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(54) Titre : SHAMPOING CONDITIONNEUR TRES MOUSSANT, A BASE D'UN CONDITIONNEUR AU SILICONE, D'UN COPOLYMERE D'ACRYLATE QUATERNAIRE CATONIQUE, D'UN SURFACTIF ANIONIQUE ET DE POLYETHYLENEIMINE

(54) Title: STABLE CONDITIONING SHAMPOO HAVING A HIGH FOAM LEVEL CONTAINING A SILICONE CONDITIONER, A CATIONIC QUATERNARY ACRYLATE COPOLYMER, AN ANIONIC SURFACTANT AND POLYETHYLENEIMINE

(57) Abrégé/Abstract:

A conditioning shampoo containing an anionic cleansing surfactant, in an amount of about 5% to about 65% by weight, preferably about 5% to about 25% by weight, e.g., (C₁₂-C₂₂) alkyl sulfate, and/or a long chain (C₁₂-C₂₂) partially or fully ethoxylated alkyl sulfate, and/or a long chain (C₁₂-C₂₂) alkyl sulfonate, and a combination of cationic polymers comprising (1) a cationic (protonated) polyethyleneimine in an amount of about 0.1% to about 4% by weight, preferably about 0.1% to about 1% by weight, and (2) a cationic oil-soluble, water-dispersible, cross-linked quaternary acrylate/acrylamide copolymer (Polyquaternium 32), in an amount of about 0.1% to about 20% by weight of the composition, provides excellent foaming, conditioning and stability, without settling of water-insoluble materials due to anionic-cationic complexing. The composition preferably also includes one or more silicone conditioning agents, and has extended product stability, excellent overall conditioning to human hair, particularly superior wet and dry combing properties, and unexpectedly maintains very high levels of foam.

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ABSTRACT

A conditioning shampoo containing an anionic cleansing surfactant, in an amount of about 5% to about 65% by weight, preferably about 5% to about 25% by weight, e.g., (C₁₂-C₂₂) alkyl sulfate, and/or a long chain (C₁₂-C₂₂) partially or fully ethoxylated alkyl sulfate, and/or a long chain (C₁₂-C₂₂) alkyl sulfonate, and a combination of cationic polymers comprising (1) a cationic (protonated) polyethyleneimine in an amount of about 0.1% to about 4% by weight, preferably about 0.1% to about 1% by weight, and (2) a cationic oil-soluble, water-dispersible, cross-linked quaternary acrylate/acrylamide copolymer (Polyquaternium 32), in an amount of about 0.1% to about 20% by weight of the composition, provides excellent foaming, conditioning and stability, without settling of water-insoluble materials due to anionic-cationic complexing. The composition preferably also includes one or more silicone conditioning agents, and has extended product stability, excellent overall conditioning to human hair, particularly superior wet and dry combing properties, and unexpectedly maintains very high levels of foam.

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STABLE CONDITIONING SHAMPOO HAVING A HIGH FOAM
LEVEL CONTAINING A SILICONE CONDITIONER,
A CATIONIC QUATERNARY ACRYLATE COPOLYMER,
AN ANIONIC SURFACTANT AND POLYETHYLENEIMINE-

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CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of
co-pending application Serial No. 07/719,818 filed
June 24, 1991.

FIELD OF THE INVENTION

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The present invention is directed to a hair
conditioning shampoo composition and to a method of
treating hair with the composition to provide the hair
with improved wet stage and dry stage conditioning
properties as well as other conditioning properties,
15 such as softness, without residual build-up of
conditioning agents on the hair. The conditioning
shampoo also thoroughly cleanses the hair, while
conditioning, with a cleansing detergent that develops
an unexpectedly high foam level and unexpected
20 stability containing an anionic detergent, a protonated
(cationic) polyethyleneimine conditioning agent and,
optionally, one or more silicone conditioning agents.
More particularly, the present invention is directed to
a hair conditioning shampoo composition including one
25 or more anionic cleansing surfactants, such as ammonium
lauryl sulfate or ammonium lauryl ether sulfate (ALES),
a protonated polyethyleneimine, and an
acrylate/acrylamide copolymer conditioning agent that
is stable over extended periods of time at elevated
30 temperature.

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Surprisingly, the composition develops
copious amounts of foam for a conditioning shampoo
while achieving excellent conditioning benefits, and is
unexpectedly stable while having a combination of a
5 strong anionic cleansing detergent, such as a long
chain alkyl sulfate, or a partially ethoxylated long
chain alkyl sulfate or sulfonate together with a
cationic polyethyleneimine and a silicone conditioning
agent. The anionic surfactant/cationic
10 polyethyleneimine conditioning agent components are
compatible and stable while developing surprisingly
high amounts of foam without the problem of anionic
surfactant-cationic conditioning agent incompatibility.

BACKGROUND OF THE INVENTION

15 Soiled human hair is shampooed to remove
sebum that is naturally secreted by the head as well as
soil and other atmospheric contaminants that accumulate
on the hair. Sebum, in particular, accumulates on the
hair in a relatively short period of time leaving the
20 hair with a greasy, dirty feel and poor manageability.
The most effective shampoos for cleansing the hair for
removal of the atmospheric contaminants and sebum, are
those that contain high lather synthetic anionic
detergents, such as the long chain alkyl sulfates, the
25 partially ethoxylated long chain alkyl sulfates and the
long chain sulfonates. These synthetic anionic
detergents are very effective for cleansing the hair
but, after rinsing with water, leave the hair with a
dried touch, usually called "creak" and result in hair,
30 when wet, that is in an extremely tangled and
unmanageable after-shampoo condition.

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Thoroughly cleansed hair is extremely difficult to comb, in either the wet or dry state because the individual hair fibers tend to snarl, kink, and interlock with each other. Particularly, prior to
5 complete drying of thoroughly cleansed hair, in this after-shampoo stage, the hair is very difficult to comb or brush. Even after complete drying, the thoroughly cleansed hair remains difficult to comb or brush and does not set well. Thoroughly clean, dried hair also
10 has undesirable electrostatic properties in a low humidity atmosphere that causes the hair to "fly away", thereby further reducing the combing or brushing property of the hair. Generally, these above-outlined problems that result from synthetic detergent cleansing
15 of the hair, particularly in the high-lather synthetic anionic detergents, have been alleviated either by the after-shampoo treatment of the hair with hair conditioners, for example, in the form of a hair rinse, or by including hair conditioners directly within the
20 shampoo composition.

