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DETERGENT AND STERILIZING
COMPOSITION

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This invention relates to improvements in detergent and disinfecting compositions. More particularly, this invention relates to substantially dry cleansing and disinfecting salt mixtures of stable character.

The improved composition of this invention is a salt mixture containing a solid calcium hypochlorite of high purity, and a synthetic organic detergent salt hereinafter more fully described. The invention provides a dry stable mixture in which the available chlorine content is not reduced on standing and in which the detergent is not altered in structure. This mixture is readily soluble in water, a quality which is of special value in applications where strong cleansing and detergent action is desired concurrently with bactericidal action.

It is well-known that the hypochlorites of the alkali metals and alkaline earth metals exert a strong germicidal action in an aqueous solution. I have found that this sterilizing property is greatly improved when the hypochlorite is admixed with an appropriate synthetic organic detergent salt. Not only are the germicidal qualities improved as compared to the hypochlorite alone, but such a mixture adds strong detergent properties to an aqueous solution in which it is dissolved. I have found that a solid calcium hypochlorite of high purity may be mixed with certain organic detergents to form a substantially dry stable mixture which does not undergo decomposition under normal conditions of packing and storage. A stable hypochlorite composition is thus provided which does not lose its available chlorine on standing, that is the stability of the hypochlorite component of the mixture is not affected. Similarly, the stability of the organic detergent component is not impaired. A further important advantage of the mixture of the present invention when dissolved in water is that it permits efficient sterilization and cleansing to be accomplished concurrently. To obtain an amount of cleansing equivalent to that resulting from the use of the present mixture, a soap solution would normally be employed. When a soap solution is used, however, it cannot be used concurrently with the calcium hypochlorite due to the formation of insoluble calcium soaps. A two step process with careful rinsing between steps is therefore necessary when soap is used. The present salt mixture permits the attainment of complete sterilization and cleansing in a simple one step operation.

The compositions of the present invention possessing the above-described combined quali-

ties are useful in a wide variety of operations. They are particularly useful in the cleansing and disinfecting of surfaces or substances which have a tendency to be water repellent. As an example of such a use may be mentioned, the inner surfaces of dairy equipment, including churns, milking machines, storage receptacles, and the like. This increased usefulness for such purposes is due in part, at least, to an increased wetting power of aqueous solutions having dissolved therein the composition of the present invention. Increased wetting power constitutes one of the important advantages of the mixture of the present invention. The mixture may be used generally in cleansing operations which involve the washing of greasy or wax-coated, or impregnated, surfaces and substances. The additional germicidal and disinfecting properties of such mixtures constitute a further important advantage.

The materials above-referred-to broadly as "synthetic organic detergent salts" may include a wide variety of organic compounds having strong detergent and wetting action. The organic or non-polar groups of these detergent compounds include a wide variety of organic groups. In addition to carbon, hydrogen and oxygen, these groups may contain sulfur or nitrogen, or other elements commonly associated with them in organic compounds. Such groups include saturated, or unsaturated hydrocarbons, ethers, thio-ethers, primary and secondary alcohols, thioalcohols, ketones, thioketones, and esters. These groups may furthermore contain aromatic or heterocyclic ring structures. The polar groups contained in the detergents used in my invention are more limited in number. They are in most cases di-, or, poly-basic acids of sulfur or phosphorus; the sulfur containing acid groups occurring usually as sulfate or sulfonate. The cations which form the salts with the acid groups in these compounds include the alkali metals, the alkaline earth metals, and the ammonium ion. The ammonium ion may also constitute the salt forming ion as, for example, in a quaternary ammonium salt. The non-polar groups mentioned above usually form anions in solution, but the non-polar groups in quaternary ammonium compounds form cations in solution. Salts of sulfated higher alcohols are generally useful as detergents in the herein described mixtures. An example of another class of satisfactory detergent compounds are the salts of sulfonated long chain compounds. These are distinguished from the referred-to

