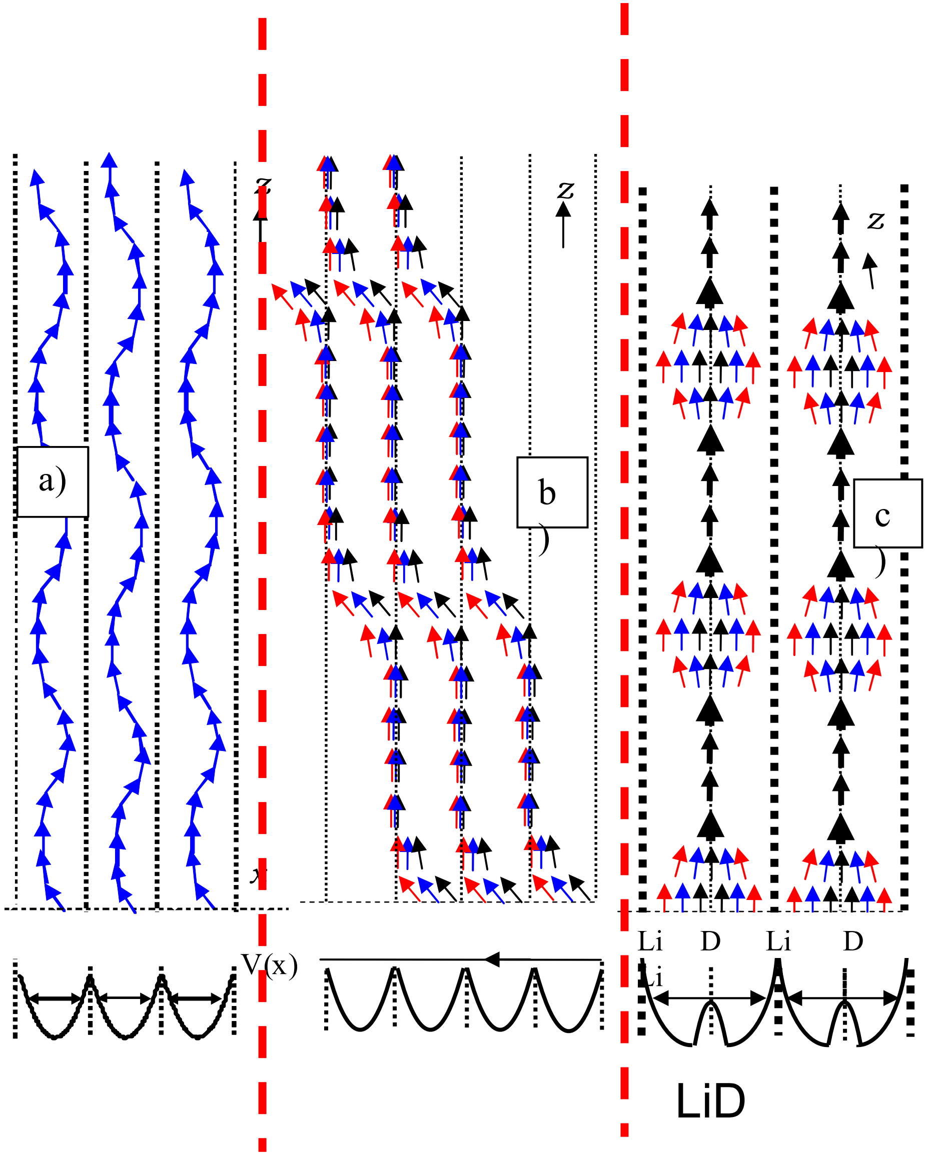
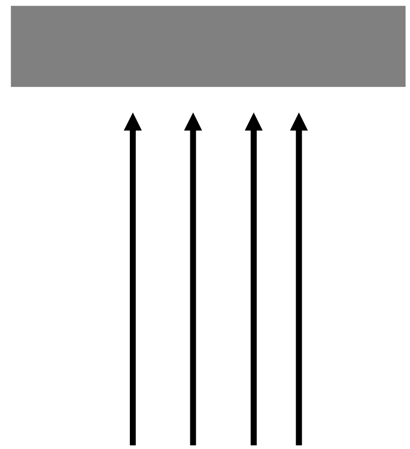
Управляемые ядерные процессы при низкой энергии

(к юбилею Н.В.Самсоненко)

В.И.Высоцкий

Методы оптимизации ядерного синтеза в кристаллических мишенях
(1981-2013…Высоцкий В.И., Кузьмин Р.Н.)





Notes on the Prehistory of LENR

Break-even controlled fusion reaction in crystalline targets

V. I. Vysotskii and R. N. Kuz'min

(Submitted April 24, 1981)
Pis'ma Zh. Tekh. Fiz. 7, 981–985 (August 26, 1981)

PACS numbers: 28.50.Re, 61.80.Mk, 61.80.Jh

The common assertion that a controlled nuclear fusion reaction with a net energy yield cannot be achieved by bombarding a target with a fast particle beam is usually based on the vanishingly small value of $\sigma_n/\sigma_e \sim 10^{-8}$, the ratio of the fusion cross section σ_n to the cross section for ionization and radiation losses, σ_e. A more systematic analysis leads to a fundamentally different estimate, as we will show here by deriving a condition for a break-even fusion reaction in an "ordinary" medium (i.e., not a plasma).

The number of particles of an accelerated beam of intensity J which undergo fusion reactions in a thin slab Δz of a target of density n_0 is

$$\Delta J_n = J\sigma_n n_0 \Delta z.$$

Energy-absorption mechanisms competing with the fusion reaction are the excitation and ionization of the target atoms, with typical cross sections $\sigma_e \sim 10^{-16}$ cm^2 for the outer electrons and $\sigma_e \sim 10^{-23}$ cm^2 for the inner electrons of elements of intermediate weight. Since the incident particle loses an energy $\delta E \sim E_{ion,exc} \sim 1$–$10$ eV in each such interaction, the number of successive collisions involving ionization and excitation of target atoms which is required to remove a particle from the picture, i.e., to reduce its energy to a level too low to cause any further fusion reactions, is $\Delta E/\delta E$, where ΔE is the energy interval around the optimum particle energy E_0 in which $\sigma_n(E)$ is at its greatest. The change in the beam intensity resulting from the loss of particles which are slowed in the medium is thus

$$\Delta J_e = J\sigma_e n_0 (\delta E/\Delta E)\Delta z.$$

The condition for a reaction with a net energy yield is therefore

$$(\Delta J_n + \Delta J_e)E_0 < \Delta J_n E_1,$$

and for the normalized parameters $J = 1$, $n_0 = 1$, $\Delta z = 1$ this condition can be written

$$P_0 \equiv (\sigma_n + \sigma_e \delta E/\Delta E)E_0 < \sigma_n E_1 \equiv P_1.$$

Here E_1 is the energy released in each fusion reaction. For the optimum reaction D + T, with $E_1 \approx 17.6$ MeV, $E_0 \approx 130$ keV, $\Delta E \approx 60$ keV, $\sigma_n^{max} \approx 5\cdot 10^{-24}$ cm^2, we fi[nd] the reduced absorbed power density to be $P_0 \approx 2\cdot(10^{-1[5]}$–$10^{-16})$ eV/(cm$^3\cdot$s). Comparison of P_0 and P_1 reveals th[at] the contrary of the necessary condition in (1) always ho[lds]: $P_0 > P_1$. At the same time, estimates show that the rati[o] σ_n/σ_e is not negligibly small, as implied by a direction[al] comparison of the cross sections. The fact that P_1 and [P_0] are not greatly different raises the hope that events mi[ght] be arranged to satisfy condition (1) by making use of cer[tain] real physical effects. In particular, it follows from (1) that if the ratio σ_n/σ_e could be increased by a factor of 3–30 a net energy yield could be achieved with an accelerated beam.

We will now show that this change can indeed be arranged by bombarding a crystalline target with particle[s] moving at a kinetic energy higher than the potential barriers in the crystal. The use of the channeled motion o[f] high-energy deuterons, in contrast, would result in a decrease in the ratio σ_n/σ_e, because channeled particles move predominantly in the regions between atomic plan[es] where the density of outer electrons is substantial but t[he] density of nuclei is zero.

Let us assume that a deuteron is incident on the cr[ys]tal at a small angle $\theta = \rho_{0x}/\rho_z$ with respect to an atomic plane. The solution of the Schrödinger equation for the two-dimensional motion of this deuteron in the crystal i[s] given in the semiclassical approximation by

$$\psi_{1,2} = C(P_{0x}/|P_x|)^{1/2}\exp\left\{i\left[p_z z \pm \int_0^x |P_x| dx\right]/\hbar\right\},$$

[14] И. М. Цидильковский. Зонная структура полупроводников. «Наука», М. (1978).
[15] С. Дэвисон, Дж. Левин. Поверхностные (таммовские) состояния. «Мир», М. (1973).
[16] M. A. Mekhtiev. Sol. St. Commun., 28, 299 (1978).

Институт физики АН БССР
Минск

Поступило в Редакцию
5 ноября 1982 г.

УДК 539.172.14

О ВОЗМОЖНОСТИ ОПТИМИЗАЦИИ РЕАКЦИИ УПРАВЛЯЕМОГО СИНТЕЗА В КРИСТАЛЛАХ

В. И. Высоцкий, Р. Н. Кузьмин

В [1] был предложен метод реализации энергетически выгодной реакции управляемого синтеза в кристаллической мишени, использующий резкое повышение сечения реакции $\sigma_n \to \sigma_n^* \gg \sigma_n$ с одновременным относительным уменьшением сечения потерь $\sigma_e \to \sigma_e^* > \sigma_e$ при надбарьерном движении пучка ускоренных частиц. При этом степень повышения эффективности реакции определяется в первую очередь отношением $k = (\sigma_n^*/\sigma_e^*)/(\sigma_n/\sigma_e)$.

Там же на основе квазиклассического описания было показано, что в случае осевого надбарьерного движения $k \approx 100$ и становится выгодной реакция синтеза при относительной концентрации тяжелого изотопа D (или T) в водородсодержащих плоскостях или осях кристалла на уровне $\eta \geqslant P_0/P_1 k \approx 0.3 \div 0.03$. Параметр $P_1/P_0 \approx 0.04 \div 0.4$ определяет отношение объемных плотностей выделяемой и поглощаемой энергии в изотопной мишени [1]. Используемые ниже обозначения соответствуют принятым в [1].

1. Кроме оптимизации η за счет увеличения $\sigma_n^* \gg \sigma_n$, рассмотренной в [1], возможно дополнительное значительное уменьшение пороговой концентрации η при управляемом абсолютном уменьшении σ_e^* до значений $\sigma_e^* \ll \sigma_e$ за счет уменьшения на время взаимодействия (реакции) плотности атомных электронов в области расположения ядер, где с подавляющей вероятностью будут находиться надбарьерные частицы. Такая кратковременная перестройка электронной оболочки водородсодержащих плоскостей возможна за счет возбуждения электронного перехода в атоме из s- в p-состояние. Использование резонансного лазерного π-импульса приводит к полной инверсии этого перехода. Оценим величину такого эффекта.

При возбуждении электронного перехода $\Psi_{100} \to \Psi_{210}$ усредненные по кристаллической плоскости линейная плотность p-электрона $f_p(x)$ и потенциал плоскости $V_p(x)$ в области $x, u \ll R$ (u — амплитуда тепловых колебаний) равны

$$f_p(x) \approx (u^2 + x^2)/16R^3, \quad V_p(x) \approx V(0)\left[1 - 3x^2/\sqrt{8\pi}Ru\right].$$

При непосредственно надбарьерном движении область локализации частицы $|\Delta x| \leqslant u$, для которой сечение $\sigma_n^* \approx \sigma_n a/\sqrt{2\pi}u$ остается тем же, соответствует условию

$$|\Delta x| \equiv \left(|E_0 - p_z^2/2m - V(0)|\sqrt{8\pi}uR/3V(0)\right)^{1/2} \leqslant u.$$

Отсюда, используя соотношение $E_0 - p_z^2/2m \approx E_0\theta^2$, находим допустимый интервал углов $\Delta\theta \approx 3u\theta/\sqrt{8\pi}R = \theta/10 \geqslant 10^{-3}$.

На основе определения σ_e^* [1] находим $\sigma_e^* \approx \sigma_e a u^2/16R^3$, что для оценочных параметров [1] соответствует $\sigma_e^* \approx 3\cdot 10^{-3}\,\sigma_e$ и $k \approx 3\cdot 10^3$. Аналогично для осевого надбарьерного движения в направлении, соответствующем пространственному минимуму функции $|\Psi_{210}|^2$, определяемому направлением и поляризацией луча лазера, находим $k > 10^4$.

Такое значительное дополнительное абсолютное подавление канала поглощения с одновременным неизменным усилением канала синтеза позволяет осуществлять энергетически выгодную реакцию при облучении ускоренными ядрами трития необогащенной мишени с естественным содержанием дейтерия $\eta \approx 1.5\cdot 10^{-4}$ в водородсодержащих плоскостях.

