Unique&Easy Micro-Encapsulation Solutions

HydroSal® SalSilk

Fuller, Healthier Hair You Can See and Feel

HydroSal® SalSilk is an advanced delivery system engineered to restore and rebuild hair fibers with vegan keratin. This technology is designed to maintain a healthy, youthful hair appearance by targeting damaged and thinning strands—enhancing natural shine, strength, and volume. The technology features sub-micron spheres engineered for the targeted delivery of vegan keratin (Figure 1) on hair fibers.

Each sphere contains a keratin-infused core encapsulated by a polymeric shell. This shell enhances adhesion to the hair shaft and enables a prolonged, controlled release
Keratin and the vegan replacement used in this product are natural structural proteins essential for strong, healthy-looking hair.

Over time, age and exposure to harsh chemicals deplete keratin, resulting in surface damage, weakened strands, and visible thinning.
HydroSal® SalSilk helps counteract these effects and promotes visibly denser, healthier, and more resilient hair.



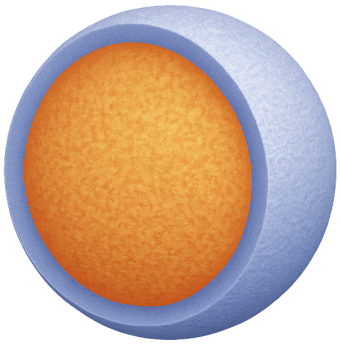


Figure 1: Illustration of HydroSal® SalSilk with a center core and a shell. Both fraction have signifian roll in changing the appearance of the hair.

HydroSal® SalSilk is a suspension (Figure 2), based on a submicron sphere.

When using this product, you can claim the following:

- Noticeably healthier-looking hair with improved thickness and smoothness
- Vibrant natural shine, silky texture, and enhanced manageability
- Environmentally safe and hair-friendly formulation
- Suitable for daily use at home, delivering salon-quality results
- Versatile for use in shampoos, conditioners, serums, and other hair care products



Figure 2: Appearance of HydroSal® SalSilk.

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The functional ingredients

1, D-Panthenol, pro-vitamin
- Penetrates the hair shaft and binds moisture, improving hydration and elasticity
- Forms a smooth film on hair, adding shine and reducing friction
- Helps reduce breakage and split ends, supporting length retention in thinning hair

2, Hydrolyzed silk amino acids
- Rich in low-molecular-weight peptides that penetrate hair fibers
- Strengthens and repairs damaged keratin structure
- Enhances smoothness, shine, and manageability
- Improves the look and feel of fragile or thinning hair

3, Natural emollient, alternative to silicone.
- Provides a lightweight, non-greasy conditioning effect
- Improves slip and detangling, reducing mechanical damage during combing
- Enhances shine and smooth texture without weighing hair down—essential for thin or fine hair
- Helps maintain a healthy appearance by sealing moisture into the cuticle.

4, Oil-soluble plant-derived keratin alternative
- Mimics the structure of natural keratin to rebuild the protein matrix of damaged hair
- Helps restore strength and resilience to chemically treated or weakened strands
- Provides lasting film-forming properties that protect against further damage
- Supports volume and thickness by reinforcing the hair shaft

1, Pro-vitamin B5



3, Natural silicone alternative



2, Amino Silk



4, Vegan Keratin



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HydroSal® technology

HydroSal® is a proprietary sub-micron encapsulation technology that transforms the way active ingredients perform in beauty and personal care products. This cutting-edge technology encapsulates powerful ingredients inside ultra-fine spheres that release over time, delivering prolonged, targeted effects where they're needed most.

Key Technical Features and Benefits:

Features	Benefit to Consumer
Particle size: Typically 0.1–1 micron	Enables precise, even distribution on hair for more consistent results and better performance.
Core types: Solid, lipid	Delivers keratin and moisturizers over time to boost texture, style memory, and frizz control. Heat-activated lipid core enhances adhesion to hair.
Shell composition: Functional polymers	• Enhances compatibility and boosts long-lasting adhesion to hair. • Targets damaged areas for visible thickness, shine, and smoothness.

