SILIGEL™
THE FOOLPROOF GELLING AGENT
WITH AMAZING SILICONE-LIKE SKIN FEEL!

Ingredient Passport

Exceptional electrolyte tolerance
Sea water
AHA
Zinc sulfate
Salts
Thermal water
Name: Siligel™

INCI: Xanthan Gum (and) Lecithin (and) Sclerotium Gum (and) Pullulan

Appearance: Light beige powder

Optimum pH: 2-10

Applications:
- Gelling agent: 0.5-2%
- Stabilizer: > 0.5%
- Co-emulsifier: > 0.5%
- Skin feel enhancer: > 0.3%
- Suspending agent: > 1.2%

Dosage: 0.3-2%

<<<<<Green processed>>>>>

<<Outstanding silicone-like skin feel<<
1. “Summary”
2. “Product Benefits”
3. “Prototypes”
4. “Process & formulation advice”
1

SUMMARY

SILIGEL™

THE FOOLPROOF GELLING AGENT
5 MINUTE PITCH

Discover our new, natural and foolproof gelling agent that provides an amazing silicone-like skin feel! Patented and optimized combination of phospholipids and polysaccharides, Siligel™ is a smart ingredient that revolutionizes the use of gums. Easy to use, Siligel™ does not require any pre-dispersion even when used in a cold process as opposed to gums. With Siligel™, dispersion problems which generate lumps are things of the PAST! Particularly resistant to a high amount of electrolytes, Siligel™ is the natural solution to easily create sturdy formulations even in extreme conditions with no compromise between efficiency and aesthetics!

STRONG ENOUGH TO RESIST...

Being very performing, Siligel™ offers a maximum resistance to electrolytes (up to 20%) making it the ideal partner for formulations enriched with active ingredients (as concentrated serums), containing stressful ingredients as preservatives or sea, mineral or thermal water... Siligel™ is compatible with pigments, mineral & chemical sunscreens, alcohol and is stable over a wide pH range.

The versatility of Siligel™ leads to several applications and uses:

• gelling agent for aqueous phase;
• thickener;
• stabilizer;
• co-emulsifier;
• suspending agent (for glitters, pearlescent pigments, beads, sand...).

Easy to use, Siligel™ can be processed at cold or hot process and can be incorporated into water phase at the beginning of the process or at the end of the process after emulsion in order to adjust the viscosity of a formula. Siligel™ does not require neutralization just as most of the conventional thickening agents, which simplifies the process. The incorporation of Siligel™ is much easier than natural gums such as xanthan or sclerotium gums since Siligel™ is more dispersible thanks to the presence of lecithin which allows to avoid the risks of lumps even in a cold process.

...BUT SOFT ENOUGH TO SEDUCE!

Besides its famous and typical Phospholipid Touch, the optimized composition of Siligel™ offers to formulas an exceptional silicone-like skin feel characterized by a high gliding sensation and an ultra-soft after feel. Thanks to its unique signature, Siligel™ can be used to substitute silicones both in natural and in conventional formulas which will decrease the amount of synthetic gelling agents or reduce the negative sensorial aspects of some thickeners.

The natural origin of Siligel™, its sustainable cold process (energy saving) and its safe ecotoxicity profile answer today’s demand for eco-friendly functional ingredients. Because of its high sensoriality, flexibility and performance, Siligel™ is an all-in-1 ingredient allowing saving on the purchase of extra raw materials and on warehouse floor space.

As phospholipids are skin-identical molecules, Siligel™ is much more than an average gelling agent! Siligel™ brings moisturizing properties to the skin and helps improve the penetration and bioavailability of active ingredients for faster and better results.
**Easy to Use**
- Cold or hot process
- Ease of dispersion:
  - No pre-dispersion
  - No lumps
- Introduction into water phase at the beginning of the process or at the end of the process after emulsion

**Technical Characteristics**
- Multi-usage:
  - Gelling agent of water phase/
  - Thickener/Co-emulsifier/
  - Stabilizer/Skin feel enhancer/
  - Suspending agent
- High compatibility with:
  - Electrolytes
  - Pigments
  - Sunscreens

**Sustainable Ingredient**
- Natural lecithin & polysaccharides
- Green process
- Cold & dry production
- Cold process

**Key Points**

**Texture & Skin Feel**
- Amazing silicone-like skin feel: softness & gliding
- Comfortable after-feel
- Poor threading
- Non-gelly aspect
Product Benefits

Siligel™

Designed to perform & seduce
PHOSPHOLIPIDS BENEFITS

The uniqueness of phospholipids!
Phospholipids are skin-identical molecules due to the fact that they are essential constituents of the cell membranes of all living organisms and therefore provide technical and physiological properties. In a topical application, phospholipids present a particular affinity with the skin (strong biocompatibility for an optimal tolerance).

