



Biopolysan[®]

BIOPOLYSAN[®] 120

Plant Derived Multifunctional Preservative for Cosmetic Products

OVERVIEW

Biopolysan[®] 120 is a novel cosmetic ingredient formulated to exploit certain active botanical constituents that are utilized by plants to provide protection from microbes in the environment. These ingredients, rearranged and concentrated, are useful for preserving and improving personal care formulations.

DETAILS

Biopolysan[®] 120 uses a patented liquid crystal delivery system¹ to deliver otherwise insoluble ingredients from coconut or palm kernel oil based lauric esters to add lauric esters that, in nature, protect everything from the coconut palm to healthy human skin.

Biopolysan[®] 120 is prepared by partial saponification and transesterification of glyceryl laurate derived from sustainable coconut or palm kernel oil and carried with propylene glycol.

¹ [Methods and compositions for novel liquid crystal delivery systems.](#)
U.S. Patent Number: 8,546,593

BENEFITS

- ◆ Formulated with natural coconut or palm kernel oil derived esters
- ◆ Water-soluble medium chain fatty acid esters - cold process capable
- ◆ Antimicrobial properties - C12 lauric esters
 - Excellent inhibition against Gram-positive bacteria and some fungi*
 - Effectiveness against Gram-negative bacteria varies on product and concentration
- ◆ Non-volatile
- ◆ Skin conditioning - emollient and humectant
- ◆ Excellent solvent or carrier for fragrances or active ingredients - other botanicals, essential oils, other actives
- ◆ Non-ionic emulsifier and mild surfactant
- ◆ Dispersant properties
- ◆ Wetting agent
- ◆ Stabilizer and pH modifier

Biopolysan[®] 120 offers multiple benefits to the formulator. In personal care and cosmetic formulations, Biopolysan[®] 120 is the first product developed that delivers all the benefits of coconut or palm kernel oil derived esters in an easy, ready to use and water soluble vehicle.

RECOMMENDATIONS FOR USE

Versatile and easy to use, Biopolysan[®] 120 preserves product formulations and provides multiple other benefits to cosmetic and personal care products. It readily forms emulsions in most aqueous and oil systems, may be added to either the oil or water phase, and is heat stable to 150°C. Biopolysan[®] 120 can be used to emulsify fragrance oils, essential oils, or other additives to formulations. It is also an excellent additive for products that control odor from Gram-positive bacteria and may help boost odor control formulation efficacy while also improving skin feel and emollient characteristics.

Recommended use levels and concentration depends upon the application and type of product. Typical concentrations range from 1.5% to 25% wt/wt%.

For preservation, concentrations between 1.5% and 8% wt/wt% are recommended.

As a self-preserving, skin-conditioning ingredient, concentrations up to 25% wt/wt% are appropriate for most personal care products.

For odor control, recommended concentrations by weight are between 1% and 3% wt/wt%.

Recommendations For Use - continued

The chart to the right shows typical MICs for Biopolysan[®] 120 against common odor causing Gram-positive bacteria.

* Each unique product formulation requires preservative challenge and stability testing to determine adequate preservation from microbial spoilage and to establish product shelf life. Please contact Copperhead

Chemical Company about study sponsorship opportunities when using Biopolysan[®] products.

MICs for Biopolysan against common odor causing bacteria. Agar Dilution Method

Test Microorganism	ATCC No.	Cell Titer (CFU/streak)	MIC (Agar Dilution Method)	Incubation Temp.	Exposure Period
<i>S. epidermidis</i> **	12228	2.00E+03	0.05%	36° C	48 hours
<i>S. aureus</i>	6538	4.70E+04	0.05%	36° C	48 hours

Cosmetic Ingredient Reviews

All of the ingredients in Biopolysan[®] 120 are commonly used in personal care and cosmetic products and have cosmetic ingredient reviews (CIRs)^{2,3,4} by expert panels and safety assessments. The ingredients are suitable for use in the USA, Canada, EU, Japan, Australia, Brazil, New Zealand and other global markets.

