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SOAPLESS-GERMICIDALLY ACTIVE DETERGENT

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7 Claims. (Cl. 252-106)

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This invention relates to chemical compositions of matter and more particularly to a composition of matter suitable for use in industrial cleaning operations wherein, in addition to the cleaning or detergent function, a germicidal function also is desired.

The object of the invention is to provide a chemical composition of matter consisting of compatible water soluble compounds, one constituent of which is germicidally active, another constituent of which is a soapless detergent and a third constituent stabilizing the solution against deterioration germicidally or as a detergent.

Another object is to provide a chemical composition which upon solution in water produces a germicidally active detergent solution stabilized against deterioration by reaction with water hardening agents in the water or by contact with metal surfaces.

A further object is to provide a germicidally active detergent mixture of compounds for general use in industrial cleaning operations which is stabilized against deterioration by reaction with water hardening constituents and metallic surfaces.

Other objects will be apparent as the invention is more fully hereinafter disclosed.

In accordance with these objects I have discovered that the mono-salt of ethylene diamine tetraacetic acid and a germicidally active quaternary ammonium compound, such as alkyl-dimethyl benzyl ammonium hydroxide, is a strong germicidal agent and is soluble and reactive as a germicide in water containing water hardening constituents and strong electrolytes.

I have further discovered that these quaternary ammonium salts are stable and germicidally active in aqueous solutions of such simple alkali metal salts as phosphates, silicates, borates, carbonates, sulfates and mixtures of said salts.

However, such simple alkali metal salts are normally reactive with poly-valent metal ions in aqueous solutions, such as water-hardening salts, to form precipitated compounds which are generally undesirable in industrial washing solutions for the reason that such precipitates are difficult to remove from the washed article.

These precipitates also detrimentally affect the germicidal activity of the quaternary ammonium salt requiring the use of relatively large amounts of the quaternary ammonium salt to obtain the same germicidal activity as compared to the amount usable in aqueous solutions free of such precipitates.

Most precipitate inhibitors heretofore em-

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ployed in hard water, however, detrimentally affect the germicidal properties of the quaternary ammonium salt, in some cases totally destroying the germicidal properties and in other cases reducing it to such a low order, irrespective of the amount of the said salt present in the solution, as to make the use of said salt as a germicidally active agent in such solutions economically and practically inoperative.

I have discovered that the alkali metal salts of ethylene diamine tetraacetic acid, preferably the tetra-alkali metal salt, is an effective precipitate inhibitor for use in the presence of such germicidally active quaternary ammonium salts, and that in the presence of such alkali metal salts of ethylene diamine tetraacetic acid the germicidal activity of the quaternary ammonium salt is actually increased in aqueous solutions.

As the germicidally active quaternary ammonium compounds, per se, are expensive, the commercial utility of said compounds is limited. By the practice of the present invention the economic utility of said compounds is greatly extended into industrial washing operations generally.

In a large number of industrial cleaning operations, such as bottle washing, dairy utensil cleaning, cosmetics and the like, it is generally undesirable to employ soap compounds in the washing solution due to the difficulty of washing free of such soap compounds and to the difficulty of preventing the precipitation of insoluble metallic soaps upon the object being washed by interaction of the soap compounds with water hardening constituents. Various water soluble alkali metal salts such as one of the many known phosphates, or carbonates, silicates or sulfates, have heretofore been employed as detergents in such solutions in lieu of soap compounds. Such detergent solutions, however, are not germicidally active and, as hereinabove noted, are precipitated by poly-valent metal ions present in the water.

In accordance with the present invention I provide a soapless-germicidally active detergent composition for use in industrial washing operations of various types which consists essentially of a mixture of water soluble compounds consisting of simple alkali metal detergent salts of the type hereinabove disclosed, an alkali metal salt of ethylene diamine tetraacetic acid, and a germicidally active quaternary ammonium salt of ethylene diamine tetraacetic acid, said mixture containing from a small amount up to 20% of the quaternary ammonium salt, 10% to 30% of the polycarboxylic acid alkali metal salt, bal-

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ance consisting of the said simple alkali metal detergent salt.