<table>
<thead>
<tr>
<th>CHARACTERISTICS</th>
<th>SILIGEL™</th>
</tr>
</thead>
<tbody>
<tr>
<td>INCI Name</td>
<td>Xanthan Gum (and) Lecithin (and) Sclerotium Gum (and) Pullulan</td>
</tr>
<tr>
<td>Textures</td>
<td>Aqueous gels (without oily components), gel-creams, creams</td>
</tr>
<tr>
<td>Skin feel</td>
<td>Silicone-like</td>
</tr>
<tr>
<td>Appearance</td>
<td>Light beige powder</td>
</tr>
<tr>
<td>Recommended dosage</td>
<td>0.3-2%</td>
</tr>
<tr>
<td>pH</td>
<td>2-10</td>
</tr>
<tr>
<td>Final viscosity</td>
<td>Achieved at T 24h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Process</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot process</td>
<td>Yes</td>
</tr>
<tr>
<td>Cold process</td>
<td>Yes</td>
</tr>
<tr>
<td>Introduction via oil phase</td>
<td>No</td>
</tr>
<tr>
<td>Introduction in aqueous phase</td>
<td>Yes</td>
</tr>
<tr>
<td>Introduction at the end of process</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Compatibilities</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil phase</td>
<td>Compatible with all kinds of oil phases</td>
</tr>
<tr>
<td>Sunscreens</td>
<td>Yes (mineral and chemical)</td>
</tr>
<tr>
<td>Pigments, pearlescent pigments, glitters</td>
<td>Yes</td>
</tr>
<tr>
<td>Electrolytes</td>
<td>Up to 20% NaCl &amp; MgSO₄</td>
</tr>
<tr>
<td>Alcohols</td>
<td>Up to 15%</td>
</tr>
<tr>
<td>Ethoxylated</td>
<td>Yes</td>
</tr>
<tr>
<td>Glycols</td>
<td>Yes</td>
</tr>
<tr>
<td>Organic acids</td>
<td>Yes</td>
</tr>
<tr>
<td>Preservatives</td>
<td>Yes</td>
</tr>
<tr>
<td>Surfactants</td>
<td>Anionic: &lt; 5% active matter Amphoteric: &lt; 5% active matter Cationic: no Non-ionic: yes</td>
</tr>
<tr>
<td>Aluminum salts</td>
<td>No</td>
</tr>
</tbody>
</table>
The combination of Siligel™ ingredients provides not only formulas with an outstanding skin feel but also exhibits a significant synergistic viscosity effect. The combination of the three polysaccharides brings +25% more viscosity than the viscosity of each ingredient separately, which shows the creation of a stronger network.

The other strength of this combination is that it has an easy dispersion when compared to the ingredients used separately. Actually polysaccharides, just like xanthan and sclerotium gums generate lumps and agglomerate when they are introduced into water. This is why formulators have to make pre-dispersions in glycols before using them. The smart and optimized combination with phospholipids makes the use of natural gums possible without their disadvantages. Phospholipids, by coating gums, prevent the formation of lumps and agglomerates, without the need for pre-dispersion.
**EASY TO PROCESS**

Siligel™ is an easy-to-use gelling agent:
- **Cold** and hot process
- **Easy to disperse:**
  - No pre-dispersion necessary
  - No lumps
- Introduction into water phase or at the end of the process after emulsion
- No neutralization requirements
- All types of stirring tools

**ECO-FRIENDLY INGREDIENT**

All of the ingredients of Siligel™ are **green processed** which contributes to the **sustainable preservation of the environment**. Phospholipids are obtained from crude lecithin which is a by-product of the food industry in the soybean oil manufacturing. The valorization of by-products is the key for the preservation of natural resources.

Xanthan gum, sclerotium gum and pullulan are obtained by biotechnological processes. Biotechnology enables the preservation of natural areas and the environment by limiting the harvest of vegetable species.

Siligel™ is manufactured with a **cold and dry process** with saves energy and reduces waste in effluent.

