



EFFECTS OF HEAT TREATMENT INTENSIFICATION ON THE QUALITY OF MEAT PRODUCTS

page 4–8

Heat treatment intensification of meat culinary products by applying the combined method is discussed in the article. The essence of this method is using a conductive and intermittent infrared heat supply. Some results of research are given. The main aim of research is optimizing the heat treatment optimization of products to improve the quality of finished products. An experimental device is used for this purpose. This unit consists of the stainless steel working chamber placed with two IR heating elements and electric burner for conductive heating in it. Generalized quality index was used as parameters of frying process optimization. This index is calculated based on the sensory evaluation of the samples and the cooking time. Indices of chemical, biological and microbiological compositions, organoleptic evaluation of quality for control and experimental samples were determined using standard techniques. The authors suggest the use of research results for development of the device of combined frying of meat culinary products in foodservice companies.

Keywords: intensification, heat treatment, steak, crust, conductive heating, infrared heating.

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EFFECT OF ELECTROACTIVATED WATER ON THE DEVELOPMENT OF SURFACE MEAT MICROFLORA

page 8–12

An influence of electroactivated water fractions on development of surface meat microflora is given in the article. Quantitative and qualitative composition of surface meat microflora at its processing by catholyte, anolyte and tap water (control) is investigated. The study was conducted over 6 days. It is noted that population of microorganisms on the 3rd day by 45 % less than in the control sample, and six days for 70 % less than in controls at anolyte processing. According to obtained data catholyte shows no bactericidal properties at the surface microflora. Qualitative analysis of microflora showed that lactic *Leuconostoc* diplobacteria are discovered at anolyte processing. This fact is positive for raw meat microflora because the lactic acid bacteria prolong the shelf life of meat and suppress putrefactive microflora. Influence of anolyte is also compared with influence of food chemical acids with the same pH. It is determined that inhibition of microorganisms for anolyte processing and 10 % acetic acid is almost the same, but this acetic acid concentration causes significant deterioration of the organoleptic properties of meat and denaturation of the surface proteins. The study can be

used in meat processing technology to improve the microbiological safety of raw materials and lengthening periods of storage of meat and meat products.

Keywords: electroactivated water, anolyte, surface microflora, meat, bactericidal effect.

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IMPROVING QUALITY OF APPLE POWDER CONFECTIONERY

page 12–17

Comprehensive analysis of domestic and foreign literature on the use of processed products of vegetable raw materials in the manufacture of confectionery is conducted. Use of apple powder is promising direction in this case.

Rational formulation and production technology of apple biscuit, fruit gingerbread, butter-apple and protein-apple creams were developed on the basis of the experimental elaborations and mathematical programming: a rational number of additives for biscuit – 10 %; gingerbread – 10 %; butter cream – 20 %, protein cream – 30 % of

apple puree. New technologies promote rational use of raw materials and improve the quality of confectionery.

Analysis of the chemical composition of the developed products represents a significant increase in the number of vitamins, minerals, and reducing calories.

Quality models of proposed products were developed and built. The research results show an improvement of quality of products with the apple powder and to increase their biological value.

Keywords: apple powder, apple biscuit, fruit gingerbread, butter-apple cream, protein-apple cream.

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RESEARCH OF FATTY ACID AND MINERAL COMPOSITION OF SOFT BODY OF FRESHWATER BIVALVES (GENUS ANODONTA) IN THE NORTHERN UKRAINE

page 17–23

The fatty acid and mineral composition of the freshwater bivalves (genus *Anodonta*) in the north of Ukraine are determined for the first time and compared with the investigated data on the type of shellfish of genus *Mytilus* (*Mytilus galloprovincialis* specie). It was proved that lipids of freshwater aquatic are presented by valuable polyunsaturated fatty acids of family ω -3 and ω -6. Freshwater bivalves of genus *Anodonta* are particularly rich in eicosapentaenoic, docosahexaenoic, linoleic, linolenic, arachidonic and oleic fatty acids, which can't be synthesized in humans. Also a study of iodine and heavy metals such as cadmium and lead was conducted for the soft body of freshwater bivalves of genus *Anodonta* and genus *Mytilus* (*Mytilus galloprovincialis* specie). It was revealed that the amount of iodine contained in a soft body of bivalves of genus *Anodonta* provides almost half the daily requirement of this element

