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Extraordinary Traces Produced during Pulsed Discharges in Water

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Abstract

This paper describes experiments of electrical discharges in water, in which AC shots of up to 100 V were applied to wire electrodes of palldium and platinum. Various kinds of anomalous traces were observed on the nuclear emulsions. Some of them were similar to that which were observed in previous experiments of electrolysis cold fusion. Extraordinary combined rings were newly observed, suggesting that tiny ball-lightning was hopping up and down between the nuclear emulsions. The mechanisms of forming the traces are also discussed by The Nattoh Model.

Keywords

AC shots discharge in water, wire electrodes, nuclear emulsion, extraordinary traces, tiny ball-lightening, The Nattoh Model.

1. Introduction

Since Pons and Fleishmann published the cold fusion phenomena (1), many experiments have been performed in the world in order to initially reproduce the similar results and recently progress in the excess heat production (2). The method of electrolysis has been mainly employed, but it is well known that this method has the low reproducibility due to cracks induced in the metal. The method of electrical discharges, on the other hand, also has been remarked due to it's simplicity and it's high degree of reproducibilty (3, 4). There are two methods of electrical discharges: in water and in hydrogen gas. The author reported that many of the extraordinary traces that were observed on a copper plate with pulsed discharges clearly indicated that cold fusion reactions could occur associated with the formation of hydrogen-cluster (3). Furthermore, Kucherov et el. attempted experiments of discharges in hydrogen gas phase, in which many elements were produced during the discharge (4).

The key reason why the electrical discharge is superior to induce cold fusion reactions is because the high density of electrical current, and simultaneously the high concentration of

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hydrogen on the surface of the electrodes that is generated by the electrical potential. Plasma generated by the discharge has such a dense region on the electrode surface that it cannot be treated as an ideal plasma at all. At this location, hydrogens form a cluster including surface materials, and many induced electrons take an important role to accelerate the formation of the hydrogen-cluster. Cold fusion reactions can be induced in the hydrogen-cluster under the strong interaction of many bodies including hydrogens and electrons. Therefore, the cold fusion reactions are very different from the conventional D - D fusion reactions.

The author has been using the method of nuclear emulsion for the experiments of electrolysis cold fusion (5 - 7) and has successfully obtained many extraordinary traces.The nuclear emulsion is highly sensitive for any emitted products and has provided us with rich information.

This paper describes an experiment of AC shots discharge with wire electrodes of palladium and platinum in water, in which the method of nuclear emulsion was employed. Traces similar to those obtained in the previous electrolysis experiments of cold fusion (5, 6) were observed on some of the nuclear emulsions. Furthermore extraordinary traces that were likely generated by the hopping behavior of tiny ball-lightening were newly observed. The mechanisms of forming the traces are also discussed by The Nattoh Model.

