Antiperspirant or Deodorant Compositions Containing a Silicone Polyether

Title: ANTI-PERSPIRANT OR DEODORANT COMPOSITIONS CONTAINING A SILICONE POLYETHER

Abstract: Translucent roll-on compositions in the form of an oil in water emulsion obtainable by blending an emulsion concentrate comprising a disperse oil phase a low molecular weight siloxane a silicone polyether having the formula where R1 represents an alkyl group containing 1-6 carbon atoms; R2 represents the radical \(-\text{CH}(2)\text{O}(\text{C}2\text{H}4\text{O})_n\text{H}_6\text{O}\) where \(n\) is 0-1000; \(y\) is 2-500; \(z\) is 2-500; \(a\) is 3-6; \(b\) is 4-30; \(c\) is 0-30; and \(R3\) is hydrogen, a methyl radical, or an acyl radical; an anionic surfactant and water the oil phase having an average droplet size of less than 5 micrometers; with an aqueous solution of an antiperspirant or deodorant active containing polyhydric alcohol, the two phases having matched refractive indexes.
ANTIPERSPIRANT OR DEODORANT COMPOSITIONS CONTAINING A SILICONE POLYETHER

The present invention relates to translucent roll-on cosmetic compositions containing an antiperspirant or deodorant and in particular to such compositions in the form of oil in water emulsions. The invention further relates to methods for preparing such compositions, and cosmetic products employing such compositions.

Background to the Invention

Herein, the term cosmetic compositions indicates that such compositions are non-therapeutic.

Translucent roll-on antiperspirant compositions have been marketed for many years, but commonly they have comprised a solution of an antiperspirant or deodorant active in an ethanolic solution. Whilst, the sensation resulting from application of an ethanolic solution to the skin, such as in axila, may be regarded as fresh or invigorating by some people, others consider the sensation as sharp and unpleasant. Accordingly, it is inherently desirable to offer prospective users of a translucent antiperspirant or deodorant, an alternative composition that does not rely upon alcoholic solutions, by which usually is meant solution in monohydric alcohols and in particular ethanolic solutions.
Antiperspirant or deodorant compositions in the form of emulsions are also employed. These are conventionally made by blending a water-immiscible oil or mixture of oils with an aqueous solution of the antiperspirant or deodorant active in the presence of sufficient emulsifier or mixture of emulsifiers to form a dispersion. Although the dispersion can be made each time by the user prior to axillary application, for example by shaking the dispenser containing the composition, this is inconvenient for a user and may easily dissuade him from purchasing the product again, and especially if there is a more convenient alternative. Emulsions can be made that are sufficiently stable for the user not to have to shake the dispenser every time, but this often requires considerable skill in selecting the appropriate balance of individual constituents and the difficulty is not lessened by simultaneously seeking to produce a translucent roll-on composition for aesthetic reasons. The choice of emulsifiers is critical to match them to the particular constituents which the producer wishes to employ, and notably the oil constituents to form an effective interface between the oil and aqueous liquids and thereby enable droplets to be formed that do not coalesce.

It would be particularly desirable to produce antiperspirant emulsions using volatile silicones in an antiperspirant composition by virtue of their aesthetic properties. However in order to produce stable emulsions, as indicated above, the choice of emulsifying system is crucial.
It is an object of the present invention to form an antiperspirant or deodorant emulsion that not only employs a low molecular weight polysiloxane in the oil phase but with an emulsifying system that enables the emulsion to be rendered translucent.

It is a further object of the present invention in at least some embodiments to obtain antiperspirant or deodorant emulsion by dilution of a stable emulsion concentrate containing a low molecular weight polysiloxane

Summary of the Invention

According to a first aspect of the present invention, there is provided a translucent antiperspirant or deodorant composition as described in claim 1 hereinafter.

The choice of the identified emulsifier system comprising certain silicone polyethers together with an anionic surfactant enables a stable dispersion of an oil phase containing at least 50 weight percent of a low molecular weight polysiloxane to be made and thereby allow a polyhydric alcohol to adjust the refractive index of the aqueous phase containing an antiperspirant or deodorant active to render the entire composition translucent and capable of being applied using a roll-on dispenser. The oil in water emulsions are stabilized by the combination of a silicone polyether and an anionic surfactant. The oil in water emulsions concentrates and subsequently diluted
antiperspirant or deodorant emulsions obtainable therefrom are stable with time.

Moreover, the system employed herein enables the preparation of the antiperspirant or deodorant composition to be carried out via the formation of a stable intermediate, a dilutable emulsion concentrate that is made without the antiperspirant or deodorant active and the refractive index adjuster.

