Abstracts of the 12th Russian Conference on Cold Nuclei Transmutation of Chemical Elements and Ball Lightning (RCCNT&BL-12)

September 19 - 26, 2004

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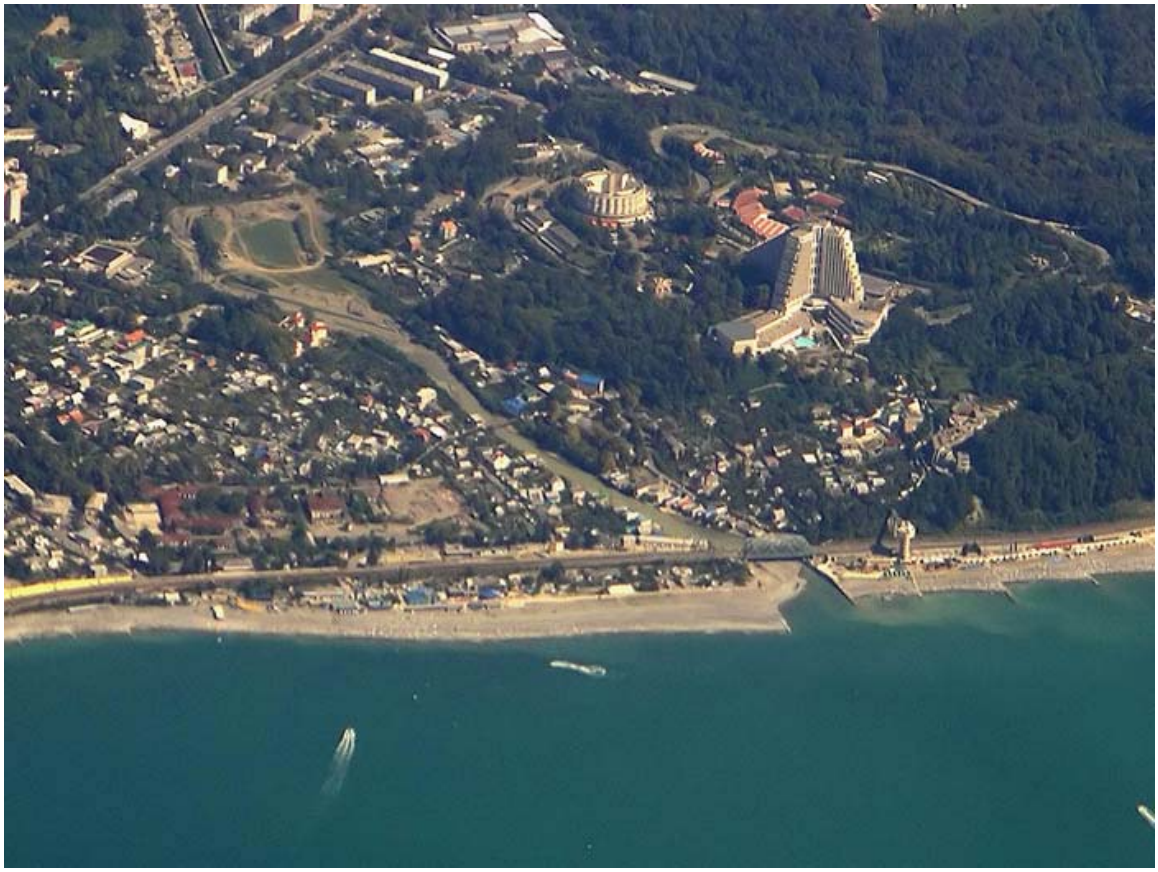
The 12th Russian Conference on Cold Nuclei Transmutation of chemical elements and Ball Lightning was held in the city of Sochi (at the Olimpiyskaya-Dagomys Hotel, Dagomys settlement) during September 19 through 26, 2004.

The Conference was arranged by the RCCNT&BL-12 Organizing Committee, and Interdisciplinary Committee on Cold Fusion in cooperation with the Russian Committee on the Problems of Ball Lightning at Russian Academy of Science and held under the auspices of the Russian Physical Society, Nuclear Society of Russia, Russian Mendeleev Chemical Society, Moscow Lomonosov State University and Russian Peoples Friendship University.



