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CLEANING COMPOSITION

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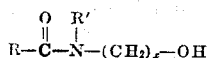
6 Claims. (Cl. 252-153)

This invention relates to improvements in dry-cleaning textiles and related materials with chlorinated solvents. More particularly it relates to improved adjuvants for use in conjunction with chlorinated solvents in dry cleaning to increase their cleansing action.

In dry-cleaning processes as normally carried out, it has long been the practice to add to the solvents so-called dry-cleaning soaps hereinafter referred to as dry-cleaning assistants. The earliest soaps used were employed mainly to render the highly inflammable gasoline-type solvents conducting, and so avoid the accumulation of a static charge from friction during operation, with resultant danger of sparking and fire. With the realization of the importance of detergent action, the superfatted type of soap, i. e., a soap containing an excess of free fatty acid, was developed to aid in the suspension and removal of insoluble dirt. With increased use of the chlorinated solvents, there has been a tendency to use those assistants which have proved to be of value in the older naphtha-type solvents and which are readily available. However, it has been found that most of the soaps developed for naphtha-type solvents are poorly adapted for use with chlorinated solvents because of their limited detergent action, adverse effect on stability, and the dangerous introduction of inflammable solvents. Addition of soap ordinarily introduces inflammable solvents since most of the dry cleaning soaps are sold as a solution of the agent in, for example, kerosene or in Stoddard solvent. When these soaps are used with chlorinated dry cleaning solvents, sufficient of the inflammable solvent may be introduced over a period of time to make the entire cleaning bath inflammable and therefore hazardous.

This invention has as an object an improved dry-cleaning composition. A further object is the provision of a new detergent for use with chlorinated solvents in dry-cleaning. Other objects will appear hereinafter.

These objects are accomplished by the following invention of a dry-cleaning fluid comprising essentially a chlorinated hydrocarbon dry-cleaning solvent to which has been added from 0.01-10 per cent by weight of an N-hydroxyalkylamide of an aliphatic, monobasic, monocarboxylic acid, said amide being of the general structural formula



in which R is an aliphatic radical containing at least 8 carbon atoms, R' is hydrogen or lower

alkyl groups, and x is an integer having a value of one to two. The N-hydroxyalkylamide is preferably a hydroxymethyl derivative of a primary amide, with the substituents on the carbons thereof limited to hydrogen and hydroxyl, preferably the former.

In the present invention an N-hydroxyalkylamide of an aliphatic monocarboxylic acid is employed in a chlorinated dry-cleaning fluid to give enhanced detergent power. Fabrics are cleaned by treatment with a solvent containing the assistant, rinsed in clear solvent, and dried.

The more detailed practice of the invention is illustrated by the following examples, wherein parts given are by weight. There are of course many forms of the invention other than these specific embodiments.

Example I

Wool crepe cloth soiled by immersion in a carbon tetrachloride solution of liquid paraffin, olive oil, and lanolin, containing carbon black in suspension, and dried shows a brightness (whiteness) of 6 per cent by photometric test (Macbeth Illuminometer as described in the Leeds and Northrup Company Catalog #60 of 1929). A piece of the soiled fabric is immersed in a solution of one part of N-hydroxymethylstearamide in 219 parts of commercial trichloroethylene and agitated at 25° C. for 30 minutes. The sample is removed, rinsed once in fresh solvent free from amide, and dried. The dried sample shows a brightness of 23 per cent by photometric test (Macbeth Illuminometer). When a like soiled sample is cleaned in the absence of the N-hydroxymethylstearamide, the sample has a brightness of only 8 per cent.

Example II

A piece of fabric soiled as in Example I together with a like size unsoiled white sample (having a brightness of 63 per cent) of the same material is placed in a vessel containing the cleaning solvent of Example I and agitated at 25° C. for 20 minutes. The fabric samples are then removed and agitated for 10 minutes with the same volume of solvent free from amide and dried. The dried soiled sample shows a brightness of 17 per cent and the dried unsoiled sample a brightness of 49 per cent (Macbeth Illuminometer). When like samples of soiled and unsoiled fabric are cleaned in the absence of the N-hydroxymethylstearamide, the soiled sample has a brightness of 8 per cent and the unsoiled sample a brightness of 46 per cent.

When N-hydroxymethyl dihydroxystearamide is substituted for the N-hydroxymethylstearamide of Example II, the procedure being otherwise the same, the soiled sample shows a brightness of 14 per cent and the clean sample a brightness of 38 per cent.

