



THE INFLUENCE OF ORTHO-PHOSPHORIC ACID AND KAOLIN ON THE PROPERTIES OF UNBURNT REFRACTORY MATERIAL

page 4–6

This thesis investigates the development of a composition of unburnt refractories based on shards of high-alumina refractory products and sintered corundum, kaolin and ortho-phosphoric acid. The experiment was carried out to determine physical and mechanical properties of the developed compositions. The analyzed results show that 7–9% ortho-phosphoric acid content allows to receive the best properties specimen. It was also identified that the quantity of ortho-phosphoric acid influences the physical and mechanical properties of high-alumina samples both after heat treatment and after hard firing. In addition the experiment shows that the interaction of kaolin and ortho-phosphoric acid leads to the formation of combinations, which provide high mechanical strength to the obtained refractory material. The use of the ortho-phosphoric acid for such products manufacturing significantly simplifies the manufacturing technology of refractory materials, excludes their hard firing, cuts process losses and reduces finished material costs. The paper shows the perspective for production of the unburnt mullite-corundum refractories with improved operational properties based on the shards of mullite-corundum products, sintered corundum, kaolin as a clay bond and ortho-phosphoric acid as a phosphate binder.

Keywords: unburnt refractories, phosphate binder, kaolin, mullite-corundum products shards.

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COMPARATIVE ANALYSIS OF THE MINERALOGICAL COMPOSITION OF THE NATURAL CHALK DEPOSITS OF UKRAINE

page 7–11

Using the methods of quantitative infrared spectroscopy and the X-ray phase analysis it is analyzed sedimentary chalk of five different domestic deposits compared to chemically precipitated and import calcite. Presence of calcite, dolomitic, aragonite in their composition is fixed. It is given a quantification of the content (for half-width

within the 562–1047 cm^{-1} for imported calcite, 440–703 cm^{-1} for the national sedimentary chalk and 530 cm^{-1} for the chemically-deposited chalk, and the ratio of the intensities of characteristic absorption bands of carbonate anion respectively 10,38–45,33; 26,80–47,33 and 35,15) of the main structure minerals of these kinds of carbonates. It is received the data confirmation of IR spectroscopy by X-ray phase analysis of the main types of natural chalk and it is obtained quantitative structure of main content (calcite, dolomite) and extrinsic (quartz, kaolinite, iron hydroxide) minerals. According to the parameters of characteristic absorption bands in the range of 712–876 and 2512–2522 cm^{-1} modification of calcium carbonate – calcite – it is conducted differentiation of quantitative indicators, depending on the origin of the material. It is noted greater uniformity of mineralogical composition of import carbonates.

These data allow formulate reasonable frameworks of use of domestic sedimentary chalk and assess its competitiveness compared with chemically-deposited chalk and Turkish calcite.

Keywords: calcium carbonate, calcite, dolomite, aragonite, quartz, infrared spectroscopy, absorption band, intensity.

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RESEARCH INTO MINERAL HYDRAULIC OIL AGING. II. HOMOLOGICALLY AND GROUP COMPOSITION OF THE FRACTIONS

page 12–15

One of the indicators that determine the level of safety is the reliability of the aircraft, including the hydraulic system and its units. Reliability is a property of the system (or item) to store the parameters within specified limits under specified conditions for a specified time (service time). It should be a sufficient level of reliability of the hydraulic system of the aircraft and its units, along with others, ensure the quality of the hydraulic oil at the time of filling the hydraulic system, and for a long operation – the degree of preservation of the guaranteed shelf life of oil resources. In this regard, the task is urgent studies of chemical processes that occur in the hydrocarbon composition of oil during prolonged its use, and its impact on the conservation of the resource life of guaranteed oil. Hydrocarbon oil composition determines the values of the specified standards of quality oils, their change reduces the reliability of the hydraulic system of the aircraft.

Features of compression reactions of molecular unsaturated hydrocarbons are established, thereby forming secondary naphthenic structure in the second fraction of model samples of «Hydrauncoil FH-51» oil. It is also found that densification processes of thermal oxidative compression of olefin and naphthenic-aromatic hydrocarbons are intensified with the time of oil exploitation, resulting in formation of high-boiling compounds. The progress of the fore-said processes leads to the formation of associates between molecules of phenyl- α -naphthylamine additives and aromatic molecules, and

unsaturated oxygenates, aromatics and naphthenic-aromatic compounds.