The present invention also relates to a method of making a translucent oil in water antiperspirant or deodorant roll-on emulsion comprising the steps of:
I) forming an emulsion concentrate by
   Ia) mixing;
   A) a low molecular weight siloxane, and
   B) a silicone polyether having the formula

\[
\begin{align*}
R_1 & \quad \left[ \begin{array}{c} R_1 \\ R_2 \end{array} \right] \quad \left[ \begin{array}{c} R_1 \\ R_2 \end{array} \right] \quad \left[ \begin{array}{c} R_1 \\ R_2 \end{array} \right] \quad \left[ \begin{array}{c} R_1 \\ R_2 \end{array} \right] \\
\quad & \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \Quad
x is 20-1,000; y is 2-500; z is 2-500; a is 3-6; b is 4-30; c is 0-30; and R3 is hydrogen, a methyl radical, or an acyl radical; to form an oil phase wherein the oil phase contains at least 50% by weight of the low molecular weight siloxane, and

Ib) adding the oil phase to an aqueous phase comprising;

C) an anionic surfactant, and

D) water,

II) mixing from 30 to 50 parts by weight of the emulsion concentrate obtained in step 1 with an aqueous solution of an antiperspirant or deodorant, optionally containing a polyhydric alcohol and

III) introducing sufficient polyhydric alcohol into the mixture of step 2 to match the refractive indexes of oil and aqueous phases, the total of antiperspirant or deodorant solution and polyhydric alcohol being from 50 to 70 parts by weight of the resultant formulation.

Detailed Description of the Invention

In the present invention, translucent roll-on compositions are obtainable by combination of an emulsion concentrate, an aqueous solution of an antiperspirant or deodorant and a polyhydric alcohol that adjusts the refractive index of the
aqueous phase, enabling it to be matched with the dispersed oil phase.

In a number of desirable embodiments, the resultant antiperspirant or deodorant compositions comprise from 5 to 11% by weight of the oil phase, from 2 to 4% by weight of the silicone polyether, from 0.1 to 0.2% by weight of the anionic surfactant, from 15 to 25% by weight of the polyhydric alcohol and from 60 to 78% of the aqueous solution of the antiperspirant or deodorant component (A) in the present invention is an oil phase containing at least 50% of a low molecular weight siloxane. As used herein, the phrase low molecular weight siloxane is intended to mean and to include polysiloxanes having the general formula \( R_1 SiO(4-i)/2 \) in which \( i \) has an average value of one to three, and having a molecular weight \( (M_w) \) of less than 1000, \( R \) is any monovalent organic group, but typically \( R \) is a methyl group. Alternatively, the structures of the low molecular weight siloxanes can be represented by monofunctional "M" units \((CH_3)_3SiO_{1/2}\) , difunctional "D" units \((CH_3)_2SiO_{2/3}\) , trifunctional "T" units, and tetrafunctional "Q" units \(SiO_{4/2}\). The phrase "low molecular weight siloxane" is intended to mean and to include (i) low molecular weight linear and cyclic volatile methyl siloxanes, (ii) low molecular weight functional linear and cyclic siloxanes. Most preferred, however, are the low molecular weight linear and cyclic volatile methyl siloxanes (VMS). Volatile methyl siloxanes conforming to the CTFA
definition of cyclomethicones are also considered to be within the definition of low molecular weight siloxane.

Linear VMS have the formula \((\text{CH}_3)_3\text{SiO}\{(\text{CH}_3)_2\text{SiO}\}_f\text{Si}(\text{CH}_3)_3\). The value of \(f\) is 0-7. Cyclic VMS have the formula \((\text{CH}_3)_2\text{SiO})_g\). The value of \(g\) is 3-6. Preferably, these volatile methyl siloxanes have a molecular weight of less than about 1,000; a boiling point less than about 250 °C; and a viscosity of about 0.65 to about 5.0 centistoke (mm²/s), generally not greater than 5.0 centistokes (mm²/s).

