Shiseido

Next Generation WEARABLE SKIN

A Topical Formulation for Facial Remodeling

BL-498

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1. INTRODUCTION

- **Objective** Establish a non-invasive facial remodeling technology that allows consumers with no special skills to drastically improve the appearance of eye bags, requiring the same amount of effort as ordinary cosmetics, for an effect that lasts all day.
- **Why?** While eye bags greatly affect the impression of the face, there was no available technology other than cosmetic surgery that could improve eye bags to such an extent and for such a length of time.
- **How?** By pushing the capabilities of crosslinked polymer layer (XPL) technology by both solving the trade-off between compression of the eye bags and adhesion to skin, in addition to validating the effectiveness, natural appearance, and usability.
- **Value** Significantly lowered the hurdle for morphological facial remodeling, paving the way for other non-invasive facial remodeling applications beyond eye bags.

2. MATERIALS & METHODS

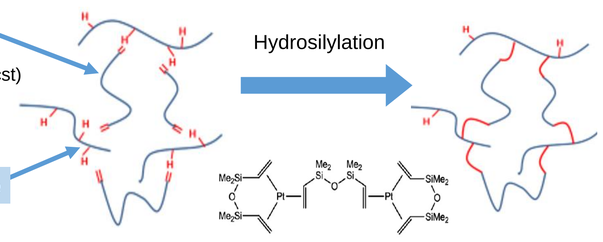
Materials

Vinyl dimethicone

Long vinyl dimethicone
(Long vinyl, 100,000~200,000 cst)

Short vinyl dimethicone
(Short vinyl, less than 1000 cst)

Hydrogen dimethicone
(Si-H)



Karstedt platinum catalyst （Pt）

XPL preparation

Apply **Step 1** containing Si-H and long vinyl

100 µm **Step 1**

Skin or Substrate

Apply **Step 2** containing Pt on Step 1

100 µm **Step 2**

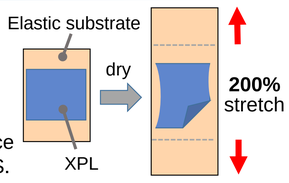
100 µm **Step 1**

Skin or Substrate

Dry 8 hours under skin surface temperature (30 ℃)

XPL characterization method

1. Stretch test (Adhesion) : Evaluated by how much XPL remained unpeeled when the substrate was stretched to 200% after drying.
2. *In vitro* Film Viscoelasticity: Young's modulus of the surface side and underside of the film were measured by AFM. The silicon tips had a radius of 125 nm with a spring constant of 4.0 N m^{-1}.
3. Facial remodeling analysis: cross-sectional shape and height difference of under eye skin on which XPL was applied was analyzed by PRIMOS.



Home use test

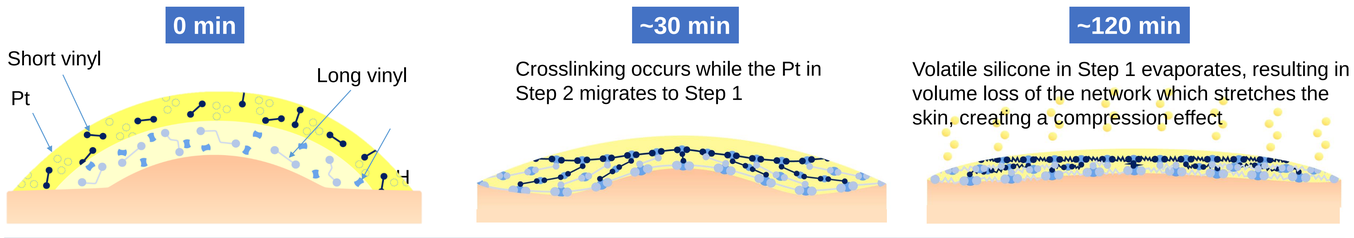
- ✓ 58 Japanese females with eye bags (Age 58.4 ± 4.3 years old)
- ✓ Panelists were asked to wear the samples at least 6 hours before removing every day.
- ✓ Masks and glasses were used as usual, and there were no restrictions on going out or physical activities.
- ✓ The online questionnaires were conducted by the panelists on the last day of the five-day test.

XPL characterization method

Assessment of the face impression from others: Questionnaire of 35 panelists' impressions of 18 randomized photos before and after XPL application, and gaze behavior analysis.

