**Сonversion technologies of chlorine-free water-soluble complex fertilizers production**

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**Keywords:** chlorine-free fertilizers, conversion, ammonium nitrate, potassium-ammonium phosphate, potassium chloride, technological scheme.

The paper dwells upon the relevant issue of obtaining water-soluble chlorine-free complex fertilizers based on technical products for greenhouse facilities. There have been investigations of conversion ways to obtain water-soluble chlorine-free complex fertilizers based on chemical potassium chloride, ammophoses, ammonium nitrate and urea. The study also involved the influence of basic technological parameters of conversion and rinsing processes on the composition of the obtained fertilizers, i.e. potassium nitrate and potassium ammonium phosphate. Optimum process conditions have been determined as well as process operating mode to enable high-quality product recovery confirmed by industrial testing results under the conditions of real production process together with product testing in both open and under-glass grounds. The most rational techniques for disposing of exhausted conversion solutions have been proposed, i.e. production of liquid and suspended liquid complex fertilizers on their basis along with the production of granulated complex fertilizers of various grades. A universal fail-safe process layout for the production of potassium ammonium phosphate and potassium nitrate has been developed.

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**Kinetic regularities and mathematical model of dissolution process of potassium salt of carboxymethylcellulose in water**

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**Keyword:** carboxymethylcellulose, dissolution process, induction period of dissolution, kinetic curves, kinetic coefficient, degree of substitution.

It has been investigated the dissolution process of the potassium salt of carboxymethylcellulose (K-CMC) in water with various degree of substitution by carboxymethyl groups in macrochain. It has been established that the dissolution process of this polymer is accompanied by induction transition. It has been shown that with growth of degree of substitution the induction period time is reduced. The empirical equation describing the dependence of induction period of polymer solution in water on degree of its substitution with carboxymethyl groups and temperature has been proposed. Some equations describing the decrease process of the concentration of soluble polymer and increase of its concentration in the solvent have been proposed. The kinetic coefficient values due to degree of substitution have been experimentally determined. It has been shown that the equilibrium in these systems is achieved when the chemical potentials of the solid polymer and its solution are equal. Beginning from this moment, the dissolution rate of solid polymer and its crystallization from solution as are equal. In this case the concentration of its saturation depends on properties of polymer, solvent and temperature.

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**Best Available Techniques in Oil Refinery**

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**Keywords:** Oil refinery, Best Available Techniques (BAT), Reference Books on Best Available Techniques, JSC "Gazpromneft-MNPZ", reconstruction and modernization programme, biological wastewater treatment plant, combined oil refining unit (CORU).

Larger Russian industries (including oil refineries) experience now a transition to environmental regulation based on Best Available Techniques. In the near future it is necessary to complete a comparative study of resource efficiency and environmental performance to identify technological parameters of Best Available Techniques. JSC "Gazpromneft-MNPZ" experience proves that modernization programmes form the basis for the continual reduction of negative environmental impacts of oil refineries. The enterprise is ready to take an active part both in the sector benchmarking and in pilot projects in the field of transfer to environmental regulation based on Best Available Techniques.

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**Investigation of modification of elemental sulfur
by cyclic diene hydrocarbons**

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**Keywords:** Sulfur, surplus, modification, modified sulfur, cyclic diene hydrocarbons, high-molecular compounds.

Russia is a major producer of elemental sulfur. In 2014, production was
6,0 million tons, the level of consumption was 2,45 million tons. A surplus of 3,5 million tons was sold to foreign markets (exports). The problem of implementation of excess sulfur which is caused by the limited volume of domestic market and the high competition in foreign markets is in the long term possible. Solution of the problem of accumulation of excess of sulfur is expansion of area of its use in other industries, including construction (production of road and construction materials on the basis of sulfur) that will give opportunity of sale of additional volumes of sulfur.The modified sulfur can be used as cement for production of the construction materials possessing increased qualitative and operation properties. Results of research of stage of copolymerization of the modified sulfur receiving process are given. Influence of mixing time, amount of the modifier, way of giving of the modifier is studied, comparison of efficiency of modifiers is carried out. Number of samples with different characteristics is received.

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**Production problems of synthetic esters as bases contemporary lubricants**

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**Keywords:** grease, synthetic base, oil base, ethers, esters, fatty acids.

The problematic issues of organizing production of domestic synthetic esters and ethers to be used as the basic components of advanced plastic lubricants with improved freezing resistance, thermal stability, fire-resistance and chemical resistance are defined. Current manufacturing states of synthetic esters and ethers, and crude for their domestic and foreign manufacturing is presented. Contemporary and advanced technologies, (including electrochemical ones) of obtaining esters and ethers, and aliphatic acids based on domestic raw materials are considered (which is specially sound during economic sanctions).

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**«Anhydrol» - inhibitor side processes of the new generation**

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**Keywords:** extractive distillation, extract ant, hydrolysis, inhibitor.

This article сontains data on inhibitors of hydrolysis of dimethylformamide (DMF) produced by the Research and Development Center and used in PJSC «Nizhnekamskneftekhim». Development researches of local DMF hydrolysis inhibitor were carried out as part of the program of import phase-out; inhibitor would not disgrace the properties and efficiency of currently used import inhibitor. The new hydrolysis inhibitor of DMF has the trademark «Ingidrol». «Inhidrol» is a composition of amine-containing compounds in a solvent with the basic substance weight ratio is not less than 50 %. It was experimentally proved that DMF keeps high hydrolytic stability in the presence of the inhibitor. The new agent effect on the extractant selectivity was studied. The relative volatility of the system izopren-isoamylene in the presence of «Ingidrol» with DMF were presented. The noncorrosiveness of the inhibitor was loufirmed. During the industrial use of ingidrol we obtained the results, which overcome all technical and economic chareteristics previously obtained for the inhibitors of dimethylformamide.

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**Model of chemical kinetics and identification of cationic copolymerization of isobutylene isoprene kinetic constants**

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**Keywords:** isobutylene, isoprene, cationic copolymerization, kinetic constant, chemical kinetics.

The model of chemical kinetics in the ideal mexedreaitor flow of cationic copolymerization of isobutylene isoprene process (the catalyst is AlCl3, the solvent is CH3Cl, synthesis temperature ≥ 173 K) has been developed. It was found that the kinetics of the process includes elementary reactions initiation, chain propagation, chain termination and transfer of active chains to the isobutylene and isoprene molecules. The Arrhenius dependence of kinetic constants of the process was identified on the base of known experimental data on the kinetics of copolymerization (isoprene conversion curve) and molecular-weight characteristics of butyl rubber. Adequacy of the developed model was acknowledged by comparing the calculated on the model characteristics both independent experimental molecular-weight characteristics, and unsaturation of butyl rubber.

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**The practical aspects of alkaline wastewater neutralization with carbon dioxide in an industrial scale**

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An experimental study of the process of neutralization of alkaline waste water from a large chemical JSC "Kazanorgsintez" using carbon dioxide was carried out. It was shown that using of carbon dioxide both in the laboratory and in industrial conditions has the advantages in relation to using of sulfuric acid: the ability of neutralization process automation and of practical elimination of operating staff from the process; the principal exception of a number of recurrent technical operations with dangerous and corrosive products - sulfuric acid; in accident-caused apparatus failure the excess of carbon dioxide will not reduce the pH below 5.5-6 units. The received experience of introduction of the method of alkaline wastewater neutralization using carbon dioxide to the industrial wastewater treatment plants shows the viability and validity of the conclusions and suggestions that were made earlier on the basis of theoretical considerations and the results of model tests.

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