Pushing the boundaries of sensoriality: the influence of a novel elastic fluid on the flow behaviour of the resulting formulations

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Introduction:

Silicones are used in make-up and personal care in a great variety of forms, to improve the aesthetics, to explore new textures and to push the sensory profile of cosmetics.

Silicones main features

unique emolliency | skin conditioning properties | high versatility | huge multiplicity of structures

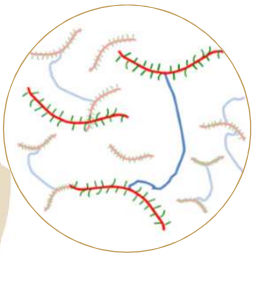
A **tailor-made alkylated silicone fluid** with **elastic behavior** and **peculiar lubricant properties** was developed **to push the boundary of sensoriality** in selected cosmetic products.

The unique flow behaviour and **the distinctive sensorial transformation** perceived by applying and wearing the formulations are explained by the presence of the novel material.

Materials & Methods:

The synthesis

The alkyl-silicone material was prepared through **one-pot hydrosilylation** reaction between two polyfunctional linear silicones and alkyl olefins, to simultaneously form an extended branched structure and perform side chain functionalization.

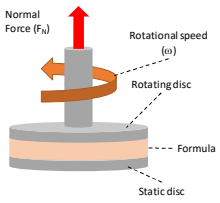


Formulation

The alkyl-silicone was used as a cosmetic ingredient in different fluid formulations: a lip fluid and a W/Si foundation.

LIP FLUID: the material was combined with silicon oils, waxes and bentone gels and a high pigment concentration

W/Si FOUNDATION: an external phase constituted by the combination of a viscous silicone and organo-gel system combined and stabilized by the presence of the novel material.



Rheological studies

Rheological studies were performed to pinpoint the elastic and lubricating behaviour of the raw material and the formulations. The flow curves in the rotational regime and measurement of the normal force in response to the shear stress were recorded

The shear stress examined are comprised between in the range 0.1 s-1 and 1000 s-1, within which we can find the same shear stresses relative to the topical application of a cosmetic product. The normal force obtained in the performed tests is obtained at 20°C and using rotational discs of 50mm dimeter and spaced at 1mm

Conclusions:

Thanks to its peculiar flow behaviour, in particular to its distinctive Weissemberg effect, the elastic alkyl-silicone is able **to improve and to elevate the aesthetic and the sensoriality of the final products** in which is introduced.
Its application in different categories of product shows a decisive contribution in the sensorial benefits of face and lip formulations.

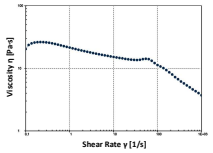
Results & Discussion:

By tuning the reactivity of the starting materials and the stoichiometry, a high branched, lightly cross-linked and high molecular weight structures without reaching the gel point is obtained.

The fluid's marked elasticity was demonstrated with the **arising of a normal stress when subjected to flow**
- Weissemberg effect -

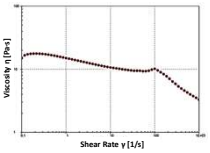
elastic fluid MTS
85 wt% elastic fluid and 15 wt% myristyl trisiloxane

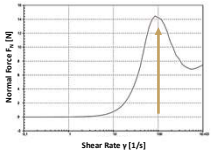
elastic fluid 1,5
85 wt% elastic fluid and 15 wt% volatile silicone 1,5 cst



Shear-thinning behaviour

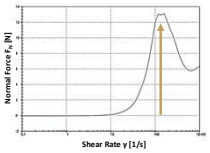
Flow and spreading facilitated





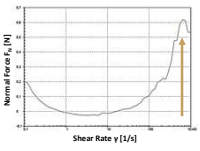
Arising of a Normal Force

Lubricating sensoriality, comfort

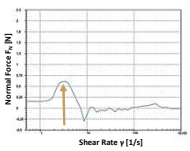


The unique properties of the elastic fluid are conferred to the cosmetics in which it is contained.

W/Si FOUNDATION



LIP FLUID



Normal Force to the direction of **flow hinders the thinning of the product** between the applicator and the application surface.

	F_N / N	P_N / Pa	Shear rate $F_{N,MAX}$ / s^{-1}
Elastic fluid 1,5	13	6621	ca. 150
Elastic fluid MTS	14,5	7385	ca. 100
W/Si foundation	0,65	331	ca. 800
Lip fluid	0,45	229	ca. 3

		wt %
Phase A	Skin-conditioning agents	19,0
	Emulsifying Agents	9,0
	Viscosity Increasing Agents	10,0
Phase B	***Elastic fluid MTS***	***6,0***
Phase C	Colorants	18,3
Phase D	Preservatives	1,0
Phase E	Solvents	33,0
	Viscosity Increasing Agent	2,0
	Chelating Agent	0,2
Phase F	Antioxidants	0,5
	Fragrance	1,0

		wt%
Phase A	***Elastic fluid 1,5***	***8,00***
	Skin-conditioning agent	21,00
	Antifoaming Agent	18,00
Phase B	Emollient	4,00
	Viscosity Increasing Agent	12,00
Phase C	Solvent	18,00
	Dispersing Agents	1,30
	Skin-conditioning agent	3,20
	Colorant	14,50

The peculiar flow beahviour confers to the formulation an **extreme comfort**, a **long playtime** and a **sophisticated thickness.**