3. RESULTS & DISCUSSION

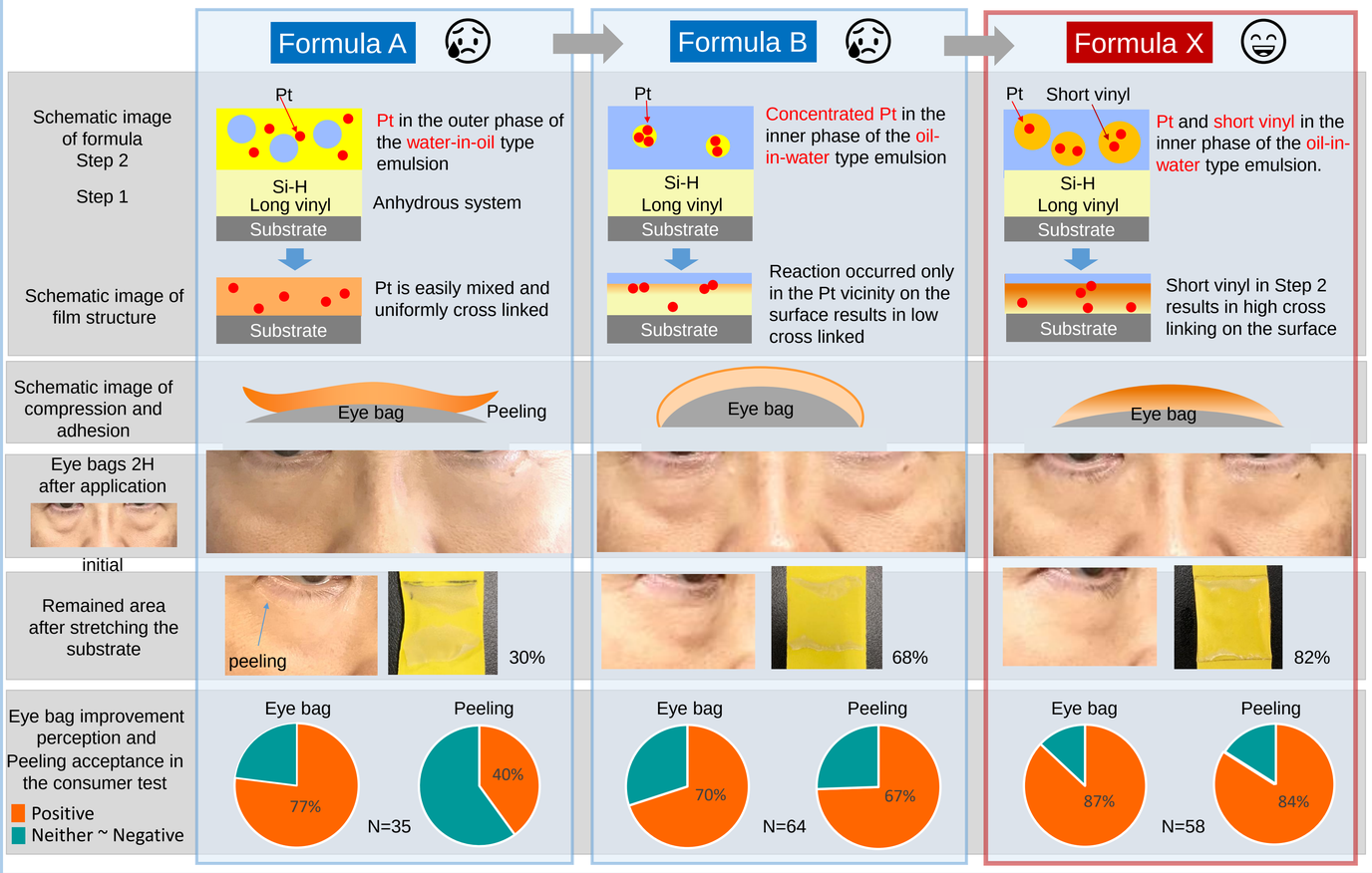
3-1. XPL compression mechanism



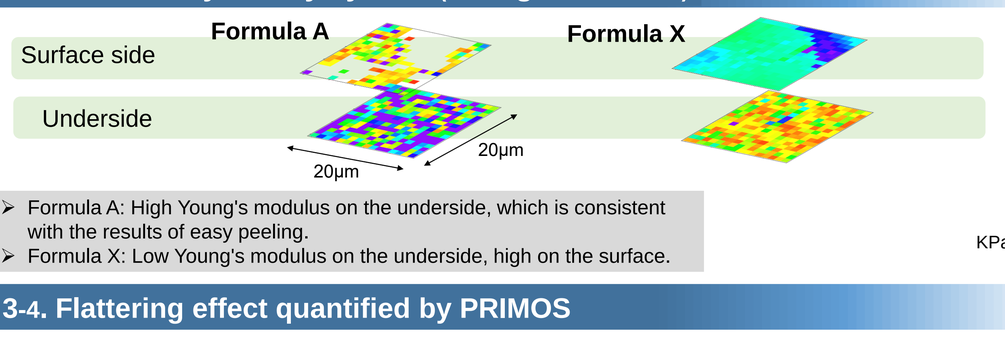
3-2. Devising formulations to overcome trade-offs

Crosslink density	Film property	Adhesion	Compression
Low	Soft and flexible	○ **Adhesive**	× **Low**
High	Hard and brittle	× **Non adhesive**	○ **High**

- ➢ Adhesion and compression are affected by the cross-link density of XPL, and represent a trade-off. We tried to overcome this trade-off by controlling Pt migration via a layered application method; low crosslink density atop the skin, and high crosslink density on the surface.
