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New nuclear physical phenomenon - spontaneous nuclear synthesis

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For the first time, a new nuclear-physical phenomenon is described - the flight out from complex nuclei of the lightest clusters with mass numbers from 1 to 4. The interpretation of the phenomenon consists in the assertion that the multiclusters recently experimentally discovered in the volume of nuclei [1] spontaneously enter into thermonuclear fusion reactions with each other. While they have the indicated lightest clusters with noticeable kinetic energies in the output channels.
Until now, only the spontaneous fission of nuclei discovered in 1940 by Petrzhak K.A. and Flerov G.N. and alpha-decays were known. An experimental search for spontaneous fusion of nuclei was not carried out, first of all, due to the lack of physically reasonable initial premises. Currently, such physical conditions have arisen in connection with the experimental discovery in the volume of nuclei of spatially separated clumps of nuclear matter —multiclusters with mass numbers A = 1, 2, 3, 4 [1] and measurements of their cluster widths. In fact, with an asymptotic giant mean density of nuclear matter of 0.147 Fm^{ˆ(-3)}, it turned out that spatial clusters coexist in the volume of complex nuclei in the form of deuterons (d), tritons (t), helium-3 nuclei (h) and helium-4 nuclei (α) [2]. Naturally, this gives rise to a noticeable probability of their fusion in various combinations, including exothermic ones, which in modern terminology can be described as the implementation of "spontaneous thermonuclear fusion" in the solid phase of a substance. Note that until now they are trying to carry out controlled thermonuclear fusion only in the gas-plasma phase, for example, in installations of the Tokamak type.
In this work, the calculation of the spectra of spontaneous thermonuclear particles emitted as a result of spontaneous nuclear fusion between multiclusters inside the volume of complex nucleus was performed under the condition that the effective number of clusters (multicluster widths), which are given in [1], are equal. Theoretical spectra of spontaneous intranuclear synthesis for gamma quanta, neutrons, protons, deuterons, tritons, helions, alpha ions (intranuclear α-particles) and heavy ions are calculated. The calculated spectra contain only high-energy components for each output channel, without taking into account the loss of their energy in nuclear matter inside the nucleus volume. Comparison with experiment shows satisfactory agreement. It should be noted that in the world literature there is no information about the search for deuteron, triton and helion radioactivity of complex nuclei. Therefore, these sections of the physics of stable and radioactive nuclei are relevant for research.

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