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⑤④ **MONOGLYCOSIDES AS VISCOSITY MODIFIERS IN DETERGENTS.**

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Description

Background of the invention

1. Field of the invention

5 This invention deals with liquid detergent products.

2. Description in the art practices

10 In recent years, it has become common for detergent manufacturers to move away from powdered or granular detergent products to liquids. The liquid detergents usually contain a substantial amount of water in the product. Liquid detergent products are considerably easier to manufacture than are granular detergent products. The latter materials require a substantial amount of capital investment for spray-drying towers. Additionally, a consumer preference has emerged for the liquid products due to their more concentrated form. Most liquid detergent products do not contain the inert inorganic material which is required to give spray-dried granules their crisp, non-caking structure. Accordingly, the liquid detergent products are used in much smaller amounts while giving approximately the same level of active ingredients in the wash water.

A second consumer preference is for a product having a desirable viscosity. Products which are water-thin are not desirable. In part, products which are too thin are more likely to be spilled by the consumer when attempting to handle the approximately four-liter bottles in which liquid detergents are commonly packaged. Another advantage of liquid detergent products is that they can be applied directly to a heavily soiled portion of a garment. In such cases, raising the viscosity of a normally thin liquid detergent product allows the detergent to stay on the soiled area longer. A market also exists for shampoo, liquid hand soaps, body soaps, dishwashing liquids, cosmetics and personal care products having a relatively high viscosity.

25 Various methods of thickening liquid detergent products are known in the art. These methods employ cellulosic polymer such as carboxymethylcellulose, guar gums, xanthan, colloidal silicates or clays. The glucoside ester-ether adducts as described in United States Patent 4,450,090 to Kinney issued May 22, 1984 are suggested as thickeners for olefin sulfonates.

The use of short chain alkyl polyglycosides to reduce viscosity in aqueous liquid detergent compositions is taught in European Patent Application No. 0 136 844, published 10.04.85. The particular glycosides taught in this application are those materials containing from 2 to 6 carbon atoms in the alkyl portion and from 1 to 10 saccharide units. United States Patent 3,219,656 issued November 23, 1965 to Boettner teaches the production of alkyl polyglycosides including those glycosides prepared from an oxo-undecyl alcohol, and as compounds, the 2,6,8-trimethyl-4-nonanol glycosides.

35 Renauto in United States Patent 3,721,633 issued March 20, 1973 teaches aqueous built liquid detergent compositions disclosing alkyl polyglycosides and anionic surfactants in combination with inorganic detergent builders. United States Patent 4,077,894 issued March 7, 1978 to Langdon et al describes glycol-based anti-freeze products containing a glycoside for the purpose of foam suppression.

Payne et al in United States Patent 4,396,520 issued August 2, 1983 describes the combination of alkyl polyglycosides and calcium-sensitive anionic surfactants in granular detergent compositions. United States Patent 4,446,042 issued May 1, 1984 to Leslie describes the preparation of detergent products containing nonionic surfactants, cationic surfactants, anionic brighteners and glycosides in heavy-duty liquid detergent compositions.

45 Rau in United States Patent 4,465,828 issued August 14, 1984 describes alkyl saccharides (glycosides) which are stated to have improved color due to the inclusion of a hydroxypolycarboxylic acid. Rau also discloses that the glycosides may be formed from a saccharide and a fatty alcohol containing from 1 to 20 carbon atoms which may be primary or secondary or having a straight or branched chain.

50 European Patent Application No. 0070075 laid open on January 19, 1983 to Cook et al describes alkyl polyglycoside detergent compositions which contain as an anionic cosurfactant an alkyl benzene sulfonate, an alkyl glycerol ether sulfonate, an alpha-olefin sulfonate, an alkyl polyethoxy carboxylate or mixtures of the foregoing. Arnaudis in European Patent Application No. 0077167 published on April 20, 1983 describes a process of manufacturing surface-active glycosides in the presence of reducing acids. The Arnaudis application states that the glycosides may contain branching in the hydrophobic portion and that the alcohol may be primary or secondary.

