ALI F. ABUTAHA
CONSULTANT

May 20, 1989

COLD FUSION - THE HEAT MECHANISM
TOTAL WORDS: 3,000 Words
ABSTRACT: 250 Words
PREPARED FOR: WORKSHOP ON COLD FUSION PHENOMENA

[redacted] Reston, VA USA 22091
TEL/FAX: (703) [redacted]

ABSTRACT

The belief that deuterium, and not palladium, is the fuel in the experiments of Professors Stanley Pons and Martin Fleischmann led to high expectations of cold nuclear fusion. Just as coal, and not air (oxygen), is the combustion fuel; so is palladium, and not deuterium, the fuel in cold fusion. The abundance of air, in the case of carbon ashes, or deuterium, in cracked palladium, will not produce heat.

A basic mechanism of heat generation was neglected in studying cold fusion: The conversion of mechanical energy to heat. Considerable strain energy is released, then discharged, during propagation of cracks in palladium (Pd). Hydrogen or deuterium induce and propagate cracks in metals and alloys, including Pd. The work-of-fracture is calculated to be the source of the excess heat.

The heat liberated in palladium-deuterium is considerable. Professors Pons and Fleischmann projected 1000% excess heat from their process and expect one million per cent thermal yield. The confident figures are based on the small energy input to the electrolytic cells, but do not consider the substantial energy required to process (melt), or recycle, palladium. In this paper, I show that less than 50% of break-even has been attained, and that break-even may not be possible. The heat mechanism and other parameters are described. Though the process may be better described as Metal-Burning or Rapid-Corrosion, and not Nuclear Fusion, it leads to vital scientific and technical studies and applications, some of which are identified by this author.

[redacted], RESTON, VIRGINIA 22091/[redacted]

ALI F. ABUTAHA
CONSULTANT

NEWS RELEASE
May 7, 1989

THE HEAT MECHANISM IN "COLD FUSION"

Considerable effort has been undertaken by scientific centers to identify the heat source and energy mechanism in the "Cold Fusion" process.

We have been able to identify the process of "crack initiation and propagation" in the palladium electrode as the agent responsible for the excess heat content. The mechanical strength of the palladium (or other alloys) electrode, for example, must be checked before and after exposure to heavy water, or light water. Quantitative analysis is available for study by other scientists, and will be presented for peer review.

In the seminar presented by the Space Research Institute (SRI) of the Florida Institute of Technology (FIT) in Melbourne, Florida, the following subjects were covered:

1. The mechanism responsible for heat generation.
2. Why variable "heat content" is obtained by different labs.
3. Why the excess "enthalpy" is missing in experiments with similar configuration to those by Professors Pons and Fleischmann.
4. The maximum amount of heat that can be extracted from the process.
5. The viability of the process as a new source of energy.
6. Potential study programs and possible applications of the reported phenomenon.

We feel obligated to inform the scientific community of these findings promptly so that further effort and resources can be directed wisely, and we thank Florida Today and The Orlando Sentinel for their coverage.

For further information, contact us or SRI/FIT.

TEL/FAX
RESTON, VIRGINIA 22091/

ALI F. ABUTAHA
CONSULTANT

April 27, 1989

HEAT SOURCE IN COLD FUSION

Metals and alloys are characterized by the presence of very large number of microcracks in the bulk. The fine cracks cause considerable reduction in the theoretical cohesive strength of materials as described by the Griffith theory. The measured strength of materials reflect the chemical and physical bonds in the bulk, less the effect of the area of the cracks. Atomic and molecular bonds in metals can be destroyed by different mechanisms, such as, fracture, melting, or chemical attacks.

When a metal sample is fractured across the bulk, two new surfaces are produced. The energy required to produce the two surfaces is a function of the number and spacing of the atoms involved in the process. The energy is absorbed by local deformation in the fractured surfaces. If the sample is placed in water, for example, the "unlocking" energy is converted into heat. The enthalpy of this reaction is simply:

$$\Delta H = C\ U$$

Where ΔH is the heat content imparted to the environment, a liquid bath, for example, C is a constant < 1.00, and U is the cohesive bond energy of the two layers of atoms involved at the two surfaces. The situation described above applies to transgranular fractures.

If the metal sample fractures along grain boundaries, intergranular fracture, then the released energy is much lower than for the transgranular case; and so will the released heat be lower.

The load carrying capacity of metals and alloys is reduced by the attack of molecular and atomic hydrogen. The degrading effect of deuterium on metals is greater than that of the lighter hydrogen. In addition to the formation of hairline cracks, or flakes, in large ignots and forgings during cooling, hydrogen or deuterium can induce cracks in the bulk. During the propagation of cracks, the atomic, molecular, or granular bonds are severed; and the energy is partially converted into heat as described above.

Many factors affect the hydrogen-induced crack initiation and propagation in metals and alloys. For example, hydrogen-induced crack propagation is discontinuous. This and other factors contribute to the variable results of cold fusion tests to date.

Mathematical treatise and other characteristics are described in my seminars on the subject and a detailed article is under preparation.

Ali F. AbuTaha
Consultant
Reston, Virginia
April 27, 1989