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OLIVEM® 2090

FSSBO105

The Ultimate W/O Cold Process Emulsifier!

AGENDA

- Fundamentals of water-in-oil emulsions
- Why Olivem® 2090?
  - Biomimetic performance
  - Excellent emulsification performance
  - Sun care benefits
- Regulatory overview
- Competitive mapping

WHY OLIVEM® 2090?

?

Performant AND functionalized single ingredient wasn't available yet

Hallstar expertise in olive oil chemistry and B&PC

Olivem® 2090 = Unique and functionalized molecule

Water-in-oil emulsifier that gives **stable, pleasant, natural, light but hydrating products**

One single ingredient (not a blend or a mixture) with the additional advantage of a short INCI list

OLIVEM® 2090: THE ULTIMATE W/O COLD PROCESS EMULSIFIER

- Know-how: Hallstar expertise in olive oil chemistry
- Innovative: Patent application filed
- Eco-friendly: Energy, costs and time saving, readily biodegradable according to OECD 310
- Globally-approved: Global version compliant with China regulation (Olivem® 2090G)
- Natural: 100% renewable, COSMOS-approved, No palm-derived ingredient, vegan friendly
- Unique sensoriality: Light sensoriality with rich after-feel

BIOMIMETIC PERFORMANCE

High Skin Compatibility

- Biomimetic innovative structure and performance
- Biomimetic emollience
- Light and fast absorbing

OLIVEM® 2090: OLIVATE BENEFITS

Olivate component imparts high sensoriality, biomimetism and functional benefits for a high-performing W/O cold process emulsifier

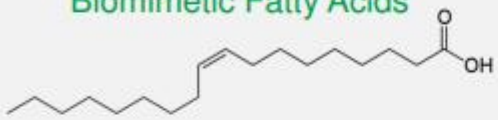
- Sensorial Improvement
  - Light but nourishing
  - No need for texturizing additives of siliconic or synthetic origin
  - Fast absorbed emulsions
- Biomimetism
  - Olive fatty acids have high compatibility with the skin
  - Biomimetic ingredients immediately and safely melt on the skin
- Improved Performance
  - Maintain maximal barrier integrity
  - Prevent trans-epidermal water loss
  - Maintain optimal skin hydration

OLIVEM® 2090: WHY WATER-IN-OIL?

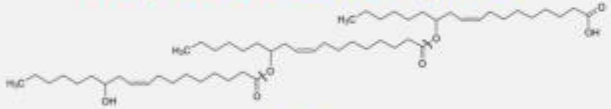
- W/O Intrinsic Emollience
  - Provides skin with natural hydration, thanks to its biomimetic properties
- Dry and Light Touch
  - Confers a light touch and fast spread-ability, thanks to olive oil chemistry
- Easy to Formulate With
  - Enables a broad range of different formulations, thanks to its high versatility and performance
- Effective with high quantity of Oil
  - Thanks to 1) wetting properties of inorganic UV filters and 2) the ability to load the formula with high quantity of organic UV filters

OLIVEM® 2090: INNOVATIVE BIOMIMETIC STRUCTURE

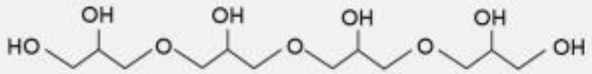
Olive Oil Fatty Acids – Biomimetic Fatty Acids



