

The logo consists of the letters 'P2' in a bold, white, sans-serif font, enclosed within a white square. The background of the entire image is a close-up, macro shot of a glass pipette with several droplets of clear liquid, set against a light blue background with a subtle pattern of water droplets.

P2

Citropol[®]

A new line of liquid
performance polymers
based on green chemistry

AGENDA

1 What is Citropol?

2 Citropol 1A, HA, & H

3 Citropol V5

4 Citropol F





All About Citropol®

Citropol® Liquid Polymers

For Cosmetics and Personal Care



High Performing

- Emolliency, lubrication, hydration and silky silicone-like feel for skin; shine and conditioning for hair; increased performance and longevity for fragrance
- 100% miscible with most cosmetic and personal care ingredients
- Easily formulate high-performing skincare, makeup and haircare products



Natural

- Patented polyterpene chemistry made from 100% forest-derived terpenes
- Biorenewable, biocompatible and biodegradable
- Low E-factor: low amount of processing waste in manufacture



Safe

- Safe for human health and the environment
- Non-irritating, non-sensitizing and non-allergenic

Citropol® Polymers: Made with sustainable feedstocks and green processing



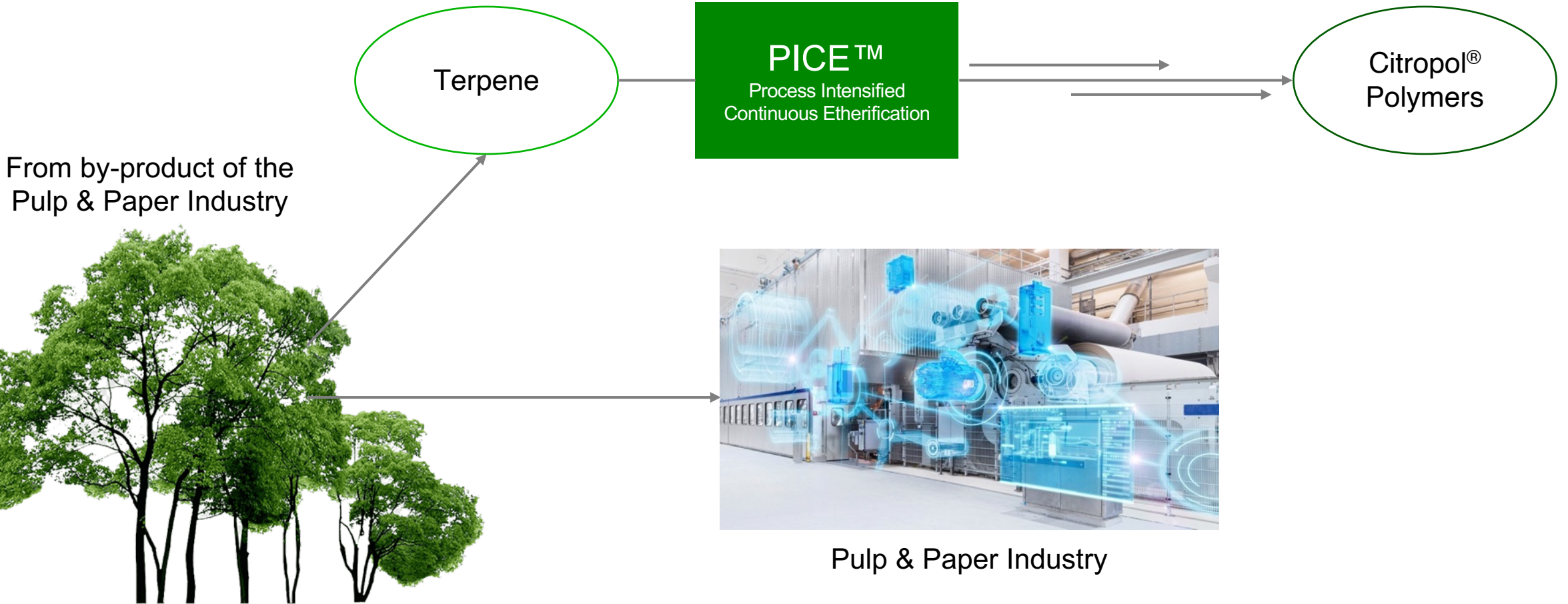
Citropol® polymers are derived from Citronellol, a natural acyclic monoterpenoid found in citronella oils. The Citronellol is derived from terpenes that are extracted from the sap of sustainably grown pine trees.

These raw material terpenes are Forest Stewardship Council® (FSC) certified. This certification confirms that the forest is managed to preserve biodiversity, benefit the lives of local people and workers, and sustain economic viability.

P2 Science converts the Citronellol into Citropol® polymers by way of a green, clean, mild, and high yielding conversion process called **Process Intensified Continuous Etherification (PICE™)**.

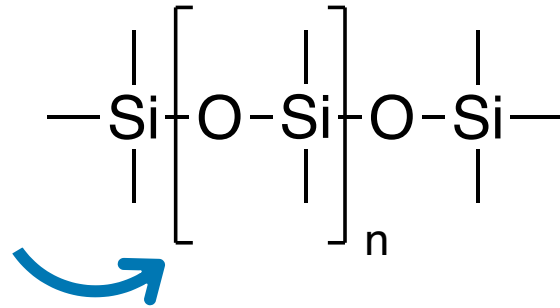
Citropol[®] Engineering

Green, Clean, Mild, High Yielding Manufacturing Process

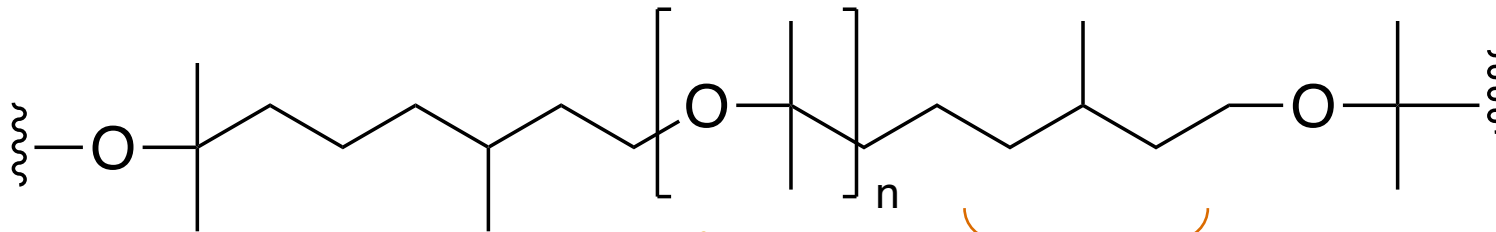


Safe Biodegradation

1 Silicones rely on a repeating dimethyl ether motif for their functional performance



2 However, this motif provides no handles for degradation, and therefore they are not biodegradable (some are even designated Persistent Organic Pollutants!)



3 Polyterpenes have a near identical repeating dimethyl ether motif to give it the same functional performance

4 But it also has a branched alkyl 'spacer' as a handle for biodegradation. All the benefits, none of the drawbacks!



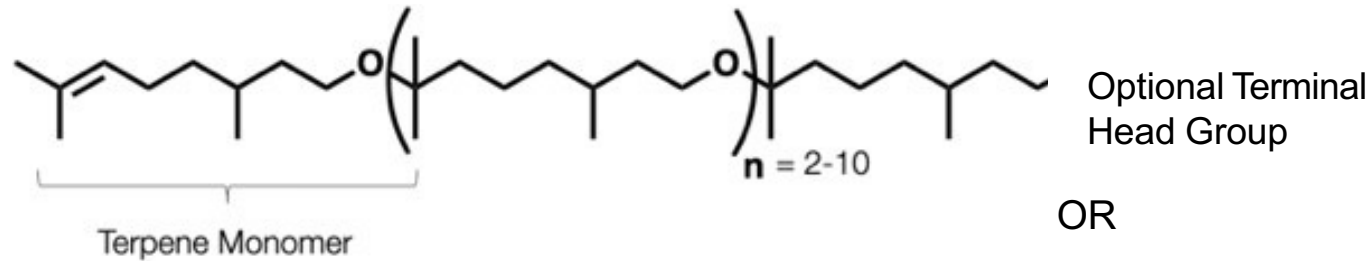
Citropol[®] Synthesis

PICE[™] Process

- P2's green chemistry manufacturing plant in Naugatuck, CT is the first commercial plant of its kind running the patented PICE[™] process to make Citropols for customers around the world
- P2 Science shows its commitment to continually improving its products and services by being ISO 9001:2015 certified and operating according to FSSC 22000 food safety standards

Citropol[®] Polymers: A Wide Range of Structures is Possible

The general molecular structure of Citropol[®] is based on a polyether chain:



The materials are generally short-chain polymers that are biodegradable and biocompatible.

They have better hydrolytic stability than polyesters and good oxidative stability.

Free flowing liquids down to below room temperature and are miscible with nearly all common ingredients.

Nontoxic and mild on skin and hair.

Citropol® Commercial Products

	Citropol® 1A	Citropol® HA	Citropol® H	Citropol® V5	Citropol® F
INCI Name	Polycitronellol Acetate	Polycitronellol Acetate	Polycitronellol	Polycitronellol Acetate (and) Undecane (and) Tridecane	Polycitronellol
CAS Numbers	2417284-25-2	2417284-25-2	888224-71-3	2417284-25-2, 1120-21-4, 629-50-5	888224-71-3
Primary Functions	← Emollient, silicone alternative →			D5 silicone alternative	Fragrance fixative and carrier
Secondary Functions	← Pigment wetting, longwear, humectant →			-	-
Sustainability	← Biodegradable, renewable, low e-factor →				
Appearance	← Translucent liquid →				
Color	← Clear to slight yellow →				
Viscosity (mPaxs@25°C)	20-50	85-110	330-370	2.5-5.5	-
Refractive Index (@20°C)	1.4-1.5	1.4-1.5	1.4-1.5	1.4-1.5	-
Surface Tension (mN/m)	25-35	27-33	27-33	25-30	-
Comparable Ingredient	Dimethicone 5cPs	Dimethicone 100cPs	Dimethicone 350cPs	Cyclomethicone D5	N/A

Our Product Families

[Click here for more information](#)

Citropol®

Citropol is a class of low MW liquid polymers that are made from 100% forest-derived terpenes using a clean, mild, and high yielding conversion process.

[Learn More](#)

Citrolatum™

Citrolatum is a biorenewable, biodegradable, and biocompatible cosmetic semi-solid and viable natural alternative to petrolatum.

