



(86) **Date de dépôt PCT/PCT Filing Date:** 2012/03/23
(87) **Date publication PCT/PCT Publication Date:** 2012/09/27
(45) **Date de délivrance/Issue Date:** 2018/11/06
(85) **Entrée phase nationale/National Entry:** 2013/09/20
(86) **N° demande PCT/PCT Application No.:** EP 2012/001275
(87) **N° publication PCT/PCT Publication No.:** 2012/126630
(30) **Priorité/Priority:** 2011/03/24 (DE10 2011 015 046)

(51) **Cl.Int./Int.Cl.** ***B01F 17/42*** (2006.01),
C09K 8/584 (2006.01), ***C11D 1/29*** (2006.01)
(72) **Inventeurs/Inventors:**
JAKOBS-SAUTER, BRITTA, DE;
KALTWASSER, UWE, DE
(73) **Propriétaire/Owner:**
SASOL GERMANY GMBH, DE
(74) **Agent:** KIRBY EADES GALE BAKER

(54) **Titre : SELS DE SULFATES D'ALKYLPOLYALCOXY TRES CONCENTRES DOUES D'ECOULEMENT**
(54) **Title: HIGHLY-CONCENTRATED FLOWABLE SALTS OF ALKYL POLYALKOXY SULPHATES**

(57) **Abrégé/Abstract:**

The subject matter of the present invention relates to highly-concentrated compositions of salts of alkyl polyalkoxy sulphates, whereby in total at least 2/3 of all alkoxy unit of the alkyl polyalkoxy sulphates are propoxy units, a method of their production as well as their use in oil and gas field applications.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



WIPO | PCT



(10) International Publication Number

WO 2012/126630 A1

(43) International Publication Date
27 September 2012 (27.09.2012)

(51) International Patent Classification:

C09K 8/584 (2006.01) *C11D 1/29* (2006.01)
C07C 303/24 (2006.01) *C07C 305/02* (2006.01)
C07C 303/42 (2006.01)

(21) International Application Number:

PCT/EP2012/001275

(22) International Filing Date:

23 March 2012 (23.03.2012)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

10 2011 015 046 24 March 2011 (24.03.2011) DE

(71) Applicant (for all designated States except US): **SASOL GERMANY GMBH** [DE/DE]; Anckelmannsplatz 1, 20537 Hamburg (DE).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **JAKOBS-SAUTER, Britta** [DE/DE]; Brahmsstrasse 14, 40764 Langenfeld (DE). **KALTWASSER, Uwe** [DE/DE]; Am Erzsacht 27, 45770 Marl (DE).

(74) Agent: **SCHUPFNER, Georg**; Müller Schupfner & Partner, Schellerdamm 19, 21079 Hamburg (DE).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(54) Title: HIGHLY-CONCENTRATED FLOWABLE SALTS OF ALKYL POLYALKOXY SULPHATES

(57) Abstract: The subject matter of the present invention relates to highly-concentrated compositions of salts of alkyl polyalkoxy sulphates, whereby in total at least 2/3 of all alkoxy unit of the alkyl polyalkoxy sulphates are propoxy units, a method of their production as well as their use in oil and gas field applications.



WO 2012/126630 A1

Highly-concentrated flowable salts of alkyl polyalkoxy sulphates

The present invention relates to highly-concentrated compositions of salts of alkyl polyalkoxy sulphates, wherein in total at least 2/3 of all alkoxy units of the salts of alkyl polyalkoxy sulphates are propoxy units, a method of producing the composition and their use in oil and gas field applications.

Alkyl polyalkoxy sulphates often also called alkyl polyether sulphates, (fatty) alcohol polyglycol ether sulphates or (fatty) alcohol polyether sulphates, commonly known and referenced hereunder in short as ether sulphates or alkyl ether sulphate salts, are used as surfactants or emulsifiers in numerous consumer products such as cleaning agents, shampoos and cosmetics. Structurally they have a lipophilic alkyl group and a hydrophilic area composed of the polar ether groups and the chemically bonded sulphate anion. These physical properties make these compounds surfactants and allow them to emulsify fats and oils. They are not very sensitive to hard water and are generally easily biodegradable. Fatty alcohols are understood hereunder to reference C8- to C18- branched and/or unbranched aliphatic mono-alkanols.

