

Development of a new cosmetic product in the form of cream

Abstract

Highlighter, luminizer, illuminator- it's all about it, a little helper in the arsenal of every self-respecting makeup artist and not just a professional. This product will not be superfluous in a cosmetic bag of self-make-up enthusiasts. And for those who follow the "no makeup" technique of makeup - this is the number one among the "must-haves". Decorative cosmetics, which are available on the market of Ukraine are mainly of foreign production, so expanding the range of cosmetic products at the expense of domestic production is an urgent task.

The purpose of our work is a substantiation of components and development of a highlighter for the face in the form of a cream for skin care, application of make-up, and correction of the face.

Modern data on the history of highlighters and modern methods of application have been analyzed and summarized. Existing types of highlighters, excipients used in the composition are reviewed.

According to the results of complex physicochemical, pharmacotechnological and microbiological studies, the composition of the highlighter in the form of a cream has been developed.

Considering the studied colloidal and thermal stability, homogeneity, pH, structural viscosity, dispersion, the optimal composition of the emulsion base of the cream has been developed: corn oil, Ercamuls NF V, Carbopol Ultrez 10, triethanolamine, glycerin, purified water. The amount of corn oil is substantiated. Oil included in the composition has been selected: corn, sesame, grape seed, shea, coconut, almond. The preservative introduction was justified.

Keywords: highlighter, structural viscosity, base, carbopol ultrez 10, preservative.

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Halyna Slipchenko

National University of Pharmacy, Ukraine

Correspondence: Halyna Slipchenko, Department of Industrial Technology of Drugs, National University of Pharmacy, Ukraine, Tel +380957355942, Email galinaslipchenko@ukr.net

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Introduction

Strobing is a new technique for everyday makeup. Strobing allows reviving the face, giving extra volume to the lips, placing radiant highlights on the back of the nose, above the eyes, in the cheekbones. Strobing was used by professional models, actresses, make-up artists to achieve perfection on the screen or photographs, printed products. The secret of success is in playing with light, highlighting those areas of the person that need it. Illuminators or shadows with nacre will help to give the effect of a natural glow to the skin without feeling greasy. The product can have an aqueous gel texture, instantly hiding on the skin or in powder form.

Highlighter is one of the most popular make-up cosmetics in recent years.

Highlighter broke into the field of modern make-up just recently and has already gained immense popularity among makeup artists and fashionistas who want to improve themselves.

Highlighter is a cosmetic product designed to "attract" and "reflect" light rays that fall on the skin. This creates the magic of backlighting from the depths of the skin, which looks very impressive in the spotlight.

It allows highlighting the cheekbones, the area under the eyebrows, above the upper and lower lip, the inner corners of the eyes. Highlighter has the main function in its name, to highlight. Hence the use of this product: to mask skin imperfections, highlighting and illuminating certain areas of the face. The highlighter perfectly hides dark circles under the eyes, giving the skin a relaxed, radiant look. The correction is due to small reflective particles that are part of the highlighter.

Analytical review of literature

Facial brighteners are much older than the beauty industry. Pearl powder existed yet in 320 BC. Made, as the name implies, from crushed pearls, it was first used in traditional Chinese medicine to treat a variety of diseases, and later became a popular way to whiten skin. Shimmering powders were applied to the face, no one even thought about sculpting.¹

Much later, during the Middle Ages, the perception of color was different from today: the color was measured by brightness, so everything that shines was revered. Light skin was described as "shiny". Cosmetics to achieve the effect of "shiny" skin were then produced mainly handicraft (to avoid lead and other, as it turned out, dangerous ingredients). Women from the working class and the countryside grew ingredients for the lighting potion themselves or bought them from traveling peddlers. Recipes for ointments were kept by local healers and passed down from generation to generation. Ingredients such as peas, chickpeas, pearl barley, almonds, horseradish seeds, and milk were used.²

The first attempts at contouring were made by theatrical actors in the mid-16th century: they painted their faces with soot and chalk to identify and darken the desired areas of the face for greater expressiveness.

