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TEXTILE FINISHING

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This invention represents an improvement in the finishing of fabrics with carbamide-aldehyde condensates. In particular it relates to preventing or correcting odor in fabric which has been treated with resin or resin-forming compositions of the urea-formaldehyde type.

Finishing fabrics with carbamide-aldehyde reaction products has recently become a relatively common practise, not only for producing anti-creasing effects or non-crushing effects, but for such diverse purposes as stabilizing cloth against shrinkage, preventing "laddering" and the pulling-out of seams, improving the handle and appearance, as shown by apparent bulk, smoothness, fullness, etc. When fabrics have been fully processed with proper care, no difficulties have been encountered from the development of odors. From time to time, however, fabrics which have not been properly finished have been observed to possess or to develop odors. The faulty application of condensates of the urea-formaldehyde type may have been due to improper control of conditions, inadequate equipment, or attempts to obtain economies by such means as insufficient temperature or time in curing or by omitting the step of washing the treated fabric. It is frequently found impractical to give the thorough wash which is necessary to ensure against odor when every other condition has been correctly attained and controlled.

It is the main object of this invention to provide a simple, practical method for preventing odor in fabrics processed with carbamide-aldehyde type condensates. It is also an object to overcome odor in fabric which has been treated with urea-formaldehyde type reaction products.

It has been found that odor can be corrected or prevented by treating fabric containing resin of the carbamide-aldehyde type with a mild oxidizing agent under alkaline conditions. In the most direct procedure the fabric, which has been resin-treated, is passed or padded through a mildly alkaline, oxidizing solution, and immediately dried by any suitable means, such as a loop drier, heated cans, or enclosed tenter frame. Since the oxidizing solution may be applied at relatively high speeds, this process is more economical than the longer washing procedures which have heretofore been necessary. It is also more satisfactory because of dependability and uniformity of results. But, if desired, the oxidizing step can be combined with or used in conjunction with the washing procedure.

Typical useful oxidizing agents which are suitable for this application include hydrogen peroxide, organic peroxides, the perborate salts, the percarbonate salts, the persulfates, etc. All such materials may be classified as peroxide-type oxidizing agents. The perborates and the percarbonates, being salts of weak acids, give somewhat alkaline solutions by themselves. In case, however, that it is desired to render the solution definitely alkaline, particularly when hydrogen peroxide, an organic peroxide, or a persulfate is used, such mildly alkaline materials as sodium bicarbonate, soda ash, borax, or disodium phosphate, or mixtures of such materials, or mixtures of such materials with other alkaline reagents, such as metasilicate or trisodium phosphate, are preferred. In general any freely soluble, fixed, alkaline material may be used which will impart to the treating bath a pH between 7 and about 11. The treating bath may be used at any temperature from room temperature up to about 150° F.

The proportions of oxidizing agent and alkaline reagent which are used are not critical but should be adjusted in accord with the amount of resin and catalyst used and with the rate at which the process is run. As more resin and catalyst are used, there is more material which must be acted upon with the oxidizing and alkaline material. If the rate at which cloth is run through the solution is relatively low, the concentrations of reagents can be lower than when the rate of operation is faster. In general, enough alkali should be used so that the pH of cloth after treatment is on the alkaline side, preferably about 7.5. In general the concentrations of oxidizing agent and alkaline material each fall between 0.1% and 2%, but lower and higher concentrations may also be used.

For the finishing of fabrics there may be used any of the water-soluble or organic solvent-soluble forms of urea-formaldehyde reaction products, such as methylol urea, dimethylol urea, alcohol-urea-formaldehyde condensation products, etc., or the urea-formaldehyde reaction products modified with thiourea, dicyandiamide, melamine or its derivatives, etc. Such carbamide-aldehyde reaction products may be applied with any of the usual catalysts such as acid salts, ammonium salts, organic acids, etc. There may also be used softening and modifying agents, such as the quaternary ammonium compounds with long chains, sulfonated oils or tallows, etc.

The mechanism by which an alkaline oxidizing solution overcomes odor may be postulated

in the following way, but the proposed explanation is not to be interpreted as limiting the invention. The type of odor which is due to loosely held formaldehyde is overcome by oxidation to formic acid which forms salts in the presence of alkaline agents. The types of odors, which are sometimes described as fish-like or mouse-like, and which apparently depend upon some obscure reaction of formaldehyde, ammonia, amines, or urea in the presence of an acid catalyst, are apparently prevented by oxidizing formaldehyde or similar sensitive compounds, removing ammonia and neutralizing the acidity.

