SALVONA
Unique & Easy Micro-Encapsulation Solutions

MultiSal® Vitamins C (MS Vit C)

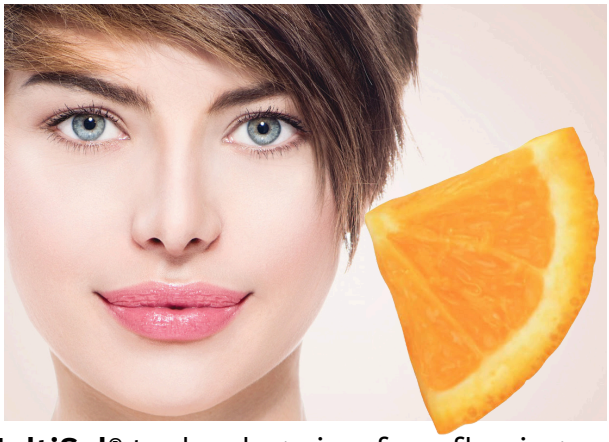
Time-Release Vitamin C for Lasting Radiance

MultiSal® Vit C is an advanced encapsulated antioxidant system based on L-Ascorbic Acid (Vitamin C) delivered in smooth, liquid-compatible MultiSal® microspheres. It is engineered to provide stability, efficacy, and skin performance in topical skincare formulations and selected supplement applications.

Vitamin C is a powerful antioxidant that helps protect the skin against oxidative stress, environmental damage, and premature aging, while also supporting collagen synthesis and skin radiance.

However, in its free form, L-Ascorbic Acid is easily degraded by light, oxygen, heat, and moisture, and is difficult to formulate—especially in water-based systems. MultiSal® encapsulation overcomes these challenges by physically protecting Vitamin C from degradation, enabling consistent potency and extended shelf life.

The microspheres feature a delicate, fine particle size, allowing the product to be used in liquid anhydrou formulations with an exceptionally smooth, non-gritty skin feel.



MultiSal® technology is a free-flowing solid micro powder (Fig 1). When applied as a powder, it creates a smooth, soft, and luxurious feel on the skin.

The active ingredient, **vitamins C (L ascorbic Acid), is** encapsulated in the tiny **sub-micron spheres** that compose the sphere's core. The Core is re-encapsulated by adding a Shell. The **shell** is made of hydrophilic polymers that form a physical crosslinked layer that shields the core from environmental factors such as light, temperature changes, and oxidative ingredients.

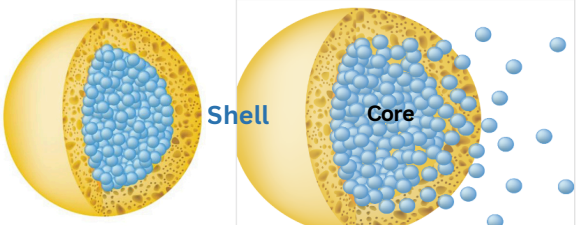


Figure 1: Image of MultiSal® Vitamins C.

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The Technology

When purchased from raw-material suppliers, L-Ascorbic acid typically has:

- Primary particle size: ~50–300 microns (crystalline powder)
- Median particle size (D50): commonly 100–200 microns
- Particle shape: irregular crystals (not spherical)
- Flow & feel: gritty, crystalline, poor skin sensory
- Exact particle size depends on the supplier and grade (pharma vs. cosmetic vs. food), but it is not micronized and not suitable for elegant topical application in its native form.

Because of its large particle size and crystalline nature, free L-Ascorbic acid:

- Feels gritty on skin
- Dissolves slowly and unevenly
- It is difficult to stabilize in water-based systems
- Oxidizes rapidly during processing and storage
- This is why technologies like MultiSal® encapsulation are used.

MultiSal® Vit C is a fine, free-flowing powder with a soft, silky touch, designed for easy handling and seamless incorporation into cosmetic formulations (Figure 2).

- The product is based on MultiSal® double-layered encapsulation technology (figure 1), featuring a core–shell microsphere structure in which Vitamin C is securely entrapped within a protective outer shell.

