ABSTRACT AND REFERENCES

ECOLOGY. TECHNOLOGY AND EQUIPMENT OF FOOD PRODUCTION

THE RESEARCH OF PRECIPITATION PROCESS OF CALCIUM CARBONATE FROM LIQUID WASTES OF SODA MANUFACTURE (p. 4-8)

Evgenia Mikhaylova, Michael Vorozhbiyan, Nicolay Moroz

The paper deals with solving environmental problems of soda producing enterprises. A promising direction is developing low-waste technologies, which consist in processing wastes with obtaining products that are in great demand. As a commercial product, it is proposed to obtain chemically precipitated calcium carbonate, which is widely used as a filler to create various composite materials.

The most bulky waste of soda ash production using ammonia process is distiller slurry, which is formed in an amount of 8–10 m^3 per 1 ton of product and contains calcium ions. According to the results of complex theoretical and experimental studies, it is found that the best way to produce synthetic calcium carbonate is its precipitation from distiller liquid (clarified part of distiller slurry) using carbonate ion-containing solutions. Excessive mother liquor of purified sodium bicarbonate production or sodium carbonate solution with a predetermined concentration can be used as precipitant.

The paper presents the results of studies of the dependence of precipitation degree and basic physicochemical characteristics of calcium carbonate on the process parameters. Process conditions (temperature, reaction time, the ratio of reactants), which allow to obtain a product that meets modern requirements for filler, are defined.

Keywords: soda ash, distiller liquid, calcium carbonate, chemical precipitation.

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PROBLEMS SHAPING THE CONTENT OF TEACHING MATERIALS IN PREPARING FUTURE ECOLOGISTS (p. 8-13)

Volodymyr Bogolyubov

The article deals with the methodology of content development of training materials for the preparation of the future environmentalists in the context of education for sustainable development taking into account the main production functions and typical tasks of the activity.

Proposed to shape the content of teaching materials based on the content modules of education standards, which in turn should be developed on the analysis of production functions of future professionals with the principles of sustainable development.

Developed the option structural and logical scheme of the educational process of future environmentalists training on the basis of disciplines of mathematics, natural sciences, professional and practical training cycles. Thus, the internal optimization of professional and practical training cycle must be accompanied by the strengthening of ties with other structural elements of the training content.

Recommended to shape the content of scientific and teaching materials for each base core competence of future bachelor ecologist based on specific disciplines in which these competencies are to be covered on the basis of their interdisciplinarity in the context of the transition to sustainable development of society.

Demonstrated the feasibility of upgrading the content of subjects of humanitarian and socio-economic training cycle with the content of subjects of professional and practical training with account of sustainable development principles.

Established that the lack in educational and vocational training program for environmental disciplines such subjects as "Sociology", "Politics" and "Law" increases the content load on the base regulatory discipline "Philosophy" and leads to the need to expand its content with not typical educational elements.

Keywords: content, teaching, training, professionalism, qualification, competence, education, sustainable, development, environmentalist.

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ECOLOGICAL SAFETY OF THE URBANIZED TERRITORIES UNDER CONDITIONS OF TECHNOGENIC TRANSFORMATION OF ATMOSPHERIC PRECIPITATIONS (p. 13-17)

Galyna Geretsun

Formation conditions of ecological hazard of urbanized territories under the influence of atmospheric precipitations are analyzed in the paper. Self-consistent control scheme of ecological safety of precipitations is developed. It includes the stages of identification of hazards, formation of databases and making managerial decisions. The analysis of identification features of hazardous factors that cause ecologically hazardous precipitations is conducted. The features of atmospheric precipitations as the object of the ecological safety assessment are described. The choice of acidity index of precipitations in the city of Chernivtsi as an environmental hazard indicator is justified. The model scheme of interaction of natural and anthropogenic factors in the formation of ecologically hazardous sediments is developed. The influence of wind conditions on the environmental safety of precipitations is determined. In particular, it is shown that, in Chernivtsi north-west winds have the greatest influence on the formation of the ecological hazard of atmospheric precipitations. The contribution of stationary and mobile sources to the technogenic transformation of precipitations is analyzed. The role of transport networks and automotive pollution in the formation of roadside areas of high ecological hazard of precipitations is shown. It is found that, in Chernivtsi contribution of mobile sources to the overall picture of air pollution is consistently high and ranges from 91,6–92,3 %. Herewith, 60.4 % of the total emissions of sulfur oxides, 93 % of nitrogen oxides and 97.4 % of carbon oxide is formed due to mobile sources. This in turn leads to the formation of local areas of environmentally hazardous precipitations.

