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(54) **Title:** SWOLLEN SILICONE COMPOSITION, PROCESS OF PRODUCING SAME AND PRODUCTS THEREOF

(57) **Abstract:** There is provided herein, in one specific embodiment, silicone composition(s) comprising unique combination(s) of silicone polymer and alkyltrisiloxane(s) which can produce silicone composition(s) with lower solids content than silicone compositions that use other than alkyltrisiloxane(s); while still maintaining a desirable viscosity.

WO 2007/061623 A1

SWOLLEN SILICONE COMPOSITION, PROCESS OF PRODUCING SAME AND PRODUCTS THEREOF

CROSS-REFRENCE TO RELATED APPLICATIONS

This application is a continuation in part of U.S. Application No. 11/274,450 filed on November 15, 2005 and claims priority benefit under 35 U.S.C. § 120 of the same.

BACKGROUND OF THE INVENTION

(1) Field of the Invention

The invention relates to composition of swollen silicone polymer, process for making the same and personal care formulations using the same.

(2) Description of Related Art

The personal care industry thrives on being able to deliver multiple performance products based on mixtures of several components, with each component having a performance and compatibility profile, which can lend that component to properties that are important to or desirable in certain final product formulations. One desirable property is the ability to provide a silky initial feel. This property can be derived from the use of cyclic siloxanes in the formulation. In addition to the silky initial feel, cyclic siloxanes used in silicone gels can simultaneously maintain a high viscosity product, which can also be desirable for various product formulations. Although cyclic siloxanes provide the desired feel characteristics, they are low viscosity, highly flowable liquids. Thus, they are not easily held in a formulation, preferring rather to separate and flow out of a given container or flow uncontrollably across the skin when used in a specific application. Further desirable properties include achieving an initial silky feel while providing a smooth, low-residue feel upon dry-down, as well as achieving a high transfer resistance in as short a period as possible.

Cyclic siloxanes have limitations in terms of their performance and compatibility profile. A desired performance and/or compatibility profile possessing the various desirable properties described above is not always achievable by using a cyclic siloxane. Certain applications can require a different performance and/or compatibility profile that cannot be met by the use of cyclic siloxanes.

In addition to providing a particular performance and/or compatibility profile, cyclic siloxanes provide effective swelling of silicone polymer networks. In addition to cyclic siloxanes, linear siloxane fluids have been used to swell silicone polymer networks and to provide a different performance and/or compatibility profile and different end application benefits from that of cyclic siloxanes. These linear siloxane fluids are made via an equilibrium process and comprise a distribution of molecular weights. Unfortunately, up to now, the use of linear siloxanes has required a much higher level of silicone polymer network (solids) to obtain the desired viscosities that are obtainable through cyclic siloxanes. Using higher amounts of solids has processing and cost disadvantages. In addition, using higher amounts of solids can cause "balling" of a product on the skin, which is a negative sensory attribute.

BRIEF DESCRIPTION OF THE INVENTION

In this brief description it is noted that the present inventors have unexpectedly discovered, in one specific embodiment, swollen cross-linked silicone polymer network composition(s). This swollen cross-linked silicone polymer network composition comprises a unique combination(s) of silicone polymer network and linear organosiloxane, which can produce swollen cross-linked silicone polymer network with desirable viscosity and solids content.

Thus in one embodiment, there is provided a first swollen cross-linked silicone polymer network composition comprising:

a) the reaction product of

$$M_aM^H_bM^{vi}_cM''_dM^*_eD_fD^H_gD^{vi}_hD''_iD^*_jT_kT^H_LT^{vi}_mT''_nT^*_oQ_p$$

where

$M = R^1R^2R^3SiO_{1/2}$;

$M^H = R^4R^5HSiO_{1/2}$;

$M^{vi} = R^6R^7R^8SiO_{1/2}$;

$M'' = R^9R^{10}R''SiO_{1/2}$;

$M^* = R^{11}R^{12}R^*SiO_{1/2}$;

$D = R^{13}R^{14}SiO_{2/2}$;

$D^H = R^{15}HSiO_{2/2}$;

$D^{vi} = R^{16}R^{17}SiO_{2/2}$;

$D'' = R^{18}R''SiO_{2/2}$;

$D^* = R^{19}R^*SiO_{2/2}$;

$T = R^{20}SiO_{3/2}$;

$T^H = HSiO_{3/2}$;

$T^{vi} = R^{21}SiO_{3/2}$;

$T'' = R''SiO_{3/2}$;

$T^* = R^*SiO_{3/2}$; and,

$Q = SiO_{4/2}$

where R^1, R^2, R^3, R^{13}, R^{14} and R^{20} are each independently monovalent hydrocarbon radicals having from one to about sixty carbon atoms, more specifically of from 1 to about 30 carbon atoms and most specifically of from 1 to about 20 carbon atoms; R^4, R^5 and R^{15} are each independently monovalent hydrocarbon radicals having from one to about sixty carbon atoms, more specifically of from 1 to about 30 carbon atoms and most specifically of from 1 to about 20 carbon atoms; or hydrogen; R^6 is a monovalent unsaturated hydrocarbon radical having from two to about ten carbon atoms, more specifically of from 2 to about 8 carbon atoms and most specifically of from about 2 to about 6 carbon atoms, and R^7 and R^8 are each independently monovalent hydrocarbon radicals having from one to about sixty carbon atoms, more specifically of from 1 to about 30 carbon atoms and most specifically of from 1 to about 20 carbon atoms; R^{16} is a monovalent unsaturated hydrocarbon radical having from two to about ten carbon atoms, more specifically of from 2 to about 8 carbon

atoms and most specifically of from about 2 to about 6 carbon atoms; and R^{17} is a monovalent hydrocarbon radical having from one to about sixty carbon atoms, more specifically of from 1 to about 30 carbon atoms and most specifically of from 1 to about 20 carbon atoms; R^{21} is a monovalent unsaturated hydrocarbon radical having from two to about ten carbon atoms, more specifically of from 2 to about 8 carbon atoms and most specifically of from about 2 to about 6 carbon atoms; R^{9}, R^{10}, and R^{18} are independently monovalent hydrocarbon radicals having from one to about sixty carbon atoms, more specifically of from 1 to about 30 carbon atoms and most specifically of from 1 to about 20 carbon atoms; or R"; each R" is independently a monovalent alkoxy radical having from one to about sixty carbon atoms, more specifically of from 1 to about 30 carbon atoms and most specifically of from 1 to about 20 carbon atoms, and optionally containing greater than one alkoxy group, such as the non-limiting examples of at least two or three alkoxy groups; R^{11}, R^{12}, and R^{19} are independently monovalent hydrocarbon radicals having from one to about 200 carbon atoms, more specifically of from 1 to about 30 carbon atoms and most specifically of from 1 to about 20 carbon atoms; or R*; each R* is independently a monovalent ether radical having from one to about two hundred carbon atoms, more specifically of from 1 to about 100 carbon atoms and most specifically of from 1 to about 50 carbon atoms; and containing one or more ether moieties, optionally terminated by H; the stoichiometric subscripts a, b, c, d, e, f, g, h, i, j, k, L, m, n, o and p are either zero or positive subject to the following limitations: $a+b+c+d+e>1$; $b+g+L\geq 1$; and $c+h+m\geq 1$ and/or where reaction product also optionally comprises reaction with an alkenyl resin containing of from about 1 to about 2000 carbon atoms, such as the non-limiting example of polybutadiene, more specifically of from 1 to about 10 carbon atoms and most specifically of from about 1 to about 8 carbon atoms; and provided that reaction product does not result in a polymer containing a polyether crosslink; and,

b) a swelling amount of an alkyltrisiloxane wherein said reaction product is swollen by said alkyltrisiloxane to form a first silicone composition and wherein said first silicone composition possesses a lower solids content than a solids content present in a second silicone composition comprising said reaction product and a linear silicone

fluid other than an alkyltrisiloxane, whereby second silicone composition and first silicone composition have equivalent viscosities.

In another embodiment there is also provided a process of producing said first silicone composition comprising combining said reaction product (a), which optionally comprises reaction with an alkenyl resin containing of from 1 to about 12 carbon atoms and reaction product (a) does not result in a polymer containing a polyether crosslink; and, said swelling amount of an alkyltrisiloxane (b).

In another embodiment there is also provided a process of producing said first silicone composition comprising combining reaction product (a') as described below, which optionally comprises reaction with an alkenyl resin containing of from 1 to about 12 carbon atoms; and, said swelling amount of an alkyltrisiloxane (b).

DETAILED DESCRIPTION OF THE INVENTION

Applicants have discovered, in one embodiment, that first swollen cross-linked silicone polymer network composition (first silicone composition) with low solids content can be obtained by using alkyltrisiloxane to swell reaction product (a) or (a'), where reaction product (a) or (a') optionally comprises reaction with alkenyl resin, and where reaction product (a') is described below.

As used herein the term trisiloxane is used both specifically as a trisiloxane also collectively includes generically higher molecular weight well defined linear siloxanes having a higher number of D repeat units such as tetrasiloxanes pentasiloxanes and the like or alternatively low molecular weight well defined linear siloxanes such as disiloxanes; such higher order or lower order linear siloxanes are subtended by the cumulative usage herein defined as long as the phenomenological properties and parameters or solid content at constant viscosity are met.

As used herein the terms polyorganosiloxane and organopolysiloxane are

interchangeable one with the other.

It will be understood herein that all uses of the term centistokes were measured at 25 degrees celsius.

It will be understood herein that all specific, more specific and most specific ranges recited herein comprise all sub-ranges therebetween.

It will be understood herein that in one embodiment, the numerical range phrases of "from about" and "to about" can comprise the phrases "an integer of from about" and "to an integer of about" respectively

It will be understood herein that all percent ranges are weight percent based upon total weight of first silicone composition unless stated otherwise.

As used herein, the terminology "reaction product (a)" or "reaction product (a')" means a three dimensionally extending structure comprising interconnected polysiloxane chains. In one specific embodiment, reaction product (a) or (a') contains at least one fluid component within interstices of reaction product (a) or (a') that is present as a result of generating cross-linked reaction product (a) or (a'). The term "interstices" is used herein in reference to a reaction product (a) or (a') to denote spaces within reaction product (a) or (a'), that is, spaces between the polysiloxane chains of the reaction product (a) or (a').

In one specific embodiment, reaction product (a) or (a') is cross-linked silicone polymer network that is insoluble in said fluid component, but that is capable of being swollen by said fluid component. The amount of crosslinking present in the reaction product (a) or (a') can be characterized with respect to the degree of swelling exhibited by reaction product (a) or (a') in the fluid component. In one specific embodiment, the cross-linked structure of the reaction product (a) or (a') is effective to allow reaction product (a) or (a') to be swollen by a low molecular weight silicone

fluid, from its original volume to a swollen volume that is a factor of specifically from about 1.01 to about 5000, more specifically, of from about 2 to about 1000, and most specifically of from about 5 to about 500, times its original volume. In another specific embodiment, the original volume of reaction product (a) or (a') can be determined, for example, by extracting or evaporating all fluid component present in the first silicone composition described herein, to leave the original volume, that is, the volume of the reaction product (a) or (a') in the absence of fluid component.

In another specific embodiment, reaction product (a) or (a') is a swollen cross-linked silicone polymer network gel, more specifically a swollen cross-linked silicone polymer network gel that can be swollen to a volume as described above. It will be understood herein, that in one embodiment herein, gels described herein are formed following the polymerization of an epoxy-functional organosiloxane to form a polyether siloxane copolymer network, which is known to those skilled in the art and is described in U.S. Patent No. 6,531,540, the contents of which are incorporated herein by reference in their entirety. In one embodiment the contents of U.S. Patent Application No. 11/274,450 filed on November 15, 2005 are incorporated by reference herein in their entirety.

In one embodiment solids can generally be defined as any particles that are swollen by fluid component in first silicone composition described herein. In one embodiment, particles that are swollen by fluid component in first silicone composition are particles of reaction product (a) or (a') as described herein. In another embodiment, as stated above, certain applications require first silicone composition with a lower level of solids than second silicone composition, while still maintaining a desired viscosity. In one embodiment herein, solids content is measured by evaporation or extraction of all of the fluid component from first silicone composition and reported as weight percent of the total weight of first silicone composition. In one specific embodiment, solids content can be a lower solids content than that of second silicone composition comprising an equivalent reaction product (a) or (a') and a linear silicone fluid (and/or any other swelling solvent) other than alkyltrisiloxane. In one specific embodiment, solids level can be measured by

evaporation of the fluid component by heating in an oven at 150°C.

A desired viscosity as used herein can vary greatly depending upon application of first silicone composition described herein. In one specific embodiment, first silicone composition can be used in personal care formulations as described herein. A personal care formulation can also have any viscosity that would be desirable for the particular personal care formulation.

As used herein, cross-link density is used to define the extent of the cross-linking between polysiloxane chains. Thus, "low" cross-link density would be used to describe a loosely cross-linked network having more interstitial space between the polyorganosiloxane chains, whereas "high" cross-link density would be used to describe a more tightly cross-linked structure with smaller or fewer, interstitial spaces between the polyorganosiloxane chains. As used herein, cross-link structure means a three dimensionally extending structure comprising interconnected siloxane copolymer chains. At high cross-link densities in a cross-linked polymer the polymer will not swell significantly in the presence of a compatible solvent and thus will not imbibe much solvent.

In one specific embodiment herein, first silicone composition can have a lower solids content than that of second silicone composition (where second silicone composition comprises an equivalent reaction product (a) or (a') as first silicone composition) but comprising other than alkyltrisiloxane such as the non-limiting example of cyclic siloxane.

In one more specific embodiment, a lower solids content can entail, where first silicone composition has a given cross-linked structure and a given cross-link density and said lower solids content of first silicone composition is at least about 10 percent lower than the solids content for second silicone composition which has an equivalent cross-linked structure and an equivalent cross-link density to first silicone composition; and where first silicone composition has a viscosity of greater than

about 10,000 centistokes.

In one more specific embodiment, a lower solids content can entail, where first silicone composition has a given cross-linked structure and a given cross-link density and said lower solids content of first silicone composition is at least about 25 percent lower than the solids content for second silicone composition which has an equivalent cross-linked structure and an equivalent cross-link density to first silicone composition; and where first silicone composition has a viscosity of greater than about 100,000 centistokes.

In one more specific embodiment, a lower solids content can entail, where first silicone composition has a given cross-linked structure and a given cross-link density and said lower solids content of first silicone composition is at least about 40 percent lower than the solids content for second silicone composition which has an equivalent cross-linked structure and an equivalent cross-link density to first silicone composition; and where first silicone composition has a viscosity of greater than about 200,000 centistokes.

In one other embodiment, any of the above-described viscosities for swollen cross-linked silicone polymer network composition can be obtained at any of the above-described ranges of solids content.