After-shampoo hair conditioning compositions are easily formulated but are inconvenient to use because of the necessity of applying the conditioner to the hair in a separate stage, after shampooing. The
25 preparation of a conditioning shampoo has been more difficult because of inherent incompatibility problems between anionic surfactants and the cationic compounds that are good conditioning agents. Contact between an anionic surfactant and a cationic surfactant or
30 cationic polymer produces a precipitate that forms immediately or causes an interaction between the anionic and cationic compounds that significantly reduces their respective cleaning and conditioning

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properties, and especially a very noticeable severe
loss of foam attributed by the anionic cleansing
surfactant. The reduction in cleansing and
conditioning effectiveness is observed even in
5 compositions wherein the anionic and cationic compounds
do not precipitate from the composition but remain in
solution or suspension. This incompatibility between
an anionic surfactant and a cationic conditioning
compound is well recognized by those skilled in the
10 art. For example, Sagarin in *Cosmetics*, Interscience
Publishers, Inc., New York, p. 538 (1957), states that
anionic and cationic compounds cannot be used in
combination because they react to form insoluble salts.

A partial solution to this incompatibility
15 problem in the formulation of conditioning shampoos is
exemplified by the following patents that disclose
compositions that contain surfactants that are not
anionic, e.g., non-ionics, amphoterics and
zwitterionics together with cationic conditioning
20 compounds: U.S. Patent No. 3,849,348 to Hewitt;
U.S. Patent No. 3,990,991 to Gerstein; and U.S. Patent
No. 3,822,312 to Sato.

Another problem inherent in formulating a
conditioning shampoo is an instability problem that
25 results when water-insoluble conditioning agents are
also included in the conditioning shampoo composition,
such as the non-volatile silicones that are well
recognized in the art as providing a degree of softness
to the hair.

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Silicones in shampoo compositions have been disclosed in a number of different patents: U.S. Patent No. 2,826,551, March 11, 1958 to Green; U.S. Patent No. 3,964,500, June 22, 1976 to Drakoff; U.S. Patent No. 4,364,837, December 21, 1982 to Pader; British Patent No. 849,433, September 28, 1960 to Woolston; U.S. Patent No. 4,741,855 to Grote, et al.; U.S. Patent Nos. 4,788,006 and 4,902,499 to Bolich, Jr., et al. and U.S. Patent No. 4,704,272 to Oh, et al. The silicones are well known to substantially reduce the foaming of anionic cleansing surfactants.

A particularly difficult problem to solve in silicone-containing conditioning shampoos is that of providing a conditioning shampoo that provides excellent cleansing of the hair while providing high foaming and, at the same time, also has excellent conditioning performance. The capability of providing excellent conditioning, cleansing and foam levels is achieved with the compositions of the present invention. In accordance with one embodiment of the present invention, it has been found that a combination of (1) a cationic (protonated) polyethyleneimine (PEI) in an amount of about 0.01% to about 4% by weight of the composition, preferably about 0.01% to about 1% by weight, together with (2) a cationic oil-soluble, water-dispersible cross-linked quaternary acrylate/acrylamide copolymer (Polyquaternium 32), in an amount of about 0.1% to about 20% based on the total weight of the composition, is stable over long periods of time while providing excellent simultaneous conditioning, cleansing and foaming. Optionally, a number of materials can be included in the conditioning

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shampoos of the present invention for purposes of thickening and stabilization such as xanthan gum, long chain acyl derivatives, long chain amide oxides or amine oxides, and long chain alkanolamides, as
5 disclosed in U.S. Patent Nos. 4,7888,006; 4,704,272; and 4,741,855, hereby incorporated by reference.

SUMMARY OF THE INVENTION

In accordance with the principles of the present invention, it has been found, surprisingly,
10 that a conditioning shampoo containing an anionic cleansing surfactant, in an amount of about 5% to about 65% by weight, preferably about 5% to about 25% by weight, e.g., (C₁₂-C₂₂) alkyl sulfate, and/or a long chain (C₁₂-C₂₂) partially or fully ethoxylated alkyl
15 sulfate, and/or a long chain (C₁₂-C₂₂) alkyl sulfonate, or alkyl ether sulfonate, and a combination of cationic polymers comprising (1) a cationic (protonated) polyethyleneimine in an amount of about 0.1% to about 4% by weight, preferably about 0.1% to about 1% by
20 weight, and (2) a cationic oil-soluble, water-dispersible, cross-linked quaternary acrylate/acrylamide copolymer (Polyquaternium 32), in an amount of about 0.1% to about 20% by weight of the composition, provides excellent foaming, conditioning
25 and stability, without settling of water-insoluble materials due to anionic-cationic complexing. The composition preferably also includes one or more silicone conditioning agents, and has extended product stability, excellent overall conditioning to human
30 hair, particularly superior wet and dry combing properties, and unexpectedly maintains very high levels of foam.

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According to one aspect of the present invention, there is provided a mild conditioning shampoo composition capable of thoroughly cleansing and conditioning hair while maintaining a high foam level comprising water, an anionic
5 cleansing surfactant in an amount of about 5% to about 65% by weight; a cationic polyethyleneimine in an amount of about 0.01% to about 4% by weight; and a cationic oil-soluble, water-dispersible, cross-linked acrylate/acrylamide copolymer conditioning agent in an amount of about 0.1% to
10 about 20% by weight.

According to another aspect of the present invention, there is provided a method of cleansing and conditioning hair, simultaneously, while maintaining a substantial quantity of foam and excellent cleansing in a
15 mild shampoo composition comprising contacting the hair with a mild conditioning shampoo comprising water, a cleansing surfactant in an amount of about 5% to about 65% by weight, a protonated polyethyleneimine in an amount of about 0.01% to about 4% by weight and a cationic oil-soluble, water-
20 dispersible, cross-linked acrylate/acrylamide copolymer conditioning agent in an amount of about 0.1% to about 20% by weight.

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The compositions of the present invention are stable and do not exhibit the inherent anionic surfactant/cationic polymer, (polyethyleneimine and/or Polyquaternium 32 conditioning agents) incompatibility while providing excellent cleansing, conditioning and foam levels in a conditioning shampoo. It was further surprisingly and unexpectedly found that hair treated with the compositions of the present invention is thoroughly cleansed at high foam levels and exhibits improved physical and cosmetic properties, such as gloss, wet combing, dry combing, thickness, manageability, softness and body.

Therefore, an aspect of the present invention is to provide a hair-treating composition that cleanses the hair and imparts improved physical properties and cosmetic properties to the hair in a single application from a mild conditioning shampoo that develops unexpectedly high foam quantities.

Another aspect of the present invention is to provide a physically stable conditioning shampoo containing an anionic surfactant, and a combination of cationic polymers that provide hair conditioning and composition stability, wherein the composition develops excellent foam levels and can be formulated at room temperature.

Another aspect of the present invention is to provide a new and improved conditioning shampoo containing a strong anionic detergent, such as a long chain alkyl sulfate, long chain alkyl ether sulfate, and/or long chain sulfonate, that is compatible with

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cationic conditioning agents, and that maintains an unexpectedly high foam level although the composition contains a silicone conditioning agent.

