

APPLICATION GUIDELINES

How to formulate with Lumia.

C-phycocyanin is a protein. Treat it like one: keep it cold, keep it above pH 4.5, and keep it out of the light. The matrix, the order of addition, and the things that go wrong, on the pages that follow.

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APPLICATIONS & DOSAGE

Where Lumia lives.

APPLICATION	DOSAGE	INCORPORATION PHASE	PROCESS NOTE
Serum, water phase	0.05–0.5%	Cold water phase	Disperse in DI water under 40 °C
Cream, O/W emulsion	0.1–0.5%	Water, post-emulsification	Avoid contact with low-pH actives
Gel, aqueous	0.1–0.3%	Pre-gelation water phase	Stable in carbomer & xanthan systems
Mask, peel-off & sheet	0.2–1.0%	Direct addition to base	High visual impact at higher doses
Color cosmetic, water-based	0.05–0.3%	Pigment dispersion phase	Co-pigments with natural colorants
Shampoo, transparent	0.05–0.2%	Final mixing phase	Avoid SLS/SLES interaction at high dose

PH WINDOW

Optimal 5.5 to 7.5.
Acceptable to 4.5 with reduced retention. Below 4.5 needs encapsulation.

TEMPERATURE

Add below 40 °C. Brief 60 °C tolerated; avoid sustained heat above 75 °C.

PACKAGING

Opaque or UV-protective, airless preferred, for shelf-life retention.

INCORPORATION METHOD

Order of addition.

STANDARD METHOD

- 01 Pre-disperse Lumia in cold deionized water as a 5 to 10% w/w pre-mix.
- 02 Stir gently until fully dissolved, 3 to 5 minutes at 25 °C. No clumps.
- 03 Build the formulation water phase and cool it below 40 °C.
- 04 Add the Lumia pre-mix to the water phase under low shear.
- 05 Confirm finished-product pH stays above 4.5; buffer if needed.
- 06 Fill into opaque or UV-protective primary packaging.

LIMITS & COMPATIBILITY

ADD TEMP	Below 40 °C
PH FLOOR	4.5 (5.5+ preferred)
SHEAR	Low to moderate
SOLVENT	Water soluble; not oil
AVOID	Low-pH actives in same phase
COMPATIBLE	Carbomer, xanthan, glycerin, NaPCA

RULE OF THUMB

It is a protein. Cold, dark, above pH 4.5. Every loss mechanism traces back to one of those three.

STARTER FORMULA

Brightening blue serum.

REFERENCE FORMULA • PER 100 G

Deionized water	ad 100 g
Glycerin	4.0 g
Pentylene glycol	3.0 g
Niacinamide	4.0 g
Xanthan gum	0.3 g
Sodium hyaluronate	0.1 g
Preservative (phenoxyethanol)	1.0 g

Lumia 0.30 g • 0.30%
cold pre-dispersed

TARGET HUE • SHEER BLUE
SERUM

TARGET PH

5.5–6.5

buffer with sodium citrate if needed

PROCESS

- 01 Disperse xanthan in glycerin, add to water under stirring until hydrated.
- 02 Add niacinamide, sodium hyaluronate, pentylene glycol. Mix until clear.
- 03 Pre-disperse Lumia in 5 g cold DI water; stir 3 to 5 min at 25 °C.
- 04 Add Lumia pre-mix to main phase below 40 °C. Low shear.
- 05 Add preservative. Adjust pH to 5.5 to 6.5.
- 06 Fill into opaque airless packaging.

THINGS THAT GO WRONG

- 00 **pH below 4.5:** blue fades within days. Hold above 5.5, buffer.
- 01 **Hot pre-mix:** above 40 °C the protein denatures and color drops. Disperse cold.
- 02 **Clear packaging:** UV bleaches the color. Opaque or airless only.
- 03 **Ascorbic acid in-phase:** local low pH denatures Lumia. Separate phases.

STARTER FORMULA

Blue clay brightening mask.

REFERENCE FORMULA • RINSE-OFF • PER 100 G

Deionized water	ad 100 g
Kaolin clay	12.0 g
Bentonite	6.0 g
Glycerin	6.0 g
Pentylene glycol	3.0 g
Niacinamide	2.0 g
Xanthan gum	0.4 g
Preservative (phenoxyethanol)	1.0 g

Lumia 0.60 g • 0.60%
cold pre-dispersed

TARGET HUE • DEEP BLUE
RINSE-OFF

TARGET PH

5.5–6.5

re-check after clays; they can drift pH up

PROCESS

- 01 Hydrate xanthan in glycerin, add to water under stirring until smooth.
- 02 Disperse kaolin and bentonite slowly; mix until lump-free.
- 03 Add niacinamide and pentylene glycol; mix until uniform.
- 04 Pre-disperse Lumia in 5 g cold DI water; stir 3 to 5 min at 25 °C.
- 05 Add Lumia pre-mix below 40 °C under low shear.
- 06 Add preservative, adjust pH to 5.5 to 6.5, fill into opaque tube or jar.

