

## **Detection of $^4_2\text{He}$ by Morrey et al. (1990)\***

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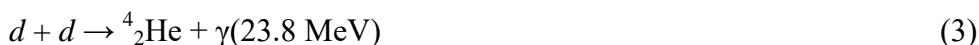
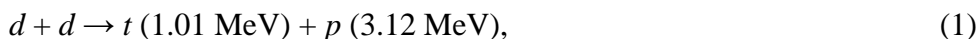
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In the history of CFP (Cold Fusion Phenomenon) research, the cases where scientists working in the established research fields participated in this field are very rare except in the early days of the discovery of the CFP. The investigations of the works in this field by scientists group assigned by DOE in 1989 and 2004 as referred in the previous News No. 87 belong to these cases even if they did not do experiments or calculations themselves.

One of the crucial evidences of nuclear reactions in the CFP is detection of  $^4_2\text{He}$  accompanied to excess energy. The trial to check the nature of the apparent nuclear reactions in the CFP had been performed as early as 1989 just after the pioneering paper by Fleischmann et al. The Pacific Northwest Laboratory (PNL) presided the six laboratories chosen by the University of Utah (U-o-U) to check existence of  $^3_2\text{He}$  and  $^4_2\text{He}$  in Pd samples provided by the U-o-U. Their experimental result was published in the *Fusion Technology* (ISSN:0748-1896) published by the American Nuclear Society [Morrey 1990]. For the benefit of readers, this paper is posted at the CFRL website after the CFRL News No. 87:

<http://www.geocities.jp/hjrfq930/News/news.html>

They measured no  $^3_2\text{He}$  and a scanty  $^4_2\text{He}$  in the surface region of a width about 25  $\mu\text{m}$  with an amount incommensurate to the reported excess energy from the sample according to the presupposed  $d - d$  nuclear fusion reactions [Fleischmann 1989]:



Their conclusion is summarized as follows:

*“It cannot be proven that the minimal excess heating in one of the rods reported by Fleischmann and Pons can be attributed to the formation of  $^4\text{He}$ , although the*

*possibility that some  $^4\text{He}$  could have formed during electrolysis cannot be ruled out. If  $^4\text{He}$  were generated, the mechanism must be surface related, not bulk related. No attempt was made to measure any helium or tritium that might have left the cathode surface as gas during electrolysis. The results presented cannot, unfortunately, confirm the existence or nonexistence of cold fusion via helium production. However, they provide a basis for follow-on experiments that should lead to a final conclusion.”*  
[Morrey 1990]

This conclusion might be accepted, in general, to show the negative evidence against the CFP on the assumption that the mechanism of nuclear reactions in the CFP is the  $d - d$  fusion reaction. However, it is absurd to deny experimental results in contradiction to the presupposed conclusion and to try repeatedly to find a result in accord to it. In science, we have to rely on the confirmed facts irrespective of the supposed anticipation.

When we accept the experimental results frankly and investigate them without prepossession of the reactions (1) – (3), we can construct a model consistent with many experimental data including the one by Morrey et al. [Kozima 1998, 1999, 2006, 2014]. We have to notice here the difficulty in determination of He amount in samples. W.B. Clarke was a specialist in measurement of a trace of helium for instance the blood helium concentration. He was asked to measure the helium content in a sample supplied by M.C.R. McKubre et al. of SRI (Stanford Research Institute). The result was not consistent with the excess energy result obtained in the sample according to the reactions (1) – (3). However, our analysis had given a consistent explanation of the data by Clarke et al. as presented at ICCF9 [Kozima 2002].

The short survey of the history of  $^4_2\text{He}$  detection given above clearly shows us a simple fact that researches in science ask us to rely on experimental data leaving our presumptions. This proper common sense seems in weak current in the CF research field, unfortunately. We have to be scientific above all else.

Another remarkable result obtained by Morrey et al. is the surface nature of the cold fusion phenomenon (*“If  $^4\text{He}$  were generated, the mechanism must be surface related, not bulk related.”*) . This characteristic of the nuclear reactions in the CFP has been confirmed by many experiments and explained by our model (or used to construct our model) [Kozima 1999].

## **References:**

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