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(54) Title: AQUEOUS CARRIER SYSTEMS FOR LIPOPHILIC INGREDIENTS

(57) Abstract: A composition containing at least one organic phospholipid capable of forming bilayers in aqueous solution; at least one amphoteric surfactant; at least one nonionic surfactant present in an amount by weight equal to or greater than the amount of the phospholipid; at least one suspending agent present in an amount effective for maintaining a stable composition; and a lipophilic ingredient. The invention also relates to a delivery system for lipophilie ingredients containing the above components, and an aqueous phase, wherein the organic phospholipid, amphoteric surfactant, and nonionic surfactant are present in a combined amount sufficient to allow the lipophilic ingredient to be incorporated into the system. A method of treating a keratinous substance is also disclosed.

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AQUEOUS CARRIER SYSTEMS FOR LIPOPHILIC INGREDIENTS

The present invention relates to novel carrier systems based on organic phospholipids capable of forming bilayers in aqueous solution, nonionic surfactants, amphoteric surfactants and suspending agents, wherein these carrier systems allow lipophilic materials to be incorporated into aqueous solutions.

Organic phospholipids play an important role in the cosmetics and pharmaceutical industries because of their outstanding physiological properties, such as, for example, emulsifying, softening, and anti-oxidant effects. When hydrolyzed, organic phospholipids yield phosphoric acid, an alcohol, a fatty acid, and a nitrogenous base. Most phospholipids are amphipathic, i.e., have polar "heads" and non-polar "tails." As a result, most phospholipids tend to arrange spontaneously into a bilayer when suspended in an aqueous environment, with the polar heads contacting the water and the non-polar tails contacting each other. Most naturally occurring phospholipids prefer to form vesicular bilayers in water solutions. In such a bilayer vesicle, no non-polar part of the phospholipid has any contact with the water solution.

Because of their non-polar portions, phospholipids typically are water-insoluble and incompatible with many water soluble anionic compounds, such as anionic surfactants. While they can be solubilized in water at low levels by a range of surfactants, this is often not easily accomplished.

Instead, solubilization has been accomplished conventionally using specific solubilizing agents in aqueous alcoholic solutions. For example, U.S. Patent No. 4,874,553 to Hager et al. discusses methods of rendering phospholipid mixtures water-soluble or water-dispersible by using certain amine compounds as solubilizing agents. U.S. Patent No. 4,174,296 to Kass describes a method of improving the solubility of phospholipid compounds in water, in particular lecithin compounds, by mixing lecithin with specific single solubilizing agents, including amphoteric and anionic surfactants. These methods utilize alcohol for cosolubilization. Alcohol solutions can have the drawback of disrupting any bilayer formation by altering the solution such that the alcohol functions as a secondary solvent.

Lecithins and other phospholipids have been used in the pharmaceutical industry to formulate carriers for water-insoluble drugs. For instance, in U.S. Patent No. 5,173,303 to Lau et al., water-insoluble material is encapsulated by vesicles

composed of phospholipids such as lecithin. Ribosa et al., in "Physico-chemical modifications of liposome structures through interaction with surfactants," Int'l Journal of Cosmetic Science 14:131-149 (1992), also discuss solubilization of phospholipids via the interaction of liposomes with surfactants. Lau and Ribosa, however, investigated only dilute solutions of pure liposomes.

Despite difficulties in solubilization, certain organic phospholipids, such as lecithin, can advantageously give hair and skin a soft, moisturized feel because they have a strong affinity for the hydrophobic surface of the hair and skin. In addition, lipophilic ingredients, including hydrocarbons such as petrolatum, offer moisturizing and protecting properties that are also desirable in many applications including hair care and skin care. However, in addition to the difficulties encountered in solubilizing phospholipids, the incorporation of high concentrations or "loads" of lipophilic ingredients into an aqueous environment has proven difficult. The water-insoluble nature of the these ingredients has made their utilization in aqueous environments complicated. It would thus be desirable for cosmetic and pharmaceutical applications to provide delivery systems that include such organic phospholipids as carriers for high loads of other lipophilic ingredients, without the need for alcohols and other similar solvents.

For the most part, the use of hydrocarbons such as petrolatum in hair care and skin care has been accomplished through the use of water-in-oil emulsions, encapsulating lipids and other multi-phase compositions. For example, U.S. Patent No. 5,716,920 to Glenn et al. describes a method of making a liquid personal cleaning composition that contains a lipophilic skin moisturizing agent such as hydrocarbon oils and waxes by the use of an encapsulation technique. However, the methods described result in a multi-phase emulsion or composition comprised of droplets.

Thus, there remains a need for an aqueous delivery system that can solubilize and/or form a stable suspension (*i.e.*, without phase separation) with lipophilic materials such as hydrocarbons, waxes, and silicones, where these lipophilic materials will remain stable and/or not precipitate out of solution, where the amount of deposition of lipophilic material can be controlled, and where the system could carry other ingredients in addition to the lipophilic ingredient. For example, it would be beneficial to have a system which incorporates lipophilic materials into compositions

containing other ingredients, such as dyeing and permanent wave compositions. The present invention provides such a delivery system.

To achieve these and other advantages, the present invention is drawn to a composition made up of at least one organic phospholipid capable of forming bilayers in aqueous solution, at least one amphoteric surfactant, at least one nonionic surfactant, and at least one suspending agent or viscosity increasing agent. The nonionic surfactant is present in an amount equal to or greater than the amount of the organic phospholipid. The suspending agent is present in an amount effective for maintaining a stable composition. A stable composition or system is one that experiences substantially no settling out or phase separation.

In another embodiment, the present invention relates to an aqueous delivery system for lipophilic materials. The delivery system (or "carrier") includes the above-described composition in addition to at least one lipophilic ingredient, and an aqueous phase. The nonionic surfactant preferably is present in an amount equal to or greater than the amount of the organic phospholipid. The organic phospholipid, the amphoteric surfactant, and the nonionic surfactant are present in a combined amount sufficient to allow the lipophilic ingredient to be incorporated into the delivery system by the composition of the present invention. The suspending agent is present in an amount effective for maintaining a stable delivery system, *i.e.* one that experiences substantially no settling out or phase separation.

In a preferred embodiment, the delivery system of the present invention results in a stable, milky suspension, solution, lotion, or cream. A delivery system comprising at least one organic phospholipid capable of forming bilayers in aqueous solution, at least one amphoteric surfactant, at least one nonionic surfactant, at least one water-insoluble ingredient, and an aqueous phase has been described previously. *See* WO 98/56333. This system is referred to as the "LAN" because it preferably contains a lecithin (L) as the phospholipid, an amphoteric surfactant (A), and a nonionic surfactant (N). The LAN system previously described "solubilized" a water-insoluble ingredient resulting in a clear or cloudy solution. However, the LAN system of the present invention is different in that, by containing a suspending or viscosity increasing agent, it enables a lipophilic ingredient to be incorporated into the system to give a stable, milky suspension, solution, lotion, or cream.

A milky solution is not equivalent to a cloudy solution. For example, a cloudy solution is a solution that contains small particles, is turbid, will experience settling over time and/or will experience separation/precipitation of phases. The stable milky solution of the present invention generally does not settle over time and typically experiences no separation of phases. Like the previously disclosed LAN clear solution system, the milky LAN system of the present invention will incorporate or act as a carrier for lipophilic materials. However, the LAN system of the present invention, with the inclusion of a suspending agent, offers the advantage of being able to incorporate a larger amount or higher weight of lipophilic material per weight of the entire composition than the LAN system of WO 98/56333. Additionally, the LAN system of the present invention can be a more effective carrier of hydrocarbons, such as petrolatum and polyethylenes; waxes, such as Beeswax; and silicones.

The stable, milky LAN system of the present invention may be either a solution, suspension, lotion, or cream. Regardless of their form, the milky solutions, lotions, creams, or suspensions remain stable without substantial settling or substantial separation of phases. It is the viscosity of the resulting milky LAN system that will determine whether the composition is a solution, suspension, lotion, or cream.

The present invention is also drawn to a process for the preparation of the milky aqueous system comprising: (a) combining at least one organic phospholipid capable of forming bilayers in aqueous solution, at least one amphoteric surfactant, at least one nonionic surfactant, at least one lipophilic ingredient, and water, (b) stirring the combined ingredients of (a) while heating, (c) adding an appropriate amount of a suspending agent and stirring while heating, and (d) cooling the resulting solution.

Finally, in yet another embodiment, the present invention is drawn to a method for treating keratinous substances such as hair, skin, or eyelashes. First an aqueous solution is prepared containing at least one organic phospholipid capable of forming bilayers in aqueous solution; at least one amphoteric surfactant; at least one nonionic surfactant present in an amount by weight equal to or greater than the amount of the phospholipid; and at least one lipophilic ingredient. The phospholipid, amphoteric surfactant, and nonionic surfactant are present in a combined amount sufficient to allow the lipophilic ingredient to be incorporated into a stable aqueous

system. A suspending agent, in an amount effective for maintaining a stable system, is subsequently added to the aqueous system. The resulting stable milky system is then applied to the keratinous substances.

Reference will now be made in detail to the present preferred embodiment(s) of the invention.

Advantageously, the present invention allows lipophilic materials or ingredients to be incorporated into an aqueous system to give a stable, milky solution, lotion, cream, or suspension. No alcohol is required for cosolubilization, and there is no need for liposome preparation. Further, when the water evaporates, the residue left behind includes the lipophilic material and/or the phospholipid. The composition of the invention is also easy to formulate and is gentle on the hair, skin, or eyelashes when the surfactants used are mild.

The compositions and delivery systems of the present invention readily deposit the organic phospholipid/lipophilic substances on the hair, skin, and eyelashes, and, because of their inherent insolubility, resist being washed off with water. Accordingly, these compositions and delivery systems can be used in hair shampoos, conditioners, hair dyeing compositions, including oxidative dyes and bleaches, permanent waving compositions, curl relaxing compositions, hair setting compositions, bath and body products, sunscreens, or cosmetics such as mascaras and foundations.

Additionally, the "load" carried by these systems can be quite high, a benefit that inures both to the user and to the manufacturer in an economic sense. Load is defined as the weight of added hydrophobe (lipophilic material) divided by the weight of the phospholipid expressed as a percentage. Thus, 1 g of hydrophobe in a composition with 5 g phospholipid is a 1/5 or 20% load. In the art, 50% is considered a high load and can be achieved with certain hydrophobes and surfactant combinations. In the present invention, loads of greater than 100% are possible. In other words, stable solutions, lotions, and creams that contain more hydrophobe than phospholipid can be obtained. For example, one preferred method of the present invention results in stable creams comprising 50 times more petrolatum than phospholipid.

Without being bound to a particular theory, the inventors believe that in the composition of the present invention an organized structure, likely a laminar gel, is formed between the organic phospholipid and the nonionic surfactant and is solubilized by the amphoteric surfactant. The organized structure can incorporate other water-insoluble materials or hydrophobes. In aqueous systems, the structure remains organized. The suspending agent helps to maintain a stable system. The result is a stable milky system as evidenced by the lack of substantial settling out or substantial separation of phases.

In one embodiment, therefore, the invention is drawn to a composition comprising at least one organic phospholipid capable of forming bilayers in aqueous solution, at least one amphoteric surfactant, at least one nonionic surfactant, and at least one suspending agent, where the nonionic surfactant is present in an amount by weight equal to or greater than the amount of the phospholipid and the suspending agent is present in an amount effective for maintaining a stable system. Neither the amphoteric nor the nonionic surfactant alone will give a satisfactory solution with the organic phospholipids.

With respect to the ingredients of the inventive composition, the preferred organic phospholipids capable of forming bilayers in aqueous solution are lecithins. Lecithins are mixtures of phospholipids, i.e., of diglycerides of fatty acids linked to an ester of phosphoric acid. Preferably, lecithins are diglycerides of stearic, palmitic, and oleic acids linked to the choline ester of phosphoric acid. Lecithin is usually defined either as pure phosphatidyl cholines or as crude mixtures of phospholipids which include phosphatidyl choline, phosphatidyl serine, phosphatidyl ethanolamine, phosphatidyl inositol, other phospholipids, and a variety of other compounds such as fatty acids, triglycerides, sterols, carbohydrates, and glycolipids.

The lecithin used in the present invention may be present in the form of a liquid, powder, or granules. Lecithins useful in the invention include, but are not limited to, soy lecithin and hydroxylated lecithin. For example, ALCOLEC S is a fluid soy lecithin, ALCOLEC F 100 is a powder soy lecithin, and ALCOLEC Z3 is a hydroxylated lecithin, all of which are available from the American Lecithin Company.

