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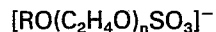
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Description

This invention relates to surface active compositions.

Alcohol ether sulphate salts of which the anion has the formula



where R is an alkyl group having 10 to 20 and preferably 12 to 16 carbon atoms and n is an integer in the range 1 to 7 and preferably 1 to 4 are known surface active agents which are used in, for example shampoos, liquid dishwashing liquids etc.

They are normally produced by ethoxylating an appropriate alcohol, reacting the product with a sulphating agent for example H_2SO_4 , SO_3 or SO_2Cl_2 and neutralising with an amine for example a C_1 to C_5 mono alkyl amine or ammonia or with an alkali or alkaline earth base or ammonium compound to give the salt which is normally produced as a concentrate containing for example 65 to 75% by weight of the salt and a minor amount of water which includes any water of neutralisation and any introduced as solvent for the neutralising agent. Such concentrates are normally viscous liquids, but if free inorganic sulphates, for example sodium sulphate, or the unsulphated alcohol ethoxylate is present the concentrate may become an elastic gel which is difficult to handle.

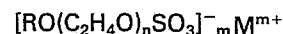
The alcohol ether sulphate salts are normally transported as concentrates and then diluted with water and optionally other materials to produce the product ultimately used by the consumer. On dilution of the concentrate another gel of a particularly troublesome type is encountered when a composition of about 55% of the alcohol ether sulphate salt and 45% of water is reached. Frequently ethanol is added to break the gels and allow dilution, but this represents a considerable expense and because of its volatility, a fire hazard.

We have found that the addition of a compound (other than a sulphate or sulphate salt) of average molecular weight 500 to 10,000, preferably 500 to 6,000 and more preferably 1,000 to 3,000, which comprises at least one polyalkylene glycol chain, the compound comprising a total of at least two ether linkages per seven carbon atoms, for example a polyethylene glycol of average molecular weight 500 to 6,000, reduces the problem of dilution with water. The said compounds are of low volatility, and the quantities required are small.

European Patent Application 24,711, published 11.03.81, discloses aqueous surfactant concentrates containing at least 20% by weight of water soluble salts of (inter alia) alkyl polyglycol ether sulphates which contain as viscosity regulators water-soluble salts of mono and/or disulphates of lower polyalkylene ether glycols having a molecular weight of at least 600 (for example polyethylene and polypropylene glycol sulphates) as viscosity regulators, if desired together with poly-

alkylene ether glycols having a molecular weight of at least 1500. In our invention the viscosity regulators/gel inhibitors do not include such sulphates.

The invention comprises a composition comprising at least 65% by weight of a salt of an alcohol ether sulphate of formula



where R and n are as previously defined, M is an ammonium, substituted ammonium, alkali or alkaline earth metal ion and m is the valency of M, characterised in that it further contains an amount of a gel inhibiting compound (other than a sulphate or sulphate salt) of average molecular weight 500 to 10,000 preferably 500 to 6,000 and more preferably 1,000 to 3,000, which comprises at least one polyalkylene glycol chain, the compound comprising a total of at least two ether linkages per seven carbon atoms, for example a polyethylene glycol, which is sufficient to reduce the maximum elasticity of any gel encountered on dilution with water to at most 4×10^{-4} Newtons per sq mm.

The compound may be a polyalkylene or mixed polyalkylene glycol, for example polyethylene glycol or a mixed polyethylene/polypropylene glycol, a compound comprising a polyalkylene glycol chain linked to a phenol or alcohol, for example an alkyl phenol (suitably having 4 to 12 carbon atoms in its alkyl group or groups) or alcohol (suitably having 1 to 16 and preferably 10 to 16 carbon atoms)/ethylene oxide condensate or with two or more polyalkylene glycol chains linked to a residue of a compound having two or more active hydrogen atoms, for example, glycerol or butane 1,4 diol. The compound is very suitably a polyethylene glycol.

The amount of gel inhibiting compound is preferably sufficient to reduce the maximum elasticity of any gel encountered during dilution with water to at most 1×10^{-4} Newtons per sq mm. In general 0.5 to 5% by weight of polyethylene glycol is used. Compositions according to the invention tend to be thixotropic; they are readily pumpable in suitable conventional equipment.

The salt is suitably a sodium, potassium, magnesium or ammonium salt, and may be produced by neutralising the acid with a hydroxide, carbonate or bicarbonate of the cation. Direct neutralisation with ammonia or an amine may be carried out.