COMPACT CAVITATIONS SET PROJECT

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Cavitations set project was discussed. Steam bubbler was collapsed in electric field in this set. Dynamics parameter stability was very impotent for these projects.

CALORIMETRIC & NEUTRON DIAGNOSTIC OF THE LIQUIDS DURING THEIR LASER IRRADIATION

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It was carried out experimental series with laser irradiation on different liquids in special working cell. It was used red semiconductor laser (λ=655 +/- 25 nm) & power output ~ mW. Every time before, during & after laser irradiation calorimetric & neutron diagnostic was fulfilled. For calorimetric diagnostic the semiconductor thermo resistor (sensitivity ~ 0,05°) was used. For neutron diagnostic the gas (BF_3 & He^3) neutron counters were used. All received results are discussed.

SEARCH OF ERZION NUCLEAR CATALYSIS CHAINS FROM COSMIC RAY ERZIONS STOPPING IN ORGANIC SCINTILLATOR

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In framework of Erzion model charged cosmic ray Erzion, stopping in organic substance, begins to create Erzion nuclear catalysis chains with frequency of ~ 100 MHz during ~ 10-100 mks. If for an organic substance to use plastic scintillator we can observe long & flat (10-100 mks) pulse of large amplitude (~100 MeV). Not any elementary particle can imitate such pulses. It is expected that such pulses in plastic scintillator with mass of 100 kg must be appeared at the see level every week. Such pulses can be observed every day on the Spectrometric Scintillation Super-Telescope (SSTIS) creating in IZMIRAN for cosmic rays monitoring.

EXPERIMENTS ON REGISTRATION IT IS ABNORMAL A HIGH OUTPUT OF HEAT AT REALIZATION BACKS - DEPENDENT OF NUCLEAR REACTIONS OF EASY NUCLEUS BY MEANS OF HIGH-VOLTAGE ELECTROLYSIS HEAVY WATER.

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Results of experiments on which course at high-voltage electrolysis heavy water (D_2O) with application Pd of the cathode steadily and it is reproduced are submitted was registered is abnormal a high relative output of heat. Continuous monitoring possible nuclear emanations (neutrons and scale - quanta) in a wide power range was carried out. In these experiments electrolysis distilled water (H_2O and D_2O) was exposed. The given series of experiments differed application of cooled cathodes that has allowed supporting a high output of heat for a long time. The analysis of the data received as a result of carrying out of experiments, has shown steady excess (~ in 3 times) to relative growth rate of temperature of system at electrolysis D_2O with Pd-the cathode. Monitoring of nuclear emanations was carried out by the equipment and forces RNC «Kurchatovsky institute». Experiments were carried out according to a technique following from a hypothesis of an opportunity of realization of backs - dependent of nuclear reactions of easy nucleus at low (is lower nuclear electrostatic than a barrier of a nucleus) energy interactions.

INFLUENCE OF EXCITATION AND IONIZATION OF THE ATOMS ON THE VELOCITY OF NUCLEAR PROCESSES AT LOW ENERGIES

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We have concluded that transmutation of nuclei at low energies is possible in the framework of the modern physical theory -excitation and ionization of atoms and universal resonance synchronization principle are responsible for it [1]. Investigation of this phenomenon requires knowledge of different branches of science: nuclear and atomic physics, chemistry and electrochemistry, condensed matter and solid state physics,... The results of this research field can provide a new source of energy, substances and technologies.

References

[1] F.A. Gareev, I.E. Zhidkova and Yu.L. Ratis, Preprint JINR P4-2004-68, Dubna, 2004 (in russian).

