

BARNET

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POLYOLPREPOLYMERS

Advanced Delivery and Deposition Technology



Table of Contents

I.	Introduction	1
II.	Product Characteristics	3-8
	Polyolprepolymer-2	3
	Polyolprepolymer-14	5
	Polyolprepolymer-15	7
III.	Applications	9-26
	Skin Care	9-14
	AHA	10
	Acne	11
	Vitamin A	12
	Vitamin C	13
	Ethanol	14
	Antimicrobial	14
	Sun Care	15-18
	Deposition	16
	Water Resistance	16
	TiO ₂ Suspension	17
	Color Cosmetics	19-20
	TEWL	20
	Hair Care	21-24
	Sustantivity	22
	Sunscreen Deposition	22
	Antifungal Agent Deposition	23
	Other	25-26
	Volatile Compounds	26
IV.	Formulary	27-53
	Skin Care	29
	Sunscreen	39
	Color	43
	Hair Care	49
V.	Bibliography	55
VI.	Patents	56

Introduction

Polyolprepolymers form a long-lasting liquid reservoir. They deposit and hold cosmetic or therapeutic agents on and in the stratum corneum and epidermis.

Polyolprepolymers are polyalkylene glycol-based polyurethane polymers. They possess unique properties which make them useful for application on the cosmetic and personal care industry.

Polyolprepolymers can significantly influence deposition of skin care agents on and in the skin, yet because of their high molecular weight, Polyolprepolymers tend to remain within the top layers of the skin.

Polyolprepolymers penetrate the skin only to a very negligible degree, as demonstrated through *in vitro* and percutaneous absorption studies.

Barnet currently is offering three different Polyolprepolymers to the cosmetic and personal care industry:

Polyolprepolymer-2 (PP-2) is a lipophilic mixture of liquid, hydroxyl-terminated polymers (oligomers) in polypropylene glycol. It is particularly suited for use with hydrophobic compounds and in hydrophobic systems.

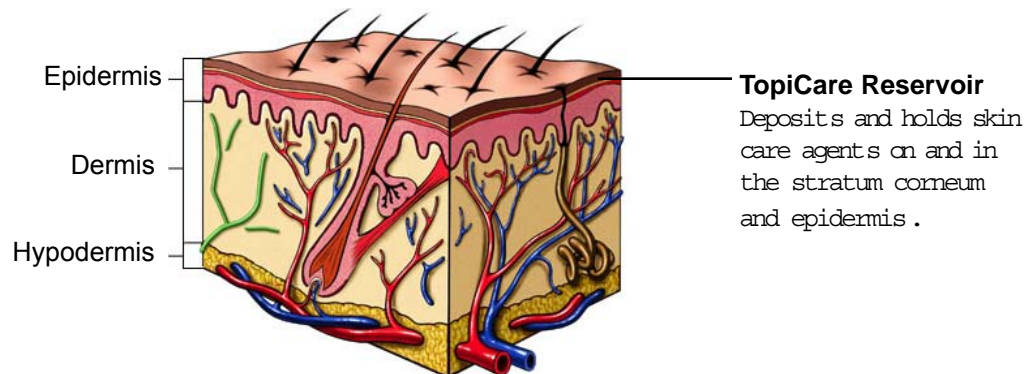
Polyolprepolymer-14 (PP-14) is a liquid higher molecular weight version of PP-2 but more lipophilic. Being tasteless in formulation makes it particularly suitable for lip care products.

Polyolprepolymer-15 (PP-15) is a mixture of liquid hydroxyl-terminated polymers (oligomers) in polyethylene glycol. This material is soluble in water as well as alcohol. It is particularly suited for use in aqueous-based systems and/or with compounds that have hydrophilic character.

General Characteristics of Polyolprepolymers

- Form a noninvasive liquid reservoir which remains on and in the upper layers of the skin.
- Can significantly modify deposition and absorption characteristics of ingredients into skin.
- Can modify deposition of specialty ingredients on hair.
- Easily formulated into all types of cosmetic and personal skin care products. (eg. liquids, creams, gels, lotions) and all forms of pigmented products.
- Clear, colorless, viscous nonvolatile liquids, which allow for cosmetically elegant formulations.
- Nontoxic in topical skin care and makeup products.
- Relatively inert, thermally stable and resistant to oxidation.
- Unaffected by pH change.
- Nonsensitizing, nonirritating.
- Are emollient and impart a soft, smooth feel.
- Have outstanding spreading characteristics.
- Are nonsticky and nongreasy in formulation.

TopiCare Delivery Compounds®



Polyolprepolymer-2 (PP-2)

Composition and Mechanism of Action

Polyolprepolymer-2 (PP-2) is composed of oligomers ranging in molecular weight from 1,500-10,000 with an average of 4,000.

PP-2 contains polypropylene glycol moieties in the polymer chain and has an estimated HLB range of 12-14.

Due to the molecular weight distribution of the PP-2 oligomers and its chemical structure, a concentration gradient is formed within the stratum corneum. This creates a long-lasting liquid reservoir for release of various agents into the deeper layers of the skin.

Mechanism of action is dependent on certain physical and chemical properties of the agent to be delivered including solubility, molecular size and chemical reactivity.

Because of its lipophilicity, PP-2 is the Polyolprepolymer of choice for use with hydrophobic compounds and/or in hydrophobic systems. It has broad application in lipophilic, emulsion, alcohol and high solid-content systems.

PP-2 has strong affinity for the skin where it readily deposits on and within the stratum corneum forming a reservoir rather than migrating further into the skin.

Combined with formulations, PP-2 remains in the upper layers of the skin where it can act as a regulator for the deposition and release of various ingredients.

PP-2 is noncomedogenic and does not block transepidermal water loss, allowing skin to function normally.

Key Attributes

PP-2 can be used with skin care, makeup and hair care ingredients to:

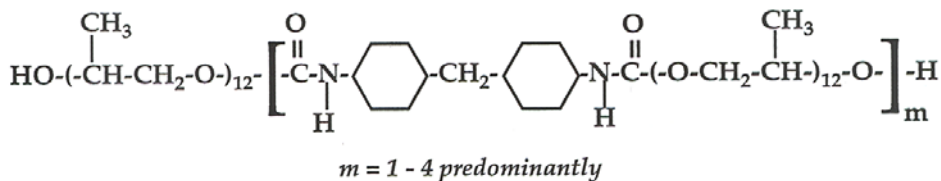
- Modify deposition characteristics.
- Improve deposition on hair.
- Reduce amount of agent needed for desired effect.
- Reduce skin irritation.
- Resist washoff.
- Prolong activity.
- Enhance wearability.
- Provide emolliency and reduce drying side effects.
- Enhance spreadability.
- Impart a soft silky-smooth feel to the skin.

Polyolprepolymer-2

Polyolprepolymer-2 is a mixture of liquid, hydroxyl-terminated polymers in polypropylene glycol. The structure of the polymers is represented below.

CAS# 9042-82-4

CAS Name: Poly[oxy(methyl-1,2-ethanediyl)], a-hydro-to-hydroxy-, polymer with 1,1'-methylene-bis-[4, isocyanatocyclohexane]



PRODUCT SPECIFICATIONS

Trade Name	Polyolprepolymer-2 (A TopiCare Delivery Compound)
CTFA Name	PPG-12/SMDI Copolymer
Molecular Weight (weight average)	Approximately 4000
Appearance	Clear viscous, odorless liquid
Viscosity (35°C)	2500 - 4500 cps
APHA Color	APHA No. ≤ 30
Boiling Point	Decomposes
Freezing Point	Less than 32°F (0°C)
Vapor Pressure at 20°C	Less than 1mm Hg
Solubility in Water by Weight	Less than 1%
Evaporation Rate (Butyl Acetate = 1)	Less than 0.01
Stability	Extremely Stable
Microbial Activity	Not known to support bacteria or fungus growth

HANDLING and STORAGE

PP-2 is shipped in steel pails and drums lined with an epoxy/phenolic resin and can be stored in these containers under normal ambient conditions. Routine safety precautions should be observed as in the handling of any chemical substance. Small amounts can be conveniently stored in glass or in HDPE containers.

SOLUBILITY (25°C)

Water	insoluble
Alcohol (95% SDA 40-2)	50
Isopropyl Alcohol	50
Propylene Glycol	dispersible*
PEG 300	dispersible*
Polysorbate 20	10
Miglyol 812	50
Silicone (Dimethicone)	insoluble
Mineral Oil	insoluble
Ethoxydiglycol	50
PEG-12 palm kernel glycerides	50
Oleyl Alcohol	50
Ethoxylated Oleyl Alcohol (3 mols)	50
Isopropyl Myristate	50
Glycerine	dispersible*
Refined Sesame Oil	1.0

*When a level of 1.0% or less of PP-2 was added to this solvent, tiny droplets were observed under the microscope.

Polyolprepolymer-14 (PP-14)

Composition and Mechanism of Action

Polyolprepolymer-14 (PP14) is composed of oligomers with an average molecular weight of 18,000. It consists of a mixture of liquid, hydroxyl-terminated polymers in polypropylene glycol having an estimated HLB value of 11-13.

PP-14 is similar in chemical structure to PP-2, differing primarily by the increased size of the polyglycol portions. Due to the very lipophilic nature and the molecular weight distribution of the PP-14 oligomers, a concentration gradient is formed within the stratum corneum. This gradient creates a long-lasting liquid reservoir for release of various agents on and into the skin.

The outstanding characteristic of PP-14 is its tastelessness in formulation which makes it particularly suitable for lipsticks and products used on and around the lip area.

