6-Sigma 측정법에 의한 립스틱의 광택 및 광택지속성 영향인자의 분석

김 경 남[†] · 김 윤 정 · 이 화 영 · 김 은 정 · 천 지 민 · 강 학 희 · 이 옥 섭

태평양기술연구원 화장품연구소
(2005년 12월 6일 접수, 2005년 12월 17일 채택)

An Analysis of the Gloss & Gloss-lasting Capability Factors of Lipstick by the Six-Sigma Measurement Tools

Kyung Nam Kim[†], Yoon Jeong Kim, Hwayoung Lee, Eunjeong Kim, Jimin Cheon, Hak Hee Kang, and Ok-Sub Lee

Cosmetic Research Institute, Amore Pacific R&D Center, 314-1, Bora-ri,
Giheung-eup, Yongin-si, Gyeonggi-do 449-729, Korea
(Received December 6, 2005; Accepted December 17, 2005)

요 약: 주관적인 관능평가와 밀접한 관계가 있었던 표준화된 측정법을 이용하여 립스틱에서의 광택 및 광택지속성의 영향인자를 도출하였고 이를 분석하였다. 일부인자들을 분석하면서 립스틱의 광택에 영향을 주는 인자로서 스틱경도, 휘발성 실리콘 오일의 양, 왁스의 종류 등이 유효한 인자로 도출할 수 있었다. 그리고 립스틱의 광택지속성에서는 주요인자로 휘발성 실리콘 오일의 양, 스틱경도, 폴리머의 함량 등을 도출할 수 있었다. 이러한 결과는 립스틱의 일반적인 특성에 대해서 6-Sigma라는 새로운 분석기법을 이용하여 분석하는데 성공하였으며 본 연구를 통하여 광택을 향상시키는 제품을 설계하는데 초석이 될 것이다.

Abstract: Using optimized standard methods, which were previously done by sensory tests, many factors have been analyzed and their significance were determined according to gloss and gloss-lasting capability in lipstick. Analyzing some factors, we could conclude that the effective factors were the kind of wax, amount of volatile silicone oil, and stick hardness in the aspect of lipstick's gloss. And in the point of lipstick's gloss-lasting properties, vital few X's were quantity of volatile silicone oil, stick hardness, and polymer contents and so on. We successfully have tried new analytical approach, 6-sigma to general property of lipstick. Furthermore this study will be a base on the prescription design in gloss-enhanced products.

Keywords: gloss, gloss-lasting, lipstick, make-up, 6-sigma

1. Introduction

Recently customers want natural make-up and glamorous and shiny lips with natural color, so enhanced glossy lip products like lipgloss and glossy lipsticks are esteemed as trends.

In case of lipstick, it is ordinarily used to estimate gloss and gloss-lasting capability by observer's subjective sensibility. And it seemed to be a lot of factors about the gloss properties. But until now we couldn't know which factors were critical or trivial exactly.

We have already set up the optimized standard methods of gloss and gloss-lasting capability measurements in lipsticks, which were highly correlated sensory tests [1]. According to SOPs (Standard Operating Procedure), we experimented various factors and collected the numerical data each individual sample, gloss value and glossy ratio (%). And then we use six-sigma statistic tool in order to analyze the data exactly.

Here we analyzed some factors like volatile silicone oil, wax, stick hardness, polymer content and so on to extract vital Few X's, which are strongly impacted on glossy and gloss-capability property in lipsticks.

Table 1. Hidden Factors of Glossy Properties (A Perfect Score: 10.0)

Gloss hidden factors	Multi-voting mean	Gloss-Lasting Hidden Factors	Multi-voting mean
pay-off	7.7	taking in food/drink	7.0
stick hardness	6.7	lip movement	5.7
viscosity	6.0	stick hardness	7.7
wax content	5.7	viscosity	7.0
glossiness of wax	7.3	glossiness of wax	6.0
kind of wax	5.3	kind of wax	5.7
powder content	5.3	powder content	6.0
powder oil-absorption property	5.7	powder oil-absorption property	5.7
oil content	7.3	powder shape (plate/sphere)	6.0
oil refractive index	9.0	kind of powder	5.3
molecular weignt of oil	5.0	oil content	7.7
volatile silicone oil	5.0	viscosity of oil	6.3
glossy polymer	8.0	molecular weignt of oil	6.0
pearl content	7.0	volatile silicone oil	6.3
		polymer content	6.7
		glossy polymer	6.3
		film former	5.7

2. Material and Methods

2.1. Material [1]

The gloss of lipsticks was measured by glossmeter (Micro-Tri-Gloss, BYK Gardner). And gloss-lasting capability of lipsticks was measured by optimizing system using both water bath (J-SWB1, Jisco Corp.) and glossmeter. Shaking speed and temperature were controlled in this system and we experimented under constant environments.

2.2. Methods

The standardization of measurement methods was followed by SOPs published at previous paper [1].

Analytic samples were prepared to put materials chosen about each factor into lipstick base and disperse and make general manufacture process of lipsticks.

3. Results and Discussion

Several factors were extracted through 6-sigma methodology, like brainstorming, multi-voting, and list-up hidden factors and so on. And we designed the efficient experiments under control of other variables and each factor related to gloss properties was respectively proved by statistics like ANOVA. Table 1 is the results of list-up hidden factors through multi-voting for glossy properties.

