

BENTONE GEL® GTCC V

Questions & Answers

ELEMENTIS

SPECIALTIES





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Q: What is BENTONE GEL® GTCC V?

A: BENTONE GEL® GTCC V is a dispersion of fully activated BENTONE® 27 V, a non-animal origin hectorite organoclay, in caprylic/capric triglyceride. This emollient trimer is recommended as an alternative for mineral oil and vegetable oils. The BENTONE GEL® GTCC V delivers a combination of benefits in a single, easy to use product. The caprylic/capric triglyceride provides a fine, soft emollience with lubricity, forming a non-occlusive film on the skin surface and acting as a good solvent for chemical sunscreen actives. The organoclay offers rheological modifications for the oil phase and emulsions, which leads



Figure 1. BENTONE GEL® GTCC V

to enhanced product stability, as well as increased viscosity, suspending capability, rich texture, silky skin feel, good spreading properties and thixotropic flow characteristics.

The INCI name of BENTONE GEL® GTCC V is Caprylic/Capric Triglyceride, Stearalkonium Hectorite, Propylene Carbonate.

Typical Properties

Property	Specification
Appearance	Light Tan Paste
Viscosity (MM cps)	1.5 - 3.2
Ash Content (%)	7.6 - 8.2

Table 1. Typical Properties of BENTONE GEL® GTCC V

Q: What is Caprylic/Capric Triglyceride?

Caprylic/capric triglyceride is a natural coconut and palm kernel oil derived mixture of glycerin triester with caprylic and capric acids, which can be used as an alternative to mineral and vegetable oils. It is an excellent moisturising emollient oil with good skin care properties, giving a pleasant non-slippery after feel on the skin.

It is used as a less oily alternative to castor oil in lipsticks and in colour cosmetics. In figure 2 we can see that it has a low Emollient Skin Spreading Factor (ESSF=5.9) indicating good spreading properties. Caprylic/capric triglyceride is a penetration enhancing solvent, which leaves no visible greasy coating on the skin, and is insoluble in water, soluble in warm alcohols and miscible with fats & oils. It has a very high polarity, which can be seen by the low interfacial tension, shown in figure 3, and it can be used as a solvent for lipophilic active ingredients and UV filters. Caprylic/capric triglyceride is odourless with excellent oxidative stability.

