

Introduction To “A Summary of NRL Research on Anomalous Effects in Deuterated Palladium Electrochemical Systems” (published in 1996)

Melvin H. Miles

February 2016

Two U.S. Navy laboratories reported important cold fusion results in 1991 at ICCF-2 in Como, Italy. Stan Szpak and Pam Boss reported studies involving co-deposition, and this author, along with Ben Bush, reported correlations at China Lake between the excess heat effect and helium-4 production. In January 1992, a Navy program began that was funded by the Office of Naval Research (ONR) and involved NCCOSC-NRaD in San Diego (now SPAWAR), NAWC in China Lake, and NRL in Washington, D.C. The Naval Research Laboratory (NRL) is recognized worldwide as a top research facility, and a major publication from NRL on positive cold fusion results would have been a game-changer for this field in 1992 and equivalent to the CalTech, Harwell and MIT negative cold fusion publications in 1989. Even today, a publication in a major scientific journal from NRL supporting cold fusion would likely have a dramatic effect on the acceptance of this new science.

Today, 27 years after the Fleischmann and Pons announcement on March 23, 1989, the cold fusion anomalous effects can still be very difficult to reproduce. This is especially true when one laboratory tries to pass on information to another laboratory attempting to reproduce their results. It is usually too tempting for the second laboratory to change instructions and try to make improvements. This is what happened when Fleischmann and Pons tried to assist the New Hydrogen Laboratory in Sapporo, Japan in 1992 and when I tried to assist NRL, also in 1992.

My calorimetry was changed at NRL such that my experimental error of ± 20 mW for excess power measurements became ± 200 mW at NRL as stated in this report. I usually preferred a three sigma effect (60 mW of excess power) before considering an excess heat effect significant. For the NRL version of my calorimetry, this would require 600 mW of excess power for a significant effect. My excess power measurements at China Lake were very seldom larger than about 500 mW and were mostly in the 100-200 mW range. Therefore, NRL would have likely missed most of my China Lake excess power effects because of their large calorimetric error. Because they never measured any excess power effects at NRL, no tritium or helium measurements were conducted.

The changes made to my calorimetry at NRL without consulting me included adding studies of deuterium loading that increased the size of the calorimetric cell. These loading studies also added four additional wire leads attached to the palladium and coming out of the cell top which acted as antennas in conducting heat out of the cell into the room. This may not be a problem for flow calorimeters as used by McKubre at SRI, but it was a major problem for my small isoperibolic calorimeter. Furthermore, the grooves added to the palladium cathode for attachment to these four leads would act as cracks which lessen the possibility for excess power.

Near the end of this Navy program, NRL purchased a commercial Hart Seebeck (heat conduction) calorimeter for more accurate studies. However, the proper use of this calorimeter was not understood. In January of 1995, Roger Hart was called in to examine about three months of the NRL data from this calorimeter. He privately reported to me that all this data was useless because

NRL had not determined the zero point for excess power measurements in these experiments. Roger Hart, a calorimetric expert, also visited my China Lake laboratory in 1995 and confirmed that my excess power measurements using isoperibolic calorimetry were accurate to within 20 mW. There was an interesting study at NRL using this Hart calorimeter for the exothermic loading of deuterium into a Pd-B cathode (see p.48 of this report), but the NRL calculation is incorrect. The corrected result is -33.8 kJ/mol D₂ for a D/Pd loading of 0.6 for this Pd-B cathode (-10.12 kJ/mol Pd)(1 mol Pd/0.6 mol D)(2 mol D/1 mol D₂). The reported value for pure palladium is -35.1 kJ/mol D₂. This result is important in showing that Pd-B behaves similarly to Pd with respect to deuterium loading.

A major goal of this U.S. Navy program was to make and characterize our own palladium cathode materials. It was recognized by 1992 that cold fusion was largely a materials problem. Some palladium materials produced the anomalous excess heat effect but most did not. A considerable portion of this NRL program centered on the analysis of palladium materials, including some cathodes from NAWC and SRI that previously produced excess heat. However, no “smoking gun” was found that explained any significant difference in metallurgy, bulk, or surface analysis for these palladium materials.

Most of these materials made at NRL did not exhibit any sign of excess power in my China Lake calorimeter. This changed suddenly in 1994 when Pd-B cathodes were sent to me. Nearly every Pd-B cathode produced excess power in my calorimeter. I even ran a NRL Pd-B cathode in a Fleischmann-Pons Dewar calorimeter at NHE in Japan in 1997. Excess power was again measured using different equipment at another laboratory in a far-away country. Vigorous boiling was observed at the end of this experiment that showed that the Pd-B cathode was the hot spot in this cell. Nearly 10 W of excess power was measured during this cell boiling process. This was reported in another NRL report (NRL/MR/6320-01-8526, March 26, 2001).