1.2.2* Control Experiments with Light Water

In the sentences of critiques to the cold fusion phenomenon, there appears the words "control experiment" as we see in the following sentences by J.R. Huizenga,

"One of the crucial experiments he (H.P. Furth) suggested was to compare light water (H_2O) and heavy water (D_2O) under the same electrolytic conditions. Pons replied that he was preparing to do this. On the other hand, based on the discussion following Pons' lecture at Dallas it appeared that Pons and Fleischmann had already performed this control experiment." [Huizenga 1992 (p. 31)]

"There are many similarities with cold fusion; lack of control experiments, statistical uncertainties, irreproducibility and the public description as a 'simple experiment'." [Huizenga 1992 (p. 206)]

The experiment with light water (H_2O) or with protium system is considered a control experiment designed to check the experiment with heavy water (D_2O) by many people including the critiques. However, the situation is not so simple in this case. As we have seen in our book [Kozima 1998 (Chapter 7)] where are compiled our papers on the CFP, there occurs the CFP in protium systems including mainly NiH_x but some PdH_x.

Therefore, it is not a perfect control experiment to use a protium system for the experiment with deuterium instead of protium (light hydrogen). It is possible to infer that some negative experiment may be not a negative one because the standard (control experiment) is not reliable.

It is interesting to recollect two articles on the control experiments performed by Pons et al. cited in two books. [Kozima 2016a, 2016b (Appendix)], An episode about the control experiment by F. Pons is taken up by two opponents, Huizenga and Taubes, in their books as if the heat measurement by Fleischmann et al. is incredible. We can read their paragraphs telling the episode below. The episodes in Paragraphs from Huizenga* and from Taubes** are underlined at citation.

*

[Huizenga 1992, pp. 31 – 32] (The underlines in the following sentences are added at citation.)

"*Furth, in an excellent review paper on nuclear fusion, discussed progress toward achievement of practical fusion power. He was the token nuclear physicist speaking at the Dallas ACS session. In his talk, Furth discussed also the extremely small probabilities of fusing hydrogen isotopes at room temperature and the large effective electron mass that would be required to account for the University of Utah claims.*

Furth concluded that many additional experiments needed to be performed before nuclear physicists would believe the University of Utah's reported data. One of the crucial experiments he suggested was to compare light water (H_2O) and heavy water (D_2O) water under the same electrolytic conditions. Pons replied that he was preparing to do this. On the other hand, based on the discussion following Pons' lecture at Dallas it appeared that Pons and Fleischmann had already performed this control experiment. When Pons was asked why he had not reported results of control experiments with light water substituted for heavy water, he replied "A baseline reaction run with light water is not necessarily a good baseline reaction." When asked to elaborate, Pons intimated he had performed the experiment with light water and had seen fusion, saying "We do not get the expected baseline experiment. . . We do not get the total blank experiment we expected" (Science 244, p. 285)."

**

[Taubes 1992, pp. 260 – 261] (The underlines in the following sentences are added at citation.)

"*The collaboration, however, was undone by Pons's feelings of persecution and then by the local lawyers. First, Linford had a run-in with Pons, sparked by a slight Pons felt he had suffered at the congressional hearings. Harold Furth of Princeton had called Linford before the hearings to learn exactly what Pons had said about his light water controls in his Los Alamos seminar. Linford, who had a videotape of the seminar, found the point at which Pons answered the question about light water – that he had seen heat and then discontinued the experiment – and played it for Furth over the telephone. In Washington, Furth had apparently confronted Pons with what he had said in Los Alamos, suggesting it was proof cold fusion did not exist. Pons had not taken it well. Now Linford stopped by the Utah lab as Pons and Fleischmann were showing the Texas A&M people around; then he slipped away for a few minutes with Pons*."

The citation of this episode by Huizenga and Taubes shows their clear intention to show how incredible is the excess heat measurements by CF researchers and to denunciate the discovery of the CFP. However, regrettably to them, the history of the CF research in these 25 years have shown reality of the CFP and occurrence of unexpected events in hydrated and deuterated solids revealing a realm of new physics unknown before.

It is possible to explore a new field in deuterium system and another in protium

system separately as several people have tried for many years. On the other hand, it is possible to look for a new clue to explain the CFP in protium and in deuterium systems simultaneously. Our trial has belonged in the latter and given fairly good qualitative and sometimes semi-quantitative explanations for the experimental data sets. The analysis of the data by Bush and Eagleton given above [Kozima 1996, 2015] is an example and many examples are given in my books [Kozima 1998, 2006] and papers, especially papers given recently [Kozima 2014a, 2014b, 2014c]. We hope these trials using the TNCF model are useful to promote investigations in this field.

[Kozima 2016a] H. Kozima, "The First Observation of Nuclear Transmutation in a Protium System by R.T. Bush and R.D. Eagleton (1993, 1994)," *From the History of Cold Fusion Research,* **3**, pp. 1 – 6 (January 2015) published electronically in CFRL website;
http://www.geocities.jp/hjrfq930/Papers/paperf/paperf.html
[Kozima 2016b] H. Kozima, "From the History of CF Research – A Review of the Typical Papers on the Cold Fusion Phenomenon –" *Proc. JCF16,* **16-13** (2016), ISSN 2187-2260 at the JCF website; http://jcfrs.org/file/jcf16-proceedings.pdf