Low molecular weight functional polysiloxanes can also be employed, and are represented by the formula \(R_3\text{SiO}(RQSio)_{f}SiR_3\) or the formula \((RQSio)_{g}\) where \(Q\) is a functional group. Examples of such functional polysiloxanes are acrylamide functional siloxane fluids, acrylate functional siloxane fluids, amide functional siloxane fluids, amino functional siloxane fluids, carbinol functional siloxane fluids, carboxy functional siloxane fluids, chloroalkyl functional siloxane fluids, epoxy functional siloxane fluids, glycol functional siloxane fluids, ketal functional siloxane fluids, mercapto functional siloxane fluids, methyl ester functional siloxane fluids, perfluoro functional siloxane fluids, silanol functional siloxanes, and vinyl functional siloxane fluids. Again, the values of \(f\) and \(g\), and the functional group \(Q\), are selected to provide functional polysiloxanes with a viscosity generally not greater than about 5 centistoke (mm²/s), and a molecular weight of less than about 1,000.
Provided that at least 50 weight percent of the oil phase contains a low molecular weight siloxane, alternatively 60 weight percent of a low molecular weight siloxane alternatively 70 weight percent of a low molecular weight siloxane, or alternatively 80 weight percent, the oil phase may contain other components that are dispersible in the selected low molecular weight siloxane. These other oil phase components can be selected from any silicone oil, hydrocarbon oil, or other oil such as emollient oil, or personal care additive that is substantially soluble in or miscible with the low molecular weight siloxane, and conversely, is substantially insoluble in water. Thus, other typical oil phase components can include hydrocarbon oils, emollients, fragrances, and personal care organic actives such as vitamins. Typically, when the other oil phase component is primarily an ester oil such as a vegetable oil, it is preferred that at least 50 weight percent of the oil phase contain a low molecular weight siloxane.

Emulsion concentrates that are employable in the present invention contain 20 to 80, alternatively 20 to 60, or in some embodiments 20 to 40 weight % of the oil phase, component (A).

In the translucent antiperspirant or deodorant compositions herein, the oil phase commonly constitutes from 6 to 11% by weight, alternatively from 6 to 9.5% and in a number of convenient embodiments from 6 to 8%.
Component (B) is a silicone polyether having the structure represented by:

\[
\begin{align*}
R_1 & \quad \text{Si-O} \quad \text{Si-O} \quad \text{Si-R} \quad \text{R} \quad \text{Si-O} \quad \text{Si-R} \\
R_1 & \quad \text{Si-O} \quad \text{Si-O} \quad \text{Si-R} \quad \text{R} \quad \text{Si-O} \quad \text{Si-R} \\
R_1 & \quad \text{Si-O} \quad \text{Si-O} \quad \text{Si-R} \quad \text{R} \quad \text{Si-O} \quad \text{Si-R}
\end{align*}
\]

or

\[
\begin{align*}
R_1 & \quad \text{Si-O} \quad \text{Si-O} \quad \text{Si-R} \quad \text{R} \quad \text{Si-O} \quad \text{Si-R} \\
R_1 & \quad \text{Si-O} \quad \text{Si-O} \quad \text{Si-R} \quad \text{R} \quad \text{Si-O} \quad \text{Si-R} \\
R_1 & \quad \text{Si-O} \quad \text{Si-O} \quad \text{Si-R} \quad \text{R} \quad \text{Si-O} \quad \text{Si-R}
\end{align*}
\]

A cyclic polyether of the type shown below can also be used.

\[
\begin{align*}
\begin{bmatrix}
\text{CH}_3 \\
\text{CH}_3
\end{bmatrix}
\quad \text{Si-O} \\
\begin{bmatrix}
\text{CH}_3 \\
\text{CH}_3
\end{bmatrix}
\end{align*}
\]

In these structures, R1 represents an alkyl group containing 1-6 carbon atoms such as methyl, ethyl, propyl, butyl, pentyl, and hexyl; R2 represents the radical (CH₂)ₐO(C₂H₄O)ₐR₃; x has a value of 20-1,000, alternatively 20-200, or alternatively 20-50; y has a value of 2-500, alternatively 2-50, or alternatively 2-10, z has a value of 2-500, alternatively 2-50, or alternatively 2-10; m has a value of 3-5; n is one; a has a value of 3-6; b has a value of 4-30; c has a value of 0-30; and R₃ is hydrogen, a methyl radical, or an acyl radical such as acetyl. Preferably, R₁ is methyl; b is 6-25; c is zero; and R₃ is hydrogen.
Typically, the silicone polyether is chosen such that the ratio of x/y or x/z, as described in the structures above, ranges from 2:1 to 50:1, alternatively from 5:1 to 20:1, or alternatively from 10:1 to 12:1.

The silicone polyether can be prepared by any of the techniques known in the art, and many are commercially available.

Emulsion concentrates employable in the present invention desirably contain 2 to 20, alternatively 2 to 15, or in some embodiments 5 to 10 weight % of the silicone polyether, component (B). The antiperspirant or deodorant compositions herein usually contain from 0.65 to 10%, commonly up to 7.5%, in a number of embodiments at least 1.5% and in the same or other embodiments up to 3.5% by weight of the silicone polyether component (B).