2. Следующим важным вопросом оптимизации реакции является учет влияния всегда имеющего место деканалирования на эффективность синтеза. Уравнение баланса, учитыва-

Высоцкий В.И., Кузьмин Р.Н. Реакция управляемого синтеза в кристаллических мишенях. **Письма в ЖТФ, т. 7, в. 16, 1981, с. 981-985**

Высоцкий В.И., Кузьмин Р.Н. О возможности оптимизации реакции управляемого синтеза в кристаллах. **ЖТФ, т. 53, № 9, 1983, с. 1861-1863**

Annals of Nuclear Energy 62 (2013) 613–617

Contents lists available at SciVerse ScienceDirect

Annals of Nuclear Energy

journal homepage: www.elsevier.com/locate/anucene

Nuclear fusion in ordered crystal targets bombarded by monochromatic beams of light or middle-mass isotopes

Vladimir I. Vysotskii [a], Mykhaylo V. Vysotskii [a], Sergio Bartalucci [b,*]

[a] Kiev National Shevchenko University, Vladimirskaya St. 64, 01033 Kiev, Ukraine
[b] LNF-INFN Research Division, Via E. Fermi 40, 00044 Frascati, Italy

ARTICLE INFO

Article history:
Available online 29 March 2013

Keywords:
Nuclear fusion
Crystal target
Channeling
Resonant tunneling

ABSTRACT

In ordered crystal lattice there is very strong influence of crystal axes and planes electrical field on motion and interaction of fast charged particles with crystal atoms and nuclei. It is shown that in mono-crystal targets like *LiD* the rate of fusion process with the participation of both target nuclei (e.g. *D*) and beam of fast nuclei (e.g. *T*), directed at *Lindhard* angle, may be increased by 10–100 times compared to the alternative process of deceleration on atomic electrons. Such changes are based on the use of specific channeling physics regime of motion – "overbarrier motion". At such regime the processes of spatial redistribution and dechanneling of accelerated ions take place. In this article the methods of optimization and practical realization of such a nuclear fusion are discussed in details.

Another method for radical optimization of fusion processes with the use of monochromatic beams of middle mass isotopes is proposed. The features of optimized nuclear fusion model based on resonant tunneling effect were considered. This leads, in combination with the use of particle beams with optimum energy and energy spread, which correspond to total transparency "window" of reaction barrier, to the possibility of positive nuclear fusion energy release on one atomic monolayer! Such effect can be regarded as nuclear super absorption of accelerated beam. The possibility of nuclear reactions $C^{12} + O^{16}$ and $C^{12} + O^{18}$ at such motion regime with positive energy release is examined.

1. Introduction

The problem of optimizing nuclear fusion is one of the most important in modern physics.

It is well known that the total probability of nuclear reactions to occur with the participation of charged particles at low energy (for $E \ll Z_1Z_2e^2/R$) is defined, in the first approximation, by the action of the Coulomb barrier $Z_1Z_2e^2/R$ and, as a result, is limited by the very small probability of the tunnel effect.

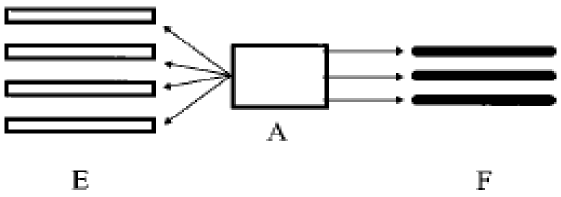
This fundamental limitation sharply complicates the solution of the problem of nuclear synthesis and stimulates the use of fast particles in the volume of a hot thermonuclear plasma, which leads to the necessity of solving the extremely complicated technological unfavorable for the time being even for lightest particles (d and t). It is also obvious that the choice of the "thermonuclear" way makes any attempt to use, under the terrestrial conditions, the reactions of synthesis on the base of isotopes heavier than deuterium or tritium (they in turn are not optimum candidates) absolutely unrealistic.

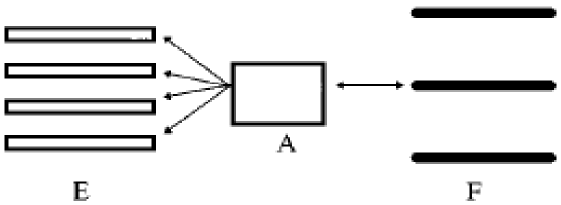
From another point of view the optimal energy for effective interaction of light particles (e.g. $E_{opt} \approx 130$ keV for $d + t$ interaction) is much lower than the energy release at fusion reaction with the participation of these nuclei ($Q_R \approx 17.6$ MeV). Such circumstance leads to the possibility of "accelerated way" of nuclear fusion with energy release. The common assertion that a controlled nuclear fusion reaction with a positive energy release cannot be

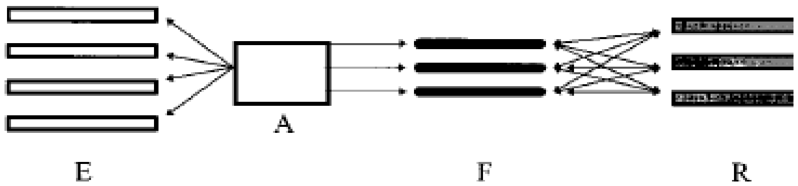
Дистанционное управление вероятностью, скоростью и анизотропией гамма-распада ядер

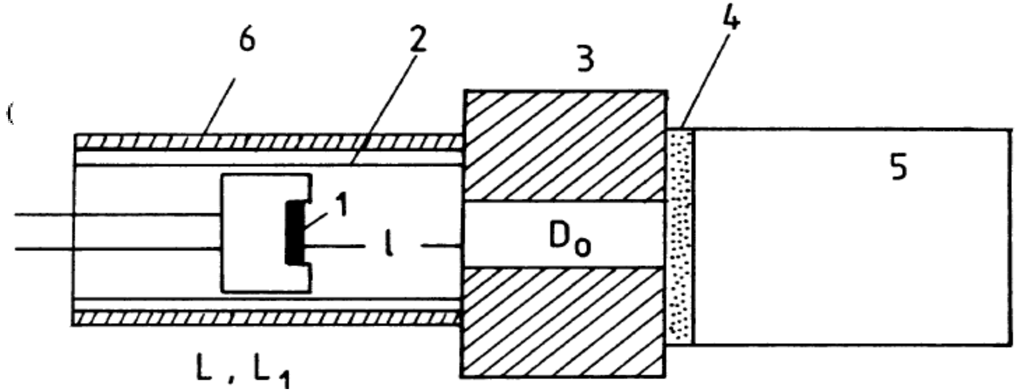
Высоцкий В.И., Кузьмин Р.Н., Корнилова А.А.(1984-2013)

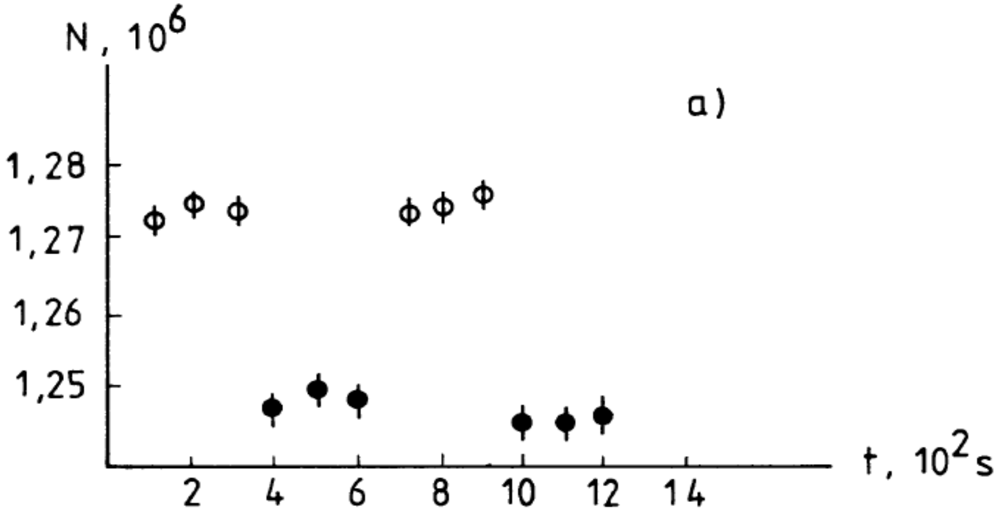
$$\rho(\omega)=\frac{\omega^2}{\pi^2c^3};A_{eg}\equiv\frac{1}{\tau}=\frac{4\pi^2\omega_{eg0}\,|\vec{d}_{eg}|^2}{3\hbar}\rho\left(\omega_{eg0}\right)=\frac{4\omega_{eg0}^3\,|\vec{d}_{eg}|^2}{3\hbar c^3}$$

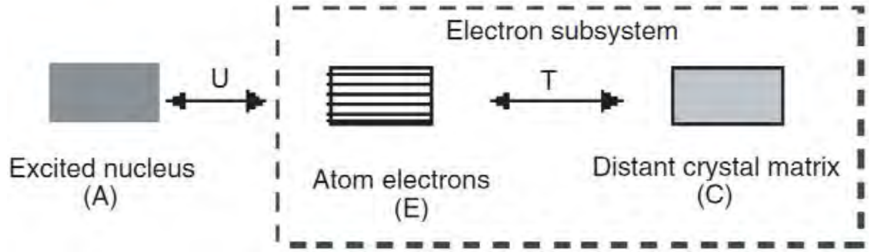


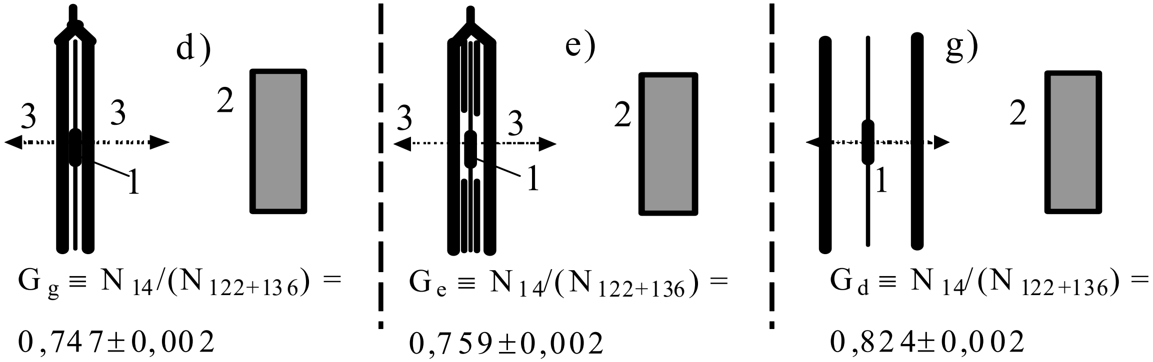


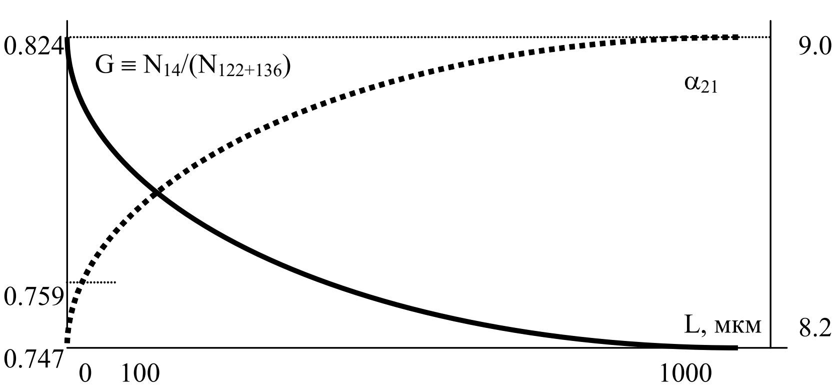


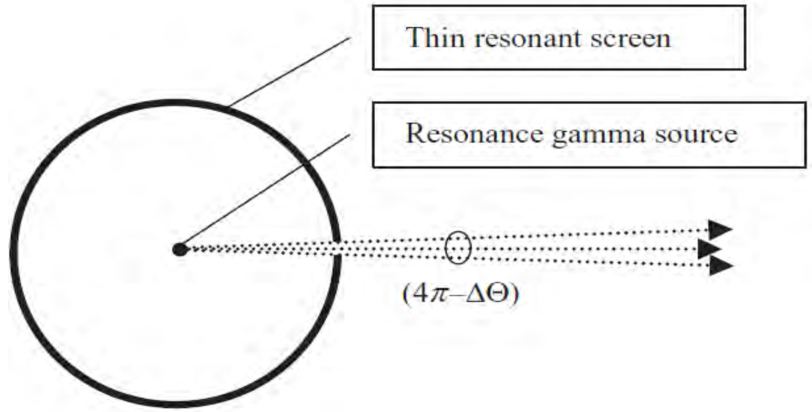





Electron subsystem
U
T
Excited nucleus
(A)
Atom electrons
(E)
Distant crystal matrix
(C)


d)
e)
g)
3
3
2
1
$G_g \equiv N_{14}/(N_{122+136}) =$
0,747±0,002
$G_e \equiv N_{14}/(N_{122+136}) =$
0,759±0,002
$G_d \equiv N_{14}/(N_{122+136}) =$
0,824±0,002


