Berg+Schmidt
Functional Lipids

BergaMuls ET 2 – The sustainable choice for modern cosmetic formulations from upcycled emulsifi(b)ers



What to expect today
Agenda

1. Introducing BergaMuls ET 2
   - background
   - pickering emulsifiers vs classical emulsifiers
2. Innovative Formulation Solutions with BergaMuls products
3. BergaMuls ET 1 vs BergaMuls ET 2







What does a sustainable cosmetic formulation look like?

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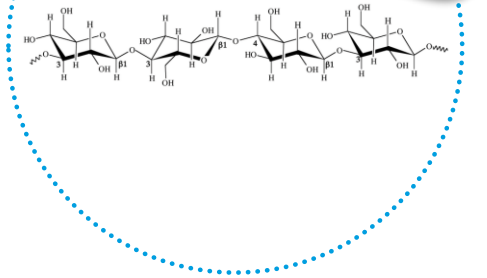
Selection



Seen with the eyes of a Chemist.

Sourcing



Seen with the eyes of a Purchaser.

Formulating



Seen with the eyes of a Formulator.

Marketing



Seen with the eyes of the Consumer.

But what does „sustainable“ actually mean?

But what does „sustainable“ actually mean?



Sustainability	Meeting the needs of the present without compromising the ability of future generations to meet their own needs.
Naturality	Different standards for natural cosmetic products.
Water-less	Increasing water scarcity leads to new and sustainable product formats.
Up-cycling	Processing wastes from agro-food industries (fruits and vegetables).

Dietary fibers

Selection of fibers
Soluble fibers/ Hydrocolloids in food

- **Emulsifying activity of hydrocolloids**
  - Not regarded as classic emulsifier
  - Supports emulsion stability and shelf life

- **Hydrocolloids in food processing**
  - Widely used in food industry
  - Thickeners or gelling agent for soups, dressings or pudding
  - Emulsifier in ice cream yoghurt or butter

  - Fat substitute in meat or dairy products
  - Coating agents in confectionary
  - Organic adhesive in bread glaze
  - Clarifying bevearges, turbidify fruit juices



Selection of fibers
Soluble and insoluble fibers in cosmetic formulations



Emulsifier by forming a protective layer (“pickering”)
- Decreasing the energy at oil-water interface by adsorption
- Particle wettability, contact angle measurement



Rheology modifier
- Shear-thinning or thickening
- Helps to suspend particles



Sensory enhancer
- Smoothening
- Soft touch or anti-chafing



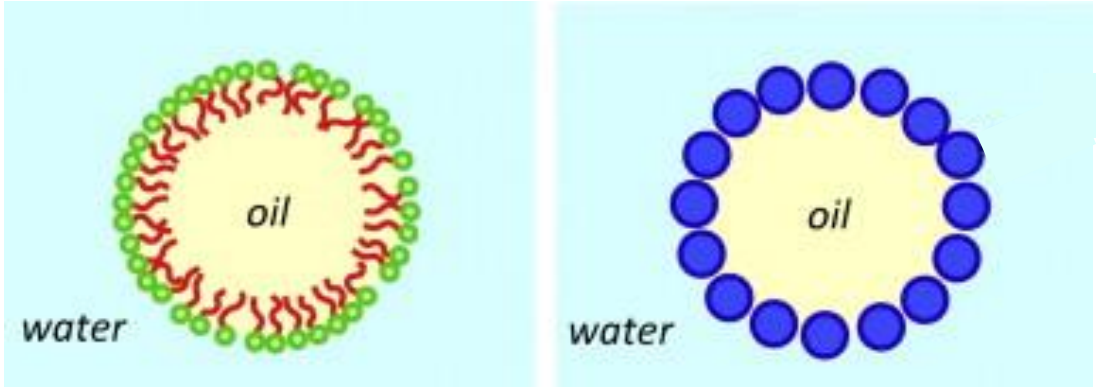
Care ingredients
- Skin moisturizing
- Lubricant in hair care

BergaMuls ET 2
Pickering emulsions

- No common emulsifier with hydrophilic head and lipophilic tail
- Emulsification by solid particles that absorb at the surface of the oil droplet → balanced ratio of hydrophilic / hydrophilic required

Advantages of pickering emulsions

- Kinetically stable
- Stability against coalescence
- Higher skin compatibility (do not wash lipids off the skin)
- Low cytotoxicity
- Biodegradability



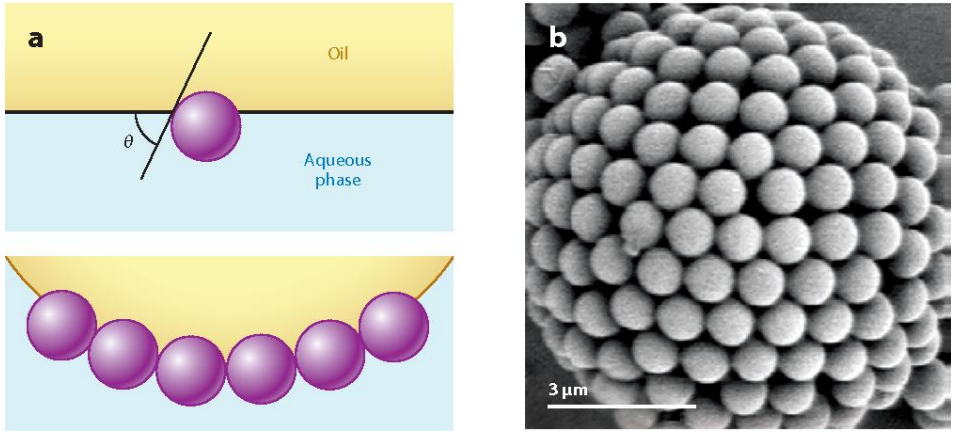
Classic o/w emulsion Pickering o/w emulsion

