



CHEMICAL AND TECHNOLOGICAL SYSTEMS

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MODELING OF PROBIOTIC GEL SHAMPOO RECIPES WITH VEGETABLE EXTRACTS AND MARKETING ANALYSIS OF THEIR MARKET PROMOTION

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The object of research is the formulation of probiotic gel shampoos enriched with short-chain peptides of whey proteins and probiotic lysate. The intensive growth in demand for new types of cosmetics, including cosmetics with probiotics, causes the desire of manufacturers to constantly improve products to meet consumer requirements. Of the whole complex of factors that form the final quality of natural cosmetics, from the point of view of the consumer, one of the most important is the planning and development of component content of products. Therefore, a promising task is studying the possibilities of creating probiotic gel shampoos based on available natural components, which, thanks to the mathematical modeling of formulations and the use of promising technologies, allows to predict their high popularity and effectiveness.

The work substantiates the feasibility of using whey nanofiltrate as an extractant to extract biologically active substances from medicinal raw materials for the production of probiotic gel shampoos. The expediency of using extracts of peppermint grass, nettle leaves and marigold flowers as part of probiotic gel shampoos enriched with short-chain peptides of whey proteins and probiotic lysate has been shown. Due to the optimized ratio of medicinal plant extracts in the composition, the target product has high functional properties. The ratio of extracts of nettle leaves, marigold flowers and peppermint grass is 2:1:1, while the mixture of extracts has a maximum antioxidant activity of 1262.255 act. units. As a result of the research, «Probio-beauty» probiotic gel shampoo formulations are developed for daily use and for strengthening and restoring hair. Quality indicators developed with optimized formulations of «Probio-beauty» probiotic gel shampoos meet the requirements of regulatory documents.

Since today there are no cosmetic products with probiotics produced in Ukraine on the market, the implementation of research will allow to occupy the niche of «natural cosmetics». And correctly conducted marketing activities that are offered in this work will allow to gain a foothold in the cosmetics market, make the brand recognizable and expand the product range based on consumer preferences.

Keywords: natural cosmetics, gel shampoo, recipe composition, antioxidant activity, response surface, marketing analysis.

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ECOLOGY AND ENVIRONMENTAL TECHNOLOGY

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INFLUENCE OF THE SYSTEM OF MATERIAL FLOWS ON THE ENVIRONMENT OF INDUSTRIAL AREAS

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The object of research is the transport component, as the basic element of the environment of industrial zones. The paper considers an analytical approach to determining the patterns of dependence of the environmental friendliness of the material flow system on the characteristics of the transport component. A model of an intelligent system for managing efficiency and environmental friendliness based on the decomposition of industrial transport complexes into two components, differing in the methods and conditions for the formation of pollution emissions, is proposed: a subsystem of stationary sources and a subsystem of mobile sources.

The obtained results make it possible to highlight a number of features of the nature of the influence of material flows on the environment of industrial zones, grouped into basic analytical groups of threats and development opportunities of the studied object with an average expert rating (e. r.), namely:

- threat group: poor strategic planning of activity and its development (12.8 e. r.); a significant dependence of the financial condition on the volume of orders of several major consumers (9.6 e. r.); weak legal framework governing the environmental safety of the facility (6.6 e. r.); implementation of foreign innovative solutions in the operation of the facility (11.8 e. r.); intensive updating of existing mechanisms of environmental protection (2.8 e. r.);

- opportunity group: staffing opportunities to create a powerful engineering base and professional management team (14.6 e. r.); effective use of information technology (5.6 e. r.); implementation of the functions of city logistics (5.6 e. r.); improving the quality of transport services (10 e. r.); creation of a specialized center for managing the process of ensuring the environmental sustainability of the facility (10 e. r.).

The results of a study of the influence degree of material flows on the environment of an industrial zone confirm the authors' working hypothesis. This hypothesis is based on the consideration of transport systems and the environmental

safety of their work, as a whole and the degree of their interaction throughout the entire life cycle of their development.

Keywords: transport component, industrial zone, environmental sustainability, environmental profile, transformation ratio.

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IMPROVEMENT OF THE CALCULATION METHOD OF CYCLONE DUST COLLECTORS

page 20–25

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The object of research is a method for calculating the efficiency of cyclones using the magnitude of the velocity of transverse pulsations of a turbulent gas flow in the inlet of the cyclone. One of the most problematic issues when creating a new cyclonic technique for gas dust cleaning is the need to carry out a fairly large amount of work – modeling cyclones in laboratory conditions on model cyclones, taking into account the large-scale transition, etc. Therefore, the development of the most accurate analytical method for calculating the efficiency of cyclones is an important problem since it makes it possible to quickly and accurately determine all the necessary cyclone parameters for specific production conditions.