Polyricinoleic acids - ↓ HLB

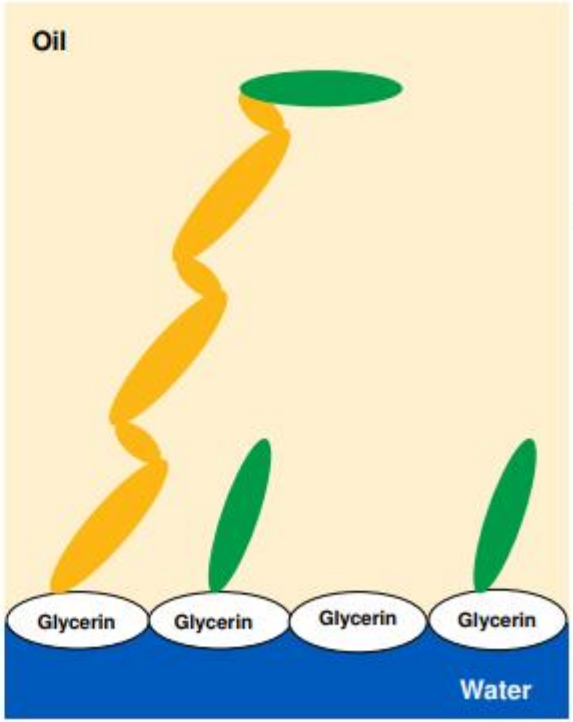


Polyglycerine 4 - ↑ HLB



Hallstar Beauty Innovation

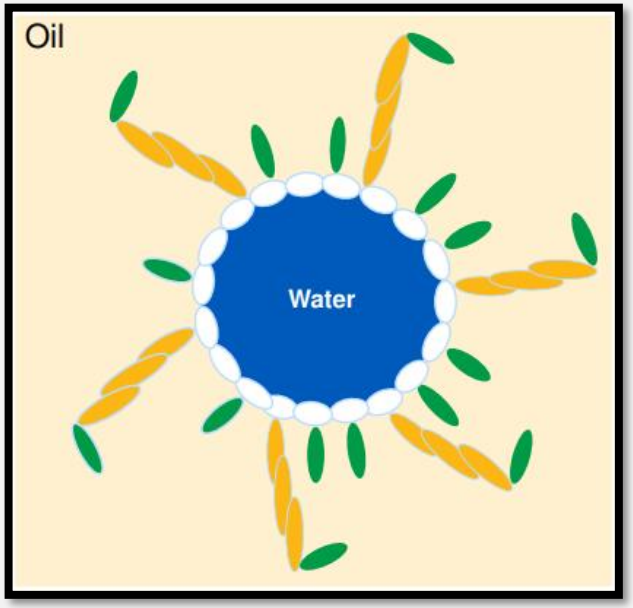
Olivem® 2090: Polyglyceryl-4 Olivate/Polyricinoleate



OLIVEM® 2090: INNOVATIVE BIOMIMETIC PERFORMANCE

Olivem® 2090 creates a thick layer of emulsifier that completely surrounds water droplet, imparting high stability to the final W/O formulation.

External olive-derived fatty acid chains provide excellent sensorial benefits and high compatibility with the skin.



OLIVEM® 2090: REGULATORY INFORMATION

Olivem® 2090:

Polyglyceryl-4 Olivate/Polyricinoleate

Olivem® 2090 G:

Polyglyceryl-4 Oleate (and) Polyglyceryl-3 Polyricinoleate

- Non-irritating (HRIPT, HET-CAM)
- Non-phototoxic (3T3 NRU)
- No heavy metal (ICH Q3D)
- Readily Biodegradable (OECD 310)
- Not derived from palm oil or palm kernel oil
- 100% from vegetable origin
- ISO 16128 natural derived Index 1
- COSMOS-approved
- REACH-compliant (polymer under REACH definition)
- Patent filed

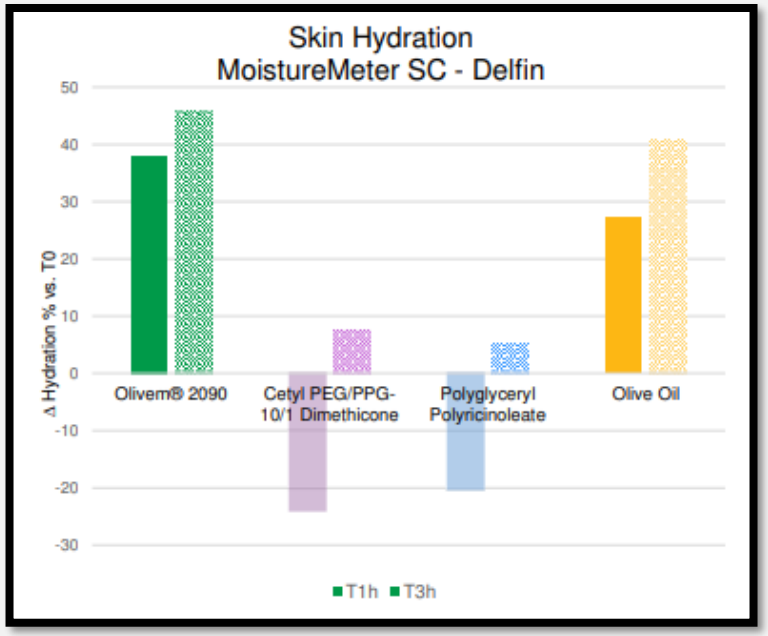
OLIVEM® 2090: BIOMIMETIC EMOLLIENCE

The olive oil origin of Olivem® 2090 confers hydrating properties similar to olive oil itself, on the contrary other W/O emulsifiers have a negative effect on the skin.

Skin hydration test on direct application of 2mg/cm^2 on 12 panelists. Measurements after 1 hour and 3 hours.

