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INTERNATIONAL KOSYGIN FORUMINTERNATIONAL SCIENTIFIC AND TECHNICAL SYMPOSIUM "IMPROVING ENERGY AND RESOURCE EFFICIENCY AND ENVIRONMENTAL SAFETY OF PROCESSES AND DEVICES IN THE CHEMICAL AND RELATED INDUSTRIES" DEDICATED TO THE 110TH ANNIVERSARY OF A. N. PLANOVSKY

ANLYTICAL OVERVIEW/REVIEW OF MATERIALS OF THE INTERNATIONAL SCIENTIFIC AND TECHNICAL SYMPOSIUM "ENHANCING/IMPROVING ENERGY RESOURCE EFFICIENCY/EFFECTIVENESS AND ENVIRONMENTAL/ECOSECURITY OF PROCESSES AND APPARATUSES OF CHEMICAL AND ALLIED INDUSTRIES/BRANCHES OF THE INDUSTRY" DEDICATED TO THE 110-TH ANNIVERSARY OF A.N. PLANOVSKY

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The materials analyzed in this paper/article were presented in plenary papers/deliberations of leading/distinguished scientists in the sphere/field of processes and apparatuses of chemical technology/engineering and published in transactions of the International Scientific and Technical Symposium (ISTS) "Enhancing/Improving Energy Resource Efficiency/ Effectiveness and Ecosecurity/Environmental Safety of processes of chemical and allied industries/branches of the industry dedicated to the 110-th anniversary of A.N. Planovsky. The symposium took place/was held at A.N. Kosygin Russian State University within the framework/gambit of the Third International Kosygin Forum "Current Problems/Issues of Engineering Sciences." The ISTS was held in accordance with the plan of measures for/on carrying out activities of Years of Russo-Chinese Scientific-Technical and Innovative Collaboration (Decree/Order/Directions of the Government of the Russian Federation/Russian Federal Government No. 1020-r of 15 April 2020).

In Prof. N.N. Kulov's paper titled Contribution of A.N. Planovsky's School to Emergence and Development of Processes and Apparatuses of Chemical Technology as a Science and an Education Discipline, the issues/problems of development and chemical technology and the problem of chemical engineering education analyzed/discussed. Special attention is focused/paid in the paper on/to the bright/brilliant and multifaceted personality of Prof. A.N. Planovsky. The author notes/comments that the broad formulation of the problem of transition/switching/passage from periodic/batch to continuous processes and engineering solution of basic/key processes of this problem belongs precisely to A.N. Planovsky, who brilliantly accomplished/performed theoretical analysis of the structure of flows in apparatuses, which is original/ unique in approach and profound in content, having developed the model of complete displacement and complete mixing. The works of A.N. Planovsky on the theory of continuous processes evoked a huge resonance – detailed study of hydrodynamic structure of flows in apparatuses began, new mathematical models were developed, and the results of these were used in designing of apparatuses/equipment for chemical, petrochemical, food, and other branches of the industry/industries. During the years of A.N. Planovsky's supervision/chairmanship of the Department of Processes and

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Apparatuses of Chemical Technology (PACT) Moscow Institute of chemical Engineering, the course PACT acquired the \nature of a general engineering discipline. The methodology of teaching of this discipline is elaborated in his textbooks translated into English and Chinese.

The main/basic tenets of the theory of the theory of engineering of energoresource efficient chemical engineering/ chemicotechnological systems in conditions/situations of digital economy are discussed in the plenary paper of Academician V.P. Meshalkin. Methods for/of intensification of chemical engineering processes and systems, methods of digitalized physicochemical engineering and computer simulation of the texture of nanocomposites are elucidated/ elaborated. Methods of energy resource saving in chemical engineering systems and the basic concepts of energy-resource saving logistics are described. The main/basic current/urgent/important priority areas/directions of scientific research on engineering of energoresource efficient ecologically safe chemical engineering systems are proposed. It is noted that in situations/conditions of digital economy, it is essential, for ensuring steady development and enhancement of energy-resource efficiency of productions/industries/plants, enterprises, and supply chains of petrochemical complexes, to make wide use of modern methods of the theory of engineering of energoresource efficiency of chemical engineering systems that include methods of digitalized physicochemical engineering and computer simulation of the texture/structure of effective composites, intensification of chemicotechnological/chemical engineering processes and chemicotechnological/chemical engineering systems, ensuring energy resource saving, digitalization/digitization of chemicotechnological/chemical engineering systems and supply chains, eco-economic/ecological-economic optimization of chemicotechnological/chemical engineering systems and supply chains, logistic management/control of waste handling/ treatment, automated synthesis of optimum/al energoresource efficient chemicotechnological/chemical engineering systems, and methods of resource-energy saving logistics. It is underscored that designing and logistic control of operation/ performance of energoresource efficient ecologically/environmently safe/eco-/environment-friendly products/plants/ industries and supply chains of oil-gas chemical complexes can be accomplished only by highly qualified chemical engineers and technologists, who acquire through training wide/high competence based on gaining knowledge and, skill and ability/capacity for active application of modern tools of digitalized/digital engineering energoresource efficient chemicotechnologica/chemical engineering systems.

