**Determination of the effectiveness of turbulent deposition of aerosols on the contact element of the device intensification**

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***Keywords****: turbulent migration, aerosols, gas separators, the separation efficiency.*

We consider the migration of fine turbulent phase in the gases and deposition of particles on the walls of the channels with the elements of the intensification and chaotic surface nozzle. Expressions Mednikova VP to calculate the turbulent particle migration rate to the wall, with associated dynamic rate. On the basis of applying cell model the flow pattern in the channel expressions are obtained for the calculation of the profile of the particle concentration and separation efficiency. Formulas for determining the model parameters - diffusion Peclet number and the number of complete mixing of cells. The results of calculations of the efficiency of deposition of particles in the channels with smooth and rough walls, a liquid film with a strong interaction with the axial movement and flow with a twist ribbon screw and nozzle and chaotic. The conclusions of the most effective designs of contact devices gas cleaning devices.

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**Developing the mathematical model of zeolite-catalyzed benzene alkylation with ethylene**

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***Keywords:*** *ethylbenzene, mathematical model, alkylation reactor.*

Ethylbenzene and the following styrene production is a basic direction of benzene consumption. Nowadays the market of styrene polymers is decreasing in Russia, therefore, it seems currently essential to upgrade resource efficiency of raw materials and energy consumption for plants in a chain of styrene production. The following article describes a heterogeneous catalytic reactors mathematical models developing approach for benzene alkylation with ethylene. The process of mathematical model developing includes various stages: analysis of operational and experimental data of an industrial reactor, creating reaction network of alkylation process, calculation of thermodynamic parameters for targets and adverse reactions, creation of kinetic scheme and determination its parameters, verification the model in HYSYS comparing the calculated and experimental data. Developed model might be used for optimality research for upgrading raw materials efficiency and energy consumption during industrial processes.

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**Methods of manufacturing a cathode for lithium-ion batteries and the influence of the components of the composite cathode based on LiFePO4 active material on the electrochemical performance LIB**

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***Keywords:*** *chemical current source, an electrode, a cathode material, current collector, optimization, application of the composite, an active material, a binder, a conductive additive, lithium iron phosphate.*

The electrochemical performance of lithium power sources directly depend on the type of cathode material, but the methods of forming the composite electrode, the coating methods and the subsequent operations for the manufacture of the electrode can significantly affect the performance of the electrode. The article deals with various industrial and laboratory methods for the production of cathode for lithium-ion batteries. There is the scheme of cathode fabrication for lithium ion battery which discussed in detail and each stage is analyzed. Also discussed the influence of qualitative and quantitative composition of the components of the electrode mixture (an active material, a binder and a conductive additive) on the electrochemical performance of lithium-ion batteries on example of LiFePO4 cathode material.

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**Effect of humidity and structure of complex phosphate fertilizer granules on their physico-mechanical properties**

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***Keywords****: complex mineral fertilizers, humidity of granules, strength of granules, non-destructive methods of analysis, X-ray microtomography, scanning electron microscopy.*

Being one of the most important characteristics of physical and mechanical properties of mineral fertilizers, the strength of the granules determines product preservation during storage and transportation. In this research, the dependence of the granules strength on their structure, moisture content and settings of the granulation and drying processes was investigated for complex NP-, NPS- and NPK- fertilizers. The structure of the fertilizer granules was studied using modern non-destructive methods of analysis - X-ray microtomography and scanning electron microscopy. When the moisture content of the product rises, the static strength of the granules decreases significantly, which is probably due to dissolution of a part of the solid-phase contacts between the crystals and replacement of them by weaker liquid-phase ones. It was shown that in the absence of large defects such as cracks and pores in granules, the strength of the granule is determined by the strength of its binding phosphate part.

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**Study of microwave regeneration of active coal, saturated n-butanol**

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***Keywords:*** *gas purification; activated carbon; microwave irradiation; regeneration; desorption.*

The desorption n-butanol from active carbon in modified 800-Watt domestic microwave oven was investigated. The experiment was conducted in a quartz weighing bottle. A sample of saturated coal which was placed in one. For removing condensate in the desorption process, the lid has been provided with a nipple in the weighing bottle. By fitting silicone hose was attached. The one was passed through a microwave oven through a small drilled hole. Coal temperature in the weighing bottle was measured by a pyrometer with a narrow spectral range - it is possible to measure through the glass door of the microwave oven. The kinetic curves of the carbon condensate volume and temperature during the 15-minute experiment were obtained. It is shown that the main part butanol is desorbed from the active carbon in a microwave oven in the first 3 minutes of regeneration, which is not achievable for desorption by live steam.

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**Study of the effectiveness of electroflotation method for the extraction of highly dispersed carbon materials from wastewater and liquid industrial waste in the presence of surfactants**

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***Keywords****: electroflotation, surfactant, highly dispersed carbon materials (HDCM), carbon nanoflakes, activated carbon, Zeta potential, hydrodynamic radius, the degree of extraction.*

The process of electro-flotation extraction of highly dispersed carbon materials (carbon nanoflakes and activated coal OU-B) from aqueous solutions in the presence of different types of surfactants was studied experimentally. The influence of the important characteristics of interfacial phenomena, such as hydrodynamic radius, Zeta potential, on the efficiency of electro-flotation extraction of highly dispersed carbon materials was studied. Values of these parameters for carbon nanoflakes and activated coal OU-B were compared. The effect of solution pH on the process of electro-flotation of carbon nanoflakes was shown. The influence of flocculants of different nature on the efficiency of electro-flotation extraction of carbon nanoflakes was investigated.

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**A calculation method of gas mixtures membrane separation**

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***Keywords****: membrane separation, thermodynamics, vapor-liquid equilib-rium, continuous mixing, plug flow, cascade, membrane module.*

A calculation method for gas mixtures separation was suggested. Method uses analogy of thermodynamic vapor-liquid flash calculation. Program module is realized for continuous stir mixing in permeate and retantat zones. Analysis of mathematical equations solution was performed. For plug flow regime the cascade of arbitrary configuration from standard membrane modules is composed. The figures and tables of the results are presented. The method is checked and realized in engineering information system SATRAPiS. On the base of our mathematical model this system allows to solve direct and reverse tasks of membrane gas separation. A criterion from physical and chemical parameters is suggested to obtain the solution.

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