[Learn More](#)

CitroVisc™

CitroVisc is a silicone-like various viscosity cosmetic fluid for personal care & cosmetics use. It is made from 100% plant origin.

[Learn More](#)

CitroButter™

CitroButter is an all-natural butter that forms a nice protective layer on the skin and hair to help prevent dryness, while also retaining moisture.

[Learn More](#)

CitroComplex™

Citrocomplex is an all-natural oil complex that adds hydration and shine.

[Learn More](#)

Flavor & Fragrance

100% renewable aroma ingredients made with proprietary green chemistry.

[Learn More](#)

Citropol® Safety

Safety assessment:

Citropols® are safe for human health and the environment.

Toxicological evaluations:

Based on the results of several in vitro safety tests and the results of computer modeling, Citropol® :

- Does not Irritate eyes or skin
- Is not capable of inducing skin sensitization, phototoxicity or photo allergy
- Is not mutagenic or clastogenic

Tests conducted:

Bovine Corneal Opacity and Permeability Test: Not an eye irritant (OECD 437)

SENS-IS, Human Cell Line Activation Test (OECD 442C), Direct Peptide Reactivity Assay (OECD 442D), KeratinoSens Assay (OECD 442E):
Not dermal sensitizers

3T3 Neutral Red Uptake Test (OECD 432): No phototoxic potential

No light absorbance in UV-Visible range:
Will not induce phototoxicity and/or photoallergy

In Vitro Mammalian Cell Micronucleus Test: (OECD 487) Does not cause genetic toxicity

Bacterial Reverse Mutation Test (Ames Test) (OECD 471):
Not mutagenic

OECD 301B Biodegradability study:
Inherently biodegradable

EpiDerm™ Skin Irritation Test (OECD 439)

Citropols vs. Silicones



A versatile and sustainable alternative to silicone

Citropols are incredibly easy to formulate with and are compatible with a wide range of cosmetic and personal care ingredients. They can function as a replacement to silicone in skin care, hair care, color cosmetics, and other personal care applications. Citropols show performance benefits at low usage levels in formulation to effectively replace and improve upon benchmark silicone ingredients.

	Citropols	Silicones
Biodegradable	✓	✗
Low E-factor	✓	✗
Renewable	✓	✗
Clean label	✓	✗
Long lasting	✓	✓
Non-greasy	✓	✓
Slippery	✓	✓

End Products Built on Citropol®

Clean Beauty

Natural Skin & Sun Care

- Dry skin products
- Anti-aging
- Mineral sunscreens
- Moisturizers

Natural Hair & Body Care

- Shampoo
- Conditioner
- Styling products and hair sprays
- Hair Detangling Products

Natural AP/Deo

- Antiperspirant/Deodorant

Cosmetics

- Mascara
- Foundation
- Eyeliner
- Concealer
- Eye Shadow
- Lipstick



Citropol® Enables Strong Performance Claims

- Reduces Frizz
- Produces less buildup than silicones
- Protects hair from heat damage up to 450F
- Silky smooth skin feel
- Enhanced skin moisturization
- Fragrance extended release
- Imparts hair shine
- Hair detangling and enhanced combability
- Vegan
- Cruelty-Free
- Biodegradable, Biocompatible, & Biorenewable





Citropol® — Finished Product Strategy Ideas

Substitute nonrenewable emollient oils

- Dimethicone and cyclomethicone
- Petroleum derivatives

Meet Clean Beauty criteria

- Renewable, biodegradable, biocompatible
- Naturally derived, vegan and cruelty-free
- Sustainable feedstock and made with green chemistry principles

Formulate with ease

- Miscible with most oils
- Desirable neutral odor is excellent for unscented products
- High performance at low levels

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01

Citropol® 1A, HA, & H

Citropol® 1A, HA, & H are low to medium molecular-weight liquid polymers that are made from terpenes derived from the forest. Citropol 1A, HA, & H imparts distinct lubricating properties in skin-care and hair-care formulations. Even in concentrations as low as 1%, the result is a slippery, silky formulation. Citropols are a valuable component in a range of applications in the beauty industry: cosmetics, skin care, hair care, fragrance, deodorants, and moisturizers.

All P2 Science products are biorenewable, biodegradable, and biocompatible. They do not compromise human and environmental safety.

Citropol 1A INCI: Polycitronellol Acetate

Citropol HA INCI: Polycitronellol Acetate

Citropol H INCI: Polycitronellol



Biodegradable



Biorenewable



Biocompatible

Citropol® 1A, HA, & H

Haircare, Skincare, & Color Cosmetics

- Citropol® 1A, H, & HA are low-medium MW liquid polymers made from forest-derived terpenes.
- They impart lubricating properties to skin and hair care formulations when used at 1% or above, resulting in a silky sensory feel.
- Sensory performance during rubout, after feel and product appearance is directly comparable to Dimethicone 20, 100, & 350.
- In many formulations, these Citropols® are direct replacements for various dimethicones.
- Unlike silicone oils, all Citropols® are biodegradable, biocompatible, and biorenewable.



Representative properties

	Citropol 1A	Citropol H	Citropol HA
Appearance	Clear liquid	Clear liquid	Clear liquid
Odor	Slight fresh	Slight fresh	Slight fresh
Color	Straw	Straw	Straw
Viscosity (mPa·s @ 25°C)	25 - 60	255-405	75-105
Refractive index @ 20°C	1.4 - 1.5	1.4 - 1.5	1.4 - 1.5
Surface tension (mN/m)	25 - 35	27 - 33	27 - 33
Density (g/mL)	0.850 - 0.950	0.850 - 0.950	0.850 - 0.950
Boiling point (°C)	> 200	> 200	> 200
Solubility	Soluble in alcohols and oils	Soluble in alcohols and oils	Soluble in alcohols and oils
Bio-based (%)	> 90	> 90	> 90
Hazen Color Method	≤ 50	≤ 50	≤ 50



Did You Know?
 Citropol® is made by a clean, mild, and high yielding conversion process called Process Intensified Continuous Etherification (PICE™).



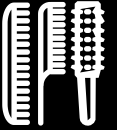
Advantages of Citropol 1A, HA, & H

- Easy to spread
- Protects hair from heat damage up to 450°F
- Leaves less build-up behind on hair
- Leaves hair and skin feeling hydrated
- Creates a healthy glow and shine
- Thinner residue, silicone-like character
- Leaves the skin feeling smoother

Hair Performance



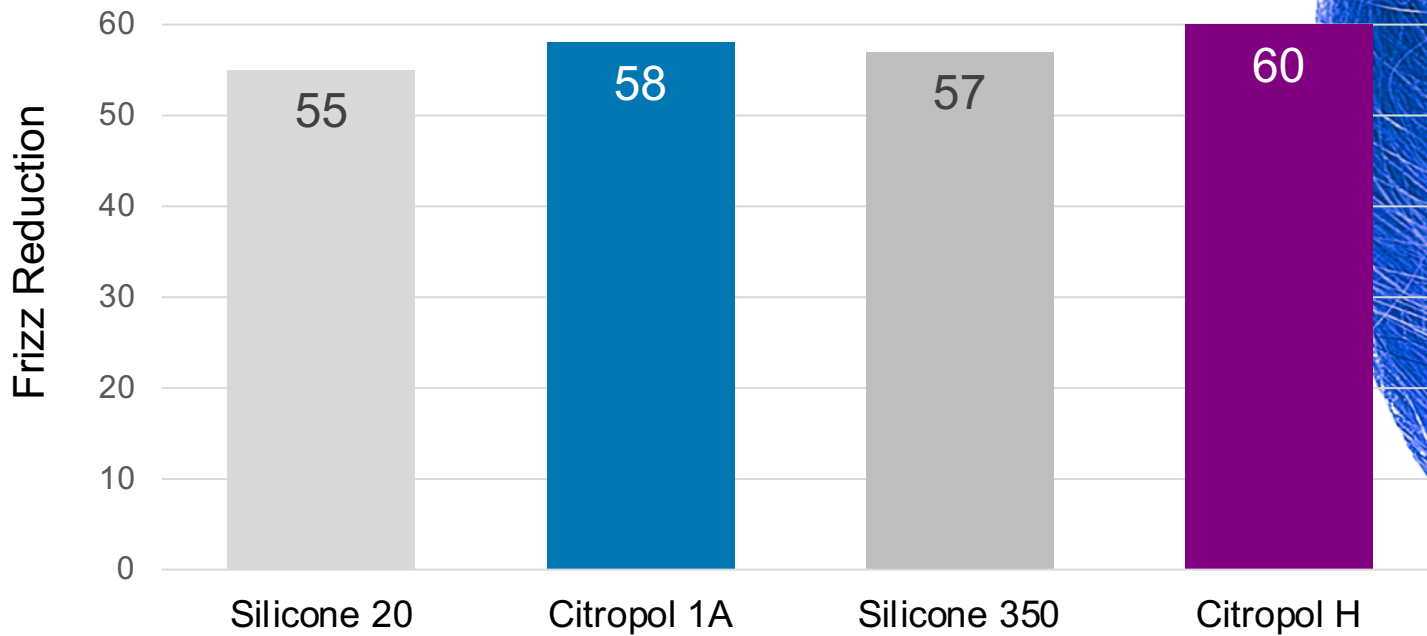
Anti-Frizz Data Overview



The similarities between Citropol and dimethicone makes it an easy and sustainable swap, without having to rework an existing formulation. **Citropol imparts better frizz reduction and MUCH LESS build-up, while also adding heat protection up to 450°F.**

Citropol 1A & H all reduce frizz more efficiently than their comparative Dimethicone.

The frizz reduction characteristics of Citropol 1A & H makes them a go-to for long-lasting hair styling and higher combability.



Want more Volume?



Citropol HA is a
star volumizer! It:

- Reduces frizz
- Leaves very little buildup
- Defines curls
- Adds volume
- Creates higher combability

Citropol HA adds **10%
MORE VOLUME** in hair than
dimethicone alternatives,
while reducing frizz with very
little buildup!

