Abnormal excess heat measured during Mizuno-type experiments: a possible artefact?

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« Anyone who has never made a mistake has never tried anything new » A. Einstein

Abstract. Recently performed Mizuno-type experiments confirmed generation of excess heat but not at the rate reported in ref. 2 (Sotchi -ICCF13). The main reason for the discrepancy is now clear; the bandwidth of our Unigor wattmeter, used in old experiments, was insufficient for correcting measurements of highly fluctuating electric energies.

1. Introduction

Using the boiling water calorimeter, described in reference 2, we measured excess heat generated during high voltage electrolysis. The experimental setup is shown in Figure 1. The input electric energy was measured with a D6000 Norma Goerz wattmeter, rather than with simple Unigor instrument. Note that the frequency bandwidth of the Goerz wattmeter is significantly wider than that of the Unigor wattmeter (see below). The new setup, containing the boiling water calorimeter, allowed us to eliminate two additional artifacts that could possibly be responsible for systematic errors:

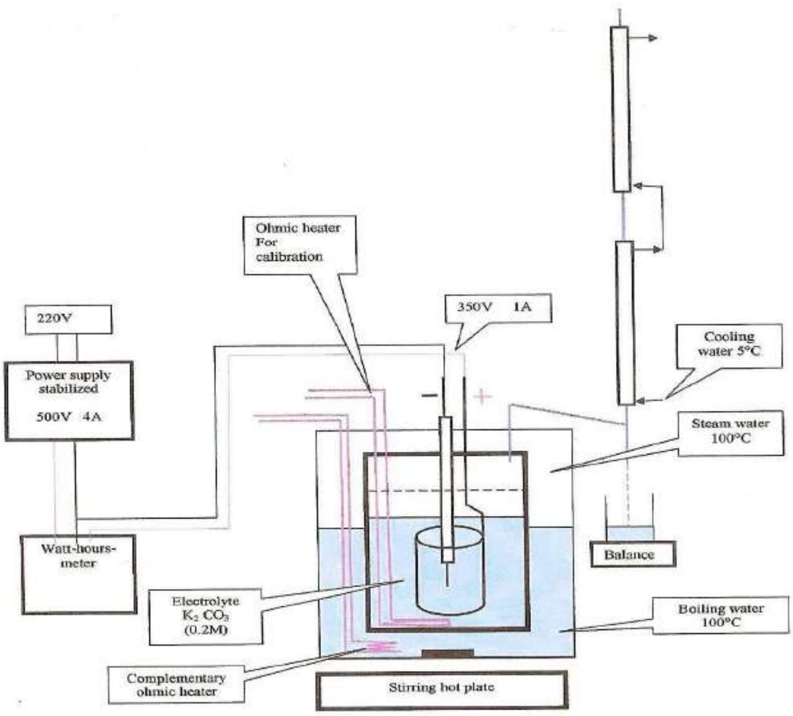

Fig. 1 - Experimental setup.

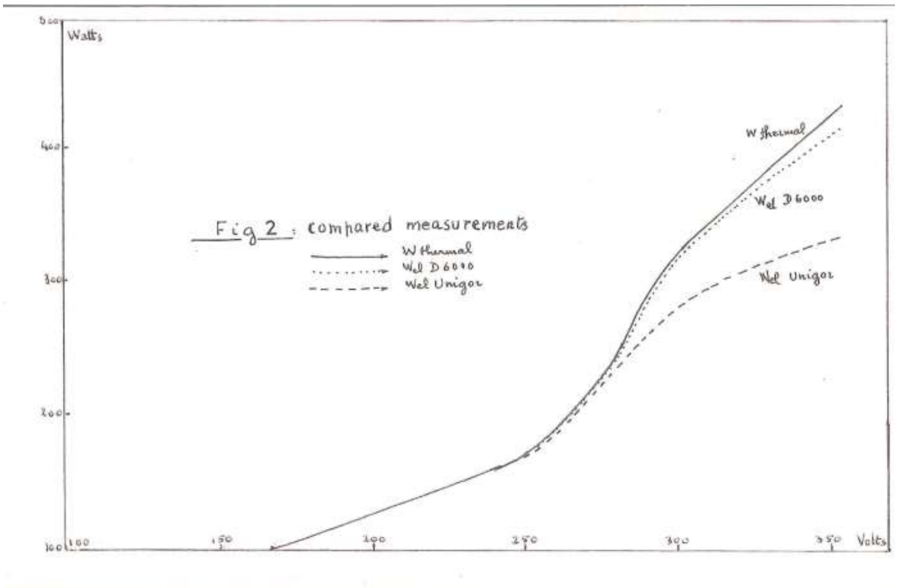

Fig. 2 – Comparison of power measurements

- storage and destorage (the internal reactor temperature remains always at 100°C and then do not allow any stored heat)
- electrolyte droplets losses (the condensed steam gives an easy chemical way to check up if electrolyte droplets are carried on)

Let us elaborate on the issue of electric power measurements. In the early experiments, they were performed by using the Unigor wattmeter. Its readings were shown to be reliable when the electrolytic cell was replaced by an ohmic resistor, that is when the current was constant. But the current in the electrolytic cell rapidly fluctuated between zero and approximately ten amperes. Wide fluctuations of the current, observed with the oscilloscope, were responsible for wide fluctuations of the voltage between the anode and the cathode. Unlike the Unigor 390M (bandwidth up to 0.1 MHz), the Goerz D6000 instrument (bandwidth up to 2 MHz) is designed to function properly at such fluctuations.

