

A MEMBRANE TECHNOLOGY OF SEPARATING THE BASIC AVIATION KEROSENE FROM PETROLEUM (p. 4-11)

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The study focuses on the problems associated with separating kerosene from petroleum and subsequent applying it as a main component of aviation kerosene. Traditional technologies of separating the basic kerosene from crude oil solve the problem of producing AK only partially. Convection technologies cannot guarantee obtaining the basic kerosene with the same physical and chemical parameters that are strictly limited in modern jet fuel. The article presents some basic parameters of aviation kerosene and the same parameters of kerosene produced by distillation. Comparison of these parameters shows that the required quality of aviation kerosene requires significant transformations of the basic kerosene and involves tangible costs.

The situation drastically changes with the use of membrane technologies of crude oil refining, namely, the pervaporation technology of kerosene separation. The efficiency of this technology is proved by comparison of properties of the basic kerosene produced by means of different technologies. The use of special polymeric membranes allows recovering "pure" kerosene fractions, not "polluted" with components of adjacent fractions, at low temperature modes and under atmospheric pressure, which permits controlling the composition and properties of the basic kerosene. In addition, polymeric membranes are acid-resistant, waterproof, and significantly limit the penetration of sulfur compounds. All this allows producing the basic AK with the required parameters, which reduces the number of additional technological processes and additives, and, therefore, decreases costs of producing aviation kerosene (AK).

Keywords: aviation kerosene (AK), pervaporation, oil refining, membrane, polymer, a mixture of hydrocarbons.

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INFLUENCE OF VACUUM ON KINETIC OF LOW QUALITY RAPESEED OIL AMIDATION BY AMINOETHYLETHANOLAMINE (p. 12-17)

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The process of direct amidation of low-grade canola oil with high free fatty acids content has been researched. Influence of different technological parameters on consumption of reagents and accumulation of reaction products have been established for the temperature of reaction 160 °C. Concentrations of esters, free fatty acids, alkylimidazolines and amine components have been determined during the reaction time. Application of vacuum during the amidation process has great influence on free fatty acids consumption as well as on alkylimidazoline formation. Effective rate constants have been calculated for reactions of conversion of free fatty acids and esters into amides with and without vacuum. It has been determined that effective rate constant of free fatty acids consumption under atmospheric pressure is three times lower than under vacuum 40–60 mm. Hg. as well as those for esters. Along with an increase in free fatty acids consumption,

the speed of alkylimidazolines formation rapidly increases with vacuum applying. Such effect is explained by shifting of equilibrium in reactions of free fatty acids consumption and alkylimidazoline formation by removing of reaction water by vacuum. Formation of amides of fatty acids and alkylimidazolines confirmed by IR-spectroscopy.

Keywords: amidation, low-quality oils, alkylimidazolines, surfactants, rate constants.

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AN IMPROVEMENT OF THE TECHNOLOGY OF MANUFACTURING SUPPLE LEATHER THROUGH ENZYMIC PLASTICIZING OF A STRUCTURED SEMI-FINISHED PRODUCT (p. 18-22)

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We have developed a technology of enzymatic plasticizing of chrome-tanned semi-finished leather with using protosubtilin G3x in the production of leather. To develop the enzymatic

plasticizing technology, the used material was a semi-finished product of the method of chrome tanning after a neutralization process; it had been derived from large pig hides with an average area of 180 dm² (a weight of 6.8 kg) and cattle (heifers) with an average heavy weight of 24.3 kg. The average area of the finished leather material was 133.0 dm² and 316.0 dm². Enzymatic plasticizing was produced by applying protosubtilin G3x at a temperature of 54 °C. Enzymatic plasticizing of semi-finished leather compared with the control technology ensures the formation of the material structure with deformation and plastic properties increased by 28.0–44.0 % and 26.0–43.0 %, respectively from hides of pigs and heavy heifers.