The invention also comprises a process in which the alcohol ether sulphate salt is mixed with an amount of a compound (other than a sulphate or sulphate salt) of average molecular weight 500 to 10,000, preferably 500 to 6,000 and more preferably 1,000 to 3,000, which comprises at least one polyalkylene glycol chain, the compound comprising a total of at least two ether linkages per seven carbon atoms, for example a polyethylene glycol, which is sufficient to reduce

the maximum elasticity of any gel encountered on dilution with water to at most 4×10^{-4} Newtons per sq mm, and then diluted with water.

Preferably the compound has at least two ether linkages per five carbon atoms.

Example

A sodium salt of mixed C_{13} and C_{15} alcohol (7 to 3 by molar ratio) ethoxylated with an average of 3 mole C_2H_4O per mole of alcohol, sulphated with SO_3 and neutralised with NaOH solution to produce a 70% mixture by weight of the salt with water (hereinafter referred to as material A) was tested in an oscillating can rheometer to determine its dynamic viscosity and elasticity at a frequency of oscillation of 9.8 cycles per second. Material A with the specified additives was also tested in the same way.

The elasticity of Material A was 745 Nm^{-2} and

its dynamic viscosity at 25°C at low shear was 3.95 Pascal seconds (39.5 poise).

Material A with 2.5% w/w of polyethylene glycol (800 mol wt) added had a dynamic viscosity under the same conditions of 3.7 Pascal seconds (37 poise) at low shear and an elasticity of $3.2 \times 10^{-4} \text{ N mm}^{-2}$.

Material A with 1% w/w polyethylene glycol (1,000 mol wt) added had a dynamic viscosity under the same conditions of 3.4 Pascal seconds (34 poise) at low shear and an elasticity of $4.1 \times 10^{-4} \text{ N mm}^{-2}$.

Material A with $2\frac{1}{2}$ w/w polyethylene glycol (1,000 mol wt) added had a dynamic viscosity under the same conditions of 3.6 Pascal seconds (36 poise) at low shear and an elasticity of $2.1 \times 10^{-4} \text{ N mm}^{-2}$.

The performance of other additives in material A is shown in the following table.

Additive	Concentration % w/w	Viscosity pascal seconds	Elasticity N mm^{-2}
Condensate of Butane 1,4-Diol with Ethylene Oxide			
900 MW	2	4.58	2.390×10^{-4}
1100 MW	2	4.52	2.070×10^{-4}
1600 MW	2	4.57	2.730×10^{-4}
2100 MW	2	4.94	3.070×10^{-4}
Polyethylene glycol MW 1500	2	4.21	2.220×10^{-4}
"Synperonic" A50	2	4.64	3.030×10^{-4}
"Synperonic" OP40	2	5.29	3.250×10^{-4}
Methoxy poly- ethylene glycol MW 1,500	2	3.7	2.100×10^{-4}
"Synperonic" TLE	2	4.8	2.700×10^{-4}

"Synperonic" TLE is a commercial product produced by alkoxyating methanol. It contains 28 ether links per 63 carbon atoms and has a molecular weight of 1,400.

"Synperonic" A50 is a commercial product produced by condensing a mixed C_{13} and C_{15} alcohol (7 to 3 by molar ratio) with c. 50 moles of ethylene oxide per mole.

"Synperonic" OP40 is a product of condensing octyl phenol with c. 40 moles of ethylene oxide per mole.

M.W. means molecular weight.

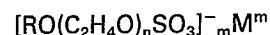
Materials with the additives all diluted much more readily with water than the pure material. The time required for comparable dilutions was

substantially less, for example one tenth, and no problems were encountered with gel formation during dilution.

"Synperonic" is a trademark, the property of Imperial Chemical Industries PLC.

Claims

1. A composition which comprises at least 65% by weight of a salt of an alcohol ether sulphate of formula



where R is an alkyl group having 10 to 20 carbon atoms and n is an integer in the range 1 to 7, M is

an ammonium, substituted ammonium, alkali or alkaline earth metal ion and m is the valency of M, characterised in that it further contains an amount of a compound (other than a sulphate or sulphate salt) of average molecular weight 500 to 10,000, preferably 500 to 6,000 and more preferably 1,000 to 3,000 which comprises at least one polyalkylene glycol chain, the compound comprising a total of at least two ether linkages per seven carbon atoms, which is sufficient to reduce the maximum elasticity of any gel encountered on dilution with water to at most 4×10^{-4} Newtons per sq mm.

2. A composition as claimed in claim 1 in which the compound of average molecular weight 500 to 10,000 is a polyethylene glycol.

