ANNOTATION

to the dissertation for the degree of doctor of Philosophy (PhD) in the educational program

"6D074000 – Nanomaterials and nanotechnologies."

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on the topic "Development of nanocosmetic preparations of systems of treatment-and-prophylactic action using natural raw materials"

General description of work. The dissertation is devoted to the production and comprehensive study of nanocomposite preparations for cosmetic purposes with a therapeutic effect.

Relevance of the research topic. However, in recent years there has been a growing interest in natural and organic ingredients such as plant extracts, essential oils, honey and other natural ingredients. This is due to increased consumer awareness of the importance of choosing safe and environmentally friendly products for their health and the environment.

One of the main requirements for modern cosmetic products is their hypoallergenicity. In addition to natural ingredients, manufacturers also try to avoid the use of various aggressive substances that can cause irritation and allergic reactions.

An important aspect when creating cosmetic preparations is their structure and texture. It is known that the smaller the particle size in creams and ointments, the better they penetrate the skin and perform their functions. This is why many modern cosmetic products contain nanoparticles that provide a deep effect on the skin.

Nanoparticles quickly penetrate the top layer of the skin, pass through the epidermis and reach the dermis, where they can exert their healing and rejuvenating properties. They also improve the absorption of the active components of creams and ointments, enhance their effect and make them more effective.

In conclusion, the particle size of cosmetic preparations plays an important role in their effectiveness and ability to penetrate deep into the skin. Nanoparticles can enhance the healing and anti-aging properties of cosmetic products, but more research and monitoring is needed to ensure their safe use. It is important to choose quality products and pay attention to their composition in order to get maximum benefits for the skin and minimize health risks.

The use of plant components in cosmetic preparations has a number of advantages. Firstly, such components are natural and low-aggressive for the skin. This is especially important for people with sensitive skin or allergic reactions to synthetic additives. Secondly, plant components contain biologically active substances that can have a beneficial effect on the condition of the skin. For example, aloe vera extracts help moisturize and soothe the skin, chamomile, calendula and green tea extracts have anti-inflammatory properties, and ginseng extract stimulates cell regeneration.

However, it is important to note that not all herbal ingredients are equally beneficial or safe. Research and testing must be conducted to determine the effectiveness and safety of each individual ingredient before using it in cosmetic products. Thus, the use of plant components in cosmetic preparations has great potential for improving skin condition and achieving a therapeutic effect. However, each component must be carefully selected and tested, and the user's skin reaction to the product must be monitored.

The goal of the work is to develop nanocosmetic preparations with therapeutic and prophylactic effects based on plant raw materials.

Work objectives. To achieve the goal of dissertation work, the following tasks were set:

1. Determine the optimal composition based on the gelator and the time of ultrasonic treatment of the gel base (agar-agar and cellulose ether) to obtain a nanocomposite treatment drug ebno-preventive action;
2. Develop a mode of mechanochemical and ultrasonic processing to obtain nano-sized particles of natural raw materials (Ak-Marzhan rice) and determine the content of Ak-Marzhan rice as a filler in the gel system;
3. To establish the physico-chemical stability of the indicators of nanocomposite preparations for restoring the appearance of the skin for therapeutic and preventive action with “gel” compositions base-nanodisperse filler “Ak-Marzhan”-acid modifier-dietary supplement”;
4. Determine the toxic effects, therapeutic efficacy and biocompatibility of nanocosmetic preparations with therapeutic and preventive effects *in vitro.*

Basic provisions for defense:

1. To prepare the gel base of the nanocomposite drug with the optimal content of gelling agents - cellulose ether in a mixture with glycerin 20% and minimal water from the Kok source tem" is 1-2%, agar-agar – 4-6% after ultrasonic treatment for 20 minutes, in which the gel bases show stability of pH and viscosity values after 1 month of storage.
2. Mechanochemical treatment of Ak-Marzhan rice for 20 minutes leads to a reduction in particle size to 5 microns and an increase in reactivity, followed by ultrasonic treatment within 20 minutes allows you to reduce the particle size to 10-50 nm, which further promotes uniform distribution and structuring of these fillers in the composition of nanocosmetic preparations. A 10% content of Ak-Marzhan rice filler leads to stabilization of the gel system in terms of pH and viscosity.
3. Nanocomposite preparations based on agar-agar with nanodispersed filler “Ak-Marzhan”, acid modifiers and dietary supplements are stable and have therapeutic and preventive properties action according to physical and chemical indicators: to remove allergic reactions from the surface of the skin, pH=5.32, viscosity - 4.20 μS; for cleansing, smoothing and renewing the skin, pH=5.60, viscosity-4.15 μS; for the treatment of acne, pH=5.51, viscosity-4.40 μS;

4. The developed nanocosmetic preparations have a therapeutic and preventive effect and are toxicologically safe: toxicological elements lead, arsenic and mercury are not detected wives, therapeutically effective: skin-irritant effect and effect on mucous membranes - absent and biocompatible: Escherichia coli, P aeruginosa, S. Aureus, Cadida albicans - not detected.

The object of the study is Nanocosmetic preparations.

The subject of the research is gel systems based on agar-agar and cellulose ether and nano-sized filler from rice “Ak-marzhan”.

Research methods

The following research methods were used in the work: Rotational viscometer EAK-2M, pH meter "pH-150MI", combined (Salinity meter/Conductivity meter) TDS/EC meter HM COM-80, scanning electron microscopy, TEM, IR spectrum, mechanochemical treatment, UZT .

Scientific novelty of the work

In this work, the following results of scientific novelty were obtained:

1. For the first time, a method for preparing gel compositions with therapeutic and prophylactic action has been developed;

2. For the first time, nano-sized particles of rice “Ak-Marzhan” with a size of 10-50 nm were used as a filler for composite systems. A regime of complex use of mechanochemical treatment for 20 minutes, followed by ultrasonic treatment for 10 minutes, was experimentally selected, which leads to a reduction in particles of the Ak-Marzhan rice filler, and the optimal filler content in the gel system was determined to be 10%.

3. Nanocomposite preparations based on agar-agar, after exposure for 6 months at room temperature, show stable indicators of organoleptic and physicochemical properties, due to the formation of mechanically strong jellies or plastic gels.

Theoretical significance.

The theoretical significance of the dissertation work lies in the fact that the gap in obtaining nanocomposite drugs with therapeutic and prophylactic action is filled in expanding knowledge about the impact of nanotechnology on cosmetic products, increasing the efficiency of their use, as well as in the use of natural components to create innovative and safe skin care products .

Practical significance

From a practical point of view, the significance of the work lies in the development of nanocosmetic preparations from natural raw materials that have anti-allergic, anti-burn effectiveness and can be used for the treatment of post-acne. The results of the dissertation work can be used when giving lectures and conducting practical classes in the specialty EP “8D074000-Nanotechnologies and Nanomaterials”.

The author of this dissertation personally took part in setting up and conducting scientific experiments, determining methods of analysis and ways of applying the stated theoretical and practical problems, discussing the results obtained, substantiating conclusions and writing articles.

//III All-Russian conference with international participation, dedicated to the 75th anniversary of the Institute of Solid State Chemistry and Mechanochemistry SB RAS, October 1-5, 2019. p. 250 ABSTRACTS Novosibirsk, Russia, INTERNATIONAL.

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Publications. Based on the materials of the dissertation work, 12 scientific papers were published, of which 2 articles included in the Scopus database, 4 publications in journals recommended by the Committee for Control in the Sphere of Education and Science of the Republic of Kazakhstan; 5 published works - in collections of international scientific and practical conferences and symposiums, 1 patent for a utility model of the Republic of Kazakhstan was received.

Scope of work structure. The dissertation work is completed on 120 pages and contains 30 figures and 14 tables. The work consists of an introduction, literature review, experimental methodology, results and discussions, conclusion and a list of sources used, including 155 titles.