TECHNOLOGY OF ORGANIC AND INORGANIC SUBSTANCES

STRUCTURE INVESTIGATION OF THE RECOVERED ZINC SULFIDE FROM FULFILLED ELECTRON-EXCITED PHOSPHORUS

page 4–7

Some investigation results of recovered zinc sulfide from electron-excited phosphorus of fulfilled television picture tubes and computer monitors is shown in the article. The purpose of investigation is determination of modification type of crystal structure, investigation of some its characteristics and behavior of recovered zinc sulfide. For this purpose the crystalline precipitate of recovered zinc sulfide obtained from electron-excited phosphorus solutions in an aqueous solution of hydrochloric acid by deposition method. The processes of dehydration and crystallization are investigated by thermographic, differential — thermal, chemical and X-ray diffraction analysis methods. It is possible to determine the type of structural modifications of recovered zinc sulfide and also explore the behavior of recovered substances in aqueous solutions. Complex of physical and chemical properties of recovered zinc sulfide can be used as semiconducting compound. Zinc sulfide recovery from electron-excited phosphorus of fulfilled television picture tubes and computer monitors from aqueous solutions by precipitation allow to establish basic patterns of behavior in these solutions, to identify the sphalerite modification of zinc sulfide.

Keywords: recovered zinc sulfide, sphalerite modification.

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THE FORMATION OF CONSTRUCTIONS OF FLOATING COMPOSITE STRUCTURES FOR TRANSPORTATION AND STORAGE OF RADIOACTIVE CARGO

page 7–9

The patterns and technological recommendations on the formation of multilayer biological protection for floating objects, performing the function of overload and temporary storage of radioactive cargo of low and intermediate level are discussed. The purpose of the article is development of science-based practical recommendations for the development of protective structures with using of new materials. The mechanism of multiple internal reflection of radiation absorption in a heterogeneous environment is fundamental in the design. This mechanism is created by the introduction of the composite layer of hollow glass microspheres, powders of sodium silicate and plumbiferous glasses. The results are based on established patterns in the interaction of ionizing radiation of cargo with materials of constructions and include the selection of compositions and methods for forming of new materials and coatings on their surfaces. The basis of the design of protective constructions of floating structures is new scientific understanding of the processes and mechanisms of interaction of ionizing radiation of transported cargo with new materials of constructions. The research results can be applied in the design of specialized vessels, floating structures and other equipment for the transport and storage of radioactive cargo.

Keywords: floating structures, constructions of biological protection, radioactive cargo, composite materials, coatings.

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IGNITION PROCESS INVESTIGATION OF THE GAS DISCHARGE IN THE GAS — LIQUID SYSTEM

page 10–12

The results of experimental investigations of DC discharge ignition under reduced pressure between the liquid anode and metal cathode are shown. The discharge ignition process for distilled water and prepared solutions is considered. The obtained data will be used in the future to obtain an adequate mathematical description of the processes in the plasma-liquid system. During investigations it is fixed the occurrence of cathode streamer with a deficiency of the charge carriers. It is noted that by using a liquid solution, in which impurities are present, that affect the structural changes in the water, the instantaneous breakdown with a bright flash of discharge ignition occurs at the streamer formation at the anode.

The presence of bubbles helps to formation and migration of the charged particles that helps to maintaining a discharge. The obtained data allow a better understanding of the regularities of the plasma-chemical treatment process of liquid environment.

Keywords: plasma, streamer, discharge, ignition, liquid cathode.

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PROCESSES AND EQUIPMENT OF FOOD AND CHEMICAL INDUSTRIES

VERTICAL CYLINDRICAL IR DRYER DEVELOPING

page 13–15

The possibility of film radiant electric heater use in a designed vertical cylindrical IR dryer with the possibility of the secondary (heated) air use is grounded in the article.

In this regard, the vertical cylindrical infrared dryer has been developed and designed at the Department of processes, devices and automation of food production of Kharkiv State University of Food Technology and Trade.