Rationale for Encapsulation of Vitamin C

The encapsulation of Vitamin C is designed to overcome its inherent instability and formulation challenges while maximizing performance on skin.

In the MultiSal® system, Vitamin C is first processed into submicron-sized spheres, forming a stable suspension. Reducing Vitamin C to the submicron range significantly increases surface uniformity and enables more controlled handling during the encapsulation process.
Once dispersed as submicron particles, Vitamin C is entrapped within a protective shell formed by a polysaccharide–complex polymer network. These polymers interact to create a physically cross-linked capsule, producing a robust core–shell microsphere structure. This physical crosslinking effectively locks Vitamin C within the core of the microsphere without chemically modifying the active.
The resulting capsule acts as a protective barrier against light, oxygen, heat, and moisture—key factors responsible for Vitamin C degradation. At the same time, the shell is designed to allow controlled, time-release of the active upon application, triggered by skin contact, hydration, or mechanical action.

Figure 2: Image of MultiSal® Vitamins C.

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TECHNICAL DATA

Table 1: INCI of MultiSal® Vitamins C&E PID: 2101-05

INCI
Ascorbic Acid
Corn Starch
Sodium Starch Octenylsuccinate
Silica

SPECIFICATIONS

Table 2: Specifications of MultiSal® Vitamins C&E

Specifications	Characteristics
Appearance @ 20°C	Free flowing powder
Color	Off-white
Odor	Characteristic
pH (1 % solution)	3.0 ± 1.0
Storage (°C)	Closed container at 12-32°
Shelf Life (months)	24
Loading	7+/- 2 wt % L-Ascorbic Acid

An average diameter of ~10 µm provides an optimal balance between handling (Figure 4), formulation compatibility, and skin sensory performance. The particles are small enough to feel smooth and non-gritty on the skin, yet large enough to remain stable, free-flowing, and easy to disperse into a wide range of cosmetic systems, including emulsions, gels, and serums.

This well-defined particle size also supports controlled release behavior, consistent dosing, and reliable performance in finished products, while maintaining excellent stability during processing and storage.

MICROSCOPY

Figure 3: Microscopy (x60) of dry MultiSal® Vitamins C shows round spheres with an average diameter of 10 microns.

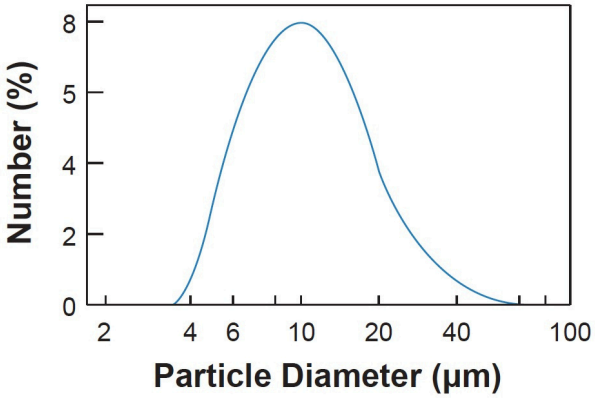

Figure 4: Particle size distribution of dry MultiSal® Vitamins C shows an average diameter of 10 microns.

This controlled, narrow size range reflects the uniform core–shell microsphere structure produced by the MultiSal® encapsulation process.

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In-Vitro Evaluation: Potent Vitamin C

An in-vitro experiment was designed to compare the antioxidant performance of Vitamin C in its free form versus its encapsulated form, using equivalent active concentrations. The model system was based on apple slice browning, a well-established visual indicator of oxidative degradation.

Fresh apples were sliced uniformly and divided into three treatment groups, each exposed to a different antioxidant system. The samples were monitored over time to evaluate the extent of oxidation-induced browning.

Antioxidant efficacy was assessed using a visual observation, color retention and browning intensity.

This approach enabled a direct, side-by-side comparison of oxidation prevention, clearly highlighting differences in stability and performance between free and encapsulated Vitamin C systems.