Component (C) is an anionic surfactant. Any anionic surfactant known in the art to stabilize oil in water emulsions can be selected as component (C). Examples of suitable anionic surfactants include alkali metal sulforicinates, sulfonated glyceryl esters of fatty acids such as sulfonated monoglycerides of coconut oil acids, salts of sulfonated monovalent alcohol esters such as sodium oleylisothianate, amides of amino sulfoic acids such as the sodium salt of oleyl methyl tauride, sulfonated products of fatty acids nitriles such as palmitonitrile sulfonate, sulfonated aromatic hydrocarbons such as sodium alpha-naphthalene monosulfonate, condensation products of naphthalene sulfonic acids with formaldehyde, sodium
octahydroanthracene sulfonate, alkali metal alkyl sulfates such as sodium lauryl sulfate, ammonium lauryl sulfate or triethanol amine lauryl sulfate, ether sulfates having alkyl groups of 8 or more carbon atoms such as sodium lauryl ether sulfate, ammonium lauryl ether sulfate, sodium alkyl aryl ether sulfates, and ammonium alkyl aryl ether sulfates, alkylarylsulfonates having 1 or more alkyl groups of 8 or more carbon atoms, alkylbenzenesulfonic acid alkali metal salts exemplified by hexylbenzenesulfonic acid sodium salt, octylbenzenesulfonic acid sodium salt, decylbenzenesulfonic acid sodium salt, dodecylbenzenesulfonic acid sodium salt, cetylbenzenesulfonic acid sodium salt, and myristylbenzenesulfonic acid sodium salt, sulfuric esters of polyoxyethylene alkyl ether including

CH₃(CH₂)₆CH₂O(C₂H₄O)₂SO₃H, CH₃(CH₂)₇CH₂O(C₂H₄O)₃.₅SO₃H,
CH₃(CH₂)₈CH₂O(C₂H₄O)₆SO₃H, CH₃(CH₂)₉CH₂O(C₂H₄O)₇SO₃H, and
CH₃(CH₂)₁₀CH₂O(C₂H₄O)₆SO₃H, sodium salts, potassium salts, and amine salts of alkylnaphthylsulfonic acid.

Alternatively, the anionic surfactant is selected from a sulfate of ethoxylated alcohols. Sulfates of ethoxylated alcohols are well known in the art and many are sold commercially under numerous trade names such as ALFONINIC, NECODOL, STANDAPOL ES, STEOL, SULFOTEX, TEXAPON, WICOLATE.

Alternatively, the anionic surfactant is STANDAPOL ES or EMPICOL ESB-3.

Emulsion concentrates employable in producing the present invention contain 0.1 to 2, alternatively 0.1 to 1, or in some embodiments 0.2 to 0.5 weight % of the anionic
surfactant, component (C). The antiperspirant or deodorant compositions herein desirably contain from 0.03 to 1%, often up to 0.5%, in some embodiments at least 0.06% and in the same or other embodiments up to 0.25% by weight of the composition.

Preferably, the oil in water emulsion compositions contain concentrations of the silicone polyether and the anionic surfactant such that the weight ratio of the silicone polyether to anionic surfactant is 5:1 to 60:1, in many instances is at least 10:1. Said weight ratio in a number of embodiments is up to 40:1, and conveniently up to 30:1.

The antiperspirant or deodorant compositions herein contain one or more antiperspirant or deodorant actives.

The composition preferably contains an antiperspirant active and more preferably in an amount of from 0.5-60%, particularly from 5 to 30% or 40% and especially from 5 or 10% to 30 or 35% of the weight of the composition. In some desirable embodiments the compositions contain from 10 to 20% by weight antiperspirant active.

Antiperspirant actives for use herein are often selected from astringent active salts, including in particular aluminium, zirconium and mixed aluminium/zirconium salts, including both inorganic salts, salts with organic anions and complexes. Preferred astringent salts include aluminium, zirconium and aluminium/zirconium halides and halohydrate salts, such as chlorohydrates and complexes thereof. Complexes with chlorohydrates are commonly
referred to as chlorhydrrex, for example when in association with glycol. Activated aluminium chlorhydrates can be incorporated, if desired, the term activated herein indicating that the antiperspirant actives comprise a higher proportion of more active species resulting in increased efficacy, such as an enhanced Band 3 proportion. Activated aluminium-containing actives are often obtained by preparation in dilute solutions and controlled ageing/drying at elevated temperatures to promote the formation of the more active species.