T student test:

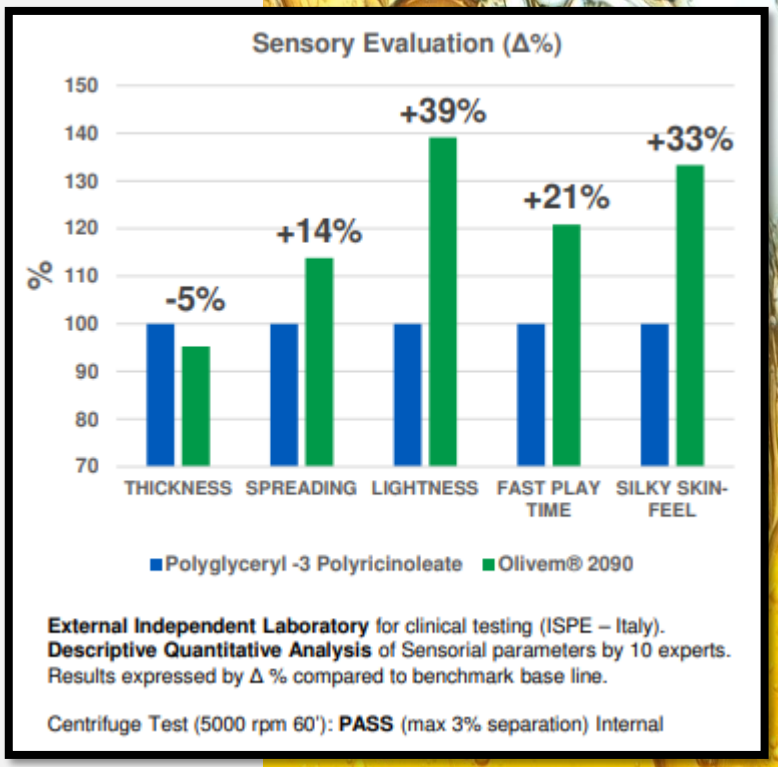
P<0.01 Very Significant difference between Olivem® 2090 and the other emulsifiers both after 1h and 3h. No significant difference between Olivem® 2090 and Olive Oil, both at 1 and 3 hours.



OLIVEM® 2090: LIGHT SENSORIALITY

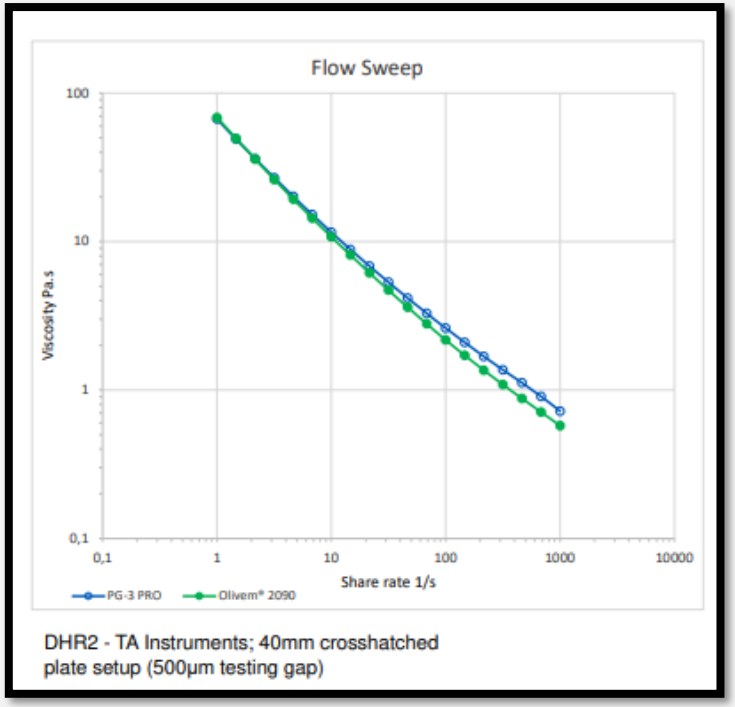
- Olivem® 2090 confers superior skin feel
- Spread-ability is improved and the play time is reduced
- Extraordinary lightness for a water-in-oil emulsion
- Excellent after-feel

Phase	INCI Name	% Wt	% Wt
	Water (Aqua) (deionized)	74.0	74.0
A	Magnesium Sulfate	0.50	0.50
	Glycerin	2.00	2.00
	Olivem® 2090	**3.00**	**-**
	Polyglyceryl-3 Polyricinoleate	**-**	**3.00**
	Caprylic/Capryc Triglycerides	10.0	10.0
B	Dicaprylyl Ether	5.0	5.0
	Olea Europea (Olive) Fruit Oil	5.0	5.0
	Hydrogenated Castor Oil	0.5	0.5
	Preservative	a.n	a.n