Alkyl ether sulphates can be produced from fatty alcohols in that fatty alcohols are initially converted with alkylene oxide, usually ethylene oxide. EO references ethylene oxide or an ethylene oxide group ($-\text{CH}_2\text{CH}_2\text{O}-$). The average number of ether groups is normally between 1 and 12. The hydroxyether is then converted to an ester with sulphur trioxide which results in a sulphuric acid monoester or a sulphuric acid semiester. This acid is unstable and is converted into a salt with the use of alkali hydroxide or ammonia. Common commercial forms in the case of sodium ether sulphates with 2 or 3 EOs are aqueous paste-like compositions with a concentration of approximately 70% by weight or aqueous liquid compositions comprising up to 28% by weight anionic active substances (in each case measured as anionic active substance in accordance with DIN ISO 2271). Concentration ranges between approximately 30% by weight and below approximately 70% by weight active content (anionic active substance) result in non-flowable and non-pumpable compositions, as liquid crystalline structures in the form of hexagonal or cubic phases with a very high viscosity are formed. These often constitute a problem when diluting 70% ether sulphate pastes, which have a lamellar liquid crystalline structure, to the desired usage concentration.

Concentrations of slightly over 70% by weight and more are also no longer flowable or pumpable as crystallisation of the ether sulphate begins, whereas concentrations of around 70% by weight are often found to be flowable and pumpable.

5 Several solutions to prevent very high viscosities in ether sulphates have been described in the literature, such as the use of alkyl- or alkanol-amines as neutralizing agents or addition of organic solvents like alkylene glycols or short chain alcohols or polyalkylene sulphates or nonionic surfactants such as alcohol alkoxylates as viscosity reducers. Viscosity reducers need to be present in significant amounts, meaning
10 more than the usual residual unsulphated matter under standard sulphation conditions. This can be achieved by either intentional incomplete sulphation reaction or by adding viscosity reducers in the neutralization step.

Whereas the use of alcohol ether sulphates containing ethylene-oxy/ethylenoxide
15 units as ether groups is well known in personal care, washing and cleaning formulations as well as in industrial applications, for example as emulsifiers for emulsion polymerisation, ether sulphates containing propylene-oxy units are less familiar on the market. To date, only up to 40% solutions of alkali fatty alcohol (poly)propoxy sulphates are available in a convenient, i.e. flowable and pumpable, viscosity range,
20 and no supply forms which dissolve both in water and in oils are known.

For use in industrial applications such as textile and leather auxiliary agents, metal working and lubricants, oil and gas field chemicals or tertiary oil recovery, surfactants or emulsifiers are required which exhibit a high emulsifying effect for various oils with
25 water. Products with a high active content are required in order to keep the amount used and raw material and transport costs associated therewith as low as possible. The products should also be available in the form of flowable and pumpable material which is as homogenous as possible, as this is the simplest form of transporting, storing and dispensing them for use. The products should be essentially free of organic solvents and/or other viscosity reducers, have a low salt content, mix well with
30 water and oils and be easily dilutable to the desired usage concentration. In addition, as low a pour point as possible is desirable which allows it to be used at low temperatures.

35

The aim of the present invention is to find a highly-concentrated form of salts of alkylpolyalkoxysulphates, which is flowable at least at room temperature (25°C), more particularly in the range from 10°C to 35°C, and is essentially free of organic solvents or other viscosity modifying additives, dissolves easily in both water and oils, can be easily
 5 diluted and has a pour point considerably below -5°C and more particularly even below -15°C .