Further on, its **cold process** during the formulation of finished products (energy saving) and its **multifunctionality** (1 ingredient for several applications) also meet sustainability criteria.
SILICONE-LIKE SKIN FEEL

Siligel™ answers the need for gelling agents that are easy to use, highly efficient and imparts an appealing sensory profile.

Besides the phospholipid touch, Siligel™ offers an exceptional skin feel close to silicone, due to its proprietary synergistic combination of polysaccharides and lecithin.

A panel specialized in sensory analysis performed comparative analysis and found that an aqueous gel of Siligel™ was very similar to an aqueous gel of xanthan gum containing 2% silicone oil. Being a multi-functional ingredient, Siligel™ is able to bring both the texture and an outstanding silicone-like skin feel in 1 ingredient without having to use silicones (Figure 1).

Even better, an aqueous gel of Siligel™ exceeded the performance of a silicone elastomer blend and a silicone oil for its gliding aspect but also in terms of softness this demonstrates an attractive sensory identity (Figure 2).

Consequently, by offering a high glide and an ultra-soft skin feel, Siligel™ will improve the sensory attributes of any finished product. Alternative to silicones in terms of skin feel, Siligel™ meets the growing demand for “silicone free” products as consumers are looking for more environmental-friendly products.

Furthermore, Siligel™ does not create threading effect in aqueous gels unlike xanthan gum.

**Figure 1:** Sensory profile of Siligel™ VS. xanthan gum + silicone oil

**Figure 2:** Skin feel of Siligel™ VS. pure silicones

*Evaluation by an expert panel*
MAKES EMULSIONS MORE STURDY

Siligel™ is easy to use and offers multiple performance benefits: thickening, stabilization, co-emulsification properties. The stabilizing properties of Siligel™ and its high resistance to electrolytes, make the formulations more robust.

✔ Helps the stabilization of emulsions

Siligel™ is proven to stabilize emulsions:

• It acts as a co-emulsifier by reducing droplet size
• It helps the suspension of oil droplets

Decrease in size of distribution by increasing the % of Siligel™

Siligel™ provides thinner and homogenous droplets for better stability

After 1 month 50°C

Control = emulsion without Siligel™

Emulsion with 0.5% Siligel™

Emulsion with 2% Siligel™

Siligel™ helps suspend oil droplets for better stability
Offers resistance to electrolytes

Most of the cosmetic products incorporate active ingredients and preservatives which contain electrolytes. These ingredients are a challenge for formulators as they impact viscosity and stability. The use of a gelling agent that offers a high resistance to electrolytes is therefore essential.

Different studies have proven the resistance of Siligel™ to electrolytes:

- Over time, Siligel™ shows a good stability in presence of monovalent salt (NaCl) or divalent salt (MgSO₄) up to 20% (see techfile).
- Tested at 1% in sea water vs. purified water (Figure 3), Siligel™ has a good resistance without decreasing its gelling function. On the opposite side, a synthetic polymer known for its high resistance to electrolytes tested at 1% in the same conditions has failed (no viscosity).
- Furthermore, Siligel™ was evaluated in presence of several stressful ingredients such as zinc sulfate, glycolic acid (AHA), EDTA, PBSA* highlighting its robustness against different electrolytes.

Siligel™ is therefore, the natural technical solution for any formula incorporating ingredients that generate electrolytes, even with charged waters as mineral, spring and sea waters.

* Phenylbenzimidazole sulfonic acid

RESISTS TO MOST OF STRESSFUL CONDITIONS

- Siligel™ is stable in a wide range of pH (2-10)
- Siligel™ can thicken up to 15% ethanol
- Siligel™ is compatible with preservatives and agents with anti-microbial properties

See part 5 “Process & Formulations advice” for more information.

CAPABLE OF SUSPENDING PARTICLES

Siligel™ exhibits a superior elastic behavior and high viscosity at rest measured by rheology that provides good suspending particles from 1.2%.

At 2% Siligel™ can suspend either heavy (sand, beads) or light particles (pearlescent pigments, glitters).
### Product Benefits

**Siligel™**

#### Hydrates Skin

As skin-identical molecules, phospholipids present a strong affinity with the *stratum corneum* and can reinforce its barrier function in order to decrease TEWL. The polar head groups of phospholipids are also capable to bind 15 to 25 molecules of water per molecule of phospholipid, thus maintaining the water reserve in the skin.