sulfates by the fact that the sulfonic group is attached directly to a hydrocarbon group, whereas the alcohol sulfates are in reality sulfuric acid esters of the alcohols. Specific examples of synthetic organic detergent salts useful in the composition of my invention are sodium lauryl sulfate, sodium lauryl sulfonate, sodium ethylene palmitate sulfonate, sodium ethylene methyl lauramide sulfonate, and palmityl trimethyl ammonium chloride. Soaps react alkaline in water solution and form insoluble compounds with the alkaline earth metals. The water soluble detergents of the present invention do not form such insoluble compounds. They produce substantially neutral aqueous solutions, apparently owing to the fact that their solubilizing groups are more strongly acidic than the carboxyl group in soap with the result that their metallic salts are more nearly neutral. These detergent compounds therefore do not contain the carboxyl group as such, but may contain it in a "muzzled" form, for example, as an ester grouping. By the phrase "synthetic organic detergent salt" as used in this application and in the claims, I refer to a detergent compound of the above-referred-to type, and I intend to exclude organic compounds which may be classified as soaps, which give a strong alkaline reaction in aqueous solution and which precipitate insoluble compounds with the alkaline earth metals.

The calcium hypochlorite which I prefer to use in the product of the present invention is one which is a stable product high in available chlorine and low in calcium chloride. Characteristically this hypochlorite contains upwards of 50% available chlorine and with particular advantage upwards of 60%. The free lime content is preferably maintained at a low value. The calcium hypochlorite referred to herein as useful in my process is not to be confused with the conventional bleaching powder or chlorinated lime from which it differs materially, both as to chemical constitution and in its exceptionally high content of available chlorine. As examples of calcium hypochlorite products suitable for use in the composition of the present invention may be mentioned the products whose preparation is described in United States Patents Nos. 1,481,039, 1,481,040, 1,713,650, 1,713,654, 1,713,668, and 1,713,669. The term "calcium hypochlorite" as used herein refers to a product having the properties just described. The high stability which such a hypochlorite product possesses is particularly advantageous in the mixed product of the present invention since it permits storage for considerable periods of time without decomposition. Its stability is due in part to its low content of calcium chloride, which at most should not exceed about 10% of the hypochlorite product and preferably should not exceed 2-3%. When this salt which is very hygroscopic is present in substantial amount, it not only makes the product difficult to keep dry, but it also decreases the stability of the product due to the hydrolysis occasioned by the absorbed water.

I have found that the relative proportions of hypochlorite and detergent may vary over wide limits and the mixture still maintain its stable character. The relative proportions used will depend to a large extent in each instance on the purpose for which the mixture is to be used and also on the economic considerations involved in the relative costs of the components. In solutions used in the dairy industry for sterilizing

purposes the maximum concentration of available chlorine desired in the solution is approximately 200 parts per million. If a similar concentration of a detergent, such as sodium lauryl sulfate, is required, the dry mixture used would contain 59 parts by weight of calcium hypochlorite and 41 parts by weight of the detergent. For other uses the proportion of the detergent present may be considerably reduced below this value of approximately 60 parts hypochlorite and 40 parts detergent. On the other hand, if an even greater wetting or detergent action is desired, the proportion of detergent to hypochlorite may be increased. For example, a mixture containing 50 parts hypochlorite and 50 parts detergent may be used.

The dry stable mixture of the present invention is prepared by intimately admixing the two above-described components by any suitable means for comminuting and admixing solid chemical substances. A primary precaution necessary in the preparation of the mixture is that both substances should be completely dry before mixing. If this condition is attained the mixture will then remain stable under conditions of storage.

The above-described mixture may advantageously be used in a great many operations as a substitute for soap particularly where sterilizing, bleaching, or other such function together with cleansing is desired. The mixture is useful in laundry operations and various specialized cleaning operations, such as, for example, rug and carpet cleaning. Due to the complete solubility of the mixture it is more easily removed by washing than is soap. Thus, in rug cleaning, after the shampooing treatment it is very difficult to rinse all of the soap from the fabric and particularly at the base of the pile. As a consequence the rug often has a dull appearance, and dust tends to adhere to the fibers. Another advantage of the present mixture resides in the fact that the various functions of the hypochlorite and also the detergent and wetting action are performed simultaneously in a one step operation, which could not be accomplished by the use of soap, due to the insoluble precipitate formed by the calcium and the soap. A further advantage experienced in the use of the present mixture over soap is that the type of water used does not affect the operation. In operations where soap is employed use of "hard water" presents a serious problem. In the present instance, however, the detergent component of the mixture does not form insoluble precipitates with the metallic ions present in hard water.

