The seminar VB LHEP of 24 June 2016 provided an overview of the status of experiments on cold nuclear fusion in conductive crystals. The mechanism for deuterium fusion into helium and other similar reactions were discussed.

A situation has developed in human society where the energy shortage can no longer be ignored. Chemical energy—oil and gas—will run out in the next 30–50 years. No solar panels or wind turbines will be able to replace our fossil fuels. In addition to drying out our chemical energy sources, there is the so-called greenhouse effect, which imposes severe restrictions on the use of fuel. At the same time, energy is a critical need on a large scale for the survival and development of mankind. Nuclear reactors use uranium and thorium, and their reserves will last for no more than 100–200 years. In addition, it is apparent that the safe disposal of nuclear waste for a period of thousands of years is an absolutely unrealistic goal.

However, there is another energy source that is a million times greater than the reserves of all chemical sources: Deuterium, which is contained in seawater, can provide all mankind's energy needs for tens of billions of years. We are on the threshold of this new energy breakthrough.

Cold fusion in metals is possible due to the fact that the implantation of impurity atoms in a crystal leads to their excitation at ***p***-levels in the crystalline niches of the conductor. Calculations show that the transparency of the Coulomb barrier in the case DD of fusion is increased by 60–65 orders when two deuterium atoms in the ***2p*** state meet each other in the same crystal niche in a crosswise orientation. The heat released from cold fusion reactions is 10^6 times greater than any chemical reaction.

Conduction electrons do not allow an unexcited atom of impurity to exist in conductive crystals. This prohibition is overcome with the excitation of an impurity atom at 10 eV or more, which is essentially a chemical reaction. Such a deuterium atom in an excited ***2p*** state or higher does not bother conduction electrons much. If two such atoms are placed in the same cell at a small distance in a crisscross configuration, the quantum vibration with a frequency of 10^{17} appears between the nuclei of these atoms. In the fraction of a second, the residual Coulomb barrier is overcome; thus, the fusion of two deuterium atoms into a helium nucleus occurs. At full saturation of the metal crystal with deuterium the number of cells, already filled once, is about 10^{23} per cm^3.

Laboratory of High Energies of JINR is best suited to do this research. Until now cold nuclear fusion is engaged mostly by amateurs. Andrea Rossi has created a compact reactor, an energy catalyst, which is a tube with a nickel powder inside. When heated to about 1300 degrees Celsius, the tube produces more heat than it consumes.

The question of whether there is a cold fusion effect or not is no longer on the agenda. This effect has been observed; it exists. Unfortunately, the initial studies were performed mostly by amateurs, who often risked their lives. A. G. Parkhomov claims he has observed no harmful emissions in the process. His Geiger counter readings do not differ from the background. However, a Geiger counter is extremely

insensitive to high-energy photons. Thus, the professionals have to begin to join in on these studies. The Laboratory of High Energy Physics of JINR is perfectly suited for this.

Last year, CERN began to engage in cold fusion, though “semi-underground.” In the end, the governments of developed countries need to bring order to the research in this direction. There are signs that the USA will deal with this soon in the Defense Advanced Research Projects Agency (DARPA).

The purpose of this seminar was to support the opening of cold fusion topics at the Laboratory for High Energy Physics. VB LHEP is fully capable of bringing full clarity here.

Mankind has encountered a new physical phenomenon that affects the whole course of our civilization. The practical application of this phenomenon (e.g., ships, aircraft, space) marks the transition to a new technology.

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