Contents

• What is BENTONE GEL® ISD V?
• What is Isododecane?
  • What are the major application benefits?
  • Where can BENTONE GEL® ISD V be used?
  • How do I incorporate this product into my formulations?
  • What are the typical use levels?
  • How do the rheological properties of BENTONE GEL® ISD V differ from that of pure isododecane?
  • Can you demonstrate the applications with some formulation examples?
  • Is testing data available to help show the performance benefits provided by BENTONE GEL® ISD V?
Q: What is BENTONE GEL® ISD V?

A: BENTONE GEL® ISD V is a dispersion of fully activated BENTONE® 38 V, a non-animal origin hectorite organoclay, in Isododecane.

It has been designed to impart rheological control and suspension in organic and silicone based cosmetics. BENTONE GEL® ISD V is particularly useful in emulsions and can be used in cold process systems. BENTONE GEL® ISD V provides the combined benefits of Isododecane and hectorite organoclay. The isododecane evaporates rapidly. This combined with the smooth after feel achieved with hectorite organoclay results in a pleasant residual silkiness on the skin, masking greasy or tacky components. The hectorite organoclay also provides thermostable viscosity control and provides thermostable viscosity control. It can also be used as an alternative to traditional polymer or cellulose-based thickeners for stabilising emulsions.

The INCI name of BENTONE GEL® ISD V is Isododecane, Distearidimonium Hectorite and Propylene Carbonate.

Typical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Light Tan Paste</td>
</tr>
<tr>
<td>Viscosity (MM cps)</td>
<td>1.7 - 3.0</td>
</tr>
<tr>
<td>Ash Content (%)</td>
<td>5.6 - 6.6</td>
</tr>
<tr>
<td>Total Plate Count</td>
<td>0 - 100 (US)</td>
</tr>
</tbody>
</table>

Table 1. Typical Properties of BENTONE GEL® ISD V
Q: What is Isododecane

Isododecane is a branched chain aliphatic hydrocarbon with 12 carbons, which belongs to the isoparaffin family and corresponds to distillation at 175-185°C. It is volatile, with a flash point of approximately 43°C, which means that it is more volatile than cyclomethicone, so it evaporates rapidly, giving good drying. Isododecane enhances the spreadability of formulations, while leaving a weightless feel on the skin.

Isododecane is completely soluble with silicones, hydrocarbons, isoparaffin and mineral spirits, but insoluble in water. Its low density and low viscosity mean that it can be used as a replacement for oils in emulsions. Isododecane acts as a non-polar dispersing agent, and can help prevent evaporation of water from the skin. The volatility of isododecane makes it perfect for use in various colour cosmetics where no residues are wanted, where improved wear and water resistancy is desired.

Figure 2. Typical chemical structure of isododecane in the 2-methylundecane form
Q: What are the major application benefits?

A: The application benefits include:

- Improved formulation stability, including elevated temperature stability
- Thickening and suspending
- Thixotropic rheological flow
- Enhanced dispersion of actives
- Rich texture and improved formulation aesthetics
- Silky skin feel
- Masks greasy or tacky components
- Ease of spreading and even coverage
- Provides emollience
- Suitable for cold process formulations
Q: Where can BENTONE GEL® ISD V be used?

A: BENTONE GEL® ISD V is suitable for various personal care applications. Some formulation examples are listed in this application guide. This product is very easy to incorporate into the oil phase of emulsions, or all oil systems. Applications may include:

- Mascara
- Eye Shadow
- Antiperspirants
- Skincare products
- Suncare products
- Make-up
- Creams/lotions
- Ointments/oil gels/sticks
Q: How do I incorporate the product into my formulations?

A: BENTONE GEL® ISD V may be added to the oil phase of a formulation at any convenient stage during the manufacturing cycle. This is a very high viscosity, shear-thinning product. To ensure good homogeneous mixing is achieved, care should be taken to overcome the large viscosity differential existing between the BENTONE GEL® and the other lower viscosity components. The use of medium to high shear mixing equipment is recommended. Thorough mixing of the BENTONE GEL® in the oil phase should be ensured before continuing to the next processing step, such as emulsification.

Batch Processing

Single Phase Systems
Always add the BENTONE GEL®, under shear, to a portion of the organic component or solvent with which it is most compatible. Mix until homogeneous before adding the other ingredients.

Multi-Phase Systems (e.g. emulsions)
Treat as with the single phase but always ensure the BENTONE GEL® additive is thoroughly mixed in before continuing to the emulsification stage.

Continuous Processing
The BENTONE GEL® should be added to the oil phase at any convenient point, which meets the above guidelines for batch processing. In multi-manifold systems, a flowable pre-mix of the BENTONE GEL® with a compatible oil or solvent should be made in a side vessel.

Where only lower shear mixing equipment is available, stir the BENTONE GEL® and slowly add the most compatible component gradually, always ensuring the mixture remains homogeneous at each stage.
Q: What are the typical use levels?

A: Product use levels depend on the amount of thickening, stabilisation and cushioning emollience desired in the final formulation. Suspension will be provided by concentrations of 2.5-10.0%. In emulsions, thickening will occur only in the oil phase. Emulsion viscosities will be influenced by concentrations of 3-5%. Higher levels of BENTONE GEL® will have a greater effect on the viscosity. Thermostable viscosity in single phase systems may be achieved by adding 10-25% to the formulation.

