

CONTENTS, ABSTRACTS AND KEYWORDS OF PAPERS

EXPERIMENTAL INVESTIGATION OF EXTRUSION KINETIC DEPENDENCIES OF THE FISH-VEGETABLE MIXTURE FOR THE EXPANDED POTATO SNACKS PRODUCTION

O.I. Aksenova

Relevance of the work is that the kinetic dependencies revealed during the investigation allow determining the optimal parameters of the technological process of extrusion of fish-vegetable mixture of balanced composition. The aim is to establish the kinetic dependencies of the process for producing expanded potato snacks in a single-screw extruder, which describe the dependence of the temperature and pressure in front of die and of extrudate expansion ratio from such variables of the investigated process as the sectional area of the forming channel and the initial moisture of fish-vegetable mixture. Obtained during the investigation of the dependence allowed to find that the optimum parameters of the technological process of extrusion of the fish-vegetable mixture at which the required basic physical qualitative indices of extended snacks - the largest expansion ratio is $S = 300\%$ and the porous texture of the extrudate - are achieved with the mixture moisture is 28-30%, the temperature in front of die is 140-150 °C, the screw speed is 10.8 rev/s, the pressure is 4,5-5 MPa and sectional area of the forming channel is $2,0 \cdot 10^{-4} \text{ m}^2$. The obtained data allowed developing of method for producing new extruded potato snacks recipe of which includes by-products of salmon and sugar beet processing which have high nutritional value and low cost.

Keywords: kinetic dependencies, high temperature extrusion, potato snacks, expansion ratio, by-products of processing, temperature in front of die, sectional area of the forming channel, moisture of fish-vegetable mixture, method for producing snacks, nutritional value.

STUDYING OF KINETICS OF DEATH CLOSTRIDIUM BOTULINUM SPORES DISPUTE IN FRUIT CANNED FOOD

R. A. Volkova, T. A. Pozdnyakova, M. T. Levshenko

It is considered in the Russian Federation that if pH value of canned food made of peaches, apricots and pears exceeds 3,8, in them the development of Clostridium botulinum and toxin formation is possible, therefore they were collected into a separate group. By recent researches it is established that the existing location of canned food made of peaches, apricots and pears in the special group should be reviewed, because the spores of C. botulinum in this canned food with pH lower than 4,5 do not develop, and perish with various speed, depending on pH value of canned food.

In the presented work the studying of kinetics of death of C. botulinum spores in fruit canned food made of tropical fruit like mango and bananas with pH from 3,8 to 4,5 has been continued. The kinetics of C. botulinum spores death during the storage of canned mango and banana for 24 months has been experimentally established. By the end of a biennial period of storage only single spores per cubic centimeter of product remained viable in a product with pH 3,9 and 4,2 and dozens of spores (per cm^3 of product) survived in the product with pH 4,5. The kinetics of death of C. botulinum spores in mango and banana puree is similar to speed of death of spores in apricot puree at equal product pH values.

Thus, the conducted researches confirm the suggestion to change approaches to division of fruit canned food into groups and respectively, to development of sterilization regimes (pasteurization) of canned food made of apricots, peaches and pears.

Keywords: Clostridium botulinum, canned food made of apricots, mango and bananas, survival of bacterial spores, pH of canned food, division of canned food into groups.

THE USE OF SECONDARY RESOURCES TO OBTAIN PROTEIN-CARBOHYDRATE COMPOSITE FEED PURPOSE

S. K Volonchuk, I. V. Naumenko, A. I. Resepin

The article provides an experimental justification for the feasibility and necessity of using secondary resources in the development of technology for the production of protein-carbohydrate composite for feeding farm animals, in particular cattle (cattle). The main raw components are wheat, dairy cheese whey and wheat bran. The new technology should take into account and not repeat the shortcomings of existing technologies. Using the advantages of infrared radiation exposure to wet material can be porous grain wheat dextrinization starch, which further, in the rotary-pulsating apparatus together with cheese whey by the presence of enzymes amilosubtilin and glucosamine is converted into molasses with high sugar content. Then the molasses is mixed with bran, enriching it with proteins and fiber to obtain a protein-carbohydrate composite moisture 40 – 60%, sugar content 10,805 – 16,980%, protein 11,7 – 12,1%.

Keywords: technology, infrared radiation (IR), serum, bran, grain, enzymes, molasses, composite.