In one specific embodiment, reaction product (a) or reaction product (a') described below, can be any known or commercially used reaction product (a) or reaction product (a') provided that reaction product (a) or (a') can be swollen to a swollen volume as described above. In another specific embodiment, reaction product (a) or (a') is an organopolysiloxane. In yet a further specific embodiment, reaction product (a) or (a') can be a three-dimensional organo-functional polyorganosiloxane, with copolymer cross-links.

In yet another more specific embodiment, the organo group(s) of organopolysiloxane can be any organo group commonly associated with such polymers and can generally

be selected from the non-limiting examples of alkyl radicals of 1 to about 60 carbon atoms, such as methyl, ethyl, propyl; cycloalkyl radicals such as cyclohexyl, cycloheptyl, cyclooctyl; mononuclear aryl radicals such as phenyl, methylphenyl, ethylphenyl; alkenyl radicals such as vinyl and allyl; alkylene oxide radicals, such as ethylene oxide, propylene oxide and mixtures thereof; and haloalkylradicals such as 3, 3, 3, trifluoropropyl. In a more specific embodiment, the organo groups are alkyl radicals of 1 to 8 carbon atoms, and are most specifically methyl. In one embodiment, polyorganosiloxane has some hydroxyl groups in the polymer. In one specific embodiment the organo group(s) of organopolysiloxane can be any of the organic functional groups described in U.S. Patent No. 6,531,540 the contents of which are incorporated herein by reference. It will be understood that the nomenclature used in U.S. Patent No. 6,531,540 regarding hydrocarbon radicals will deemed to be equivalent to organo groups as they are described herein, in that any hydrocarbon radical described in U.S. Patent No. 6,531,540 can be used as an organo group as is described herein so that the terms hydrocarbon radical as it is described in U.S. Patent No. 6,531,540 and organo group(s) as used herein is interchangeable. In one embodiment herein it will be understood that any organo groups described herein can be present on said organopolysiloxane or can be bonded to said organopolysiloxane through a reaction with an organic compound, such as the non-limiting example of an alpha-olefin.

In one specific embodiment herein, there is provided a first swollen cross-linked silicone polymer network composition comprising:

(a') the reaction product of :

$$M'_{\alpha}M^{H'}_{\beta}M^{vi'}_{\gamma}M^{E'}_{\delta}M''_{\varepsilon}M^{*}_{\zeta}D'_{\eta}D^{H'}_{\theta}D^{vi}_{\iota}D^{E'}_{\kappa}D''_{\lambda}D^{*}_{\mu}T'_{\nu}T^{H'}_{\pi}T^{vi'}_{\rho}T^{E'}_{\sigma}T''_{\tau}T^{*}_{\varphi}Q'_{\chi}$$

where

$M' = R^{22}R^{23}R^{24}SiO_{1/2}$;

$M^{H'} = R^{25}R^{26}HSiO_{1/2}$;

$M^{vi'} = R^{27}R^{28}R^{29}SiO_{1/2}$;

$M^{E'} = R^{30}R^{31}R^{E}SiO_{1/2}$;

$M''= R^9R^{10}R''SiO_{1/2}$;

$M^*=R^{11}R^{12}R^*SiO_{1/2}$;

$D'= R^{32}R^{33}SiO_{2/2}$;

$D^{H'}= R^{34}HSiO_{2/2}$;

$D^{vi'}= R^{35}R^{36}SiO_{2/2}$;

$D^{E'}= R^{37}R^ESiO_{2/2}$;

$D''= R^{18}R''SiO_{2/2}$;

$D^*= R^{19}R^*SiO_{2/2}$;

$T'= R^{38}SiO_{3/2}$;

$T^{H'}=HSiO_{3/2}$;

$T^{vi'} =R^{39}SiO_{3/2}$;

$T^{E'} =R^ESiO_{3/2}$

$T''= R''SiO_{3/2}$;

$T^*= R^*SiO_{3/2}$; and,

$Q'=SiO_{4/2}$

where R^{22}, R^{23}, R^{24}, R^{32}, R^{33} and R^{38} are independently monovalent hydrocarbon radicals having from one to about sixty carbon atoms, more specifically from 1 to about 30 carbon atoms and most specifically of from 1 to about 20 carbon atoms; R^{25}, R^{26} and R^{34} are independently monovalent hydrocarbon radicals having from one to about sixty carbon atoms, more specifically from 1 to about 30 carbon atoms and most specifically of from 1 to about 20 carbon atoms; or hydrogen; R^{27} is a monovalent unsaturated hydrocarbon radical having from two to about ten carbon atoms, more specifically of from 2 to about 8 carbon atoms and most specifically of from 2 to about 6 carbon atoms, and R^{28} and R^{29} are independently monovalent hydrocarbon radicals having from one to about sixty carbon atoms, more specifically from 1 to about 30 carbon atoms and most specifically of from 1 to about 20 carbon atoms; R^{35} is a monovalent unsaturated hydrocarbon radical having from two to about ten carbon atoms, more specifically of from 2 to about 8 carbon atoms and most specifically of from 2 to about 6 carbon atoms; and R^{36} is a monovalent hydrocarbon radical having from one to about sixty carbon atoms, more specifically from 1 to about 30 carbon atoms and most specifically of from 1 to about 20 carbon atoms; R^{39}

is a monovalent unsaturated hydrocarbon radical having from two to about ten carbon atoms, more specifically of from 2 to about 8 carbon atoms and most specifically of from 2 to about 6 carbon atoms; R^{30}, R^{31} and R^{37} are independently monovalent hydrocarbon radicals having from one to about sixty carbon atoms, more specifically from 1 to about 30 carbon atoms and most specifically of from 1 to about 20 carbon atoms; or R^{E}; each R^{E} is independently a monovalent hydrocarbon radical containing one or more oxirane moieties having from one to about sixty carbon atoms, more specifically from 1 to about 30 carbon atoms and most specifically of from 1 to about 20 carbon atoms; R^{9}, R^{10}, R^{11}, R^{12}, R^{18}, R^{19}, R" and R* are as defined above, the stoichiometric subscripts α, β, γ, δ, ε, ζ, η, θ, ι, κ, λ, μ, ν, π ρ σ τ φ and χ, are either zero or positive subject to the following limitations: $\alpha+\beta+\gamma+\delta+\varepsilon+\zeta>1$, $\beta+\theta+\pi\geq 1$ and $\gamma+\iota+\rho\geq 1$; and/or in a separate reaction product, $\alpha+\beta+\gamma+\delta+\varepsilon+\zeta>1$ and $\beta+\theta+\pi\geq 1$ where reaction product comprises reaction with a alkenyl resin containing of from about 1 to about 12 carbon atoms, more specifically of from 1 to about 10 carbon atoms and most specifically of from about 1 to about 8 carbon atoms; and,

(b) a swelling amount of an alkyltrisiloxane wherein said reaction product is swollen by said alkyltrisiloxane to form a first silicone composition and wherein said first silicone composition possesses a lower solids content than a solids content present in a second silicone composition comprising said reaction product and a linear silicone fluid other than an alkyltrisiloxane, whereby second silicone composition and first silicone composition have equivalent viscosities.

In one further specific embodiment herein, the reaction product (a'), as described above, can comprise where $\alpha+\beta+\gamma+\delta+\varepsilon+\zeta>1$, specifically where $\alpha+\beta+\gamma+\delta+\varepsilon+\zeta\geq 2$; $\delta+\kappa+\sigma\geq 1$; and, $\beta+\theta+\pi\geq 1$.

In another embodiment there is also provided a process of producing said first silicone composition comprising combining said reaction product (a) or reaction product (a') and/or said alkenyl resin and said swelling amount of an alkyltrisiloxane (b).

In yet a further specific embodiment, reaction product (a') having the formula $M'_{\alpha}M^{H'}_{\beta}M^{vi'}_{\gamma}M^{E'}_{\delta}M''_{\varepsilon}M^{*}_{\zeta}D'_{\eta}D^{H'}_{\theta}D^{vi}_{\iota}D^{E'}_{\kappa}D''_{\lambda}D^{*}_{\mu}T'_{\nu}T^{H'}_{\pi}T^{vi'}_{\rho}T^{E'}_{\sigma}T''_{\tau}T^{*}_{\varphi}Q'_{\chi}$ as described above, can comprise the reaction product of (I) a compound comprising the formula:

$$M^{H'}_{\beta}D'_{\eta}D^{H'}_{\theta}M^{H'}_{2-\beta}$$

where

$M^{H'}$, D'; and, $D^{H'}$ are as defined above; the stoichiometric subscripts β, η and θ are zero or positive subject to the limitations: η is a number greater than 10, specifically greater than about 15 and most specifically greater than about 20, θ is a number from zero to about 20, specifically of from 1 to about 15 and most specifically of from 1 to about 10, β is a number from zero to two, subject to the limitation that β+θ is of from 1 to about 22, more specifically of from 1 to about 17 and most specifically of from 1 to about 12; (II) alkenyl cycloalkylene oxide such as the non-limiting example of vinyl cyclohexene oxide; (III) alpha-olefin fraction such as Alpha Olefin Gulftene C30+ available from Chevron or C_{16-18} alpha olefin obtained from Innovene; (IV) linear siloxane and optionally cyclic siloxane, where linear siloxane can comprise the non-limiting example of alkyltrisiloxane, specifically ethyltrisiloxane (ETS) such as the non-limiting example of heptamethylethyltrisiloxane, octyltrisiloxane (OTS), such as the non-limiting example of heptamethyloctyltrisiloxane, hexyltrisiloxane such as the non-limiting example of heptamethylhexyltrisiloxane and any other alkyltrisiloxanes described herein (V) catalyst such as the non-limiting example of platinum catalyst, more specifically Karstedt's Catalyst; (VI) epoxide polymerization catalyst formed through the interaction of platinum with a Si-H bond containing compound such as the non-limiting example of $MD^{H}_{50}M$ in fluid component such as the non-limiting examples of ethyltrisiloxane and optionally decamethyl cylcopentasiloxane; and (VII) agent for quenching residual Si-H functionality such as the non-limiting example of C_{16-18} alpha olefin.

In one other specific embodiment herein reaction product (a') having the formula $M'_{\alpha}M^{H'}_{\beta}M^{vi'}_{\gamma}M^{E'}_{\delta}M''_{\varepsilon}M^{*}_{\zeta}D'_{\eta}D^{H'}_{\theta}D^{vi}_{\iota}D^{E'}_{\kappa}D''_{\lambda}D^{*}_{\mu}T'_{\nu}T^{H'}_{\pi}T^{vi'}_{\rho}T^{E'}_{\sigma}T''_{\tau}T^{*}_{\varphi}Q'_{\chi}$

as described above, can further comprise the reaction product of (I) a compound having the formula $M^{H'}D'_{133}D^{H'}_{2.5}M^{H'}$; (II) vinyl cyclohexene oxide; (III) alpha olefin Gulftene C30+ available from Chevron; (IV) ETS and optionally decamethylcyclopentasiloxane; (V) solution of a platinum catalyst (Karstedt's Catalyst); (VI) $M'D^{H'}_{50}M'$ in ETS and optionally decamethyl cylcopentasiloxane; and (VII) C_{16-18} alpha olefin.

In yet a further specific embodiment compound (I), of reaction product (a'), as described above, further comprises epoxy functional polyorganosiloxane such as epoxy-functional polyorganosiloxane described above.

In one embodiment herein reaction product (a) can comprise the reaction product of (I) a compound comprising the formula:

$$M^H_bD_fD^H_gM_{2-b}$$

where M, M^H, D and D^H are as defined and the stoichiometric subscripts b, f, and g are zero or positive subject to the limitations: f is a number from about 10 to about 50, specifically of from 10 to about 30 and most specifically of from 10 to about 25, g is a number from zero to about 50, specifically of from 1 to about 30 and most specifically of from 2 to about 10, b is a number of from zero to two, provided that b+g is of from 1 to about 100, more specifically of from 1 to 32 and most specifically of from 2 to about 12; (II) alkenyl resin, specifically alkenyl resin of from 1 to about 12 carbon atoms, more specifically of from 1 to about 10 carbon atoms and most specifically of from 1 to about 8 carbon atoms; (III) alpha-olefin fraction; (IV) alkyltrisiloxane and optionally cyclic siloxane, (V) platinum catalyst; (VI) catalyst formed through the interaction of platinum with a Si-H bond containing compound in fluid component; and (VII) agent for quenching residual functionality of (I) and/or (II). In one embodiment one non-limiting example of compound of formula (I) $M^H_bD_fD^H_gM_{2-b}$ comprises $MD_{20}D^H_3M$ and one non-limiting example of alkenyl resin of formula (II) comprises 1,5-hexadiene.

In one other embodiment herein reaction product (a) can comprise the reaction product of (I) a compound comprising the formula:

$$M^{H}_{b}D_{f}D^{*}_{j}D^{H}_{g}M_{2-b}$$

where M^{H}, D, D*, D^{H} and M are as defined and the stoichiometric subscripts b, f, j and g are zero or positive subject to the limitations: f is 0 or a number from 1 to 500, specifically of from 10 to about 150 and most specifically of from 10 to about 125, j is a number from 0.1 to 10, more specifically of from 0.1 to about 8 and most specifically of from about 0.1 to about 6; g is a number from zero to about 50, specifically of from 1 to about 30 and most specifically of from 2 to about 10, b is a number from zero to two, subject to the limitation that b+g is of from 1 to about 100, more specifically of from 1 to 32 and most specifically of from 2 to about 12; (II) $M^{vi}_{c}D_{f}D^{vi}_{h}M_{2-c}$ and/or an alkenyl resin of from 2 to about 2000 carbon, more specifically of from 2 to about 12 carbon atoms and most specifically of from 2 to about 8 carbon atoms, where M^{vi}, D, D^{vi} and M are as defined and the stoichiometric subscripts c, f, and h are zero or positive subject to the limitations that f is a number from 1 to 300, specifically of from 10 to about 30 and most specifically of from 10 to about 25, h is a number of from zero to 20, more specifically of from 1 to about 12 and most specifically of from 1 to about 6, and c is a number of from zero to 2, provided that c+h is a number of from 1 to 22, more specifically of from 1 to about 14 and most specifically of from 1 to about 8; (III) alpha-olefin fraction; (IV) alkyltrisiloxane and optionally cyclic siloxane, (V) platinum catalyst formed through the interaction of platinum with a Si-H bond containing compound in fluid component; and (VII) agent for quenching residual functionality of (I) and/or (II). In one embodiment one non-limiting example of compound of formula (I) $M^{H}_{b}D_{f}D^{*}_{j}D^{H}_{g}M_{2-b}$ comprises $MD_{24}D^{*}_{0.3}D^{H}_{3.7}M$ and one non-limiting example of (II) having formula $M^{vi}_{c}D_{f}D^{vi}_{h}M_{2-c}$ comprises $M^{vi}D_{20}M^{vi}$. In another specific embodiment one non-limiting example of compound of formula (I) $M^{H}_{b}D_{f}D^{*}_{j}D^{H}_{g}M_{2-b}$ comprises $MD_{100}D^{*}_{1.25}D^{H}_{5.4}M$ and one non-limiting example of (II) being an alkenyl resin comprises 1, 5-hexadiene.