Keywords: ecological safety, ecological hazard, atmospheric precipitations, urbanized territories, air pollution.

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THE IMPLEMENTATION OF ELECTROCHEMICAL DESTRUCTION PROCESS FOR DECONTAMINATION OF WASTEWATERS OF MEDICAL ESTABLISHMENTS (p. 18-21)

Natalia Samoilenko, Iryna Yermakovych

Studies, conducted at leading laboratories in Europe and the United States, have revealed that of microconcentrations of pharmaceutical preparations and their derivatives have a significant negative impact on the quality of surface and drinking water, natural food chains of biota, reproductive disorders, developmental abnormalities. Purification from pharmaceutical preparations (PP) at the existing treatment plants, carried out mainly by the biological method, is low for some of the most stable molecules. The content of such hardly-biodegradable substances can be reduced by applying additional aftertreatment methods, including using advanced processes, among which the electrochemical destruction.

In Ukraine, the infected sewage of medical establishments before being discharged into the sewer system pass disinfection by chlorination. Given this fact, the authors have investigated the effect of the electrochemical destruction in the presence of chloride ions on the infected wastewater, contaminated with hardly-biodegradable PP (Diclofenac, Ibuprofen, β-estradiol). Criterion for evaluating the wastewater decontamination was the state of the enzymatic machinery of bacteria, namely their dehydrogenase activity, which is analyzed during the control of treated wastewater at municipal treatment plants.

It was found that the infected solutions, containing Diclofenac, Ibuprofen and β-estradiol, before the electrochemical destruction cause only inhibitory effect on E. coli, which is somewhat higher than in the case of the presence of one PP (Diclofenac) in it. After the electrochemical destruction in the presence of chloride ions, solutions, containing three components when in contact with a suspension of E. coli have a pronounced bactericidal effect on it. It lies in inhibiting the enzymatic activity of bacteria, fixed by the instrumental method and determined by the absence of pharmazan in the studied solution.

The results show the possibility of using the destruction of hardly-degradable medical products, as well as water decontamination from pathogenic microflora in a single electrochemical treatment process of infected wastewater of medical establishments, pharmaceutical preparations, containing pharmaceutical preparations.

Keywords: hospitals, sewage, pharmaceutical contaminants, water reservoirs, purification, infection, destruction, chlorine, disinfection.

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USE OF CRITERION OF MIDFREQUENCY OF EMISSIONS IN THE PROCESS OF ENVIRONMENTAL CONTROL (p. 22-26)

Nina Lyubymova

In this paper, it is proposed to use the midfrequency of the emissions of the controlled parameters as a criterion for environmental control of the gaseous emissions and liquid discharges of the energy-intensive enterprises. A mathematical model of the midfrequency of the emissions of the controlled pollution process as the sum of the amplitude and phase components is considered. Analytical expressions of these components are obtained. Graphical interpretations of the components for optimizing the control and preventive limits, and intervals for a minimum criterion of the midfrequency of the emissions are analyzed. Experimental use of the model of the midfrequency of the emissions during the active control of the concentrations of sulfur oxide in the power plant emissions is considered.

The obtained results allow adjusting the control and preventive limits and optimally organizing them during planning. Using this model increases the reliability, sensitivity of control to prevent the violations of natural resource management.

Keywords: control, ecology, technique, statistics, processing, model, criterion, validity, sensitivity, quality.