55 Mao in European Patent Application No. 0092875 published on November 2, 1983 discloses a process for the production of alkyl glycosides involving a wiped-film evaporator. Mao further teaches that the fatty portion of the glycoside may be a primary or secondary alcohol having straight or branched chains which may be either saturated or unsaturated and may contain either linkages as well. Substantially similar teachings to European Patent Application No. 0092875 are also found in United States Patent 4,393,203 issued July 12, 1983 to the same inventor.

60 European Patent Application No. 0096917 (laid open December 12, 1983) to Farris describes the production of glycosides containing from 8 to 25 carbon atoms in the alcohol residue of the glycoside. The alcohol residue may be primary or secondary, straight or branched and obtained from a saturated or unsaturated material. European Patent Application No. 0105556 to Jones et al made public April 18, 1984 describes detergent products containing glycosides, nonionics, and anionics. Canadian Patent 919,424 to

Culver et al issued January 23, 1973 describes alkaline drain cleaning compositions containing phosphate esters, and a glycoside or an anionic surfactant.

To the extent that the references mentioned herein are applicable to the present invention, they are incorporated by reference. Throughout the specification and claims, percentages and ratios are by weight, temperatures in degrees Celsius, and pressures in atmospheres over ambient unless otherwise indicated.

Summary of the invention

This invention describes a liquid detergent comprising:

(a) from 3% to 45% by weight of an anionic surfactant:

(b) from 0.3% to 20% by weight of monoglycoside represented as ROG wherein R is the hydrophobic moiety (fatty organic portion) of the molecule containing from 10 to 24 carbon atoms O is an oxygen, preferably in the 1 position of the saccharide, and G represents the saccharide and

(c) from 30% to 95% by weight of water,

and wherein the content, if any, of glycoside compounds having a degree of polymerization (D.P.) of 2 or more within said composition is such that the average D.P. of all glycoside compounds within said composition is less than 1.4.

Also described is a method of increasing the viscosity of an aqueous liquid detergent composition containing an anionic surfactant by including therein from 0.3% to 20% by weight of an alkyl monoglycoside represented as ROG wherein R is the hydrophobic moiety (fatty organic portion) of the molecule containing from 10 to 24 carbon atoms, O is an oxygen, preferably in the 1 position of the saccharide, and G represents the saccharide, to thicken the aqueous liquid detergent composition and by ensuring that the content, if any, of glycoside compounds having a degree of polymerization (D.P.) of 2 or more within said composition is such that the average D.P. of all glycoside compounds within said composition is less than 1.4.

Detailed description of the invention

The glycosides which have been found useful in increasing the viscosity of aqueous detergent products containing an anionic surfactant are monoglycosides.

The term monoglycoside as used herein includes such substituted monosaccharides as fructosides, glucosides, mannosides, galactosides, talosides, allosides, altrosides, idosides, arabinosides, xylosides, lyxosides, ribosides, and mixtures thereof.

The monoglycosides useful in raising the viscosity of the detergent composition are represented as



wherein R is the hydrophobic moiety (fatty organic portion) of the molecule containing from 10 to 24 carbon atoms, O is an oxygen, preferably in the 1 position of the saccharide, and G represents the saccharide. While more than one R group may be on each saccharide molecule (attached as an ether linkage), the difficulty and expense outweigh the benefit of introducing more than the initial hydrophobic moiety.

It is observed that the benefits of the invention in the order of importance are that the glycoside first be a monoglycoside, and second that the glycoside contain from 10 to 24, and preferably from 12 to 18 carbon atoms in the hydrophobic moiety of the molecule. Preferably a third condition is that the hydrophobic moiety on the monoglycoside be branched either by using a secondary alcohol or by branching within the hydrophobic moiety. A further variable herein is that the branching is desirably multiple branched, e.g. several groups. The oxo alcohols having multiple methyl branching are particularly desirable.

