

NEW FILM-FORMING COMPLEX FOR ALL-DAY LASTING YOUTHFUL LOOK

POSTER ID : 198

Huang, Tsang Min¹; Saini, Jotie¹; Biderman, Norbert¹; Phamduy, Theresa¹; Roux, M.A²; Bonnard, Jerome²; Portal, Julien²; Farran, Alexandra¹; Deng, Y. I.; Weinkauff, Ronni¹; Bernard, Anne-Laure¹; Bui, Hy¹

¹L'Oréal Research & Innovation, Clark, USA; ²L'Oréal Research & Innovation, Aulnay-sous-bois, France

1 INTRODUCTION

CONSUMER TENSION

In today's world, in-office cosmetic procedures have become commonplace among beauty savvy consumers, with majority seeking treatments for undereye bags, dark circles, fine lines, and wrinkles. However, many still prefer at-home solutions with a lower cost and risk.



State of the art

- Reactive Silicones
- Sodium Silicate*
- Other film technologies

Limitations of current technologies

- Film softening
- Cracking
- Loss of adhesion over time

OBJECTIVE

Invent a novel formulation to instantly and dramatically reduce the look of undereye bags, wrinkles & fine lines, crows' feet, forehead wrinkles and glabellar lines, approaching the results of cosmetic procedures, lasting for the day until removal.

TECHNICAL SOLUTION

- A novel film-forming complex with unique properties
- Consisting core-shell copolymer particles, a thermoplastic elastomer
- Anhydrous in volatile oils or in W/O emulsion
- Tailorable internal stress, softness or hardness, elasticity and soft focus
- Good adhesion.

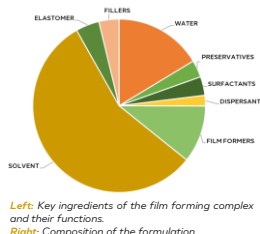
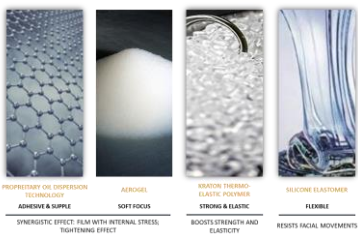
2 MATERIALS AND METHODS

FORMULATION

A water-in-oil emulsion with four key ingredients:

- Oil dispersion of particles of acrylates/isobornyl acrylates copolymer
- Hydrogenated styrene/butadiene copolymer (thermoplastic; Kraton)
- Dimethicone crosspolymer
- Hydrophobically modified silica silylate (Aerogel)

The continuous oil phase is present in volatile isododecane for quick dry time. The small internal aqueous phase was finally encapsulated in superabsorbent microspheres of sodium acrylates cross polymer (Aquekeep).



Left: Key ingredients of the film-forming complex and their functions. Right: Composition of the formulation

IN VITRO EVALUATION

- Formula microstructure (Light microscopy)
- Morphological & Mechanical Analyses
 - Wear under abrasion
 - Tack evolution during film formation and drying
 - Sensitivity to water, artificial sebum and olive oil
- Internal stress
 - Elastic modulus and % elongation at break
- Optical properties (Haze-guard; gloss meter)
 - Transparency & Haze
 - Gloss

EX VIVO EVALUATION

- Lifting and filling efficacy evaluation using ex vivo boxcar scar- skin model
- Film microstructure evolution at 50% strain

IN VIVO EVALUATION

- Expert & Instrumental Tests
 - Formula applied by skincare expert aesthetician
 - Grading of undereye bags, wrinkles, crows' feet, forehead and glabellar wrinkles by expert before and after application at 10 min, 30 min, 1 h, 3 h and 6 h and after removal
 - 3D instrumental analysis using dermatop
- Consumer Tests
 - An array of -use tests with over 500 consumers in their daily routine for up to 5 days.