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SURFACTANTS SYNTHESIS ON THE BASIS OF SECONDARY RAW MATERIALS AFTER WASTE TREATMENT (p. 26-30)

Yuliya Nikitchenko

The scale of production of surfactants as one of the most popular products of petrochemical synthesis are determined by a number of factors, among which the availability of accessible and commercially attractive materials is the most important. For a long time, oleochemical and petrochemical products were used as raw materials, but today, because of the instability in the global market of raw materials, the issues of finding new and diversification of existing sources of raw materials become particularly relevant. One of such sources may become production and consumption waste, produced in large quantities in every country. It is globally recognized that resource-oriented consumption waste treatment can be a powerful source of secondary material-energy raw materials for many industries, including the petrochemical.

In the paper, the possibility of using a narrow fraction of pyrolysis condensate that boils at a temperature above 350 °C and contains more than 50 % of aromatic hydrocarbons to synthesis anion-active surfactants was experimentally confirmed. Pyrolysis condensate is obtained during thermal processing of waste tires of vehicles which, at significant accumulation in the environment is an important factor of environmental hazards in all regions of Ukraine. For the synthesis of surfactants, technology of processing the mentioned fraction by sulfonation at 50–60 °C using SO_3 as sulfonating agent and extraction of sulfonates by aqueous isopropanol solution is recommended. Composition and properties of the resulting product depend on the sulfonation conditions. All samples obtained are water-soluble.

In order to confirm the practical significance of the results, the paper gives the results of using the synthesized product in compositions for cleaning oil-contaminated soils. The cleaning efficiency of soils is 85–90 %, which is not inferior to surfactants, based on traditional raw materials.

Keywords: waste tires, pyrolysis, pyrolysis condensate, sulfonation, surfactants.

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TECHNOLOGIES FOR MONITORING THE COHESION OF GEOLOGICAL ENVIRONMENT AS CAUSES OF TECHNOGENIC ACCIDENTS (p. 31-36)

Igor Uchytel, Stepan Voitenko, Boris Kapochkin

The problem of creating the technology for monitoring aseismic geodeformations has been considered. Aseismic ultrafast reversible geodeformations with the amplitude of vertical and horizontal displacements between 10–50 cm were destructive towards engineering structures. Unlike earthquakes, these processes are dangerous for engineering structures not only because of the resonance effect, but rather it is the changes in the cohesion of the geological environment. Divergent motions lead to an increase in the geological environment and are accompanied by the deforming of buildings, breaks of linearly elongated objects. Monitoring technologies of this type of geodeformations has not been created yet. It was shown that the existing global monitoring of seismic manifestations in the form of a global seismometric network allows measuring the type of geodeformations under examination only in a high-frequency part of the time spectrum. The possibilities of applying the existing system of monitoring tsunamis to measure the type of geodeformations under consideration in water areas are reviewed. The possibilities of the satellite geodesy as the existing permanent geodetic network for monitoring these processes are considered. It was proposed to use 3D dynamic features of geodeformations as a monitoring tool.

Keywords: seismic hazard, deformations of the Earth surface, destruction of engineering structures, monitoring of geodeformations

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PROBABILISTIC-AUTOMATON MODELING IN SOILS MIGRATION PROCESSES RESEARCH (p. 37-43)

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Structural-functional systems stochastic approach to the study and analysis of the process of migration accumulation of substances in the soil was presented in the paper. The purpose of the model investigation of the considered system is to study stochastic flow patterns of substances, which in some discrete time points come in the studied type of soil. The feasibility of the approach to solving a given problem is caused by dynamic process of migration accumulation of substances, as well as a large number of probabilistic factors of influence. The proposed approach is founded on the theory of probabilistic-automaton modeling of dynamic processes, which is based on the selected Moore automaton. The authors have synthesized probabilistic-automaton model of migration accumulation of certain substances in specific-type soil subsystems. The input parameters of this model are statistical data, relating to the time points of substances arrival in the soil and the amount of certain substances arrival at fixed, sufficiently large time intervals. Depending on the accumulation intensity of anthropogenic changes and conditional intensity of equilibrium transitions of ecosystem, expressions for the probability of system stable functioning take different forms. According to examples of using the synthesized model, this approach allows to conduct research, analysis and forecasting of processes of migration accumulation of pollutants under anthropogenic load and is one of the most suitable for environmental studies.