Oxidation darkens the apple's fruit over time (Figure 5). This method clearly demonstrates the antioxidant protective power of vitamin C by visually comparing its ability to prevent or slow oxidative browning of apple slices. When an apple is cut, cell damage exposes polyphenol oxidase (PPO) to oxygen and phenolic substrates. In the absence of vitamin C, PPO oxidizes phenols to o-quinones, which polymerize into brown, melanin-like pigments. Vitamin C normally suppresses this process by reducing o-quinones and scavenging oxygen. Without it, oxidation proceeds unchecked, causing visible browning.

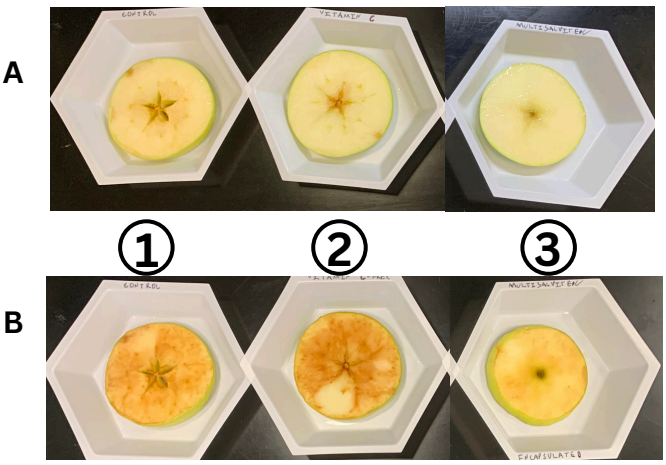

Figure 5: The oxidation process was simulated on fresh-cut apple slices. The top photo (A) shows immediately after addition, and the bottom (B) shows after six hours.
1: Control, no treatment
2: Free Vitamin C
3: MultiSal® Vitamins C

Prevention of apple browning reflects effective suppression of oxidative pathways, indicating strong antioxidant activity of the encapsulated Vitamin C system. Similarly, stabilized Vitamin C delivery systems mitigate skin oxidative stress by neutralizing environmentally generated reactive oxygen species, supporting cellular protection and skin integrity.

By suppressing oxidation-driven pigment formation, reducing oxidized melanin intermediates, and limiting UV-induced oxidative stress, Vitamin C promotes skin brightening and improved tone uniformity. Stabilized delivery systems enhance these effects by preserving Vitamin C activity and enabling sustained antioxidant performance.

Stabilized Vitamin C helps brighten skin by reducing oxidative pigment formation and protecting against environmental stress that contributes to uneven tone.

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Functions of Vitamin C:

Vitamin C is a multifunctional anti-aging active that supports skin health through several interconnected biological mechanisms (Fig 6). As a potent antioxidant, it neutralizes reactive oxygen species generated by UV exposure, pollution, and metabolic stress, reducing oxidative damage that accelerates skin aging. Vitamin C is also an essential cofactor for prolyl and lysyl hydroxylase enzymes involved in collagen biosynthesis, enabling proper collagen formation, stabilization, and cross-linking. This results in improved skin firmness, elasticity, and reduced appearance of fine lines and wrinkles.

In parallel, Vitamin C suppresses UV-induced matrix metalloproteinases that degrade collagen, helping preserve dermal structural integrity.

Vitamin C further supports skin brightening by inhibiting oxidation-dependent melanin formation, contributing to a more even skin tone.

It also enhances barrier function by supporting epidermal differentiation and ceramide synthesis, reducing transepidermal water loss, and improving skin hydration and resilience. Because free Vitamin C is inherently unstable, stabilized or encapsulated delivery systems are critical to preserve activity, enable controlled release, and maintain effective skin concentrations for sustained anti-aging performance.

Benefits of Encapsulated Vitamin C in Skincare:

1. Encapsulation significantly improves Vitamin C stability by protecting it from oxidation caused by light, air, heat, and moisture, preserving bioactivity and extending shelf life.
2. Controlled release systems maintain adequate skin levels over time, enhancing antioxidant protection, collagen support, and brightening performance.
3. By moderating immediate exposure, encapsulated Vitamin C improves skin tolerability and reduces irritation, making it suitable for sensitive skin. Preserved activity enhances efficacy against oxidative stress, supporting anti-aging and tone-unifying benefits.
4. Encapsulation also increases formulation flexibility, allowing easy incorporation into the basis. Targeted delivery improves bioavailability in the stratum corneum and viable epidermis, providing longer-lasting protection and improved skin resilience throughout the day.