and contained amount of salts of heavy metals doesn't exceed the maximum permissible concentrations for aquatic organisms. Amount of calcium and phosphorus in the soft body of bivalves of genus *Anodonta* in the obtained ash in times greater than their number in the body of the soft marine counterparts, which provides a better absorption of iodine in the body because these elements are its synergists. The possibility of using freshwater bivalves of genus *Anodonta* as a complete and biologically healthy food was proved. This product provides the body with vital essential fatty acids, micro and macro elements and helps the prevention of iodine deficiency disorders.

Keywords: freshwater bivalves, soft body, fatty acids, minerals, iodine.

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RESEARCH OF LIPOLYTIC PROCESSES IN FUNCTIONAL PRODUCTS MADE FROM RAW MATERIALS OF THE CARPATHIAN REGION

page 23–29

The article presents the results of research of lipolytic processes in the production and maturation of Bryndza cheese made from cow, sheep and goat milk, and their mixtures. It has been established that a Bryndza cheese made from goat milk, compared with cheese from cow and sheep milk, and their mixtures contained in 1,77 and 1,99 times more saturated fatty acids, and 1,27 and 1,36 times less unsaturated fatty acids.

Peculiarities of accumulation of flavoring substances after the change of technological modes of cheese brining are shown. Experimental cheese samples had a higher content of flavoring substances, volatile organic acids, esters, diacetyl compared to controls, and the highest content of which was observed in the a Bryndza made from goat milk.

Keywords: technology, cheese, lipolysis, fatty acids, volatile organic acids, esters, diacetyl.

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CHANGE OF TECHNOLOGICAL INDICATORS FOR SOFT CHEESE WITH BRAN DEPENDING ON THE RYE BRAN DOSE

page 29–33

Assortment of cheese is the most diverse of dairy products and has several hundred items that can satisfy the needs of the most demanding customers. However, there are many studies on the creation of new types of cheese, the composition of which, in addition to milk, will include plant raw material. These products are called combined products and their including in the diet is provided energy homeostasis of the consumer. When creating combined dairy products, researchers try to correct the amino acid, fatty acid, vitamin and mineral composition of products to provide health promoting properties.

The object of research is technology of soft cheese made from cheese «Feta» with adding plant components (rye bran) in the normalized mix of this cheese.

Currently it is important to provide sufficient content of dietary fiber in the human diet. Cereals are often used for this purpose, but rye bran has advantage because they have more fiber content than other.

Thus, the aim of this work was to develop a new type of technology of soft cheese with rye bran, which enriches the cheese with dietary fiber. The newly created product will facilitate removal of heavy metals, radionuclides and other pollutants from the human body. In addition, soft cheeses are the protein products and inclusion of non-dairy raw materials in their composition will enhance the positive effect of protein and added elements on the human body activating health promoting properties of the products.

Keywords: soft cheese, rye bran, organoleptic properties, active acidity, health promoting products.

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ANALYSIS OF EXISTENT CONCEPTS OF TRADITIONAL METHODS OF METAL WHISKERS GROWING. DEPOSITION OF SUBSTANCE FROM THE GAS PHASE

page 34–37

Existing presentation about one of the traditional methods of metal whiskers growing – their deposition in the gas phase is considered in the article. This problem in modern conditions given enough attention, so that, no doubt, speaks about the relevance of the research topic. It is found that the whisker growth mechanism during the deposition from the gas phase is based on the dislocation theory positions, while for the growth of a perfect crystal faces must buildup thereon individual atomic layers transferred from the gas phase. It is confirmed that deposition of substances from the gas phase based on