METHODS OF METHANOL REDUCTION IN VEGETAL RAW MATERIAL DISTILLATES

L.N. Krikunova, E.V. Dubinina

While using different kinds of vegetal raw materials for distillates and distillate-based spirits, industry faces acute problem - reduction of methanol, which forms from destruction of pectin substances and is highly toxic. The purpose of present work was to develop effective methods of methanol reduction in such distillates. The target of research became cherries (Vladimirskaya variety), fresh fruits of white mulberry (Morus alba L.), Jerusalem artichoke (Skorospelka variety, autumn crop). In the samples of distillates and fermented raw material alcohol by volume was determined by standard areometric method. Mass concentration of methanol was determined by gas chromatography method on "Kristall 5000.12" (Chromatech, Russia). Have been stated that acidifying of Jerusalem artichoke wort leads to decreasing of methanol content in the fermented wort in 1.2-4 times depending on the pH. It was shown that usage of enzyme preparation attacking only soluble pectin in cherries during the maceration doesn't lead to methanol concentration growth in fermented pulp. The advantage of usage of selected yeast race for each kind of raw material in purpose of decreasing methanol concentration have been stated. It is found that in the distillation process the most effective way to decrease methanol share is to change operating condition of the distillation still.

Keywords: vegetal raw material distillates, methanol concentration, raw material preparation, active acidity, enzymatic maceration, fermentation, yeast race, fractional distillation.

«NON-DAIRY MILK»: REVIEW OF RAW MATERIALS AND TECHNOLOGIES

E. Ju. Egorova

The article is devoted to the food use issues of renewable resources of protein-containing raw materials. On the example of the international and domestic food market, general trends in the development of a relatively new sector of the dairy industry – "vegetable milk" are traced. The most popular brands and most often used groups and types of protein-containing plant raw materials (legumes, cereals, nuts) are considered. The main and additional components of the formula composition of vegetable milk and the accepted classification of this drink by the types of raw materials are characterized. The advantages and disadvantages of the nutritional value of vegetable milk of different types and the basic requirements for its colloidal state are analyzed. The main stages of production technology of vegetable milk are considered, with an emphasis on operations and technological methods to ensure the physical and chemical stability of the colloidal system of the drink and suitability of the drink for industrial sterilization methods to ensure long shelf life. The contribution of various technological factors in the formation of vegetable milk quality is estimated. The relationship is shown between the fractional composition of proteins of the raw material used – as a characteristic of the potential suitability for the production of vegetable milk – and the most important technological and consumer properties of the resulting drink, including its nutritional value.

Keywords: vegetable milk, non-dairy milk, soy milk, market overview, assortment, nutritional value, technology, raw materials, colloidal stability, protein.

PECULIARITIES FOR OBTAINING SYNBIOTIC FERMENTED MILK PRODUCT BASED ON BIFID BACTERIA CONSORTIUM

E.P. Kamenskaya, M.V. Obrezkova, E.E. Bazeeva

*One of the priority directions in food technology is the development of products with medical and functional effect. In particular, it is the development of synbiotic fermented milk products with complex components of directed actions – probiotics and prebiotics. The aim of the article is to research the interaction of different kinds of bifid bacteria strains for obtaining consortium with new biotechnological features and development of synbiotic fermented milk product with bifid bacteria high titres. *Bifidobacterium bifidum* 791, *Bifidobacterium longum* 379 M, *Bifidobacterium adolescentis* MC-42 strains were chosen as the research object. Standard research methods were used in quality estimation. It is stated that the favorable ratio of *B. bifidum* 791, *B. longum* 379 M, *B. adolescentis* MC-42 strains is 1:1:2 in the list of combined ferments ingredients. The authors conducted diffusion test for consortium stability of 23 types of antibiotics of different generations and coverage. The largest stability was referred to B-lactam antibiotics. Their bacterial activity is determined by inhibiting microorganism cell wall synthesis. The article studies the impact of different concentrations of polysaccharide nature prebiotics (pectin and inulin) on the change of bifid bacteria living cells number. It is presented that synbiotic fermented milk product based on the chosen bifid bacteria consortium with the introduction of 2.5% of pectin can be recommended for preventing and correction of internal microbial balance and sustentation of nonspecific organism resistance.*

Keywords: bifid bacteria, strains, antibiotics, consortium, probiotics, prebiotics, pectin, inulin, synbiotic fermented milk product, resistance.