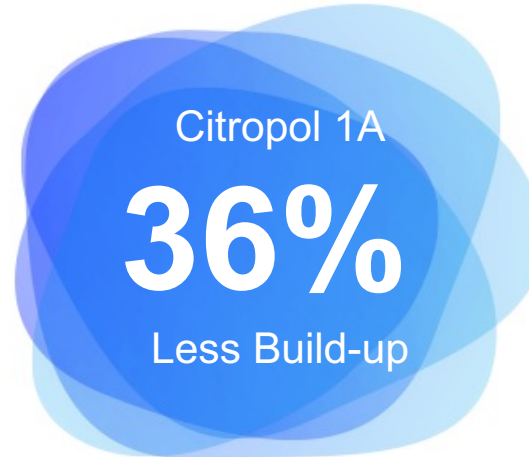
Build Up Data Overview



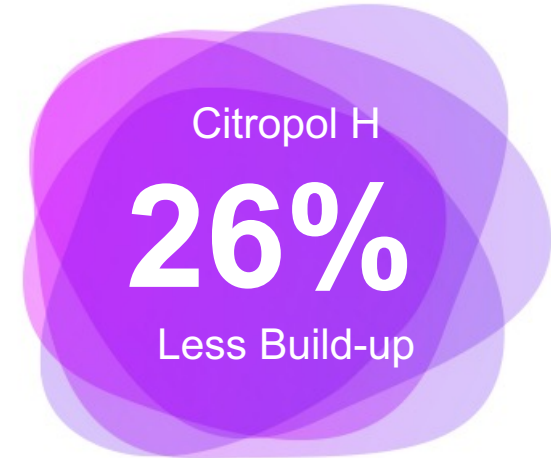
Citropol 1A, H, & HA produces less build-up on hair after use than Dimethicones.

Less build-up and residue makes Citropol 1A, H, & HA a great additions to any haircare product and allow for less frequent hair washing.

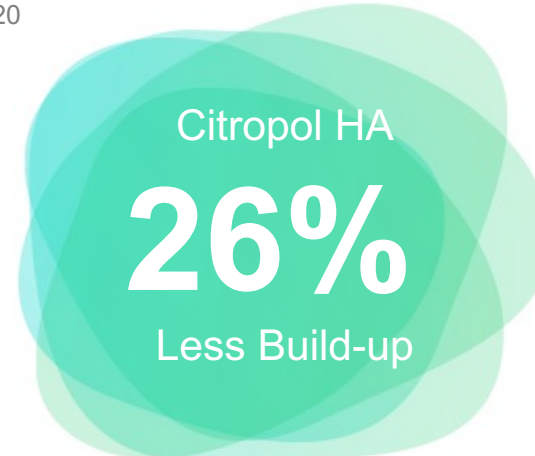
Build-up after 10x



When compared to Dimethicone 20



When compared to Dimethicone 350



When compared to Dimethicone 100

Heat Protection: Comparing Citropol 1A to Dimethicone 20, Citropol H to Dimethicone 350, Citropol HA to Dimethicone 100

The use of Citropol 1A, HA, & H protect hair against the heat damage with a flat iron at 450°F.

Dimethicones do **NOT**

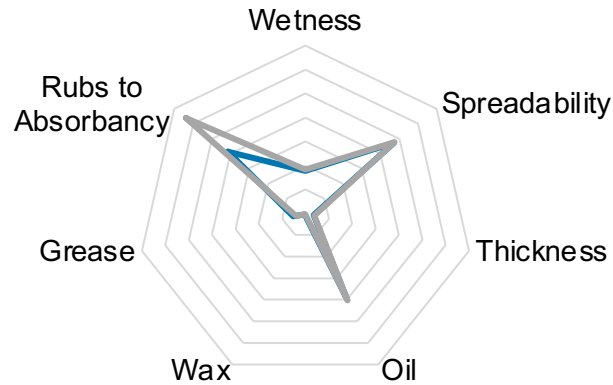
Skin Performance



Sensory Profile of Citropol 1A

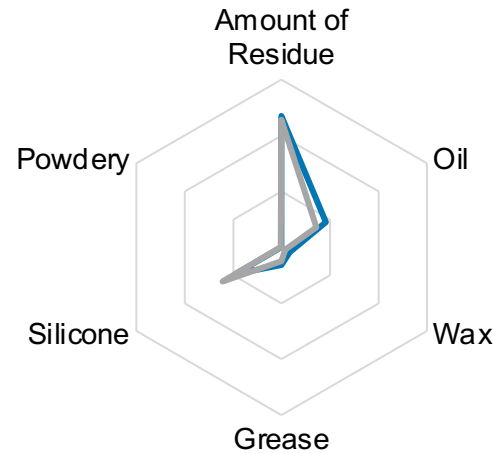
Citropol 1A imparts a silky, second-skin feel to skin care products that closely mimics Dimethicone 20. Citropol 1A provides improved spreadability and slip to formulations that will enhance the experience and aesthetic of the finished product.

Sensory Profile



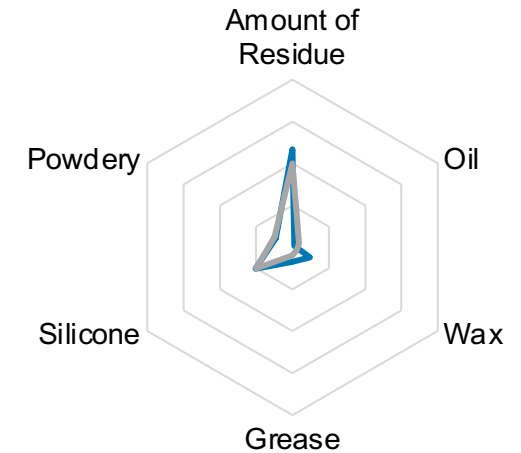
— Citropol 1A — Dimethicone 20

Immediate Afterfeel



— Citropol 1A — Dimethicone 20

20 Minute Afterfeel



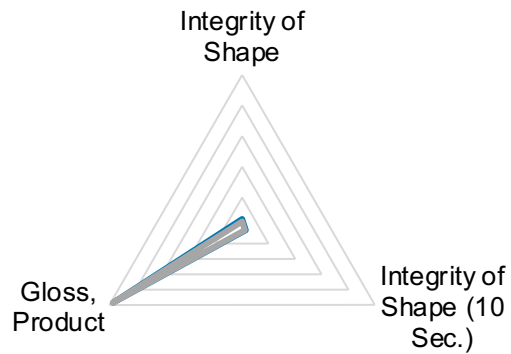
— Citropol 1A — Dimethicone 20

Skincare Benefits of Citropol 1A

Citropol 1A imparts a silky, second-skin feel to skin care products that closely mimics Dimethicone 20. Citropol 1A provides improved spreadability and slip to formulations that will enhance the experience and aesthetic of the finished product.

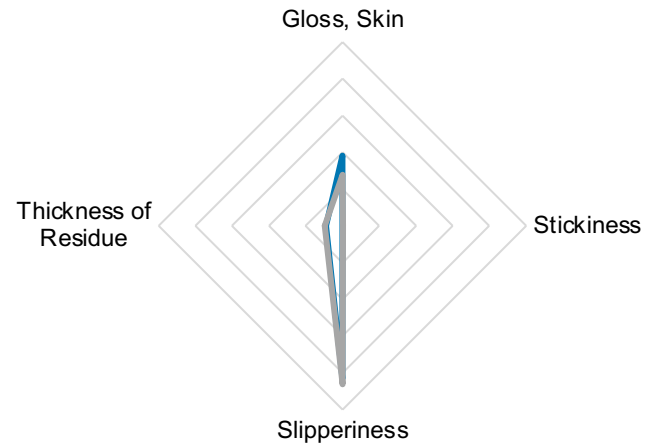


Appearance



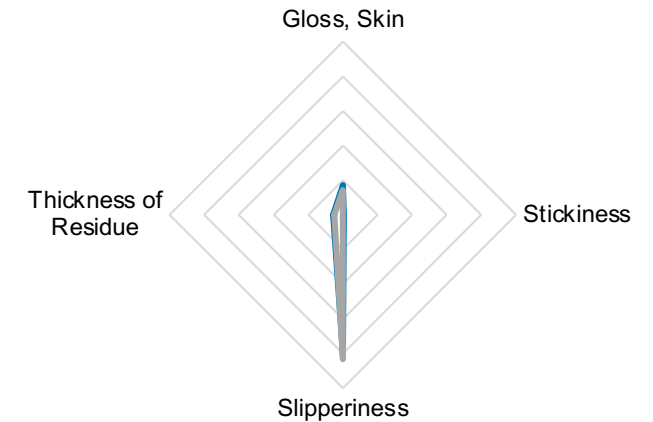
— Citropol 1A — Dimethicone 20

Immediate Absorption



— Citropol 1A — Dimethicone 20

20 Minute Absorption

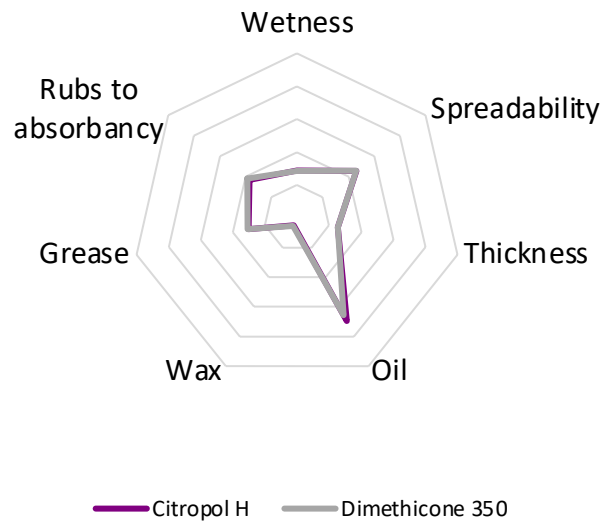


— Citropol 1A — Dimethicone 20

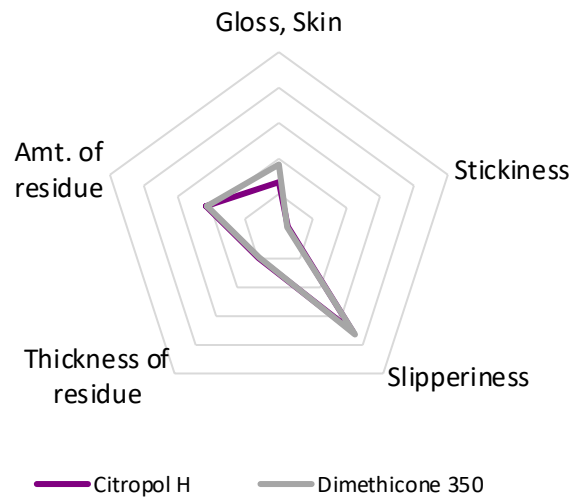
Sensory Profile of Citropol H

Citropol H imparts a silky, second-skin feel to skin care products that closely mimics Dimethicone 350. Citropol H provides improved spreadability and slip to formulations that will enhance the experience and aesthetic of the finished product.

