Naturally Derived and High Performance Polymers for Hair and Skin Care

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Tom Castle
A unique specialty chemical company focussed on the development of novel polymers, responsive encapsulation and targeted delivery systems.

Delivering compelling performance enhancing ingredients for home care, personal & health care, coatings, adhesives & sealants and more.
Location - Deeside, UK

State of the art facility with:

- Development labs
- Home Care & Industrial Application labs
- Personal Care and Cosmetic labs
- Food suite
- cGMP analytical testing lab
- Semi tech scale-up facility
- Established outsourced manufacturing links

→ MAN 40 minutes
→ LPL 20 minutes
Enhancing Functional Performance of Our Partners’ Products

Key Markets

Personal Care and Healthcare
• Skin care
• Hair care
• Colour cosmetics
• Oral care
• Topical skin care

Home Care
• Laundry, dishwash, hard surface cleaners

Industrial
• Coatings, sealants & adhesives

Personal Care and Healthcare

Specialty Polymers
• Film formers
• Natural ingredients
• Moisturisation
• Increased substantivity and deposition
• Hair styling
• Sensory enhancement

Encapsulation
• Fragrances, skin care actives
• Friction, pH, concentration, temperature release
RevCare Skin Sense
*Overview*
RevCare™ Skin Sense - Multifunctional for Skin Products

Multifunctional polymer technology:

- Natural feel film former
- Excellent sensory profile
- Long lasting moisturisation
- Enhanced Fragrance longevity
- Improved substantivity of actives

- Perfect with a range of different products:
  - Colour cosmetics - lipstick to foundation
  - Skin care - skin cream to deodorant
  - Skin friendly & excellent toxicological profile
  - China compliant INCI name available
RevCare™ Skin Sense - Moisturisation in Lip Care

External test comparing RevCare lipstick with a market leading moisturising lipstick

- Product applied to inner arm of panel of 20 people
- Actual moisture levels measured using corneometer
- Compared with baseline after 1 hour in climate controlled lab

Outstanding moisturisation:

- 19% increase in moisturisation of the skin with Rev product
- RevCare product gave 67% bigger increase in moisturisation compared with competitor
- RevCare SS locks in moisture
RevCare™ Skin Sense - Organoleptic Benefits

The material was tested in a blind sensorial trial:

• RevCare Skin Sense creates lipstick that can be perceived for extended periods of time
• RevCare Skin Sense lipstick observed to have enhanced skin feel including softness and hydration

Percentage of testers who noted long lasting film on lips
RevCare™ Skin Sense - Fragrance Retention in Deodorants

Superior longer lasting retention of fragrance in stick with Skin Sense

Retention of Fragrance

Intensity Compared with Neat Fragrance

<table>
<thead>
<tr>
<th>Time (h)</th>
<th>0</th>
<th>0.5</th>
<th>1</th>
<th>1.5</th>
<th>2</th>
<th>2.5</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

- **Rev Polymer**
- **Standard**

Fragrance molecules caught in RevCare Skin Sense Film

Tortuous path through film gives sustained fragrance release
RevCare™ Skin Sense - Fragrance Retention by GC

- Performance with and w/o RCSS compared

  - Samples in solvent placed in glass vials and allowed to dry (T0)

  - Vials capped at time points, added to GC autosampler

**Graphs:**
- GC headspace - isoamyl acetate dispensed from THF solvent
- GC headspace - isoamyl acetate & RCSS dispensed from THF solvent
RevCare Skin Sense

Formulation
### RevCare™ Skin Sense - Multiple Formats

**Versions designed for ease of formulation into your product**

<table>
<thead>
<tr>
<th>Format</th>
<th>RCSS Solid * RevCare Skn 100S</th>
<th>RCSS Paste RevCare Skn 110P</th>
<th>RCSS Dispersion RevCare Skn 120L</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RCSS Active</strong></td>
<td>100%</td>
<td>40%</td>
<td>25%</td>
</tr>
<tr>
<td><strong>Example Uses</strong></td>
<td>Anhydrous products, oil phase of emulsions</td>
<td>Emulsions, creams</td>
<td>Transparent water based products</td>
</tr>
</tbody>
</table>

*RCSS is the best form for incorporation into silicone based formulations, please ask Revolymer for formulation advice*
RevCare™ Skin Sense - Deodorant Example