Y. Chevalier and M. Bolzinger, Colloids and Surfaces A: Physicochemical and Engeneering Aspects, 2013, 439, pp. 23 – 34.

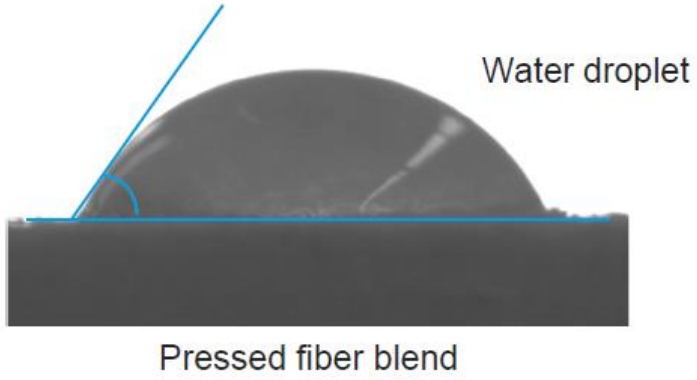
BergaMuls ET 2
Pickering emulsions

Wetting ability

- Particles for pickering stabilisation should exhibit both hydrophilic and hydrophobic properties
- Analyzed by contact angle measurement
- Ideally, the contact angle is close to 90 °



Pickering Emulsions for Food Applications: Background, Trends, and Challenges
Claire C. Berton-Carabin and Karin Schroën
Annual Review of Food Science and Technology 2015 6:1, 263-297

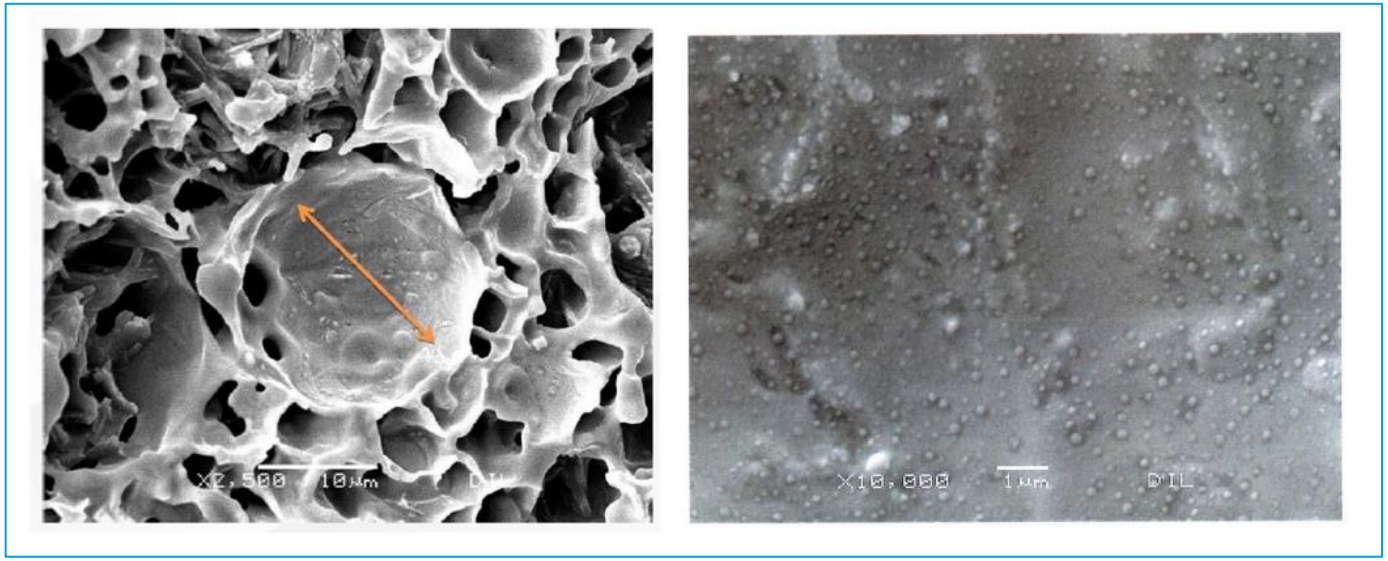


Contact angle measurement of Fiber Mix 1: **85 °**

BergaMuls ET 2
Pickering emulsions

Fiber swelling

- Stabilisation / thickening by swelling of the fibers to form a fibre network
- For thickening in oil-free systems min. 3% of the fiber is needed

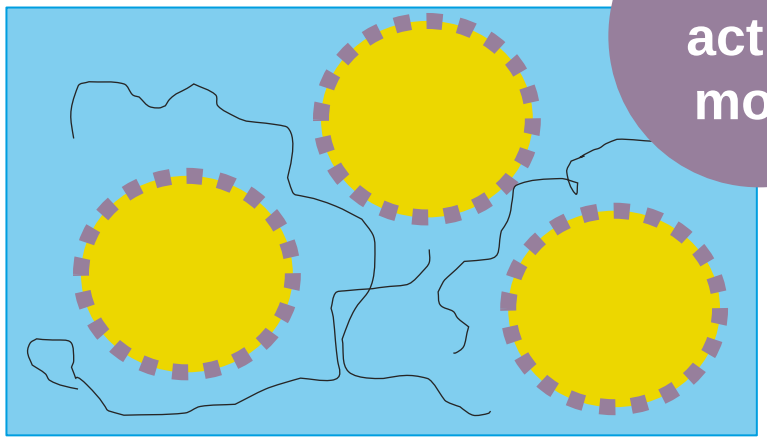


Selection of fibers
Requirements

Dual action mode

Wetting ability

- Particles for pickering stabilisation should exhibit both hydrophilic and hydrophobic properties
- Analyzed by contact angle measurement



