United States Patent Office 3,449,261
Patented June 10, 1969

3,449,261

NON-FOAMING WETTING AGENTS

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No Drawing. Filed Feb. 1, 1966, Ser. No. 523,855
Int. Cl. B01f 17/14, 17/00, 17/12
U.S. Cl. 252—351 1 Claim

ABSTRACT OF THE DISCLOSURE

This specification discloses non-foaming wetting agents comprising 50–99 parts of tris(butoxyethyl) phosphate and 1–50 parts of anionic or non-ionic detergent.

This invention relates to non-foaming wetting agents and more particularly to non-foaming wetting agents based upon a specific water-insoluble triester of phosphoric acid—to wit, tris(butoxyethyl) phosphate.

Detergents are commonly used as wetting agents by the textile industry in various textile treating processes such as bleaching, dyeing, desizing, mercerizing and finishing. These agents promote fast wetting of the textile as it passes through the various treating baths. However, in general the detergents which provide the shortest wetting time tend to be high foaming detergents. In the above textile treating operations the formation of foam can become a serious problem since in many cases the volume of foam exceeds the capacity of the treating vessel. Moreover, in the case of dyeing operations, if foam is present, it will contain undissolved dye particles which cause "specking" of the dyed textile. In finishing operations, the presence of foam causes prewetting of the textile which results in uneven application of the finishing agent. Thus it is desirable to use wetting agents which are essentially non-foaming. However, the wetting agents which produce the least amount of foam also tend to be the least effective as wetting agents. Accordingly, there is a real need for wetting agents which are essentially non-foaming and which have especially short wetting times.

In U.S. Patent No. 2,794,004 wetting agents containing water-soluble salts of alkylaryl sulphonic acids and water-insoluble triesters of phosphoric acid are disclosed and claimed. According to that patent it was found that the addition of triesters of phosphoric acid to alkylaryl sulphonic acids increases their wetting power. The patent suggests the use of 10–40% of a triester of phosphoric acid based upon the amount of sulphonic acid salt present. It is stated that a further increase in the quantity of phosphates over 40% is generally not profitable since the increase in cost caused by a larger quantity of phosphate is not compensated by any increase in wetting power. None of the wetting compositions disclosed in that patent are essentially non-foaming, although some produce less foam than others.

It is an object of this invention to provide essentially non-foaming wetting agents which have especially short wetting times. This and other objects will become apparent from the following description of this invention.

It has now been found that compositions containing 50–99 parts by weight of tris(butoxyethyl) phosphate and 1–50 parts of an anionic or non-ionic detergent have outstanding properties as wetting agents. These wetting agents are essentially non-foaming while at the same time providing especially short wetting times.

Quite surprisingly it has been discovered that tris (butoxyethyl) phosphate is not only an additive for increasing the wetting power of wetting agents, but is itself a superior wetting agent. Because of the water-insolubility of this neutral phosphate ester, prior investigators failed to recognize its independent wetting properties.

This discovery is quite unexpected in view of the prior art which considered phosphate esters to merely be additives for wetting agents, and not in themselves wetting agents. Tris(butoxyethyl) phosphate is unique among the phosphate esters in its superior wetting power.

In accordance with this invention non-foaming wetting compositions result from the use of a major amount of tris(butoxyethyl) phosphate in combination with sufficient anionic or non-ionic detergent to solubilize the phosphate ester in aqueous media. We have found that the addition of as little as 1% of an anionic or a non-ionic detergent solubilizes the neutral phosphate ester in water thereby developing its excellent properties as a wetting agent. As the amount of detergent present in the composition is increased, an increase in the tendency of the mixture to foam is encountered. Further increases in the amount of detergent beyond an amount equal to the amount of phosphate ester present give rise to objectionable foaming characteristics and eventually a decrease in the wetting power of the composition. Accordingly, the wetting agents of the prior art which contained only a minor amount of phosphate ester had inferior wetting and foaming characteristics as compared with those obtained in accordance with the present invention.