Applications:

- Used in rinse-off and leave-on formulas for haircare, skincare, odor control, and anti-aging treatments
- Compatible with water and hydroalcoholic bases and surfactant-rich formulations

HydroSal® SalSilk consists of a core–shell structure, where actives (hydrophilic or lipophilic) are infused within a solid inner matrix and further encapsulated by a polymeric shell.

The solid **core** is composed of Shea Butter, Cetearyl Alcohol, and Cetearyl Glucoside, blended with a natural mix of esters. It remains semi-solid at room temperature, providing a stable matrix for encapsulating D-Panthenol, Vegan Keratin, and Amino Silk Proteins (Figure 1).

The **shell** is composed of the following key components:

- **Hydroxypropyl Guar Hydroxypropyltrimonium Chloride** – a cationic polysaccharide that enhances adhesion to negatively charged hair fibers, particularly in damaged areas. It forms a conditioning film that improves substantivity and softness.
- **Hyaluronic Acid Complex** – provides moisture retention and flexibility to the polymeric shell. It functions as both a humectant and a binder within the matrix, supporting hair hydration and improving scalp comfort.
- **Hydrolyzed Vegetable Protein** – a penetrative, film-forming protein that mimics natural keratin. It reinforces the hair structure and enhances long-lasting adhesion to the hair shaft through semi-covalent interactions.

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Mechanism of action

HydroSal® SalSilk – Smart Keratin Delivery for Stronger, Shinier, and Fuller Hair

HydroSal® SalSilk is a sub-micron delivery system engineered to efficiently deposit vegan keratin onto the hair shaft, forming a uniform, adherent, and protective layer that reinforces the hair's structure and improves its aesthetic appearance.

Mechanism of Action (Figure 3):

1. Efficient Deposition and Adhesion:

A sub-micron sphere with a diameter of approximately 0.1 micron (100 nanometers) can readily deposit onto the hair shaft, particularly in areas where the cuticle is disrupted or damaged. In damaged hair, cuticle cells become lifted, misaligned, or partially missing, creating gaps and irregularities on the hair surface. These defects increase the surface roughness and electrostatic charge, which enhances the adsorption of small, functional particles like HydroSal® SalSilk.

The small size and high surface-area-to-volume ratio of the spheres allow them to penetrate microfissures and anchor within these cuticular gaps, resulting in targeted delivery of keratin to the most compromised areas—where repair is needed most.

The sub-micron spheres are surface-active and designed to adhere selectively to the negatively charged, damaged areas of the hair cuticle. The polymeric shell facilitates strong contact with the hair surface, ensuring localized delivery of keratin where it's needed most.

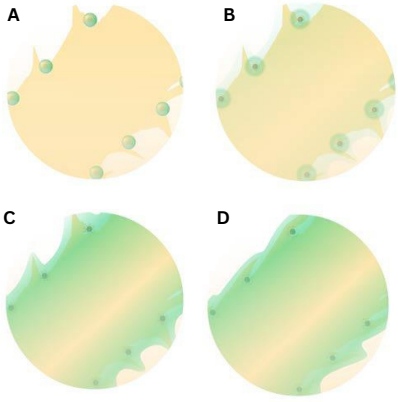


Figure 3: An illustration of HydroSal® SalSilk's mechanism of action on damaged hair. HydroSal® SalSilk (A) targets the damaged hair shaft where the cuticles are lifted, (B) adheres to the hair, (C) forms a protective layer along the hair shaft that (D) makes the cuticles flush with the rest of the hair shaft and results in thicker, healthier-looking hair.

2. Modulated Keratin Release by Diffusion:

- Keratin is infused into the core of each particle and released via diffusion through the semipermeable polymeric shell. This controlled release mechanism extends the activity of the keratin on the hair over time, contributing to lasting thickening effects, enhanced shine, and improved tensile strength.

3. Thermal and Mechanical Protection:

- The shell itself forms a film-forming layer that acts as a protective barrier against heat-induced damage from tools like flat irons and blow dryers. This layer also helps minimize moisture loss, reduce breakage, and improve combing manageability, particularly in chemically treated or aging hair.

