

CONTENTS, ABSTRACTS AND KEYWORDS OF PAPERS

ALTERNATIVE TECHNOLOGY ENSURE THE SHELF LIFE OF MEAT-BARBABATCH IN THE MEAT INDUSTRY

S. L. Tikhonov, N. V. Tikhonova

The article is devoted to the evaluation of the effectiveness of the sterilizing treatment of meat products by high pressure. For the experiment, the samples used beef weighing 500 g from a shoulder of the carcass. Test samples were subjected to short-term treatment of high pressure (400 MPa for 3 minutes) using the experimental setup. Before processing, the meat is placed in vacuum-sealed film packaging. It was found that control samples of meat QMAFAnM after 10, 30 and 39 days of storage did not exceed $1.1 \cdot 10^2$, $1,8 \cdot 10^2$ and $2.1 \cdot 10^3$ COE/g. Contamination with yeast control samples after 30 and 39 days of storage was $1 \cdot 10^3$ and $3.2 \cdot 10^4$ CFU/g. At high pressure processed samples of meat QMAFAnM and yeast not detected. Acid number of fat in the control samples of meat after 20 and 39 days of storage 1.6 and 12.6 times higher compared to samples; the peroxide number of the fat through 10, 20, and 39 days of storage for control samples of chilled meat was 2.0; 3.1, and 5.4 mmol of active oxygen per 1 kg, peroxide value experienced meat samples after 20 and 39 days of storage – at the level of 1.3 and 2.2 mmol of active oxygen per 1 kg. Content of amino-ammoniac nitrogen in the control samples of the meat after 10, 30 and 39 days of storage were 0,8; 1,2; and 2,1 mg/10 cm³ of the extracts in the test samples is 0.1; 0,17; 0,21 mg/10 cm³, the amount of volatile fatty acids in the control samples of the meat after 10, 20, and 39 days of storage was at 1.1; 2.3 and 3.0 mg of alkali/g, in experimental models, – 0,1; 0,4; 1,3 mg of alkali/g. The results of the study indicate the positive impact of processing of meat by high pressure to its expiration date.

Keywords: chilled meat shelf life, processing of high pressure, indicators of freshness, microbiological indicators, nutritional value, oxidative damage, vakuumno-film packaging.

DETERMINATION OF NITRITE-IONS IN SAUSAGE PRODUCTS AND MILK QUALITY INDICATORS

L.S. Egorova, E.A. Leites, K.V. Greku, E.Yu. Evdokimova

The paper presents a test-method for the determination of nitrite-ions based on the Griess reaction – diazotization and azocombination with education azodye, adapted for the analysis of food products, in particular sausage products, by replacing the medium. The choice of methodology is determined by the following reasons: availability of used reagents, absence of complex, expensive equipment, ease of execution, speed. The requirements for analytical reagents are taken into account: the contrast of the color scale, high speed of interaction with the component being determined. Indicator tubes are made and a standard color scale was created for the rapid determination of the content of nitrite-ions. The test method is approved for the content of nitrite ions in sausage products. The range of the detected nitrite ion content is 0,05-0,28 µg/ml, the determination time is 15-20 minutes.

To determine the milk quality indicators, chemical and physicochemical methods of analysis were used. Titrated acidity, buffer capacity, mass share of lactose and calcium – titrimetric methods of analysis. Gravimetric method established the content of solids and water. The active acidity (pH) is determined by the potentiometric method, the density is determined by means of areometer. Virtually all milk samples have indicators corresponding to GOST. The greatest deviations in the indicators of qualities, and milk, were revealed in the sample "Biosnezhka" LLC "Biosnezhka", Barnaul.

Keywords: nitrite-ions, diazotization, 1-naphthylamine, 1-(4-Aminonaphthylazo)-benzene-4-sulfonic acid, milk quality indicators, mass share of lactose, mass share of calcium.

DEVELOPMENT OF MARMALADE WITH POMEGRANATE AND BEET JUICE, EVALUATION OF ITS CONSUMER PROPERTIES

I.Yu. Reznichenko, T.V. Renzyaeva, T.F. Kiseleva, A.M. Lebedik

The modern development of the confectionery industry is connected with the solution of the tasks of the state policy in the field of improving the range of confectionery products in terms of satisfying consumer demand in "healthy" food products, selecting natural ingredients that affect not only the technological properties of raw materials but also possess high biological value. Development and practical implementation of new types of enriched products is the most effective and expedient vector for solving the tasks. The purpose of the study is to study the consumer properties of jelly-fruit marmalade based on pomegranate and beet juice. Objects of research were samples of marmalade, prepared according to traditional and author's recipes. In justifying the choice of raw materials for enriching marmalade, its nutritional, including biological value, compatibility of components and their effect on the organoleptic characteristics of the finished product were taken into account. In assessing the quality of the work used generally accepted research methods. The developed recipes for marmalade are distinguished by a low content of sugar and citric acid. The regulated indicators of the quality of the new product are determined, nutritional value is calculated. It was found that the proportion of proteins increased by 114%, the content of dietary fiber increased by 41-32%, the content of iron - increased 71 times, calcium, on average, 4-8 times, potassium 30-40 times. In addition, it should be noted that the composition of the developed fruit-jelly marmalade is characterized by the presence of vitamin C, which uniquely increases the nutritional value of the product. On the new products technical documentation has been compiled.

Keywords: jelly-fruit jujube, pomegranate juice, beet juice, recipes, technology, quality assessment, nutritional value.

