otherwise identical substituted and unsubstituted dimethicones and dimethiconols are generally interchangeable ingredients in the lubricant compositions of the present invention.

The present substantially clear or translucent, stable, silicone-in-water emulsions lubricants can be produced using silicone lubricant(s), for example, a silicone lubricant as noted above, in combination with one or more (for example, two or more) non-ionic surfactants. Such surfactants may comprise, without limitation, ethoxylated fatty alcohol surfactant emulsifiers. These ingredients are preferably mixed to create a water-in-silicone emulsion, then the emulsion is inverted to a silicone-in-water emulsion using phase inversion processing techniques to reduce the droplet/particle size of the emulsion's silicone phase, thereby reducing viscosity as desired.

In the present invention, the average diameter of the aqueous phase-dispersed silicone droplets is less than about 1 micrometers (µm) and greater than about 99 nm; such as less than 999 nm, or less than about 600 nm, or less than about 500 nm, or less than about 400 nm, and greater than 99 nm. In preferred examples the droplet size is between about 200 nm and about 400 nm, or about 300 nm.

Applicants have found that average droplet sizes in this range cause a reduction in the viscosity of the emulsion as compared to otherwise identical emulsions having a larger average droplet size, while at the same time requiring less surfactant and/or rheology modifier to form a stable emulsion than is the case in a microemulsion, in which the average droplet size is less than about 99 nm. Lower surfactant

CLAIMS

What is claimed is:

1. A method of making a low-viscosity, substantially clear or translucent lubricant composition comprising:

a) slowly adding water with gentle mixing to a silicone lubricant, at least one non-ionic surfactant component, and a hydrophilic rheology modifier to form a viscous water-in-silicone emulsion;

b) combining water and a glycol with the viscous water-in-silicone emulsion with mixing for a sufficient time to invert the viscous water-in-silicone emulsion to a silicone-in-water emulsion, thereby forming a stable, low viscosity, silicone-in-water lubricant composition; and

c) optionally adding an effective amount of a refractive index (RI) adjustment agent ("RIAA") to the low viscosity, clear silicone-in-water lubricant emulsion composition to obtain a substantially clear or translucent emulsion i) having an average diameter of the dispersed phase silicone droplets in the range between about 600 nm and about 99 nm, (ii) having an emulsifier component comprising no ionic surfactants, (iii) having a viscosity of 15,000 cPa or less, and (iv) remaining stable for at least 1 year at room temperature.

2. The method of claim 1, wherein the silicone-in-water emulsion obtained in step b) contains silicone phase droplets having an average droplet size greater than 200 nm and less than 400 nm in size.

3. The method of claim 1 or 2, wherein at least one non-ionic surfactant component is selected from the group consisting of polyalkylene glycol alkyl ethers; glucoside alkyl ethers;

polyethylene glycol alkylphenyl ethers, glycerol alkyl esters; polyoxyethylene glycol sorbitan alkyl esters; sorbitan alkyl esters; an alkyl polyglucoside; alkylamide ethanolamines; alkane alkylamine oxides; block copolymers of polyethylene glycol and polypropylene glycol; polyethoxylated fatty acid amines; and ethoxylated aliphatic alcohols;

or wherein at least one non-ionic surfactant component is selected from the group consisting of: a Brij 4™ surfactant; a Brij™ 35 surfactant; C12-13 Pareth-23; C12-13-Pareth-4; Cetomacrogol™ 1000; C11-15 Pareth-7; Trideceth-6; decyl glucoside; decyl polyglucose; glycerol monostearate; IGEPAL™ CA-630; isoceteth-20; lauryl glucoside; maltosides; monolaurin; mycoosubtilin; narrow-range ethoxlate; Nonidet™ P-40; nonoxynols; NP™-40; octaethylene glycol monodoceyl ether; N-octyl beta D-thioglucopyranoside; octyl glucoside; oleyl alcohol; PEG-10 sunflower glycerides; pentaethylene glycol monodecyl ether; polidocanol; poloxamers; poloxamer 407; polyethoxylated tallow amine; polyglycerol polyricinoleate; polysorbate; polysorbate 20; polysorbate 80; sorbitan; sorbitan monolaurate; sorbitan monostearate; sorbitan tristearate; stearyl alcohol; surfactin; Tritons; Triton™ X-100; Tween™; and Tween™80.

4. The method of claim 1 or 2 wherein the at least one non-ionic surfactant component comprises two different fatty alcohol ethoxylate surfactant components.

5. The method of claim 1 or 2 wherein the at least one non-ionic surfactant component comprises two different non-ionic surfactant components, preferably wherein a non-ionic surfactant component comprises at least one of (A) a first polymeric material made from a polyoxyethylene alkyl alcohol containing

from 2 to 12 ethylene glycol units and (B) a second polymeric material made from a polyoxyethylene alkyl alcohol containing from 12 to 100 ethylene glycol units, preferably from 12 to 50 ethylene glycol units.

