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GERMICIDAL DETERGENT

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This invention relates to improvements in germicidal detergent compositions, and includes such compositions in a concentrated or dry state, such as a dry powder, as well as germicidal solutions made therefrom.

The new compositions are valuable for use in homes, hotels, restaurants, hospitals and institutions, as well as in the beverage and dairy industries, where a germicidal action as well as a detergent action is desired.

The new germicidal detergent compositions are in general mixtures of chemicals containing three ingredients, or three types of ingredients, namely, alkalies or buffer salts, soaps, and phenyl phenols, in such proportions that when, for example, a solution is made of the composition, containing from ½% to 2% of the composition, the solution will have a pH of from 7 to 11, and the soap and phenyl phenol will each form only a small fraction of 1% of the solution.

The buffer salts which are used in the new composition are alkaline salts or alkalies, such as carbonates, phosphates or silicates, etc., used in such amounts and proportions as will give to the final solution the desired pH value. Among such buffer salts may be mentioned sodium carbonate and bicarbonate, mono-sodium- and di-sodium phosphate, sodium silicates, etc.

In using these buffer salts, in making the new composition, the proper pH is obtained by a selection of the buffer salts employed which may, in some cases, be a single salt or salts of the same acid, such as sodium carbonate and bicarbonate, or salts of different acids, etc. For example, the proper pH may be obtained by the use of a mixture of various phosphates and carbonates, or various phosphates and silicates, or carbonates and silicates, or by mixtures of phosphates, carbonates and silicates, as well as by mixtures of various phosphates alone, or carbonates alone, or silicates alone. Similarly, other salts besides phosphates, carbonates and silicates may be used to obtain the proper pH.

Since it appears to be the pH value itself which is important in the final solution of the germicidal detergent, rather than the particular salt or salts used in obtaining the pH value, the particular salt or salts employed are best defined by the pH limits of the resulting solution rather than by attempting to give the various combinations of chemicals which will provide pH values within these limits. For example, to produce a carbonate solution containing 1% of carbonate with a pH value of 9, a mixture of sodium bicarbonate and sodium carbonate is used with the proper

proportions of the two carbonates, or a solution containing sodium bicarbonate can be treated with added caustic soda until the pH value reaches 9, in which case the alkali converts some of the bicarbonate to carbonate so that the specified pH is reached when the proportions of carbonate and bicarbonate are the correct proportions for this pH value. Similarly, to obtain a carbonate solution with a pH value of 8, a definite but different proportion of bicarbonates and carbonates is used or formed which in this case is different from the proportions for a solution having a pH value of 9. Similarly, with solutions of phosphates and silicates, or mixtures of different salts, the pH and the strength of the solution determine the composition. If, for example, one makes a mixture of salt containing about 61% of di-sodium phosphate and about 39% of mono-sodium phosphate, a 1% solution will give a pH value of about 7, whereas a 1% solution of a salt containing 95% di-sodium phosphate and 5% mono-sodium phosphate will give a pH of about 8.

Among the soaps which may be used in making the new composition may be mentioned sodium laurate, soaps of unsaturated fatty acids, sulfate ester derivatives of these soaps, sodium resinate, or mixtures of these various soaps, etc.

The phenyl phenols employed in the new composition are phenols having a high germicidal value, and particularly phenyl phenol derivatives in the form of their sodium salts. Such phenyl phenolates as sodium ortho-phenyl phenolate, sodium chlor-ortho-phenyl phenolate, etc., are particularly valuable.

In general, the amount of soap employed, in proportion to the amount of buffer salts, will be such that the soap will be present to the extent of only a small percentage of 1% in the final solution, where the pH value is from 7 to 11; and the amount of phenyl phenol used will in general be such that it will form only a small percentage of 1% of such a solution. The proportions which have been found particularly valuable are such that where the final solution has a pH value of from 7 to 11, the soap concentration in the solution will be around 0.1% and the phenyl phenol concentration will be from around 0.01 to 0.1%.