The detergents which are useful for increasing the solubility of the phosphate ester in water without giving rise to objectional foaming characteristics are anionic and non-ionic detergents. By "anionic detergent" we mean surface active agents which are water-soluble salts of carboxylic acids, organic sulfonic acids, organic sulfuric acids, and organic phosphoric acids each of which contain an alkyl or acyl radical of about 8–20 carbon atoms. The water soluble salts are most commonly sodium, potassium and ammonium salts.

Typical examples of anionic detergents which are useful in accordance with this invention include water soluble salts of sulfonated hydrocarbons including alkylaryl sulfonic acids such as octylbenzene sulfonates, decylbenzene sulfonates, dodecylbenzene sulfonates and decylnapthalene sulfonic acid, sulfonated rosin, sulfonated abietene, sulfonated terpenes and sulfonated mineral oil; water soluble salts of sulfonated fatty acids such as lauric acid, palmitic acid, myristic acid, oleic acid, linoleic acid, eleostearic acid and ricinoleic acid; water soluble salts of sulfonated fatty acid esters and glycerides including sulfonated fatty acid esters such as propyl ricinoleate, butyl ricinoleate and amyl rincinoleate, and sulfonated fatty acid glycerides such as olive oil, linseed oil, cottonseed oil, corn oil, sesame seed oil, soybean oil, peanut oil, coconut oil, grapeseed oil, castor oil, spermaceti oil and codliver oil; water soluble salts of sulfonated dicarboxylic acid esters such as alkyl and dialkyl succinates; water soluble salts of fatty acid esters of sulfonated alcohols such as fatty acid esters of 2-hydroxyethane sulfonic acid; water soluble salts of sulfonated fatty amides including aliphatic amides such as stearamide, ricinoleic amide, oleyl diisobutylamide and lauryl hydroxyethyl amide, aromatic amides such as stearyl anilide and heptadecyl benzimidazol, and amides of amino alcohols such as lauryl hydroxyethyl amide; water soluble salts of acid esters of sulfuric acid with alcohols including fatty alcohols such as lauryl alcohol, oleyl alcohol, tetradecyl alcohol and cetyl alcohol, and alkylphenols such as octylphenol and dibutyldiphenyl oxide; water soluble salts of waste sulfite liquors; water soluble salts of fatty acids such as palmitic, stearic and oleic acids; and water soluble salts of acidic esters of phosphoric acid with fatty alcohols such as lauryl alcohol, tetradecyl alcohol, cetyl alcohol and oleyl alcohol.

Typical examples of non-ionic detergents which are

suitable for use in accordance with this invention are those derived from the polycondensation of ethylene oxide or propylene oxide with certain hydrophobes. Suitable hydrophobes include higher alkyl and alkenyl alcohols containing 8–18 carbon atoms such as octyl, capryl, decyl, lauryl, tridecyl, myristyl, cetyl, stearyl, oleyl, linoleyl and linolenyl alcohols; higher alkanoic and higher alkenoic acids containing 8–18 carbon atoms such as octanoic, caprylic, capric, lauric, tridecanoic, myristic, palmitic, stearic, oleic, linoleic, and linolenic acids; higher alkanoic and higher alkenoic amides containing 8–18 carbon atoms such as octanoic, caprylic, capric, lauric, tridecanoic, myristic, palmitic, stearic, oleic, linoleic, and linolenic acid amides; higher alkylphenols containing 4–12 carbon atoms in the alkyl group such as butylphenol, isobutylphenols, isooctylphenol, diocytlphenol, nonylphenol, dinonylphenol, dodecylphenol, and mixtures thereof; polyol fatty acid esters such as ethylene glycol, glycerol and sorbitan laurates, myristates, palmitates, stearates, oleates, linoleates and linolenates; polypropylene glycol ethers formed by the condensation of propylene oxide with propylene glycol; and condensation products of propylene oxide with ethylenediamine.