Still another aspect of the present invention
5 is to provide a new and improved conditioning shampoo including about 5% to about 25% of an anionic surfactant; about 0.01% to about 4% of a cationic polyethyleneimine that surprisingly provides composition stability and added conditioning benefits,
10 particularly increased wet and dry combing and reduced static (fly away) for better manageability; and about 0.1% to about 20% of a cationic polymeric conditioning agent (Polyquaternium 32), about 0.01% to about 10% of a silicone conditioning agent, and optionally any known
15 emulsion stabilizer and/or a viscosity increasing agent for added stability of aqueous emulsions, each in an amount of about 0% to about 10% by weight, active, preferably about 0.1% to about 5% by weight.

A further aspect of the present invention is
20 to provide a new and improved method of cleansing and conditioning hair, simultaneously, with a composition containing one or more anionic surfactants; a cationic (protonated) polyethyleneimine having an increased charge density; a cationic acrylate/acrylamide
25 copolymer conditioning agent; and one or more silicone conditioning agents while providing high foam levels, excellent cleansing, excellent conditioning in a stable conditioning shampoo and is capable of being mixed together at room temperature.

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Still another aspect of the present invention is to provide a new and improved conditioning shampoo having a pH in the range of about 4 to about 7, preferably about 5 to about 6, including about 5% to about 65% of an anionic surfactant; polyethyleneimine in an amount of about 0.01% to about 4%, preferably about 0.01% to about 1% by weight; optionally about 0.1% to about 20% of a cationic, nitrogen-containing acrylate/acrylamide copolymer conditioning agent; and optionally about 0.5% to about 10% of a cationic silicone conditioning agent.

Another object of the present invention is to provide a new and improved conditioning shampoo having a pH in the range of about 4 to about 7, preferably about 5 to about 6, including about 5% to about 65% of an anionic surfactant; protonated polyethyleneimine in an amount of about 0.01% to about 4%, preferably about 0.01% to about 1% by weight, and having a cationic polymer charge density of at least about 10 milliequivalents per gram, preferably about 15 to about 20 milliequivalents per gram; about 0.1% to about 20% of a cationic acrylate/acrylamide copolymer (Polyquaternium 32) conditioning agent; and about 0.5% to about 10% of a non-volatile silicone material.

The above and other aspects and advantages of the present invention will become apparent from the following detailed description of the preferred embodiments.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The aqueous conditioning shampoo compositions of the present invention generally include water in an amount of about 60% to about 80-90% by weight; an
5 anionic surfactant preferably in an amount of about 5% to about 25% by weight of the composition; a poleythyleneimine in an amount of about 0.01% to about 4%, preferably about 0.01% to about 1% by weight; optionally a silicone conditioning agent in an amount
10 of about 0.1% to about 10% by weight of the composition; and Polyquaternium 32, a cationic conditioning agent, in an amount of about 0.1% to about 20% by weight of the composition.

The conditioning shampoo of the present
15 invention provides the hair with improved physical and cosmetic conditioning properties, such as gloss, thickness, softness, and manageability, including excellent wet and dry combing properties and body simultaneously with excellent cleansing at high foam
20 levels in a mild conditioning shampoo. As will be demonstrated more fully hereinafter, it is surprising and unexpected that the composition of the present invention, including an anionic cleansing detergent, and a cationic conditioning compound is able to provide
25 the demonstrated cleansing at such a high foam level in a stable composition containing a silicone conditioning agent.

The anionic cleansing surfactant used in the composition and method of the present invention can be
30 any of the anionic surfactants known or previously used

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in the art of hair shampoos. An anionic cleansing
surfactant should be included in the composition of the
present invention to effectively cleanse the hair and
generates a high, stable foam level that consumers
5 equate with cleaning efficiency. While nonionic and
amphoteric surfactants have not been as effective in
cleansing the hair and do not provide the high foam
level desired by consumers, surprisingly, it has been
found that the composition of the present invention
10 provides excellent foam levels with the less strong
anionic cleansing detergents or with the strong anionic
detergents at levels generally below about 9% by weight
of the composition, particularly when the foam level is
boosted with one or more common foam boosters, such as
15 a betaine or other foam booster. Optionally, nonionic
amphoteric and/or zwitterionic surfactants can be
included in the compositions of the present invention
in addition to one or more anionic surfactants, to help
stabilize foam, to provide a suitable viscosity, or to
20 give other functional or esthetic properties to the
composition.

Usually, the anionic cleansing surfactant
includes a hydrophobic moiety, such as a carbon chain
including from about eight carbon atoms to about 30
25 carbon atoms, and particularly from about 12 carbon
atoms to about 22 carbon atoms and further includes a
hydrophilic moiety, such as a sulfate, sulfonate,
carbonate, phosphate or carboxylate. Often, the
hydrophobic carbon chain is etherified, such as with
30 ethylene oxide or propylene oxide, to impart a
particular physical property, such as increased water-
solubility or reduced surface tension, to the anionic
cleansing surfactant.

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Suitable anionic cleansing surfactants include, but are not limited to, compounds in the classes known as alkyl sulfates, alkyl ether sulfates, alkyl sulfonates, alkyl ether sulfonates, sulfate
5 esters of an alkylphenoxy polyoxyethylene ethanol, alpha-olefin sulfonates, beta alkyloxy alkene sulfonates, alkyl arylsulfonates, alkyl carbonates, alkyl ether carboxylates, fatty acids, succinamates, sulfosuccinates, sarcosinates, octoxynol or nonoxynol
10 phosphates, taurates, fatty taurides, sulfated monoglycerides, fatty acid amino polyoxyethylene sulfates and isothienates; or combinations thereof. Many additional anionic cleansing surfactants are described in McCUTCHEON'S DETERGENTS AND EMULSIFIERS,
15 1989 ANNUAL published by McCutcheon's Division MC Publishing Company, herein incorporated by reference. Usually, the anionic cleansing surfactant is present in the composition as a neutralized salt in the form of a sodium, potassium, lithium, ammonium.
20 alkylammonium or hydroxyalkylammonium salt, wherein the alkyl moiety includes from one to about three carbon atoms.