Solutions made from the new composition, in proportions and amounts such as those above mentioned, are excellent detergents and exhibit sufficient germicidal properties so that they can be used as germicides. In general, the solutions

made with the new composition will contain from around ½% to 2% of the composition.

The new composition is advantageously compounded and marketed in the form of a dry powder, containing the various ingredients in the form of an intimate and homogeneous admixture, such that a definite weight of the powder can be used to give a solution of definite strength or proportions of the different ingredients. Such a dry mixture of the ingredients can be readily produced, handled, shipped and stored, and a definite amount measured out for use in producing germicidal detergent solutions.

In testing the solutions of the new composition, we have used the following test: The dry mixture, containing the ingredients of the composition, is made into a solution of from ½% to 1% strength. To 5 cc. of this solution is added ½ cc. of a 24 hour culture of the standard test organism, *Staphylococcus aureus* (Insecticide Board strain). Before the culture is added to the test solution, it is brought to the required temperature; the temperature we have used has been 37° C. After the culture has been in the test solution for five minutes, a 4 mm. loopful is removed and added to a tube of molten agar at a temperature of 45° C. and the mixture is poured into a Petri plate. The plates are incubated for 48 hours, at the end of which time a count is made of the colonies appearing on the plate. The number of organisms originally added to the test solution is in the neighborhood of five hundred millions (500,000,000). If no organisms are killed, the loopful removed will contain an excess of 10,000 organisms, and therefore the number of colonies appearing on the plates will be in excess of 10,000. If some of the organisms are killed, the number of colonies appearing on the plates will be less than 10,000. In the data reported in the following examples, the numbers indicate the colonies appearing on the test plate after 48 hours of incubation. Similar tests were made using *Eberthella typhi* (Hopkins strain).

In the following examples, the buffer salts used are identified by their amount and by the pH value of the resulting solution. It will be understood that different proportions of the same buffer salts, or different buffer salts in suitable proportions, will be used to obtain solutions of different pH value.

As an example of the invention, a dry mix is made of buffer salts, sodium resinate and sodium orthophenyl phenolate in such proportions that the solution made from this dry mix will contain about 1% of buffer salts, about 0.1% of sodium resinate and about 0.1% of sodium orthophenyl phenolate. The resulting solution, when subjected to the test above described, gave the following results:

pH	Plate counts
11.0.....	100
10.0.....	0
9.0.....	0
8.0.....	500

As another example of the composition, a dry mixture was prepared made up of buffer salts, sodium laurate and sodium ortho-phenyl phenolate in such proportions that the resulting solution contained 1% of buffer salts, 0.1% of sodium laurate and 0.1% of the phenolate. Tests

made with the resulting solution gave the following results:

pH	Plate counts
11.0.....	100
10.0.....	0
9.0.....	0
8.0.....	0

When sodium lauryl sulfate was used with buffer salts and sodium ortho-phenyl phenolate, and a solution formed containing similar proportions of the ingredients to those mentioned in the above example, that is, a solution containing 1% of the buffer salts, 0.1% of sodium lauryl sulfate and 0.1% of the phenolate, the following results were obtained by the foregoing test:

pH	Plate counts
11.0.....	0
10.0.....	0
9.0.....	0
8.0.....	0
7.0.....	0

As another example of the invention, a composition was made of buffer salts, sodium resinate and sodium chlor-ortho-phenyl phenolate in such proportions that a solution could be made containing about 1% of the buffer salts, about 0.1% of sodium resinate, and about 0.02% of the sodium chlor-ortho-phenyl phenolate. Such a solution, when tested by the above test, gave the following results:

pH	Plate counts
11.0.....	100
10.0.....	0
9.0.....	0
8.0.....	100

In a similar composition, in which sodium laurate was used instead of sodium resinate, in similar amounts, the following results were obtained:

pH	Plate counts
11.0.....	100
10.0.....	0
9.0.....	0
8.0.....	0

When sodium lauryl sulfate was used instead of sodium resinate and a solution formed containing about 1% of buffer salts, about 0.1% of sodium lauryl sulfate and about 0.02% of sodium chlor-ortho-phenyl phenolate, and the solution was tested by the above test, the following results were obtained:

pH	Plate counts
11.0.....	100
10.0.....	0
9.0.....	0
8.0.....	0
7.0.....	0

Instead of using the soaps mentioned in the above examples, other suitable soaps can be used, such as sodium oleate, sodium oleyl sulfate, mixtures of sodium oleate with sodium palmitate or sodium stearate, etc. For example, using sodium

oleate or sodium oleyl sulfate together with a buffer and sodium chlor-ortho-phenyl phenolate in such proportions that there was about 1% of buffer salt present, about 0.1% of the soap, and about 0.02% of the phenolate, and with a pH value of the solution of 10.0, the plate counts, by the above test, were zero. Similar results were obtained where, instead of sodium oleate alone, a mixture of equal parts of sodium oleate and sodium palmitate, or equal parts of sodium oleate and sodium stearate, were used.

We have obtained results by the combined use of the buffer salts, soaps, and phenyl phenols, which we have not been able to obtain with any two of these three ingredients, and, accordingly, we consider it essential to use all three ingredients, namely, the buffer salts, soaps, and phenyl phenols. We consider it important also that the three ingredients should be present in proper proportions. In general, the amount of buffer salts used will be such that these salts form the greater part of the dry mix, and the soap and phenyl phenol form only relatively small proportions of the dry mix. Similarly, when a detergent solution is made from the dry mix, it will contain a relatively much larger proportion of buffer salts than of soaps and phenyl phenols.

In preparing the new compositions for the market, they are advantageously prepared, as above described, in the form of a dry powder or mixture containing the different ingredients in the proper proportions. Such a dry powder can be readily manufactured, and stored and shipped, and can be readily used for detergent purposes, where a germicidal action is also desired, merely by adding the composition to water in the proper proportions, and using the resulting solution as the germicidal detergent.

The new compositions are thus useful for many purposes, as in hospitals or institutions, as well as in hotels and restaurants for dish-washing and other purposes, and in various industries such as the beverage and dairy industries where, for example, the washing and sterilizing of bottles or containers is important.

We claim:

1. A germicidal detergent composition in the form of a dry mixture of buffer salts, soaps, and the sodium salt of a phenyl phenol, in such proportions that when a solution, adapted for use as a detergent solution, is made of the mixture in such strength that the resulting pH will be from 7 to 11, the soap and phenolate will each be present in solution and to the extent of only a small fraction of 1% in the solution, the proportion of phenolate being such that the solutions would not be germicidal in the absence of the soap.

2. A germicidal detergent composition in the form of a dry mixture of buffer salts, soaps, and the sodium salt of a phenyl phenol, in such proportions that when a solution, adapted for use as a detergent solution, is made of the mixture in such strength that the resulting pH will be from 7 to 11, the soap and phenolate will be present in solution and to the extent of about 0.1%, and from 0.01 to 0.1% respectively in the solution, the proportion of phenolate being such that the solutions would not be germicidal in the absence of the soap.

3. A germicidal detergent composition in the form of a solution containing buffer salts, soap and the sodium salt of a phenyl phenol, said solution having a pH of from 7 to 11 and containing a small fraction of 1% of soap and of the phenolate in solution, the amount of phenolate being less than that required to produce a germicidal solution at the pH specified in the absence of the soap.

4. A germicidal detergent composition in the form of a solution containing buffer salts, soap and the sodium salt of a phenyl phenol, said solution having a pH of from 7 to 11 and containing about 0.1% of soap and from about 0.01 to about 0.1% of the phenolate in solution, the amount of phenolate being less than that required to produce a germicidal solution at the pH specified in the absence of the soap.

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