it had been told that their experiment had lasted several years[1-5] by the time of its publication in 1989. The profoundness itself induced confusion in readers' mind, in reverse. We will give our analysis of some of their data in Chapter 11 (Section 11.2). In Fig. 6.1, their recent apparatus[1-3] used by Pons' group in France is shown.

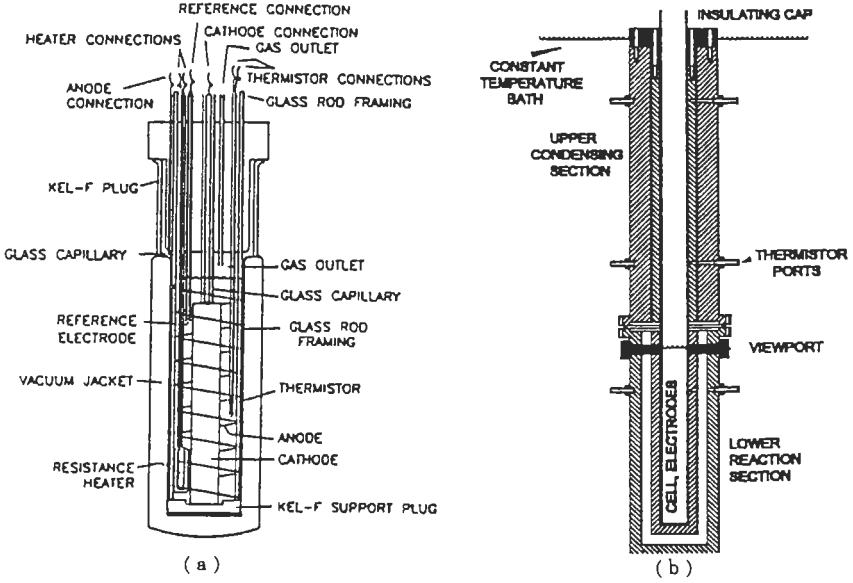

Figure 6.1: Open and closed cell systems with DS-cathode. (a) DS-cathode; open type (left). This open-cathode can detect inner pressure up to about 900 atm which is limited only by pressure gauge. (b) On the contrary, closed-cathode will be rising up some thousand atm. Authors' "closed-cell" system is shown in (b); inlet and outlet water temperature are measured by both of reversely-connected thermocouple and Pt-Resister at the same time. (Fig. 5 of Roulette et al.[1-3])

6.1b McKubre et al.[3,3']

Mike McKubre and his collaborators in SRI International, California, USA has been working especially with the excess heat measurement in the same electrolytic system Pd/D/Li as used by Fleischmann et al. They obtained very many data of the excess heat Q in the system varying D/Pd ratio ($\equiv x$), current density i and occluding velocity dx/dt (Fig. 6.2). The result was used to deduce

a following empirical relation between Q, x, i and $\mathrm{d}x/\mathrm{d}t$:

$$Q = M(T)(i - i_0)^a (x - x_0)^b |\mathrm{d}x/\mathrm{d}t|. \tag{6.1}$$

In this relation, $M(T)$ is a constant depending on the temperature, quality of the Pd cathode, the surface condition and others, The quantities i_0 and x_0 are threshold values of i and x, and a and b are constants with values $a \sim 1$ and $b \sim 2$, respectively. The threshold values of i and x were determined as $i_0 \sim 0.2$ mA/cm^2 and $x_0 \sim 0.85$.

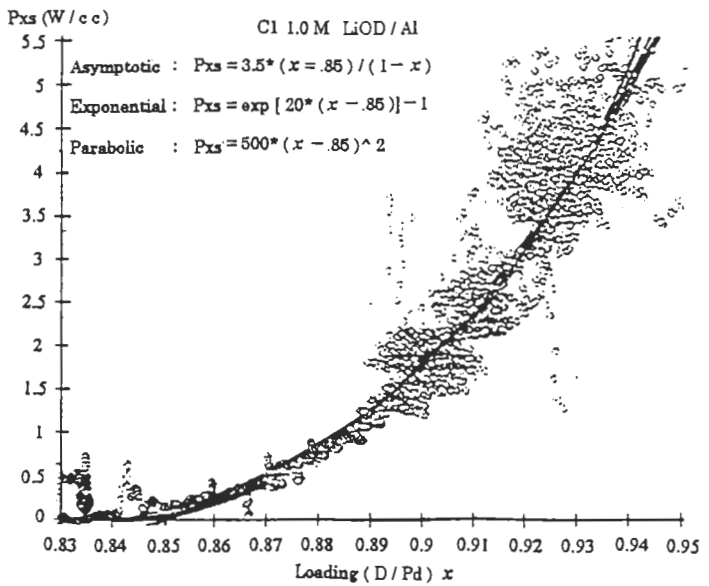

Figure 6.2: Variation of excess power P_{xs} with loading ratio x. (Fig. 7 of McKubre et al.[3'])

This relation is fundamentally a statistical one and therefore there are many exceptions as we can see in Fig. 6.2. Also, it should be kept in mind that the variables in this equation are not independent each other, i.e. i_0 are dependent on the variable x and x_0 are dependent on i, and so on.

The experimental results[3)] by McKubre et al. have shown that if the experimental set up satisfy the above condition and the constant M is made finite, then the excess heat can be expected with a value of several tens % of input energy with high probability. A key point is the factor M: it is not possible to know the value M for a sample

cathode beforehand. They chose cathodes with $M \neq 0$ by the trial-and-error method. After this selection of the cathode by experience in their pre-run, Fig. 6.2 was obtained (so Dr. McKubre told in a conversation with the author).

In addition to these moderate excess heat generation, there had occurred several rare events of the excess heat generation of more than 100 %. The amount of the excess heat in these events corresponded to $\sim$ 1 kW/cm^3. These events were very rare and almost irreproducible. This is a similar experience to the one reported by Fleischmann et al. that the event where the cathode had melted. We have to be careful to deny an event reported by an experienced scientist who can be trusted by his work done before and we are safe with appropriate protection for hazardous radiation from active nuclei generated in the reaction.

The data of McKubre et al. will be analyzed in Chapter 11 (11.3b).

6.1c E. Storms and C. Talcott[4~4'')]

E. Storms who had been working in Los Alamos National Laboratory as an electrochemists had made experiments with the Pd/D/Li system[4,4')] by electrolytic method to induce deuteron into palladium and also published several review papers[4''~4-6)] on the cold fusion. He and his collaborator C. Talcott made a first quantitative measurement of tritium generation accompanied with the excess heat[4)]. He also confirmed the excess heat generation with use of a closed system in which the electrolytic product gases recombined in the system to make ambiguity small in the heat measurement.

Their tritium measurement was analyzed consistently with the TNCF model as shown in Chapter 11 (11.7c). The excess heat measured by them attained 0.17 MJ/cm^2 in average for a long runs of several days and the excess power was 1.1 W/cm^2 at maximum.

6.1d Takahashi et al.[5~5-3)]

Many semi-successful attempts have been performed to improve the troublesome poor reproducibility. The so-called L-H mode is one of the successful attempts which was proposed by A. Takahashi of Osaka University in which the electrolytic voltage is changed between two values (low and high modes) alternatively with a