In yet one other embodiment herein reaction product (a) can comprise the reaction product of (I) a compound comprising the formula:

$$M^{H}_{b}Q_{p}M_{2-b}$$

where M^{H}, Q and M are as defined and the stoichiometric subscripts b and p are zero or positive subject to the limitations: p is a number ≥ 1, more specifically p is a number ≥ 2, and most specifically p is a number ≥ 3; b is a number of from one to two, subject to the limitation that b+p is a number of from 2 to about 20, more specifically of from 2 to about 10 and most specifically of from 2 to about 6;

(II) $M^{vi}_{c}D_{f}D^{vi}_{h}M_{2-c}$

where M^{vi}, D, D^{vi}, and M are as defined; the stoichiometric subscripts c, f and h, are zero

or positive subject to the limitations that f is 0 or a number of from about 1 to about 1200

more specifically of from about 700 to about 1000 and most specifically of from about

800 to about 950; h is a number of from zero to about 20, more specifically of from 1 to about 12 and most specifically of from about 1 to about 6; and c is a number of from zero to 2, provided that c+h is a number of from 1 to about 22, more specifically of from 1 to about 14 and most specifically of from 1 to about 8; (III) alpha-olefin fraction; (IV) alkyltrisiloxane and optionally cyclic siloxane, (V) platinum catalyst formed through the interaction of platinum with a Si-H bond containing compound in fluid component; and (VII) agent for quenching residual functionality. In one specific embodiment herein, one non-limiting example of compound of the formula (I) $M^{H}_{b}Q_{p}M_{2-b}$ comprises $M^{H}_{2}Q$ and one non-limiting example of (II) having formula $M^{vi}_{c}D_{f}D^{vi}_{h}M_{2-c}$ comprises $M^{vi}D_{897}M^{vi}$.

In yet even one further embodiment herein reaction product (a) can comprise the reaction product of (I) a compound comprising the formula:

$M^H_bD_fD''_iD^H_gM_{2-b}$

where M, M^H, D, D'' and D^H are as defined and the stoichiometric subscripts b, f, i and g are zero or positive subject to the limitations: f is a number of from 10 to 50, more specifically of from 10 to about 40 and most specifically of from 10 to about 35; i is zero or a number of from 1 to 20, more specifically of from 1 to about 12 and most specifically of from about 1 to about 8; g is a number of from zero to 20, more specifically of from about 1 to about 12 and most specifically of from about 1 to about 8; and b is a number of from zero to 2, provided that b+g is a number of from 1 to 100, more specifically of from 1 to about 14 and most specifically of from 1 to about 10;

(II) $M^{vi}_cD_fD^{vi}_hM_{2-c}$

where M^{vi}, D, D^{vi}, and M are as defined; the stoichiometric subscripts c, f and h, are zero or positive subject to the limitations that f is a number of from 10 to 50, more specifically of from 10 to about 30 and most specifically of from about 10 to about 25; h is a number of from zero to 20, more specifically of from about 1 to about 12 and most specifically of from about 1 to about 6; c is a number of from zero to 2; provided that c+h is a number of from 1 to 22, more specifically of from 1 to about 14 and most specifically of from 1 to about 8; (III) alpha-olefin fraction; (IV) alkyltrisiloxane and optionally cyclic siloxane, (V) platinum catalyst formed through the interaction of platinum with a Si-H bond containing compound in fluid component; and (VII) agent for quenching residual functionality. In one specific embodiment herein, one non-limiting example of compound of the formula (I) $M^H_bD_fD''_iD^H_gM_{2-b}$ comprises $MD_{24.5}D^H_{3.5}M$ and one non-limiting example of (II) having the formula $M^{vi}_cD_fD^{vi}_hM_{2-c}$ comprises $M^{vi}D_{20}M^{vi}$. In yet another specific embodiment herein, one non-limiting example of compound of formula (I) $M^H_bD_fD''_iD^H_gM_{2-b}$ comprises $MD_{32}D''_3D^H_6M$ and one non-limiting example of (II) having the formula $M^{vi}_cD_fD^{vi}_hM_{2-c}$ comprises $M^{vi}D_{20}M^{vi}$.

In one other embodiment herein, reaction product (a) or (a') can comprise polymerization product selected from the group consisting of addition product of silane functional silicones; condensation product of amino resin formed from urea

monomer or melamine monomer and formaldehyde monomer, furan polymer produced by polymerizing furfuryl alcohol monomer, polyacetal polymer formed from dialdehyde monomer and dialcohol monomer, poly(alkylene sulfide) polymers formed from alkyl bromide monomer and potassium sulfide monomer, polyamide polymer formed from diacid monomer and diamine monomer, polyamine formed from diamine monomer and dihalide monomer, polyaminotriazole polymer formed from dihydride monomer and hydrazine monomer, polyanhydride formed from polymerization of diacid monomer, polycarbonate formed from diol monomer and phosgene monomer, polyhydrazide polymer formed from phenyl diester monomer and dihydrazine monomer, polyimide formed from tetraacid monomer and diamine monomer, polyquinoxaline polymer formed from tetracarbonyl monomer and diamine monomer, polysaccharide formed from polymerization of monosaccharide monomer, polysulfide polymer formed from dihalide monomer and polysulfide monomer, polyurea formed from diamine monomer and phosgene monomer, protein polymer formed from polymerization of amino acid monomer, silicone formed from dihaloalkylsilane monomer and water, polyester formed from difunctional acid monomer and difunctional alcohol monomer; step reaction polymerization of diisocyanato monomers and polyol monomers, as well as step reaction polymerization of the condensation polymerizations; and combinations thereof. In one specific embodiment herein, reaction product (a) is the polymerization product of any of the above-described polymerization products provided that reaction product (a) does not comprise a polyether cross-link.

In one specific embodiment reaction product (a) or (a') can comprise two or more cross-linked silicone polymers and specifically two or more three-dimensional cross-linked silicone polymers. In one embodiment (a) can comprise two or more cross-linked polyorganosiloxanes, wherein the organo groups of the polyorganosiloxane can comprise any one or more of the above-described organo groups. In one embodiment (a') can comprise two or more epoxy-functional cross-linked polyorganosiloxanes, wherein the organo groups of epoxy-functional polyorganosiloxane can comprise, in

addition to at least one epoxy functional group, any one or more of the above-described organo groups.

In one specific embodiment herein, "a swelling amount" is an amount that can provide for an increase in volume of reaction product (a) or (a') as described herein. In one embodiment a swelling amount is specifically of from about 1 to about 99 weight percent, more specifically of from about 5 to about 95 weight percent and most specifically of from about 10 to about 90 weight percent based on the total weight of first silicone composition. In one embodiment herein, the amount of first silicone composition which substantially comprises silicone gel is specifically greater than about 10 weight percent, more specifically greater than about 50 weight percent and most specifically greater than about 90 weight percent based upon the total weight of silicone gel.

In one embodiment, fluid component, as described above, can be any known or commercially used alkyltrisiloxane provided that alkyltrisiloxane provides for the above stated lower solids content and desirable viscosity in first silicone composition. In one specific embodiment, alkyltrisiloxane (b) is alkyl-substituted trisiloxane. In one embodiment, the term "alkyl" means a saturated straight or branched monovalent hydrocarbon radical. In a specific embodiment, monovalent alkyl groups are selected from linear or branched alkyl groups containing from 1 to 60 carbon atoms per group, more specifically of from 1 to about 30 carbon atoms per group and most specifically of from 1 to about 20 carbon atoms per group, such as the non-limiting examples of, methyl, ethyl, propyl, iso-propyl, n-butyl, iso-butyl, sec-butyl, tert-butyl, pentyl, hexyl, heptyl, decyl, and dodecyl. In another specific embodiment there is provided alkyltrisiloxane (b) which is linear alkyltrisiloxane which is high purity material which results from the alkylation of a polyorganosiloxane having the formula (A):

$$MD^{H}M \qquad (A)$$

where

$M = R^{A}R^{B}R^{C}SiO_{1/2}$; and

$D^H = R^DHSiO_{2/2}$;

where R^A, R^B, and R^C are independently monovalent hydrocarbon radicals having from one to sixty carbon atoms, more specifically of from one to about 30 carbon atoms and most specifically of from 1 to about 20 carbon atoms; and R^D is a monovalent hydrocarbon radical having from one to sixty carbon atoms, more specifically of from one to about 30 carbon atoms and most specifically of from 1 to about 20 carbon atoms; or hydrogen. In one embodiment, a high purity material as described herein is defined as substantially comprising the alkylated polyorganosiloxane of formula (A). In a specific embodiment herein, alkylation of a polyorganosiloxane having the formula (A) can be accomplished by reacting a polyorganosiloxane having the formula (A) with alkene compound such as the non-limiting example of ethylene or any of the above-described alkenyl compounds. In a more specific embodiment a high purity material comprises greater than about 90 weight percent of the alkylated polyorganosiloxane of formula (A) based on the total weight of high purity material. In an even more specific embodiment a high purity material comprises greater than about 95 weight percent of the alkylated polyorganosiloxane of formula (A) based on the total weight of the high purity material. In a most specific embodiment a high purity material comprises greater than about 97 weight percent of the alkylated polyorganosiloxane of formula (A) based on the total weight of the high purity material. In one other embodiment herein at least one alkyltrisiloxane (b) can be formed by any known or conventionally used method known to those skilled in the art.

In one specific embodiment, at least one alkyltrisiloxane (b) has the formula:

$$M\text{^}D\text{^}_rM$$

where

M or M^ = $R^FR^GR^ISiO_{1/2;}$ and,

D^= $R^JR^KSiO_{2/2}$

where each R^F, each R^G, and each R^I are independently monovalent hydrocarbon radicals having from one to sixty carbon atoms to allow for M and M^ to be different; and where R^J and R^K are independently monovalent hydrocarbon radicals having from two to sixty carbon atoms; the stoichiometric subscripts r is positive subject to the limitations: that the silicon atom of D^ has a pendant group that is other than hydrogen, methyl and polyether, and r is equal to one.

In one specific example some non-limiting examples of alkyltrisiloxane (b) are linear alkyltrisiloxanes selected from the group consisting of ethyltrisiloxane, such as the non-limiting examples of 1,1,1,3,5,5,5-heptamethyl-3-ethyltrisiloxane; octyltrisiloxane, such as the non-limiting example of 1,1,1,3,5,5,5-heptamethyl-3-octyltrisiloxane; hexyltrisiloxane such as the non-limiting example of 1,1,1,3,5,5,5-heptamethyl-3-hexyltrisiloxane, and combinations thereof. In one specific embodiment herein alkyltrisiloxane (b) can be at least one alkyltrisiloxane such as those described in U.S. Patent Application Publication No. 2004/0197284A1 which is incorporated by reference herein in its entirety. In another specific embodiment herein alkyltrisiloxane (b) can be at least one alkyltrisiloxane such as those described in U.S. Patent Application Publication No. 2005/0069564A1 the contents of which are incorporated by reference herein in its entirety. In yet one even more specific embodiment, alkyltrisiloxane (b) can comprise octamethyltrisiloxane (surface tension=17.4 mN/m), sold, for example, under the name DC 200 Fluid 1 cst by the company Dow Corning; 3-pentyl-1,1,1,3,5,5,5-heptamethyltrisiloxane; 1-hexyl-1,1,3,3,5,5,5-heptamethyltrisiloxane; 1,1,1,3,3,5,5-heptamethyl-5-octyltrisiloxane; 1,1,1,3,5,5,5-heptamethyl-3-octyltrisiloxane, sold, for example, under the name "Silsoft 034" by the company General Electric; 1,1,1,3,5,5,5-heptamethyl-3-hexyltrisiloxane (surface tension=20.5 mN/m), sold, for example, under the name "DC 2-1731" by the company Dow Corning; 1,1,3,3,5,5-hexamethyl-1,5-dipropyltrisiloxane; 3-(1-ethylbutyl)-1,1,1,3,5,5,5-heptamethyltrisiloxane; 1,1,1,3,5,5,5-heptamethyl-3-(1-methylpentyl)trisiloxane; 1,5-diethyl-1,1,3,3,5,5-hexamethyltrisiloxane; 1,1,1,3,5,5,5-heptamethyl-3-(1-methylpropyl)trisiloxane; 3-(1,1-dimethylethyl)-1,1,1,3,5,5,5-heptamethyltrisiloxane; 1,1,1,5,5,5-hexamethyl-3,3-bis(1-methylethyl)trisiloxane; 1,1,1,3,3,5,5-hexamethyl-1,5-bis(1-

methylpropyl)trisiloxane; 1,5-bis(1,1-dimethylethyl)-1,1,3,3,5,5-hexamethyltrisiloxane; 3-(3,3-dimethylbutyl)-1,1,1,3,5,5,5-heptamethyltrisiloxane; 1,1,1,3,5,5,5-heptamethyl-3-(3-methylbutyl)trisiloxane; 1,1,1,3,5,5,5-heptamethyl-3-(3-methylpentyl)trisiloxane; 1,1,1,3,5,5,5-heptamethyl-3-(2-methylpropyl)trisiloxane; 1-butyl-1,1,3,3,5,5,5-heptamethyltrisiloxane; 1,1,1,3,5,5,5-heptamethyl-3-propyltrisiloxane; 3-isohexyl-1,1,1,3,5,5,5-heptamethyltrisiloxane; 1,3,5-triethyl-1,1,3,5,5-pentamethyltrisiloxane; 3-butyl-1,1,1,3,5,5,5-heptamethyltrisiloxane; 3-tert-pentyl-1,1,1,3,5,5,5-heptamethyltrisiloxane; 1,1,1,5,5,5-hexamethyl-3,3-dipropyltrisiloxane; 3,3-diethyl-1,1,1,5,5,5-hexamethyltrisiloxane; 1,5-dibutyl-1,1,3,3,5,5-hexamethyltrisiloxane; 1,1,1,5,5,5-hexaethyl-3,3-dimethyltrisiloxane; 3,3-dibutyl-1,1,1,5,5,5-hexamethyltrisiloxane; 3-ethyl-1,1,1,3,5,5,5-heptamethyltrisiloxane; 3-heptyl-1,1,1,3,5,5,5-heptamethyltrisiloxane; 1-ethyl-1,1,3,3,5,5,5-heptamethyltrisiloxane; 1,1,1,5,5,5-hexamethyl-3,3-diethyltrisiloxane; 1,1,3,3,5,5-hexamethyl-1,5-diethyltrisiloxane; 1,1,1,3,5,5,5-heptamethyl-3-butyltrisiloxane and combinations thereof. In one specific embodiment reaction product (a) can be homogenized using conventionally known methods specifically using fluid component described herein and more specifically alkyltrisiloxane described herein.