Other than lecithins, another group of phospholipids which may be useful in the present invention are multifunctional biomimetic phospholipids. For example, the following multifunctional biomimetic phospholipids manufactured by Mona Industries may be useful: PHOSPHOLIPID PTC, PHOSPHOLIPID CDM, PHOSPHOLIPID SV, PHOSPHOLIPID GLA, and PHOSPHOLIPID EFA.

The amphoteric surfactants useful in the present invention include, but are not limited to, betaines, sultaines, hydroxysultaines, alkyl amphodiacetates, alkyl amphodipropionates, and imidazolines, or salts thereof. It is recognized that other fatty acid condensates such as those formed with amino acids, proteins, and the like are suitable. Amphoteric surfactants are typically available for commercial sale in solution form with the active surfactant accounting for approximately 40% of the total solution weight. Cocamphodipropionate is particularly preferred, for example, MIRANOL C2M-SF Conc. (disodium cocamphodipropionate), in its salt-free form, available from Rhône-Poulenc. MIRANOL is sold in solution form with amphoteric surfactants composing approximately 40% of the total solution weight; for example, 10 g of MIRANOL contain about 4g of amphoteric surfactant. Also preferred is CROSULTAINE C-50 (cocamidopropyl hydroxysultaine), available from Croda. CROSULTAINE is also sold in solution form with the amphoteric surfactant composing approximately 50% of the total solution weight. Other amphoteric surfactants useful in the present invention include disodium wheatgermimido PEG-2 sulfosuccinate, available under the trade name MACKANATE WGD from McIntyre Group Ltd., which is a solution with amphoteric surfactants composing approximately 39% of the total solution weight, and disodium soyamphodiacetate, available under the trade name MACKAM 2S from McIntyre Group Ltd., which is a solution with amphoteric surfactants composing approximately 34.5% of the total solution weight.

The nonionic surfactants useful in the present invention are preferably formed from a fatty alcohol, a fatty acid, or a glyceride with a C_8 to C_{24} carbon chain, preferably a C_{12} to C_{18} carbon chain, more preferably a C_{16} to C_{18} carbon chain, derivatized to yield a Hydrophilic-Lipophilic Balance (HLB) of at least 10. HLB is understood to mean the balance between the size and strength of the hydrophilic group and the size and strength of the lipophilic group of the surfactant. Such derivatives can be polymers such as ethoxylates, propoxylates, polyglucosides,

polyglycerins, polylactates, polyglycolates, polysorbates, and others that would be apparent to one of ordinary skill in the art. Such derivatives may also be mixed polymers of the above, such as ethoxylate/propoxylate species, where the total HLB is preferably greater than or equal to 10. Preferably the nonionic surfactants contain ethoxylate in a molar content of from 10-25, more preferably from 10-20 moles.

Nonionic surfactants may be selected from, but are not limited to, the following:

# of C's	Name	Trade Name
C-12	Laureth-23	BRIJ 35, available from ICI Surfactants
C-16	Ceteth-10	BRIJ 56, available from ICI Surfactants
C-16	Ceteth-20	BRIJ 58, available from ICI Surfactants
C-16	IsoCeteth-20	Arlasolve 200, available from ICI Surfactants
C-18	Steareth-10	Volpo S-10, available from Croda Chemicals Ltd.
C-18	Steareth-16	Solulan-16, available from Amerchol Corp.
C-18	Steareth-20	BRIJ 78, available from ICI Surfactants
C-18	Steareth-25	Solulan-25, available from Amerchol Corp.
C-18=	Oleth-10	BRIJ 97, available from ICI Surfactants
C-18=	Oleth-20	Volpo-20, available from Croda Chemicals Ltd.

Alkyl polyglucose surfactants sold under the name PLANTAREN, available from Henkel, may also be used.

One of ordinary skill in the art may vary the suspending agent or viscosity increasing agents, both of which are referred to as a suspending agent herewith, based on the specific content of the LAN delivery system, including the lipophilic material being employed. Any suspending agent that is unreactive and/or will not form a complex that results in substantial phase separation with the organic phospholipid, the amphoteric surfactant, the nonionic surfactant, or the lipophilic ingredient is useful in the present invention. Thus, some suspending agents that are useful in some LAN delivery systems may not be useful in all LAN delivery systems. Suspending agents useful in the practice of the invention include, but are not limited to, biopolymers such as sclerotium gum available as AMIGEL from Alban Muller; polysaccharide gums such as hydroxyethylcellulose available as CELLOSIZE from Amerchol; polyacrylamides such as SEPIGEL 305 available from SEPPIC; stearates such as PEG-150 pentaerythrityl tetrastearate available as CROTHIX from Croda, and inorganic clays such as Bentonite.

In one preferred embodiment of the composition of the present invention, the organic phospholipid capable of forming bilayers in aqueous solution, the amphoteric

surfactant, and the nonionic surfactant are present in the composition such that the nonionic surfactant is present in an amount by weight greater than the amount of phospholipid. In a more preferred embodiment, the amount of phospholipid in the composition is kept fixed while the amounts of the amphoteric and nonionic surfactants are increased.

In a still more preferred embodiment, calculating the phospholipid as present at a value of 1, the phospholipid, amphoteric surfactant and nonionic surfactant are preferably present in the composition in a ratio of about 1:0.8:2 and above by weight, i.e., where the amounts of the surfactants can be increased independently of each other but the amount of phospholipid stays fixed. The ratio is considered to be "above" 1:0.8:2 when the amount of either of the surfactants increases. When the phospholipid/amphoteric/ nonionic system is employed as a carrier for a lipophilic material, the ratio is preferably about 1:1.2:2 and above and even more preferably about 1:1.6:2. The loading capability for lipophilics carried by the delivery system of the present invention may be maximized if the ratio of nonionic surfactant to phospholipid is minimized, with the bilayers still being solubilized, because an excess of nonionic surfactant may disrupt the organized structure.

In one preferred embodiment, the composition of the present invention comprises ALCOLEC S (soy lecithin), MIRANOL C2M-SF Conc. (disodium cocamphodipropionate, an amphoteric surfactant), ARLASOLVE 200 (IsoCeteth-20, a nonionic surfactant) in a ratio of 1:4:2 (which is a LAN ratio of 1:1.6:2) when the lipophilic water-insoluble ingredient, petrolatum, is employed, wherein the ratios are calculated by weight. In other words, a LAN ratio of 1:1.6:2 is equal to 10g lecithin, 40g MIRANOL, and 20g ARASOLVE. Although lecithin is particularly preferred, the amphoteric and nonionic surfactants may vary.

When used as an ingredient in further formulations, the LAN is compatible and generally gives stable milky solutions, lotions, or creams with anionic surfactants such as alkyl sulfates and ethoxylated alkyl sulfates. Other anionic surfactants such as sulfosuccinates may also be used. Typically, LAN compositions are stable and can resist storage at 45°C for three months or more, which would predict that they have a shelf life at room temperature of at least three years.

In another aspect, the present invention relates to an aqueous delivery or carrier system comprising: at least one organic phospholipid capable of forming bilayers in aqueous solution, at least one amphoteric surfactant, at least one nonionic surfactant preferably present in an amount greater than or equal to the amount of the phospholipid, at least one suspending agent, at least one lipophilic ingredient, and an aqueous phase. The phospholipid, amphoteric surfactant, and nonionic surfactant are present in a combined amount sufficient to allow the lipophilic ingredients to be incorporated into the aqueous delivery system. The amount sufficient to incorporate and maintain a stable system may vary depending on the type of composition; for example, shampoo and mascara formulations may require a lower concentration of LAN than do conditioner, deep treatment, bleach, permanent wave, dye, and relaxant compositions. The suspending agent is present in an amount effective for maintaining a stable system. This amount too may vary depending on the specific make-up of LAN and the particular lipophile(s) used.

The combined amount of organic phospholipid, amphoteric surfactant, and nonionic surfactant used in the composition or delivery system of the invention is preferably equal to or above 1 percent by weight relative to the weight of the delivery system. The preferred phospholipid, lecithin, is preferably used in an amount greater than 0 to about 5% by weight of the delivery system and more preferably in an amount greater than 0 to about 3% by weight of the delivery system. Since lecithin itself is not a pure raw material and may have free glycerides, glycerin, fatty acids, and soaps, adjustments in this ratio may need to be made, i.e., one source of lecithin may require different ratios of amphoteric and nonionic surfactants than another in order to maximize incorporation of lipophilic ingredient and stability of the system. Preferably, the composition and system of the invention form a stable solution, suspension, lotion, or cream.

The amphoteric surfactants are preferably present in the composition in an amount greater than 0 to about 25% by weight relative to the weight of the delivery system. When the phospholipid/ amphoteric/nonionic system is employed as a carrier for a lipophilic material, the amphoteric surfactants are preferably present in the composition in an amount greater than 0 to about 15% by weight relative to the weight of the delivery system.

The nonionic surfactant is preferably present in an amount greater than 0 to about 20% by weight relative to the weight of the delivery system. More preferably, the nonionic surfactant is present in an amount greater than 0 to about 15% by weight relative to the weight of the delivery system.

The suspending agents are preferably present in the composition in an amount ranging from about 1% to 20% by weight relative to the total weight of the delivery system. However, the amount of suspending agent will depend on the viscosity increasing properties of the particular suspending agent. More preferably, the suspending agents are present in an amount ranging from about 1% to about 10% by weight. Preferably, one of ordinary skill in the art will be able to determine routinely the preferred amount of suspending agent depending on the specific LAN delivery system and the application envisaged. The suspending agent is added in an amount effective for maintaining a stable composition or stable system. As defined above, a stable composition or system is one that does not experience substantial settling out or substantial phase separation.

Lipophilic "ingredients" or "materials" or other water-insoluble materials include, but are not limited to hydrocarbons, waxes, silicones, oil-soluble vitamins such as Vitamin E and Vitamin A, sunscreens, ceramides and natural oils. The lipophilic ingredients may be in the form of sunscreens, bacteriostats, moisturizers, colors, topical pharmaceuticals and the like. Preferred lipophilic ingredients include: petrolatum, polyethylenes, beeswax, Vitamin E, Vitamin E Acetate, Vitamin A Palmitate, olive oil, mineral oil, 2-oleamido-1,3-octadecanediol, octylmethoxy cinnamate, octyl salicylate, and silicones such as siloxanes, dimethicone, cyclomethicone, phenyl trimethicone, dimethiconol, dimethicone copolyol, and laurylmethicone copolyol. The lipophilic ingredients can, for example, moisturize or condition the skin, hair, and/or eyelashes and leave behind no oily feel.

The aqueous phase of the inventive delivery system can contain additional ingredients such as anionic surfactants, organic salts, inorganic salts, proteins, hair dyes, water-soluble polymers, quaternary ammonium compounds, complex and simple carbohydrates, amino acids, preservatives and fragrances.

If the inventive system is to be used in concentrated form, i.e., with about 5% by weight of the organic phospholipid and greater than 1% of added lipophilic

ingredient, the composition preferably has a pH ranging from 4-12 for maximum stability. The more concentrated the solution, the better the delivery. In the present invention, the amount of lipophilic ingredient preferably ranges from about 0.1% to about 50% by weight relative to the weight of the delivery system.

If this blend is diluted with water or the blend is used as an ingredient in another composition, then the pH has a broader range, i.e., preferably ranges from 2-12, and a wider variety of additives can be included in the solution. These dilute blends can still be very effective in delivering lipophilic ingredients.

Another embodiment of the present invention is drawn to a process for preparing the aqueous system of the present invention. This process comprises: (a) combining the following ingredients to obtain a mixture: at least one organic phospholipid capable of forming bilayers in aqueous solution, at least one amphoteric surfactant, at least one nonionic surfactant, at least one lipophilic agent, and water, where the nonionic surfactant is present in an amount by weight equal to or greater than the amount of the organic phospholipid, (b) heating and stirring the combined ingredients of (a), and (c) adding an effective amount of suspending agent and stirring with additional heating. Either a high shear apparatus or a normal mechanical stirrer may be used for the stirring.

The mixture is preferably heated at a temperature of 65°C to 85°C in step (b), depending on the melting points of the solid surfactants. Still more preferably, the mixture is heated to about 70°C.

More specifically, the preparation of the carrier system of the present invention may be carried out as follows. Lecithin (L) is dispersed in water. The lipophilic material is combined with nonionic surfactant(s) (N) at appropriate ratios and added to the lecithin/water dispersion. An amphoteric surfactant (A) is added and the mixture is heated, while being stirred for about 15 minutes at about 70°C . An effective amount of suspending agent is subsequently added and the solution stirred at about 70°C for an additional 10 minutes. The combination of these ingredients results in a stable, milky system that is referred to as the LAN delivery system which can then be used as a "raw material" to make finished products.

In another embodiment, the present invention is drawn to a method for treating keratinous substances such as, but not limited to, hair, skin, or eyelashes.