IMPROVE SPREAD-ABILITY AND PLAY TIME: RHEOLOGY TEST

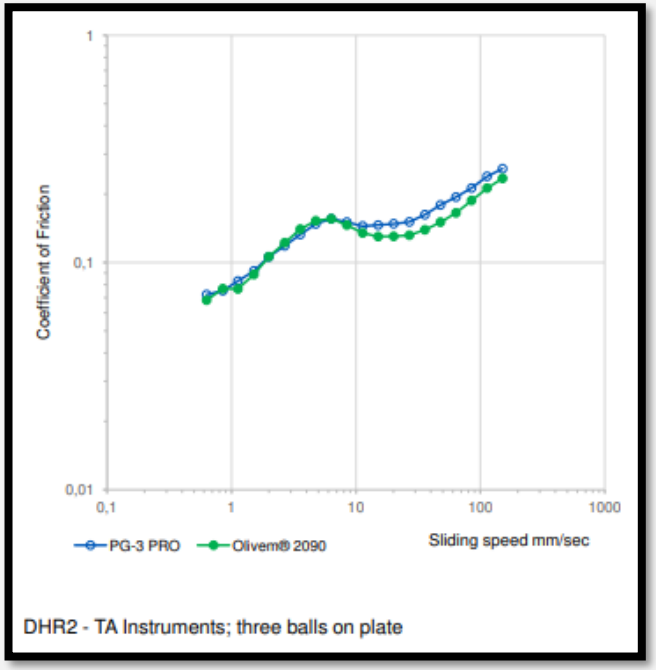
The two formulations were also evaluated using Rheology tests, to demonstrate that the two are very similar under static condition (below 10 sec^{-1}) while during application Olivem® 2090 confers lower resistance to flow.



DHR2 - TA Instruments; 40mm crosshatched plate setup (500µm testing gap)

IMPROVE SPREAD-ABILITY AND PLAY TIME: TRIBOLOGY TEST

The two formulations were evaluated using Tribological testing, to demonstrate that the two are very similar under static condition (below 5mm/sec) while during application Olivem® 2090 confers lower friction to the formulation, confirming the sensoriality test.



HIGH PERFORMING EMULSIFIER

Oils, Preservatives, Inorganic Filters, Organic Filters

- W/O formulations
- Best dosage 2 – 4%
- Water phase 85% - 30%
- Formulation flexibility: from serums to thick creams
- Versatile and cold processable
- Range pH 3 – 10

PERFORMANCE OVERVIEW

Oils

- High compatibility with every type of oil
- Excellent with vegetable oils
- Good with mineral oils and esters
- Good with texturizers as volatile oils, silicones and EtOH

Preservatives & Additives

- All types of preservatives
- Best thickeners: Hydrogenated Castor Oil, Hydrophilic fumed silica and Olivem® 900

Inorganic Filters

- Improve the wettability of TiO_2 and ZnO

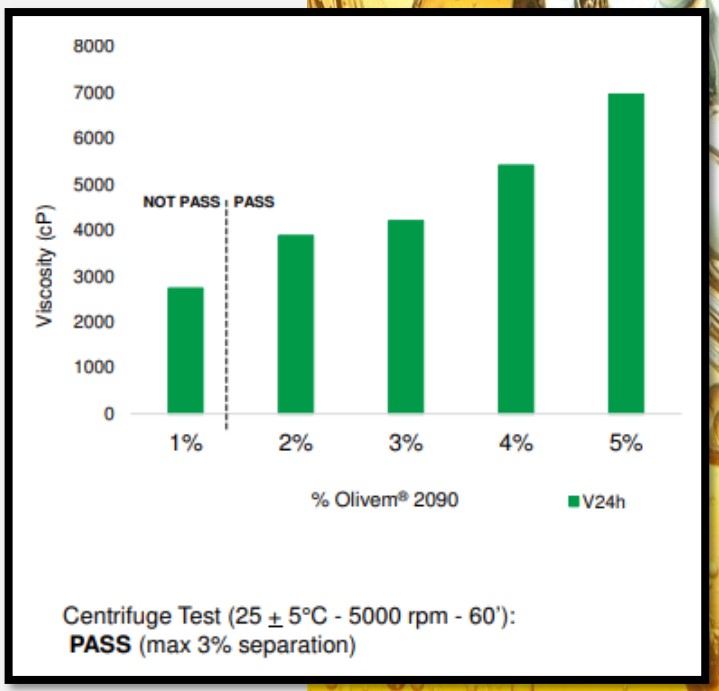
Organic Filters

- It perfectly emulsifies all organic sun filters conferring a superb sensoriality

OLIVEM® 2090 DOSAGE

- Effective as a sole emulsifier at 2%
- Suggested dose is 2 – 4%
- Viscosity depends on the percentage used

