



CLOSTRIDIUM PERFRINGENS: CHARACTERIZATION, BIOLOGICAL ACTIVITY, THE INDICATION IN FOOD

page 4–8

The main properties of the microorganisms *C. perfringens*, their stability, ability to preserve in raw material and products of its processing have been characterized. The biological activity of *C. perfringens*, its ability to cause the food poisoning of people, spoilage of food products have also been described. These clostridia are widely distributed in the environment that leads to contamination of raw material and food products by means of them. In this regard, *C. perfringens* is regulated in raw materials and food products, it is not allowed in can food with a pH above 3,5 and this microorganism should be systematically controlled. *C. perfringens* as the microorganism-contaminant is a criterion of sanitary safety of products. The classic and modern methods of determination of *C. perfringens* have been described. It has been shown that the basic methods of identification of this microorganism in food products are either prolonged or insufficiently specific. The results of development of indicative accelerated method for determination of *C. perfringens* in food products using polymerase chain reaction (PCR) have been presented. Species-specificity of the developed method has been confirmed. The developed PCR-method allows to make determination of *C. perfringens* ten times as quick in comparison with the traditional methods of research, to get a reliable high-quality or quantitative result and describe the regulated degree of sanitary safety of products, that is especially important for perishable raw materials and the long-term storage ones.

Keywords: *Clostridium perfringens*, description, biological action, PCR-determination, food products, accelerated method.

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PURPOSEFUL MODIFICATION OF CARBONATE FILLERS FOR WATERBORNE PAINTS

page 9–12

In order to maximize the potential of Ukrainian carbonate deposits in composition of waterborne paints were studied properties and their possible for modification by mechanochemical activation in the presence of $\text{CH}_3\text{Si}(\text{OH})_2\text{OK}$.

Filtration coefficient, size of the effective specific surface, hydrophilic factor for initial and modified materials are determined during the work in the methodology of moistening research at leaking of polar and nonpolar liquids.

Based on the data can be argued that the surface modification of carbonate by hydroalcoholic solution $\text{CH}_3\text{Si}(\text{OH})_2\text{OK}$ makes its surface less hydrophilic, increases dispersion, reduces the size of interparticle capillary, increases the effective surface area and will enhance the properties of the finished composite materials.

Thus, investigations have shown that at filling of waterborne paints by carbonates of Ukrainian deposits is reasonable to conduct their preliminary mechanical activation using hydroalcoholic solution $\text{CH}_3\text{Si}(\text{OH})_2\text{OK}$ at a concentration of 0,5 % wt, because this treatment allows to bring the nature of carbonate surface to film former and improve moistening and distribution of the filler particles in the coating structure.

Keywords: carbonate filler, surface area, polymerophilicity, modification, surfactants.

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FEATURES OF INTERACTION BETWEEN STYRENE-ACRYLIC FILM FORMERS AND MODIFIED KAOLIN

page 12–16

The processes of interaction in systems of kaolin with modifiers and styrene-acrylic film former are analyzed in the article. Researches were performed using infrared spectroscopy. The aim of the work was to assess the level of interaction processes in the investigated systems. In this paper the quantitative parameters of the main characteristic bands responsible for the stretching vibrations of reactive groups of kaolin and film former are determined. Maximum shift of the characteristic bands of the IR spectra and change their intensity are indicated. It is determine which of the investigated surfactants provide the most complete interaction of kaolin with styrene-acrylic film former. The results demonstrates that the interactions of the modifiers, fillers, and film former are proceed in presence of OH-groups of adsorbed water and linkages Si-O-Al of kaolin surface. The authors suggest the use of modified kaolin, which are characterized by the most complete interaction with the styrene-acrylic film former, as fillers for waterborne paints that provide higher performance properties of coatings.

Keywords: kaolin, styrene-acrylic film former, modifier, characteristic absorption bands, stretching vibrations.

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CURRENT CONCEPTS OF NON-TRADITIONAL METHODS OF CULTIVATION METAL WHISKER CRYSTALS. PULLING WHISKER POLE FROM MELT

page 16–19

The results of previous studies of whisker crystals were reviewed and analyzed in the materials of the article on non-traditional methods of growing whisker crystals, namely one of them – the «pull» of metal whiskers from melts. The analysis of data showed that the problem in modern conditions given enough attention, which undoubtedly be indicative of the relevance of research topic and, hence, these issues need to be addressed. The results of the literature review suggest that the crystallization front of whisker crystal delves into the supercooled melt zone and whiskers are growing during the experiments from the melt at a sufficiently high speed. If the seed material from crystallizing directly immersed into the melt and then pulled out of the melt with the material for the crystallization, the whisker growth rate decreases cardinaly. Cooling and crystallization of the melt of metal whiskers accompanied by a bright flash, which indicates the allocation of considerable latent heat of crystallization and demonstrates the tremendous transformation rate of the liquid crystal in charge. Using a capillary device for «pulling» sapphire fibers from the melt showed that these fibers are uniquely single crystals. The research results confirmed that a major indicator of the degree of stretching is the strength of crystal whiskers. Registration and use of research to improve the implementation of environmental protection requirements of man and the environment given the fact that the range of use of whiskers in modern industry is expanded.

