EXPERIMENTAL RESEARCHES OF THE SYNERGISTIC EFFECT IN TECHNOLOGIES FOR PRODUCING HIGH-DYSPERSE FLUID SYSTEMS

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An experimental stand was created for the study of heat and mass transfer, hydrodynamic and hydroacoustic effects on liquid systems and the study of the synergistic effect from their implementation in order to develop methods and create efficient process equipment for the production of emerge functional products.

The technologies for producing highly dispersed liquid media cover the implementation of the complex of heat-exchange and physical and chemical processes in the solid-liquid, liquid-liquid, or solid-gas-liquid systems. This applies to such functional products as suspensions, pastes, gels, emulsions in the pharmaceutical, food, chemical, microbiological, perfume-and-cosmetic and other industries and man-made activities.

The research stand was designed at the IET NASU. The stand provides the variation of flow regimes of the researched system, the realization of complex effects in the system and the registration of hydrodynamic, sonar and temperature parameters with a resolution of 0,1s in real time. The implementation of the DPIE effects is carried out in 2-flow rotary-pulsation apparatus of a disc-cylindrical type in vertical and horizontal design with various constructive features.

Highly dispersed systems are complex systems from the point of view of self-organization and thermodynamically nonequilibrium. The research of the mechanisms of bifurcation and the definition of bifurcation points is crucial for the organization of technological processes for producing products with desired properties. So, for example, producing sorption pastes (the content of the highly dispersed porous phase in a liquid medium is 70 %), was revealed that a synergistic effect achieved when the system is in the shear stress field for a limited time, namely, 1-2 cycles of passage through the apparatus with 2 rotary - stator pairs. If we compare the samples obtained at 2 and 10 processing cycles in the apparatus, then the specific surface indicator decreased by 2,6 times and the maximum sorption pore volume – by 1,5 times, that is, systems with different structural-sorption properties were obtained.

The experimental stand, created by ITTF NASU specialists, has wide functional capabilities and allows implementing technologies based on a synergistic approach.