#### Offers Happiness

Various techniques developed by specialists in psychology and neuroscience scientifically measured that phospholipids trigger positive emotions and provides moments of happiness upon application.

### Added Values

**Skin hydration (TEWL)**

<table>
<thead>
<tr>
<th>Time (hours)</th>
<th>Siligel™</th>
<th>Placebo</th>
</tr>
</thead>
<tbody>
<tr>
<td>T+2h</td>
<td>-24%</td>
<td>-13%</td>
</tr>
<tr>
<td>T+4h</td>
<td>-13%</td>
<td>-7%</td>
</tr>
<tr>
<td>T+8h</td>
<td>-7%</td>
<td>-5%</td>
</tr>
</tbody>
</table>

* * p<0.05  ** p<0.01

### Facial Micro-expression Analysis

<table>
<thead>
<tr>
<th>Positive patterns</th>
<th>Negative patterns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placebo</td>
<td>Phospholipid-based cream</td>
</tr>
<tr>
<td>18</td>
<td>13</td>
</tr>
<tr>
<td>6</td>
<td>12</td>
</tr>
</tbody>
</table>

Happy facial micro-expressions as a pleasant application

### Evolution of the Musicality of the Voice

<table>
<thead>
<tr>
<th>Fundamental frequency variation (%) vs. before application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placebo</td>
</tr>
<tr>
<td>-3.3%</td>
</tr>
</tbody>
</table>

Higher vocal frequency as an enjoyable experience

### Evolution of Pupil Dilation

<table>
<thead>
<tr>
<th>Pupil diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before application</td>
</tr>
<tr>
<td>After phospholipid-based cream application</td>
</tr>
<tr>
<td>+23%</td>
</tr>
</tbody>
</table>

Increase in pupil dilation as a high emotional arousal

### Evolution of Skin Conductance

<table>
<thead>
<tr>
<th>Skin conductance (Siemens)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before application</td>
</tr>
<tr>
<td>+61%</td>
</tr>
</tbody>
</table>

Increase in electrodermal response as a high intensity emotion

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**Behavioral measures**

Happy facial micro-expressions as a pleasant application

**Physiological measures**

Increase in pupil dilation as a high emotional arousal
APPLICATIONS

DOSAGE

• Gelling agent: 0.5-2%
• Stabilizer: > 0.5%
• Co-emulsifier: > 0.5%
• Suspending agent: > 1.2%
• Skin feel enhancer: > 0.3

FOR ALL TYPES OF APPLICATIONS

Ideal partner for finished products containing electrolytes such as highly concentrated serums, sea water, mineral or thermal water-based products...

For Ecocert/Cosmos/nature compliant formulations, ask for Ecogel™, the Eco-version of Siligel™

• Multi-action: thickener, co-emulsifier, stabilizer, suspending agent, skin feel enhancer
• High compatibility with electrolytes
Prototypes

Siligel™

An amazing sensorial identity
<table>
<thead>
<tr>
<th>SILIGEL™’S ROLE</th>
<th>SILIGEL™ DOSE</th>
<th>ASSOCIATION</th>
<th>FORMULA</th>
<th>INTRODUCTION</th>
<th>ASPECT</th>
<th>FORMULATION CHALLENGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gelling agent</td>
<td>1.5%</td>
<td>/</td>
<td>Resurfacing SEArum</td>
<td>Water phase</td>
<td>Light beige opaque serum, ( \eta = 10.000 - 15.000 \text{ mPa.s}^* )</td>
<td>Formula with sea water (high amount of electrolytes) Counteracts the tacky effect of sea water High silicone-like skin feel High comfort even with low oil phase 2% oil phase (( \Rightarrow ) emulsifying properties) Minimalist Cold process</td>
</tr>
<tr>
<td>Thickener &amp; stabilizer</td>
<td>15%</td>
<td>4% Biophilic™ H</td>
<td>S.O.S Rescue Cream</td>
<td>Water phase</td>
<td>Off-white thick cream, ( \eta = 20.000 - 30.000 \text{ mPa.s}^* )</td>
<td>Typical skin feel in a thick texture Rich skin feel Highly slippery on skin Non-greasy Non-tacky</td>
</tr>
<tr>
<td>Suspending agent</td>
<td>2%</td>
<td>/</td>
<td>Soft Exfoliating Cleanser</td>
<td>Water phase</td>
<td>Translucent gel with purple beads, ( \eta = 10.000 - 20.000 \text{ mPa.s}^{**} )</td>
<td>Amphoteric surfactants 3% (active matter = 0.9%) Exfoliating particles 1% ( \Rightarrow ) suspending effect Translucent Cold process Comfortable sensation after rinsing</td>
</tr>
</tbody>
</table>