The wetting compositions are particularly useful in textile applications such as bleaching, desizing, dyeing, mercerizing, finishing, and Sanforizing because of their excellent wetting and especially their non-foaming characteristics. In operations such as desizing and mercerizing where foaming is a serious problem, these compositions are particularly useful. In operations such as bleaching, dyeing and finishing it is desirable to avoid even small amounts of foam which cause spotting. Other applications for these compositions include wetting agent for agricultural sprays and wash compositions for home and commercial dishwashing, automatic vehicle washing, automatic floor scrubbing, commercial reusable bottle washing, and commercial equipment pipe flushing.

The following examples, illustrating the novel wetting compositions disclosed herein, are given without any intention that the invention be limited thereto.

Examples 1 to 9 and A to F for comparison

A number of compositions were prepared containing various proportions of tris(butoxyethyl) phosphate and detergents. Each of these compositions were diluted with distilled water to a concentration of 0.1%.

The wetting time of the diluted solution was measured in accordance with Standard Test Method 17–1952 of the American Association of Textile Chemists and Colorists. A 5.00-gram skein of cotton yarn 36 inches long and folded 4 times to form a loop 9 inches around was used. With the solution at 25° C., the wetting time was measured as the time lapse between release of the skein and relaxation of the linen thread. The resulting data are given in the table below.

The initial foam height of each of the solutions was measured at 120° F. in accordance with Standard Test Method D1173–53 of the American Society for Testing and Materials. The resulting data are given in the following table.

	Composition	Wetting time, sec.	Foam height, millimeters
1	90% tris(butoxyethyl)phosphate, 10% isooctylphenyl polyethoxy ethane.	2	0
2	75% tris(butoxyethyl)phosphate, 25% isooctylphenyl polyethoxy ethane.	2	4
3	50% tris(butoxyethyl)phosphate, 50% isooctylphenyl polyethoxy ethane.	2	24
A	25% tris(butoxyethyl)phosphate, 75% isooctylphenyl polyethoxy ethane.	3	44
B	10% tris(butoxyethyl)phosphate, 90% isooctylphenyl polyethoxy ethane.	5	73
C	100% isooctylphenyl polyethoxy ethane.	7	110
4	90% tris(butoxyethyl)phosphate, 10% sodium dioctyl sulfosuccinate.	2	9
5	75% tris(butoxyethyl)phosphate, 25% sodium dioctyl sulfosuccinate.	3	8
6	50% tris(butoxyethyl)phosphate, 50% sodium dioctyl sulfosuccinate.	3	8
D	100% sodium dioctyl sulfosuccinate.	3	214
7	90% tris(butoxyethyl)phosphate, 10% Rohm & Haas DN 65 (modified ethoxylated straight chain alcohol).	3	0
8	75% tris(butoxyethyl)phosphate, 25% DN 65.	4	0
E	100% DN 65	7	130
9	90% tris(butoxyethyl)phosphate, 10% nonylphenyl polyethoxy ethane.	3	0
F	100% nonylphenyl polyethoxy ethane.	11	101

The fast wetting and essentially non-foaming characteristics of the compositions of this invention, as compared with prior art compositions, is obvious from the results shown in the table.

What is claimed is:

1. A non-foaming wetting composition useful in the production of non-foaming aqueous wetting dispersions which comprises 50–99 parts of tris(butoxyethyl) phosphate and 1–50 parts of a detergent selected from the group consisting of isooctylphenyl polyethoxy ethanol, nonylphenyl polyethoxy ethanol, and sodium dioctyl sulfosuccinate.

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U.S. Cl. X.R.

252—137, 152, 352, 353, 357

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,449,261 June 10, 1969

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It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, lines 10-19, change the last word in each of the compositions 1, 2, 3, A, B and C from "ethane" to "ethanol"; lines 29 and 30, change the last word in compositions 9 and F from "ethane" to "ethanol".

Signed and sealed this 6th day of January 1970.

(SEAL)
Attest:

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