Key Attributes

PP-14 can be used with skin care and makeup ingredients to:

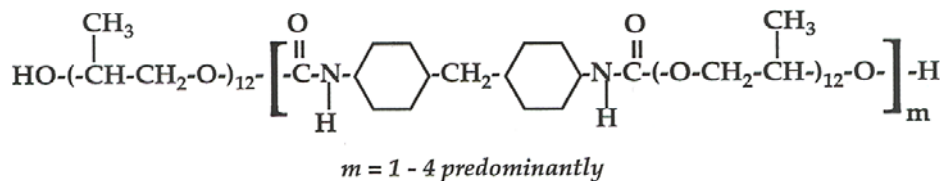
- Modify deposition characteristics.
- Resist washoff.
- Enhance spreadability.
- Impart superior moisturizing and reduce drying effects.
- Improve color retention.
- Enhance overall color characteristics.
- Imparts a soft, smooth feel.

Polyolprepolymer-14

Polyolprepolymer-14 is a mixture of liquid, hydroxyl-terminated polymers in polypropylene glycol. The structure of the polymers is represented below:

CAS# 9042-82-4

CAS Name: Poly[oxy(methyl-1,2-ethanediyl)], *a*-hydro-to-hydroxy-, polymer with 1,1'-methylene-bis-[4, isocyanatocyclohexane]



PRODUCT SPECIFICATIONS

Trade Name	Polyolprepolymer-14 (A TopiCare Delivery Compound)
CTFA Name	PPG-51/SMDI Copolymer
Molecular Weight (weight average)	Approximately 18000
Appearance	Clear viscous, odorless liquid
Viscosity (35°C)	2500 - 6000 cps
Boiling Point	Decomposes
Freezing Point	Less than 32°F (0°C)
Vapor Pressure at 20°C	Less than 1mm Hg
Solubility in Water by Weight	Less than 1%
Evaporation Rate (Butyl Acetate = 1)	Less than 0.01
Stability	Extremely Stable
Microbial Activity	Not known to support bacteria or fungus growth

HANDLING and STORAGE

PP-14 is shipped in steel pails and drums lined with an epoxy/phenolic resin and can be stored in these containers under normal ambient conditions. Routine safety precautions should be observed as in the handling of any chemical substance. Small amounts can be conveniently stored in glass or in HDPE containers.

SOLUBILITY (25°C)

Water	insoluble
Alcohol (95% SDA 40-2)	50
Isopropyl Alcohol	50
Propylene Glycol	dispersible*
PEG 300	dispersible*
Polysorbate 20	dispersible*
Miglyol 812	50
Silicone (Dimethicone)	insoluble
Mineral Oil	insoluble
Ethoxydiglycol	50
PEG-12 palm kernel glycerides	50
Oleyl Alcohol	50
Ethoxylated Oleyl Alcohol (3 mols)	50
Isopropyl Myristate	50
Glycerine	dispersible*
Refined Sesame Oil	5.0

*When a level of 1.0% or less of PP-2 was added to this solvent, tiny droplets were observed under the microscope.

Polyolprepolymer-15 (PP-15)

Composition and Mechanism of Action

Polyolprepolymer-15 (PP15) is composed of oligomers with an average molecular weight of 1,800. PP-15 consists of polyethylene glycol moieties (compared to polypropylene glycol moieties for PP-2 and PP-14).

Due to the molecular weight distribution of the PP-15 oligomers and its chemical structure, a concentration gradient is formed within the stratum corneum, creating a long-lasting liquid reservoir for release of various agents on and into the skin.

Because of its hydrophilicity, PP-15 is the Polyolprepolymer of choice for use with hydrophilic compounds and/or in aqueous-based and hydroalcoholic systems.

Key Attributes

PP-15 can be used with skin care and makeup ingredients to:

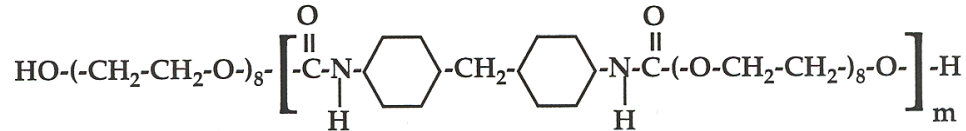
- Modify deposition characteristics.
- Improve deposition in upper layers of skin.
- Improve deposition on hair and scalp.
- Enhance spreadability.
- Reduce drying side effects.
- Improve color retention.
- Enhance wearability.
- Impart a silky, smooth feel.

Polyolprepolymer-15

Polyolprepolymer-15 is a mixture of liquid, hydroxyl-terminated polymers in polyethylene glycol. The structure of the polymers is represented below:

CAS# 39444-87-6

CAS Name: Poly(oxy-1,2-ethanediyl), a-hydro-to-hydroxy-, polymer with 1,1'-methylene-bis-(4, isocyanatocyclohexane)



m = 1 - 4 predominantly

PRODUCT SPECIFICATIONS

Trade Name	Polyolprepolymer-15 (A TopiCare Delivery Compound)
CTFA Name	PEG-8/SMDI Copolymer
Molecular Weight (weight average)	Approximately 1800
Appearance	Clear viscous, odorless liquid
Viscosity (35°C)	2500 - 5000 cps
Boiling Point	Decomposes
Freezing Point	Less than 32°F (0°C)
Vapor Pressure at 20°C	Less than 1mm Hg
Solubility in Water by Weight	Miscible
Evaporation Rate (Butyl Acetate = 1)	Less than 0.01
Stability	Extremely Stable

HANDLING and STORAGE

PP-15 is shipped in steel pails and drums lined with an epoxy/phenolic resin and can be stored in these containers under normal ambient conditions. Routine safety precautions should be observed as in the handling of any chemical substance. Small amounts can be conveniently stored in glass or in HDPE containers.

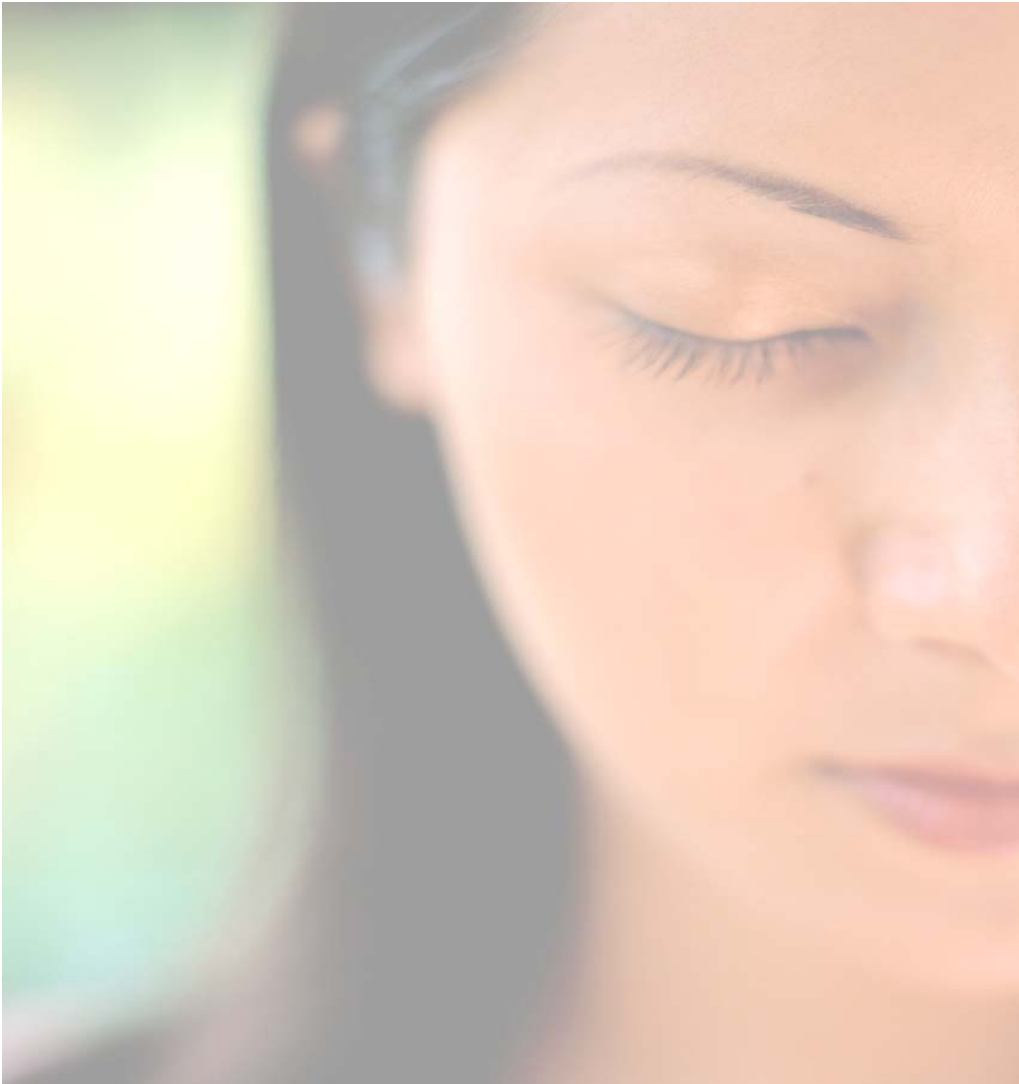
SOLUBILITY (25°C)

Water	soluble†
Alcohol (95% SDA 40-2)	50
Isopropyl Alcohol	50
Propylene Glycol	50
PEG 300	50
Polysorbate 20	50
Miglyol 812	insoluble
Silicone (Dimethicone)	insoluble
Mineral Oil	insoluble
Ethoxydiglycol	50
PEG-12 palm kernel glycerides	dispersible*
Oleyl Alcohol	dispersible*
Ethoxylated Oleyl Alcohol (3 mols)	insoluble
Isopropyl Myristate	insoluble
Glycerine	dispersible*
Refined Sesame Oil	insoluble

†PP-15 shows increasing aqueous solubility as temperature decreases.