PRODUCTION OF EXCESS HEAT POWER ON THE BASIS OF LOW ENERGY NUCLEAR REACTIONS (LERN) IN THE SOLID MEDIUM

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The results of the experiments with a high-current glow discharge are given. The precision system of measuring input power of an electric discharge and heat output power was used. The discharge was carried out in H_2, D_2, Ar, Xe, Kr at pressure up to 10Torr,current up to 500mA and discharge voltage of 500-2500V. The excess heat power up to 10 –15W and efficiency up to 150 % was registered under the experiments for Pd cathode samples in D2 discharge. The excess heat power up to 5 W and efficiency up to 150 % were registered for previously deuterium-charged Pd cathode samples in Xe, Kr discharges. At the same time the excess heat power was not observed for pure Pd cathode samples in Xe, Kr discharges. The soft X-ray radiation from the solid-state cathode medium with the intensity up to1.0 Gy/s was registered under the experiments with the discharge in H_2, D_2, Ar, Xe, Kr. X-ray energy considerably exceeded possible ion energy (discharge voltage). The results of the X-ray radiation registration showed that the exited energy levels having the lifetime up to 100 ms and more and the energy of 1.0 - 3.0keV existed in the solid medium. Hypothetically, under these conditions it was possible to carry out the nuclear transmutation reactions in the solid medium with producing the excess heat power and the nuclear reactions products. The probability of such reactions proceeding is defined by the characteristic temperature, excited energy levels density and lifetime of excited levels. These nuclear reactions can be called non-equilibrium nuclear reactions.

RESEARCH INTO CHARACTERISTICS OF X-RAY EMISSON FROM SOLID-STATE CATHODE MEDIUM OF HIGH-CURRENT GLOW DISCHARGE

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X-ray emissions ranging 1.2 – 3.0 keV with intensity up to 1.0 Gy/s·4π have been registered in experiments with high-current Glow Discharge in D_2,H_2, Kr. The emissions energy and intensity dependence of the cathode material used, kind of plasma-forming gas and the discharge parameters has been studied. Two emission modes were revealed under the experiments: 1 - Diffusion X-rays was observed as separate X-ray bursts (up to 10^5 bursts a second and up to 10^6 X-ray quanta in a burst), 2 - X-rays in the form of laser microbeams (up to 10^4 beams a second and up to 10^9 X-ray of quanta in a beam). The emission of the X-ray laser beams occurred during the discharge burning and within 100 ms after current turning off. The obtained results were the direct experimental evidence of existing the excited metastable energy levels with the energy of 1.2-3.0 keV in the solid of the cathode sample. Hypothetically, the mechanism of forming the metastable energy levels with the energy of 1.2-3.0 keV in the solid was caused by exciting the inner electrons M and L of the solid atom shells when bombarding the cathode surface by plasma ions. Hypothetically, the inverse medium population with the energy of 1.2-3.0 KeV was created in the volume of separate crystals having the sizes of 0.1-0.01 mm. When generating the laser X-ray in the mode of super intensification, the duration of the separate laser beams must be $\tau = 3 \cdot 10^{-13} - 3 \cdot 10^{-14}$ sec, the separate beam power must be $10^7 - 10^8$ W.

RESEARCH OF SECONDARY PENETRATING RADIATION WHEN INTERACTING X-RAY BEAMS FROM CATHODE OF HIGH-CURRENT GLOW DISCHARGE WITH TARGETS MADE OF VARIOUS MATERIALS

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The results of experimental research into characteristics of secondary penetrating radiation occurring when interacting primary X-ray beams from a solid-state cathode medium with targets made of various materials are reported. The experiments were carried out in a high-current glow discharge device with H_2, D_2, Kr, Xe gases and cathode samples made of Al, Sc, Ti, Ni, Nb, Zr, Mo, Pd, Ta, W, and Pt. The targets are shields made of various materials foil (Al, Ti, Ni, Zr, Yb, Ta, and W) with thickness of 10-30μm. They were mounted at a distance of 21 and 70cm from the cathode. The secondary radiation of two types was observed. 1-The emission with a continuos temporal spectrum in the form of separate bursts with intensity up to 10^6 fast electrons a burst. This emission began in 0.5 - 1.0 ms after the discharge current turning off. 2-The emission with a discrete temporal spectrum and emission rate up to 10^9 fast electrons a burst. The bursts distribution of this emission with time was defined by the target material. It was shown that the secondary radiation consisted of fast electrons. A third type of the penetrating radiation was observed as well. This type was recorded directly by the photomultiplier placed behind of the target without the scintillator. The obtained results show that creating optically active medium with long-living metastable levels with the energy of 1.0-3.0 keV and more is possible in the solid state.