TECHNOLOGY OF PRODUCTION OF ENRICHED SUGAR COOKIES AS A FACTOR SHAPING THE QUALITY

A. M. Shistyakov, A. N. Tabatorovich, M. I. Gytova, A. V. Novikova

The main task facing in terms of the government's programs for the development of the food industry in the field of healthy nutrition of the population is to meet the consumer demand for products of dietary, preventive and children's purposes that meet the needs of specific groups of the population. The article discusses the problem of the formation of the quality of flour confectionery products on the example of enriched cookies for children's nutrition, implemented in the consumer market of Kemerovo. The role of production technology and raw materials as factors forming the quality of products is shown. The guarantee of stable production of high-quality and safe products is the introduction into practice of confectionery companies quality management system and food safety, which is aimed at preventing marriage, not its consequences. Analyzed consumer properties of the enriched children's biscuit enterprises CDW "Minusing" having a certified quality management system (QMS) and enriched children's cookie company "Swisslion", information about the availability of QMS in public access was not found. The importance for the consumers of the information placed on the individual packaging of the enriched product is shown. It is revealed that the label indicates the biological value, recommendations for use as important criteria for enriched children's products. Analysis of organoleptic and physico-chemical indicators of the quality of sugar children's enriched cookies, sold in retail Kemerovo, revealed a number of inconsistencies with the requirements of the ND. The data obtained can be used by manufacturers when carrying out acceptance control quality of food products for children, including specialised and functionality.

Keywords: the consumer market, sugar cookies, technology, raw materials, nutritional value, enriched food products, quality evaluation, consumer properties.

GLUTEN-FREE CUPCAKES WITH AMARANTH FLOUR

E. Ju. Egorova, L. A. Kozubaeva

The article is devoted to the development of new pastry for consumers who adhere to gluten-free diet. The object of research was the recipe of the cupcake from traditional gluten free flour (rice and corn flour), with the addition of flour from amaranth seeds. Amaranth flour was introduced into the dough in the form of a homogeneous mixture with corn flour or rice flour in the range of from 5.0 % to 25.0 % of the total amount of flour, provided the recipe. On the results of research general patterns of changes in the basic organoleptic and physico-chemical indicators of the quality of the cupcakes, the authors propose the optimal combination of corn flour and amaranth flour; rice flour and amaranth flour. It is shown that using as the basis for the test corn flour and amaranth flour in the ratio 10.0–12.5 % : 90.0–87.5 % or rice flour and amaranth flour in the ratio 15.0–17.5 % : 85.0–82.5 % allows to obtain cupcakes standard quality. Compared to existing analogues, in the new cupcakes is improving the ratio of basic nutrients: reduced content of simple carbohydrates, increases the content of dietary fiber, easily digestible proteins and essential fatty acids.

Keywords: celiac disease, gluten-free diet, pastry, cupcakes, corn flour, rice flour, amaranth, amaranth flour, nutritional value, quality assessment.

METHOD OF PRODUCTION OF BREAD ADDING AMARANTH CEREAL FLOUR

N.A. Shmalko, S.O. Smirnov

The article is devoted to the development of a method for producing white bread from wheat baking flour of the first grade with the addition of amaranth cereal flour. Product of "anatomical" grinding of food amaranth grain – amaranth cereal flour is characterized by specific chemical composition and technological properties that determine its use as a saccharifying component in bakery production. The results of the trial laboratory bread baking indicate the possibility of using amaranth cereal flour as an improver in the processing of wheat flour of normal quality and with reduced baking properties. Industrial approbation of the method of bread production in the conditions of bakery enterprise showed the possibility of introducing a new type of raw materials for sorting to wheat flour in the amount of 7,0 % without deterioration in the quality of bakery products. The proposed method of improving the quality of bread meets the requirements of a comprehensive technology for the production of bakery products from wheat flour with weak gluten. Biological and nutritional value of bread when adding amaranth cereal flour meets the requirements of natural functional food product to meet the daily needs of functional food ingredients that have a beneficial effect on the physiological functions of the human body.

Keywords: bakery production, white bread from wheat flour of the first grade, amaranth cereal flour.

RESEARCH OF GRAIN AND FLOUR OF SELECTED VARIETY SORTS FOR CREATION OF FLOUR CONFECTIONERY AND CULINARY PRODUCTS OF SPECIALIZED PURPOSE

T.S. Bazhenova, I.A. Bazhenova, E.E. Safonova

In the production of specialized products, special attention is paid to grain and leguminous crops. For the food security of the Russian Federation, the revival of Russian cultures is important. One of them is millet, which contains the main macronutrients, fiber, vitamins, mineral elements. The absence in the proteins of millet gluten makes it possible to use it in the production of products for people suffering from celiac disease. There are no such products on the consumer market. Therefore, it is important to create a product line based on millet grain and its processing products. In this paper, the physical and chemical characteristics of grain and millet flour were studied, the composition of fatty acids of the grain, the content of carotenoids, the total number of phenolic compounds was determined. Recipes of shortbread cookies with partial and complete replacement of wheat flour with millet, shortbread biscuits with the addition of pumpkin, pancake dough with partial and complete replacement of wheat flour for millet, pies with the addition of carrots with the combination of wheat, millet, amaranth and linseed flour have been developed. Special attention has been paid to optimizing the classical formulation of the pancake dough for the production of products with partial and complete replacement of wheat flour with millet. A tasting expertise of all experimental samples was carried out. Recommendations are given on the use of developed flour confectionery and culinary products in specialized food.

Keywords: millet, specialized products, millet flour, flax flour, amaranth flour, combining different types of flour, gluten, celiac, pancake dough, recipes, flour confectionery and culinary products, nutritional value, tasting.