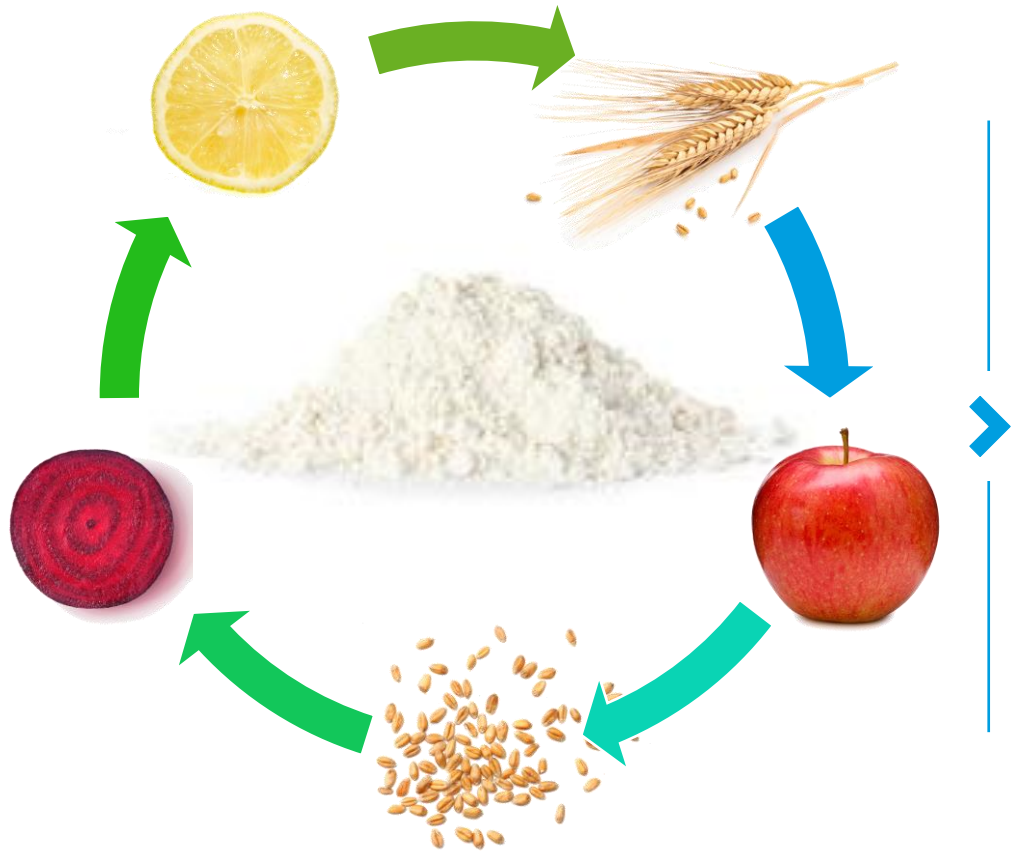
Fiber swelling

- Stabilisation / thickening by swelling of the fibers to form a fibre network

- **Fiber color**
- **Particle sizes**
- **Compatibilities e.g. ionic charge**



What makes the sourcing sustainable?



Fibers are

Water-less powders based on dried and milled fruit and cereal fibers

Abundant and draught-resistant material

Palm-free and not grown in mono-cultures

Renewable sources and affordable

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Innovative Formulation Solutions

BergaMuls products

Formulating

- **Typical emulsifiers used in (natural) cosmetics**
  - Are known to the market
  - Have a good availability
  - Create standard emulsions and textures
- **But:**
  - Are esterified
  - Need hot process
  - Tend to soap
  - Give waxy feel

- **Fiber-based emulsifier**
  - Create different texture
  - Skin feel more like a filler
  - Are not surface active → mild to skin barrier
  - Cold-processible!



BergaMuls ET 2
At a glance

INCI: Cellulose (and) Cyamopsis Tetragonoloba (Guar) Gum (and) Beta-glucan



- Main or co-emulsifier in o/w emulsions at 1.5 -3%, depending on product type.
- Ivory colored powder based on wood and cereal fibers for hot and cold process.
- Allows for different concept – from cream-gel to lotion and cream.
- Based on by-products from agro-food industries.

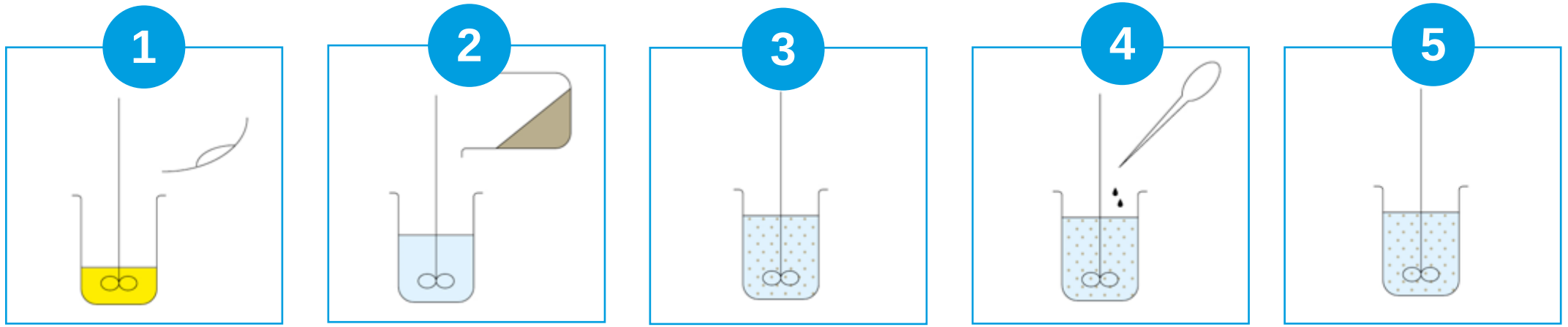
Formulating BergaMuls ET 2

- **Typical use concentrations**
  - Up to 2% as co-emulsifier, stabilizer and consistency enhancer
  - Up to 3 % as main or standalone emulsifier
- **Dosage also depends on**
  - Size of the oil phase
  - Desired viscosity
  - % use concentration
  - Overall concept



How and where to use
Manufacturing procedure

- **Application**: o/w emulsions
- **Use concentration**: 1.5 – 3,0 % (depending on size of oil phase)



1	2	3	4	5
Disperse BergaMuls ET 2 in the oil phase.	Mix ingredients of water phase. If needed apply heat.	Add oil phase to water phase under stirring at 1500 rpm for 20 min.	Add sensitive ingredients subsequently (after cooling down)	Adjust pH value to 5 - 5.5.