Going up in the world

The second wave of highlighter popularity came in the 1970s when natural makeup was in vogue. The iconic models Linda Evangelista, Naomi Campbell, and Christy Turlington appeared on the covers of glossy magazines with glowing skin and a perfect oval face. Kevyn Aucoin added to the popularity of highlighters: he became the first

celebrity makeup artist to publish a series of successful books on makeup, in which he told how an ordinary woman can look like a star. Gradually, the face-darkening and illuminating products began to go beyond movie theaters and studios. The market reacted instantly: in 1987 Guerlain released its famous “meteorites”, in 1991 the highlighter concealer Touche Éclat by Yves Saint Laurent went on sale.

Triumph of the highlighter

There is a whole highlighter niche in the beauty industry now. No brand can do without it in the range. Cream, powder, crumbly - they come in different textures and shades. In almost every beauty image from fashion shows, make-up artists use highlighter, and bloggers teach strobing and contouring. No Grammy or Oscar ceremony is complete without a highlighter.³

Kim Kardashian's personal make-up artist Mario Dedivanovich says that the star has a small bump on her nose, so above and below it he applies a highlighter. “This technique visually straightens the nose. I also apply highlighter over the lip, chin, and cheekbones to give the face relief” says the make-up artist.

Today, all makeup artists work according to the schemes proposed by Kevyn Aucoin and Scott Barnes (makeup artist for Jennifer Lopez). They use highlighter according to the laws of light and shadow: apply it on the cheekbones to lift them, on the back of the nose to make it visually thinner, on the Cupid's bow (above the upper lip) to give volume to the lips, on the inner corners of the eyes to increase their incision.

Materials and methods

The purpose of this work is a substantiation of components and development of technology of a highlighter for the face in the form of cream.

Objects of research

Isopropyl palmitate, gelling agents: Carbopol Ultrez 21, Carbopol Ultrez 10, aristoflex; emulsifiers: Ercamuls NF V, guar gum, prolipid 141; oils and butters: corn, sesame, grape seed, shea, coconut, almond; triethanolamine and preservatives, cream and mica samples.

Each component was selected due to its properties. Thus, isopropyl palmitate as an emollient and smoothing component; glycerin as moisturizing and retaining moisture in the upper skin; corn oil has a high content of vitamin E, provides antioxidant, emollient, and nourishing effect, improves face color; grape seed oil has a strong anti-inflammatory, regenerating effect, promotes rejuvenation, increases skin elasticity, maintains moisture balance in the skin, has a strong antioxidant effect; almond oil has anti-inflammatory, regenerating, and tonic effects. The oil relieves irritation, eliminates dryness and roughness of the skin, nourishes and cleanses the skin, improves its water balance. Shea butter protects the skin from climatic influences and UV radiation; prevents the formation of wrinkles; soothes irritation, moisturizes the skin. Coconut oil has a moisturizing, anti-inflammatory effect.^{4,5}

Mica is a derivative of natural mica rocks and is the finest powder obtained by special treatment.

Mica is one of the most common rock-forming minerals of intrusive, metamorphic, and sedimentary rocks, as well as an important mineral deposit.

From this, we can conclude that mica is a natural and safe ingredient that can be safely used in natural care, decorative, and

mineral cosmetics. The most popular and most commonly used in cosmetics is Sericite Mica. And its further coating with iron oxide pigments allows obtaining multi-colored pearl mica of different degrees of shimmer.

The subject of the study

Scientific approaches to the development of semisolid cosmetics for the face with a complex of oils for making a cream for skincare, makeup, and face correction.

Research methods

To solve these problems, general scientific (analysis and generalization of literature data), organoleptic (appearance, homogeneity, odor, color), pharmaco-technological (moisture content, dispersion of emulsion systems, colloidal and thermal stability, structural and mechanical properties, etc.), physicochemical (solubility, relative density, pH), microbiological (effectiveness of antimicrobial preservatives, microbiological purity of experimental samples) and mathematical (statistical processing of results) research methods were used.