A procedure by which odor-free fabric is prepared is shown in the following examples:

Example 1

An 80 x 80, 4.00 yard, 36'' bleached white cotton, woven fabric was impregnated with an aqueous solution containing 15% dimethylol urea and 0.3% diammonium hydrogen phosphate. The impregnated fabric was squeezed between rolls so that it retained solution to the extent of 60% of its original dry weight, dried in a covered tenter at 300° F. for about one-half minute, batched, and cured in an oven at 320° F. for about one and one-half minutes. Due to this short period of cure, the fabric possessed a modified formaldehyde-like odor. It was then run through a solution at 120° F. containing one-half per cent. of 30% hydrogen peroxide and 0.3% of soda ash. The fabric was run at the rate of 80 yards per minute and squeezed so as to take up solution to the extent of about 60% of the weight of the fabric. It was then dried in a closed tenter at 300° F.

The processed fabric was free from any objectionable odor. On storage there was no development of odor. Cloth, cured by the same general procedure but with omission of the treatment with a mild oxidizing agent in an alkaline bath, possessed an odor at the start and developed stronger and more objectionable odors on storage.

Example 2

Rayon-pile, silk-backed, transparent velvet was impregnated on a quetch with solution containing 25% of a water-soluble, urea-formaldehyde reaction product and 1% of diammonium phosphate as catalyst. The fabric was allowed to retain a weight of solution approximately equal to its dry weight. The fabric was dried at a low temperature on a frame with brushing. Curing was accomplished in a conveyor drier at about 300–320° F. for four to eight minutes. The fabric was then washed on a rope washer for 15 minutes at 140° F. in a solution containing 1 lb. of octylphenoxyethoxyethoxyethyl sodium sulfonate, 6 oz. of trisodium phosphate, and 10 lbs. of 30% hydrogen peroxide in 500 gallons of water. The fabric was then opened up, passed over a vacuum bar extractor, passed through a quetch supplying a solution containing 0.06% of cetyldimethylbenzyl ammonium chloride, over a vacuum bar extractor, and through a frame where the fabric was dried while being brushed. It was then given the usual finishing sheer. The resulting fabric was crush-resistant without pile embrittlement and had a smooth, silky hand, good bloom, excellent cover, no slippage, and uniform, full appearance without lay. There was no odor in the fabric immediately after processing nor after four months storage in a closed carton.

Example 3

A spun rayon suiting was treated by immersion in a solution containing 5% of methylol urea and 0.2% of diammonium phosphate and squeezed so as to obtain an 80% "pick-up" of solution in the cloth. The cloth was dried on a set of steam-heated cans and the resin cured during passage through a 90' closed tenter heated at 300–340° F., running at 60 yards per minute. The dried cloth was then padded at 120 yards per minute through a solution containing 4 lbs. of sodium perborate and 1 lb. of sulfonated teaseed oil in 100 gallons of water and dried on a bank of cans. The cloth was finally passed through a "Sanforizing" machine to reduce shrinkage to less than 1%. By virtue of the resin treatment the actual shrinkage left for removal by the Sanforizing machine was reduced from 7% to 3%.

The suiting possessed a resilient, wool-like hand. It was free from all objectionable odors.

The process herein described may obviously be applied not only to fabrics which are being freshly processed but also to fabrics which have previously been finished and which have developed odor during storage.

I claim:

1. The process of overcoming or preventing development of odor in textile fabrics carrying a finished resin of the urea-formaldehyde type which comprises treating the resin-carrying fabric with an aqueous solution having a pH between 7 and about 11 and containing a small amount of a water-soluble peroxide-type oxidizing agent.

2. The process of overcoming or preventing development of odor in textile fabrics carrying a resin of the urea-formaldehyde type which comprises treating the finished resin-carrying fabric with an aqueous solution having a pH between 7 and about 11 and containing hydrogen peroxide and drying the fabric.

3. The process of overcoming or preventing development of odor in textile fabrics carrying a finished resin of the urea-formaldehyde type which comprises treating the resin-carrying fabric with a dilute aqueous solution of sodium perborate and drying the fabric.

4. In the process of producing permanent finishes of textile fabrics with urea-formaldehyde type reaction products the improvement which comprises treating fabric carrying insoluble urea-formaldehyde reaction products with a solution having a pH between 7 and about 11 and containing a water-soluble, peroxide-type oxidizing agent thereby to overcome or prevent subsequent development of odor in the fabric.

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