*When a level of 1.0% or less of PP-2 was added to this solvent, tiny droplets were observed under the microscope.

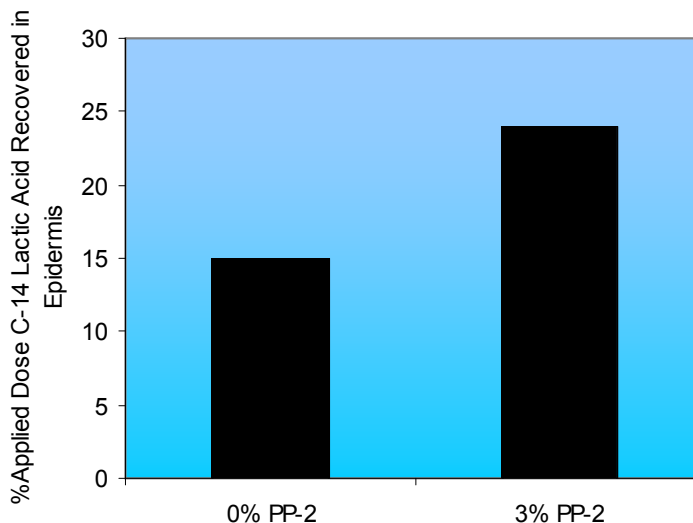
Skin Care



Alpha Hydroxy Acids

Deposition of Lactic Acid with and without PP-2

A study was performed with a 7.5% Lactic Acid cream containing 3% and 0% of Polyolprepolymer-2. Results of this study show that epidermal levels of Lactic Acid were significantly higher ($p < 0.05$) delivered from the formulation with 3% PP-2.



In Vivo Comparison of Skin Cell Renewal Rate in Lactic Acid Formulation

A dansyl chloride study was conducted in humans to evaluate stratum corneum renewal, as an indication of skin regeneration, from Lactic Acid with and without PP-2. As seen in the charts below, the addition of 3% PP-2 increased the efficacy of Lactic Acid in increasing desquamating cells (squame analysis) and cell turnover.

Squame Cell Analysis of 7.5% Lactic Acid Formula with PP-@ (3%) versus Formula without PP-2

TEST MATERIAL	INCREASE IN SQUAME CELL NUMBER
Polyolprepolymer-2 (3%)	130.3%
Polyolprepolymer-2 (0%)	75.3%

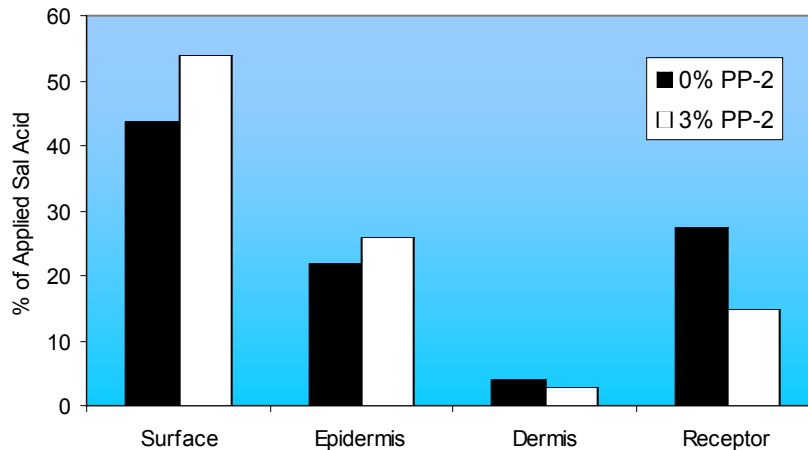
Increase in Cell Renewal of 7.5% Lactic ACid Formula with PP-2 (3%) versus Formula without PP-2

TEST MATERIAL	INCREASE IN CELL RENEWAL
Polyolprepolymer-2 (3%)	25.5%
Polyolprepolymer-2 (0%)	20.0%

Salicylic Acid

Ex Vivo Deposition of Salicylic Acid with PP-2

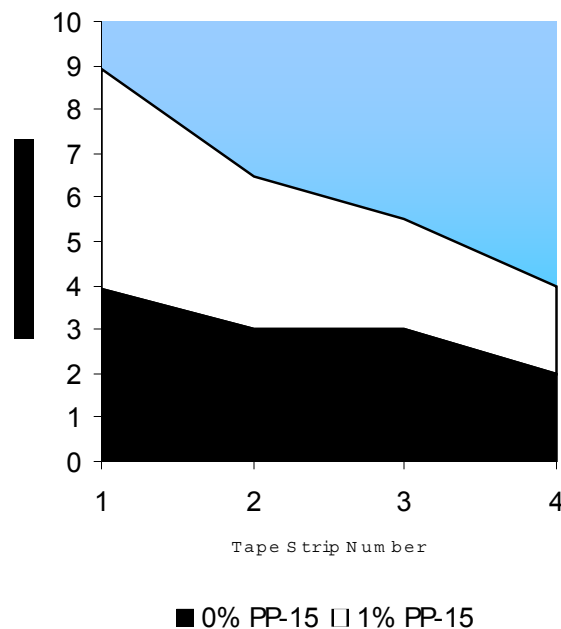
The Ex Vivo study showed that a greater amount of Salicylic Acid was retained on an in the upper layers of the skin from the formulation containing 3% PP-2 while there was significantly less in the dermis and significantly less penetration through the skin (see receptor level).



In Vitro Study Demonstrating Increased Localization of Salicylic Acid in the Upper Layers of Skin Using Polyolprepolymer-15

A skin penetration study, using radiolabeled Salicylic Acid and human skin, was performed with a 1% Salicylic Acid ethanol / water mixture containing 1% and 0% PP-15. The study showed that a greater amount of Sal Acid was present in the upper layers of the skin (as represented in the first four tape strips) from the formulation containing 1% PP-15, compared to formulation without PP-15. The increased deposition of Sal Acid in the upper layers provides the potential for increased keratolytic activity.

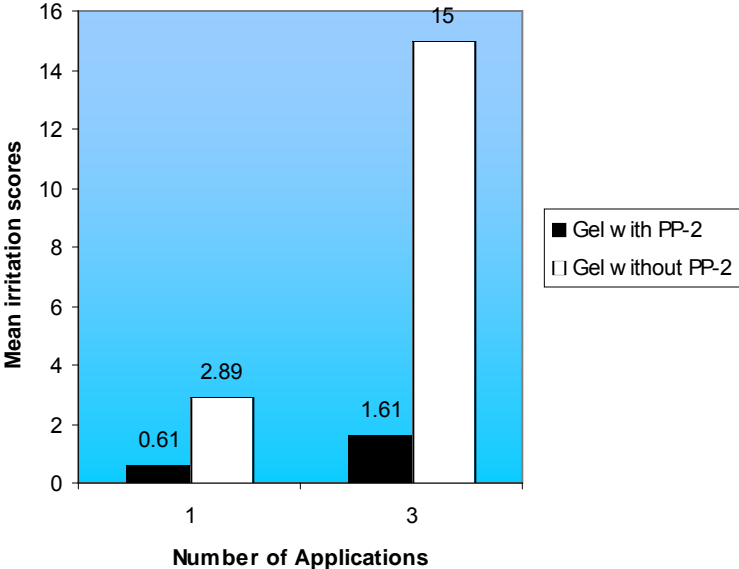
Effect of PP-15 on Amount of Salicylic Acid in Upper Stratum Corneum Following a 24-Hour Exposure



Vitamin A Analogs

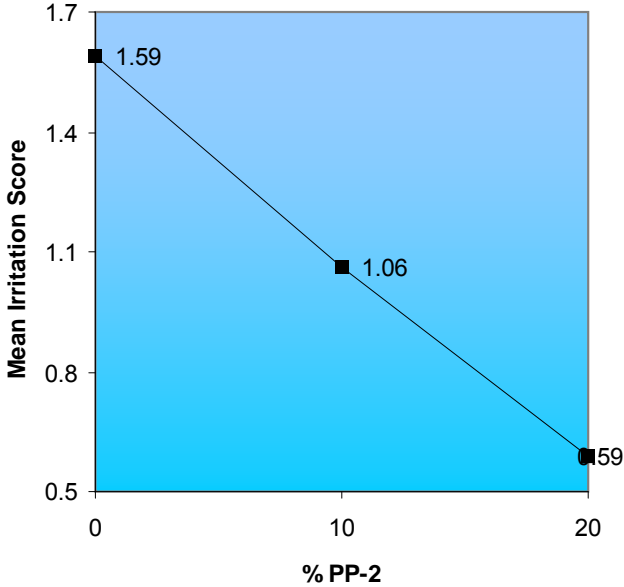
Human Test Data Comparing Degree of Skin Irritation of Vitamin A Acid Gels With PP-2

A Vitamin A Acid Gel containing 10% PP-2 reduced retinoid-induced dermal irritation compared to the Vitamin A Acid Gel without PP-2 by almost five-fold after one application. After three applications, the cumulative difference increased to nine-fold.