USE OF FLOUR FROM KUNZHUT SEEDS IN MEAT PRODUCT TECHNOLOGY

N.L. Naumova, A.A. Lukin, V.S. Lyulkovich

Modification of the nutritional value of meat products through the use of plant ingredients contributes to balancing the nutritional status of the population by essential essential nutrients. In this connection, the purpose of this work was to study the possibility of using flour from sesame seeds in meat product technology. The material for research was: flour from sesame seeds (trademark "Oily King", Technical Conditions 9146-016-70834238-09); steamed burgers, prepared according to the recipe № 399 Collection of recipes for dishes and culinary products for public catering establishments. It has been experimentally established that the use of sesame flour in an amount of 7% in the recipe of steam cutlets by substituting the same amount of pork contributes: to increase the fat content and ash content of the finished chopped semi-finished products by 9.7% and 6.8%, respectively; the appearance in the meat product of plant fibers in an amount of 3.4 ± 0.5 g / 100 g; increase in the content of minerals: phosphorus (1.3 times), calcium (1.4 times), copper (2.1 times), iron (by 35.2%), magnesium (2.4 times), manganese (by 5.2 times), zinc (by 39.7%) against the background of preservation of consumer properties, microbiological stability and toxicological safety.

Keywords: meat chopped semi-finished products, cutlets, sesame seed meal, nutritional value, quality.

ABOUT MISTAKES IN PRODUCTION OF CANNED MEAT IN PIECES

V.B. Krylova, T.V. Gustova

Product quality is one of the most important indicators of enterprise activities. It was noted that an increase in the product quality determines to a large extent survival and success of an enterprise in market conditions.

The authors emphasize that nonadherence to simple technological methods in production of canned meat in pieces leads to a decrease in quality of the finished product and loss of its competitiveness on the market. For example, the use of meat that was not fully aged results in an increased meat toughness of the finished product; improper grading of the used raw materials to deterioration of the organoleptic and physico-chemical indicators; incorrectly chosen equipment for meat preliminary comminution to obtaining many small meat pieces; addition of the stage of mixing of the recipe ingredients, which is not envisaged by the technology, to obtaining the monolithic structure of a product, which is unacceptable for canned meat in pieces stewed in its own juices.

Keyword: canned foods, quality, standard, mistake, nonadherence

INNOVATIVE TECHNOLOGY LIPOCAROTENE IN THE PRODUCTION OF POLYFUNCTIONAL BAD ACTIONS

B.Tohiriyon, E.V. Vialykh, A.N. Austriavskih, V.M. Poznyakovsky

An innovative technology of a new type of specialized product - biologically active additive (BAA) has been developed. The production technology ensures high safety of biologically active components due to liposome. Liposomirovaniya allows the simultaneous delivery into the body of active substances with different pathways of penetration and absorption, but with a common point of application of biological effects. This functional orientation is complemented by the presence in the BAA of other biologically active substances that enhance the natural defense of the organism under the conditions in question, preventing alimentary chronic diseases. The sanitary-hygienic and sanitary-toxicological studies allowed to establish the terms and implementation modes - 2 years, in a dry place at a temperature not exceeding 22 ± 3 °C. The hygienic well-being of the developed product is also shown. The use of a new specialized product form of dietary supplements on 1-2 capsules a day, guarantees the consumption of vitamins in accordance with the specified functional properties. It should be noted that a specialized product was tested in Rospo-tranadvisor and the head testing center of the Institute of Nutrition of the Russian Academy of Sciences, a certificate of state registration was received, which served as the basis for introducing a bio-logically active additive (BAA) into the Federal Register.

Keywords: Biologically active complex - dietary supplements, production, innovative technology, quality, safety, efficiency, functional orientation.

