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SIMULTANEOUS DESIZE-SCOUR-BLEACH WITH ACTIVATED HYDROGEN PEROXIDE

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ABSTRACT OF THE DISCLOSURE

This invention provides a combination desizing, scouring and bleaching process for greige textiles employing an aqueous alkaline hydrogen peroxide containing a dipersulfate, a petroleum distillate fraction solvent, a stabilizer and a surfactant.

DESCRIPTION OF THE PRIOR ART

Textiles are usually desized, scoured and bleached before they are dyed or subjected to similar "finishing" processes such as processes for imparting permanent-press or stain-repellent properties. To obtain consistent, high quality results with commercial quantities of textiles the desizing, scouring and bleaching steps are usually performed separately.

Desizing consists of removing any sizing compound that may have been added during weaving. Scouring removes fats, oils or waxes that may be on the fabrics and which interfere with uniform dyeing and bleaching. After desizing and scouring the fabric is bleached to whiten the fabric and make it more receptive to finishing chemicals. Various tests are performed on the fabric to determine the effectiveness of the desizing, scouring and bleaching operations and the receptiveness of the treated fabric to post-bleaching processes. The properties of the fabric normally tested are the reflectance (whiteness), average drop absorbency, the drop absorbency range, percent water extractables, percent enzyme extractables and percent fats, oils and waxes.

Fabrics having acceptable values for the above properties have been obtained by separate desizing, scouring and bleaching treatments. For example, fabrics are desized with enzymes, hot caustic, alkaline peroxygens or bromine. Following this desizing step the fabric is scoured with an alkali to remove the fats, oils and waxes as well as other impurities that the desizing process fails to remove. Good drop absorbency properties are usually obtained by this scouring process. Subsequently, the fabric is bleached to obtain high whiteness (reflectivity) employing bleaching chemicals such as hydrogen peroxide.

Substantial commercial advantages are obtainable by a process which would combine the desizing, scouring and bleaching operations into one continuous process; however, such a commercially feasible "single-stage bleaching" process has not been developed that is capable of continuously producing high quality products.

A significant improvement towards development of a "single-stage bleaching" process is described in U.S. Pat. No. 3,026,166, issued to Gerald Gallagher et al. That patent describes a cold bleaching process using a hydrogen peroxide-dipersulfate bleaching solution which is sometimes referred to herein as the Gallagher process. The Gallagher process is carried out at about room temperature for a prolonged period, that is from 6 to 24 hours. Although the Gallagher process bleaches and improves the drop absorbency of fabrics, it is not readily adaptable to continuous operation but is practiced batch-wise because of the long retention time required for processing. A significant disadvantage of the Gallagher process is

that a commercially acceptable product can only be consistently obtained at cold bleaching temperatures, that is from about 50 to 120° F., which temperatures require substantial bleaching times of from 6 to 24 hours.

U.S. Pat. No. 3,148,019, issued to Gallagher et al. performed both a high temperature scouring step with an alkali and then a bleaching step with alkaline hydrogen peroxide in a single piece of equipment, but did not combine desizing, scouring and bleaching into a single-step.

SUMMARY OF THE INVENTION

We have invented a combination desizing, scouring and bleaching process which is capable of continuous production of consistently high quality bleached textiles that are very suitable for post-bleaching finishing treatments such as dyeing, stain repelling and permanent press treatment. This process comprises dampening the fibers with an aqueous alkaline hydrogen peroxide solution containing a dipersulfate, a petroleum distillate fraction solvent, a stabilizer and a surfactant and heating the dampened fibers to a processing temperature of 180° F. to 275° F., and preferably about 212° F., for between 1.0 and 90 minutes whereby a high quality desized, scoured and bleached fiber is obtained.

DETAILED DESCRIPTION OF THE INVENTION

This invention provides a combination desizing, scouring and bleaching process for textiles comprising dampening the textile fibers with a bleach containing as essential ingredients an aqueous alkaline hydrogen peroxide, a dipersulfate, a petroleum distillate fraction solvent, a stabilizer and a surfactant and heating the dampened fibers to a processing temperature of about 180° F. to 275° F. for between 1.0 and 90 minutes.

