"Cold" Fusion in a Complex Cathode

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ABSTRACT

A new cathode was developed, consisting of a nickel rod with a palladium layer applied by plasma spraying, the palladium layer activates the surface functions of the deuterated cathode. High reproducibility of a "cold" fusion reaction is confirmed by using this cathode.

INTRODUCTION

The authors have had a concept that the existence of microdefects is a necessary condition for cold fusion. A "complex cathode" with a sprayed layer of palladium including suitable microdefects has been developed and employed in a cold fusion experiment.[1]

Since the surface of the complex cathode has numerous microdefects such as cracks, porosity,boundary layer defects, lattice defects, dislocations, uneven surfaces, localized strain, etc compared with the surface of a cathode without a sprayed palladium layer, the actual surface area of the complex cathode was incommensurably larger than that of an ordinary palladium cathode. .

EXPERIMENT

The experimental arrangement consists of an electrosis cell, located in a cooling water basin.[2] Anode is a platinum tube, the cathode (see Fig. 1) consists of a 20-mm-diam x 50-mm-high nickel rod coated with a 300 μm surface layer of palladium, which was applied by plasma spraying in a low vacuum. [The abbreviations Pd(Ni) used herein to represent this complex cathode.] Neutrons were measured by using BF_3 and ^3He detectors.

The N-patterns actually measured with the BF_3 detector and mulitichannel analyzer are the puls height spectra of reactions A and B, as shown in Fig. 2. Through the wall effect in the detector with respect to reaction A, energy zone C is also formed.

Morefover, Fig. 2 shows N-patterns of the ^{252}Cf calibration neutron source and the Pd(Ni) cathode itself. The occurrence or nonoccurrence of the cold fusion reaction can be determined by using the ^{252}Cf N-patterns as the basis for comparison of the N-patterns of the cathode and of the background. To derive quantitative values for these N-patterns, the zone$ labeled (a), (b), (c), (d), and (e) in Fig. 2, each spanning 34 channels, were selected as regions of interest.

If the detector is not influenced by any disturbance (noise or background radiation), then (c)=(d)=(e)=0. When there is a disturbance, however, then usually (c)≈(d≈(e)≠0, and these values will increase in close proportion to the time elapsed. Hence, to use N-pattern data to derive a quantitative value for the intensity of a neutron flux radiated from any neutron source, it is necessary to consider the background Y_b arising from various sorts of disturbances, defined as

$$Y_b = \frac{(c) + (d) + (e)}{3}$$

We have located reaction A, which is regarded as the key phenomenon for demonstrating generation of neutron flux, in region of interest (a). That region's pulse count relates to the neutron flux valuation Y_N, Y_N=(a) - Y_b.
When Y_N= 0, there is no neutron flux, and when Y_N has significant value, generation of a neutron flux is confirmed. When the experiment contineued the long period,Y_b is a key factor in demonstrating the existence of neutron flux generation as shown in Fing. 3..

Three Pd (Ni) cathodes were deuterated in an electrolyte of heavy water with 0.07M LiOH, and one Pd(Ni) cathode was hydrogenerated in light water with the same electrolyte content. Generation of neutrons from the deuterated cathodes was continuously detected, indicating the occurrence of cold fusion. The neutron measurement for the hydrogenerated cathode was virtually identical to the background level, indicating there was no neutron generation from the hydrogenerated cathode.

Figure 4 presents a comparison of the "N-patterns" (pulse-high spectra) observed after 120 h from the background, a deuterated cathode, and the hydrogenated cathode. To aid comparison, is also presents the N-pattern of a deuterated cathode after 192 h next to that of a calibrated neutron ^{252}Cf (2.6 10^3 n/s) after 30 min. of measurement. Figure 5, which is derived from observed N-patterns such as those in Fig.4, shows that similar results were repeatedly observed in several experiments on different dates. This is vital data, for it is the first reported confirmation of the reproducibility of cold fusion.

Neutrons were measured simultaneously by identically collaborated ^3He and BF_3 detectors, the measurements indicating that the deuterated cathodes are the neutron sources.[2]

REFERENCES

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6. Y. ARATA and Y. C. ZHANG, "Reproduced "Cold" Fusion Reaction using a

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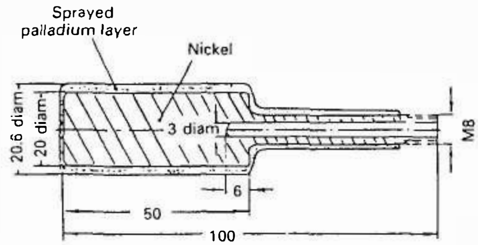

Fig. 1. Schematic of the complex cathode.

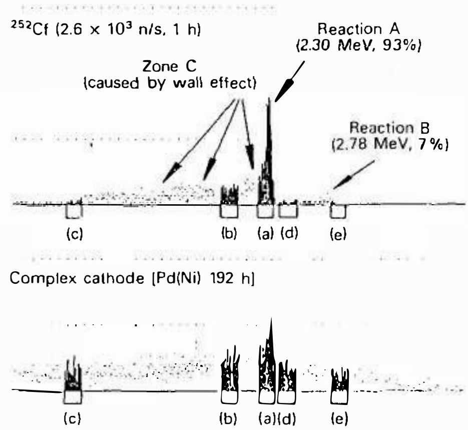

Fig. 2. Definition of Y_N and Y_b, in terms of 34-channel regions of interest of the N-pattern of the deuterated Pd(Ni) cathode, obtained by using a BF_3 detector and multichannel analyzer (MCA-7800, 1024 channels). The horizontal axis is channel number, the vertical axis is pulse height: Counts in channels (a) 500 through 533, (b) 430 through 463, (c) 137 through 170, (d) 543 through 576, and (e) 640 and 673.

