

WHITE PAPER

Fine Silicas Enable the Power of Microencapsulation for Personal Care Products

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Microencapsulation is an important carrier system technique in personal care product formulation because it protects the active ingredient from instability and degradation caused by factors like light exposure, temperature, evaporation and oxidation. Microencapsulation ensures that the active ingredient remains potent and is released only when the product is applied or absorbed into other products.

Choosing the right shell material and microencapsulation method depends on the active ingredient and the intended application or final product. Shells can be made from various materials, including bio-based substances like oils, proteins or sugars or synthetic polymers. Fine silica microspheres, known for enhancing performance properties of personal care products, are an effective, environmentally safe alternative for encapsulation shells.

Silica Microspheres in Skincare and Cosmetic Formulations

RESIFA™ SOLESPHERE™ silica microspheres from AGC are widely used in skincare and cosmetics formulations as fillers to diffuse light for a matte effect, absorb sweat and sebum, and contribute to a smooth feel and application. They are environmentally safe, non-nanoparticle, nonplastic, nonpetroleum ingredients and are an ideal alternative to Nylon 12, polymethyl methacrylate (PMMA) and other plastic beads used in cosmetics and personal care products.

SOLESPHERE silica is made from silicon dioxide, a natural and sustainable material, and they are Ecocert and COSMOS certified for safety and sustainability. Most grades are porous, so they naturally reflect light, providing an SPF boost for sunscreen formulations.

These microspheres possess a lower coefficient of friction compared to titanium dioxide and other popular fillers. At the molecular level, their freer movement enhances both touch and visual aesthetics. Their near-perfect spherical shape allows for more uniform formulations that apply smoothly to the skin. Additionally, the microspheres are sturdy and do not deform easily under pressure, ensuring products glide on effortlessly.

RESIFA™ SOLESPHERE™ H-33 Silica for Microencapsulation

RESIFA SOLESPHERE H-33 silica is a natural, high-oil-absorption fine silica with a high surface area. Not only is it used in products to absorb oil and sebum from skin, but it can also be loaded with oil and fragrances while remaining in a free-flowing powder form. These attributes pave the way for creating innovative products such as powdered cleansers, soaps and deodorants with enduring fragrance.

RESIFA SOLESPHERE H-33 for microencapsulation traps oils and other active ingredients in the silica's microporous structure to form dry, waterless powders. The internal capsule ingredients are not activated until mixed with water or absorbed into other products, enabling applications in powder form including:

- Shower and bath gels
- Lotions and creams
- Powdered shampoos
- Dry shampoos
- Sunscreens
- Perfumes
- Exfoliants

Turning Oils Into Powders

RESIFA SOLESPHERE H-33 silica can absorb and encapsulate between 50% and 200% of its mass in oil, depending on the emollient used and the desired product texture. It provides optimal absorption and encapsulation performance for commonly used therapeutic oils such as jojoba, argan and tea tree oil. The silica allows for greater amounts of oil to be incorporated into formulations without causing phase separation as compared to adding in liquid form.

RESIFA SOLESPHERE H-33	
INCI Name	Silica
Appearance	White, powder
Particle Size	~3 µm
Oil Absorption	400 mL/100 g
Surface Area	600–800 m ² /g
Pore Volume	~1.8 mL/g

The table below lists the amounts of common oils absorbed with one gram of RESIFA SOLESPHERE H-33 silica.

Appearance	Oil Types					
	Jojoba Oil	Coconut Oil	Caprylic/Capric Triglyceride	Neossance™ Squalane	Tea Tree Oil	Clear Imitation Vanilla Extract
Fine powder	0.5 g	0.5 g	0.5 g	0.6 g	0.5 g	0.5 g
Dry, slightly clumpy, flowing powder	1.32 g	1.25 g	0.8 g	1.3 g	0.875 g	0.9 g
Sticky, clumpy powder but suitable if adding to a formulation	2.06 g	2.00 g	1.05 g	1.75 g	1.75 g	1.59 g

The most efficient way to combine ingredients is by using a mortar and pestle, pressing and breaking up the oil clumps to ensure even dispersion throughout the powder. If a large amount of oil is being added to the silica, it may be necessary to scrape the sides of the mortar with a spatula halfway through the process. Using simpler mixing methods may result in oil clumps that do not disperse thoroughly enough within the silica for complete blending.

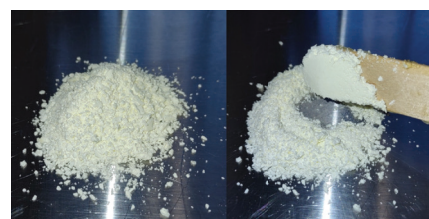
The images below illustrate the appearance of the SOLESPHERE silica when different amounts of jojoba oil are added.