Hydra-Silk Gel Elixir
Cold-processed cream-gel

Phase	Product	INCI Name	Supplier	% (w/w)
A	demin. Water	Aqua	–	Up to 100
	Cosphaderm Dicapo Natural	Caprylyl Glycol (and) Propanediol (and) Glyceryl Caprylate	Cosphatec	1.0
	Cosphaderm Pentiol Natural	Pentylene Glycol	Cosphatec	2.0
	Rice PO4 Natural	Distarch Phosphate	Agrana	1.5
	Glycerin 99.5%	Glycerin	Diverse	3.0
B	BergaCare FG M12	Coco-Caprylate/Caprate (and) Dodecane (and) Citrullus Lanatus (Watermelon) Seed Oil	Berg+Schmidt	2.0
	BergaMuls ET2	Cellulose (and) Cyamopsis Tetragonoloba Gum (and) Beta-Glucan	Berg+Schmidt	1.5
	Grape Seed Oil	Vitis Vinifera Seed Oil	Diverse	5.0
	Hazelnut Oil	Corylus Avellana Seed Oil	Diverse	3.0
	Keltrol CG-SFT	Xanthan Gum	CP Kelco	0.1
	Cosphaderm T70 non-GMO ECO	Tocopherol, Helianthus Annuus Seed Oil	Cosphatec GmbH	0.5
B1	Perfume	Aloe Stars	Vögele	0.1
C	Citric Acid (25% Lsg.)	Citric Acid	Diverse	Adjust pH

Claims
- Skin Barrier Restoring
- Velvelt- Like Skin Feel

Manufacturing procedure

- Weigh in all raw materials from phase A and start stirring, until everything is dissolved.
- Combine all materials of phase B separately and mix together.
- Add phase B to A under stirring.
- Stir for 20 min at 1500 rpm .
- Add phase B1 and adjust pH.

pH = 5.2
Viscosity (24 h) = 8400 mPas
Internal Ref.: SC100-ELA

Body cream
Hot-processed with co-emulsifier

Phase	Product	INCI Name	Supplier	% (w/w)
A	demin. Water	Aqua	-	83.7
	Glycerin 99.5%	Glycerin	Berg+Schmidt	2.5
	Cosphaderm® Pentiol natural	Pentylene Glycol	Cosphatec	5.0
B	BergaCare FG Olive	Hydrogenated Ethylhexyl Olivate (and) Hydrogenated Olive Oil Unsaponifiables	Berg + Schmidt	3.0
	Vegarol 1618 50:50	Cetearyl Alcohol	Berg+Schmidt	2.5
	Dermofeel GSC	Glyceryl Stearate Citrate	Berg+Schmidt	1.0
	BergaCare EM-CP	Cetyl Palmitate	Diverse	3.0
	Vegarol 1898	Stearyl Alcohol	Berg+Schmidt	1.0
	BergaCare SB	Butyrospermum Parkii (Shea) Butter	Berg + Schmidt	10.0
	Grape Seed Oil	Vitis Vinifera Seed Oil	Diverse	2.0
	Jojoba Oil	Simmondsia Chinensis (Jojoba) Seed Oil	Diverse	2.0
	Cosphaderm® T-70 non GMO Eco	Tocopherol (and) Helianthus Annuus (Sunflower) Seed Oil	Cosphatec	0.1
	BergaMuls ET 2	Cellulose (and) Cyamopsis Tetragonoloba (Guar) Gum (and) Beta-glucan	Berg + Schmidt	2.0
C	Citric Acid solution (25%)	Citric Acid	Diverse	adjust pH

Claims

- Vegan and COSMOS approved
- Rich formulation with caring after feel

Manufacturing procedure

- Weigh in all raw materials from phase A and start stirring
- Weigh in all raw materials from phase B heat both phases up to 75 °C
- When phase B is melted add it to phase A under stirring.
- Continuously stirring for some minutes.
- Cool down under stirring at 1500 rpm for 20 minutes.
- Adjust pH if necessary

pH = 5.5
Viscosity (24 h) = 23600 mPas
Internal Ref.: SC99-ELA

Standard lotion
Cold-processed o/w emulsion

Phase	Product	INCI Name	Supplier	% (w/w)
A	demin. Water	Aqua	-	Up to 100
	Cosphaderm® KG	Amorphophallus Konjac Root Extract	Cosphatec	0.2
	Cosphaderm® Pentiol natural	Pentylene Glycol	Cosphatec	5.0
B	BergaCare FG Olive	Hydrogenated Ethylhexyl Olivate (and) Hydrogenated Olive Oil Unsaponifiables	Berg+Schmidt	5.0
	Cosphaderm® T-70 non GMO Eco	Tocopherol (and) Helianthus Annuus (Sunflower) Seed Oil	Cosphatec	0.1
	Sunflower Seed Oil	Helianthus Annuus Seed Oil	Diverse	4.0
	BergaMuls ET 2	Cellulose (and) Cyamopsis Tetragonoloba (Guar) Gum (and) Beta-glucan	Berg+Schmidt	2.0
C	Citric Acid solution (25%)	Citric Acid	Diverse	Adjust pH

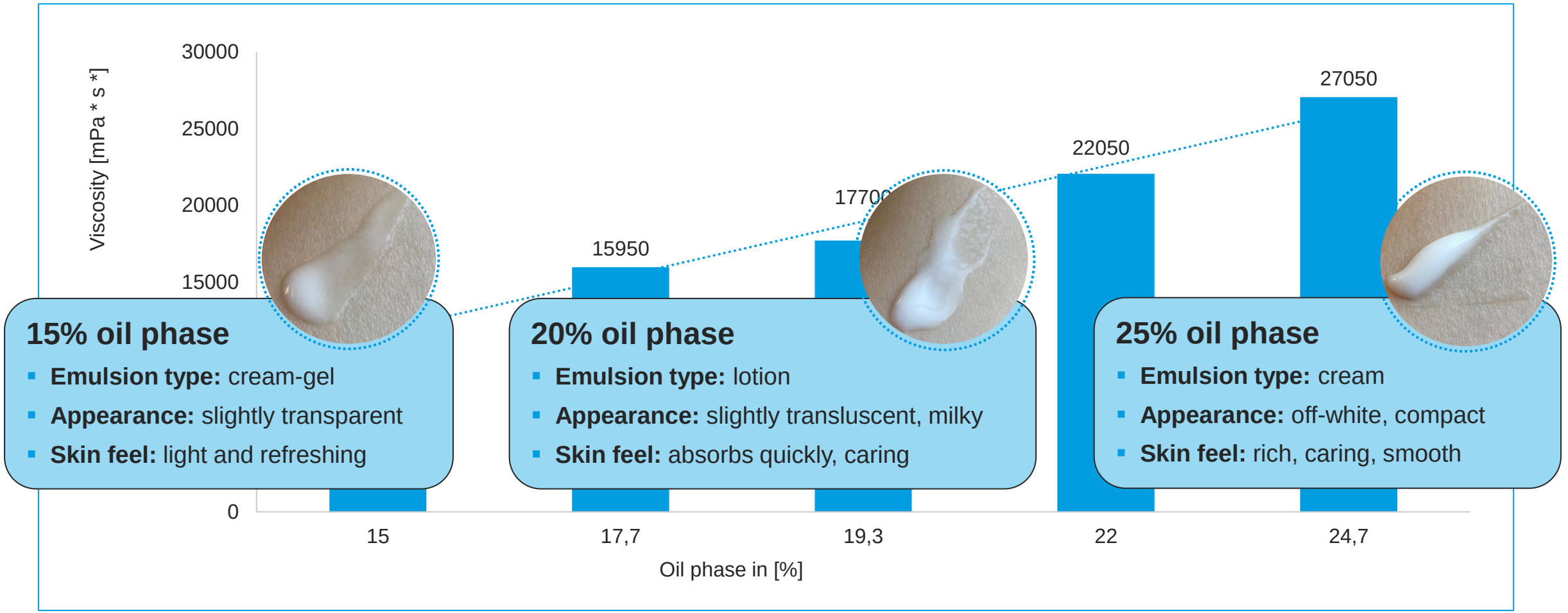
Claims
- Cold-processable
- Easy to produce