6. The method of any of the foregoing claims wherein the non-ionic surfactant component comprises two different fatty alcohol ethoxylate surfactant components present in an effective amount of 1% to 6% by weight of the silicone-in-water emulsion, preferably wherein the rheology modifier is present in an effective amount of 0.1% to 1% by weight of the silicone-in-water emulsion.

7. The method of any of the foregoing claims, wherein the rheology modifier is present in an effective amount of 0.1% to 1% by weight of the silicone-in-water emulsion.

8. The method of any foregoing claim, wherein said one non-ionic surfactant component comprises at least one polymeric material made from a polyoxyethylene lauryl alcohol; or wherein said one non-ionic surfactant component comprises at least two different polymeric materials made from a polyoxyethylene alkyl alcohol; or wherein said one non-ionic surfactant component comprises a first ethoxylated lauryl alcohol, containing 4 ethylene glycol units; and a second ethoxylated lauryl alcohol containing 23 ethylene glycol units.

9. The method of claim 5 wherein at least one of (A) and (B) is present in an effective amount of 1% to 6% by weight of the silicone-in-water emulsion; or

wherein both (A) and (B) are present in a combined effective amount of 1% to 6% by weight of the silicon-in-water emulsion.

10. The method of any foregoing claim, wherein the RIAA has a higher refractive index, or a lower refractive index, than the water phase prior to step c) and is present in an amount in the emulsion to increase the clarity of the silicone-in-water emulsion for use as a lubricant in intimate care applications.

11. The method of any foregoing claim, wherein the RIAA is supplied so that the silicone-in-water emulsion includes 1% by weight to 40% by weight of the RI adjustment agent.

12. The method of any foregoing claim, wherein the silicone droplets in the silicone-in-oil emulsion have an average size of above 200 nm and below 400 nm.

13. A low-viscosity, substantially clear or translucent silicone-in-water emulsion composition comprising an amount of water and,

0.1% to 1% by weight of a rheology modifier,

1% to 6% by weight of a non-ionic emulsifier;

15% to 40% by weight of one or more silicone lubricants; and

15% to 30% by weight of one or more water-miscible refractive index (RI) adjusting agent sufficient to render the composition substantially clear or translucent; the low-viscosity, substantially clear or translucent silicone-in-water emulsion composition being effective as a lubricant suitable for use in intimate care applications and having an average diameter of the dispersed phase silicone droplets in the range between about 600 nm and about 99 nm, and

said low-viscosity, substantially clear or translucent silicone-in-water emulsion composition

(i) having an emulsifier component comprising no ionic surfactants,

(ii) having a viscosity of 15,000 cPa or less, and
(iii) remaining stable for at least 1 year at room temperature.

14. The silicone-in-water emulsion composition of claim 13 which includes silicone droplets having an average diameter greater than 200 nanometers and less than 400 nm.

15. The silicone-in-water emulsion composition of either of claims 13 or 14 wherein the one or more silicone lubricants is or are selected from the group consisting of dimethicone fluids, dimethicone gums, dimethiconol fluids, dimethiconol gums, silicone crosspolymers, silicone elastomers, ethoxylated dimethicone fluids, phenyl silicones, alkyl silicones, alkyl silanes, and mixtures thereof.

16. The silicone-in-water emulsion composition of any of claims 13-15 wherein the refractive indices of the silicone phase and the hydrophilic phase are substantially the same.

17. A low-viscosity, substantially clear or translucent silicone-in-water emulsion comprising:

15% to 60% by weight of one or more silicone lubricants;

1% to 6% by weight of at least one non-ionic surfactant component;

0.1% to 0.8% by weight of a rheology modifier component;

10% to 40% by weight of one or more water-soluble RIAA other than water to cause the refractive index of the water phase to substantially match the refractive index of the silicone phase of the composition; and

water in a sufficient quantity so that the composition totals 100% by weight, the composition being suitable for use as

a lubricant in one or more intimate care applications and i) having an average diameter of the dispersed phase silicone droplets in the range between about 600 nm and about 99 nm, (ii) having an emulsifier component comprising no ionic surfactants, (iii) having a viscosity of 15,000 cPa or less, and (iv) remaining stable for at least 1 year at room temperature.

18. The emulsion of either of claims 16 or 17 wherein the emulsion has an average silicone droplet size greater than 99 nm and less than 500 nanometers, more preferably between 200 nm and 400 nm.

19. A condom product comprising packaging containing a condom and the composition of any of claims 13-18.

20. Use of the silicone-in-water emulsion of any of claims 13-18 as a surgical lubricant or as a skin treatment composition.

21. A pharmaceutical or cosmetic composition comprising the silicone-in-water emulsion of any of claims 13-18 and an additional pharmaceutical or cosmetically active ingredient, preferably wherein the additional pharmaceutical or cosmetically active ingredient is selected from the group consisting of a hormone component, an antimicrobial component, an antibacterial component, an antibiotic component, an antiviral component, a non-steroidal anti-inflammatory component, a spermicide component, an immunodilator component, an anesthetic component, a plant extract component, a vitamin component, a corticosteroid component, and an antifungal component and the like, and mixtures thereof.