Keywords: oil aging, liquid chromatography, mass spectral analysis, reliability of the hydraulic system.

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ANALYSIS OF INTENSIFICATION METHODS OF HEAT AND MASS TRANSFER IN THE DRYING PROCESS AND DEWATERING FEATURES OF THERMOLABILE ORGANIC MATERIALS

page 16–19

The traditional ways of intensification of heat and mass transfer in drying materials are analyzed in the article.

Part of the above methods of intensification is implemented in the cameras of compatible processes.

Construction analysis of compatible processes showed that in order to implement active hydrodynamic regime in the chamber during processing high-wet thermally labile materials such as chicken manure, sludge after fermentation process and so on is most advisable to use a mechanical rotor rotating along the axis of the camera. This results in generation of a weighted layer material, separation of large pieces, swirl of the gas flow, reducing adhesion to surfaces of working chamber, constant updating of heat transfer surface.

The author has experimentally proved that you can get these orders of magnitude using a method of compatible drying and dispersion processes by mechanical rotor drying thermally labile high-wet materials:

- heat-transfer coefficient within 900–1200 W/(m²·deg.);
- initial coolant temperature within 600–800 °C;
- number of heat for evaporation within 3500–4000 kJ/kg of evaporated water;
- average camera strain on evaporated moisture 350–400 kg/(m³·h).

Keywords: drying, intensification, thermolabile material, camera, compatible process, machine rotor.

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OPTIMIZATION OF GRANULARITY AGGREGATE OF THE PERICLASE CONCRETE

page 19–25

Magnesia concrete used for the manufacture of complex configuration and monolithic linings of thermal units of ferrous and nonferrous metallurgy, industry of cement production is effective respond to combination of high temperature properties and adaptive capacity to the conditions of usage. Promising species of magnesia concrete include periclase concrete on hydraulic binders such as concretes containing cements of different nature.

Using simplex-lattice method of planning experiment it is investigated the influence of grain size of concrete mixes, which contain a filler recycled materials – crushed lack of periclase products and sintered periclase, and a binder – a mixture of periclase and calcium-alumina cements on the performance properties of the treated periclase concrete. Using the obtained polynomial models in the «structure-property» optimized particle size distribution of periclase concrete on hydraulic binders, which corresponds to a ratio of narrow fractions of filler and achieves a complex set of physical and technical properties of the composite indexes after drying and high-temperature firing.

Keywords: grain size, periclase concrete, aggregate, hydraulic binder, performance of the properties.

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OBTAINING THE NANOSIZED PARTICLES FROM AQUEOUS SOLUTION OF SILVER BY PLASMA CHEMICAL METHOD

page 30–34

The influence of plasma chemical treating of aqueous solution containing silver ions for formation of the nanosilver particles, their size and their variation over a predetermined time interval are studied. As a processing tool is used the contact non-equilibrium low-temperature plasma that formed between the electrode (anode), located in the gas phase and the liquid surface, a recessed electrode therein. As the cathode it is used an electrolytic solution AgNO_3 in the distilled water. Characteristics of the obtained nanoparticles, their absorption spectra, size, stability in aqueous medium and in the dry state in powder form are studied. The results will be used to create a refined mathematical model of plasma-chemical treatment of liquid media, the general equation of which is given in this article.

Keywords: non-equilibrium plasma, discharge, liquid cathode, low pressure, aqueous solution.

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DEVELOPMENT OF WHITE TITANIC ENAMEL COATINGS WITH REDUCED BURNING TEMPERATURE

page 25–30

The work contains research of the influence of modifying additives Li_2O and BaO on the properties of frits and optical characteristics of white titanium low-fluoric enamel coatings.

Optimal concentration of research oxides (0,5 mas. % Li_2O and 0,75 mas. % BaO) is determined in composition of enamel coatings. White low-fluoric titanic glass coatings are obtained with specified optical characteristics: diffuse reflectance (DR) – 78 %, yellowness (G) – 4,57 %, regular reflectance (RR) – 75 %.

Softening temperature of glass enamel being lower than domestic industrial analog is established by the method of differential and thermal analysis. Prevailing crystalline phase represented foremost in anatase form of titanium dioxide is using roentgen and phase analysis.

The developed enamel glass coatings with specified optical parameters are more fusible compared with industrial analogs and meet the requirements of standards for internal and external enamel coatings and can be recommended for industrial testing with low-temperature short-term mode of burning.

Keywords: white coating, low-phosphorus enamel, whiteness, yellowness, barium oxide, lithium oxide.