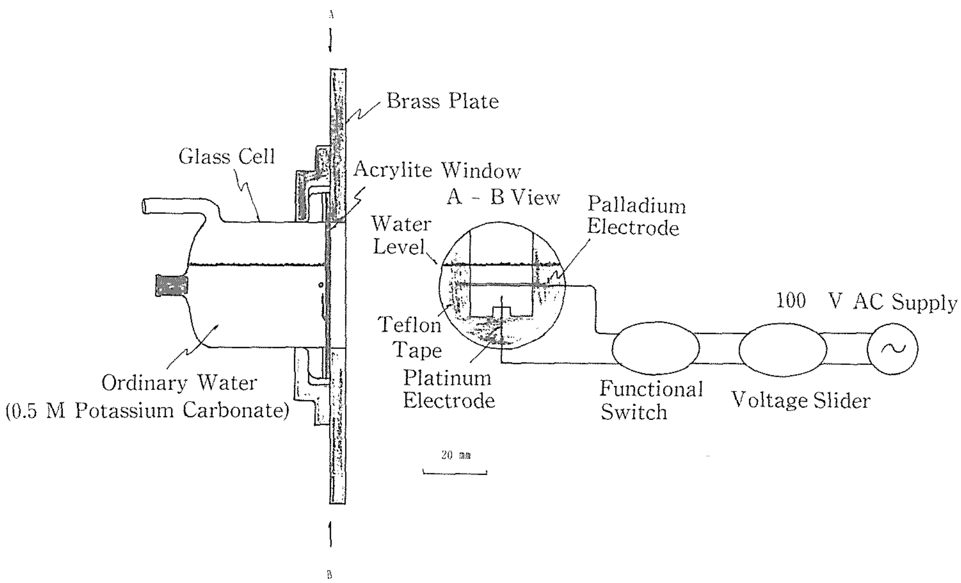


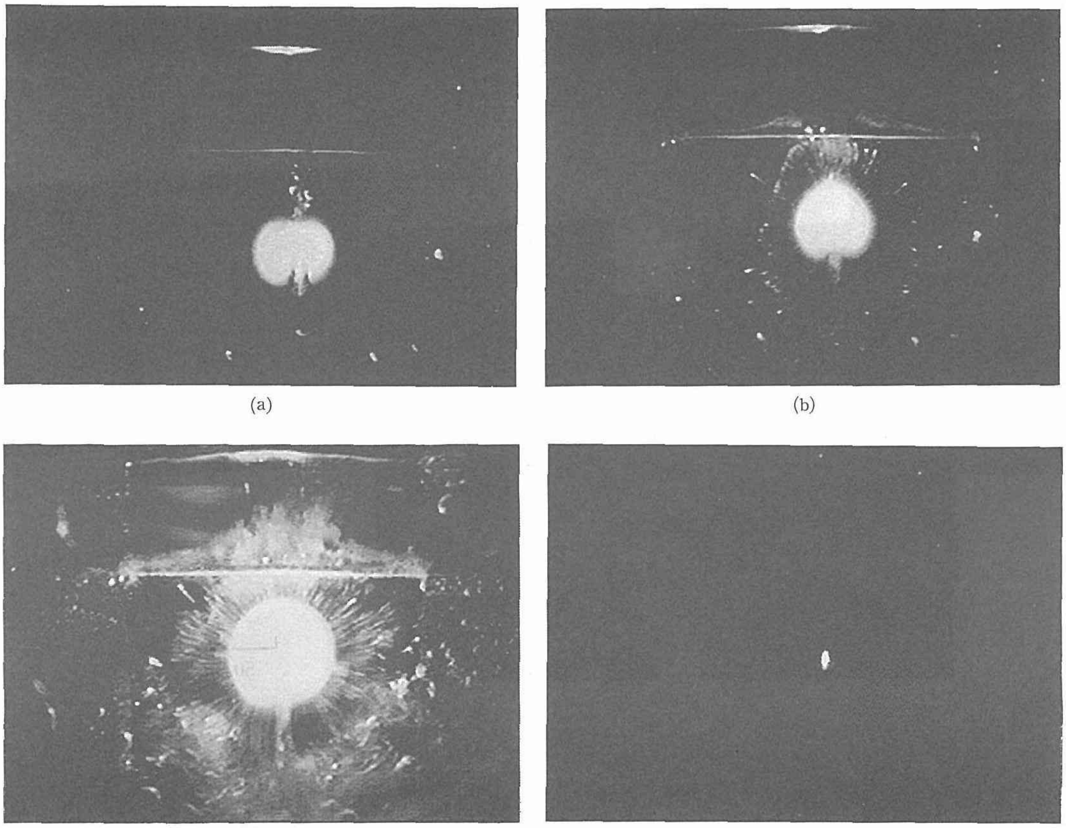
Fig. 1: Experimental arrangement

2. Experiment

A series of experiments of electrical discharges in water were carried out applying AC shots with wire electrodes of palladium and platinum.

Figure 1 shows the experimental arrangement. Wire electrodes of palladium (0.5 mm $\phi \times$ 25 mm long) and platinum (0.3 mm $\phi \times$ 2 mm long) were used for the electrodes, that were vertically located to each other. A gap between the top of the platinum electrode and the center of the palladium electrode was 2 or 3 mm. The electrodes were fixed with a teflon tape, close to the window of the glass cell. The window was made from a plate of acrylite (2 mm thick) and had the effective diameter of about 40 mmϕ. The electrolyte solution consisted of ordinary water mixed with 0.5 Mol/l potassium carbonate.

The electrical discharge was employed with AC shots of up to 100 V (50 Hz ; 20 - 80 msec ON and 1 - 15 sec OFF). The AC shots were generated with a functional electrical switch, and the voltage was varried with a voltage slider, respectively. The phase was fixed such that the voltage at the platinum electrode started to increase positively. Reactions were observed using a system of a microtelescope and a VTR, and nuclear emulsions. They were alternately located outside the window, where the cell was located such that the window was vertical. Pictures from the microtelescope (10 - 100 times amplification) were recorded on the VTR. Important pictures were then stepwise picked up with a color copier. The nuclear emulsions were similar to that used previously (5 - 7) (100 μm thick emulsions were coated on both sides of a thin acrylite plate of 1mm thick $\times$ 50 mm $\times$ 50 mm).
Reference nuclear emulsions were located at about a 5 m distance from the cell in the same room.