0.824
0.759
0.747
$G \equiv N_{14}/(N_{122+136})$
α_{21}
9.0
8.2
L, мкм
0
100
1000


Thin resonant screen
Resonance gamma source
$(4\pi-\Delta\Theta)$

PHYSICAL REVIEW C VOLUME 58, NUMBER 1 JULY 1998

Controlled spontaneous nuclear γ decay: Theory of controlled excited and radioactive nuclei γ decay

Vladimir I. Vysotskii
Kiev Shevchenko University, Radiophysical Faculty, 252033, Kiev, Ukraine

(Received 16 June 1997)

A general theory of controlling and changing the spontaneous nuclear γ decay is proposed. The phenomenon of nuclear decay controlling is a result of the inter
netic modes, which in turn interact with the cont
probability with the presence of adjacent material b
free space. It is shown for the first time that the dec
the radiation shift (radiation correction) of the reso
atom electrons). This shift is determined by proces
netic field modes (the lowest by energy or ground
appears to be more significant than for the nonres
decay process will be realized in the case when the
which interact with the nucleus, occur to be mutual
increased by many orders of magnitude. [S0556-2

PACS number(s): 23.20.Nx, 23.20.Lv, 21.10.Tg, 2

I. INTRODUCTION IN THE GENERAL PROBLEM OF CONTROLLED SPONTANEOUS γ DECAY OF EXCITED NUCLEI

Hyperfine Interactions 107 (1997) 277–281

The problem of gamma-laser and controlling of Mössbauer nuclei decay (theory and practice)

V.I. Vysotskii [a], V.P. Bugrov [b], A.A. Kornilova [b], R.N. Kuz'min [b] and S.I. Reiman [b]

[a] *Kiev Shevchenko University, Radiophysical Dept., 252017, Kiev, Ukraine*
[b] *Moscow State University, 119899, Moscow, Russia*

This paper discusses the control process of the radioactive Mössbauer nuclei spontaneous decay probability. The possibility of using this effect in order to produce an optimized gamma-laser is considered. For the first time, the experiment has shown
...e doubling for ^{57}Fe nuclei and a general lifetime increase (including
n-Mössbauer decay channels) by 2%.

ıma of gamma-laser (that is, it requires nuclei exhibiting short-
ith $\tau < 10^{-6}$ s, $\Gamma\tau = 1$, maximal amplification coefficient
α) and very intensive pumping, or long-lived nuclei with $\tau > 1$ s,
ification coefficient $G = \lambda^2 \Delta n f / 2\pi(1+\alpha)\Gamma\tau$ and slight pump-
lly solved in case of controlled nuclear decay, when τ equals τ_{max}
τ_{min} during gamma-generation.
: considered the posibility to control the A_{ij} decay probability
er nuclei by means of electromagnetic vacuum controlled mode
n idea of spontaneous decay velocity control consists in the
veraged modes density in a unit fequency interval

$$\rho(\nu_n) f(\nu_n, \nu_{ij}, \Omega)\, d\nu_n d\Omega\,, \qquad \rho(\nu_n) = 8\pi\nu_n^2/c^3\,,$$

CHAPTER 14

CONTROLLED SPONTANEOUS DECAY OF MÖSSBAUER NUCLEI (THEORY AND EXPERIMENTS)

Vladimir I. Vysotskii[1] and Alla A. Kornilova[2]

[1]*Mathematics and Radiophysics Department, Kiev National Shevchenko University, Kiev, Ukraine*
[2]*Moscow State University, Moscow, Russia*

14.1 INTRODUCTION TO THE PROBLEM OF CONTROLLED SPONTANEOUS GAMMA DECAY

The problem of controlled spontaneous decay of the excited nucleus or atom states is one of the most interesting in nuclear physics and nuclear technology. There are many very important possible applications of controlled decay. First of

Трансмутация на основе LENR стабильных и радиоактивных изотопов в биологических системах

Высоцкий В.И., Корнилова А.А.(1993-2021…)

$$Mn^{55} + d^{2} = Fe^{57}$$

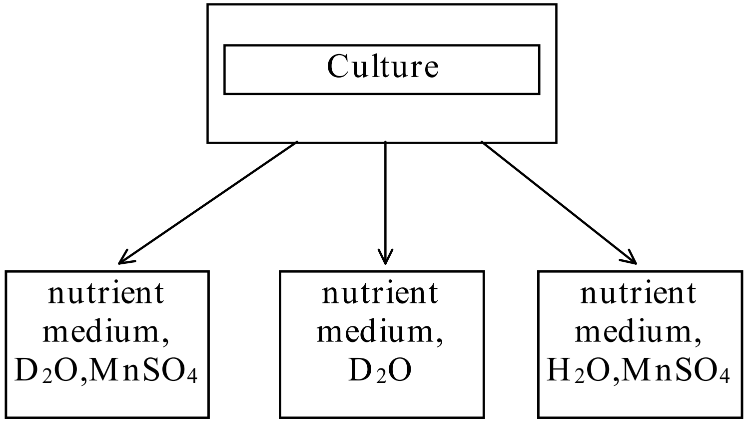
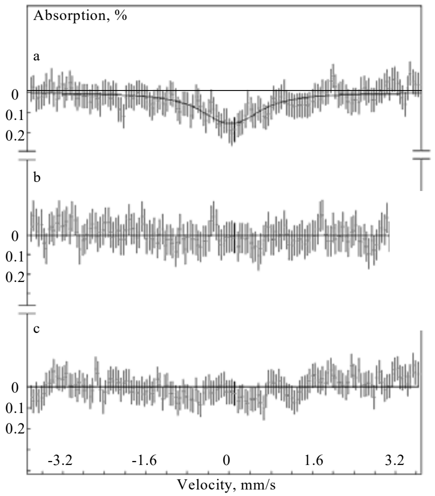
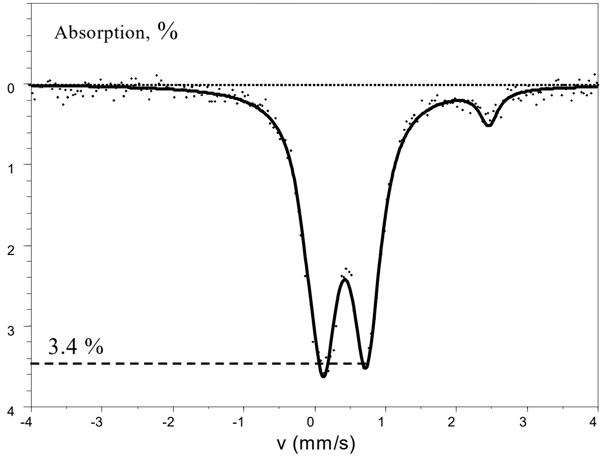
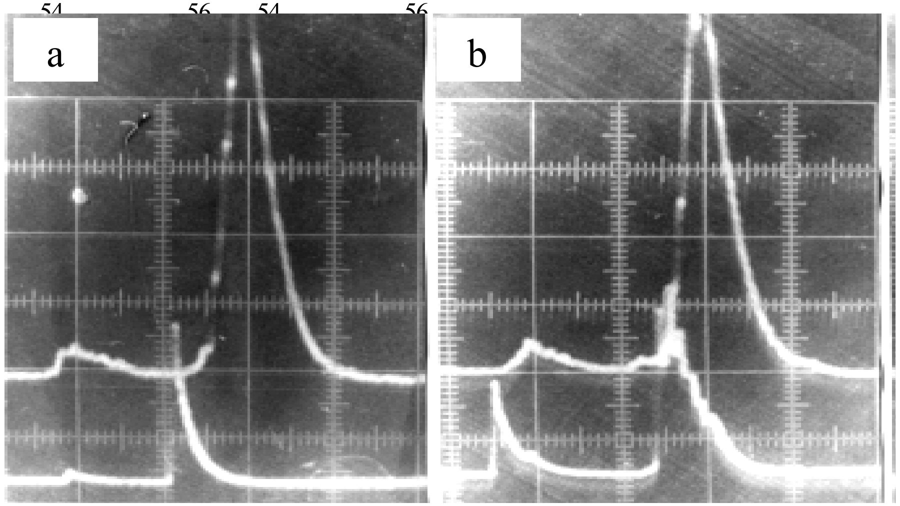


Fig.1 The scheme of experiment.







Fe^{54} Fe^{56} Fe^{54} Fe^{56}

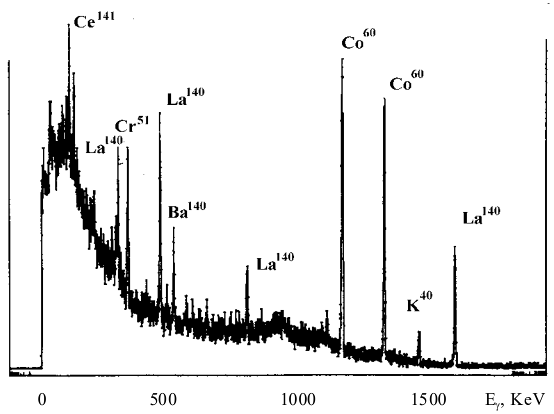
$$\lambda = \frac{\Delta N(Fe^{57})}{N(Mn^{55})\Delta t} \approx 10^{-6}$$

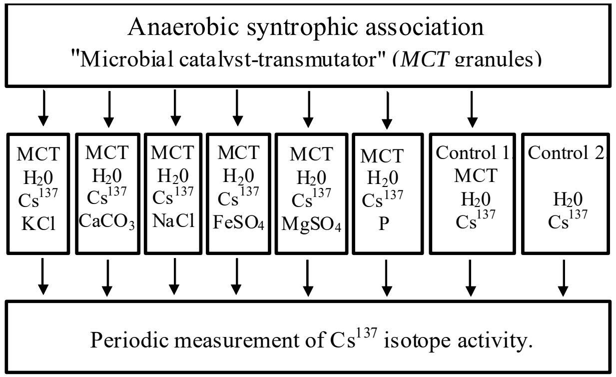
synthesized Fe^{57} nuclei per s and per single Mn^{55} isotope;

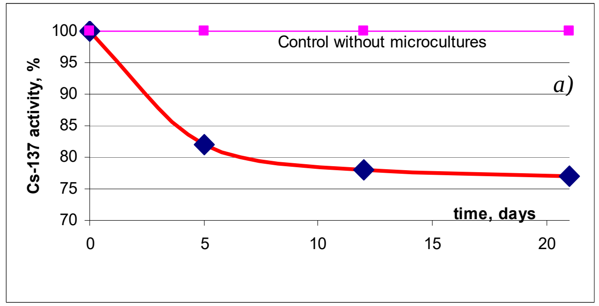
$$Na^{23} + P^{31} = Fe^{54}$$

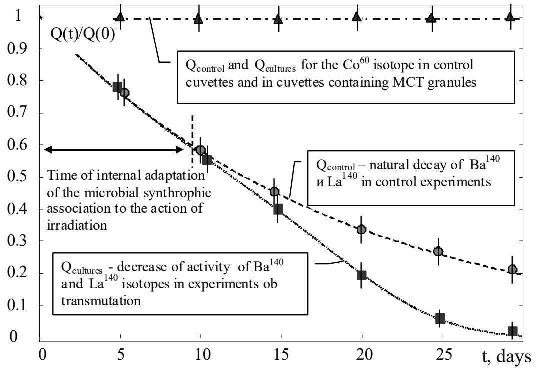
$$Cs^{133} + p = Ba^{134}$$

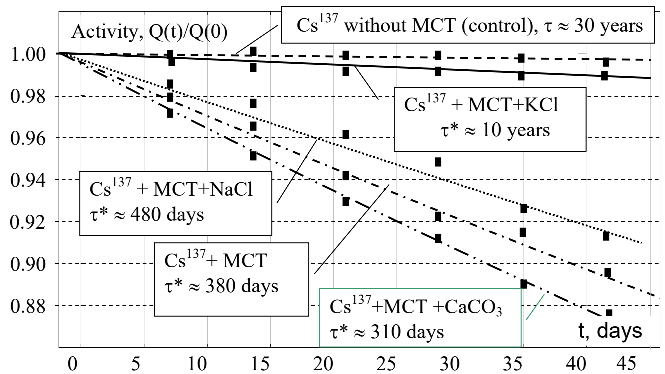
Transmutation of radioactive isotopes and reactor waste

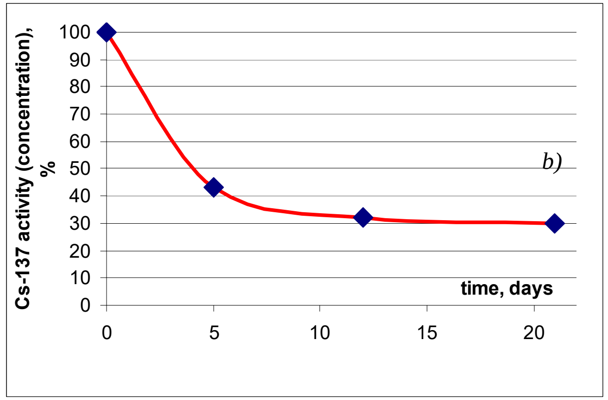












Accelerated transmutation of radioactive isotope Ba140

Ba140 + C12 = Sm152

Accelerated transmutation of radioactive isotope Cs137 in microbiological syntrophic association