Q: How do the rheological properties of BENTONE GEL® ISD V differ from that of pure Isododecane?

A: The flow curves and oscillation curve (frequency sweep) of BENTONE GEL® ISD V and Isododecane are compared below. BENTONE GEL® ISD V is a high viscosity gel, with thixotropic flow behaviour, while Isododecane is a low viscosity liquid with almost a constant viscosity when the shear rate is varied. In addition, BENTONE GEL® ISD V is a gel with a strong structure and excellent stability.

Figure 3. Addition of BENTONE® 38 V produces a high viscosity gel, with thixotropic flow behaviour

Figure 4. BENTONE® 38 V provides excellent stability in Isododecane
Q: Can you demonstrate the applications with some formulation examples?

A: A representative formulation with BENTONE GEL® ISD V is listed here to demonstrate the potential applications.

Formula 1: Powder Veil Foundation

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Supplier</th>
<th>% w/w</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PHASE A</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BENTONE GEL® ISD V (Isododecane and Distearidimonium Hectorite and Propylene Carbonate)</td>
<td>ELEMENTIS Specialties</td>
<td>15.0</td>
</tr>
<tr>
<td>Dow Corning 345 Fluid (Cyclomethicone)</td>
<td>Dow Corning</td>
<td>21.0</td>
</tr>
<tr>
<td>DHL Black (C.I. 77499 and Dimethicone)</td>
<td>US Cosmetic Group</td>
<td>20.0</td>
</tr>
<tr>
<td>Cerauba T1 (Carnauba Wax)</td>
<td>Barlocher France</td>
<td>1.0</td>
</tr>
<tr>
<td>Tegin 4100 Pellets (Glyceryl Stearate)</td>
<td>Evonik Degussa</td>
<td>1.0</td>
</tr>
<tr>
<td>Paratexin P (Propylparaben)</td>
<td>S. Black Group</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>PHASE B</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deionised Water</td>
<td></td>
<td>31.5</td>
</tr>
<tr>
<td>Glycerine</td>
<td></td>
<td>4.0</td>
</tr>
<tr>
<td>Propylene Glycol</td>
<td></td>
<td>2.0</td>
</tr>
<tr>
<td>Crill 43 (Sorbitan Sesquioleate)</td>
<td>Croda</td>
<td>2.0</td>
</tr>
<tr>
<td>Luviskol VA 64 Powder (VP/VA Copolymer)</td>
<td>BASF</td>
<td>1.0</td>
</tr>
<tr>
<td>D-Panthenol USP (Panthenol)</td>
<td>BASF</td>
<td>1.0</td>
</tr>
<tr>
<td>Paratexin M (Methylparaben)</td>
<td>S. Black Group</td>
<td>0.2</td>
</tr>
<tr>
<td>Tetrasodium EDTA</td>
<td></td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>100.0</td>
</tr>
</tbody>
</table>

Procedure

1. Into the main vessel combine Phase A and silverson homogenise until smooth.
2. In a separate vessel blend Phase B together and heat to 55°C. Add Phase C and mix for 20 minutes.
3. Add Phase D to Phase A and silverson homogenise until smooth.
4. Add Phase B+C to Phase A+D and silverson homogenise until smooth.

Physical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Tan Semi-Solid</td>
</tr>
<tr>
<td>pH</td>
<td>N/A</td>
</tr>
<tr>
<td>Viscosity</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Q: Is testing data available to help show the performance benefits provided by BENTONE GEL® ISD V?

A: Experimental data has been obtained by testing the formulation, with and without BENTONE GEL® ISD V. Apparent performance benefits are demonstrated here.

BENTONE GEL® ISD V in Powder Veil Foundation (Formula 1)

The Isododecane provides an emollient effect, with the organoclay helping to improve the application properties and stabilise the product. The sample with organoclay gave a softer smoother skin feel compared to the sample without organoclay.

The temperature oscillation curve shows that the sample with BENTONE GEL® ISD V remains stable from 10-80°C, whereas the sample without organoclay undergoes a phase change at high temperatures.

Figure 5. Temperature oscillation comparison for foundation with and without BENTONE GEL® ISD V
Before using any of our products please consult our Safety Data Sheets.

The information in this publication is, to the best of our knowledge, true and accurate, but since the conditions of use are beyond our control, no warranty is given or to be implied in respect of such information. In every case, caution must be exercised to avoid violation or infringement of statutory obligations and any rights belonging to a third party. We are, at all time, willing to study customers’ specific outlets involving our products in order to enable their most effective use.

© Copyright 2008, Elementis Specialties, Inc. All rights reserved.
Copying and/or downloading of this document or information therein for republication is not allowed unless prior written agreement is obtained from Elementis Specialties, Inc.

© Registered trademark of Elementis Specialties, Inc.

For more details please contact:

AMERICAS
Elementis Specialties
P.O. Box 700
Hightstown
New Jersey 08520
USA
Tel: +1.609.443 2500
Fax: +1.609.443 2446

EUROPE
Elementis Specialties
De Kleetlaan 12a
1831 Diegem
Belgium
Tel: +32.2.790.7600