First an aqueous solution is prepared containing:

at least one organic phospholipid capable of forming bilayers in aqueous solution;

at least one amphoteric surfactant;

at least one nonionic surfactant present in an amount by weight equal to or greater than the amount of the phospholipid;

at least one lipophilic ingredient;

and at least one suspending agent.

The phospholipid, amphoteric surfactant, and nonionic surfactant are present in a combined amount sufficient to allow the lipophilic ingredient to be incorporated into the aqueous solution. The suspending agent is present in an amount effective for maintaining a stable system. The milky LAN system is then applied to the keratinous substances. The term "treating" in the context of this invention includes, but is not limited to, shampooing, conditioning, dyeing, bleaching, permanent waving, relaxing, setting, moisturizing, and making-up, for example, applying mascara or foundation.

As mentioned previously, the composition and carrier system of the present invention can be used as an ingredient itself in, for example, shampoos, conditioners (rinse-off and leave-in), deep treatments for hair, body washes, bath gels, hair dyeing compositions, permanent wave formulations, relaxers, make-up preparations, particularly mascara and foundation, and skin creams or lotions.

With respect to hair products, the carrier system of the present invention can be used to formulate hair products, e.g., for normal hair, color-treated hair, dry hair, fine hair, and damaged hair. For each type of hair, the LAN delivery system can be used to create a regimen comprising shampoo, conditioner, and deep treatment, (i.e., deep conditioner). Additional nonionic, amphoteric, and also anionic surfactants can be added to the LAN delivery system. In general, the concentration of the LAN delivery system is increased within each regimen from shampoo to conditioner to deep treatment. Thus, the deep treatment formulations may have the most concentrated hydrophobe-carrying LAN.

The LAN systems of the invention can be further associated, in the hair products described above, with proteins including hydrolyzed soy protein, lauryldimonium hydrolyzed soy protein (cationic Soya protein) and wheat amino

acids. The proteins could also include corn, wheat, milk, or silk proteins, collagens, keratins, or others. Furthermore, taurine and arginine hydrochloride may be associated therein to maximize protein binding to the hair. Cationic proteins or proteins in general may be stabilizers for the LAN delivery system and enhance its delivery by changing the charge on the surface of the LAN structure. The skin and the hair attract cationic ingredients, and proteins are generally substantive to these tissues.

In conditioning emulsions, nonionic emulsifiers such as glyceryl stearate and PEG-100 stearate can be used, and the LAN delivery system is treated as a water-insoluble, particularly a lipophilic, ingredient itself.

Other ingredients in the LAN delivery system hair care compositions may include cationic polymers, such as polyquaternium 4, polyquaternium 6, polyquaternium 7, polyquaternium 10, polyquaternium 11, polyquaternium 16, polyquaternium 22, and polyquaternium 32, cationic conditioners, such as quaternium 27, behenamidopropyl PG-dimonium chloride, hydroxyethyl tallowdimonium chloride, hexadimethrine chloride, stearalkonium chloride, and cetrimonium chloride; isoparaffins; sodium chloride; propylene glycol; preservatives such as phenoxyethanol, methylparaben, ethylparaben, and propylparaben; pH adjusters such as phosphoric acid; humectants such as trehalose; and emollients such as octyldodecanol. Many other examples of materials from the classes listed above would be readily known to one of ordinary skill in the art.

Further, shampoos, conditioners, and deep treatments within the scope of the present invention may be used on hair which has been treated, e.g., with color (dye or bleach) or chemicals (permanent wave or straightening), or which is dry or fine and show significant substantivity for the hair.

The invention will be further clarified by the following examples, which are intended to be illustrative of the invention, but not limiting thereof.

EXAMPLES

Example 1: Study using LAN with the lipophilic material petrolatum.

The following example illustrates the use of LAN to incorporate the lipophilic ingredient petrolatum into an aqueous system. Petrolatum is a highly desirable component in numerous skin and hair care products because of its moisturizing and

protecting properties. However, because of its hydrophobic nature, petrolatum has previously been difficult to formulate in an aqueous environment without phase separation.

A LAN composition comprising lecithin (L), MIRANOL C2M-SF Conc. (A), ARLASOLVE 200 (Iso-Ceteth-20) (N), and the suspending agent, SEPIGEL 305 (Polyacrylamide/C13-14 Isoparaffin/Laureth 7) from SEPPIC Inc , was used to incorporate White Fonoline, a petrolatum from Witco Petroleum Specialties, into a LAN delivery system. Table 1 shows that stable lotions of lipophilic agents can be achieved in systems that contain as low as 1.75% by weight of the lecithin, amphoteric surfactant, and nonionic surfactant, relative to the total weight of the delivery system. The LAN ratio was maintained at 1:1.6:2.

Table 1:

Varying amounts of LAN used to incorporate petrolatum into an aqueous system.

L Lecithin (g)	A MIRANOL (g)	N ARLASOLVE (g)	White Fonoline (Petrolatum) (g)	Sepigel 305 (g)	Water (g)	Result	% LAN
0.25	1	0.5	16	2	80.25	Stable lotion	1.75
0.5	2	1	16	2	78.5	Stable lotion	3.5
1	4	2	16	2	75	Stable lotion	7
2	8	4	4	6	76	Stable lotion	14

* MIRANOL C2M-SF Conc. contains about 40% amphoteric surfactant.

Example 2: Comparison of increasing amounts of petrolatum incorporated by the LAN system.

Similar to example 1 above, a LAN delivery system was prepared with the following ingredients: lecithin (L), MIRANOL C2M-SF Conc. (A), ARLASOLVE 200 (N), the suspending agent, SEPIGEL 305, and White Fonoline. Stable systems of the petrolatum/LAN delivery system that contain from 4% to 50% petrolatum were

accomplished while maintaining a LAN ratio of 1:1.6:2 (This is because 1g MIRANOL C2M-SF Conc. is approximately 0.4 g of amphoteric surfactant.). See Table 2. As the experiments demonstrate, the loads of the following LAN systems may be greater than 100% and as high as 50 times the amount of phospholipid present. As is evidenced by the examples of Table 2, the skilled artisan may be required to vary the amount LAN ratio or adjust the amount of suspending agent in order to obtain a stable system.

Table 2: Increasing amounts of petrolatum incorporated into a LAN delivery system.

L Lecithin (g)	A MIRANOL (g)	N ARLASOLV E (g)	White Fonoline (g)	Sepigel 305 (g)	Water (g)	Results
2	8	4	4	2	80	Unstable
2	8	4	4	4	78	Stable solution
2	8	4	6	4	76	Stable lotion
2	8	4	8	4	74	Stable lotion
1	4	2	8	2	83	Unstable
1	4	2	16	2	75	Stable lotion
1	4	2	25	2	66	Stable lotion
1	4	2	50	4	39	Unstable
1	4	2	50	6	37	Stable cream

Example 3: Study varying the amount of suspending agent in the LAN system.

The compositions of Example 1 and 2 were utilized to study the effect of varying the amount of suspending agent in a LAN delivery system that incorporates petrolatum. As reflected in Table 3, one of ordinary skill in the art would routinely vary the amount of suspending agent in order to maintain a stable, milky system. Table 3 illustrates the amount of suspending agent needed to incorporate petrolatum into a stable, milky system using different amounts of lecithin, amphoteric surfactant, and nonionic surfactant. In each example, an unstable LAN delivery system was stabilized by the addition of more suspending agent. Up to 15% of the suspending

agent was used in the LAN milks.

Table 3: LAN delivery systems with varying amounts of suspending agent.

L Lecithin (g)	A MIRANOL (g)	N ARLASOLV E (g)	White Fonoline (g)	Sepigel 305 (g)	Water (g)	Results
1	4	2	16	2	75	Unstable
1	4	2	8	2	83	Stable lotion
1	4	2	8	4	81	Stable lotion
2	8	4	4	2	80	Unstable
2	8	4	4	6	76	Stable lotion
1	4	2	50	2	41	Unstable
1	4	2	50	4	39	Unstable
1	4	2	50	6	37	Stable lotion
1	4	2	20	15	58	Stable lotion

Example 4: Use of LAN compositions to incorporate silicones.

Silicones are highly desirable ingredients to enhance shine and softness but are difficult to formulate because of their inherent insolubility in water and alcohol. The following example illustrates the use of a LAN composition to incorporate silicones into an aqueous system The amount of lecithin (L), MIRANOL C2M-SF Conc. (A), and ARLASOLVE 200 (Iso-Ceteth-20) (N), remained constant while the amount and type of suspending agent were varied. The suspending agents utilized include: AMIGEL, a sclerotium gum available from Alban Muller; CELLOSIZE QP 4400, a hydroxyethylcellulose available from Amerchol; CROTHIX, a PEG- 150 Pentaerythrityl Tetrastearate available from Croda.

The resulting LAN compositions were able to incorporate the following silicones into a stable, milky delivery system as described in Table 4:

DC 1411: Octamethylcyclotetrasiloxane from Dow Coming;

DC Q2-5200: Silicone glycol/dodecene from Dow Coming;

DC 1402: Decamethylcyclopentasiloxane from Dow Coming; and

DC 200: Polydimethylsiloxane 60,000 cSt (centistokes) from Dow Coming.

Table 4: Incorporation of silicones into LAN delivery systems.

L Lecithin (g)	A MIRANOL (g)	N ARLASOLVE (g)	Silicone (g)	Suspending Agent (g)	Water (g)	Results
1	4	2	DC 1411, 10	Sepigel 305, 3	80	Stable lotion
1	4	2	DC Q2-5200, 10	Amigel, 1	82	Stable solution
1	4	2	DC 1402, 15	Cellosize, 3	75	Stable lotion
1	4	2	DC 200, 5	Crothix, 5	83	Stable lotion

Example 5: Use of LAN compositions to incorporate various lipophilic ingredients.

LAN compositions have been utilized to formulate a variety of LAN delivery systems that incorporate a variety of lipophilic ingredients. Additionally, it is within the routine experimentation of the skilled artisan to vary the lipophilic ingredient or the suspending agent in order to produce a stable, milky LAN system. Table 5 reveals the use of different lipophilic agents as well as different suspending agents that were used to make stable LAN delivery systems.

In Table 5, the LAN composition was composed of lecithin (L), MIRANOL C2M-SF Conc. (A), ARLASOLVE 200 (Iso-Ceteth-20) (N), and a variety of suspending agents including CROTHIX, SEPIGEL, and BENTOLITE WH, a bentonite clay from Southern Clay Products. The LAN compositions were used to incorporate several lipophilic ingredients in addition to White Fonoline including: VERSAFLOW, a liquid polyethylene from Shamrock; Beeswax from Kostner Keunen, Inc.; and Diglyceride, a vegetable diglyceride from Kostner Keunen, Inc.

Table 5: Examples of various LAN delivery systems.

L Lecithin (g)	A MIRANOL (g)	N ARLASOLV E (g)	Lipophile (g)	Suspending Agent (g)	Water (g)	Results
2	8	4	Versaflow, 4	Sepigel, 4	78	Stable lotion
2	8	4	Beeswax, 4	Sepigel, 4	78	Stable lotion
2	8	4	White Fonoline, 4	Bentolite WH, 2	80	Stable lotion
2	8	4	White Fonoline, 4	Bentolite WH, 6	76	Stable lotion
1	4	2	Diglyceride, 5	Crothix, 3	85	Stable lotion

Example 6: Preparation of hair relaxer containing a milky LAN system.

The following hair relaxer was formulated from a LAN delivery system that incorporated petrolatum. All the ingredient amounts are shown in weight percent.

Lecithin	1.0%
Miranol C2M-SF	4.0%
Arlasolve 200	2.0%
White Fonoline	20.0%
Sepigel 305	15.0%
Sodium Hydroxide	2.5%
Water	55.5 %

The resulting hair relaxer cream was applied to six swatches of kinked hair at room temperature. The hair swatches were then rinsed with water. Following shampooing with 10% Sodium Laureth Sulfate (SLES), each of the six swatches was almost 98% relaxed. The relaxed hair swatches were also notably soft.

Example 7: Use of a milky LAN/petrolatum system in hair care.

The superior moisturizing and protecting properties of petrolatum offer many advantages for use in hair care. The following hair care treatment was formulated using a LAN/Petrolatum delivery system. All the ingredient amounts are shown in weight percent.

Lecithin	1.0%
Miranol C2M-SF	4.0%
Arlasolve 200	2.0%
White Fonoline	8.0%
Sepigel 305	4.0%
Water	81.0%

The resulting LAN/Petrolatum lotion was applied to bleached hair and relaxed hair for 5 minutes at room temperature then rinsed with warm water. The treated hair was moist and had improved softness.

Example 8: Use of a milky LAN/silicone system in hair care.