The designed experimental vertical cylindrical IR dryer has the following advantages: a uniform heat flux across the receiving surface (trays of raw materials) due to the form of IR dryers and similar geometry of FREH; optimal radiant component of IR sources during the heat transfer process, protected the raw material against overheating of excessive moisture evaporation and destruction of the surface layer because of the drying process temperature is 45 °C (point a) at a wavelength of 9 micrometers; simplicity of design and operation with the use of automation at all stages of drying; the use of secondary (heated) air for intensification of drying processes, the creation of the turbulent regime in the boundary layer near IR emitters; low energy and metal content of construction.

Keywords: IR radiation, vertical cylindrical IR dryer, film radiant electric heater, fruit and aromatic raw materials.

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CHOICE OF METHOD FOR FLUID INFLOW LIQUIDATION

page 15–17

The analysis of scientific articles and published industry data to generalize the problem of fluid inflow liquidation and develop the recommendations for choosing the optimal method of fluid ablation with accounting the conditions of its admission into the hole is conducted in the article. It is established that the widest practical application have the acquired expectations and weighting method and the «driller method». A generalized comparison of methods is obtained and the factors that affect the technological possibility of their implementation are established. The basic of which is the amount of fluid that entered the hole. The recommendations on their use depending on the conditions of inflows are developed. The results of the investigation can be used by drilling-engineers at inflow liquidation and professionals involved in the creation of intelligent decision support systems.

Keywords: hole drilling, fluid, fluid inflow liquidation.

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STRAW CELLULOSE OBTAINING IN THE ISOBUTANOL — HYDRAZINE — KOH SYSTEM

page 17–20

The delignification process of wheat straw in isobutyl alcohol — hydrazine — KOH system in the range of 140–160 °C and length 60–150 min is investigated. It is shown that the quality values of obtained cellulose are naturally decreased with increasing of temperature and duration of cooking, due to the intensification of lignin destruction process. Laboratory castings of straw pulp has the following physical and mechanical properties, tensile length of 6200–6900 meters, forcing index 4,2–4,5 kN/g, number of double kinks 520–600, that is higher than the wood cellulose quality obtained by traditional sulfate and sulfite cooking methods.

The chemical composition of top layer of worked-out solution is determined by the method of proton magnetic resonance. Four major peaks that correspond to isobutanol groups and confirm ability to use the top layer of worked-out cooking solution to the following cooking are observed in the obtained spectra.

Keywords: cellulose, wheat straw, isobutyl alcohol, hydrazine, nuclear magnetic resonance.

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DEVELOPMENT OF SYNTHETIC ELECTRICAL INSULATING PAPER

page 20–22

The analysis of modern high requirements to paper features that used for electric insulation, among which it is highlighted a number of key features such as heat resistance, dielectric strength, water absorption, tangent of the angle of dielectric losses is presented in the article. Some results of our research in this area are given. The research is conducted by manufacturing of laboratory samples of 100 % synthetic paper using a composition of polyester fibers as main and two binding options. It is developed a composition of paper that have a high thermal stability and gives an electric insulation synthetic paper with low water absorbency, low dielectric loss tangent. The synthetic paper made using a matrix of polypropylene fiber has low dielectric loss index value, which will use this paper for insulation in high voltage cables. Using of such paper will reduce losses during electricity transmission.

Keywords: synthetic electrical-insulating paper, breaking force, electric strength, tangent of the angle of dielectric losses.

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TRANSPORT TECHNOLOGY

PROBLEMS OF TRANSPORTATION TECHNOLOGY IMPLEMETING OF COMPRESSED NATURAL GAS IN MARINE AREAS

page 23–25

The problems of transportation technology implementing of compressed natural gas in marine waters are considered in the article. The results of international experience investigation of companies involved in maritime transport gas market are given. The aim of the research is to develop the basic principles of drafting the transportation of compressed natural gas for their success. It is considered the possible reasons for the lack of implemented projects and it is outlined the feasibility area of marine transportation of compressed natural gas. The list of issues that require consideration when developing projects is determined according to the research results taking as a basis the implementation scheme of compressed natural gas transportation technology using self-propelled barges. The research results will contribute to the implementation of a specific project in reality and will serve as support for technology in general.