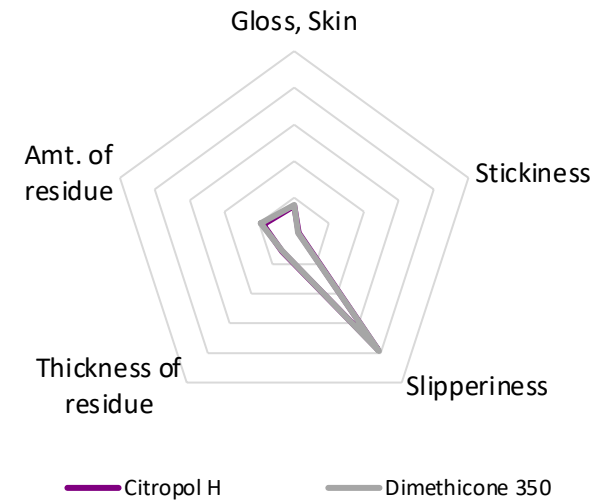
Sensory Profile



Immediate Afterfeel



20 Minute Afterfeel

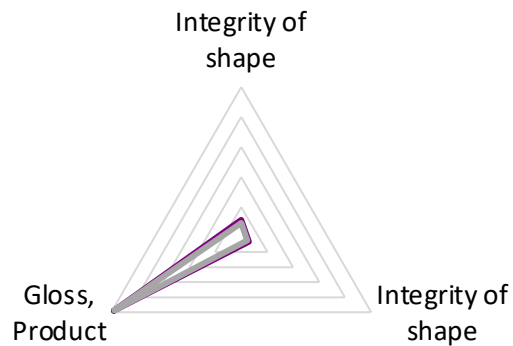


Skincare Benefits of Citropol H

Citropol H imparts a silky, second-skin feel to skin care products that closely mimics Dimethicone 350. Citropol H provides improved spreadability and slip to formulations that will enhance the experience and aesthetic of the finished product.

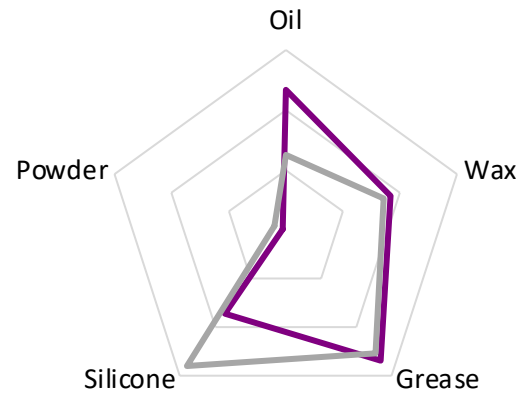


Appearance



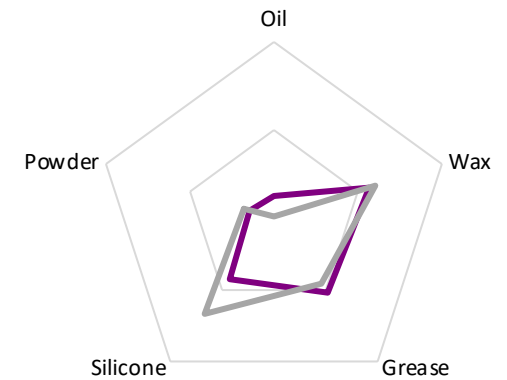
— Citropol H — Dimethicone 350

Immediate Absorption



— Citropol H — Dimethicone 350

20 Minute Absorption

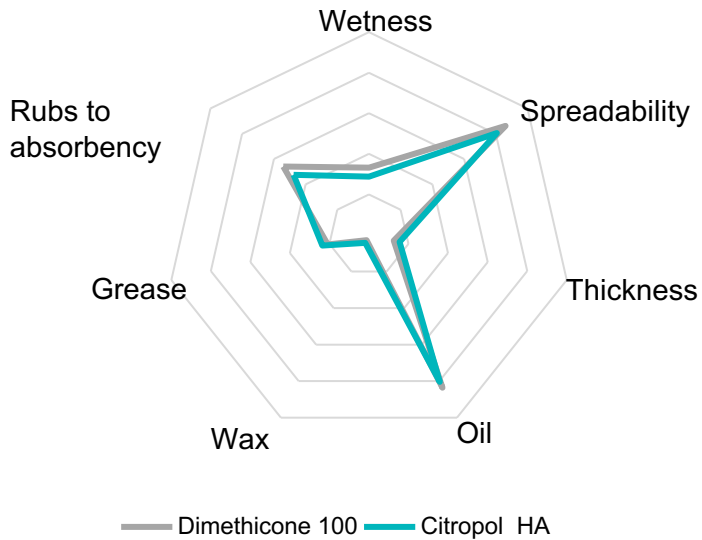


— Citropol H — Dimethicone 350

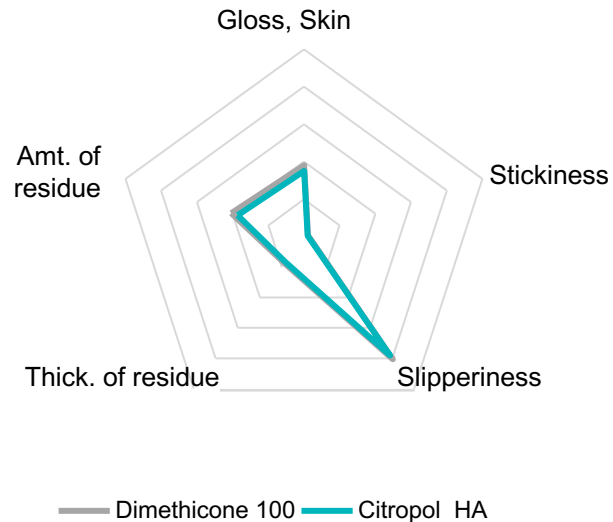
Sensory Profile of Citropol HA

Citropol HA imparts a silky, second-skin feel to skin care products that closely mimics Dimethicone 100. Citropol HA provides improved spreadability and slip to formulations that will enhance the experience and aesthetic of the finished product.

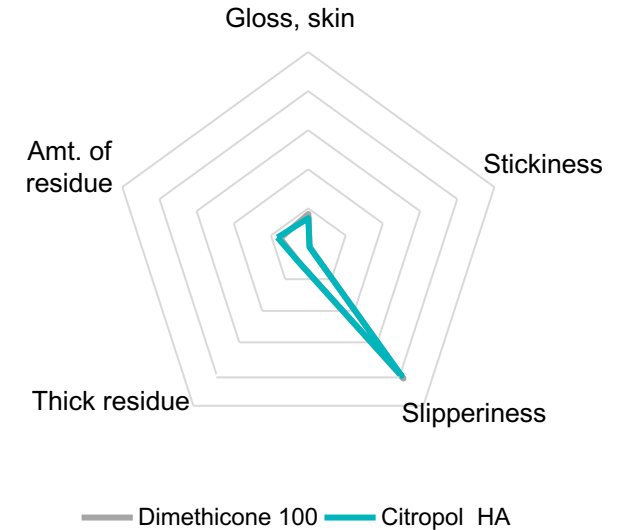
Sensory Profile



Immediate Afterfeel



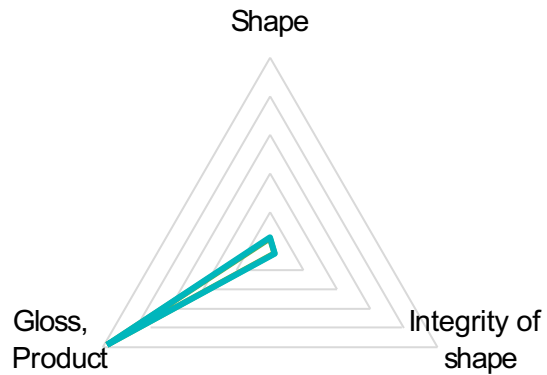
20 Minute Afterfeel



Skincare Benefits of Citropol HA

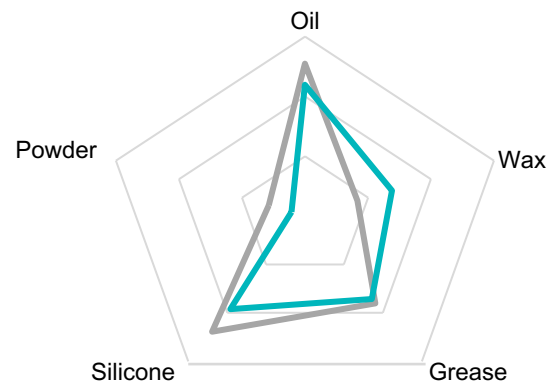
Citropol HA imparts a silky, second-skin feel to skin care products that closely mimics Dimethicone 100. Citropol HA provides improved spreadability and slip to formulations that will enhance the experience and aesthetic of the finished product.