<table>
<thead>
<tr>
<th>Name</th>
<th>Weight%</th>
<th>Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cetyl Alcohol</td>
<td>6.0</td>
<td>A</td>
</tr>
<tr>
<td>C_{18-36} Acid Triglyceride</td>
<td>6.0</td>
<td>A</td>
</tr>
<tr>
<td>Tribehenin</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>Oleth-5</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>RevCare Skn 100S</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>Octyl Palmitate</td>
<td>20.6</td>
<td>B</td>
</tr>
<tr>
<td>Cyclomethicone</td>
<td>10.1</td>
<td></td>
</tr>
<tr>
<td>Pentaerythritol Tetracaprylate/Caprate</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>Al Zr Tetrachlorohydrate Gly</td>
<td>20.1</td>
<td>C</td>
</tr>
<tr>
<td>Talc</td>
<td>22.6</td>
<td></td>
</tr>
<tr>
<td>Preservative</td>
<td>0.5</td>
<td>D</td>
</tr>
</tbody>
</table>

Method:
1) Heat phases A and B to 80 °C and mix molten ingredients.
2) Add phase B to phase A with stirring and homogenise mixture.
3) Add Phase C with stirring.
4) Add Phase D with stirring.
5) Allow formulation to cool to 60 °C and pour into deodorant tubes.
# RevCare™ Skin Sense - Lip Balm Example

<table>
<thead>
<tr>
<th>Name</th>
<th>Weight%</th>
<th>Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>RevCare Skn 100S</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>Caprylic/Capric Triglyceride</td>
<td>21.25</td>
<td></td>
</tr>
<tr>
<td>Polyethylene</td>
<td>10.00</td>
<td></td>
</tr>
<tr>
<td>Beeswax</td>
<td>5.00</td>
<td>A</td>
</tr>
<tr>
<td>Bis-Diglyceryl Polyacyladipate-1</td>
<td>15.00</td>
<td></td>
</tr>
<tr>
<td>Isopropyl Myristate</td>
<td>5.00</td>
<td></td>
</tr>
<tr>
<td>Ricinus Communis Oil</td>
<td>20.00</td>
<td></td>
</tr>
<tr>
<td>Olus (vegetable) oil</td>
<td>8.00</td>
<td></td>
</tr>
<tr>
<td>Butyrospermum Parkii</td>
<td>10.00</td>
<td>B</td>
</tr>
<tr>
<td>Dl-alpha-Tocopheryl Acetate</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>Phenoxyethanol, Ethylhexylglycerin</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>Sodium Saccharin</td>
<td>0.05</td>
<td>C</td>
</tr>
<tr>
<td>Mentha Piperita</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>Argania Spinosa Kernel Oil</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

**Method:**

1) Melt RevCare polymer and Caprylic triglyceride at 90 °C followed by remainder of ingredients in phase A.
2) Cool to 80 °C, add phase B and mix in.
3) Mix in ingredients of phase C until homogenous.
4) Pour into lip balm tubes whilst hot.
RevCare™ Skin Sense - Skin Cream Example

<table>
<thead>
<tr>
<th>Raw Material</th>
<th>INCI</th>
<th>Weight%</th>
<th>Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>Aqua</td>
<td>68.20</td>
<td>A</td>
</tr>
<tr>
<td>Pricerine™ 9091</td>
<td>Glycerin</td>
<td>5.00</td>
<td></td>
</tr>
<tr>
<td>Keltrol® CG</td>
<td>Xanthan Gum</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>Crodamol IPP</td>
<td>Isopropyl Palmitate</td>
<td>12.00</td>
<td></td>
</tr>
<tr>
<td>Lipomulse® Luxe</td>
<td>Cetearyl Alcohol (and) Glyceryl Stearate (and) PEG-40 Stearate (and) Ceteareth-20</td>
<td>4.50</td>
<td>B</td>
</tr>
<tr>
<td>Crodacol™ C90</td>
<td>Cetyl Alcohol</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td><strong>RevCare Skin 100S</strong></td>
<td>Isoprene/MA/Methoxy PEG-40 Copolymer (and) PEG-40 Methoxy Ether</td>
<td>5.00</td>
<td></td>
</tr>
<tr>
<td>BELSIL® DM 100</td>
<td>Dimethicone</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>Euxyl® PE 9010</td>
<td>Phenoxyethanol (and) Ethylhexylglycerin</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Bell Cucumber Fantasy ECO 0803081</td>
<td>Parfum</td>
<td>0.10</td>
<td>C</td>
</tr>
</tbody>
</table>

