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COMPONENT COMPOSITION DEVELOPMENT OF HAIR MASK

Cosmetic emulsion components on the basis of their functional identity analysis in the cosmetics composition have been selected. Emulsion samples with different component composition have been obtained by means of "hot/hot" disperse method. The main organoleptic and physical-chemical characteristics have been determined. The resulting regularities have been analyzed, the preferred composition has been selected. Hair mask sample has been prepared and tested. Organoleptic and physical and chemical characteristics of the cosmetic were shown to meet the requirements of STB 1673-2006.

Introduction. The Republic of Belarus is steadily expanding the range and overall production of cosmetics. However, the market share of domestic goods in the retail chain is considerably lower than that of imported ones, which indicates the need to increase their market share. This tendency is typical both for hair conditioners and scalp. Hair masks which serve for hair structure recovery, revitalizing and improvement of hair appearance, as well as for dry scalp nutrition and oily scalp pre-drying, etc. occupy an important place among these cosmetics [1]. To increase the share of domestic goods it is necessary to improve the quality and expand the range of products, which is promoted by the development and introduction of new cosmetics into the manufacture. Cosmetics efficacy and their main performance attributes (nutrition, recovery, wetting, etc) and application properties (color, odor, consistency, storage behavior) depend on the component composition [2].

The aim of the research was to study the effect of the emulsion systems ingredients on their properties and to develop the component composition of hair masks.

Preparation and research methods. Emulsion samples were prepared by disperse method using variable speed mixing device (IKA firm). Operating parameters of emulsion preparation have been practiced earlier [3]. The analysis of the samples obtained was carried out in accordance with the STB 1673-2006 [4].

Thermal stability was determined by incubating emulsion samples for 24 hours at a temperature of 40–42°C. The emulsion was considered stable if, there occurred neither aqueous stage nor oil phase layer precipitation (the height no more than 0.5 cm) after incubation in the test-tubes. The colloidal stability was established by centrifuging of pre-incubated samples (20 min, 42–45°C) for 5 min at a speed 2,000; 4,000 and 6,000 min^{-1}. The emulsion was considered stable if, following the exposure in the test tubes no more than a drop of the aqueous stage or an oil phase layer (the height no greater than 0.5 cm) had been precipitated [5].

Absorption (absorbability) was evaluated by the number of massage movements required for a complete scalp absorption of the product (lack of feeling by scalp) [6].

Acid number was determined by titrating the dissolved batch of the emulsion sample 0.1N with an alcoholic solution of KOH. The pH of the samples was determined after dilution with distilled water in 1 : 9 ratio and thorough mixing prior formation of a homogeneous system [7].

Main part. Hair is an important element of the appearance which serves protective function. It is subjected to various effects (decoloration, dyeing, curling, environmental factors, etc.), thereby becoming dull, dry, brittle and non-elastic. The action of hair cosmetics is aimed at correcting hair damage and ensuring its beautiful appearance, as well as healthy scalp, so they must contain proper ingredients.

It is known [8] that the main components of cosmetics, providing the complex of consumer properties (conditioning and antistatic, increase of hair gloss, hair growth, appearance, etc.), are oil phase ingredients.

Sunflower oil is easily absorbed by scalp and promotes rapid penetration of biologically useful additives. It also has moisturizing and softening effects. In the cosmetic composition it can be used as a fatty base of hair growth stimulant, filming agent, etc. Sea buckthorn oil containing natural biologically active substances, stimulates hair growth, improves its appearance, and positively effects dry scalp [9–12]. Paraffin oil is used in cosmetic products due to its water-repellent and film-forming effect. It provides occlusion, has a detangling effect and makes hair smooth [13].

Thickeners and texturizers are necessary for the manufacture of cosmetics [14]. Beeswax, cetyl alcohol and carbomer were used to develop cosmetic emulsion structure.