Cs137 + p = Ba138

Correlated coherent states of particles and Schrödinger-Robertson uncertainty relation (1930)

In 1930, Schrödinger and Robertson independently generalized the Heisenberg idea of the quantum-mechanical uncertainty of different dynamical quantities A and B for the case of mutual coherence of the particle states corresponding to each energy level of quantized states and received the more universal condition called the Schrödinger--Robertson uncertainty relation

$$\sigma_A \sigma_B \geq \frac{|<[\widehat{A}\widehat{B}]>|^2}{4(1-r^2)}; \; |r| \leq 1, \; r = \frac{\sigma_{AB}}{\sqrt{\sigma_A \sigma_B}}$$ - coefficient of correlation

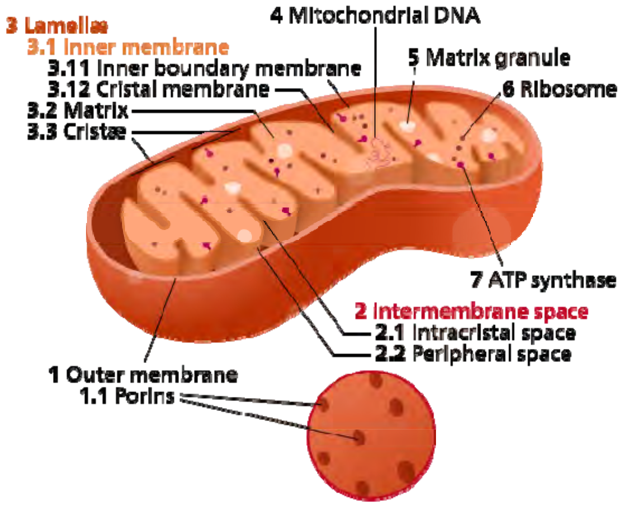
$$\sigma_{AB} = \frac{<\{\Delta\widehat{A}, \Delta\widehat{B}\}>}{2} = \frac{(<\widehat{A}\widehat{B}> + <\widehat{B}\widehat{A}>)}{2} - <A><B>$$ - cross dispersion of A and B

$$\delta p \delta q \geq \frac{\hbar}{2\sqrt{1-r^2}} \equiv \hbar_{eff}/2, \quad \hbar_{eff} = \hbar / \sqrt{1-r^2}$$ - effective Planck constant

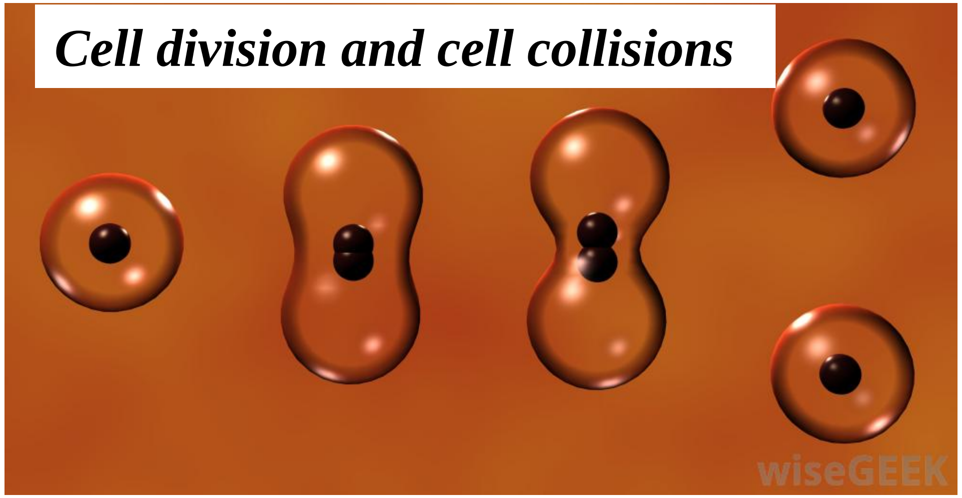
$$r = \frac{\{<qp> + <pq>\}}{2\sqrt{<p^2><q^2>}}; \quad \delta E \delta t \geq \hbar_{eff}/2$$

Formation of non-stationary potential wells in growing biological objects (the possible place of CCS formation and LENR realization)

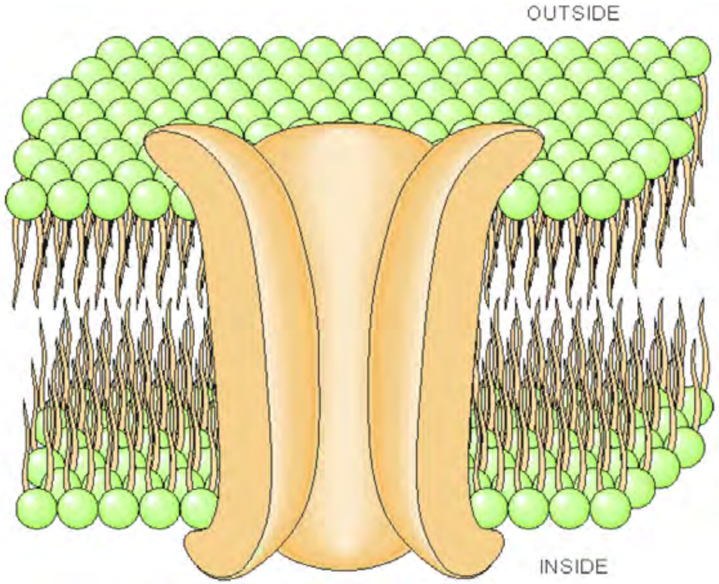
Mitochendrion

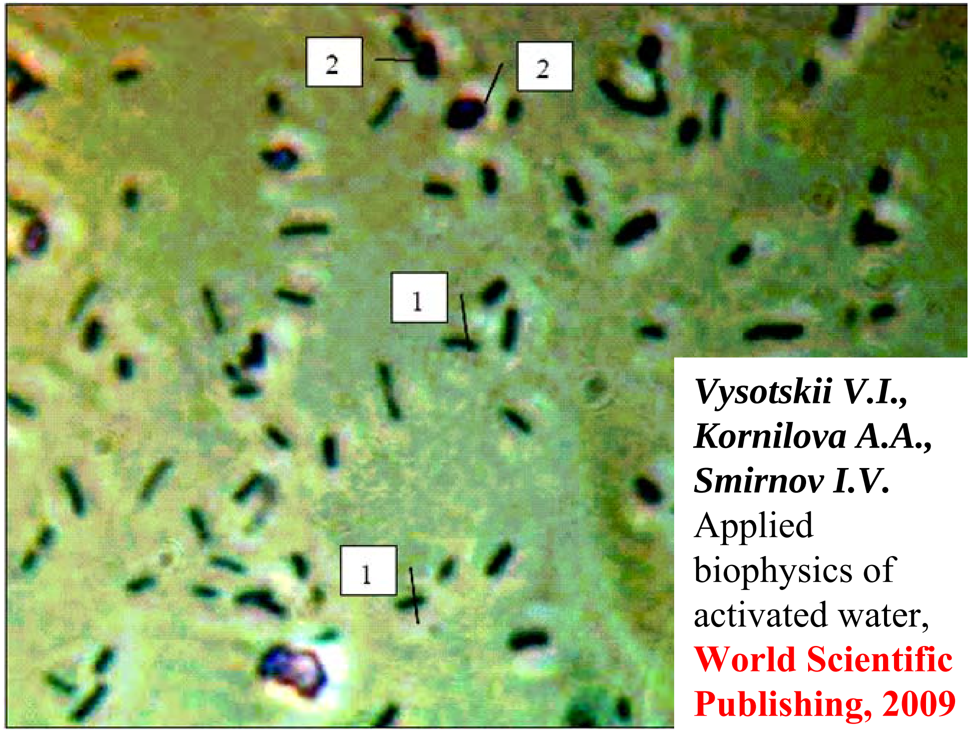


Cell division and cell collisions



Pore in cell membrane





Vysotskii V.I., Kornilova A.A., Smirnov I.V. Applied biophysics of activated water, **World Scientific Publishing, 2009**

DNA replication

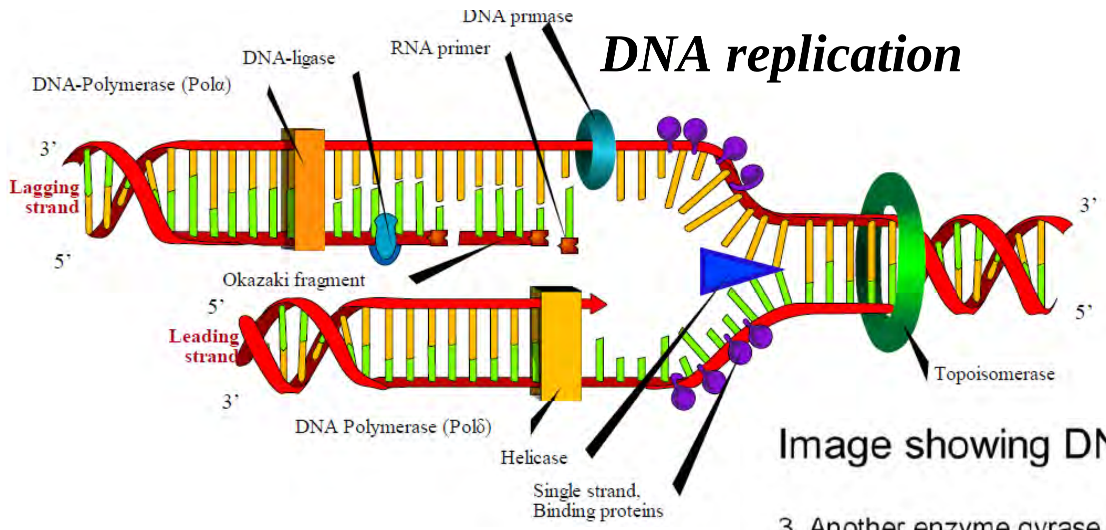
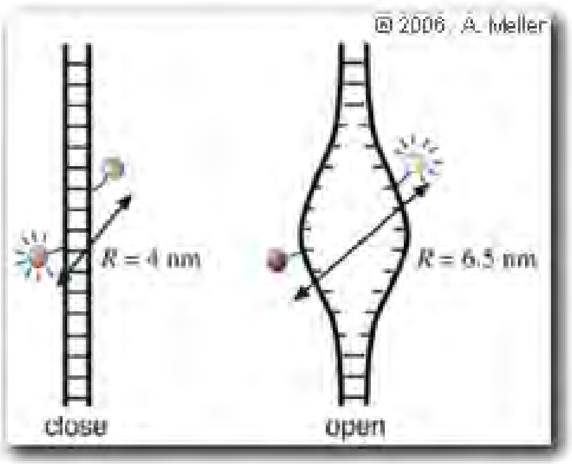
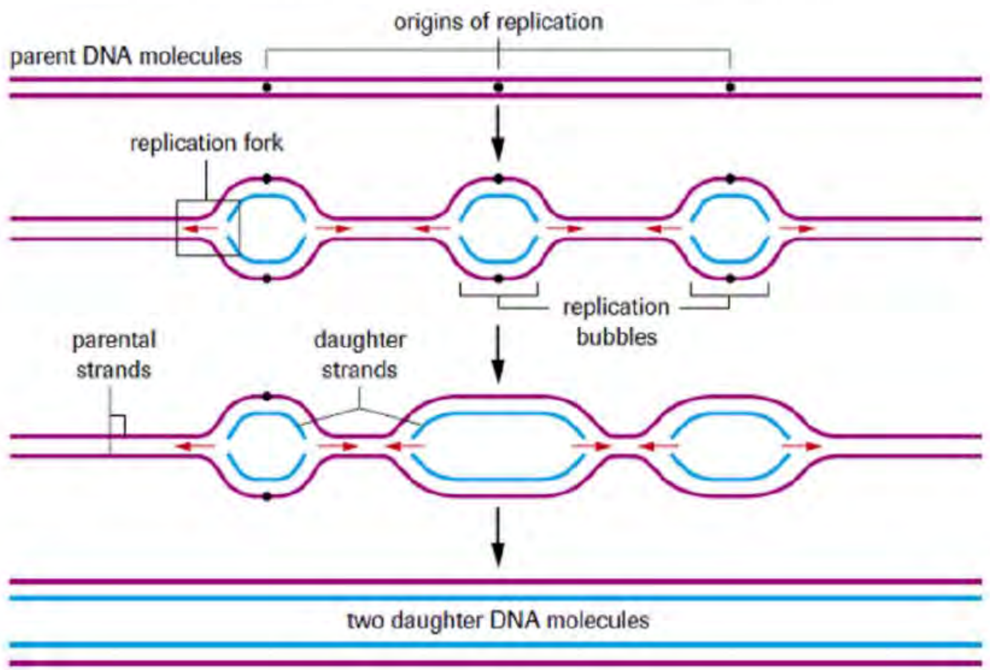