Appearance



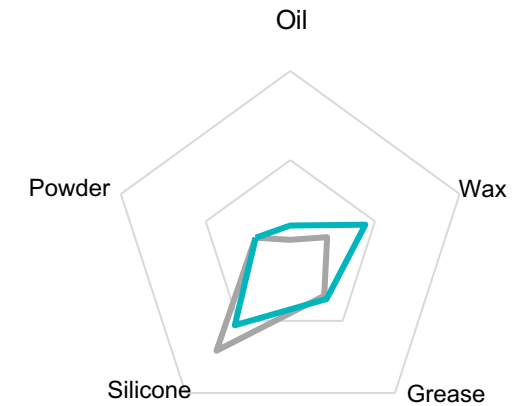
— Dimethicone 100 — Citropol HA

Immediate Absorption



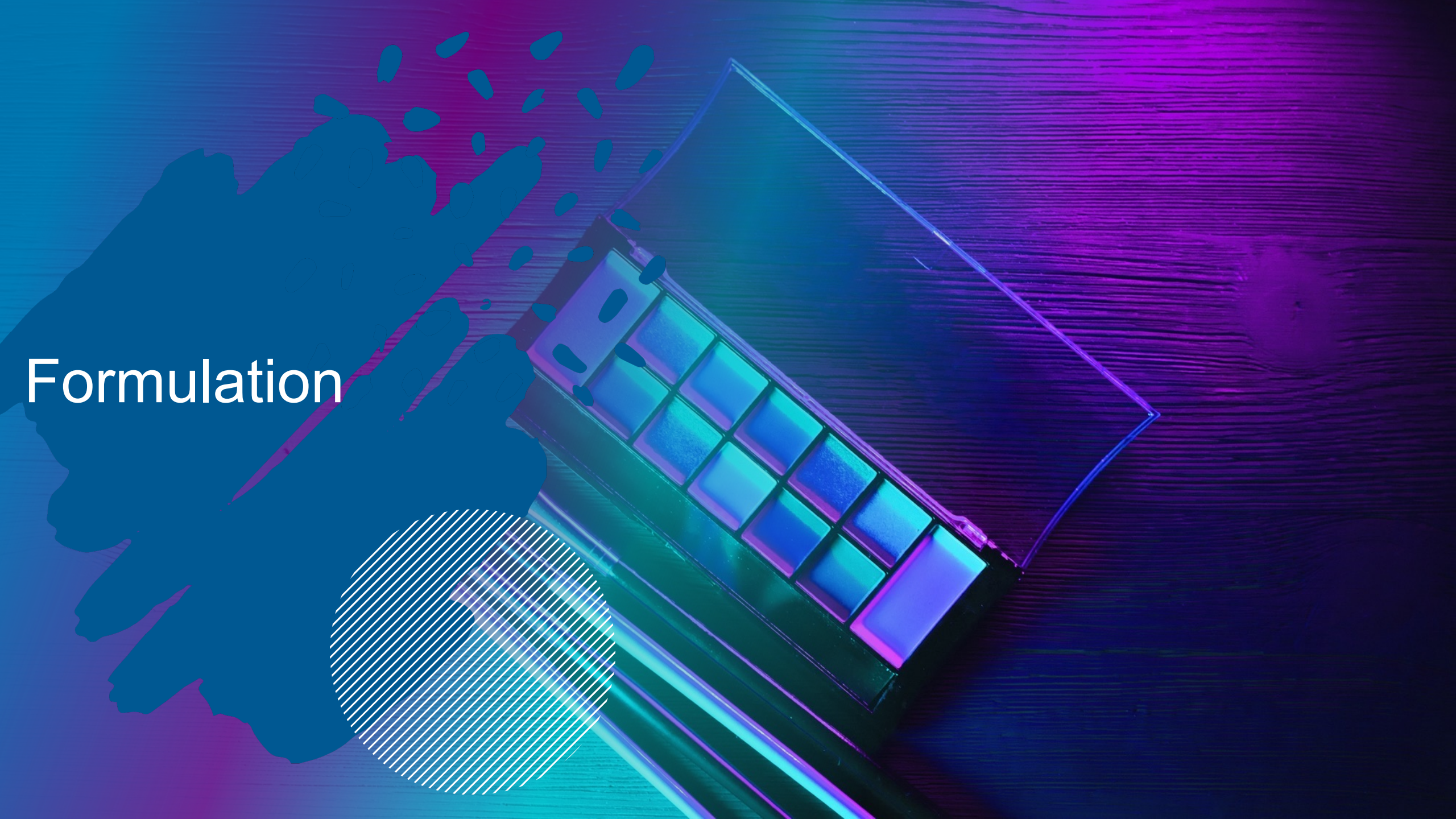
— Dimethicone 100 — Citropol HA

20 Minute Absorption



— Dimethicone 100 — Citropol HA

Formulation



Hydrating Detangler

Phase	Ingredient	%
A	DI Water	93.8
	Glycerin	1.0
	Incroquat Behenyl TMS-50	2.0
	Polyquaternium 7	0.1
B	Polysorbate 20	1.5
	Citropol® H	0.25
	Citropol® 1A	0.25
	Fragrance-Papaya Milk	0.1
C	Euxyl K 712	1.0

Procedure

1. In a suitable beaker, heat Phase A to 65°C, while mixing
2. In a separate beaker, mix Phase B.
3. Add Phase B to Phase A. Continue heating, while mixing.
4. Once uniform, begin to cool to room temperature.
5. Once below 45°C, add Phase C.

Foaming Beard Wash

Phase	Ingredients	%
A	DI Water	56.30
	Glycerin, USP	2.00
	SCI Pearl	20.00
	Cocamidopropyl Hydroxysultaine	10.00
B	Cetearyl Alcohol	2.00
	Cetyl Alcohol	3.00
	Citropol® HA	1.00
	Coconut Oil	0.50
	Hemp Seed Oil	0.20
	Joboba Oil	0.20
	Tigernut Oil	0.20
	Watermelon Seed Oil	0.20
C	Keratin Protein, Hydrolyzed	1.00
	Vitamin E	0.50
	Agave Extract	0.50
	Goji Berry Extract	0.50
	Phenoxyethanol	0.90
	Fragrance	1.00

Procedure

1. Measure and weigh Phase A and Phase B ingredients.
2. In a suitable container, add water and begin mixing at a low speed. Then, add the remaining Phase A ingredients and begin heating to 80°C.
3. In another suitable container, add Phase B ingredients and begin heating to 80°C. Mix well until melted and uniform.
4. Add Phase B to Phase A and mix well for 10 minutes.
5. Measure and weigh Phase C ingredients
6. Begin cooling to 40°C, using a water bath.
7. While cooling, add Phase C to the main vessel. Mix well by hand for 5 minutes.
8. Cool to 30°C. Then, pour into suitable component.

Natural Deodorant Stick



Phase	Ingredients	%
A	Citropol 1A	20
A	Cetearyl Oliviate (and) Sorbitan Oliviate	15
A	Isoamyl Laurate	36.1
A	Oryza Sativa (Rice) Bran Wax	10
A	Zinc Ricinoleate	3
A	Hydrogenated Soy Polyglycerides (and) C15-23 Alkane	15
B	Essential Oil	0.8
B	Tocopherol	0.1

Procedure

1. Combine Phase A and begin heating to 85°C. Mix until melted and homogenous.
2. Remove from heat and cool to 70°C then add Phase B and mix until homogeneous.
3. Pour into moulds while still molten.
4. Allow to set a full 24 hours before packing into final packaging.

Liquid Cream Cleanser

Phase	Ingredients	%
A	DI Water	54.2
A	Glycerin	2.0
A	SMC Taurate	10.0
A	SCI Pearl	20.0
A	Sodium Behenoyl Lactylate	8.0
A	Behenyl Alcohol	2.0
A	Glyceryl Stearate	2.0
A	Citropol 1A	2.0
B	Preservative	1.0

Procedure

1. Combine Phase A. Heat to 75°C and mix until ingredients melted and homogenous.
2. Once homogeneous begin cool down to 40°C.
3. Once at 40°C, add perseverative and mix until homogeneous.

Soothing Baby Balm



Phase	Ingredients	%
A	Beeswax	5.0
A	Shea Butter	45.0
A	Citropol 1A	16.5
A	Grape Seed Oil	16.5
A	Sunflower Seed Oil	16.5
A	Tocopherol	0.5

Procedure

1. Combine Phase A. Heat until all ingredients have melted accordingly.
2. Once melted, remove from heat. Before pouring, stir to trace.

Cocoa Shea Dark Chocolate Moisturizing Lip Balm



Phase	Ingredients	%
A	Shea Butter	20.0
A	Cocoa Butter	20.0
A	Grape Seed Oil	21.0
A	Citropol 1A	10.5
A	Sunflower Seed Oil	10.5
A	Beeswax	7.5
A	Candelilla Wax	7.5
B	Anti-Oxidant	0.5
B	Flavor Oil	2.5

Procedure

1. Combine Phase A. Heat to 80°C mix until gum swells or gel forms.
2. In a separate beaker, combine Phase B and heat to 80°C and mix until melted.
3. Once done, add Phase B into Phase A and mix or homogenize at homogenous.
4. Once mixed, pour into lip balm components.

Intense Moisture lotion



Phase	Ingredients	%
A	DI Water	73.9
A	Glycerin	1.0
B	Panthenol DL	0.2
B	Sodium Hyaluronate	0.3
B	Sodium Behenoyl Lactylate	2.5
B	Behenyl Alcohol	2.5
B	Citropol 1A	5.0
B	Sunflower Seed Oil	5.0
B	Shea Oil	5.0
B	Pomegranate Seed Oil	2.0
C	Oat amino acid	0.5
C	Tocopherol	0.1
C	Preservative	1.0

Procedure

1. Combine Phase A ingredients and heat to 70°C. Mix until uniform.
2. Once at 70°C, add Phase B one by one.
3. Homogenize under high shear until fully homogenous.
4. Then, begin cooling to 40°C, while mixing.
5. Add Phase C and mix until homogeneous.
6. Finally, cool to 25°C and adjust pH accordingly.
7. Pour into suitable component and enjoy!

Gentle foaming facial cleanser

Phase	Ingredients	%
A	DI Water	67.58
A	Glycerin	3.0
A	Sodium Cocoyl Apple Amino Acids	27.0
B	Citropol 1A	0.3
B	Sodium Sunflowerseedate	1.0
B	Avocado Oil	0.01
B	Rose Hip Oil	0.01
C	Tocopheryl acetate	0.1
C	Euxyl K 712	0.1

Procedure

1. Measure out ingredients in phase A. Add DI H₂O and glycerin then begin heating to 75°C.
2. Once batch temp reaches 60°C, add remaining ingredients of Phase A one by one and mix until homogenous.
3. Combine Phase B ingredients in a separate beaker and heat to 85°C or until melted.
4. Add Phase B ingredients to Phase A and mix until homogenous mixture formed.
5. Cool batch to 40°C and add Phase C and mix until homogenous. Adjust pH as necessary.

