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Cold Fusion Research Laboratory (Japan) by Dr. Hideo Kozima, Director
E-mail address; hjrfq930@ybb.ne.jp, cf-lab.kozima@pdx.edu
Websites; http://www.geocities.jp/hjrfq930/, http://web.pdx.edu/~pdx00210/
(Back numbers of this News are posted on the above geocities and/or PSU site of the CFRL Websites)

CFP (Cold Fusion Phenomenon) *stands for*

"nuclear reactions and accompanying events occurring in open (with external particle and energy supply), non-equilibrium system composed of solids with high densities of hydrogen isotopes (H and/or D) in ambient radiation" belonging to Solid-State Nuclear Physics (SSNP) or Condensed Matter Nuclear Science (CMNS).

This is the *CFRL News* (in English) No. 83 for Cold Fusion researchers published by Dr. H. Kozima, now at the Cold Fusion Research Laboratory, Shizuoka, Japan.

This issue contains the following items:

1. JCF14 was held on December 7 and 8 in Tokyo and CFRL presented 4 papers there

As announced in this news No. 82, the JCF14 was held by the following schedule:

Date :　December 7 (Saturday) ～8 (Sunday)

Place : Tokyo Institute of Technology, Room 501 in Building South 8
Details are posted at JCF website: http://jcfrs.org/jcf14.pdf
JCF14 Chief Administrator: H. Numata, Faculty of Science and Technology, Tokyo Institute of Technology http://jcfrs.org/NEW.HTML

There are 15 presentations and many participants about 50 as a whole. The program and abstracts of presented papers are posted at JCF website:
http://jcfrs.org/JCF14/jcf14-program.pdf
http://jcfrs.org/JCF14/jcf14-abstracts.pdf

We presented four papers at this conference:

1. JCF14-5 H. Kozima and K. Kaki, "Atomic Nucleus and Neutron — Nuclear Physics Revisited with the Viewpoint of the Cold Fusion Phenomenon"
2. JCF14-6 H. Kozima, "Nuclear Transmutation in Actinoid Hydrides and Deuterides"
3. JCF14-15 H. Kozima, "Nuclear Transmutations (NTs) in Cold Fusion Phenomenon (CFP) and Nuclear Physics"
4. JCF14-16 H. Kozima, "The Cold Fusion Phenomenon – What is It?"

Abstracts of these papers are posted at above JCF website:

Proceedings of JCF14 in electronic style will be published after March 2014 and papers passed peer review will be posted at JCF website:
http://jcfrs.org/file/jcf14-proceedings.pdf

2. E-CAT and the Cold Fusion Phenomenon in Ni-H Systems.

This is my letter on November 7, 2013 to a researcher who raised a question on the preferable combination of a host and a hydrogen isotope for the cold fusion phenomenon (CFP).

"*Dear Sir*,

Your letter made me look back my history of research on the riddle of the preferable combination of Pd-D and Ni-H for the occurrence of the cold fusion phenomenon (CFP). The first realization of the preference was tabulated in the tables of events in the CFP in my book "Discovery of the Cold Fusion Phenomenon" (Ohtake Shuppan, Tokyo 1998)[*]*. In several papers and books published thereafter, I have discussed this problem incompletely but finally given my answer in my paper published in Proc. JCF9, pp. 84 – 93 (2009) and also Rep. CFRL, 9-3, pp. 1 – 10 (2009).*

'The famous riddle of the compatibility between a host metal and a hydrogen isotope,

Pd-D and Ni-H, in the CFP may be closely related to the inverse isotope effect of their diffusion coefficients in palladium. The ratios of diffusion coefficients of isotopes of hydrogen in nickel and palladium show normal and inverse isotope effect, respectively, as shown in Figs. 5 and 6 [8].' (Proc. JCF9, pp. 84 – 93 (2009))
The explanation for this riddle is supplemented in the recent paper ***Rep. CFRL***, **12-1**, pp. 1 – 14 (2012). *So, in my opinion, the riddle has been fundamentally solved or put its first step to solve at least.*

The papers referred above are accessible in JCF website and CFRL website:
JCF website; http://jcfrs.org/file/jcf9-proceedings.pdf
CFRL website; http://www.geocities.jp/hjrfq930/paper/

It should be added a remark that there are many quality papers in the Proceedings of JCF Conferences annually published and posted at above JCF website which are valuable for you to notice.

Hideo
November 7, 2013"
*Note added in citation: *Discovery of the Cold Fusion Phenomenon*, Ohtake Shuppan, Tokyo, 1998. ISBN 4-87186-044-2.

As this letter shows clearly, the cold fusion phenomenon (CFP) in hydrides and deuterides is a long sustaining problem, a part of which has been ignored sometimes by researchers who were eager to solve the wonder of nuclear reactions in room-temperature solids only by the *d-d* fusion reactions echoing in the dispute discussed in the next article in this *News*.