(a) (b) (c) (d)

10mm

Fig. 2 : Electrical discharge with 100 V
(time step ; 33 msec)

3. Results

Figure 2 shows a sequence of pictures for one shot with 100 V taken by the VTR system. The time step was 33 msec. Here explosive reactions can be seen on the pin electrode of platinum. In Fig. 2(a), an electrical discharge took place in the gap of the electrodes and silmultaneouly a spherical reactive region appeared on the electrode of platinum. In Figs. 2(b) and (c), high energy clusters seem to be emitted almost isotropically and a couple of wave fronts were clearly formed due to the AC cycle. After the shots, the electrode of platinum remained to be hot, as is shown in Fig. 2(d).

Several kinds of traces were recorded on the nuclear emulsions located outside the acrylite window. When the nuclear emulsions were placed, the AC shots of 100 V (40 msec 0N and 2 sec 0FF) were apllied for 19 min. Unlike the usual discharge, a large sound was associated at the last shot, where the platinum pin completely disappeared and the palladium wire sharply bent down at the shotting point. Simultaneously the solution became black by fine scattered materials.

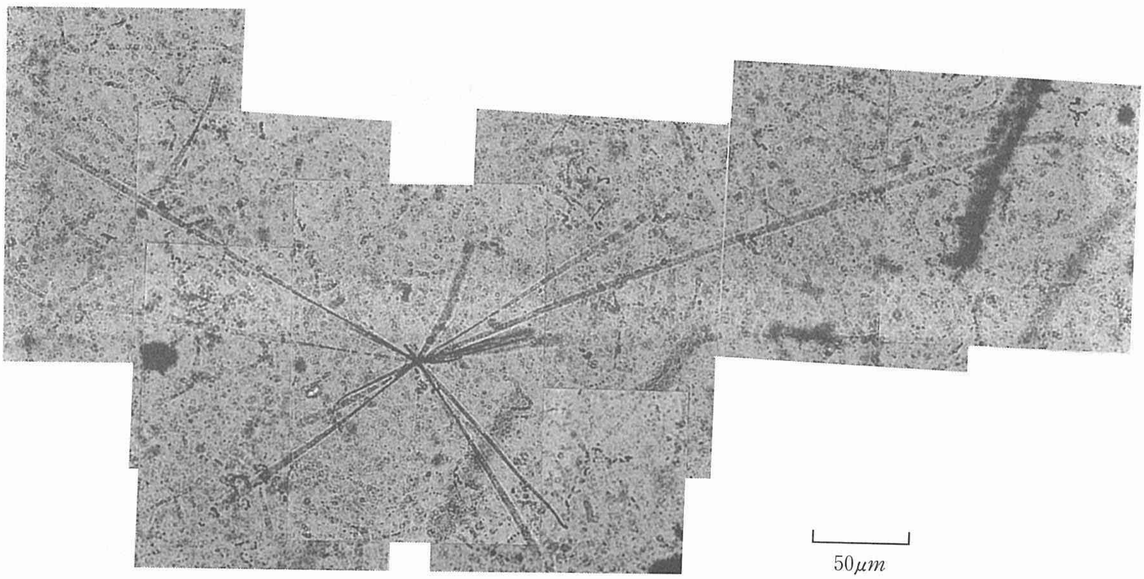
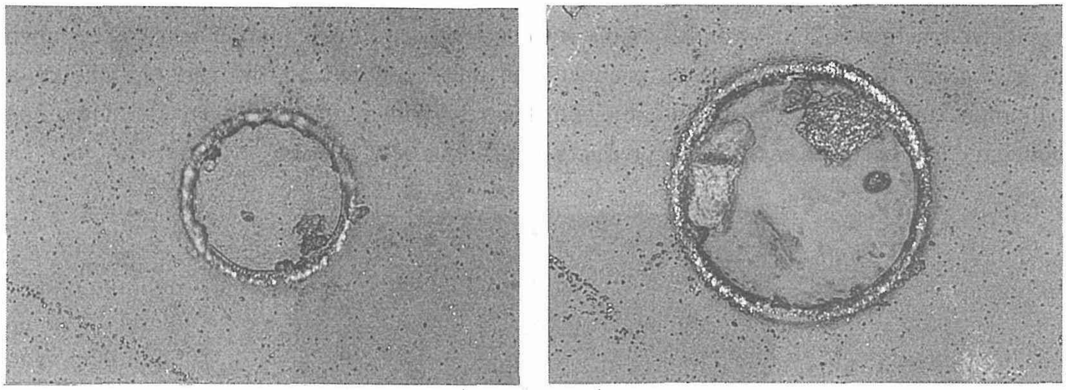