Citrus Lip Balm



Phase	Ingredients	%
A	Beeswax	10.0
A	Candelilla Wax	7.0
A	Orange Peel Butter	35.0
A	Citropol 1A	10.0
A	Jojoba Oil	15.0
A	Aloe Vera Butter	20.0
A	Flavor Oil	3.0

Procedure

1. In a beaker, measure out ingredients in Phase A and begin heating to 80°C. Allow to melt.
2. Pour into mold and allow to settle

Gentle Exfoliating Facial Cleanser

Phase	Ingredients	%
A	DI Water	52.5
A	Glycerin	3.0
A	Foaming Oats Surfactant	17.0
B	Citropol 1A	5.0
B	Behenyl Alcohol	4.0
B	Stearic Acid	3.0
B	Glyceryl Stearate	3.0
B	Rose Extract	0.1
B	Rose Oil	0.1
C	Rice Bran Beads	11.0
C	Tocopheryl acetate	0.1
C	Grapefruit Splash Plant Based Fragrance Oil	0.2
C	Preservative	1.0

Procedure

1. Measure out ingredients in Phase A and begin heating to 65°C.
2. In a separate beaker measure out ingredients in Phase B and to 65°C.
3. Combine Phase B ingredients in a separate beaker and heat to 65°C or until melted.
4. Add Phase B ingredients to Phase A and mix until homogeneous mixture formed.
5. Cool batch to 40°C and add Phase C and mix until homogeneous. Adjust pH if necessary

Face Oil Elixir



Phase	Ingredients	%
A	Rose Hip Oil	30.0
A	Jojoba Oil	15.0
A	Grape Seed Oil	22.0
A	Citropol 1A	5.0
A	Red Raspberry Oil	26.4
A	Lavender Plant Based Fragrance Oil	0.3
A	Cananga Flower Plant Based Fragrance Oil	0.3
A	Vitamin E	1.0

Procedure

1. In a beaker, weigh and mix Phase A ingredients at room temperature.
2. Mix until homogeneous.

Whipped hand cream

Phase	Ingredients	%
A	Di Water	76.0
A	Glycerin	2.0
B	CCT	3.0
B	Olivem 1000	3.5
B	Behenyl Alcohol	3.0
B	Citropol HA	4.0
B	Shea Oil	3.0
B	Pomegranate Seed Oil	2.0
B	Apricot Kernel Oil	2.0
C	Vitamin E	0.5
C	Preservative	1.0

Procedure

1. In a beaker added ingredients in Phase A. Slowly heat the mixture up to 65°C.
2. Add oil phase into Phase A. Heated up to 75°C.
3. Added emulsification system and let mix on high sheer.
4. Cool down mixture to room temperature. Add Phase C and mix until homogenized.

Cream Facial Cleaner



Phase	Ingredients	%
A	DI Water	61.2
A	Hydroxyethyl Cellulose	0.5
A	Glycerin	2.0
A	SCI	10.0
A	Coco Glucose	10.0
B	Glyceryl Stearate	3.8
B	Cetyl Alcohol	3.0
B	Stearic Acid	3.0
B	Citropol® HA	3.0
B	Argan Oil	1.0
B	Avocado Oil	1.0
C	Vitamin E	0.5
C	Preservative	1.0

Procedure

1. In a beaker added DI water, glycerin, and slowly sprinkle HE Cellulose.
2. Once a homogenous mixture formed, added remainder ingredients of Phase A and gradually heated the mixture up to 65°C.
3. Add oil phase into Phase A. Heated up to 75°C.
4. Added emulsification system and let mix until homogenized.
5. Cool down mixture to room temperature. Add Phase C and mix until homogenized.

Rose Shea Skin Cream



Phase	Ingredients	%
A	DI Water	71.2
B	Glycerin	4.0
B	Hydroxyethyl Cellulose	0.3
C	Olivem 1000	4.0
C	Citropol® 1A	6.0
C	Castor Oil	3.0
C	Shea Butter	3.0
C	Rose Hip Seed Oil	3.0
C	Stearic Acid	2.0
C	Glyceryl Stearate SE	2.0
D	Vitamin E Tocopherol	0.5
D	Caprylyl Glycol	1.0

Procedure

1. Measure out Phase A. Combine Phase B to form a slurry.
2. Add Phase B to Phase A while stirring until fully hydrated and a gel forms. Heat to 75°C. Combine Phase C and heat to 75°C
3. Add Phase C to Phase A and B and mix until a homogeneous emulsion forms.
4. Begin cool down of batch. Continue mixing while product cools.
5. At 40°C, add Phase D ingredients and stir until homogeneous. Check and adjust pH if needed

Skin Healing Cream



Phase	Ingredients	%
A	DI Water	77.2
B	Glycerin	3.0
B	Xanthan Gum	0.3
C	Olivem 1000	4.0
C	Citropol® 1A	10.0
C	Stearic Acid	2.0
C	Glyceryl Stearate SE	2.0
D	Vitamin E Tocopherol	0.5
D	Caprylyl Glycol	1.0

Procedure

1. Measure out Phase A. Combine Phase B to form a slurry.
2. Add Phase B to Phase A while stirring until fully hydrated and a gel forms. Heat to 75°C.
3. Combine Phase C and heat to 75°C. Add Phase C to Phase A and B and mix until a homogenous emulsion forms.
4. Begin cool down of batch. Continue mixing while product cools. At 40°C, add Phase D ingredients and stir until homogenous. Check and adjust pH if needed

Beard Balm

Phase	Ingredients	%
A	Citropol® 1A	73.0
A	Beeswax	15.0
A	Carnauba Wax	5.0
A	Orange Peel Butter	5.0
A	Vitamin E Tocopherol	2.0

Procedure

1. Measure out and combine Phase A. Heat to 85°C.
2. Melt until homogeneous.
3. Begin cool down of batch. Hot pour if necessary.

Ultra Conditioning Hair Balm



Phase	Ingredients	%
A	DI Water	61.1
B	Glycerin	5.0
C	AminoSensyl HC	12.5
	Citropol® 1A	10.0
	Coconut Oil	5.0
	Cetyl Alcohol	5.0
D	Caprylyl Glycol	1.0

Procedure

1. Measure out Phase A. Add Phase B to Phase A while stirring. Heat to 80°C.
2. Combine Phase C and heat to 80°C.
3. Add Phase C to Phase A and B and mix until a homogeneous emulsion forms.
4. Begin cool down of batch. Continue mixing while product cools.
5. At 40°C, add Phase D ingredients and stir until homogeneous. Check and adjust pH if needed.

Hemp Seed Skin Cream

Phase	Ingredients	%
A	DI Water	69
B	Glycerin	2
B	Sodium PCA (sodium L-pyrroglutamate)	3
C	Brassica Alcohol (and) Brassicyl Valinate Esylate (and) Brassica Glycerides	10
C	Citropol® 1A	10
C	Cannabis Sative (Hemp) Seed Oil	5
D	Caprylyl Glycol, ethylhexylglycerin	1

Procedure

1. Measure out Phase A. Add Phase B to Phase A while stirring. Heat to 80°C.
2. Combine Phase C and heat to 80°C. Add Phase C to Phase A and B and mix until a homogenous emulsion forms.
3. Begin cool down of batch. Continue mixing while product cools.
4. At 40°C, add Phase D ingredients and stir until homogenous. Check and adjust pH if needed.

Lightweight Pomegranate Shea Hand Cream



Phase	Ingredients	%
A	Di Water	78.5
A	Glycerin	2.0
B	Olivem 1000	4.0
B	Behenyl Alcohol	3.0
B	Citropol® 1A	4.0
B	Shea Oil	3.0
B	Pomegranate Seed Oil	2.0
B	Apricot Kernel Oil	1.0
C	Vitamin E	0.5
C	Preservative	1.0

Procedure

1. In a beaker added ingredients in Phase A. Slowly heat the mixture up to 65°C.
2. Added oil phase into Phase A. Heated up to 75°C.
3. Added emulsification system and let mix on high sheer.
4. Cool down mixture to room temperature. Add Phase C and mix until homogenized

Tinted Moisturizing Lip Balm



Phase	Ingredients	%
A	Shea Butter	43.0
A	Beeswax	10.0
A	Rose Floral Wax	5.0
A	Candelilla wax	3.0
A	Citropol® H	7.0
A	Coconut Oil	13.0
A	Safflower Oil	15.0
A	Vanilla Flavor Oil	2.0
B	Vitamin E	0.5
B	Titanium Dioxide in Oil, Mica Sugar Blush, Mica Red	0.5-1.5

Procedure

1. In beaker, add Phase A butters and waxes. Heat to 80°C. Add oils.
2. In a separate beaker, mix titanium dioxide in oil, mica sugar blush, and mica red. Add Citropol H.
3. Add Phase B to Phase A, while mixing.
4. Pour into lip balm mold and let cool.
5. Once cooled, add to suitable component and enjoy!

Cold Cream

Phase	Ingredients	%
A	DI Water	59.5
A	Glycerin	2.0
B	Beeswax	1.0
B	Cetyl Alcohol	2.0
B	Cetearyl Alcohol (and) Cetearyl Glucoside	5.0
B	Citropol® 1A	15.0
B	Sunflower Oil	10.0
B	Pomegranate Seed Oil	4.5
End	Preservative	1.0

Procedure

1. Measure out ingredients in Phase A and heat to 50°C. Gradually increase heat to 70°C.
2. Measure out ingredients in Phase B and heat to 70°C. Allow to melt.
3. Pour Phase B into Phase A. Mix until homogenized.
4. Cool to 40°C and add preservative.
5. Cool to room temperature before use.
6. Add to suitable container and enjoy!

Ultra-Hydrating Lip Balm



Phase	Ingredients	%
A	Jojoba Oil	20.0
	Coconut Oil	19.4
	Cocoa Butter	20.0
	Kester Wax K-BWR	20.0
	Citropol [®] H	8.0
	Shea Butter	8.0
	Sunflower Seed Wax	4.0
B	Vitamin E	0.5
	Flavor Oil	0.1

Procedure:

1. Measure and weigh Phase A and Phase B ingredients.
2. Gently melt Phase A in a suitable beaker, while mixing
3. Add Phase B while cooling and mixing
4. Once uniform, pour hot liquid into lip balm stick components
5. Cool to solidification at room temperature.

Brightening & Tightening Vitamin C Serum



Phase	Ingredients	%
A	DI Water	70.23
	Aloe Vera Pure Juice	2.00
	Glycerin, USP	2.00
	Hyaluronic Acid	0.02
	Hydroxyethyl-cellulose	0.90
B	DI Water	15.00
	Vitamin C	1.00
	Apple Extract	0.50
	Mulberry Root Extract	3.00
	Orange Secrets	0.10
C	Oleth-20	1.50
	Citropol® H	0.50
	Phenoxyethanol	0.70
	Polysorbate 20	1.50
	Caprylyl Glycol	0.50
	Vitamin E	0.10
	Sweet Orange Essential Oil	0.05
Tangerine Essential Oil	0.15	
D	Citric Acid	0.25

Procedure:

1. Add Water, Aloe, Glycerin to the main beaker and begin heating to 65°C while mixing.
2. Slowly add the rest of Phase A.
3. Once at 65°C, cover and mix at high speed for 30 minutes.
4. While Phase A is heating, premix Phases B and C.
5. Add water to a suitable beaker and mix at a sufficient speed to product a vortex. Slowly add the rest of Phase B while mixing.
6. Combine these ingredients from Phase C: Oleth-20, Citropol® H, and Polysorbate 20 in a small beaker, then heat to 45°C to melt the Oleth-20.
7. Once the Oleth is melted, remove from heat and add the rest of Phase C. Mix well by hand.
8. After 30 minutes mixing at 65°C, remove the main beaker from heat to begin cooling to 40°C while mixing.
9. Once cooled to 40°C, slowly add Phase B to main beaker, while mixing. Continue mixing.
10. Slowly add Phase C while mixing.
11. Add Phase D and mix well.
12. Pour into suitable component and enjoy!