Keywords: compressed natural gas, self-propelled barges, project planning.

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ENERGETICS AND ENERGY SAVING

ABOUT THE ECONOMIC EQUIVALENT OF REACTIVE POWER OF ELECTRIC SUPPLY SYSTEMS

page 26–30

A scientific and methodological approach to assess the economic costs of electricity consumers from their own reactive load power supply systems, based on an understanding of electricity as a physical phenomenon is proposed. In this case: 1. A working tool of this system is its electromagnetic field that creates the simultaneous action of voltage and conduction current of conducting part of system on electro-elastic dielectric environment surrounding the mentioned parts. 2. Reactive power of system is its internal energy and it isn't physically transferred to consumers or from them.

By regulation definition, such economic losses of consumers are provided if the standard value of economic equivalent of reactive power, the same for all consumers, depending on the number of transformations in their supply network, is kept in systems of its supply. This position is not supported by either physically or mathematically. Therefore, there is no single point of view on the use of such factors in the specialized electric energy literature.

In this article there are proposed the determination of economical coefficient of reactive supply based on real mathematical model of electric supply system and there are given the technique of its determination for real system. In this case, the consumer's loss from its reactive load in cash is determined. This technique can uniquely determine the problem: pay for not existing reactive power by suppliers, or buy the compensate devices of their own reactive load.

Keywords: electricity, electric supply, reactive load, economic equivalent of reactive power.

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DEVELOPMENT OF ALGORITHM AND PRODUCTIVITY CALCULATION PROGRAM OF COAL-PULVERIZATION SYSTEMS OF BOILERS ТП-92

page 31–34

The urgent need to identify the actual productivity of coal-pulverization system for an extended period of operation appears in connection with the supply of coal to power plants with non-project specifications.

The purpose of this article — developing an algorithm and calculation program for drying and grinding productivity of coal-pulverization system with mills 6M75U of boilers ТП-92 units of 150 MW energy unit that allows to perform calculations of actual productivity of coal-pulverization system depending on coal quality and availability of coal-pulverization system.

The parameters, which measure in coal-pulverization system is impossible, to analyze the impact of some fuel characteristics of coal-pulverization system condition for drying and grinding performance and the impact of some coal-pulverization system characteristics on specific electricity consumption for coal dust preparation may be additionally determined by the developed program.

Keywords: pulverized coal boiler ТП-92, mill 6M75U, coal-pulverization system productivity calculation program.

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CONTROL METHOD OF THE QUANTITATIVE CONTENT OF LIQUEFIED PETROLEUM GAS COMPRNENTS AND DEVICE FOR ITS REALIZATION

page 34–36

The quantitative value of liquefied petroleum gas, such as methods of its measurement and sensors based on them, are shown in the article. It is proved that determine the mass fraction of liquefied petroleum gas is critical because the constant improvement of liquefied petroleum gas quality control is very important for industry today. The aim of work is developing a method for controlling the quantitative content of liquefied petroleum gas components and experimental unit for its implementation. To achieve this aim it is necessary to develop a method for determining the quantitative content of components in the mixture of liquefied petroleum gas, that improving a general accuracy due to taking into account not only the quantitative composition of propane and butane, but impurities, that affect the quality of liquefied petroleum gas and have a detrimental effect on manufacturing equipment and unit due to the temperature parameters, confirming the adequacy of the proposed method.

Keywords: liquefied petroleum gas, mass fraction, propane, butane, impurities.

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DEVELOPMENT OF COMPLEX METHOD OF INTELLECTUAL CONTROL IN COGENERATION SYSTEMS

page 36–39

It is developed a complex method for controlling the operation of the cogeneration system using such dynamic subsystems as: electric accumulator battery, heat electric accumulator; electric accumulator battery, heat pump, which uses a recover heat as a low-grade energy source, which changes as the production of energy and its consumption as a part of a cogeneration unit; biogas plant, heat pump, which uses the fermented wort as a low-potential power source, electric accumulator battery and heat electric accumulator. Predictive information obtaining for decision-making under conditions of not matching production and consumption of electric power and heat can reduce the cost of energy production and emissions of carbon dioxide by 15 %. Biogas saving, for example, by fermentation of 60,2 t/day with increasing marketability of raw biogas unit at 10–15 % is 49400 m^3/year.