PHOSPHOLIPIDS OF CAMELINA SATIVA OIL IN THE PRODUCTION OF BISCUITS

T. V. Renzyaeva, I. Y.Reznichenko, C.V. Novocelov, E.V. Dvitrieva

The article is devoted to the development of flour confectionery goods using phospholipids of camelina sativa oil. The two-factor experiment was planned at three levels, as a result of which the regression equation was obtained, adequately describing the dependence of the residual amount of phospholipids in the oil after hydration on the temperature and volume of water. The region of optimal parameters of water hydration of phospholipids of camelina sativa oil is established: temperature from 60 to 65 ° C; the amount of water from 2 to 5% of the oil volume. The possibility of using a lactic acid solution with a pH of 1.8 to 2.2 as a hydrating agent has been shown. The feasibility and effectiveness of using phospholipids of camelina sativa oil in the production of sugar biscuits is grounded in the work. For the manufacture of cookies, a method is used that provides for the use of liquid vegetable oil and food additives of stabilizing action. The dosage of phospholipids in the biscuits recipe has been established, which makes it possible to obtain a product that meets the requirements. The use of phospholipids of camelina sativa oil in the production of sugar biscuits with vegetable oil makes it possible to increase its consumer properties and enrich such functional ingredients as phospholipids, tocopherols, polyunsaturated fatty acids, macroelements.

Keywords: flour confectionery goods, sugar cookie, camelina sativa oil, hydration, phospholipids.

MODERN PACKAGING TECHNOLOGIES AS A FACTOR OF INCREASING COMPETITIVENESS OF CHEESE-MAKING ENTERPRISE

Krieger A.V., Sturova Y.G.

Cheese is one of the necessary goods in the consumer basket. In this regard, the demand for cheese is fairly stable. Nevertheless, we can note some fluctuations in demand and supply. High quality of products, the introduction of new technologies and the product innovation can increase sales on the regional market.

Analysis of the competitive environment helps form a more complete and accurate picture of the internal motives of behavior of the competitors

High quality of products, introduction of new technologies and the emergence of new types of products helps to increase sales in the regional market. Full use of the productive capacities of the enterprise allow to obtain the maximum profit.

Market relations are developing significantly, manufacturers are engaged in offer, have only one effective way to meet consumer demand is a all kinds of improving the quality of the product.

An integral part of the production process is packaging. Modern packaging technologies have made a huge step forward in improving the sanitary and hygienic parameters of the product and increasing its shelf life. Cutting cheese with a slicer and using a vacuum packer will allow the product to compete with similar products of other manufacturers.

Keywords: packaging, cheese, quality, competitiveness, cutting, analysis, market, slicer, polymeric materials.

THE STUDY OF TECHNICAL INDICATORS FLAX SEEDS, WHITE AND BROWN FOR USE IN THE FOOD INDUSTRY

K. N. Nitsievskaya, G. P. Chekryga, O. K. Motovilov

The analysis (comparison, synthesis, generalization) of the literature data on the chemical composition of flax seeds and their application in food and pharmaceutical industries. Analyzed the process of grinding flax seeds, white and brown in a visual, tactile and obonyatel-tion characteristics, "grit", "humidity", "fat", "stickiness". The changes of seeds of the studied varieties of flax in the process of hydration of the indicators – "content digidratirovannogo water", "foam", "mucus" and "viscosity solution", indicating the relationship with the chemical composition of the used seeds. Comparative evaluation of mono-component flour (rice, corn, amaranth) and flour from flax seeds of different varieties for cooking grilled Glebovo-lichnyh products. Studied sensory characteristics of sourdough samples and finished products. The data obtained on the possible use of flax seeds, white and brown while getting fried bakery products.

Keywords: flax, white flax co-sichnevyi, texture, sourdough, fried, bakery products.

THE INFLUENCE OF THE STORAGE MEDIUM ON PHYSIOLOGICAL, BIOCHEMICAL AND TECHNOLOGICAL INDICATORS OF BEER YEAST

L.V. Permyakova

Important stages in the process of yeast culture in the production of beer are its storage and preparation for the next fermentation cycle. The viability and activity of the population, the fermentation process of the wort and the quality of the finished beer depend on the conditions for performing these operations. To assess the effect on traditional yeast media (water, young beer, 11% beer wort) on seed yeast, an assessment was made of the change in the physiological, biochemical and technological characteristics of the crop during its long-term storage (from 2 to 7 days at a temperature of 2-4 °C). An increase in the number of non-viable cells, a reduction in cells with a glycogen reserve, enzyme activity (maltase and zymase) of yeast, deterioration in the ability to settle, the composition of the incubation medium (increase in amine nitrogen, pH and acidity) has been established. These shifts are more pronounced when the inoculum is suspended in water, to a lesser extent - in young beer in comparison with beer wort, and also with lengthening of shelf life. Possible causes of this are a violation of the permeability of the yeast cell membrane and autolytic processes in conditions of nutritional deficiency. The fullness of the wort composition neutralizes the ongoing processes, providing a certain increase in enzyme activity and reproduction of yeast. Long-term culture even under a layer of wort leads to negative changes in the studied parameters. Updating (at least once every two days) of the incubation medium allows storing the seminal yeast for more than 2 days without significantly deteriorating the physiological and enzymatic activity, technological functions.

Keywords: seed yeast beer, storage, medium of incubation, water, beer wort, green beer, physiological indicators, flocculation, enzyme activity.

THE SCIENTIFIC BASIS AND DEVELOPMENT OF RECIPES FOR SALTY CURDS WITH SPICES

E. I. Pershina, I. Y. Reznichenko, D. G. Popova, O.V. Zhukova

The article is devoted to the development of recipes and technology of a new curd product with the introduction of natural spices and table salt. By results of experimental researches dosages of introduction of spices (cumin, ginger, garlic, parsley and dill greens) as sources of natural essential oils are defined, possibility of use of salt of food as a preservative is shown. During researches organoleptic and physico-chemical indicators of quality of the developed curd masses, and their change in the course of storage are defined. Evaluation of organoleptic quality indicators of the developed curd products with spices was carried out according to the developed 5-point scale. Selection of nomenclature of indicators and characteristics of quality levels was carried out in accordance with organoleptic and physico-chemical indicators of sweet curd products. It was found that the presence of natural preservative in the formulation of salt and spices contributes to the increase in the shelf life of curds. On the basis of the carried-out researches the method of production of curd product with fillers is proved. It was found that the introduction of spices into curd products positively affects the change of organoleptic quality indicators of the finished product, gives a special specific taste and aroma, increases nutritional value and contributes to the extension of shelf life. In accordance with the regulated indicators, technical documentation for curd products with spices has been developed.

