An Analysis of Experimental Data Using the TNCF Model

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Synopsis

The TNCF model, which I proposed three years ago, was used to analyze the typical quantitative experimental data reported over the seven years since the discovery of the cold fusion phenomenon, i.e. the generation of the excess energy and the nuclear products which were unexplainable by the usual physical and chemical processes occurring in solids with hydrogen isotopes.

The fundamental assumptions of the model: the existence of stable thermal neutrons trapped in cold fusion materials and their fusion reaction with the lattice nuclei at the boundary region, were verified by the success of the analyses. Furthermore, the success of the model has given a consistent interpretation for the wide-spread spectrum of results and the strangeness of the phenomenon, which is unexplainable from the viewpoint of conventional nuclear physics, solid state physics and electrochemistry.

Predictions for the new phenomena are given which need to be tested experimentally.

Introduction

Atomic physics, including nuclear phenomenon, have been developing for more than a century, including the discoveries of Faraday's law of electrolysis, Thomson's electron, H-atom Bohr's model, and the neutron as a constituent of the nucleus. In the history of the development the theory and experiments have played characteristic roles as two inevitable complementary partners of science.

The energy differences between nuclear physics and solid state (atomic) physics have caused the two modern physics branches to exist almost independently — with a few exceptions, such as the Mössbauer effect. Nuclear physics has been studied in the energy region over ~ keV per particle. Solid state physics, on the other hand, has been dealing with phenomena with energies up to 100 eV per event. Interactions between energetic particles and solids have bridged the two sciences in special rare cases.

Therefore, the cold fusion phenomenon in solids, where processes occur with energies up to few MeV per event, i.e. the generation of huge amount of excess energy unexplainable by chemical processes and the accompanied production of elementary particles and nuclei usually observed in nuclear processes with high energy particles, attracted much attention in scientific world.

The characteristics of the cold fusion phenomenon, as shown by experiments, has denied simple interpretation using the conventional solid state and nuclear physics theories.

The poor reproducibility, one of the characteristics of the phenomenon, has even raised disbelief in the facts themselves. This situation has helped destroy the dialog between the theorists and the experimentalists.

This unfortunate situation, together with the relation to the phenomenon's technical applicability, have made cold fusion's research progress somewhat biased.

To help build better communication between the theorists and the experimentalists, we want to provide a direct dialogue between them using the trapped neutron catalyzed fusion (TNCF) model as a tool to analyze the cold fusion phenomenon.

The TNCF model

The model assumes a stable existence of the trapped thermal neutrons in crystals which show cold fusion phenomenon. The possible mechanisms for neutron trapping are the differences in the neutron band structures in two media, Bragg reflection and total reflection at boundaries. The condition for the trapping depends on stochastic processes in the sample. This will result in irreproducibility of the cold fusion phenomenon.

This assumption has been a target of a study based on the quantum statistical treatment of a system composed of thermal neutrons and the lattice nuclei. The treatment resulted in a birth of a new idea "neutron affinity of the lattice nuclei" and a calculation of the neutron band in the lattice.

The difference of the band structures in two crystals is supposed to reflect the neutron at the boundary to trap it in a crystal. On the other hand, a positive value of the neutron affinity represents the stability of the trapped neutron in the crystal against beta decay.

It is considered that the formation of a neutron Cooper pair makes the stability of the trapped thermal neutron higher against beta decay and also against fusion with one of lattice nuclei.

Assuming the existence of the trapped thermal neutron as a neutron Bloch wave in the sample crystal, the TNCF model predicts nuclear reactions between the thermal neutron and a nucleus in the lattice or on the surface when the nucleus works on the neutron as a perturbing center. Though the trapped neutron is fairly stable against the perturbation, the neutron suffers much, especially at the boundary surrounding a region where the neutron is trapped.

If there is a large perturbation in the boundary region where a nucleus can fuse with a neutron, the trapped thermal neutron loses its stability and is fused with the nucleus. Otherwise, the trapped neutron may be fused with a nucleus in the trapping region if the perturbation for the neutron becomes large, for instance via high temperature.

If the stability of the trapped neutron is lost, the fusion probability can be calculated by the same formula as the usual collision process between a thermal neutron and a nucleus:

$$P_f = 0.35nnvnn_N V sn_N, \qquad (1)$$

where $0.35nnvn$ is the flow density of the neutron per unit area and time, n_N is the density of the nucleus, V is the volume where the nucleus is, sn_N is the fusion cross section for the reaction.