Fig. 3 : Cold fusion star



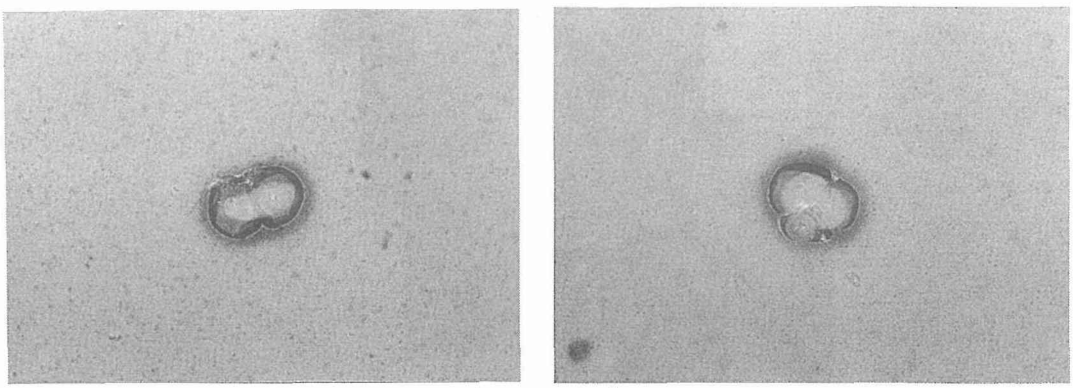
(a) (b)

50μm

Fig. 4 : Explosive traces

The first kind of the traces was a star, shown in Fig. 3. Similar traces of the star were already observed in previous experiments (6). This time, however, the number of the fragments was the greatest. The production of the star was predicted by The Nattoh Model ; the star can be generated by a multibody fission reaction of a highly excited compound nucleus that results by the capture of a multiple neutron emitted from the cell(6).

The second kind was a ring trace that results from an explosive reaction, shown in Fig. 4. Similar ring traces were also observed in previous electrolysis experiments of cold fusion (5). There.the ring trace was asigned to be an explosive decay of the multiple neutron such as di- and quad-neutrons. The trace was one of the most credible pieces of experimental evidence, indicating that cold fusion reactions had taken place. When the hydrogen-cluster is compressed to induce cold fusion reactions, surplus hydrogen atoms that are not directly involved in the fusion reaction should scatter. Those traces could be seen in the traces in this experiment, shown in Figs. 4(a) to (b).

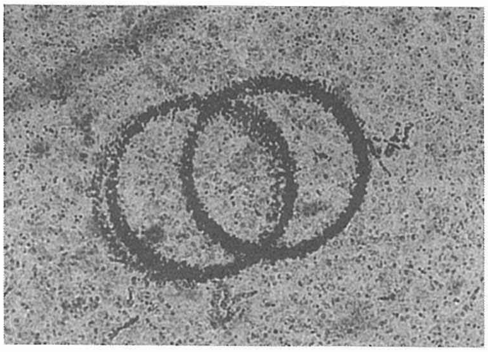


(a) (b)

50μm

Fig. 5 : Combined traces

The third was combined traces, shown in Fig. 5. The traces could indicate two or three simultaneous reactions, because they were fortunately recorded on mismade nuclear emulsions that were thinner than the usual ones. If the nuclear emulsions were thick, individual explosive traces would grow and combine with each other to form a larger trace as is shown in Fig. 4(b). A similar combined product was also observed on the rear surface of a palladium thin foil that was used in an electrolysis experiment of cold fusion (7). There the boundary line between each of the products could obviously be seen.