Similar to petrolatum, silicones offer superior moisturizing and protecting properties that are desirable for many hair and skin care applications. The following hair care treatment was formulated using a LAN/silicone delivery system. All the ingredient amounts are shown in weight percent.

Lecithin	1.0%
Miranol C2M-SF	4.0%
Arlasolve 200	2.0%
DC 1411	10.0%
Sepigel 305	3.9%
Water	80.0%

The resulting LAN/silicone lotion was applied to hair for 5 minutes at room temperature then rinsed with warm water. The treated hair felt soft, was easy to detangle, and had increased shine.

What is claimed is:

1. A composition comprising:

at least one organic phospholipid capable of forming bilayers in aqueous solution;

at least one amphoteric surfactant;

at least one nonionic surfactant present in an amount by weight equal to or greater than the amount of said at least one phospholipid; and

at least one suspending agent present in an amount effective for maintaining a stable composition.

2. A composition according to claim 1, wherein said composition further comprises water.

3. A composition according to claim 1, wherein said at least one nonionic surfactant is present in an amount by weight greater than the amount of said at least one phospholipid.

4. A composition according to claim 1, wherein said at least one amphoteric surfactant is present in an amount by weight greater than the amount of said at least one phospholipid.

5. A composition according to claim 1, wherein said at least one organic phospholipid capable of forming bilayers in aqueous solution is a lecithin.

6. A composition according to claim 1, wherein said composition further comprises at least one lipophilic ingredient.

7 A composition according to claim 6, wherein said at least one lipophilic ingredient is selected from hydrocarbons, waxes, and silicones.

8. A composition according to claim 7, wherein said hydrocarbon is selected from petrolatum and polyethylenes.

9. A composition according to claim 7, wherein said silicones include siloxane.

10. A composition according to claim 1, wherein said at least one suspending agent is selected from biopolymers, polysaccharide gums, polyacrylamides, stearates, and inorganic clays.

11. A composition according to claim 1, wherein said at least one nonionic surfactant contains at least one group selected from C_8 to C_{24} fatty alcohol, C_8 to C_{24} fatty acid, and C_8 to C_{24} glyceride.

12. A composition according to claim 1, wherein said at least one nonionic surfactant has an HLB of at least 10.

13. A composition according to claim 1, wherein said at least one amphoteric surfactant is selected from betaines, sultaines, hydroxysultaines, alkyl amphodiacetates, alkyl amphodipropionates, imidazolines, and salts thereof.

14. A composition according to claim 13, wherein said at least one amphoteric surfactant is selected from cocamphodipropionate and cocamidopropyl hydroxysultaine.

15. A composition according to claim 1, wherein said at least one organic phospholipid, said at least one amphoteric surfactant, and said at least one nonionic surfactant are present in a ratio of 1:0.8:2 and above.

16. A composition according to claim 1, wherein said at least one organic phospholipid, said at least one amphoteric surfactant, and said at least one nonionic surfactant are present in a ratio of 1:1.2:2 and above.

17. A composition according to claim 16, wherein said at least one organic phospholipid, said at least one amphoteric surfactant, and said at least one nonionic surfactant are present in a ratio of 1:1.6:2 and above.

18. A delivery system for lipophilic ingredients comprising:

at least one organic phospholipid capable of forming bilayers in aqueous solution;

at least one amphoteric surfactant;

at least one nonionic surfactant present in an amount by weight equal to or greater than the amount of said at least one phospholipid ;

at least one suspending agent present in an amount effective for maintaining a stable delivery system;

at least one lipophilic ingredient; and

an aqueous phase,

wherein said at least one organic phospholipid, said at least one amphoteric surfactant, and said at least one nonionic surfactant are present in a combined amount

sufficient to allow said at least one lipophilic ingredient to be incorporated into said system.

19. A delivery system according to claim 18, wherein said delivery system is a stable solution, suspension, lotion, or cream.

20. A delivery system for lipophilic ingredients according to claim 18, wherein said at least one amphoteric surfactant is present in an amount by weight equal to or greater than the amount of said at least one organic phospholipid and wherein said at least one nonionic surfactant is present in an amount by weight equal to or greater than the amount of said at least one organic phospholipid.

21. A delivery system according to claim 18, wherein said aqueous phase further comprises additional ingredients selected from anionic surfactants, organic salts, inorganic salts, proteins, hair dyes, water-soluble polymers, and amino acids.

22. A delivery system according to claim 18, wherein said at least one lipophilic ingredient is selected from hydrocarbons, waxes, and silicones.

23. A delivery system according to claim 22, wherein said at least one lipophilic ingredient is selected from hydrocarbons.

24. A delivery system according to claim 23, wherein said hydrocarbons are selected from petrolatum and polyethylenes.

25. A delivery system according to claim 22, wherein said silicones include siloxane.

26. A delivery system according to claim 18, wherein said at least one suspending agent is selected from biopolymers, polysaccharide gums, polyacrylamides, stearates, and inorganic clays.

27. A delivery system according to claim 18, wherein said suspending agent is present in an amount of 1% to 20% by weight relative to the total weight of the delivery system.

28. A delivery system according to claim 27, wherein said suspending agent is present in an amount of 1% to 10% by weight relative to the total weight of the delivery system.

29. A delivery system according to claim 18, wherein said at least one organic phospholipid capable of forming bilayers in aqueous solution is a lecithin.

30. A delivery system according to claim 18, wherein said at least one nonionic surfactant contains at least one group selected from C_8 to C_{24} fatty alcohol, C_8 to C_{24} fatty acid, and C_8 to C_{24} glyceride.

31. A delivery system according to claim 18, wherein said at least one nonionic surfactant has an HLB of at least 10.

32. A delivery system according to claim 18, wherein said at least one amphoteric surfactant is selected from betaines, sultaines, hydroxysultaines, alkyl amphodiacetates, alkyl amphodipropionates, imidazolines, and salts thereof.

33. A delivery system according to claim 32, wherein said at least one amphoteric surfactant is selected from cocamphodipropionate and cocamidopropyl hydroxysultaine.

34. A delivery system according to claim 18, wherein said at least one organic phospholipid is present in an amount greater than 0 to 5% by weight relative to the total weight of the delivery system.

35. A delivery system according to claim 34, wherein said at least one organic phospholipid is present in an amount greater than 0 to 3% by weight relative to the total weight of the delivery system.

36. A delivery system according to claim 18, wherein said at least one amphoteric surfactant is present in an amount greater than 0 to 25% by weight relative to the total weight of the delivery system.

37. A delivery system according to claim 36, wherein said at least one amphoteric surfactant is present in an amount greater than 0 to 15% by weight relative to the total weight of the delivery system.

38. A delivery system according to claim 18, wherein said at least one nonionic surfactant is present in an amount greater than 0 to 20% by weight relative to the total weight of the delivery system.

39. A delivery system according to claim 38, wherein said at least one nonionic surfactant is present in an amount greater than 0 to 15% by weight relative to the total weight of the delivery system.

40. A delivery system according to claim 18, wherein said at least one organic phospholipid, said at least one amphoteric surfactant, and said at least one nonionic surfactant are present in a ratio of 1:0.8:2 and above.

41. A delivery system according to claim 18, wherein said at least one organic phospholipid, said at least one amphoteric surfactant, and said at least one nonionic surfactant are present in a ratio of 1:1.2:2 and above.

42. A delivery system according to claim 41, wherein said at least one organic phospholipid, said at least one amphoteric surfactant, and said at least one nonionic surfactant are present in a ratio of 1:1.6:2 and above.

43. A delivery system according to claim 18, wherein said at least one organic phospholipid is a lecithin, said at least one amphoteric surfactant is disodium cocamphodipropionate and said at least one nonionic surfactant is selected from PPG-5-Ceteth-20, PEG-20 Isocetyl Ether, and Oleth-10.

44. A delivery system according to claim 18, wherein said system is in the form of a shampoo, a conditioner, a deep treatment for hair, a body wash, a bath gel, a bath oil, a hair dyeing composition, a permanent wave formulation, a make-up composition, a skin cream, or a lotion.

45. A delivery system according to claim 44, wherein said make-up composition is a mascara or a foundation.

46. A method for the preparation of a delivery system as claimed in claim 18, said method comprising:

(a) combining said at least one organic phospholipid, said at least one amphoteric surfactant, said at least one nonionic surfactant; said at least one lipophilic ingredient and water to obtain a mixture;

(b) heating and stirring the mixture obtained in step (a);

(c) adding an effective amount of said at least one suspending agent; and

(d) heating and stirring the mixture obtained in step (c).

47. A method for treating a keratinous substance, said method comprising:

preparing a delivery system comprising

at least one organic phospholipid capable of forming bilayers in aqueous solution;

at least one amphoteric surfactantt;

at least one nonionic surfactant present in an amount by weight equal to or greater than the amount of said at least one phospholipid; and

at least one suspending agent present in an amount effective for maintaining a stable delivery system and at least one lipophilic ingredient,

wherein said at least one organic phospholipid, said at least one amphoteric surfactant, and said at least one nonionic surfactant are present in a combined amount sufficient to allow said lipophilic ingredient to be incorporated into said delivery system; and

applying said delivery system to said keratinous substance.

48. A method according to claim 47, wherein said treating comprises a treatment selected from shampooing, conditioning, dyeing, bleaching, permanent waving, relaxing, setting, moisturizing, and making-up.

49. A method according to claim 47, wherein said keratinous substance is selected from hair, skin, and eyelashes.

50. A method according to claim 48, wherein making-up comprises a treatment selected from applying mascara to the eyelashes and applying foundation to facial skin.

51. A hair relaxing composition comprising:

at least one organic phospholipid capable of forming bilayers in aqueous solution;

at least one amphoteric surfactant;

at least one nonionic surfactant present in an amount by weight equal to or greater than the amount of said at least one phospholipid ;

at least one suspending agent present in an amount effective for maintaining a stable composition;

at least one lipophilic ingredient, wherein said lipophilic ingredient is petrolatum;

sodium hydroxide; and

water,

wherein said at least one organic phospholipid, said at least one amphoteric surfactant, and said at least one nonionic surfactant are present in a combined amount sufficient to allow said at least one lipophilic ingredient to be incorporated into said hair relaxing composition.

52. A hair relaxing composition according to claim 51, wherein said at least one organic phospholipid capable of forming bilayers in aqueous solution is a lecithin.

53. A hair relaxing composition according to claim 51, wherein said at least one organic phospholipid, said at least one amphoteric surfactant, and said at least one nonionic surfactant are present in a ratio of 1:1.6:2.

54. A hair relaxing composition according to claim 51, wherein at least one suspending agent is polyacrylamide.

55. A hair relaxing composition according to claim 51, wherein said at least one nonionic surfactant is PEG-20 isocetyl ether.

56. A hair relaxing composition according to claim 51, wherein said at least one amphoteric surfactant is disodium cocamphodipropionate.

57. A hair conditioning composition comprising:

at least one organic phospholipid capable of forming bilayers in aqueous solution;

at least one amphoteric surfactant;

at least one nonionic surfactant present in an amount by weight equal to or greater than the amount of said at least one phospholipid ;

at least one suspending agent present in an amount effective for maintaining a stable composition;

at least one lipophilic ingredient, wherein said lipophilic ingredient is selected from silicones;

sodium hydroxide; and

water,

wherein said at least one organic phospholipid, said at least one amphoteric surfactant, and said at least one nonionic surfactant are present in a combined amount sufficient to allow said at least one lipophilic ingredient to be incorporated into said hair conditioning composition.

58. A hair conditioning composition according to claim 57, wherein said at least one organic phospholipid capable of forming bilayers in aqueous solution is a lecithin.

59. A hair conditioning composition according to claim 57, wherein said at least one organic phospholipid, said at least one amphoteric surfactant, and said at least one nonionic surfactant are present in a ratio of 1:1.6:2.

60. A hair conditioning composition according to claim 57, wherein at least one suspending agent is polyacrylamide.

61. A hair conditioning composition according to claim 57, wherein said at least one nonionic surfactant is PEG-20 isocetyl ether.

62. A hair conditioning composition according to claim 57, wherein said at least one amphoteric surfactant is disodium cocamphodipropionate.

63. A hair conditioning composition according to claim 57, wherein said silicones are octamethylcyclotetrasiloxane.

INTERNATIONAL SEARCH REPORT

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B. FIELDS SEARCHED

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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)
WPI Data, PAJ, EPO-Internal, CHEM ABS Data, MEDLINE, EMBASE, BIOSIS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 897 718 A (GEIER) 24 February 1999 (1999-02-24) the whole document	1-63
A	WO 98 56333 A (L'OREAL) 17 December 1998 (1998-12-17) cited in the application the whole document	1-63
A	EP 0 596 465 A (MITSUBISHI PENCIL KK) 11 May 1994 (1994-05-11) the whole document	1-63
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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

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

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"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

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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	Fischer, J.P.