Composition

INCI Name: Propylene Glycol (and) Propylene Glycol Laurate

Ingredient (INCI)	CAS No.	EINECS	Description
Propylene Glycol	57-55-6	200-338-0	Diluent
Propylene Glycol Laurate	27194-74-7	248-315-4	Active

Typical Physical Properties

Typical Physical Properties – Biopolysan [®] 120	
Appearance	Clear, colorless to nearly colorless liquid
Color Index (Gardner Scale)	<1
Odor	Characteristic, slight soap odor
pH (25°C) (BPS-120 neat)	8.8
Specific Gravity (25°C)	1.031
Refractive Index (20°C)	1.436
Viscosity (Room Temperature)	69 cp
Boiling point/range	>188°C
Flash point	>99°C
Vapor Pressure	<0.129 mmHg @ 25°C
Vapor density (Air = 1)	2.6
Solubility (20°C)	Appreciably soluble in water, alcohol and glycol

² Safety Assessment of Propylene Glycol Esters as Used in Cosmetics. September 20, 2014. http://www.cir-safety.org/sites/default/files/PGEste_092014_Tent_for%20posting.pdf

³ Amended Safety Assessment of Monoglyceryl Monoesters as Used in Cosmetics. August 28, 2015. <http://www.cir-safety.org/sites/default/files/monoglyceryl%20monoesters.pdf>

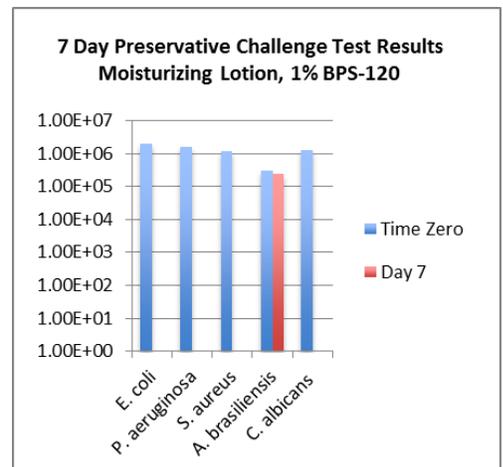
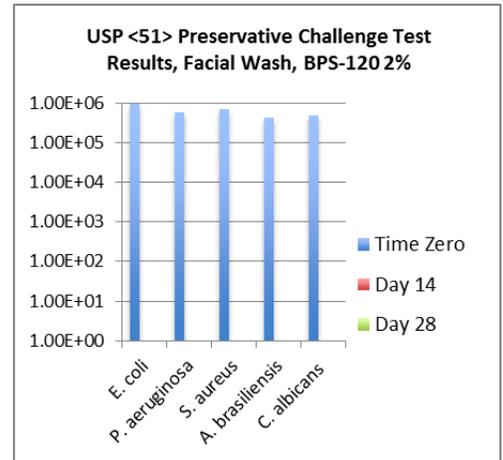
⁴ Fiume MM et al. Safety assessment of propylene glycol, tripropylene glycol, and PPGs as used in cosmetics. Int J Toxicol. 2012 Sep-Oct;31 (5 Suppl):245S-60S

Microbial Studies

Biopolysan® 120 possesses certain antimicrobial properties that make it suitable as a preservative or as part of the overall product preservation strategy for personal care and cosmetic products. The following charts show preservative challenge testing data for two Biopolysan® 120 products. The facial wash was comprised of 2% Biopolysan® 120 and 1% Salicylic Acid; the Moisturizing Lotion contained 1% Biopolysan® 120.

The facial wash chart shows the results of a standard USP <51> Preservative Challenge test on a product containing 2% Biopolysan® 120 (wt/wt%). USP <51> passing criteria requires that there be no increase in fungal load and a 2 log reduction in bacterial load. The results show the initial concentration of bacteria and fungi as added to the product, followed by testing at Days 14 and 28 wherein no microbes were detectable. This product meets the criteria for preservation of personal products. Note, in this formula Biopolysan® 120 was used to aid preservation, compliment the surfactant system, and to solubilize salicylic acid.

The 1% Biopolysan® 120 lotion was tested using a modified protocol wherein all the microbes are pooled together and the contact time reduced to 7 days. The graph shows the initial concentration of microbes followed by testing on Day 7. All of the microbes are non-detectable on Day 7 except for the fungi *A. brasiliensis*. These results show that the product passes preservation challenge testing as the bacteria are non-detectable and there was no increase in fungal growth.



