Cold nuclear fusion.
Seminar in BLTP 2014

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http://www.youtube.com/watch?v=oVREaeowqJ8&list=PLHorZmSbM-E4Xydx6Z6xmYPDur5ZBLCvj
http://wwwinfo.jinr.ru/jinrmag/
http://www1.jinr.ru/News/Jinrnews_rus.html

In the Laboratory of Theoretical Physics of the Joint Institute for Nuclear Research the seminar, which dealt with the cold nuclear fusion, took place. In his report Professor Edward Tsyganov gave possible explanation of the effect observed in numerous experiments. The scientist has been asked with a lot of questions. Currently – physicists believe – there is no conclusive evidence for the existence of this phenomenon. However, in various studies carried out in different countries cold fusion studies continue in order to be able to receive and secure an inexhaustible nuclear energy.

It all started with a report of chemists Martin Fleischmann and Stanley Pons of the electrochemically induced nuclear fusion – the conversion of deuterium to tritium or helium under electrolysis conditions on a palladium electrode. This report, which appeared in March 1989, caused quite a stir. Scientists observed neutron emission and recovering large amounts of heat, which is a sign of nuclear processes. But the scientific community believes that their claims are incomplete and inaccurate. The so-called cold fusion has established itself as a pseudoscience. However, since 2008, after a public demonstration of the experiment with electrochemical cell by Yoshiaki Arata of Osaka University cold fusion talks began appearing again.

Known nuclear fusion reactions – thermonuclear reactions – are taking place in a plasma at temperatures of millions degrees of Kelvin. And in the so-called cold nuclear fusion, it is assumed a possibility of nuclear fusion reactions in chemical (atomic and molecular) systems without significant heating of the working substance. However, most chemists and physicists are trying to find an alternative (non-nuclear) an explanation of the phenomenon.

Professor Edward Tsyganov remarked: during the saturation of conductive crystals by deuterium atoms the presence of free electrons in the crystal potential niches leads to a ban for unexcited deuterium atoms occupy these niches. At the same time, even the first excitation level of deuterium atom removes this ban. When all the potential niches are filled already by deuterium atoms at least once, further saturation of a crystal by deuterium atoms gives rise to appearance of in one such niche the twin clusters of such atoms.

In most of these clusters deuterium nuclei are pulled together by 1/10 – 1/20 of the nominal size of these atoms. Zero level of quantum mechanics vibration of adjacent deuterium nuclei leads rather quickly to the penetration of two deuterium nuclei through the reduced Coulomb barrier. Spatial orientation of the excited deuterium atom in the crystal lattice is strictly determined with respect to one of the spatial directions of the crystal lattice.

The report also discussed the further dissipation of energy during the transition from the excited state of ^{4}He* to the ground state formed nuclei of ^{4}He (~24 MeV).

This is already the second seminar on the topic of cold fusion at JINR. About a year and half ago, Professor Edward Tsyganov gave a similar talk at JINR. Both then and now his report "DD fusion in conducting crystals" has caused heated debate.

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Editor: Inna Orlova

Video: Igor Belvedersky
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