In the case of a sample with a definite boundary surrounding a trapping region where the thermal neutron is, the volume V should be the boundary region where the nucleus fuses with the thermal neutron. On the other hand, in a sample without a definite boundary, but a disordered array of minor species of lattice nuclei, the volume should be the whole volume of the sample.

If a fusion reaction occurs between a trapped thermal neutron and one of lattice nuclei ${}^A_Z\mathrm{M}$ with a mass number A and an atomic number Z, there appears an excess energy Q and nuclear products:

$$n+{}^A_ZM={}^{A+1-b}_{Z-a}M'+{}^b_aM''+Q, \qquad (2)$$

where ${}^0_0M\equiv\gamma,{}^0_1M\equiv n,{}^1_1M\equiv p,{}^2_1M\equiv d,{}^3_1M\equiv t,{}^4_2M\equiv{}^4He.....etc.$

The excess energy Q may be measured as the excess heat by the attenuation of the nuclear products g or charged particles in the reaction (2). Otherwise, the nuclear products may be observed outside or may induce succeeding nuclear reactions in the sample with one or other of the nuclei there.

Typical reactions related with TNCF model are written down as follows. The trapped thermal neutron can fuse with ^{6}Li nucleus in the surface layer formed on the cathode by electrolysis of D_2O + LiOD with a large cross section ~ 1 x 10^3 barns:

$$n + {}^6\mathrm{Li} = {}^4\mathrm{He}\ (2.1\ \mathrm{MeV}) + t\ (2.7\ \mathrm{MeV}) \qquad (3)$$

The triton with 2.7 MeV generated in this reaction can pass through the crystal along the channeling axis on which is an array of occluded deuterons or it can proceed on a finite path with a length (@ 1 x 10 μm) determined by the interaction with the charged particles in the crystal. In these processes, the triton can fuse with a deuteron with a cross section of ~ 1.4 x 10^{-1} barns:

$$t\ (2.7\ \mathrm{MeV}) + d = {}^4\mathrm{He}\ (3.5\ \mathrm{MeV}) + n\ (14.1\ \mathrm{MeV}). \qquad (4)$$

The neutron with 14.1 MeV generated in this reaction can interact with particles, especially with deuterons in the crystal, elastically, giving a large amount of energy to the deuteron and inelastically dissociating it or fusing with it:

$$n + d = n' + d', \qquad (5)$$

$$n + d = n' + p + n'', \qquad (6)$$

$$n + d = t + g + 6.25\ \mathrm{MeV}, \qquad (7)$$

$$n + {}^6\mathrm{Li} = {}^8\mathrm{Be} = 2{}^4\mathrm{He} + e^- + \nu_e + 16.2\ \mathrm{MeV}, \qquad (8)$$

The reaction (7) for a thermal neutron has a cross section 5.5 x 10^{-4} barns, which will be used in the estimation given in the following section.

The deuteron, having an energy up to 12.5 MeV, accelerated elastically in the scattering (5) by the neutron with 14.1 MeV, can fuse with another deuteron in two modes with a fairly large cross section of the order of 0.1 barn: (9)-(10)

$$d + d = t\ (1.01\ \mathrm{MeV}) + p\ (3.02\ \mathrm{MeV}),$$
$$= {}^3\mathrm{He}\ (0.82\ \mathrm{MeV}) + n\ (2.45\ \mathrm{MeV}),$$

Depending on the situation in the cold fusion system, the trapped thermal neutron can induce trigger reactions like the reaction (1) and the generated energetic particles sustain breeding chain reactions producing a lot of the excess heat and the nuclear products.

Typical quantitative experimental data and their analysis on TNCF model.

In measurements of some cold fusion events it is possible to obtain several quantities simultaneously. The lack of a general understanding of the relation between physical quantities makes the description of the results vague and sometimes even chaotic. Generally speaking, there are too many data observed without definite relation between them.

Therefore, it is usually impossible to explain the whole data obtained in an experiment, including complexly interrelated physical variables. It should be necessary to select data from one point of view, neglecting others for a while, leaving them for a future program to explain in relation with known factors. We will take up only a couple of events including quantitative relations between observed quantities from excellent experimental results obtained until now

(1) M. Fleischmann, S. Pons and M. Hawkins[13].