In Vivo Study Comparing Degree of Skin Irritation of Vitamin A Acid Creams With PP-2

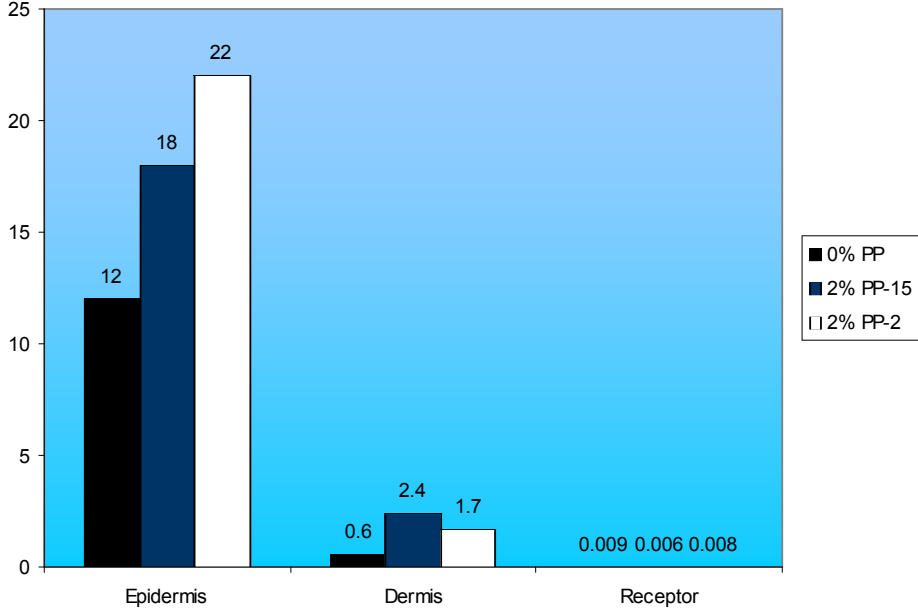
A 24-hour primary irritation occlusive patch test was performed in humans (18 subjects). A Vitamin A Acid Cream (0.10%) containing 10% PP-2 showed a significant reduction in irritation. The irritation level was cut to less than half in the same cream containing 20% PP-2. The data indicates that the reduction in irritation is a function of the amount of PP-2 present in the formulation.



Vitamin C Derivatives

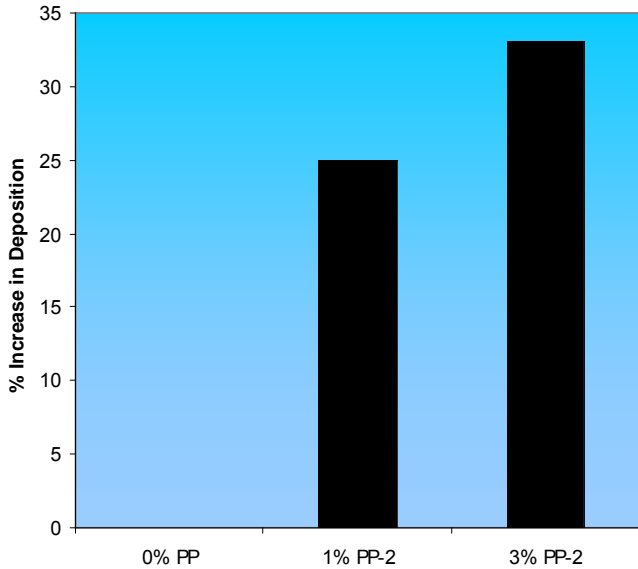
In Vitro Deposition of BV-OSC with PP-2 and PP-15

A study was conducted using human skin comparing the percutaneous absorption of topically applied BV-OSC from cream formulations containing 2% PP-2 and 2% PP-15 following a 24 hour exposure. The results showed an increased presence of BV-OSC in the epidermis and dermis compared to the cream without Polyolprepolymers.



In Vitro Deposition Of Magnesium Ascorbyl Phosphate (3%) with PP-2

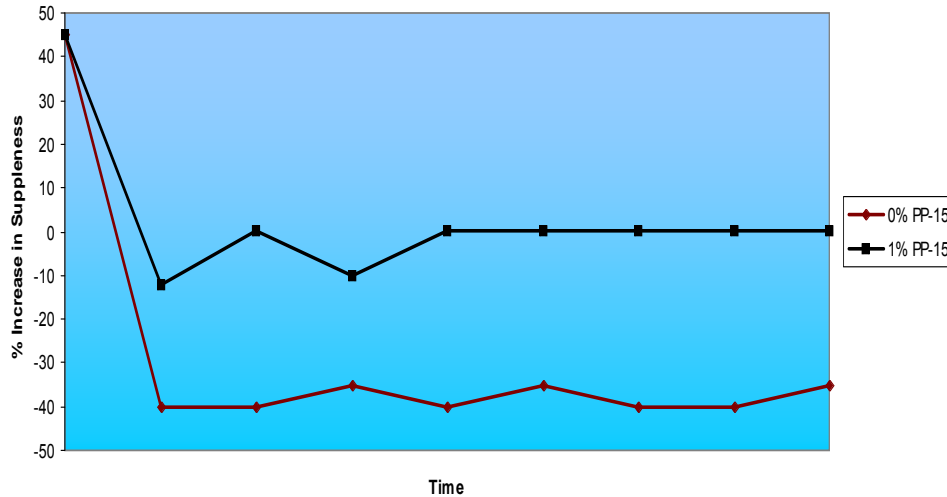
A study was conducted comparing the release of MAP into human skin from a cream formulation, with and without PP-2, following a washing procedure. The results showed that the deposition of MAP into the epidermis/dermis increased with an increasing concentration of PP-2.



Ethanol Formulations

Evaluation of Skin Suppleness Effect of PP-2 in Ethanol

A visco-elastic study (measurement of skin suppleness) evaluated the skin-softening effect of PP-2 in Ethanol when applied to excised human skin (5mg / cm²) over an eight-hour period. The study showed that the addition of 5% PP-2 significantly reduced the drying effect of Ethanol.



Antimicrobials

In Vivo Study Evaluating Effect of PP-2 and PP-15 on Antimicrobial Activity from Liquid Soaps

A series of experiments were conducted to evaluate the antimicrobial activity of liquid soaps containing Triclosan with and without PP-15. Results showed that PP-15 enhanced Triclosan activity against gram positive bacteria as well as against gram negative bacteria and yeasts & molds.

Evaluation of Activity Against Gram Positive Bacteria (Percent Decrease in Bacteria on Palms After Washing)

POLYOLPREPOLYMER-2

EXPERIMENT 1		EXPERIMENT 2		EXPERIMENT 3	
Dial + PP-2 (1%)	70%	Dial + PP-2 (1%)	52%	Dial + PP-2 (1%)	62%
Dial	46%	Dial	36%	Dial	50%

POLYOLPREPOLYMER-15

EXPERIMENT 1		EXPERIMENT 2		EXPERIMENT 3	
Dial + PP-15 (1%)	71%	Dial + PP-15 (1%)	63%	Dial + PP-15 (1%)	65%
Dial	59%	Dial	51%	Dial	54%

Evaluation of Activity Against Gram Negative Bacteria and Yeast & Molds

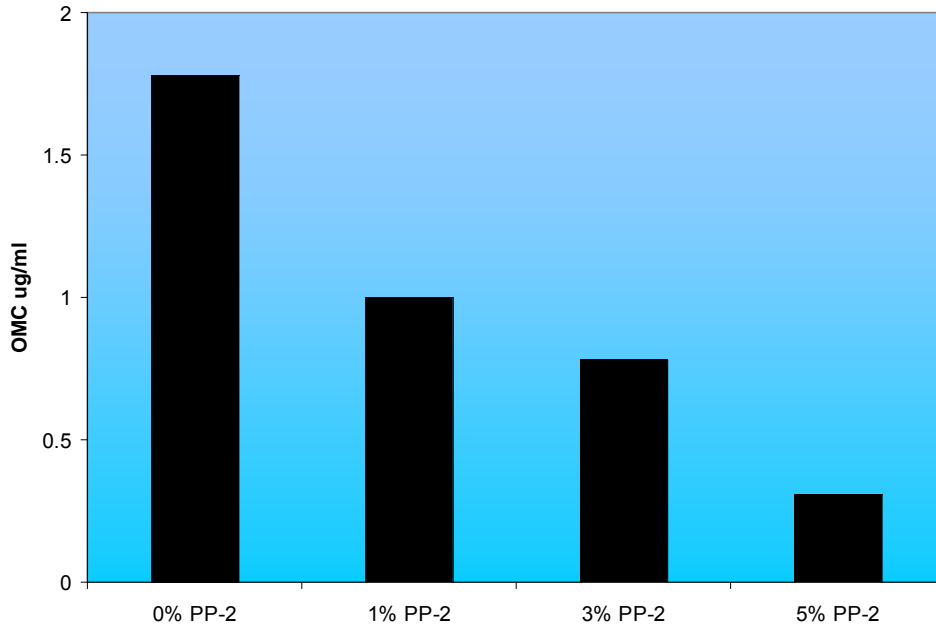
TEST MATERIAL	GRAM NEGATIVE	YEAST & MOLDS
Dial + PP-15 (0.05%)	60%	52%
Dial	28%	29%