As one specific embodiment of the present invention, but not as a limitation of the same, the mixture which I have found to be most widely utilizable will first be disclosed.

In this specific embodiment of the present invention, I prefer to form a substantially dry mixture of materials consisting of 50% to 60% of a detergent alkali metal compound of the class consisting of phosphates, carbonates, silicates, borates and sulfates or mixtures of any two or more of these salts and from 30% to 20% of the tetra-alkali metal salt of ethylene diamine tetraacetic acid and about 20% of a quaternary ammonium salt of ethylene diamine tetraacetic acid. The precise amount of the quaternary ammonium salt of ethylene diamine tetraacetic acid employed in the mixture may be varied from a small percentage up to 20% in this mixture depending upon the germicidal efficiency desired in the solution and the amount of the tetraalkali metal salt of ethylene diamine tetraacetic acid likewise may vary depending in the main upon the hardness of the water employed in forming the detergent solution.

As a general practice, however, I have found that with 50% to 60% of said alkali metal detergents in the mixture a safe average percentage of the tetra-sodium salt of ethylene diamine tetraacetic acid to employ for use in water of average hardness is about 20%.

As a general practice I have also found that in this mixture of 50% to 60% alkali metal detergent compounds and 20% tetra-sodium salt of ethylene diamine tetraacetic acid, a safe average amount of the quaternary ammonium salt of ethylene diamine tetraacetic acid to employ for reasonably high germicidal activity approximates 20%. For lesser germicidal activity, 5% of the quaternary ammonium salt may be employed and for higher germicidal activity 25% of the quaternary ammonium salt may be employed, if desired.

Generally, in such a mixture of materials, the addition of 1 oz. to 5 ozs. of the mixture to 5 gallons of water is adequate to provide for an effective germicidally active detergent solution.

As specific examples of the dry mixture of materials of the above specific embodiment, the following are given:

A mixture of materials suitable for use in water of medium hardness:

	Per cent
A -----	20
B -----	20
C -----	60

wherein A is the tetra-sodium salt of ethylene diamine tetraacetic acid; B is the mono-quaternary ammonium tri-sodium salt of ethylene diamine tetraacetic acid and the germicidally active quaternary ammonium compound alkyl-dimethyl benzyl ammonium hydroxide; and C is sodium carbonate.

In substitution for sodium carbonate, I may employ equal amounts of di- or tri-sodium phosphate or employ various mixtures of the two compounds. In substitution for sodium carbonate I may also employ a mixture of di- or tri-sodium phosphate and sodium silicate, preferably in the ratio of 10 parts phosphate to one (1) part silicate. Sodium sulfate may be substituted for sodium carbonate in whole or in part, if desired.

In substitution for the quaternary ammonium-trisodium salt of ethylene diamine tetraacetic acid specified I may substitute the similar salt of

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any other germicidally active quaternary ammonium compound. A large number of these quaternary ammonium compounds are known in the art, and the quaternary ammonium compound, per se, reacted with the ethylene diamine tetraacetic acid forms no part of the present invention. All such germicidally active quaternary ammonium compounds generally contain a long chain aliphatic carbon group for one of the amino hydrogens of the amino nitrogen, in which aliphatic carbon group the number of carbon atoms is within the range 12 to 14. All such quaternary ammonium compounds are chemically reactive as strong bases and are highly reactive with ethylene diamine tetraacetic acid to form therewith the mono- to tetra-salts of said acid. The germicidal activity of said quaternary ammonium compounds is carried over into the mono- to tetra-salts of the amino acid with the added advantage that such salts are non-reactive with anionic compounds such as alkali metal soap compounds to form water insoluble reaction products therewith. For the purpose of this invention, the mono-quaternary ammonium salt of the amino acid has adequate germicidal properties for most purposes and due to the cost of said quaternary ammonium compounds is preferred over the poly-salts. The invention, however, is not limited to such mono-quaternary ammonium salts, as one skilled in the art will recognize.