Manufacturing procedure

- Weigh in all raw materials from phase A and start stirring, until everything is dissolved.
- Combine all materials of phase B separately and mix together.
- Add phase B to A under stirring.
- Stir for 20 min at 1500 rpm .
- Adjust pH.

pH = 5.45
Viscosity (24 h) = 11620 mPas
Internal Ref.: SC98-ELA

BergaMuls ET 2
Emulsion types – depending on size of oil phase



15% oil phase
- **Emulsion type:** cream-gel
- **Appearance:** slightly transparent
- **Skin feel:** light and refreshing

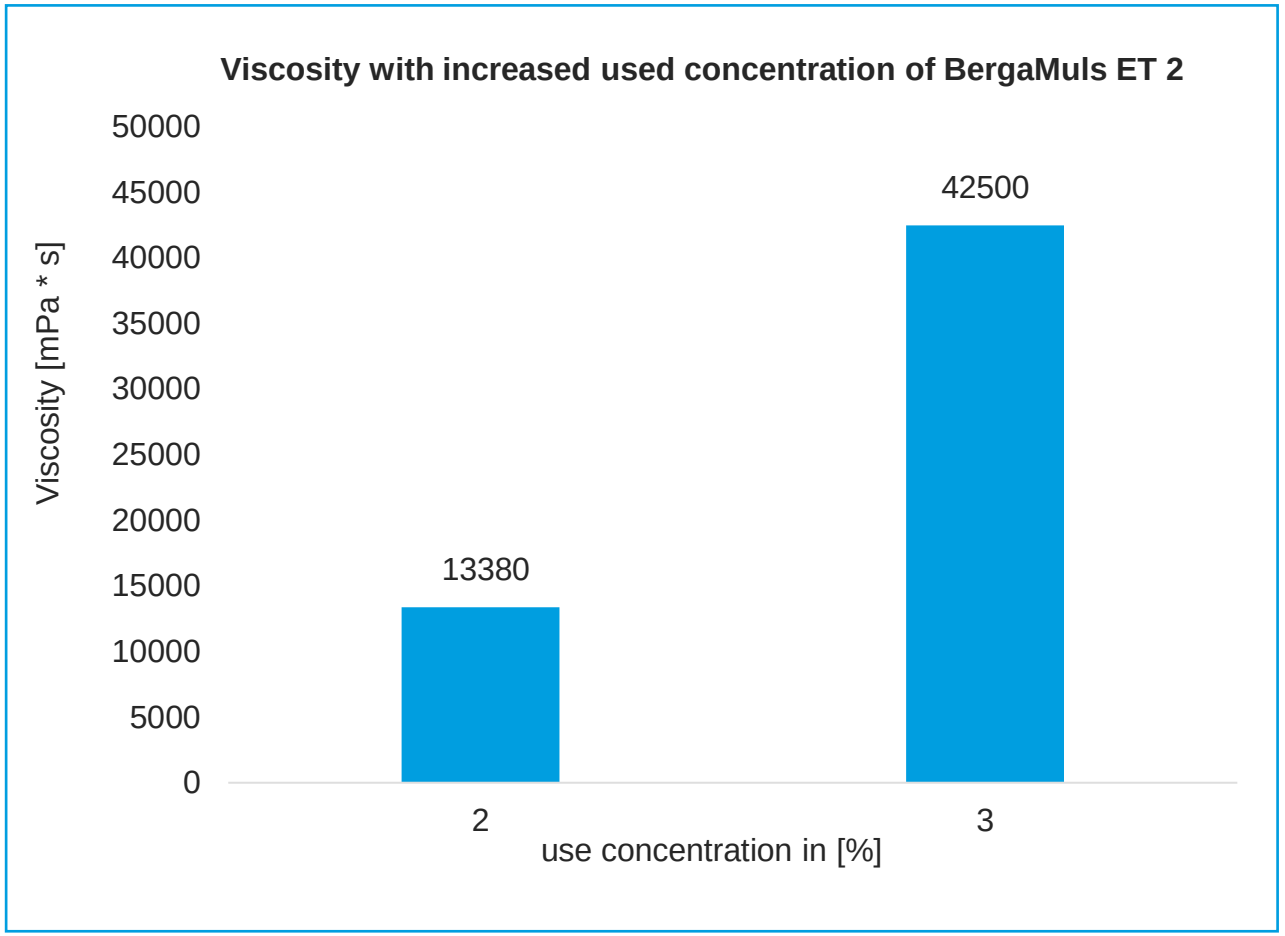
20% oil phase
- **Emulsion type:** lotion
- **Appearance:** slightly transluscent, milky
- **Skin feel:** absorbs quickly, caring

25% oil phase
- **Emulsion type:** cream
- **Appearance:** off-white, compact
- **Skin feel:** rich, caring, smooth

