ABSTRACT AND REFERENCES

TECHNOLOGY OF ORGANIC AND INORGANIC SUBSTANSE

USING *n*-TOLUENESULFURIC ACID SALTS AS ESTERIFICATION CATALYSTS (p. 3-6)

Stepan Melnyk, Maryana Dzinyak, Volodymyr Starchevsky

The influence of n-toluenesulfonic acid salts on technological parameters of the process of acetic and adipinic acids esterification by 1-butanol and 3-methylbutan-1-ol has been analyzed in non-stationary conditions. It has been determined, that using these kinds of catalysts, as compared to n-toluenesulfonic acid, provides reducing the dibutyl adipate and alkylacytates synthesis duration, lower acid number of reaction products and higher acid conversion with the concentration rate, proportional to the p-TSA. Although there is no need for the high catalyst concentration for achieving the effect, still it allows faster esterification process. The research has shown that low content of water, added to reagents in amount of 3-4 mass %, can reduce the dibutyl adipate and alkylacytates production duration almost by half without worsening its technological parameters. The effect of water influence lies in improvement of salt-catalyst solubility in reaction mixture at the initial reaction phase, that probably cuts the induction period of forming the catalyst–substrate complex. Further increasing of water content in the output reaction mixture causes low values of acid conversion. A series of cationic activities of n-toluene sulfonic acid salt metals in reaction of acetic acid esterification by 3-methylbutan-1-ol has been singled out. It has been found out that using aluminum and stannum n-toluene sulfates provides better technological parameters, than when using n-toluene sulfonic acid. The research results prove the effectiveness of using n-toluenesulfonic acid salts as esterification catalysts.

Keywords: esterification, catalyst (catalyst agent), n-toluenesulfonic acid salts, adipinic acid, acetic acid, 1-butanol, 3-methylbutan-1-ol.

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FORMATION OF NICKEL-SILICA GELS STRUCTURE IN THE CONDITIONS OF THERMAL- AND HYDROTHERMAL PROCESSING (p. 6-9)

Olena Kosenko, Antonina Kustovska

Silica gel-based binary jointly precipitated oxide-hydroxide systems can be considered as perspective adsorbents and blank substrates for catalytic active substances in which both regulation of porous structure and acid-base properties of surface are possible due to the presence of metal oxide. In the paper the systematic investigation of influence of jointly precipitated NiO: SiO_2 systems composition and conditions of their thermal and hydrothermal modification on porous structure of nickel-silica gels and their phase composition has been conducted. It has been shown that hydrothermal processing provides more opportunities for regulation of the porous structure than thermal processing, besides after hydrothermal modification nickel-silica gels have higher thermostability, which is important for their use in the high-temperature catalytic processes. The samples of nickel-silica gels with values of specific surface area 20-550 m^2/g, sorption volume of pores 0,1-0,8 cm^3/g, diameter of pores 20-800 Å and various phase composition were synthesized, that opens wide prospects for their application. The revealed laws were explained by combined action of mass transport and phase transformations and mutual influence of the components on these processes.

Keywords: nickel-silica gel, porous structure, hydrothermal modification, thermal processing, phase transformations.

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PRODUCTION OF SULFURIC ACID DURING ELECTROCHEMICAL PROCESSING OF SULPHATE-CONTAINING ELUATES (p. 10-13)

Inna Trus, Valentina Grabitchenko, Mukola Gomelya

The paper gives the results obtained during electrochemical processing of sulfuric acid solution. It is shown that when using double-chamber electrolyzer, doubled by anionic membrane MA-41, in the process of electrolysis sulfuric acid concentration can be increased

by 0,1÷1,0 - 7÷9 H. The process effectiveness depends on the acid concentration at the cathode and the initial acid concentration at the anode. The process proceeds efficiently with reduced to 0.01H acid concentration at the cathode. At high acid concentration at the anode the decreased amount of acid current efficiency can be observed.

High values of acid current efficiency were achieved using the acid concentration of 1÷2 h-eqv/dm^3 at the cathode.

It was found that with increasing current density the rate of electrochemical concentration of sulfuric acid significantly increases at the anode with decreasing acid current efficiency.

Keywords: electrodialysis, electrolysis, reverse osmosis, ion exchange, concentration, desalting, processing of eluates

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IMPROVEMENT OF SUPERPOSITION PRINCIPLE OF SUBSTANCE CONCENTRATION FOR WATERCOURSES (p. 14-19)

Sergey Ostroumov, Vladimir Kresin, Alexander Lesov

The paper deals with improving the superposition principle of substance concentration for watercourses. The substance superposition principle in watercourses arises from the linearity of turbulent diffusion equation and its boundary conditions. When using the superposition principle of substance concentration in water courses, usually only point sources of substance are taken into account, neglecting diffuse (distributed along the watercourse) sources and substance-containing effluents. Diffuse sources of substance are formed by the surface and ground waters getting to the watercourse as well as atmospheric precipitation on the water surface. Diffuse effluents are connected with the processes of water filtration through the watercourse bottom. The paper justifies the use of the superposition principle of substance concentration for watercourse with regard to the diffuse sources and substance-containing effluents. The formulas were obtained which reflect the superposition principle of non-conservative substance concentration in watercourse and simplify the calculation of two-dimensional field of substance concentration in view of point and diffuse sources and substance-containing effluents. The formulas allow improving the accuracy of calculations of water quality in watercourses.

Keywords: watercourse, maximum allowable discharge of substances, diffuse sources and substance-containing effluents.