Surprisingly it was found that highly-concentrated alkylpolyalkoxysulphate compositions containing

- 10 a) more than 75 % by weight, preferably more than 80% by weight salts of alkyl polyalkoxy sulphates,
 wherein the alkyl polyalkoxy sulphates have an alkyl residue and on average 3 to 20 alkoxy groups, at least 2/3 of all alkoxy groups of the alkyl polyalkoxy sulphates are propoxy groups and the alkyl residue is a fatty alcohol residue with
 15 8 to 18 carbon atoms and
- b) 1 to below 25 % by weight water, preferably 1 to below 20 % by weight water, satisfy the above requirements.

Particularly preferred as salts of alkyl polyalkoxy sulphates are those in which - if
 20 present - the various alkoxy units are present in one molecule chain (and not only as a mixture of homoalkoxylates) and more particularly alkyl polypropoxy sulphates (also known in simplified form as (fatty) alcohol propoxy sulphates).

In contrast, fatty alcohol ethoxy sulphate pastes or fatty alcohol propoxy sulphates with
 25 smaller active contents are no longer flowable or pumpable or not easy to dilute or have higher pour points or are insoluble in oil or exhibit a combination thereof.

Suitable for use as fatty alcohols or fatty alcohol residues are linear or branched primary alcohols with 8 to 18 carbon atoms, preferably with 12 to 17, more particularly with 12 to
 30 15 carbon atoms, and preferably more particularly mixtures containing at least more than 25 mol% branched primary alcohols.

Particularly suitable are the above fatty alcohols or alcohol residues with more than 40 mol% branched portions and very particularly fatty alcohols with on average at least one branch per molecule, more particularly (greater than 50 %) on the C2, C3 or C4 carbon atom, more particularly on the C2 carbon atom. The branching preferably has 1, 2, 3 and/or 4 carbon atoms.

The alkoxylation takes place with an average of 3 to 20 alkoxy groups, preferably 3 to 16 in accordance with the methods known to a person skilled in the art, whereby the alkoxyates can exhibit a conventional or a narrow homolog distribution. Contents of ethylene oxide groups or higher alkylene oxide such as butylene oxide groups are possible, if at least 2/3 of all alkoxy groups are propylene oxide. Particularly preferably the alkoxyate exclusively has 3 to 13, more particularly 4 to 10, propoxy groups.

The sulphation of the alcohol propoxylates can take place in a known manner for fatty alcohol ether sulphates with the usual methods, whereby the use of falling film reactors is preferred. As sulphation agents oleum, chlorosulphonic acid, amidosulphonic acid (sulfamic acid) or more particularly sulphur trioxide, for example, can be considered, whereby the latter is used diluted with an inert gas. The resulting sulphuric acid semi-ester is not stable and must therefore immediately be transferred into a neutralisation cycle in which it is converted, under high shear, with as highly concentrated aqueous alkali hydroxide as possible, more particularly 50% sodium hydroxide solution. In the preferred forms of embodiment the temperature during neutralisation is kept at 45 to 65°C, more particularly 50 to 60°C, at a pH value (related to 1% of the product in water) of pH 10 and higher, more particularly at least 11 and higher, in order to avoid viscosity peaks in the medium concentration ranges.

The thus obtained highly-concentrated alcohol ether sulphate (salt) contains smaller portions of alcohols, propylene glycols (also sulphated) and alcohol propoxylates.

The proportion of unsulphated material in the end product is typically 0 to 10 % by weight, preferably 0 to less than 5 % by weight. The content of alkyl polyalkoxy sulphate salts in accordance with the invention in the compositions is more than 75 % by weight, more particularly more than 80 % by weight, preferably more than 82 % by weight and more particularly up to 95 % by weight.

The obtained product can, but does not have to be mixed with commercially available preservatives and/or buffers in order to increase the stability to chemical decomposition and/or the stability to microorganisms in possibly diluted form. In a preferred form of embodiment 0.05 to 5% by weight, more particularly 0.1 to 2% by weight of citric acid is added to the product.

The compounds are used as an oil-soluble lubricant, e.g. in metal working, but more particularly as a surface active substance (surfactant) for deployment in improved or tertiary crude oil recovery. Together with the entrapped crude oil, the aqueous surfactant solution, which can also contain other components such as polymers, solvents, co-surfactants, salts, alkalisation agents, preserving agents, forms a micro-emulsion which is characterised by an extremely low interfacial tension and can thereby solubilise and mobilise the oil.

