RESIFA™ SOLESPHERE™ for Skincare and Cosmetics

Tests demonstrate that adding silica gel helps makeup last longer with a softer feel and reduced shine.
Improving the Softness and Smooth Application of Water-in-Oil Formulations
Testing for Softness and Smoothness

- Softness and smoothness are achieved by reducing a formulation’s friction.
- Frictional coefficient (MIU) is correlated with slipperiness.
- The standard deviation of MIU is mean deviation (MDD).
- MDD is correlated with smoothness.

Your Dreams, Our Challenge
Process with a KES-SE* Friction Tester

• Spread 20 mg samples on 10 cm² SUPPLALE** artificial leather

• Tested samples with the following fillers: nylon beads, PMMA beads, SOLESHERE microspheres

• Dried with air drier

• Evaluated texture with KES-SE friction tester
SOLESPHERE enhanced the formulation’s slipperiness and smoothness versus plastic beads, especially after drying. *t-test *P < 0.05
PLASTIC BEADS
- Plastic beads are soft, so they can deform when touched.
- This increases the contact and frictional force between the beads.

SOLESPHERE MICROSPHERES
- Silica beads are hard and do not deform. They are spherical, which improves rolling.

● = Nano-sized particles (ZnO, etc.)
Improving a Water-in-Oil Formulation’s Sebum Absorption
As sebum secretion accumulates, two things happen:

1. Light reflection is reduced and shiny spots form
2. Too much sebum causes makeup to collapse/break up

Sebum secretion causes shiny spots and makeup deterioration.

Testing Sebum Absorption with a Sebumeter

Process with Sebumeter SM815*

- Four men washed their faces.
- They immediately entered a room held at a constant 68 °F degrees and 55-60% humidity.
- After 30 minutes, two 1.0 mg/cm² samples were applied to their foreheads: one containing SOLESPIHERE™ and one without.
- Sebum was measured with the sebumeter for 10 seconds after 30 minutes and after 150 minutes.
Results of Sebum Absorption Testing with a Subumeter

SOLESHERE decreased the sebum leakage.
Testing Sebum Absorption with a Glossmeter

Process with a BIO Color PG-1M Glossmeter*

- A 1 mg/cm$^2$ sample of artificial sebum was mixed and applied to a BIOSKIN** plate.
- Glossmeter measured shine at an 85° angle according to JIS Z 8741.

<table>
<thead>
<tr>
<th>INCI name</th>
<th>Contents (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caprylic/capric triglyceride</td>
<td>33.3</td>
</tr>
<tr>
<td>Octyldodecyl myristate</td>
<td>33.3</td>
</tr>
<tr>
<td>Oleic mcid</td>
<td>20.0</td>
</tr>
<tr>
<td>Squalane</td>
<td>13.4</td>
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</table>

*Nippon Denshoku Industries Co., Ltd. | **Beaulax Co., Ltd.
When compared with plastic beads, SOLESHERE better prevented shiny spots from forming.
SOLESPHERE’s high pore volume can absorb considerable sebum, which helps makeup last longer.
## Comparison of the Physical Properties of Bead Fillers

<table>
<thead>
<tr>
<th>Grade</th>
<th>Mean particle size (µm)</th>
<th>Pore volume (ml/g)</th>
<th>Specific surface area (m²/g)</th>
<th>Pore diameter (nm)</th>
<th>Oil absorption capacity (ml/100 g)</th>
<th>Bulk gravity (g/ml)</th>
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</thead>
<tbody>
<tr>
<td>H-121-N</td>
<td>11.7</td>
<td>0.62</td>
<td>872</td>
<td>2.8</td>
<td>128</td>
<td>0.36</td>
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<tr>
<td>H-53</td>
<td>5.0</td>
<td>1.88</td>
<td>750</td>
<td>10.0</td>
<td>375</td>
<td>0.10</td>
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<tr>
<td>H-51</td>
<td>5.1</td>
<td>0.78</td>
<td>870</td>
<td>3.6</td>
<td>161</td>
<td>0.23</td>
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<td>L-51</td>
<td>5.1</td>
<td>0.82</td>
<td>321</td>
<td>10.2</td>
<td>168</td>
<td>0.23</td>
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<td>H-121-ET</td>
<td>11.8</td>
<td>0.83</td>
<td>835</td>
<td>4.0</td>
<td>136</td>
<td>0.30</td>
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<tr>
<td>PMMA</td>
<td>Microsphere M-305*</td>
<td>8^</td>
<td>-</td>
<td>-</td>
<td>53</td>
<td>0.36</td>
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<tr>
<td>Nylon</td>
<td>SP-500**</td>
<td>5^</td>
<td>-</td>
<td>-</td>
<td>68</td>
<td>0.28</td>
</tr>
</tbody>
</table>

*Matsumoto Yushi-Seiyaku Co., Ltd. | **Toray Industries, Inc. | ^Catalog information
SOLESHERE Improves the Physical Properties of Lipstick
A 1 mg/cm² lipstick formulation sample was applied to a BIOSKIN plate.