POTENTIAL REASON OF INITIATION OF FLUCTUATIONS IN SYSTEMS

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The structure of the Universe and the structure of fluctuations in different media were observed by the author in the proceedings of the Cold Fusion conferences in 1997 and in 2002 and were reported at the conference meetings in 2003. The model of lognormal distribution genesis on the basis of the Gaussian law of entropy distribution over the system volume was suggested. It seems that the initiation of fluctuation in systems, which, in fact, is postulated by the modern physics, is connected with violation of law of degradation of energy (the second law of thermodynamics). For the discussion, we introduce the model of the cycle, which, we believe, gives the possibility to extract energy from media with constant temperature. The model was published in the collection of articles "Mathematical methods of the analysis of cycling in geology", Part I, Moscow, Voentekhizdat, 2004, pp. 54-59.

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ANALYSIS OF VIOLATION OF RADIOACTIVE DECAY REGULARITIES

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Y.A. Sapoznikov, Department of Radiochemistry of Moscow State University (MGU)

The statistically significant anomalies of scintillation and Geiger counters operation were discovered in the previous investigations (B.V. Karasev, 2000, 2001), and the computer methods using Fisher and Abbe criteria for the confident and fast allocation of the anomalies were suggested (B.V. Karasev, I.B. Karasev, 2002, 2003). According to the hypothesis, the anomalies were caused by the impact of vacuum cosmic media on radioactive decay, which requires the further examination of the phenomenon. We noticed that the anomalies often not correspond to the excess counting rate spikes, but to the appropriate counting rate zones with small deviation from average. For 10 one-second measurement steps, the correlation between device operations in MosCGMS and MGU was observed. The similar anomalies were observed during investigation of radiocarbon spectrometer operation in the Institute of Geology of Russian Academy of Sciences in October – December, 2003 with 20-minute measurement steps and during investigation of tritium decay rate on "Trikarb" spectrometer (MGU). The overall period of anomalous zones with less than 2,5% level is nearly 10-16% of overall measurements time. The analogous results were likewise received during measurements of alpha and beta activity in the continuous series of decay rates obtained with PPD equipment and submitted to us by A.A. Konradov and A.G. Parkhomov. The results received indicate the inadequacy of the Poisson distribution to the experimental series of count rates registered in various laboratories and with various monitoring periods.

THE STRUCTURE ANALYSIS OF PRODUCTS OF ELECTRIC EXPLOSION OF TITANIC SAMPLES

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The structure analysis of titanic and deuterated titanic foil before and after its electric explosion in distilled water is lead. All metal details of the explosive chamber have been made of the titan, isolators - from teflon. The battery of condensers in capacity 300 mkF, charged up to 3 kV, served as a source of high voltage. The maximum current of the discharge was about 30 kA. The mass-spectrometer analysis has shown the change of structure of impurity and the isotope structure of the titanium occurring in result of the electric explosion.

PRELIMINARY CONSIDERATIONS ABOUT DYNAMIC FEATURES OF TERLETSKI QUADRIGA

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The authors put forward hypothesizes, postulates and assumptions about the features of matter in physical vacuum, which develop further the idea of Ya.Terletski on a possibility of simultaneous generation out of vacuum, i.e. out of nothing, matter in the form of four particles with positive and negative mass – quadrigae. The dynamic features of Terletski quadrigae ($T_к$) have been considered with implementation to the models of β-decay of neutrons and reaction of deuteron synthesis. It has been demonstrated how those processes in protons and neutrons run at the level of u- and d-quarks, consisting of fractional electric charges and magnetic dipoles similar to the dipoles in $T_к$, but with the charge equal to ½ g . It has been shown also that $T_к$ can obtain the features of massless bozon with zero energy and serve as a carrier of weak and strong interactions.

RATE CONSTANTS FOR VIBRATIONAL TRANSITIONS IN HYDROGEN AND ISOTOPES

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The dynamics of the vibrating molecules is in the focus last decades, because practical applications to the cold fusion problems.