- ➢ Firstly, Pt was added in W/O type Step 2 for quick drying, but a uniformly hard film was formed, which resulting in easy peeling (Formula A).
- ➢ Then, Pt was added in O/W type Step 2 for slow Pt migration, resulting in an overall low crosslink density which lowered compression (Formula B).
- ➢ By adding short vinyl in Step 2, crosslink density at the top was increased, resulting in a film with ideal asymmetry (Formula X).

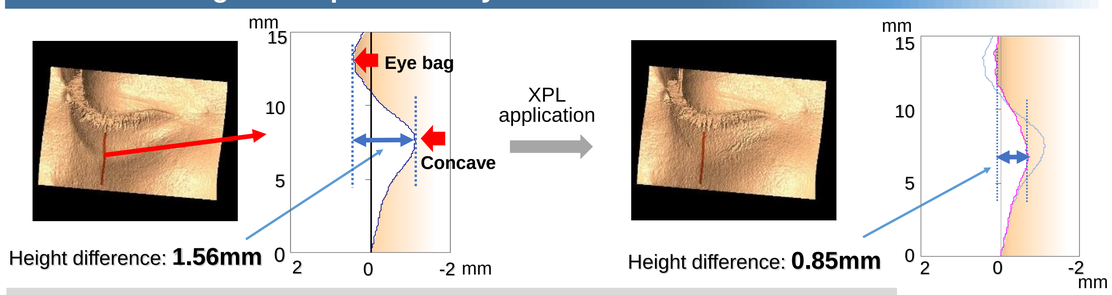


3-3. Proof of asymmetry by AFM (Young's modulus)