Exemplary anionic cleansing surfactants that are useful in the composition and method of the present
25 invention include, but are not limited to, the ammonium, monoethanolamine, diethanolamine, triethanolamine, isopropylamine, sodium, potassium, lithium, or magnesium salts of lauryl sulfate, dodecylbenzenesulfonate, lauryl sulfosuccinate, lauryl
30 ether sulfate, lauryl ether carboxylate, lauryl sarcosinate, cocomethyl tauride, and sulfosuccinate half ester amide; or combinations thereof. Also useful are the zwitterionic betaines, e.g., cocamdopropyl

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betaine, cocamidopropyl hydroxysultaine, and the like;
and the anionic carboxylate cleansing detergents, such
as C₁₁-C₁₅ Pareth-7 carboxylic acid, C₁₁-C₁₅ Pareth-9,
C₁₁-C₁₅ Pareth-12, C₁₁-C₁₅ Pareth-20, C₁₁-C₁₅ Pareth-30,
5 C₁₁-C₁₅ Pareth-40, C₁₁-C₂₁ Pareth-10, C₁₂-C₁₃ Pareth-5
carboxylic acid, C₁₂-C₁₅ Pareth-2 phosphate, C₁₂-C₁₅
Pareth-7 carboxylic acid, C₁₂-C₁₅ Pareth-9, C₁₂-C₁₅
Pareth-12, C₁₄-C₁₅ Pareth-13, C₂₂-C₂₄ Pareth-33,
cocaminobutyric acid, cocaminopropionic acid, coceth-7
10 carboxylic acid, cocoamphodipropionic acid, coconut
acid, deceth-7 carboxylic acid, hydrogenated coconut
acid, hydrogenated menhaden acid, hydrogenated tallow
acid, hydroxystearic acid, isostearic acid, lanolin
acid, lauraminopropionic acid, laureth-5 carboxylic
15 acid, laureth-10 carboxylic acid, lauroamphodipropionic
acid, linoleic acid, linolenic acid, linseed acid,
MEA-laureth-6-carboxylate, myristaminopropionic acid,
palmitic acid, sodium C₁₂-C₁₅ Pareth-6 carboxylate,
sodium C₁₂-C₁₅ Pareth-7 carboxylate, sodium ceteth-13
20 carboxylate, sodium isosteareth-6 carboxylate, sodium
isosteareth-11 carboxylate, sodium laureth-13
carboxylate, sodium trideceth-7 carboxylate, sodium
trideceth-12 carboxylate, trideceth-4 carboxylic acid,
trideceth-7 carboxylate acid, trideceth-15 carboxylic
25 acid, and trideceth-19 carboxylic acid.

The following low-irritation surfactants are
particularly useful in formulating a "baby" shampoo
having high performance in terms of foam level and
cleansing while achieving exceptional mildness:

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ANIONICS:

Disodium Laureth Sulfosuccinate;
Disodium Lauroamido MEA Sulfosuccinate;
Disodium Ricinoleamido MEA Sulfosuccinate;
5 Ceteareth-25-Carboxylic Acid;
Trideceth-7-Carboxylic Acid;
Pareth-25-6-Carboxylic Acid;
Trideceth-4-Carboxylic Acid;
Trideceth-19-Carboxylic Acid;
10 Sodium Trideceth-12-Carboxylate;
Sodium Ceteth-13-Carboxylate;
Laureth-5-Carboxylic Acid (SANDOPAN® LA8);
Sodium Laureth-13-Carboxylate;
Sodium Oleth-13-Carboxylate;
15 Sodium Ceteareth-5-Carboxylate;
Sodium Ceteareth-9-Carboxylate;
Isosteareth-6-Carboxylic Acid; and
Isosteareth-11-Carboxylic Acid.

NONIONICS:

20 PEG 30 Glyceryl Mono Cocoate;
PEG 78 Glyceryl Mono Cocoate;
PEG 82 Glyceryl Mono Tallowate;
PEG 200 Glyceryl Mono Tallowate; and
PEG 20 Glyceryl Mono Tallowate.

25

AMPHOTERICIS:

Cocampho-Carboxyglycinate (VARION® 2C);
Lauroampho-Carboxyglycinate (VARION® 2L);
Cocamidopropyl Betaine; and
Cocamidopropyl Hydroxysultaine (VARION® CAS).

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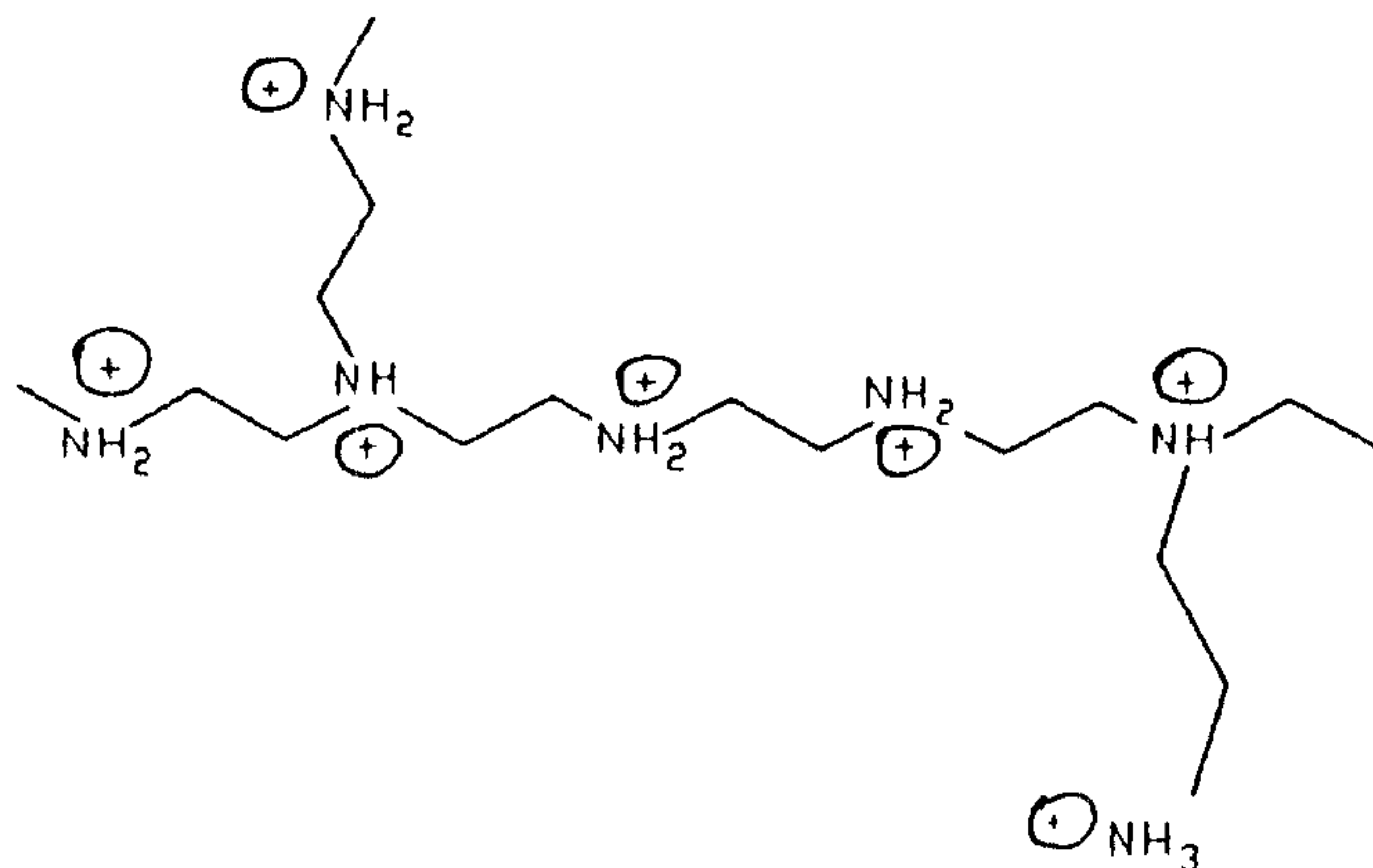
The polyethyleneimine(s) contained in the conditioning shampoos of the present invention generally have the formula $(CH_2CH_2NH)_n$ wherein n has an average value of about 5 to about 2500. Specific
5 examples of polyethyleneimines are PEI-7; PEI-15; PEI-30; PEI-45; PEI-1000; PEI-1500; and PEI-2500, wherein the integer following the PEI corresponds to the value of n in the formula above.