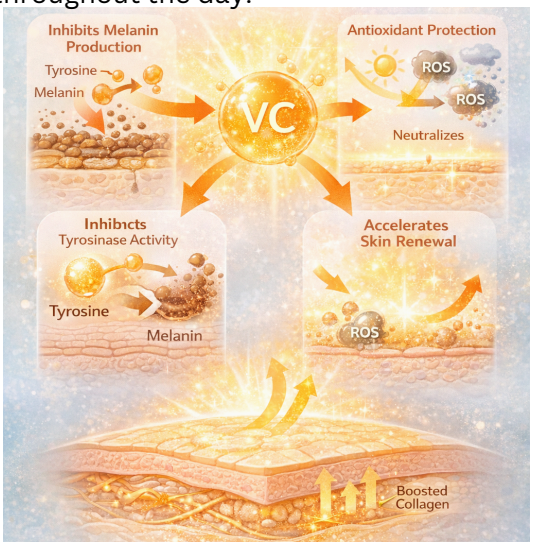

Figure 6: The mechanism of Vit C brighteneing the skin

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Mechanism of Release of Vitamin C from MultiSal® Vitamins C

MultiSal® Vitamins C employs a double-layer encapsulation system that protects Vitamin C from degradation while enabling controlled release upon application. The Vitamin C core is stabilized within submicron domains and entrapped in a physically cross-linked polysaccharide shell, protecting against oxidation and environmental stress during storage and formulation.

MultiSal® Vitamin C can remain protected in water-based emulsions when water activity is maintained at low levels (approximately 10–30%). Under these conditions, the encapsulating shell remains intact and limits water penetration into the core. When water content exceeds this threshold, the shell begins to absorb water and swell, initiating structural expansion as illustrated in Figure 7B.

Upon topical application, release is primarily triggered by hydration and mechanical interaction. Skin moisture causes the polymeric shell to swell and become more permeable, allowing controlled diffusion of Vitamin C from the core. Mechanical shear during application further facilitates release without an immediate burst.

This diffusion-controlled process delivers sustained release of Vitamin C at the skin surface and upper epidermis, maintaining effective antioxidant levels over time. By preventing rapid oxidation and ensuring prolonged bioavailability, MultiSal® Vitamin C supports consistent antioxidant, brightening, and anti-aging performance with improved skin tolerability.

Figure 7 A: **Dry, Intact Microsphere**

- The MultiSal® microsphere is in a dry, stable state.
- The outer polysaccharide shell is compact and intact.
- The Vitamin C–rich core is fully protected from moisture, oxygen, and light.
- No release occurs at this stage, ensuring maximum stability during storage and formulation.

B. Shell Swelling Upon Moisture Contact

- Upon application to the skin or exposure to ambient moisture, the hydrophilic shell begins to swell.
- The shell becomes hydrated and flexible, while the core remains intact and isolated.
- This step primes the system for activation without premature release.

C. Mechanical Rupture (Pressure / Rubbing)

- Mechanical forces such as rubbing, massaging, or skin movement generate localized stress.
- The swollen shell ruptures or fractures, exposing the inner core.
- This creates a triggered, on-demand release event, rather than passive leakage.

D. Dissolution and Diffusion of Vitamin C

- Once exposed, the Vitamin C core rapidly dissolves in water.
- Dissolved Vitamin C diffuses outward into the surrounding skin environment.
- This results in localized, fresh delivery of active Vitamin C, maximizing antioxidant efficacy and skin-brightening performance.