From the abundant data in the first cold fusion paper[13], we take up a case of a thin rod Pd cathode with dimensions 0.4 cmf x 10 cm. When the electrolyzing current density was 64 mA/cm^2, the system with the Pd cathode, Pt anode and LiOD+D_2O gave the excess power 1.75 W (= 1.1 x 10^{13} MeV/s), tritium atoms 4 x 10^{11}/s and neutrons 4 x 10^4/s.

To analyze this data, we take the thickness of the surface layer of Li atom on the surface (area S) of the cathode as l_0 = 1 μm, an abundance of ^{6}Li in LiOD as the natural one 7.5%, an average velocity of the trapped neutron v_n = 2.7 x 10^5 cm/s (T = 300 K). Then, we can determine the density of the trapped neutron n_n using a relation between n_n and the number of tritium atom N_t generated in a time t by the reaction (1): $N_t = 0.35 n_n v_n n_{{}^6Li} l_0 S \sigma_{nLi} \tau$,
where S = 12.8 cm^2, σ_{nLi} = 10^3 barns, $n_{{}^6Li} = 3.5x10^{21}\, cm^{-3}$.The observed value of N_t per unit time 4 x 10^{11} /s gives us: n_n = 1.5 x 10^{7}cm^{-3}.
The triton generated in the reaction (1) induces the reaction (2) producing a neutron with an energy 14.1 MeV. Taking the path length of the triton in the cathode PdD_x as ~ 1 μm and using the cross section of the reaction (2) for 2.7 MeV triton σ_{t-d} ~ 1.4 x 10^{-1} barns and the density of deuterium near the surface layer as 6.8 x 10^{22}cm^{-3}(D/Pd = 1), we obtain the probability of reaction (2) induced by a triton as 1.6 x 10^{-6} which gives a ratio of events generating tritium and neutron: t/n ~ 5.3 x 10^5.

This value is compared with the experimental value 10^7. The coincidence of these values which are only one order of magnitude apart may be taken as very good when we look at our assumptions used in this estimation[14].

Another quantity we can use as an index of the cold fusion phenomenon is the ratio of events producing the excess heat and neutron N_Q/N_n. The values given above allows us to estimate this ratio on an assumption that nuclear reactions liberate energy about 5 MeV per reaction on the average. Then,
$N_Q/N_n = (1.1 \times 10^{13} + 5)/(4 \times 10^{11} \times 1.6 \times 10^{-6}) = 8.6 \times 10^7$.

The experimental value of N_Q/N_n is $(1.1 \times 10^{13} + 5)/4 \times 10^4 = 5.6 \times 10^7$. Therefore, there is only a small difference of a factor 1.5 between the experimental and theoretical values of this ratio.

This value of N_Q gives a ratio of events producing the excess heat and tritium N_Q/N_t as follows, using the experimental value for $N_t = 4 \times 10^{11}$:
$N_Q/N_t = 1.1 \times 10^{13} + 5)/(4 \times 10^{11}) = 5.5$.

(2) A. Takahashi, T. Iida, T. Takeuchi, A. Mega, S. Yoshida and M. Watanabe[15].

Next, we will take up an experiment[15] where the excess heat, tritium and neutron with $t/n = 8.7 \times 10^5$ was observed. Similar analysis as shown above gives following results[16];$n_n = 10^2$ cm^{-3}, $t/n = 5.3 \times 10^5$,

(3) M.H. Miles, R.A. Hollins, B.F.Bush and J.J. Lagowski[17].

Third, we will give a result[18] of the analysis of an experiment where observed the excess heat and helium in Pd/D_2O+LiOD system[17] using a massive cylindrical Pd cathode with a surface area of 2.6 cm^2. Similar analysis to these given above in (1) resulted in the following conclusion with the number of events N_{He} producing ^{4}He:
$n_n = 1.1 \times 10^9 \sim 10^{10}\text{cm}^{-3}$, $N_Q/N_{He} = 5$.

(4) R. Bush and R. Eagleton[19].

Fourth, we will give a result[20] of the analysis of an experiment where the excess heat and the nuclear transmutation of Rb into Sr in Ni/H_2O+$RbCO_3$ system[19] was observed. The reaction that was supposed to occur in the system was $n + {}^A\text{Rb} = {}^{A+1}\text{Sr} + e^- + \nu_e$
in the surface layer of Rb on the Ni cathode. The density was determined as follows: $n_n = 1.6 \times 10^7\text{cm}^{-3}$.