Keywords: whisker crystals, methods of cultivation, metal «whiskers», seed reactor, capillary device.

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RESULTS OF EXAMINATIONS OF SHABO TERROIR WINES PHYSICAL-CHEMICAL PROPERTIES

page 19–22

The reliable criteria able to show the naturalness of wine products are physical-chemical properties such as kinematical viscosity, buffer capacity, and electrical conductivity. Hereby we examined the samples of white stems, champagnes (Aligote, Green Sauvignon, Rhine Riesling, Rose Traminer, Chardonnay, Telti-Kuruk, Rkatsiteli, Pinot Noir «of white method») and red (Cabernet Sauvignon, Merlot) wine materials of LLC «Production and trading wine company Shabo» in purpose to determine the following criteria: kinematical viscosity, buffer capacity, electric conductivity. The correlative dependency between buffer capacity, electric conductivity and viscosity was established. The examination results showed the values of the researched calculated correlations are within the range provided for wine materials and wines of Ukraine, but differing with more narrow variation subrange, that is specific peculiarity of wine production zone. The adjustment of value ranges of quality properties of wine materials and wines is possible in the process of additional examinations of new sample batches of LLC «Production and trading wine company Shabo».

Keywords: wine, wine materials, terroir Shabo, kinematical viscosity, buffer capacity, electric conductivity.

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MATHEMATICAL DESCRIPTION OF THE COOLING PROCESS OF GENERATING GAS DURING A WASTE DISPOSAL

page 23–29

This article discusses the gas-dynamic processes of interfacial interactions occurring in the cooling block of generator gas by water injection, dispersed by centrifugal nozzle, designed to increase the level of environmental safety for waste disposal. The main purpose of this study is to develop mathematical models of gas and dispersed phase, as well as the mathematical description of interfacial interactions in cooling unit of generator gas. Using the classical theory of gas dynamics provides a mathematical relations describing the gas and dispersed phase. To solve the resulting system of equations is necessary to consider two-way communication by alternately solving the equations of dispersed and continuous phases as long as the decision of the two phases is not installed. The research results can be applied to design of cooling unit of generator gas as one of the elements of device for waste management in order to improve the region's environmental safety.

Keywords: recycling, waste, environmental safety, dioxins, mathematical modeling, two-phase multicomponent medium.

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OPTIMIZATION OF FATTY COMPOSITION OF LIVER PATE OF FUNCTIONAL PURPOSE

page 29–34

The paper presents the results of analytical and experimental studies of the possibility of combining the fats of animal and vegetable origin in formulations of liver pate of functional purpose. The analysis of the fatty acid composition of vegetable oils is widely available on the market of Ukraine. It is recommended to use the soybean oil as the most valuable content of polyunsaturated fatty acids such as ω -3 for introduction a meat products of emulsion type in the composition.

It is investigated an influence of introduction of vegetable oil to change the structural, mechanical and organoleptic characteristics of pate masses and experimentally established that at inclusion of more than 12,5 % of vegetable oil to the weight of the main raw material is occurred its large separation and it significantly affects the organoleptic characteristics of the finished product.

Finding the optimum mass fraction of soybean oil in formulations of liver pate of functional purpose is decided by using the desirability function proposed by Harrington. For this purpose, it is developed generalizing model that takes into account the influence of the organoleptic quality indicators, the ratio of monounsaturated, polyunsaturated and saturated fatty acids to recommend the best, limiting shear stress and the ratio of polyunsaturated fatty acids series of ω -6 and ω -3. With the help of the developed model it is found the optimum mass fraction of soybean oil for inclusion into liver pate of functional purpose, which is 11,6 %.

Keywords: optimization, fat composition, functional foods, liver pate, Harrington's function.

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RESEARCH OF TECHNOLOGICAL PROPERTIES OF BIOCHEMICALLY MODIFIED PECTIN SUBSTANCES

page 34–39

The paper presents the results of experimental studies to determine the mass fraction of effectors — calcium ions, which allow you to adjust the solubility of low-esterified pectin gel to create structural compositions depending on the time and concentration of enzymatic de-esterification of pectin in the solution.