- Density = 1.0 mg/cm²
- Thickness: 10 μm*
- PG-1M glossmeter** measured shine at 20°, 60° and 85° angles.

**Nippon Denshoku Industries Co., Ltd.
Results of Gloss and Matte Effect Testing

- Adding SOLESPHERE to the formulation decreased its glossiness.
- SOLESPHERE can provide a matte effect for cosmetic formulations.
SOLESPHERE Improves the Formulation Stability of Lipstick
Testing Formulation Stability

Process

• A lipstick formulation sample was clamped on the stage by a supporting fixture.

• It was stored overnight at 25 °C.

• Sample was measured by a FUDOH rheometer RTC.*

*Rheotech Co., Ltd.
Results of Lipstick Formulation Stability Test

SOLESHERE provided some physical stability.
## Physical Properties of SOLESPHERE

<table>
<thead>
<tr>
<th>SOLESPHERE Grade</th>
<th>Mean particle size (µm)</th>
<th>Pore volume (ml/g)</th>
<th>Specific surface area (m²/g)</th>
<th>Oil absorption capacity (ml/100 g)</th>
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</thead>
<tbody>
<tr>
<td>H-121-N</td>
<td>12.4</td>
<td>0.62</td>
<td>843</td>
<td>132</td>
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<tr>
<td>H-53</td>
<td>4.9</td>
<td>1.87</td>
<td>760</td>
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SOLESPHERE Improves Smooth Application of Water-in-Oil Sunscreen
<table>
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<tr>
<th>Fillers</th>
<th>INCI</th>
<th>Particle size (µm)</th>
<th>Specific surface area (m²/g)</th>
<th>Oil absorption (mL/100 g)</th>
<th>Specific volume (mL/g)</th>
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</thead>
<tbody>
<tr>
<td>SSP H-121</td>
<td>Silica</td>
<td>11.7</td>
<td>872</td>
<td>128</td>
<td>2.8</td>
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<tr>
<td>SSP H-53</td>
<td>Silica</td>
<td>5.0</td>
<td>750</td>
<td>275</td>
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</tr>
<tr>
<td>SSP L-51</td>
<td>Silica</td>
<td>5.2</td>
<td>339</td>
<td>163</td>
<td>4.2</td>
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<tr>
<td>PMMA</td>
<td>Polymethyl methacrylate</td>
<td>8</td>
<td>–</td>
<td>53</td>
<td>2.7</td>
</tr>
<tr>
<td>Nylon</td>
<td>Nylon-12</td>
<td>5</td>
<td>–</td>
<td>58</td>
<td>3.6</td>
</tr>
<tr>
<td>Competitor’s silica</td>
<td>Silica</td>
<td>6.1</td>
<td>181</td>
<td>140</td>
<td>3.5</td>
</tr>
</tbody>
</table>
Testing Slipperiness and Smoothness

Method

- Five 2.0 and 3.0 mg/cm² samples of water-in-oil sunscreen formulations were applied to a 10 cm² sample of SUPPLALE artificial leather.

- Formulations used nylon, PMMA and SOLESPHERE bead fillers.

- Samples were stored overnight at 25 °C.

- Samples were blow dried.

- Samples were evaluated with a KES-SE* friction tester for MIU and MMD.

*Kato Tech Co., Ltd.
Comparison of Smooth Feel Using Different Bead Fillers

- SOLESPHERE provided higher slipperiness and smoothness
- SOLESPHERE: hard particle and point-contact
SOLESPHERE vs. Other Brand Silicas

- SOLESPHERE provided higher slipperiness and smoothness.
- SOLESPHERE has higher specific volume and more particles per unit weight.
Conclusions

• It’s challenging to achieve both SPF and good frictional properties in sunscreens, BB creams and cosmetics. For example, the high load of UV absorbers such as ethylhexyl methoxycinnamate causes high stickiness.

• RESIFA SOLESPHERE microspherical gels can moderate stickiness because they impart high slipperiness and smoothness properties into both oil- and water-based formulations.