*Measured with RV Brookfield Spindle 5, 20.000 rpm

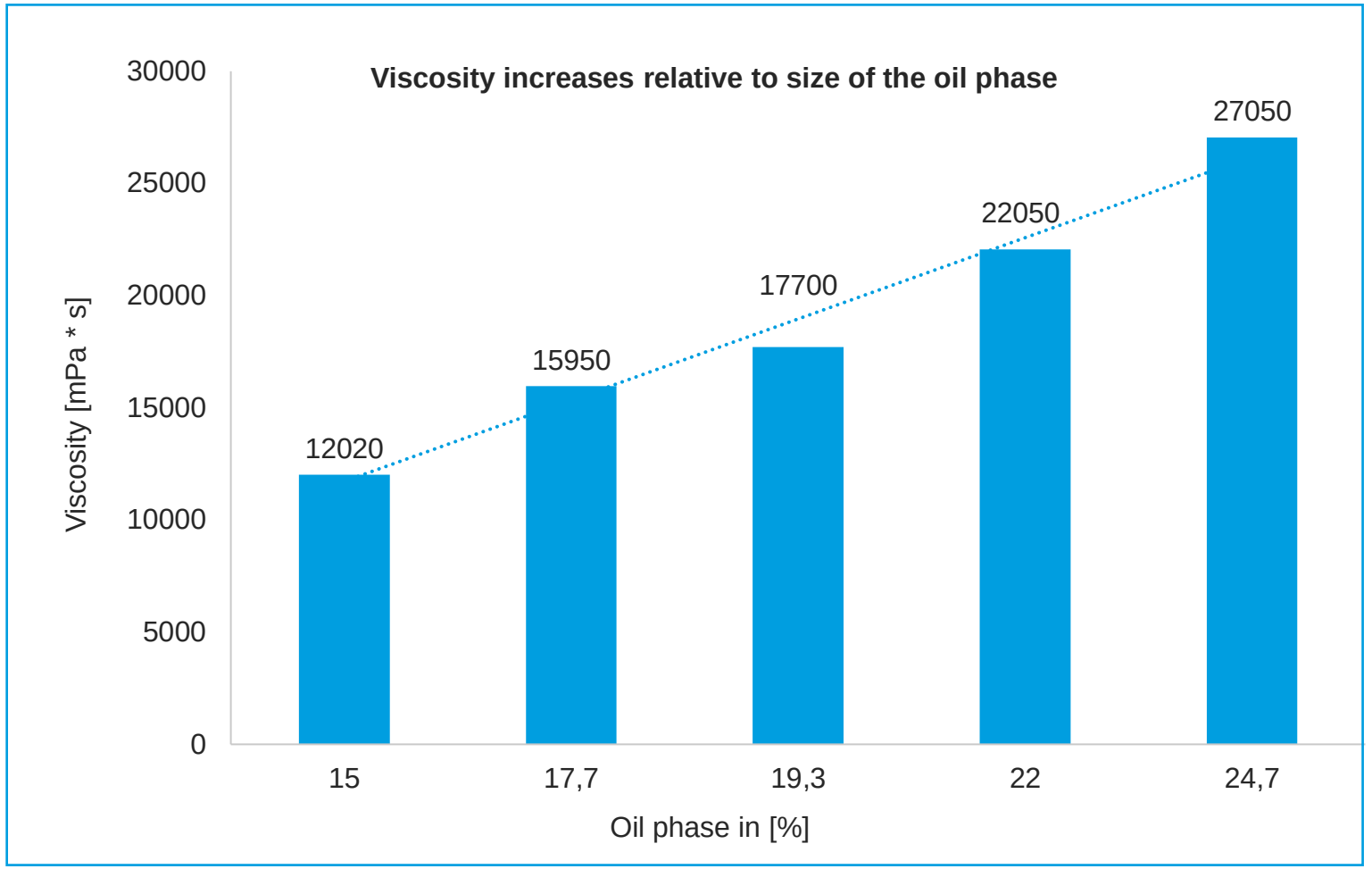
BergaMuls ET 2
Technical aspects – use concentration

- No surface active molecule, hence mild to skin barrier
- Stabilizes o/w emulsions without additional co-emulsifiers
- Fiber-based emulsifier
  - Create a variety of different texture
  - Skin feel depends on formulation concept
  - Cold-processible and hot-processible



BergaMuls ET 2
Technical aspects – size of oil phase

- No homogenization is needed within the process
- Hot as well as cold process is possible
- Different textures possible – from gels to lotions and creams



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BergaMuls ET 1

Ahead of the trend curve

BergaMuls ET 1
At a glance

INCI: Beta-glucan (and) pectin



- Multiple functionality as co-emulsifier, thickener or sensory enhancer.
- Ivory colored powder-based fruit and cereal fibers.
- Excellent compatibility with high amounts of electrolytes or tricky ingredients.
- Based on by-products from agro-food industries.

BergaMuls ET 1
The story behind or: How it started in 2012!

STERNWYWIOLGruppe
WE FUTURE FOOD

The development was based on a collaboration with our sister food company Hydrosol. We are part of the interdisciplinary Stern-Wywiol Gruppe, and can benefit in many ways from its outstanding expertise in all kinds of food applications.





Food for beautiful skin.

Consumers expect natural ingredients to do the same job as traditional systems when used in the same way. In talking about natural and sustainable alternatives, we have to re-think not only the origin of the raw materials but also the formulation process. *Let's talk about what's in cosmetic formulations, and not what isn't!*

BergaMuls ET 1
(INCI: Beta-Glucan and Pectin)

The **trendsetter** within our range of natural cosmetic raw materials. It's based on fruit and cereal fibre by-products from the food industry i.e. juice production, and is therefore a prime example of **"circular beauty"**.
The fruit fibres that provide the thickening pectin are obtained from freshly harvested, de-juiced and de-oiled fruits. The pulp is then dried and milled. ß-glucan is derived from cereal fibre. It's known for its **moisturizing, soothing and skin calming** properties.
BergaMuls ET 1 is also an outstanding multi-functional ingredient, because it's an:

- *Emulsifier*
- *Thickener*
- *Sensory enhancer*

BergaCare FG products

... are natural silicone alternatives to cyclopentasiloxane and are readily biodegradable. The range consists of four products, giving a broad choice for formulators.

