

Anomalous “deuterium-reaction energies” within solid

By Yoshiaki ARATA, M. J. A., and Yue-Chang ZHANG

Osaka University, 11-1 Mihogaoka, Ibaraki, Osaka 567-0047

(Communicated Sept. 14, 1998)

Abstract: Anomalous difference appears between the reaction energies generated within highly deuterated Pd-black and highly hydrogenated one under the chemical reaction energies are subtracted in both samples. Enormous excess energy generates within highly deuterated Pd-black through a long period such as over several thousands hours, on the contrary highly hydrogenated Pd-black do never produce any excess energy. Furthermore, Pd-black included mixed gases of deuterium and hydrogen also generates an excess energy, but with the considerably different characteristics from deuterated Pd-black. These experimental results clearly show that deuterium nuclear reaction is generated essentially within solid as the “solid-state plasma fusion”.

Key words: DS-cathode; Pd-black; spillover-effect; atom-cluster; nano-particle; enormous excess energy; solid-state plasma fusion.

Introduction. Enormous reports have been published on the reaction energy of deuterons within solids by a great many researchers so far,^{1),2)} but it seems to be fixed as a common knowledge that their results can never be recognized because of too poor reliability concerned with a very little reproducibility and an extreme small amount of the “reaction-effect”.

All of those researchers have utilized “bulk-cathode” made by bulk-solid ever since their starting research. The authors consider that bulk-cathode causes the above bad result because of its absorption characteristic of deuteriums, that is, it is extremely difficult to get highly deuterated bulk-cathode with uniform density through the bulk-solid because of utilizing essentially the “diffusion-effect” only.

Consequently, authors³⁾ developed the “DS-cathode” (Double Structure Cathode) whose principle is shown in Fig. 1. That is constructed with the both “inner-cathode” (Pd-black) and “outer-cathode” (Pd-vessel). Pd-black used is extremely fine powder of the nano-scale, which is called “nano-particle” and/or “atom-cluster,”⁴⁾ and is kept in a vacuum space inside the Pd-vessel.

Comparing with the “bulk-cathode”, the DS-cathode provides the following essentially excellent functions as demonstrated in Fig. 1;

- 1) Deuteriums are instantly absorbed over 100% in content into all particles of the Pd-black because of both “spillover-effect” and “atom-cluster effect”.

- 2) Deuterium purity is extremely pure within the DS-cathode by the “filter-effect” of Pd-vessel.
- 3) Deuterium pressure within DS-cathode becomes extremely high such as over several thousands atmosphere, until Pd-vessel breaks by the “Sievertz-law” effect.

As a result, the “said-functions” of the DS-cathode provide the capability to generate tremendous excess energy within highly deuterated solid, while the “bulk-cathode” is impossible at all to realize the “said-functions”.

Experiment. In order to make clear essentially the difference of the reaction energy generated in the both highly deuterated and highly hydrogenated solids, the authors developed “Double-cell” system consisted of both D₂O-cell and H₂O-cell, each of which is constructed with same DS-cathode, were connected in series as shown in Fig. 2.

In this case, electrolytic current passing through both cells are the same current and same density. Furthermore, when pure D₂O-cell and H₂O-cell are used, pure deuterium and pure hydrogen can be filled up essentially by the “said-function” to an extremely high pressure over several thousand atmosphere during electrolysis for long hours within the DS-cathode in each cell, respectively. Fig. 3 shows typical example of these experimental results with the electrolytic current 5.5 [Amp] and 200[mA/cm²] in the current density, and the similar results were reproduced with 100% reproducibility. Fig. 3 shows “ τ -Q₀” character-