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In-use test results

We used the following protocol to qualify HydroSal® SalSilk in a rinse-off conditioner with 2% HydroSal® SalSilk.

	Ingredient	% w/w
1	Water	QS to 100
2	Cetearyl Alcohol	3
3	Behentrimonium Chloride	1.5
4	Cetyl Alcohol	2.0
5	Glycerin	2.0
	Procedure: 1. Heat Phase A to 70–75°C with gentle mixing until completely uniform.	
	Phase B – Cool-Down Phase to below 40°C with slow, gentle stirring, adjust pH to 4.5-5	
6	HydroSal® SalSilk	2.0

Hair was treated with a rinse-off conditioner containing HydroSal® SalSilk (Figure 4). After rinsing, the hair was blow-dried and combed through.



Figure 4: (A) Before and (B) after application of HydroSal™ SalSilk from a rinse-off conditioner shows visible improvement in shine, thickness and combability.

The images (Figure 4), along with panelist feedback, support the claim that the inclusion of HydroSal® SalSilk technology results in smoother, thicker, and more voluminous hair.

The sub-micron delivery system forms a protective layer along the hair shaft, helping to seal cuticle damage and reinforce fiber structure. This targeted action contributes to visibly thicker hair, long-lasting shine, and an overall healthier and fuller appearance.

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Hair Thickness Measurement

Optical Microscopy

- Individual hair fibers are placed under a calibrated microscope with a measurement scale.
- Measuring the diameter (µm) of hair fibers.

A study was done to determine the effect of HydroSal® SalSilk on hair thickness when used in a rinse-off hair conditioner application to free keratin and a keratin-containing market product (Figure 5).
Measuring hair thickness is used to evaluate hair diameter. Individual hair strands are examined under a microscope, and thickness is determined by analyzing the captured images.

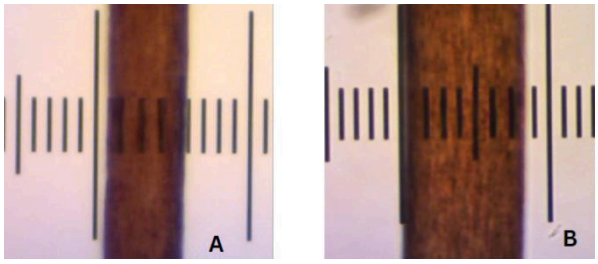


Figure 5: Microscopy of untreated hair strand (A) and HydroSal® SalSilk treated hair strand (B), 100x magnification. (number of hair fibers, n=10).

This example shows thicker hair with HydroSal® SalSilk. Thickness improved from 0.05mm (A) to 0.085mm (B) (Figure 5).

A more detailed study was conducted using 10 randomly selected hair strands per group. The strands were treated with (1) a base formulation containing a blend of actives at concentrations similar to those used in HydroSal® SalSilk, (2) a leading market product claiming to increase hair thickness, and (3) the same base (as 1) formulation containing 2% HydroSal® SalSilk.

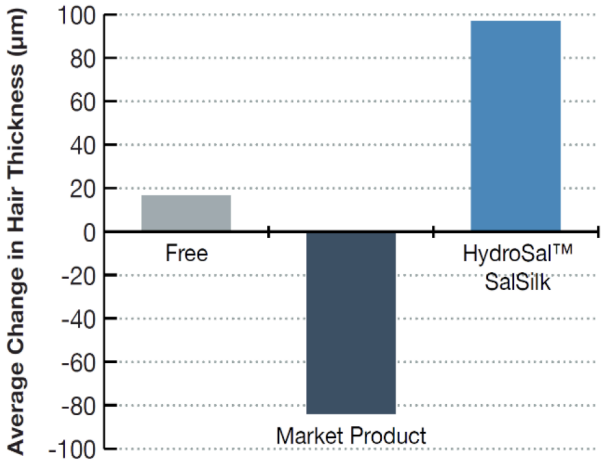


Figure 6: Average change in thickness of hair strands post-rinse after treatment with a market product containing keratin vs. HydroSal® SalSilk from rinse-off applications (n=10).