In one specific embodiment alkyltrisiloxane (b) can comprise two or more alkyltrisiloxanes.

In a further specific embodiment herein, first silicone composition can further comprise silicone fluid other than said alkyltrisiloxane. In a more specific embodiment, said silicone fluid other than alkyltrisiloxane can be cyclic siloxane and/or linear silicone fluid such as, decamethylcyclopentasiloxane fluid and/or high molecular weight polyorganosiloxane fluid, respectively. In a most specific embodiment herein said high molecular weight polyorganosiloxane fluid has a greater viscosity relative to alkyltrisiloxane (b) and can be selected from the group consisting of organo polydimethylsiloxanes having a viscosity of specifically from about 1 to about 400, more specifically of from about 3 to about 350, and most specifically from

about 5 to about 300 centistokes, wherein the organo groups are any of the above described organo groups. In one specific embodiment organo polydimethylsiloxane can have a viscosity of from about 1 to about 100 centipoise, more specifically 2 to about 50 centipoise and most specifically 5 to about 10 centipoise. In one very specific embodiment, polydimethylsiloxane can have a viscosity of 5 centipoise. In one very specific embodiment, polydimethylsiloxane can have a viscosity of 50 centipoise.

In a specific embodiment, first silicone composition described herein is a solid, typically having a creamy consistency, wherein reaction product (a) or (a') act as a means for gelling fluid component to reversibly impart characteristics of a solid to fluid component.

In one specific embodiment herein there is provided silicone gel substantially comprising first silicone composition. In one embodiment herein, the amount of first silicone composition, which substantially comprises silicone gel, is specifically greater than about 10 weight percent, more specifically greater than about 50 weight percent and most specifically greater than about 90 weight percent based upon the total weight of silicone gel. It will be understood herein that silicone gel as described herein can also have the above-described viscosities and solids content.

In one specific embodiment herein other silicone compositions comprising at least one alkyltrisiloxane (b) can be made by using silicone polymers formed from other cross-linking processes known to those skilled in the art. In one specific embodiment herein there are provided silicone gels substantially comprising other silicone compositions as described above, made by other cross-linking processes known to those skilled in the art, that can also be swollen by at least one alkyltrisiloxane (b) described herein.

In one other embodiment, first silicone composition exhibits high stability and resistance to syneresis, that is, first silicone composition exhibits little or no tendency for fluid to flow from first silicone composition and imparts high stability and syneresis resistance to personal care formulations which include first silicone composition as a component. The high stability and syneresis resistance persists with prolonged aging of such first silicone composition and personal care formulations comprising the same. However, fluid component can be released from reaction product (a) or reaction product (a') by subjecting first silicone composition to a shearing force, such as, for example, by rubbing first silicone composition between one's fingers, to provide improved sensory feel characteristic of the fluid component of first silicone composition. In one embodiment herein, first silicone composition as described herein, can be utilized as prepared or as the silicone component in emulsions, such as are described in U.S. Patent Nos. 6,531,540; 6,060,546 and 6,271,295, the contents for all of these patents are incorporated by reference herein in their entirety.

In one embodiment, there is provided a personal care formulation comprising silicone gel substantially comprising first silicone composition as described herein where said personal care formulation is at least one non-limiting example such as those selected from the group consisting of deodorant, antiperspirant, antiperspirant/deodorant, shaving product, skin lotion, moisturizer, toner, bath product, cleansing product, hair care product such as shampoos, conditioners, mousses, styling gels, hair sprays, hair dyes, hair color products , hair bleaches, waving products , hair straighteners, hair frizz control; hair volumizing; manicure product such as nail polish, nail polish remover, nails creams and lotions, cuticle softeners, protective cream such as sunscreen, insect repellent and anti-aging products , color cosmetic such as lipsticks, foundations, face powders, eye liners, eye shadows, blushes, makeup, mascaras, as vehicles for fragrance delivery benefits, and other personal care formulations where silicone components have been conventionally added, as well as drug delivery system for topical application of medicinal composition that is to be applied to the skin.

In a more specific embodiment, the personal care formulation described herein further comprises one or more personal care ingredients. Suitable personal care ingredients include, for example, emollient, moisturizer, humectant, pigment, including pearlescent pigments such as, for example, bismuth oxychloride and titanium dioxide coated mica, colorant, fragrance, biocide, preservative, antioxidant, anti-microbial agent, anti-fungal agent, antiperspirant agent, exfoliant, hormone, enzyme, medicinal compound, vitamin, salt, electrolyte, alcohol, polyol, absorbing agent for ultraviolet radiation, botanical extract, surfactant, silicone oil, organic oil, wax, film former, thickening agent such as, for example, fumed silica or hydrated silica, particulate filler, such as for example, talc, kaolin, starch, modified starch, mica, nylon, clay, such as, for example, bentonite and organo-modified clays, and combinations thereof.

In another embodiment herein first silicone composition can be formed by any known or commercially used process provided that said process provides for the above-described swelling of reaction product (a) or (a'). In one specific embodiment there is provided a process for producing first silicone composition comprising combining at least one reaction product (a) or (a'); and, a swelling amount of at least one alkyltrisiloxane (b); to produce first silicone composition possessing substantially the same viscosity, but a lower solids content, than that of second silicone composition described herein.

In one specific embodiment, said process of producing first silicone composition can comprise forming reaction product (a) or (a') by a polymerization method selected from the group consisting of addition polymerization, condensation polymerization, cationic polymerization, anionic polymerization, and combinations thereof.

In one embodiment herein, reaction product (a') is prepared in the normal manner through the use of a hydrosilation reaction to attach a vinyl or allyl substituted epoxide onto an Si-H bearing siloxane. In one other embodiment herein, reaction product (a) is prepared in the normal manner through the use of a hydrosilation reaction to attach a vinyl or allyl substituted siloxane or alkyenyl resin onto an Si-H bearing siloxane. SiH containing siloxanes are well known in the art and can be

linear, branched, or cyclic in structure. Some non-limiting examples of useful vinyl or allyl substituted epoxides include 4-vinyl cyclohexene oxide, allyl glycidyl ether, limonene oxide, 1,2-epoxy-5-hexene, 1,2-epoxy-7-octene, norbornadiene monoepoxide and 1,2-epoxy-9-decene. In one further embodiment herein, precious metal catalysts suitable for making reaction product (a) or (a'), alkyltrisiloxane (b) and first silicone composition described herein are well known in the art and include complexes of rhodium, ruthenium, palladium, osmium, iridium and/or platinum. Epoxy-hydride reactions used to form cross-linked silicone network (a') and gels comprising swollen cross-linked silicone network which are made using epoxy-hydride reactions are known to those skilled in the art as is described in U.S. Patent No. 6,531,540, the contents of which are incorporated herein by reference. Vinyl-hydride reactions used to form cross-linked silicone network (a) and gels comprising swollen cross-linked silicone network which are made using vinyl-hydride silylation reactions which are known to those skilled in the art.

In one specific embodiment, reaction product (a') is a compound which is formed by polymerizing the epoxy functional organosiloxane compound under cationic polymerization conditions and, more specifically, in the presence of fluid component, more specifically a low molecular weight siloxane fluid. In one specific embodiment herein,the silicone gel network forms from the hydrosilylation reaction products of a multifunctional vinyl compound with a multifunctional Si-H fluid and, more specifically, in the presence of fluid component, more specifically a low molecular weight siloxane fluid. In one embodiment, reaction product (a) or (a') can have been polymerized in the presence of fluid component or fluid component mixture to directly form a first silicone composition. In another embodiment, reaction product (a') can have been polymerized in the presence of a first fluid component or first fluid component mixture to form cross-linked polyether siloxane copolymer network which is reaction product (a'), and then reaction product (a') so formed, is subsequently swollen with a second fluid component or second fluid component mixture to form first silicone composition described herein; with the second fluid component or second fluid component mixture being the same as or different from first fluid

component or first fluid component mixture, provided that said first fluid component(s) and/or second fluid component(s) comprise alkyltrisiloxane (b). In yet another embodiment, reaction product (a) can have been polymerized in the presence of a first fluid component or first fluid component mixture to form cross-linked siloxane copolymer network which is reaction product (a), and then reaction product (a) so formed, is subsequently swollen with a second fluid component or second fluid component mixture to form first silicone composition described herein; with the second fluid component or second fluid component mixture being the same as or different from first fluid component or first fluid component mixture, provided that said first fluid component(s) and/or second fluid component(s) comprise alkyltrisiloxane (b). In one embodiment herein, the first fluid component(s) can, optionally, be removed from reaction product (a) or (a') by, for example, evaporation, prior to addition of second fluid component(s). As a further specific embodiment herein, cross-linked epoxy functional reaction product (a') is polymerized in the absence of fluid component(s) to form reaction product (a'), and reaction product (a') is subsequently swollen with fluid component or mixture of fluid components to form first silicone composition described herein, provided that fluid component or mixture of fluid components comprises alkyltrisiloxane (b). As a further specific embodiment herein, cross-linked organosiloxane reaction product (a) is polymerized in the absence of fluid component(s) to form reaction product (a), and reaction product (a) is subsequently swollen with fluid component or mixture of fluid components to form first silicone composition described herein, provided that fluid component or mixture of fluid components comprises alkyltrisiloxane (b).

In another embodiment, the polymerization of the epoxy functional organosiloxane (reaction product (a')) is conducted with a sufficient amount of excess hydridosiloxane functionality such that there is residual hydride remaining after polymerization that may be subsequently reacted under conditions suitable for hydrosilylation with one or more alkenyl functional compounds. This is especially advantageous in cases where the alkenyl functional compounds can act as inhibitors of cationic cure. Such alkenyl compounds are those that contain a functionality that can act as an inhibitor of the cationic cure mechanism, e.g. a base. In another

embodiment, a small amount of a concentrated hydridosiloxane or hydridosilane compound is added in order to increase the rate of polymerization.

In one specific embodiment herein, there is provided a process of producing first silicone composition comprising where at least one reaction product (a) or (a') is produced in the presence of at least one first fluid component and is subsequently swollen, where swelling said reaction product (a) or (a') comprises diluting the reaction product (a) or (a'), that has been produced in the presence of at least one first fluid component, with at least one second fluid component with the proviso that at least one first fluid component and/or at least one second fluid component is alkyltrisiloxane (b).

In one embodiment herein there is provided a silicone gel produced by any process described herein. In another specific embodiment there is provided silicone gel substantially comprising first silicone composition which is produced by the process of producing first silicone composition as described above. In yet a further embodiment herein, there is provided a personal care formulation, such as those described above, comprising silicone gel produced by any process described herein.

In one embodiment herein there is provided silicone gel produced by any process described herein where the silicone gel has a lower solids content and a desirable viscosity as described above.

In one specific embodiment herein there is provided a cosmetic composition comprising silicone gel described herein where silicone gel comprises one or more of the formulations described in Table 4.

In another specific embodiment herein there is provided a sunscreen composition comprising silicone gel described herein where silicone gel comprises the following sunscreen formulation in Table A:

TABLE A

Ingredient	Wt (%)
Part A	
Glyceryl Stearate (and) PEG-100 Stearate.(4)	2.52
Dimethicone 5 cSt (1)	4.5
Isopropyl Palmitate	2.7
Example 2, Sample 2 from Table 1 below (1)	4.5
Caprylyl Methicone (Silsoft 034) (1)	4.5
PEG-5/PPG-3 Methicone (Silsoft 305) (1)	1.14
Dimethicone (and) Trimethylsiloxysilicate (SS4267) (1)	0.90
Tocopherol acetate USP (3)	0.27
Benzophenone-3 (2)	2
Octyl MethoxyCinnamate (2)	3
Butylmethoxydibenzoylmethane (2)	1.5
TiO2 (C47-60, Sunchemical)	0.3
Part B	
Water deionized	65.77
Glycerin	3.60
Niacinamide (3)	0.90
Panthenol (3)	0.36
Arbutin (3)	0.05
Na4EDTA	0.07
Sodium Ascorbyl phosphate (3)	0.05
Carbopol 941	0.12
Triethanolamine	0.21
Preservative (2)	0.06
Fragrance	quantity sufficient
Part C	
Polyacrylamide (and) C13-C14 Isoparaffin (and) Laureth-7 (5)	0.90

It will be understood that Wt% as used in Table A is weight percent of based on the total weight of the sunscreen formulation.

In one embodiment herein sunscreen composition in Table A is prepared by the following procedure:

1. Combine ingredients of Part A at room temperature, heat to 75 degrees celsius
2. Combine ingredients of Part B, heat to 75 degrees celsius.
3. Slowly add B to A, carefully monitoring the temperature.

4. Add C.
5. Cool to 30 degrees celsius with moderate mixing. Add fragrance and preservative.
6. Homogenize

It will be understood that the ingredients of the sunscreen composition in Table A are available under the trade name or from the supplier indicated by the number in parentheses next to each ingredient in Table A which is defined in the list below:
Trade Names/Suppliers

(1) GE Advanced Materials, Silicones
(2) ISP
(3) BASF
(4) Uniqema
(5) Seppic

It will also be understood that quantity sufficient as used in Table A can be adjusted by the end user to specific desired amounts.

In one specific embodiment herein it will be understood that reaction product (a') can comprise a silicone network such as the non-limiting example of Velvesil available from GE Advanced Materials.

The examples below are given for the purpose of illustrating the invention of the instant case. They are not being given for any purpose of setting limitations on the embodiments described herein. All weights are weight percent based on the total weight of first silicone composition unless stated otherwise.

EXAMPLES

The use of alkyltrisiloxanes as fluid component for first silicone composition(s) provides a means of obtaining high viscosity silicone gel at low solids concentrations.

This result is unexpected when compared with other linear silicone fluids, which are typically much less effective silicone fluid components than corresponding cyclic silicone fluids and therefore require increasing amounts of cross-linked silicone network such as reaction product (a) or (a') to provide first silicone composition with desired properties. The addition of alkyltrisiloxane as fluid component also offers a number of formulation and sensory benefits when compared with silicone compositions swelled by other linear polydimethylsiloxane fluids. A number of silicone gels have been prepared using both octyltrisiloxane (OTS) and ethyltrisiloxane (ETS) as the fluid component either alone or in combination with other silicone fluids. It is quite clear from these studies that OTS and ETS fluids function as more efficient gel fluid components than other linear polydimethylsiloxane fluids. Also, when these gels with trisiloxanes are formulated into personal care formulations, the personal care formulations show a number of functional or aesthetic performance benefits not seen with gels swelled by other fluid component(s); some non-limiting examples of such sensory benefits include decreased balling on the skin, general feel of the personal care formulation on the skin and improved thickening of personal care formulations.

