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## SILVER NITRATE STAIN REMOVAL COMPOSITION AND METHOD FOR USING SAME

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12 Claims

### ABSTRACT OF THE DISCLOSURE

Compositions and process comprising a combination of a persulfate salt and a thiourea compound which is dissolved in water to provide a solution for removing silver nitrate stains from fabrics.

This invention relates to techniques applicable to silver nitrate stain removal including compositions therefor and method for carrying out such techniques.

The problem of silver nitrate stain on hospital type garments and fabrics has been one of long standing. Even when such a stained garment is given conventional laundering and sterilization treatments the presence of the not easily removable silver nitrate stains presents the appearance of uncleanness.

In the present invention it is contemplated that a composition comprising a quantity of a persulfate of an alkali metal or ammonium persulfate and a quantity of thiourea or organo derivatives thereof, such as dibutylthiourea and diethylthiourea, is utilized in the removal of silver nitrate stains. The ratio of these active ingredients may vary considerably so that the said persulfate to thiourea may range from about 0.1:1 to about 10:1 by weight.

In utilization, the composition of the present invention is maintained as a dry blend of powdered or agglomerated ingredients. The ingredients are dissolved in a quantity of water to achieve a concentration which is fairly dilute of the order of from about 0.1 to 10% by weight. The solution should be made up just prior to use inasmuch as the two active noted ingredients comprise an oxidation-reduction system. Naturally, the solution may be employed either hot or cold, the treatment time not being materially effected by temperature.

After preparing the solution as in the above, a garment stained with silver nitrate is dipped into the solution for a relatively short period of time. It has been observed that a dwelling time of only 30 seconds after complete wetting of the stained portion produces remarkable results in that the stain is noticeably lightened, if in fact not completely removed. It is only a short period thereafter that the stain is hardly discernible.

Subsequent to the dipping step the garment may be directly laundered in the usual manner without drying. As a matter of fact the preferred techniques of the present inventive concept encourages immediate laundering to eliminate residual persulfate and thiourea.

As an example of the general inventive concept but not limited thereto attention is directed to the following examples:

#### EXAMPLE I

	Parts by weight
Thiourea .....	1
Sodium persulfate .....	1

The thiourea is in a particulate condition as is the sodium persulfate. The particle size of each is approximately the same so that stratification is avoided. The ingredients are blended in conventional mixing apparatus.

To utilize the resulting mixture five parts by weight

thereof is added to one thousand parts of water at approximately room temperature. The water is stirred for a sufficient period to dissolve the persulfate-thiourea mixture.

Thereafter, a garment such as a hospital gown which has become stained with silver nitrate is dipped into the aqueous bath. The garment is stirred to insure complete wetting. After a relatively short period of time of only 30 seconds the garment is removed from the bath with the concomitant result that the stain due to silver nitrate is completely removed.

It has been found that once the stains have been removed, the garment should be immediately removed from the bath so that the system is not needlessly exhausted. The bath may be used for a considerable number of garments before exhaustion is noticed. In such an event it is possible to replenish the strength of the solution by adding an additional quantity of the persulfate-thiourea mixture. On the other hand, it is relatively simple to prepare an entire fresh batch of the solution to insure uniform treatment.

#### EXAMPLE II

	Parts by weight
Thiourea .....	1.5
Ammonium persulfate .....	5

The ingredients are compounded and utilized in the same manner as in connection with Example I.

#### EXAMPLE III

	Parts by weight
Thiourea .....	2
Potassium persulfate .....	3

Again the ingredients are compounded and utilized in the same manner as in connection with Example I.

At the end of the treatment for stain removal the garment is laundered in the conventional manner usually by automatic washing machines employing standard commercially available detergents and soaps.