The flowability of a liquid phase depends on many external factors such as the temperature, the container, the pump and the viscosity. In connection with the invention flowable means that at a temperature of 25°C and a shear rate of $D=10\text{s}^{-1}$ the compound has a viscosity of less than 10000 mPas, preferably even less than 5000 mPas. The viscosity can be determined with the aid of commercially available measuring devices such as rotational viscometers or rheometers with cone/plate measuring geometry in accordance with DIN 53019.

The oil solubility of the compound in accordance with the invention is preferably at least 5 % by weight in paraffin oil (e.g. Merkur® WOP 100 PB) or mineral oil (e.g. Shell Gravex® 915), whereby at 25°C gentle stirring results in a clear solution.

To determine the dilutability, at room temperature (25°C) the product is mixed with water at such a ratio that a 20% by weight solution (anionic active substance) is produced. If this can take place in a glass beaker through manual stirring with a spatula or glass rod without passing through highly viscous states which can no longer be stirred and therefore mixed by hand the product is by definition easily dilutable. If not, the product cannot be easily diluted in water.

In connection with this invention the pour point means that (in accordance with ASTM D97-09) the product is cooled in 3°C steps. If after 10 minutes at this temperature it does not flow within 5 seconds of tilting the container into the horizontal, the 3°C higher value is taken as the pour point.

Example 1

A branched primary C12/C13 alcohol (ISALCHEM[®] 123) with on average 8 propoxy groups was sulphated in a continuous sulphation apparatus.

Raw material: ISALCHEM[®] 123 + 8 PO (OH number: 83.2 mg KOH/g, water: 0.03%, molecular weight: 674.3 g/mol). At a V₂O₅ catalyst gaseous SO₂ was converted to SO₃ at high temperature. The gas was cooled and diluted with air (dew point -60°C). The proportion of SO₃ in the air was 7% by volume.

In a falling film reactor with distributors the propoxylated alcohol was made to react with the SO₃/air mixture. The reaction gas flows through the falling film reactor at high speed and generates high turbulences on contact with the propoxylated alcohol. This resulted in an intensive exchange of substances. Intensive cooling of the falling film reactor ensures the removal of the reaction heat. Gas/liquid separation was carried out at the outlet of the falling film reactor. The fluid phase is taken for neutralisation, the gaseous phase for exhaust gas treatment.

The product is pumped around in a neutralisation circuit with the appropriate neutralisation medium. A pH value regulator adds the appropriate quantity of alkaline components, in this case aqueous NaOH, 50% by weight. At the same time the product is homogenised in the circuit through a very highly shearing mixer tool. The finished product was removed continuously from the neutralisation circuit. 0.1% by weight citric acid was added to the finished product.

The conversion parameters were as follows:

Temperature in the converter:	450°C
SO ₃ concentration in the reaction gas:	7% by volume
Molar ratio propoxylate/SO ₃ :	SO ₃ in excess
Quantity used (propoxylate):	3.9 kg/hour
hydroxyl number material used:	83.2 mg KOH/g
Temperature at the lower outlet of the falling film reactor:	25 – 30°C
Theoretical acid number, sulphuric acid semi-ester:	74.4 mg KOH/g
Actual acid number, sulphuric acid semi-ester	94 mg KOH/g
Temperature neutralisation circuit:	55-60°C

A product with the following composition was obtained:

Anionic active substance	90 +/-1 % by weight (DIN ISO 2271)
Unsulphated material (non-ionic substance):	< 1% by weight% (DIN EN 13273)
Na ₂ SO ₄ :	0.55% by weight
Free alkali:	0.01% by weight
Water:	around 10% by weight

with the following properties:

pH 1% in water:	9.3
Pour point:	-24 °C
5 % tel quel in paraffin oil:	clearly soluble
5 % t.q. in mineral oil:	clearly soluble
Viscosity (in mPas, at pH >11.25 °C und 10 s ⁻¹):	1100

