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FOAM BREAKERS

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This invention relates to foam breakers, and more particularly to the use of fatty acids, alkaline earth metal salts or earth metal salts of fatty acids as foam breakers.

It is known that addition products formed by an addition reaction between ethylene oxide and high-molecular weight organic compounds which contain exchangeable hydrogen atoms linked to a hydrocarbon radical through oxygen, sulfur or nitrogen possess surface-active properties. Among these products, those with hydrocarbon radicals containing less than 12 carbon atoms possess primarily wetting properties, while those products with high-molecular weight hydrocarbon radicals containing 12 or more carbon atoms exhibit primarily emulsifying properties. These differences are even more pronounced in those addition products which contain a hydrocarbon radical with less than 12 carbon atoms in combination with less than 5 ethylene oxide groups in the molecule, and in those high-molecular weight compounds which contain a hydrocarbon radical with 12 or more carbon atoms in combination with more than 4 ethylene oxide groups in the molecule.

The compounds containing a hydrocarbon radical with less than 12 carbon atoms in combination with less than 5 ethylene oxide groups in the molecule exhibit relatively low water-solubility, so that it is necessary to use certain proportions of the above-indicated higher-molecular weight compounds with 12 or more carbon atoms in the hydrocarbon radical in addition thereto as emulsifying agents, if it is desired to produce useful wetting agents. Such mixtures, however, have the disadvantage that they foam too strongly for a number of uses, which is primarily due to the properties of the high-molecular weight compounds containing 12 or more carbon atoms in the hydrocarbon radical.

I have found that industrially useful wetting agents are obtained if fatty acids or difficultly soluble salts of fatty acids, especially their alkaline earth metal or earth metal salts, are added in small amounts to such mixtures; they are soluble in water and form clear solutions, possess excellent wetting properties and very minor foaming properties, which are for all practical purposes negligible.

Ethylene oxide addition products suitable for use in accordance with my invention include those formed by ethylene oxide with medium- or high-molecular weight alcohols, phenols, carboxylic acids, mercaptans, amines, carboxylic acid amides, sulfonic acid amides, and the like, the hydrocarbon radicals of which may also contain heteroatoms, i.e. oxygen, sulfur or nitrogen atoms, or heteroatom groups or substituents. In place of the ethylene oxide addition products, may be used other corresponding alkylene oxide addition products, such as propylene oxide addition products, and so forth.

The proportion of compounds with 12 or more carbon atoms in the hydrocarbon radical in combination with more than 4 ethylene oxide groups in the low-foaming mixture is very small. Amounts to about 2–25% by weight, preferably 8–12% by weight, of the weight of wetting compounds.

Fatty acids which may be added, in accordance with the invention, to foaming aqueous solutions or dispersions of the above alkylene oxide addition products as anti-foaming agents include primarily high-molecular weight saturated or unsaturated fatty acids, such as capric acid,

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lauric acid, myristic acid, palmitic acid, stearic acid, oleic acid, etc., as well as mixtures thereof which are present, for example, in animal or vegetable fatty acid mixtures, such as tallow fatty acids, coconut fatty acids, or also in high-molecular weight carboxylic acid mixtures resulting from paraffin oxidation. In addition, high-molecular weight branched-chain aliphatic carboxylic acids or those which also carry substituents, for example hydroxyl groups, may be used as foam breakers. Furthermore, other high-molecular weight carboxylic acids, such as naphthenic acids and the like, may be employed. In place of these high-molecular weight carboxylic acids, especially the fatty acids, it is especially advantageous to use difficultly soluble metal salts of the fatty acids, especially calcium, magnesium and aluminum salts. It is not necessary that the salts be employed as such; instead, they may be formed by in situ reaction in the solution; for example, the in situ salt formation may be brought about by using the fatty acids and simultaneously stoichiometric or less than stoichiometric amounts of water-soluble metal salts, such as magnesium acetate, calcium formate, etc.

In order to achieve the purpose according to the present invention, the fatty acids or their salts are added to the solutions or dispersions of the alkylene oxide addition products in amounts from 0.5 to 30% by weight, preferably from about 2 to 10% by weight, based on the weight of alkylene oxide addition products present. The fatty acids may also be added to the solutions together with the addition products themselves.

The non-foaming wetting agent compositions thus obtained are suitable for use in all those processes where it is desirable to operate in the presence of small amounts of foam or in the complete absence of foam; for example, in dyeing baths, textile-sizing solutions, kier-boiling solutions, and especially in all those wetting procedures which are carried out in mechanical devices.

The following examples will further illustrate the present invention and enable others skilled in the art to understand my invention more completely. It should be understood, however, that the invention disclosed herein is not limited to the particular examples given below.