Keywords: automaton-probabilistic modeling, soils, regional ecosystem, power of anthropogenic impact, technogenesis.

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RESEARCH OF METHANOGENESIS WASTE WATERS OF PRIMARY WINEMAKING (p. 43-47)

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The present work provides an overview on the issues of analysis of wastewater of the primary winemaking enterprises. A comprehensive study on the wastewater's chemical composition is provided aiming to select the optimal method of wastewater's treatment. The chemical composition of wastewater is characterized by significant BOD (5.6 Zr02/1) and COD (9.1 Zr02/1). On the basis of the results of the research of chemical composition of the wastewater a method of anaerobic digestion in a reactor is proposed, as the most effective method of purification of wastewater, with the possibility of production of biogas and organic fertilizers. The essence of this method is the decomposition of organic substances without access of oxygen, by means of microorganisms, that are propelled to use carbon, constituting a part of organic molecule, or CO_2, as the electron acceptor. As a result, the organic substances in the waste liquid are transformed into biogas. The comparative analysis of existing reactors intended for fermentation of wastewater, used in the fermentation industries, was performed. On the basis of the above characteristics the UASB-reactor was selected. The optimal process parameters of anaerobic digestion of wastewater are studied and, according to the results, the optimum ambient temperature in the bioreactor is 40 °C. pH 7.4, the ratio of C: N=1:0,1, fermentation time made 4 days. On the basis of these results, the process flow diagram of wastewater treatment is proposed.

Keywords: winemaking, biogas, methanogenesis, bioreactor, waste, fermentation, purification, wastewater, energy carrier.

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EFFECT OF HEAT TREATMENT ON QUALITY OF FEED ADDITIVE USING TOMATO POMACE (p. 48-53)

Bogdan Egorov, Ilona Malaki

Rapid development of the poultry industry requires solving such problems as expanding the resource base and using alternative sources of raw materials, reducing manufacturing cost of animal feed products and ensuring calcium deficiency in highly productive layers. However, during the production of canned vegetables, there are large amounts of waste in the form of tomato pomace, which are very perishable and require immediate disposal. Therefore, a necessary condition for the development of the poultry industry is to elaborate a method of producing a feed additive using the by-products of the canning industry. The aim of the research is to study the effect of heat treatment, namely the extrusion process on the physicochemi-

cal properties and quantitative-qualitative composition of the feed additive microflora using tomato pomace. It is found that the extrusion process not only does not affect the feed additive quality, but also significantly improves the physical properties, increases the digestibility of nutrients by enzymes of the gastrointestinal tract of birds, and considerably enhances the sanitary properties of the additive. During extrusion, the content of solid starch in the feed additive decreases by 33.4 % and the amount of water-soluble carbohydrates increases 5 times, which greatly improves its absorption by the body of birds. Conducting the extrusion process has allowed to reduce moisture content in feed additive by 34.5 %, which is positive in terms of the perspective of its further processing and storage. In addition, under high temperature and pressure, the total amount of bacteria has decreased by 89 %, and mycelium fungi - by 83 %, which allows to count on the efficient storage of feed additive and use in the manufacture of animal feeds for poultry. The obtained feed additive will allow to solve the problem of disposal of tomato wastes, and the developed method of their processing will be less expensive as compared to the existing ones. Since the extrusion process is less energy-intensive, using the tomato pomace as a mixture humidifier before extrusion reduces the humidification costs.

Keywords: tomato pomace, extrusion, additive, physical properties, chemical composition, microflora.

