

# Natural-derived Lipstick can go beyond Petrolatum-based Lipstick!

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## Introduction:

### <Natural-derived cosmetics for SDGs >

The trend of SDGs (Sustainable Development Goals) in cosmetic field has been emerging and driving cosmetic products composed of natural-derived ingredients which are highly desired by consumers as a new trend. Under this eco-natural system trend, ISO 16128-2 was officially published in 2017. According to this visible criteria, Natural-origin Index (hereinafter, called N.I.) can be calculated. (Fig.1)

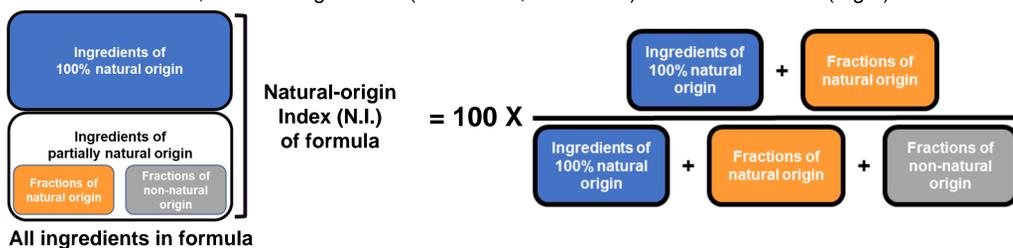


Fig.1 Calculation of Natural-origin Index (N.I.) of formula according to ISO 16128-2

### <New consumer expectation to Lipstick>

The result of tele-survey in China for understanding consumers' attitudes when they buy lipstick in the market (Table 1) clearly shows that ;

- Increase of attention to contents of lipstick
- Needs for lipstick by natural and healthy ingredients

### <Prior-art for development of natural lipstick>

The combination effect in lipstick stability with two different natural-derived waxes (i.e. Candelilla wax and Rice wax [1] [2], Candelilla wax and Behenyl Behenate [3] [4] [5] [6] [7]) were reported previously, but the formula designing for comfort texture and caring efficacy with robust stability by three different natural-derived waxes had not been reported. In addition, deep investigation for combination of several natural-derived oils had not been well studied.

By this research, we also show sensorial comparison between natural-derived lipstick and petrolatum-based lipstick, which had not been reported ever.

	N=	Overall	Less than 35 Y.O.	35 Y.O. and more
Q.1 Did you look at the composition/list of ingredients of the marketed caring lipstick product before buying it?		68	59	9
	Yes	76%	75%	89%
	No	24%	25%	11%
Q.2. Do you have any expectations regarding the marketed caring lipstick product's composition?		67	58	9
	Natural/Organic/non-chemical ingredients	42%	40%	56%
	Healthy/Safe	13%	14%	11%
	Eco-friendly	6%	7%	0%
	Better moisturising effects	13%	14%	11%
	Good/better (general)	21%	22%	11%
	Other	16%	16%	22%

Table.1 Tele-survey to Chinese consumers for lipstick products

## Materials & Methods:

### <1. Materials>

All ingredients were chosen based on Natural-origin Index (N.I.) defined with ISO16128-2.

	Candelilla Wax	Carnauba Wax	Ricebran Wax	Sunflowerseed Wax	Bees Wax	Behenyl Behenate
Melting point (°C)	73	84	82	77	64	72
Natural-origin Index (N.I.)	1	1	1	1	1	1

	Polyglyceryl-2 Triisostearate	Caprylic/Capric Triglyceride	Polyglyceryl-2 Isostearate/Dimer Dilinoleate Copolymer	Hydrogenated Castor Oil Dimer Dilinoleate
Viscosity (mPas·s) at 25°C	400	20	40000	N.D. (pasty form)
Permittivity	3.6	3.8	3.9	3.9
Natural-origin Index (N.I.)	1	1	1	0.99

Table.2 Natural-derived waxes & oils adopted on this research

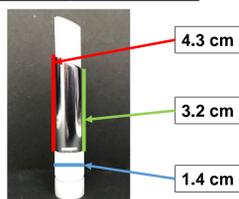


Fig.2 Shape of model lipstick on this study

### <2. Formulation protocol of model lipstick>

All ingredients were mixed at 90°C for 10 minutes, and formulas were filled into metal mold at 85°C. After 10 minutes at room temperature, leaving for 10 minutes at -18°C. Then, formulas were picked up by model lipstick mechanism. Measurement of stick-hardness and bulk-hardness in jar was evaluated by SUN RHEOMETER COMPAC-100.

### <3. Evaluation of caring efficacy>

Hydration test was conducted in 6 hours after application by Corneometer by following to LVMH guideline.

### <4. Evaluation of thermal profile for model lipstick>

Differential Scanning Calorimetry (DSC) was adopted for thermal profile of model lipstick. Programming rate was to heat up at 10°C/min. from 25°C to 100°C.

### <5. Evaluation of sensory profile for model lipstick>

Quantitative Descriptive Analysis (QDA®) was adopted. Prepared lipsticks were evaluated by 12 trained panelists under blind condition. All evaluation were conducted in sensory booths under standardized conditions in which temperature and humidity were strictly controlled. Questionnaire on important elements specified by LVMH Research was prepared.

## Results & Discussion:

### <Screening for oil species>

By simple screening test of oil species on natural lipstick (Fig.3), natural-derived oil having high viscosity enabled to give higher stick-hardness and bulk-hardness (Fla.K) because smaller particles of waxes delivering formula-hardness could be maintained even after crystallization.