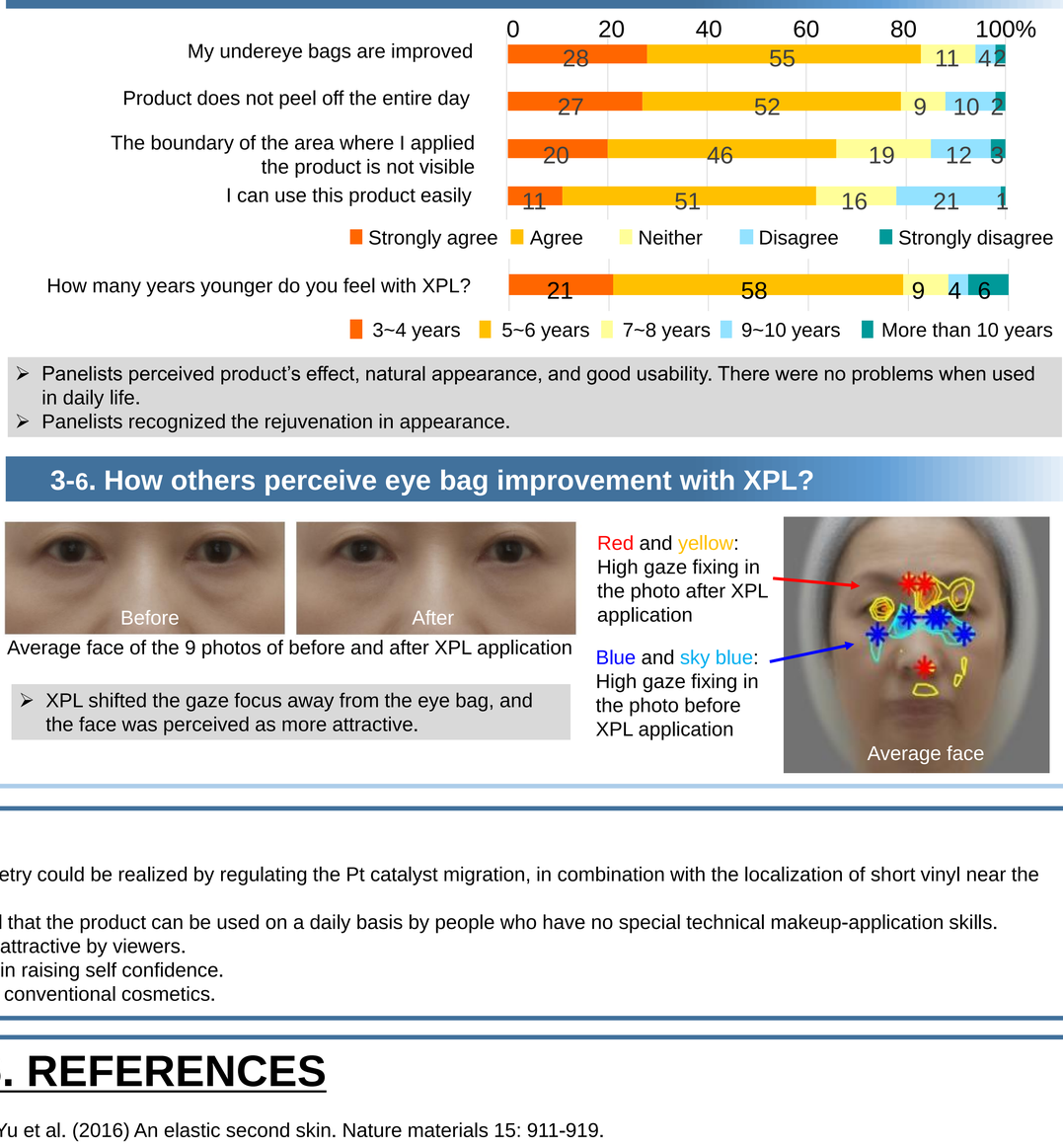
- ➢ Formula A: High Young's modulus on the underside, which is consistent with the results of easy peeling.
- ➢ Formula X: Low Young's modulus on the underside, high on the surface.

3-4. Flattering effect quantified by PRIMOS



- ➢ The shadow caused by the eye bag almost disappears as the puffy area is pushed downward and the concave area is pushed upward, reducing the unevenness by about half.

3-5. Evaluation of Formula X



- ➢ Panelists perceived product's effect, natural appearance, and good usability. There were no problems when used in daily life.
- ➢ Panelists recognized the rejuvenation in appearance.

3-6. How others perceive eye bag improvement with XPL?

Average face of the 9 photos of before and after XPL application

- ➢ XPL shifted the gaze focus away from the eye bag, and the face was perceived as more attractive.

Red and yellow: High gaze fixing in the photo after XPL application

Blue and sky blue: High gaze fixing in the photo before XPL application

4. CONCLUSIONS

- ➢ Overcoming the trade-off of high compression and high adhesion in XPL film was achieved by imparting structural asymmetry into the film. Such asymmetry could be realized by regulating the Pt catalyst migration, in combination with the localization of short vinyl near the surface and long vinyl on the underside, resulting in targeted high viscoelasticity on the surface and low viscoelasticity on the underside.
- ➢ High eye bag improvement effect, natural appearance, durability, and good usability of XPL were proved by consumer tests. These results demonstrated that the product can be used on a daily basis by people who have no special technical makeup-application skills.
- ➢ The results of the psychological and gaze evaluations showed that XPL shifted gaze focus away from the eye bag, and the face was perceived as more attractive by viewers.
- ➢ The product's positive effects were found to manifest both physically and psychologically, making panelists feel 5-6 years younger on average, resulting in raising self confidence.
- ➢ We have developed a breakthrough technology to naturally improve eye bags in a non-invasive way, which was previously thought not to be possible by conventional cosmetics.

5. ACKNOWLEDGMENTS

We thank Yasuko Sano, Motoki Oguri, Yohei Takahashi, Norinobu Yoshikawa and Makoto Uyama for experimental support, and we also thank Prof. Robert Langer, MIT for his continual support and guidance.

6. REFERENCES

1.Yu et al. (2016) An elastic second skin. Nature materials 15: 911-919.