The process of enzymatic plasticizing of chrome-tanned semi-finished leather is enabled by the destruction of hydrogen and natural links between the lateral radicals of collagen macromolecules as a result of forming temporary enzyme-collagen complexes, followed by blocking released functional groups with fat emulsion particles. This twice reduces the duration of mechanical plasticizing after the processes of drying and moisturizing.

The current technology used by the PJSC “Chinbar”, which includes enzymatic plasticizing by enzymaz 10TD, provides an increased output area of the leather material from semi-finished hides of pigs and heavy heifers compared with the control technology, respectively by 3.5 % and 4.0 %, and an opportunity to get an economic benefit of 1.2 thousand UAH and 3.3 thousand UAH per 100 m² of the finished material.

The use of protosubtilin G3x in the developed technology of enzymatic plasticizing in optimal conditions helps reduce the duration of mechanical plasticizing two times and increase the output area by 6.3 % and 5.4 %, respectively for leather obtained from hides of pigs and cattle, which can provide an economic benefit of 1.86 thousand UAH and 4.45 thousand UAH per 100 m² of the finished material compared with the control technology.

The developed energy-efficient and more cost effective technology of enzymatic plasticizing of chrome-tanned semi-finished leather from cattle hides and large pig hides can be considered rather promising for introduction into the manufacturing of supple leather materials.

Keywords: enzymatic plasticizing, chrome-tanned semi-finished product, leather material, output area.

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RESEARCH OF CONSUMER PROPERTIES OF LEATHER FILLED WITH THE USE OF ELECTROACTIVATED WATER REAGENT SOLUTIONS (p. 23-28)

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Consumer properties of the filled macroporous chrome-tanned semi-finished leather obtained by the developed technology using electrochemically activated aqueous solutions of the composition comprising xanthan acrylamide were studied. Sorption-desorption properties of different sections of the filled material during its interaction with water, relaxation and deformation characteristics, differential moisture content on a thermo-gravi-calorie-metric installation, volume yield were determined.

It was found that the leather material obtained by the developed technology has higher elastic and plastic strain components by 1.7 and 1.3 times respectively compared with the current technology; porosity, volume yield and hygroscopic ability of obtained samples exceed those of the samples of the experimental technology by 4.5; 19.0; and 9.8–11.3 % respectively. The technology of filling of chrome-tanned leather material from pig skin is implemented by diffusion of the composition ingredients in the anolyte solution at pH 4.2–4.4 with the reduction of surface tension, the formation of mostly hydrogen bonds between the elements of the modified structure

of collagen and the filler reagents. The interaction with water results in partial destruction of bonds that are restored after moisture removal. Optimum consumer properties are achieved at a certain ratio of the hydrophilic ability and the differential porosity type of the leather material.

The use of the filling composition involving xanthan acrylamide in the anolyte provides effective alignment of porosity in different sections of the semi-finished product due to preferred filling of large pores and increase in the specific volume of smaller pores with the composition. The resulting fine-pored leather material with the split fibrillar structure causes a smaller loss of its area by 0.3 % after moisturizing and drying processes compared with the current technology.

The leather material formed using the developed technology due to the complex of consumer properties is recommended for making the insides of shoes – insoles and lining and moisture removal material in the mechanical surface cleaning of products and structures.

Keywords: semi-finished leather, filling, activated water, xanthan acrylamide, porosity, hydrophilic ability, elasticity.

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DESIGNING A COMPOSITION FORMULATION OF SURFACE ACTIVE SUBSTANCES FOR THE PRETREATMENT OF KNITTED FABRIC (p. 29-36)

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The process of pretreatment of knitted fabrics for dyeing is the most important technological operation. As a result of the pretreatment, fabrics acquire capability to wet evenly, which contributes to the uniform putting of the solutions of dyes and other decoration substances.

Based on the analysis of the washing and wetting capacity of different classes of surface active substances, we determined those preparations, which ensure the optimal capillary properties of knitted fabric.

A mathematical model by the wetting and washing capacities was obtained by the method of mathematical planning of the experiment – the Scheffe's simplex lattice plan of the second order.