3. A composition as claimed in claim 2 in which the polyethylene glycol has an average molecular weight of 500 to 6,000.

4. A composition as claimed in any preceding claim in which 0.5 to 5% by weight of polyethylene glycol is present.

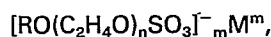
5. A composition as claimed in any preceding claim in which the salt of the alcohol ether sulphate is a sodium, potassium, magnesium, or ammonium salt.

6. A composition as claimed in any preceding claim in which R is an alkyl group having 12 to 16 carbon atoms and n is an integer in the range 1 to 4.

7. A process in which a composition as claimed in any preceding claims is diluted with water.

Patentansprüche

1. Zusammensetzung, die mindestens 65 Gew.-% eines Salzes eines Alkoholethersulfats der Formel



in der R eine Alkylgruppe mit 10 bis 20 Kohlenstoffatomen ist und n eine ganze Zahl in dem Bereich von 1 bis 7 ist, M ein Ammonium-, substituiertes Ammonium-, Alkalimetall- oder Erdalkalimetallion ist und m die Wertigkeit von M ist, enthält, dadurch gekennzeichnet, daß sie ferner eine Verbindung (die weder ein Sulfat noch ein Sulfatsalz ist) mit einem Durchschnittsmolekulargewicht von 500 bis 10.000, vorzugsweise 500 bis 6.000 und insbesondere 1.000 bis 3.000, die mindestens eine Polyalkylenglykolkette enthält und insgesamt je sieben Kohlenstoffatome mindestens zwei Etherbindungen aufweist, in einer Menge enthält, die ausreicht, um den maximalen Elastizitätsmodul irgendeines Gels, das bei der Verdünnung mit Wasser auftritt, auf höchstens 4×10^{-4} N/mm² zu vermindern.

2. Zusammensetzung nach Anspruch 1, in der die Verbindung mit einem Durchschnittsmolekulargewicht von 500 bis 10.000 ein Polyethylenglykol ist.

3. Zusammensetzung nach Anspruch 2, in der

das Polyethylenglykol ein Durchschnittsmolekulargewicht von 500 bis 6.000 hat.

4. Zusammensetzung nach einem der vorhergehenden Ansprüche, in der 0,5 bis 5 Gew.-% Polyethylenglykol vorhanden sind.

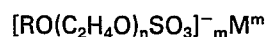
5. Zusammensetzung nach einem der vorhergehenden Ansprüche, in der das Salz des Alkoholethersulfats ein Natrium-, Kalium-, Magnesium- oder Ammoniumsalz ist.

6. Zusammensetzung nach einem der vorhergehenden Ansprüche, in der R eine Alkylgruppe mit 12 bis 16 Kohlenstoffatomen und n eine ganze Zahl in dem Bereich von 1 bis 4 ist.

7. Verfahren, bei dem eine Zusammensetzung nach einem der vorhergehenden Ansprüche mit Wasser verdünnt wird.

Revendications

1. Composition qui comprend au moins 65% en poids d'un sel d'un alcool-éther-sulfate de formule



où R représente un radical alcoyle comptant 10 à 20 atomes de carbone et n représente un nombre entier de 1 à 7, M représente un ion ammonium, ammonium, substitué, de métal alcalin ou de métal alcalino-terreux et m représente la valence de M, caractérisée en ce qu'elle contient en outre un composé (autre qu'un sulfate ou sel de sulfate) d'un poids moléculaire moyen de 500 à 10.000, de préférence de 500 à 6000 et plus avantageusement de 1000 à 3000 qui comprend au moins une chaîne polyalcoylène-glycol, le composé comprenant au total au moins deux liaisons éther pour sept atomes de carbone, qui est suffisante pour abaisser jusqu'à 4×10^{-4} Newtons par mm² au maximum la viscosité maximale de tout gel formé pendant la dilution avec de l'eau.

2. Composition suivant la revendication 1, dans laquelle le composé d'un poids moléculaire moyen de 500 à 10.000 est un polyéthylène-glycol.

3. Composition suivant la revendication 2, dans laquelle le polyéthylène-glycol a un poids moléculaire moyen de 500 à 6000.

4. Composition suivant l'une quelconque des revendications précédentes, dans laquelle 0,5 à 5% en poids de polyéthylène-glycol sont présents.

5. Composition suivant l'une quelconque des revendications précédentes, dans laquelle le sel de l'alcool-éther-sulfate est un sel de sodium, de potassium, de magnésium ou d'ammonium.

6. Composition suivant l'une quelconque des revendications précédentes, dans laquelle R représente un radical alcoyle comptant 12 à 16 atomes de carbone et n représente un nombre entier de 1 à 4.

7. Procédé, dans lequel une composition suivant l'une quelconque des revendications précédentes est diluée avec de l'eau.