Injection of calcium salts in a mixture having influence on both the solubility and the viscosity characteristics and the gelling ability of modified pectin solution. With injection of calcium salts in solution of citrus pectin it is observed their different behavior depending on the nature of amount of salts and introduced pectin. With an increase in the mass fraction of low-esterified pectin and calcium salts take place a gradual increase in viscosity of the solution with a transition to the dense gel, but higher concentrations of calcium lead to syneresis process.

It has been established that structural and mechanical properties of the gel affect the amount and type of pectin, as well as in its content in the composition of calcium ions. It is shown that low-esterified pectin substances may make up the thermoreversible gels. Anions of calcium salts significantly affect the structuring of the pectin and calcium cation allows receiving a variety of gel compositions with a mass fraction of pectin is not less than 0,6 g per 100 cm³, which is important for producing structured and canned foods.

Keywords: low-esterified pectin substances, solubility, viscosity, calcium salt, pectin methyl esterase, gel formation.

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THE JUSTIFICATION OF EVALUATION CRITERIA OF DESTRUCTION MATERIAL BY EMBROIDERY NEEDLES

page 39–44

Compound fabric pieces with a sewing machine leads to destruction of material. Extent of destruction of the sample depends on the number of needles and stitch step. It leads to change of explosive loading and coefficient of air permeability. But remains the question of influence of extent of destruction of material in the course of machine embroidery is not studied.

The results of the researches, related to justification criteria for assessing material destruction by embroidery needles are in this work. needles number 75, 80, 90 and 100, and physical material model – polysiloxane (silicone) membrane, which is 0.1 mm of thickness, (50 × 200) mm of size and 83.0 N of breaking characteristic, were used for this experiment. Similar studies were carried out with the increasing of T seam imitation through the length and breadth of samplings, which are shown in the scheme. Such criteria as the change of values of tensile properties and the air permeability coefficient were used to evaluate the degree of destruction of samples, depending on their number and pitch of the seams. The experimental results, which are given in the article for the needle number 75.

The experimental data indicate that as the change of the stitches pitch such process as machine embroidery, have been used, is interconnected multi function, and the embroidery needle is a destructive factor.

Keywords: degree of destruction of the material, polysiloxane film, embroidery needle, seam step, evaluation criteria.

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OBTAINING OF HIGHLY ACTIVE STREPTOMYCIN-RESISTANT BACTERIOLYSINS'S PRODUCERS OF STREPTOMYCES ALBUS

page 44–50

The application of N-methyl-N'-nitro-N-nitrozoguanidin (NG), as chemical mutagen along with the use of mutations of resistance to an antibiotic streptomycin in the selection of a producer of the bacteriolytic enzyme complex of *Streptomyces albus* 2435 with the increased biosynthetic ability are investigated. The conditions of NG mutagen treatment (1 mg/ml, 20 min.), allowing to obtain mutants with supersynthesis of a target product are determined.

The nitrozoguanidin-induced strains of *Streptomyces albus* 105 and 107, steady to streptomycin (in concentration of 100–250 mkg/ml) with the increased (1,6 times) ability to synthesis of bacteriolytins are received. The efficiency of the offered combination of selective factors (nitrozoguanidin and mutation of streptomycin-resistance) for the selection of producers in the course of the supporting selection and for industrial application is shown.

The need of a producer's supporting selection is caused by heterogeneity of cultures of streptomycetes and decrease in biosynthetic activity in the course of storage. For the development of industrial technology only the producer with supersynthesis of a product, in this case a producer of antimicrobial enzyme preparations, can be used.

Keywords: *Streptomyces albus* 2435, superproducer, bacteriolytins, selection, nitrozoguanidin, streptomycin.

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DEVELOPMENT OF AUTOMATED CONTROL SYSTEM OF ENVIRONMENTAL RISKS AT DISPOSAL OF WASTE USING THE «ECOPYROGENESIS» TECHNOLOGY

page 50–56

The article considers the structure of the automated system of ecological risk control. The system is to be implemented for the minimization of the ecological hazard level of the modular facilities operation at the plants for the thermal recycling of municipal solid waste using the «Ecopyrogenesis» technology with obtaining the alternative fuels. The algorithm of the functioning of the hierarchical control system of ecological risks is suggested. At the first level it involves the development of the control system of the database of the parameters of the considered technological process. At the second level it deals with the developed method of the multi-criterion evaluation of the environmental hazardous factors, taking into account the procedures of the automatic elimination of experts' incorrect decisions. The third level determines the formation of an umbrella program of measures for the ecological safety ensuring. The results of the evaluation of the factors by the level of danger on the basis of the hierarchy analysis method according to such criteria as the

possibility of environmental hazards occurrence, the expected consequences of the factors and the level of quality of the implemented technical solutions on safety are represented. The ranking of the hazardous factors allowed one to form an optimal decision-making circuit for the prevention of the environmental hazards at the operation of the disposal unit using the «Ecopyrogenesis» technology in optimal and emergency situations.

