth.

TABLE II

	pH	Blue "B," reflectance	Green "G," reflectance	Whiteness $W = 4B - 3G$
45 Run Number:				
Control		66.4	72.2	49.0
	8.0	75.9	80.7	61.5
	8.5	75.5	80.1	61.7
50	9.0	74.5	78.9	61.3
	9.5	73.1	77.6	59.6
	10.0	71.4	76.3	56.7
	10.5	71.0	75.7	56.9

- 55 The figure represents a graphic comparison of the effect of the final pH of the bleaching solutions on color stability and whitening power employing the results of the foregoing examples. It is evident that color safeness, noted as ΔE in the figure, i.e. resistance to fading, is
- 60 increased markedly when employing a pH within the range described herein. The whitening power, i.e.

$$W = 4B - 3G$$

of the solutions, on the other hand, is not detrimentally affected thus indicating the value of employing higher pH values in organic monoperacid bleaching solutions.

Various modifications may be made in the present invention without departing from the spirit or scope thereof for it is understood that I am limited only

70 as defined in the appended claims.

What is claimed is:

1. In the method for bleaching color-dyed textiles wherein said textiles are contacted with an aqueous organic monoperacid bleaching and oxidizing solution prepared by the reaction in an aqueous solution of an in-
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organic peroxygen compound and an organic acid anhydride the improvement which comprises:

- (a) adjusting the pH of the bleaching solution to at least about 9.0 by incorporating in said solution an effective amount of a base selected from the group consisting of alkali and alkaline earth metal salts of weak organic and inorganic acids and mixtures thereof to prevent the fading of said dyed textiles.
2. The method as defined in claim 1 wherein the pH of the bleaching solution is adjusted to at least about 9.5.

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