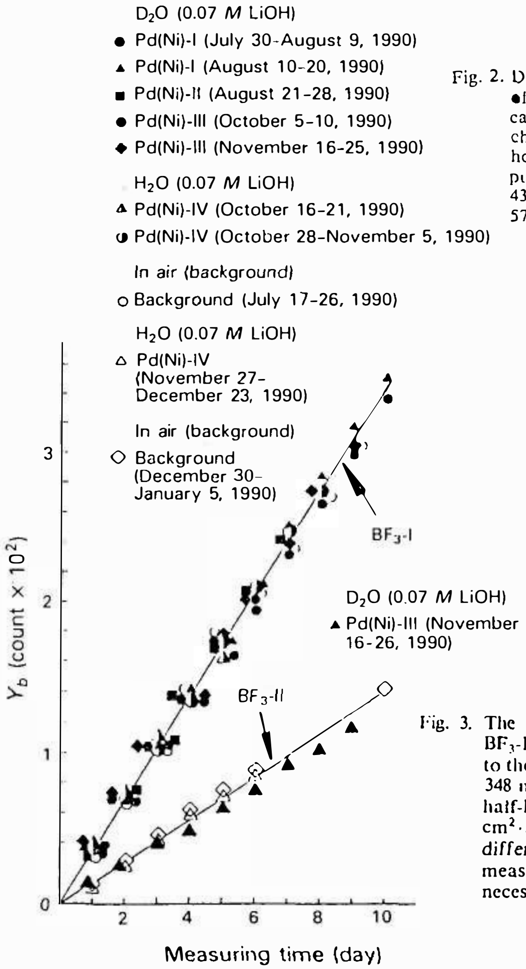

Fig. 3. The Y_b characteristics obtained by detectors BF_3-I and BF_3-II. The detectors are identical models manufactured to the same standards (Mitsubishi ND-8534-34-30; 25 × 348 mm; gas pressure 300 Torr; applied voltage 1.7 kV; half-handwidth 2.5 to 4%; neutron sensitivity 2.5 n/cm^2·s; amplification factor 15). They nevertheless have *different sensitivities, as indicated by the differing* Y_b measurements; hence, for comparative purposes, it is necessary to use data from only the same detector.

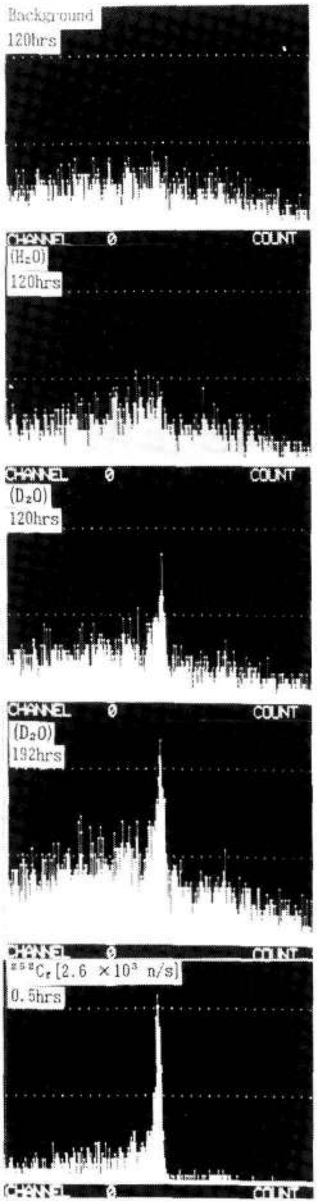

Fig. 4.

Comparison of N-patterns (pulse-height spectra) of the background, the hydrogenated complex cathode, two deuterated complex cathodes, and a calibrated ^{252}Cf neutron source, obtained by detector BF_3-I (full scale: 64 counts).

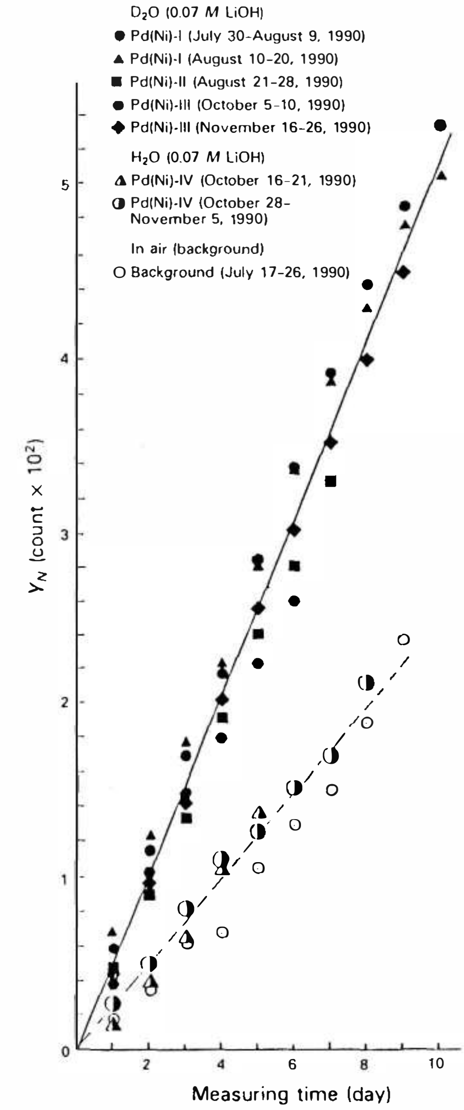

Fig. 5.

Comparison of Y_N characteristics of the background, the hydrogenated complex cathodes, and the deuterated complex cathodes, obtained by detector BF_3-I. Note that the characteristics of the background and the hydrogenated cathode are almost the same.