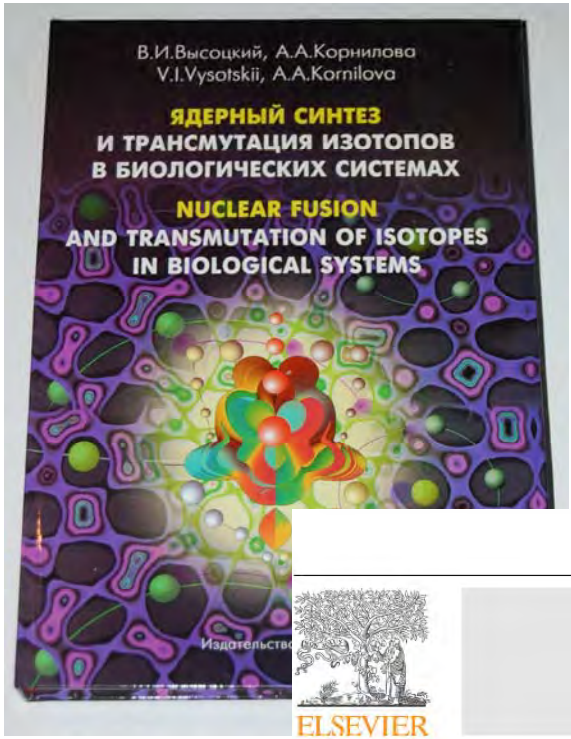
Image showing DNA replication in Prokaryotes

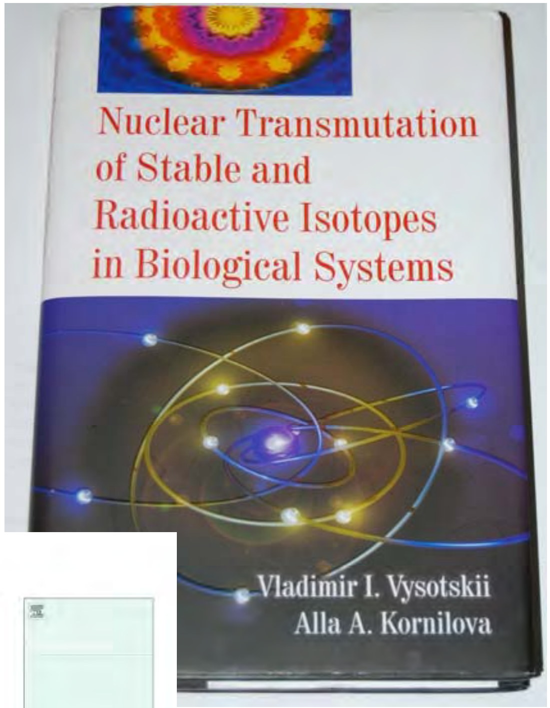
3. Another enzyme gyrase helps to release the tension in the separated strands by cutting and resealing them.

4. DNA is unwound at multiple locations forming bubbles known as replication bubbles. The junction where DNA is still attached is known as replication fork.









Annals of Nuclear Energy 62 (2013) 626–633

Contents lists available at SciVerse ScienceDirect

Annals of Nuclear Energy

journal homepage: www.elsevier.com/locate/anucene

Transmutation of stable isotopes and deactivation of radioactive waste in growing biological systems

Vladimir I. Vysotskii [a],*, Alla A. Kornilova [b]

[a] Kiev National Shevchenko University, Vladimirskaya Str., 64, Kiev 01033, Ukraine
[b] Moscov Lomonosov's State University, Moscow 119899, Russia

ARTICLE INFO

Article history:
Available online 6 March 2013

Keywords:
Isotope transmutation
Microbiological association
Low-energy reaction

ABSTRACT

The report presents the results of qualifying examinations of stable and radioactive isotopes transmutation processes in growing microbiological cultures. It is shown that transmutation of stable isotopes during the process of growth of microbiological cultures, at optimal conditions in microbiological associations, is 20 times more effective than the same transmutation process in the form of "one-line" (pure) microbiological cultures. In the work, the process of direct, controlled decontamination of highly active intermediate lifetime and long-lived reactor isotopes (reactor waste) through the process of growing microbiological associations has been studied. In the control experiment (flask with active water but without microbiological associations), the "usual" law of nuclear decay applies, and the life-time of Cs^{137} isotope was about 30 years.

The most rapidly increasing decay rate, which occurred with a lifetime $\tau^* \approx 310$ days (involving an increase in rate, and decrease in lifetime by a factor of 35 times) was observed in the presence of Ca salt

Patents on biotransmutation

(19) RU (11) 2 052 223 (13) C1

(51) Int. Cl.⁶ G 21 B 1/00, G 21 G 1/00

RUSSIAN AGENCY
FOR PATENTS AND TRADEMARKS

(12) ABSTRACT OF INVENTION

(21), (22) Application: 95100839/25, 18.01.1995

(46) Date of publication: 10.01.1996

(71) Applicant:
Tovarishchestvo s ogranichennoj otvetstvennost'ju Nauchno-proizvodstvennoe ob"edinenie "Inter-Nart"

(72) Inventor:
Kornilova A

(73) Proprietor:
Tovarishch
otvetstvenn
ob"edineni

(54) METHOD FOR PRODUCING STABLE ISOTOPES DUE TO NUCLEAR LOW-TEMPERATURE NUCLEAR FUSION OF ELEMENTS IN MICROBIOL

(57) Abstract:
FIELD: nuclear physics. SUBSTANCE: microorganism cells growing in nutrient medium deficient in respect to target isotope (target isotopes) are subjected to action of factors enhancing failure of interatomic binding and causing concentration of free atoms or ions of hydrogen isotopes. Nutrient medium is formed on heavy wa doped with o results in nc nutrient mediu form target st of formation enlarged nun produced. 5 cl

RUSSIAN FEDERATION

FEDERAL SERVICE
FOR INTELLECTUAL PROPERTY

(19) RU (11) 2 580 952 (13) C1

(51) Int. Cl.
G21F 9/18 (2006.01)

(12) ABSTRACT OF INVENTION

(21)(22) Application: 2015113324/07, 10.04.2015

(24) Effective date for property rights:
10.04.2015

Priority:
(30) Convention priority:
11.04.2014 ES P201430540

(45) Date of publication: 10.04.2016 Bull. № 10

Mail address:
141074, Moskovskaja obl., g. Korolev-4, a/ja 825, Kudakovu A.D.

(72) Inventor(s):
Vysotskij Vladimir Ivanovich (UA),
Kornilova Albina Aleksandrovna (RU)

(73) Proprietor(s):
Kornilova Albina Aleksandrovna (RU)

(54) METHOD OF WATER PURIFICATION FROM RADIONUCLIDES

(57) Abstract:
FIELD: chemistry.
SUBSTANCE: in claimed method prepared is nutrient medium for growth of microbiological cultures, deficient by chemical element, corresponding to isotope, radionuclides, which do not lead death of biomass due to radioactive irradiation, up to reaching concentration of solution to be purified. Then optimisation of biological part of process of transmutation in obtained

RU 2580952

Ядерные реакции в морской биогеологии

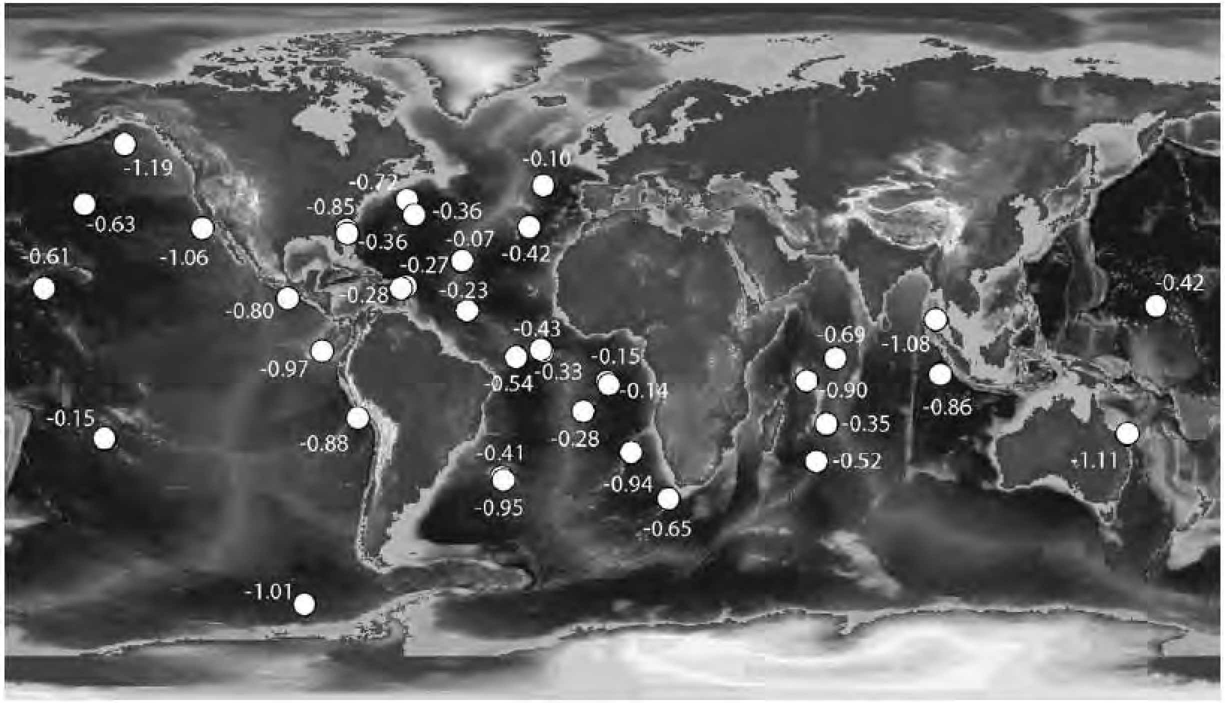


Fig. 1. Map of ferromanganese crust sample locations and the δ^{57}Fe [‰ ; (○)] values of a surface scrapings from each crust.

It should be noted that usually the standard ratio of isotopes

Fe^{54} (5.845%), Fe^{56} (91.754%) and **Fe^{57} (2.119%)**

is observed with very high accuracy both on Earth and in space.

Во всех (без исключения) образцах железо-марганцевых конкреций во всех точках мирового океана была обнаружена нехватка Fe^{57} по отношению к Fe^{54} и Fe^{56}.
Мы показали, что это связано с трансмутацией с участием микроорганизмов

$$Na^{23} + P^{31} = Fe^{54},$$

$$Mn^{55} + p = Fe^{56},$$

$$Mn^{55} + d = Fe^{57}$$

Глобальная производительность микроорганизмов (Fe54 и Fe56) более 1000 тонн/сек (больше, чем все металлургические заводы мира)

J. Condensed Matter Nucl. Sci. 33 (2020) 323–332

Research Article

Creation of Fe Isotopes in Natural Geology Crusts as the Result of Self-controlled Global Biostimulated LENR in Oceans and Seas

V.I. Vysotskii* and M.V. Vysotskyy

Taras Shevchenko National University of Kyiv, Kyiv, Ukraine

A.A. Kornilova, S.N. Gaydamaka, A.A. Novakova, D.S. Novikov and V.V. Avdonin

Moscow Lomonosov State University, Moscow, Russia

---

bstract

he paper considers the mechanism of formation of natural iron–manganese crusts, which are located at the bottom of all seas and ceans. These crusts are characterized by a periodic structure and an anomalous ratio of iron isotopes. These anomalies are similar n all seas and oceans and consist in excess of Fe^{54} and Fe^{56} isotope concentration and, accordingly, decrease of Fe^{57} isotope

J. Condensed Matter Nucl. Sci. 33 (2020) 333–339

Research Article

The Possible Role of LENR in Dentistry (Reasons, Effects and Prevention)

A.A. Kornilova, S.N. Gaydamaka and A.I. Panchishin
Lomonosov Moscow State University, Russia

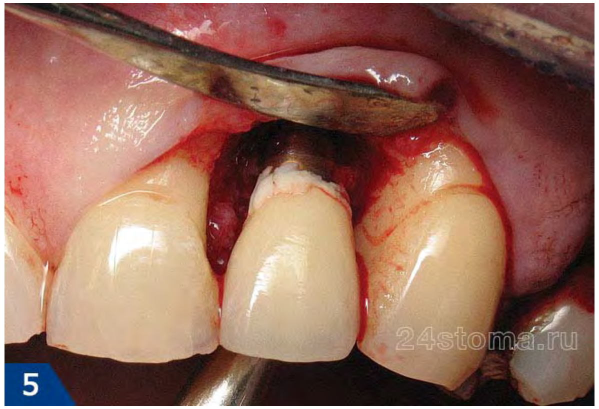
V.I. Vysotskii* and M.V.Vysotskyy
Taras Shevchenko National University of Kyiv, Ukraine

A.A. Bolotokov
LLC "Amtertek", Moscow, Russia

---

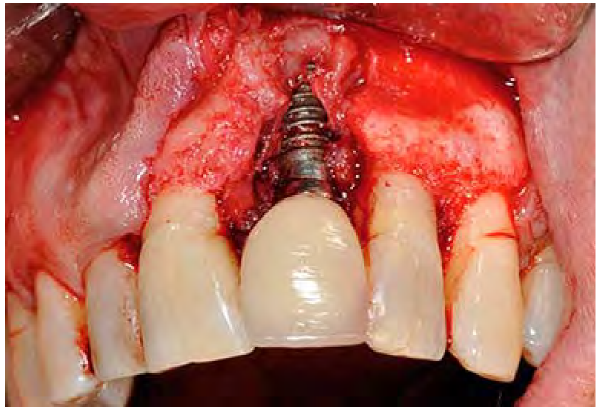
influence of nuclear effects on the destruction of the tooth surface using dental implants made of titaniu
been shown for the first time that this process is associated with LENR occurring between selective titaniu
and leading to the formation of a molybdenum isotope. This reaction is stimulated by the growth of natur

The practice of experimental dentistry shows that, despite the fulfillment of these conditions, processes are often observed leading to catastrophic destruction of the area of the installed implant, embrittlement of a tooth adjacent to the implant, and other local tooth destruction.