Results and discussion

The advantages of a cream highlighter are that it is well absorbed and stays on the skin for a long time due to its dense texture. It is good to apply to large areas of the face, such as the cheekbones, forehead, nose completely or give shine to the collarbone or chest^{5,6}

At the first stage of experimental research, we developed the optimal composition of the emulsion base of the cream, which should have such properties:

- evenly dissolve or distribute substances with different physicochemical properties;
- penetrate skin tissues and have nutritional properties;
- not to destroy the water-lipid layer and the epidermal barrier of the skin;
- be comfortable when applied to the skin of the face.

The range of excipients that are part of emulsion creams is diverse.³ Auxiliary components of emulsion bases differ in the source (natural, semi-synthetic, and synthetic), chemical structure, and functional purpose. The modern pharmaceutical and cosmetic industry offers an unlimited number of carriers of different compositions, but all emulsions are united by a common feature: they consist of hydrophilic and hydrophobic phases, evenly distributed in each other using emulsifiers or surfactants. Therefore, the development of emulsion bases-carriers involves the selection of a rational ratio of oil and water phases^{7,3}

Table 1 shows the experimental compositions of the bases.

Prepared bases were evaluated for organoleptic and consumer properties, determined colloidal and thermal stability, structural viscosity, pH, dispersion, and the degree of penetration into the agar gel.

The samples were homogeneous in appearance, cream-colored with a greenish tinge, the characteristic odor of pumpkin oil; the bases had pH values from 4,0 to 5,2 within the norm for dosage forms for the face (Table 2). The best indicators had compositions № 1 - 3, which were selected for further research.

To assess the homogeneity of the obtained cream, studies were conducted with different contents of corn oil, the largest component

of the oil phase (samples a and b), and various gelling agents (Figure 1- 3).

Table 1 Studied compositions of bases

No.	Component name	The amount of the component, g							
		1	2	3	4	5	6	7	8
1	Corn oil	15	15	15	15	15	15	15	15
2	Ercamuls NFV	3	3	3	3				
3	Guar gum				1	1			
4	Prolipid 141					3	3	3	3
5	Carbopol Ultrez 21			1			1		
6	Aristoflex		1					1	
7	Carbopol Ultrez 10	1							1
8	Triethanolamine	0.5		0.5			0.5		0.5
9	Glycerol	5	5	5	5	5	5	5	5
	Purified water	up to 100.0							

Table 2 Research of quality parameters of model samples of emulsion bases (n = 9, P = 95%)

Base No.	Quality parameters				Structural viscosity, MPa · s (20 rpm, 20°C)
	Colloidal stability	Thermal stability	Homogeneity	pH	
	visual observation				
	2	3	4	5	6
1	Stable	Stable	Homogeneous	4.8 ± 0.09	8063 ± 19
2	-/-	-/-	-/-	4.9 ± 0.09	8993 ± 24
3	-/-	-/-	-/-	5.0 ± 0.10	8042 ± 25
4	-/-	-/-	-/-	4.9 ± 0.08	2054 ± 22
5	-/-	-/-	-/-	3.8 ± 0.09	5147 ± 28
6	-/-	-/-	-/-	5.0 ± 0.10	6121 ± 37
7	-/-	-/-	-/-	5.1 ± 0.07	4020 ± 27
8	-/-	-/-	-/-	3.9 ± 0.07	2082 ± 16

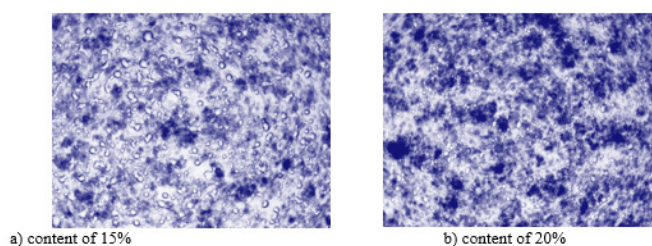


Figure 1 Dispersion of oil phase particles (compositions № 1).

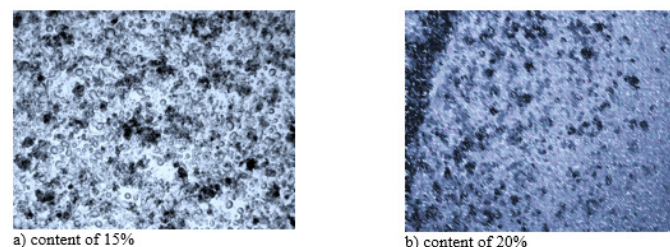


Figure 2 Dispersion of oil phase particles (compositions № 2).