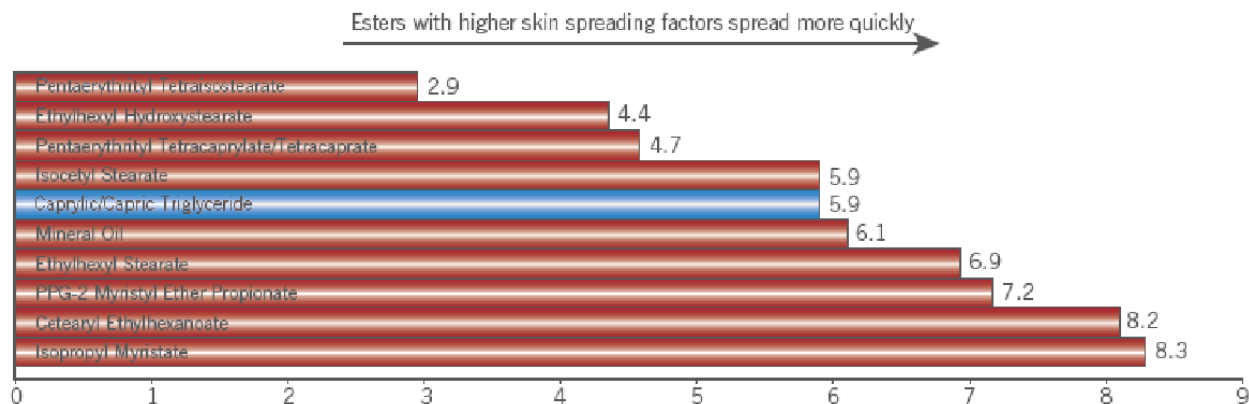


Figure 2. Emollient skin spreading factors

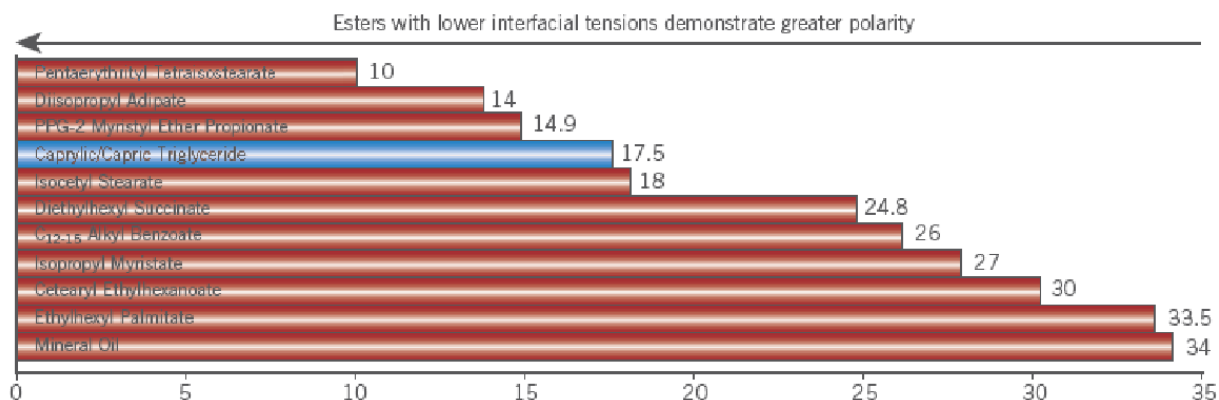


Figure 3. Interfacial tensions

Q: What are the major application benefits?

A: The application benefits include:

- Formulation stability including elevated temperature stability
- Thickening and suspending
- Thixotropic rheological flow
- Enhances dispersion and is a good solvent for chemical sunscreen actives
- Contributes to rich texture and improved formulation aesthetics
- Gives a softer skin feel
- Offers ease of spreading and even coverage
- Provides emollience



Q: Where can BENTONE GEL® GTCC V be used?

A: BENTONE GEL® GTCC 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:

- Make-up
- Skin care products
- Antiperspirant/Deodorants
- Sunscreens
- Hair products
- Creams/lotions
- Ointments/oil gels/sticks
- Baby oils



Q: How do I incorporate the product into my formulations?



A: BENTONE GEL® GTCC 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.

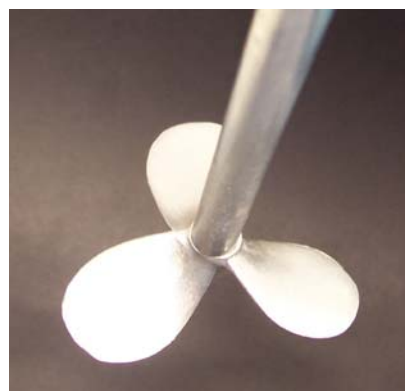
Multi-Phase Systems (e.g. emulsions)

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 and stabilisation desired in the final formulations. Suspension will be provided by 2.5-10.0% additions. In emulsions, thickening will occur in the oil phase only and emulsion viscosities will be influenced by 3-5% additions. Higher levels of BENTONE GEL® will have a greater viscosity influence. Thermostable viscosity in single phase systems may be achieved by 10-25% additions.

Q: How do the rheological properties of BENTONE GEL® GTCC V differ from that of pure caprylic/capric triglyceride?