Sun Care



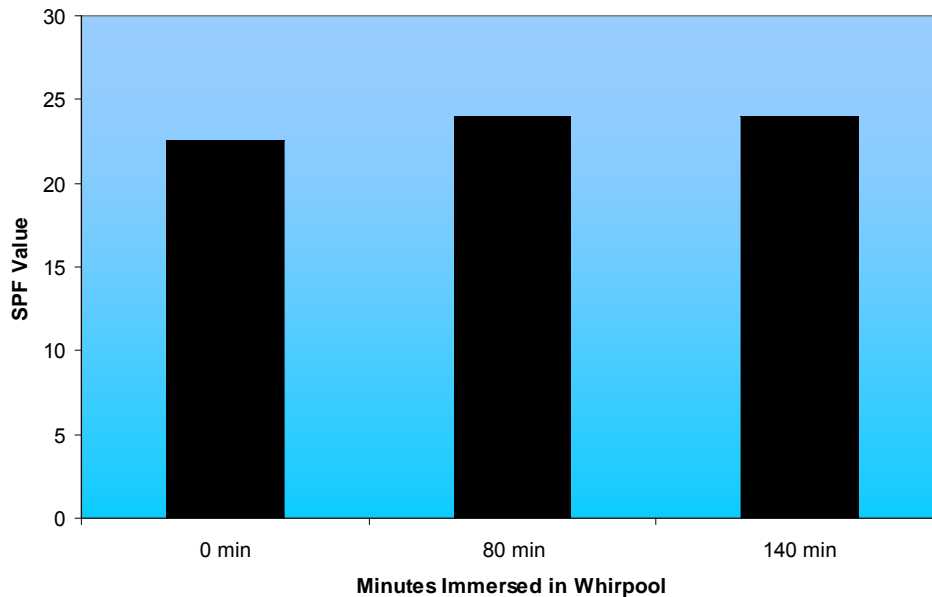
In Vitro Skin Penetration Evaluation of Octylmethoxycinnamate (OMC) With and Without PP-2

A study was performed using excised human stratum corneum to evaluate the effect of PP-2 on the in vitro penetration of OMC. The evaluated concentrations of PP-2 were, 0, 1, 3 and 5%. The results of this study show a significant decrease in OMC penetration through the stratum corneum with the increasing concentration. The relative effect of PP-2 on OMC penetration provides the potential for increased duration of UV absorbancy on the skins surface as well as reduced irritation.



Duration of Sunscreen Substantivity from a SPF-20 Formulation with PP-2

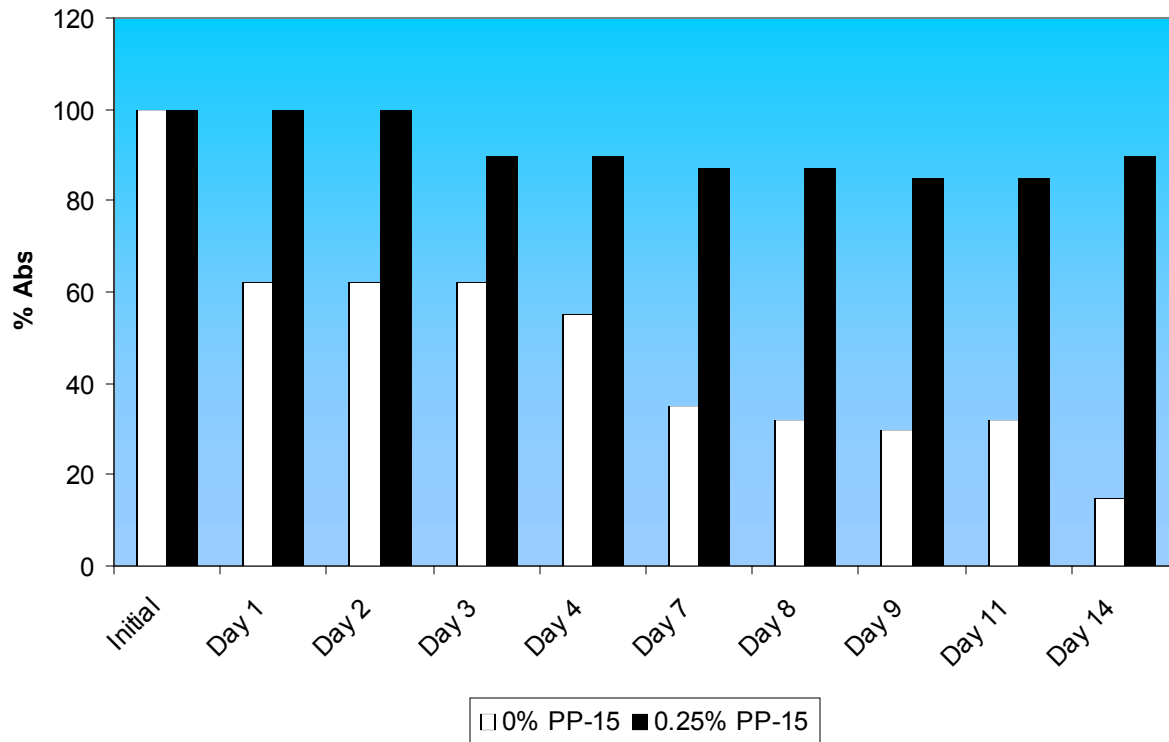
Substantivity of a SPF 20 lotion formulation with 3% PP-2 was determined by evaluating its resistance to washoff in a water immersion test after measuring static SPF as outlined in the Federal Register, Vol. 43:38264-28267, 1978. Following a total immersion of 140 minutes on four subjects, the sunscreen lotion with 3% PP-2 retained its static SPF determination



Suspension Comparison of TiO2 With and Without PP-15

A study was performed to measure the effect of 0.25% PP-15 in dispersing 0.25% Titanium Dioxide in water. The mixture was placed in a beaker, then diluted with water. Using a spectrophotometer, percent absorbance was measured over a 14-day period. Particle size was also analyzed over a 10-day period.

UV measurements showed that the sample with PP-15 had a much higher retention time for suspending Titanium Dioxide than the sample without PP-15. Results indicate that PP-15 is very effective in dispersing Titanium Dioxide, helping to prevent agglomeration. The prevention of agglomeration may have application in the dispersion of other pigments.



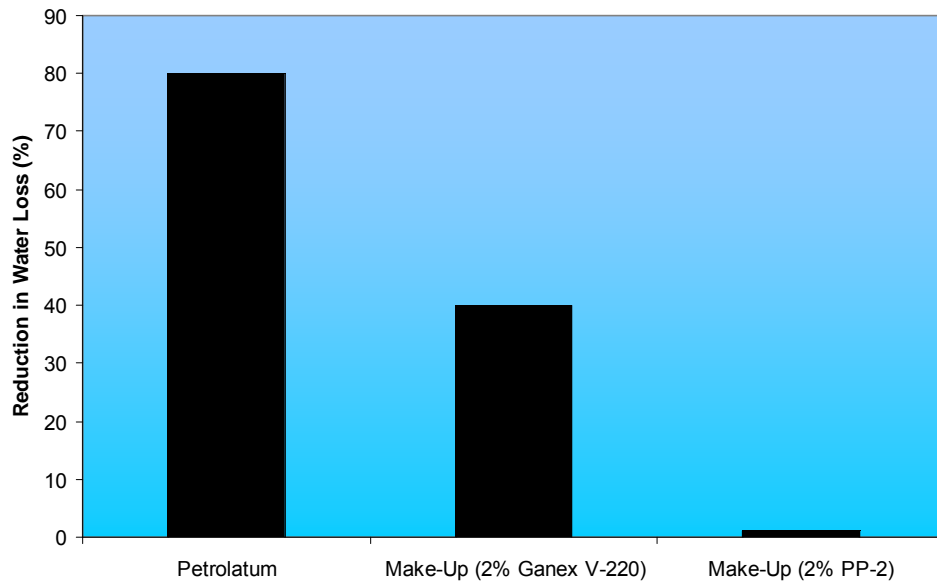
Color Cosmetics



Evaluation of Transepidermal Water Loss (TEWL) from Human Skin Using a Liquid Makeup

A study was performed with a liquid makeup foundation product to evaluate TEWL as a measure of the extent of interference or blocking of the natural body process of transpiration. A formulation containing 2% PP-2 was compared to one containing 2% Ganex V-220 (ISP), and petrolatum was used as a positive control because of its high occlusivity.

The study indicated that PP-2 does not interfere with the transpiration process. Reduction rate of water loss in the PP-2 containing formulation was 0% as compared to 40% for the liquid makeup containing Ganex V-220. Petrolatum reduced water loss by 80%.



