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DETERGENT COMPOSITION

Herbert L. Sanders, Phillipsburg, N. J., and William J. Maxcy, Easton, Pa., assignors to General Aniline & Film Corporation, New York, N. Y., a corporation of Delaware

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This invention relates to novel detergent compositions comprising essentially a mixture of a non-ionic polyglycol ether type of detergent, a solid alkali metal hydroxide and a minor amount of thiourea.

Many cleaning compositions have been suggested comprising a mixture of a synthetic organic detergent and an alkali metal hydroxide. Among the synthetic organic detergents which have been employed at times in such mixtures are polyglycol ether type detergents of the type disclosed in U. S. Patent No. 1,970,578 and particularly the polyglycol ethers of alkyl phenols of the type disclosed in U. S. Patent No. 2,213,477. It has been found, however, that when synthetic organic detergents of the polyglycol ether type are mixed with solid alkali metal hydroxides a marked darkening of color results. This darkening is particularly pronounced with the polyglycol ether type detergents obtained from alkyl phenols; i. e. those of the type disclosed in U. S. Patent No. 2,213,477. However, this same difficulty is encountered to some extent with practically all polyglycol ether type detergents when they are stored in contact with caustic alkalies in a solid state.

I have now discovered that if the polyglycol ether type detergent is mixed with a small amount (about 10% by weight) of thiourea, little or no discoloration occurs, even after prolonged storing when the polyglycol ether type detergent containing the thiourea is mixed with and stored in contact with caustic alkalies; i. e. sodium or potassium hydroxide.

For example, a mixture of 95 parts by weight of sodium hydroxide in chip or flake form with 5 parts by weight of a water soluble ethylene oxide condensation product of diamyl phenol, obtained by condensing about 10 mols of ethylene oxide with one molar proportion of diamyl phenol, as described in said U. S. Patent No. 2,213,477, was found to be an excellent degreasing agent for metal. However, on standing overnight at room temperature, the mixture changed from almost colorless to a deep red shade. When this same polyglycol ether type detergent, obtained by condensing ethylene oxide with diamyl phenol, was mixed with 10% of its weight of thiourea and then added to the caustic soda in the same way by mixing so as to form a thin film

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around the solid particles, it was found that there was little, if any, discoloration even after several weeks' storage. At the same time the mixture retained its full effectiveness as a degreasing agent for metal. Similar results were obtained when potassium hydroxide was used in place of the sodium hydroxide in the above compositions.

The cause of this discoloration on storing a polyglycol ether type detergent in contact with a solid alkali is not clearly understood. It is possible that it may be connected with air oxidation, but no conclusive evidence that this is so has been found, and I therefore do not wish to be held to any theory of operation, particularly since thiourea appears to be unique in its stabilizing action among a wide variety of known anti-oxidants which have been tested. Thus, such materials as sodium sulfite, itaconic acid and ascorbic acid have been tested as well as thiourea, but of these only thiourea proved to be effective.

The thiourea can be dissolved directly in anhydrous polyglycol ether type detergents and the modified detergent can then be stored in contact with alkali metal hydroxides. The relative proportions of polyglycol ether type detergent and solid alkali do not form a critical feature of the present invention since the discoloration has been found to occur in substantially all proportions, and thiourea has been found to be effective in preventing this discoloration in the mixtures of polyglycol ether type detergents and solid alkalies in wide variety of proportions, i. e. from mixtures containing 1% polyglycol ether type detergents to mixtures containing 50% or higher polyglycol ether type detergents. The amount of thiourea which should be incorporated in the polyglycol ether type detergent to effect the maximum color stabilization can readily be determined for any particular composition by simple preliminary tests. In general, the maximum color stabilization appears to be obtained when from 5 to 10% of thiourea, based on the weight of the polyglycol ether type detergent, is used.

By the term polyglycol ether type detergent, I mean the non-ionic surface active agents obtained by condensing alkylene oxides with water insoluble organic compounds containing at least

6 carbon atoms and having an active hydrogen, such as organic hydroxy compounds, (i. e. alcohols, phenols); primary and secondary amines; amides (carboxylic and sulfonic acid amides); and organic carboxylic and sulfonic acids. Compounds of this type are well known in the art and are disclosed, along with suitable methods for their preparation, in U. S. Patents Nos. 1,970,578 and 2,213,477. They may be represented by the following general formula:

$$R-\left(CHR'-CHR'-O\right)_n-H$$

wherein R represents the residue of an organic compound containing an active hydrogen and the R' represents hydrogen or lower alkyl and n represents an integer of from 3 to 100 or higher, and usually from 6 to 50. These compounds may readily be obtained as disclosed in the above mentioned patents by condensing a polyglycol ether containing the required number of alkenoxy groups or an alkylene oxide, usually ethylene oxide (although propylene or butylene oxides may be employed if desired) with a water insoluble organic compound containing at least 6 carbon atoms and having an active hydrogen. The amount of alkylene oxide condensed with the water insoluble organic compound having an active hydrogen, i. e. the length of the polyglycol ether chain, will depend primarily on the particular compound with which it is condensed. As a convenient rule of thumb, approximately 1 mol of alkylene oxide should be employed for each two carbon atoms in the water insoluble organic compound containing an active hydrogen with which it is condensed. However, the optimum amount of alkylene oxide can readily be determined in any particular case by preliminary test.