Comparative Example

260 grams (g) of a silicone hydride fluid with the approximate composition $M^{H}D_{133}D^{H}_{2.5}M^{H}$ was mixed with 8.5 g of vinyl cyclohexene oxide, 21.7g of Alpha Olefin (Gulftene C30+ from Chevron), 630 g of decamethyl cylcopentasiloxane (D_5) and 0.075 g of platinum catalyst solution, Karstedt's Catalyst. The mixture was heated to 90 degrees celsius and then mixed for 45 minutes. Then 9.7 g of another silicone hydride fluid, $MD^{H}_{50}M$ in 80 g of D_5 was added to the hot reaction mixture. This was stirred at 90 degrees celsius for another 4 hours and then the reaction was quenched with the addition of a terminal olefin which was $C_{16\text{-}18}$ alpha olefin from Innovene. The resulting material had a solids content of 29.8 weight percent and extractables of 20 weight percent based upon the total weight of reaction product (a'). Then 250 g of this material was diluted with 350 g of D_5, and then passed through a Gaulin homogenizer one time at 9000 pounds per square inch (psi). The resulting gel

(Sample 1) had a solids content of about 12.5 weight percent based upon the total weight of first silicone gel and a viscosity of 183,000 centipoise (cP) at 24 hours.

Example 1

260 g of a silicone hydride fluid with the approximate composition $M^HD_{133}D^H_{2.5}M^H$ was mixed with 8.5 g of vinyl cyclohexene oxide, 21.7g of alpha Olefin (Gulftene C30+ from Chevron), 630 g of ethyltrisiloxane and 0.075 g of platinum catalyst solution (Karstead's catalyst). The mixture was heated to 90 degrees celsius and then mixed for 45 minutes. Then 9.7 g of another silicone hydride, $MD^H_{50}M$ in 80 g of ethyltrisiloxane was added to the hot reaction mixture. This was stirred at 90 degrees celsius for another 4 hours and then the reaction was quenched with the addition of a terminal olefin which was C_{16-18} alphaolefin from Innovene. The resulting material had a solids content of 29.8 weight percent and extractables of 24.5 weight percent based upon the total weight of reaction product (a'). Then 250 g of this material was diluted with 350 g of ethyltrisiloxane and passed through a Gaulin homogenizer one time at 9000 psi. The resulting material (Sample 2) had a solids content of about 12.5 weight percent based upon the total weight of the silicone gel and a viscosity of 220,000 cP at 24 hours. When 250 g of this 29.8 weight percent cross-linked silicone powder was homogenized one time with 350 g of octyltrisiloxane , the resulting gel (Sample 2-a) had a solids content of about 12.5 weight percent based upon the total weight of silicone gel and a viscosity of 205,000 cP at 24 hours.

Example 2

260 g of a silicone hydride fluid with the approximate composition $M^HD_{133}D^H_{2.5}M^H$ was mixed with 8.5 g of vinyl cyclohexene oxide, 7.4 g of C_{16-18} alpha olefin from Innovene, 630 g of ethyltrisiloxane and 0.075 g of platinum catalyst solution (Karstedt's Catalyst). The mixture was heated to 90 degrees celsius and then mixed for 45 minutes. Then 9.7 g of another silicone hydride, $MD^H_{50}M$ in 80 g of ethyltrisiloxane was added to the hot reaction mixture. This was stirred at 90 degrees

celsius for another 4 hours and then the reaction was quenched with the addition of a terminal olefin (C_{16-18} from Innovene) The resulting material had a solids content of 31 weight percent and extractables of 18 weight percent based upon the total weight of reaction product (a'). Then 250 g of this material was diluted with 350 g of ethyltrisiloxane and passed through a Gaulin homogenizer one time at 9000 psi. The resulting material (Sample 3) had a solids content of about 12.5 weight percent based upon the total weight of silicone gel and a viscosity of 254,000 cP at 24 hours. When 250 g of this 31 weight percent cross-linked silicone powder, was homogenized with 350 g of octyltrisiloxane , the resulting gel (Sample 3-a) had a solids content of about 12.5 weight percent based upon the total weight of silicone gel and a viscosity of 185,000 cP at 24 hours.

Table 1 Summary of Results of Examples 1 and 2

	Sample	Alkyl Chain Length in Number of Carbon Atoms	Fluid Component	Extractables (weight-percent of reaction product (a'))	Gel Solids (weight-percent of silicone gel)	Viscosity (cP)
Comparative Example	1	30-45	D5	20	12.5	183,000
Example 1	2	30-45	ETS	24.5	12.5	220,000
	2a	30-45	ETS/OTS	24.5	12.5	205,000
Example 2	3	16-18	ETS	18	12.5	254,000
	3a	16-18	ETS/OTS	18	12.5	185,000

As the summary of results in Table 1 indicates, the decamethyl cylcopentasiloxane (D5) and ethyltrisiloxane have similar gel-swelling efficiencies when cross-linked polymer alkyl chain length and extractables measures are considered. Typically, higher extractables measures results in somewhat higher viscosity materials. Also noted from these experiments is that octyltrisiloxane is a less efficient swelling agent than ethyltrisiloxane as shown in Sample-2a and Sample-3a.

Example 3

Preparation of the reaction product (a'), and its swelling by a range of organosiloxane fluids. 260 g of a silicone hydride fluid with the approximate composition $M^HD_{133}D^H_{2.5}M^H$ was mixed with 8.5 g of vinyl cyclohexene oxide, 15.4g of $C_{16\text{-}18}$ alpha olefin from Innovene, 630g of polydimethylsiloxane (5cP) and 0.075 g of platinum catalyst solution (Karstedt's Catalyst). The mixture was heated to 90°C and then mixed for 45 minutes. Then 8.6g of another silicone hydride, $MD^H_{50}M$, in 80g of polydimethylsiloxane (5cP) was added to the hot reaction mixture. This was stirred at 90°C for another 4 hours and then the reaction was quenched with the addition of a terminal olefin ($C_{16\text{-}18}$ alpha olefin from Innovene). The resulting material had a solids content of 30%, based on the total weight of reaction product (a'). The following swollen silicone gels were prepared by passing blends of reaction product (a') powder with mixtures of octyltrisiloxane and 5 cP polydimethylsiloxane (PDMS) through the Gaulin homogenizer at 9,000 psi twice. The solids and viscosities of the resulting silicone gels (Samples 4-14) are listed in the following table; (Table 2).

Table 2: Silicone gels with linear silicones as swelling agents

Sample	Amount in grams of reaction product (a')	Amount in grams of octyltrisiloxane	Amount in grams of 5cP PDMS	Solids in gel (weight-percent of silicone gel)	Viscosity at 1 week (cP)
4	19,340	0	16,980	16	90,000
5	533	233	233	16	114,000
6	533	467	0	16	134,000
7	20,566	0	15,754	17	110,000
8	566	217	217	17	143,000
9	566	324	108	17	173,500
10	566	434	0	17	204,500
11	21,792	0	14,528	18	180,000
12	600	200	200	18	219,500

13	600	400	0	18	277,500
14	633	364	0	19	329,500

As the results in this example clearly illustrate, increasing the proportion of octyltrisiloxane to 5 cP PDMS increases the viscosity of the silicone gel at a given level of reaction product (a') solids in the silicone gel. Therefore alkyltrisiloxane is a more efficient fluid component for silicone gel than the linear 5 cP PDMS fluid.

Also, the alkyltrisiloxane is able to effectively swell reaction product (a') in the presence of a linear higher molecular weight PDMS fluid. Therefore, combination of PDMS and alkyltrisiloxane in silicone gel provides unique end user benefits, said combination of PDMS and alkyltrisiloxane will also be a more efficient swelling fluid component for reaction product (a') than PDMS used alone.

Example 4

260 grams (g) of a silicone hydride fluid with the approximate composition $M^HD_{133}D^H_{2.5}M^H$ was mixed with 8.5 g of vinyl cyclohexene oxide, 21.7g of Alpha Olefin (Gulftene C30+ from Chevron), 630 g of decamethyl cylcopentasiloxane (D_5) and 0.075 g of platinum catalyst solution, Karstedt's Catalyst. The mixture was heated to 90 degrees celsius and then mixed for 45 minutes. Then 9.7 g of another silicone hydride fluid, $MD^H_{50}M$ in 80 g of D_5 was added to the hot reaction mixture. This was stirred at 90 degrees celsius for another 4 hours and then the reaction was quenched with the addition of a terminal olefin which was $C_{16\text{-}18}$ alpha olefin from Innovene. The resulting material had a solids content of 30%, and extractables of 15 weight percent based on the total weight of reaction product (a'). The following silicone gels (Samples 15-20) were prepared by passing blends of reaction product (a') powder with mixtures of octyltrisiloxane and decamethyl cyclopentasiloxane through the Gaulin homogenizer at 9,000 psi. The solids and viscosities of the resulting gels are listed in the following table (Table 3).

Table 3: Silicone Gels with trisiloxanes as fluid components

Sample	Amount in grams of reaction product (a')	Amount in grams of octyltrisiloxane	Amount in grams of D5	Solids in gel (weight-percent of silicone gel)	Viscosity at 1 wk (cP)
15	247	0	353	12.5	126,000
16	247	176	176	12.5	108,000
17	247	353	0	12.5	83,500
18	297	0	303	15	334,500
19	297	152	152	15	204,000
20	297	303	0	15	200,500

As the results in Table 3 indicate, blending octyltrisiloxane with decamethyl cyclopentasiloxane provides silicone gels with lower viscosity implying that D_5 is a more effective fluid component than octyltrisiloxane .

Upon analysis of Examples 1-5, the following trend is very easy to ascertain: decamethyl cyclopentasiloxane (D5) ≅ ethyltrisiloxane > octyltrisiloxane > 5 cP PDMS fluid > higher molecular weight PDMS fluids in ranking of ability to swell reaction product (a').

Example 5

Enhanced Thickening Performance of Silicone Gel in Cosmetic Formulations: When silicone gels were formulated into "cream to powder" foundations, gels containing alkyltrisiloxanes provided had much higher viscosity products than gel containing D5 alone (Sample 1); and were easy to spread with very pleasant sensory properties and exhibited enhanced product stability. The formulations (1-4) are shown in the table below (Table 4). It will be understood that weight percent as used in Table 4 for the formulations 1-4 is weight percent was based on the total weight of the formulation.

Table 4: Foundation Formulations

Ingredient	Formulation 1	Formulation 2	Formulation 3	Formulation 4
Part A	weight percent	weight percent	weight percent	weight percent
Sample 1 (Example 1) (D5)	44.5			
Sample 2 (Example 2) (ETS)		44.5		
Sample 16 (Example 5) (D5/OTS)			44.5	
Sample 19 (Example 5) (D5/OTS)				44.5
Cyclopentasiloxane	30.2	30.2	30.2	30.2
Phenylpropyldimethylsiloxysilicate	3.0	3.0	3.0	3.0
Cyclopentasiloxane & Dimethicone	6.6	6.6	6.6	6.6
Part B				
Polymethylsilsequioxane	11.8	11.8	11.8	11.8
Part C				
TiO_2	2.8	2.8	2.8	2.8
Colored Pigments	1.1	1.1	1.1	1.1
Viscosity of final Foundations	9,500 cP	28,000 cP	62,000 cP	100,000 cP

These formulations were made by mixing all of the parts A, B and C for 5 to 10 minutes with an overhead stirrer at 3000 rotations per minute (rpm). As noted by the viscosity measurements of the final products, the use of ethyltrisiloxane or octyltrisiloxane in the silicone gels provided much higher viscosity cream to powder foundations (Formulations 2-4) than silicone gels without the trisiloxane (Formulation 1). These foundation formulations were also easy to spread with a differentiating sensory property that provided a powdery after feel for the product.

Example 7

Hydrosilylation of a linear hydrogen polyorganosiloxane and a linear alkenyl polyorganosiloxane. Partial Hydrosilylation of $MD_{24}D^{H}_{4}M$ with $CH_2=CHCH_2(OCH_2CH_2)_8OH$ (APEG 350) from Dow Chemical.

A organopolysiloxane with the average structure of $Me_3SiO(Me_2SiO)_{24}(MeHSiO)_4SiMe3$ ($MD_{24}D^{H}_{4}M$, 340 g, 0.15 mol) and mono-allyl functional polyether with the average structure of $CH_2=CHCH_2O(C_2H_4O)_8H$ (18.51 g, 0.5 mol) was charged into a 1 liter (L) reactor. Isopropanol (214 g, 3.56 mol) was added. The reaction mixture was agitated under nitrogen and heated to 75°C. Karsted'ts catalyst (10 ppm) was added. The reaction was allowed to proceed for two hours. The product was transferred to a rotary evaporator and stripped at 100°C and 4 torr for 1 hour.

Gel B Synthesis: The polyether modified silicone organopolysiloxane (336.77 g) ($MD_{24}D^{*}_{0.3}D'_{3.7}M$), an organopolysiloxane with the average structure of $CH_2=CHSi(CH_3)_2O(Me_2SiO)_{20}Si(CH_3)_2CH=CH_2$ ($M^{V}D_{20}M^{V}$, 224.00 g, 0.13 mol) and decamethylcyclopentasiloxane (439.97 g, 1.19 mol) were charged into a Ross mixer (Ross & Son Co. Hauppauge, NY model DPM-2). The low viscosity cloudy solution was agitated for 5 min under a nitrogen atmosphere. at 50 rpm. The temperature of the kettle was 80 °C. Karstedt's catalyst (0.2 mL, 10 wt% Pt) was added via a pipette and the reaction temperature was raised to 90 °C. Within 30 minutes (min.) a white powder was seen. The reaction was allowed to proceed for 1.5 hours, and then the agitation was increased to 100 rpm for an additional 30 min. A white powder in near quantitative yield was obtained.

Gel B Homogenization: Gel B (101.9 g) and each of the solvents, ETS, D5 or SF96-5, separately in amounts of (348.1 g) were premixed in separate suspensions using a Waring commercial blender (Torrington, CT). The composition of each suspension is disclosed in Table 7. Each suspension was transferred to a Gaulin Homogenizer

model 15MR-8TA (APV Homogenizer Group, Chino, CA) and homogenized at 8000 psig. The viscosity of each resulting gel was taken using a Brookfield Model DV-IT+ Pro viscometer (Middleboro, Massachusetts). The viscocity of each was also measured after a given length of time as indicated in Tables 5 and 6.

Example 8

Hydrosilylation of a linear hydrogen polyorganosiloxane having two or more hydrides and additionally alkyl or polyether functionality with an
α, ω, reactive organic molecule.

Partial Hydrosilylation of $MD_{100}D^{H}_{6.65}M$ with APEG 350: A organopolysiloxane with the average structure of $Me_3SiO(Me_2SiO)_{100}(MeHSiO)_{6.65}SiMe3$ ($MD_{100}D^{H}_{6.65}M$, 300.0 g, 0.04 mol), a monoallyl polyether (18.51 g, 0.05 mol) with the average structure of $CH_2=CHCHO(CH_2CH_2O)_8H$, and isopropanol (136.5 g, 2.3 mol) were charged into a 1000 ml round bottom equipped with a condenser, an overhead stirrer, and a temperature controller with a heating mantle. The turbid mixture was heated to 75°C and 0.5 ml of a 1 wt% platinum Karstedt's catalyst was added. The mixture was stirred for two hours. The product was stripped in a rotary evaporator at 100°C and at a reduced pressure.