Aluminium halohydrates are usually defined by the general formula \( \text{Al}_2(\text{OH})_xQ_y\cdot\text{H}_2\text{O} \) in which \( Q \) represents chlorine, bromine or iodine, \( x \) is variable from 2 to 5 and \( x + y = 6 \) while \( \text{H}_2\text{O} \) represents a variable amount of hydration.

Zirconium actives can usually be represented by the empirical general formula: \( \text{ZrO(OH)}_{2n-2z}\cdot\text{B}_2\cdot\text{H}_2\text{O} \) in which \( z \) is a variable in the range of from 0.9 to 2.0 so that the value \( 2n-2z \) is zero or positive, \( n \) is the valency of \( B \), and \( B \) is selected from the group consisting of chloride, other halide, sulphamate, sulphate and mixtures thereof. Possible hydration to a variable extent is represented by \( \text{H}_2\text{O} \). Preferable is that \( B \) represents chloride and the variable \( z \) lies in the range from 1.5 to 1.87. In practice, such zirconium salts are usually not employed by themselves, but as a component of a combined aluminium and zirconium-based antiperspirant.

The above aluminium and zirconium salts may have co-
ordinated and/or bound water in various quantities and/or may be present as polymeric species, mixtures or complexes.
In particular, zirconium hydroxy salts often represent a range of salts having various amounts of the hydroxy group. Zirconium aluminium chlorohydrate may be particularly preferred.

Antiperspirant complexes based on the above-mentioned astringent aluminium and/or zirconium salts can be employed. The complex often employs a compound with a carboxylate group, and advantageously this is an amino acid. Examples of suitable amino acids include dl-tryptophan, dl-\(\beta\)-phenylalanine, dl-valine, dl-methionine and \(\beta\)-alanine, and preferably glycine which has the formula \(\text{CH}_2(\text{NH}_2)\text{COOH}\).

It is highly desirable to employ complexes of a combination of aluminium halohydrates and zirconium chlorohydrates together with amino acids such as glycine, which are disclosed in US-A-3792068 (Luedders et al). Certain of those Al/Zr complexes are commonly called ZAG in the literature. ZAG actives generally contain aluminium, zirconium and chloride with an Al/Zr ratio in a range from 2 to 10, especially 2 to 6, an Al/Cl ratio from 2.1 to 0.9 and a variable amount of glycine. Actives of this preferred type are available from Westwood, from Summit and from Reheis.

Other actives which may be utilised include astringent titanium salts, for example those described in GB 2299506A.

Herein in calculating the weight of the active antiperspirant salt, any water of hydration is ignored.
The antiperspirant active will often provide from 3 to 60% by weight of the aqueous phase, particularly at least 10% and in many instances at least 20% by weight of that phase.

Deodorant Actives

Suitable deodorant actives can comprise deodorant effective concentrations of antiperspirant metal salts, deoperfumes, and/or microbicides, including particularly bactericides, such as chlorinated aromatics, including biguanide derivatives, of which materials known as Irgasan DP300™ (triclosan), Tricloban™, and Chlorhexidine warrant specific mention. A yet another class warranting express disclosure comprises bis-biguanide salts such as are available under the trade mark Cosmocil™. For aqueous solution, a halide salt such as especially a chloride of the biguanides is particularly suitable. Deodorant actives are commonly employed at a concentration of from 0.1 to 25% by weight of the composition and in a number of embodiments at least 0.2 % by weight of the aqueous phase.

In order to attain translucency herein, the refractive indexes of the oil and aqueous phases are matched. In general, the closer the matching, the better will be the clarity of the resultant composition. It is desirable to match within 0.003 refractive index units, the refractive index [RI] of the phases or the component constituents thereof herein being taken at 22°C, unless otherwise stated. It is preferable to seek to match the RI of the phases to within 0.002 and even better within 0.001 RI units.
The RI of the aqueous phase is adjusted by incorporation of a polyhydric alcohol. The polyhydric alcohol is commonly selected from dihydric alcohols, often called glycols and oligomers thereof, and trihydric alcohols. It is particularly convenient to employ 1,3 or 1,2 propylene glycol, or di or tripropylene glycol or glycerol. Mixtures of two or more of such alcohols can be employed.

Whether the liquid compositions produced in the instant invention are translucent can be ascertained by eye. This is an appropriate test because the judgement of the eventual consumer will also be by eye. However, where it is desired to measure translucency quantitatively, this can be achieved by placing a sample of standardised thickness in the light path of a spectrophotometer and measuring light transmittance, as a percentage of light transmitted in the absence of the sample.