Surprisingly, protonated polyethyleneimines,
10 together with the cationic Polyquaternium 32, provide excellent stability while achieving additional conditioning benefits from the protonated polyethyleneimine. The polyethyleneimines can be obtained protonated with any suitable acid at a pH
15 below about 7.0, or the polyethyleneimines can be protonated in-situ (during mixing of the composition with an acid, e.g., citric acid) by adding sufficient acid that is free to protonate the polyethyleneimine. The molecular weight of the polyethyleneimine is not
20 critical and can be any molecular weight commercially available, e.g., protonated polyethyleneimines available from BASF Corporation having a weight average molecular weight in the range of about 700 to about 70,000. The ability to provide a conditioning shampoo
25 that has excellent conditioning benefits, as well as excellent foaming and stability, has been a long-felt need in the conditioning shampoo art. The conditioning shampoos of the present invention solve this long-felt need by including a protonated polyethyleneimine and a
30 cationic acrylate/acrylamide copolymer, particularly Polyquaternium 32. The structure of protonated polyethyleneimine is as follows:

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The preferred protonated polyethylenimines have a ratio of primary:secondary:tertiary nitrogen atoms of about 1:2:1, respectively.

5 The emulsified conditioning shampoo of the present invention also includes a cationic conditioning agent, such as a SALCARE SC92 acrylate/acrylamide copolymer conditioning agent of Allied Colloids (POLYQUATERNIUM 32) as disclosed in our parent application Serial No. 07/719,818 filed June 24, 1991,
10 hereby incorporated by reference.

To achieve the full advantage of the present invention, an optional foam booster, in an amount of about 0.1% to about 20% by weight of the composition, is included in the composition to aid in the formation
15 of copious amount of foam. Suitable foam boosters include one or more of the following:

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	Capramide DEA	Disodium Isostearyl Sulfosuccinate
	Cetearyl Alcohol	Hydrogenated Tallow Amine Oxide
	Cetyl Alcohol	Hydroxyethyl Hydroxypropyl C ₁₂ -C ₁₅ Alkoxypropylamine Oxide
	Cetyl Betaine	Hydroxyethyl Stearamide-MIPA
5	Cocamide	Isopropyl Stearate
	Cocamide DEA	Isostearamidopropylamine Oxide
	Cocamide MEA	Isostearamidopropyl Morpholine Oxide
	Cocamide MIPA	Lauramide
	Cocamidoethyl Betaine	Lauramide DEA
10	Cocamidopropylamine Oxide	Lauramide MEA
	Cocamidopropyl Betaine	Lauramide MIPA
	Cocamidopropyl Hydroxysultaine	Lauramidopropylamine Oxide
	Cocamine Oxide	Lauramidopropyl Betaine
15	Cocoamphodipropionic Acid	Lauramine Oxide
	Coco-Betaine	Lauryl Alcohol
	Coco-Morpholine Oxide	Lauryl Betaine
	Coconut Alcohol	Lauryl Sultaine
20	Coco/Oleamidopropyl Betaine	Myristamide DEA
	Coco-Sultaine	Myristamide MEA
	Cocoyl Hydroxyethyl Imidazoline	Myristamide MIPA
	Cocoyl Sarcosinamide DEA	Myristamidopropylamine Oxide
25	DEA-Cocoamphodipropionate	Myristamidopropylamine Betaine
	DEA-Lauraminopropionate	Myristamine Oxide

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5	Decylamine Oxide	Myristaminoproionic Acid
	Decyl Betaine	Myristyl Alcohol
	Dihydroxyethyl C ₈ -C ₁₀ Alkoxypropylamine Oxide	Myristyl Betaine
	Dihydroxyethyl C ₉ -C ₁₁ Alkoxypropylamine Oxide	Oleamidopropylamine Oxide
	Dihydroxyethyl C ₁₂ -C ₁₅ Alkoxypropylamine Oxide	Oleamidopropyl Betaine
10	Dihydroxyethyl Cocamine Oxide	Oleamidopropyl Hydroxysultaine
	Dihydroxyethyl Stearamine Oxide	Oleamine Oxide
	Dihydroxyethyl Tallowamine Oxide	Oleyl Betaine
		Palmamide DEA
15	Palmamide MEA	PEG-5 Lauramide
	Palmamide MIPA	PEG-6 Lauramide
	Palmamidopropyl Betaine	PEG-3 Lauramine Oxide
	Palmitamide DEA	Sodium Cocoamphoacetate
	Palmitamide MEA	Sodium Cocoamphopropionate
20	Palmitamidopropylamine Oxide	Sodium Lauraminopropionate
	Palmitamidopropyl Betaine	Sodium Lauroamphopropionate
	Palmitamine Oxide	Sodium Lauroyl Sarcosinate
	Palm Kernel Alcohol	Sodium Myristoamphoacetate
25	Palm Kernelamide DEA	Sodium Myristoyl Sarcosinate
	Palm Kernelamide MEA	Stearyl Alcohol
	Palm Kernelamide MIPA	TEA-Hydrogenated Tallow Glutamate

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Peanutamide MEA	TEA-Lauraminopropionate
Peanutamide MIPA	TEA-Myristaminopropionate
PEG-6 Cocamide	Undecylenamide DEA
PEG-3 Lauramide	Undecylenamide MEA
	Undecylenamidopropylamine Oxide

5 One or more zwitterionic detergents, such as
a betaine, in an amount of about 5% to about 25% by
weight of the composition aids in stabilizing the
composition but generally is not necessary to achieve a
stable composition. Suitable betaines include, for
10 example:

	Betaine	Myristamidopropyl Betaine
	Cetyl Betaine	Myristyl Betaine
	Cocamidoethyl Betaine	Oleamidopropyl Betaine
	Cocamidopropyl Betaine	Oleamidopropyl Hydroxysultaine
15	Cocamidopropyl Hydroxysultaine	Oleyl Betaine
	Coco-Betaine	Palmamidopropyl Betaine
	Coco/Oleamidopropyl Betaine	Palmitamidopropyl Betaine
20	Coco-Sultaine	Ricinoleadmidopropyl Betaine
	Decyl Betaine	Stearamidopropyl Betaine
	Hydrogenated Tallow Betaine	Stearyl Betaine

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5	Isostearamidopropyl Betaine	Tallowamidopropyl Betaine
	Lauramidopropyl Betaine	Tallowamindopropyl Hydroxysultaine
	Lauryl Betaine	Wheat Germamidopropyl Betaine
	Lauryl Sultaine	

Other compounds useful for composition stabilization, in an amount of about 0.1% to about 10% by weight of the composition include any one or more of the following:

10	Acetylated Glycol Stearate	Maltodextrin
	Aluminum Caprylate	Methoxy PEG-22/Dodecyl Glycol Copolymer
15	Aluminum Dilinoleate	Methylcellulose
	Aluminum Distearate	Microcrystalline Cellulose
	Aluminum Isostearates/Laurates/Palmitates	Microcrystalline Wax
20	Aluminum Isostearates/Laurates/Stearates	Montmorillonite
	Aluminum Isostearates/Myristates	Myristyl Alcohol
	Aluminum Isostearates/Palmitates	Ozokerite
25	Aluminum Isostearates/Stearates	Pectin
	Aluminum Lanolate	PEG-2M
	Aluminum Myristates/Palmitates	PEG-5M
30	Aluminum Stearate	PEG-7M

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	Aluminum Stearates	PEG-9M
	Aluminum Tristearate	PEG-14M
	Beeswax	PEG-20M
	Bentonite	PEG-23M
5	C ₉ -C ₁₁ Alcohols	PEG-45M
	C ₁₂ -C ₁₃ Alcohols	PEG-90M
	C ₁₂ -C ₁₅ Alcohols	PEG-115M
	C ₁₂ -C ₁₆ Alcohols	PEG-22/Dodecyl Glycol Copolymer
	C ₁₄ -C ₁₅ Alcohols	PEG-45/Dodecyl Glycol Copolymer
10	C ₁₅ -C ₁₈ Glycol	Polyacrylic Acid
	Calcium Carrageenan	Polyethylene
	Calcium Stearate	Polyvinyl Acetate
	Carbomer 910	Potassium Alginate
	Carbomer 934	Potassium Carrageenan
15	Carbomer 934P	PVM/MA Copolymer
	Carbomer 940	PVP/VA Copolymer
	Carbomer 941	Saccharated Lime
	Carboxymethyl Hydroxyethylcellulose	Sodium Acrylate/Vinyl Alcohol Copolymer
20	Carboxymethyl Hydroxypropyl Guar	Sodium C ₄ -C ₁₂ Olefin/Maleic Acid Copolymer
	Carrageenan	Sodium Carboxymethyl Dextran
	Cellulose Gum	Sodium Carrageenan
	Ceresin	Sodium Cellulose Sulfate
25	Cetearyl Alcohol	Sodium Polymethacrylate
	Cetyl Alcohol	Sodium Polynaphthalene Sulfonate
	Cholesterol	Sodium Polystyrene Sulfonate

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	Coconut Alcohol	Stearyl Alcohol
	Ethylene/Acrylate Copolymer	Stearylvinyl Ether/Maleic Anhydride Copolymer
5	Ethylene/Vinyl Acetate Copolymer	Styrene/Maleic Anhydride Copolymer
	Guar Gum	Synthetic Beeswax
	Hydroxybutyl Methylcellulose	Synthetic Wax
	Hydroxyethylcellulose	Tallow Alcohol
10	Hydroxyethyl Ethylcellulose	Tragacanth Gum
	Hydroxypropylcellulose	Tridecyl Alcohol
	Hydroxypropyl Guar	Xanthan Gum
15	Hydroxypropyl Methylcellulose	
	Isopropyl Ester of PVM/MA Copolymer	
	Karaya Gum	
	Lanolin	
20	Lanolin Alcohol	
	Lauryl Alcohol	
	Locust Bean Gum	

Other common cosmetic components and additives that can be incorporated into the conditioning shampoos of the present invention, as long as the basic properties of conditioning, cleansing and high foam levels are not adversely affected include, for example, fragrances, dyes, hair colorants, opacifiers, pearlescing agents, dandruff control agents, hydrotropes, foam stabilizers, solubilizers, preservatives, water softening agents, acids, bases, buffers and the like. These optional components and

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additives usually will be present in weight percentages of less than about 2% each, and from about 5% to about 10% by weight in total.

5 The vehicle of the hair-treating composition is generally predominantly water, but organic solvents also can be used in order to help solubilize compounds that are not sufficiently soluble in water. Suitable solvents include the lower alcohols like ethyl alcohol and isopropyl alcohol; polyols like glycerol; glycols
10 or glycol ethers, like 2-butoxyethanol, ethylene glycol, ethylene glycol monoethyl ether, propylene glycol and diethylene glycol monoethyl ether or monoethyl ether; and mixtures thereof. These non-aqueous solvents can be present in the hair-
15 treating composition of the present invention in an amount from about 1% to 100% by weight and, in particular, from about 5% to about 50% by weight, relative to the total weight of the carrier vehicle in the composition.

20 The conditioning shampoos of the present invention also can be thickened, for example, with sodium alginate; guar gum; xanthan gum; gum arabic; cellulose derivatives such as methylcellulose, hydroxyethylcellulose, hydroxypropylmethylcellulose and
25 carboxymethylcellulose; and various polymeric thickeners, such as polyacrylic acid derivatives. These thickeners are present in an amount ranging from about 0.1% to about 5%, and preferably from about 0.25% to about 1%, by weight relative to the total weight of
30 the composition.

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If instability of the composition is a problem, the composition also can include a suspending agent for the conditioning agent or other water-insoluble material, in an amount of about 0.5% to about 10%, by total weight of the composition. Suitable suspending agents are for example, distearyl amate (distearyl phthalamic acid); fatty acid alkanolamides; esters of polyols and sugars; polyethylene glycols; the ethoxylated or propoxylated alkylphenols; ethoxylated or propoxylated fatty alcohols; and the condensation products of ethylene oxide with long chain amides. These suspending agents, as well as numerous others not cited herein, are well known in the art and are fully described in literature, such as McCUTCHEON'S DETERGENTS AND EMULSIFIERS, 1989 Annual, published by McCutcheon Division, MC Publishing Co.