Reimplantation

Reimplantitis



Eepulis

Implant rejection

В наших контрольных экспериментах показано,
что эти процессы связаны с ядерной трансмутацией

$Ti^{46} + Ca^{48} = Mo^{94}$

в ротовой полости человека с участием
естественных мироорганизмов,
присутствующих в слюне.

Стимуляция LENR в удаленных мишенях с использованием незатухающих температурных волн

Высоцкий В.И., Корнилова А.А.(2013-2021…

$$\frac{\partial T(\vec{r},t\pm\tau)}{\partial t}=G\nabla^2 T(\vec{r},t)-\text{уточненное уравнение температуропроводности};$$

$$T(\omega,x,t)=A_\omega\,\mathrm{e}^{-\delta x}\,\mathrm{e}^{i(\omega t-k'x)}+B_\omega\,\mathrm{e}^{\delta x}\,\mathrm{e}^{i(\omega t+kx)}\equiv$$

$$A_\omega\exp\left(-\kappa\left|\cos\frac{\omega\tau}{2}\pm\sin\frac{\omega\tau}{2}\right|x\right)\exp\left\{i\left(\omega t-\kappa\left|\cos\frac{\omega\tau}{2}\mp\sin\frac{\omega\tau}{2}\right|x\right)\right\}+$$

$$B_\omega\exp\left(\kappa\left|\cos\frac{\omega\tau}{2}\pm\sin\frac{\omega\tau}{2}\right|x\right)\exp\left\{i\left(\omega t+\kappa\left|\cos\frac{\omega\tau}{2}\mp\sin\frac{\omega\tau}{2}\right|x\right)\right\},$$

Waves with frequencies $\omega_{opt(n)} = (n+1/2)\pi/\tau, \;\; n = 0,1,2,...$

correspond to the existence of undamped temperature (thermal) waves with a damping coefficient $\delta \equiv 0$!

In this case, the general solution of thermal equation has the form of the **superposition of the forward and backward undamped temperature waves**:

$$T(\omega_{opt}, x, t) = A_{\omega_{opt}} \exp\left\{i\left(\omega_{opt}t - \kappa\sqrt{2}x\right)\right\} + B_{\omega_{opt}} \exp\left\{i\left(\omega_{opt}t + \kappa\sqrt{2}x\right)\right\}$$

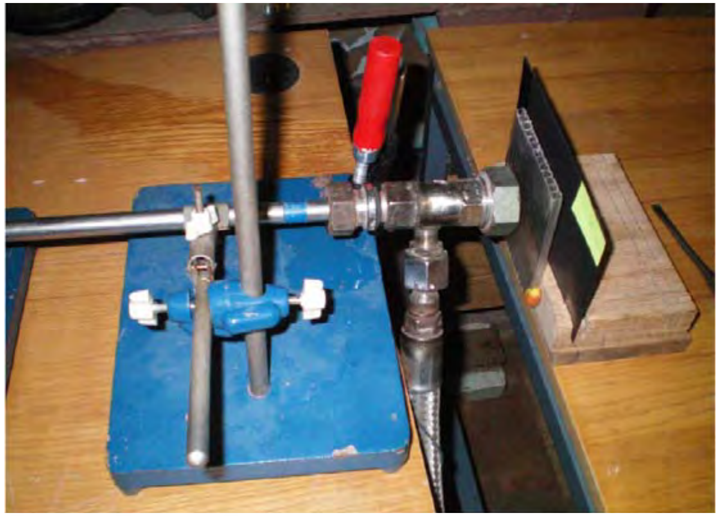
In air $\omega_{opt(n)} \approx 70...90(2n+1)\,MHz, \;\; n = 0,1,2,...$

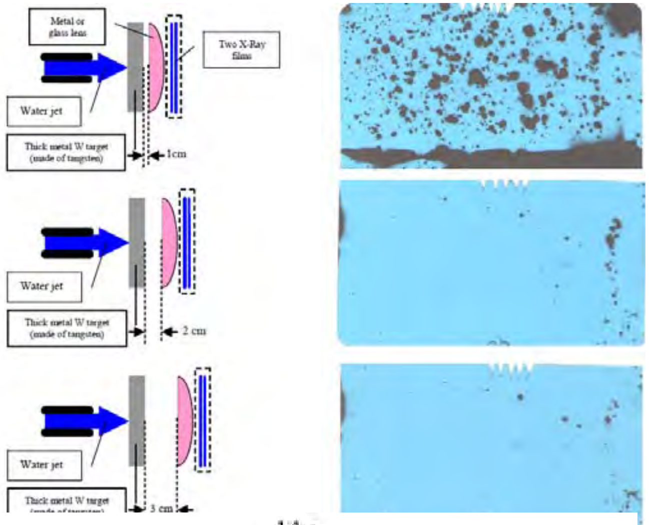
In water $\omega_{opt(n)} \approx 100(2n+1)GHz$

In metals $\omega_{opt(n)} \approx 10...50(2n+1)THz$

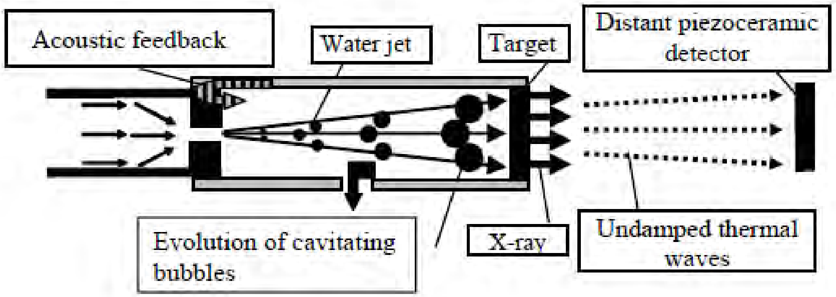
The velocity of this waves in air at normal conditions is

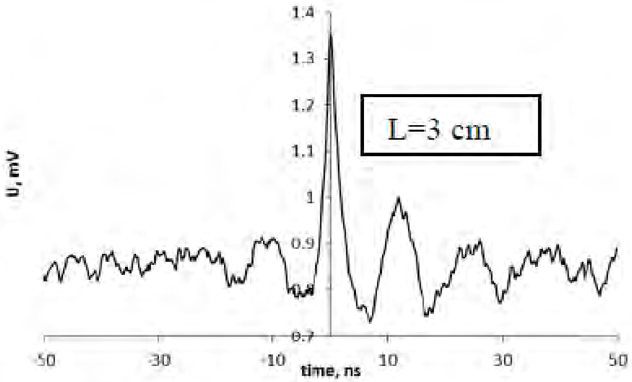
$$v_p = \sqrt{2G\omega} = 50...60m/\sec$$



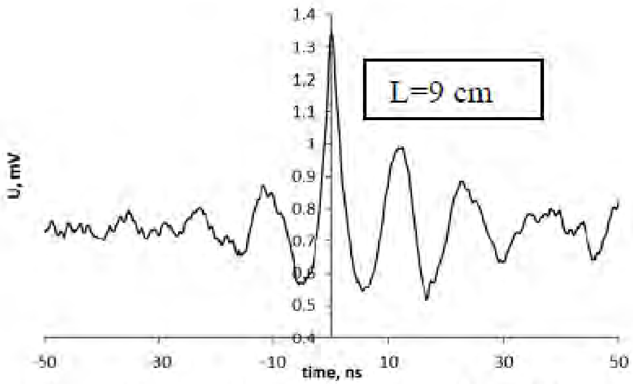


Observation of long-distance thermal waves at water cavitation





V.I.Vysotskii, A.A.Kornilova, A.O.Vasilenko. Observation and investigation of X-ray and thermal effects at cavitation. Current Science, 2015, v.108, No.4, p. 114-119



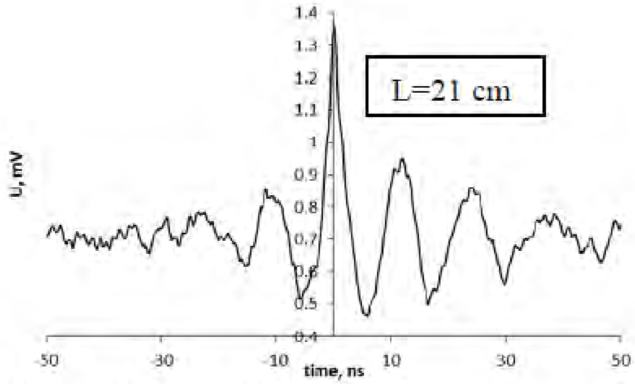
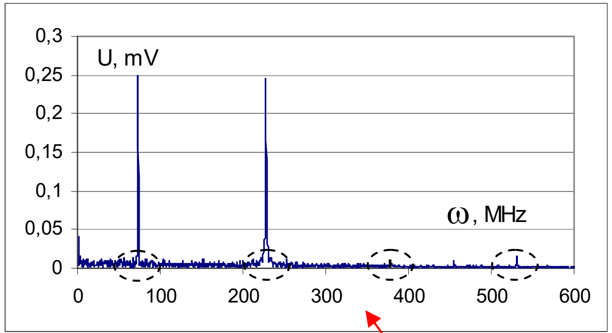
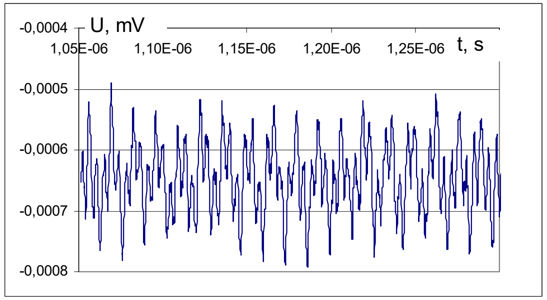
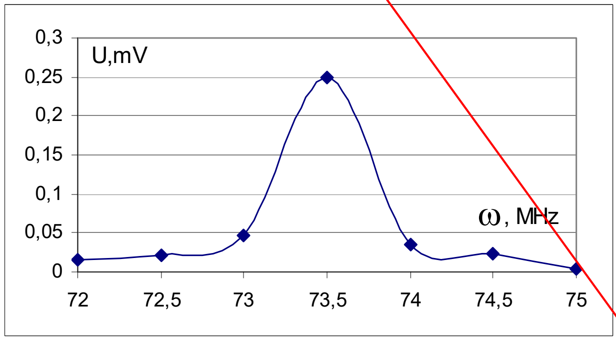


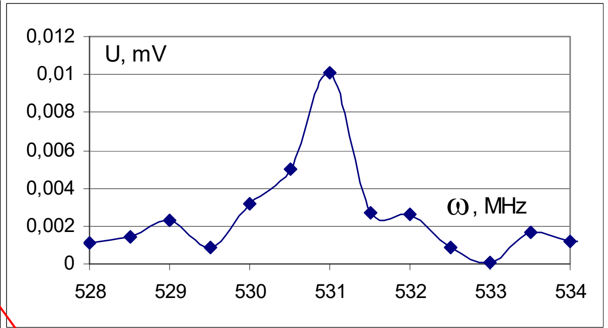
Fig.6. Experimental setup for study of X-ray and undamped thermal waves at cavitation of fast water jet and high-frequency signals registered in air at different distances L.