Based on the obtained results, the Authors carried out optimization of the models “composition-property” and determined the optimal formulation of the composition for pretreatment of cotton knitted fabric for dyeing, g/l: SAS1=3,40; SAS2=2,75; SAS3=0,90; SAS4=2,90. It was found that the application of the proposed composition of SAS of the concentration 1,2 g/l for the technology of pretreatment of knitted fabric leads to a significant increase in the capillarity of knitted fabric (by 3 times) and the degree of fixation of active dye (by 7,5 %).

Keywords: knitted fabric, pretreatment of knitted fabric, formulation of surface active substances, the Scheffe's plan.

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THE IMPROVEMENT OF DAMPENING SOLUTION FOR OFFSET PRINTING (p. 37-44)

Olena Velychko, Kateryna Zolotukhina, Tatiana Rozum

Experimental models of dampening fluids with antibacterial additives are developed. The influence of additives on the change in conductivity and acidity of dampening fluids and stability characteristics during operation and storage are studied. Methods of processing dampening fluids to improve their performance level and quality of the final printed product are studied. The work reveals some new facts about the characteristics for printability such as influences of dampening solution's additives on the color characteristics of imprints. The material is devoted to the study of complex technological environment interference parameters printed contact and method of stabilization for the normalization of quality reproduction images of porous and non-adsorbent materials. There were grounded technological parameters of stable color reproduction by minimizing the ratio of ink transferring on non-adsorbent and porous materials.

There were developed for a special purpose additions to regulate the offset printing process and method of their introduction into the technology environment and its control that allows to improve the quality of printed production. The effect of technological environment components on stability of printing process has been determined.

Keywords: printing products, offset printing, dampening fluid, antibacterial additives, conductivity, acidity.

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EFFECT OF MODIFIED GLASS MATRICES ON THE STRENGTHENING OF GLASS CRYSTALLINE COATINGS (p. 44-49)

Georgy Lisachuk, Ruslan Krivobok, Lubov Bilostotska, Yulia Trusova, Ludmila Pavlova, Katerina Podchasova

The possibility of strengthening glass-crystalline coatings with the joint action of three types of modifiers (ZnO, TiO₂, SnO₂) was studied. The influence of the concentration of each out of three modifiers on phase transformations in the process of thermal treatment of the coatings was experimentally examined. A mechanism of the action of oxides-modifiers on the formation and growth of the crystal nuclei of the formed phases was proposed. The mechanism for strengthening a glass matrix consists in intercalation (embedding) of the modifying groups (ZnO and TiO₂) into the grid of glass with the subsequent formation of nuclei of a new crystalline phase of the type of solid solutions. The specific character of chemical composition consists in the introduction of SnO₂ to a glass-crystalline coating in the amount of not less than 15 %, which does not activate the process of phase formation but contributes to the inhibition of growth of the crystals of newly formed phases. It is the presence of tin dioxide that offers a possibility of controlled crystallization and obtaining materials with the set submicrostructure.

The fine crystalline phases, which are immobilized to a glass matrix, contribute to the formation of homogeneous siall-like structure. In this case, the proportionality of the particles is achieved, which makes it possible to obtain material with high strength and thermomechanical properties.

The new compositions of glass-crystalline coatings with increased (by 50 %) strength and thermal resistance (by 70 %) may find wide application in the technology, different areas of chemical, textile industry, machine building, electrochemistry, medicine and construction.

Keywords: glass matrix, modifiers (ZnO, TiO₂, SnO₂), fine crystalline phases, strength and thermomechanical properties.

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TECHNOLOGICAL AND KINETIC REGULARITIES OF FORMATION OF SUSPENSION AND ITS INTERACTION WITH NITRIC ACID WHILE OBTAINING CALCIUM NITRATE (p. 49-55)

Mykola Oliinyk, Anatoliy Shestozub, Vladimir Suprunchuk

The results of studying the processes of forming calcium hydroxide transportation suspensions and their neutralization by nitrate acid with the development of energy-saving technologies of obtaining calcium nitrate were presented.