The investigated samples contained 15 and 20% of corn oil. The finest, and therefore the most resistant to delamination, is sample 1, which contains 20% corn oil and Carbopol Ultrez 10 as a gelling agent.

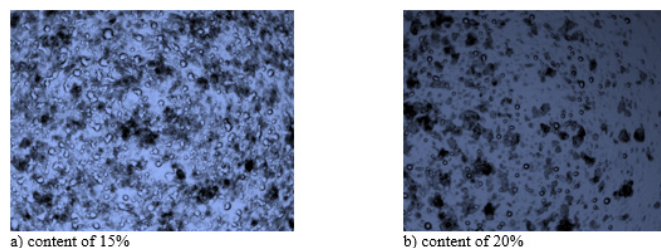


Figure 3 Dispersion of oil phase particles (compositions №3).

The cream also included oil: sesame (2%), grape seed (3%), shea (5%), coconut (2%), almond (5%). The concentration of each oil was chosen according to the literature on the compositions of existing highlighters and taking into account the effect of each on the skin.

The next stage of the experiment was to study the rheological properties of the selected experimental samples (structural viscosity, degree of thixotropy, mechanical stability), which was carried out at a temperature of 20 °C on a rotary viscometer “Myr 3000 V2R” (“Viscotech”, Spain) in a system of coaxial cylinders according to the method (SPU I ed., p. 2.2.10 p. 24) in a wide range of shear rates. The results obtained are shown in Figure 4.

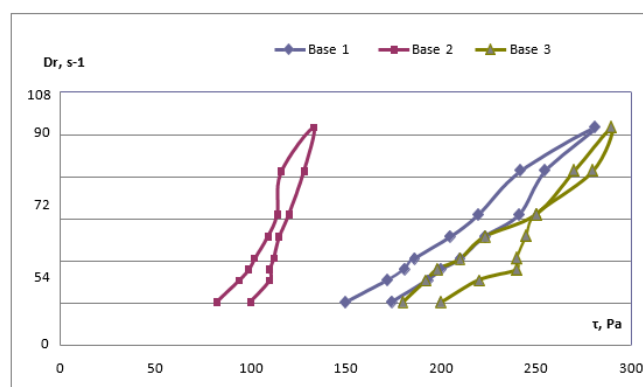


Figure 4 Flow rheograms of the selected emulsion bases.

Studies have shown that the structural viscosity at 20 rpm and 20 °C for the samples was in the range: No. 1 - (9058 ± 25) MPa · s, No. 2 - (6121 ± 37) MPa · s, No. 3 - (10998 ± 22) MPa · s (viscosity value exceeds the rheological optimum). All bases were characterized by the non-Newtonian type of flow and thixotropic properties.

For samples № 1 and 2 hysteresis loops with an area of medium size were observed; base № 3 is characterized by a discontinuous hysteresis loop since the ascending and descending curves collided at a shear rate of 54 s⁻¹. Moderate thixotropy and a plastic type of flow stipulate good lubrication of samples No. 1 and 2 and easy distribution on the skin, as well as their satisfactory extrusion ability.

The values of mechanical stability (MS) of experimental samples were defined as the ratio of the tensile strength of the structure before deformation (τ_1) to the value of the tensile strength after deformation (τ_2). The values of MS (at norm 1) for the studied samples were as follows: No. 1 - 1.0; No. 6 - 1.12; No. 10 * - 1.08. Therefore, taking into account the optimal values of all studied parameters, we stopped our choice on composition № 1, which contains:

Microbiological stability is an important requirement for the quality and stability of cosmetics, on which depends their effectiveness and safety when applied topically. Semisolid dosage forms with a

high concentration of the aqueous phase (gels, emulsion ointments, and creams) are most susceptible to microbial contamination and promote intensive reproduction of microorganisms. In order to prevent microbial contamination, products for external use are

manufactured in compliance with sanitary and hygienic requirements, and antimicrobial preservatives are introduced. The results obtained are shown in Table 3.