* Viscosity method: Brookfield, LV, spindle 4, 6 rpm, 1 min
** Viscosity method: Brookfield, LV, spindle 3, 6 rpm, 1 min
Resurfacing SEArum / Pitch

With this concentrated serum, enjoy the fabulous and typical silicone-like skin feel of Siligel™ which is characterized by a high glide and an extreme softness. Here, Siligel™ works not only as a gelling agent which texturizes sea water demonstrating its exceptional electrolyte tolerance, but it also helps counteract the well-known tacky after feel of sea water. Used on its own only, Siligel™ is able to incorporate a moderate amount of oil phase content (2%) due to high shear stress. The skin is ultra-soft, very comfortable and with no sensation of tightness even if the formula contains few oil phase. The active ingredients SWT-7™ H and Riboxyl™ are used to provide a smoothing effect. This is an easy process and a friendly formulation as it requires no heat.

**Resurfacing SEArum**

<table>
<thead>
<tr>
<th>INGREDIENT</th>
<th>INCI NAME</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deionized Water</td>
<td>Water</td>
<td>96.50</td>
</tr>
<tr>
<td>Spray-dried Sea water</td>
<td>Spray-Dried Sea Water</td>
<td>3.50</td>
</tr>
</tbody>
</table>

**Solution of 3.5% Spray-dried Sea Water**

<table>
<thead>
<tr>
<th>INGREDIENT</th>
<th>INCI NAME</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Solution of 3.5% Spray-dried Sea Water</td>
<td>Water (and) Spray-Dried Sea Water</td>
<td>89.60</td>
</tr>
<tr>
<td>Dermofeel® PA-3*</td>
<td>Sodium Phytate (and) Water (and) Alcohol Propanediol</td>
<td>0.10</td>
</tr>
<tr>
<td>Zemea® Propanediol</td>
<td>Xanthan Gum (and) Lecithin (and) Sclerotium Gum (and) Pullulan</td>
<td>2.00</td>
</tr>
<tr>
<td>B Siligel™</td>
<td>Glycerin (and) Picea Abies Extract</td>
<td>1.00</td>
</tr>
<tr>
<td>C Granlux® AOX-GL</td>
<td>Cetyl Ethylhexanoate</td>
<td>2.00</td>
</tr>
<tr>
<td>D Schercemol™ CO Ester</td>
<td>Fragrance</td>
<td>0.20</td>
</tr>
<tr>
<td>Rainforest 2**</td>
<td>Phenoxyethanol (and) Caprylyl Glycol</td>
<td>1.10</td>
</tr>
<tr>
<td>Verstatil® PC*</td>
<td></td>
<td></td>
</tr>
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</table>

**S.W.T-7™ H**

<table>
<thead>
<tr>
<th>INGREDIENT</th>
<th>INCI NAME</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riboxyl™</td>
<td>Maltodextrin (and) Swertia Chirata Extract Ribose</td>
<td>2.00</td>
</tr>
</tbody>
</table>

