JOURNAL OF CONDENSED MATTER NUCLEAR SCIENCE

Experiments and Methods in Cold Fusion

VOLUME 4, February 2011

JOURNAL OF CONDENSED MATTER NUCLEAR SCIENCE

Experiments and Methods in Cold Fusion

Editor-in-Chief
Jean-Paul Biberian
Marseille, France

Editorial Board

Peter Hagelstein
MIT, USA

George Miley
Fusion Studies Laboratory, University of Illinois, USA

Xing Zhong Li
Tsinghua University, China

Michael McKubre
SRI International, USA

Edmund Storms
KivaLabs, LLC, USA

Akito Takahashi
Osaka University, Japan

JOURNAL OF CONDENSED MATTER NUCLEAR SCIENCE

Volume 4, February 2011

© 2011 ISCMNS. All rights reserved.

This journal and the individual contributions contained in it are protected under copyright by ISCMNS and the following terms and conditions apply.

Electronic usage or storage of data

JCMNS is an open-access scientific journal and no special permissions or fees are required to download for personal non-commercial use or for teaching purposes in an educational institution.

All other uses including printing, copying, distribution require the written consent of ISCMNS.

Permission of the ISCMNS and payment of a fee are required for photocopying, including multiple or systematic copying, copying for advertising or promotional purposes, resale, and all forms of document delivery.

Permissions may be sought directly from ISCMNS, E-mail: CMNSEditor@iscmns.org. For further details you may also visit our web site: http:/www.iscmns.org/CMNS/

Members of ISCMNS may reproduce the table of contents or prepare lists of articles for internal circulation within their institutions.

Orders, claims, author inquiries and journal inquiries

Please contact the Editor in Chief, CMNSEditor@iscmns.org or webmaster@iscmns.org

J. Condensed Matter Nucl. Sci. 4 (2011) 1–316
©2011 ISCMNS. All rights reserved.

JOURNAL OF CONDENSED MATTER NUCLEAR SCIENCE

Volume 4 2011

CONTENTS

PREFACE

REVIEW ARTICLE

Hot and Cold Fusion for Energy Generation 1
David J. Nagel

RESEARCH ARTICLES

What is Real about Cold Fusion and What Explanations are Plausible? 17
Edmund Storms and Brian Scanlan

Cold Fusion, LENR, CMNS, FPE: One Perspective on the State of the Science Based on Measurements Made at SRI 32
Michael C.H. McKubre and Francis L. Tanzella

Measurements of Excess Power Effects In Pd/D_2O Systems Using a New Isoperibolic Calorimeter 45
M.H. Miles and M. Fleischmann

Heat Evolution from Pd Nano-powders Exposed to High-pressure Hydrogen Isotopes and Associated Radiation Measurements 56
Akira Kitamura, Akito Takahashi, Reiko Seto and Yushi Fujita

Absorption Capacity and Heat Evolution with Loading of Hydrogen Isotope Gases for Pd Nanopowder and Pd/Ceramics Nanocomposite 69
T. Hioki, H. Azuma, T. Nishi, A. Itoh, S. Hibi, J. Gao, T. Motohiro and J. Kasagi

Codeposition Methods: A Search for Enabling Factors 81
Dennis Letts

Impact of an Applied Magnetic Field on a High Impedance Dual Anode LANR Device 93
Mitchell R. Swartz

Detection of Abnormal Quantity of Hydrogen upon Electrical Explosion of Titanium Foil in a Liquid 106
Leonid I. Urutskoev, Dmitry V. Filippov, Anri A. Rukhadze and Larion A. Lebedev

Studies on Anomalous Phenomena of D/Pd Systems using a Gas-loading Process – A Stride Towards Neutrino Detection 119
Zhan M. Dong, Chang L. Liang, Bin Liu, Qing M.Wei, Jian Tian, Shu X. Zheng, Jin Z. Yu and Xing Z. Li

Observation of Low Energy Nuclear Transmutation Reactions Induced by Deuterium Permeation through Multilayer Pd and CaO thin Film 132
Y. Iwamura, T. Itoh, N. Yamazaki, J. Kasagi, Y. Terada, T. Ishikawa, D. Sekiba, H. Yonemura and K. Fukutani