Rate constants for V-V and V-T/R transitions in hydrogen and its isotopes (HD , D2) have computed using a recent *ab initio* potencial energy surface. The results are compared with
experimental data as well as previous calculations using a simplified dumpbell type
of potencial.

PROTON TRANSFER IN HYDRODYNAMICS PULSATIONAL FLUXES OF FLUIDS IN FRAME OF CLASSICAL S-MATRIX.

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The proton transfer as a radiationness elementary process in the conditions of the hydrodynamic pulsational fluxes of fluid transition to the low frequency term considered in frame of 1D collinear model. The probability of transition has been written quasiclassically in frame of classical S-matrix. In terms of increment of classical action on the classical trajectory upon coordinate of reaction. Hydrogynamical field treated as the gaussian stochastic process with correlational function depends on the fluid's temperature. Two alternative cases were considered: when the pulsations are slow and fast relatively to the time of transition. It has been shown that for the slow pulsations case probability of transitions grow up exponentially against the temperature and for the fast pulsations behaves as Arrenius law, but with the more reduced activation gap. So, therefore dependence is nonlinear and it means that it is possible to organize senergetic cooperative regime flow of the process.

COLD FUSION AS NON ADIABATIC MANY QUANTUM ELECTRON-NUCLEAR ELEMENTARY PROCESS

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The physical model of cold fusion treated as the non adiabatic electron-nuclear elementary process developed. Such an approach allowed one to use variety of theory of non adiabatic transitions approaches elaborated in the solid state physics and also in the theory of absolute rates of chemical reactions to describe electron-nuclear interactions in cluster 's macromolecules with taken into account contribution of the low frequency degrees of freedom to these processes. The 1-D model of many quantum processes considered in the clusters of water moving in the flux of the fluid. Defective bond of the consider as the low frequency mode and also as the coordinate of reaction. The field ionization was considered. The transition upon coordinate of reaction activates just by one electron. It has been shown that even in case when there is no external motion was involved the under barrier transition will be more probable than the usual over barrier reaction.

LOW ENERGY TRANSMUTATION OF ATOMIC NUCLEI OF CHEMICAL ELEMENTS

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Annotation

A short review of experimental results on transformation (transmutation) of some atomic nuclei into other atomic nuclei at low energies is given. The coefficient of transmutation in a number of experiments reaches tens percent The phenomenological model of transmutation is offered. A calculation of possible end products that are yielded in this process under consideration of energy balances of nuclear reactions are shown. Three mechanisms of prohibition of transmutation phenomenon within modern physical conceptions are indicated. The conclusion is drawn that a sole possibility to match these prohibitions with the observed transmutation processes consists in increasing the reaction domain up to atomic dimensions.

DIRECT INTERPARTICLE ACTION (DIPA) FOR ATOMIC NUCLEI

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By the end of the twentieth century by works of the large theorists (Fokker, Feynman, Whileer, Hoyle, Narlikar, Davies, Rjasanov, Vladimirov etc.) have been established, that the ancient concept of direct interparticle action (DIPA or long-range action) - direct interpartial interaction without any intermediary (intermediate particles or fields) - is worthy alternative of performances about physical fields (gravitational, electromagnetic, weak and strong) connected to short distances forces. Now DIPA has allowed to construct the uniform theory of all physical interactions (Yu. S. Vladimirov) and helps in a new fashion to look as at known effects (such Mössbauer' effect) and to offer an explanation to observable effects, which part is completely unacceptable for the supporters of the traditional field theories. To such effects concern «cold» transmutations of nuclei, which «impossibility» are explained by necessity for nuclei Coulomb' barrier overcoming. At presence DIPA for nuclei, in atomic quantum ensembles confined, Coulomb' barrier simply is absent, that makes possible «cold» multinuclear reactions. In this work are given the experimental evidences of DIPA for all physical interactions and, in particular, - DIPA for nuclear forces.

MEASUREMENT OF GAMMA-RAY IN THE GLOW DISCHARGE ON THE HYDROGEN ISOTOPES AND AT IMPOSING A MAGNETIC FIELD

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Maintenance of reliable reproducibility of the tritium generation in the glow discharge on a hydrogen isotopes has resulted in increase of the total speed account for gamma- radiation on the detector NaI (Tl) from 3-5 % up to 5-8 %. The study of energies spectra for gamma - radiation with the detector NaI (Tl) and spectrometers AI-1024 has allowed to determine energetic zones with the increased account during of the glow discharge on a hydrogen isotopes and at imposing an external magnetic field up to 15 % from a level of a background in a range 10-50 keV. The results are discussed.