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02

Citropol® V5

Citropol® V5 imparts distinct volatility and spreadability properties, providing a natural alternative to low viscosity, volatile silicones. This volatile emollient will allow formulators to create high-performing, renewable, biodegradable products when used as low as 1% in cosmetic and personal care products. Citropol V5 is compatible in skin care, hair care, deodorant, color cosmetics, and anti-perspirant applications.

All P2 Science products are biorenewable, biodegradable, and biocompatible. They do not compromise human and environmental safety.

INCI: PolycitronelloI Acetate (and) Undecane (and) Tridecane



Biodegradable



Biorenewable



Biocompatible

Citropol® V5

High Performance Volatile Ingredient for Clean Beauty

- Citropol® V5 is volatile and has high spreadability, making it a green and natural alternative to low viscosity, volatile silicones such as D5.
- Allows formulators to create high-performing, natural, and biodegradable products at a use level in cosmetic and personal care products as low as 1%.
- Compatible with skin care, hair care, color cosmetics, and AP/deo applications.
- Over 95% natural content.





Advantages of Citropol V5

Citropol V5 is a volatile liquid polymer, feeling virtually indistinguishable from Silicone D5.

Immediately after absorption Citropol V5 leaves a hydrating and pliable coating that imparts a silky afterfeel on skin.

Citropol V5 protects hair against heat damage up to 450°F and leaves much less build-up and reduces frizz.

Citropol V5 representative properties

Appearance	Clear liquid
Odor	Slight fresh
Color	Straw
Viscosity (mPa·s @ 25°C)	2.5 - 5.5
Refractive Index @ 20°C	1.4 - 1.5
Surface Tension (mN/m)	25 - 30
Density (g/mL)	0.750 - 0.850
Boiling Point (°C)	> 200
Solubility	Soluble in alcohols and oils
Bio-Based (%)	> 95%
Hansen Color Method	≤ 50

	Citropol® V5	Silicone D5
Flashpoint (°C)	77	73
Viscosity (cPs @ 25°C)	4.0	3.7
Surface Tension (mN/m)	26.8	18
Refractive Index	1.438	1.398



Did You Know?

Citropol® is made by a clean, mild, and high yielding conversion process called Process Intensified Continuous Etherification (PICE™).

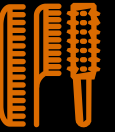
Hair Performance



Citropol® V5 Anti-Frizz Data



The similarities between Citropol V5 and D5 makes it an easy and sustainable swap, without having to rework an existing formulation. **Citropol V5 imparts better frizz reduction and MUCH LESS build-up and the addition of heat protection up to 450°F.**



Less frizz makes Citropol V5 a go-to for long-lasting hair styling and higher combability.

Citropol V5 reduces

5%

more frizz than D5

Less Buildup on Hair for Citropol® V5 vs. D5

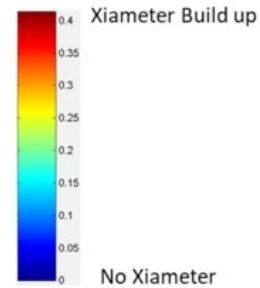
Product buildup on hair tresses measured with ATR-FTIR spectroscopy at TRI Princeton shows significantly less buildup with Citropol V5 than with Silicone D5

When compared to D5, Citropol V5 produces much less build-up and helps to reduce a higher amount of frizz.

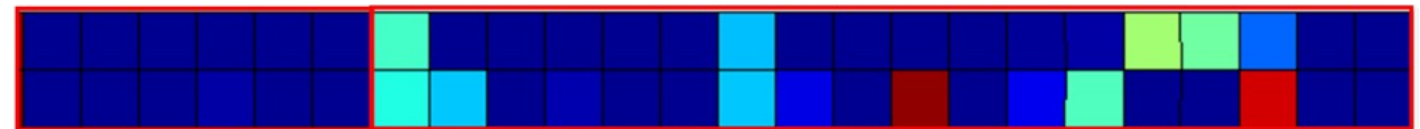
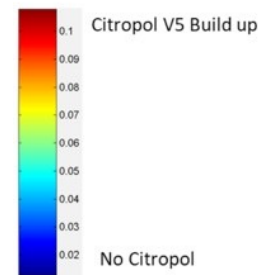
As an added bonus, Citropol V5 protects the hair from heat damage up to 450°F, whereas Silicone D5 offers no protection.

Citropol V5 is the clear winner when it comes to damage control, appearance, and styling.

800 cm⁻¹ band area



1740 cm⁻¹ band area



Heat Protection: Comparing Citropol V5 to Silicone D5

The use of Citropol V5 protects hair against the heat damage with a flat iron at 450°F.

Silicone D5 does **NOT**

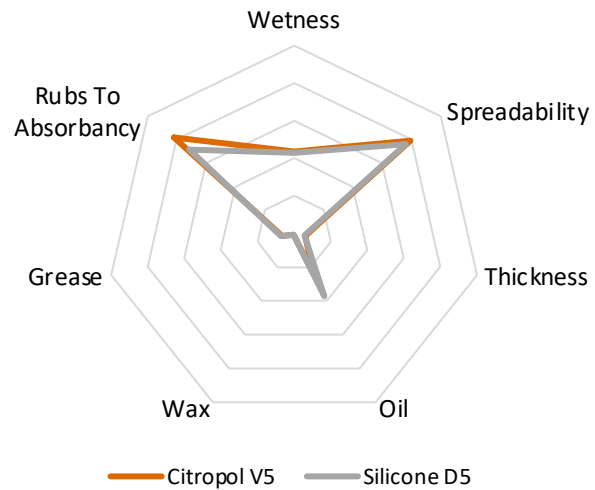
Skin Performance



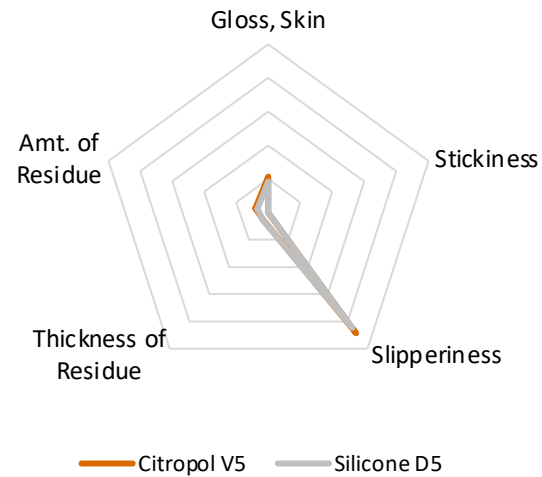
Skincare Benefits of Citropol V5

Citropol V5 imparts a silky, second-skin feel to skin care products that closely mimics Silicone D5. Citropol V5 provides improved spreadability and slip to formulations that will enhance the experience and aesthetic of the finished product.

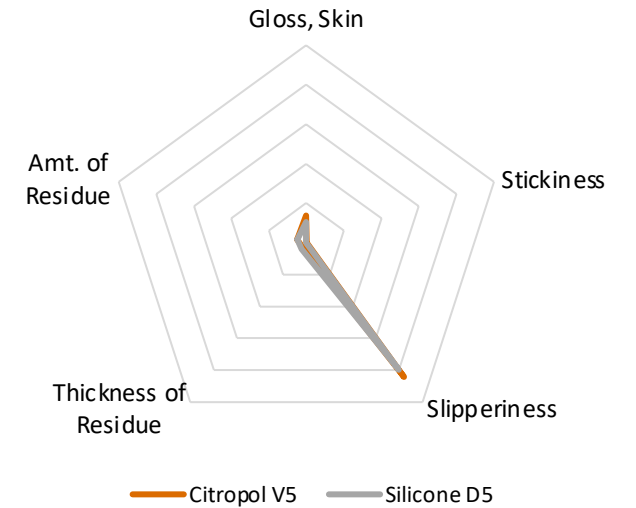
Sensory Profile



Immediate Afterfeel



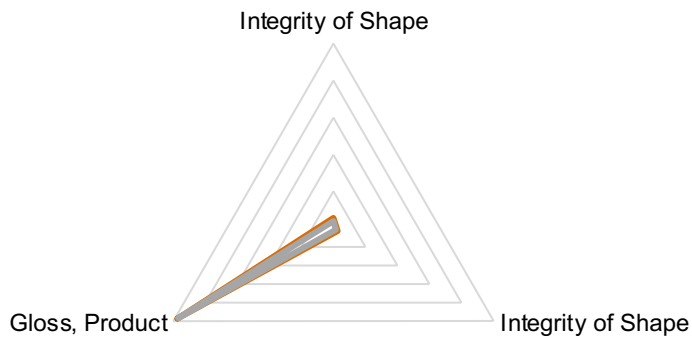
20 Minute Afterfeel



Skincare Benefits of Citropol V5

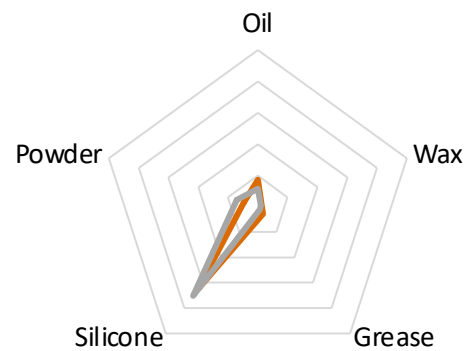
Citropol V5 imparts a silky, second-skin feel to skin care products that closely mimics Silicone D5. Citropol V5 provides improved spreadability and slip to formulations that will enhance the experience and aesthetic of the finished product.