The conditioning shampoos also can include other emulsifiers, inorganic salts, humectants and similar materials to provide esthetic properties and desirable physical properties to the composition. Generally, such optional ingredients are present in weight percentages ranging from about 0.1% to about 10% each, and from about 0.1% to about 20% in total, relative to the total weight of the composition.

For example, representative nonionic surfactants that can be included in the hair-treating composition of the present invention include esters of polyols and sugars; the polyethoxylated and/or polypropoxylated alkylphenols; and the condensation products of ethylene oxide with long chain amides.

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All these nonionic surfactants, as well as numerous others not cited here, are well known in the art and are fully described in the literature.

5 The compositions of the present invention
can be relatively viscous dispersions that are stable
to phase separation at a temperature of about 20°C to
about 25°C for a period of time of at least 24 hours
after preparation, and typically are stable to phase
separation indefinitely at such temperatures. The
10 compositions of the present invention usually are
emulsions that are stable to phase separation at a
temperature of about 25°C for a period of about
24 hours after preparation. The emulsions should
demonstrate sufficient stability to phase separation at
15 temperatures normally found in commercial product
storage and shipping to remain unaffected for period of
one year or more.

20 The following examples illustrate various
conditioning shampoos made in accordance with the
present invention:

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EXAMPLES 1-3

		1 WT. %	2 WT. %	3 WT. %
	1. Water	30.00	30.00	30.00
	2. Polyvinylpyrrolidone (stabilizing agent)	1.00	1.00	1.00
5	3. Polyethyleneimine (Polymin G-35 BASF) wt. av. M.W - 1,700 as measured by GPC (conditioning and stability)	1.00	1.00	1.00
10	4. Acrylate/acrylamide copolymer (Allied Colloids Salcare SC92) (50% in mineral oil)	1.00	1.00	1.00
	5. Citric Acid (pH adjustment)	1.80	1.80	1.80
15	6. Cocamide DEA (foam booster)	1.00	1.00	1.00
20	7. Surfactant blend (cleansing) (a) ALES (1 mole ethoxylation) (8.0%) (b) lauramide DEA (3.5%) (c) ammonium xylene sulfonate (0.5%) (d) water q.s.	35.00	35.00	35.00
25				
30	8. Silicone blend 33% SE 30 67% SF96-350 (conditioners)	0.65	0.65	0.65
	9. Water	8.00	10.00	9.50
	10. Sodium lauryl sulfate (cleansing, foam)	15.00	15.00	15.00

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		1 WT. %	2 WT. %	3 WT. %
	11. Cocamidopropyl Hydroxysultaine (40%) (VARION® CAS) (amphoteric surfactant)	4.00	2.00	2.00
5	12. Cocamide DEA (foam booster)	1.00	1.00	1.00
	13. Kathon CG (preservative)	0.05	0.05	0.05
10	14. Glydant (preservative)	0.20	0.20	0.20
	15. Fragrance	0.30	0.30	0.30
	pH	4.2	4.4	4.2
	Viscosity	2,000 cps.	2,250 cps.	2,150 cps.

Mixing Procedure Examples 1-3

15 Add the polyvinylpyrrolidone (#2) to
water (#1) with high agitation. Then add the
polyethyleneimine (#3) and continue mixing. Then add
the acrylate/acrylamide copolymer (#4) and mix until
homogeneous (lump free). Then add the citric
20 acid (#5), the cocamide DEA (#6), the surfactant
blend (#7) and the silicone blend (#8). Into a
separate container add the sodium lauryl sulfate (#10)
to water (#9) and then add the contents of the separate
container to the mixture of (#1) through (#8), with
25 agitation. Then add the VARION® CAS (#13), the
glydant (#14) and the fragrance (#15).

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EXAMPLE 4

		<u>WT. %</u>
	1. Water	59.05
5	2. Polyethyleneimine (Polymin G35, BASF) (conditioning and stability)	0.10
	3. Acrylate/acrylamide copolymer Allied Colloids D.P. 64297C (50% in mineral oil)	2.50
10	4. SURFODONE® QSP (polylauryl pyrrolidone) polymeric emulsion stabilizer	0.50
	5. SANDOPAN® LA 8 (carboxylate surfactant)	7.00
15	6. SURFINE® WNT A (carboxylate surfactant)	7.00
	7. KOH (50%)	0.60
	8. Cocamidopropyl Hydroxysultaine (40%) (VARION® CAS) (amphoteric surfactant)	15.00
20	9. C ₁₆₋₁₈ amine oxide (40%) (SCHERCAMOX® CMA)	2.00
	10. GLUCAMATE® DOE 120* (thickener)	0.50
	11. Color, fragrance, preservative	q.s.

25 pH = 5.19
Viscosity (25°C) = 3,000 cps.

* polyethylene glycol diester of methyl glucose
and oleic acid with an average of 120 moles
of ethylene oxide.

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EXAMPLE 5

		<u>WT. %</u>
	1. Water	19.50
5	2. Polyethyleneimine (Polymin P, BASF) (conditioning and stability)	0.50
	3. Acrylate/acrylamide copolymer Allied Colloids D.P. 64297C (50% in mineral oil)	2.00
10	4. Cocamidopropyl Hydroxysultaine (40%) (VARION® CAS) (amphoteric surfactant)	15.00
	5. Cocamide DEA (foam booster)	4.00
	6. SANDOPAN® LA 8 (carboxylate surfactant)	15.00
15	7. Water	42.05
	8. KOH (50%)	1.40
	9. Perfume	0.30
	10. Glydant	0.20
	11. Kathon CG	0.05
20	pH - 5.0	
	Viscosity (25°C) = 2,000 cps.	

Mixing Procedure Example 5:

Add the sultaine (#4), the polyethyleneimine (#2), and the acrylate/acrylamide copolymer (#3) to
25 water (#1) with mixing (1 hour). Then add the Cocamide
DEA (#5) and mix until homogeneous (lump free). Into a
separate container, add the SANDOPAN® carboxylate
surfactant (#6) to water (#7) followed by the KOH (#8)
addition and then mix all items (#1) through (#8). The
30 perfume (#9), glydant (#10) and Kathon CG (#11) then
are added.