Example III

Wool crepe cloth soiled by immersion in a carbon tetrachloride suspension of carbon black and dried shows a brightness of 16 per cent (Macbeth Illuminometer). A piece of the soiled fabric 2½" x 3", together with a like size unsoiled piece of the same fabric (brightness 63 per cent) is placed in a closed vessel with a solvent prepared by adding one part of N-beta-hydroxyethyl lauramide to 487 parts of perchloroethylene and agitated at 25° C. for 20 minutes. The cloth samples are removed, agitated for 10 minutes with the same volume of solvent free from amide, and dried. The dry soiled sample shows a brightness of 25 per cent, while the dry unsoiled sample has a whiteness of 58 per cent. When like samples are cleaned in the absence of the N-beta-hydroxyethyl lauramide, the brightness of the soiled sample is 14 per cent and of the clean sample 48 per cent. When a cleaning solvent prepared by adding one part of N-hydroxymethyl oleylamide to 487 parts of perchloroethylene, is substituted for the solvent in the above example, the procedure being otherwise the same, the brightness (whiteness) of the soiled sample is 22 per cent, and that of the clean sample is 60 per cent.

Example IV

Twenty-five pounds of soiled silk garments (30 pieces) are cleaned in a closed-type dry-cleaning machine, using 0.08 per cent by weight of N-hydroxymethylstearamide in perchloroethylene, according to the following cleaning cycle: Eight-minute wash with solvent containing assistant, 2 three-minute rinses with clean solvent free from amide, extraction, 23-minute drying. The clean garments had a bright and attractive appearance and 14 garments were passed without hand spotting or further washing. In a like run on the same number of garments using a commercial dry-cleaning soap containing water, only five garments were passed and the remainder required hand spotting or washing to produce a satisfactory appearance.

The dry-cleaning assistants described in this invention may be used in any chlorinated dry-cleaning solvent or any solvent containing a preponderance of chlorinated hydrocarbon. The customary chlorinated solvents used for dry cleaning are trichloroethylene, perchloroethylene, and carbon tetrachloride but the assistants may also be used, for example, in a mixture of trichloropropane and carbon tetrachloride as disclosed in U. S. 2,010,038, or with solvents consisting essentially of 1,1,2-trichloropropene-1, as disclosed in U. S. 2,116,437.

In practicing the invention using the N-hydroxyalkylamides as assistants, any cleaning procedure as normally carried out may be employed. For example, the materials may be used in small dry-cleaning machines in which the solvent is passed through a filter and recirculated without distillation, or they may be used in large closed machines in which the solvent is continually purified by distillation, amide being added with each batch of distillate.

N-hydroxyalkylamides which have been found

suitable for the present process are derived from amides of saturated or unsaturated monocarboxylic acids having at least 9 carbon atoms. The amide may be a crude mixture obtainable from natural or synthetic fatty glycerides, or from fatty acids or esters by direct amidation, or the amides can be the purified individual compounds. Typical amides which are representative of those suitable for conversion to the N-hydroxyalkyl derivative are the following: pelargonamide, lauramide, myristamide, palmitamide, oleamide, stearamide, 10-hydroxystearamide, 9,10-dihydroxystearamide, linoleamide, eleostearamide, carnaubamide, undecylenamide, clupanodonamide, montanamide, melissamide, stearyl-
amide, erucamide, linolenamide, ketostearamide, and the mixed amides of the fatty acids of coconut oil, palm oil, linseed oil, China-wood oil, cottonseed oil, castor oil, olive oil, tallow, corn oil, rapeseed oil, and the like. The amides may also be prepared from synthetic acid mixtures obtainable by the destructive oxidation of paraffin wax, paraffin, oil, or like nonaromatic high molecular hydrocarbons and fractions of such oxidation products. Either the N-hydroxymethyl or N-hydroxyethyl derivatives of any of the above amides may be used. The hydroxyalkylamides may also contain substituents on the amido nitrogen atom, thus N-methyl or N-ethyl derivatives of any of the above-mentioned N-hydroxymethyl- or N-hydroxyethylamides may be employed. They may also contain various inert substituents on the carbon atoms, e. g., hydroxy, halo, nitro, keto groups. The invention is thus generic to the use in chlorinated hydrocarbon dry cleaning solvents of an N-hydroxyalkylamide of an aliphatic monocarboxylic acid of at least nine and preferably 9-24 carbon atoms wherein the hydroxyl is on a carbon not more than one carbon removed from the amido nitrogen. The various N-hydroxyalkylamides mentioned above are generally used individually in a dry-cleaning fluid, but two or more of them may be used jointly.