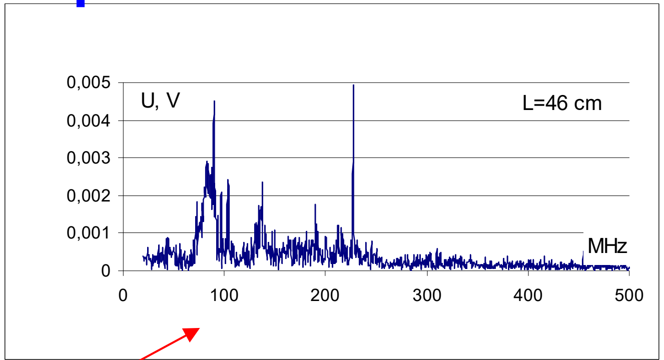
Observation of long-distance thermal waves at the same cavitation experiments

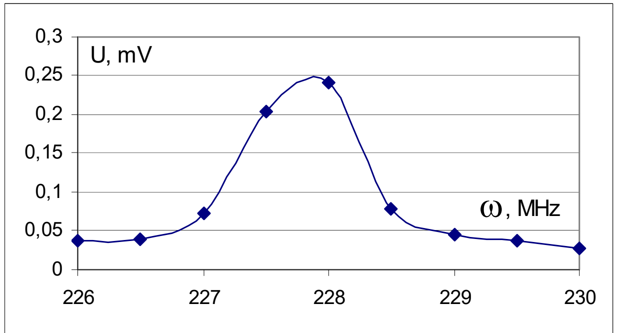


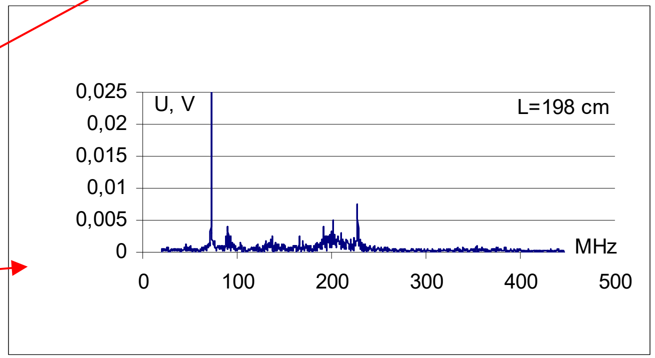


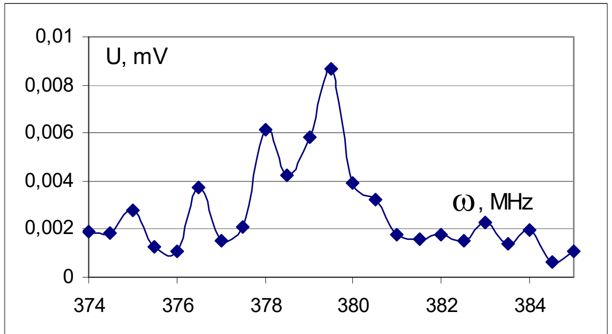








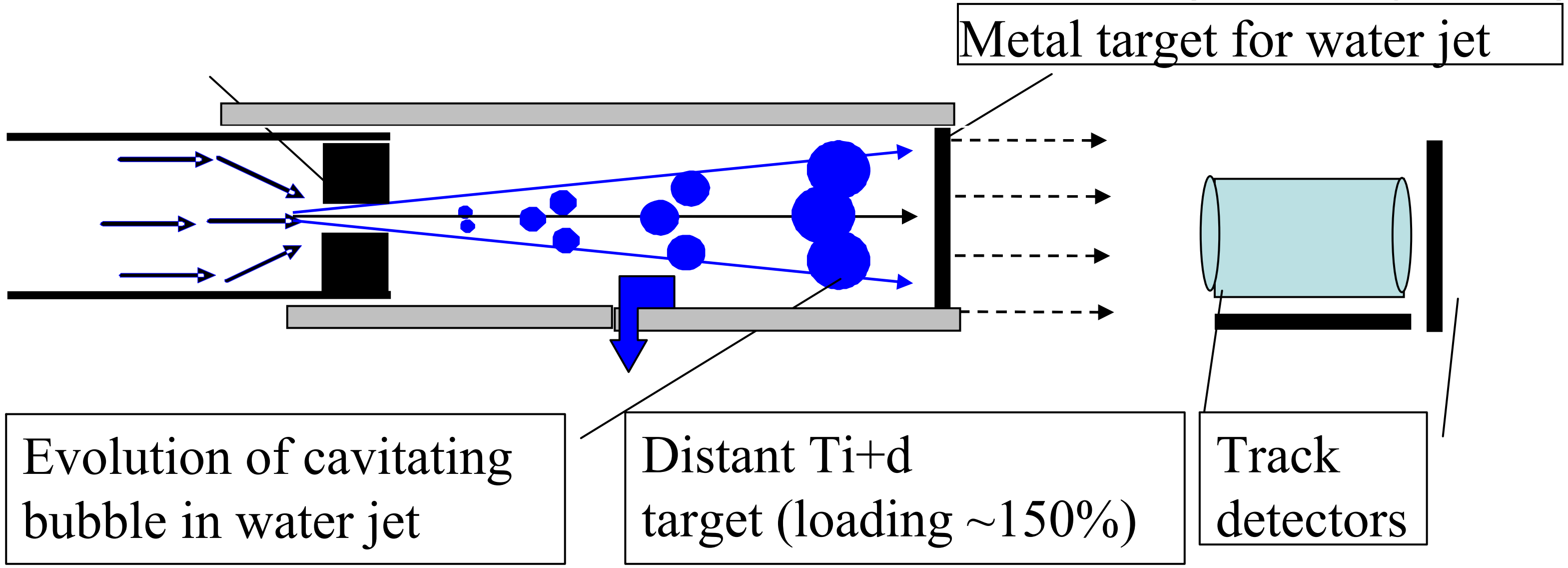




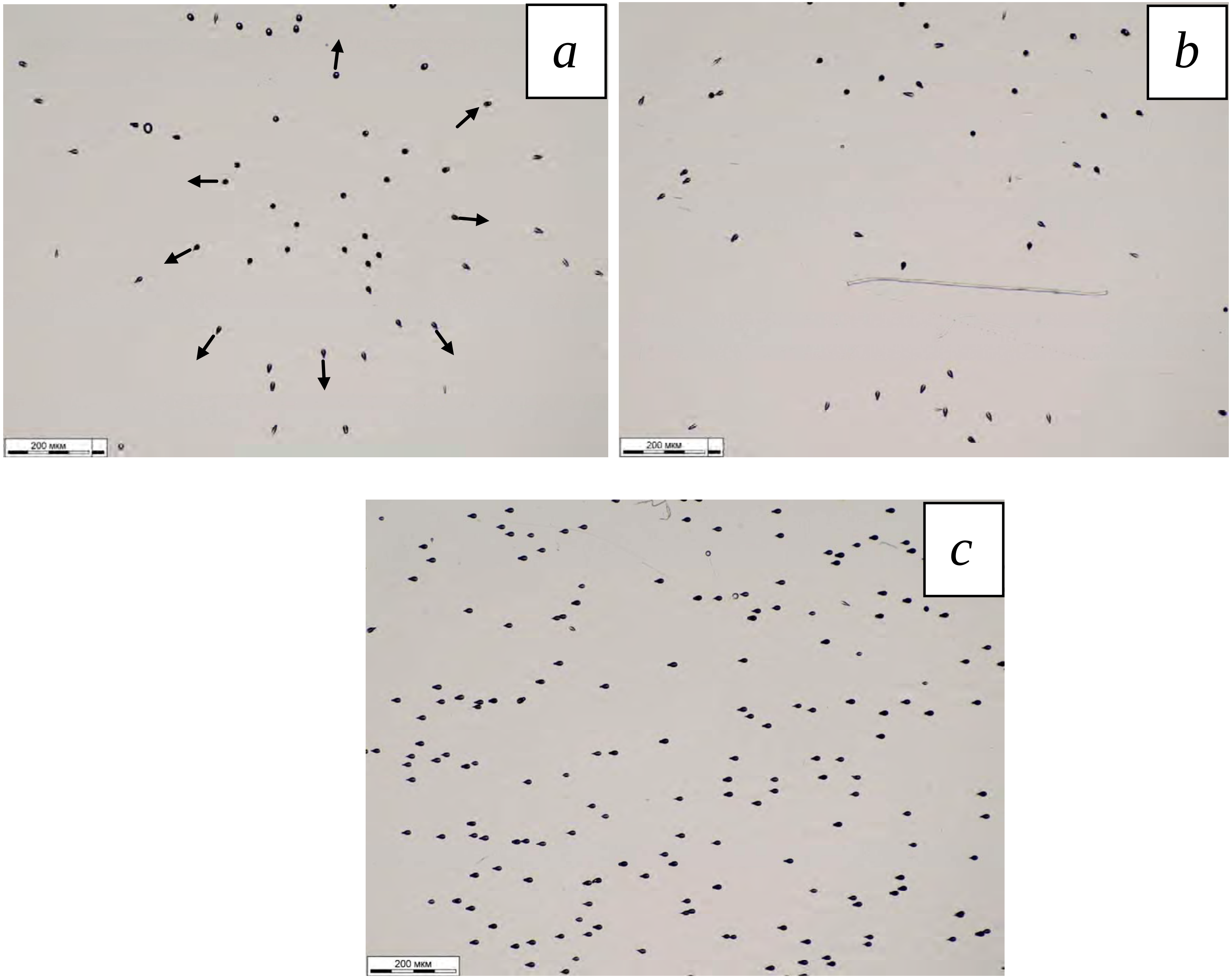
Spectrum of temperatures waves, recorded at distances of
(a) L = 18.5 cm;
(b) 46 cm;
(c) 198 cm
from the outer surface of the screen. The maximum distance (198 cm) was limited only by the size of the laboratory

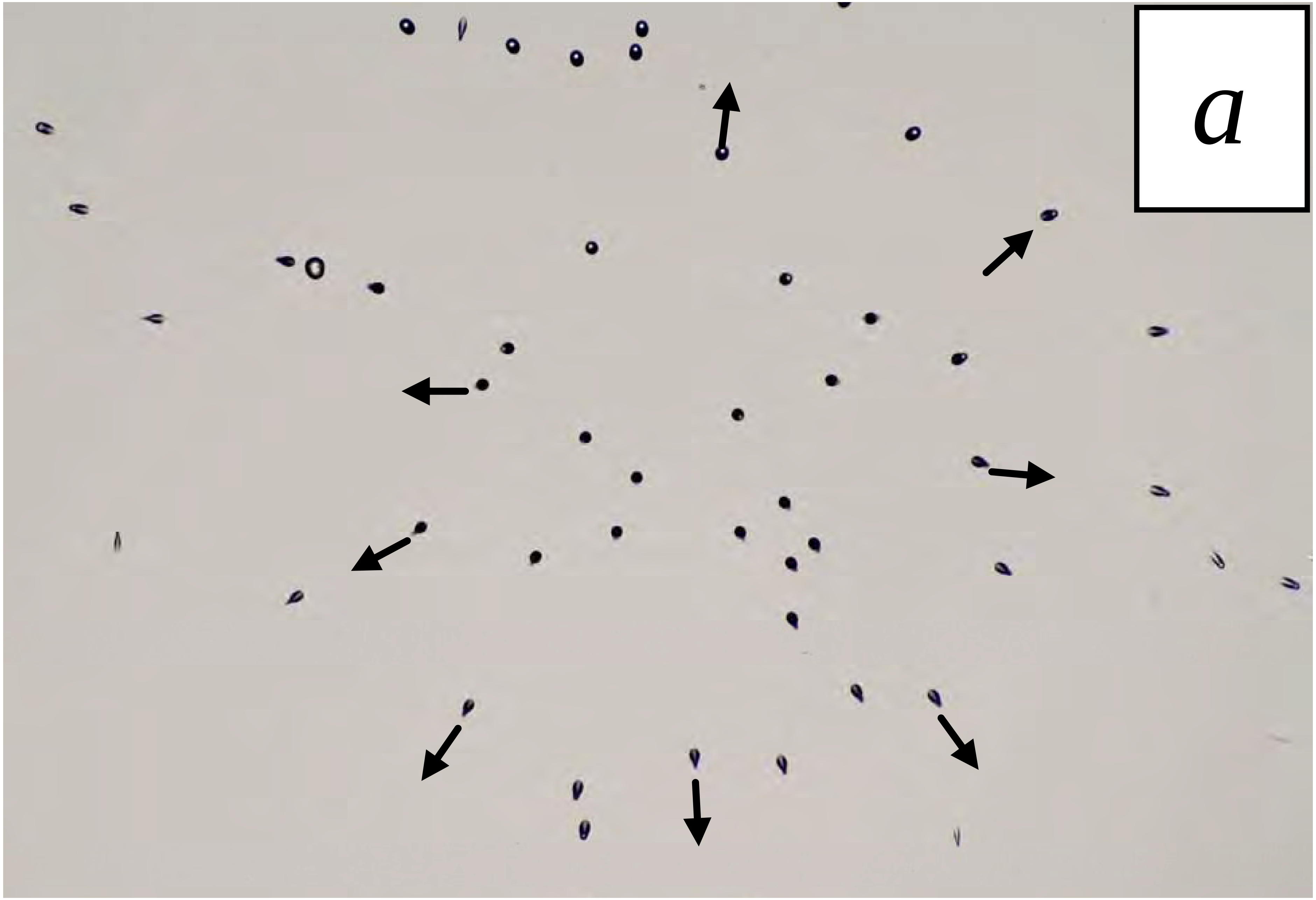
Controlled LENR stimulated by the action of undamped thermal waves in deuterated titanium

One of the possible application of undamped thermal ways is connected with direct distant stimulation of nuclear processes (including LENR).



For carrying out the alpha-track analysis, a plastic detector made of polycarbonate (polyallyl diglycol) of the CR-39 type with a density of 1.3 g / cm^3 was used. The thickness of the "TASTRAK®" detector (Track Analysis Systems Ltd, Bristol, UK) was 1 mm thick. The typical setting of the experiments corresponded to the location of the detector at a distance of 5 mm from the surface of the target, which was affected by the thermal wave for a certain time (for example, 20 and 40 min).