Fresh/New viewing of cross-linking of chemical elements in the form of volume/bulk matrix is proposed in the paper "New model of cross linking of chemical elements" by Corresponding Member States of the Russian Academy of Sciences B.V. Gusev. This allows prediction of new elements, indicating their nuclear mass and electronic structure of their shells. New mechanisms in cyclicity (modularity/bloc) structure of horizontal rows/series are formulated and structure of vertical groups and their physical interpretation/understanding are refined.

Prof. R.Sh. Abiev's paper "Mini- and micro-scale reactors: current state and prospects of application/use for synthesis of nano-sized particles" discusses the demerits of conventional macro-scale methods of in-solution synthesis of nano-sized particles. The spatial and time scales of heterogeneous nucleation process are indicated. The merits/ advantages of milli- and micro-scale approaches to continuous synthesis of nano-sized particles in both single- and two-phase flows are demonstrated. Examples are given of microreactor synthesis of oxide and fluoride nano-sized materials. The work was carried out with the support of the Russian Science Foundation, Grant No. 20-63-47016.

The goal of the work of professors V.E. Mizonov and Hneri Berthiaux "Application of the theory of Markov chains in chemical engineering" was to demonstrate the efficacy of use of mathematical apparatus/tool of the theory of Markov chains for modeling a wide range/spectrum of processes in chemical engineering. It is shown that the theory of Markov chains is an effective tool for modeling chemical engineering processes. It proposes a universal algorithm for modeling various processes, which is tangible/comprehensible and available to design engineers and enables one to readily/easily use models of components of the main/primary/basic process and to effectively perform/conduct numerical experiments and optimization using standard programs/software for operations with matrices. The study was carried out with the financial support of the Russian Foundation for Basic Research within the framework of the Project No. 20-48-370001/The research was carried out with the financial support of the Russian Science Foundation for Fundamental/ Basic Research within the gambit/framework of the Research Project No. 20-48-370001.

Prof. S.P. Rudobashata's paper "Efficiency of mass transfer processes in systems with a solid phase (drying, adsorption, extraction, etc.) examine with specific examples the possibility of enhancing/augmenting/improving at the current stage the efficiency of (in broad sense of the word) of such mass transfer processes as drying, adsorption, extraction, etc. by application/use of modern methods of mathematical modeling and kinetic calculation of apparatuses, intensification

of energy and resource saving, maintenance/retention/preservation or even improvement of the quality indexes/indicators/parameters of the treated materials, solution of environmental/ecological problems, etc.

In his paper "Organoboron and organophosphorus polyols in processes of separation of liquid mixtures (extractive fractionation, pervaporation, etc.)" Prof. A.V. Klinov presented the results of study of aminoesters of boric and orthophosphoric acids (AEBA and AEFA) as potential extractants for separation of azeotropic aqeous-alcohol/ic/water-alcohol mixtures by extractive fractionation. The vapor-liquid equilibrium conditions in aqueous ethanol–water and isopropanol–water solutions in the presence of AEBA and AEFA were/are investigated. Subdivision of AEBA molecules into group components is proposes and previously unknown geometric and energy parameters are determined within in the UNIFAC model. AEBA- and AEFA-based polyurethane ionomers were obtained and investigated as the material for a selective layer of pervaporation membrane for separation of ethanol–water and isopropanol–water mixtures. The study was carried out with financial support of the Ministry of Science and Higher Education of the Russian Federation, Grant No. 075-00315-01 "Energy saving processes of separation of liquid mixtures for regeneration of industrial solvents.

The paper "Some characteristics of mathematical modeling of heat and mass transfer phenomena at interface of two-phase media" presented by S.V. Fedorov, Academician of the Russian Academy of Architectural and Structural Sciences, discusses the mathematical aspects of the phenomenal of heat and mass transfer of substances in a gas/liquid–solid system in the boundary layer adjoining the flat solid surface. The distinctions/characteristics of the basic models of the boundary layer in a moving continuous layer are shown. The boundary problems of thermal conductivity and diffusion in a boundary layer are formulated and expressions for describing densities of flows of heat and mass of substances within and at the boundary/interface of laminar and turbulent boundary layers are given.