The mono-quaternary ammonium tri-alkali metal salt of ethylene diamine tetraacetic acid and any of these germicidally active quaternary ammonium compounds is most conveniently formed by dissolving one molar weight of the amino acid in an aqueous solution containing one molar weight of the quaternary ammonium hydroxide compound and adding to the solution three molar weights of sodium hydroxide. The resulting aqueous solution on evaporation to dryness yields the dry mono-quaternary tri-sodium salt of ethylene diamine tetraacetic acid. Other alternative ways of forming the quaternary ammonium salt of the amino acid are available.

Where the above mixture is to be employed with water of low hardness the amount of element A therein can be lowered to 10% to 15%. Where the above mixture is to be employed in water of high hardness or in strongly saline solutions, the amount of element A may be increased to 30%.

Where the pH of the solution to which the germicidally active detergent mixture is to be added is under about 10, the pH of the mixture may be varied by the substitution therein of various amounts of the di-, and tri-alkali metal salt for the tetra-alkali metal salt specified for element A of the mixture.

One preferred method of forming the mixture of materials A, B and C is to add the elements A and B, each in their liquid phase, to element C in its solid phase with thorough mixing and drying. This mixture is then reduced to fine particle size to obtain thorough dispersion of the three elements throughout.

Various modifications of the specific examples given will be apparent to those skilled in the art. All such modifications of and departures from the present invention, however, are contemplated as may fall within the scope of the appended claims.

This application is a continuation application of my prior filed application Serial No. 724,250 filed January 24, 1947 (now abandoned)..

What I claim is:

1. A germicidally active detergent composition

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for use in water containing water hardening constituents, said composition consisting of a mixture containing 10% to 30% of an alkali metal salt of ethylene diamine tetraacetic acid and from small amounts up to 25% of a quaternary ammonium salt of ethylene diamine tetraacetic acid, the quaternary ammonium cation of said salt being germicidally active, balance consisting of simple alkali metal detergent salts of the group consisting of phosphates, carbonates, silicates, borates, sulfates and mixtures thereof.

2. A germicidally active detergent composition for industrial washing solutions, said composition consisting of 10% to 30% of an alkali metal salt of ethylene diamine tetraacetic acid, from small amounts up to 20% of a quaternary ammonium salt of ethylene diamine tetraacetic acid, the quaternary ammonium cation of said salt being germicidally active, balance consisting of a water soluble alkali metal salt of the group consisting of phosphates, carbonates, silicates, borates and sulfates and mixtures thereof.

3. A detergent composition of matter for industrial washing solutions, said composition consisting of about 20% the tetrasodium salt of ethylene diamine tetraacetic acid, about 20% the mono-quaternary ammonium tri-sodium salt of ethylene diamine tetraacetic acid, the quaternary ammonium cation being a germicidally active cation, balance of the mixture consisting of a water soluble alkali metal salt of the group consisting of phosphates, carbonates, silicates, borates and sulfates and mixtures thereof.

4. A detergent composition of matter for industrial washing solutions, said composition consisting of about 20% the tetrasodium salt of ethylene diamine tetraacetic acid, about 20% the

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mono-quaternary ammonium tri-sodium salt of ethylene diamine tetraacetic acid, the quaternary ammonium cation being a germicidally active cation, balance consisting of sodium carbonate.

5. A detergent composition of matter for industrial washing solutions, said composition consisting of about 20% the tetrasodium salt of ethylene diamine tetraacetic acid, about 20% the mono-quaternary ammonium tri-sodium salt of ethylene diamine tetraacetic acid, the quaternary ammonium cation being a germicidally active cation, balance consisting of water soluble phosphate of sodium.

6. A detergent composition of matter for industrial washing solutions, said composition consisting of about 20% the tetrasodium salt of ethylene diamine tetraacetic acid, about 20% the mono-quaternary ammonium tri-sodium salt of ethylene diamine tetraacetic acid, the quaternary ammonium cation being a germicidally active cation, balance consisting of a mixture of sodium carbonate and trisodium phosphate.

7. The detergent composition of claim 3, wherein said quaternary ammonium cation is the cation of the quaternary ammonium compound, alkyl-dimethyl benzyl ammonium hydroxide.

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The following references are of record in the file of this patent:

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