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

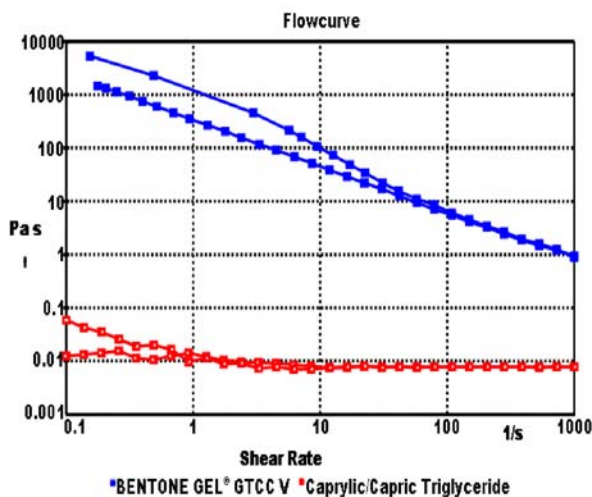


Figure 4. Addition of BENTONE® 27 V produces a high viscosity gel, with thixotropic flow behaviour

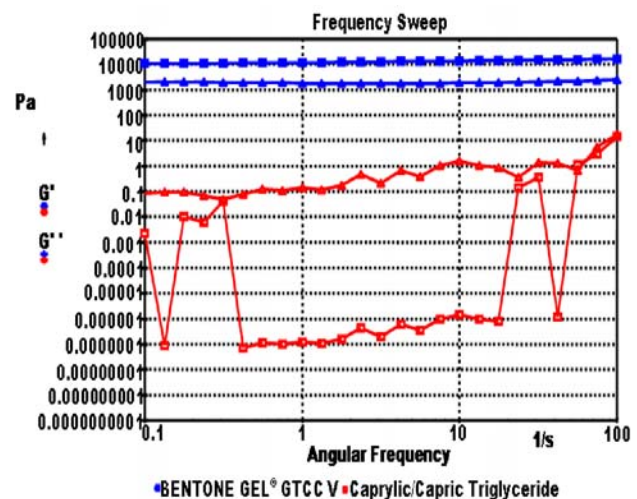


Figure 5. BENTONE® 27 V provides excellent stability in caprylic/capric triglyceride

Q: Can you demonstrate the applications with some formulation examples?

A: Some representative formulations with BENTONE GEL® GTCC V are listed here to demonstrate the various potential applications.

Formula 1: Sugar Body Scrub

Ingredient	Supplier	% w/w
PHASE A		
BENTONE GEL® GTCC V (Caprylic/Capric Triglyceride and Stearalkonium Hectorite and Propylene Carbonate)	ELEMENTIS Specialties	20.0
Crovol M70 (PEG-60 Corn Glycerides)	Croda	10.0
Lexol PG-86d (Propylene Glycol Dicaprylate/Dicaprate)	Inolex	9.1
Lipovol RB (Oryza Sativa (Rice) Bran Oil)	Lipo	5.0
Lipex 106 (Shorea Stenoptera Butter)	Karlshamns AB	3.0
Lipex 203 (Mangifera Indica (Mango) Seed Oil)	Karlshamns AB	2.0
Lipovol ALM (Prunus Amygdalus Dulcis (Sweet Almond) Oil)	Lipo	2.0
Tocopheryl Acetate		0.5
Paratexin P (Propylparaben)	S. Black Group	0.2
BHT	Merck	0.2
PHASE B		
THIXCIN® R (Trihydroxystearin)	ELEMENTIS Specialties	5.0
PHASE C		
Glycerin		13.0
Butylene Glycol		10.0
PHASE D		
Sugar		20.0
Total		100.0

Procedure

1. Heat Phase A together to 75-80°C.
2. Add Phase B to Phase A and mix for 20 minutes using a Silverson homogeniser.
3. Heat Phase C together to 75-80°C.
4. Add Phase C to Phase A+B and mix.
5. Add Phase D to Phase A+B+C and cool to 35°C.