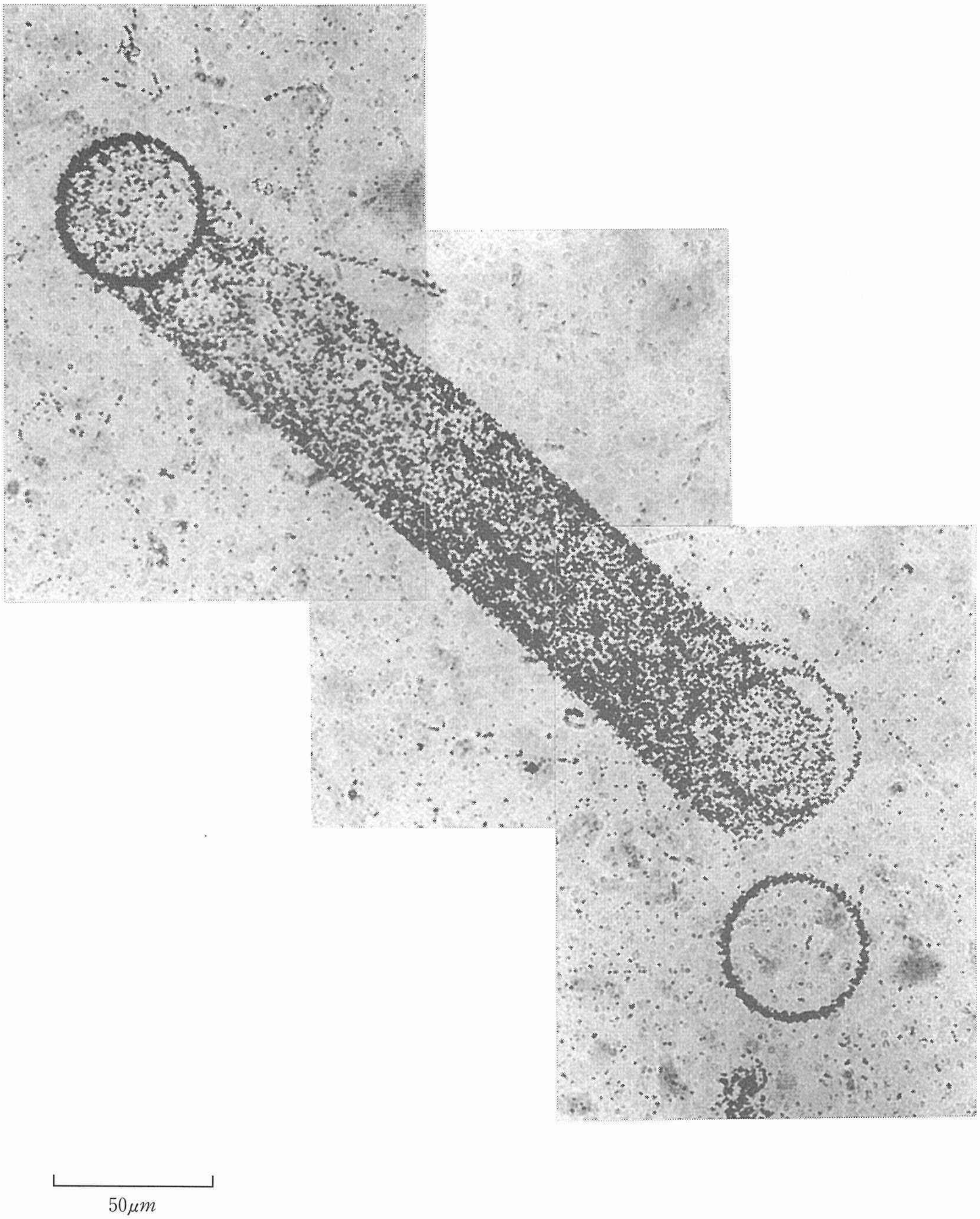


50μm

(a)

50μm

(b)



(c)

(d)