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EXAMPLE 6

		<u>WT. %</u>
	1. Water	35.50
5	2. Polyethyleneimine (POLYMIN WATERFREE, BASF) (conditioning and stability)	0.50
	3. SURFADONE® QSP (polylauryl pyrrolidone) polymeric emulsion stabilizer	0.60
10	4. Acrylate/acrylamide copolymer Allied Colloids D.P. 65780E (50% mineral oil)	3.00
	5. Surfactant Blend:	20.00
15	(a) ALES (1 mole ethoxylation) (4.5%)	
	(b) lauramide DEA (2.5%)	
	(c) ammonium xylene sulfonate (0.6%)	
20	(d) water q.s.	
	6. KOH (50%)	0.50
	7. SANDOPAN® LA 8 (carboxylate surfactant)	15.00
	8. KOH	1.00
25	9. Cocamidopropyl Hydroxysultaine (40%) (VARION® CAS) (amphoteric surfactant)	10.00
	10. Perfume	0.50
	11. Glydant	0.20
30	12. Kathon CG	0.05
	13. Cold pearl mix	3.00
	14. Cocamide DEA FO (foam booster)	3.00
	15. Water, color	7.15

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Mixing Procedure Example 6:

Add (#2) and (#3) in (#1), mix until no lumps,
then add (#4) and mix until a soft gel is formed in
about 40 minutes, avoid aeration;

5 Add (#5), mix for 5 minutes (precipitation is
observed);

Add (#6) and (#7) and mix for 5 minutes;

Add (#8), mix until product is uniform (pH 4.5);

10 Add (#9), gradually, add (#10), (#11), (#12),
(#13), (#14) and (#15).

pH 4.5

ADD KOH (50%) - 0.6% to pH 5.13

FINAL pH = 5.13

Viscosity (25°C) = 6,300 cps.

15 To show that the compositions of the present
invention are compatible with a relatively low
percentage of sodium lauryl ether (1 mole of
ethoxylation) sulfate (SLES), Example 7 incorporates
5% by weight of sodium lauryl ether sulfate (1 mole of
20 ethoxylation) (SLES) together with about 15% of
other, mild carboxylate anionic surfactants.

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EXAMPLE 7

		<u>WT. %</u>
	1. Water, Soft	20.72
5	2. Polyethyleneimine (POLYMIN PS, BASF) (conditioning and stability)	2.00
	3. SURFODONE® QSP (polylauryl pyrrolidone) polymeric emulsion stabilizer	0.38
10	4. Acrylate/acrylamide copolymer Allied Colloids D.P. 65789E (50% in mineral oil)	1.90
	5. Water	22.75
	6. SANDOPAN® LA 8 (90%) (carboxylate surfactant)	15.00
15	7. KOH (50%)	1.50
	8. SLES (25%)	20.00
	9. Cocamidopropyl Hydroxysultaine (40%) (VARION® 2L) (amphoteric surfactant)	10.00
20	10. Cocamide DEA (foam stabilizer)	3.00
	11. Perfume	0.50
	12. Kathon CG	0.05
	13. Clydant	0.20
25	14. C ₁₆₋₁₈ amide oxide (40%) SHERCOMOX® CMA	2.00

pH = 6.0

Viscosity (25°C) = 8,500 cps.

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Mixing Procedure Example 7:

Add (#2) to (#3) to (#1), mix well and add (#4),
mix until soft gel is formed.

Add remaining ingredients. Allow 5 minutes of
5 mixing for each addition.

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CLAIMS:

1. A mild conditioning shampoo composition capable of thoroughly cleansing and conditioning hair while maintaining a high foam level comprising water, an anionic cleansing
5 surfactant in an amount of about 5% to about 65% by weight; a cationic polyethyleneimine in an amount of about 0.01% to about 4% by weight; and a cationic oil-soluble, water-dispersible, cross-linked acrylate/acrylamide copolymer conditioning agent in an amount of about 0.1% to about 20%
10 by weight.
2. The composition of claim 1, wherein the anionic surfactant is a carboxylate surfactant.
3. The composition of claim 1 further including a long chain (C₁₂-C₂₂) amine oxide emulsion stabilizer in an
15 amount of about 0.1% to about 55 based on the weight of the composition.
4. The composition of claim 1 having a pH of about 4.5 to about 7.5.
5. The composition of claim 1, wherein the surfactant
20 includes a viscosity increasing agent in an amount of about 0.1% to about 10% by weight capable of raising the viscosity of the composition to at least about 3,000 centipoises.
6. The composition of claim 1 further including a zwitterionic detergent in an amount of about 5% to about 15%
25 by weight of the composition.

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7. The composition of Claim 1, wherein the surfactant includes a betaine surfactant in an amount of about 5% to about 25% by weight of the composition.

8. The composition of Claim 7, wherein the betaine surfactant is cocamidopropyl hydroxysultaine.

9. The composition of Claim 1, further including a silicone conditioning agent in an amount of about 0.1% to about 10% by weight of the composition.

10. The composition of Claim 1, wherein the composition includes less than about 9% by weight of a strong anionic surfactant.

11. The composition of Claim 10, wherein the strong anionic surfactant is selected from the group consisting of a long chain (C_{12} - C_{22}) alkyl sulfate; a long chain (C_{12} - C_{22}) alkyl ether sulfate; a long chain (C_{12} - C_{22}) alkyl sulfonate; and a long chain (C_{12} - C_{22}) alkyl ether sulfonate.

12. The composition of Claim 1, wherein the polyethyleneimine has a cationic polymer charge density of at least about 10 milliequivalents per gram.

13. The composition of Claim 12, wherein the polyethyleneimine has a cationic polymer charge density in the range of about 15 to about 20 milliequivalents per gram.

14. The composition of Claim 1, wherein the polyethyleneimine has a weight average molecular weight in the range of about 700 to about 70,000.

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15. A method of cleansing and conditioning hair, simultaneously, while maintaining a substantial quantity of foam and excellent cleansing in a mild shampoo composition comprising contacting the hair with a mild conditioning shampoo comprising water, a cleansing surfactant in an amount of about 5% to about 65% by weight, a protonated polyethyleneimine in an amount of about 0.01% to about 4% by weight and a cationic oil-soluble, water-dispersible, cross-linked acrylate/acrylamide copolymer conditioning agent in an amount of about 0.1% to about 20% by weight.

16. The method of Claim 15, wherein the surfactant is an anionic carboxylate surfactant.

17. The method of Claim 15, wherein the conditioning shampoo further includes a long chain (C_{12} - C_{22}) amine oxide emulsion stabilizer in an amount of about 0.1% to about 5% based on the weight of the composition.

18. The method of Claim 15, wherein the conditioning shampoo further includes a viscosity increasing agent in an amount of about 0.1% to about 10% by weight capable of raising the viscosity of the composition to at least about 3,000 centipoises.

19. The method of Claim 15, wherein the surfactant includes a zwitterionic detergent in an amount of about 5% to about 15% by weight of the composition.

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20. The method of Claim 15, wherein the surfactant includes a betaine surfactant in an amount of about 5% to about 25% by weight of the composition.

21. The method of Claim 20, wherein the betaine surfactant is cocamidopropyl hydroxysultaine.

22. The method of Claim 20, wherein the composition further includes a silicone conditioning agent in an amount of about 0.1% to about 10% by weight of the composition.

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