The correlation of the excess heat and helium generation was explained quantitatively by a factor of 3.

(5) M. Okamoto, H. Ogawa, Y. Yoshinaga, T. Kusunoki and O. Odawara[21].

Fifth, we will give a result[22] of the analysis of an experiment where the excess heat and the nuclear transmutation in the surface layer of Al into Si in Pd/D_2O+LiOD[21] system was observed as follows:

$n_n \sim 10^{10}\text{cm}^{-13}$, $N_Q/N_{NT} = 1.4$.

In the calculation of the number of events inducing the nuclear transmutation N_{NT}, we assumed the same value of N_Q in this experiment[21] as in Ref.(17). This value of N_Q/N_{NT} shows that the number of events generating the excess heat and the nuclear transmutation are almost the same in this case within the assumption made above.

(6) Y. Arata and Y.C. Zhang[23].

Next, we will give a result[24] of the analysis of an experiment where a huge excess heat and a tremendous number of helium atoms as high as $10^{20} \sim 10^{21}\text{cm}^{-3}$ in Pd-black contained in a Pd cylinder cathode was observed as follows: $n_n \sim 10^{12}\text{cm}^{-3}$, $N_Q/N_{He} = 6$.

In this calculation, the path length of the 2.7 MeV triton generated by the reaction (3) was taken as large as 1 cm, considering the triton channeling to enter into the Pd-black part of the cathode from the wall surface of the Pd container. It was difficult to understand such a high value of ^{4}He density in their Pd-black cathode without the large path length of tritium assumed in this calculation.

(7) M. C. H. McKubre, S. Crouch-Baker and F. L. Tanzella[25].

The elaborate experimental data in Pd/LiOD+D_2O system giving a semi-quantitative relation between the excess heat, the electrolyzing current density, the density of the occluded deuterium and the speed of the occlusion[25] were analyzed with the TNCF model[26], giving a qualitative explanation for the relation and the density of the trapped neutron: $n_n \cong 10^9 \sim 10^{10} cm^{-3}$.

(8) D. Cravens[27].

The remarkable system[27,28] generating the excess energy up to about 2000 times the input energy with a very high qualitative reproducibility in Pd/H_2O+LiOH system was analyzed on the TNCF model[29] giving following results.

The analysis showed that it is necessary to have enough deuterium in the cathode by a preliminary treatment to accomplish the reported excess power. If the special multi-layer Pd cathode invented by Dr. Patterson is treated previously to occlude an enough amount of deuterium, it is possible to generate the observed large amount of excess heat by H_2O+LiOH electrolysis. The experimental data of the excess power gave a following value for the trapped neutron density: $n_n = 8.5 \times 10^9 cm^{-3}$.

(9) J.O'M. Bockris, et al.[30].

Careful measurements of tritium and the excess heat have been done by Bockris, et al[30] with remarkable results. Here we take up only one data giving a maximum tritium generation of 3.8×10^7 $s^{-1}cm^{-2}$ per unit surface area. With the same assumptions made above, we could estimate the density of the trapped thermal neutron as follows:

$n_n = 1.1 \times 10^6 cm^{-3}$.

(10) I.B. Savvatimova et al.[31].

The researchers in the Institute LUTCH in Podrisk near Moscow have been working in the glow discharge experiments with D_2 and other gases and Pd and other transition metal cathodes. They measured the excess heat, NT (nuclear transmutation) of various isotopes and elements with multi-layer cathode. Here we take up only one data of an increase of ^{107}Ag from 20 to 5000 ppm in the glow discharge with D_2 gas and Pd cathode. After the discharge of 4 hours, the sample was sent to mass spectrometry (SIMS) and was analyzed for its isotope composition about 3 months later. Assuming continuous production of ^{107}Ag by n —^{106}Pd fusion reaction through 3 months at the surface layer of the cathode, we obtain a following value for the density of the trapped thermal neutron: $n = 1.1 \times 10^6$ cm^{-3}.