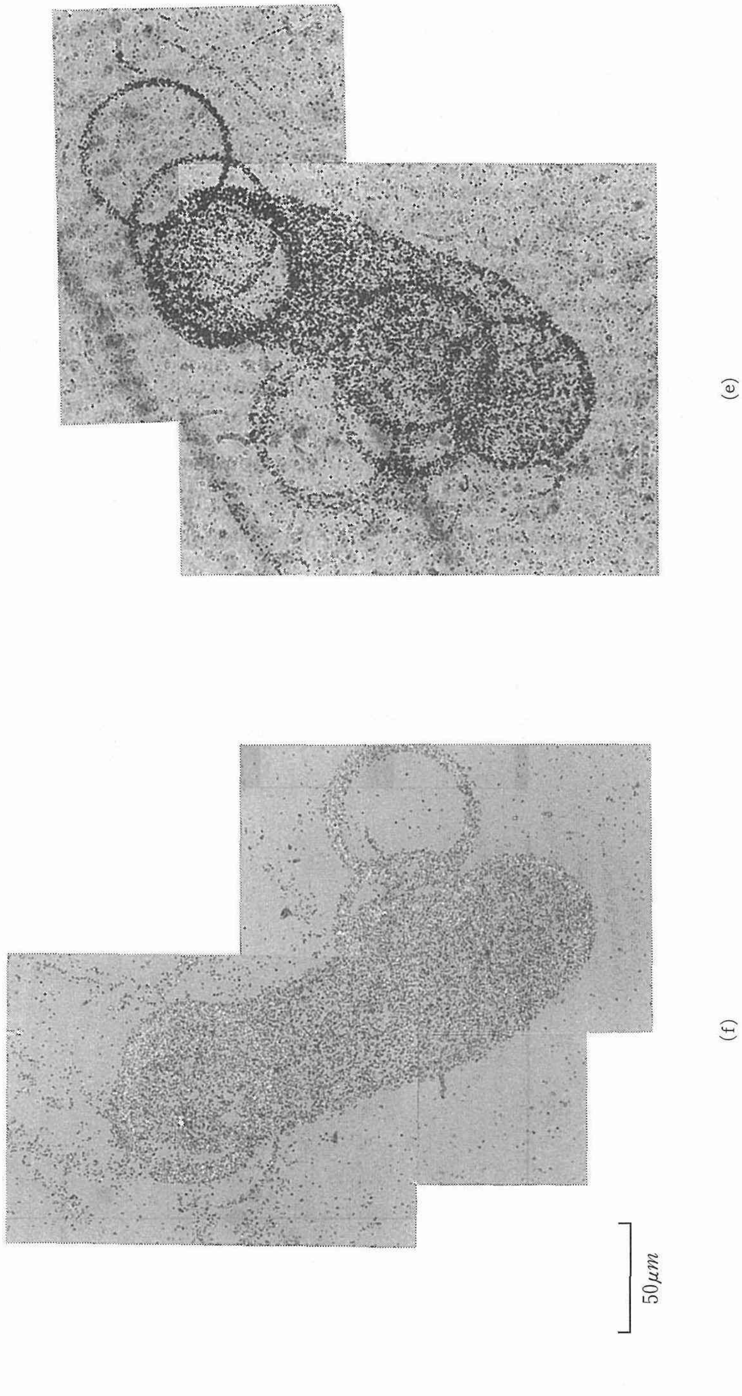


Fig. 6 : Combined ring traces

The fourth was strange combined rings that were first observed in this experiment, shown in Fig. 6. These rings could be clearly distinguished from the second explosive traces, because the combined rings were recorded only on the surface while the second traces were distributed three dimensionally. Some rings seemed to have been moved on the surface of the nuclear emulsion and then remained as continuous traces, shown in Figs. 6(c) to (f). The diameter of the combined rings were different in each event but almost the same within the same event. The combined rings, shown in Figs. 6(a) to (d), were registered by independent events, but Figs. 6(e) and (f) were made by the same event. Two events, shown in Figs. 6(e) and (f), were recorded on the backside of the first nuclear emulsion and on the front side of the second one, respectively. They were almost symmetrical. During the development process, the nuclear emulsions were placed in a development solution with a gap of more than 3 mm, so no combined rings could be simultaneously generated on the different nuclear emulsions by any reasons such as the chemical reactions of tiny bubbles. It is reasonable to infer that the traces were generated by the same particle emitted from the cell during the discharge. Figure 7 shows the spatial distribution of the events of the combined rings. The events were densely concentrated between the first and the second nuclear emulsions. It shows that the particles did not have enough kinetic energy so that they could be sufficiently slowed down during the passing through of a 3 mm thick layer of acrylite (2 mm thick window and 1 mm thick nuclear emulsion plate).