N-hydroxyalkyl derivatives of primary amides of saturated aliphatic monocarboxylic acids, i. e., those having a hydrogen on the amido nitrogen and having the formula



wherein the hydroxyl is on a carbon not more than one carbon removed from the amido nitrogen show the best detergent action and are therefore preferred. A particularly preferred class is that of aliphatic N-hydroxyalkylamides wherein the radical R is strictly hydrocarbon.

Short chain hydroxymethyl amides may be prepared as described by Einhorn in Ann. 343, 207 (1905) and 361, 113 (1908) and in German Patents 157,355; 158,088 and 162,395, i. e., by the condensation of acid amides with formaldehyde in the presence of alkaline agents. The longer chain hydroxymethyl amides may be prepared in the same manner. See for example, British Patent 446,912 and German Patent 641,865. The N-beta-hydroxyethyl amides may be prepared by reacting ethanolamine with an acid or acid derivative, e. g., acid chloride or ester, as described by Knorr, Ber. 36, 1278 (1903); Fränkel and Cornelius, Ber. 51, 1654 (1918); or Wenker, J. Am. Chem. Soc. 57, 1079 (1935).

The amount of assistant to be used depends upon the particular assistant and solvent chosen, but the usual concentration is from .01-10 per cent

by weight, and preferably 0.02-2 per cent by weight. The assistants need not be completely soluble in the cleaning solvent at the concentration used, since any material which is not removed by rinsing will not tend to become rancid. Other additives such as paraffin wax, oil, lustering agents, water repellents, and mothproofing compositions may, of course, be added to the solvent.

The products of the present invention are chlorinated hydrocarbon solvent compositions having enhanced detergency. They are therefore of great utility in the dry-cleaning industry and also in other cleaning applications, for example, the cleaning and degreasing of metals.

The hydroxyalkylamides are not salts, i. e., soaps, such as the ethanolamine soaps, nor do they exhibit any surface-active effect in aqueous solutions. Indeed, these assistants are essentially insoluble in water. In view of the fact that the materials hitherto considered as dry-cleaning assistants are of the type which exhibit surface-active effects in aqueous media, it is surprising that the compounds of the present invention show such good cleaning action. Furthermore, exceedingly small amounts of these new assistants are sufficient to give potent cleaning solvents of marked detergent effect.

The above description and examples are intended to be illustrative only. Any modification of or variation therefrom which conforms to the spirit of the invention is intended to be included within the scope of the claims.

What is claimed is:

1. A composition for use in dry cleaning and in degreasing metals which comprises a liquid chlorinated aliphatic hydrocarbon dry cleaning solvent and from 0.01 to 10%, by weight, of an N-hydroxyalkylamide of an aliphatic monobasic monocarboxylic acid of at least nine carbon

atoms, said amide having the hydroxyl on a carbon not more than one carbon removed from the amido nitrogen and having in the hydroxyalkyl group not more than two carbon atoms.

2. A composition for use in dry cleaning and in degreasing metals which comprises a liquid chlorinated aliphatic hydrocarbon dry cleaning solvent and from 0.01 to 10%, by weight, of an N-hydroxyalkylamide of an aliphatic monobasic monocarboxylic saturated acid of at least nine carbon atoms, said amide having the hydroxyl on a carbon not more than one carbon removed from the amido nitrogen and having in the hydroxyalkyl group not more than two carbon atoms.

3. A composition for use in dry cleaning and in degreasing metals which comprises a liquid chlorinated aliphatic hydrocarbon dry cleaning solvent and from 0.01 to 10%, by weight, of a secondary N-hydroxyalkylamide of a saturated fatty acid, said amide having the hydroxyl on a carbon not more than one carbon removed from the amido nitrogen and having in the hydroxyalkyl group not more than two carbon atoms.

4. A composition for use in dry cleaning and in degreasing metals which comprises a liquid chlorinated aliphatic hydrocarbon dry cleaning solvent and from .01 to 10 per cent, by weight, of N-hydroxymethylstearamide.

5. A composition for use in dry cleaning and in degreasing metals which comprises a liquid chlorinated aliphatic hydrocarbon dry cleaning solvent and from .01 to 10 per cent, by weight, of N-hydroxymethyloleamide.

6. A composition for use in dry cleaning and in degreasing metals which comprises a liquid chlorinated aliphatic hydrocarbon dry cleaning solvent and from .01 to 10 per cent, by weight, of N-beta-hydroxyethylauramide.

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