During the study, patterns of dust particle deposition in the approximation of the «diffusion boundary layer» were used, which made it possible to calculate with high accuracy the efficiency of cleaning industrial dust in cyclones of various designs. At the same time, the time and the amount of experimental work are also significantly reduced in the development of new types of cyclones or in their modernization or selection.

The most accurate dependencies are obtained for evaluating the most important parameters of dust cleaning efficiency in various cyclones. This is due to the fact that the method for calculating cyclones proposed in the work has a number of features, in particular, the development of new dependences for calculating the cut-off diameter « $d_{\eta=50}$ », the inertial capture coefficient of dust particles «E», and others. It is also proposed to use the average cross section of the inlet pipe of the cyclone of the velocity of transverse pulsations of the turbulent gas flow and the new interpolation dependence of the coefficient of inertial capture of dust particles «E» at the potential flow regime in the inlet pipe of the cyclone x machines. Thanks to this, it is possible to obtain accurate values of the indicators of cleaning efficiency in cyclones of various design parameters. Compared with similar well-known calculation methods, this provides such advantages as accuracy of calculations, speed of execution and reliability of the results.

Keywords: cyclonic technics for gas cleaning from dust, «cut-off» diameter, dynamic speed, cleaning coefficient.

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FOOD PRODUCTION TECHNOLOGY

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THE FORMATION OF FUNCTIONAL AND TECHNOLOGICAL PROPERTIES OF THE DOUGH AND QUALITY INDICATORS OF OATMEAL COOKIES WITH THE USE OF «MAGNETOFOOD» FOOD ADDITIVE

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The object of research is the technology of oatmeal cookies using the Magnetofood food additive. Prospective enhancers of food systems (in particular, dough confectionery masses) are nanoadditives, which are characterized by a wide range of functional and technological properties, due to the specificity of their physico-chemical characteristics due to nanoscale size and quantum-mechanical effects.

In order to study the influence of the Magnetofood food additive on the functional and technological properties of the dough and the quality indicators of Magnetofood oatmeal cookies

additive was injected into the formulation in the form of a fatty suspension at the stage of «oil rubbing». It was established that the administration of the Magnetofood food additive in the formulation of oatmeal cookies in the amount of 0.1; 0.15; 0.2 % of the weight of the prescription mixture as a fatty suspension (as compared to control) contributes to:

- increase in the moisture content of the dough (1.2 ± 0.2) %, the stress of the dough shift – by (20 ± 2) Pa and the plastic viscosity of the dough – by (2.2 ± 0.4) kPa·s;

- reduction of the dough density on (0.6 ± 0.1) g/cm³;

- increase of humidity of oat cookies – by (2.25 ± 0.1) %, typical cookie on (10 ± 2) %, the yield of the cookie – by (2.0 ± 0.5) %, the average value of the ball scoring of the cookie by the organoleptic analysis – by (1.0 ± 0.1) points, improvement of the chewing of the cookie – by (0.4 ± 0.2) points;

- decreasing the density of the cookie on (0.10 ± 0.02) g/cm³, bread crumbling – by (0.9 ± 0.2) %, losses at heat treatment on (1.8 ± 0.2) % and alcohols of the cookie on (0.3 ± 0.1).

Compared with similar well-known enhancers of food systems, nanoobjects, which include nanopowders (Magnetofood), have enormous potential and carry many important discoveries, new functional and technological properties and promising technological applications. The interaction of Magnetofood nanoparticles with biopolymers is a complex of complex chemical reactions. The result is the formation of spatial nanostructures, which significantly affect the functional and technological properties of raw materials and semi-finished products. In food systems, such additives, in particular Magnetofood, exhibit antioxidant, bacteriostatic, sorption, emulsifying, structure-forming, moisture and fat-retaining properties. This ensures the possibility of obtaining high values of the investigated indicators.

Keywords: Magnetofood food additive, oatmeal cookies, oatmeal wheat dough, quality measurements.

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REPORTS ON RESEARCH PROJECTS

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RESEARCH OF N,N-DIALLYL (3-ARYLISOXASOL-5-YL)-METHYLENESULFONYLAMIDES AS ADDITIVES FOR INCREASING THE LOAD CARRYING CAPACITY OF SYNTHETIC OIL BASED ON THE PENTAERYTHRITOL ESTER AND BUTYRIC ACID

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The object of research is N,N-diallyl (3-arylisoxasol-5-yl)-methylenesulfonylamides (Ar: C₆H₅ (1); C₆H₄-4-CH₃ (2); C₆H₄-4-OC₂H₅ (3)) as antiwear additives to oils that are derived from the corresponding sulfonyl chloride and dialylamine. The industrial additive DF-11 (zinc dialkyldithiophosphate) (4) was used as a reference in action, and the 2-mercaptobenzthiazole allyl ether was used as a structural standard (5). As a synthetic oil, pentaerythritol and n-butyric acid ester, which is obtained by the esterification reaction, is used.