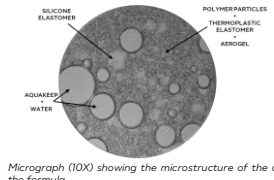
REFERENCES

- Yu B, Kang SY, Akthakul A, et al. An elastic second skin. *Nat Mater*. 2016;15(8):911-918. doi:10.1038/nmat4635
- Jachowicz J, McMullen R, Pretypaul D. Alteration of skin mechanics by thin polymer films. *Skin Res Technol*. 2008;14(3):312-9. doi:10.1111/1600-0846.2008.00296.x
- de Mul MNG, Uddin T, Yan X, Hubschmitt A, Klotz B, Chan WKM. Reducing facial wrinkle size and increasing skin firmness using skin care polymers. *J Cosmet Sci*. 69 (2018), pp. 131-143
- Maidhof R, Knapp E, Liebel F, Fair M, Rubinson EH. Technical approaches to select high-performance instant skin smoothing formulations: Correlation of in vitro and in vivo assessment methods. *Skin Res Technol* 2019; 25: 606- 611. <https://doi.org/10.1111/srt.12691>
- Masayuki Iida. Novel facial rejuvenation method: rapid removal of laugh lines using special cosmetic film. *IFSCC 2020*, Yokohama (online, October 21-30, 2020).
- Method for reducing skin wrinkles. WO 2020067358A1 assigned to KAO (2020)
- Portal J, Schultze X, Taupin S, Arnaud-Roux M, Bonnard J, Naudin G, Hely M, Bui H, Biderman N. Adhesion Aspect and Film-Forming Properties of Hydrocarbon Polymers-Based Lipsticks. *Surface Science and Adhesion in Cosmetics 2021:451-48*. <https://doi.org/10.1002/9781119654926.ch14>
- Bernard A, Deng Y, Bui H, Daubersies L, Debaoud R, Farran A. Compositions and methods for improving the appearance of the skin, US patent 10,864,157 assigned to L'OREAL (2020)
- Luengo G, Bui H and Portal J. Formation and Performance of Cosmetic Films in Cosmetics. *Handbook of Cosmetic Science and Technology*. Ed. Dreher F, Jungman E, Sakamoto K and Maibach H. CRC Press. 2022. 167-181.

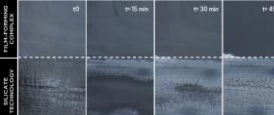
3 RESULTS & DISCUSSION

IN VITRO RESULTS

ASPECT	RESULT
ORIGINAL FILM	
WEAR RESISTANCE	Marked 200 < strokes < 300
CHEMICAL RESISTANCE	Water (1H) Solubilized Sebum (24 H) Solubilized Olive Oil (24 H) Solubilized
TACK AFTER 24 H DRYING ON BYK CONTRAST CARD AND FP40	0.0
TRANSPARENCY	90-95
HAZE	>90
GLOSS AT 60°	8
INTERNAL STRESSES AT 24 H (%)	10
MECHANICAL PROPERTIES	E (MPa) 14.8 εg (%) 34



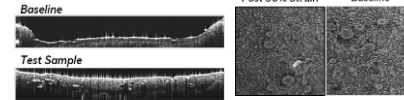
Micrograph (10X) showing the microstructure of the formula



While the silicate technology is notorious for whitening and cracking as it dries, the new film forming complex form a continuous, blurring film without any whitening or cracking as it dries

EX VIVO RESULTS

Left: Lifting and filling effect of the film-forming complex formula (bottom) compared to a baseline boxcar scar model, reflecting a significant level of lifting of scar floor and filling of the hollow volume. Right: SEM of the film before and after subjected to load to stretch at 50% show negligible difference in film microstructure, indicative of good elasticity.

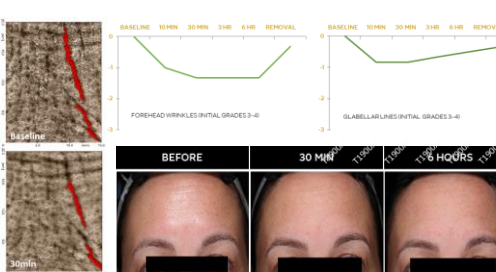


IN VIVO RESULTS

EXPERT & INSTRUMENTAL EYE CONTOUR



- 1-2 GRADE Reduction in undereye bags
- 60% Reduction in undereye wrinkles
- 1-1.5 GRADE Reduction in forehead wrinkles
- 55% Reduction in glabellar lines



EFFICACY OF FILM FORMING COMPLEX BASED ON QUANTITATIVE CONSUMER TEST

- Performance on undereye bags and wrinkles to be at par with silicate technology
- Greater benefits for comfort, lastingness, lack of flaws and compatibility with makeup.
- Dual application on forehead and undereye contour enhances purchase intent



KEY PROJECT ATTRIBUTES	CONSUMER END BENEFITS	PERFORMANCE VS. SILICATE TECHNOLOGY
	Flaws (Whitening)	+
	All-day lastingness	+
	Instant & dramatic results on undereye bags	=
KEY CATEGORY DRIVERS	Improved appearance of eye contour	=
	Comfort (during all-day wear)	++
	Makeup compatibility	++
MUST-HAVE	Safety (Irritation, redness)	++

4 CONCLUSION

- A film-forming complex with tunable physical and mechanical properties was engineered to cater to the consumers' demand for an at-home solution for instant and dramatic reduction of undereye bags, and eye/glabellar/forehead wrinkles.
- The presented technology offers significant improvement over the currently available solutions for such applications for undereye area (e.g. silicate technology and a limited number of products with reactive silicone technology)
- Easy incorporation into consumers' daily skincare or makeup routine
- Versatility to use on multiple facial zones for a holistic rejuvenated appearance.
- A potential future in hybrid technologies at skincare-makeup interface, offering a new possibility for consumers to temporarily combat signs of fatigue and aging with easy application and removability.