Table 3 Study of the effectiveness of antimicrobial preservatives in cream samples

Sample batch	Exposure time	SPU requirements (criterion A)		Number of microorganisms - lg CFU/g;					
		Number of bacteria, * lg of reduction	Number of fungi, * lg of reduction	* lg of reduction		<i>S. aureus</i>	<i>E. coli</i>	<i>P. aeruginosa</i>	<i>A. brasiliensis</i>
0,9% sol.	Immediately after contamination	10 ⁶	10 ⁵	6,72	7,72	7,50	6,34	7,00	
№ 1	2 days	*2	-	4,25	5,45	3,6	3,12	2,5	
Samples with potassium sorbate	7 days	*3	-	* 2,47	* 2,27	*3,9			
(0,15)	14 days	-	*2	2,08	2,12	2,0	2,0	0	
	28 days	NI	NI	* 4,64	5,6	* 5,50	0	0	
№ 2	2 days	*2	-	2,00	0	2,00	* 6,34	*7,00	
Samples with potassium sorbate and salicylic acid (1:1)	7 days	*3	-	3,0	4,2	3,8	0	0	
	14 days	-	*2	* 3,72	* 3,52	*3,7	3,30	2,14	
	28 days	NI	NI	0	0	0	ND	ND	
№ 3	2 days	-	-	* 6,72	* 7,72	*7,50	0	0	
Samples without a preservative	14 days	-	-	ND	ND	ND	* 6,34	*7,00	
	28 days	NI	NI	ND	ND	ND	0	0	
	7 days	-	-	6,55	7,75	7,4	6,45	6,88	
	14 days	-	-	6,9	8,12	7,85	7,34	7,21	
	28 days	-	-	7,45	8,5	8,25	7,86	7,56	
		-	-	7,68	8,82	9,22	8,16	7,74	

Experimental studies have shown that potassium sorbate (0.15%) should be used in the composition to ensure the necessary preservative action and prevent the development of microorganisms.

The technology of preparation of the cream is as follows: prepare the base at first. Melt coconut oil in a water bath, then add almond oil and shea butter, mix and add all other oils. The resulting mixture of oils is cooled to 40°C and mixed with the base adding potassium sorbate. Mica is added to the finished mixture and homogenized. The resulting cream is packaged.

Thus, conducted comprehensive experimental physicochemical, pharmacological, and microbiological studies have made it possible to substantiate the final composition of the highlighter in the form of face cream. The final composition is given in Table 4.

Table 4 The composition of the highlighter in the form of a cream

Ingredient name	Content, %
Isopropyl palmitate	5,0
Glycerol	5,0
Corn oil	20,0
Ercamuls NFV	3,0

Ingredient name	Content, %
Carbopol Ultrez 10	1,0
Triethanolamine	0,3
Potassium sorbate	0,15
Dimethicone	2,5
Sesame oil	2,0
Shea butter	5,0
Grape seed oil	3,0
Coconut oil	2,0
Almond oil	5,0
Mica	28,0
Vitamin E	2,0
Purified water	up to 100,0

The ratios of highlighter components are selected in such a way as to ensure deep penetration into the skin structure, as well as proper consumer properties (odor, ease of application, safety in dermal application, stability during storage). The proposed composition in addition to the decorative function will have a nourishing effect on the skin due to the content of a wide range of oils.^{8,9}

Notes: ND - no viable cells of microorganisms detected; NI - no increase in the number of viable cells of microorganisms, which is determined on the 7th day (for bacteria) or 14 days (for fungi).

Conclusion

Based on the conducted experimental studies, the selected components of the cream were studied: isopropyl palmitate as a moisturizer and emollient, glycerol as a moisture-retaining, emollient and moisturizing component, emulsifiers, gelling agent (Carbopol Ultrez 10), oils, and mica. The quantity of each component is substantiated and experimentally confirmed, the technology of creating a highlighter in the form of a cream is chosen. The structural and mechanical properties of the obtained cream were studied and a preservative (potassium sorbate) was selected. The highlighter in the form of a cream is recommended for skin care, make-up, and face correction.

Acknowledgments

None.

Conflicts of interest

None.

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