METHOD OF WATER ACTIVATION (STRUCTURING) BY ELECTRIC DISCHARGE PLASMA PROCESSING

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We developed method and made series pilot facilities for structuring (activating) of water solutions by processing liquid-phase water film by plasma of electric discharge, which of ignited in water vapor above the surface of water film. Plasma is created between electrodes one of which covered by water film with thickness about 0.5-0.7 mm. The reduced electric field amounts $E/N = (5–8)\cdot 10^{-16}$ Vcm^2. Electrodes separation was equal to 7 mm. During processing pressure in chamber was maintained at 15-20 Torr. Current density was about 0.02 A/cm^2, residence time of processed water in discharge region of amounts about 50 seconds. A good reproducibility of data dependence of spectral absorption on energy and time of procession was observed. Such high absorption was conservation more than one of year. Attempts of destructing this effect by heating, formation ice, mechanical vibrations did not change these water properties. Results of experiments may be useful for theoretical simulation of processes activating water. Future trends of using this product in hydrogen energetic, medicine, biology and ecology are actively discussed in scientific literature. Plasma technology right now is ready wide implementation of structuring water.

ON THE NEW FORMALISM OF QUANTUM MECHANIC

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It is known many formalisms of quantum mechanic: ψ - function, path integral of R.Fainman and so on. For every problem it is necessary it's own formalism. For example, for nuclear transmutation for room temperature very important principle "act on distance" in Fainman's formalism (B.Rodionov). In the report present new formalism of quantum mechanic and it some physical consequence. The main idea of this construction is non-Kantor - ordinary infinity.

VOLUME DIFFUSION DISCHARGE IN NATURAL WATER

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It has been developed experimental and theoretical investigation on volume-diffusion electrical discharge in electrolyte (VDEDE). According to the tasks wich is being solved by Physics-Chemistry Hydroairodynemic Laboratory there was given aqueduct water (electrolyte) between the electrode space which already have been crossed through barboter, dispergator and cavitator. Formed on this way “porous electrolyte” is an individual substance in which, in particulary, the velocity of the sound has a value approximately 100 time less than in the water and 10 time less in the air. Phialical technology allows to regulate physical and chemical properties of the porouse electrolyte and, consequently, changes VDEDE. It is conveyed preliminary research of changed VDEDE and their properties in depend on blow-waved procceding of the aqueduct water. We had devleloped VDEDE visualization methodics and their modification in the experiment dynamic. The obtained results has a scientifical and practical interest as well.

ABOUT ONE OPPORTUNITY OF RECEPTION THE QUARK - GLUON PLASMA IN MACROSCOPICAL SCALES

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According to modern theoretical views a matter as a quark – gluon plasmas (QGP) existed in the first 10^{-6} s after " the Big explosion ". Exist also assumptions, that QGP exists in the center of the most massive neutron stars. There is a model agrees, which nucleus of atoms except for protons and neutrons contain inclusion QGP - " heterogeneous model ". On the basis of views quantum chromo dynamic (QCD) (in its computer variant) there is a phase transition by 1-st sorts at temperature $T \geq$ 200 МэВ, at which quarks and gluons, captivated in hadron matters, are released and can be distributed as quasi free particles. Arises “color conductivity". In work it is shown, that such big temperatures in macroscopically scales can be received in a "heavy" microporous liquid (for example, mercury or her solutions with other metals, containing microbubbles them steams in diameter d=10-100 microns and high volumetric steam’s composition φ=0.5 - 0.85) at influence on it shock waves (SW). At passage SW with speed V=60 - 100 km/s in zones acceleration of a stream of a microporous liquid, where pressure according to the Bernoulli equation falls, the temperature in microbubbles can exceed $T \geq$200 МэВ. It is caused that speed of a sound - a in a "heavy" microporous liquid in zones of acceleration stream can make shares of centimeters per one second. Thus temperature - T in microbubbles at the moment of compression $T/T_0 \approx M^2$, where M=V/a, T_0 - reference temperature steams in microbubbles.