Testing be carried out conveniently using a dual-beam spectrophotometer eg a Perkin Elmer Lambda 40™ or a Mettler RE40™. The sample of composition is poured into a cuvette (often 4.5ml) made of poly(methyl-methacrylate) (PMMA). Such a cuvette gives a 1 cm thickness of composition. Measurement is carried out at 580 nm, with an identical but empty cuvette in the reference beam of the spectrophotometer. A transmittance measured at any temperature in the range from 20-25°C is usually adequately accurate, but measurement is made at 22°C if more precision is required. If a composition has a light transmittance of at least 1% at 22°C when measured in the above apparatus, it can be considered translucent. Compositions having a much
higher light transmittance under the same conditions can be regarded as transparent.

The amount of the polyhydric alcohol that is employed herein depends on the refractive index of the oil phase, the concentration and nature of antiperspirant or deodorant active within the aqueous phase and the particular polyhydric alcohol or mixture employed. The polyhydric alcohol concentration in the composition is often selected within the range of from 15 to 25% by weight.

The antiperspirant or deodorant compositions herein can be made by any method that is known for making oil in water emulsions.

In one particularly convenient method, the method of manufacture comprises an intermediate step in which an emulsion concentrate is made by mixing together constituents \( \text{(A)}, \text{(B)}, \text{(C)} \) and \( \text{(D)} \) as mentioned herein before, typically using high shear mixing techniques such as milling, blending, homogenizing or shear stirring or employing a Sonolator\textsuperscript{TM} mixer. These mixing procedures can be conducted either in a batch or continuous process and conveniently at ambient temperature.

Such emulsion concentrates comprise an oil phase, component \( \text{(A)} \), dispersed in a water continuous phase. The oil phase is stabilized in the emulsion by the combination of the silicone polyether, \( \text{(B)} \), and anionic surfactant, \( \text{(C)} \). The oil phase is thus dispersed in the water continuous phase as discrete oil phase particles. Typically, the oil phase
droplets have an average droplet size that is less than 5 micrometers, alternatively less than 1 micrometers, or alternatively less than 0.5 micrometers. "Average droplet size" is employed in the accepted meaning in the emulsion art, and can be determined for example using a particle size analyzer such as a Nanotrac 150™.

Advantageously, formation of a stable intermediate emulsion concentrate enables the emulsion to be formed having a small droplet size in the absence of any antiperspirant or deodorant active. The intermediate when made can be diluted straightaway to form the antiperspirant or deodorant composition, or can be stored before use, or made in one location and the antiperspirant composition made in another.

The subsequent steps in making the antiperspirant or deodorant compositions comprise the incorporation of an antiperspirant or deodorant active. Preferably, the antiperspirant active is pre-dissolved in water before it is mixed with the emulsion concentrate. This can be achieved by dissolving a particulate antiperspirant active in water or more conveniently by employing a supplied aqueous solution, optionally diluted.

The polyhydric alcohol is conveniently mixed with the emulsion formed from the concentrate and the antiperspirant solution, though a fraction of the polyhydric alcohol can be incorporated in the antiperspirant or deodorant solution before it is mixed with the intermediate concentrate.
The refractive index of a single phase can be determined by measuring the refractive index of individual components and then calculating the weight average of them. Such calculations can be used to obtain an estimate of the proportion of polyhydric alcohol needed for RI matching. Alternatively, in a preliminary test, a preformed mixture of concentrate and antiperspirant or deodorant solution can be mixed with an increasing proportion of polyhydric alcohol until a translucent composition is observed. Thereafter, the calculated or predetermined proportions of polyhydric alcohol can be employed on a production scale. It can be more convenient, though to employ slightly less that the calculated or pre-determined proportion of such polyhydric alcohol initially eg 95 to 99% and thereafter gradually augment its concentration until translucency is achieved.

Data-sheets for commercially available oils or commonly include the refractive index, and where not included, it can be measured conveniently using commercially available refractometers, such as an RFM 340™ Refractometer available from Bellingham and Stanley Ltd. Refractive index matching is made herein at or for 22°C unless otherwise expressly stated.

Steps 2 and 3 herein can be carried out at ambient temperature. This is advantageous since it avoids the capital and processing costs associated when the emulsion is formed or converted at an elevated temperature.

The invention antiperspirant or deodorant compositions can be dispensed from roll-on bottles. Conventionally, roll-on
bottles comprise a reservoir having an outlet aperture that forms a housing within which a ball or roller can rotate, the ball or roller being dimensioned so as to define with the housing a narrow passageway through which the composition can be carried out of the reservoir on the skin-contactable surface of the ball or roller. The ball and housing is normally covered by a removable cap. The cap or the reservoir at a position opposed to the outlet can define a planar surface that is large enough to permit the dispenser to be stood up, in respectively an invert or upright orientation.