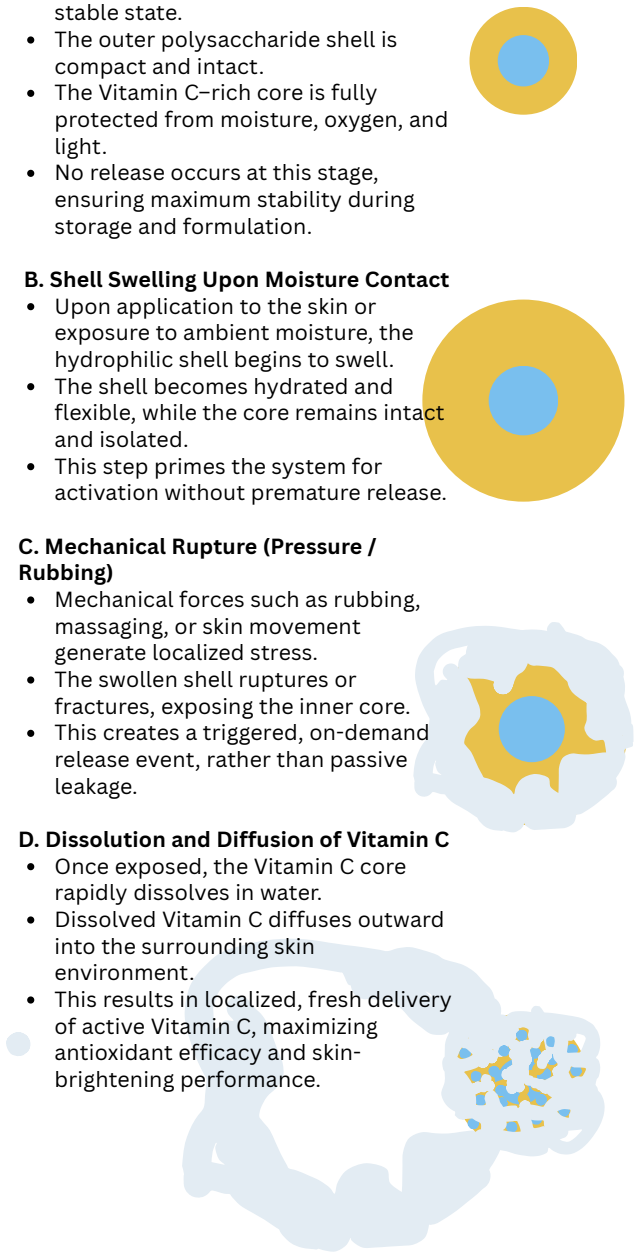

Figure 7: Illustration of the major step in the release of Vit C from MultiSal® Vitamins C

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Benefits of Water-Triggered Release

1. Controlled and Predictable Activation
Water-triggered systems release Vitamin C only upon exposure to moisture (skin hydration, formulation water, or application), reducing premature release during storage and ensuring activation at use.

2. Improved Stability During Storage
Encapsulation limits contact between Vitamin C and water prior to application, protecting against oxidation and degradation and extending shelf life.

3. Sustained Antioxidant Delivery
Gradual hydration-driven diffusion allows prolonged release, maintaining effective antioxidant levels over time rather than a rapid burst.

4. Enhanced Skin Tolerability
Moderated release reduces localized high concentrations of free Vitamin C, lowering the risk of irritation, stinging, or redness.

5. Broad Formulation Compatibility
Water-triggered systems can be incorporated into emulsions, gels, and aqueous products without requiring extreme pH control.

Disadvantages / Limitations of Water-Triggered Release

1. Dependence on Moisture Levels
Release rate is influenced by skin hydration, ambient humidity, and formulation water content, leading to variability in performance.

2. Limited Penetration Depth
Water-driven diffusion primarily favors release at the skin surface and upper epidermis, with reduced delivery to deeper layers.

3. Slower Onset of Action
Compared to free Vitamin C, water-triggered systems may show delayed initial activity due to gradual release kinetics.

4. Formulation Constraints
Highly aqueous systems or prolonged water exposure may accelerate release and reduce long-term control if not properly engineered.

5. Reduced Impact in Anhydrous Systems
In low-water or oil-based products, release may be minimal unless additional triggers (friction, temperature) are incorporated.