It was also discovered that it's possible to regulate stick-hardness and bulk-hardness by combination of natural-derived liquid oil species (Fig.4).

	Fla.I	Fla.J	Fla.K	Fla.L	Fla.M	Fla.N	Fla.O	Fla.P
Candelilla Wax	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Rice Bran Wax	5	5	5	5	5	5	5	5
Behenyl Behenate	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Polyglyceryl-2 Triisostearate (Vis:400 mPas·s at 25°C)	88			58	58	58	58	58
Caprylic/Capric Triglyceride (Vis:20 mPas·s at 25°C)		88		30	20	15	10	
Polyglyceryl-2 Isostearate/Dimer Dilinoleate Copolymer (Vis:40000 mPas·s at 25°C)			88		10	15	20	30

Table.3 Compositions of model natural-derived lipsticks

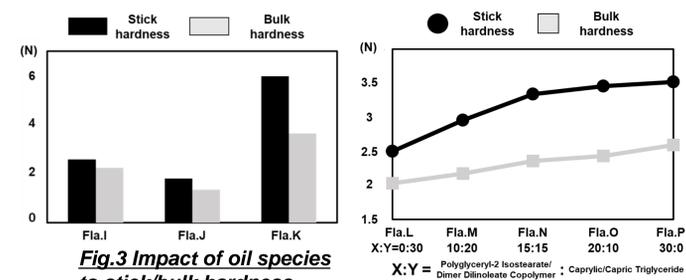


Fig.3 Impact of oil species to stick/bulk hardness

Fig.4 Impact to stick/bulk-hardness by ratio of different oil species

### <Hydration test and thermal profile>

Newly developed lipsticks by specific combination of waxes and natural-derived oils delivered robust stability yet smooth application texture while showing an increase of lip moisture contents comparing before application (Table 4). Smooth texture yet robust stability was achieved thanks to two different crystal-structures having different melting points (51°C & 66°C), which was confirmed with DSC chart (Fig.5)

	Fla.Q	Fla.R
Candelilla wax	5	5
Ricebran wax	5	
Sunflowerseed wax		4
Behenyl Behenate	2.15	2.15
Polyglyceryl-2 Triisostearate	33	34
Caprylic/Capric Triglyceride	35	35
Polyglyceryl-2 Isostearate/Dimer Dilinoleate Copolymer	7	7
Hydrogenated Castor Oil Dimer Dilinoleate	12	12
Other materials (pigment, fragrance)	To 100%	To 100%
Stability at 50C 1M	OK	OK
Stick hardness (N)	2.80	2.74
Bulk hardness (N)	2.35	1.54
Hydration 6 hours	14%	22%
Natural-origin Index(N.I.)	>99%	>99%

Table.4 Developed natural-derived lipstick

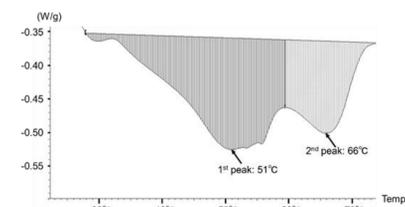


Fig.5 DSC chart of natural-derived lipstick (Fla.Q)

### <Sensorial profile>

Developed natural-derived lipstick (Fla.Q, N.I > 99%) showed close sensorial profile with marketed petroleum-based lipstick (Fig.6), while providing following differences;

- Higher gliding both at start and during application
- Thinner makeup layer
- Less stickiness

Newly developed natural-derived lipstick enabled to deliver sufficient quality as a caring lipstick while providing higher Natural-origin Index on formula.

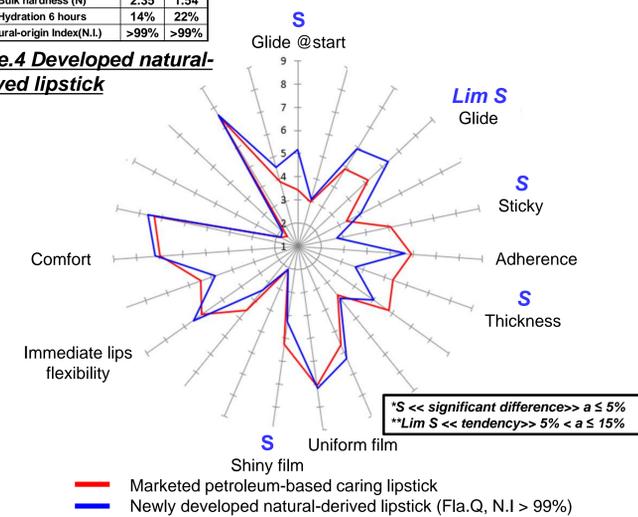


Fig.6 Spider chart of Sensorial profile

## Conclusions:

This study revealed a brand-new formula architecture of natural-derived lipstick providing formula robustness and comfort texture. The combination effect in lipstick stability with two different natural-derived waxes (i.e. Candelilla wax and Rice wax [1] [2], Candelilla wax and Behenyl Behenate [3] [4] [5] [6] [7]) were reported previously, but the formula designing for comfort texture and caring efficacy was newly achieved with robust stability by combination of three different natural-derived waxes. Furthermore, the new method by combining specific natural-derived oils, which can well regulate formation of natural-derived wax gel in lipstick structure, was a novel finding. It was concluded that these findings realized a brand-new natural-derived lipstick having superior or at least the same level of textural quality to conventional petrolatum-based lipstick while enabling high sustainability to lipstick formula.

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