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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权利要求书6页 说明书14页 附图页数0页

[54]发明名称 用于亲油性组分的水性运载体系

[57]摘要

一种组合物包含至少一种能在水溶液中形成双层的有机磷脂;至少一种两性表面 活性剂;重量含量等于或大于磷脂含量的至少一种非离子表面活性剂;维持稳定组合 物有效量的至少一种悬浮剂;和亲油性组分。本发明还涉及含有上述组分以及水相的 亲油性组分输送体系,其中有机磷脂、两性表面活性剂和非离子表面活性剂的组合含 量足以使亲油性组分掺入体系中。另外还公开了一种处理角质物质的方法。

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权 利 要 求 书

1．一种组合物，它包含：

至少一种能在水溶液中形成双层的有机磷脂；

至少一种两性表面活性剂；

重量含量等于或大于所述至少一种磷脂的含量的至少一种非离子表面活性剂；和有效地维持稳定的组合物所需量的至少一种悬浮剂。

2．根据权利要求 1 所述的组合物，其中所述组合物还包含水。

3．根据权利要求 1 所述的组合物，其中所述至少一种非离子表面活性剂的重量含量大于所述至少一种磷脂的含量。

4．根据权利要求 1 所述的组合物，其中所述至少一种两性表面活性剂的重量含量大于所述至少一种磷脂的含量。

5．根据权利要求 1 所述的组合物，其中所述至少一种能在水溶液中形成双层的有机磷脂是卵磷脂。

6．根据权利要求 1 所述的组合物，其中所述组合物进一步包含至少一种亲油性组分。

7．根据权利要求 6 所述的组合物，其中所述至少一种亲油性组分选自烃类、蜡和聚硅氧烷。

8．根据权利要求 7 所述的组合物，其中所述烃选自矿脂和聚乙烯。

9．根据权利要求 7 所述的组合物，其中所述聚硅氧烷包括硅氧烷。

10．根据权利要求 1 所述的组合物，其中所述至少一种悬浮剂选自生物高分子、多糖胶、聚丙烯酰胺、硬脂酸和无机粘土。

11．根据权利要求 1 所述的组合物，其中所述至少一种非离子表面活性剂含有至少一个选自 C_8-C_{24} 脂肪醇、C_8-C_{24} 脂肪酸和 C_8-C_{24} 甘油酯的基团。

12．根据权利要求 1 所述的组合物，其中所述至少一种非离子表面活性剂的 HLB 至少为 10。

13．根据权利要求 1 所述的组合物，其中所述至少一种两性表面活性剂选自甜菜碱、磺基甜菜碱、羟基磺基甜菜碱、两性双乙酸烷酯、两性双丙酸烷酯、咪唑啉和它们的盐。

14．根据权利要求 13 所述的组合物，其中所述至少一种两性表面活性剂选自椰油基两性双丙酸盐和椰油酰氨基丙基羟基磺基甜菜碱。

15．根据权利要求 1 所述的组合物，其中所述至少一种有机磷脂、所述至少一种

两性表面活性剂和所述至少一种非离子表面活性剂的比例为 1：0.8：2 及以上。

16. 根据权利要求 1 所述的组合物，其中所述至少一种有机磷脂、所述至少一种两性表面活性剂和所述至少一种非离子表面活性剂的比例为 1：1.2：2 及以上。

17. 根据权利要求 16 所述的组合物，其中所述至少一种有机磷脂、所述至少一种两性表面活性剂和所述至少一种非离子表面活性剂的比例为 1：1.6：2 及以上。

18. 一种亲油性组分的输送体系，它包含：

至少一种能在水溶液中形成双层的有机磷脂；

至少一种两性表面活性剂；

重量含量等于或大于所述至少一种磷脂的含量的至少一种非离子表面活性剂；

含量能有效维持稳定的输送体系的至少一种悬浮剂；

至少一种亲油性组分；和

水相，

其中所述至少一种有机磷脂、所述至少一种两性表面活性剂和所述至少一种非离子表面活性剂的组合含量足以使所述至少一种亲油性组分掺入所述体系中。

19. 根据权利要求 18 所述的输送体系，其中所述输送体系是稳定的溶液、悬浮液、洗液或软膏。

20. 根据权利要求 18 所述的亲油性组分的输送体系，其中所述至少一种两性表面活性剂的重量含量等于或大于所述至少一种有机磷脂的含量，其中所述至少一种非离子表面活性剂的重量含量等于或大于所述至少一种有机磷脂的含量。

21. 根据权利要求 18 所述的输送体系，其中所述水相还包含选自阴离子表面活性剂、有机盐、无机盐、蛋白质、染发剂、水溶性聚合物和氨基酸的额外组分。

22. 根据权利要求 18 所述的输送体系，其中所述至少一种亲油性组分选自烃类、蜡和聚硅氧烷。

23. 根据权利要求 22 所述的输送体系，其中所述至少一种亲油性组分选自烃类。

24. 根据权利要求 23 所述的输送体系，其中所述烃类选自矿脂和聚乙烯。

25. 根据权利要求 22 所述的输送体系，其中所述聚硅氧烷包括硅氧烷。

26. 根据权利要求 18 所述的输送体系，其中所述至少一种悬浮剂选自生物高分子、多糖胶、聚丙烯酰胺、硬脂酸和无机粘土。

27. 根据权利要求 18 所述的输送体系，其中所述悬浮剂的含量为输送体系总重量的 1%-20%重量。

28. 根据权利要求 27 所述的输送体系，其中所述悬浮剂的含量为输送体系总重量的 1%-10%重量。

29. 根据权利要求 18 所述的输送体系，其中所述至少一种能在水溶液中形成双层的有机磷脂是卵磷脂。

30. 根据权利要求 18 所述的输送体系，其中所述至少一种非离子表面活性剂含有至少一个选自 C_8-C_{24} 脂肪醇、C_8-C_{24} 脂肪酸和 C_8-C_{24} 甘油酯的基团。

31. 根据权利要求 18 所述的输送体系，其中所述至少一种非离子表面活性剂的 HLB 至少为 10。

32. 根据权利要求 18 所述的输送体系，其中所述至少一种两性表面活性剂选自甜菜碱、磺基甜菜碱、羟基磺基甜菜碱、两性双乙酸烷酯、两性双丙酸烷酯、咪唑啉和它们的盐。

33. 根据权利要求 32 所述的输送体系，其中所述至少一种两性表面活性剂选自椰油基两性双丙酸盐和椰油酰氨基丙基羟基磺基甜菜碱。

34. 根据权利要求 18 所述的输送体系，其中所述至少一种有机磷脂的含量是大于 0 至输送体系总重量的 5%重量。

35. 根据权利要求 34 所述的输送体系，其中所述至少一种有机磷脂的含量是大于 0 至输送体系总重量的 3%重量。

36. 根据权利要求 18 所述的输送体系，其中所述至少一种两性表面活性剂的含量为大于 0 至输送体系总重量的 25%重量。

37. 根据权利要求 36 所述的输送体系，其中所述至少一种两性表面活性剂的含量为大于 0 至输送体系总重量的 15%重量。

38. 根据权利要求 18 所述的输送体系，其中所述至少一种非离子表面活性剂的含量为大于 0 至输送体系总重量的 20%重量。

39. 根据权利要求 38 所述的输送体系，其中所述至少一种非离子表面活性剂的含量为大于 0 至输送体系总重量的 15%重量。

40. 根据权利要求 18 所述的输送体系，其中所述至少一种有机磷脂、所述至少一种两性表面活性剂和所述至少一种非离子表面活性剂的比例为 1：0.8：2 及以上。

41. 根据权利要求 18 所述的输送体系，其中所述至少一种有机磷脂、所述至少一种两性表面活性剂和所述至少一种非离子表面活性剂的比例为 1：1.2：2 及以上。

42. 根据权利要求 41 所述的输送体系，其中所述至少一种有机磷脂、所述至少一种两性表面活性剂和所述至少一种非离子表面活性剂的比例为 1：1.6：2 及以上。

43. 根据权利要求 18 所述的输送体系，其中所述至少一种有机磷脂是卵磷脂，所述至少一种两性表面活性剂是椰油基两性双丙酸二钠，所述至少一种非离子表面活性剂选自 PPG-5-Cetech-20, PEG-20 异十六烷基醚和 Oleth-10。

44. 根据权利要求 18 所述的输送体系，其中所述体系的形式是洗发剂、护发剂、头发深层处理剂、身体洗液、沐浴胶、沐浴油、染发组合物、烫发制剂、化妆品组合物、护肤软膏或洗液。

45. 根据权利要求 44 所述的输送体系，其中所述化妆品组合物是染睫毛油或粉底。

46. 一种制备权利要求 18 所述的输送体系的方法，该方法包括：

(a)将所述至少一种有机磷脂、所述至少一种两性表面活性剂、所述至少一种非离子表面活性剂、所述至少一种亲油性组分和水混合，获得一混合物；

(b)加热并搅拌步骤(a)所得的混合物；

(c)加入有效量的所述至少一种悬浮剂；和

(d)加热并搅拌步骤(c)获得的混合物。

47. 一种处理角质物质的方法，所述方法包括：

制备一输送体系，该输送体系包含

至少一种能在水溶液中形成双层的有机磷脂；

至少一种两性表面活性剂；

重量含量等于或大于所述至少一种磷脂含量的至少一种非离子表面活性剂；和

至少一种悬浮剂，其含量能有效地维持稳定的输送体系和至少一种亲油性组分，

其中所述至少一种有机磷脂、所述至少一种两性表面活性剂和所述至少一种非离子表面活性剂的组合含量足以使所述亲油性组分掺入所述输送体系；和

将所述输送体系施加到所述角质物质上。

48. 根据权利要求 47 所述的方法，其中所述处理包括选自洗发、护发、染发、漂白、烫发、松发、定型、润湿和化妆的处理。

49. 根据权利要求 47 所述的方法，其中所述角质物质选自头发、皮肤和眼睫毛。

50. 根据权利要求 48 所述的方法，其中化妆包括将染睫毛油施加到眼睫毛上，将粉底施加到面部皮肤上的处理步骤。

51. 一种头发松弛组合物，它包含：

至少一种能在水溶液中形成双层的有机磷脂；

至少一种两性表面活性剂；

重量含量等于或大于所述至少一种磷脂的含量的至少一种非离子表面活性剂；

至少一种悬浮剂，其含量能有效地维持稳定的组合物；

至少一种亲油性组分，其中所述亲油性组分是矿脂；

氢氧化钠；和

水，

其中所述至少一种有机磷脂、所述至少一种两性表面活性剂和所述至少一种非离子表面活性剂的组合含量足以使所述至少一种亲油性组分掺入所述头发松弛组合物中。

52. 根据权利要求 51 所述的头发松弛组合物，其中所述至少一种能在水溶液中形成双层的有机磷脂是卵磷脂。

53. 根据权利要求 51 所述的头发松弛组合物，其中所述至少一种有机磷脂、所述至少一种两性表面活性剂和所述至少一种非离子表面活性剂的比例为 1：1.6：2。

54. 根据权利要求 51 所述的头发松弛组合物，其中至少一种悬浮剂是聚丙烯酰胺。

55. 根据权利要求 51 所述的头发松弛组合物，其中所述至少一种非离子表面活性剂是 PEG-20 异十六烷基醚。

56. 根据权利要求 51 所述的头发松弛组合物，其中所述至少一种两性表面活性剂是椰油基两性双丙酸二钠。

57. 一种头发护理组合物，它包含：

至少一种能在水溶液中形成双层的有机磷脂；

至少一种两性表面活性剂；

重量含量等于或大于所述至少一种磷脂的含量的至少一种非离子表面活性剂；

至少一种悬浮剂，其含量能有效地维持稳定的组合物；

至少一种亲油性组分，其中所述亲油性组分选自聚硅氧烷；

氢氧化钠；和

水，

其中所述至少一种有机磷脂、所述至少一种两性表面活性剂和所述至少一种非离子表面活性剂的组合含量足以使所述至少一种亲油性组分掺入所述头发护理组合物中。

58. 根据权利要求 57 所述的头发护理组合物，其中所述至少一种能在水溶液中形成双层的有机磷脂是卵磷脂。

59. 根据权利要求 57 所述的头发护理组合物，其中所述至少一种有机磷脂、所述至少一种两性表面活性剂和所述至少一种非离子表面活性剂的比例为 1：1.6：2。

60. 根据权利要求 57 所述的头发护理组合物，其中至少一种悬浮剂是聚丙烯酰胺。

61. 根据权利要求 57 所述的头发护理组合物，其中所述至少一种非离子表面活

性剂是 PEG-20 异十六烷基醚。

62．根据权利要求 57 所述的头发护理组合物，其中所述至少一种两性表面活性剂是椰油基两性双丙酸二钠。

63．根据权利要求 57 所述的头发护理组合物，其中所述聚硅氧烷是八甲基环四聚硅氧烷。

说　明　书

用于亲油性组分的水性运载体系

本发明涉及基于能在水溶液中形成双层的有机磷脂、非离子表面活性剂、两性表面活性剂和悬浮剂的新的运载体系，这些运载体系能使亲油性物质掺入水溶液中。

有机磷脂由于其杰出的生理性质(如乳化、软化和抗氧化作用)在化妆品和药物工业上起着重要作用。水解时，有机磷脂产生磷酸、醇、脂肪酸和含氮碱。大多数磷脂是两性的，即有极性的“头”和非极性的“尾”。结果，当大多数磷脂悬浮在水环境中时，它们会自发地排列成双层，极性的头与水接触，而非极性的尾相互接触。大多数天然磷脂更倾向于在水溶液中形成微泡体状双层。在这种双层微泡体中，磷脂的非极性部分不与水溶液接触。