evaporation or sublimation of the starting material, its subsequent mass transport through the gas phase and condensation in the deposition zone. It is shown that the production of whiskers by crystallization method from the gas phase through the liquid commonly used for semiconductor whiskers. The peculiarity of the method is that the crystallization of vapor is performed through the liquid intermediate layer. It is analyzed that the transfer of material inside the drop using crystallization method occurs by diffusion, but crystal growth rate is determined by diffusion rate and crystallization rate of substances. Whiskers obtained by VLS, usually have no axial dislocation, their growth doesn't occur on a screw axial dislocation, independence of their growth rate from crystal thickness is confirmed. The mechanisms of whisker growth during their deposition are investigated. The process of obtaining this group of crystals by crystallization from the gas phase through the liquid is considered.

Keywords: whiskers, growing methods, metal «whiskers», gas phase, liquid phase.

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INFLUENCE OF AMOUNT OF GRAPHITE AND MODIFYING AGENT ON THE PROPERTIES OF PERICLASE-CARBON REFRACTORIES

page 38–41

One of the main components of periclase-carbon materials is graphite, which provides high thermal conductivity and slag resistance of refractories. However, at temperatures of 600 °C it begins to oxidize. To prevent oxidation it is proposed to modify the sol-gel graphite by composition based on nickel salts for further formation of NiO coating on its surface, which will provide additional protection. An influence of graphite amount and its modifier agent on physical and mechanical properties and slag resistance of periclase-carbon samples are investigated. It is established that graphite amount significantly affects only the strength of periclase-carbon refractories — strength of graphite decreases at increase of graphite amount from 5 to 20 %. The impact of graphite modifier agent amount on physical and mechanical properties of the samples appears on the contrary, that is by increasing the amount — properties increase. Amount of graphite and modifier agent doesn't effect on slag resistance. We recommend the following optimal ratio of graphite in an amount of from 5 to 10 % and its modifier agent in an amount of 1,75 % for high performance periclase-carbon refractories.

Keywords: periclase-carbon refractories, antioxidant, phenol-formaldehyde resin, modifier agent.

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DETERMINATION OF PRECIPITATION REGULARITIES FOR NANOPARTICLES OF HYDRATED METAL OXIDES IN THE ANION EXCHANGE RESIN

page 42–47

Organic and inorganic ion-exchange materials containing incorporated inorganic particles of ion exchangers are characterized by enhanced selectivity for ions of toxic metals and resistant to poisoning by organic substances. An important task for achieve the necessary kinetic parameters of ion exchange is to reduce the size of the incorporated particles that is particularly important for hydrated

oxides containing functional groups, mainly, on the outer surface of the particles. Regularities of forming Zr(IV), Fe(III), Al(III) oxide particles in a polymeric anion exchange matrix are considered in the article. The aim of research is establishing and experimental confirmation of deposition mechanism for inorganic ionite in the polymer for directional control of size and state of the particles.

Using computer analysis of TEM images it was revealed that the fractal dimension of the aggregate particles is 2,38–2,72. Nature of modifier also determines the state of the polymer particles. The effect of these factors was analyzed using the Ostwald-Freundlich equation. It was established that the primary nanoparticle size is determined by reprecipitation. Accordingly, the formation mechanism of aggregates is association of nanoparticles with a small cluster, and the limiting step is the diffusion of the polymer nanoparticles. The equation for the diffusion flux of nanoparticles was obtained and it was shown that flux slowing leads to formation of dendritic multi-level structures.

The results can be used to develop technologies for ionite synthesis, ion-exchange membranes and materials for baromembrane separation. The proposed approach allows to obtain materials with a given particle size and, consequently, with certain functional properties.

Keywords: organic and inorganic ionites, hydrated metal oxides, nanoparticles, fractals.