Keywords: intelligent control, decision making, cogeneration system.

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STUDY OF ENVIRONMENTAL PERFORMANCE OF THE BOILER ТПП-210А AT DIFFERENT DUST FEEDING SYSTEMS

page 39–42

The environmental problems of reduce the harmful effects of thermal environment are actual for Ukraine. Replacing of old equipment requires substantial new funds. Therefore, an important task in the energy of Ukraine is extending the life of existing thermal power plants. The effectiveness of the fuel regime of energy boilers equipped with a high concentrated dust feeding with pressure on burners at combustion of low-reactive worsen quality coal is investigated in the article. The results of the comparative tests of ТПП-210А boilers with dust feeding with a high concentration and traditional dust feeding system are given. The comparative experiments, experiments to determine the effect of operational factors on the value of emissions of nitrogen oxides are included in the extent of testing.

Analysis of comparative research shows that environmental (for NO_x) performance of the boiler equipped with dust feeding system differ from the boilers with traditional pulverization system and reducing of NO_x emissions is observed.

The experience of using the system of high concentration dust feeding (HCDF) on boilers of Trypilska TPP can recommend it for implementation in similar boilers of Ukrainian power stations. Based on experimental studies performed on the boiler ТПП-210А with the traditional dust feeding system and dust feeding system of high concentration it is found that the dust feeding system of high concentration has advantages over the traditional system, namely reduction of NO_x emissions, the cost of electricity for own needs and repair work.

Keywords: steam boiler, fuel, dust feeding system of high concentration, fuel treatment, nitrogen oxides.

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STATIC CHARACTERISTICS OF ELECTROMECHANICAL SYSTEMS WITH SECOND ORDER SLIDING MODE

page 42–46

The article is devoted to analytical investigation of the steady state points of generalized closed electromechanical systems that are experiencing the oscillatory processes. The main purpose of this paper is to develop the method for steady-state values determining of the state vector components of a closed system, depending on its control algorithms and equations of motion. Methods of differential geometry and modern control theory allow converting these equations, representing them to the different phase spaces. Transition to the space, the coordinates of which are interconnected by differential dependencies, is done in the work by the feedback conversions and a system of equations of a generalized electromechanical object motion in controlled Brunovsky form is obtained. Based on the analysis of the system it is found the equation of static equilibrium of the object, and it is shown that this equation equating to controller algorithm simplifies the determination of steady-state values of the state variables of the object. Using the proposed method is illustrated by the definition of control error and finding the static characteristics of control loop of DC electric drive position. This material can be useful for specialists in the field of electromechanical systems of automation and control systems of dynamic objects.

Keywords: electromechanical system, second-order sliding mode, static characteristics, nonlinear control.

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EFFICIENCY ASSESSMENT OF BALANCING DEVICES APPLICATION IN THE LIGHTING SYSTEMS OF BUILDINGS

page 47–51

In the article there are discussed the using of balancing devices in lighting systems of buildings carried out on the basis of lighting devices with LED light sources, in order to increase their efficiency by eliminating the single-ended modes, which arise at random switching on and switching off the power single-phase receivers and lighting loads.

It is proposed the possible variants for power supply of lighting devices with LED light sources, including through the balancing thyristor voltage regulator, which is a source of direct current and fully balanced the load. Transition to the DC power supply will help reduce losses, costs of electricity and the higher harmonic components of current and voltage, increase the coefficients of power, reliability and electrical safety of these systems.

The technical and economic evaluation of different variants of power supply of LED light sources is done in the article, the variant with the best specifications is proposed.

It is proposed in the future to perform the scheme of power supply of buildings in combined variant, which implies the power supply of power electrical receivers from AC 380/220 V, and the lighting power consumers — from the DC network.

Keywords: electricity, lighting, LED light source, thyristor voltage regulator, balancing.

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