Low-energy Nuclear Reactions and Transmutation of Stable and Radioactive Isotopes in Growing Biological Systems 146
Vladimir I. Vysotskii and Alla A. Kornilova

Neutron Emission in Bursts and Hot Spots: Signature of Micro-Nuclear Explosions? 161
Mahadeva Srinivasan

Review of Twenty Years of LENR Research Using Pd/D Co-deposition? 173
Pamela A. Mosier-Boss, Jack Y. Dea, Frank E. Gordon, Lawrence P.G. Forsley and Melvin H. Miles

Bose–Einstein Condensate Theory of Deuteron Fusion in Metal 188
Yeong E. Kim

Energy Exchange Using Spin-Boson Models with Infinite Loss 202
P.L. Hagelstein and I.U. Chaudhary

Concerning the Role of Electromagnetism in Low-energy Nuclear Reactions 213
Scott R. Chubb

Weight of Evidence for the Fleischmann–Pons Effect 225
Rodney Johnson and Michael Melich

Tunneling Beneath the $^{4}He^{*}$ Fragmentation Energy 241
Andrew Meulenberg and Krityunjai P. Sinha

Ultra-High Density Deuteron-cluster Electrode for Low-energy Nuclear Reactions 256
George H. Miley, Xiaoling Yang and Heinrich Hora

Progress in Condensed Cluster Fusion Theory 269
Akito Takahashi

Inhibition of LENR by Hydrogen within Gas-loaded Systems 282
Dennis Cravens

Dynamics in Pd–H(D) Systems 291
Antonella De Ninno

Model for Sonofusion 304
Roger S. Stringham

PREFACE

This special volume includes the proceedings of the March 2010, New Energy Technology Symposium held at the 239th American Chemical Society National Meeting and Exposition in San Francisco. These proceedings were to be published as a book by AIP Publishing, a branch of the American Institute of Physics. Jan Marwan, the editor of the book did an excellent job. All papers were ready for printing, when AIP Publishing without any reason cancelled the work. They did so based on an evaluation of the contents that drove them to exercise their right to decline publishing the proceedings and materials as an AIP publication. In fact, even though no precise argument was given for the cancellation, it is obvious that some people from AIP Publishing triggered the change. They might have realized that by publishing papers related to Condensed Matter Nuclear Science, they were actually supporting Cold Fusion. Mainstream science does not accept this field as genuine. After more than twenty years of research by hundreds of scientists worldwide, the change is extremely slow. The proceedings edited by Jan Marwan were of excellent scientific quality, and could not be challenged on these grounds, and AIP Publishing made their decision using their legal right of controlling what is acceptable to them. It is my pleasure to publish these proceedings as a special volume of the *Journal of Condensed Matter Nuclear Science*. No change has been made from the original papers; they have been solely adapted to the format of the journal, including the following preface by Jan Marwan.

Jean-Paul Biberian
February 2011

The year 1989, Martin Fleischmann and Stanley Pons announced, to great fanfare, excess heat without harmful neutron emissions or strong gamma radiation involving electrochemical cells using heavy water and palladium. Their significant claims have held strong in spite of chagrin and criticism from many people in the scientific community.

In recent years, Low-Energy Nuclear Reactions (LENR), within the field of condensed matter nuclear science, have begun to attract widespread attention. The LENR is now regarded as a potential alternative and renewable energy source to confront climate change and energy scarcity. The aim of the research is to collect experimental findings for LENR in order to present reasonable explanations and a conclusive theoretical basis for a practical working model.