Emulsifiers which help to increase system dispersability in the process of its fragmentation as well as to stabilize emulsion droplets are necessary to obtain stable, high-dispersion emulsions. Colloidal surfactants are known to possess good emulsifying and stabilizing properties [15, 16]. Tween 20 and Cremophor A25 have been chosen to produce emulsions from the previously studied colloidal surfactants [17] because estimated hydrophilic-lipophilic balance (HLB) values confirm that these surfactant preparations can be used as oil-in-water emulsion emulsifiers. The main characteristics of surfactant preparations are given in Table 1.

Table 1

Main surfactant characteristics

Surfactant preparation	Appearance	HLB	σ, mJ/m^2
Tween 20	Light-yellow viscous liquid	16.7	39.7
Cremophor A25	Small white flocks	9.1	50.2

Depending on the surface tension value (σ_{SAS}) there are quick and "slow emulsifiers. The lower the surface tension of surfactants, the better they function as emulsifiers. Emulsifiers with the surface tension less than 35 mJ/m^2 are referred to as "quick" ones, and those with the surface tension higher than the estimated value – as "slow" ones [19, 20]. The surface tension of surfactant preparations indicates that both surfactants belong to the "slow" emulsifiers providing systems stabilization by adsorption – solvation and mechanical – structural stabilization factors.

Triethanolamine soaps of palmitoleic and stearinic acids functioned as "quick" emulsifiers. The soaps were formed in the result of the interaction between triethanolamime and stearin in the oil phase. Triethanolamine soaps have conditioning properties and also help to remove hair static stress. They are ionic surfactants, they help emulsification and provide emulsion stability due to the electrostatic stabilization factor.

Fig. 1 is an emulsification scheme of mechanical dispersion in the presence of "quick" and "slow" emulsifier.

"Quick" and "slow" emulsifier action mechanism is different. Triethanolamine soaps stabilize emulsion and enhance its dispersability. At the same time, emulsifier concentration on the newly formed finer droplets in the adsorption layer remains constant and maximum. The number of emulsifier molecules at the interphase becomes larger if the dispersability increases.

Tween 20 and Cremophor A25 generally only stabilize the emulsion. Thus, emulsifier concentration on the newly formed finer droplets in the adsorption monolayer decreases, but the number of emulsifier molecules at the interphase remains constant and equils to the original. As a result, when the emulsion reaches maximum possible dispersability, smaller droplets begin to coalesce till the formation of a stable emulsion of lower dispersability and a larger droplet size.

Using the selected components we have obtained 11 emulsions samples, their composition is shown in Table 2.

Organoleptic analysis of the resulted samples has been carried out (color, texture). Samples No. 1, 5–8 were stated to possess substantial fluidity, their texture failed to meet the consumer requirements, so their further studies were not conducted. Basic physical and chemical characteristics of the emulsion samples No. 2–4, 9–11 have been tested. A diagram based on a five-point scale for each parameter has been plotted to determine the preferred emulsion composition (Fig. 2).

Sample No. 11 is shown to meet the requirements optimally. The composition, corresponding to this sample was used to prepare a hair mask. Besides, the system was added with a perfume component and a cosmetic preservative which don't affect physical and chemical characteristics of a beauty preparation.