As previously stated, the non-ionic polyglycol ether type detergents derived from alkyl phenolic compounds are particularly valuable in compositions comprising a mixture of such non-ionic detergents and solid inorganic alkalies and are particularly subject to discoloration in such mixtures. Therefore, the poly-alkylene oxide derivatives of such phenolic compounds are a preferred type of non-ionic surface active agents which are employed in the compositions of the present invention. Numerous compounds of this type, i. e. poly-alkylene oxide derivatives of phenolic compounds containing one or more alkyl substituents, which may be employed in the compositions of the present invention are described in U. S. Patent 2,213,477, and I preferably employ the water soluble poly-alkylene oxide derivatives of alkyl phenolic compounds in which the total number of alkyl carbon atoms is between 6 and 18. As examples of such phenolic compounds may be mentioned the isomeric dibutyl and diamyl phenols and cresols, tripropyl phenol and cresol, secondary or tertiary isomeric heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tetradecyl, cetyl, oleyl, octadecyl and the like phenols and cresols. Of particular value are the poly-alkylene oxide derivatives of secondary and tertiary alkyl substituted phenols and cresols obtained by condensing olefines of the type obtained in petroleum refining with phenols or cresols. In the case of products obtained by condensing phenol or cresol with olefines of from 3 to 5 carbon atoms such as propylene, butylene and amylene, it is desirable to employ the dialkylated phenols or cresols, while in the case of compounds obtained by condensing a phenol or cresol with an olefine containing 8 or more carbon atoms, the mono-substituted derivatives are preferred. Particularly desirable derivatives can be obtained from the phenols and cresols containing a substituent derived from olefines containing from 8 to 18 carbon atoms, such as di-isobutylene and other alkylenes as nonylene, decylene, undecylene and dodecylene, pentadecylene, octadecylene and mixtures thereof, and may advantageously be the dimers and trimers obtained by polymerization of such low molecular weight olefines as propylene, butylene, amylene or mixtures thereof. However, the water soluble poly-alkylene oxide derivatives of other water insoluble organic compounds containing at least 6 carbon atoms and having an active hydrogen may be employed in the compositions of the present invention. Thus, the poly-alkylene oxide derivatives, described in U. S. Patent 1,970,578, of aliphatic organic hydroxy compounds, carboxy compounds and amino compounds, as well as phenolic compounds, may be employed if desired. As examples of water insoluble higher fatty acids whose poly-alkylene oxide derivatives may be employed may be mentioned lauric, oleic, ricinoleic, palmitic and stearic acid, and the like, or mixtures thereof, such as the mixtures obtained from animal and vegetable fats and oils or by the oxidation of such petroleum fractions as paraffin wax. There may also be employed poly-alkylene oxide derivatives of water insoluble aliphatic hydroxy compounds such as higher aliphatic alcohols, i. e. the alcohols corresponding to the fatty acids specified immediately above, particularly the alcohols obtainable by hydrogenation of the fatty acids or glycerides present in animal or vegetable oils and waxes such as cocoanut oil, castor oil and the like. There may also be used poly-alkylene oxide derivatives of higher molecular weight amines such as octyl amine, cetyl amine, oleyl amine, naphthyl amines, alkyl anilines, etc.; also the poly-alkylene oxide derivatives of organic mercapto compounds such as the products described in U. S. Patent 2,205,021, i. e. the poly-alkylene oxide derivatives of such mercapto compounds as dodecyl mercaptan, oleyl mercaptan, cetyl mercaptan, decyl mercaptan and thiophenols, thionaphthols, benzo-mercaptan, etc.; also the poly-alkylene oxide derivatives, such as those described in U. S. Patent 2,085,706, of carboxylic acid amides and of sulfonamides of the type described in U. S. Patent 2,002,613, or the poly-alkylene oxide derivatives, described in U. S. Patent 2,266,141, of sulfonic acids may be employed if desired.

We claim:

1. A color stabilized detergent composition, consisting essentially of a mixture of 99 to 50 percent by weight of solid alkali metal hydroxide selected from the group consisting of sodium hydroxide and potassium hydroxide and 1 to 50 percent of a mixture consisting essentially of about 90% of a water soluble, non-ionic, surface active agent having a polyglycol ether radical and about 10 percent of thiourea.

2. A composition as defined in claim 1, wherein the non-ionic detergent specified is a polyglycol ether of an alkyl phenol.

3. A color stabilized detergent composition consisting essentially of a mixture of about 95 percent by weight of solid sodium hydroxide, about 5 percent of a water-soluble non-ionic surface-active agent said non-ionic surface-active agent being a polyglycol ether of an alkyl phenol containing from 6 to 18 alkyl carbon atoms

and in which the polyglycol ether group contains about 1 ethyleneoxy group for each 2 carbon atoms in said alkyl phenol and about 0.5 percent of thiourea.

HERBERT L. SANDERS.
WILLIAM J. MAXCY.

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