由于它们的非极性部分，磷脂一般是不溶于水的，且与许多水溶性阴离子化合物(如阴离子表面活性剂)不相容。虽然它们可以在少数表面活性剂存在下少量增溶在水中，但这通常是不容易办到的。

相反，传统上在醇水溶液中使用特定的增溶剂进行溶解。例如，Hager 等人的美国专利 4,874,553 讨论了通过使用一些胺化合物作为增溶剂来使磷脂混合物溶解于或分散于水的方法。Kass 的美国专利 4,174,296 描述了通过使卵磷脂与特定的单种增溶剂(包括两性和阴离子表面活性剂)混合来提高磷脂化合物(特别卵磷脂化合物)在水中的溶解度的方法。这些方法利用醇来共增溶。醇溶液具有通过改变溶液来破坏双层形成的缺点，因此醇起次要溶剂的作用。

卵磷脂和其它磷脂已在制药行业被用来配制水不溶性药物的载体。例如，在美国专利 No. 5,173,303(Lau 等人)中，水不溶性物质被诸如卵磷脂的磷脂所组成的微泡体包囊。Ribosa 等人在“通过与表面活性剂相互作用对脂质体结构作物理化学修饰”，《国际美容科学杂志》14：131-149(1992)中也讨论了通过脂质体与表面活性剂相互作用来使磷脂增溶。然而，Lau 和 Ribosa 仅仅研究了纯脂质体的稀溶液。

尽管增溶有困难，但某些有机磷脂(如卵磷脂)有利于使头发和皮肤产生柔软、湿润的感觉，因为它们对头发和皮肤的疏水性表面具有强的亲和性。另外，亲油性组分(包括烃类如矿脂)会提供许多用途(包括头发护理和皮肤护理)中需要的增湿和保护的性质。然而，除了使磷脂增溶所遇到的困难外，将高浓度或高“负载”的亲油性组分掺入水环境中是困难的。这些组分的水不溶性使得它们在水环境中的应用变得复杂。

因此，化妆品和医药应用上需要提供一种输送体系，它包括作为其它亲油性组分高载荷的载体的有机磷脂，且不需要醇和其它类似的溶剂。

在很大程度上，已经通过使用油包水乳液、包囊脂质和其它多相组合物实现了在头发护理和皮肤护理中使用烃类如矿脂。例如，Glenn 等的美国专利 5,716,920 描述了一种通过使用包囊技术来制备个人清洁用的液体组合物的方法，其中该组合物含有亲油性皮肤润湿剂如烃油和烃蜡。然而，所述方法阐述了多相乳液或包含液滴的组合物。

因此，需要有一种水性输送体系，该体系能增溶和/或形成具有亲油性物质(如烃类、蜡和聚硅氧烷)的稳定的悬浮液(即没有相分离)，这些亲油性物质在悬浮液中保持稳定和/或不从溶液中沉淀出来，而且可以控制亲油性物质的沉积量，除了亲油性组分外，该体系还能运载其它组分。例如，在含有其它组分的组合物(如染料和烫发组合物)中掺入亲油性物质所得的体系将是有好处的。本发明提供了这样一种输送体系。

为了实现这些和其它优点，本发明涉及一种组合物，该组合物由至少一种能在水溶液中形成双层的有机磷脂、至少一种两性表面活性剂、至少一种非离子表面活性剂和至少一种悬浮剂或增粘剂组成。非离子表面活性剂的含量等于或大于有机磷脂的含量。悬浮剂的含量有效地维持了稳定的组合物。稳定的组合物或体系是基本上不发生沉淀或相分离的组合物或体系。

在另一个实施方案中，本发明涉及一种亲油性物质的水性输送体系。除了至少一种亲油性组分外，该输送体系(或“载体”)还包括上述组分和水相。非离子表面活性剂的含量宜等于或大于有机磷脂的含量。有机磷脂、两性表面活性剂和非离子表面活性剂的组合含量足以使亲油性组分通过本发明组合物作用而掺入输送体系中。悬浮剂含量能有效地维持稳定的输送体系，即，基本上不发生沉淀或相分离的体系。

在一个较佳的实施方案中，本发明的输送体系产生了一个稳定的、乳状悬浮液、溶液、洗液或软膏。包含至少一种能在水溶液中形成双层的有机磷脂、至少一种两性表面活性剂、至少一种非离子表面活性剂、至少一种水不溶性组分和水相的输送体系在以前已有描述，见 WO98/56333。该体系称为“LAN”，因为它宜含有卵磷脂(L)作为磷脂、两性表面活性剂(A)和非离子表面活性剂(N)。以前描述的 LAN 体系使水不溶性组分“增溶”，从而产生了澄清或混浊的溶液。然而，本发明的 LAN 体系的不同之处在于，通过包含悬浮剂或增粘剂，它能使亲油性组分掺入体系中，从而得到一个稳定的、乳状悬浮液、溶液、洗液或软膏。

乳状溶液并不等同于混浊的溶液。例如，混浊的溶液是含有小颗粒的混浊的溶液，它会随时间的过去而产生沉淀和/或产生相分离/沉淀。本发明的稳定的乳状溶液通常不会随时间的过去而产生沉淀，而且通常没有相分离。和以前公开的 LAN 澄清溶液

体系一样，本发明的乳状 LAN 体系可掺入亲油性物质或起亲油性物质载体的作用。然而，在加入悬浮剂后，本发明的 LAN 体系提供了单位重量的总组合物中能掺入比 WO98/56333 的 LAN 体系更多或更高量的亲油性物质的优点。另外，本发明的 LAN 体系可以是更有效的烃类(如矿脂和聚乙烯)、蜡(如蜂蜡)和聚硅氧烷的载体。

本发明的稳定的乳状 LAN 体系可以是溶液、悬浮液、洗液或软膏。无论它们是何种形式，乳状溶液、洗液、软膏或悬浮液都能维持稳定而基本上没有沉淀产生或相分离。所得乳状 LAN 体系的粘度决定了该组合物是溶液、悬浮液、洗液还是软膏。

本发明还涉及一种制备乳状含水体系的方法，该方法包括：(a)将至少一种能在水溶液中形成双层的有机磷脂、至少一种两性表面活性剂、至少一种非离子表面活性剂、至少一种亲油性组分和水混合，(b)搅拌(a)中混合的组分同时加热，(c)加入适量悬浮剂，搅拌并加热，(d)使所得溶液冷却。

最后，在另一实施方案中，本发明涉及一种处理角质物质如皮肤、毛发或眼睫毛的方法。首先制得一水溶液，该水溶液含有至少一种能在水溶液中形成双层的有机磷脂；至少一种两性表面活性剂；至少一种非离子表面活性剂，其重量含量等于或大于磷脂的含量；和至少一种亲油性组分。磷脂、两性表面活性剂和非离子表面活性剂的组合含量足以使亲油性组分掺入稳定的含水体系中。随后，将维持稳定体系有效量的悬浮剂加入该含水体系中。然后将所得稳定的乳状体系施加到角质物质上。

下面将具体参照本发明的较佳实施方案进行详细描述。

本发明的优点是能使用亲油性物质或组分掺入含水体系中形成稳定的乳状溶液、洗液、软膏或悬浮液。不需要醇来进行共增溶，也不需要脂质体制剂。另外，当水蒸发后，残留的残余物包括亲油性物质和/或磷脂。本发明的组合物也很容易配制，当所用表面活性剂为温和时，对头发、皮肤或眼睫毛是温和的。

本发明的组合物和输送体系易于将有机磷脂/亲油性物质淀积在头发、皮肤和眼睫毛上，而且由于它们固有的不溶解性，它们是耐水洗的。因此，这些组合物和输送体系可用于洗发香波、护发剂、染发组合物(包括氧化染料和漂白剂)、烫发组合物、松发组合物、头发定型组合物、沐浴和洗身产品、防晒剂或化妆品(如染睫毛油和粉底)。

另外，这些体系运载的“负载量”可以相当高，从经济意义上讲，这对用户和制造商都有好处。负载量定义为加入的疏水物(亲油性物质)的重量除以磷脂的重量，以百分数表示。因此，含 5 克磷脂的组合物中有 1 克疏水物为 1/5 或 20%负载量。在本领域中，50%认为是高的负载量，这可用某些疏水物和表面活性剂的组合来达到。在本发明中，可达到超过 100%的负载量。换句话说，可以获得含有疏水物比磷脂多的

稳定的溶液、洗液和软膏。例如，本发明的一个较佳方法产生了矿脂含量是磷脂 50 倍的稳定的软膏。

虽然不想受具体的理论束缚，但本发明者认为在本发明的组合物中，在有机磷脂和非离子表面活性剂之间形成了有组织的结构，可能是层状凝胶，且被两性表面活性剂增溶。这种有组织的结构中可以掺入其它水不溶性物质或疏水物。在含水体系中，该结构仍然保持有组织的。悬浮剂有助于维持稳定的体系。通过没有显著的沉淀出来或显著的相分离，可表明结果是稳定的乳状体系。

因此，在一个实施方案中，本发明涉及一种组合物，该组合物含有至少一种能在水溶液中形成双层的有机磷脂、至少一种两性表面活性剂、至少一种非离子表面活性剂和至少一种悬浮剂，其中非离子表面活性剂的重量含量等于或大于磷脂的含量，悬浮剂的含量能有效地维持稳定的体系。两性表面活性剂和非离子表面活性剂都不能单独与有机磷脂产生令人满意的溶液。

对于本发明组合物中的组分，优选的能在水溶液中形成双层的有机磷脂是卵磷脂。卵磷脂是各种磷脂(即与磷酸酯连接的甘油二脂肪酸酯)的混合物。卵磷脂宜为与磷酸胆碱酯连接的硬脂酸甘油二酯、棕榈酸甘油二酯和油酸甘油二酯。卵磷脂通常定义为纯的磷脂酰胆碱或磷脂(包括磷脂酰胆碱、磷脂酰丝氨酸、磷脂酰乙醇胺、磷脂酰肌醇、其它磷脂)和各种其它化合物(如脂肪酸、甘油三酯、甾醇、碳水化合物和糖脂)的粗混合物。

本发明所用的卵磷脂可以是液体、粉末或颗粒形式。本发明所用的卵磷脂包括，但不限于大豆卵磷脂和羟基化卵磷脂。例如，ALCOLEC S 是液体大豆卵磷脂，ALCOLEC F100 是粉末大豆卵磷脂，ALCOLEC Z3 是羟基化卵磷脂。所有这些卵磷脂都购自美国卵磷脂公司。

除了卵磷脂以外，可用于本发明的另一类磷脂是多功能的仿生磷脂。例如可采用以下由 Mona Industries 生产的多功能仿生磷脂：PHOSPHOLIPID PTC，PHOSPHOLIPID CDM，PHOSPHOLIPID SV，PHOSPHOLIPID GLA 和 PHOSPHOLIPID EFA。

可用于本发明的两性表面活性剂包括，但不限于，甜菜碱、磺基甜菜碱(sultaine)、羟基磺基甜菜碱、两性双乙酸烷酯(alkyl amphodiacetates)、两性双丙酸烷酯、咪唑啉或其盐。据认为，其它脂肪酸缩合物(如与氨基酸、蛋白质等形成的脂肪酸缩合物)是适用的。两性表面活性剂通常以溶液形式市售购得，该溶液中的活性表面活性剂占溶液总重量的大约 40%。椰油基两性双丙酸盐(Cocamphodipropionate)是特别佳的，例如购自罗纳普朗克的无盐型 MIRANOL C2M-SF Conc.(椰油基两性双丙酸二钠)。