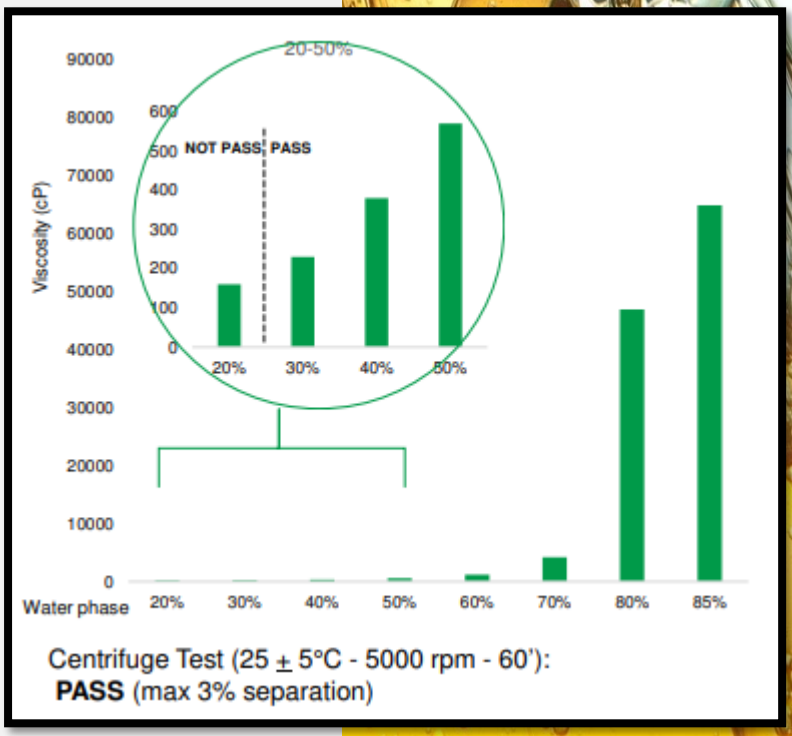
Phase	INCI Name	% Wt	Function
A	Water (Aqua) (deionized)	64.2	Volatile Carrier
	Magnesium Sulfate	0.5	Stabilizer
	Glycerin	2.0	Humectant
B	**Olivem® 2090**	**1.0- 5.0**	**Multifunctional Cold Process Emulsifier**
	Natural oil	28.0 – 32.0	Emollient
	Preservative	a.n	



INTERNAL PHASE QUANTITY

- 3% of Olivem® 2090 creates stable emulsions from 85% to 30% of internal phase
- Viscosity increases with the water content, creating textures from lotions to butters

Phase	INCI Name	% Wt	Function
A	**Water (Aqua) (deionized)**	**85.0 – 20.0**	
	Magnesium Sulfate	0.5	Stabilizer
	Glycerin	2.0	Humectant
B	**Olivem® 2090**	**3.0**	**Multifunctional Cold Process Emulsifier**
	Natural Oil	9.5 – 74.5	Emollient
	Preservative	a.n	



OIL PHASE COMPATIBILITY

- High compatibility with every type of oil
- Excellent with vegetable oils
- Good with mineral oils and esters
- Good with texturizers as volatile oils

Phase	INCI Name	% Wt	Function
A	Water (Aqua) (deionized)	64.5	
	Magnesium Sulfate	0.5	Stabilizer
	Glycerin	2.0	Humectant
B	Olivem® 2090	3.0	Multifunctional Cold Process Emulsifier
	Oil	**30.0**	Emollient
	Preservative	a.n	

Oils	Centrifuge test
Triglycerides	pass
Mineral oils	pass
Esters	pass
Ethers	*
Volatile oils	*

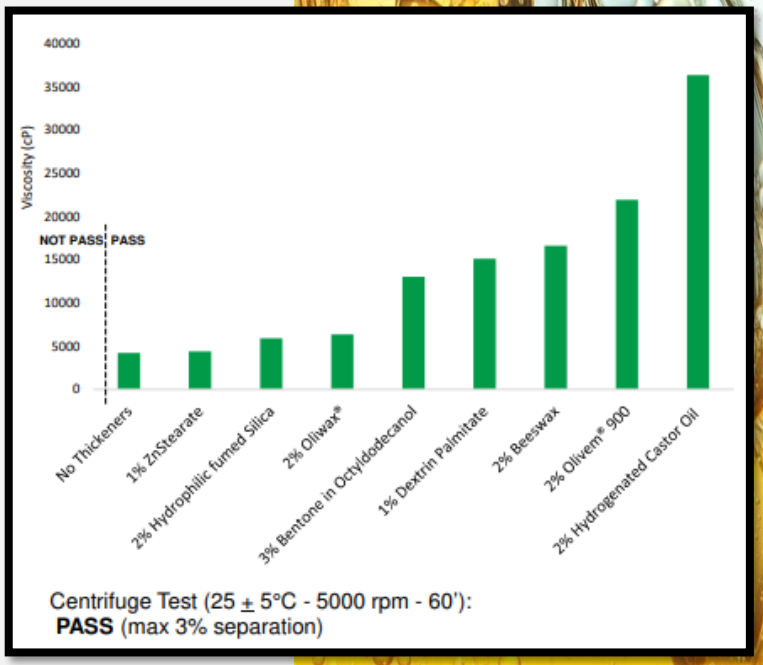
*__PASS__ with co-emulsifiers or with lower oil concentration