Keywords: recipes, cottage cheese, spices, quality assessment, regulated requirements.

INVESTIGATION OF THE FERMENTATION PROCESS OF COW'S MILK BASED ON THE STARTER MICROFLORA OF CAMEL MILK, WHICH CAUSES SPONTANEOUS FERMENTATION

A. Orazov, L.A. Nadtochii, Ruixia Gu, A.V. Proskura, M.B. Muradova

In present research were investigated the methods of fermenting cow's milk with starter culture based on camel milk, obtained by spontaneous fermentation. The object of study was pasteurized cow milk with a 3.2% fat content, which was inoculated in equal quantities, in the quality of starter culture was used fermented milk product shubat based on camel milk. Further, the test samples were cultured for various actions in the thermostat for 24 hours. The temperature regime of cultivation was selected depending on the type of LAB and yeast. All experiments were carried out in three replications to obtain reliable results. The results of titratable and active acidity showed that the greatest activity of development of microorganisms was observed in the third sample: thermophilic lactic streptococci, fermented at 40 °C. Thermophilic lactic streptococci, in comparison with other types of lactic acid microorganisms, are lactose fermenting with the formation of lactic acid, thereby promoting acidity in the product in a short time. The intensity of development of thermophilic lactic acid microorganisms takes 6 hours, mesophilic for 12 hours, and yeast for 24 hours. Carrying out the sensory analysis gave organoleptic parameters corresponding to the sour-milk product: taste, smell, consistency, color and appearance.

Keywords: shubat, cow milk, camel milk, lactic acid bacteria, yeast, active acidity, titrated acidity, sensorial aspects, fermentation.

THE DEVICE ACCELERATED ULTRASONIC DRYING OF PASTA IN THE FIELD OF INFRARED RADIATION

S.A. Romanchikov

Drying of semi-finished pasta products is a complex, multi-stage and long-lasting process, affecting the quality of finished products. Lowering the humidity of the structure of semi-finished pasta products by increasing the temperature makes it possible to significantly reduce the development of microbiological, biochemical and other processes, and also significantly affects the shelf life of finished products. The paper describes a device whose operation is based on the principles of high-temperature drying of pasta in the field of infrared radiation with continuous exposure to ultrasound. The features and advantages of modernizing the drying cabinet are considered and described. The proposed technical solution allows speeding up the process of drying, stabilization and cooling of semi-finished pasta products in an automatic mode without reducing their quality characteristics. Modernization of the drying cabinet provides an acceleration of the intensification of the rate of high-temperature drying by 24-26%. Operation of the device is based on the combined use of ultrasonic waves and infrared radiation during drying, stabilization and cooling of pasta semi-finished products. The combined effect of infrared radiation with ultrasound provides an even distribution of moisture between the test particles, allowing moisturizing corpuscles of the disperse phase more quickly. This leads to the formation of relaxing gluten, which causes adhesive and cohesive effects and strengthens the "gluing" of the dough. The carried out experimental studies made it possible to establish that the main factors for accelerating the drying of semi-finished pasta products are an increased coefficient of heat transfer and a decrease in the viscosity of the liquid from ultrasound. The effect of ultrasound promotes the acceleration of moisture migration through the capillaries from the depth of the pasta dough to the surface and high-frequency oscillations of cavitating gas bubbles in the structure of products that squeeze water from the capillaries. During the research, the most rational values of the parameters of the ultrasound pressure level and the infrared radiation range were established.

Keywords: device for drying, ultrasonic concentrator, infrared radiation, semi-finished pasta, drying.

INCREASING EFFICIENCY OF THE MILLING WORK BY REDUCING SHOCK VIBRATION LOADS

S.E. Ivanov, A.N. Gavrilin, A.N. Kozyrev, B.B. Moyzes

The research was carried out with the purpose to develop the vibration diagnostics methods for milling metal cutting machines and to increase the machines reliability by selecting the most efficient cutting parameters. One of the factors improving the efficiency of metal cutting machines is an introduction of wider ranges of the technological capabilities such as ranges of cutting modes. Thereby, the wider range of cutting modes leads to the increased operation of metal cutting machines at resonant frequencies. This aspect makes it important to perform vibrodiagnostics of metal-cutting machine tools to reduce the probability of occurrence of resonant modes. The given research is focused on the development of methods for vibrodiagnostics of milling metal-cutting machine tools. The basic vibration diagnostic routine is developed as well as experiment plan and the testing procedure is described. A three-factor experiment was carried out when the spindle rotational speed, table feed and cutting depth were changed in the given ranges. The vibration level diagrams are developed basing on the specified cutting modes, which allowed to choose the optimal modes. These modes determine the operation of the "machine-tool-tool-instrument-piece" technological system at a lower level of vibration. It was concluded that the developed vibration diagnostics techniques for increasing efficiency of the milling machine is feasible. The test procedure allows to determine the cross-factor, by the results of which it can be concluded that the drive elements are faulty.

Keywords: metalworking, milling machine, vibration diagnostics, reduction of vibration level, machining quality, reliability, cutting parameters, cross-factor.