According to our analysis, several factors were verified as vital few X's. From Figure 1 to Figure 5 showed the tendency of gloss value and gloss ratio (%) related gloss and gloss-lasting capability each experimental factor. Gloss value, measured value by glossmeter means glossiness of lipstick. And gloss ratio, relative % gloss ratio after/before physical shaking stands for gloss-lasting capability (Figure 1 ~ 4).

In the aspect of lipstick's gloss, the wax is the most important factor as Figure 1 shows that the gloss value and gloss ratio (%) scattered over broad ranges. And as other factors there are contents of volatile silicone oil, and stick hardness after wax. Of cause the effects by these factors can be positive or negative about lipstick's gloss. For example, the harder a lipstick is, the more the gloss value of lipstick is fallen (Figure 2). So stick hardness is a negative factor of lipstick's gloss. And the more volatile polymer content is, the less the gloss value of lipstick is. Therefore volatile polymer content is a negative factor of lipstick's
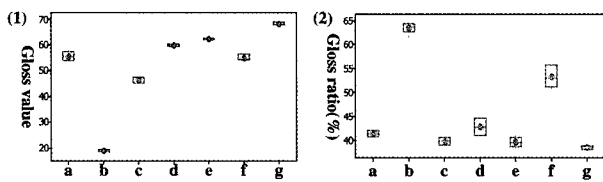
Figure 1. Analysis of each wax about (1) gloss and (2) gloss-capability (a, b, c) ester wax, (d) ceresin, (e) synthetic wax, (f) ozokerite, and (g) polyethylene. The data are analyzed by ANOVA.
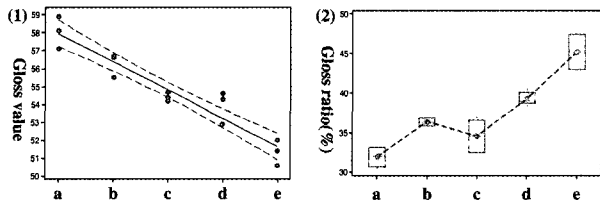

Figure 2. Analysis of stick hardness about (1) gloss and (2) gloss-capability (a, b, c, d, e) increasing order of stick hardness. The data are analyzed by ANOVA.
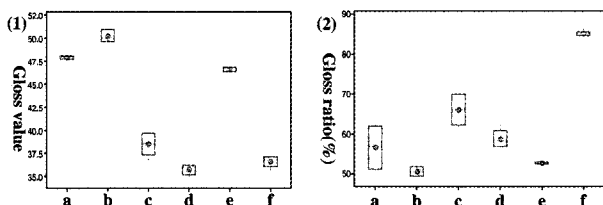
Figure 3. Analysis of volatile silicone oil about (1) gloss and (2) gloss-capability (a, b, c, d, e, f). (a) nonvolatile special polymer, (b, c, d) volatile acryl, (f) fluoro modified silicone. The data are analyzed by ANOVA.

gloss. In the case of nonvolatile silicone polymer, the more than meaning content is a positive factor of lipstick's gloss (Figure 4).

In the aspect of lipstick's gloss-lasting capability, vital few X's are contents of volatile silicone oil, stick hardness, polymer content, and so on. Figure 1 shows that the gloss ratio (%) scattered over broad ranges. Figure 2 shows the harder a lipstick is, the higher lipstick's gloss is. So stick hardness is a positive factor
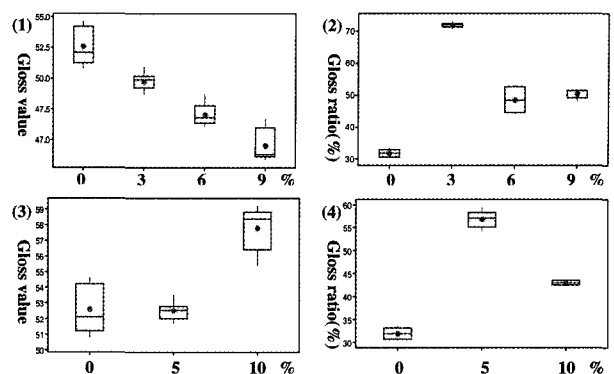
Figure 4. Analysis of (1) gloss and (2) gloss-capability in volatile special polymer, and (3) gloss and (4) gloss-capability in nonvolatile silicone polymer. The data are analyzed by ANOVA.

of lipstick's gloss-lasting property. If the content of volatile silicone polymer is more than specific content, the lipstick's gloss-lasting capability is not influenced.

4. Conclusion

We successfully have tried new analytical approach, 6-sigma to general property of lipstick, which lead us to jump up a limitation of sensory estimation in lipstick. The statistical results shows that gloss and gloss-lasting capability of lipstick are correlated with several dominant factors. And these measurement system and analytical approach will be the foundation of designing experiments and proving the effectiveness of the glossy properties in lipsticks.

Reference

1. Yoon Jeong Kim, Kyung Nam Kim, Hwayoung Lee, Eunjeong Kim, Jimin Chen, Hakhee Kang, and Oksub Lee. A study on the sensory tests correlated objective measurements for the gloss and gloss-lasting capability of lipstick. *7th Scientific Conference of the Asian Society of Cosmetic Scientists (ASCS) 2005.*