**S.O.S. Rescue Cream**

<table>
<thead>
<tr>
<th>INGREDIENT</th>
<th>INCI NAME</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Deionized Water</td>
<td>Water</td>
<td>66.00</td>
</tr>
<tr>
<td>Dermofeel® PA-3*</td>
<td>Sodium Phytate (and) Water (and) Alcohol</td>
<td>0.10</td>
</tr>
<tr>
<td>B Siligel™</td>
<td>Xanthan Gum (and) Lecithin (and) Sclerotium Gum (and) Pullulan</td>
<td>1.50</td>
</tr>
<tr>
<td>C Biophilic™ H</td>
<td>Hydrogenated Lecithin (and) C12-16 Alcohols (and) Palmitic Acid</td>
<td>4.00</td>
</tr>
<tr>
<td>D Sweet Almond Oil</td>
<td>Prunus Amygdalus Dulcis (Sweet Almond) Oil Disostearyl Malate</td>
<td>4.00</td>
</tr>
<tr>
<td>Schercemol™ DiSM Ester</td>
<td>Shorea Stenoptera Seed Butter Behenyl Alcohol</td>
<td>4.00</td>
</tr>
<tr>
<td>Lipex® 106</td>
<td>Beeswax</td>
<td>6.00</td>
</tr>
<tr>
<td>Lanette® 22</td>
<td>Disobpropyl Adipate</td>
<td>2.00</td>
</tr>
<tr>
<td>Schercemol™ DIA Ester</td>
<td>Stearyl Heptanoate (and) Stearyl Caprylate</td>
<td>2.00</td>
</tr>
<tr>
<td>Dub Solid</td>
<td>Tocopherol (and) Helianthus Annuus (Sunflower) Seed Oil</td>
<td>2.00</td>
</tr>
<tr>
<td>Vitapherole® E-1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E Verstatil® PC*</td>
<td>Phenoxyethanol (and) Caprylyl Glycol</td>
<td>1.00</td>
</tr>
<tr>
<td>F Exo-H™</td>
<td>Water (and) Butylene Glycol (and) Alteromonas Ferment Extract</td>
<td>1.00</td>
</tr>
<tr>
<td>Neutrazen™</td>
<td>Water (and) Butylene Glycol (and) Dextran (and) Palmitoyl Tripeptide-8</td>
<td>1.00</td>
</tr>
<tr>
<td>Abyssine™ 657</td>
<td>Water (and) Butylene Glycol (and) Alteromonas Ferment Extract</td>
<td>1.00</td>
</tr>
<tr>
<td>Orange Blossom**</td>
<td>Fragrance</td>
<td>0.20</td>
</tr>
</tbody>
</table>

**S.O.S. Rescue Cream / Pitch**

Pamper and soothe your skin with this unctuous and soft cream. Used at 4%, Biophilic™ H, a lamellar emulsifier, creates a luxurious white texture, whereas Siligel™ used at 1.5% contributes to the stability of the emulsion due to its co-emulsifying properties and by improving the suspension of the oil droplets. Biophilic™ H emulsifies 24% oil phase providing a thick texture while giving a rich but non greasy skin feel. Furthermore, Siligel™ works with Biophilic™ H by adding a higher glide and bringing softness. This formula is specially designed for sensitive skin because of its combo of active ingredients: Exo-H™ which brings hydration while Abyssine™ and Neutrazen™ calm and soothe skin irritations.
**Soft Exfoliating Cleanser / Pitch**

This translucent face scrub demonstrated the ability of Siligel™ used at 2% to thicken and to suspend particles (1% beads).

The presence of 3% (active matter = 0.9%) amphoteric surfactants shows that Siligel™ could be formulated with such ingredients. Thanks to Siligel™, the skin is comfortable with no sensation of tightness even if the formula has no oil phase content. The smooth and even skin tone is provided by combining 2 skin exfoliation inducers: Lime Pearl™ AF and Exo-T™. Furthermore, the texture is easy to formulate and is cold-processed.

* Distributed in France by Lucas Meyer Cosmetics
** IFF fragrance
Process & Formulation Advice

Siligel™

Easy to use process
DESCRIPTION

Siligel™ is a natural gelling agent for aqueous media with an excellent resistance to electrolytes and providing high sensorial benefits to formulas. Very versatile, Siligel™ can be also used as a co-emulsifier, a stabilizer or a viscosity adjuster for O/W emulsions.

Siligel™ is a light beige powder.

FORMULATION WITH SILIGEL™

1. RECOMMENDED DOSAGE

Siligel™ is generally used from 0.3% to 2%. It is recommended not to exceed 3%.

- Used as a skin feel agent: from 0.3%
- Used as a gelling agent: from 0.5%
- Used as a co-emulsifier: from 0.5%
- Used as a suspending agent: from 1.2%

2. RECOMMENDED PROCESS


a. Recommended temperature

Siligel™ can be used via cold and hot (max 80°C) process.

b. Introduction process

i. The way of incorporation

The optimized composition of Siligel™ allows a direct dispersion into aqueous phase, by sprinkling the powder under stirring. Nevertheless, a pre-dispersion into a glycol phase is possible.

ii. The introduction stage

Siligel™ can be used as an aqueous phase gelling agent at the beginning of the manufacturing process before the emulsification step. In addition, it can also be introduced after emulsification or at the end of the process using a strong stirring in order to adjust the viscosity or stabilize the emulsion and on the condition that the emulsion is not shear sensitive.

c. Tools and time processing

Various mixers can be used to develop the gel. Nonetheless, in order to maximize the viscosity result, it is highly recommended to be under the highest shear conditions as possible, by using a rotor stator type homogenizer and/or by applying the highest rotation speed as possible. The higher the shear force applied, the quicker the gel development and the higher the viscosity. Accordingly, the user will set up the laboratory process carefully to ensure the best manufacturing scale up.