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COLOR STABILIZATION OF GREEN VEGETABLES AT STORAGE (p. 53-58)

Olesia Priss, Alina Kulik

The effect of antioxidant preparations on color changes during storage of parsley, cucumbers and zucchini was investigated. The application of antioxidants is proposed to delay dissociation of chlorophylls, carotenoids and maintain high quality of green vegetables. Postharvest heat treatment by antioxidant solution which contains chlorophilipt for cucumbers and zucchini is recommended. The nutrient solution with antioxidants based on hydrogel may be used for parsley. It was established that the use of complex antioxidant composition of chlorophyllipt promotes certain stabilization of color during parsley, cucumbers and zucchini storage. It is shown that the application of nutrient solution with the addition of antioxidants can reduce the rate of chlorophyll destruction up to 1.1...1.6 times and carotenoids destruction up to 1.2...1.6 times according to the season of cultivation and varieties of parsley. After using the antioxidant composition for cucumber treatment there is a statistically significant decrease in the concentration of chlorophylls comparing with the initial value. It was detected after 21 days storage. The concentration of carotenoids in experimental cucumbers at the end of storage is 21 to 23 percent more than it is in the control ones. Antioxidant treatment also reduces the chlorophylls and carotenoids degradation in zucchini.

Keywords: color, storage, green, parsley, cucumbers, zucchini, antioxidants, chlorophylls, carotenoids, quality.

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ANALYZING CHEMICAL COMPOSITION OF BUCKWHEAT GROAT OF DIFFERENT BUCKWHEAT VARIETIES (p. 58-62)

Antonina Dubinina, Tatyana Popova, Svitlana Lenert

This paper presents the research results and the comparative analysis of the chemical composition of buckwheat groat of different buckwheat varieties. Due to the significant expansion of the range of the buckwheat cultivation all over the world, it was interesting to determine the content of specific nutrients in buckwheat groat of different buckwheat varieties, the most promising for cultivation in the forest-steppe zone. The following varieties of buckwheat, grown in the fields of the V.Ya. Yuryev Institute of Plant Industry of NAAS: Ukrainka, Yaroslavna, Kvitnik, Kosmeya, Duimovochka, Dozhdik were selected for the research. The varietes were differed by the morphological characteristics, economic and biological characteristics, origin and genetic basis. It was experimentally confirmed that the chemical composition of buckwheat groat significantly varies depending on the buckwheat variety. The most significant differences were observed in the number of nutrients by the content of protein and fiber. It was found that the high nutrient and the most balanced by the most chemical composition indexes was buckwheat groat of the buckwheat varieties of "Kosmeya", "Kvitnik", "Ukrainka". These sorts can be considered as the most promising and can be regarded as plant raw materials for producing functional products and health food.

Keywords: buckwheat groat, buckwheat, variety, chemical composition, comparative analysis.

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OXIDATION KINETICS OF ORGANIC DISINTEGRATION PRODUCTS OF YEAST IN CAVITATION CONDITIONS (p. 63-66)

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The oxidation features of yeast cells in the glucose solution under acoustic cavitation in order to determine the influence patterns of acoustic cavitation on the rate of water purification

from biological contamination was investigated in the paper. It was shown that the disintegration rate of the microorganisms under the influence of ultrasound is described by the first-order equation, whereas the change in COD of dispersion of yeast in time under acoustic cavitation is described by the second-order kinetic equation. Oxidation of organic compounds of yeast cells in acoustic cavitation conditions proceeds by a radical chain mechanism. This is confirmed by the dependence of the rate constant on the concentration of oxygen, dissolved in a given system. The glucose oxidation rate under acoustic cavitation is much lower than the yeast oxidation rate in an aqueous dispersion. Increasing the glucose concentration in the dispersion of the yeast leads to slowing down the process at a constant concentration of yeast cells in the system. It was shown that glucose inhibits the oxidation of organic substances, contained in yeast cells. The obtained results allow to optimize the treatment process of wastewater of the food enterprises.

Keywords: cell agglomerates, acoustic cavitation, ultrasound, clusters, disintegration kinetics, cell destruction.

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