Low Energy Nuclear Reaction Research – Global Scenario

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IISC Campus, Bangalore, India, January, 9, 2008

Balanced Reporting

Richard Garwin  Moshe Gai  Walter Gratzer
David Williams  Robert Park  Nathan Lewis
Steven Koonin  Alan Bard  Frank Close
William Happer
Myth: Fleischmann and Pons were disproved

Fleischmann and Pons’ Theory and Gamma Spectrum
The claim of excess energy (heat) was never disproved.

Dominant Nuclear Ash: $^4\text{He}$

Other products: $^3\text{He}$, $n$, transmutations, T
U.S. Navy SPAWAR San Diego Co-deposition Experiment:

Repeatable and Reproducible

Evidence of Low Energy Neutrons

Evidence of Charged Particles

Co-deposition Experiment:

Strong Evidence of Low Energy Neutrons

(March 2007 APS Meeting, Denver, CO
March 2007 ACS Meeting, Chicago, IL)

Naturwissenschaften, EPJA)

Instrument: Solid-State Nuclear Track Detectors and TASL Scanner
SRI Replication of Co-deposition Ex.
Neutron signal 14x > than background
14-hour burst (BF3)
(8th Conf. on H and D/Pd Anomalies)

SRI Replication Confirmation
(RAS – A. Lipson and A. Roussetski)
Sequential Etching
Other Permanent Anomalous Evidence

Melted Metal, Vaporized Metal
Craters, Morphological Deformation

Fleischmann-Pons Effect

Excess Heat
Anomalous Nuclear Products, Emissions and Effects

Absence of Greenhouse Gases
Absence of Long-Lived Radiation
Absence of Strong Prompt Radiation
Potential Civilian Applications

Heating
Electricity
Desalinization

Potential Military Applications

Tritium Production
Neutron Production
Rapid Energy Release?
Two Groups of Theories

Heat+4He (~D/Pd)
Transmutation (D/Pd and Ni/H)

Fusion Theories

D+D
D+D+D
D+D+D+D

“New” Physics
Incomplete Math
DD Thermonuclear Fusion

D+D → **3He** (0.82 MeV) + **n** (2.45 MeV)
D+D → **T** (1.01 MeV) + **p** (3.02 MeV)

D+D → **4He** (0.08 MeV) + **gamma ray** (23.77 MeV)

**n:T = ~1:~1**

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DD Thermonuclear Fusion

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D+D > T (1.01 MeV) + p (3.02 MeV)
n:T = \approx 50:50
D+D > \textbf{4He} (0.08 MeV) + gamma ray (23.77 MeV)
n:4He = 10,000,000:1

LENR Experiments

D+D > \textbf{3He} + n (Energy and Ratio Unknown)
D+D > T + p (Energy and Ratio Unknown)

D+D > \textbf{4He} + heat (lattice) (~12- ~48 MeV )
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\[
\begin{align*}
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DD Thermonuclear Fusion ≠ LENR

1. Lattice heat vs. gamma
2. Weak data showing 24 MeV reaction
3. n:T ratio does not match
4. n:4He ratio does not match
The Widom-Larsen Not-Fusion Theory

Story to publish 10 January, 2008
New Energy Times, Issue #26

“Lateral Thinking”
- P.K. Iyengar

Weak Interaction Theory

Allan Widom, Northeastern University
Lewis Larsen, Pres./CEO Lattice Energy

“Ultra Low Momentum Neutron Catalyzed Nuclear Reactions”

(1) EPJA
(3) Pre-print
No Coulomb Barrier

Claim to explain heat and helium-4
Claim to explain transmutations
Claim to explain exploding wires
Claim to explain H/Ni reactions

Other Weak Interaction Ideas and Neutron Models

Stan Szpak, SPAWAR, San Diego, US
John Fisher - US
Hideo Kozima, Tadahiko Mizuno - Japan
George Anderman, Lali Chatterjee - US
My Evaluation Process

Published Papers?
Endorsements?
Positive Critique?
Negative Critique?
Invite Debate

Debate and Critique

“Cold Fusion” Theorists
A. Takahashi
K.P. Sinha and A. Meulenberg
J. Brown
S. Chubb (NRL)
P. Hagelstein (MIT)
H. Kozima
Debate and Critique

CMNS Experimentalists and others
   E. Storms
   J. Dufour
   R. Gimpel
   B. Josephson
   D. Nagel

Debate and Critique

People outside CMNS Group
   D. Rees (Particle Physicist, U.S. Navy)
   R. Deck (Particle Physicist, Toledo U.)
Debate and Critique

Richard Garwin

No Errors Reported

Unusual Comments

“Not fusion, but some other low energy nuclear reaction”

- Sir Arthur C. Clarke
- Robert Park
Transmutation Experiments

George Miley, UIUC
Worldwide Summary

Yasuhiro Iwamura, Mitsubishi
Heavy Industries

Not Fusion Energy But…

Not 8,000,000x Chem.

Perhaps 1,000x - 100,000x Chem.