Especially the origin from olive and **Kalahari melon seed oil** gives the different blends additional functionality, as well as great sustainability. The latter oil is very rich in essential fatty acids, while providing antioxidant properties in topical applications.

- *BergaCare FG 5*
- *BergaCare FG Olive*
- *BergaCare FG M12*
- *BergaCare FG L11*

BergaCare Shea Butter

Women's gold is what shea butter is often referred to. This valuable and natural ingredient not only nourishes the skin when used in lotions or creams. It also nourishes African women and communities that harvest the widely growing shea nuts. In contrast to huge monoculture plantations, shea nuts are only collected between May and October, and only as much as is available. The nuts are then dried and mechanically processed to obtain the raw butter. This work enables women to improve the quality of their lives and the lives of their families and communities. It's more than just an ingredient. It's a tradition. BergaCare SB shea butter (INCI: Butyspermum Parkii (Shea) Butter) supports this tradition.

BergaMuls ET 1
For certified natural cosmetics

For certified natural cosmetics

“The jury stated: A very interesting multifunctional component, which fulfils a lot of needs in formulating natural cosmetics. The efficacy of glucans are well-known, but the idea to form an emulsifying agent with additional components seems new to me and is really convincing. The performance data are very good and this raw material is a very good one additional to known emulsifying agents.”

Dr. Jan-H. Riedel

BSB Innovation Award® NATURAL Products 2021
1. Prize Category Most Innovative Raw Material

BSB Innovation Award® Environment 2021
1. Prize Category Raw Materials

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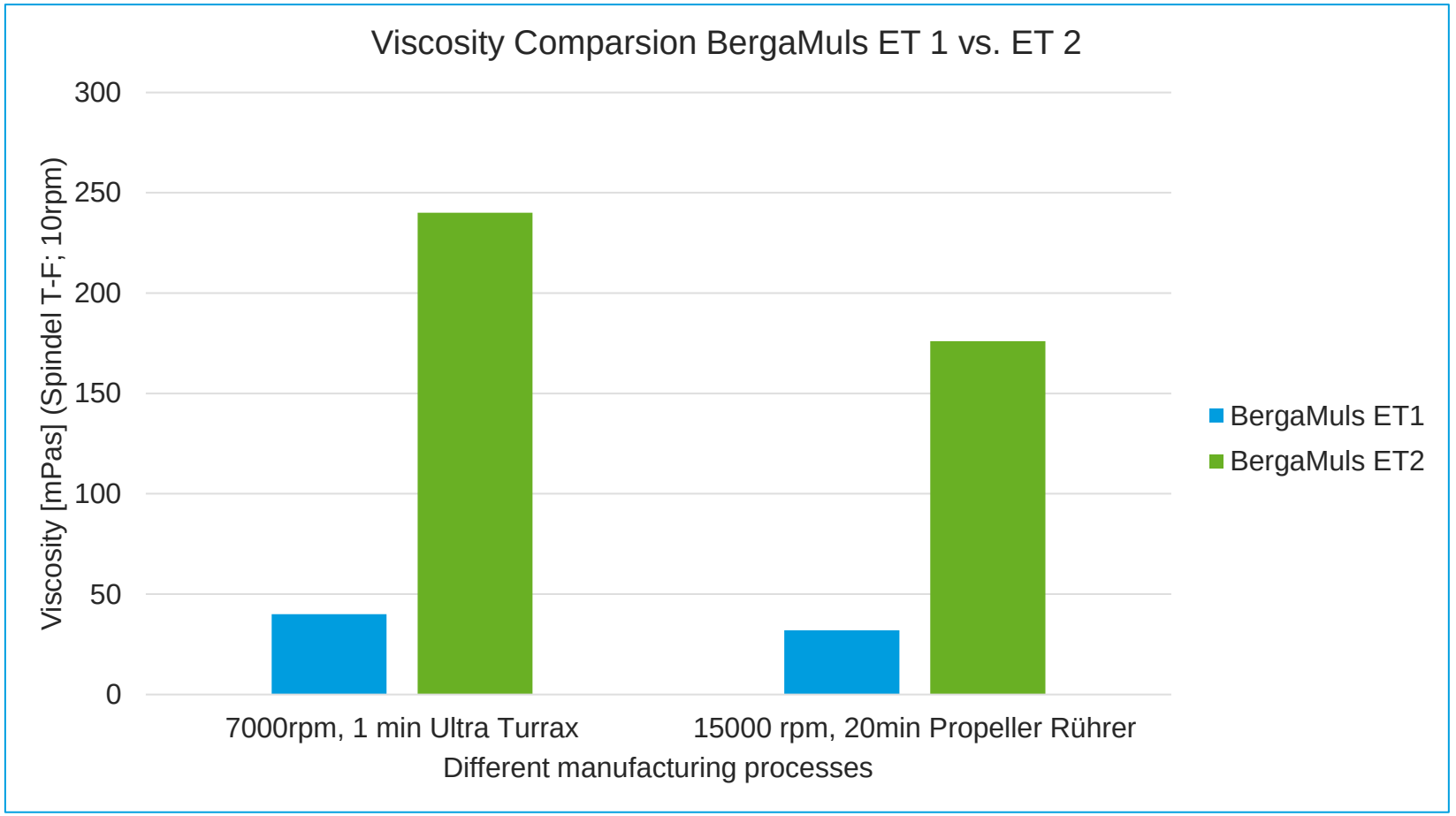
STERNWYWIOLGruppe

BergaMuls ET 1 vs. ET 2
Same, same but different

	BergaMuls ET 1	BergaMuls ET 2
		
INCI	▪ Beta-glucan (and) pectin	▪ Cellulose (and) Cyamopsis Tetragonoloba (Guar) Gum (and) Beta-glucan
Application	▪ Co-stabilizer in o/w emulsions at use concentrations up to **3%**. ▪ Thickening agent and rheology modifier in oil-free serum formulations at **3-5%** or for face masks up to **8%**. ▪ Sensory enhancer at **1-3%**. ▪ **Creates lotion-like textures**	▪ Main emulsifier or co-emulsifier in o/w emulsions at use concentrations of **1.5-3%**. ▪ The size of the oil phase and use concentration defines the product type. Emulsifi er-free claim possible! ▪ Thickening agent. ▪ Co-stabilizer. ▪ **Creates cream-gels**
Benefits of both	▪ Natural and sustainable ingredients up-cycled from food by-products. ▪ Mild to the skin and does not identify as emulsifier.	