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DETERMINATION OF REACTION AREAS FOR THE SULFUR CONVERSION DURING LOW-METAMORPHOSED COAL OXIDATIVE DESULPHURIZATION

page 48–53

Taken into account the global trends of metallurgy, in order to save energy, new technologies in blast furnaces are actively developed in Ukraine, namely, substitution of natural gas for pulverized coal (PC). However, use of this technique is complicated by inconsistencies of characteristics of a large part of domestic coal with requirements that apply to PC raw materials, primarily because of the high sulfur content in it.

To solve this problem, it is proposed to use the method of coal oxidative desulphurization that consists in selective conversion of pyritic sulfur by vapor-air mixture. However, the content of sulfur in coal is not the only requirement, so the task of research is determination of process parameters that will enable to minimize the destruction and burning of organic carbon that occurs during its oxidative desulphurization.

Series of experiments on detailed determination of patterns for high-sulfur low-metamorphosed coal oxidative desulphurization to produce raw materials for PC are began in this article. The effect of linear velocity of the oxidant and the grain size of raw materials on the process is determined and the values of these factors when oxidative desulphurization isn't limited to diffusion velocity of the oxidant to the coal grain surface are established. The dependence of the process stages from parameters of fluidized bed and mass transfer criteria of the reagent is shown.

Keywords: pulverized coal, coal, sulfur, linear velocity of the oxidant.

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ANALYSIS OF PROSPECTS TO OBTAINING NANOSIZED METAL COMPOUNDS BY TREATMENT OF THE WATER SOLUTION BY CONTACT NON-EQUILIBRIUM PLASMA

page 53–57

This paper discusses the prospects of using the method of processing solutions by the contact non-equilibrium plasma with reduced pressure to obtain nanosized metal compounds as highly dispersed powders and colloidal dispersions on example of obtaining oxygen-containing compounds of cobalt, copper and silver compounds in water solution. The difference of this method is the ability to use very dilute solutions, also thanks to its constructive design, the process of synthesis of particles is controlled by adjusting the parameters of plasma-chemical process. It is noted that this method has undoubted advantages in terms of versatility, low power, the possibility of obtaining a size of 10–100 nm particles. A separation into fractions

by separating them in the water solution after the plasma chemical treatment is possible. The ability to control the process of synthesis of particles by adjusting the parameters of plasma chemical processing, ease of control parameters of the process, possibility of obtaining particles with the division on fractions, possibility of a significant reduction in energy consumption and improve product quality in the transition to film mode allows to speak about high prospects of this method to produce ultra and nanosized metal compounds.

Keywords: contact non-equilibrium plasma, solution, nanoscale cobalt compounds, copper nanocompounds, nanosilver.

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FEATURES OF DESIGN OF RATIONAL INTERNAL SHAPE OF ATHLETICS SHOES FOR CHILDREN-ATHLETES 12–16 YEARS OLD

page 57–62

Shoes of sportsmen of each kind of sport is, on the one hand, a special sports equipment, drafted to enhance athletic achievements, quality and efficiency of the training process and on the other hand it is a device, which should protect the lower limb of an athlete from adverse environment possible clashes, bumps etc. Compliance of sports shoes with foot and shin of the athlete largely determines the positive performance of sports challenges.

There is enough information on methods of designing certain types of athletic shoes for different sports in the current technical literature. However there is not enough research relating to the impact of stress on the foot of an athlete in the course of sports biomechanical movements in the system «feet – footwear – support». Physiological characteristics of the influence of long-term athletics trainings on the body of the child-athlete are also studied not enough.

Object of the research is a rational internal shape and design of children's sports athletic footwear of age group 12–16 years old.

Existing size range of shoes in our market does not meet shape and size of children's feet. Using for a long time such inappropriate shoes can influence the child's foot and even cause deformities.

As a result of analytical review of features efficient internal shape of sports athletic shoes design generalization and analysis of existing systems of efficient internal shape design of sports athletic shoes have been made, calculated and empirical transition from shapes and sizes of a foot to shapes and sizes of lasts has been analyzed, biomechanical prerequisites for building a sustainable footwear have been defined and contact and non-contact methods to obtain information about the characteristics of movement of athletes have been analyzed.

