The CFRL English News No. 116 (September 20, 2022)

Published by Dr. Hideo Kozima, Director of the Cold Fusion Research Laboratory (Japan),

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https://www.researchgate.net/profile/Hideo_Kozima

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).

This is the ***CFRL News* No.116** (September 20, 2022) for Cold Fusion researchers published by Dr. H. Kozima, at the Cold Fusion Research Laboratory, Shizuoka, Japan.

This issue contains the following items:

1. My paper "Peculiarities of Physics and Chemistry in the Transition Metal Hydrides" will be published in the *JCMNS* Vol. **37** (2022), ISSN 2227-3123.
2. DOE, USA, will fund up to $10 million to establish for the low-energy nuclear reactions (LENR) research.
3. The paper H. Kozima, "A Sketch of the Solid State-Nuclear Sciences" presented at the 23rd International Conference on the Cold Fusion (ICCF23) was published as the *Reports of the CFRL* **22-1**, pp. 1 – 28 (January 2022).

1. My paper "Peculiarities of Physics and Chemistry in the Transition Metal Hydrides" will be published in the *JCMNS* Vol. 37 (2022), ISSN

2227-3123.

This paper was accepted for publication in the *Journal of Condensed Matter Nuclear Science (JCMNS)* and will be printed in the Vol. **37** of the Journal. The preprint of this paper has been uploaded to the following page of the ResearchGate:
https://www.researchgate.net/profile/Hideo_Kozima

The Contents and the Abstract of the paper is cited below;

Contents

"Abstract

Since the discovery of nuclear reactions in PdD_x alloys in 1989, there have been accumulated very many experimental data sets showing existence of nuclear reactions in materials composed of lattice nuclei of transition metals and occluded hydrogen isotopes (let us call them the *CF materials*, for short) resulting in various nuclear products such as transmuted nuclei, tritium, neutrons, and others accompanied with large excess energies at relatively low temperatures up to 1000 ºC (let us call these whole events the *cold fusion phenomenon* (*CFP*), for short).

As the cause of these nuclear reactions in the CFP, we have to accept the existence of the interactions between nucleons in the CF material through the nuclear force, i.e. the *weak interaction* (let us call this interaction the *nuclear-force interaction,* for short) recognized in the nuclear physics. It should be emphasized that our phenomenological approach based on the nuclear-force interaction between lattice nuclei and occluded hydrogen isotopes has been successful to give qualitative and sometimes semi-quantitative explanations for the events in the CFP.

In this paper, we have given contemplations of the effect of the nuclear-force interaction revealed in the CFP on physics and chemistry in transition metal hydrides where have been observed the peculiar phenomena such as the super-diffusivity, HER (hydrogen

electrode deposition), and UPD (underpotential deposition) for long without satisfactory explanation consistent with other characteristics of the materials.
It is shown that the fundamental mechanism giving a consistent explanation of the CFP seems also an essential factor giving rise to the peculiar characteristics observed in the transition-metal hydrides even if the necessary condition for the CFP is not satisfied there."

2. DOE, USA, will fund up to $10 million for the low-energy nuclear reactions (LENR) research.

As we see in the Press Release of ARPA-E cited below, the DOE are going to check the applicability of the LENR to the carbon-free energy source funding up to $10 million: https://arpa-e.energy.gov/news-and-media/press-releases/us-department-energy-announces-10-million-study-low-energy-nuclear

We remind the following comment on "the DOE Workshop 2021 on the LENR" in the *CFRL News* No. **115** (January 1, 2022), which is still effective to remember:

" It is interesting to notice that the DOE, USA had decided to hold a workshop on the Low-Energy Nuclear Reactions (LENR) after 17 years of their second negative estimation on the Cold Fusion Phenomenon in 2004.

It is well known that DOE has given negative estimations on the Cold Fusion in 1989 and 2004 to discourage researchers in this field as we discussed them in our papers, e.g. the one published in 2016; H. Kozima, "From the History of CF Research – A Review of the Typical Papers on the Cold Fusion Phenomenon –," *Proc. JCF16,* 16-13, pp. 116 – 157 (2016), ISSN 2187-2260.

The workshop on the LENR in October 2021 held by DOE in this timing seems that they have recognized and are interested in the reality of the cold fusion phenomenon, i.e. nuclear reactions in CF materials at around room temperature, developed in these more than 30 years since 1989. We have to celebrate the recognition of the interdisciplinary science in between the solid state physics and the nuclear physics by sincere scientists in other fields than ours."