MIRANOL 以溶液形式出售，其中两性表面活性剂占溶液总重量的大约 40%；例如 10 克 MIRANOL 中含有大约 4 克两性表面活性剂。同样优选的是购自 Croda 的 CROSULTAINE C-50 椰油酰氨基丙基羟基磺基甜菜碱(cocamidopropyl hydroxysultaine)。CROSULTAINE 也以溶液形式出售，其中两性表面活性剂占溶液总重量的大约 50%。用于本发明的其它两性表面活性剂包括以商品名 MACKANATE WGD 购自 McIntyre Group Ltd.的麦胚亚氨基(wheatgermimido)PEG-2 磺基琥珀酸二钠，它是溶液形式，其中两性表面活性剂约占溶液总重量的 39%；和以商品名 MACKAM 25 购自 McIntyre Group Ltd.的大豆两性二乙酸二钠(disodium soyamphodiacetate)，它是溶液形式，其中两性表面活性剂约占溶液总重量的 34.5%。

用于本发明的非离子表面活性剂宜由带有 C_8-C_{24} 碳链(较好为 C_{12}-C_{18} 碳链，更好为 C_{16}-C_{18} 碳链)的脂肪醇、脂肪酸或甘油酯制成，以衍生得到至少为 10 的亲水-亲油平衡值(HLB)。HLB 是指表面活性剂中亲水基团的大小和强度与亲油基团的大小和强度间的平衡值。这些衍生物可以是聚合物，如乙氧基化物(ethoxylates)、丙氧基化物、聚葡糖苷、聚甘油、聚乳酸、聚羟乙酸酯、聚山梨酯以及其它本领域中普通技术人员已知的其它物质。这些衍生物也可以是上述物质的混合聚合物，如乙氧基化物/丙氧基化物类物质，它的总亲水亲油平衡值宜大于或等于 10。非离子表面活性剂宜含有 10-25 摩尔，更好 10-20 摩尔的乙氧基化物。

非离子表面活性剂可选自，但不限于如下物质：

Cs 的编号	名称	商品名
C-12	Laureth-23	购自 ICI Surfactants 的 BRIJ 35
C-16	Cetech-10	购自 ICI Surfactants 的 BRIJ 56
C-16	Cetech-20	购自 ICI Surfactants 的 BRIJ 58
C-16	IsoCetech-20	购自 ICI Surfactants 的 Arlasolve 200
C-18	Steareth-10	购自 Croda Chemicals Ltd.的 Volpo S-10
C-18	Steareth-16	购自 Amerchol Corp.的 Sululan-16
C-18	Steareth-20	购自 ICI Surfactants 的 BRIJ 78
C-18	Steareth-25	购自 Amerchol Corp.的 Solulan-25
C-18=	Oleth-10	购自 ICI Surfactants 的 BRIJ 97
C-18=	Oleth-20	购自 Croda Chemicals Ltd.的 Volpo-20

也可使用以商品名为 PLANTAREN 的购自 Henkel 公司的烷基聚葡萄糖表面活性剂。

根据 LAN 输送体系中的具体含量(包括所用的亲油性物质)，本领域技术人员可改变悬浮剂或增粘剂(两者均在本文中称为悬浮剂)。没有反应性和/或不会与有机磷

脂、两性表面活性剂、非离子表面活性剂或亲油性组分形成导致显著相分离的复合物的任何悬浮剂均可用于本发明。因此，可用于某些 LAN 输送体系的某些悬浮剂可能不能用于所有的 LAN 输送体系。在本发明实践中有用的悬浮剂包括，但不局限于，生物高分子例如以 AMIGEL 购自 Alban Muller 的菌核胶(sclerotium gum)；多糖胶，例如以 CELLOSIZE 购自 Amerchol 的羟乙基纤维素；聚丙烯酰胺，例如购自 SEPPIC 的 SEPIGEL305；硬脂酸酯，例如以 CROTHIX 购自 Croda 的 PEG-150 四硬脂酸季戊四醇酯，以及无机粘土，如澎润土。

在本发明组合物的一个优选实施方案中，能在水溶液中形成双层的有机磷脂的有机磷脂、两性表面活性剂和非离子表面活性剂存在于组合物中，非离子表面活性剂的重量大于磷脂的重量。在一个更优选的实施方案中，组合物中的磷脂量保持不变，而增加两性表面活性剂和非离子表面活性剂的用量。

在一个更优选的实施方案中，把磷脂含量算作 1，磷脂、两性表面活性剂和非离子表面活性剂在组合物中的重量比例宜为大约 1：0.8：2 和更高，即，表面活性剂的量可以相互独立增加，但磷脂的量保持固定。当任一表面活性剂的含量增加时，认为该比例“高于”1：0.8：2。当用磷脂/两性表面活性剂/非离子表面活性剂体系作为亲油性物质的载体时，该比例宜为大约 1：1.2：2 及以上，更佳的宜约 1：1.6：2。如果使非离子表面活性剂与磷脂之比最小且双层仍然保持溶解，则本发明输送体系携带亲油性物质的负载能力可以达到最大，因为过量的非离子表面活性剂可能会破坏有组织的结构。

在一个较佳的实施方案中，当采用亲油性水不溶性组分矿脂时，本发明的组合物包含 ALCOLEC S(大豆卵磷脂)、MIRANOL C2M-SF Conc.(椰油基两性二丙酸二钠，两性表面活性剂)、ARLASOLVE 200(IsoCeteth-20，非离子表面活性剂)，它们的比例为 1：4：2(即 LAN 比例为 1：1.6：2)，其中比例根据重量来计算。换句话说，1：1.6：2 的 LAN 比例等于 10 克卵磷脂、40 克 MIRANOL 和 20 克 ARASOLVE。尽管卵磷脂是特别佳的，但两性表面活性剂和非离子表面活性剂可以变化。

当在进一步的制剂中用作组分时，LAN 是相容的，并且通常和诸如烷基硫酸盐和乙氧基化烷基硫酸盐等阴离子型表面活性剂一起提供了稳定的乳状溶液、洗液或软膏。还可采用诸如磺基琥珀酸酯等其它阴离子型表面活性剂。通常，LAN 组合物是稳定的，能在 45℃下保藏 3 个月或更长时间，因此预计它们在室温下的储存寿命至少为 3 年。

另一方面，本发明涉及一种水性输送或运载体系，该体系包含：至少一种能在水溶液中形成双层的有机磷脂；至少一种两性表面活性剂；含量宜大于或等于磷脂含量

的至少一种非离子表面活性剂；至少一种悬浮剂；至少一种亲油性组分，和水相。磷脂、两性表面活性剂和非离子表面活性剂的组合含量足以使亲油性组分掺入含水体系中。足以实现掺入和维持稳定体系的量可能会因组合物类型而异；例如，洗发剂和染睫毛油配方所需的 LAN 浓度低于护发、深层处理、漂白、烫发、染发和松发组合物。悬浮剂的含量为能有效地维持稳定的体系。该用量根据 LAN 的具体组成和所用的具体亲油性物质有很大变化。

本发明组合物或输送体系中所用的有机磷脂、两性表面活性剂和非离子表面活性剂的组合含量宜等于或高于输送体系重量的 1%。较佳的磷脂(卵磷脂)的用量宜为从大于 0 至约占输送体系重量的 5%。更佳的是从大于 0 到占输送体系重量的 3%内。由于卵磷脂本身不是纯的原料，它可能有游离的甘油酯、甘油、脂肪酸和皂类，所以需要调节这种比例，即，为了使亲油性组分的掺入量最大、体系的稳定性最高，一种卵磷脂来源所需的非离子表面活性剂和两性表面活性剂的比例可能与另一卵磷脂来源不同。本发明组合物和体系宜形成稳定的溶液、悬浮液、洗液或软膏。

两性表面活性剂在组合物中的含量宜为从大于 0 到约占输送体系重量的 25%(重量)。当采用磷脂/两性表面活性剂/非离子表面活性剂体系作为亲油性物质的载体时，两性表面活性剂在组合物中的含量宜为从大于 0 到约占输送体系重量的 15%(重量)范围内。

非离子表面活性剂的含量宜从大于 0 到约占输送体系重量的 20%(重量)。更佳的是，非离子表面活性剂的含量从大于 0 到约占输送体系重量的 15%(重量)。

悬浮剂在组合物中的含量宜约占输送体系总重量的 1%-20%(重量)。然而，悬浮剂的用量将取决于具体悬浮剂的增粘性。更佳的，悬浮剂的含量约为 1%-10%(重量)。较佳的是，本领域普通技术人员能根据具体的 LAN 输送体系和预计的用途来用常规方法确定较佳的悬浮剂用量。悬浮剂加入量有效地维持了稳定的组合物或稳定的体系。如上定义，稳定的组合物或体系是没有显著沉淀出来或显著相分离的组合物或体系。

亲油性“组分”或“物质”或其它水不溶性物质包括，但不局限于，烃类、蜡、聚硅氧烷、油溶性维生素如维生素 E 和维生素 A、防晒剂、神经酰胺和天然油。亲油性组分的形式可以是防晒剂、抑菌剂、增湿剂、色料、局部用药等。较佳的亲油性组分包括：矿脂、聚乙烯、蜂蜡、维生素 E、乙酸维生素 E、棕榈酸维生素 A、橄榄油、矿物油、2-油酰氨基-1,3-十八烷二醇、甲氧基肉桂酸辛酯、水杨酸辛酯和聚硅氧烷如硅氧烷、聚二甲基聚硅氧烷、环甲基硅酮、苯基三甲基聚硅氧烷、聚二甲基聚硅氧烷醇、聚二甲基聚硅氧烷共聚醇和月桂基甲基聚硅氧烷共聚醇。亲油性组分例如会润湿

或调节皮肤、头发和/或眼睫毛而不留下油性感觉。

本发明输送体系的水相还可含有额外的组分，如阴离子表面活性剂、有机盐、无机盐、蛋白质、染发剂、水溶性聚合物、季铵化合物、复杂和简单的糖类、氨基酸、防腐剂和芳香剂。

如果本发明体系以浓缩形式使用，即含有大约 5%重量的有机磷脂和 1%以上的加入的亲油性组分，则该组合物宜具有 4-12 的 pH 以获得最大程度的稳定性。溶液越浓缩，输送越佳。在本发明中，亲油性组分的量宜约占输送体系重量的 0.1%-50%(重量)。

如果用水稀释该混合物，或将该混合物用作另一组合物中的组分，则其 pH 具有较宽的范围，即范围宜为 2-12，且溶液中可包括各种添加剂。这些稀释的混合物仍然能非常有效地输送亲油性组分。

本发明另一实施方案涉及一种制备本发明含水体系的方法。该方法包括：(a)混合下列组分获得一混合物：至少一种能在水溶液中形成双层的有机磷脂、至少一种两性表面活性剂、至少一种非离子表面活性剂、至少一种亲油性试剂和水，其中非离子表面活性剂的重量含量等于或大于有机磷脂的含量，(b)对(a)中的合并的组分进行加热和搅拌，和(c)加入有效量的悬浮剂，搅拌并作额外的加热。可采用高剪切装置或通常的机械搅拌装置来进行搅拌。

在步骤(b)中，混合物宜在 65℃-85℃下加热，这取决于固体表面活性剂的熔点。更佳的是，混合物在大约 70℃下加热。

更具体地说，本发明的运载体系的制备可如下进行。将卵磷脂(L)分散在水中。将亲油性物质与非离子表面活性剂(N)以合适比例混合，然后加入卵磷脂/水分散液中。加入两性表面活性剂(A)，加热该混合物，同时在大约 70℃下搅拌大约 15 分钟。随后加入有效量的悬浮剂，在大约 70℃下再搅拌该溶液 10 分钟。这些组分的组合产生了称为 LAN 输送体系的稳定的乳状体系，然后它可作为“原料”来制备最终的产品。

在另一实施方案中，本发明涉及一种处理角质物质(例如但不局限于头发、皮肤或眼睫毛)的方法。

首先制备含有下列物质的水溶液：

至少一种能在水溶液中形成双层的有机磷脂；

至少一种两性表面活性剂；

重量含量等于或大于磷脂含量的至少一种非离子表面活性剂；

至少一种亲油性组分；

和至少一种悬浮剂。

磷脂、两性表面活性剂和非离子表面活性剂的组合含量足以使亲油性组分掺入水溶液中。悬浮剂的含量应有效地维持稳定的体系。然后将该乳状 LAN 体系施加到角质物质上。本文中的术语“处理”包括，但不局限于，洗发、护发、染发、漂白、烫发、松发、定型、润湿和化妆，例如施加染睫毛油或粉底。

如上所述，本发明的组合物和运载体系本身可作为组分，用于例如洗发剂、护发剂(洗去型和留下型)、头发深层处理剂、身体洗液、沐浴胶、染发组合物、烫发配方、松弛剂、化妆品制剂(尤其是眼睫毛油和粉底)以及护肤软膏或洗液。