Oftentimes the apparatus in which the stain removing operation is accomplished contains parts fabricated from brass or copper. In order to avoid deposition of copper salts on the treated garments, it is contemplated within the preferred purview of the present invention to treat such garments with an aqueous solution of sodium nitrate or oxalic acid. This may be undertaken by either adding a quantity of the sodium nitrate or oxalic acid equal to the amount of persulfate compound utilized directly to the stain removal bath. On the other hand, the stain removal solution may be drained from the washing apparatus and substituted with an aqueous solution of the sodium nitrite or oxalic acid. The latter solution may be made by preparing the solution before supplying it to the washing apparatus or it may be prepared in situ.

The garments are treated for a period of 5 to 10 minutes with suitable agitation. Thereafter, the garments are washed with detergents in the usual manner.

Again, turning to the examples, in connection with Example I the invention is further demonstrated by adding one part by weight of sodium nitrite directly to the solution of thiourea and sodium persulfate after the garment has been freed of silver nitrate stains. After approximately five minutes the garment is removed for further washing.

In a modification of Example II, 5 parts by weight oxalic acid is added to the aqueous bath containing thiourea and ammonium persulfate and the garment is handled as in the foregoing.

In connection with modifying Example III, 3 parts by weight of sodium nitrite is dissolved in a quantity of water equal to that used in dissolving the thiourea and potassium persulfate. The aqueous bath of thiourea and po-

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tassium persulfate is drained from the washing apparatus. The prepared sodium nitrite solution is then added to the washing apparatus. The garment is treated with the sodium nitrite solution for approximately 10 minutes. Thereafter the garment is laundered in a conventional manner.

What is claimed is:

1. An aqueous bath for removal of silver nitrate stains from fabrics consisting essentially of from about 0.1 to 10 parts of at least one salt selected from the group consisting of alkali metal persulfates and ammonium persulfate and about one part of at least one thiourea type compound selected from the group consisting of thiourea, dibutylthiourea and diethylthiourea dissolved in water, said parts by weight.

2. The aqueous bath of claim 1 wherein the combined concentration of the persulfate salt and the thiourea type compound in water is about 0.1 to 10% by weight.

3. The aqueous bath of claim 1 wherein the combined concentration of the persulfate and thiourea type compound is approximately 5 parts by weight to 1,000 parts by weight of water.

4. The composition of claim 1 in which the persulfate salt is potassium persulfate and the thiourea type compound is thiourea.

5. The aqueous bath of claim 2 wherein the thiourea type compound is thiourea.

6. The method of removing silver nitrate stains from fabrics comprising dipping said fabric in an aqueous bath consisting essentially of from about 0.1 to 10 parts of at least one salt selected from the group consisting of alkali metal persulfates and ammonium persulfate and about one part of at least one thiourea type compound selected from the group consisting of thiourea, dibutylthiourea and diethylthiourea dissolved in water, maintaining the fabric in said bath for a period of time sufficient to obliterate said stain and then removing the fabric from said aqueous bath, said parts by weight.

7. The method of claim 6 wherein the combined con-

centration of the persulfate salt and the thiourea type compound in the water is about 0.1 to 10% by weight.

8. The method of claim 6 in which the persulfate salt is potassium persulfate and the thiourea type compound is thiourea.

9. The method of claim 7 wherein the concentration of the mixture of persulfate and thiourea type compound is approximately 0.5% by weight.

10. The method of claim 9 wherein the period of time for treating the fabric is approximately 30 seconds.

11. The method of removing silver nitrate stains from fabrics comprising dipping said fabric in an aqueous bath consisting essentially of from about 0.1 to 10 parts of at least one salt selected from the group consisting of alkali metal persulfates and ammonium persulfate and about one part of at least one thiourea type compound selected from the group consisting of thiourea, dibutylthiourea and diethylthiourea dissolved in water, maintaining the fabric in said bath for a period of time sufficient to obliterate said stain and then removing the fabric from said aqueous bath, thereafter treating said fabric to an aqueous bath containing approximately an equal amount of another salt selected from the group consisting of sodium nitrite and oxalic acid, said parts by weight.

12. The method of claim 10 wherein the combined concentration of the persulfate salt and the thiourea type compound in the water is about 0.1 to 10% by weight.

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