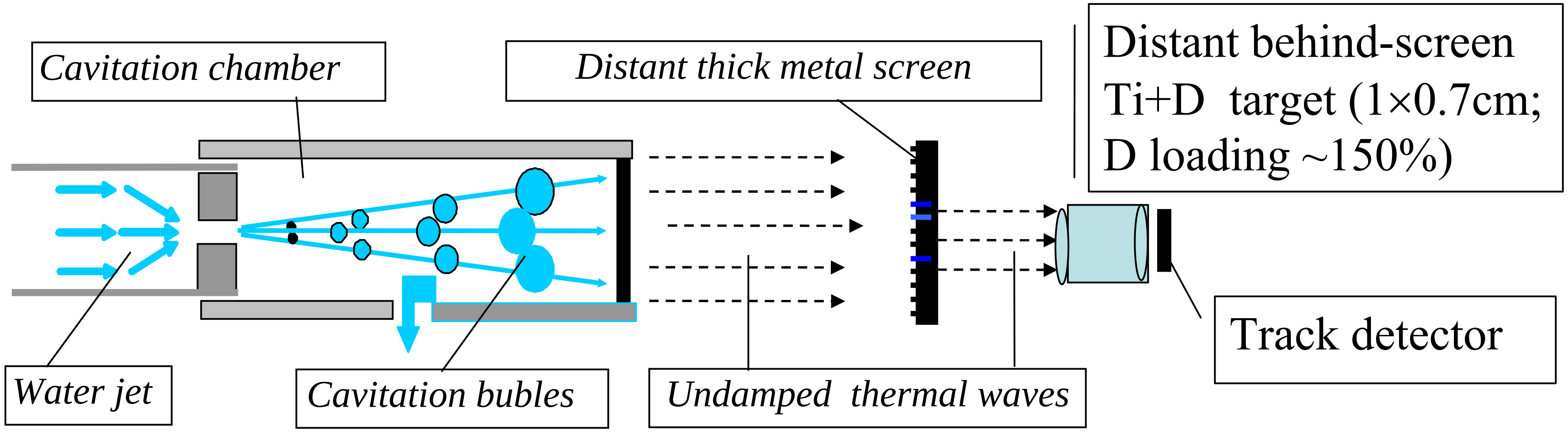

a
200 мкм
b
200 мкм
c
200 мкм



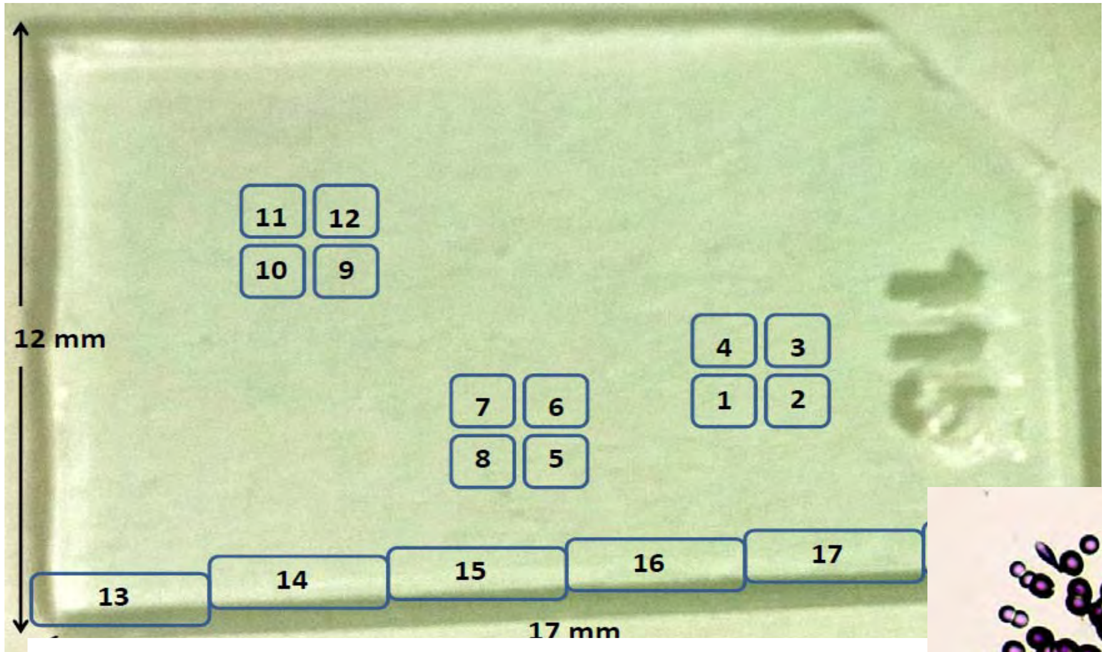
The direction of motion of the alpha particles correlates well with the axial symmetry of the target end

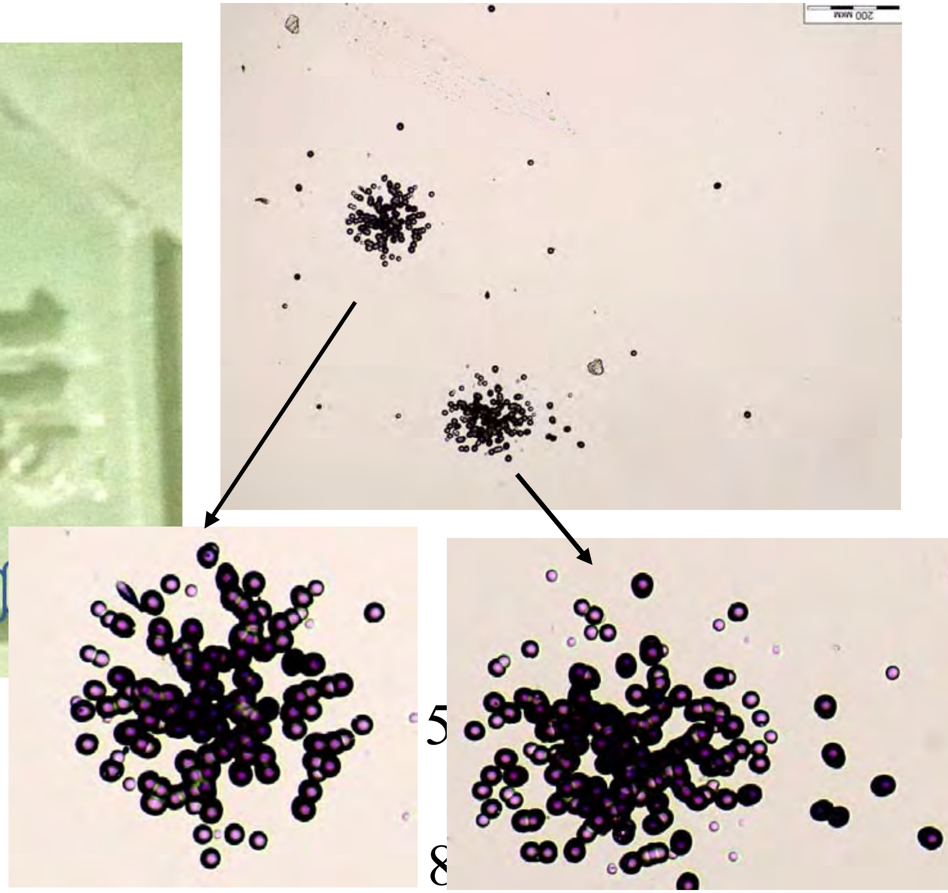
Distant behind-screen LENR under the action of undamped heat waves

[V.I. Vysotskii, A.A. Kornilova, P.L.Hagelstein, T.B. Krit, S.N.Gaydamaka, M.V.Vysotskyy, JCMNS, v.33, 2020].



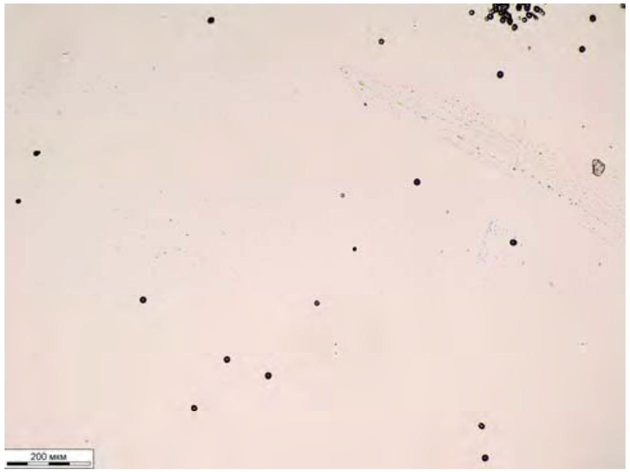
For carrying out the alpha-track analysis, a plastic detector made of polycarbonate (polyallyl diglycol) of the CR-39 type with a density of 1.3 g / cm^3 was used. The thickness of the "TASTRAK®" detector (Track Analysis Systems Ltd, Bristol, UK) was 1 mm thick. The typical setting of the experiments corresponded to the location of the detector at a distance of 5 mm from the surface of the target, which was affected by the thermal wave for a certain time (1 or 2 hours).



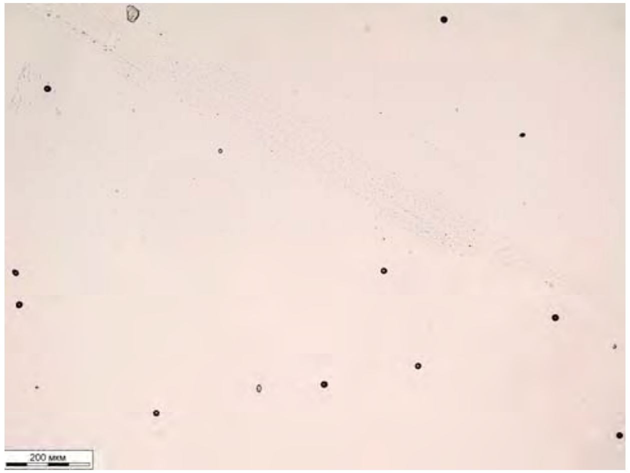


5

6



7



8

Articles on undamped thermal waves investigation and LENR stimulation

1. V.I.Vysotskii, V.B.Vassilenko, A.O.Vasylenko. Heat transfer equation with delay for media with thermal memory, ***Intern. Jour. of Sci.: Basic and App. Research (IJSBAR),*** 12 (2013) 160.
2. V.I.Vysotskii, V.B.Vassilenko, A.O.Vasylenko. Generation and propagation of undamped temperature waves under pulse action on a target surface, ***Journal of Surface Investigation: X-ray, Synchrotron and Neutron Techniques,*** 8 (2014) 367-373.
3. V.I.Vysotskii, V.B.Vassilenko, A.O.Vasylenko. Nonequilibrium thermal effects during pulsed action on conducting medium. ***Inorganic Materials: Applied Research***, 6 (2015) 199–204.
4. V.I.Vysotskii, A.A.Korniloa, A.O.Vasylenko, V.I.Tomak. Detection and investigation of undamped temperature waves excitation under water jet cavitation. ***Journal of Surface Investigation: X-ray, Synchrotron and Neutron Techniques,*** 8 (2014) 1186-1192.
5. Vysotskii, A,A,Kornilova, A.O.Vasilenko. Observation and investigation of X-Ray and thermal effects at cavitation. ***Current Science***, 108 (2015) 114-119.
6. V.I.Vysotskii, A.A.Korniloa, A.O.Vasylenko, M.V.Vysotskyy. The prediction, observation and study of long-distant undamped thermal waves generated in pulse radiative processe. ***Nuclear Instruments and Methods in Physics Research B***, 402 (2017) 251–255.

7. V.I.Vysotskii, A.A.Korniloa, A.O.Vasylenko, T.B.Krit, M.V.Vysotskyy. On the long-range detection and study of undamped directed temperature waves generated during the interaction between a cavitating water jet and targets. ***Journal of Surface Investigation: X-Ray, Synchrotron and Neutron Techniques*****,** 11 (2017) 749-755.
8. V.I.Vysotskii, A.A.Kornilova, T.Krit, S.Gaydamaka. Generation and detection of undamped temperature waves at large distance in LENR related experiments. ***Journal of Condensed Matter Nucl. Sci*****.** 29 (2019) 368-375.
9. A.A. Kornilova, V.I.Vysotskii et al., The problem and realization of the stable generation of alpha particles by deuterated titanium located in the field of a heat wave. ***Engineering Physics*****,** №5 (2018) 13-22 (in Russian).
10. A. A. Kornilova, V. I. Vysotskii,T. Krit, M.V.Vysotskyy, S. N. Gaydamaka. Study of the Influence of Remote Undamped Temperature Waves on Nuclear Fusion. **Journal of Surface Investigation: X-ray, Synchrotron and Neutron Techniques**, 2020, Vol. 14, No. 1, pp. 117–123.
11. V.I. Vysotskii, M.V.Vysotskyy, A.A. Kornilova, T.B. Krit, S.N. Gaydamaka, P.L. Hagelstein. Distant Behind-screen Action of Undamped Temperature Waves . **Journal Condensed Matter Nucl. Science,** v.33 (2020), pp. 296-304