Both synthetic and cotton fibers and combinations thereof can be desized, scoured and bleached by the process of this invention.

The processing temperature preferably is about 212° F., and normally is obtained by contacting the dampened fabric with steam at ambient pressure. However, temperatures somewhat lower than 212° F., e.g. about 180° F., can be employed although the processing time increases as the temperature decreases below 212° F. Temperatures above 212° F. can be obtained by performing the process in a pressure type bleaching vessel in which temperatures as high as about 275° F. can be obtained. At these elevated temperatures above 212° F. processing time is decreased and good results obtained in as little as one minute.

The process is performed by dampening the textile fibers with the bleach solution so that the dampened fibers contain about 50 to 150 parts by weight of bleach solution for each 100 parts by weight of fiber. The dampening of the fibers is carried out by conventional means, for example, they can be immersed in the bleaching bath, removed from the bath and squeezed to remove excess bleach. Other suitable means will be apparent to one skilled in fiber-treating.

The bleaching solution is an aqueous solution containing as essential ingredients:

(a) Between 0.5% and 5.0% hydrogen peroxide (based on 50% hydrogen peroxide solution) and/or amounts of other peroxygens, e.g. perborates or percarbonates, that yield hydrogen peroxide in solution such that the hydrogen peroxide value is within the required percentages of 0.5% and 5%;

(b) Between 0.1% and 1.5% by weight of a water-soluble dipersulfate of an alkali metal or ammonium;

(c) Between 0.1% and 2.0% of an alkali such as sodium hydroxide, preferably about 0.8% to 0.9%;

(d) A stabilizing amount of a silicate such as sodium silicate;

(e) At least 0.1% of an organic hydrocarbon solvent such as Varsol or similar petroleum distillate fraction solvents; and

(f) At least about 0.005% and preferably about 0.1% of a wetting agent or surface active agent such as Triton X–100 or other nonionic or anionic wetting agents such as an alkyl aryl sodium sulfonate or an alkyl aryl polyether alcohol.

The preferred amount of the petroleum distillate fraction solvent is between 0.8% to 1.0% because greater amounts do not produce sufficient improvement in relation to their added cost and increased disposal problem. The preferred characteristics of the petroleum distillate fraction solvent are, Aniline Point between 100° F. and 150° F., Kairi-Butanol Value between 32 and 47, a Solubility Parameter between 7.5 and 8.1, Flash Point, TCC between 100° F. and 145° F., Initial Boiling Point greater than 300° F. and Final Boiling Point less than 410° F. A typical composition of such a solvent is (vol. percent) Aromatics between 10% and 33%, Olefins less than 1%, Naphthenes between 26% and 43%, Paraffins between 32% and 60% and a Bromine Number between 0.08 and 0.28.

Additives for adjusting or buffering the pH of this solution are not required as long as the essential ingredients are contained within their desired concentrations.

The following examples are given by way of illustration of the present invention only and are not intended to limit the scope thereof. In testing the properties of the cloth both before and after treatment, the following procedures were used:

(a) Non-cotton content was determined using AATCC tentative test method 97–1960 with the results obtained as percent enzyme extractables, percent water extractables and percent fats, oils and waxes.

(b) Reflectance values were determined with a Hunter lab. reflectometer for whiteness, Model D–40 using a blue filter and employing AATCC test method 110–1968.

(c) Absorbency was determined using AATCC test method 79–1968.

In all of the examples the greige textile fabric treated was a 100% cotton broadcloth, 2.6 yards per pound and 66 x 66 threads per inch. Before treatment the fabric contained 6.2% water extractables, 5.2% enzyme extractables and 0.82% fats, oils and waxes. All percentages herein are weight percentages unless otherwise stated and percentages of hydrogen peroxide stated herein are weight percentages of 50% hydrogen peroxide solution.