This comparison supports the conclusion that HydroSal® SalSilk effectively increases hair thickness. Hair strands treated with HydroSal® SalSilk showed a six-fold increase in diameter compared to those treated with free keratin. In contrast, the benchmark commercial product resulted in a decrease in hair thickness of approximately 85 microns.

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Style memory, Anti-frizz properties

Testing the anti-frizz properties of hair care products was conducted using uniform swatches of untreated (virgin) human hair. A leave-in conditioner (0.1 g), with and without HydroSal® SalSilk, was applied evenly to each swatch. A control group using the same conditioner formulation without HydroSal® SalSilk was included for comparison.

The hair swatches were allowed to dry and then styled to form uniform curls (Figure 7). After one hour, the swatches were placed inside a humidity chamber set to high humidity levels (e.g., 100%) for an additional hour. This chamber simulates extreme environmental conditions known to induce frizz. Following exposure, the swatches were hung vertically and aligned along a measurement board to assess changes in curl length and frizz response.



Figure 7: Styling hair swatches to measure retention of curls.

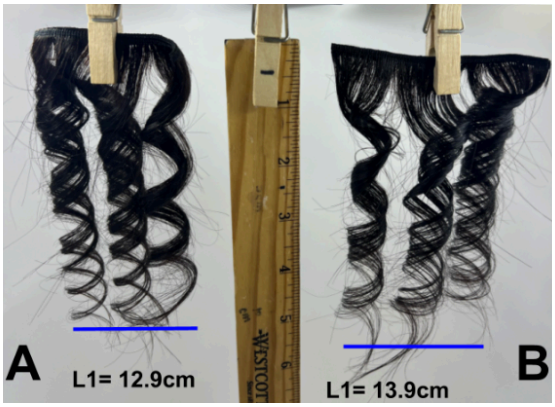


Figure 8: Hair swatches before frizz test.
A- Without technology
B - With 5% SalSphere® SalSilk

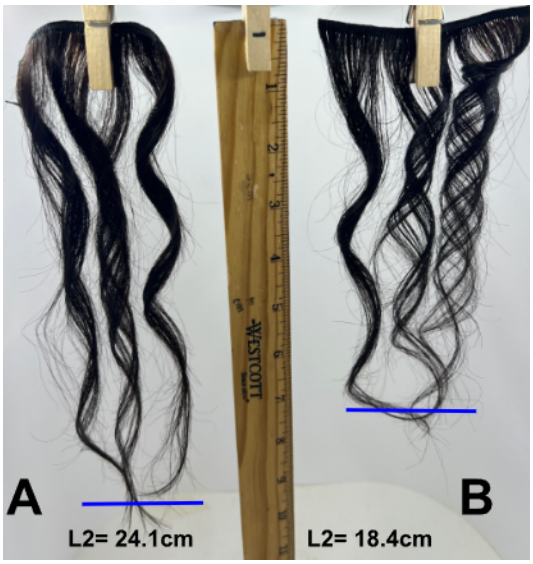


Figure 9: Hair swatches before frizz test.
A- Without technology
B - With 5% SalSphere® SalSilk

The swatch treated with HydroSal® SalSilk (B) exhibited significantly less frizz compared to the base sample (A). The control hair swatch retained **75.5%** of the style.

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Product Overview - 8392-14

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Technical Data

INCI

Benzyl Alcohol, Brassica Alcohol, Butylene Glycol, Capryloyl Glycerin/Sebacic Acid Copolymer, Cetearyl Alcohol, Cetearyl Glucoside, Chenopodium Quinoa Seed Extract, Diheptyl Succinate, Glucose, Glycerin, Hydrolyzed Cicer Seed Extract, Hydrolyzed Sodium Hyaluronate, Hydroxypropyl Guar, Lens Esculenta (Lentil) Fruit Extract, Panthenol, Pentylene Glycol, Phenethyl Alcohol, Potassium Sorbate, Propanediol, Prunus Armeniaca (Apricot) Kernel Oil, Saccharomyces/Rice Ferment Filtrate, Silk Amino Acids, Sodium Benzoate, Sodium Hyaluronate, and Water (Aqua).