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APPLICATIONS

General Formulation Guidelines for MultiSal® Vitamin C
Recommended Use Level: typically used at 5–10% in cosmetic formulations, depending on the desired performance and claim intensity.

Preferred Base System

- Anhydrous or low-water systems are ideal to maintain capsule integrity and maximize stability.
- Suitable bases include:
  - Oils and esters
  - Silicone-based systems
  - Water-free serums, foundations, balms, and sticks
  - Low-water emulsions (<10% water activity)

Use in Water-Containing Formulations

- MultiSal® Vitamin C can be incorporated into water-based or emulsified systems provided that:
  - Water activity remains low (generally ≤10–30%)
  - The formulation minimizes humectant load and free water
- At higher water levels, the capsule shell may absorb water and swell, which primes the system for release but may reduce long-term storage stability.

Addition & Processing

- Add MultiSal® Vitamin C during the final stage of formulation, preferably below 40 °C.
- Use low shear mixing to ensure uniform dispersion without damaging the microspheres.
- Avoid high-energy homogenization after addition.

Trigger-Based Release Mechanism

- Release occurs primarily through:
  - Moisture exposure on skin
  - Mechanical action (rubbing, massage, application)
- This enables fresh, localized Vitamin C delivery at the point of use rather than during storage

Formulation Compatibility

- Compatible with:
  - Oils, silicones, esters
  - Antioxidants (e.g., tocopherol, ferulic acid)
  - Encapsulated or oil-dispersible actives
- Avoid prolonged exposure to:
  - Excess free water
  - High shear post-addition
  - Strong oxidizing environments

Water-Free Anti-Aging Foundation (Anhydrous) with MultiSal® Vit C

Format: Silicone / oil-based liquid foundation.
Benefits: coverage + soft-focus + “fresh Vit C release on skin”.

Phase A — Silicone elastomer / base

- Cyclopentasiloxane (or Isododecane if “volatile hydrocarbon” style) — 18.0%
- Dimethicone (5–10 cSt) — 10.0%
- Dimethicone/Vinyl Dimethicone Crosspolymer (silicone elastomer gel, ~10–15% active in D5) — 12.0%
- Trimethylsiloxysilicate (film former) — 3.0%
- Phenyl Trimethicone — 4.0% (radiance, slip)

Phase B — Emollients / binders (anhydrous)

- Hydrogenated Polyisobutene — 8.0%
- Caprylic/Capric Triglyceride — 6.0%
- Squalane — 4.0%
- Isostearyl Isostearate — 2.0% (pigment wetting / glide)
- Polyhydroxystearic Acid — 1.0% (pigment dispersant; improves stability)

Phase C — Powders / pigments (adjust shade)

- Titanium Dioxide (coated, cosmetic grade) — 6.0%
- Iron Oxides (yellow/red/black blend) — 3.0% (shade dependent)
- Mica — 6.0%
- Silica (spherical) — 3.0% (blur, oil control, slip)
- Boron Nitride — 2.0% (soft-focus, wear)
- Nylon-12 or PMMA — 2.0% (silky feel, optical diffusing)

Phase D — Anti-aging / antioxidant system (add cool)

- MultiSal® Vitamin C — 5.0%
- Tocopherol — 0.5%
- Bisabolol (optional) — 0.2% (comfort)
- Fragrance — 0–0.1% (optional; low is better for retinol-like positioning even if none)
  q.s. to 100%
- Dimethicone or Cyclopentasiloxane/Isododecane — to 100%
- (Typically ~4–8% depending on pigment load and desired viscosity.)

Processing

1. Pre-disperse pigments/powders into Phase B using a high-shear disperser or 3-roll mill until uniform and smooth.
2. Add Phase A components and mix until homogeneous (target a pourable but creamy viscosity).
3. Cool to <35–40°C.
4. Add MultiSal® Vitamin C last and mix gently (low shear) just to uniform dispersion.
5. Fill into airless pump or squeeze tube (best for oxidation control and consumer use).

free, powder and serum with low water activity.