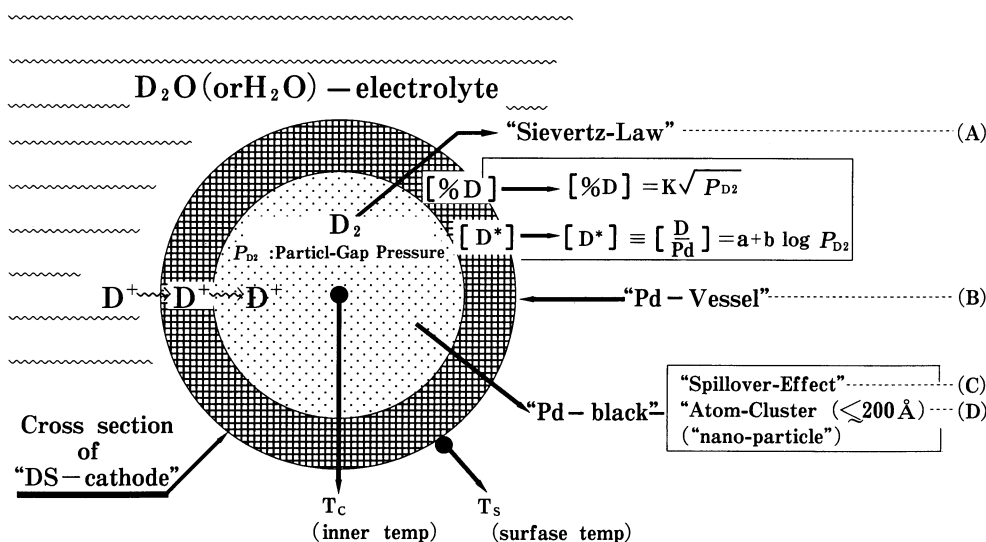


Fig. 1. Concept of DS-cathode (Double Structure Cathode). Note: Symbols (A), (B), (C) and (D) have special function as follows; (A) Extreme high pressure of D_2 gas takes place easily inside DS-cathode because of "Sievertz-law". (B) Deuterium purity is extremely high inside DS-cathode because Pd-vessel works as a filter. (C) Deuterium distribution on the surface of all particles of Pd-black instantaneously extends with uniformity and high density because of function of "spillover-effect". (D) Pd-black in nano-scale instantaneously absorbs much deuteriums with over 100% in content because of essential function of "atom-cluster".

istic curve in each cell (τ : measuring time, [hr]; Q_{\odot} : excess energy, [watt]; $Q_{\odot} \equiv Q_{out} - Q_{in}$; here Q_{out} =output power, Q_{in} =input power) and also " $Q_{in} - Q_{\odot}$ " and " $T_s - Q_{\odot}$ " relations is shown in this figure, respectively (T_s ; electrolyte temperature near the surface of the cathode). These experimental results provide the following facts:

- 1) Tremendous reaction energy generates within the DS-cathode in D_2O -cell, but any energy does not produce in H_2O -cell when the chemical reaction energy is subtracted in each cell.
- 2) "Deuterium-reaction" is created in large quantities within highly deuterated solid, but "Hydrogen-reaction" never created within highly hydrogenated solid.

In the present experiment, another experiment using "Mixed-cell" blended with D_2O and H_2O electrolytes ($D_2O/H_2O=2$ in weight), which is also constructed with the same DS-cathode, was carried out. Fig. 4 shows one example obtained by using this "Mixed-cell" during a long period of 8,800 hrs (\approx one year).

The result shows that the reaction energy also creates in the "Mixed-cell", but that its characteristic is different in the following points from those in the D_2O -cell:

- 1) To generate the same level of excess energy, input power in the "Mixed-cell" is required considerably larger than that of the D_2O -cell.
- 2) When electrolytic current is stopped during electrolysis, the "Mixed-cell" suddenly degenerates the