As a result of the research, the process of calcium oxide hydration in the calcium nitrate solution was substantiated and the mechanism of the suspension thickening was proposed.

The limit lime concentrations in the calcium nitrate solutions were established, the process of calcium oxide hydration in these solutions was theoretically calculated. The mechanism of thickening of the prepared suspension (suspension of $\text{Ca}(\text{OH})_2$ in $\text{Ca}(\text{NO}_3)_2$ solution), based on the formation of hydrogen bonds due to the presence of oxygen with unfilled orbitals, was explored.

The degree of CaO conversion (kinetics of hydration) depending on the time and the intensity of mixing in 35 % solution of calcium nitrate, which increases from 0.67 to 0.89 o. n. with an increase in the intensity of mixing $\text{Re}=1000\div 13000$ was established. The limit of the lime content for different concentrations of $\text{Ca}(\text{NO}_3)_2$ was defined: for 15 %-solution of calcium nitrate, the highest possible lime concentration on conversion to CaO is 350 g/dm^3 , for 20 %-solution, it is 320 g/dm^3 , for 25 %-solution, it is 295 g/dm^3 , for 30 %-solution, it is 275 g/dm^3 , for 35 %-solution – 240 g/dm^3 and for 40 %-solution, it is 200 g/dm^3 , respectively.

The results of the experimental research presented in the form of graphical dependencies and tabular data may be used for the improvement of existing and design of the new production facilities of calcium nitrate.

Keywords: calcium nitrate, lime, hydration, concentration, suspension, neutralization, nitrate acid, technology.

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COMPARISON OF THE EFFECT OF SUPERPLASTICIZING ADMIXTURES ON THE PROCESSES OF CEMENT HYDRATION DURING MECHANOCHEMICAL ACTIVATION (p. 56-63)

Ruslan Ibragimov, Sergey Pimenov, Ilham Kiyamov, Ramil Mingazov, Laysan Kiyamova

The results of the study of the influence of two different super-plasticizers on the peculiarities of the process of hydration during mechanochemical activation (MCA) of a binder are given. The influence of SAS admixtures during the MCA of a binder on the kinetics of heat release and the alkalinity of the liquid phase of cement slurry is revealed. Technological properties of concrete mixture and physicomechanical properties of heavy-weight concrete, obtained by the MCA of a binder with the SAS admixtures, were studied. Dependencies of the influence of SAS on the processes and the nature of cement hydration were established, as well as on granulometric and phase composition of hydrated new formations.

It was established that the application of SAS admixtures at the MCA of a binder makes it possible to substantially increase the efficiency of cement dispergation, which manifests itself in the decrease of grain sizes and the increase in specific surface area. The MCA of a binder with SAS admixtures makes it possible to obtain homogeneous cement suspension with the uniform distribution of water in the volume of cement, which positively affects physicomechanical properties and the quality of the obtained concrete.

The application of SAS admixtures at the MCA of a binder results in the reduction of induction period of hydration by 2–5 hours, and also in the acceleration of crystallization period by 5–7 hours faster than in the reference compositions.

MCA of cement suspension with SAS admixtures leads to the increase in the density of concrete mixture and a substantial increase in the strength limit of heavy-weight concrete at compression during all periods of hardening.

With the MCA of a binder with SAS, an increase in the amount of crystalline phase by 10–12 % is observed in the first twenty-four hours of hardening, which confirms the conclusion about acceleration of cement hydration with the joint use of SAS and MCA.

According to the results of a comprehensive study we received new data of the influence of super-plasticizing admixtures of different chemical bases on the peculiarities of the processes of hydration of a binder during MCA.

The obtained data can be used for selection of super-plasticizing admixtures in the production of the ferroconcrete products, obtained with the MCA of a binder, as well as in the technology of construction of buildings made of monolithic reinforced concrete.

Keywords: modification, super-plasticizing admixtures, mechanochemical activation, cement suspension, heavy-weight concrete.

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