DEVELOPMENT OF THE TECHNOLOGY OF A CURD PRODUCT WITH BUTTERMILK

Y.K. Nasonova, T.P. Arsenyeva, E.A. Roshchina, V.S. Mukhamedova, A.I. Lepeshkin

*This article considers the possibility of using reconstituted buttermilk in the production of low-fat curd products with adapted protein composition. Due to the absence of additional separation of serum after the clot formation, the proposed technology allows to reduce raw material consumption and technological process duration. Full use of milk component will expand the range of dairy products and contribute to growth of technical and economic indicators of dairy companies. The objects of this research are skimmed milk, dry buttermilk with a mass fraction of fat of 6%, and starter for curd in the amount of 5 and 10%, including of cultures of *Lactococcus lactis* subsp. *lactis*, *Lactococcus lactis* subs. *creatoris*, *Streptococcus thermophilus*. According to the classical production technology of cottage cheese, the mass fraction of dry substances in the clot is 8-9%, we selected the concentration of dry substances, which will eliminate the technological operation of whey separation and allow to get the product of satisfactory quality. The results of the studies on the determination of organoleptic and physicochemical parameters and the calculation of the biological value of the protein component of clots were obtained.*

Key words: curd products, buttermilk, resource-saving technologies, formulation development, food technology.

ANALYSIS OF THE CHEMICAL COMPOSITION AND NUTRITIVE VALUE OF FRUIT VEGETABLE AND BERRY RAW MATERIALS WITH A VIEW TO ITS USE IN BABY FOODS.

S.A. Urubkov, S.S. Hovanskaya, N.V. Dremina, S.O. Smirnov

This article presents an analysis of the calculated data of the chemical composition and nutritional value of dried fruits, berries, vegetables and fruits for the purpose of their further use as components in the creation of products for the nutrition of children over one year, as well as preschool and school age. The importance of the use of dried fruits in the concept of balanced nutrition and the impact on the development and growth of the child's body. The raw material in question includes 12 dried fruit items. The data on the composition in terms of the content of the main components of food in fruits: proteins, fats and carbohydrates, organic acids, vitamins, minerals. The analysis extends our understanding of the biological value of dried fruits, provides direction for further research on the development of diets, where it is necessary to strive for the optimal composition of children's diets, include in its composition all groups of products considering the diversity of properties of their nutrients. The results of further research will be the development of production technology, which has no analogues in its biological and nutritional value, based on the combination of grain raw materials with natural fruit, vegetable and berry components for baby food.

Keywords: products for baby food, fruit, vegetable and berry raw materials, children of preschool and school age, balanced diet, grain-based products, dried fruits.

OPPORTUNITIES FOR USING VEGETABLE OILS FOR MEAT PRODUCTION

V.V. Nasonova, K.I. Spiridonov, Yu.I. Afanasyeva

This article presents the results of a review of global trends in partial or complete replacement of animal fat with various vegetable fats. The informative data of fatty acid composition of pork, beef, bacon and various vegetable oils are presented. Thus, the content of unsaturated fatty acids in the fat is at the level of 53 g / 100g, and in vegetable oils – at least 69.7 g/100g, except for palm and coconut oil. The data of foreign studies on the positive effect of the partial replacement of animal fats with vegetable oils on the biological value of meat products is shown. It is expressed in reducing the content of saturated fatty acids: for example in sausages - to 21% with the complete replacement of pork fat on a combination of vegetable oils. The problems that enterprises may face when using vegetable oils in sausage production such as the deterioration of the consistency of products and the acceleration of oxidative spoilage are reflected. Faster oxidation is associated with greater unsaturation of fatty acids. The deterioration of consistency, resulting in a decrease in density, elasticity and chewing, due to the fact that vegetable fats in their native form have a liquid consistency. In order to avoid these defects, the possibility of adding vegetable fats in the form of a pre-prepared emulsion is shown.

Keywords: Fat, animal fat, vegetable fats, oils, fatty acid composition, saturated fatty acids, unsaturated fatty acids, emulsion, sausages, meat products.

THE ANALYSIS OF TECHNOLOGICAL RISKS IN THE PRODUCTION OF SEMI-SMOKED SAUSAGE

A. I. Yashkin, L. A. Popova

The paper shows the implementation of an integrated approach to the identification, systematization and management of technological risks in the production of semi-smoked sausage. The purpose of the work is to analyze the technological risks leading to the appearance of defects of sensory indicators of the sausage "Armavirskaya", and to develop measures to manage significant risks. Frequency of occurrence is defined and the detail of production defects depending on technical, technological, raw and other aspects of production of sausage in coordination with all possible reasons is carried out. Gradation of production defects of organoleptic indicators of sausage with identification of the main factors (technological risks) which entailed production of nonconforming production is carried out. Dimensionless scales of assessment of the importance of technological risks, probability of their occurrence and possibility of detection in relation to conditions of the enterprise are used. During the quantitative characteristics of the causes of rejection coefficients were calculated technological risks leading to the occurrence of defects in products, in particular, the violation of the order of bookmarks raw materials in the preparation of meat, excess of temperature tolerances for heat treatment and for the disbalance of equipment. The complex of control actions (corrective actions) on minimization of significant technological risks for decrease in defectiveness of sausage is offered.