Hair Care



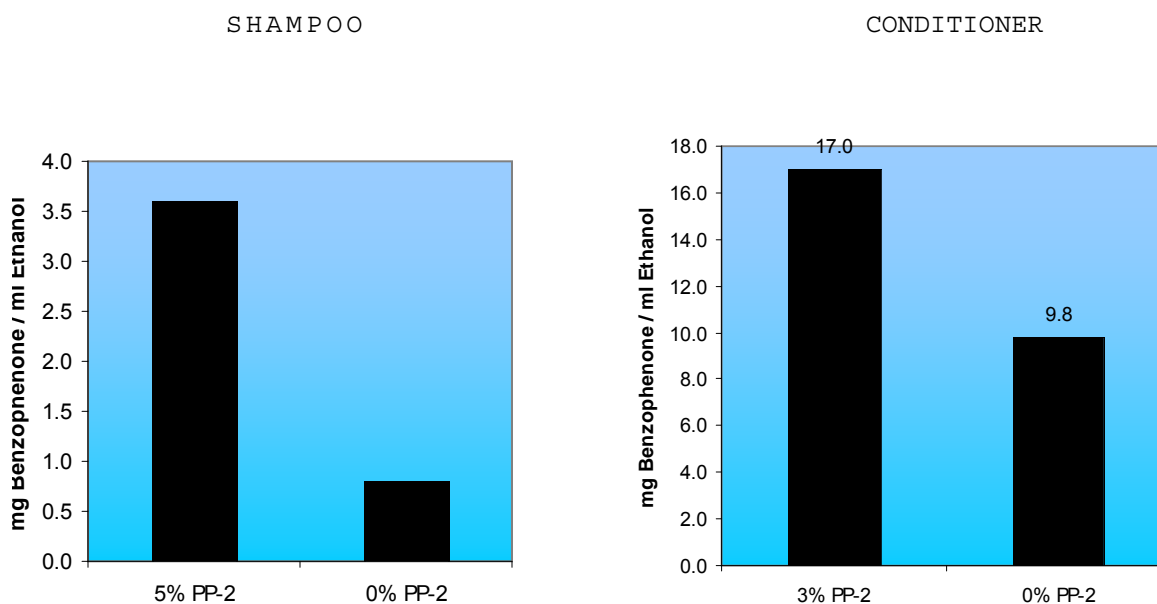
Substantivity of Polyolprepolymer-2: Retention on Hairs Surface

Quantitative evaluation using radioactive assay techniques was performed on hair swatches to determine the amount of PP-2 remaining on the hair after treating (and rinsing) with conditioner formulations containing 1% and 2% of PP-2. Results of the study showed that PP-2 was substantive to normal and damaged hair but did not build up after repeated cycles of application.

TEST MATERIAL	NORMAL HAIR (TREATED W/ 1% PP-2)	DAMAGED HAIR (TREATED W/ 2% PP-2)
Once Cycle	204 (± 53)	2150 (± 304)
Three Cycle	192 (± 55)	1811 (±30)

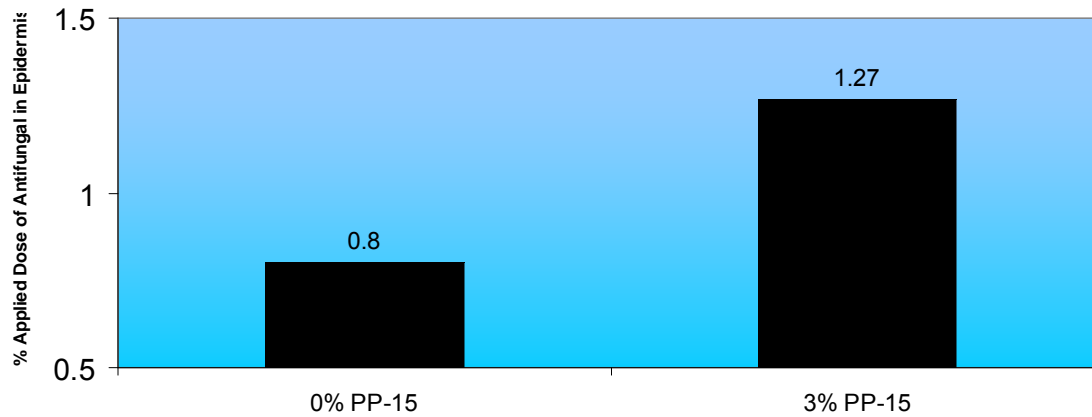
Deposition of Sunscreen on Hair from a Shampoo and Conditioner With and Without PP-2

Quantitative evaluation by HPLC analysis was performed on hair swatches to determine the amount of sunscreen remaining on the hair after washing (and rinsing) with a shampoo (with 0.70% Benzophenone-3) and conditioner (with 3.0% Benzophenone-3) with and without PP-2. The results showed that the addition of PP-2 in the shampoo and conditioner significantly increased the deposition of Benzophenone-3.



Deposition of Hair Care Agent in Skin from a Shampoo with & without PP-15

A skin penetration study, using a radiolabeled antifungal agent and human skin, was performed with a 1% antifungal shampoo containing 1% and 0% PP-15. Following a 15-minute exposure period, the skin was repetitively rinsed with water. Results of the study showed that the content of antifungal in the epidermis was higher from the formulation with 1% PP-15 compared to the formulation without PP-15.



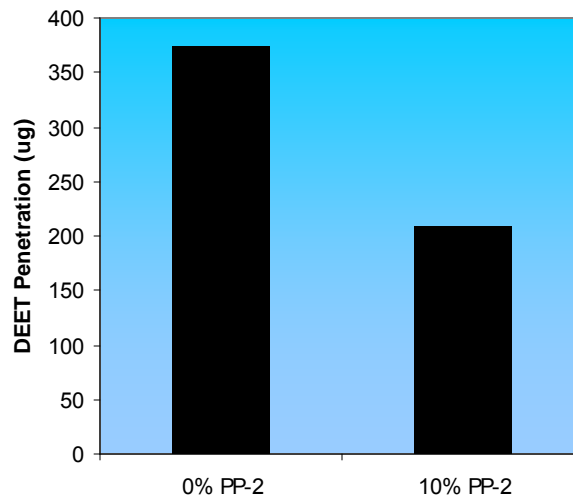
Other



Volatile Compounds

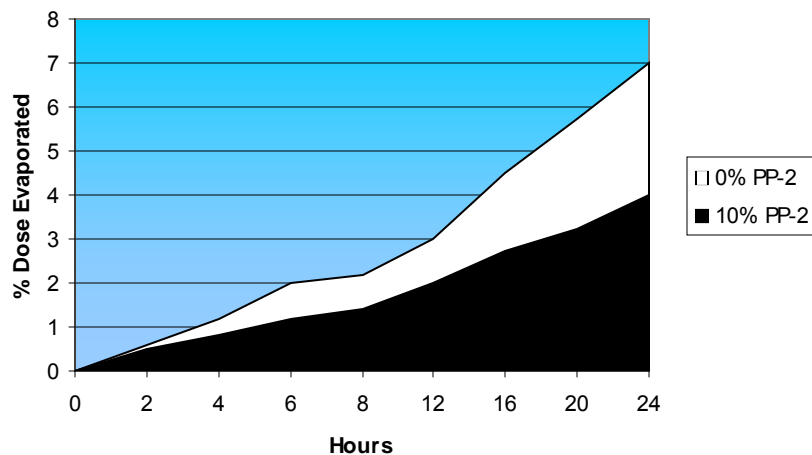
In Vitro Skin Penetration Study of DEET With and Without PP-2

A skin penetration study was performed to evaluate the effect of PP-2 on the penetration profile of DEET (N-N-Diethyl-M-Toluamide). DEET with and without PP-2 was applied to excised skin ($60 \mu\text{g}/\text{cm}^2$) for a total exposure of 24 hours. Results showed that 10% PP-2 significantly ($p < 0.05$) reduces DEET penetration.



Measurement of DEET Evaporation Rate With and Without PP-2

DEET (N-N-Diethyl-M-Toluamide) was applied to microculture slides in an ambient room temperature environment. Rate of evaporation was measured as the reduction in weight of each slide as function of time. Results of this study showed that 10% PP-2 significantly ($p < 0.05$) reduces DEET volatility (rate of evaporation).

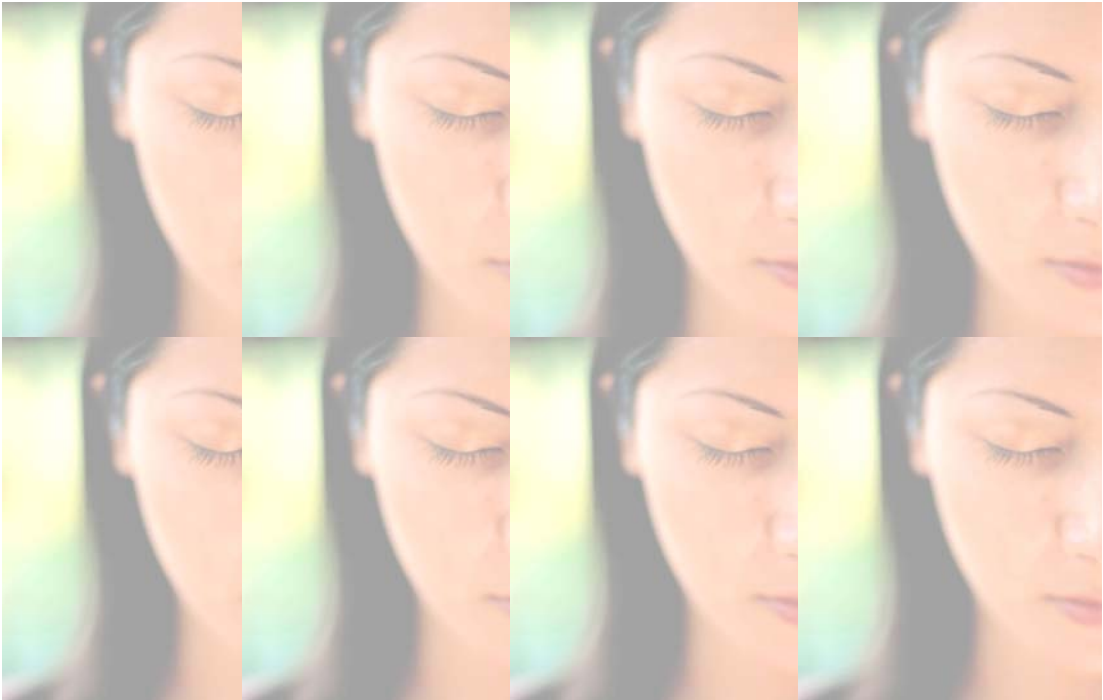


Formulary

$$\begin{aligned} \bar{z} &= \frac{1}{V} \int z \, dV = \frac{\pi r_1^2}{V H^2} \int_0^h (z^3 - 2z^2 H + z H^2) \, dz \\ &= \frac{\pi r_1^2}{V H^2} \left[\frac{z^4}{4} - \frac{2z^3 H}{3} + \frac{z^2 H^2}{2} \right]_0^h \\ &= \frac{\pi r_1^2 H^3}{V H^2} \left[\frac{1}{4} - \frac{2H}{3H} + \frac{H^2}{2H^2} \right]. \end{aligned}$$

...ular cone is $\frac{1}{4} \pi R^2 Z$
...height. The
... 20

Skin Care



Aqueous Gel

Aqueous Gel Vehicle with Polyolprepolymer-15 (PP-15)

Benefits:

PP-15 helps increase deposition of cosmetic actives in skins upper layer and provides emolliency.

