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MODELING OF THE EVOLUTION OF HYDRODYNAMIC INSTABILITIES AND MIXING DURING COMPRESSION OF AN INDIRECT IRRADIATION TARGET USING THE TIGR-3T AND OMEGA-3T SOFTWARE COMPLEXES *)

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The evolution of hydrodynamic instabilities and mixing of fuel with an ablator prevent the achievement of thermonuclear ignition conditions for ITS targets. In [1,2], the results of experiments conducted at the NIF facility to study mixing to the atomic level are published. In these experiments, plastic shells filled with T_2 gas to a density of ~ 11 mg/cm^3 at a temperature of 32 K° were used. The residual deuterium concentration in the T_2 gas did not exceed 0.1%. A series of experiments with targets was carried out in which the CD layer was inserted into the CH shell at various depths from its inner boundary. The target was placed in a cylindrical gold converter, where an X-ray field with a maximum temperature of T_I =294±4 eV was formed under the action of laser radiation. In experiments [1,2], both the yields of DT-, TT-, and DD- reactions and the ion temperatures at which they occurred were measured. It was shown [1,2] that the generation of DT neutrons in experiments with shells filled with pure T_2 gas was possible only as a result of the evolution of hydrodynamic instabilities leading to mixing of the gas and shell to the atomic level. The report presents the results of shell compression calculations [1,2] performed according to the TIGR-3T and OMEGA-3T programs developed at VNIITF [see, for example, 3] using the $k\varepsilon$ model of turbulent mixing [4]. The calculations performed describe well the experimental dependence of the output of DT neutrons on the thickness of the "locking" layer. A series of two-dimensional calculations was performed to estimate the decrease in neutron yield due to the asymmetry of the X-ray flux on the shell surface in experiments [1,2], as well as to compare the results of numerical modeling of the evolution of hydrodynamic instabilities with experimental data obtained in shell compression experiments [5,6] with small initial disturbances corresponding to spherical harmonics with numbers l~30-100. The results of calculations carried out on the complex of TIGR-3T and OMEGA-3T programs, in general, confirmed the main conclusions of works [1,2,5,6].

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