Light Hydrogen LENR in Copper Alloys

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Low Energy Nuclear Reactions (LENR) produced in dilute copper alloys containing light hydrogen will be described here. This system was selected because of the low cost of its constituents, ease of processing, and similarity to other, much more expensive, materials that have been extensively reported in the literature to produce nuclear heat. The focus here is on heat, with an excursion into thermal radiation, rather than on reaction products that are difficult and expensive to investigate.

A fundamental basis, and advantage, of LENR over other nuclear energy developments is the production of substantial power WITHOUT dangerous by-products. So this research has been guided by the well-known nuclear reactions between the stable isotopes of hydrogen and the stable isotopes of boron and lithium that produce helium-four and roughly eight MeV of energy. Strong interatomic forces in metals, as affected by solutes and the cloud of free electrons must also be important in LENR. If young's modulus is used as a stand-in for those forces they are much smaller in copper than nickel or palladium, but still substantially in excess of one million atmospheres.

The effort has been divided into three phases, each involving significantly different processes, complexity and instrumentation:

(1) **Simple addition of hydrogen to a copper-based alloy.**
Hydrogen was loaded into copper-lithium-boron alloys at elevated temperature (400–900°C) and pressure (about 10 atmospheres). The encapsulated specimens were quenched, and immediately inserted into a calorimeter to detect nuclear heat. That method showed little success. It is apparently too simple.

(2) **Low Q capacitors.**
Cells containing hydrogenated copper–lithium–boron alloy electrodes separated by a liquid dielectric containing fine graphite particles have been tested. A vacuum-insulated seebeck calorimeter was used. When the layers of copper alloy are alternately charged, electric currents are constrained to flow through the graphite particles at specific sites, resulting in microscopic variations of charge in the metal and localized electron flows. Note that most LENR experiments involve such charge mobility [1]. An example of this anomalous heat effect from a low Q capacitor was exhibited at ICCF-18 (University of Missouri, U.S.A.) [2]. That specimen showed a small (about 25 milliwatt, 9% of input), statistically significant (on a three sigma basis) excess heat. Results from a control specimen, devoid of hydrogen, are indistinguishable from the calibration data of the calorimeter. Other examples using the Low-Q capacitor method will be presented. Infrared images of electrodes producing anomalous heat by this method are being taken.

(3) **Substantial reduction of input power to produce a self-sustaining demonstration.**

Phases (2) and (3) will be discussed. Other scientists (especially those with limited resources), are encouraged to participate in these important efforts.

[1] Edmund Storms , The Science of Low Energy Nuclear Reaction, A Comprehensive Compilation of Evidence and Explanations about Cold Fusion, 1st edition, World Scientific Publishing Co., Hackensack NJ, Whole book especially Table 2, pp 53-63, 2007.
[2] William H. McCarthy, "Water-free Replication of Pons–Fleischmann LENR," Condensed Matter Nucl. Sci. vol 15, pp. 256-267, 2015.