EXAMPLE A (COMPARATIVE)

A cotton broadcloth sample was dampened to 100% saturation with an aqueous solution containing 3% hydrogen peroxide (50% solution), 2% sodium silicate (42° Bé.), 0.8% sodium hydroxide, 0.25% petroleum distillate fraction solvent and 0.1% nonionic wetting agent. The dampened fabric was heated to 212° F. with steam for 90 minutes and then washed. The fabric was then analyzed and had the properties reported in Table I, column A.

EXAMPLES B, C, I, AND II

The procedure of Example A was repeated with comparative bleaching solutions B and C having the composition reported in Table I and with bleaching solutions I and II having composition within the scope of this invention as reported in Table I. The effects of each bleach solution upon the fabrics are reported in Table I. A comparison of the results reported in Table I substantiates the consistently high quality results obtained with the process of this invention.

The best mode contemplated for practicing this invention is by employing the solution composition, process time and temperature used in Example II. However, within the best mode contemplated for practicing this invention, the solution composition can vary from the amounts used in Example II, that is, the preferred composition ranges are:

(a) hydrogen peroxide, between 2.5% and 3.5%,
(b) alkali, between 0.8% and 0.9%,
(c) a stabilizing amount of silicate, usually about 2% sodium silicate,
(d) dipersulfate, between 0.2% and 0.5%,
(e) solvent, between 0.8% and 1.0%, and
(f) wetting agent, about 1.0%.

Pursuant to the requirements of the patent statutes, the principle of this invention has been explained and exemplified in a manner so that it can be readily practiced by those skilled in the art, such exemplification including what is considered to represent the best embodiment of the invention. However, it should be clearly understood that, within the scope of the appended claims, the invention may be practiced by those skilled in the art, and having the benefit of this disclosure, otherwise than as specifically described and exemplified herein.

TABLE I

	Example				
	A	B	C	I	II
Composition:					
Hydrogen peroxide	3.0	3.0	3.0	3.0	3.0
Sodium hydroxide	0.80	0.80	0.90	0.90	0.90
Sodium silicate (42° Bé.)	2.0	2.0	2.0	2.0	2.0
Sodium dipersulfate				0.30	0.30
Varsol	0.25		0.25	0.25	0.25
Triton X–100	0.10	0.10	0.10	0.10	0.10
Results:					
Percent reflectance	84.2	84.2	84.5	84.9	85.5
Drop absorbency	52.3	120+	28.3	15.9	5.8
Percent extractables:					
Water	.63	(*)	(*)	(*)	0.56
Enzyme	.51	(*)	(*)	(*)	0.42
Fats, oils and waxes	.24	(*)	(*)	(*)	0.10

*Cloth samples not tested for percent extractables or fats, oils and waxes.

We claim:

1. A combination desizing, scouring and bleaching process for greige textile fibers comprising dampening the fibers with from 50 to 150 parts by weight of a solution, based on 100 parts by weight of fibers, consisting essentially of water, between 0.5% and 5.0% hydrogen peroxide, between 0.1% and 2.0% of an alkali, between 0.1% and 1.5% of a water-soluble dipersulfate of an alkali metal or ammonium, at least about 0.1% of a paraffinic-naphthenic nonolefinic petroleum distillate fraction solvent, a stabilizing amount of a water-soluble silicate and at least about 0.005% of a nonionic or anionic wetting agent, heating the dampened fibers to a processing temperature of about 180° F. to 275° F. for between 1.0 and 90.0 minutes, and then washing the fibers.

2. The process of claim 1 in which the solution contains between 0.8% and 1.0% of the petroleum distillate fraction solvent, between 0.2% and 0.5% of the dipersulfate, between 2.5% and 3.5% hydrogen peroxide values, and about 0.1% of the wetting agent.

References Cited

UNITED STATES PATENTS

3,026,166	3/1962	Gallagher	8—111
3,514,247	5/1970	Lawes et al.	8—111
3,595,603	7/1971	Cerana et al.	8—111

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