NEW APPROACH TO COLD FUSION (LOW-TEMPERATURE NUCLEAR FUSION)

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This is the first communication giving the results of a fundamentally new approach to low-temperature nuclear fusion, based on a new unified fundamental field theory, together with experimental corroboration of predictions of the theory and illustrations of possible practical uses of the results.

In the two years since the sensational communications of Fleischmann and Pons [1] and of the Jones group [2] hundreds of articles and communications have been published describing the results of theoretical and experimental research on low-temperature nuclear fusion (for example, see the detailed review by Tsarev [3]). The present report differs substantially from all the previous publications in putting forward a fundamentally novel theoretical approach and new results of experimental examination of theoretical predictions.

These investigations are based entirely on the new unified theory of all interactions in matter described by one of the authors in [4, 5]: **unified fundamental field theory (FFT)**.

We have shown that it is not necessary to resort to additional hypotheses in order to explain the phenomenon of overcoming the Coulomb barrier at low temperatures in the process of low-temperature nuclear fusion [3]. According to this theory, the basic unified fundamental field is concentrated in an almost linear string, which for elementary particles scans in the surface of a cone. Analysis of all fundamental phenomena in nature must then be made exclusively in layered spaces. In our "laboratory" space we observe only the result of a process, but it takes place in another layer of the enveloping layered space. In the layer where direct interactions of particles take place there is axial symmetry in the disposition of the force (fundamental) field, and the spherical symmetry of the field observed in laboratory space is characteristic only of this space. It follows, therefore, that in the subspace where nuclear particles interact there is an enhanced field (fundamental, and not Coulomb) barrier along the string of the fundamental field that is greatly reduced in the orthogonal plane. Consequently, the encounter of interacting particles depends chiefly not on the relative energy of the encounter (temperature), but on the mutual orientation of the spins of the particles interacting in low-temperature nuclear fusion (CF), since the axial symmetry noted above is related to the orientation of particle spin; artificial orientation of the spins of particles interacting in CF should have a substantial effect on the course of the process.

Experiments conducted by us showed that even a constant magnetic field has a substantial effect on the entire course of the process and on the yield of neutrons in particular.

According to FFT a physical vacuum is not a "curved void," as generally assumed, but a real material substance consisting of elementary vacuum particles resulting from annihilation conversion of, for example, a proton and an antiproton or an electron and a positron. In other words, proton-antiproton and electron-positron vacuums are a physical reality. However, elementary vacuum particles exist not in our laboratory space, but in another layer of enveloping space, and for us, making observations in laboratory space, they are virtual particles. Such, according to FFT, is the real nature, and not the formal nature, of virtual states: particles that really exist, not in our space, however, but in a space complementary (in the mathematical sense) to it. Elementary vacuum particles (EVP) and other virtual particles are states.of the microworld that manifest themselves indirectly in laboratory space through the results of processes taking place in other spaces.

According to FFT, all observable elementary particles are systems consisting of "bare" elementary particles and excited vacuum particles (EVP) that form certain quark structures. The physical vacuum not only plays a major role in spontaneous processes of nuclear decay, as shown in detail in [4, 5], but also in nuclear reactions. The effect of the physical vacuum on the process of CF has not been taken into account previously.

Our analysis of the effect of the physical vacuum on the course of processes in low temperature nuclear fusion has shown that interactions of nuclei with the physical vacuum are not predominant but that nuclear fusion itself is a side effect and not the main one. This, in our opinion, and only this, explains the fact that in experiments with electrodes previously strongly saturated with deuterium, which one would think should be the best way to bring about CF, it in fact does not generally take place. We explain this as follows. Deep saturation of the electrodes with deuterium prevents development of reactions involving the physical vacuum. It is understandable that, having suppressed the main process, interaction with the physical vacuum, we also suppress the side effect (fusion of nuclei) to an even greater degree.

From studies of fundamental field theory and correlated work with this theory it is known that the solar system moves relative to the physical vacuum with an extremely high velocity of hundreds of kilometers per second. Therefore all processes involving the physical vacuum have daily, yearly, and secular temporal variations. Consequently, a sufficient direct corroboration of the theoretical conclusion that the physical vacuum plays a major role in processes of CF would be experimental detection of temporal variations in the process. The authors have data on experiments in CF collected over 18 months. In all the experiments we, like many other researchers, have observed spontaneous jumps in the yield of neutrons over several seconds. These intermittent processes, in our opinion, are entirely governed by. sporadic growth in the intensity of processes involving the physical vacuum. This theoretical conclusion was corroborated experimentally by the fact that these jumps in neutron emissions (by one to two orders of magnitude) occur predominantly at a particular time of day. According to our observations, statistically reliable data indicate that the greatest probability of appearance of spontaneous jumps in the number of neutrons emitted takes place at the following times in local time: 10:20 to 10:30 a.m., 11:40 to 11:50 a.m., and 12:10 to 12:20.p.m. At another time of the day the probability of these processes appearing is substantially lower.

Since, according to our ideas, the process generally called cold fusion is in fact a process of interaction of nuclei with the physical vacuum and is only accompanied by a minor process of nuclear fusion, then the energy characteristics of the process cannot be entirely determined by nuclear fusion. In order to check this theoretical conclusion experimentally we tested and confirmed by experiment the following consequences: a) The process of neutron emission in an experiment takes place even if distilled water is used as the electrolyte and the electrodes are not saturated with deuterium; b) the energy characteristics of the process depend on the manner and magnitude of orientation of nuclei both in the electrode material and in the electrolyte.

We plan to publish an article on the results of theoretical and experimental investigations. In that sense the present note serves as notification of the existence of these results.

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