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APPLICATIONS

Skin-Brightening Soap Bar with Vitamin C

Option A: Syndet
Lower alkalinity, gentler on skin, better for brightening claims.

Base Formula (100%)
-Sodium Cocoyl Isethionate (SCI, noodles/powder) — 45.0%
-Sodium Stearate — 12.0%
-Stearic Acid — 8.0%
-Cocamidopropyl Betaine (powder or paste, low water) — 6.0%
-Glycerin — 6.0%
-Shea Butter — 4.0%
-Caprylic/Capric Triglyceride — 3.0%
-MultiSal® Vitamin C — 5.0%
-Titanium Dioxide (optional, brightness/opacity) — 1.0%
-Fragrance — 0.5%
-Preservative (if needed for humectant phase) — 0.5%
-Sodium Chloride / Sodium Isethionate — q.s. to 100% (≈4.0%)

Why syndet works
No high-pH saponification → better capsule stability
MultiSal® Vitamins C remains protected until water + rubbing during washing
Gentler cleansing supports brightening / even-tone positioning

Option B: Traditional Soap Bar (Cold Process)
Possible, but higher pH—use for “wash-off brightening” positioning.

Oil Phase (before saponification)
-Coconut Oil — 30.0%
-Palm Oil or RSPO alternative — 25.0%
-Olive Oil — 20.0%
-Shea Butter — 10.0%
-Castor Oil — 5.0%

Additives (post-trace)
-MultiSal® Vitamin C — 5.0%
-Titanium Dioxide — 1.0%
-Fragrance — 0.5%
-Sodium Lactate — 1.0%
-Lye + Water — q.s. (standard SAP, use minimum water)

Important: Add MultiSal® Vitamins C, mix well. Claims should focus on appearance of brightness and radiance, not Vitamin C penetration.

Processing Notes
Keep processing temperature ≤60 °C when adding MultiSal® Vitamins C.
Add MultiSal® Vitamins C last, under low shear
Avoid excess free water in syndet bars
Cure/dry thoroughly before packing

Claim-Appropriate Positioning
Instant / Wash-Off
-Helps reveal brighter-looking skin
-Removes dullness-causing impurities
-Leaves skin looking fresh and radiant

Technology-Driven
-Encapsulated Vitamin C
-Water-activated release during cleansing
-Stable Vitamin C delivery in a solid format

Packaging
-Flow-wrap or carton with low humidity
-Avoid glycerin “sweating” (use barrier film if needed)

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APPLICATIONS

Skin Brightening Serum

Form type: Low-water emulsion / anhydrous serum
Target: Brightening, tone evenness, antioxidant protection

Phase A – Oil / Carrier Phase (≈78–82%)

Ingredient	% w/w	Function
Caprylic/Capric Triglyceride	30.0	Lightweight emollient
Squalane (olive or sugar-derived)	18.0	Barrier support
Isoamyl Laurate	8.0	Fast-absorbing, silky feel
Dimethicone (5–10 cSt).	6.0	Slip, glow, water barrier
Hydrogenated Polyisobutene.	6.0	Soft-focus, serum body
Polyglyceryl-6 Polyricinoleate.	4.0	Low-water emulsifier
Polyglyceryl-4 Oleate	2.0	Co-emulsifier

Phase B – Brightening Actives

MultiSal® Vit C	5.0.	Antioxidant, tone brightening
Niacinamide (oil-dispersible).	2.0	Tone evenness, barrier
Alpha-Arbutin (SalSphere® Light)	1.0.	Pigment modulation
Tocopherol (Vitamin E)	0.8	Antioxidant synergy
Ferulic Acid (oil-soluble)	0.3.	Photostability support

Phase C – Minimal Water Phase (≤10%)

Water	6.0.	Controlled hydration
Glycerin	1.5	Low-activity humectant
Propanediol	1.0.	Solvent, penetration aid
Preservative (oil/low-water compatible)	0.5	Protection

Total Water Content: ~7.5%

Processing Notes

1. Heat Phase A to ~60 °C until uniform.
2. Prepare Phase C separately at room temperature.
3. Slowly add Phase C into Phase A under low shear.
4. Cool below 40 °C, then gently disperse Phase B actives.
5. Avoid high shear to prevent premature swelling or release.