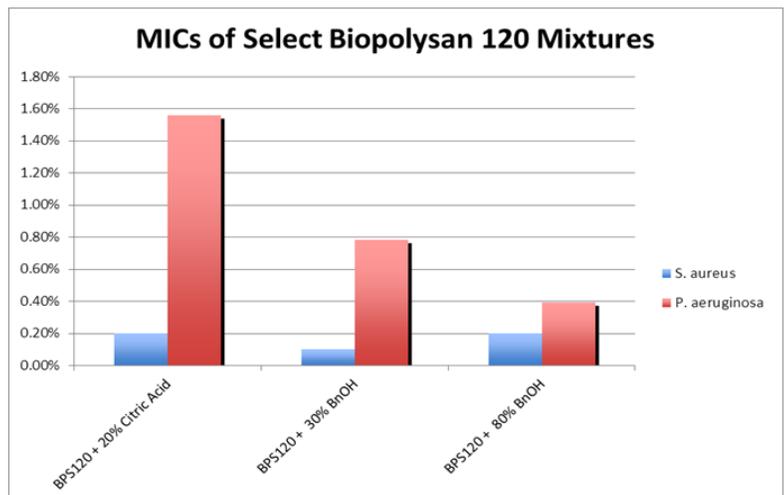
Complimentary Preservative Strategies

In some formulations Biopolysan® 120 may not always provide adequate preservation. In some cases, a co-preservative or higher concentration of Biopolysan® 120 may be required; Biopolysan® 120 is compatible with a variety of organic acids and alcohols. The chart to the right shows synergy of various Biopolysan® 120 blends and their minimum inhibitory concentrations (MICs).

Benzyl alcohol boosts the broad range antimicrobial efficacy of Biopolysan® 120 to levels that help ensure product stability. In the study, Biopolysan® 120 was used in concentrations ranging from 30% to 80%.

Citric acid also helps to boost broad spectrum antimicrobial efficacy. 20% citric acid blended directly into Biopolysan® 120 returned MICs less than 2% against Gram-negative bacteria.

Benzyl alcohol or citric acid may be added directly to Biopolysan® 120 or added separately to the formulation.



Biopolysan[®] 120 Sample Formulations

The plant derived emollient esters in Biopolysan[®] 120 preserve formulations and provide other significant benefits. In the example formulae that follow, Biopolysan[®] 120 serves as the preservative, an emollient ester blend, emulsifier for fragrance oils and other ingredients, a gentle surfactant, and skin penetrating agent.

Facial Wash, 2% Biopolysan	
Phase 1	
Water	Q.S. to 100%
Disodium EDTA	0.05%
Phase 2	
Plantapon [®] SF	18.00%
Cocamidapropyl Betaine	2.00%
Lamesoft [®] PO	1.50%
PEG 150 Distearate	1.00%
Phase 3	
Biopolysan [®] 120	2.00%
Polysorbate 80	2.00%
<i>Cucumis sativus</i> (Cucumber) in Glycerine	1.00%
Fragrance	Q.S.

Soothing Lotion, 1% Biopolysan	
Phase 1	
Water	Q.S. to 100%
Disodium EDTA	0.04%
Carbopol [®] Ultrez 21	0.50%
Phase 2	
Biopolysan [®] 120	1.00%
Capric/Caprylic Triglycerides	3.00%
Polysorbate 80	2.00%
Coconut Oil	4.50%
<i>Cucumis sativus</i> (Cucumber) in Glycerine	1.00%
Fragrance	Q.S.

Storage

Store product in a cool, dry area out of direct sunlight. Store in original container only. Product is hygroscopic; keep container tightly closed when not in use.

Biopolysan[®] 120 is supplied in 5 and 30 gallon HDPE containers.



About Copperhead Chemical Company[®]

Copperhead Chemical is a leading manufacturer of active pharmaceutical ingredients and specialty chemicals located in Tamaqua, PA USA. Copperhead is dedicated to quality and operates in accordance with Good Manufacturing Practice regulations enforced by the U.S. FDA. Contact information is as follows:

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