CAVITY TYPE DEFECTS DETECTION IN ELECTRICAL CONTROL OF CABLE PRODUCTS INSULATION USING WEAK AND STRONG FIELDS

V.V. Redko, L.A. Redko

Technological quality control of insulation of cable products allows to exclude the transfer of defective products to the consumer and receive feedback for adjustment of technological production modes. In the process of technological control of polymer insulation of cable products, an electric spark inspection method is used. The study of changes in parameters during the monitoring process is an urgent task. The article deals with the possibility of detecting air-cavity defects of polymer insulation of electric wires by an electric spark inspection method based on monitoring the electrical parameters of the defective area. A comparative analysis of the behavior of defects in the region of weak and strong electric fields is carried out. Theoretically, the change in the electrical capacitance and dielectric loss resistance of the defective section is justified. The results of numerical modeling of the distribution of the electric field strength in the insulation of a round solid wire in the region of weak and strong fields are presented; description and results of experimental studies of the insulation area with an air cavity. On the basis of numerical modeling and analysis of experimental data, theoretical assumptions are confirmed that with increasing the applied voltage, the electrical capacity of the defective portion increases, and the dielectric loss resistance decreases. The possibility of increasing the informative value of electric spark monitoring of cable products insulation is described.

Key words: insulation of cable products, defect, control, electro-capacitive control method, electric spark control method, electric field, electric insulation strength, electrical capacitance, dielectric permittivity.

THE DETERMINATION OF METROLOGICAL TERRESTRIAL LASER SCANNER TOPCON GLS-1500

B. F. Azarov, I. V. Karelina

The article considers the question of determining the optimal accuracy of the scan mode by means of terrestrial laser scanner TOPCON GLS-1500. Noted that different models of laser scanners information about the technical characteristics of the device typically has no single form and each manufacturer is different. Therefore, for a specific device of a specific model, you must perform a study of the technical characteristics with the aim of identifying its real possibilities and compare them with those declared by the manufacturer. Experience obtained while performing work on terrestrial laser scanning shows that the main requirements to the results of terrestrial laser scanning are relative and absolute accuracy and point density of laser reflections. It was also noted that the accuracy of measurements by laser scanning depends not only on the main technical characteristics of the device, but also on the dimensions of the scanned object, its albedo (reflectivity), measurement mode and directly set the scan settings. The article describes the method of determining a maximum optimum density scan TOPCON GLS-1500 when scanning of an object located at different distances from the scanner. According to the results of the research conclusions on the feasibility of using one or another method of specifying density scan TOPCON GLS-1500 to determine the minimum interval between scanned points in the horizontal and vertical planes with the aim of improving the accuracy of terrestrial laser scanning.

Keywords: terrestrial laser scanner, terrestrial laser scanning, scanning mode, the point density of laser reflections, the angle of field of view, range, distance between points, angle between the scanned points, scan speed, scan step.

NUMERICAL RESEARCH OF METHANE COMBUSTION IN LABORATORY TUBE

M.O. Sysoyeva, Y.A. Galenko, O.B. Kudryashova, E.V. Sypin

The purpose of hazard operability where the explosive gas mixture is possible and the purpose of safe use of the gas fuel in daily life and production stimulate the development of means and methods of object protection from gas mixture explosion.

The information about the mechanism of origination and development of inflammability is needed for the development of methods of explosion prevention and means for inflammability reduction. The conditions of inflammability and detonation of explosive gas mixture are studied carefully, but the studies devoted to the research of dynamics of inflammability process are insufficient. Besides, the knowledge of time ignition induction depending on the environment conditions is necessary for the development of monitoring and accident prevention systems.

The information about the dynamics of development of reactive gaseous mixtures may be obtained by numerical and full-scale experiment.

The paper is devoted to theoretical research of the combustion process of explosive gas mixture in the laboratory tube, its influence on kinetic parameters of gas mixture and environment parameters on the given process. The physico-mathematical model is based on heat conduction equation and Arrhenius equation in one-dimensional arrangement with the heat flow of the specified intensity in the origin of the coordinates. It also shows the stages of origin and flame propagation. The computer model describing the dynamics of the process is developed.

According to the numerical research of the model the temperature and combustion rate - time relationship is found. Laboratory bench scheme for the experimental research of the methane-air combustion is offered.

Keywords: combustion, temperature, heat flow, flame front, modeling, computer model, numerical research, analytical decision, laboratory tube, laboratory bench, transducer.

CLASSIFICATION OF PARAMETERS AND QUALITY INDICATORS OF THE CHOICE OF X-RAY OPTICAL SYSTEM'S ELEMENTS

S.S. Baus, I.V. Plotnikova, N.V. Chicherina

Scientific and educational process has to represent nowadays the system in which the idea of the changing world is formed and in which traditions of responsibility to the future generations for the proposed engineering solutions are fixed and transferred. Now at the designing of new modifications of X-ray tomographs there is a problem of selection of values of some parameters, such as: tension on an x-ray tube and type of the studied material. For reduction of time and labor input of design it is necessary to determine key parameters and characteristics of elements. In the article a bigger attention is paid to the key elements of an X-ray optical system – to an X-ray tube, the detector of X-ray radiation and also the geometrical and spatial sizes of the X-ray optical system as the final quality of the shadow image depends on the choice of the correct distance, in particular, its sharpness, clearness, optimum scale, an opportunity to recreate the three-dimensional image. Key parameters of the image quality, received by means of digital detectors are determined. Key characteristics, the main dependences of parameters, quality indicators and also recommendations about the choice of elements of X-ray systems are received. The dependence of the size of the detector's voxel from changes of distances' values from an X-ray tube to an axis of rotation of an object is given.

Keywords: classification, parameters, characteristic, elements, radiation, X-ray optical system.

MODELING OF THE REGULATOR DEVICES WITH TORQUE BREAKING

A.V. Fominykh, O.A. Ponomareva, A.A. Ezdina

The device and operation of the hose regulating device are described. When the regulating element is rotated, spiral channels are formed from the hose to ensure a swirling flow. In such a tube, the bearing capacity and flow efficiency increase due to the reduction of friction and the prevention of sedimentation.

A regulating device is proposed with a twisting of the flow of the conducted medium, in which a confuser and a diffuser are formed due to four identical channels inclined to the axis of the regulating device.