The news of E-CAT, a popular theme discussed frequently and eagerly in this research field recently, seems to have given a decisive answer for the reality of the CFP in protium (light hydrogen) systems. Details of E-CAT apparatus are posted at E-CAT website:
http://ecat.com/news

There are pros and cons to the E-CAT apparatus itself. The recent document by the Swedish power industry's R&D entity Elforsk seems in favor of the excess energy production in the E-CAT:
http://elforsk.se/Rapporter/?rid=13_90
On the other hand, Steve Krivit is criticizing the apparatus for several years. His critical articles are posted at *New Energy Times* website:
http://newenergytimes.com/v2/sr/RossiECat/RossiScientificFailure7Steps.shtml

Looking back our history of the research in protium systems, we find an article by

Focardi et al. published in as early as 1994 [Focardi 1994] which was taken up in my book as an excess heat generating system [Kozima 1998, Table 11.3]. Focardi's group has been working on this system thenceforth and published many papers some of which are listed up in References of this article.

Therefore, I have had no wonder about the reality of excess energy generation by the E-CAT plant or apparatus based on the Ni-H system [Focardi 1994, 1998, 2010] with such a long history of successful researches in this system. Only some comments should be mentioned on the use of the CFP as an energy source and an apparatus for nuclear transmutations: 1. Sporadicity of the events, 2. Emission of neutron and other radiations [Battaglia 1999, Focardi 2006], 3. Deterioration of materials by radiation and heat as shown by the surface analyses [Campali 2006a, 2006b]

The first point was cleared by the E-CAT plant that uses 106 smaller ECAT units. The imbalance of the output of individual units is averaged out as a whole making the output of the plant fairly stable. The second point is hazardous for human beings at the site. We have to be careful for these radiations. The third point is neutralized somewhat by the use of multiple smaller units but needs regular exchange of the units in a period depending on the cf-material used in the unit.

I would like to mention on this occasion when the E-CAT plant is discussed widely in the world that the CFP is not a simple phenomenon producing excess energy but is a complex one including nuclear transmutations at around surface/boundary regions belonging to complexity. We have to say now that the CFP is asking to establish a new physics in solids with high densities of hydrogen isotopes. When we know fundamental physics of the CFP, we will be able to explore many extensions in the new field between the solid-state physics and nuclear physics and then new applications for energy generation and elemental transmutations.

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3. Storms-Krivit Dispute and the Physics of the Cold Fusion Phenomenon.

It is not necessarily pleasant experience to read sentences of the dispute between researchers/reporters in the field of the cold fusion phenomenon (CFP) [Storms 2010, 2013, Krivit 2013a, 2013b]. However, the dispute reflects something in our research

field which is also a source of negligence of the CFP by the scientific community outside our field. So, it is necessary to investigate the contents of the dispute to promote our effort to make the research of the CFP a science acceptable to the science community in the 21st century.

Here, to visualize the essence of the dispute, we cite abstracts or first several paragraphs of the papers published in *Naturwissenschaften* and *New Energy Times*:

(1) From Storms' 2010 paper, "**Status of cold fusion (2010)"**[Storms 2010]:

"Abstract. The phenomenon called cold fusion has been studied for the last 21 years since its discovery by Profs. Fleischmann and Pons in 1989. The discovery was met with considerable skepticism, but supporting evidence has accumulated, plausible theories have been suggested, and research is continuing in at least eight countries. This paper provides a brief overview of the major discoveries and some of the attempts at an explanation. The evidence supports the claim that a nuclear reaction between deuterons to produce helium can occur in special materials without application of high energy. This reaction is found to produce clean energy at potentially useful levels without the harmful byproducts normally associated with a nuclear process. Various requirements of a model are examined."

(2) From Krivit's 2013 paper, "**Nuclear phenomena in low-energy nuclear reaction research"**[Krivit 2013a]:

"**Abstract**. This is a comment on Storms (Naturwissenschaften 97:861–881, 2010) Status of Cold Fusion, Naturwissenschaften, 97:861–881. This comment provides the following corrections: other nuclear phenomena observed in low-energy nuclear reactions aside from helium-4 make significant contributions to the overall energy balance; and normal hydrogen, not just heavy hydrogen, produces excess heat."

(3) From Storms' 2013 paper, "**Efforts to explain low-energy nuclear reactions"**[Storms 2013]:

"The phenomenon called "cold fusion" or "low-energy nuclear reaction" (Storms 2007) has now reached a stage when explanations are attracting attention. The major experimental work was summarized by Storms in 2010 (Storms 2010). Now, Krivit has cited "errors" in this review which he believes might guide an explanation in the wrong direction. He notes that heat, detected using light hydrogen and when transmutation occurred, was frequently overlooked in this review. In addition, in his opinion, the claim for $d + d = {}^4He$ being the major source of heat is not supported by the cited evidence.