Keywords: environmental risks, environmental hazard factors, pyrolysis, accidents, hierarchy analysis.

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MANAGING THE PROCESS OF CATALYTIC REFORMING BY THE OPTIMAL DISTRIBUTION OF TEMPERATURE AT THE REACTOR BLOCK INLETS

page 56–60

In this paper it is investigated an influence of the temperature of the reaction mixture at the inlets of a catalytic reforming reactor block on increment of aromatic hydrocarbons at outlets of separate reactors. It is found that for each reactor of a catalytic reforming exists some optimal temperature of the initial mixture from the standpoint of the increment of aromatics, which does not exceed a noticeable increase of flavoring materials, however, increases the rate of deactivation of the catalyst due to the acceleration of hydrocracking reactions, contribute to the formation of coke on its surface.

It is proposed the new method of finding the optimum point temperature at the reactor inlets, which provides optimum ratio of aromatization reactions and hydrocracking in reactors, depending on the desired rigidity of conducting the process.

It is made a formulation of the problem of optimal control based on technical and economic analysis of the reforming unit of the Odesa refinery. A method to solve this problem based is proposed on the method of nonlinear Hooke-Jeeves optimization, supplemented by the procedure of border control of variable parameters. An algorithm for calculating the optimal process conditions and the control method based on it, which increases the yield of the desired product – the catalyzate an average of 3–5 %, which is confirmed by the results of experimental testing.

Keywords: catalytic reforming, control, optimal temperature distribution, process rigidity.

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THEORETICAL RESEARCH OF OZONATION INFLUENCE ON THE SOOT CONTENT IN THE EXHAUST GASES OF DIESEL

page 60–63

In this paper we examine the effect of ozonation on the process of burning petroleum diesel fuel and diesel fuel of biological origin. The analysis of existing research in the field of ozonation of hydrocarbon fuels is conducted.

The mechanism of formation of solid particles in the combustion chamber of a diesel engine is developed. A mathematical model describing the formation and soot burning in the combustion chamber of diesel engine is developed.

The technique is developed and results of calculation of temperature, solids content and the rate of their formation in the combustion chamber of diesel engine are presented.

As a result of work it is established that oxygen that included in the diesel fuel composition of biological origin intensifies the soot burning in the later stages of the combustion mixture, resulting in lower levels of particulate matter in diesel exhaust gases.

Keywords: diesel fuel, biodiesel, ROME, soot, soot emission.

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MODELING OF Ni²⁺ EXCHANGE ON THE STRONG ACID ION-EXCHANGE RESIN AND THE ORGANIC-INORGANIC ION EXCHANGER

page 63–67

Currently, for calculations of processes in the ion-exchange columns is used the model which require the use of parameters such as diffusion coefficients of the ions in solution and the ion exchanger, exchange capacity, selectivity coefficients, and particle size of the ion exchanger and bed height, velocity of the solution. The greatest difficulty is the definition of the diffusion coefficient of exchanging ions in the ion exchanger, as this parameter varies with the degree of substitution of the resin and is very dependent on the presence of other ions in solution. In this regard, the actual task is creating a formalized process model in a dynamic mode, which allows minimizing the number of parameters, eliminating the diffusion coefficients and selectivity. The aim of research is creation of a formalized model of ion exchange, taking into account only empirical parameters.

It is investigated the strongly acidic gel ion exchanger modified by aggregates of nanoparticles of zirconium hydrogen phosphate. In dynamic mode it was performed deionization of combined solution prepared in tap water, which contains ions of calcium, magnesium and nickel.

Under dynamic conditions it is investigated extract of nickel ions from the combined solution by using a strongly acidic gel cation exchange resin and the composite ion exchanger on its base, containing aggregates of nanoparticles of zirconium hydrogen phosphate. A model is proposed, which allows determining the time at which the capacity is reached before breakthrough for nickel ions. This model involves the use of only empirical parameters obtained in the investigation of ion exchange in a dynamic mode, reflecting the concentration of ions in the solid phase and does not require prior identification and selectivity coefficient of diffusion of sorbed ions, and the communication mode (external and internal diffusion or mixed).