Gel C Synthesis: The product of the partial hydrosilylation $MD_{100}D^{H}_{6.65}M$ with APEG 350 (194.84 g) was mixed with 1,5-hexadiene (5.0g, 0.06 mol) and decamethylcyclopentasiloxane (799.32 g, 2.16 mol) then charged into a Ross mixer (Charles Ross & Son Co. Hauppauge, NY model DPM-2). The low viscosity clear solution was agitated for 5 min under a nitrogen atmosphere at 50 rpm. Karstedt's catalyst (0.2 mL, 10 wt% Pt) was added via a pipette. After 10 min a white powdery solid formed in the mixer. The mixer was shut off and allowed to stand for 12 hours. The agitator was then turned back on and set to 100 rpm. A white powder was obtained in near quantitative yield.

Gel C Homogenization: Gel C (238.0 g) and each of the solvents, D5, ETS, or SF96-5, separately, in amounts of (212.0 g) were premixed in separate suspensions using a Waring commercial blender (Torrington, CT). The composition of each suspension is disclosed in Table 7. Each suspension was transferred to a Gaulin Homogenizer model 15MR-8TA (APV Homogenizer Group, Chino, CA) and homogenized at 8000 psig. The viscosity of each resulting gel was taken using a Brookfield Model DV-IT+ Pro viscometer (Middleboro, Massachusetts). The viscocity of each gel was also measured after a given length of time as indicated in Tables 5 and 6.

Example 9

Hydrosilylation of a hydride resin and linear alkenyl polyorganosiloxane.

Gel D Synthesis: An organopolysiloxane with the average structure of CH_2=CHSi(CH3)$_2$O(Me$_2$SiO)$_{897}$Si(CH$_3$)$_2$CH=CH$_2$ ($M^{vi}D_{897}M^{vi}$, 353.50g, 0.005 mol) and $M^H{}_2Q$ (1.51 g) and decamethylcyclopentasiloxane (658.8 g, 1.8 mol) was added to a Ross mixer (Charles Ross & Son Co. Hauppauge, NY model DPM-2). The Ross mixer was preheated to 80°C. The clear solution was agitated for 5 min under a N_2 atmosphere at 50 rpm. Karstedt's catalyst (0.2 mL, 10 wt% Pt) was added via a pipette and the speed of the mixer was set at 100 rpm. After 10 min a white powdery solid formed in the mixer. The reaction was allowed to continue for an additional 1.5 hours. A white powder was obtained in quantitative yield.
Gel D Homogenization: Gel D (92.1 g) and each of the solvents ETS, D5, or SF96-5, separately, in amounts of (357.9 g) were premixed in separate suspensions using a Waring commercial blender (Torrington, CT). The composition of each suspension is disclosed in Table 7. Each suspension was transferred to a Gaulin Homogenizer model 15MR-8TA (APV Homogenizer Group, Chino, CA) and homogenized at 8000 psig. The viscosity of each resulting gel was taken using a Brookfield Model DV-IT+ Pro viscometer (Middleboro, Massachusetts). The viscocity of each gel was also measured after a given length of time as indicated in Tables 5 and 6.

Furthermore, the M^H_2Q could be condensed with a hydroxyl-containing compound to form an alkoxy functional linear polyorganosiloxane or polyorganosiloxane resin that could then be reacted with linear alkenyl polyorganosiloxane.

Example 10

Hydrosilylation of a linear hydrogen polyorganosiloxane and a linear alkenyl polyorganosiloxane.

Gel E Synthesis: An organopolysiloxane with the average structure of $Me_3SiO(Me_2SiO)_{24.5}(MeHSiO)_{3.5}SiMe3$ ($MD_{24.50}D^H_{3.5}M$, 118.95 g, 0.05 mol), an organopolysiloxane with the average structure of $CH2=CHSi(CH3)_2O(Me_2SiO)_{20}Si(CH_3)_2CH=CH_2$ ($M^{vi}D_{20}M^{vi}$, 162.74g, 0.10 mol) and decamethylcyclopentasiloxane (718.36 g, 1.94 mol) were charged into a Ross mixer (Charles Ross & Son Co. Hauppauge, NY model DPM-2). The low viscosity clear solution was agitated for 5 min under a nitrogen atmosphere at 50 rpm. The temperature of the kettle was 80 °C. Karstedt's catalyst (0.2 mL, 10 wt% Pt) was added via a pipette and the reaction temperature was raised to 90 °C. Within 30 min. a white powder was seen. The reaction was allowed to proceed for 1.5 hours, and then the agitation was increased to 100 rpm for an additional 30 min. A white powder varying in particle size from very small to over 1 cm was obtained in near quantitative yield.

Gel E Homogenization: Gel E (241.9 g) and each of the solvents ETS, D5, and SF96-5, separately, in amounts of (208.1 g) were premixed using a Waring commercial blender (Torrington, CT). The composition of each suspension is disclosed in Table 7. Each suspension was transferred to a Gaulin Homogenizer model 15MR-8TA (APV Homogenizer Group, Chino, CA) and homogenized at 8000 psig. The viscosity of each resulting gel was taken using a Brookfield Model DV-IT+ Pro viscometer (Middleboro, Massachusetts). The viscocity of each gel also measured after a given length of time as indicated in Tables 5 and 6.

Example 11

Hydrosilylation of a linear alkenyl polyorganosiloxane with a organopolysiloxane containing at least one alkoxy group and at least two hydride functionalities, specifically, 2 or more D^H functionalities, where D^H is as described above.

Partial Condensation of $MD_{32}D^H_9M$ with stearyl alcohol: Decamethylcyclopentasiloxane (183.26 g, 0.5 mol), stearyl alcohol (25.68 g, 0.09 mol), and a organopolysiloxane with the average structure of $Me_3SiO(Me_2SiO)_{32}(MeHSiO)_9SiMe3$ ($MD_{32}D^H_9M$, 102.73 g, 0.03 mol) were charged into a 500 mL round bottom flask equipped with a condenser, an overhead stirrer, and a temperature controller with a heating mantle. The flask was heated to 130 °C and 0.1 mL of a 1 wt% solution of chloroplatinic acid in ethanol was added. After the initial flash off of ethanol hydrogen proceeded to bubble out of the flask. The reaction was allowed to continue for 3.5 hrs at 130 °C. The reaction was followed by FT-IR until no further reduction in the Si-H peak, at 910 cm^{-1}, was observed.

Gel F Synthesis: The stearyl alcohol modified silicone produced in the above reaction specifically,$MD_{32}D"_3D^H_6M$ silicone in Tables 5 and 6 was transferred to a Ross mixer (Charles Ross & Son Co. Hauppauge, NY model DPM-2) set to 95 °C. Decamethylcyclopentasiloxane (516.37 g, 0.5 mol) and an organopolysiloxane with the average structure of $CH2=CHSi(CH3)_2O(Me_2SiO)_{20}Si(CH_3)_2CH=CH_2$ ($M^{vi}D_{20}M^{vi}$, 171.60g, 0.10 mol) were agitated at 100 rpm for 10 min. 0.2 mL of a 10 wt% platinum Karstedt's catalyst was added. A white powder started to form after 10 minutes. The product was agitated in the Ross mixture for an additional 1.5 hours. A fine white powder was obtained in near quantitative yields.

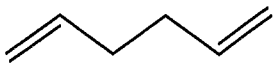
Gel F Homogenization: Gel F (226.51 g) and each solvent, ETS, D5 and SF96-5, separately, in amounts of (223.49 g) were premixed in separate suspsensions using a Waring commercial blender (Torrington, CT). The composition of each suspension is disclosed in Table 7. Each suspension was transferred to a Gaulin Homogenizer

model 15MR-8TA (APV Homogenizer Group, Chino, CA) and homogenized at 8000 psig. The viscosity of each resulting gel was taken using a Brookfield Model DV-IT+ Pro viscometer (Middleboro, Massachusetts). The viscocity of each gel was also measured after a given length of time as indicated in Tables 5 and 6.

Example 12

By analogy with Examples 7-11, it is expected that the reaction of a linear alkoxy hydride polyorganosiloxane with an α, ω, reactive organic diene molecule would yield a structure that could be effectively homogenized with trisiloxane to form a swollen gel.

Table 5: Summary of Results

			Viscosity (cP)		
Sample	Alkene	Hydride Fluid	ETS	D5	SF96-5
Gel B	$M^VD_{20}M^V$	$MD_{24}D^*_{0.3}D^H_{3.7}M$	23000[1]	37000[1]	1500[1]
Gel C	 1,5-hexadiene	$MD_{100}D^*_{1.25}D^H_{5.4}M$	27500[1]	104000[1]	10000[1]
Gel D	$M^VD_{897}M^V$	M^H_2Q	52000[2]	145000[2]	16000[2]
Gel E	$M^VD_{20}M^V$	$MD_{24.5}D^H_{3.5}M$	92000[3]	105500[3]	15000[3]
Gel F	$M^VD_{20}M^V$	$MD_{32}D"_3D^H_6M$	44500[2]	75000[2]	25000[2]

D* = $CH_3Si(O)CH_2(CH_2)_2O(CH_2CH_2O)_8H$

D" = $CH3Si(O)O(CH_2)_{17}CH_3$

SF96-5 is a linear polysiloxane with a viscocity of 5 cst obtainable from GE Silicones.

[1] : Viscocity taken 72 hrs after homogenization

[2] : Viscocity taken 48 hrs after homogenization

[3] : Viscocity taken 24 hrs after homogenization

Table 6: Viscosity Data of various gels swollen in D5, ETS, or SF96-5

	Viscosity 24hrs (cP)			Viscosity 48hrs (cP)			Viscosity 72hrs (cP)		
Solvent	ETS	D5	SF96-5	ETS	D5	SF96-5	ETS	D5	SF96-5
Gel A	32500	92000	50500				115500	196000	155500
Gel B	18000	29000	500				23000	37000	1500
Gel C							27500	104000	10000
Gel D	45000	141000	15000	52000	145000	16000			
Gel E	92000	105500	15000						
Gel F	44000	71000	25000	44500	75000	25000			

Table 7: Percent composition of the homogenized gels

Sample	Solvent	Polymer (wt%)	D_5 (wt%)	ETS (wt%)	SF96-5 (wt%)
Gel A	D5	8%	92%	-	-
Gel A	ETS	8%	29%	63%	-
Gel A	SF96-5	8%	29%	-	63%
Gel B	D5	13%	87%	-	-
Gel B	ETS	13%	10%	77%	
Gel B	SF96-5	13%	10%		77%
Gel C	D5	11%	89%		
Gel C	ETS	11%	42%	47%	
Gel C	SF96-5	11%	42%		47%
Gel D	D5	7%	93%		
Gel D	ETS	7%	13%	80%	
Gel D	SF96-5	7%	13%		80%
Gel E	D5	15%	85%		
Gel E	ETS	15%	39%	46%	
Gel E	SF96-5	15%	39%		46%
Gel F	D5	15%	85%		
Gel F	ETS	15%	35%	50%	
Gel F	SF96-5	15%	35%		50%

While the above description comprises many specifics, these specifics should not be construed as limitations, but merely as exemplifications of specific embodiments thereof. Those skilled in the art will envision many other embodiments within the scope and spirit of the description as defined by the claims appended hereto.

CLAIMS

1. A first silicone composition comprising:

a) the reaction product of

$$M_aM^H_bM^{vi}_cM"_dM*_eD_fD^H_gD^{vi}_hD"_iD*_jT_kT^H_LT^{vi}_mT"_nT*_oQ_p$$

where

$M= R^1R^2R^3SiO_{1/2}$;

$M^H= R^4R^5HSiO_{1/2}$;

$M^{vi}= R^6R^7R^8SiO_{1/2}$;

$M"= R^9R^{10}R"SiO_{1/2}$;

$M*=R^{11}R^{12}R*SiO_{1/2}$;

$D= R^{13}R^{14}SiO_{2/2}$;

$D^H= R^{15}HSiO_{2/2}$;

$D^{vi}= R^{16}R^{17}SiO_{2/2}$;

$D"= R^{18}R"SiO_{2/2}$;

$D*= R^{19}R* SiO_{2/2}$;

$T= R^{20}SiO_{3/2}$;

$T^H=HSiO_{3/2}$;

$T^{vi}=R^{21}SiO_{3/2}$;

$T"= R"SiO_{3/2}$;

$T*= R*SiO_{3/2}$; and,

$Q=SiO_{4/2}$

where R^1, R^2, R^3, R^{13}, R^{14} and R^{20} are each independently monovalent hydrocarbon radicals having from one to about sixty carbon atoms; R^4, R^5 and R^{15} are each independently monovalent hydrocarbon radicals having from one to about sixty carbon atoms or hydrogen; R^6 is a monovalent unsaturated hydrocarbon radical having from two to about ten carbon atoms, and R^7 and R^8 are each independently monovalent hydrocarbon radicals having from one to about sixty carbon atoms; R^{16} is a monovalent unsaturated hydrocarbon radical having from two to about ten carbon atoms; and R^{17} is a monovalent hydrocarbon radical having from one to about sixty carbon atoms; R^{21} is a monovalent unsaturated hydrocarbon radical having from two

to about ten carbon atoms; R^9, R^{10}, and R^{18} are independently monovalent hydrocarbon radicals having from one to about sixty carbon atoms or R"; each R" is independently a monovalent alkoxy radical having from one to about sixty carbon atoms; R^{11}, R^{12}, and R^{19} are independently monovalent hydrocarbon radicals having from one to about 200 carbon atoms or R*; each R* is independently a monovalent ether radical having from one to about two hundred carbon atoms and containing one or more ether moieties; the stoichiometric subscripts a, b, c, d, e, f, g, h, i, j, k, L, m, n, o and p are either zero or positive subject to the following limitations: a+b+c+d+e>1; b+g+L≥1; and c+h+m≥1 and/or where reaction product also optionally comprises reaction with an alkenyl resin containing of from about 1 to about 2000 carbon atoms; and reaction product does not result in a polymer containing a polyether crosslink; and,

b) a swelling amount of an alkyltrisiloxane wherein said reaction product is swollen by said alkyltrisiloxane to form a first silicone composition and wherein said first silicone composition possesses a lower solids content than a solids content present in a second silicone composition comprising said reaction product and a linear silicone fluid other than an alkyltrisiloxane, whereby second silicone composition and first silicone composition have equivalent viscosities.

2. The first silicone composition of Claim 1, where first silicone composition has a given cross-linked structure and a given cross-link density and said lower solids content of first silicone composition is at least about 10 percent lower than the solids content for second silicone composition which has an equivalent cross-linked structure and an equivalent cross-link density to first silicone composition; and where first silicone composition has a viscosity of greater than about 10,000 centistokes.