The following is a brief description of the manner of obtaining the monoglycoside utilized herein. The monoglycoside is preferably a glucoside and may be obtained as is described in United States Patent 3,219,656 to Boettner issued November 23, 1965 or the article entitled "Preparation and Properties of Pure Alkyl Glucosides, Maltosides, and Maltotriosides by Koeltzow and Urfer, JAOCS, V. 61, No. 10, p. 1651 (1984). The amount of monoglycoside obtained can be maximized by utilizing an excess of alcohol to promote the acetal formation over the polymerization reaction.

Particular alcohols which may be utilized herein are n-dodecyl, n-tridecyl, n-tetradecyl, n-pentadecyl, n-hexadecyl, n-octadecyl, n-decyl, tetramethyl 1-nonanol, and trimethyl-nonanol. Secondary alcohols which may be used to obtain the monoglycoside include 2-decanol, 2-undecanol, 2-dodecanol and 2-tridecanol.

Additional alcohols which may be employed in forming the monoglycoside include guerbet alcohols such as are described in United States Patent 4,425,458 to Lindner issued January 10, 1984.

The anionic surfactants which are useful herein are alkyl ether sulfates, alkyl benzene sulfonates, alkyl sulfates, olefin sulfonates, paraffin sulfonates and soap (carboxylate). Particularly valuable are those anionic surfactants containing from 10 to 20 carbon atoms in the hydrophobic portion of the molecule. A preferred surfactant group is the alpha-olefin sulfonates. A second preferred surfactant is an alkyl ether sulfate which contains an average of from 1 to 3 ethoxy groups in the molecule. The preferred cation for the anionic surfactants is sodium or potassium or mixtures thereof. Further anionic surfactants which may be employed are those described in United States Patent 4,476,045 to O'Lenick issued October 9, 1984.

Alkoxylated nonionic surfactants are to be minimized as an ingredient in the compositions of this

invention. It has been found that nonionics such as ethoxylated alcohols reduce the viscosity thereby negating the advantages of the monoglycosides described herein. Typically the alkoxylated nonionic should not be present at greater than 10%, preferably less than 5% by weight. It has also been observed that higher glycosides (DP₂ and greater) reduce the viscosity as the DP increases and the hydrophobic moiety decreases. Therefore higher (DP₂ and greater) glycosides are minimized such that the average DP is less than 1.4, preferably less than 1.3.

The amount of glycoside as monoglycoside in the product is preferably from 0.5% to 10%, most preferably from 1% to 5% by weight. The amount of anionic surfactant in the formula is preferably from 5% to 30%, most preferably from 8% to 25% by weight. The level of water in the product is conveniently set at from 35% to 92%, preferably from 40% to 90% by weight. It is also desirable that the amount of monoglycoside as used herein be in a weight ratio to the anionic surfactant of from 4:1 to 1:60, preferably from 2:1 to 1:10.

The ingredients of the present invention may be combined in any convenient manner. A preferred order of addition of the components involves obtaining the monoglycoside in its solid state, and adding thereto a mixture of the anionic surfactant and water. As the anionic surfactant is usually a fairly concentrated material, it is often necessary to add further water to the end mixture to obtain the desired product. As the viscosity will increase substantially as the monoglycoside is added, adequate mixing and pumping capabilities should be utilized to ensure that the product may be efficiently transferred.

Desirably the product herein will have a viscosity of from 50 to 100,000 preferably from 150 to 10,000 mPa · s at 25°C as determined by a Brookfield cone-plate viscometer having a cone angle of 1.57°.

The compositions of the present invention may also include all manner of materials normally found in aqueous liquid detergent products including, compatible hydrotropes, optical brighteners and dyes, perfumes, enzymes and the like. Additional ingredients which may be included in the composition of the present invention include builders such as tripolyphosphate, nitrilotriacetate, pyrophosphate and any of the organic builders as discussed in European Patent Application No. 0150930 published 07.08.85.

The products of the invention when utilized as laundry detergent products are normally employed at from 0.05% to 1% by weight of the active ingredients in the wash water. It is recommended that the laundry be washed at from 37°C to 60°C.