BergaMuls ET 1 vs. ET 2
Viscosities



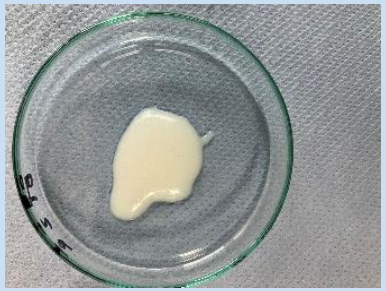
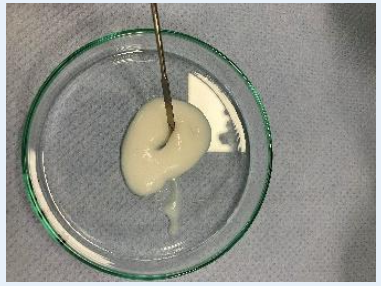
Observations

- Viscosities of BergaMuls ET 1 and ET 2 both used at 3% use differ significantly.
- BergaMuls ET 1 creates less viscous and flowable systems.
- BergaMuls ET 2 builds higher viscosity and gelly systems.

Formulation implications

- BergaMuls ET 1 traditionally used for light lotions or serums.
- BergaMuls ET 2 suitable for creams and cream-gels.

BergaMuls ET 1 vs. ET 2
Macroscopic analysis

	Homogenization	Stirring
BergaMuls ET1		
BergaMuls ET2		

Observations

- Viscosities of BergaMuls ET 1 and ET 2 both used at 3% use differ significantly.
- BergaMuls ET 1 creates less viscous and flowable systems.
- BergaMuls ET 2 builds higher viscosity and gelly systems.

Formulation implications

- BergaMuls ET 1 traditionally used for light lotions or serums. *note that if used as emulsifiers/co-emulsifiers, it has to be homogenised
- BergaMuls ET 2 suitable for creams and cream-gels, no need for homogeniser

BergaMuls ET 1
Basic Pickering Emulsion with BergaMuls ET1

Phase	Product	INCI Name	Supplier	% (w/w)
A	Demin Water	Aqua	diverse	77.9
	Glycerin 99.5%	Glycerin	Berg+Schmidt	3.0
B	**BergaMuls ET 1**	**Beta-Glucan (and) Pectin**	**Berg+Schmidt**	**3.0**
	BergaCare FG Olive	Hydrogenated Ethylhexyl Olivate (and) Hydrogenated Olive Oil unsaponifiables	Berg+Schmidt	5.0
	BergaBest MCT Oil 60/40	Caprylic Capric Triglyceride	Berg+Schmidt	5.0
	Sunflower Seed Oil	Helianthus Annuus (Sunflower) Seed Oil		5.0
	Cospaherm MultiMeg	Glyceryl Caprylate, Pentylene Glycol, Magnolia Officinalis Bark Extract	Cosphatec	1.0
	Cosphaderm T-70 non GMO ECO	Tocopherol, Helianthus Annuus Seed Oil	Cosphatec	0.1

Manufacturing procedure

1. Weigh in phase A and phase B in two Beaker.
2. Add phase A to B with homogenization process (1min 9000rpm).
3. Adjust pH if necessary.

- Cold process
- Lotion with silky skin feel

pH = 5.2
Viscosity (24 h) = 1000 mPas (Brookfield, 20 rpm)
Internal Ref.: ET-01.01-1123

Stability: ongoing

BergaMuls ET 2

Basic Pickering Emulsion with BergaMuls ET 2

Phase	Product	INCI Name	Supplier	% (w/w)
A	Demin Water	Aqua	diverse	77.9
	Glycerin 99.5%	Glycerin	Berg+Schmidt	3.0
B	**BergaMuls ET 2**	**Cellulose (and) Cyamopsis Tetragonoloba Gum (and) Beta-glucan**	**Berg+Schmidt**	**3.0**
	BergaCare FG Olive	Hydrogenated Ethylhexyl Olivate (and) Hydrogenated Olive Oil unsaponifiables	Berg+Schmidt	5.0
	BergaBest MCT Oil 60/40	Caprylic Capric Triglyceride	Berg+Schmidt	5.0
	Sunflower Seed Oil	Helianthus Annuus (Sunflower) Seed Oil		5.0
	Cospaherm MultiMeg	Glyceryl Caprylate, Pentylene Glycol, Magnolia Officinalis Bark Extract	Cosphatec	1.0
	Cosphaderm T-70 non GMO ECO	Tocopherol, Helianthus Annuus Seed Oil	Cosphatec	0.1

Manufacturing procedure

1. Weigh in phase A and phase B in two Beaker.
2. Add phase A to B while stirring (1500rpm, 15 min).
3. Adjust pH if necessary.

- Cold process
- Cream-gel with cooling effect

pH = 5.2
Viscosity (24 h) = 4000 mPas (Brookfield, 20 rpm)
Internal Ref.: ET-01.04-1123

Stability: ongoing

BergaMuls ET 1 and ET 2

More data availabale soon.

For further tips & tricks make your appointment with us at in-cosmetics in Paris!



What are common challenges?

Or in different words: Are we ready yet?

- New claims
  - Up-cycled and circular beauty
  - No or zero waste
  - Sustainable and „skenvironmental“
- New conceptual work
  - New textures and sensories
  - Requirements for suitable and efficient antimicrobial i.e. high natural content and cold-processed
- New way of formulating with fiber-based ingredients
  - Different mode of action compared to traditional systems → Pickering emulsions
  - Purely natural ingredient with certain variations

Conclusion

Up-cycled and fiber-based cosmetic ingredients offer sustainable solutions and gain more visibility

Derived from food by-products allows zero waste policy

Versatile and easy to formulate for various concepts

Answer today’s market and consumer needs and requirements

BergaMuls ET products ecognized as certified and award-winning ingredient

A new way of formulating and processing

Fibers – the perfect ingredients for tomorrow’s cosmetic formulations and for conscious consumers.

Thank you.