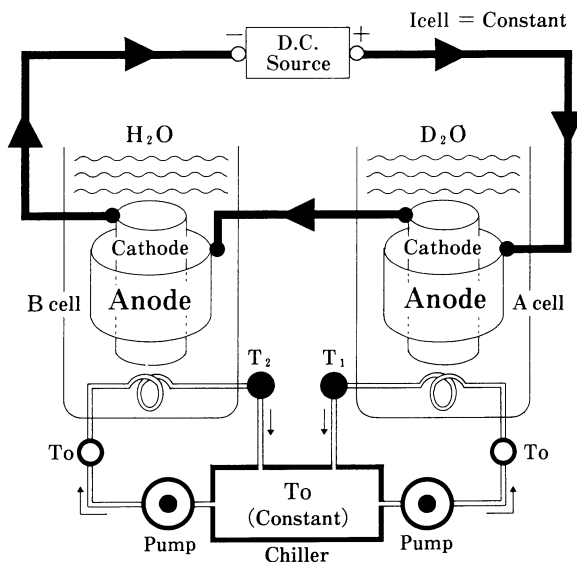


Fig. 2. "Double-cell connected with two unit same cell in series: A-cell (D_2O) and B-cell (H_2O). Note: Although A and B cells are same construction, electrolyte only is different.

excess energy and quickly comes back mostly to the starting condition, while the D_2O -cell does not so much change about that, in other words, the "regeneration-function" of the excess energy from its degenerated condition related to cut in input power such as "on-off" for the input power, in the "Mixed-cell" is considerably weak than the D_2O -cell.