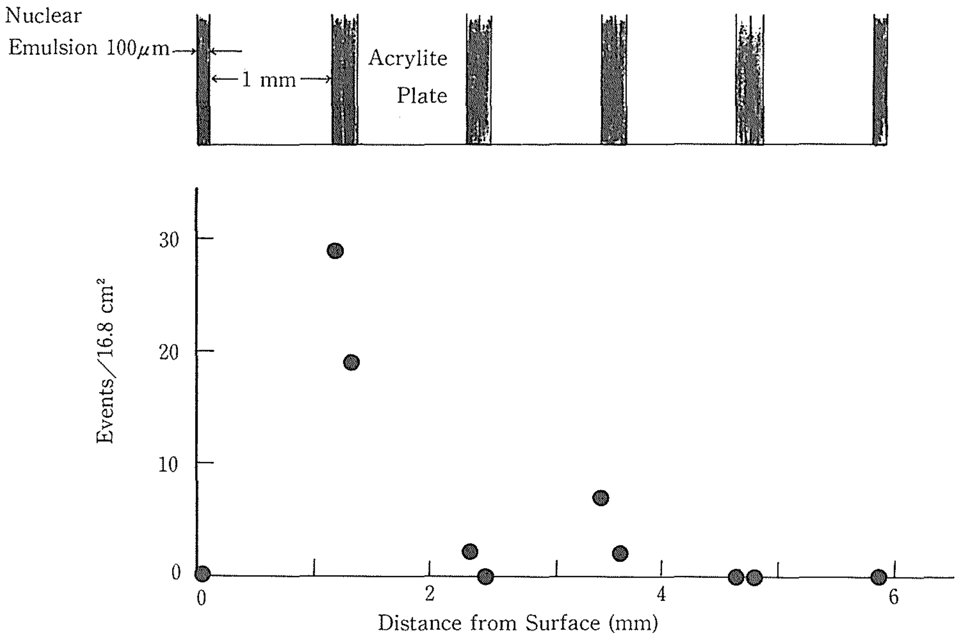
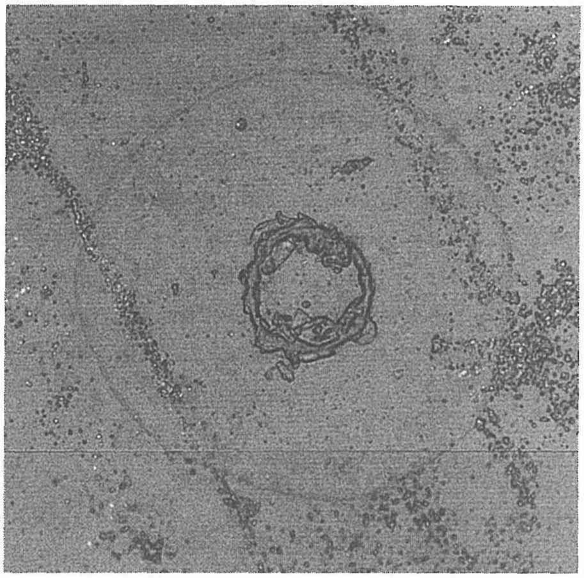


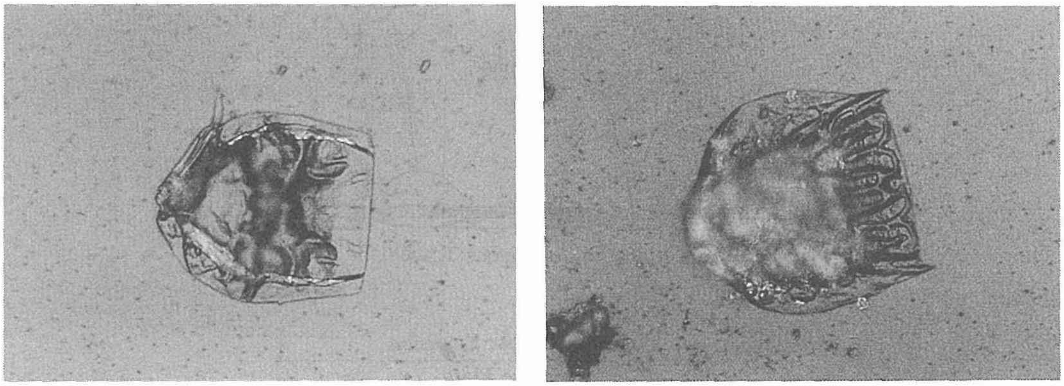
Fig. 7: Spatial distribution of combined ring traces

The fifth was a ring-like product that was observed on the surface of the nuclear emulsion, shown in Fig. 8. This kind of product that was first observed in this experiment could be clearly distinguished from both of the second and the fourth traces. The relationship between the fifth product and the fourth rings will be discussed later in this paper.



50μm

Fig. 8 : Ring-like product



(a) (b)

50μm

Fig. 9 : Prototype of microbacteria

The sixth was strange traces like microbacteria, shown in Fig. 9. Four traces were observed so far and they all were found on the surface of the nuclear emulsions. They all had common shapes with the similar dimensions of about 60 μm long and seemed to have organ like things in the body. Especially in Fig. 9(a), something like a mouth and feeler appeared. However, they were not complete microbacteria that exist in the natural environment. They might be the prototypes of microbacteria. Since they were not seen on the reference nuclear emulsions but were observed on both the nuclear emulsions that were seperately coated in our laboratory and at Fuji Film Inc., it is reasonable to infer that they were newly created by the electrical discharge. More data should be required for a detailed discussion about this topic.