0.5 g of jojoba oil absorbed in 1 g of RESIFA SOLESPHERE H-33 silica is still a fine powder



1.32 g of jojoba oil absorbed in 1 g of RESIFA SOLESPHERE H-33 silica is dry, but a bit clumpy



2.06 g of jojoba oil absorbed in 1 g of RESIFA SOLESPHERE H-33 silica is sticky

Benefits of using RESIFA SOLESPHERE H-33 silica for the microencapsulation of oils into powders include:

- Stability—prevent active ingredients from losing their efficacy as soon as they are bottled
- Protection—safeguard against UV degradation and/or oxidation
- Sustainability—provide longer shelf life by developing products in powder form
- Eco-friendliness—eliminate the need for water and reduce package weight and plastic usage
- Easier incorporation—reduce or eliminate preservatives and surfactants
- Enhancement—enable higher levels of oils to be added to formulations
- Safety—protect active ingredients from phase separation in final form, which could affect product performance

Formulations Demonstrate Results

AGC worked with ACT Solutions Corp. to develop test formulations that exhibit the performance advantages of RESIFA SOLESPHERE H-33 for encapsulation.

Face, Body and Hand Soaps

Powdered cleansers are water-free, enabling the consumer to create a personal texture for each need and skin type. RESIFA SOLESPHERE encapsulates key ingredients for hand, face and body soaps that are activated by adding water. These soaps in powdered form create great foam.

Formulations ACTS23735 (Face Soap), ACTS23736 (Body Wash) and ACT23737 (Hand Soap) are excellent examples of powdered cleansers in which RESIFA SOLESPHERE silica encapsulates fragrances and jojoba oil to form a powder.



Powdered Shampoo

RESIFA SOLESPHERE allows high levels of fragrances and oils in a powdered form. Encapsulating with RESIFA SOLESPHERE has many benefits because water and preservatives for bacteria control are not needed. Pigments can be dispersed into an emollient and added to the silica to create powdered shampoos for any hair color. Powdered shampoos are environmentally friendly because less plastic is needed, which helps to reduce waste.

Formulation ACTS23960 is a great example highlighting RESIFA SOLESPHERE H-33 in a powdered shampoo.



Powdered Fragrances

RESIFA SOLESPHERE carries fragrance to the skin and absorbs oil and moisture, giving the fragrance staying power. RESIFA SOLESPHERE significantly protects fragrances because it prevents oxidation and allows easy incorporation into an emulsion. Fragrances encapsulated by the silica have a longer-lasting effect than fragrances placed directly into formulations.

ACTS23735, ACTS23736, ACT23237 and ACTS23960 are several examples of RESIFA SOLESPHERE absorbing fragrances into a powder.

Powdered Cosmetics

RESIFA SOLESPHERE is ideal for encapsulating fragrances as well as promoting uniform color dispersion in cosmetic powders.

Formulation ACTS23796 is a good example of a mattifying setting powder in which RESIFA SOLESPHERE encapsulates fragrance and provides color uniformity.



Deodorants

RESIFA SOLESPHERE H-33 encapsulates fragrances that can be used to create deodorants that not only absorb odor but also release fragrance slowly throughout the day, resulting in a fresh smell all day long.

ACTS23770 is a simple deodorant formulation in which RESIFA SOLESPHERE H-33 encapsulates lavender fragrance.

Dry Shampoo

RESIFA SOLESPHERE provides two functions in dry shampoos. First, it encapsulates fragrances and carries them to the hair and scalp and releases a fresh scent all day long. Second, the silica is a great absorber of oil from the hair and scalp.

Formulation ACTS23977 is an example in which RESIFA SOLESPHERE H-33 forms a powder and absorbs oil from the hair.

Concluding Thoughts

Microencapsulation is vital in personal care product formulation, safeguarding active ingredients from degradation and enabling controlled release of the agent. RESIFA™ SOLESPHERE™ silica microspheres are environmentally safe fillers used in skincare and cosmetics, offering smooth application, sweat and sebum absorption and a matte effect. Formulators can create stable, protective, sustainable, eco-friendly and easily incorporated products using these silica microspheres.

For more information about RESIFA SOLESPHERE H-33 silica formulations or to submit a product inquiry or sample request, visit resifasolesphere.com or call 1-800-424-7833.

For samples of any of the ACT formulations incorporating RESIFA SOLESPHERE H-33 silica encapsulation, visit www.ACTSolutionsCorp.com or email info@actsolutionscorp.com.

To learn more visit www.ResifaSolesphere.com
or contact an AGC product expert at 800-424-7833.

AGC's RESIFA™ SOLESPHERE™ product line is a series of revolutionary spherical silicas that vastly improve any personal care product to which they are added. Made from silicon dioxide, a natural and sustainable material, RESIFA™ SOLESPHERE™ gels are Ecocert- and COSMOS-certified for safety and sustainability.



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