Keywords: meat products, sausage, quality of production, organoleptic indicators, quality management, non-compliance, defect of production, technological risk, risk assessment, correcting actions.

DETERMINATION OF ASCORBIC ACID AND NITRAT ION IN FRUIT AND VEGETABLE JUICE

E.A. Leites, L.S. Egorova, N. Yu. Kornienko, P.V. Lykov

Safe nutrition of the population is one of the important factors for maintaining health. The paper presents the results of the determination of ascorbic acid and nitrate ions in fruit and vegetable juices. The products of nitrate metabolism in the body can significantly affect the physiology of the organism as a whole, including the reproductive organs and the appearance of malignant tumors. Ascorbic acid prevents the formation of N-nitrosamines from nitrates and nitrites, and also stimulates the synthesis of interferon. Determination of ascorbic acid was performed by the method of reverse titration, nitrate ions - by the test method, which is based on the reaction of diazotization and azo coupling to form an azo dye. The test method for the determination of nitrate ions is adapted for the analysis of fruit and vegetable juices. The paper presents recalculation of the results in mg / kg, because in the literature there is no information about the maximum allowable concentration of nitrate ions in fruit and vegetable juices. The highest content of ascorbic acid is contained in the juice of home canning (21.0 ± 0.4) g / l. This is followed by industrial-made juices, including those for baby food: Orchard, Handsome, Yes, Pridonya Gardens, My Family, Frutonyanya, Kids, Gifts of Kuban, Gold, where the content is (1.7 - 2.0) g / l. In all studied samples, the content of nitrate ions does not exceed the maximum permissible contents.

Keywords: fruit and vegetable juices, ascorbic acid, nitrate ions, diazotization, 1-naphthylamine, back titration method.

METHOD FOR ELECTROSTIMULATION OF PAIRED MEAT TO ACCELERATE THE MATURATION PROCESS

S. A. Romanchikov

Acceleration of maturation of paired meat is an urgent task, especially when organizing slaughtering in the field. The impact on the process of accelerating the transformation of anatomical structures and physiological processes in carcasses of slaughter animals allows to increase resistance to microbiological damage, to shorten the maturation time and the volume of storage facilities. In order to realize this task, a method of electrostimulation of paired meat is proposed to accelerate the maturation process. The method is based on the use of the technological equipment "Devices for accelerating the autolysis of meat raw materials (UDUAMS-M) is designed for processing paired meat with electric current, in order to prevent its rapid rigor and accelerate the autolysis process. Processing of carcasses of slaughter animals with electric current carries out a voltage for: MPC - 36 V, for 1 minute; pork - 110 V, for 2 minutes; Cattle - 230 V, up to 10 minutes, at the stage of bleeding.

Operation of the device is based on the use of physical principles for changing the tone of muscle fibers of paired meat (compression - stretching muscles under the influence of electric current) of carcasses of slaughter animals in order to prevent "cold" muscle contraction with intensive refrigeration and attain meat tenderness in a short time. A feature of the method is that it is proposed for implementation in the field, in particular for slaughtering animals in trailer meat stations (PM-40).

Keywords: paired meat, electric current, electrostimulation, autolysis, microorganisms.

SINGLE-STAGE TREATMENT OF OAT HULLS TO PRODUCE BIOETHANOL – AN ETHYLENE PRECURSOR

O.V. Baibakova, E.A. Skiba, I.N. Pavlov, V.V. Budaeva, Yu.A. Kryukov, V.N. Zolotukhin, E.I. Kashcheyeva, Yu.A. Gismatulina, G.F. Mironova, E.K. Gladychева, A.A. Korchagina, G.V. Sakovich