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EXTRANEOUS DIFFUSION KINETICS OF AMMONIUM IONS ADSORPTION IN THE PRESENCE OF OTHER IONS (p. 19-23)

Jaroslav Gumnitsky, Vira Sabadash, Oksana Matsuska

The present article substantiates theoretical foundations of competitive adsorption of multicomponent systems on mineral sorbents. Monitoring of wastewater contaminated with ammonium ions, estimation of quantities, pecularities of localization and estimation of toxicological impacts on the environment was carried out. The existing theoretical apparatus for adsorption processes description was analyzed. Adsorption process mechanism and methods for identification of experimental data to theoretical models was developed. Kinetic characteristics of adsorption of ammonium ions on natural sorbents were determined. Sorption capacity of zeolite to ammonium ions in static and dynamic conditions was experimentally investigated. Influence of presence of phosphoric compounds and proteins on equilibrium and speed of absorption of ammonium ion was determined. Experimental data and theoretical models of adsorption were identified. Kinetic coefficients of adsorption processes were set. It has been established that the presence of foreign ions in solution significantly reduces sorption capacity of zeolite on ammonium ions.

Keywords: ammonium ion, zeolite, external diffusion, wastewater.

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FLOCCULANTS FOR NATURAL WATER CLARIFICATION (p. 23-26)

Yaroslav Radovenchik, Anastasiia Kostrytsia, Vyacheslav Radovenchik

The main objective of the study was investigating the effectiveness of new types of flocculants of foreign production for removal of bentonite particles from natural and waste water. Anion-active Magnafloc 156 with molecular mass of about 20 million mass units, cation-active flocculant Zetag 7692 with molecular mass of about 20 million mass units, as well as solutions of polyacrylamide (PAA) as a nonionic flocculant were investigated. It was found that in the process of natural water purification none of flocculants provides residual solids concentration after clarification, thus does not meet the requirements of regulatory documents. Therefore, they can be recommended for waste water purification or as the stage of preliminary treatment of natural water. All investigated flocculants are highly efficient in strongly acid environments. The PAA solutions are recommended for removing bentonite particles in neutral environment, and the PAA and Zetag 7692 in alkaline environment. The results allow precise selection of the type of flocculant for removing pollutants in various conditions.

Keywords: flocculant, clarification, bentonite, precipitation, residual concentrations

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MULTICOMPONENT COMPOSITIONS OF SULPHURIZED RAPESEED OIL FOR LUBRICATION OF BRONZE – STEEL PAIR (p. 27-32)

Olha Kuzyshyn, Hennadiy Sirenko, Liliya Midak

The article investigates the processes of bronze-steel pair wear rate during friction on steel45 (HB 4,45 HPa; Ra_0 =0,3±0,05 Mm) during lubrification by chemically modified rapeseed oil with multifunctional additives. The objective of work was to establish the influence of sulphur chemically combined with glycerides of rapeseed oil, and also triphenylphosphine and benzotriazole as multifunctional additives and diphenyl sulphourea as a catalist of sulphidation on wear-resistant properties of compositions. There were used mathematical methods of experimentation planning for obtaining of dependency models of wear rate intensity on ingredients content of lubrification composition and methodology of analysis of the obtained regularities by two-dimensional cross-cuts. As a result, we have received the adequate mathematical models of the second order from four factors with response function – volumetric intensity of wear. By the method of fixing of two factors on certain levels there were received partial mathematical models that enabled two dimensional cross-cuts analysis of dependency of response function on two aspects.

According to the analysis results there was established that the minimal values of wear rate of tin plated phosphor bronze are observed at minimal concentration of sulphur, triphenylphosphine and benzotriazole (0,1-0,2%) and high content of diphenyl sulphourea in the composition. Increase of sulphur content in the composition leads to increase of minimal values of specific wear rate 10-20 times, and increase of triphenylphosphine content at fixed sulphur concentration - 100 times, and narrowing of the respective area.

Keywords: wear, steel, bronze, oil, additives, concentration, rapeseed oil, sulfur.

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BITUMEN EMULSION BASED ON SURFACE-ACTIVE SUBSTANCES OF THE CJSC «FOSP «BARVA» PRODUCTION (p. 32-36)

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The paper considers the causes of poor quality of Ukrainian roads. One of possible solutions is using the emulsion technology instead of traditional "hot on hot" methods of paving and repair of roads. In addition to prevention of bitumen obsolescence tendency using emulsions has a number of significant advantages (lower energy costs, the ability to pave on a wet basis). The paper proves the possibility of bitumen emulsions production under the SSU.2.7-129:2006 based on surface-active substances produced at the JSC «FOSP«Barva». These emulsions, containing 50% of bitumen and 1-3% of surface-active substances "Barvoteks-30", "2K", "Cationic fat" and "Ripoks-3", meet the above standard by their sieve residue homogeneity, storage stability after 7 and 14 days and t relative viscosity at 25 ^{0}C.

Keywords: bitumen, bitumen emulsion, surface-active substance, road pavement, emulsion technology.

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DEFINITION OF RATIONAL CONDITIONS FOR FRACTIONAL CRYSTALLIZATION OF PALMITIC SUNFLOWER OIL FROM MELT (p. 36-43)

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The paper deals with defining rational conditions of fractional crystallization of palmitic sunflower oil from the melt. Modification of fats by fractionation method allows splitting fats and oils into fractions with different degrees of hardness, melting temperatures and various compositions of triacylglycerines. Thorough selection of operation parameters is required for each kind of raw materials. The objective of the work is defining optimal operation parameters of fractional crystallization of palmitic sunflower oil from the melt. The selection of rational conditions for the fractional crystallization was carried out using the method of mathematical planning of experiments. Response function values and regression equations were obtained, which accurately describe the response surface. The research results will be used in further studying the regularities of saturated sunflower oil fractionation using the method of crystallization from the melt, involving some additional substances for the process intensification.

Keywords: fractional crystallization, palmitic sunflower oil, melt, orthogonal composite design.

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