The invention includes the aqueous solutions formed by dissolving the compositions of the invention in water. Such solutions may also include caustic alkalies such as caustic soda and caustic potash and alkaline salts such as trisodium phosphate and sodium metasilicate. In preparing solutions including such alkaline agents, the alkaline agent is not added to the dry compositions of the invention but is dissolved in water with the mixture of calcium hypochlorite and synthetic organic water soluble detergent salt. Such solutions are also stable. Such solutions are useful particularly in connection with operations combining cleansing and bleaching. The proportion of the alkaline agent added may approximate that of the detergent, or it may be larger or smaller than this proportion.

I claim:

1. A substantially dry stable mixture having

improved detergent and germicidal properties comprising a stable calcium hypochlorite and a synthetic organic water soluble detergent salt which does not produce an insoluble precipitate in the presence of calcium ions.

2. A substantially dry stable mixture having improved detergent and sterilizing properties comprising a stable calcium hypochlorite containing upwards of 50% available chlorine and substantially free of calcium chloride, and a synthetic organic water soluble detergent salt which does not produce an insoluble precipitate in the presence of calcium ions.

3. A substantially dry stable mixture having improved detergent and sterilizing properties comprising a stable calcium hypochlorite containing upwards of 50% available chlorine and substantially free of calcium chloride, and a water soluble detergent sulfate salt of a higher alcohol which does not produce an insoluble precipitate in the presence of calcium ions and which is selected from the class consisting of the alkali metal alcohol sulfates, the alkaline earth metal alcohol sulfates and ammonium alcohol sulfates.

4. A substantially dry stable mixture having improved detergent and sterilizing properties comprising a stable calcium hypochlorite containing upwards of 50% available chlorine and substantially free of calcium chloride, and a detergent sodium salt of a higher alcohol sulfate which does not produce an insoluble precipitate in the presence of calcium ions.

5. A substantially dry stable mixture having improved detergent and sterilizing properties comprising a stable calcium hypochlorite containing upwards of 50% available chlorine and substantially free of calcium chloride, and sodium lauryl sulfate.

6. A substantially dry stable mixture having improved detergent and sterilizing properties comprising a stable calcium hypochlorite containing upwards of 50% available chlorine and substantially free of calcium chloride, and a water soluble salt of a sulfonated organic compound of high molecular weight having detergent properties which does not produce an insoluble precipitate in the presence of calcium ions.

7. A substantially dry stable mixture having improved detergent and sterilizing properties comprising a stable calcium hypochlorite containing upwards of 50% available chlorine and substantially free of calcium chloride, and sodium ethylene palmitate sulfonate.

8. A substantially dry stable mixture having improved detergent and sterilizing properties comprising a stable calcium hypochlorite containing upwards of 50% available chlorine and substantially free of calcium chloride, and sodium ethylene methyl lauramide sulfonate.

9. A substantially dry stable mixture having improved detergent and sterilizing properties comprising a stable calcium hypochlorite containing upwards of 50% available chlorine and substantially free of calcium chloride, and a water soluble quaternary ammonium salt having detergent properties and containing at least one high molecular weight organic group as a substituent.

10. An aqueous solution containing calcium hypochlorite and a synthetic organic water soluble detergent salt which does not produce an insoluble precipitate in the presence of calcium ions.

11. An aqueous solution containing calcium hypochlorite, an alkaline agent and a synthetic organic water soluble detergent salt which does not produce an insoluble precipitate in the presence of calcium ions.

12. A substantially dry stable mixture having improved detergent and germicidal properties comprising about 50-60 parts by weight of a stable calcium hypochlorite and about 50-40 parts by weight of a synthetic organic water soluble detergent salt which does not produce an insoluble precipitate in the presence of calcium ions.

13. A substantially dry stable mixture having improved detergent and sterilizing properties comprising 59 parts by weight of a stable calcium hypochlorite containing upwards of about 50% available chlorine and substantially free of calcium chloride, and 41 parts by weight of sodium lauryl sulphate.

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