(11) V.A. Romodanov, et al.[32]

Another group in the Institute LUTCH has been working also with a glow discharge experiment[32]. They measured a lot of tritium with cylindrical Mo cathode in D_2 gas. The pressure of the gas was 1 atm in the cylinder and 0.2 atm outside. With a cylindrical cathode of 2.5 cmϕ x 10 cm with wall thickness of 5 mm, they measured tritium production of 10^7 s^{-1}. In this case, the temperature of the cathode was very high (up to 3000°C) and we may assume that deuterons in the cathode interact to fuse with the trapped thermal neutron in the whole volume of the cathode. Then, taking the volume of the interaction V in the $n-d$ reaction as the sample volume and using the fusion cross section for thermal neutrons ~ 5.5 x 10^{-4} barns, we obtain a following value for the density of the trapped thermal neutron in MoDx cathode: $n_n = 1.8 \times 10^7$ cm^{-3}, where we assumed $x = 1$.

(12) A.G. Lipson, et al.[6]

Lipson, et al. have been working with ferroelectrics to measure the excess heat and nuclear products. In a recent work[6], they measured gamma radiation in the energy range up to 10 MeV from a cathode and electrolyte system PdO/Au/Pd/PdO/NaOD+D_2O (KOH+H_2O). There are several peaks in the gamma spectrum at 2.2, 3.5 to 4.2, 6.3 and small peaks up to 9 MeV in the system with deuterium. Here, we take up the peak at 6.3 MeV and interpret it as a result of the reaction (7) between n and d. Assuming the reaction occurs at boundary layer between Pd and PdO with thickness 1 μm in the cathode, we obtained the density of the trapped thermal neutron as follows: $n_n = 4 \times 10^5$ cm^{-3}. In the calculation, we assumed the efficiency of the gamma measurement as 1%.

(13) O. Reifenschweiler[33].

Reifenschweiler[33] measured the resulting X-ray induced by β-decay of 'tritium' absorbed by Ti ($TiT_{0.0035}$). The sample was in a shape of extremely small monocrystalline particles with diameter f = 15 nm. In a heating process of sample, he observed a decrease of the radioactivity, i.e. intensity of X-ray from the sample Ti/T, up to 40% in a temperature range between 115 and 275°C.

Assuming the change of the radioactivity was caused by the change of the neutron stability, we could estimate the density of the trapped thermal neutrons in the sample knowing the change of the radioactivity from experimental data. If the neutron became stable where the decrease of radioactivity was measured, the estimation[34] gives a value $n_n = 1.1 \times 10^9$ cm^{-3}.

(14) J. Dufour[35].

Dufour had observed the excess energy of Q ~ 2.5 W in the sparking experiments in D_2 or H_2 gas (~ 1 atm) with a cylindrical cathode of Pd or Stainless Steel (SS) with dimensions 10 ~ 11 mmϕ x 24 mm length and thickness 0.5 mm (with a surface area ~ 7.5 cm^2).

To analyze this data on TNCF model, we will assume that the D(H)/Pd(SS) ratio is 1 and n–$d(p)$ fusion occurs in the whole volume ~ 0.38 cm^3 though there is no description in the paper[35] about D(H)/Pd(SS) ratio in the cathode.

Then the excess energy ~ 2.5 W (~ 1.6 x 10^{13} MeV/s) gives us the numbers N_t and N_d of the fusion reactions n–d and n–p as follows: $N_t = 2.6 \times 10^{12}$, $N_p = 7.3 \times 10^{12}$ s^{-1}.

The relation between the number of events $N_{d(p)}$ and the density of the trapped thermal neutron nn is given as follows: $N_{t(d)}=0.35 n_n v_n n_{d(p)} S l_0 \sigma_{n-d(p)} \tau$, where $s_{n-d(p)}$ is the fusion cross section of the reaction 5.5 x 10^{-4} or 0.35 barns, respectively. This relation with the assumptions explained above gives us following values n_n in Pd with D(H)/Pd ~ 10^{-6}:

$n_n(d) = 9.2\text{x}10^{11}$, $n_n(p) = 4.0\text{x}19\ \text{cm}^{-3}$.

This means H_2–Pd(SS) system generate about 10^2 times the more excess energy per a trapped neutron than D_2–Pd(SS) system if the D(H)/Pd(SS) ratio and the thickness l_0 are the same in the both systems.

The values obtained above is also comparable with the values in other samples of $10^5 \sim 10^{12}\ \text{cm}^{-3}$.

The results of the analyses given above were summarized in **Table 1**.