On the basis of the Bernoulli equation, a method for calculating a regulating device has been developed, which makes it possible to determine its coefficient of resistance and pressure loss. In the open position, the regulating device is full-bore and has a minimum resistance coefficient.

It is revealed that in the confuser the vortex formation, flow separation from the wall with simultaneous compression of the flow does not occur, therefore the pressure loss in the confuser is due only to the friction losses along the length. The total loss of pressure in the diffuser is considered as the sum of the pressure loss due to friction and expansion (to vortex formation).

Modeling and investigation of the current flow in the software of SolidWorks 2017 is performed. After the regulating device, the medium moves along spiral trajectories. Modeling in the SolidWorks software suite 2017 confirms the swirling of the flow by the proposed regulating device.

Keywords. Control device, conductive medium, hose, swirling flow, pressure, flow, confuser, diffuser, spiral trajectory, Bernoulli equation

YIELD IMPROVEMENT OF BIOETHANOL FROM ALKALI DELIGNIFIED OAT HULLS USING THE FEEDING STRATEGY

G.F. Mironova, I.N. Pavlov, E.I. Kashcheeva

The disposal of agro-industrial residues is an urgent problem in Russia. More specifically, oat hulls are accumulating in huge amounts at oat-processing facilities and are in no way rationally utilized, albeit having a great potential for use. Because of the high carbohydrate content, oat hulls holds promise as a feedstock for many valuable products, including bioethanol.

*This study was aimed to explore the possible improvement in yield of bioethanol produced from alkali-pretreated oat hulls (substrate) by fed-batch enzymatic hydrolysis combined with alcoholic fermentation. The process was run in a 11-L fermentor. The solid loading in the experiment was raised from 30 g/L to 120 g/L (30 g/L feeding every 12 h). Relevant quantities of the commercial cellulase and hemicellulase enzymes, CelloLux-A and Brew-Zyme BGX, were inoculated together with the substrate. The seed yeast for alcoholic fermentation was *Saccharomyces cerevisiae* Y-1693 adapted to an enzymatic hydrolyzate of the substrate used. The bioethanol yield was 29.2% on cellulose weight basis.*

*Keywords: agro-industrial residues, oat hulls, utilization, alkaline delignification, enzymatic hydrolysis, enzyme preparations, alcoholic fermentation, *Saccharomyces cerevisiae* Y-1693, batch feeding, bioethanol.*

A COMBINED PROCESS FOR THE PREPARATION OF THE PHENYL ESTER OF N- (BENZOYL) -3-PHENOXYPHENYLCARBOXIMIDIC ACID

Yu.V. Popov, T.K. Korchagina, V.S. Lobasenko, S.V. Anikeeva, I.V. Bukova

The main stages of synthesis of phenyl ester of N- (benzoyl) -3-phenoxyphenylcarboximidic acid are described in the article. Optimizing the process of obtaining the desired product, it was found that both stages of synthesis can be carried out in a single reactor without isolation of 3-phenoxybenzoic acid benzoylimidate hydrochloride by recrystallization from ethanol. After the phase of isolation of the intermediate product was abolished, the total synthesis time was reduced from 12 to 6 hours and the yield of the desired product increased, due to the absence of the intermediate product during its isolation. Optimal parameters of process management, studied earlier, are given. A combined method was developed for the preparation of N- (benzoyl) -3-phenoxyphenylcarboximidic acid phenyl ester, which has potential biological activity (antidiabetic, cardioprotective), which necessitates its synthesis and the urgency of the optimization and industrial applicability of this process. Developed reactor unit, which is a mixing reactor, equipped with a stirring device, a bubbler and a nitrogen purge system. The synthesis is carried out periodically, since the total reaction time is 6 hours. The developed technological scheme, presented in the article, can be used to synthesize other products of the class of esters of N-substituted 3-phenoxyphenylcarboximidic acids, which determines its practical importance and industrial applicability.

Keywords: technology, diphenyloxide, phenol, acylation, esters of N-substituted 3-phenoxyphenylcarboximidic acids, combined method, optimization, biological activity, reactor unit, process scheme.

COMPLETE CYCLE OF BIOETHANOL OBTENTION UNDER PRODUCTION CONDITIONS

O.V. Baibakova

Here we explore the complete-cycle process of obtaining bioethanol from oat hulls, starting from the feedstock to the finished product. Oat hulls were chemically pretreated in one stage with a dilute solution of sodium hydroxide in a 250-L vessel. One-pot treatment of oat hulls with aqueous sodium hydroxide can afford an alkaline delignification product. The alkaline delignification product is chiefly made up of hydrolyzable components: 86.7 % cellulose, 7.0 % pentosans, 5.4 % lignin, and 1.1 % ash. Bioethanol was synthesized in a 48.8% yield on solid weight basis in a 63-L fermentor (1:400 scaling ratio) under production conditions. Simultaneous enzymatic hydrolysis and alcoholic fermentation allows the ethanol yield to be enhanced, the enzymatic hydrolyzate filtration operation to be omitted and the time of process operations to be shortened by the factor 1.5. It was found by gas-liquid chromatography that the bioethanol samples obtained from the alkaline delignification product of oat hulls contained no methanol which is the quality marker for commercial ethyl alcohol.

Keywords: oat hulls, alkaline delignification, alkaline delignification product, complete cycle, production conditions, vessel equipment, enzyme, saccharification, fermentation, Saccharomyces cerevisiae Y-1693.