It is especially suitable if the reservoir comprises a translucent or transparent wall, or at least a window therein that permits a user to recognise that its contents are also translucent or transparent. It is particularly desirable if opposed walls of the reservoir are translucent or transparent, thereby enabling a user to look though the bottle and its contents.

Having summarised the present invention and provided a detailed description thereof, the invention will be further illustrated by particular embodiments hereinafter by way of example only.

Examples

All parts and percentages in the Examples are on a weight basis. All processing and all measurements were carried at
laboratory ambient temperature, about 23°C, unless indicated to the contrary.

Materials

The silicone polyether used in the examples was as follows: -
SPE 1 = a silicone polyether composition containing > 90 wt % of a silicone polyether having the average formula of MD22DO2M, where M, D, and DO represent the (CH3)3SiO1/2 , (CH3)2SiO , and (CH3)HSiO siloxyl units respectively, and 
R = -CH2CH2CH2O(CH2CH2O)12H. The silicone polyether composition results from the platinum catalyzed hydrosilylation reaction of MD22D2H M (where D2H 
represents the (CH3)HSiO siloxyl unit) with a slight molar excess of H2C=CHCH2O(CH2CH2O)12H, according to known procedures, such as those taught in US Patent No. 4,147,847.

Preparation of emulsion concentrates

Concentrate 1

Premix A: Dow Corning® 245 Fluid (8g, a low molecular weight polysiloxane, mainly D5 cyclomethicone) and SPE 1 (3.4g)

were mixed in a small beaker.

Premix B: deionized water (28.46g) and Standapol ES-3 (0.14g, sodium lauryl ether sulfate) were combined and mixed in a cream jar.

The contents of premix A were poured into premix B. The mixture was sonicated with a sonic probe in pulsed mode for
2 minutes. The resulting emulsion had a particle size of 239 nanometers. The particle size of this emulsion did not change after 20 days storage at 50°C. When 0.5 g of this emulsion was diluted into 10 g water, the particle size of the resulting emulsion did not change after 7 days at room temperature.

Concentrate 2

Premix A: Dow Corning® 245 Fluid (248g) and SPE 1 (62g) were mixed in a beaker.
Premix B: deionized water (185g) and SLES (3.73g) were combined and mixed in another beaker.
The contents of premix A were poured slowly into premix B with continuous mixing using a laboratory mixer agitating at 1350 RPM. The resultant mixture was agitated at 1350 RPM for an additional 30 minutes at room temperature. The mixture was further treated with a Silverson high shear mixer for 2-3 minutes.

Concentrate 3

In this preparation the procedure and quantities of Concentrate 2 were employed, save for replacing Dow Corning® 100cst 200 Fluid with the same weight of Dow Corning® 556 Fluid (phenyltrimethicone). Likewise, a stable emulsion was obtained.
Example 1

In this Example, a translucent antiperspirant composition also exhibiting deodorancy was made as follows:-

The emulsion concentrate made in Preparation 1 (33.3 was mixed) with an aqueous solution of an aluminium chlorohydrate solution, (50g, -50% w/w in water, abbreviated to ACH solution) by simple mixing in a at laboratory ambient temperature. Then, 1,2-propylene glycol was gradually mixed in with the emulsion until the composition became translucent by eye, (16.6g), with very vigorous still using a standard pad stirrer.

In the Examples the translucency of the resultant emulsion was confirmed by measuring light transmittance at a temperature between 20 and 25°C using a Mettler RE40™ spectrophotometer.

Example 2

Using the same method as for Example 1, concentrate 2 (41.1g) was mixed with a further sample of the same ACH solution (41.4g, of 50% w/w in water). Into this emulsion, and with vigorous stirring, very slowly 17.5% of propylene glycol was introduced, to a total amount of 17.5g by when the composition had become translucent by eye.

Example 3

Using the same method as for Example 1, concentrate 3 (30.5g) was mixed with a further sample of the same ACH
solution (46.3g). Into this emulsion, and with vigorous stirring, propylene glycol was introduced very slowly, to a total amount of 23.2g by when the composition had become translucent by eye.