Authors	System	Measured Quantities	n_n (cm^{-3})	Other Results (Remarks)
M.Fleischmann et al.[13]	Pd/D/Li	Q, t, n $N_t/N_n \sim 10^7$ $N_Q/N_n \sim 5.6 \times 10^7$	$\sim 10^9$	$N_t/N_n \sim 5.3 \times 10^3$ $N_Q/N_n \sim 8.6 \times 10^7$ $N_Q/N_t \sim 5.5$
A.Takahashi et al.[15]	Pd/D/Li	t, n $N_t/N_n \sim 8.7 \times 10^4$	10^3	$N_t/N_n \sim 5.3 \times 10^5$
M.H.Miles et al.[17]	Pd/D/Li	Q, ^{4}He	$10^9 \sim 10^{10}$	$N_Q/N_{He} \sim 5$
R.Bush et al.[19]	Ni/H/Rb	NT (^{85}Rb→ ^{86}Sr)	1.6×10^7	$N_Q/N_{NT} \sim 3$
M.Okamoto et al.[21]	Pd/D/Li	Q, NT(^{27}Al → ^{28}Si)	$\sim 10^{10}$	$N_Q/N_{NT} \sim 1.4$
Y.Arata et al.[23]	Pd/D/Li	Q, ^{4}He	$\sim 10^{12}$	$N_Q/N_{He} \sim 6$ (Assume t channeling in cathode wall)
M.C.H.McKubre[25]	Pd/D/Li	Q	$10^9 \sim 10^{10}$	
D.Cravens (P.P.C.)[27]	Pd/H/Li	Q	8.5×10^9	(If PdD exists)
J.O'M.Bockris et al.[30]	Pd/D/Li	t, ^{4}He	1.1×10^8	
A.G.Lipson et al.[6]	Pd/PdO/D,Na	γ (E_γ=6.25 MeV)	4×10^5	(If efficiency = 1 %)
V.Romodanov et al.[32]	Mo/D_2	t	1.8×10^7	(If sample is MoD)
I.Savvatimova[31]	Pd/D_2	NT (^{106}Pd→ ^{107}Ag)	9×10^{10}	
O.Reifenschweiler[33]	Ti$T_{0.0035}$	Radioactivity	1.1×10^9	($T = 0 \sim 450$ °C)
J.Dufour[35] (SS is for Stainless Steel)	Pd,SS/D_2 Pd,SS/H_2	Q, t, n	9.2×10^{11} 4.0×10^9	(D(H)/Pd ~ 1 is assumed)

Table 1. Neutron density n_n and relations between the number of events N obtained by theoretical Analysis of Experimental Data on TNCF Model

Conclusion

The above analysis of typical experimental data obtained in cold fusion experiments with electrolysis or discharge gives us a unified consistent concept of the physics of the cold fusion. The reliable data clearly showed several aspects of solid state - nuclear physics. These help us understand the physics of particles in a crystal with trapped thermal neutrons. Without an appropriate viewpoint experimental phenomena can appear as chaos and not be understood. It is true that the cold fusion phenomenon had appeared to some amateurs as only a confusion of experimental results.

Though the analysis given above has been confined to the limited data in experiments with electrolysis and discharge, the result was remarkable. Assuming only the existence of the stable thermal neutrons in cold fusion materials, we could have a consistent understanding of events in the phenomenon with quantitative relationships among them.

The assumption of the existence of

the stable thermal neutron in crystals itself has a theoretical verification[4] based on the neutron - lattice nuclei interaction, with a new concept "neutron affinity of lattice nuclei".

The success in the analysis of the cold fusion phenomenon with the TNCF model shows in reverse the reality of the trapped thermal neutron. This feature of the analysis will open a new science of the low energy neutron in solid interacting with lattice nuclei through the nuclear force. The existence of the trapped neutron in appropriate systems as Pd-black will be checked by the neutron magnetic resonance (nMR) like NMR or ESR used in the solid state physics and in the physical chemistry.

Other systems than the electrolytic and discharge ones have shown the characteristic cold fusion phenomenon. It will be a fascinating program to analyze the experimental data in various systems on the TNCF model was done here. Once we have a hint on solving the riddles it is easier to reach the goal. Exploration of the cold fusion phenomenon as an answer to the energy crisis will be accelerated by this new idea for unifying the separate facts obtained by experiments.

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