至于头发用产品，本发明的运载体系可用来配制头发用产品用于例如正常的头发、经色料处理过的头发、干性头发、细的头发和受损的头发。针对各种类型的头发，可用 LAN 来产生包括洗发、护发和深层处理(即深层护理)的配方。额外的非离子型、两性以及阴离子型表面活性剂可以加入 LAN 输送体系中。通常，在每个方案中，从洗发剂到护发剂到深层处理，LAN 输送体系的浓度是递增的。因此，深层处理配方具有最浓缩的携带疏水物的 LAN。

在上述头发用产品中，本发明的 LAN 体系还可伴随有蛋白质，这些蛋白质包括水解的大豆蛋白、月桂基二甲铵(lauryldimonium)水解的大豆蛋白(阳离子型大豆蛋白)和小麦氨基酸。蛋白质还可包括玉米、小麦、牛奶或丝蛋白、胶原、角蛋白或其它蛋白质。另外，其中还可以有牛磺酸和盐酸精氨酸，以使蛋白质与头发最大程度地结合。阳离子型蛋白质或蛋白质通常可作为 LAN 输送体系的稳定剂，通过改变 LAN 结构的表面电荷来增强其输送。皮肤和头发吸引阳离子组分，蛋白质对这些组织通常有直染性。

在护发乳剂中，可使用诸如硬脂酸甘油酯和 PEG-100 硬脂酸酯等非离子型乳化剂，LAN 输送体系本身可象水不溶性组分、尤其是亲油性组分那样来处理。

LAN 输送体系头发护理组合物中的其它组分可包括阳离子聚合物，例如聚季铵化合物(polyquaternium) 4、聚季铵化合物 6、聚季铵化合物 7、聚季铵化合物 10、聚季铵化合物 11、聚季铵化合物 16、聚季铵化合物 22、聚季铵化合物 32、阳离子调节剂如聚季铵化合物 27、氯化山嵛酰氨基丙基 PG 二甲铵(behenamidopropyl PG-dimonium chloride)、氯化羟乙基牛油基二甲铵(hydroxyethyl tallowdimonium chloride)、海美氯化铵(hexadimethrine chloride)、苄基二甲基十八烷基氯化铵(stearalkonium chloride)和西曲氯化铵(cetrimonium chloride))、异链烷烃、氯化钠、丙二醇、防腐剂(如苯氧基乙醇、羟苯甲酸甲酯、羟苯甲酸乙酯和羟苯甲酸丙酯)、pH 调节剂(如磷酸)、湿润剂(如海藻糖)、润肤剂(如辛基十二烷醇)。上列类型物质中的许多其它实例对于本领域中普通技术人员来说是易于知道的。

另外，本发明范围内的洗发剂、护发剂和深层处理剂可用于已经处理的头发(例如经色料处理(染发或漂白)或化学物质处理(烫发或拉直))、或干性或细的并显示出头发有显著直染性(substantivity)的头发上。

本发明将通过下列实施例作进一步的说明。这些实施例仅用于说明本发明，而不是用于限制本发明。

实施例

实施例 1：用 LAN 和亲油性物质矿脂的研究

下列实施例描述了利用 LAN 将亲油性组分矿脂掺入含水体系中。矿脂是在许多皮肤和头发护理产品非常需要的组分，因为它有增湿性和保护性。然而，由于它的疏水性，矿脂在以前很难被配制到水性环境中而没有相分离。

利用包含卵磷脂(L)、MIRANOL C2M-SF Con.(A)、ARLASOLVE 200(Iso-Ceteth-20)(N)和悬浮剂 SEPIGEL 305(聚丙烯酰胺/C13-14 异链烷烃/Laureth 7，购自 SEPPIC Inc.)的 LAN 组合物将购自 Witco Petroleum Specialties 的矿脂 White Fonoline 掺入 LAN 输送体系中。表 1 表明在含有低达输送体系总重量 1.75%(重量)的卵磷脂、两性表面活性剂和非离子表面活性剂的体系中，获得了亲油性试剂的稳定洗液。LAN 比例保持在 1：1.6：2。

表 1：

将矿脂掺入含水体系中所用的不同量的 LAN

L 卵磷脂 (克)	A MIRANOL (克)	N ARLASOLVE (克)	White Fonoline (矿脂) (克)	Sepigel 305 (克)	水 (克)	结果	% LAN
0.25	1	0.5	16	2	80.25	稳定的洗液	1.75
0.5	2	1	16	2	78.5	稳定的洗液	3.5
1	4	2	16	2	75	稳定的洗液	7
2	8	4	4	6	76	稳定的洗液	14

*MIRANOL C2M-SF Conc.含有大约 40%两性表面活性剂。

实施例 2：靠 LAN 体系掺入的矿脂增加量的比较

与上述实施例 1 相似，用下列组分制得 LAN 输送体系：卵磷脂(L)、MIRANOL C2M-SF Conc.(A)、ARLASOLVE 200(N)和悬浮剂 SEPIGEL 305 和 White Fonoline。当维持 LAN 比例为 1：1.6：2(这是因为 1 克 MIRANOL C2M-SF Conc.约含 0.4 克两性表面活性剂)时，获得了含有 4%-50%矿脂的矿脂/LAN 稳定的输送体系。见表 2。

实验证明，下列 LAN 体系的负载量可大于 100%，并可高达磷脂含量的 50 倍。从表 2 的实施例看出，为了获得稳定的体系，本领域技术人员可能需要改变 LAN 比例的量，或调节悬浮剂的量。

表 2：掺入 LAN 输送体系的矿脂的增加量

L 卵磷脂 (克)	A MIRANOL (克)	N ARLASOLVE (克)	White Fonoline (矿脂) (克)	Sepigel 305 (克)	水 (克)	结果
2	8	4	4	2	80	不稳定
2	8	4	4	4	78	稳定的溶液
2	8	4	6	4	76	稳定的洗液
2	8	4	8	4	74	稳定的洗液
1	4	2	8	2	83	不稳定
1	4	2	16	2	75	稳定的洗液
1	4	2	25	2	66	稳定的洗液
1	4	2	50	4	39	不稳定
1	4	2	50	6	37	稳定的软膏

实施例 3：改变 LAN 体系中悬浮剂量的研究

用实施例 1 和 2 的组合物来研究改变掺有矿脂的 LAN 输送体系中悬浮剂的量的影响。如表 3 所示，为了维持稳定的乳状体系，本领域普通技术人员可用常规方法改变悬浮剂的量。表 3 描述了利用不同量的卵磷脂、两性表面活性剂和非离子表面活性剂将矿脂掺入稳定的乳状体系中所需的悬浮剂用量。在每个实施例中，通过加入较多的悬浮剂使不稳定的 LAN 输送体系变得稳定。在 LAN 乳液中采用最高为 15%的悬浮剂。

表 3：具有不同量的悬浮剂的 LAN 输送体系

L 卵磷脂 (克)	A MIRANOL (克)	N ARLASOLVE (克)	White Fonoline (克)	Sepigel 305 (克)	水 (克)	结果
1	4	2	16	2	75	不稳定
1	4	2	8	2	83	稳定的洗液
1	4	2	8	4	81	稳定的洗液
2	8	4	4	2	80	不稳定
2	8	4	4	6	75	稳定的洗液
1	4	2	50	2	41	不稳定
1	4	2	50	4	39	不稳定
1	4	2	50	6	37	稳定的洗液
1	4	2	20	15	58	稳定的洗液

实施例 4：用 LAN 组合物掺入聚硅氧烷

聚硅氧烷是用来增强光泽和柔软性的非常需要的组分，但是由于它在水和醇中的固有的不溶性，它很难配制。下列实施例描述了用 LAN 组合物将聚硅氧烷掺入水性体系中。卵磷脂(L)、MIRANOL C2M-SF Con.(A)和 ARLASOLVE 200(Iso-Ceteth-20)(N)的量保持不变，而改变悬浮剂的用量和类型。所用悬浮剂包括：AMIGEL，(购自 Alban Muller 的菌核胶(sclerotium gum)；CELLOSIZE QP4400(购自 Amerchol 的羟乙基纤维素)；CROTHIX(购自 Croda 的 PEG-150 四硬脂酸季戊四醇酯)。

如表 4 所述，所得 LAN 组合物能将下列聚硅氧烷掺入稳定的乳状输送体系中：

DC1411：购自 Dow Coming 的八甲基环四聚硅氧烷；

DC Q2-5200：购自 Dow Coming 的聚硅氧烷二醇/十二烯；

DC 1402：购自 Dow Coming 的十甲基环五聚硅氧烷；和

DC 200：购自 Dow Coming 的聚二甲基聚硅氧烷 60000cSt(厘沲)。

表 4：将聚硅氧烷掺入 LAN 输送体系

L 卵磷脂 (克)	A MIRANOL (克)	N ARLASOLVE (克)	聚硅氧烷 (克)	悬浮剂 (克)	水 (克)	结果
1	4	2	DC 1411，10	Sepigel 305，3	80	稳定的洗液
1	4	2	DC Q2-5200，10	Amigel，1	82	稳定的溶液
1	4	2	DC 1402，15	Cellosize，3	75	稳定的洗液
1	4	2	DC 200，5	Crothix，5	83	稳定的洗液

实施例 5：用 LAN 组合物来掺入各种亲油性组分

LAN 组合物已被用来配制掺有各种亲油性组分的 LAN 输送体系。另外，为了产生稳定的乳状 LAN 体系，改变亲油性组分或悬浮剂也是本领域技术人员可通过常规实验来实现的。表 5 揭示了用来制备稳定的 LAN 输送体系的不同亲油性组分和不同的悬浮剂。

在表 5 中，LAN 组合物由卵磷脂(L)、MIRANOL C2M-SF Con.(A)和 ARLASOLVE 200(Iso-Ceteth-20)(N)以及各种悬浮剂(包括 CROTHIX、SEPIGEL 和 BENTOLITE WH(购自 Southern Clay Products 的澎润土)组成。用该 LAN 组合物来掺入除 White Fonoline 以外的几种亲油性组分，包括：VERSAFLOW(购自 Shamrock 的聚乙烯液体)、购自 Kostner Keunen, Inc.的蜂蜡和甘油二酯(购自 Kostner Keunen, Inc.的蔬菜甘油二酯)。

表 5：各种 LAN 输送体系的例子

L 卵磷脂 (克)	A MIRANOL (克)	N ARLASOLVE (克)	亲油性物质 (克)	悬浮剂 (克)	水 (克)	结果
2	8	4	Versaflow，4	Sepigel，4	78	稳定的洗液
2	8	4	蜂蜡，4	Sepigel，4	78	稳定的洗液
2	8	4	White Fonoline，4	Bentolite WH, 2	80	稳定的洗液
2	8	4	White Fonoline，4	Bentolite WH, 6	76	稳定的洗液
1	4	2	甘油二酯，5	Crothix, 3	85	稳定的洗液

实施例 6：制备含有乳状 LAN 体系的松发剂

从掺有矿脂的 LAN 输送体系配制下列松发剂。所有组分的用量用重量百分数表示。

卵磷脂	1.0%
Miranol C2M-SF	4.0%
Arlasolve 200	2.0%
White Fonoline	20.0%
Sepigel 305	15.0%
氢氧化钠	2.5%
水	55.5%

室温下，将所得松发软膏施加到 6 束发结样本上。然后用水清洗头发样本。用 10%Sodium Laureth Sulfate(SLES)洗发后，6 个样品每一个都几乎 98%地松弛。松弛的头发样品也显著柔软。

实施例 7：在头发护理中使用乳状 LAN/矿脂体系

矿脂的出众的增湿性和保护性为头发护理用途提供了许多好处。用 LAN/矿脂输送体系配制下列头发处理剂。所有组分的用量用重量百分数表示。

卵磷脂	1.0%
Miranol C2M-SF	4.0%
Arlasolve 200	2.0%
White Fonoline	8.0%
Sepigel 305	4.0%
水	55.5%

将所得 LAN/矿脂洗液施加到经漂白的头发上，使头发在室温下松弛 5 分钟，然后用温水漂清。经处理的头发是湿润的，柔软程度得到改善。

实施例 8：在头发护理中使用乳状 LAN/聚硅氧烷体系

与矿脂一样，聚硅氧烷提供了许多头发和皮肤护理场合所需的增湿性和保护性。用 LAN/聚硅氧烷输送体系配制下列头发处理剂。所有组分的用量用重量百分数表示。

卵磷脂	1.0%
Miranol C2M-SF	4.0%
Arlasolve 200	2.0%
DC 1411	10.0%
Sepigel 305	3.9%
水	80.0%

将所得 LAN/聚硅氧烷洗液施加到头发上，在室温下处理 5 分钟，然后用温水漂清。经处理的头发摸上去是柔软的，很容易解开缠结，并具有改善的光泽。