Example I

The foaming properties of an aqueous wetting agent solution which contained 0.25 gm./liter of the addition product formed by 2 mols ethylene oxide with nonyl alcohol and 0.025 gm./liter of the addition product formed by 8 mols ethylene oxide with 1 mol of a fatty alcohol mixture, wherein the fatty alcohols contained from 12 to 18 carbon atoms, were determined in accordance with the customary foaming test methods described in the periodical "Seifen-Öle-Fette-Wachse," 1955, page 277; 500 cc. of the solution were tested in a graduated cylinder having a capacity of 1000 cc. After 60 seconds, the solution developed a foam 8.2 cm. high. Upon the addition of 0.025 gm./liter tallow fatty acid and 0.005 gm./liter magnesium acetate to the solution, the height of the foam fell to 3.5 cm.

The modified wetting agent solution was useful primarily in dyeing procedures wherein it was important to operate in the absence of foam in order to achieve uniform penetration and distribution of the dye.

Example II

An aqueous wetting solution which contained 1 gm./liter of the addition product formed by 2.9 mols ethylene oxide with 1 mol n-decanol and 0.2 gm./liter of the addition product formed by 8 mols ethylene oxide with 1 mol of a fatty alcohol mixture, wherein the fatty alcohols had from 12 to 18 carbon atoms, was rendered completely free from foaming upon adding 0.2 gm./liter tallow fatty acid and 0.05 gm./liter magnesium acetate.

While I have illustrated my invention with the aid of certain specific embodiments thereof, it will be readily apparent to those skilled in the art that the present invention is not limited to these embodiments, and that various changes and modifications may be made without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. A substantially non-foaming aqueous wetting composition comprising water and a mixture of (1) from 75 to 98 parts of an addition product formed by less than 5 mols of a low-molecular weight alkylene oxide with a high-molecular weight organic compound containing a hydrocarbon radical with up to 12 carbon atoms and an exchangeable hydrogen atom linked to said hydrocarbon radical through an atom selected from the group consisting of oxygen, nitrogen and sulfur as wetting agent, and (2) from 2 to 25 parts of an addition product formed by more than 4 mols of a low-molecular weight alkylene oxide with a high-molecular weight organic compound containing a hydrocarbon radical with more than 12 carbon atoms and an exchangeable hydrogen atom linked to the hydrocarbon radical through an atom selected from the group consisting of oxygen, nitrogen and sulfur as emulsifying agent, and as defoaming agent, from 0.5 to 30 parts per 100 parts of total alkylene oxide addition products of a carboxylic compound selected from the group consisting of high-molecular weight fatty acids and their substantially water-insoluble metal salts.

2. The substantially non-foaming aqueous wetting composition of claim 1 wherein the wetting agent alkylene oxide addition product comprises from 88 to 92 parts, the emulsifying agent alkylene oxide addition product comprises from 8 to 12 parts of the total alkylene oxide addition products, and the defoaming agent comprises from 2 to 10 parts per 100 parts of total alkylene oxide addition products.

3. A substantially non-foaming wetting composition as in claim 1, wherein the carboxylic compound is an alkaline earth metal of a high-molecular weight fatty acid.

4. A substantially non-foaming wetting composition as in claim 1, wherein the carboxylic compound is an earth metal salt of a high-molecular weight fatty acid.

5. A substantially non-foaming wetting composition for use in aqueous solutions comprising (1) from 75 to 98 parts by weight of an addition product formed by less than 5 mols ethylene oxide with a high-molecular weight fatty alcohol having up to 12 carbon atoms as wetting agent and from 2 to 25 parts by weight of an addition

product formed by more than four mols ethylene oxide with a high-molecular weight fatty alcohol having more than 12 carbon atoms as emulsifying agent, and (2) from 0.5 to 30 parts per 100 parts of total ethylene oxide addition products of a carboxylic compound selected from the group consisting of high-molecular weight fatty acids and their substantially water-insoluble metal salts as a defoaming agent.

6. The composition of claim 5 wherein the wetting agent ethylene oxide addition product comprises from 88 to 92 parts, the emulsifying agent ethylene oxide addition product comprises from 8 to 12 parts of the wetting agent and the defoaming agent comprises from 2 to 10 parts per 100 parts of total ethylene oxide addition products.

7. A substantially non-foaming aqueous wetting composition comprising water, 0.25 gm./liter of the addition product formed by two mols ethylene oxide with nonyl alcohol, 0.025 gm./liter of the addition product formed by eight mols ethylene oxide with one mol of a fatty alcohol mixture composed of fatty alcohols having 12 to 18 carbon atoms, and 0.025 gm./liter of the magnesium salt of tallow fatty acid.

8. A substantially non-foaming aqueous wetting composition comprising water, 1 gm./liter of the addition product formed by 2.9 mols ethylene oxide with 1 mol n-decanol, 0.2 gm./liter of the addition product formed by eight mols ethylene oxide with one mol of a fatty alcohol mixture composed of fatty alcohols having 12 to 18 carbon atoms, and 0.2 gm./liter of the magnesium salt of tallow fatty acid.

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