However, to design a rational internal shape of athletic shoes for children athletes with improved functional and performance characteristics it is necessary to conduct a comprehensive analysis of the load on the moving system, examine the speed of the contact, geometry of the foot in contact and the type of movements for each athletic-round, which requires further additional research.

Keywords: sport shoes, foot, athletics, design, construction, rational internal shape, biomechanics.

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MATHEMATICAL DESCRIPTION OF PROCESSES IN SEPARATION UNIT FOR GAS MIXTURES DURING DISPOSAL OF WASTE

page 62–67

The system of material and energy balance equations to calculate the steady-state operation of energy-technological unit for low-temperature separation of multicomponent hydrocarbon mixtures formed during the gasification of waste is given. The aim of this research is

a mathematical description of the separation processes of multicomponent hydrocarbon mixtures formed during waste gasification by the system of closing equations and determination of mass portions of hydrocarbon gas mixture components. To achieve the aim of research, mathematical models for each individual functional elements of the unit are developed and the values of controlled parameters (temperature, pressure, mass flow rate and mass fraction of hydrocarbon gas mixture components) are determined in each control section by the method of successive approximations. Component composition of the streams is obtained: one – the fuel gas suitable for the maintenance of the waste gasification process, the other two – compressed product (analogue of automotive compressed natural gas).

Keywords: disposal, waste, environmental safety, mathematical modeling, multicomponent hydrocarbon mixtures, low-temperature separation.

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- Combined use of the different decontamination methods is expedient in cases where one of the methods hasn't the requisite properties.
- In assessing the effect of the combined action of chlorine and UV disinfection it is shown no disinfection enhancement. Also, photolysis of chlorine compounds is not accompanied by the formation of undesirable byproducts.
- Combined use of US and UV treatment is characterized by high energy consumption, which makes this method not competitive for industrial use.
- Using high frequency currents entails higher costs in comparison with traditional method and therefore this method is not practical for widespread use.
- Using water ozonation provides the primary barrier against microbial contamination and reduces the amount of reagent that enables the use of the method for decomposition of complex organic compounds.
- Combined methods of UV radiation and other physical and chemical techniques (ultrasound, chlorination, microwaves) make it possible to solve complex and specific problems on a laboratory scale. Ozonation with UV radiation can be used for industrial purposes.
- The effectiveness of each of the studied techniques is based on the results of bacteriological analysis and characteristics of the object. The proposed UV combined methods for germicidal disinfection can be used for disinfection of not only drinking water and wastewater, and for a variety of objects of agriculture, food and medical industries.

Keywords: UV radiation, UV disinfection, combined methods, ozonation, chlorination, ultrasound, microwave frequency.

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COMBINED METHODS OF WATER DISINFECTION — UV RADIATION IN COMBINATION WITH OTHER TECHNOLOGIES

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The results of the study of water disinfection using UV radiation in combination with other physical and chemical methods are shown in the article.

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THE EVALUATION OF ANAEROBIC DIGESTION EFFICIENCY FOR WASTEWATER TREATMENT

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The object of study is regularities of the anaerobic digestion process for drains treatment. This helps to improving environment.

The method of anaerobic digestion is effective for wastewater treatment from biological contaminants. The important advantage of the method is lack of negative effect to environment. Biogas is released during the process. Strict temperature limits and lack of oxygen are limited the process.

It was found that the optimum temperature of the process is 54–55 °C. At temperatures below 37 °C the amount of Enterobacteriaceae increases even in comparison with the initial values, and the content of helminths increases. Increasing the temperature to 45 °C leads to destruction of helminths, but sufficiently large number of enterobacteria are still present in the sludge. At a temperature of 55 °C the content of Enterobacteriaceae decreases. Continuous and fed batch ways of fermentation process are found to be the most effective.

Keywords: filtrate, municipal solid waste landfill, anaerobic digestion.

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