MICROBUBBLES SYNTHESIS OF LIGHT NUCLEUS

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In works: A.G.Lipson et. el.(Zh. Tech. Fiz., 1992, № 12), R.I.Nigmatulin et. el. (Science, 2002, Vol. 295) at influence by an acoustic way on deuterium containing environments the exit of neutrons exceeding in several time - on the order background is received. It specifies a basic opportunity of creation of power devices at acoustic or shock waving influence on microbubbles liquid environments, containing deuterium or tritium. In work the opportunity of creation power is examined and proved devices with a positive exit of heat or an electricity at use of synthesis easy nucleus d+d or t+d in microporous liquids (a liquid with microbubbles d=10 - 100 microns, containing steams these liquids, and volumetric steam's composition $\varphi = 0.65 - 0.85$). A base physical principle on which work of these devices is based , is that speed of a sound in microporous liquids on the order it is less than in gas and on two order less than in a liquid. At propagation shock waves (SW) in such liquids at the certain parameters volumetric steam's composition the temperature in microbubbles can be equivalent $T \geq 1 - 50$ кэВ. Microporous liquid in zones of acceleration of a stream are processed SW, generated the category with frequency 10-100 hertz. Speed of propagations SW - V =7-50 km/s in dependences on a required exit of positive energy. A power exit of devices on the basis of reaction d+d it is increased due to education t during them works.

TO THE QUESTION ON CORRECTNESS OF BALL LIGHTNING OBSERVATION CONDITIONS - PSYCHOLOGICAL ASPECTS

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The psychological factor of the observation is discussed in the present work, it can be the most important factor.

УНИПОЛЯРНАЯ ШАРОВАЯ МОЛНИЯ
UNIPOLAR BALL LIGHTNING

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On a basis of experimental data with artificial ball lightnings in gas discharges and of observation analysis of high energy ball lightning the hypothesis is put forward on ball lightning origin from highly charged melt of different materials. This melt appears at the stroke of linear lightnings or discharges into these materials. Atmospheric electric fields and obtained unipolar charge from the lightning determine the levitation capability of these objects. The unipolar charge on the ball lightning surface determines the possibility of its luminosity and heating, this in its turn determines its lifetime and ignition. High energy content of ball lightning is determined by the combustion processes of its matter in air.

SOME BALL LIGHTNING OBSERVATIONS

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New data on ball lightning observation properties collected lately are represented. The question of the observations character necessary for complete picture of ball lightning properties is under the discussion.

STUDIES OF VORTEX PLASMOID PHYSICAL PROPERTIES

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Ball Lightning (BL) physics and chemistry is not clear up today [1]. There are some evidences that smell of sulfur and ozone is connected with BL. Thin quartz threads (tubes) with heavy metals insertions were found after BL dissipation (decay) on ground surface. Dark smoke wake is created behind BL in some cases. There is considerable energy release connected with BL also [1]. So, plasma- chemistry and energy release could be realized inside BL.

Present work is devoted to study of study of plasma- chemistry and calorimetric measurements inside plasma vortex. This work is continuation of the previous one [1-4]. Remember that it was revealed that plasma vortex properties are closed to natural BL in our experiments and Kapitsa's experimental work [2].

Extra energy release up to 1800% in vortex plasmoid was measured in our experiment. Unusual anomalous properties of soot particles created inside vortex plasmoid are measured in this experiment also. Different new chemical elements such as Cl, Al, S, P and others are measured in these soot particles. Note that these elements are absent in the initial testing gas. Possible explanation of experimental results is considered in this work.

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NEW INVESTIGATIONS OF BALL LIGHTNING

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A review of modern state of the ball lightning problem is made basing on materials of international Symposium on ball lightning ISBL04.