Press Release of ARPA-E

https://arpa-e.energy.gov/news-and-media/press-releases/us-department-energy-announces-10-million-study-low-energy-nuclear

Exploratory Topics

U.S. Department of Energy Announces Up to $10 Million to Study Low-Energy Nuclear Reactions

ARPA-E (Advanced Research Projects Agency – Energy) Will Apply Scientific and

Rigorous Approach to New Exploratory Topic Focused on Specific Type of Nuclear Energy
09/13/2022

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The U.S. Department of Energy (DOE) today announced up to $10 million in funding to establish clear practices to determine whether low-energy nuclear reactions (LENR) could be the basis for a potentially transformative carbon-free energy source. The funding is part of the Advanced Research Projects Agency-Energy (ARPA-E) LENR Exploratory Topic, which aims to break the stalemate of research in this space.

"ARPA-E is all about risk and exploring where others cannot go, which is why we've set out with this LENR Exploratory Topic to conclusively answer the question 'should this field move forward, or does it not show promise?'" **said ARPA-E Acting Director and Deputy Director for Technology Dr. Jenny Gerbi.** "We look forward to seeing the intrepid teams that come forward to approach this field of study with new perspectives and state-of-the-art scientific and technical capabilities."

LENR Exploratory Topic awardees will pursue hypotheses-driven approaches toward producing publishable evidence of LENR in top-tier scientific journals by testing/confirming specific hypotheses (rather than focusing only on replication), identifying and verifying control of experimental variables and triggers, supporting more comprehensive diagnostics and analysis, and improving access to broader expertise and capabilities on research teams.

You can access more information on **ARPA-E eXCHANGE.**
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3. My paper "A Sketch of the Solid State-Nuclear Sciences" presented at the 23rd International Conference on the Cold Fusion (ICCF23) was published as the *Reports of the CFRL* 22-1, pp. 1 – 28 (January 2022).

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"**Abstract**

Since the discovery of nuclear reactions in PdD_x alloys in 1989, there have been accumulated very many experimental data sets showing existence of nuclear reactions in materials composed of lattice nuclei of transition metals and occluded hydrogen isotopes (let us call them the *CF materials*, for short) resulting in various nuclear products such as transmuted nuclei, tritium, neutrons, and others accompanied with large excess energies at relatively low temperatures up to 1000 ºC (let us call these whole events the *cold fusion phenomenon* (*CFP*), for short). As the cause of these nuclear reactions in the CFP, we have to accept the existence of the interactions between nucleons in the CF material through the nuclear force, i.e. the *weak interaction* (let us call this interaction the *nuclear-force interaction,* for short) recognized in the nuclear physics. Before the discovery of the CFP, existence of the nuclear-force interaction in solid state physics had been known only in limited phenomena as the neutron diffraction and the Moessbauer effect.

Even if the nuclear force has recognized as the cause of nuclear reactions observed in the CFP since its discovery in 1989, there should be its fingerprints in other phenomena in solid state physics and chemistry occurring in materials with similar compositions to the CF material (let us call these materials the *nuclear-solid materials,* for short). Since the Graham's discovery of the absorption of hydrogen by palladium and palladium-silver alloys in 1866, the physics of the transition metal hydrides has shown a great development revealing various characteristics of the physics in them especially the extremely high diffusivity of hydrogen in metals and alloys (let us call this phenomenon as the *super-diffusivity*, for short). We have noticed the relation between the CFP and the super-diffusivity and explained some characteristics of the CFP using the data of the super-diffusivity. Thus, we may be able to expect that the nuclear-force interaction between lattice nuclei and occluded hydrogen isotopes will give explanations for some of the unsolved problems in the super-diffusivity in the solid state-nuclear physics.

On the other hand in the electrochemistry, there have been observed such wonderful events closely related to the interaction between the transition metals and the hydrogen at the electrode surface as the hydrogen electrode reaction (HER) and the underpotential deposition (UPD). There are many characteristics of the HER and UPD remaining

unexplained for more than 80 years after the formulation of the problem in 1933 by A.N. Frumkin. In relation to the nuclear-force interaction recognized in the CFP, we can apply the same new concept to investigate the unsolved problems in the HER and UPD in the solid state-nuclear chemistry.

Furthermore, there have been discovered the *exotic nuclei* with a large unbalance of the numbers of protons and neutrons in the isolated nucleus in these 20 years. The halos observed in these exotic nuclei have shed light on the new features of the nucleon interaction in the isolated nucleus. We may expect existence of new features of exotic nuclei in the nuclear-solid materials where the lattice nuclei and the occluded hydrogen isotopes interact through the nuclear-force interaction.

These themes in the nuclear-solid materials pointed out above may be only a little examples in our knowledge in the solid state-nuclear sciences where the nuclear-force interaction between the occluded hydrogen isotopes and the lattice nuclei plays decisive roles. We want to throw light on the physics and chemistry of the nuclear-solid materials composed of specific elements (including transition metals) and occluded hydrogen isotopes by taking up the possible participation of the nuclear-force interaction which has not noticed its importance seriously until now. In this paper, we point out several characteristic events in the super-diffusivity, HER, UPD, and the exotic nucleus in the nuclear-solid materials which seems to have close relations to the nuclear-force interaction noticed in the CFP."