Because the conclusion reached by Krivit (2013) is a direct challenge to what

Storms (2010) reviewed in the cited paper, a summary of the evidence is required. Although many studies resulting in heat production using deuterium did not attempt to measure helium, over 16 independent studies using numerous samples found that helium was present when energy production was detected and some measurements found no helium when no extra energy was detected. Three independent studies measured the energy/He ratio, which can be summarized as 25±5 MeV/He. All other known reactions that produce helium result in less energy/helium atom. For example, the proposed reaction of $^{6}_{3}$Li+2n=2He + e− produces only 13.4 MeV/He. Readers must decide for themselves if this is enough evidence to go forward in search for an explanation based on helium as the major nuclear product before additional studies are made."

(4) From Krivit's paper, "**More errors by Storms published in Naturwissenschaften**," [Krivit 2013b]:

"Storms' Oct. 30 reply offers no facts that invalidate my comment. However, in his reply, Storms published new factual errors on which he bases his claim of the erroneous concept of cold fusion.

Storms wrote, "Over 16 independent studies using numerous samples found that helium was present when energy production was detected, and some measurements found no helium when no extra energy was detected. Three independent studies measured the energy/He ratio, which can be summarized as 25±5 MeV/He."

Storms' statement is incorrect for two reasons.

First, it fails on logic. Storms tries to make a quantitative comparison between heat measured from LENR experiments and atoms of helium-4 produced in those experiments. The mathematical assertion is 24 (or 25) MeV heat per each 4-He atom. In proposing such a ratio, Storms, as well as many of his peers who continue to promote cold fusion, asserts that LENRs emulate the third branch of thermonuclear fusion and therefore validate his assertion that LENRs are some kind of "cold fusion."

The first error in Storm's reply is that he does not know the true denominator in the equation (24 MeV/4-He) because the researchers who have measured the excess heat and helium-4 never performed a full assay of other nuclear products and effects that could also make contributions to the measured excess heat.

Second, Storms' statement fails on data. Even if the researchers had performed full assays, the value of 24 MeV/4-He is not representative of the entire body of published experimental measurements of excess heat per 4-He atom.

I performed a precise tally of the published data. Although proponents of cold fusion

cite this 24 MeV number as an established fact, it is not. Here are the three most commonly cited sets of excess heat versus helium-4 measurements, in MeV: (omitted)

I first reported this tally on July 10, 2008, published in my editorial "Cold Fusion—The Value of Keeping an Open Mind." I had hoped that the researchers in the field would keep an open mind when they saw that the 24 MeV number was unsupported by the published data. Unfortunately, very few researchers working in the field took notice.

My source references and data are shown in this linked document. Two years later, in 2010, I reported that Michael McKubre of SRI International had manipulated the data from experiment M4 and that therefore no meaningful conclusion could be drawn from the data I published (38.34, 34.45, 22.85), which was based on the data McKubre published."

Posted at New Energy Times website:
http://news.newenergytimes.net/2013/11/04/more-errors-by-storms-published-in-naturwissenschaften/

Author's Comment on the Dispute and the Physics of the Cold Fusion Phenomenon (CFP)

From my experience in the investigation of physics of the CFP, I think that many data sets giving quantitative amounts of helium-4 are not decisive and should be accepted with reservation. One example showing difficulty in precise quantitative determination of helium is that reported by Clarke which is discussed in my paper presented at ICCF9 [Kozima 2003]. Clarke as an expert in determination of a minute amount of helium had reported negative results on the specimen offered him through SRI International and commented difficulty in determination of helium. In my experience, one of the most reliable data sets of the helium measurement is the paper by Morrey et al. published in 1990 [Morrey 1990]. We analyzed this data and concluded that the helium observed was the result of the n-$^{6}_{3}$Li reaction in consistent with other data of $^{6}_{3}$Li/$^{7}_{3}$Li ratio decrease in cathodes analyzed later [Kozima 1998, 2006, 2014, Passell 2002].

Anyway, the dispute between Storms and Krivit revealed several features of our research field and we want to develop our investigation on experimental facts and also on the outcome of the elaborate discussions given by the parties. One point should be emphasized that the CFP is a phenomenon occurring not only in deuterium but also in protium systems and the physics of the CFP has to finally explain whole events occurring in both systems. There are two ways of approach to such a difficult problem

as the CFP where many events have been observed outside of our common sense in solid-state nuclear physics. One way is the phenomenological approach, like the TNCF model, based on the whole events in deuterium and protium systems, with assumptions which should be justified afterwards. Another is the microscopic approach concentrating on the selected event like the *d-d* fusion reactions in the room-temperature solids (naturally only in deuterium system) and extends the result to other events (e.g. in protium system). It is a problem of taste of a researcher which way he/she takes in his/her investigation. I like the former way as have been working for almost twenty years with a little success and a little self-satisfaction. In the extended frame of the TNCF model, we are looking for a new physics of neutrons of interacting lattice nuclei through hydrogen isotopes in hydrogenated solids closely related with the recently developing field of isolated exotic nuclei.

The author would like to express his thorough thanks to Ed Storms and Steve Krivit for their kindness sending him their papers by e-mail.

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