Other examples

In an analogue manner to example 1 a branched primary C14/C15 alcohol (ISAL-CHEM[®] 145) with on average 8 propoxy groups, a partially branched primary C14/C15 alcohol (LIAL[®] 145) with on average 3.8 PO (propoxy) groups, a partially branched primary C14/C15 alcohol (LIAL[®] 145) with on average 9.8 PO groups, a partially branched primary C12/C13 alcohol (SAFOL[®] 23) with on average 6.5 PO groups, a partially branched primary C12/C13 alcohol (SAFOL[®] 23) with on average 12.5 PO groups, a partially branched primary C16/C17 alcohol (LIAL[®] 167) with on average 4 PO groups, a linear C12 alcohol with on average 12.8 PO groups and a linear C12/C14 alcohol with on average 4 PO groups were converted to the corresponding alcohol propoxy sulphate salts. The obtained compounds and properties are out in table 1 below.

Comparative examples (not in accordance with the invention):

ISALCHEM[™] 123+8PO SO₃Na, anionic active 26.7% by weight, unsulphated material 2.6% (calculated on 100% by weight active): not clearly soluble in mineral oil and paraffin oil, pour point -6 °C.

ISALCHEM[™] 145+8PO SO₃Na, anionic active 33.3 % by weight, unsulphated material 9.4% (calculated on 100% by weight active): not clearly soluble in mineral oil and paraffin oil, pour point +3°C.

MARLINATTM 242/70 (C12C14+2EO SO₃Na, anionic active 70 % by weight): not clearly soluble in mineral oil and paraffin oil, not easily dilutable.

5 SAFOLTM 23 2EO SO₃Na, anionic active 70 wt. %: not clearly soluble in mineral oil and paraffin oil, not easily dilutable.

ALFOLTM 1218 7EO (narrow range) SO₃Na, high active (> 75 wt. % anionic active matter): viscosity at 25 °C / 10 s⁻¹ > 20000mPas, not easily dilutable

Table 1

	ISALCHEM 145+8 PO SO ₃ Na	LIAL 145+3.8 PO SO ₃ Na	LIAL 145+9.8 PO SO ₃ Na	SAFOL 23+6.5 PO SO ₃ Na	SAFOL 23+12.5 PO SO ₃ Na	Linear C12+12.8 PO SO ₃ Na	Linear C12C14+4 PO SO ₃ Na
Anionic active sub- stance, a-WAS (% by weight)	89.2	89.3	83.0	89	83	89	80
Unsulphated material (% by weight)	2.1	2	9	1	3	7	<1
Na ₂ SO ₄ (% by weight)	0.6	0.4	0.6	0.3	0.3	0.5	0.3
Free alkali (% by weight)	0.04	0.04	0.7	0.1	0.1	0.1	1.6
Water (% by weight)	8.1	10.6	8	8	6	6	17
pH 1 % in water	9.5	9.5	11.1	10.1	9.9	9.1	11.6
Pour point (°C)	-21	-18	-21	< -24	< -24	< -24	n.d.
5 % t.q. in mineral oil	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Viscosity (mPas, at pH >11, 25 °C and 10 s ⁻¹)	1300	1600	1200	1000	1200	1050	9000
Easily dilutable	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Claims