The products herein may also be formulated as liquid dishwashing or hard surface cleaning products in a similar fashion. As dishwashing products are typically of a lower viscosity than is desired for a laundry detergent product, smaller quantities of the monoglycoside may be used. The products described herein are also useful in cosmetics, handcleaners, body soaps, shower gels, shaving creams or gels and hair shampoos. The pH of the products described in the Summary should be from 5 to 8 when diluted on a dry solids basis at 0.1% by weight when no other pH influencing ingredients are present. The products are conveniently adjusted to a pH of from 2.5 to 7.8, preferably 3 to 7.5, most preferably 3 to 7.2 to give maximum thickening. Any convenient buffer or pH adjusting material such as citric acid and its salts may be employed therein.

The following are suggested exemplifications of the present invention.

Example I

Several glycosides are prepared. These glycosides are obtained from substantially pure compounds according to Koeltzow and Urfer, *supra*. These compounds are referenced in the style of R_xDP_y, wherein R indicates the starting alcohol used to prepare the glycoside, x indicates the chain length of the alcohol, and DP indicates that the material is a saccharide having a degree of polymerization as indicated by y, e.g., DP₁ is glucose.

The following glucosides are obtained:

- (a) C₁₀DP₁
- (b) C₁₂DP₁
- (c) C₁₃DP₁
- (d) C₁₃DP₁*
- (e) C₁₅DP₁
- (f) C₁₀DP₂
- (g) C₁₂DP₂
- (h) C₁₂DP₃

* Obtained as a branched chain alcohol described as an isomeric mixture of branched primary aliphatic alcohols containing carbon numbers predominately in the range of C₁₁ through C₁₄ with C₁₃ as the main constituent. The C₁₂ content is approximately 20%. It boils in the approximate range of 250°C to 265°C (482°F to 509°F). The alcohol is typically quite low in C₁₁ content (less than 2%); C₁₄ content is estimated at 4%.

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Example II

A base formulation of an anionic surfactant is prepared containing:

5	Sodium alpha-olefin sulfonate	8% dsb
	Sodium lauroyl sarcosinate	3% dsb
	Ammonium chloride	2% dsb
	Additive—see below	3% dsb
	Water q.s. to 100%	

10 The pH of the base formula is adjusted and maintained from 5 to 5.5 with citric acid.

A series of comparative examples as described below are made by including the additive from Example I into the base formula. The results are shown in Table I.

15	TABLE I	
	Additive	Viscosity mPa · s
	None	4
	3% Cocoamide monoethanolamine	1903
20	3% APG C ₁₀ DP ₁	162
	3% APG C ₁₂ DP ₁	703
	3% APG C ₁₃ DP ₁	926
	3% APG C ₁₃ DP ₁ *	1655
	3% APG C ₁₅ DP ₁	724
25	3% APG C ₁₀ DP ₂	4
	3% APG C ₁₂ DP ₂	8
	3% APG C ₁₂ DP ₃	4

30 The above test uses as a standard cocoamide monoethanolamine which is a commonly accepted viscosity control agent for liquid detergent products. Like all amines the cocoamide monoethanolamine has a slightly objectionable odor. The products of this invention are free of objectionable odors.

Example III

35 A base formula is prepared as indicated in Example II with the exception that the additive is increased to 4% and the water in the formulation is decreased in a corresponding amount. The oxo alcohol product* gives a viscosity measurement of 3049. A control sample utilizes an equal amount of Glucamate DOE-120 which is a methyl glucoside dioleate with 120 moles ethylene oxide. The control gives a viscosity of 835. Glucamate DOE-120 is a Registered Trademark of Amerchol Corporation, Edison N.J. USA.

Example IV

40 Substantially similar results are obtained in Example II when a similar amount of a C₁₄ triethoxysulfate sodium salt is employed. Further, substitution for the olefin sulfonate with a C₁₂ linear alkyl benzene sulfonate potassium salt gives substantially similar results.