The necessary time to develop Siligel™ depends on the type of mixer

See below for some guidelines for the laboratory process*.

<table>
<thead>
<tr>
<th>TOOLS</th>
<th>SPEED (rpm)</th>
<th>APPROXIMATE TIME (min)</th>
<th>AVERAGE VISCOSITY** (mPa.s), D+1 AT 2% IN DEIONIZED WATER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotor stator type VMI (Rayneri)</td>
<td>2500</td>
<td>5</td>
<td>12000 - 15000</td>
</tr>
<tr>
<td>Rotor stator type Silverson</td>
<td>2500</td>
<td>5</td>
<td>12000 - 15000</td>
</tr>
<tr>
<td>Tooth propeller</td>
<td>Vortex max: 1000</td>
<td>30</td>
<td>9000 - 11000</td>
</tr>
<tr>
<td>Blade propeller</td>
<td>Vortex max: 1000</td>
<td>30</td>
<td>9000 - 10000</td>
</tr>
<tr>
<td>Ultra-Turrax (IKA)</td>
<td>10000</td>
<td>7</td>
<td>10000 - 11000</td>
</tr>
</tbody>
</table>

* The stated viscosity values are indicative and depend on the entire process conditions.
** Brookfield Viscosity, RV, Spindle 3, speed 5 rpm, 25°C+/-0.5°C
3. STABILIZATION AND CO-EMULSIFYING PROPERTIES

Siligel™ acts as a co-emulsifier thanks to its optimized composition of lecithin and hydrocolloids. The co-emulsifying and suspending properties provide stabilization properties. Siligel™ is compatible with all kinds of oil phases.

For more information, please refer to the Techfile Siligel™.

4. ORGANOLEPTIC AND SENSORY PROPERTIES

Siligel™ provides light beige gels, translucent but not transparent. To ensure good color and odor stabilities and to prevent oxidation, the addition of a chelating and an anti-oxidant are highly recommended. Siligel™ gels are non-threading, offering a very high glide with a very soft skin feel but without any soaping, greasy or tacky effects. Siligel™ provides a silicone-like skin feel in formulas.

See the sensory profile of a 1% Siligel™ gel (Figure 4).

Figure 4:
Sensory profile of Siligel™

Evaluation by an expert panel

For more information, please refer to the Techfile Siligel™.
5. **RHEOLOGY**

- **Thickening power**

![Thickening Power Graph]

The viscosity stabilizes the day after the manufacturing: a rise of 15-40% of viscosity is noted between D0 and D+1 depending on the Siligel™ concentration.

- **Shear sensitivity**

Siligel™ is non shear sensitive; as a result, a shear rate stirring can be applied on the gel at any time of the manufacturing process.

*For more information regarding the rheological behavior, please refer to the Technical File Siligel™.*

6. **COMPATIBILITIES**

- **pH**

Siligel™ can be used in a wide range of pH: 2-10 because the gels are stable over time. A slight decrease in viscosity is observed at pH 2, which can be balanced by the addition of Siligel™.

![Stability with pH Graph]
**Electrolytes**

Siligel™ is compatible with monovalent electrolytes NaCl and divalent electrolytes MgSO₄ up to 20%.

![Stability with electrolytes (mono and divalent salts)](image)

* Brookfield Viscosimeter, RV, Spindle 3, Speed 5 rpm, 25°C, D+1.
  Gel deployed at 2% with a tooth propeller, maximum speed, 30 min.

**Siligel™ Performance with different ionic additives**

![Siligel™ performance with different ionic additives](image)

* Brookfield Viscosimeter, RV, Spindle 3, Speed 5 rpm, 25°C, D+1.
* Gel deployed at 2% with a tooth propeller, maximum speed, 30 min.
  ** Phenylbenzimidazole Sulfonic Acid

**Ethanol**

The gel’s viscosity is maintained with up to 10% of ethanol and is slightly increased with 15% of ethanol. All gels are stable over time.