RELATIVISTIC MODEL OF BALL LIGHTNING

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The surmise on a vortical electric nature of the ball lightning (BL) is not a new one. As early as half a century ago it was mentioned as the entire branch in the classification of hypothesis serving to explain the phenomena of BL. The ball lightning was supposed to be the secluded circular section of the linear lightning. The very fact that the plasma 'holds one itself' was beyond the question for everybody. Nevertheless the main problem was that no author was able to provide either with the evident physical mechanism or with sufficiently precise mathematical tool explaining the stability of the electrical vortex and allowing analyzing its basic features. The attempt to explain the phenomena of BL proceeding from the classical mechanics, electrodynamics and special relativity and using the common mathematical tool was made in the present work. Here we show that stable system of charged rotating particles can exist with finite radial dimension and with finite electrical charge density. If the model complies with the reality then it opens up possibilities to work out a few practical applications.

DIFFICULTLY EXPLAINED PROPERTIES of BALL LIGHTNING

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The phenomenon observed by the author is discussed in the report. The report deals with occurrence of ball lightning (BL) inside the building oft the main elevating machine. Analysis of similar messages form various sources has been made. The property of BL to penetrate through various dielectric obstacles is a reliably proved fact and is one of difficulty explained properties. It is proved in the report, that it possible to explain the observed properties by use of BL soliton model. The only drawback of such model is the high density of electromagnetic energy. BL model as a magnetic flywheel rotating with relativistic speed (RMR), can explain high density of electromagnetic energy. Energy of magnetic field RMR is increased by some orders due to rotation of its equivalent mass. The model as a big congestion a RMR allows to explain repeatedly observably(notice) properties of BL.

OBSERVED CHARACTERISTICS of the BALL LIGHTNING

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The analysis of evidence gathered from eyewitnesses brings us to the conclusion that the ball lightning is a real event with stable observed characteristics. The data is represented as a multi-dimensional vector in a space of ball lightning properties and observation conditions. Such a representation has allowed to sample the data in one or more parameters, to perform comparison of the results for different ways of sampling, and to investigate stability of the statistical results with respect to the change the sample volume. The directly observed characteristics of the ball lightning are its size, shape, occurrence time, color, brightness, distance the object covered during the observation period, and sense of heat. To the space of circumstances of conditions of the observation, the phenomenon itself, and description of the observer are referred. The influence of various factors on the observable properties of the ball lightning have been considered.

ELECTRIC MANIFESTANION OF THE BALL LIGHTNING

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The ball lightning manifests its electric properties by damaging people and animals, fusing metals and glass not only at immediate contact, splitting wood, etc. It causes electric discharge when passing in the vicinity of electric conductors and generates electric current at a significant distance. Ten per cent of eyewitnesses of the ball lightning (156 people) reported its appearance either from a metallic object (two thirds) or from the channel of a linear lightning (one third). The people who witnessed the disappearance of the ball lightning (more than 60% of the observers) describe it as explosion (55.7%), disintegration (11.4%), or gradual extinction (32.9%). Besides, there are eyewitnesses who claim direct contact with a ball lightning, which, in a significant number of cases, had no consequences. In this paper, we consider the observed characteristics of the ball lightning depending on its mode of disappearance and connection with a thunderstorm. The observed characteristics of the object were estimated both quantitatively and qualitatively. A conclusion can be drawn that differences in characteristics are virtually absent for both samples.

RESEARCHING OF ENERGY TRANSFER PROCESSES FROM A LINEAR LIGHTNING TO BALL LIGHTNING ON MODEL OF INDUCTION DISCHARGE

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Researches concern of ball lightning (BL) on model of the monopulse induction toroidal discharge stabilized by a gas vortex ring. It is shown, that transfer of electromagnetic energy from a linear lightning to BL may occur during course of back front of a current pulse of a linear lightning provided that conductivity of the plasma forming BL, is enough big. Results of computer modeling of transfer processes of electromagnetic energy from a lonely conductor in the center of the toroidal transformer to its coils with various radiuses are submitted and at various parameters of a pulse of a current in view of nonlinear character of conductivity of plasma. During experimental researches generation of pulses of a current it was carried out with the help of the IGBT-transistors working in a periodic mode with infrequent pulses, and registration of transmitted energy was carried out with the help of an oscilloscope in a circuit containing various nonlinear elements, including elements with the falling volt-ampere characteristic.