Centrifuge Test (25 ± 5°C - 5000 rpm - 60'): **PASS** (max 3% separation)

LIPOGELLING AGENT COMPATIBILITY

- Perfect compatibility with all lipogelling agents at standard suggested dosage
- Different textures can be achieved playing with different agents

Phase	INCI Name	% Wt	Function
A	Water (Aqua) (deionized)	64.5	
	Magnesium Sulfate	0.5	Stabilizer
	Glycerin	2.0	Humectant
B	Olivem® 2090	3.0	Multifunctional Cold Process Emulsifier
	Natural Oil	27.0-30.0	Emollient
	Lipogelling agent	**1.0 – 3.0**	**Oil Thickener**
	Preservative	a.n	



KEY INGREDIENTS

- Ethanol: max 10% with 3% of Olivem® 2090 without any stabilizer
- Preservatives: Olivem® 2090 works with all types of preservatives, containing glycols (caprylyl glycol and ethylhexylglycerin), is better at stabilizing the water phase
- pH: Olivem® 2090 is suitable for formulation in a wide pH range (3.0 – 10.5)
- Co-emulsifiers: when desired, Olivem® 900 is recommended for hot process; glyceryl oleate, sorbitan isostearate and polyglyceryl-n isostearate can be used for cold process

SUN CARE BENEFITS

- Highly performant with medium- to high-polarity oils
- Tested from low to high percentage of oil phase
- A wide variety of sunscreen formulations can be obtained

DISPERSING PROPERTIES

Dispersions of 30g of different powders with increasing amounts of dispersing agent (oil)

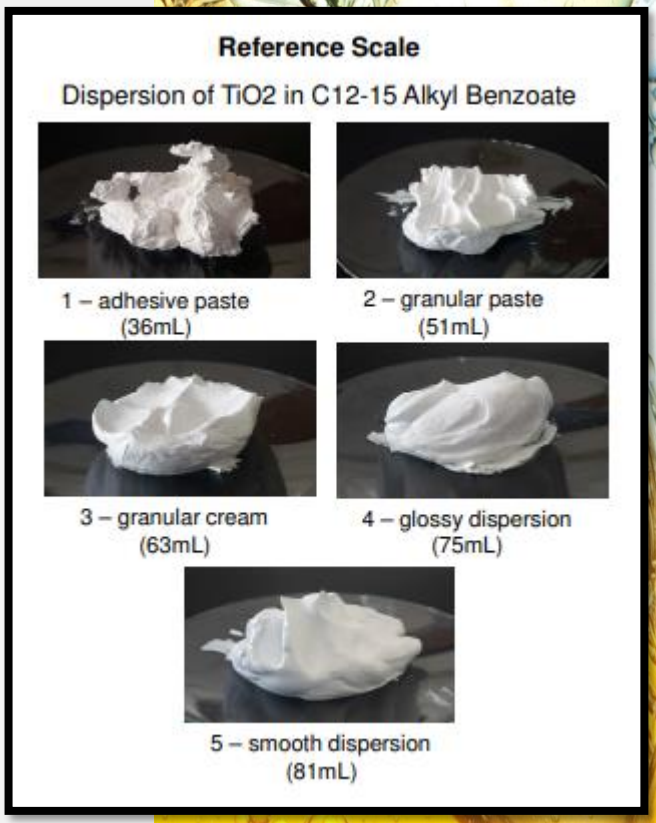
Powders:

- Titanium Dioxide (A.C.E.F TITANIUM DIOXIDE Ph.Eur.-USP-E 171)
- Zinc Oxide (A.C.E.F ZINC OXIDE 99.7% FU)