Some physical characteristics (relative viscosity and refractive index) of the obtained oil were studied with and without the addition of sulfonylamides (1)–(3).

The effect of the addition of N,N-diallyl (3-arylisoxasol-5-yl)-methylenesulfonylamides (Ar: C₆H₅ (1); C₆H₄-4-CH₃ (2); C₆H₄-4-OC₂H₅ (3)) on the dynamic strength of the test oil was evaluated by ASTM D2783 (GOST 9490-75) on the four ball friction machine in terms of critical load. The tests were carried out by friction in the corresponding liquids of standardized metal balls made of ShKh 15 steel (microhardness – 64–66 HRC, stiffness parameter – Ra < 0.25 μm). The rotation frequency of the upper loaded balls in relation to three stationary balls is 1500×1, the oil temperature is 20 °C. The test time at each load is 10 s, the experiment repeatability is three tests for each load.

The study of changes in the diameter of the wear spot D_w of metal balls during friction in the initial oil without adding compound (3) and in accordance with the addition was carried out at revolutions of 1500 rpm, an initial temperature of 25 °C, a load of 98 N, and a study time of 1:00. The results obtained indicate that D_w of the oil without making the specified compound was 0.75 mm, and when it was added (0.1 wt. %) – 0.67 mm, that is, the reduction in wear is 10.67 %.

It is found that the presence of the studied additives (1)–(3) in low concentrations in a synthetic oil based on pentaerythritol and n-butyric acid can significantly increase its bearing capacity. The most effective compound (3), which at a concentration of 0.1 % of the mass exceeds the bearing capacity in comparison with (4) by 1.38 times, and with (5) – by 1.37 times. The specified compound is more effective in concentration, 10–20 times less in comparison with known additives.

Thus, the use of N,N-diallyl (3-arylisoxasol-5-yl)-methylenesulfonylamides as additives to increase the bearing capacity of synthetic oils based on pentaerythritol and synthetic fatty acids, allows to increase the antiwear activity of lubricants. Therefore, they can be used to create new effective compositions for oils and petroleum products.

Keywords: N,N-diallyl (3-arylisoxasol-5-yl)-methylenesulfonylamides, synthetic oil, relative viscosity, refractive index, wear spot, load bearing capacity.

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THE USE OF AN ENZYME PREPARATION WHEN USING CALCIUM ACETATE IN WHEAT BREAD TECHNOLOGY

page 35–39

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An important problem of bakery is the prevention of the main causes of spoilage of bread, namely the development of microorganisms, which, under favorable conditions, become activated and lead to complete unsuitability of the product for consumption. The spores of bacteria of the group of potato sticks are quite resistant to thermal effects, they remain viable even at temperatures close to 130 °C, but are sensitive to an acidic environment. The use of calcium acetate in the recipe of wheat bread to carry out a booming effect on microorganisms will also affect the quality of products. To improve the quality of such products, it is advisable to use amylolytic enzymes to intensify the fermentation of the dough and oxidative additives to reduce its stickiness and spreading.

The object of research in the work is dough made from wheat flour of the first grade, the formulation of which includes calcium acetate, the enzyme preparation Alphamalt V and ascorbic acid.

It is established that from the point of view of influencing the quality of finished products, a rational dosage of calcium acetate is 0.3 % by weight of flour. The optimal dosage of the enzyme preparation Alphamalt V is 0.015 % by weight of flour and ascorbic acid – 0.006 %.

It is proved that the introduction of this composition of food additives improves gas removal ability by 15...20 % compared with the control and products containing only calcium acetate. The positive effect of the use of an enzyme preparation of amylolytic action along with calcium acetate on the lifting force of yeast has been established. This helps to intensify the fermentation of the dough and increase the specific volume and porosity of wheat bread.

It is established that the use of a composition of food additives positively affects the elastic-elastic properties of the dough: the spreading of the dough balls decreases and the gas-holding ability increases by 10...13 % compared with products from calcium acetate. This leads to an increase in the specific volume and shape stability of bread.

Thanks to the developed composition of food additives, it is possible to use calcium acetate to inhibit potato sticks without losing the quality of the finished product.

Keywords: wheat bread, potato disease, calcium acetate, Alphamalt V enzyme preparation, ascorbic acid, specific volume.

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