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DEVELOPMENT OF EQUIPMENT AND TECHNOLOGICAL SCHEMES TO REDUCE EMISSIONS OF SUGAR FACTORY

page 35–41

The state of utilization of steam and gas emissions in the sugar industry is analyzed. The significant emissions at low stimulation work to reduce them are stated. One reason for this situation is the lack of cost-effective recycling of heat and chemical potentials.

One of the ways to reduce emissions is to intensify the work of saturation and sulfitation devices. Data of research of saturation device with the first stage of phase contact spray and subsequent bubble are presented. The implementation of saturation process in this unit allows increasing the utilization rate of CO₂ by 20...25 % and improving the quality of the juice.

For deeper utilization of steam and gas emissions it is proposed technological scheme, which involves pretreating beet chips by exhaust sulfur burned and carbonated gases. Such treatment would allow on the one hand minimizing thermal pollution emissions and corrosive gases and, on the other hand utilizing the energy potential of the preparation of raw materials for extraction. The equipment for this treatment is available commercially or can be produced by the sugar factory itself.

Keywords: emissions, sugar factory, corrosive gases, process flow diagram, saturator, sulfitor, extraction.

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UNIT FOR VIBRO-IMPACT DEHYDRATION OF WASTES OF FOOD PRODUCTION IN THE PRESS-FORM

page 41–46

It is described the unit with hydro-pulse drive for a three-step vibro-impact dehydration of wastes of food production (distillery stillage, spent grains, beet pulp, barley coffee and sludge) in the closed mold. Made using the stand-prototype experimental verification of capabilities of the proposed facility showed that it could provide in comparison with the known machines for the mechanical dehydration of 10–60 % lower final moisture content of waste, compared with equipment for thermal and electrolytic dehydration in 270–920 times less power consumption, as compared with units for the implementation of chemical and biological methods – better performance of workflows. In addition, a comparison of the unit with previously developed by the author complex of multi-stage dehydration of four separate pieces of equipment, based on calculations, showed a higher efficiency of the first: 9,5 times better performance and 33 times lower power consumption of dehydration, proposed equipment has a lower consumption of materials and dimensions, high reliability and security for staff. The article also provides formulas for determining these indicators of economic efficiency of the vibro-impact systems for dehydration of wastes of food production in the closed mold.

Keywords: vibro-impact dehydration, wastes of food production, mold, economic efficiency.

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RESEARCHING OF HEAT TRANSFER IN THE SURFACE LAYER OF THE MEAT PRODUCTS AT BILATERAL FRYING UNDER THE ACTION OF ELECTRIC CURRENT

page 47–51

Improving the energy efficiency of processes and equipment for heat treatment of meat and meat products is an actual scientific task.

A necessary condition for the development of new energy- and resource-saving equipment for frying meat is studying the mechanism of heat transfer in the surface layers of the product.

The article is devoted to determine the coefficient of heat transfer to the semi-finished pork with bilateral fried by an electric current during the second stage frying.

It is defined the mechanism of heat transfer in the surface layers of meat during the second stage of bilateral frying by an electric current. The method of calculation of heat through steam layers is proposed. With sound experiment it is determined the cycle of evaporation in the capillary meniscus of different diameters, which range from $111 \cdot 10^{-6}$ to $400 \cdot 10^{-6}$ s. Distribution of capillary by diameters is determined in the surface layer of meat, which ranged from $54 \cdot 10^{-6}$ to $122 \cdot 10^{-6}$ m. Real heat transfer coefficient calculated from one surface and two frying the product. The dependence of heat transfer coefficient on the specific surface power of frying surfaces is determined. It is theoretically calculated lengthy of process of bilateral frying natural meat by an electric current, which is identical to the real.

Keywords: bilateral frying, heat transfer, steam layers, meat, electricity.

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RESEARCH OF BEER QUALITY WITH THE ADDITION OF ELDER SAP

page 52–55

Today, beer production is aimed at developing and implementing a new range of products using new raw material, which gives it a certain flavor characteristics and increases the demand for products. In addition, the beer produced using non-traditional raw material has advantages: functional directed action, improved organoleptic and physical and chemical properties, longer shelf life. That is why work is devoted to the possibility of using the sap of black elderberry *Sambucus nigra* to make beer that promote the formation of a new range of products, to achieve the necessary organoleptic characteristics of the finished beer.

