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LOW FOAMING DETERGENTS

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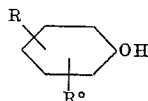
This invention deals with detergent compositions developing but little or no foam upon agitation of aqueous solutions thereof. More particularly this invention relates to low foaming detergent compositions which are based on mixtures of alkylphenols having alkyl groups of eight to ten carbon atoms and non-ionic surface-active agents which foam freely by themselves in one per cent aqueous solutions, including alkylphenoxypolyethoxyethanols having alkyl groups of 7 to 12 carbon atoms and having 8 to 30 ether groups and condensates of alkanols or alkylthiols having 9 to 15 carbon atoms and ethylene oxide in proportions yielding 8 to 40 ether groups.

Non-ionic surface-active agents of the above types have become widely used in many types of applications including those in which their foam is objectionable. Decreasing the concentration of these agents will reduce their foam but will also decrease their deterative action. Various agents including alcohols, oils, organic phosphates, esters of lower alkanols and fatty acids, amines, aldehydes and so on, which have been recommended as anti-foam agents have no or insufficient effect on the foaming of these non-ionic agents.

On the other hand while the above alkylphenols are useful foam suppressors for the above non-ionic agents, they are ineffective as defoaming agents for solutions of anion-active or cation-active agents and for some other types of non-ionic agents.

The non-ionic surface-active agents, the foam of which is effectively lessened by the recited phenols, include heptylphenoxypolyethoxyethanols, octylphenoxypolyethoxyethanols, nonylphenoxypolyethoxyethanols, decylphenoxypolyethoxyethanols, and the corresponding compounds having one or two methyl substituents of the phenyl group, there being at least eight ether groups in the hydrophilic chains of these substances.

The foam-suppressing alkylphenols are octyl-, nonyl-, and decyl-phenols and similar phenols having a second alkyl substituent up to ten carbon atoms. These may be summarized by the formula



where R is an alkyl group of eight to ten carbon atoms and R° is hydrogen or an alkyl group of not over ten carbon atoms. Some useful alkylphenols are o-(2-octyl)-phenol, diisobutylphenol, nonylphenol, tert.-decylphenol, octylmethylphenol, dioctylphenol, dinonylphenol, o-tert-butyl-p-diisobutylphenol, etc.

At least seven parts by weight of one of these phenols is needed for 93 parts of the non-ionic agent to give a useful depression of the foam of these agents and as many as 25 parts of such phenol for 75 parts of the non-ionic agent may be used. The alkylphenol is best dissolved or dispersed in the alkylphenoxypolyethoxyethanol

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to form the composition of this invention. This composition may be used for cleaning directly or in conjunction with builders or alkaline cleaning agents or the like.

Typical compositions of this invention were prepared by mixing together 20 parts by weight of a defined alkylphenol and 80 parts by weight of diisobutylphenoxypolyethoxyethanol having about ten ether groups. The foaming of these compositions at 1% in water at a temperature of 135° F. was determined by placing a 100 ml. sample of each solution in a container and subjecting it to rapid stirring with a small electrically driven mixer. The foamed solution was then poured during the course of one minute into a graduated cylinder whereupon the initial reading was taken. Readings were then taken after two, five, and ten minutes. It had been determined by practical tests in automatic dishwashers that an initial foam reading of the order of 60 in this cylinder was desirable for proper suppression of foam. Foam values should fall off on subsequent readings.

Typical results are summarized in Table I.

TABLE I
Foam values with alkylphenols in
octylphenoxypolyethoxyethanol

Phenol	Foam in cc. at—			
	0 Min.	2 Min.	5 Min.	10 Min.
Ethylphenol	109	99	89	75
Hexylphenol	68	56		
Cyclohexylphenol	79	77		
Tert.-octylphenol	35	20	20	20
Tert.-decylphenol	36	30	20	18
Nonylphenol	22	20	16	14
Dinonylphenol	40	20	10	10

The above diisobutylphenoxypolyethoxyethanol at 0.8% by itself gave a foam value of 500 at 0 to 10 minutes.

A mixture of 20 parts of nonylphenol and 80 parts of a dodecylphenoxypolyethoxyethanol having about ten ether groups was prepared. A foam test with a 0.8% solution of this non-ionic agent by itself gave foam values of 500 for 0 to 10 minutes. The above composition gave foam values of 58 to 40.

A dodecylthiopolyethoxyethanol having about 10 ether groups in 0.8% solution gave a foam value of 500 at 0, 2, and 5 minutes and 375 at 10 minutes. A 1% aqueous solution of a composition of 80 parts of this non-ionic agent and 20 parts of nonylphenol gave foam values at 135° F. of 22, 14, 12, and 10 at 0, 2, 5, and 10 minutes, respectively.

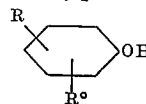
Foam values tend to decrease somewhat at temperatures above 135° F. and to increase with lower temperatures. The values at 135° F. seem, however, representative and correspond to foaming in practical use tests.

A composition based on a nonylphenoxypolyethoxyethanol having 19 to 20 ether groups and a nonylphenol in an 80:20 ratio was examined at 1% concentration at 135° F. by the above foam test. The initial foam value was 28 and values at 5 and 10 minutes were 26 and 21, respectively.

A composition from 80 parts of a dodecylphenoxypolyethoxyethanol having about 12 ether groups and 20 parts of a nonylphenol gave foam values at 1% of 46, 42, 40, and 38 at 0, 2, 5, and 10 minutes, respectively.

I claim:

1. A low-foaming composition consisting essentially of 7 to 25 parts of an alkylphenol of the formula



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wherein R is an alkyl group of eight to ten carbon atoms and R° is selected from the class consisting of hydrogen and alkyl groups of not over ten carbon atoms, and 93 to 75 parts of an alkylphenoxypolyethoxyethanol having an alkyl group of 7 to 12 carbon atoms and having 8 to 30 ether groups, the total parts being 100 by weight.

2. A low-foaming composition consisting essentially of 7 to 25 parts by weight of tert-octylphenol and 93 to 75 parts by weight of a diisobutylphenoxypolyethoxyethanol having about ten ether groups.

3. A low-foaming composition consisting essentially

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of 7 to 25 parts by weight of nonylphenol and 93 to 75 parts by weight of a diisobutylphenoxypolyethoxyethanol having about ten ether groups.

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