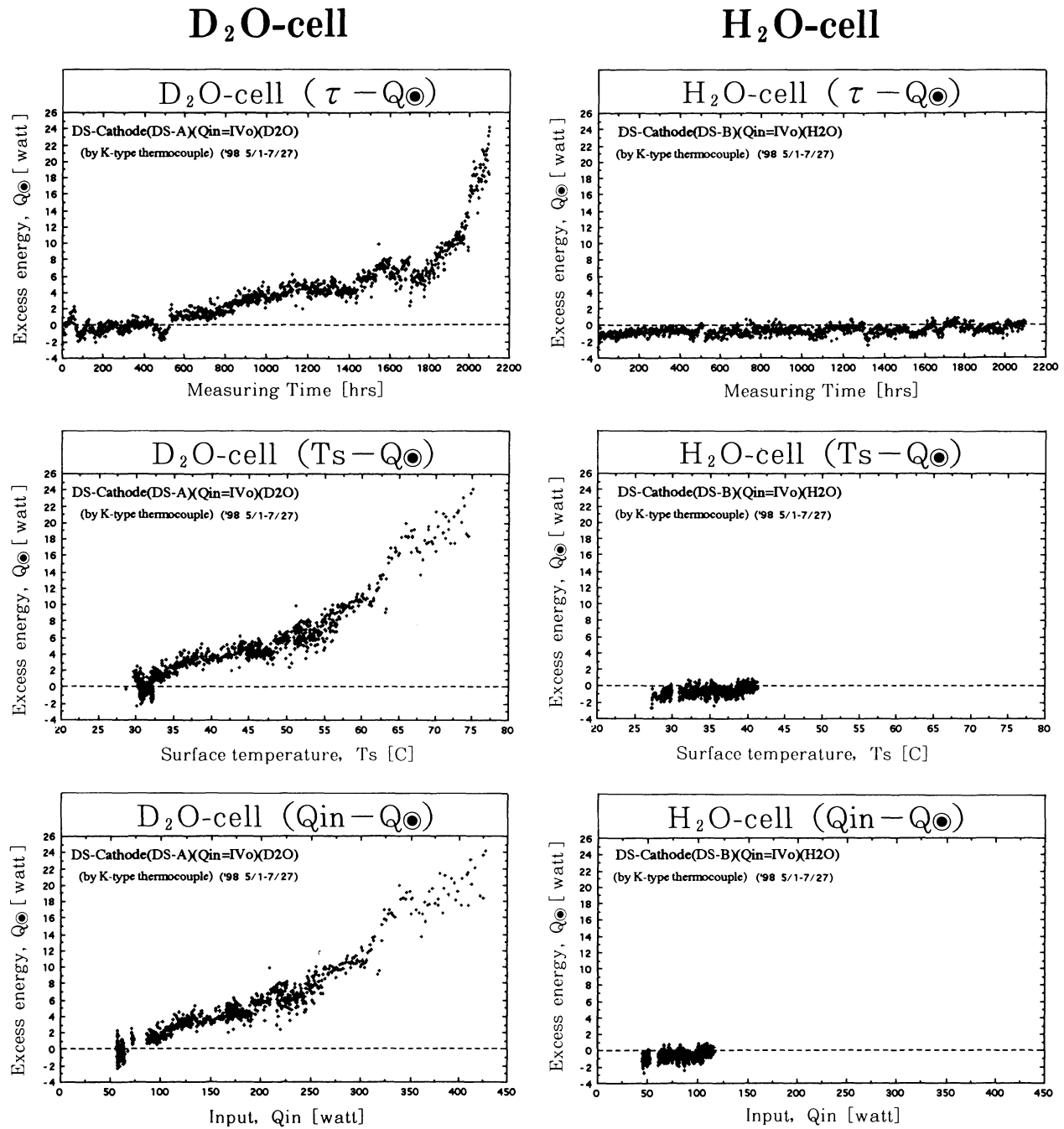


Fig. 3. Characteristics of excess energy generated in D₂O-cell (Left-line) and H₂O-cell (Right-line). Note: Enormous differences of excess energies (Q_{\odot}) generated in D₂O-cell and H₂O-cell appear correspondingly to change of measuring time (τ), electrolyte temperature near the surface of the cathode (T_s) and input (Q_{in}), respectively. These experimental data demonstrate that tremendous “reaction excess energy” generates within the D₂O-cell and the “said-energy” does not produce in the H₂O-cell.

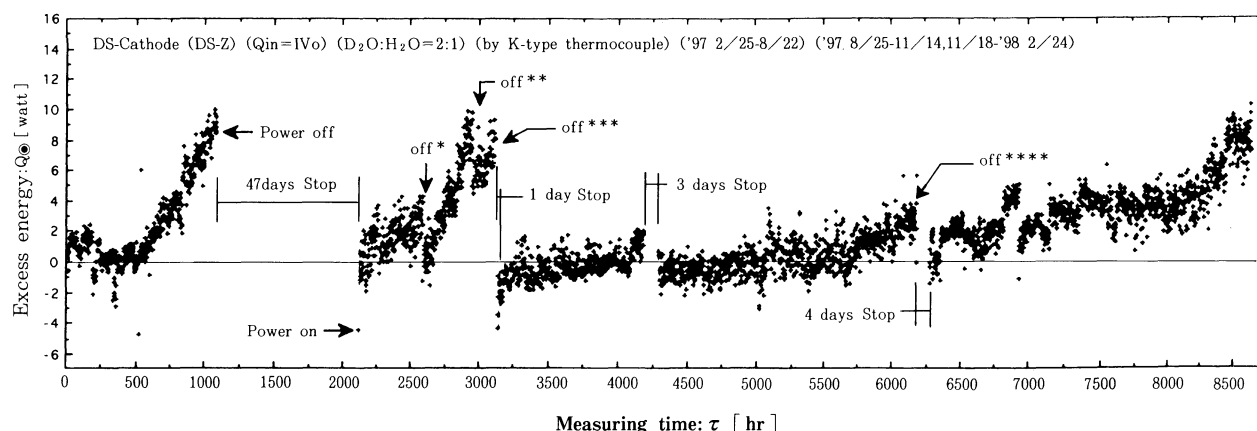


Fig. 4. Characteristic of excess energy generated in the "Mixed-cell" ($D_2O/H_2O=2$ in weight). Note: off* 1 [hr] and added 33 [gr] electrolyte. off**: power off 3 [hr] added 24 [gr] electrolyte. off***: change into a new electrolyte and polished the cathode surface. off****: a new electrolyte was added by only vaporized one.

Consequently, authors consider that the experimental facts as shown in Figs. 3 and 4 present us the information indicated essentially existing of deuterium nucleation reaction within solid as the "solid-state plasma fusion".³⁾

Acknowledgments. This study was conducted through a research grant from the Japan Society for the Promotion of Science. The authors would like to thank Dr. K. Sugimoto and Dr. T. Yamasaki; Emeritus Professors of Tokyo Univ. and Dr. H. Fujita; Emeritus Prof. of Osaka Univ. for their comments, and Prof. T. Yokobori, M.J.A.,

and Sulzer Metco Japan, President F. Kawakami for their encouragement.

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