Physical Properties

Appearance	Cloudy Off-White Semi-Solid
pH	N/A
Viscosity - Brookfield DV-II+, Spindle 4, 12 rpm (cps)	N/A

Formula 2: Water in Oil Cream

Ingredient	Supplier	% w/w
PHASE A		
BENTONE GEL® GTCC V (Caprylic/Capric Triglyceride and Stearalkonium Hectorite and Propylene Carbonate)	ELEMENTIS Specialties	9.0
Mineral Oil		16.0
Prisorine 3700 (Polyglyceryl-3 Diisostearate)	Uniqema	3.0
Paraffin Wax	Ross	3.0
PHASE B		
Deionised Water		69.0
Total		100.0

Procedure

1. Heat the Phase A and Phase B separately to 65-70°C.
2. Add Phase B to Phase A with stirring.
3. Stir to cool.

Physical Properties

Appearance	White Balm
pH	N/A
Viscosity - Brookfield DV-II+, Spindle 7, 12 rpm	60000 - 70000

Formula 3: Hair Dressing Cream

Ingredient	Supplier	% w/w
PHASE A		
BENTONE GEL® GTCC V (Caprylic/Capric Triglyceride and Stearalkonium Hectorite and Propylene Carbonate)	ELEMENTIS Specialties	34.0
THIXCIN® R (Trihydroxystearin)	ELEMENTIS Specialties	0.5
Abil OSW5 (Cyclopentasiloxane and Dimethiconol)	Evonik Degussa	8.0
Dow Corning 245 Fluid (Cyclopentasiloxane)	Dow Corning	6.0
Abil EM 90 (Cetyl PEG/PPG-10/1 Dimethicone)	Evonik Degussa	2.5
Drakeol 34 (Mineral Oil)	Penreco	2.0
Abil Soft AF 100 (Methoxy PEG/PPG-7/3 Aminopropyl Dimethicone)	Evonik Degussa	0.5
PHASE B		
Deionised Water		75.5
Sodium Chloride		0.5
PHASE C		
Germaben II E (Propylene Glycol and Diazolidinyl Urea and Methylparaben and Propylparaben)	ISP	0.5
Total		100.0

Procedure

1. Combine Phase A and heat to 60-70°C.
2. In a separate container premix Phase B and heat to 60- 70°C.
3. Slowly add Phase B to Phase A with shear for 10 minutes.
4. Homogenise at 65°C for 10 minutes.
5. Cool down to 45°C and add Phase C.

Physical Properties

Appearance	Glossy White Cream
pH	5.0 - 5.5
Viscosity - Brookfield DV-II+Pro, Spindle 7, 2.5 rpm (cps)	196800

Formula 4: Protective Lipsalve Balm

Ingredient	Supplier	% w/w
PHASE A		
BENTONE GEL® GTCC V (Caprylic/Capric Triglyceride and Stearalkonium Hectorite and Propylene Carbonate)	ELEMENTIS Specialties	8.0
Crodamol GTCC (Caprylic/Capric Triglyceride)	Croda	66.6
Supermol S (Pentaerythrityl Stearate/Caprinate/Caprylate Adipate)	Croda	9.0
Syncrowax HRC (Tribehenin)	Croda	6.0
Pure White Beeswax (Cera Alba)	A&E Connock	5.0
Crodacol C90 (Cetyl Alcohol)	Croda	5.0
Propylparaben	Clariant	0.4
Total		100.0

Procedure

1. Heat all components to 70-75°C.
2. Mix with a silverson homogeniser until uniform.
3. Stir to cool with a propeller stirrer.
4. At 50-55°C fill containers.