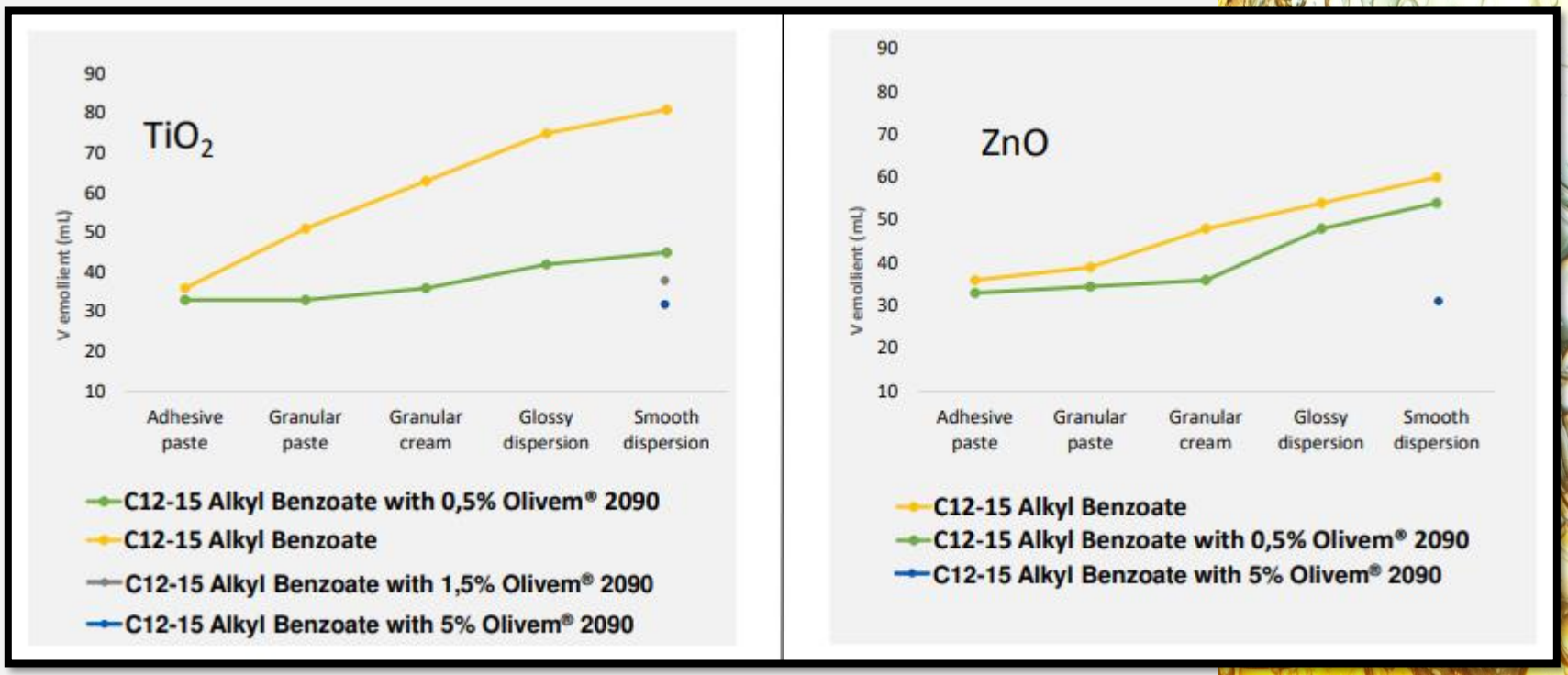
Dispersing Agents

- C_{12-15} Alkyl Benzoate (100%)
- C_{12-15} Alkyl Benzoate (99.5%) with Olivem® 2090 (0.5%)
- C_{12-15} Alkyl Benzoate (98.5%) with Olivem® 2090 (1.5%)
- C_{12-15} Alkyl Benzoate (95%) with Olivem® 2090 (5%)

*Internal method; three different operators carried out the same measurement to validate it



DISPERSING PROPERTIES



Olivem® 2090 allows a reduction in solvent quantity and enables a better dispersion of powders.

DISPERSING PROPERTIES

- Efficient wetting agent: high wettability with powders, pigments and mineral filters
- Reduced time and energy
- Dispersion of zinc oxide and C_{12-15} Alkyl Benzoate with Olivem® 2090 is more homogeneous, smoother and less viscous

Comparison of the dispersions: on the left zinc oxide plus C_{12-15} alkyl benzoate only; on the right zinc oxide plus C_{12-15} alkyl benzoate with 5% of Olivem® 2090 (anchor stirrer at 450rpm for 10mins)

SUN CARE BENEFITS

Olivem® 2090 shows broad compatibility with sunscreen ingredients tested at standard % and perfect compatibility with Hallstar photostabilizers

Type	Mineral UV Filter	Tested at (%)
Coated	Zinc Oxide (Trimethylsilane)	30
Uncoated	Zinc Oxide	20

Phase	INCI Name	% Wt	Function
A	Water (Aqua) (deionized)	Up to 100	
	Magnesium Sulfate	0.5	Stabilizer
	Glycerin	2.0	Humectant
B	Olivem® 2090	3.0	Multifunctional Cold Process Emulsifier
	Esters	5.0 – 30.0	Emollient
	Sun Filters	0.0 – 30.0	UVA/UVB Filters
	Preservative	a.n.	