THINGS THAT GO WRONG

- 00 **Clay drifts pH:** clays can push pH above 7. Re-check and buffer back to 5.5 to 6.5.
- 01 **Grittiness:** under-hydrated clay leaves specks. Hydrate fully before Lumia.
- 02 **Direct powder:** adding Lumia to the full batch leaves blue flecks. Always pre-disperse cold.
- 03 **Warm fill:** filling above 40 °C dulls color. Cool the batch first.

STARTER FORMULA

Blue-light defense gel-cream.

REFERENCE FORMULA • LEAVE-ON O/W •
PER 100 G

Deionized water	ad 100 g
Glycerin	5.0 g
Caprylic/capric triglyceride	5.0 g
Cetearyl alcohol	3.0 g
Glyceryl stearate SE	4.0 g
Niacinamide	3.0 g
Carbomer	0.30 g
Sodium hyaluronate	0.10 g
Tocopherol	0.20 g
Preservative (phenoxyethanol)	1.0 g

Lumia 0.25 g • 0.25%
post-emulsion, cold

TARGET HUE • SOFT BLUE GEL-
CREAM

TARGET PH

5.5–6.5

neutralize carbomer before adding Lumia

PROCESS

- Combine oil phase (triglyceride, cetearyl alcohol, glyceryl stearate); heat to 70 to 75 °C.
- Heat water phase (water, glycerin, carbomer) to 70 to 75 °C; disperse carbomer fully.
- Emulsify oil into water under high shear; begin cooling.
- Below 40 °C add niacinamide, sodium hyaluronate, tocopherol.
- Pre-disperse Lumia in 5 g cold DI water; add post-emulsification under low shear.
- Neutralize carbomer, add preservative, adjust pH to 5.5 to 6.5.

THINGS THAT GO WRONG

- Hot addition:** Lumia above 40 °C denatures. Always post-emulsion, cooled.
- Carbomer acidity:** localized low pH on neutralization can fade color. Neutralize first.
- Air entrainment:** high shear after adding Lumia whips in air. Low shear post-add.
- Clear jar:** leave-on bleaches under light. Opaque or airless packaging.

STARTER FORMULA

After-sun soothing gel.

REFERENCE FORMULA • LEAVE-ON • PER 100 g

Deionized water	ad 100 g
Aloe barbadensis juice	10.0 g
Glycerin	5.0 g
Panthenol	1.0 g
Allantoin	0.3 g
Carbomer (neutralised)	0.4 g
Preservative (phenoxyethanol)	1.0 g

Lumia 0.20 g • 0.20%
cold pre-dispersed

TARGET HUE • COOLING BLUE GEL

TARGET PH

5.5–6.5

neutralise carbomer before adding Lumia

PROCESS

- 01 Disperse carbomer in water; neutralise to a clear gel.
- 02 Add aloe juice, glycerin, panthenol, allantoin; mix until uniform.
- 03 Pre-disperse Lumia in 5 g cold DI water; stir 3 to 5 min at 25 °C.
- 04 Add Lumia pre-mix below 40 °C under low shear.
- 05 Add preservative; adjust pH to 5.5 to 6.5.
- 06 Fill into opaque airless or tinted packaging.

THINGS THAT GO WRONG

- 00 **Low-pH neutraliser:** neutralise the carbomer before Lumia so local pH never drops below 4.5.
- 01 **Electrolytes:** aloe salts can thin carbomer. Use a salt-tolerant grade.
- 02 **Warm fill:** filling above 40 °C dulls color. Cool first.
- 03 **Clear pack:** UV bleaches the blue. Opaque or tinted only.

COMMON CHALLENGES & SOLUTIONS

When it misbehaves.

COLOR SHIFT / FADE

Cause: pH below 4.5, UV exposure, or sustained heat. Fix: buffer to 5.5 to 6.5, opaque packaging, add below 40 °C. Consider chelants to bind trace metals.

OXIDATION OVER SHELF

Cause: dissolved oxygen and headspace. Fix: airless pack, antioxidant system, and minimise hot-hold time during manufacture.

VISCOSITY & CLARITY

Cause: incomplete dispersion leaving specks. Fix: always pre-disperse as a 5 to 10% cold pre-mix; never add powder directly to a full batch.

SURFACTANT INTERACTION

Cause: anionic surfactants (SLS/SLES) at high dose can dull color. Fix: add Lumia in the final mixing phase; cap inclusion at 0.2% in cleansing systems.

NEED A HAND?

Send your matrix, target hue, and process constraints. We will return a calibrated inclusion rate and a benchtop protocol, and ship a 30 g sample alongside.