Based on theoretical and experimental studies it is established the optimal dose of elder sap for beer production, the basic physical and chemical characteristics and organoleptic properties of the finished beer.

Keywords: beer, wort, black elder (*Sambucus nigra*), yeast, technological parameters.

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ANALYSIS OF AMINO ACID COMPOSITION AND BIOLOGICAL VALUE OF PROTEIN FROM BUCKWHEAT GROATS OF DIFFERENT VARIETIES

page 55–61

The article presents the results of studies of amino acid composition and biological value of protein from buckwheat groats of different varieties. Due to the deficiency of dietary protein in many countries is urgent search of rich, accessible and cheap sources of complete protein, especially of plant origin. One of these sources is buckwheat, which has a high nutritional value and the consumer. The lack of certainty of the chemical composition of buckwheat groats in varietal breakdown, lack of data on protein amino acid composition of different varieties of buckwheat rise to the need for research in this area. To investigate it was chosen following varieties of buckwheat grown on fields of Plant Production Institute nd. a. V. Ya. Yuryev of NAAS of Ukraine: «Ukrainka», «Yaroslavna», «Kvitnik», «Kosmeya», «Duimovochka», «Dozhdik». Varieties differed by morphological characteristics, economic and biological characteristics, different origins and genetic basis. It is experimentally determined protein amino acid composition of buckwheat, which covers the vast majority of glutamic acid, glycine, arginine, cystine, aspartic acid. Leucine, lysine and threonine are released by high concentration among the essential amino acids. The calculated amino acid score shows that buckwheat protein is the most valuable source of scarce amino acids: methionine, lysine and tryptophan; has relatively high value of the score for phenylalanine and threonine, close to the «reference» protein for valine. It is established that all studied protein cereals of buckwheat varieties characterized by high biological value in comparison with other cereals, which is within 48,5...57,5. Buckwheat varieties can be placed by this measure in the next growing number: «Kvitnik» → «Dozhdik», «Duimovochka» → «Yaroslavna» → «Kosmeya» → «Ukrainka». The leader was a variety «Ukrainka» which protein was the most balanced in amino acid composition. This variety can be considered the most promising for use in the food industry to ensure the population by proteins of plant origin.

Keywords: buckwheat, buckwheat groats, selection variety, protein, amino acid composition, biological value.

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THE USE OF INERT GASES FOR STORAGE OF WHITE DRY WINES

page 61–64

The main aspects of the application of systems of inert gases in the wine industry are defined and the impact of these systems on the quality of white dry wines during storage is considered in the article. The object of the study were the wine made from white grapes Sukholimansky of harvest in 2014, obtained in the conditions of microvinification plant of «Tairov Wine Making and Wine Growing Institute» in Odessa region. Storage process of medium of different inert gases is conducted after the alcoholic fermentation of the wort according to the following schemes 1 — neutral medium, 2 — argon, 3 — nitrogen, 4 — gas mixture of argon and nitrogen (1 : 1). The results of an experimental study show the dynamics of physical and chemical parameters of dry white wines during storage in inert gas for 6 months. Comparative characteristic of various inert gases, the peculiarities of the effect of the selected storage schemes on the wine phenolic composition and content of aroma-producing substances are revealed, most effective system for their combined use is proved.

Keywords: white wines, oxygen, oxidation, inert gases, argon, nitrogen, phenolic compounds, aroma-producing substances.

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DEFINITION OF INDICATORS OF ENVIRONMENTAL SAFETY OF THE PROJECT OF WASTE USAGE AS A ROAD-BUILDING MATERIAL

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Intensive development of road building needs to find alternative substitutes for natural road building materials. The use of alternative materials in projects and programs of construction and reconstruction of roads significantly increase the level of environmental security through energy and resource conservation.

The system of indicators of environmental safety of waste management projects in road building includes a system of indicators of environmental safety and metallurgical waste criteria of environmental safety in the use of waste as an alternative road-building material.

Determination of integrated indicator of environmental safety of the project allows selection of pavement design from options under the algorithm design of pavement with a decrease in material consumption and energy intensity of construction based on the use of alternative materials.

The current system of evaluation criteria of pavement design has allowed developing a methodology of evaluation of environmental safety in projects using slag instead of natural materials in the construction of pavement. The economic effect of the project of slag usage in road building gravel instead of natural granite is conducted during the building of the highway Kyiv-Odessa and is 635–655 thousand UAH.

Keywords: project, environmental safety, road-building material, metallurgical slag, waste.

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