Palladium is well known to absorb large quantities of hydrogen/deuterium into the bulk metal where the nuclei, electrochemically inserted, occupy interstitial octahedral/tetrahedral sites dependent on the specific palladium–hydride phase. Using this approach, Martin Fleischmann raised the idea of electrochemically inserting deuterium into bulk palladium, hoping to increase the probability of deuterium nuclei reacting and colliding efficiently. Based on this idea, in 1989 in Salt Lake City, Utah, Martin Fleischmann together with his colleague Stanley Pons designed an experiment involving as electrochemical cell using a heavy water solution with the corresponding electrolyte and palladium as the electrode, in order to generate nuclear fusion within the metal lattice. The energetic output generated after a long-term electrolysis-over a couple of days-was found to be significant. From this, Fleischmann concluded that nuclear fusion of deuterium nuclei inside the bulk palladium metal had occurred.

Because this reaction, initially named “cold fusion”, seemed to offer an opportunity solve energy problems in the future, it instantly raised widespread attention. As a result, many quickly came to regard “cold fusion” as one of the most important topics confronting the scientific community.

Research scientists from all over the world, after learning of the news announcement, attempted to replicate the experiment in their labs. Unfortunately, most of them lacked crucial information about the experiment. This, together with the well-known contradiction in physics that deuterons are unlikely to collide efficiently at room temperature because of the enormous amount of energy required to overcome the Coulomb barrier, caused mainstream science to dismiss the entire subject as error.

Twenty years later, we can see that progress came slowly but steadily. The few scientists who maintained an open interest and continuing commitment to explore the unknown had to contend with the shame and disgrace of being associated with a field of science that had been labeled as illegitimate.

Some of the LENR scientists have worked on replications of the original Fleischmann–Pons electrolysis experiment. Many others have explored new ground, performing experiments with deuterium gas and a variety of approaches. Many of these approaches and effects go well beyond the initial Fleischmann–Pons electrolytic effect.

These determined pioneers have set out to determine and evaluate the experimental parameters that may play a significant role in this process and to give plausible explanations to theoretical approaches. Given their negligible budgets, the work they have done and the understanding they have acquired of the "cold fusion"/LENR process is especially impressive, compared to the standard set by results obtained by thousands of generously funded scientists working in the "hot fusion" field. This suggests a promising research topic to discover and exploit perhaps the most auspicious alternative energy source. With limited funding and maximum resistance from science orthodoxy, the LENR scientists succeeded, regardless of the small and at times non-existent research budgets available to them. Their efforts are characterized by hard work and intensive research performed in their mostly privately funded labs. LENR scientists have remained isolated and separated from mainstream science often working in loneliness, without acknowledgement and recognition.

That was the past. The research has now achieved notable recognition as a new legitimate field of science. LENR is now poised to become a significant addition to the future of science.

Although LENR may become an option to provide energy for private households, industry and the transportation sector, running the economy on the basis of intensive use of a raw material as costly as palladium is impractical and, in the long term, perhaps impossible. Therefore, in the future LENR studies using less expensive metals such as nickel etc, are more likely to be considered as the materials on which to run a true hydrogen economy.

Considering the accelerating energy crisis, growing worldwide demands for increased energy, and geopolitical instabilities stemming from control of energy sources for a global economy, the possibilities suggested by LENR come at an ideal time. We are beginning to see this historic science development find inclusion as a research topic in university Chemistry and Physics classes worldwide. Although the promises of the field remain illusive, the interest in this exciting new field is nevertheless being received enthusiastically.

LENR does not appear to fit into current scientific understanding, and it raises uncomfortable questions about current and historical understandings of nuclear physics. The path forward will require new openness, receptivity, and tolerance. It may require flexibility on the part of orthodox physics to learn from LENR researchers. It may also require LENR researchers to learn from orthodox physics. Together, the disciplines of chemistry and physics are developing and will continue to build the foundation of a new field of science.

This Proceeding based on the New Energy Technology Symposium is a summary of selected experimental and theoretical research performed over the last 21 years that gives profound and unambiguous evidence for low-energy nuclear reactions (LENR), historically known as "cold fusion." From the experimental papers presented, the reader will discern clear evidence for excess heat, tritium and neutron emission, helium production, and nuclear transmutation of the host metal. And, from the theory papers, presented, the reader will learn of a variety of reasonable explanations to approach the understanding of the experimental behavior. In part, some authors will reveal how to design LENR devices based on the experimental results obtained over the last 21 years.

Jan Marwan
February 2011