Ingredients:

% w/w

PHASE A

Purified Water	31.00
Carbomer	0.50

PHASE B

Purified Water	40.00
Propylene Glycol	5.00
Polysorbate 80	5.00

PHASE C

Purified Water	4.90
Triethanolamine	0.60

PHASE D

Polyolprepolymer-15	3.00
Purified Water	10.00

Procedure:

1. Stir Carbomer into water in Phase A with continuous agitation until a smooth uniform slurry is formed.
2. Dissolve Tween 80 in water with moderate heating and then mix remaining ingredients in Phase B together.
3. Add Phase B to A.
4. Add Phase C to the Phase A and B mixture.
5. Add Phase D to above mixture with continuous stirring.

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Vitamin E Bath Oil

Vitamin E Bath Oil with Polyolprepolymer-2 (PP-2)

Benefits:

PP-2 provides a long lasting, soft silky feel and has the potential to reduce dry skin.

Ingredients:

	% w/w
PEG-4 Dilaurate	4.00
Dimethicone	2.00
Propylene Glycol	
Dicaprate/Dicaprylate	20.00
Isocetyl Stearate	10.00
Mineral Oil	60.00
dl-alpha-Tocopherol	1.00
Polyolprepolymer-2 (PP-2)	3.00
Dyes, Perfumes & Preservatives	q.s.

Procedure:

1. Mix together all ingredients and heat to 45 - 50°C.
2. Continue mixing and cool batch to 25 - 30°C.

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Salicylic Acid Toner

Salicylic Acid Toner with Polyolprepolymer-15 (PP-15)

Benefits:

PP-15 may increase deposition of Salicylic Acid on and in the upper layers of the skin. In addition, PP-15 provides emolliency to the skin.

Ingredients:

% w/w

PHASE A

SD Alcohol 40-A	20.00
Glycereth-7 Triacetate	15.00
PEG-8	5.00
PEG-6 Decyltetradeceth-30	1.00
Polyolprepolymer-15	1.00
Salicylic Acid	1.00

PHASE B

Purified Water	56.00
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PHASE C

Triethanolamine	q.s. to pH 4.0 - 4.5
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Procedure:

1. Mix Phase A together until all ingredients are dissolved into a clear solution.
2. Slowly add Phase B to Phase A with good agitation.
3. Use Phase C to adjust pH to between 4.0 and 4.5.

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Salicylic Acid Skin Conditioning Cream

Salicylic Acid Skin Conditioning Cream with Polyolprepolymer-2 (PP-2)

Benefits:

PP-2 may increase deposition of Salicylic Acid on and in the upper layers of the skin. In addition, PP-2 provides emolliency to the skin.

Ingredients:

% w/w

PHASE A

Salicylic Acid	2.00
Polyolprepolymer-2 (PP-2)	2.00
Oleyl Alcohol	5.00
Steareth-2	1.50
Steareth-20	3.50
Cetearyl Alcohol	5.00
Mineral Oil	2.00
dl-alpha-Tocopherol	0.10
Glyceryl Stearate	0.50

PHASE B

Propylene Glycol	3.00
Glycerin	2.00
Disodium Edetate	0.03
Purified Water	72.37

PHASE C

Polyacryamide (and)	
C-13-14 Isoparaffin (and)	
Laureth-7	1.00
Triethanolamine (99%)	q.s. to pH 4.0 - 4.5

Procedure:

1. Mix together ingredients of Phase A and heat to 70 - 75°C.
2. Mix together ingredients of Phase B and heat to 70 -75°C.
3. Add Phase A to Phase B and mix until a homogenous emulsion results.
4. Cool the batch to 60 -65°C and add Phase C and continue mixing until completely dispersed.
5. Continue mixing and reduce the batch temperature to 25 - 35°C.

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Vitamin C & E Skin Conditioning Cream

Vitamin C & E Skin Conditioning Cream with Polyolprepolymer-2 (PP-2)

Benefits:

PP-2 may increase deposition of Vitamin C in the upper layers of the skin. In addition, PP-2 provides moisturization and emolliency to the formulation.

Ingredients:

% w/w

PHASE A

Hydrogenated Soya Phospholipid	2.00
PEG-40 Stearate	0.50
Glyceryl Stearate (and)	
PEG-100 Stearate	2.00
Stearyl Alcohol	3.00
Squalane	5.00
Glyceryl Trioctanoate	10.00
Polyolprepolymer-2 (PP-2)	3.00
d-alpha-Tocopherol	0.10

PHASE B

Butylene Glycol	5.00
Methylparaben	0.10
Purified Water	50.70

PHASE C

Purified Water	15.10
Magnesium Ascorbyl Phosphate (VC-PMG)	3.00
Triethanolamine (99%)	q.s. to pH 4.0 - 4.5

Procedure:

1. Mix together the ingredients of Phase A and heat to 70 -75°C.
2. Mix together ingredients of Phase B and heat to 70 - 75°C.
3. With mixing add Phase B to Phase A and mix until a homogenous emulsion results.
4. Continue mixing and reduce the temperature to 50 -55°C.
5. Add Phase C and continue mixing and reduce the batch temperature to 25 - 30°C.

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AHA Facial Toner

AHA Facial Toner with Polyolprepolymer-2 (PP-2)

Benefits:

PP-2 has the potential to reduce the drying effects of alcohol while increasing the deposition of Lactic Acid in the upper layers of the skin.

Ingredients:

% w/w

PHASE A

Polyolprepolymer-2 (PP-2)	3.00
PPG-5 Ceteth-20	1.00
Dimethicone Copolyol	0.50
SD Alcohol 40	60.55
Fragrance	0.20

PHASE B

Purified Water	33.55
Natural Lactic Acid (Biolac)	1.00
Triethanolamine (99%)	q.s. to pH 4.0 - 4.5

Procedure:

1. Mix together ingredients of Phase A.
2. Mix together ingredients of Phase B and add to Phase A.

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Non-Alcoholic AHA Facial Toner

Non-Alcoholic AHA Facial Toner with Polyolprepolymer-15 (PP-15)

Benefits:

PP-15 provides a long-lasting, soft skin feel while potentially increasing the deposition of the Lactic Acid in the upper layers of the skin.

Ingredients:

% w/w

PHASE A

Polyolprepolymer-15 (PP-15)	3.00
Purified Water	75.45
Lactic Acid (Biolac)	1.00
Glycerin	2.00
Imidazolidinyl Urea	0.20
DMDM Hydantoin	0.40
Disodium Edetate	0.05

PHASE B

PEG-60 Hydrogenated Castor Oil	1.00
PEG-75 Lanolin	1.00
PEG-400	5.00
Ethoxydiglycol	10.00
Dimethicone Copolyol	0.50
Fragrance	0.20
Triethanolamine (99%)	q.s. to pH 4.0 - 4.5

Procedure:

1. Mix together ingredients of Phase A.
2. Mix together ingredients of Phase B.
3. Add Phase B to Phase A with mixing until solution is clear.

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Anti-Aging Lotion

Anti-Aging Lotion with Polyolprepolymer-2 (PP-2)

Benefits:

PP-2 may increase deposition of cosmetic actives on and in the upper layers of the skin. In addition, PP-2 provides emolliency to the skin.

Ingredients:

% w/w

PHASE A

Purified Water	67.05
Isopentylidol	1.00
Ergothioneine (and) Water	1.00
Phenoxyethanol	0.50
Acrylates/CT-30 Alkyl Acrylate Crosspolymer	2.00

PHASE B

Caprylic/Capric Triglyceride (and)	
Hydrogenated Lecithin (and) Cetyl Alcohol (and)	
Stearyl Alcohol (and) Behetyl Alcohol (and)	
Phytosterol (and) Glyceryl Stearate (and)	
PEG-20 Soy Sterol	5.00
Batyl Alcohol	0.25
Tetrahexyldecyl Ascorbate	1.00
Polyolprepolymer-2 (PP-2)	1.00
Triethylhexanoin	12.00
Cetyl Ethylhexanoate	1.00

PHASE C

Sodium Hydroxide (and) Water	0.20
Dimethicone	1.00
Water (and) Chlorella vulgaris extract	1.00
Water (and) Dipropylene Glycol (and)	
Delesseria sanguinea extract	1.00
Water (and) Dipropyl Glycol (and) Palmaria palmata extract	1.00

Procedure:

1. Heat Phases A & B to 80°C.
2. Once heated add Phase B to Phase A, using homogenization.
3. Cool to room temperature, using side sweep mixing.
4. At 35°C, add Phase C ingredients.