**Method:**
1) Mix phase A, heat to 75 °C
2) Mix ingredients in order, melting RCSS at 75 °C
3) Add phase B to phase A with stirring and homogenise
4) Add phase C at 40 °C
RevCare™ Skin Sense - Summary

BENEFITS OF REVCARE SKIN SENSE

1. Outstanding long lasting moisturisation
2. Enhanced skin feel
3. Retention of actives on the skin
4. Retention of fragrance on the skin
5. Retention of colour on the skin
RevCare Natural Effects
CONSUMER NEED
1. Consumer demand for products from natural, environmentally friendly ingredients
2. Clear need for high performance natural styling resin

THE REV CARE-NE SOLUTION
1. Polymer styling technology derived from natural sources (up to 100% carbon) using green processes
2. Tailored for great formulation compatibility - spray, gel etc. with no alcohol required
3. Excellent styling characteristics
POLY(SODIUM ITACONATE)
1. Sodium salt of polycarboxylic acid

\[
R = \text{Na}^+ \text{ or } H
\]

PHYSICAL FORMAT
1. Supplied as free flowing powder
2. Soluble in water up to ~ 40 weight%

PHYSICAL PROPERTIES
1. No melting point - stable up to 100+ °C
2. Forms firm glossy films - König hardness of 114
RevCare™ Natural Effects - Hair Styling with Excellent Environmental Resistance

- Tresses with styling resin left at 35 °C at 85% relative humidity
- Complete styling failure from commercial styling resin
- Outstanding moisture resistance from RevCare-NE

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RevCare™ Natural Effects - Hair Styling with Excellent Environmental Resistance

- Tresses with styling resin left at 35 °C at 85% relative humidity
- Complete styling failure from commercial styling resin
- Outstanding moisture resistance from RevCare-NE

5% 10% 5% 10%

Styled with RevCare-NE

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RevCare™ Natural Effects - Hair Styling with Excellent Environmental Resistance

- Tresses with styling resin left at 35 °C at 85% relative humidity
- Complete styling failure from commercial styling resin
- Outstanding moisture resistance from RevCare-NE

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RevCare™ Natural Effects - Hair Styling with Excellent Environmental Resistance

A = RevCare-NE
B = VP/DMAPA Acrylates Copolymer
C = PVP/VA

- Excellent RC-NE performance in mousse
- 35 °C, 85% R.H.
RevCare™ Natural Effects - Hair Styling with Excellent Environmental Resistance

- Comparable with the best petrochemical derived resin in retaining styling
- More natural feel with reduced tack and reduced flaking

A = RevCare-NE
B = Acrylates / Octylacrylamide Copolymer
C = VA/Butyl Maleate/Isobornyl Acrylate Copolymer

0 hours

35 °C, 85% R.H.

24 hours
Method:
- Add ingredients in order and stir until dissolved
- No heating required
## RevCare™ Natural Effects - Natural Hair Mousse

<table>
<thead>
<tr>
<th>Raw Material</th>
<th>INCI</th>
<th>Weight%</th>
<th>Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>Aqua</td>
<td>86.00</td>
<td></td>
</tr>
<tr>
<td>Pricerine™ 9091</td>
<td>Glycerin</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>DL Panthenol</td>
<td>Panthenol</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td><strong>RevCare Natural Effects</strong></td>
<td>Sodium Polyitaconate (pending)</td>
<td>5.00</td>
<td>A</td>
</tr>
<tr>
<td>Olivoil Glutamate FOKSNaB</td>
<td>Sodium Olivoyl Glutamate</td>
<td>6.00</td>
<td></td>
</tr>
<tr>
<td>MinaSolve Green B</td>
<td>Pentylene Glycol (and) Aqua (and) Sodium Benzoate (and) Benzoic Acid</td>
<td>2.00</td>
<td></td>
</tr>
</tbody>
</table>

**Method:**
- Add ingredients in order and stir until dissolved
- No heating required
RevCare™ Natural Effects - Summary

1. Polymer styling technology derived from natural sources (up to 100 % carbon) using green processes
2. Tailored for great formulation compatibility - spray, gel etc. with no alcohol required
3. Strong hold with low flaking and tack
4. Excellent environmental resistance
5. Natural feel curl retention
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