Excess Power Measurements For Palladium-Boron Cathodes

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One of the major goals of the U.S. Navy cold fusion program (1992-1995) was to produce our own palladium cathode materials at the Naval Research Laboratory (NRL). However, none of these Navy palladium metals and alloys were successful in producing the Fleischmann-Pons (F-P) excess power effect during the first two years. This all changed with the NRL preparation of palladium-boron (Pd-B) alloy cathodes in 1994. Seven out of eight experiments using these NRL Pd-B cathodes produced significant excess power in calorimetric studies at the Navy laboratory at China Lake, California (C/L). The one failure was related to a folded over metal region which acted as a long crack on the electrode surface. This success with Pd-B alloys made by NRL came too late to prevent the closure of the U.S. Navy cold fusion program in 1995, but these results are documented in a Navy report [1].

The author had the opportunity once again to work on cold fusion in 1997-1998 at the New Hydrogen Energy laboratory (NHE) in Sapporo, Japan. Three F-P Dewar calorimeters were available for this work, and a new Pd-B cathode from NRL was included in these experiments. Significant excess power for Pd-B was again observed [2]. The computer data from this experiment was also later carefully processed by Martin Fleischmann and published in a detailed NRL report [3]. The excess power was verified throughout most of this experiment and increased to nearly 10 watts during the boil-off of the cell contents. A significant new observation for this Pd-B cathode was the very early appearance of the excess power effect within the first two days of this experiment [3].

Last year (2017), this same Pd-B cathode was tested again using a different calorimeter at Ridgecrest, California (R/C). Excess power was observed, although the effect was considerably smaller than found at the NHE laboratory in 1998. Nevertheless, the excess power of 70 mW was clearly above the experimental calorimetric error of ±3 mW.

In summary, 9 out of 10 of my experiments using NRL Pd-B cathodes have produced excess power in six different calorimeters. Selected examples are shown in Table 1. The calorimetric results for all ten Pd-B experiments will be presented, and possible important properties of these Pd-B materials will be discussed. The effects of boron added to the palladium include a much greater hardness of the metal, a much slower rate of deuterium escaping from the cathode, the fact that boron acts as an oxygen getter, and that the Pd-B is a two-phase material. Two important unreported Pd-B experiments at NRL in 1995 will also be discussed.

Table1. Selected Examples of Pd-B Experiments.

Date	Location	Calorimeter	% B	Excess power (mW)
May, 1994	C/L	C/L-B	0.75	150
October, 1994	C/L	C/L-C	0.75	300
March, 1995	C/L	C/L-A	0.50	100
March, 1995	C/L	C/L-D	0.25	80
December, 1998	NHE	F-P	0.50	450
March, 2017	R/C	Copper-B	0.50	70

1. M.H. Miles, B.F. Bush, K.B. Johnson, “Anomalous Effects in Deuterated System”, NAWCPNS TP 8302, September, 1996.
2. M.H. Miles, “Calorimetric Studies of Palladium Alloy Cathodes Using Fleischmann-Pons Dewar Type Cells” in ICCF-8 Conference Proceedings, pp. 97-104, 2000.
3. M.H. Miles, M. Fleischmann, M.A. Imam, “Calorimetric Analysis of a Heavy Water Electrolysis Experiment Using a Pd-B Alloy Cathode”, NRL/MR/6320-01-8526, March 26, 2001.