The paper reports the results of scaling up the bioethanol process in the production environment, starting from oat hulls treated in one stage with dilute nitric acid solution. Based on the laboratory studies, a process flow diagram has been devised and suggested for the production of bioethanol from non-woody cellulosic biomass under pilot production conditions. The developed technology for producing bioethanol from the nitric-acid treatment product of oat hulls has been adapted at IPCET SB RAS under production conditions. The resultant substrate (nitric-acid treatment product) has a high content of hydrolysable constituents of 88.4±0.3 %. The process of simultaneous saccharification and fermentation was scaled up in a 63-L fermentor in aqueous medium by using the enzymes CelloLux-A and BrewZyme BGX and the Saccharomyces cerevisiae yeast strain Y-1693. Bioethanol was obtained in an yield of 17.9 dal from 1 ton of oat hulls. Gas liquid chromatography revealed the bioethanol test sample was the lowest in methanol. After rectification, the bioethanol test sample was found to correspond to pure spirit of best quality from food raw material in terms of mass concentrations of aldehydes and esters.

Keywords: bioethanol, oat hulls, nitric-acid treatment, production environment, saccharification, enzymes, fermentation, Saccharomyces cerevisiae Y-1693.

HINDERED SETTLING OF POLYSIZED PARTICLES OF FLOTATION TAILINGS

M.E. Zhurkovsky, A.N. Blaznov, I.K. Zharova

The present paper reports the measurement of the grain size distribution of suspended solid particles of flotation tailings with different settling time. Here we discuss the sedimentation of flotation tailing particles with a grain size ranging from 0 to 300 μm and with a particle content of 22% of the suspension weight. The hindered settling model is considered. The sedimentation analysis technique based on continuously weighing the particles under settling was employed to examine the sedimentation process. The obtained sedimentation curves show three linear regions and two inflections, which suggests different sedimentation rate and different particle size in these regions. The grain size distribution of the settled particles was measured by the optical technique in the discontinuity regions of the sedimentation curve. Three fractions were consequently identified, which were composed of coarse particles 50–300 μm in size (settle within the initial 120 sec), particles with a mean size of 5–25 μm (settle within the initial 120–1000 sec), and suspended particles up to 16 μm in size (settle for more than 1000 sec), respectively. The settling process completes for 24 h.

Keywords: settling, floatation tailings, particle, grain size distribution, sedimentation

A STUDY OF OXIDANT EFFECT ON SYNTHESIS OF 1,5-DIAMINO-3,7-DIOXO-2,4,6,8-TETRAAZABICYCLO [3.3.0]OCTANE

M.V. Chikina, S.G. Il'yasov, A.A. Sinitsyna

Here we report experimental study results on how the oxidant influences the synthesis process of 1,5-diamino-3,7-dioxo-2,4,6,8-tetraazabicyclo [3.3.0]octane, which is an intermediate in the synthesis of an advanced high-energy compound, hexanitrohexaaza[3.3.3]propellane. To maintain the experimental integrity, sodium persulfate was chosen as the oxidant in this study because it is reported in the literature that only one product is formed when it is used. The oxidation of uric acid with sodium persulfate was found to afford only one oxidation product at the ratio of 1:1 and two oxidation products at the ratio of 1:2, while a single reaction product, 1,5-diamino glycoluril, was formed at the ratios of 1:3 and 1:4. NMR spectroscopy showed the reaction intermediate resulting at the ratios of 1:1 and 1:2 did not match the earlier reported 5-amino-4-iminoallanthione.

Keywords: 1,5-diamino-3,7-dioxo-2,4,6,8- tetraazabicyclo [3.3.0]octane, uric acid, sodium persulfate, 5-amino-4-iminoallanthione, hexabenzylhexaaza [3.3.3]propellane, hexanitrohexaaza [3.3.3] propellane.

THERMOGRAVIMETRIC AND MECHANICAL CHARACTERIZATION OF BACTERIAL NANOCELLULOSE DEPENDING ON THE PREPARATION METHOD OF NUTRIENT BROTHS — THE ENZYMATIC HYDROLYZATES OF OAT HULLS