Claims

- 45 1. A liquid detergent composition comprising:
- (a) from 3% to 45% by weight of an anionic surfactant;
 - (b) from 0.3% to 20% by weight of monoglycoside represented as ROG wherein R is the hydrophobic moiety (fatty organic portion) of the molecule containing from 10 to 24 carbon atoms, O is an oxygen, preferably in the 1 position of the saccharide, and G represents the saccharide, and
 - 50 (c) from 30% to 95% by weight of water,
- and wherein the content, if any, of glucoside compounds having a degree of polymerization (D.P.) of 2 or more within said composition is such that the average D.P. of all glycoside compounds within said composition is less than 1.4.
- 55 2. A composition of Claim 1 wherein the anionic surfactant is selected from the group consisting of alkyl sulfates, olefin sulfonates, paraffin sulfonates, alkyl benzene sulfonates, alkyl ether sulfates, alkyl carboxylates, and mixtures thereof.
3. The composition of Claim 1 wherein the monoglycoside is a monoglucoside.
4. The composition of Claim 1 further containing a detergent builder.
5. The composition of Claim 4 wherein the detergent builder is a nitrilotriacetate or phosphate salt.
- 60 6. The composition of Claim 1 or Claim 3 wherein the hydrophobic moiety of the monoglycoside is derived from a branched alcohol.

65 * See Note Example I

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7. The composition of Claim 1 additionally containing up to 10% by weight of an alkoxyated nonionic surfactant.

8. The composition of any one of Claims 1, 3 and 6, wherein the hydrophobic moiety is derived from an oxo-alcohol structure.

5 9. The composition of any one of Claims 1 to 8 having a pH of from 5 to 8 when diluted out on a dry solids basis to 0.1% by weight in water.

10. A method of increasing the viscosity of an aqueous liquid detergent composition containing an anionic surfactant by including therein from 0.3% to 20% by weight of an alkyl monoglycoside represented as ROG wherein R is the hydrophobic moiety (fatty organic portion) of the molecule containing from 10 to 24 carbon atoms, O is an oxygen, preferably in the 1 position of the saccharide, and G represents the saccharide, to thicken the aqueous liquid detergent composition and by ensuring that the content, if any, of glycoside compounds having a degree of polymerization (D.P.) of 2 or more within said composition is such that the average D.P. of all glycoside compounds within said composition is less than 1.4.

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Patentansprüche

1. Flüssigwaschmittel enthaltend:

(a) 3 bis 45 Gew.-% eines anionischen Tensids,

20 (b) 0,3 bis 20 Gew.-% eines Monoglykosids der Formel ROG, in der R den hydrophoben Teil des Moleküls (Fettalkylrest) mit 10 bis 24 Kohlenstoffatomen, O ein Sauerstoffatom, vorzugsweise in 1-Stellung des Saccharids, und G das Saccharid bedeuten, und

(c) 30 bis 95 Gew.-% Wasser,

25 und wobei in diesem Mittel der Gehalt an Glykosidverbindungen mit einem Polymerisationsgrad (D.P.) von 2 oder höher so gewählt ist, daß der Durchschnitts-D.P.-Wert aller Glkosidverbindungen weniger als 1,4 beträgt.

2. Mittel nach Anspruch 1, in dem das anionische Tensid aus der Gruppe bestehend aus Alkylsulfaten, Olefinsulfonaten, Paraffinsulfonaten, Alkylbenzolsulfonaten, Alkylethersulfaten, Alkylcarboxylaten und Mischungen davon ausgewählt ist.

30 3. Mittel nach Anspruch 1, in dem das Monoglykosid ein Monoglucosid ist.

4. Mittel nach Anspruch 1, das zusätzlich eine Waschmittel-Buildersubstanz enthält.

5. Mittel nach Anspruch 4, in dem die Waschmittel-Buildersubstanz ein Nitrilotriacetat- oder Phosphat-Salz ist.

35 6. Mittel nach Anspruch 1 oder 3, in dem der hydrophobe Teil des Monoglykosids von einem verzweigten Alkohol abgeleitet ist.

7. Mittel nach Anspruch 1, das zusätzlich bis zu 10 Gew.-% eines alkoxylierten nichtionischen Tensids enthält.

8. Mittel nach einem der Ansprüche 1, 3 and 6, in dem der hydrophobe Teil des Monoglykosids von einer Oxoalkohol-Struktur abgeleitet ist.