SYNTHESIS OF CELLULOSE NITRATES FROM EASILY RENEWABLE NON-WOODY FEEDSTOCKS

Yu.A. Gismatulina

This study is focused on resolving the problem of providing the nation with cheap domestic cellulose to produce diverse products therefrom, particularly cellulose nitrates. Here we discuss two new promising sources of cellulose: an easily renewable perennial crop, Miscanthus, and an oilseed production residue, intermediate flax straw. High-quality celluloses suitable for esterification were derived from these feedstocks by the nitric-acid process. The synthesis of cellulose nitrates was performed by the commercial method of cellulose nitration with mixed acid. The study reports basic characteristics of cellulose nitrates from readily renewable biomasses. We demonstrate that cellulose nitrates equivalent in basic characteristics to commercial colloxylin can be obtained from Miscanthus and intermediate flax straw celluloses. Infrared spectroscopy of the resultant nitrocelluloses showed the presence of all the main typical frequencies corresponding to the absorption bands of nitro groups. Thermal gravimetric analysis revealed high decomposition points of the nitrocelluloses at 210-211 °C, suggesting high purity of the obtained products. ¹³C NMR spectroscopy ascertained a coincidence between most chemical shifts of the Miscanthus and intermediate flax straw nitrocelluloses, representative of 6 -mononitrocellulose, 2,6-dinitrocellulose 3,6-dinitrocellulose, and 2,3,6-trinitrocellulose of cotton cellulose nitrates.

Keywords: Miscanthus, intermediate flax straw, nitric-acid method, cellulose, nitration, stabilization, cellulose nitrate.

IMPROVING THE EFFICIENCY OF ACROLEIN PRODUCTION AT JSC «VOLZHISKY ORGSYNTHESE»

V. M. Mokhov, S. A. Yakovlev

The use of acrolein as an intermediate product in organic synthesis is quite diverse. Is the raw material for the production of methionine – the amino acid feed additives in poultry and cattle breeding, the world demand for which is estimated at 450-500 thousand tons per year and is constantly increasing, as well as the export of acrolein. The article is devoted to improving the synthesis step in the production of acrolein JSC "Volzhsky Orgsynthese". We investigated the production of purified acrolein in the enterprise, where the acrolein is an intermediate product and is used for the synthesis of methylthiopropionate aldehyde, which is then get methionine used as feed additive. You performed the evaluation of technical and economic indicators of the process of synthesis of acrolein. Identified deficiencies that hinder the operation of the production. The core task of work – solution to the problem of reducing the proportion of by-products and unreacted propylene in the reaction gas. Found a way to improve the technical and economic indicators of chemical-technological systems. Picked up a new catalyst for the synthesis of acrolein. Project design approved in the protection of JSC "Volzhsky Orgsynthese". Performed thermodynamic analysis of the reaction for producing acrolein. Of the production method, implemented on a new catalyst, calculated material and heat balances, the calculation of the reactor.

Keywords: oxidation, propylene, acrolein, methionine, catalysts, conversion, selectivity, the contact time, thermodynamic analysis, reactor.

MODELLING OF FILTRATION PROCESS OF HYBRID MATERIAL

I.A. Mik, V.N. Gorev

The hybrid filtering material is a composition of two types of fibers. The first type of fibers is a skeleton of the material and does not actually participate in the filtration process. The second type of fibers provides a filtering function. The material is a voluminous connected skeleton (matrix) consists of the extruded polypropylene fibers (diameter 100-300 mkm) and filtering polyamide fibers (diameter 50-500 nm) formed using electrospinning, distributed in a bulk matrix. According to the known filtration mechanisms (inertia, diffusion, interception) for each fibers type, the filter characteristics could be predicted under the specified environmental conditions. The developed physico-mathematical model with taking into account of two types of fibers allows us to predict the filter performance. As a research result the model has been approbated on the resource tests data of the material samples profiled by the filter fibers thickness. The Diethylhexyl Sebacate (DEHS) aerosol has been chosen as a resource pollutant of the hybrid filters. The obtained dependencies of the filter quality factor on the recourse tests period indicate that the filter material performance will increase with the uniform contaminant distribution along the filter thickness. The structure profiled filters formation will allow us to create a high-quality science-based product at minimal production costs.

Keywords: fibrous material, filtering efficiency, pressure drop, quality factor of filter, electrospinning.

THERMODYNAMIC JUSTIFICATION OF CHEMICAL REACTIONS OF THE DETAILS PROCEEDING WHEN HEATING BY CURRENTS OF HIGH FREQUENCY IN THE PROTECTIVE ATMOSPHERES

E. A. Ivanaysky, A.V. Ishkov, A. A. Ivanaysky, I. V. Malyshev

The main types of the atmospheres interacting with the heated metals and alloys are considered. The main chemical reactions proceeding in the oxidizing and restoring atmospheres are shown, and their thermodynamic justification is also given.

It is shown that there are conditions under which there is no oxidation of metal in the atmosphere with increased content of monoxide of carbon.

On the basis of thermodynamic calculations as a first approximation in the range of temperatures from 300 to 1500 degrees Kelvin, it is established that carbon monoxide, interacting with oxides of metals provides their restoration. Introduction of hydrocarbons in the range of temperatures from 1500 to 3500 degrees Kelvin interferes with oxidation of a surface of steel even in the presence of molecular oxygen that does possible protection of the heated metal by a recovery gas flame

Keywords: thermodynamics, heat treatment, steel, chemical reaction, J. Gibbs's criterion, carbon monoxide, oxygen, methane, protective atmosphere, restoration of oxides.