N.V. Bychin, D.S. Golubev, E.A. Skiba

*Bacterial nanocellulose (BNC) possesses unique physicochemical properties and holds much promise as a material for wide range of application. This research is into how the physicochemical characteristics of the BNC specimens synthesized by using *Medusomyces gisevii* Sa-12 bacterium depends on the preparation method of nutrient broths, the enzymatic hydrolyzates obtained from oat hulls. The BNC specimens were air-dried. Thermogravimetric analysis was done on a DTZh-60 TGA analyzer and physicochemical analysis on a TMA-60 instrument. The TGA analysis showed that the pyrolysis onset temperature varied from 268 °C to 334 °C in the test samples, the weight loss of the sample ranging from 52 % to 78 % during the pyrolysis. It is obvious that the higher the pyrolysis onset temperature and the weight loss, the purer the BNC samples and the higher their thermal stability. The tension tests of BNCs demonstrated that the mechanical properties of this polymer heavily depend upon the preparation method of the substrate to be used for enzymatic hydrolysis and subsequent biosynthesis of BNCs on the resultant growth medium. The Young's modulus of the BNC samples, depending on the preparation method of the culture broth from oat hulls, differs by the factor 13.4, that is, from 933 MPa up to 69.8 MPa, in which case the higher the elastic modulus, the lower the relative elongation at yield point, and its values change by 8.8. times, from 0.6 to 5.3 %.*

*Keywords: bacterial nanocellulose, *Medusomyces gisevii*, oat hulls, chemical pretreatment, enzymatic hydrolyzate, thermogravimetric analysis, thermomechanical analysis, strength.*

DESULFATIZATION OF RAW SODA FROM THE MIKHAILOVSKOYE DEPOSIT IN THE ALTAI TERRITORY

Yu.V. Ostrovsky, G.M. Zabortsev, V.A. Chernook

At present, there is a need to process natural raw soda from the Mikhailovskiy Chemical Reagents Plant (Altai Territory) containing an excessive amount of sodium sulfate in commercial grade A soda ash (GOST 5100-85), necessary for the production of glass containers. The purpose of the studies is to establish the possibility of obtaining conditioned sodium carbonate from natural raw materials. Radiometric analyzes of the raw soda sample confirmed the presence of α and β -activity. The calculated uranium content in the sample is 4 mg / kg. To purify the aqueous solution of raw soda from uranium impurities, galvanochemical and sorption methods are proposed using inorganic and organic sorbents. The results of the precipitating technology for cleaning a solution of raw soda from excess sodium sulfate are presented. The technology includes carbonization of a saturated raw solution of raw soda with carbon dioxide, separation and washing of the resulting sodium bicarbonate precipitate, calcination thereof to obtain anhydrous sodium carbonate, return of carbon dioxide to the carbonization step of the saturated soda solution. As a result of the implementation of this precipitation technology, simultaneously with the production of conditioned soda ash, there will be an accumulation of uranium compounds suitable for delivery to the uranium mining enterprises of SC Rosatom.

Keywords: soda lakes, raw soda, uranium, carbonates, sulphates, carbonization, carbon dioxide, precipitation, bicarbonates, purification, washing, processing

EVALUATION OF SELENIUM CONTENT IN WHEAT GRAIN GROWN ON SOILS OF DIFFERENT NATURAL AND CLIMATIC ZONES (KALUGA, TULA, OREL AND BELGOROD REGIONS)

S. M. Ponomareva, L. I. Semenova, S. O. Smirnov

In today's time is known that the main reason for the insufficient content of selenium in food is its low content in soils, and as a consequence - in plants. Wheat is one of the main sources of selenium in human nutrition. In work the estimation of the content of selenium in grain of wheat, grown on soils of different natural and climatic zones by the example of Kaluga, Tula, Orel and Belgorod regions was made. The results of the studies were obtained using two methods: fluorimetric with 2,3-diaminonaphthalene and atomic absorption spectroscopy with electrothermal atomization. Studies have shown that the content of selenium in wheat grain in these areas varies from 39 to 372 µg per kg of air-dry matter. This variation is due to the variety of soil types, as well as climatic and agrotechnical features in the investigated areas. The data obtained can be used to solve the problem of selenium deficiency in our country.

Keywords: selenium microelement, selenium content, wheat grain, soil type and acidity, fluorimetric methods and atomic absorption spectroscopy with electrothermal atomization.