4. Discussion

In the previous experiment (3), extraordianry traces were recorded on the copper plate, suggesting that a hydrogen-cluster was formed to induce cold fusion reactions. In this experiment, on the other hand, sensitive nuclear emulsions also recorded explosive traces similar to that which were previously measured in the electrolysis cold fusion experiment (5 - 7). It can be concluded from those experiments that as soon as an electrical discharge is employed beteween the electrodes in water, the cold fusion reactions can be induced on the surface of the metal. Among the traces recorded on the nuclear emulsions, the first to the third were already discussed in the previous paper (5 - 7), so the fourth and the fifth that were newly observed in this experiment will be discussed here.

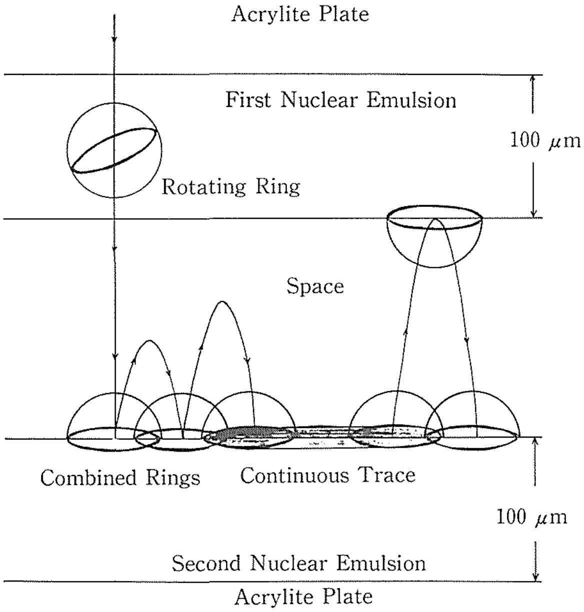


Fig. 10: Conceptual view of forming combined ring traces

Figure 10 shows a conceptual view of the recording of the third kind of traces, the combined rings. A rotating and vibrating ring, generated by the discharge, might enter the nuclear emulisons. While passing through the emulsion material and acrylite plates, it somewhat loses it's kinetic energy. Mainly bewtween the first and the second nuclear emulsions, the moving ring can be trapped and leave a ring trace on the surface of which it touches. The ring could have an electrical charge so that it hops up and down in the space between the nuclear emulsions. While the ring touches the surface of the nuclear emulsions, a portion of the electrical charge could transfer to the nuclear emulsion. Then, a static electrical repulsive force could work between the ring and the nuclear emulsion to make the ring jump up. Many ring traces could be left until the moving ring escapes from it's space. When the ring moves on the surface as it touches, a continuous trace should remain, as is shown in Figs. 6(c) to (f).

Now, the problem is finding out what the moving ring is. In a recent experiment of similar but continuous discharge in water(8), a large number of similar rings, but with the smaller diameter, were successfully observed, when tiny sparks appeared on the surface of the electrode. The ring could leave the electrode and could be driven by the electrical potential. The ring walked around on the surface of the nuclear emulsion and finally decayed to a regular hexagonal plate. According to The Nattoh Model (9, 10), hydrogens form a hydrogen-cluster on the surface of the electrode or within the metal, when the pressure of the hydrogen is increased sufficiently enough by the electrical potential. There, the hydrogen-cluster might be a sphere or ring. The shape should be determined by the condition of the energy minimum. The fifth ring-like product, shown in Fig. 8, might be the remains of the ring cluster that faded during it's moving around period.

Recently, tiny ball-lightening-like phenomena were observed twice by the author, while similar experiments of electrical discharges in water were carried out (11). The first was on August 13, 1992 when an electrical discharge was attempted on wire electrodes of palladium and platinum that were vertically arranged to each other. The second was on August 25, 1992 when an electrical discharges was also attempted but on a pallarel arrangement of palladium wires. In the first case, tiny ball-lightening was emitted from a point about 1 cm distant from the discharging point, flew about 1 cm in the oposite direction and exploded when it stopped. The emission of the ball-lightening took place with a somewhat delayed time after the discharge, and this was very often repeated. In the second case, two bolts of tiny ball-lightening were emitted upwards from the wire showing S-curves, and it also exploded at the end.

In the natural environment, on the other hand, ball-lightening was observed by many people and many reports were documented (12, 13). It seems to be often generated by a thunderstorm, that has a large scale electrical discharge. The ball-lightening can move around, up and down, enter a house through a window and very often explode at its stopping point. The ball-lightening has a large diameter but those extraordinary behaviors are very similar to that of the ring cluster mensioned earlier. Lewis early pointed out that the cold fusion phenomena are closely related to the ball-lightening phenomena (14). If the ball-lightening with a large enough diameter is generated by an electrical discharge in the laboratory, it's structure and property could be revieled in more detail.

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