

Abstract of a series of scientific publication  
**«Coupled processes in the systems formed by biofuel components:  
thermodynamic research and topology of phase diagrams»**

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A group of authors works in the field of chemical thermodynamics which is an area of knowledge directly related to the fundamental laws of nature. At the same time, the results of thermodynamic studies, namely, phase and chemical equilibria, critical phenomena and coupled processes in multicomponent reacting systems are the basis of practical applications for many branches of chemical technology.

The main scientific achievements of the group of authors are connected with the study of coupled processes, first of all, phase processes accompanied by chemical reactions, simultaneous chemical and phase equilibrium, critical phenomena in chemically reacting media, thermochemical characteristics, general aspects of thermodynamics of fluid systems with chemical reactions and development of fundamental aspects of chemical separation technology. Investigations of coupled processes are significant for the development of energy- and resource-saving environmentally friendly technologies, since, in particular, they allow combining the processes of synthesis and separation (purification) of substances. At the same time, such complex processes are of scientific fundamental interest.

The group of authors obtained a large set of new experimental data on combined phase (liquid-liquid equilibrium) and chemical equilibrium in the systems with reactions of esters and biofuel synthesis. In addition, new detailed data on phase transitions in chemically non-equilibrium states was obtained. Other than the fact that these works are significant development of the database of experimental data on phase processes in multicomponent systems with chemical reactions, in the course of research were obtained principally new results for chemical thermodynamics. First of all, the fact of intersection of the surfaces of phase and chemical equilibrium in the concentration space for the system with the reaction of propyl acetate synthesis was proved experimentally for the first time. Experimental data

on chemically equilibrium critical states, including not only critical points, but also chemically equilibrium critical curves in systems with chemical reactions are of particular interest. At the same time, critical manifolds in the course of a non-equilibrium chemical reaction were studied by the group of authors. All the experimental results got corresponding theoretical (thermodynamic) interpretation. As one of the achievements of the group of authors one should note unusualness and complexity of the problems solved by the authors in a comprehensive study of critical states in the systems with chemical interaction, for example, analysis of chemical process is complicated by features of the critical state and its dynamic nature (nucleation and decay of the nuclei of new phases).