Physical State	Organic UV Filter	Tested at (%)
Liquid	Homosalate	15
	Ethylhexyl Salicylate	5
	Ethylhexyl Methoxycinnamate	10
	Octocrylene	10
Solid	Butyl Methoxydibenzoylmethane	5
	Bis-Ethylhexyloxyphenol Methoxyphenyl Triazine	3
	Ethylhexyl Triazone	3
	Diethylamino Hydroxybenzoylhexylbenzoate	10
Salt	Phenylbenzimidazole Sulfonic Acid	6

Physical State	Hallstar Photostabilizers	Tested at (%)
Liquid	Solastay® S1 (Ethylhexyl Methoxycrylene)	5
	Diethylhexyl 2,6-Naphthalate	10
	Polycrylene® (Polyester-8)	5

Centrifuge Test (25 ± 5°C - 5000 rpm - 60'):
PASS (max 3% separation)

SUN CARE BENEFITS

Olivem® 2090 is highly performant with the most common oil phase in sun care formulations

Phase	INCI Name	% Wt	Function
A	Water (Aqua) (deionized)	63.5	
	Magnesium Sulfate	0.5	Stabilizer
	Glycerin	2.0	Humectant
B	**Olivem® 2090**	**3.0**	**Multifunctional Cold Process Emulsifier**
	Ester	30.0	Emollient
	Preservative	a.n.	

Centrifuge Test (25 ± 5°C - 5000 rpm - 60'):
PASS (max 3% separation)

Polarity ↑	Esters	Test result
	Hallbrite® BHB (Butyloctyl Salicylate)	Pass
	C_{12-15} Alkyl Benzoate	Pass
	Caprylic/Capryc Triglycerides	Pass
	Ethylhexyl Isononanoate	Pass
	Ethylhexyl Palmitate	Pass

EASY EMULSIFICATION PROCESS

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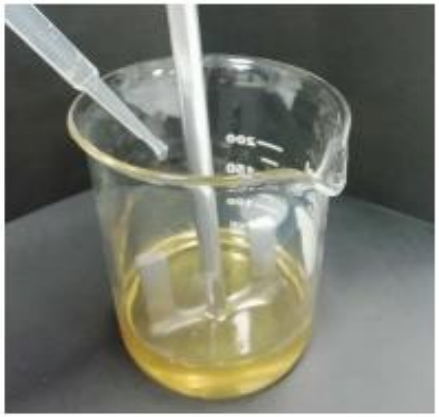
in **three simple steps:**



1 Emulsify
Add slowly the water phase into the oil phase under stirring

2 Homogenize
Reduce internal phase droplets and achieve viscosity plateau

3 Complete
Complete with other phases and homogenize it

Procedure can be done with cold or hot process, making Olivem® 2090 a very versatile ingredient

TIPS AND TRICKS

Formulation Tips

- Add salts or combine them
- Add humectants and/or glycols
- Use different oil types
- Homogenize

Texture and Viscosity Modulation

- Increase the water phase
- Combine oils, butters, waxes
- Add thickening agents
- Add silica and/or starches

OLIVEM® 2090 AS WATER IN OIL EMULSIFIER

Applications	Benefits
Natural and traditional sun care: daily wear and beach wear	Easier to formulate with inorganic UV filters and powders in general, high level of organic sun filters with a light sensoriality, water resistance (W/O)
Skin care (i.e., night cream, after-sun…)	High level of oil phase for maximized hydration feeling, maintain a very light sensoriality
Color cosmetics; foundations, BB and CC creams, creamy eyeshadow	High powder content with velvety after-feel
Baby care	For most delicate skins, all natural, powder dispersion properties

OLIVEM® 2090

New Emulsifier Solution for the most challenging emulsions!!

- **Unique Ingredient**
  - One single molecule
  - High-performing AND functionalized
  - Patent pending
- **Performance- improving**
  - Compatible with several types of oils
  - Excellent wetting properties for powders and pigments
- **Natural**
  - 100% Natural Derived- COSMOS-approved
  - Sustainable
  - No palm-derived ingredient, GMO-free
  - Vegan
- **Versatile**
  - Easy to use
  - Suitable for many applications
  - Enables multiple textures with high level of sensoriality and stability