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COMPOSITION FOR INHIBITING FOAM

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The present invention relates to a composition and a process for suppressing or inhibiting the formation of foam in aqueous systems or media, whether true solutions or colloidal suspensions, such as encountered in industrial processes, for example, industrial, alkaline cleaning operations, distillation, paper making, textile treating and finishing, glue manufacture, sugar boiling and soap manufacture. The prevention of foaming difficulties in commercial bottle washing machines employing alkaline washing solutions constitutes a field of application to which our invention is particularly adapted.

In our co-pending application Serial No. 520,960, filed February 3, 1944, now U. S. Patent No. 2,407,589, we have disclosed a foam inhibitor and a process for suppressing the formation of foam in which the major active ingredient is di-tertiary amyl phenoxyethanol or p-tertiary amyl phenoxyethanol. These two compounds have displayed unusual foam inhibiting properties, not only with respect to their ability to "knock down" foam which has already been formed in an industrial chemical process aqueous system, but also with respect to their ability to maintain foam suppression for relatively long periods of time. As compared to foam inhibiting compositions heretofore known and used, the above mentioned compounds of our aforesaid co-pending application, when tested both in the field and in the laboratory under similar rigorous conditions, have displayed vastly superior foam inhibiting properties.

In our co-pending U. S. patent application Serial No. 607,276, filed July 26, 1945, we have disclosed that other related amyl phenoxy alkanols, such as di-tertiary amyl phenoxypropanol and di-tertiary amyl phenoxy isopropanol are also excellent foam inhibiting compounds. These amyl phenoxy alkanols are in normally liquid form and somewhat viscous. They need be present in an aqueous body in but an unusually small amount in order to produce foam suppression, viz., as low as 0.001% by weight. For even the most severe foaming conditions, one part of the foam inhibiting amyl phenoxy alkanol to 1000 parts of aqueous body has proven to be satisfactory for "knocking down" foam, and holding it down. Due to the physical properties of these amyl phenoxy alkanols and the relatively small quantities in which they need be used, whereby the likelihood of their profligate use by unskilled or non-technically trained workers is quite possible, the problem has arisen of how to put

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them up in a suitable form for packaging, handling and use.

Therefore, the general object and nature of the present invention has been to discover a relatively chemically inert but physically effective and inexpensive vehicle, or carrier for these amyl phenoxy alkanol compositions whereby they may be compounded in a convenient and suitable form for handling, packaging, and use in the solid state, such as in the form of a powdered or granulated mixture. We have found that sodium carbonate, such as light soda ash (as commercial form of sodium carbonate) constitutes a solid diluent or carrier for such amyl phenoxy alkanols which is particularly chemically and physically compatible with such organic compound.

A further unusual property of sodium carbonate as a solid carrier is that it can adsorb or contain a very much higher percentage of the amyl phenoxy ethanols and propanols than other closely chemically related alkali compounds, such as sodium bicarbonate and modified soda (a molecular combination of sodium bicarbonate and sodium carbonate). The following comparison serves as an excellent illustration of this unusual property of the compositions of our invention, showing the optimum amount of di-tertiary amyl phenoxyethanol that these alkali carbonates will take up in order to produce the commercially most satisfactory mixture:

Sodium bicarbonate will take up 5% di-tertiary amyl phenoxyethanol

Modified soda will take up 10% di-tertiary amyl phenoxyethanol

Soda ash will take up 25% di-tertiary amyl phenoxyethanol

The values given above for the "optimum" amount of di-tertiary amyl phenoxyethanol that these alkali carbonates will take up is not the maximum amount (as hereinafter more fully described), but rather the amount that can be added so that the resultant mixture remains "siftable" or nonpasty and still retains the physical appearance of the alkali carbonate itself. In other words, there is no visible evidence of the organic liquid being present, such as the leaving of an oily film on the fingers after handling. This unusual ability of sodium carbonate to absorb or take up the amyl phenoxy alkanols herein specified results in a most convenient physical form of product for actual use and handling, such as in a bottle washing plant, when the operator, if need be, may simply grasp a handful of

the material from its container and drop or sprinkle it into the washing machine.

We have devised a method of testing foam inhibiting properties reproducing as closely as possible, the severest conditions of commercial foam inhibiting problems. This test procedure is performed in an apparatus which we have chosen to call a "dynamic foaming machine" and is described in detail in our aforesaid Patent No. 2,407,589.

Several exemplary foam inhibiting compositions made according to the principle of our invention have been subjected to this test procedure, and the results thereof are set forth in the following table:

Table

Foam Inhibitor	Total Amount of Formulation in Dynamic Test Sol'n.	Percentage of Di-tertiary Amyl Phenoxy-ethanol Present	Time to Suppress Foam	Duration of Foam Suppression
EXAMPLE 1				
Di-tertiary amyl phenoxyethanol, 100% [1]	*Grams* 10	0.1	*Minutes* 2	*Hours* 17
EXAMPLE 2				
Di-tertiary amyl phenoxyethanol, 12% Soda Ash, 88%	50	0.06	2	8¼
EXAMPLE 3				
Di-tertiary amyl phenoxyethanol, 25% Soda Ash, 75%	24	0.06	2¼	8½

[1] All percentages given herein are by weight unless otherwise specified.

In the case of the foam inhibitor compositions of our invention 50 to 90% by weight of soda ash can be incorporated without detracting seriously from the desired physical properties of the resultant composition. Thus, with 50% di-tertiary amyl phenoxyethanol and 50% light soda ash, the composition does not cake, set up, pack, or drain liquid on standing. Where the soda ash is increased to 90% a satisfactory physical product results, without unduly sacrificing the foam inhibiting characteristics of the composition. The composition of Example 3 represents a most suitable preferred solid form of product in which soda ash is employed as the solid vehicle.

Minute amounts of dye may be added if it is desired to impart a distinctive color to the composition. Similarly, and for convenience in formulation procedure, other known anti-foaming, but substantially less effective, organic compounds might be added in small amounts. Such other organic compounds are noted in our said co-pending application Serial No. 520,960, and include tetradecanol, tri-octyl phosphate and several other alcohols and esters.

Other modes of applying the principle of our invention may be employed, changes being made as regards to the details described, provided the features stated in any of the following claims or the equivalent of such be employed.

We, therefore, particularly point out and distinctly claim as our invention:

1. A composition for suppressing the formation of foam in aqueous systems consisting of di-tertiary amyl phenoxyethanol and 50 to 90% by weight anhydrous sodium carbonate.

2. A composition for suppressing the formation of foam in aqueous systems consisting of approximately 25% by weight di-tertiary amyl phenoxyethanol and approximately 75% by weight anhydrous sodium carbonate.

3. A composition for suppressing the formation of foam in aqueous systems, consisting essentially of a compound selected from the group consisting of di-tertiary amyl phenoxyethanol, p-tertiary amyl phenoxyethanol, di-tertiary amyl phenoxypropanol, and di-tertiary amyl phenoxy isopropanol; and 50 to 90% by weight anhydrous sodium carbonate, the resultant composition retaining essentially the dry, solid form physical appearance of the sodium carbonate itself.

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