40 9. Mittel nach einem der Ansprüche 1 bis 8, das, nach Verdünnung mit Wasser auf einen Gehalt von 0,1 Gew.-%, bezogen auf eine trockene Feststoffbasis, einem pH-Wert von 5 bis 8 aufweist.

10. Verfahren zur Erhöhung der Viskosität eines wäßrigen Flüssigwaschmittels, das ein anionisches Tensid enthält, durch Einarbeiten von 0,3 bis 20 Gew.-% eines Alkylmonoglykosids der Formel ROG, in der R den hydrophoben Teil des Moleküls (Fettalkylrest) mit 10 bis 24 Kohlenstoffatomen, O ein Sauerstoffatom, vorzugsweise in 1-Stellung des Saccharids, und G das Saccharid bedeuten, zum Verdicken des wäßrigen Flüssigwaschmittels, wobei man den Anteil der Glykosidverbindungen mit einem Polymerisationsgrad (D.P.) von 2 oder mehr so einstellt, daß der Durchschnitts-D.P.-Wert aller Glykosidverbindungen weniger als 1,4 beträgt.

50 Revendications

1. Composition détergente liquide contenant:

a) de 3 à 45% en poids d'un tensio-actif anionique,

55 b) de 0,3 à 20% en poids d'un monoglycoside représenté par la formule ROG dans laquelle R est la fraction hydrophobe (partie organique grasse) de la molécule contenant de 10 à 24 atomes de carbone, O est une atome d'oxygène placé, de préférence, en position 1 du saccharide et G représente le saccharide, et,

60 c) de 30 à 95% en poids d'eau et si la composition comporte des composés du type glycosides ayant un degré de polymérisation (DP) au moins égal à deux, leur teneur dans celle-ci est telle que le DP moyen de tous les composés du type glycosides dans la composition, est inférieur à 1,4.

2. Composition selon la revendication 1 dans laquelle le tensio-actif anionique est choisi dans le groupe constitué par les alcoylsulfates, les oléifinsulfonates, les paraffinesulfonates, les alcoylbenzènesulfonates, les alcoyléthersulfates, les alcoylcarboxylates et des mélanges de ceux-ci.

3. Composition selon la revendication 1, dans laquelle le monoglucoside est un monoglucoside.

65 4. Composition selon la revendication 1 contenant en outre un agent de structuration de détergent.

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5. Composition selon la revendication 4 dans laquelle l'agent de structuration de détergent est un sel de nitrilotriacétate ou de phosphate.

6. Composition selon la revendication 1 ou la revendication 3 dans laquelle la fraction hydrophobe du monoglycoside est dérivée d'un alcool ramifié.

5 7. Composition selon la revendication 1 contenant en supplément jusqu'à 10% en poids d'un tensio-actif non ionique alcoxylé.

8. Composition selon l'une des revendications 1, 3 et 6 dans laquelle la fraction hydrophobe est dérivée d'une structure d'alcool-oxo.

9. Composition selon l'une des revendications 1 à 8 ayant un pH variant de 5 à 8 lorsqu'elle est diluée à raison de 0,1% en poids de solide sec.

10 10. Procédé pour augmenter la viscosité d'une composition détergente liquide aqueuse contenant un tensio-actif anionique par lequel on introduit dans celle-ci de 0,3 à 20% en poids d'un monoglycoside alcoylé représenté par la formule ROG dans laquelle R est la fraction hydrophobe (partie organique grasse) de la molécule, qui contient de 10 à 24 atomes de carbone, O est un atome d'oxygène placé de préférence
15 en position 1 du saccharide et G représente le saccharide pour épaissir la composition détergente liquide aqueuse et on fait en sorte que, si la composition comporte des composés du type glycosides ayant un degré de polymérisation (DP) au moins égal à 2, leur teneur dans celle-ci, est telle que le DP moyen de tous les composés du type glycosides dans la composition soit inférieur à 1,4.

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