Physical Properties

Appearance	Cloudy Semi-Solid
pH	N/A
Viscosity	N/A

Formula 5: Water in Oil Lipgloss

Ingredient	Supplier	% w/w
PHASE A		
BENTONE GEL® GTCC V (Caprylic/Capric Triglyceride and Stearalkonium Hectorite and Propylene Carbonate)	ELEMENTIS Specialties	20.0
Castor Oil (Ricinus Communis)	John L Seatons & Co Ltd	32.5
Sisterna A10E-C (Sucrose Terastearate Triacetate)	Sisterna	5.0
COD 8006 (Ricinus Communis and CI 77491 and BHT)	Sun Chemical	3.0
Colorona Glitter Bordeaux (Mica and CI 77491)	Merck	2.5
COD 8008 (Ricinus Communis and CI 77891 and BHT)	Sun Chemical	1.0
Paratexin P (Propylparaben)	S. Black Group	0.2
PHASE B		
Deionised Water		30.6
Glycerine		5.0
Paratexin M (Methylparaben)	S. Black Group	0.2
Total		100.0

Procedure

1. Heat Phase A together to 80°C.
2. Heat together Phase B to 75°C.
3. Add Phase B to Phase A using high shear mixing (i.e. a silverson homogeniser).
4. Fill into containers and allow to cool.

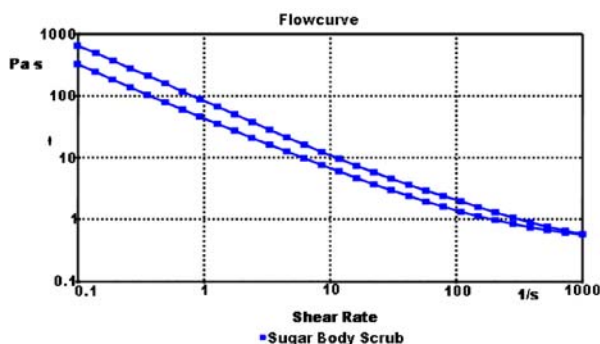
Physical Properties

Appearance	Red Semi-Solid
pH	N/A
Viscosity	N/A

Q: Is testing data available to help show the performance benefits provided by BENTONE GEL® GTCC V?

A: Experimental data has been obtained by testing the different formulations, with and without BENTONE GEL® GTCC V. Apparent performance benefits are demonstrated in the following examples.

BENTONE GEL® GTCC V in the Sugar Body Scrub (Formula 1)



The caprylic/capric triglyceride provides an emollient effect, with the organoclay helping to provide a base for the product, improve the application properties and stabilise the product.

In figure 6, we can see that the sample with BENTONE GEL® GTCC V demonstrated thixotropy.

Figure 6. Flowcurve of the sugar body scrub

BENTONE GEL® GTCC V in a Water in Oil Cream (Formula 2)

This water in oil cream uses caprylic/capric triglyceride as an emollient. The organoclay helps stabilise the emulsion, allows for even application and provides a smooth, soft finish. Figure 7 shows that the viscosity of the water in oil cream with BENTONE GEL® GTCC V is not as greatly affected by the change in temperature as the sample without organoclay.

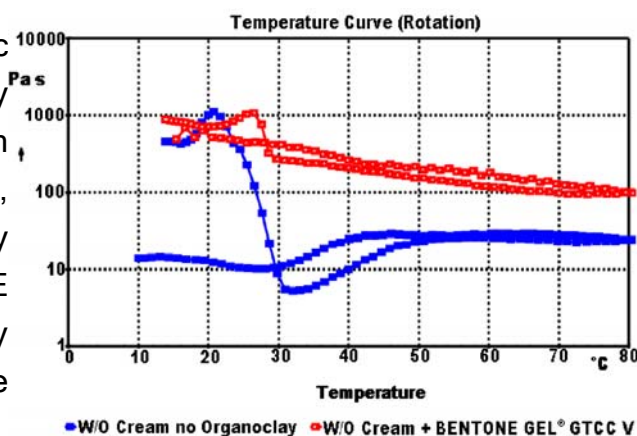


Figure 7. Temperature curves for the creams with and without organoclay

BENTONE GEL® GTCC V in a Hair Dressing Cream (Formula 3)