The translucent emulsions produced in the Examples were stable over extended periods of storage at ambient temperature.
Claims

1. A translucent antiperspirant or deodorant roll-on composition in the form of an oil in water emulsion obtainable by blending:
   i) 30 to 50 weight % of an emulsion concentrate comprising
      A) 20 to 80 weight % of an oil phase containing at least 50 weight % of a low molecular weight siloxane;
      B) a silicone polyether having the formula:

\[ \text{R}_1 - \text{Si} - \text{O} - \text{Si} - \text{O} - \text{Si} - \text{R}_1 \]

or

\[ \text{R}_1 - \text{Si} - \text{O} - \text{Si} - \text{O} - \text{Si} - \text{R}_1 \]

where \( \text{R}_1 \) represents an alkyl group containing 1-6 carbon atoms;

\( \text{R}_2 \) represents the radical \(-(\text{CH}_2)_a\text{O}(\text{C}_2\text{H}_4\text{O})_b(\text{C}_3\text{H}_6\text{O})_c\text{R}_3\);

\( x \) is 20-1,000; \( y \) is 2-500; \( z \) is 2-500; \( a \) is 3-6; \( b \) is 4-30; \( c \) is 0-30; and \( \text{R}_3 \) is hydrogen, a methyl radical, or an acyl radical;

C) an anionic surfactant; and

D) water in a sufficient amount such that the sum of the weight percents of A), B), C), and D) equals 100 weight percent,
in which the oil phase is dispersed in the emulsion as droplets having an average size of less than 5 micrometers;
ii) 50 to 70% by weight of an aqueous solution of an antiperspirant or deodorant active containing sufficient polyhydric alcohol to match the refractive indexes of the aqueous solution and oil phase of the antiperspirant or deodorant emulsion.

2. A composition according to claim 1 in which the emulsion concentrate comprises;
20 - 80 weight % A) oil phase,
2- 20 weight % B) silicone polyether,
0.1 - 2 weight % C) anionic surfactant,
a sufficient amount of D) water such that the sum of the weight percents of A), B), C), and D) equals 100 weight percent.

3. A composition according to claim 1 or claim 2 in which the low molecular weight siloxane in the emulsion concentrate is selected from the group of hexamethyldisiloxane, octamethyltrisiloxane, decamethyltetrasiloxane, dodecamethylpentasiloxane, tetradecamethylhexasiloxane,
hexadecamethylheptasiloxane, hexamethylcyclotrisiloxane, octamethylcyclotetrasiloxane, decamethylcyclopentasiloxane, dodecamethylcyclohexasiloxane, and mixtures thereof.
4. A composition according to any preceding claim in which the oil phase further comprises a silicone oil, hydrocarbon oil, or natural oil.

5. A composition according to any preceding claim in which the ratio \( x/y \) or \( x/z \) of the silicone polyether ranges from 2:1 to 50:1.

6. A composition according to any preceding claim in which the anionic surfactant is a sulfate of an ethoxylated alcohol.

7. A composition according to any preceding claim containing from 10 to 26% antiperspirant.

8. A composition according to claim 7 containing from 15 to 22.5% antiperspirant.

9. A composition according to any preceding claim employing from 40 to 50% by weight of an antiperspirant solution

10. A composition according to any preceding claim in which the polyhydric alcohol is a low molecular weight dihydric alcohol or oligomer thereof or a low molecular weight trihydric alcohol.

11. A composition according to claim 10 in which the polyhydric alcohol is propylene glycol, dipropylene glycol or glycerol or a mixture or two or more thereof.
12. A composition according to any preceding claim containing from 15 to 25% by weight of the polyhydric alcohol.

13. A composition according to any preceding claim comprising from 5 to 11% by weight of the oil phase, from 2 to 4% by weight of the silicone polyether, from 0.1 to 0.2% by weight of the anionic surfactant, from 15 to 25% by weight of the polyhydric alcohol and from 60 to 78% of the aqueous solution of the antiperspirant or deodorant.

14. A method preparing an translucent antiperspirant or deodorant roll-on composition comprising the steps of blending from 30 to 50 parts by weight of an emulsion concentrate in accordance with claim 1 with 40 to 50 parts by weight of an aqueous solution of an antiperspirant or deodorant and an amount of a polyhydric alcohol selected within the range of 15 to 25 parts by weight that is sufficient to match the refractive indexes of oil and water phases.

15. A composition made in accordance with claim 14.

16. An antiperspirant or deodorant product comprising a composition according to any one of claims 1 to 13 or 15 contained within a dispenser fitted with a roll-on applicator.

17. A product according to claim 16 in which the dispenser has a transparent or translucent wall or window therein.
18. A product according to claim 17 in which the dispenser has opposed transparent or translucent walls or windows.
INTERNATIONAL SEARCH REPORT

According to International Patent Classification (IPC) or to both national classification and IPC.

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61K 7/32

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A61K C11D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<tr>
<th>Category</th>
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Further documents are listed in the continuation of box C.

Patent family members are listed in an annex.

Special categories of cited documents:
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