Keywords: ion exchange, water treatment, ions of nickel, calcium, magnesium, dynamic model.

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IDENTIFICATION OF COMPOUNDS OF COPPER AND VANADIUM IN LOW DICARBOXYLIC ACID MIXTURE

page 68–71

The synthesis of compounds of succinic, glutaric and adipic acids with copper hydroxide and vanadium oxide is conducted. Compounds of vanadium and copper, which are contained in the unpurified mixture of low dicarboxylic acid that obtained in the production of adipic acid, are separated by recrystallization in ethyl acetate. It is conducted X-ray diffraction analysis of the synthesized samples and sediment to identify compounds of copper and vanadium and their advantageous forms in which they are in crude mixtures of low dicarboxylic acids. It has been established that the reflexes of all synthesized compounds are in sediment roentgenogram. Additional statistical processing showed that the predominant state of copper and vanadium in a mixture of low dicarboxylic acids are glutarates. These researches open an opportunity for thermodynamic calculations in order to select the most promising agents for purification technology of mixture of low dicarboxylic acid and can reduce the amount of further experimental researches.

Keywords: low dicarboxylic acid, vanadium, copper, adipates, glutarates, succinate, X-ray analysis.

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DEVELOPMENT OF COMBINED ENCAPSULATED DRUG ON THE BASIS OF NALTREXONE AND DISULFIRAM

page 71–75

In the article it is revealed the problem of choice of technology for obtaining the combined drug of prolonged action to ensure continuity of treatment process and relapse prevention of diseases such as drug dependence and alcoholism. In Ukraine and most of the world for the treatment of alcohol and drug dependencies are used disulfiram and naltrexone. In previous studies, the authors have demonstrated promising development of combined injectable drug of prolonged action based on these drugs.

The aim of this study was to obtain the combined injectable drug of prolonged action, which would contain a combination of naltrexone and disulfiram for the treatment of combined alcohol and drug addictions by encapsulation method. The objects of our study served as naltrexone, disulfiram and excipients — copolymers of lactic and glycolic acids with different ratios of elementary units, emulsifiers and solvents.

Analysis of published data allowed us to determine the recommended therapeutic dose of 250 mg of disulfiram and 200 mg of naltrexone. Based on the information, obtained from patents, it is developed the methodology and conducted experiments to obtain encapsulated substances. Size of the emulsion droplets is regulated by rate of stirring; microscale capsules were formed at a speed of 1000 rev/min and nanoscale capsules were formed at speeds over 2,000 rev/min. Capsules were prepared separately from naltrexone and disulfiram in polymers with PLG (50 : 50) and PLG (70 : 30) with a ratio of polymer to the drug under 1 : 2. Morphological characteristics of microcapsules were determined by light microscopy.

The methods of quantitative and qualitative determination of disulfiram in microcapsules are proposed. Prolonging the release of naltrexone is confirmed through test «Dissolution». Also, it is worked fundamental technological scheme of production. Advantages and disadvantages of the proposed technology are determined.

To determine the toxicity and pharmacological activity of obtained microcapsules combined with alcohol and drug addiction it is started preclinical study (Wistar rats and white mice line Balb/c). By the results of this study it will be conducted preliminary comparative analysis of the pharmacological action of drugs Naltetlong and created combined encapsulated drug from naltrexone and disulfiram provided by this technology.

Keywords: naltrexone, disulfiram, encapsulation, powder for pre-muscle injection, prolonged action of drugs.

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USING PHYSICAL AND ELECTRICAL METHODS IN CONDUCTIVE MEAT FRYING

page 75–79

The process of conductive meat frying is inefficient in terms of energy costs and heavy losses of raw materials.

Our studies of mass conductivity in meat under the influence of heat flow from electric heaters through a flat metal wall, potential difference and pressure allowed to reveal patterns of occurrence of flow of matter on the basis of which reasonable factors of conductive frying were substantiated and their impact on the effectiveness of the process were developed taking into account technological requirements.

The analytical method established the theoretical duration of processes of double-sided frying of meat in the conditions of compression and double-sided process under the influence of a thermal stream from heaters and a difference of potentials which is confirmed by experimental data.

Using physical and electrical controls over meat during conductive frying allow significantly to intensify the process, to increase its energy efficiency and output of the finished product without formation of heterocyclic amines in a crust of products. Technical solutions as to implementation of the process of conductive frying under these methods are proposed, specifications of developed devices are given.

Keywords: conductive frying, meat, potential difference, pressure.

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