EFFECT OF AUTOHYDROLYSIS PRETREATMENT OF MISCANTHUS ON REACTIVITY TO ENZYMATIC HYDROLYSIS

I.N. Pavlov

Miscanthus biomass has a complex structure made up of interlaced cellulose, hemicellulose and lignin, which hinders enzymatic hydrolysis of cellulose in bioethanol refining. Enzyme hydrolysis of native Miscanthus cellulose extracts only 15% of reducing sugars. In order to enhance the cellulose accessibility, pre-ground Miscanthus was preliminary autohydrolyzed herein by liquid hot water at saturated pressure vapor. Under the conditions used herein, by varying temperature from 200 to 220°C, saturated pressure vapor from 1.5 to 2.5 MPa, and process time from 10 to 25 min, we performed a comparative hot-water treatment and a combined hot-water pretreatment with an abrupt pressure release leading to steam explosion of the solid. The treatment done almost completely removed hemicelluloses and had no a considerable impact on lignin and allowed the maximum cellulose accumulation at 69% by steam explosion autohydrolysis. Enzymatic hydrolysis of solid residues for 72 h liberated 48% of reducing sugars. It was assumed that pseudolignin re-precipitated onto the surface of the residual solids restrained the enzyme access and played a definitive role in the enzymatic hydrolysis efficiency and sugar accumulation. For the residual lignin to be eliminated and enzyme access to cellulose to be ensured, we carried out water-alkaline treatment of the solid residues combined with hydrogen peroxide bleaching. The supplemental treatment eventually delignified the solid residues to furnish pulps whose hydrolysis resulted in a maximum yield of up to 63.7%.

Keywords: lignocellulosic biomass, Miscanthus, pretreatment, liquid hot water, enzymatic hydrolysis.

THE PRACTICAL RESULTS OF SURFACE HARDENING OF PISTON BY THE METHOD OF MICRO-ARC OXIDATION

M.L. Scriabin

The paper considers one of the promising methods of surface hardening of piston aluminum alloys- micro-arc oxidation. This type of coating, formed under the influence of micro-discharges in the solution of the electrolyte, is fundamentally different from the axial metal. A qualitative analysis of the piston alloy on the energy dispersion x-ray stress spectrometer was carried out for a more accurate indication of the oxidation parameters, which allowed the most accurate determination of the chemical composition of the alloy. Micro-arc oxidation of pistons was carried out at the experimental laboratory facility, which allowed to regulate the total density of ion current I and the quantitative ratio of cathode and anode currents I_K/I_A in a wide range, which favourably relied on the quality of oxide layers. The paper also describes the mechanism of formation of metal inclusions and high-temperature structures depending on the frequency of ion current in time. The paper describes the formation of oxide films on the surface of piston alloys based on the physical and geometric Keller model and their characteristic features. The method of research of MİK-restructur thin films, described by its ha, are characteristic features. Given a floor-chennye microstructure piston aluminum alloy after micro-arc oxy-tiravanija. Mechanisms of formation of oxide layers are considered taking into account the influence of alloying elements of piston aluminum alloys. Microphotographs of separate porous cells obtained by electron scanning microscope are also shown and analyzed. Research provided the main properties that should have a piston of aluminum alloys: heat resistance, corrosion resistance and abrasive wear. Methods of their research are described. The com-Plex analysis of the obtained results is carried out and the conclusion about the prospects of these oxide coatings is made.

Keywords: piston aluminum alloys, micro-arc oxidation, film coatings, film porosity, micro-plates of piston aluminum alloys, corrosion resistance of oxide coatings, mechanical properties of oxide coatings.

USE OF THE MINERAL FIREPROOF REST OF BROWN COAL (ASHES-ablation) AS MATERIAL FOR EFFECTIVE FIXING OF THE LOESSIAL SOIL BASES

I.V. Noskov, L.N.Amosova

Materials researches of use of the mineral fireproof rest of brown coal (ashes ablation) as material for effective fixing of the loessial soil bases are given. Assessment of a possibility of replacement of ecologically unsafe, expensive materials for strengthening of the loessial bases by ecologically safe and almost free and available in large quantities material - brown-coal ashes is result of rsearches. The existing materials and technologies promoting increase in the bearing ability of the soil massif and also giving to thickness of soil water tightness are given. It is confirmed that problems of injection fixing of soil of the bases always consisted in the guaranteed ensuring durability and durability of the fixed massifs of soil, in an opportunity to create massifs of considerable dimensions and also in ecological and sanitary safety of the applied injection materials and structures. The soil which is rather well filtering water or gas-permeable as this process is connected with introduction during a time of soil of water suspension gives in to fixing with these methods. High-porous loessial collapsible soil also belongs to such soil. The conducted researches have shown that suspension of brown-coal ashes (ashes ablation) is perspective and effective material for fixing of the loessial soil bases.

Keywords: material, ashes, soil, suspension, injection, fixing, loessial basis, materials research decisions, industrial wastes, brown-coal ashes, ashes ablation, laboratory researches, deformation module.

THE BASIC THEORY OF THE FORMATION OF OXIDE FILMS ON ALUMINUM PISTON ALLOYS WITH MICRO-ARC OXIDATION

M.L. Scriabin

The article describes the main theory of the formation of oxide films on aluminum piston alloys with special strengthening treatment – MIK-radulova oxidation. Possible schemes of deposition of non-metallic inclusions on the surface are shown. Shows step by step the formation of oxide layers on the surface of the piston, having brand-ing contrast to conventional films that are. required in the anodizing. The influence of the local effects of the ions in one of the native barrier layer on the nucleation of pores, located in the center of the cells, with the result that the barrier layer becomes smaller and there is an increase of tension in La. It is also shown that the temperature increase in the pore channel contributes to its decrease, resulting in an equal-weight dynamic system that keeps the thickness of the barrier layer within clear boundaries. In addition, the theory of formation of oxide films as colloidal formations is considered. According to this theory, the formation of pores is a consequence of the growth of oxide films, and aluminum oxide is a field-oriented gel colloidal polymer nature. As a result of chemical reactions at the active centers of the anode, a plurality of fine particles (mono) - the embryos of future mi-Zell. Over time money grow and gradually completed up to polion, which are of a fibrous rod-like micelles of a colloidal degree of dispersion. For all models are given the main characteristics, which determine the rate of formation of OK-seat adjustment layers on the surface of aluminum alloys.

Keywords: piston aluminum alloys, micro-arc oxidation, film coatings, film forming models, film porosity, film porosity.