3. The first silicone composition of Claim 1, where first silicone composition has a given cross-linked structure and a given cross-link density and said lower solids content of first silicone composition is at least about 25 percent lower

than the solids content for second silicone composition which has an equivalent cross-linked structure and an equivalent cross-link density to first silicone composition; and where first silicone composition has a viscosity of greater than about 100,000 centistokes.

4. The first silicone composition of Claim 1, where first silicone composition has a given cross-linked structure and a given cross-link density and said lower solids content of first silicone composition is at least about 40 percent lower than the solids content for second silicone composition which has an equivalent cross-linked structure and an equivalent cross-link density to first silicone composition; and where first silicone composition has a viscosity of greater than about 200,000 centistokes.

5. The first silicone composition of Claim 1 where reaction product (a) can comprise the reaction product of (I) a compound comprising the formula:

$$M^{H}_{b}D_{f}D^{H}_{g}M_{2-b}$$

where M, M^{H}, D and D^{H} are as defined and the stoichiometric subscripts b, f, and g are zero or positive subject to the limitations: f is a number from about 10 to about 50, g is a number from zero to about 50, b is a number of from zero to two, provided that b+g is from 1 to about 100; (II) alkenyl resin; (III) alpha-olefin fraction; (IV) alkyltrisiloxane and optionally cyclic siloxane, (V) platinum catalyst; (VI) catalyst formed through the interaction of platinum with a Si-H bond containing compound in fluid component; and (VII) agent for quenching residual functionality of (I) and/or (II).

6. The first silicone composition of Claim 5 wherein compound of formula (I) comprises $MD_{20}D^{H}_{3}M$ and (II) comprises 1,5-hexadiene.

7. The first silicone composition of Claim 1 where reaction product (a) can comprise the reaction product of (I) a compound comprising the formula:

$$M^H_bD_fD^*_jD^H_gM_{2-b}$$

where M^H, D, D*, D^H and M are as defined and the stoichiometric subscripts b, f, j and g are zero or positive subject to the limitations: f is 0 or a number from 1 to 500, j is a number from 0.1 to 10, g is a number from zero to 50, b is a number from zero to two, subject to the limitation that b+g is from 1 to 100;
(II) $M^{vi}_cD_fD^{vi}_hM_{2-c}$ and/or an alkenyl resin of from 2 to about 2000 carbon atoms, where M^{vi}, D, D^{vi} and M are as defined and the stoichiometric subscripts c, f, and h are zero or positive subject to the limitations that f is a number from 1 to 300, h is a number of from zero to 20, and c is a number of from zero to 2, provided that c+h is a number of from 1 to 22; (III) alpha-olefin fraction; (IV) alkyltrisiloxane and optionally cyclic siloxane, (V) platinum catalyst formed through the interaction of platinum with a Si-H bond containing compound in fluid component; and (VII) agent for quenching residual functionality of (I) and/or (II).

8. The first silicone composition of Claim 7 wherein compound of formula (I) comprises $MD_{24}D^*_{0.3}D^H_{3.7}M$ and (II) comprises $M^{vi}D_{20}M^{vi}$.

9. The first silicone composition of Claim 7 wherein compound of formula (I) comprises $MD_{100}D^*_{1.25}D^H_{5.4}M$ and (II) comprises 1, 5-hexadiene.

10. The first silicone composition of Claim 1 where reaction product (a) can comprise the reaction product of (I) a compound comprising the formula:

$$M^H_bQ_pM_{2-b}$$

where M^H, Q and M are as defined and the stoichiometric subscripts b and p are zero or positive subject to the limitations: p is a number ≥ 1, b is a number of from one to two, subject to the limitation that b+p is a number of from 2 to about 20;

(II) $M^{vi}_cD_fD^{vi}_hM_{2-c}$

where M^{vi}, D, D^{vi}, and M are as defined; the stoichiometric subscripts c, f and h, are zero or positive subject to the limitations that f is 0 or a number of from about 1 to about 1200, h is a number of from zero to about 20, and c is a number of from zero to 2, provided that c+h is a number of from 1 to about 22; (III) alpha-olefin fraction; (IV) alkyltrisiloxane and optionally cyclic siloxane, (V) platinum catalyst formed through the interaction of platinum with a Si-H bond containing compound in fluid component; and (VII) agent for quenching residual functionality.

11. The first silicone composition of Claim 10 wherein compound of formula (I) comprises M^H_2Q and (II) comprises $M^{vi}D_{897}M^{vi}$.

12. The first silicone composition of Claim 1 where reaction product (a) can comprise the reaction product of (I) a compound comprising the formula:

$$M^H_bD_fD''_iD^H_gM_{2-b}$$

where M, M^H, D, D" and D^H are as defined and the stoichiometric subscripts b, f, i and g are zero or positive subject to the limitations: f is a number of from 0 to 500, i is zero or a number of from 1 to 20, g is a number of from zero to 20, and b is a number of from zero to 2, provided that b+g is a number of from 1 to 100;

(II) $M^{vi}_cD_fD^{vi}_hM_{2-c}$

where M^{vi}, D, D^{vi}, and M are as defined; the stoichiometric subscripts c, f and h, are zero or positive subject to the limitations that f is a number of from 0 to 500, h is a number of from zero to 20, c is a number of from zero to 2 and c+h is a number of from 1 to 22; (III) alpha-olefin fraction; (IV) alkyltrisiloxane and optionally cyclic siloxane, (V) platinum catalyst formed through the interaction of platinum with a Si-H bond containing compound in fluid component; and (VII) agent for quenching residual functionality.

13. The first silicone composition of Claim 12 wherein compound of formula (I) comprises $MD_{24.5}D^H_{3.5}M$ and (II) comprises $M^{vi}D_{20}M^{vi}$.

14. The first silicone composition of Claim 12 wherein compound of formula (I) comprises $MD_{32}D''_3D^H_6M$ and (II) comprises $M^{vi}D_{20}M^{vi}$.

15. The first silicone composition of Claim 1 where reaction product (a) can comprise polymerization product selected from the group consisting of addition product; condensation product of amino resin formed from urea monomer or melamine monomer and formaldehyde monomer, furan polymer produced by polymerizing furfuryl alcohol monomer, polyacetal polymer formed from dialdehyde monomer and dialcohol monomer, poly(alkylene sulfide) polymers formed from alkyl bromide monomer and potassium sulfide monomer, polyamide polymer formed from diacid monomer and diamine monomer, polyamine formed from diamine monomer and dihalide monomer, polyaminotriazole polymer formed from dihydride monomer and hydrazine monomer, polyanhydride formed from polymerization of diacid monomer, polycarbonate formed from diol monomer and phosgene monomer, polyhydrazide polymer formed from phenyl diester monomer and dihydrazine monomer, polyimide formed from tetraacid monomer and diamine monomer, polyquinoxaline polymer formed from tetracarbonyl monomer and diamine monomer, polysaccharide formed from polymerization of monosaccharide monomer, polysulfide polymer formed from dihalide monomer and polysulfide monomer, polyurea formed from diamine monomer and phosgene monomer, protein polymer formed from polymerization of amino acid monomer, silicone formed from dihaloalkylsilane monomer and water, polyester formed from difunctional acid monomer and difunctional alcohol monomer; step reaction polymerization of diisocyanato monomers and polyol monomers, as well as step reaction polymerization of the condensation polymerizations; and combinations thereof.

16. The first silicone composition of Claim 1 where at least one alkyltrisiloxane (b) material results from the alkylation of a polyorganosiloxane having the formula (A):

$$MD^HM \qquad (A)$$

where

$M = R^A R^B R^C SiO_{1/2}$; and

$D^H = R^D HSiO_{2/2}$;

where R^A, R^B, and R^C are independently monovalent hydrocarbon radicals having from one to sixty carbon atoms; and R^D is a monovalent hydrocarbon radical having from one to sixty carbon atoms or hydrogen.

17. The first silicone composition of Claim 1 where at least one alkyltrisiloxane (b) has the formula:

$$M\text{^}D\text{^}_rM$$

where

M or M^ = $R^F R^G R^I SiO_{1/2}$; and,

D^= $R^J R^K SiO_{2/2}$

where each R^F, each R^G, and each R^I are independently monovalent hydrocarbon radicals having from one to sixty carbon atoms to allow for M and M^ to be different; and where R^J and R^K are independently monovalent hydrocarbon radicals having from two to sixty carbon atoms; the stoichiometric subscripts r is positive subject to the limitations: that the silicon atom of D^ has a pendant group that is other than hydrogen, methyl and polyether, and r is equal to one.

18. The first silicone composition of Claim 1 where at least one alkyltrisiloxane is a linear alkyltrisiloxane selected from the group consisting of ethyltrisiloxane, octyltrisiloxane, hexyltrisiloxane, and combinations thereof.

19. The first silicone composition of Claim 1 where at least one alkyltrisiloxane is a linear alkyltrisiloxane selected from the group consisting of 1,1,1,3,5,5,5-heptamethyl-3-ethyltrisiloxane; 1,1,1,3,5,5,5-heptamethyl-3-octyltrisiloxane; 1,1,1,3,5,5,5-heptamethyl-3-hexyltrisiloxane, octamethyltrisiloxane; 3-pentyl-1,1,1,3,5,5,5-heptamethyltrisiloxane; 1-hexyl-

1,1,3,3,5,5,5-heptamethyltrisiloxane; 1,1,1,3,3,5,5-heptamethyl-5-octyltrisiloxane; 1,1,1,3,5,5,5-heptamethyl-3-octyltrisiloxane; 1,1,1,3,5,5,5-heptamethyl-3-hexyltrisiloxane; 1,1,3,3,5,5-hexamethyl-1,5-dipropyltrisiloxane; 3-(1-ethylbutyl)-1,1,1,3,5,5,5-heptamethyltrisiloxane; 1,1,1,3,5,5,5-heptamethyl-3-(1-methylpentyl)trisiloxane; 1,5-diethyl-1,1,3,3,5,5-hexamethyltrisiloxane; 1,1,1,3,5,5,5-heptamethyl-3-(1-methylpropyl)trisiloxane; 3-(1,1-dimethylethyl)-1,1,1,3,5,5,5-heptamethyltrisiloxane; 1,1,1,5,5,5-hexamethyl-3,3-bis(1-methylethyl)trisiloxane; 1,1,1,3,3,5,5-hexamethyl-1,5-bis(1-methylpropyl)trisiloxane; 1,5-bis(1,1-dimethylethyl)-1,1,3,3,5,5-hexamethyltrisiloxane; 3-(3,3-dimethylbutyl)-1,1,1,3,5,5,5-heptamethyltrisiloxane; 1,1,1,3,5,5,5-heptamethyl-3-(3-methylbutyl)trisiloxane; 1,1,1,3,5,5,5-heptamethyl-3-(3-methylpentyl)trisiloxane; 1,1,1,3,5,5,5-heptamethyl-3-(2-methylpropyl)trisiloxane; 1-butyl-1,1,3,3,5,5,5-heptamethyltrisiloxane; 1,1,1,3,5,5,5-heptamethyl-3-propyltrisiloxane; 3-isohexyl-1,1,1,3,5,5,5-heptamethyltrisiloxane; 1,3,5-triethyl-1,1,3,5,5-pentamethyltrisiloxane; 3-butyl-1,1,1,3,5,5,5-heptamethyltrisiloxane; 3-tert-pentyl-1,1,1,3,5,5,5-heptamethyltrisiloxane; 1,1,1,5,5,5-hexamethyl-3,3-dipropyltrisiloxane; 3,3-diethyl-1,1,1,5,5,5-hexamethyltrisiloxane; 1,5-dibutyl-1,1,3,3,5,5-hexamethyltrisiloxane; 1,1,1,5,5,5-hexaethyl-3,3-dimethyltrisiloxane; 3,3-dibutyl-1,1,1,5,5,5-hexamethyltrisiloxane; 3-ethyl-1,1,1,3,5,5,5-heptamethyltrisiloxane; 3-heptyl-1,1,1,3,5,5,5-heptamethyltrisiloxane; 1-ethyl-1,1,3,3,5,5,5-heptamethyltrisiloxane; 1,1,1,5,5,5-hexamethyl-3,3-diethyltrisiloxane; 1,1,3,3,5,5-hexamethyl-1,5-diethyltrisiloxane; 1,1,1,3,5,5,5-heptamethyl-3-butyltrisiloxane and combinations thereof.

20. A silicone gel substantially comprising first silicone composition of Claim 1.

21. A silicone gel substantially comprising first silicone composition of Claim 2.

22. A silicone gel substantially comprising first silicone composition of Claim 3.

23. A silicone gel substantially comprising first silicone composition of Claim 4.

24. A silicone gel substantially comprising first silicone composition of Claim 17.

25. A personal care formulation comprising the silicone gel of Claim 20 where the personal care formulation is selected from the group consisting of deodorant, antiperspirant, antiperspirant/deodorant, shaving product, skin lotion, moisturizer, toner, bath product, cleansing product, hair care product manicure product, protective cream, color cosmetic, a vehicle for fragrance delivery benefits, drug delivery system for topical application of medicinal composition that is to be applied to the skin, and combinations thereof.

26. The personal care formulation of Claim 25 further comprising personal care ingredient selected from the group consisting of emollient, moisturizer, humectant, pigment, coated mica, colorant, fragrance, biocide, preservative, antioxidant, anti-microbial agent, anti-fungal agent, antiperspirant agent, exfoliant, hormone, enzyme, medicinal compound, vitamin, salt, electrolyte, alcohol, polyol, absorbing agent for ultraviolet radiation, botanical extract, surfactant, silicone oil, organic oil, wax, film former, thickening agent, particulate filler, clay, and combinations thereof.