Appearance



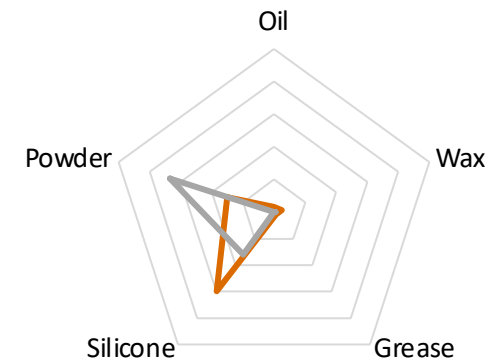
— Citropol V5 — Silicone D5

Immediate Absorption



— Citropol V5 — Silicone D5

20 Minute Absorption



— Citropol V5 — Silicone D5

Formulation



Refreshing Shaving Cream

Phase	Ingredients	%
A	Purified Water	64.83
A	Glycerine	3.40
A	Potassium Hydroxyde 45%	0.62
B	Zemea	3.00
B	Keltrol CG V	0.05
C	Phenoxyethanol	0.70
C	Sensiva SC 50	0.15
D	Stearic Acid	15.00
D	CitroVisc™ 5000	1.00
D	Citropol® V5	1.00
D	Citrolatum™ B	2.00
D	Glycol Distearate	3.50
D	Protachem ISP	1.00
D	Pelemol MM	1.00
D	Shea Butter	1.00
D	Coconut Oil	0.50
E	Soothing Mist EE17-22533	1.00
E	Menthol Crystals	0.25

Procedure

1. Add Phase A to the main vessel. Mix well using a homogenizer until uniform. Begin heating to 85°C.
2. Premix Phase B and add to the main vessel, while mixing. Continue heating to 85°C.
3. Premix Phase C and add to the main vessel. Continue heating.
4. In a suitable container, add Phase D. Heat to 85°C while mixing until uniform.
5. Add Phase D to the main vessel, while mixing.
6. Homogenize for 10 minutes
7. Begin cooling to 45°C using a water bath.
8. Once cooled to 45°C, add Phase E.
9. Remove the batch from the homogenizer and mix manually, cool to 30°C.

Full Coverage Foundation

Phase	Ingredients	%
A	Water	45.78
A	Dermofeel PA-12	0.05
A	Zley® P-hydroxyacetophenone	0.50
A	Protasorb L-20	0.30
B	Butylene Glycol	2.50
B	Vegum CH	0.35
B	Vanzan NF-C	0.13
B	Phenoxyethanol	0.70
B	Sensiva SC 50	0.15
C	GA-7811 Hydrophilic TiO2	9.22
C	GA-7831 Hydrophilic Yellow	2.05
C	GA-7249 Hydrophilic Red	0.57
C	GA-7403 Hydrophilic Black	0.18
C	RonaFlair-Synmica M	1.25
C	Naturesoft 800	0.50
D	Citropol® V5	1.00
D	Citropol® H	2.50
D	C'Ester TDTM	5.00
D	Emulium Illustro	4.00
D	Salacos 334	3.00
D	Cetiol C 5	7.00
D	Protachem ISP	7.50
D	Pèlemol GTB	0.25
D	Ecodrop Gel	3.52
E	Kobo Blur 100	1.00
E	GMS-ASG3	1.00

Procedure

1. In the main vessel, add Phase A, one item at a time under the homogenizer at 1000 rpm. Begin heating to 85°C
2. In a small beaker premix Phase B. Add to the main vessel. Increase speed as it thickens 15 minutes, avoid splashing.
3. Add Phase C one item at a time, while mixing. Mix until uniform. Avoid splashing and use spatula for side swipe.
4. In another vessel, premix Phase D and heat to 80-85°C. Mix until uniform.
5. Add phase D to the main vessel. Homogenize for 10 minutes until uniform. Increase RPM if needed avoiding splashing 6- Begin cooling to 45°C.
6. Add Phase E to the main vessel. Mix well for 5 minutes.
7. Transfer batch to a head mixer equipped with anchor paddle. Mix slowly while cooling to 30°C, using a water bath.
8. Take pH, initial and 24-hour viscosity. Evaluate for physical appearance, Color, and Odor.

Oil-Based Makeup Remover

Phase	Ingredient	%
A	Water	77.50
	Disodium EDTA	0.10
	Glycerin	1.50
	Citric Acid	0.05
	Panthenol	0.30
	Sodium Chloride	0.05
B	Solubilisant LRI	5.00
	Citrus Green Tea #EE21-49171	0.50
C	Citropol [®] V5	15.00

Procedure

1. Add Phase A to the main component. Mix at medium speed until all solids are solubilized.
2. In a suitable container, premix Phase B at 45°C. Mix until clear.
3. Add Phase B to main vessel. Mix well until clear.
4. Add Phase C to main vessel. Mix well for 15 minutes.

Shimmery Green Mascara

Phase	Ingredients	%
A	Water	53.45
	Glycerin	2.50
	Symsave H	0.50
B	Butylene Glycol	5.00
	Covathick 2009	0.50
C	GLW65CGCSP	10.00
	Covarine White	2.00
D	Glyceryl Stearate Citrate	3.45
	Kester Wax K-BWR	6.25
	Carnauba Wax	5.00
	Citropol® V5	4.00
	Pelemol GTB	1.00
E	Baycusan eco E 1001	5.00
F	Phenoxyethanol	0.70
	Sensiva SC 50	0.15
G	Mica Interference Green	0.50

Procedure

1. In the main vessel add Phase A (water phase), begin heating to 80-85°C with mixing until uniform.
2. In another suitable vessel premix Phase B, then add to main vessel while mixing until uniform.
3. Add phase C (color) to the main vessel. Mix until uniform at medium speed for 10 minutes.
4. In a separate vessel premix Phase D (oil phase), heat to 80-85°C or until waxes melted.
5. Add phases D and E to the main vessel and homogenize for 15 minutes at 7,000 rpm.
6. Begin cooling to 45°C.
7. Add Phases F and G one item at a time. Mix until uniform, continue cooling to 30°C.

Mascara Primer



Phase	Ingredients	%
A	Water	61.215
	Glycerin	2.85
	Symsave H	0.57
B	Butylene Glycol	5.70
	Covathick 2009	0.57
	Glyceryl Stearate Citrate	3.90
C	Kester Wax K-BWR	7.13
	Carnauba Wax	5.70
	Citropol [®] V5	4.56
	Pelemol GTB	1.14
D	Baycusan C 1004	5.70
E	Phenoxyethanol	0.80
	Sensiva SC 50	0.17

Procedure

1. In the main vessel, add Phase A. Heat to 85°C while mixing, until uniform.
2. Premix Phase B and add to Phase A. Mix until uniform.
3. In a suitable vessel, add Phase C. Heat to 85°C. Mix until all waxes are melted.
4. Add Phase C to main vessel. Homogenize for 10 minutes.
5. While homogenizing, add Phase D.
6. Cool to 30°C, using a water bath.
7. Add Phase E. Mix with side sweep for 10 minutes until uniform.

Hydrating face cream



Phase	Ingredients	%
A	DI Water	81.5
A	Hyaluronic acid	0.3
B	Sodium Behenyl Lactylate	3.0
B	Behenyl Alcohol	1.5
B	Glyceryl Stearate SE	1.5
B	Citropol [®] V5	4.5
B	Squalene Oil	3.0
B	Grapeseed Oil	3.0
C	Peony Fragrance Oil	0.2
C	Vitamin E	0.5
C	Preservative	1.0

Procedure

1. In a beaker, added water. Sprinkled on hyaluronic acid while mixing on high sheer. Let solution completely dissolve. Slowly heat the mixture up to 50°C.
2. In a separate beaker measure out ingredients in Phase B and let melt at 75°C. Increase Phase A solution to 75°C. Add Phase B to Phase A and let mix on high sheer.
3. Cool down mixture to room temperature. Add Phase C and mix until homogenized

Hydrating marshmallow body cream

Phase	Ingredients	%
A	DI Water	68.5
A	Glycerin	2.0
A	Xanthan Gum	0.5
B	SugarMulse	8.0
B	Sunflower Seed Oil	15.0
B	Citropol® V5	5.0
C	Preservative	1.0

Procedure

1. In a suitable beaker, measure out ingredients in Phase A. Premix xanthan gum and glycerin to form a slurry.
2. Under medium to semi high shear, add premix to water and mix until phase begins to swell or form gel like consistency.
3. In a separate suitable beaker, combine Phase B ingredients. Heat to 75°C. Melt until homogeneous.
4. Add Phase B to phase a under medium to shear or homogenize until homogenous emulsion or cream forms.
5. Begin cool down to 40°C. Under low to medium shear add preservative and mix until homogenous.
6. Pour into suitable component and enjoy!

3-in-1 color stick

Phase	Ingredients	%
A	Castor Seed Oil	38.47
	Glycerin	9.05
	Carnuaba Wax	9.78
	Candellila Wax	3.24
	CitroButter™ S	3.60
	Compritol 888 Cg	4.07
	Sodium Stearate	1.62
	Stearic Acid	1.62
	Inbp45r21a	2.00
B	Citropol® V5	15.22
	Citropol® H	2.70
	Timiron Splendid Gold	5.00
	Mica Beige	0.58
	Arrowroot Powder	3.00
	Covapearl Fire Red 333	0.05

Procedure

1. In a suitable beaker, add Castor Oil and Glycerin, begin mixing. Heat to 90°C.
2. Once at 90°C, add the remaining Phase A ingredients. Mix well, until all solids are melted. Mix for 15 minutes.
3. Cool to 70°C.
4. Add Phase B one item at a time, mixing well for 5 minutes after each addition.
5. Begin cooling to 50°C, then pour into mold. Refrigerate for 15 minutes.
6. Put into suitable component and enjoy!



03

Citropol® F

Citropol® F is a fragrance fixative and carrier. Citropol F has a light odor and can solubilize and present a wide variety of essential oils and fragrance ingredients. Fragrance solutions with Citropol F have the benefit of having an immediate and strong initial impression, as well as a controlled release of volatile ingredients over an extended period of time.

Citropol F provides hydrolytic stability while being 100% biorenewable, biodegradable, and biocompatible. Citropol F is a high-performing fragrance fixative that adheres to Clean Beauty standards and provides renewability and long-lasting benefits.

INCI: Polycitronellol



Biodegradable



Biorenewable



Biocompatible

Citropol® F

Fragrance Fixative for Clean Beauty

- Fragrance oil fixative makes fragrances last longer by solubilizing a wide variety of essential oils and fragrance ingredients.
- Incorporating Citropol® F in a fragrance application imparts a strong initial impression and sustained release of volatile ingredients over an extended period of time compared to the control.
- Citropol® F is 100% biorenewable, biodegradable, and biocompatible.



Citropol F representative properties

Appearance	Clear liquid
Odor	Slight fresh
Color	Straw
Viscosity (mPa·s @ 25°C)	260 - 400
Refractive Index @ 20°C	1.4 - 1.5
Surface Tension (mN/m)	27 - 33
Density (g/mL)	0.850 - 0.950
Boiling Point (°C)	> 200
Solubility	Soluble in alcohols and oils
Bio-Based (%)	> 90
Hazen Color Method	≤ 50



Did You Know?

Citropol® is made by a clean, mild, and high yielding conversion process called Process Intensified Continuous Etherification (PICE™).



Description of Citropol F

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