The hair dressing cream has been designed to provide a combination of styling and conditioning properties. The BENTONE GEL® GTCC V improves the appearance, creating a rich glossy white cream, with good hold and flexible control, improving the overall ease of application. The dressing cream with BENTONE GEL® GTCC V shows a much higher

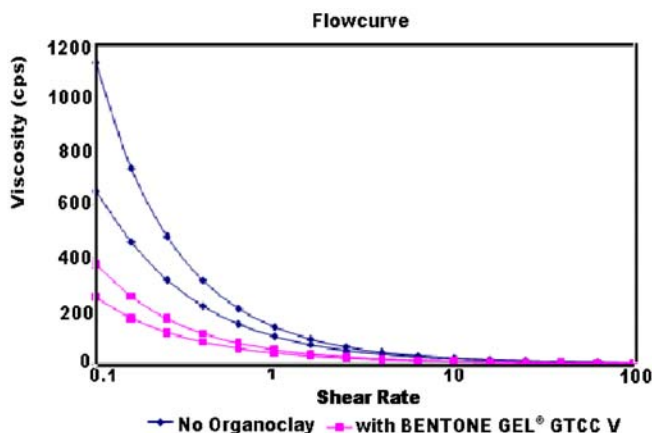


Figure 8. Flow curves for hair creams

viscosity at low shear and a greater thixotropic nature than the control without organoclay. The increased thixotropy of the formulation with BENTONE GEL® GTCC V is an indication of improved application properties and ease of spreading. Both formulations were subjected to stability testing for 3 months. The sample with BENTONE GEL® GTCC V was stable at room temperature, 45°C and after 3 freeze/thaw cycles, whereas the sample without organoclay shows instability at 45°C and after 3 freeze/thaw cycles. In figure 9 we see the results of the freeze/thaw testing.

Both samples were also subjected to sensory evaluation by 8 panelists. The results plotted in figure 10 show improvements in wet feel, wet combing, hold and gloss when organoclay was incorporated into the formulation.

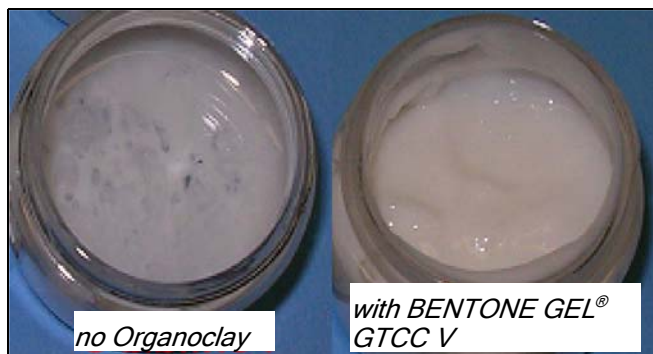


Figure 9. Hair dressing creams after 3 Freeze/Thaw cycles

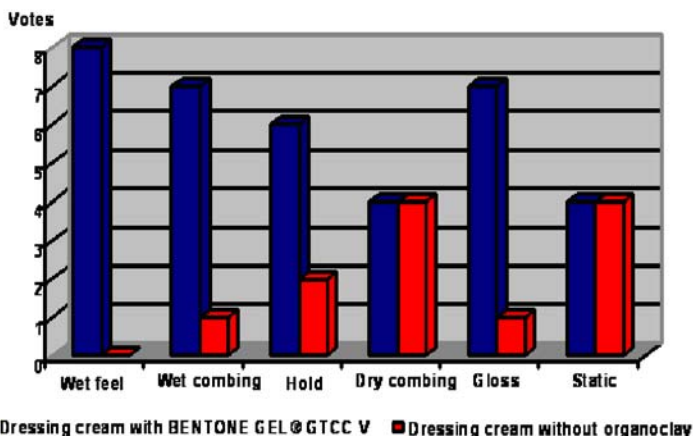


Figure 10. Hair dressing cream sensory evaluation

BENTONE GEL® GTCC V in a Protective Lipsalve Balm (Formula 4)

BENTONE GEL® GTCC V in this lipsalve balm provides easy application and stability, while also increasing the viscosity and giving a creamy feel.