1. Highly-concentrated alkyl polyalkoxy sulphate composition, flowable at least at 25°C, containing
 - 5 a) more than 75 % by weight salts of alkyl polyalkoxy sulphates, wherein the alkyl polyalkoxy sulphates have an alkyl residue and on average 3 to 20 alkoxy groups, at least 2/3 of all alkoxy groups of the alkyl polyalkoxy sulphates are propoxy groups and the alkyl residue is a fatty alcohol residue with 12 to 18 carbon atoms and
 - 10 b) 1 to below 25 % by weight water.
2. Composition in accordance with claim 1, wherein the fatty alcohol residue has 12 to 17 carbon atoms.
- 15 3. Composition in accordance with claim 1, wherein the fatty alcohol residue has 12 to 15 carbon atoms.
4. Composition in accordance with claim 1, 2 or 3, wherein the fatty alcohol residue is present in the form of a mixture containing branched fatty alcohol residues.
- 20 5. Composition in accordance with claim 4, wherein the fatty alcohol residue has more than 40 mol % branched fatty alcohol residues.
6. Composition in accordance with claim 4 or 5, wherein more than 50% of the
- 25 branches are arranged on the C2 carbon atom.
7. Composition in accordance with any one of claims 1 to 6, wherein the alkoxy groups of the alkyl polyalkoxy sulphate salts are exclusively propoxy groups.
- 30 8. Composition in accordance with claim 7, wherein the alkoxy groups are on average 3 to 13 propoxy groups.

9. Composition in accordance with claim 7, wherein the alkoxy groups are on average 4 to 10 propoxy groups.
10. Composition in accordance with any one of claims 1 to 9, wherein the proportion of the salts of the alkyl polyalkoxy sulphates is greater than 80 to 95 % by weight.
11. Composition in accordance with any one of claims 1 to 10, wherein the proportion of water is 5 to 18 % by weight.
12. Composition in accordance with any one of claims 1 to 11, wherein the salts are sodium and/or potassium salts.
13. Composition in accordance with any one of claims 1 to 12 with a pour point of less than -5°C.
14. Composition in accordance with any one of claims 1 to 12 with a pour point of less than -15°C.
15. Composition in accordance with any one of claims 1 to 14 also containing 0.05 to 5 % by weight buffers.
16. Composition in accordance with any one of claims 1 to 14 also containing 0.1 to 2 % by weight buffers.
17. Method of producing the composition in accordance with any one of claims 1 to 21 comprising at least the following steps:
- in a falling film reactor an alkoxylated fatty alcohol is reacted with SO_3 , wherein the alkoxylated fatty alcohol has on average 3 to 20 alkoxy groups, at least 2/3 of all alkoxy groups of the alkyl polyalkoxy sulphates are propoxy groups and the alkyl residue is a fatty alcohol residue with 12 to 18 carbon atoms, and
 - gas/liquid separation takes place and the liquid phase is neutralised with an alkali hydroxide in aqueous solution comprising more than 25 weight% alkali hydroxide.

18. Method in accordance with claim 17, wherein the conversion takes place with SO_3 at 20°C to 60°C.
19. Method in accordance with claim 17, wherein the conversion takes place with SO_3 at 25°C to 40°C.
20. Method in accordance with claim 17, 18 or 19, wherein the neutralisation takes place at 30°C to 70°C.
21. Method in accordance with claim 17, 18 or 19, wherein the neutralisation takes place at 50°C to 60°C.
22. Method in accordance with any one of claims 17 to 21, wherein the neutralisation takes place with alkali hydroxides with an aqueous proportion of less than 55 % by weight.
23. Method in accordance with claim 22, wherein the alkali hydroxides are sodium hydroxide or potassium hydroxide.
24. Method in accordance with any one of claims 17 to 23, wherein on completion of the neutralisation a pH of greater than 10 is set.
25. Method in accordance with claim 24, wherein a pH of greater than or equal to 11 is set.
26. Method in accordance with any one of claims 17 to 25, wherein an SO_3 /air mixture with 3 to 10 % by weight SO_3 is used.
27. Method in accordance with any one of claims 17 to 26, wherein the alkoxyated fatty alcohol has exclusively propoxy groups.
28. Method in accordance with claim 27, wherein the alkoxyated fatty alcohol has on average 3 to 13 propoxy groups.

29. Method in accordance with claim 27, wherein the alkoxylated fatty alcohol has on average 4 to 10 propoxy groups.
30. Use of the composition in accordance with any one of claims 1 to 16 after
5 dilution and further additions in supporting crude oil extraction.
31. Use of the composition in accordance with any one of claims 1 to 16 in improved oil recovery or tertiary oil recovery, optionally after dilution and optionally with further additions.