27. A process for producing a first silicone composition comprising: combining:

a) the reaction product of

$$M_aM^H{}_bM^{vi}{}_cM''_dM^*{}_eD_fD^H{}_gD^{vi}{}_hD''_iD^*{}_jT_kT^H{}_LT^{vi}{}_mT''_nT^*{}_oQ_p$$

where

$M = R^1R^2R^3SiO_{1/2}$;

$M^H = R^4R^5HSiO_{1/2}$;

$M^{vi} = R^6R^7R^8SiO_{1/2}$;

$M'' = R^9R^{10}R''SiO_{1/2}$;

$M^* = R^{11}R^{12}R^*SiO_{1/2}$;

$D = R^{13}R^{14}SiO_{2/2}$;

$D^H = R^{15}HSiO_{2/2}$;

$D^{vi} = R^{16}R^{17}SiO_{2/2}$;

$D'' = R^{18}R''SiO_{2/2}$;

$D^* = R^{19}R^*SiO_{2/2}$;

$T = R^{20}SiO_{3/2}$;

$T^H = HSiO_{3/2}$;

$T^{vi} = R^{21}SiO_{3/2}$;

$T'' = R''SiO_{3/2}$;

$T^* = R^*SiO_{3/2}$; and,

$Q = SiO_{4/2}$

where R^1, R^2, R^3, R^{13}, R^{14} and R^{20} are each independently monovalent hydrocarbon radicals having from one to about sixty carbon atoms; R^4, R^5 and R^{15} are each independently monovalent hydrocarbon radicals having from one to about sixty carbon atoms or hydrogen; R^6 is a monovalent unsaturated hydrocarbon radical having from two to about ten carbon atoms, and R^7 and R^8 are each independently monovalent hydrocarbon radicals having from one to about sixty carbon atoms; R^{16} is a monovalent unsaturated hydrocarbon radical having from two to about ten carbon atoms; and R^{17} is a monovalent hydrocarbon radical having from one to about sixty carbon atoms; R^{21} is a monovalent unsaturated hydrocarbon radical having from two to about ten carbon atoms; R^9, R^{10}, and R^{18} are independently monovalent hydrocarbon radicals having from one to about sixty carbon atoms or R"; each R" is independently a monovalent alkoxy radical having from one to about sixty carbon atoms; R^{11}, R^{12}, and R^{19} are independently monovalent hydrocarbon radicals having from one to about 200 carbon atoms or R*; each R* is independently a monovalent

ether radical having from one to about two hundred carbon atoms and containing one or more ether moieties; the stoichiometric subscripts a, b, c, d, e, f, g, h, i, j, k, L, m, n, o and p are either zero or positive subject to the following limitations: a+b+c+d+e>1; b+g+L≥1; and c+h+m≥1 and/or where reaction product also optionally comprises reaction with a alkenyl resin containing of from about 1 to about 2000 carbon atoms; and reaction product does not result in a polymer containing a polyether crosslink; and,

b) a swelling amount of an alkyltrisiloxane wherein said reaction product is swollen by said alkyltrisiloxane to form a first silicone composition and wherein said first silicone composition possesses a lower solids content than a solids content present in a second silicone composition comprising said reaction product and a linear silicone fluid other than an alkyltrisiloxane, whereby second silicone composition and first silicone composition have equivalent viscosities.

28. The process of Claim 27 where first silicone composition has a given cross-linked structure and a given cross-link density and said lower solids content of first silicone composition is at least about 10 percent lower than the solids content for second silicone composition which has an equivalent cross-linked structure and an equivalent cross-link density to first silicone composition; and where first silicone composition has a viscosity of greater than about 10,000 centistokes.

29. The process of Claim 27 where first silicone composition has a given cross-linked structure and a given cross-link density and said lower solids content of first silicone composition is at least about 25 percent lower than the solids content for second silicone composition which has an equivalent cross-linked structure and an equivalent cross-link density to first silicone composition; and where first silicone composition has a viscosity of greater than about 100,000 centistokes.

30. The process of Claim 27 where first silicone composition has a given cross-linked structure and a given cross-link density and said lower solids content of first silicone composition is at least about 40 percent lower than the solids content for

second silicone composition which has an equivalent cross-linked structure and an equivalent cross-link density to first silicone composition; and where first silicone composition has a viscosity of greater than about 200,000 centistokes.

31. The process of Claim 27 where reaction product (a) can comprise the reaction product of (I) a compound comprising the formula:

$$M^H_bD_fD^H_gM_{2-b}$$

where M, M^H, D and D^H are as defined and the stoichiometric subscripts b, f, and g are zero or positive subject to the limitations: f is a number from about 10 to about 50, g is a number from zero to about 50, b is a number of from zero to two, provided that b+g is from 1 to about 100; (II) alkenyl resin; (III) alpha-olefin fraction; (IV) alkyltrisiloxane and optionally cyclic siloxane, (V) platinum catalyst; (VI) catalyst formed through the interaction of platinum with a Si-H bond containing compound in fluid component; and (VII) agent for quenching residual functionality of (I) and/or (II).

32. The process of Claim 31 wherein compound of formula (I) comprises $MD_{20}D^H_3M$ and (II) comprises 1,5-hexadiene.

33. The process of Claim 27 where reaction product (a) can comprise the reaction product of (I) a compound comprising the formula:

$$M^H_bD_fD^*_jD^H_gM_{2-b}$$

where M^H, D, D*, D^H and M are as defined and the stoichiometric subscripts b, f, j and g are zero or positive subject to the limitations: f is 0 or a number from 1-500, j is a number from 0.1 to 10, g is a number from zero to 50, b is a number from zero to two, subject to the limitation that b+g is from 1 to 100;

(II); $M^{vi}_cD_fD^{vi}_hM_{2-c}$ and/or an alkenyl resin of from 2 to about 2000 carbon atoms, where M^{vi}, D, D^{vi} and M are as defined and the stoichiometric subscripts c, f, and h are zero or positive subject to the limitations that f is a number from 1 to 300, h is a number of from zero to 20, and c is a number of from zero to 2, provided that c+h is a number of from 1 to 22; (III) alpha-olefin fraction; (IV) alkyltrisiloxane and optionally cyclic siloxane, (V) platinum catalyst formed through the interaction of platinum with a Si-H bond containing compound in fluid component; and (VII) agent for quenching residual functionality of (I) and/or (II).

34. The process of Claim 33 wherein compound of formula (I) comprises $MD_{24}D^*_{0.3}D^H_{3.7}M$ and (II) comprises $M^{vi}D_{20}M^{vi}$.

35. The process of Claim 33 wherein compound of formula (I) comprises $MD_{100}D^*_{1.25}D^H_{5.4}M$ and (II) comprises 1, 5-hexadiene.

36. The process of Claim 27 where reaction product (a) can comprise the reaction product of (I) a compound comprising the formula:

$$M^H_bQ_pM_{2-b}$$

where M^H, Q and M are as defined and the stoichiometric subscripts b and p are zero or positive subject to the limitations: p is a number ≥ 1, b is a number of from one to two, subject to the limitation that b+p is a number of from 2 to about 20;

(II) $M^{vi}_cD_fD^{vi}_hM_{2-c}$

where M^{vi}, D, D^{vi}, and M are as defined; the stoichiometric subscripts c, f and h, are zero or positive subject to the limitations that f is 0 or a number of from about 1 to about 1200, h is a number of from zero to about 20, and c is a number of from zero to 2, provided that c+h is a number of from 1 to about 22; (III) alpha-olefin fraction; (IV) alkyltrisiloxane and optionally cyclic siloxane, (V) platinum catalyst formed through the interaction of platinum with a Si-H bond containing compound in fluid component; and (VII) agent for quenching residual functionality.

37. The process of Claim 36 wherein compound of formula (I) comprises M^H_2Q and (II) comprises $M^{vi}D_{897}M^{vi}$.

38. The process of Claim 27 where reaction product (a) can comprise the reaction product of (I) a compound comprising the formula:

$$M^H_bD_fD''_iD^H_gM_{2-b}$$

where M, M^H, D, D" and D^H are as defined and the stoichiometric subscripts b, f, i and g are zero or positive subject to the limitations: f is a number of from 10 to 50, i is zero or a number of from 1 to 20, g is a number of from zero to 20, and b is a number of from zero to 2, provided that b+g is a number of from 1 to 100;

(II) $M^{vi}_cD_fD^{vi}_hM_{2-c}$

where M^{vi}, D, D^{vi}, and M are as defined; the stoichiometric subscripts c, f and h, are zero or positive subject to the limitations that f is a number of from 10 to 50, h is a number of from zero to 20, c is a number of from zero to 2 and c+h is a number of from 1 to 22; (III) alpha-olefin fraction; (IV) alkyltrisiloxane and optionally cyclic siloxane, (V) platinum catalyst formed through the interaction of platinum with a Si-H bond containing compound in fluid component; and (VII) agent for quenching residual functionality.

39. The process of Claim 38 wherein compound of formula (I) comprises $MD_{24.5}D^H_{3.5}M$ and (II) comprises $M^{vi}D_{20}M^{vi}$.

40. The process of Claim 38 wherein compound of formula (I) comprises $MD_{32}D''_3D^H_6M$ and (II) comprises $M^{vi}D_{20}M^{vi}$.

41. The process of Claim 27 where reaction product (a) can comprise polymerization product selected from the group consisting of addition product; condensation product of amino resin formed from urea monomer or melamine monomer and formaldehyde monomer, furan polymer produced by polymerizing furfuryl alcohol monomer, polyacetal polymer formed from dialdehyde monomer and

dialcohol monomer, poly(alkylene sulfide) polymers formed from alkyl bromide monomer and potassium sulfide monomer, polyamide polymer formed from diacid monomer and diamine monomer, polyamine formed from diamine monomer and dihalide monomer, polyaminotriazole polymer formed from dihydride monomer and hydrazine monomer, polyanhydride formed from polymerization of diacid monomer, polycarbonate formed from diol monomer and phosgene monomer, polyhydrazide polymer formed from phenyl diester monomer and dihydrazine monomer, polyimide formed from tetraacid monomer and diamine monomer, polyquinoxaline polymer formed from tetracarbonyl monomer and diamine monomer, polysaccharide formed from polymerization of monosaccharide monomer, polysulfide polymer formed from dihalide monomer and polysulfide monomer, polyurea formed from diamine monomer and phosgene monomer, protein polymer formed from polymerization of amino acid monomer, silicone formed from dihaloalkylsilane monomer and water, polyester formed from difunctional acid monomer and difunctional alcohol monomer; step reaction polymerization of diisocyanato monomers and polyol monomers, as well as step reaction polymerization of the condensation polymerizations; and combinations thereof.

42. The process of Claim 27 where at least one alkyltrisiloxane (b) has the formula

$$M^{\wedge}D^{\wedge}_{r}M$$

where

M or M^ = $R^{F}R^{G}R^{I}SiO_{1/2}$; and,

D^= $R^{J}R^{K}SiO_{2/2}$

where each R^{F}, each R^{G}, and each R^{I} are independently monovalent hydrocarbon radicals having from one to sixty carbon atoms to allow for M and M^ to be different; and where R^{J} and R^{K} are independently monovalent hydrocarbon radicals having from two to sixty carbon atoms; the stoichiometric subscripts r is positive subject to the limitations: that the silicon atom of D^ has a pendant group that is other than hydrogen, methyl and polyether, and r is equal to one.

43. The process of Claim 27 further comprising where reaction product (a) is produced in the presence of at least one first fluid component and is subsequently swollen, where swelling said reaction product (a) comprises diluting the reaction product (a), that has been produced in the presence of at least one first fluid component, with at least one second fluid component with the proviso that at least one first fluid component and/or at least one second fluid component is alkyltrisiloxane (b).

44. A personal care formulation comprising the first silicone composition produced by the process of Claim 43 where the personal care formulation is selected from the group consisting of deodorants, antiperspirants, antiperspirant/deodorants, shaving products , skin lotions, moisturizers, toners, bath products , cleansing products , hair care products , manicure products, protective creams, color cosmetics, a vehicle for fragrance delivery benefits, drug delivery systems for topical application of medical compositions that are to be applied to the skin, and combinations thereof.

45. The personal care formulation of Claim 44 further comprising personal care ingredient selected from the group consisting of emollient, moisturizer, humectant, pigment, coated mica, colorant, fragrance, biocide, preservative, antioxidant, anti-microbial agent, anti-fungal agent, antiperspirant agent, exfoliant, hormone, enzyme, medicinal compound, vitamin, salt, electrolyte, alcohol, polyol, absorbing agent for ultraviolet radiation, botanical extract, surfactant, silicone oil, organic oil, wax, film former, thickening agent, particulate filler, clay, and combinations thereof.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2006/043314

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61K8/89 C08L83/04 C08L83/12

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61K C08L

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, COMPENDEX, CHEM ABS Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 083 900 A (AUGUSTE FREDERIC [FR] ET AL) 4 July 2000 (2000-07-04) column 2, line 27 - column 3, line 17 column 4, lines 1-34; claims 1-3,9; examples	10,11, 16-19, 24,36,37
Y		7-9, 33-35
A		12-14, 38-40

Y	EP 0 934 959 A1 (DOW CORNING [US]) 11 August 1999 (1999-08-11) paragraphs [0013], [0027], [0033], [0035] - [0037]; claims; examples 1,2	7-9, 33-35
A		10-14, 16-19, 24,36-40

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 April 2007	09/05/2007
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Authorized officer Hein, Friedrich

Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2005 314358 A (KOSE CORP) 10 November 2005 (2005-11-10) paragraphs [0034] - [0036], [0038]; example 7	7-14, 16-19, 24,33-40
A	EP 1 481 660 A (SHINETSU CHEMICAL CO [JP]) 1 December 2004 (2004-12-01) claims 1-5; example 48	7-14, 16-19, 24,33-40

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 1-6,15,20-23,25-32,41-45

Claim 1 relates to the "reaction product" of an organopolysiloxane according to a generic formula. The organopolysiloxane comprises =SiH- and =Si(vi)- motifs (vi comprises monovalent unsaturated hydrocarbon radical(s)) and optionally ether or alkoxy radiclas and is devoid of polyether crosslinks, but otherwise the nature of that "reaction product" is entirely unclear. The structure of the "alkyltrisiloxane" is also unclear. Furthermore, the reference point for the solids content and the viscosity is not clearly defined since the "second composition" according to claim 1 comprises a "linear silicone fluid" which is not further characterized. This would require an equally unquantifiable and thus unreasonable amount of experimentation, imposing a severe and undue burden on all those wishing to ascertain the scope of the claim, which is not in compliance with the clarity requirement of Article 6 PCT. The non-compliance with the substantive provisions is to such an extent, that the search was performed taking into consideration the non-compliance in determining the extent of the search (PCT Guidelines, 9.19 and 9.24).
Present claims 1-4, 15, 20-23, 25-32 and 41-45 relate to silicone compositions which have a given desired property or effect, namely a lower solids content at equivalent viscosities in comparison with a silicone composition comprising a linear silicone fluid. However, the description does not provide support and disclosure in the sense of Article 6 and 5 PCT for any such composition having the said property or effect other than the compositions obtained according to examples 7-11, and there is no common general knowledge of this kind available to the person skilled in the art. This non-compliance with the substantive provisions is to such an extent, that the search was performed taking into consideration the non-compliance in determining the extent of the search of the claims (PCT Guidelines 9.19 and 9.20).
The search was consequently restricted to the "reaction product" as specifically disclosed in examples 7-11 and claims 7-14 in combination with the "alkyltrisiloxane" as specifically disclosed in claims 16-19. It should be noted in this connection that components (III) alpha-olefin fraction and (VII) agent for quenching, which are mandatory according to claims 7-14 are not employed in the examples.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2006/043314

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 1-6,15,20-23,25-32,41-45
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2006/043314

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6083900 A	04-07-2000	CA 2225597 A1	31-07-1998
		DE 69704049 D1	15-03-2001
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		EP 0857481 A1	12-08-1998
		ES 2155975 T3	01-06-2001
		FR 2758985 A1	07-08-1998
		JP 3040368 B2	15-05-2000
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EP 0934959 A1	11-08-1999	DE 69906609 D1	15-05-2003
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