Figure 11 shows the high viscous and thixotropic nature of the lipsalve with BENTONE GEL® GTCC V.

In figure 12 we see that the viscosity takes time to rebuild once the application shear has been removed. This means that the product is thixotropic, giving it more desirable feel characteristics.

In figure 13 the lipsalve appears to be very stable over the entire angular frequency range, which represents good short and long term stability.

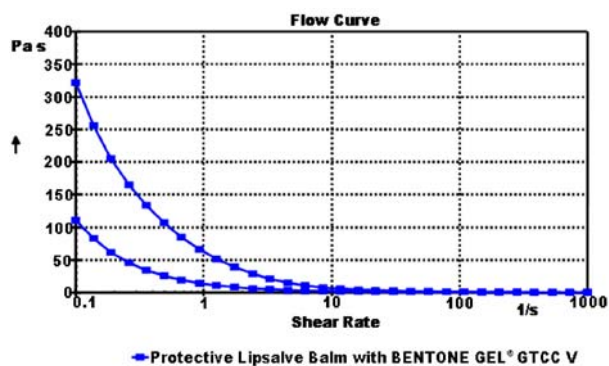


Figure 11. Flow curve for lipsalve balm

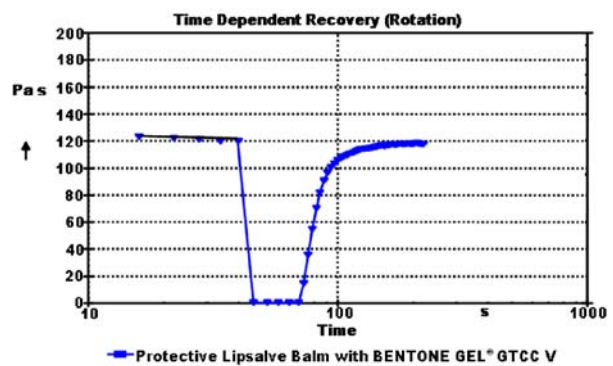


Figure 12. Time dependent recovery curve

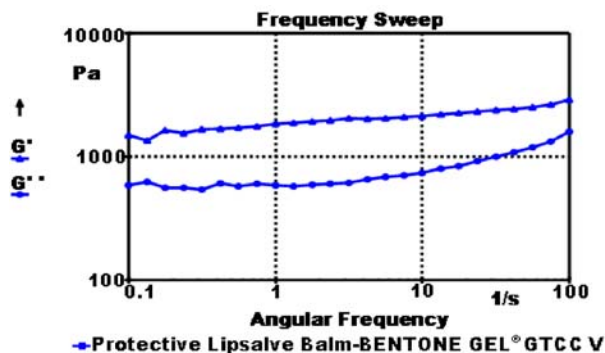


Figure 13. Frequency sweep

BENTONE GEL® GTCC V in a Water in Oil Lipgloss (Formula 5)

Here BENTONE GEL® GTCC V offers the emollient effect of caprylic/capric triglyceride along with the added creamier and softer application properties, improved stability and