USE OF SUPERCRITICAL FLUID CO₂ EXTRACTION IN THE PRODUCTION OF GINZENOSIDES FROM THE FAR EASTERN GINSENG PANAX GINSENG C.A. MEYER FOR APPLICATION IN FOOD, MEDICINAL AND COSMETIC INDUSTRY

M. P. Razgonova, T. K. Kalenik, A. M. Zacharenko, K. S. Golokhvast

Far Eastern Ginseng Panax Ginseng C.A. Meyer is a perennial plant that has been used for thousands of years in traditional Oriental medicine. The active components of ginseng, known as ginsenosides, are studied the most widely, and they have different positive drug effects: antitumor, chemopreventive, immunomodulatory and antidiabetic effects. The authors studied the extraction of the root of Far Eastern wild ginseng Panax Ginseng C.A. Meyer using supercritical fluid CO₂ extraction at variable temperatures and pressure. It was found that the most significant effect on the amount of extracted ginsenoside is provided by the use of a modifier during the experiments with variable pressure, temperature, and the amount of modifier. With the use of a larger modifier, the temperature of the extraction system was increased to the guaranteed single supercritical operating state. Supercritical fluid extraction, using CO₂ and dimethylsulfoxide as a modifier, has shown significant advantages in the extraction of medicinal plants. The increase in the concentration of the modifier affects the amount of extraction yield and the required temperature for effective supercritical extraction. The unique properties of supercritical fluid became the basis for their use in the extraction of thermolabile compounds from natural matrices of Far Eastern ginseng Panax Ginseng C.A. Meyer. The obtained extract can be successfully used as a food, therapeutic additive or for weight control.

Key words: Panax Ginseng C.A. Meyer, carbon dioxide, supercritical extraction, ginseng, high-performance liquid chromatography, ginsenosides, "green technologies", extraction of thermolabile compounds, medicinal plants, extraction.

OXIDIZING-REDUCING POTENTIAL OF CONTROLLED ATMOSPHERE FOR WELDING OF STEELS WITH SPECIAL-DEGREE DEGREING SYSTEMS

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

At present, low-carbon steels with additives of vanadium, niobium and boron are the most promising for use in construction and machine building. The basic types of atmospheres used in arc welding of steels are investigated. The purpose of the study was to determine the composition of the protective atmosphere that prevents the formation of metal oxides and nitrides in the weld zone.

It is established that the proposed protective atmosphere based on a virtually neutral flame prevents oxidation, and in some cases, restores the metal of the weld pool due to the presence of carbon monoxide and hydrogen. Chemical reactions providing restoration of various oxides of alloying elements are given.

It is shown that with an increase in the temperature of the protective atmosphere, the propensity to oxidize the metal surface will decrease. The greatest contribution to the recovery activity of the atmosphere at high temperatures is made by methane, which decomposes into constituent parts, which significantly increases the reducing ability of the gas mixture. It has been established that the introduction of reducers such as CO or CH₄ into the composition of the gas mixture makes it possible to prevent oxidation of the metal even in the presence of oxygen in a protective atmosphere. The developed protective atmosphere interacting with the oxygen of the air is burned, with the formation of non-toxic substances.

Keywords: thermodynamics, welding, steel, microalloying, niobium, boron, chemical reaction, Gibbs criterion, carbon monoxide, protective atmosphere.

CHANGES IN HIGH-CYCLE FATIGUE OF THE STRUCTURE OF THE TITANIUM ALLOY VT1-0, SUBJECTED CURRENT IMPULSE TREATMENT

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The influence of the current impulse processing of the titanium alloy VT1-0 on the change in its fatigue life is studied and a comparative analysis of the structure and phase composition is carried out. It is established that current impulse treatment leads to an increase in fatigue life of ~ 1,3 times. By means of transmission diffraction electron microscopy of thin foils, the structure and phase composition of the samples subjected to pulse current processing and fatigue tests to failure were analyzed. It was established that the structure of the surface layer of titanium, destroyed as a result of fatigue tests, has a thin (up to 4.5 μm) surface layer with a nanocrystalline structure with an average grain size of 58.6 nm. Grains form disoriented layers relative to each other, located parallel to the surface of the sample. The nanocrystalline structure is noted at a depth of up to 7-8 μm, it is formed at the junctions of the initial grains of titanium. The adjacent layer is characterized by the presence of a large number of bending extinction contours. Current impulse processing of the titanium alloy leads to a substantial increase to 422.7 nm of the crystallite size of the α-Ti surface layer of the material, which is due to recrystallization processes; contributes to the reduction of the number of sources of internal stress fields in the surface layer of the material, which ensures the reduction of potentially dangerous cracking sites; leads to a significant increase in the size of the oxide phase particles formed in the surface layer of the samples during fatigue tests.

Keywords: titanium alloy VT1-0, current impulse treatment, multi-cycle fatigue, fatigue life, structure.