Specification of HydroSal® SalSilk

Specification	Characteristic
Appearance at 20C	Viscous liquid
Color	Off White
Odor	Characteristic
pH (Neat)	4.0-6.0



Figure 8: A, HydroSal® SalSilk as a raw material, and B, HydroSal® SalSilk in a leave-in conditioner at 2%.

Applications

Formulation of leave-in conditioner with HydroSal® SalSilk Technology.

INCI	Wt (%)
Aqua	92
Polyglyceryl-4 Laurate	1.7
Bis-(isostearoyl/oleoyl isopropyl) dimonium methosulfate	1.7
Glycerin	1.7
HydroSal® SalSilk	2
Preservative	0.9
Total	100

Formulation of Shampoo with HydroSal® SalSilk

INCI	Wt (%)
Aqua	58
Hydroxypropyl Guar (AND) Hydroxypropyltrimonium Chloride	0.50
Glycerin	1.25
Xanthan Gum	0.50
Coco Glucoside	13.00
Sodium Cocoyl Glutamate	10.00
Glyceryl Stearate	1.50
Cocamidopropyl Betaine	11.00
Glyceryl Oleate Citrate (and) Caprylic/Capric Triglyceride	1.0.
Sorbitol	1.00
HydroSal® SalSilk	2
Preservative	1.25

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Ingredients	Functionality	References
Provitamin B5 (D-Panthenol)	Acts as a **humectant**, binding moisture to the hair shaft, improving flexibility and reducing breakage. Forms a smooth film on the hair surface, enhancing shine and manageability. Improves the tensile strength of damaged hair.	Robbins, C.R. Chemical and Physical Behavior of Human Hair, 5th Edition, Springer, 2012. Draelos, Z.D. “Hair cosmetics.” Dermatologic Clinics, 29(2), 2011, pp. 163–171. Weller, R.B., Hunter, J.A.A., Savin, J., Dahl, M.V. Clinical Dermatology, 4th Edition, Blackwell Publishing, 2008.
Hydrolyzed Silk Amino Acids	Contains low-molecular-weight peptides that **penetrate the hair cuticle**, improving strength and resilience. Enhances shine and smoothness by filling surface irregularities. Provides protective film-forming properties that reduce friction and mechanical damage.	Robbins, C.R. *Chemical and Physical Behavior of Human Hair*, 5th Edition, Springer, 2012. Nishikawa, K., & Doty, P. "Structure of silk fibroin films." *Journal of the American Chemical Society*, 1958, 80(4), 1003–1008. Goddard, E.D., & Gruber, J.V. *Principles of Polymer Science and Technology in Cosmetics and Personal Care*, CRC Press, 1999.
Natural Emollient	A silicone alternative (ester blend) that provides lightweight conditioning without build-up. Improves hair slip and detangling, reducing breakage caused by mechanical stress. Enhances shine and softness while maintaining hair volume.	Karabasanagouda, T., et al. “Natural ester oils as emollients in hair and skin care.” Cosmetics & Toiletries, 131(10), 2016, pp. 756–765. Goddard, E.D., & Gruber, J.V. Principles of Polymer Science and Technology in Cosmetics and Personal Care, CRC Press, 1999.
Vegan Keratin	Plant-derived alternative to animal keratin. Mimics the natural keratin structure in hair, replenishing lost proteins and reinforcing the cuticle. Forms a protective film to seal and smooth hair fibers, improving strength and preventing damage.	Robbins, C.R. Chemical and Physical Behavior of Human Hair, 5th Edition, Springer, 2012. Almeida, I.F., et al. “Hair fiber morphology and keratinization process: Implications for cosmetic treatment.” International Journal of Cosmetic Science, 39(5), 2017, pp. 447–455. CosIng (Cosmetic Ingredient Database), EuropeanCommission. Entry on “Hydrolyzed Keratin.”