To create a stable orange color that masks Vitamin C

Some vitamin C may gradually leak from the system over time, leading to visual instability such as yellowing or browning. To mask this effect without compromising formulation integrity or product claims, a stable inorganic pigment system can be used. The most effective approach is a blend of iron oxides (CI 77491 / CI 77492), which provides a consistent orange hue while remaining chemically inert, highly light- and oxidation-stable, and fully compatible with vitamin C–based formulations.

- CI 77491 (Red Iron Oxide) + CI 77492 (Yellow Iron Oxide)
- Excellent for: Serums, Creams, Foundations, Soap bars

Typical use level:

- 0.05–0.3% (very efficient)

Anti-Aging Serum

Actives: 5.0% MultiSal® Vit C + 2.0% MultiSal® Retinol
Form type: low-water emulsion-serum (W/O-lean)

Phase A — Oil / Carrier (≈80–85%)

Caprylic/Capric Triglyceride (CCT) — 28.0% (main carrier, slip)
Squalane 18.0% (barrier support, sensory)
Isoamyl Laurate — 8.0% (fast-dry emollient)
Hydrogenated Polyisobutene — 8.0% (cushion, “serum body”)
Dimethicone (5–10 cSt) — 6.0% (silky feel, helps reduce water contact)
Polyglyceryl-6 Polyricinoleate — 4.0% emulsifier
Polyglyceryl-4 Oleate — 2.0% (co-emulsifier)
Tocopherol — 0.8% (antioxidant support for oil phase)
Ferulic Acid (oil-soluble grade) — 0.2% (antioxidant synergy)

Phase B — Low-Water Phase (≤10%)

Deionized Water — 6.0%
Glycerin — 1.5%
Propanediol — 1.0%
Preservative 0.5%
Total water: 6.0% (well under 10%)

Phase C — Encapsulated Actives

MultiSal® Vitamin C — 5.0%
MultiSal® Retinol — 2.0%

Phase D — q.s. to 100%

CCT (or Isoamyl Laurate) — to 100%
(In this formula, q.s. is ~0%—it should land at 100% as written. If you tweak anything, balance with CCT.)

Processing (important for keeping capsules intact)

Phase A: Combine and mix; heat to 55–60 °C just until uniform.
Phase B: Premix at room temp until clear.
Add Phase B into Phase A slowly under low to medium shear to form a smooth low-water emulsion-serum.
Cool to ≤35–40 °C.
Add Phase C, MultiSal® capsules

Fill in airless pump or opaque packaging (best for retinol systems).

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References

	Claims	Reference
1	Enhanced Stability: Encapsulation protects these vitamins from degradation caused by exposure to light, air, and other environmental factors, thereby preserving their potency over time. This ensures that the active ingredients remain effective throughout the product's shelf life	https://fig-1.co/blogs/lab-notes/ask-a-chemist-what-is-encapsulated-vitamin-c?utm_source=chatgpt.com
2	Controlled Release: The encapsulation process allows for a sustained and controlled release of vitamins C and E upon application. This prolonged delivery enhances their efficacy in skin care treatments, providing continuous antioxidant protection and skin benefits.	https://www.ejollify.com/microencapsulated-skincare-ingredients/?utm_source=chatgpt.com
3	Synergistic Antioxidant Effects: Combining vitamins C and E enhances their antioxidant performance, offering superior protection against premature skin aging. This synergistic interaction helps in neutralizing free radicals more effectively, promoting healthier and more resilient skin.	https://www.marykay.com/en-us/tips-and-trends/loveyourskin/skincare101/skinbenefitsofvitamincandvitamine?utm_source=chatgpt.com
4	Improved Skin Penetration: Encapsulation can facilitate deeper penetration of these vitamins into the skin layers, maximizing their beneficial effects such as collagen synthesis stimulation and reduction of hyperpigmentation.	https://www.ejollify.com/microencapsulated-skincare-ingredients/?utm_source=chatgpt.com