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Self Tanning Cream

Self Tanning Cream with Polyolprepolymer-2 (PP-2)

Ingredients:

% w/w

PHASE A

Squalane	5.00
Polyolprepolymer-2 (PP-2)	1.00
Hydrogenated Lecithin	1.50
Caprylic/Capric Triglycerides	5.00
Stearic Acid	2.50
Cyclopentasiloxane	4.00
Dimethicone 100-cst	1.00
Behenyl Alcohol	4.00

PHASE B

Water	49.00
Isopentyldiol	5.00
Xanthan Gum (and) Water	5.00
O-Cymen-5-OL and Butylene Glycol	1.00
Biosaccharide Gum-4	1.00

PHASE C

Water	10.00
DHA	4.00
Water (and) Hydrolized Algin (and) Magnesium Sulfate (and) Manganese Sulfate	1.00

PHASE D

Sodium Hydroxide (and) Water	q.s.
Citric Acid (and) Water	q.s.

Procedure:

1. Heat Phases A & B to 80°C.
2. Once heated add Phase A to Phase B, using homogenization (Silverson).
3. Cool using side sweep mixing.
4. At 35°C, add Phase C ingredients.
5. Cool to Room Temperature.
6. Add Phase D, (if necessary) to adjust pH to 4 - 5.

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Sunscreen



Ultimate UV Protect Cream

Ultimate UV Protect Cream with Polyolprepolymer-2 (PP-2)

Ingredients:

% w/w

PHASE A

Water	40.10
Isopentylidol	5.00
Phenoxyethanol	1.00
Ergothioneine (and) Water	0.10
Acrylates/CT-30 Alkyl Acrylate Crosspolymer	12.00

PHASE B

Caprylic/Capric Triglyceride (and) Hydrogenated Lecithin (and) Cetyl Alcohol (and) Stearyl Alcohol (and) Behenyl Alcohol (and) Phytosterol (and) Glycerl Stearate (and) PEG-20 Soy Sterol	4.50
Batyl Alcohol	0.25
Polyolprepolymer-2 (PP-2)	1.00
Behenyl Alcohol	1.00
Cetyl Ethylhexanoate	1.00
Cocos Nuciferas Oil (and) Gardenia Tahitensis Flower	1.00
Ethylhexyl Salicylate	5.00
Homomethyl Salicylate	10.00
Butyl Methoxydibenzoylmethane	3.00
Octocrylene	2.80
Benzophenone-3	6.00
Tetrahexyldecyl Ascorbate	0.10
Olive Glycerides	2.00

PHASE C

Sodium Hydroxide (and) Water	0.30
Dimethicone	0.75

PHASE D

Plankton Extract	1.00
Arabidopsis	0.10
Sea Water (and) Phormidium Persicinum Extract	2.00

Procedure:

1. Heat Phases A & B to 80°C.
2. Once heated, add Phase B to Phase A, using homogenization.
3. Cool using side sweep mixing.
4. Once Cooled, add Phase C ingredients individually until thickened.
5. Add Phase D ingredients individually using sidesweep mixing.

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Sunscreen Lotion

Sunscreen Lotion with Polyolprepolymer-2 (PP-2)

Ingredients:

% w/w

PHASE A

Water	45.55
Carbomer (Carbopol 940)	0.08
Triethanolamine	0.62

PHASE B

Polyolprepolymer-2 (PP-2)	3.00
Octyl Methoxycinnamate	7.50
Benzophenone-3	6.00
Octyl Salicylate	5.00
Dimethicone	0.80
Elefac I-205	10.00
Isopropyl Palmitate	2.00
Cetostearyl Alcohol	1.00
Stearyl Alcohol	1.50
Stearic Acid	4.00
DEA-Cetyl Phosphate	3.50
Propylene Glycol	5.00

PHASE C

Titanium Dioxide	2.00
------------------	------

PHASE D

Water	2.00
Germall 115	0.30
Sodium Dehydroacetate	0.20

Procedure:

1. Heat Phases A, B, & C to 80°C.
2. Once heated, add Phase C to Phase B, using homogenization.
3. Add Phase BC to A using homogenization.
4. Cool to 35°C using sidesweep mixing.
5. At 35°C add Phase D using homogenization.

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Color



Sunscreen Lip Balm

Sunscreen Lip Balm with Polyolprepolymer-14 (PP-14)

Ingredients:

% w/w

PHASE A

Padimate O	7.00
Benzophenone-3	3.00
Polyolprepolymer	3.00
Petrolatum	50.00
Cetyl Alcohol	6.00
Isopropyl Lanolate	16.00
Propylene Glycol/Dicaprylate/Dicaprate	15.00
Preservative	q.s.

PHASE B

Flavor	q.s.
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Procedure:

1. Heat Phases A to 75°C.
2. Reduce the batch temperature to 55°C.
3. Add Phase B and mix until uniform.
4. Pour into molds.
5. Let cool.

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Liquid Makeup

Liquid Makeup with Polyolprepolymer-2 (PP-2)

Ingredients:

% w/w

PHASE A

Octyl Methoxycinnamate	5.00
C-12-15 Alkyl Benzoate	9.00
Trisocetyl Citrate	5.00
DEA Cetyl Phosphate	2.00
Polyolprepolymer-2 (PP-2)	3.00
Tricontanyl PVP	2.00
Glyceryl Stearate	1.60
Stearic Acid	1.50
Dimethicone 200 (50 cs)	1.00

PHASE B

Titanium Dioxide	3.00
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PHASE C

Purified Water	54.50
Magnesium Aluminum Silicate	0.40
Propylene Glycol	6.00
Glycerin	2.00

PHASE D

Iron Oxides	2.50
Silica	1.50

Procedure:

1. Heat Phases A & B to 75°C.
2. Add Phase B to Phase A.
3. Dry mix Phase D ingredients, add to Phase C slowly, and heat to 75°C.
4. Add Phase CD to Phase AB, and mix using side sweep.
5. Cool too room temperature.

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Creamy Lipstick

Creamy Lipstick with Polyolprepolymer-14 (PP-14)

Ingredients:

% w/w

PHASE A

Castor Oil	38.20
Isopropyl Lanolate	10.00
Mica	5.80
Titanium Dioxide	3.50
Iron Oxides	2.50
FD&C Colors	6.00

PHASE B

Isopropyl Lanolate	12.00
Candelilla Wax	9.00
Octyl Dodecanol	6.50
Beeswax	1.50
Microcrystalline Wax	1.00
Carnauba Wax	0.80
BHT	0.10
Tocopherol	0.10
Polyolprepolymer-14 (PP-14)	3.00

Procedure:

1. Heat Phase A & B to 85°C.
2. Add Phase A to Phase B using homogenization.
3. Dry mix Phase D ingredients, add to Phase C slowly, and heat to 75°C.
4. Cool to 72°C, using side sweep mixing.
5. Pour into molds and let cool.

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Hair Care



Shampoo with Sunscreen

Shampoo with Sunscreen and Polyolprepolymer-2 (PP-2)

Ingredients:

% w/w

PHASE A

Purified Water	60.00
Hydroxypropyl Methylcellulose	0.60

PHASE B

TEA Lauryl Sulfate	30.00
Lauramide DEA	6.50
Acetamide MEA	1.00
Polyolprepolymer-2	1.00
Benzophenone-3	0.50

PHASE C

Citric Acid	0.30
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PHASE D

Fragrance	0.10
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Procedure:

1. Heat water in Phase A to 80°C and mix Hydroxypropyl Methylcellulose to water until uniform.
2. Add Phase B to A and mix until uniform.
3. Add Phase C to Phase AB with sidesweep mixing.
4. At 35°C, add Phase D to Phase ABC and continue mixing.
5. Cool to room temperature.

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Hair Conditioner with Sunscreen

Hair Conditioner with Sunscreen and Polyolprepolymer-2 (PP-2)

Ingredients:

% w/w

PHASE A

Purified Water 81.80

PHASE B

Dicetyldimonium Chloride 2.00

Cetyl Alcohol 2.00

Behenyl Trimonium-Methylsulfate &

Cetearyl Alcohol 2.50

Glyceryl Stearate & PEG 100 Stearate 4.50

Propylparaben 0.10

Polyolprepolymer-2 **3.00**

Benzophenone-3 3.00

PHASE C

Trimethylsilylamodimethicone 1.00

PHASE D

Fragrance 0.10

Procedure:

1. Heat water in Phase A to 80°C and mix Methylparaben to water until uniform.
2. Add Phase B to A and mix until uniform.
3. Add Phase C to Phase AB with sidesweep mixing.
4. Add Phase D to Phase ABC and continue mixing.
5. Cool to room temperature.

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Instant Hair Conditioner

Instant Hair Conditioner with Polyolprepolymer-2 (PP-2)

Ingredients:

% w/w

PHASE A

Purified Water 82.80

PHASE B

Cetyl Alcohol 3.00

Cetearyl Alcohol 2.00

Glyceryl Stearate & PEG 100 Stearate 5.00

Polyolprepolymer-2 1.50

PHASE C

Purified Water 2.00

Imidazolidinyl Urea 0.40

Panthenol 0.70

PHASE D

Fragrance 0.10

Procedure:

1. Heat water in Phase A to 80°C and mix Methylparaben to water until uniform.
2. Heat Phase B to 80°C, and add to Phase A slowly mixing.
3. At 35°C, Add Phase C to Phase AB.
4. Add Phase D to Phase ABC.
5. Cool to room temperature.

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***Patents**

USA	4,971,800	5,045,317	5,051,260
Canada	1,331,861		
Europe	EP0 299 758 B1		
New Zealand	225,416		
South Africa	88/5142		
Israel	87133		
Ireland	66710		