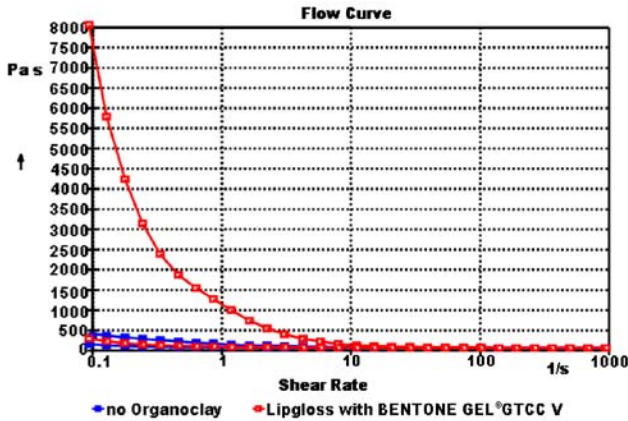


Figure 14. Flow curves for lipglosses

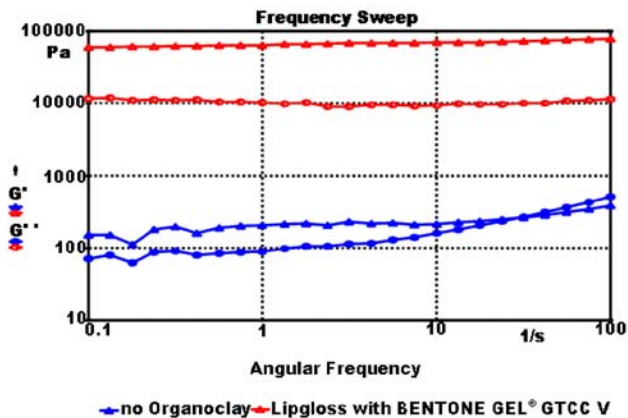


Figure 15. Frequency sweeps for lipglosses

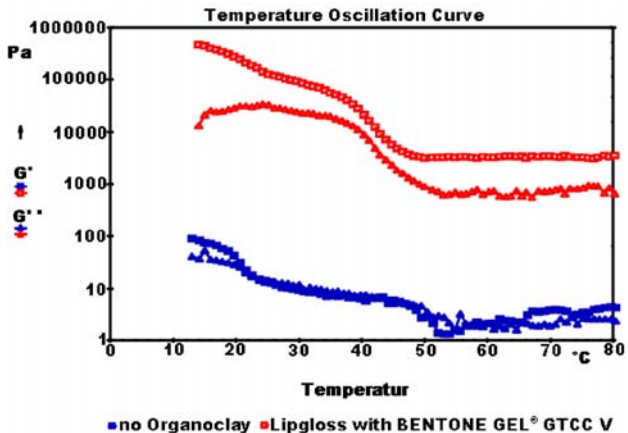


Figure 16. Temperature oscillation curves

better pigment dispersion achieved with hectorite organoclay. Figure 14 shows the difference in viscosity and thixotropy achieved when BENTONE GEL® GTCC V is added. The lipgloss with BENTONE GEL® GTCC V is shown in figure 15 to be stable throughout the angular frequency range, whereas the sample without organoclay indicates an unstable product, due to phase changes which are seen to appear in this diagram.

The sample with no organoclay in figure 16 undergoes phase changes at about 20°C, indicating instability above this temperature. The sample with BENTONE GEL® GTCC V appears to be stable from 10-80°C.

Figure 17 shows sample without organoclay. There is dramatic phase separation. The water and oil phases are not able to disperse properly with each other. The sample with organoclay shows a perfectly formed water in oil lipgloss, with good pigment dispersion and a smooth finish.

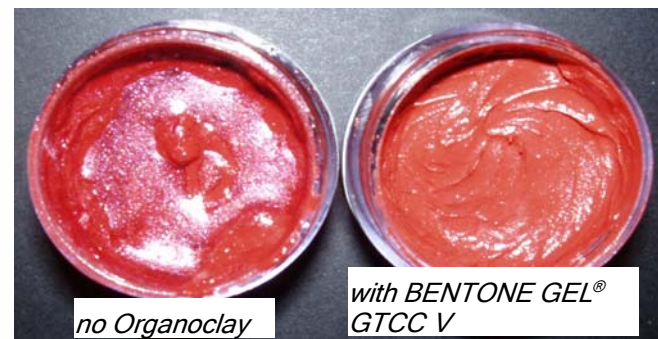


Figure 17. Lipglosses after manufacture



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