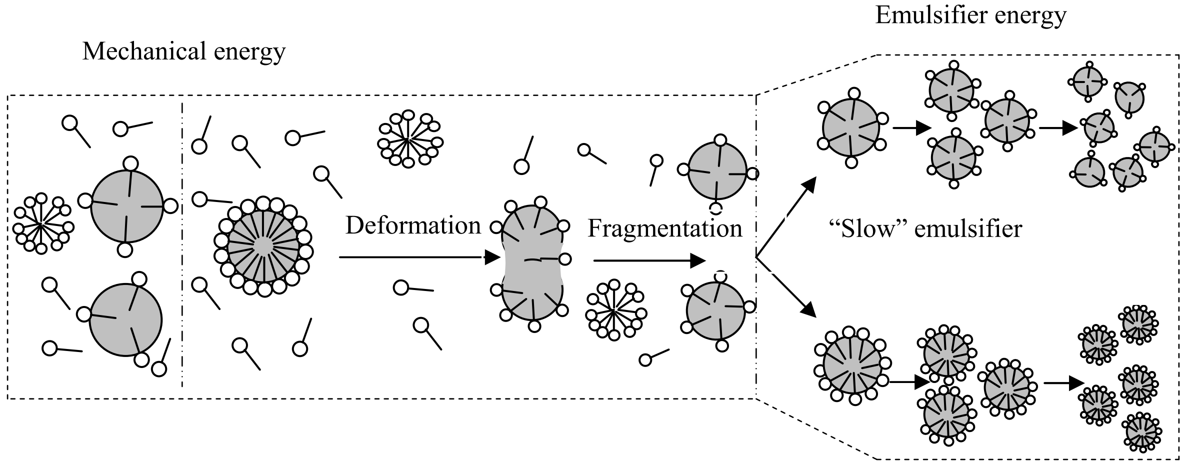

Fig. 1. Emulsification process scheme

Table 2

Component composition of emulsion samples

Component	Content, %										
	1	2	3	4	5	6	7	8	9	10	11
Oil Phase											
Sunflower oil	4.0	4.0	4.0	4.5	4.5	4.5	5.0	5.0	5.0	5.0	5.0
Paraffin oil	2.0	2.5	3.0	2.0	2.5	3.0	2.0	2.0	2.5	3.0	3.0
Sea buckthorn oil	–	1.0	1.0	0.5	1.0	1,0	–	–	–	–	0.3
Beeswax	1.5	2.0	3.0	3.0	1.5	1.5	2.0	2.0	4.0	4.0	4.0
Stearin	3.0	3.0	1.5	1.5	2.0	3.0	3.0	4.5	4.5	5.0	5.0
Cetyl alcohol	–	2.0	3.0	1.5	2.0	3.0	2.0	2.5	3.0	3.0	3.0
Cremophor A25	–	1.5	1.5	1.5	2.0	2.0	2.0	1.2	1.5	1.5	2.0
Aqueous phase											
Glycerin	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Carbomer	–	–	–	–	–	–	–	–	–	0.1	0.2
Triethanolamine	–	1.5	1.5	1.5	2.0	2.0	2.0	1.2	1.5	1.5	2.0
Tween 20	–	–	–	–	–	1.3	1.7	1.7	2.5	2.5	2.5
Water	86.0	79.5	77.5	81.0	76.5	73.7	74.8	73.8	69.5	68.4	67.5

The resulting mask was a homogeneous mass of semi-solid texture, without impurities and with a slight scent of an orange. It had a neutral pH, was easily absorbed by scalp, had a high heat stability and resistance to centrifugation.

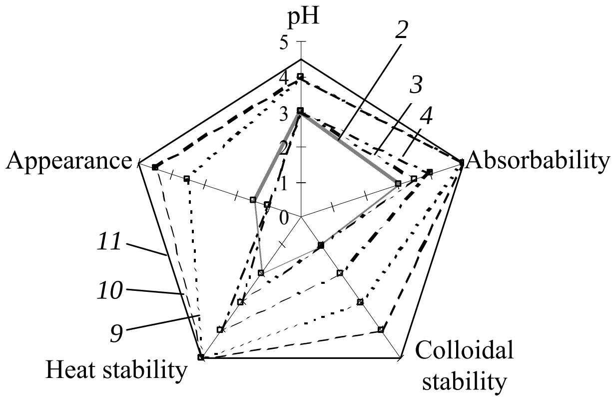

Fig. 2. Comparison analysis of emulsion samples: 2, 3, 4, 9, 10, 11 – sample number

Conclusion. Thus, the study of the ingredients influence on the properties of cosmetic emulsion allowed to develop hair mask composition which by its organoleptic and physical-chemical characteristics meets the requirements of STB 1673-2006. High stability of the product is due, in our opinion, to properly selected expenditure and "quick" and "slow" emulsifiers ratio.

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