![Stability with ethanol](image)

* Brookfield Viscosimeter, RV, Spindle 3, Speed 5 rpm, 25°C, D+1.
  Gel deployed at 2% with a tooth propeller, maximum speed, 30 min.
**Preservatives and additives**

Siligel™ is compatible with various preservatives and anti-microbial additives.

* Brookfield Viscosimeter, RV, Spindle 3, Speed 5 rpm, 25°C, D+1. Gel deployed at 2% with a tooth propeller, maximum speed, 20 min and rotor stator 2500 rpm, 2 min 30.

1. Phenoxyethanol (and) Methylparaben (and) Ethylparaben (and) Butylparaben (and) Propylparaben
2. Caprylyl Glycol (and) Glycerin (and) Phenylpropanol (and) Water
3. Glycerin (and) Water (and) Sodium Levulinate (and) Sodium Anisate
4. Levulinic Acid (and) Sodium Levulinate (and) Glycerin (and) Water

**Other compatibilities**

Siligel™ is compatible with pigments, sunscreens (chemical and mineral), pearlescent pigments, glitters and glycols. Siligel™ can be used with anionic surfactants on condition that the percentage does not exceed 5% in active matter.

**7. INCOMPATIBILITIES**

Siligel™ is not compatible with aluminum salts and cationic ingredients.
### 8. SUMMARY

#### SILIGEL™ CHARACTERISTICS

<table>
<thead>
<tr>
<th><strong>RECOMMENDED DOSAGE</strong></th>
<th>0.3-2%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>APPEARANCE</strong></td>
<td>Powder</td>
</tr>
<tr>
<td><strong>SKIN FEEL</strong></td>
<td>Silicone-like</td>
</tr>
<tr>
<td><strong>GEL APPEARANCE</strong></td>
<td>White-off, translucent</td>
</tr>
<tr>
<td><strong>TEXTURES</strong></td>
<td>Serum to cream/gel-cream/butters</td>
</tr>
<tr>
<td><strong>INTRODUCTION PATHWAYS</strong></td>
<td>Hot and cold process/ high shear stirring/ before or after emulsion/through aqueous phase</td>
</tr>
<tr>
<td><strong>RECOMMENDED pH</strong></td>
<td>2-10</td>
</tr>
</tbody>
</table>

#### FORMULATION ADVICE

<table>
<thead>
<tr>
<th><strong>COMPATIBILITIES</strong></th>
<th>Sunscreens (chemical and mineral)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Electrolytes up to 20% - monovalent and divalent ions -</td>
</tr>
<tr>
<td></td>
<td>All kinds of preservatives and additives</td>
</tr>
<tr>
<td></td>
<td>Glycols</td>
</tr>
<tr>
<td></td>
<td>Pigments, pearlescent pigments &amp; glitters</td>
</tr>
<tr>
<td></td>
<td>Ethanol up to 15%</td>
</tr>
<tr>
<td></td>
<td>Anionic surfactants ≤5%</td>
</tr>
<tr>
<td><strong>INCOMPATIBILITIES</strong></td>
<td>Aluminum salts</td>
</tr>
<tr>
<td></td>
<td>Anionic surfactants &gt;5%</td>
</tr>
<tr>
<td></td>
<td>Cationic ingredients</td>
</tr>
<tr>
<td><strong>THE VISCOSITY CAN BE INCREASED</strong></td>
<td>Significantly: by increasing the percentage of Siligel™</td>
</tr>
<tr>
<td></td>
<td>Moderately: by applying a higher shear force or a longer stirring</td>
</tr>
<tr>
<td></td>
<td>By addition of 15% ethanol</td>
</tr>
<tr>
<td><strong>THE FINAL VISCOSITY IS ACHIEVED</strong></td>
<td>The day after the production</td>
</tr>
</tbody>
</table>
SILIGEL™ is the natural lab partner to create robust formulations with amazing silicone-like skin feel even in extreme conditions!

✓ Patented natural optimized combination:
  phospholipids + polysaccharides
  • Proven synergistic viscosity effect
  • Easier introduction than natural gums
    • Outstanding skin feel

✓ Multi-functional agent
  • Gelling agent
  • Stabilizer
  • Co-emulsifier
  • Suspending agent

✓ Excellent compatibilities with
  • Electrolytes (up to 20%)
    • Pigments
  • Chemical & mineral sunscreens
    • Wide pH range

✓ Amazing silicone-like skin feel
  • High gliding effect
  • Extreme softness

✓ Easy to use
  • Cold process
  • Easy dispersion ➔ no lumps