As seen in Fig. 2 (curves normalized at 200 volts), the measurements made with the D6000 wattmeter were very close to the thermal values. On the contrary, the Unigor values did not agree with the D6000 values, specially in the 280-300 volts region. This explains the discrepancy between our now results and results reported in (2). Oscilloscopic measurements of electric energy were essentially the same as those performed by using the D6000 wattmeter (even at 300 V, where arcing was very intense). The previously-reported excess heat was not observed in our new experiments.

2. Return to our Yokohama type experiments (ref. 1)

Therefore, we tried to understand why the abnormal excess heat seemed to have disappeared. We have then thought that the reactor in our boiling water calorimeter, was not large enough (only 1 litter) for the electrolysis to be made in and that violent moves of the electrolyte consequently disrupted the plasma around the cathode. Thus, we suspect that this phenomenon is responsible for the disappearance of the abnormal excess heat.

We decided to return to the experimental set-up presented in ref.1 (Yokohama - ICCF12), in which the volume of the beaker was 5 times larger for the electrolysis, but we replaced this 5 liters beaker by a Dewar flask of the same volume. See fig 3.

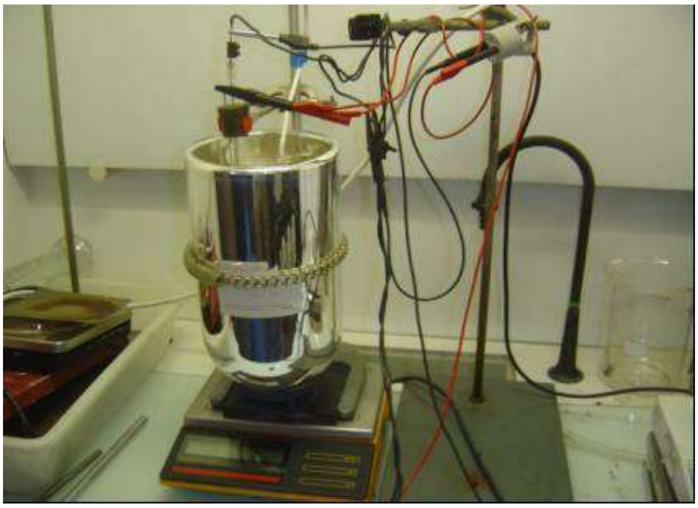

Fig. 3 - Experimental Yokohama (ICCF12) set up.

Essential parameters of experiments described in ref. 1 and ref. 2 were as follows:

- a Sartorius balance, measuring up to 6 kg at an accuracy of 0.1 g
- a continuous current electricity supply (500 volts, 4 amperes)
- a tungsten cathode of 2.4 mm
- a wire in platinized titanium for anode
- an electrolyte made with K_2CO_3 at 0.2 M

Calibration tests, made with a thermal resistance (~150 ohm), showed that in the range of 250 w to 700 w the thermal losses (escaping heat) were very small and constant.

Our first electrolysis experiments were perturbed by the storage and destorage problem. We found out that the problem was due to non uniform temperature distribution (not 100°C everywhere) inside the Dewar flask due to electrolyte stratification. We solved this problem by leaving inside the Dewar flask a thermal resistance giving a continuous power at about 300 watts. Convection of hot electrolyte inside the Dewar flask is sufficient to establish the uniform temperature distribution (100°C) within the flask. Of course, we have to take into account the continuous loss of water due to this 300 watt extra power.

Thanks to our quite deep Dewar and also to a well arranged perforated Teflon screen just above the electrodes, we did not notice any electrolyte droplets losses. Moreover, the storage and destorage problem was solved and verified by measurements made with an auxiliary thermal resistance.

3. Results obtained:

First, we will give an example of our experimental procedure, as done in our run of July 17th 2008.

Voltage applied was 300 Volts.
Duration of the run : 25 minutes.
T minutes (min)
M: water mass (g) .
Wh : Electric energy furnished (Wh).
(Water loss due to the auxiliary thermal heater for 2.5 minutes : 22g)

Table 1.

T	M	Wh
0	-150	545
2.5	-183	560.6
5.0	-240	575.1
7.5	-276	589.6
10.0	-328	602.8
12.5	-375	615.9
15	-416	628.9
17.5	-447	641.8
20	-493	654.7
22.5	-530	667.3
25	-585	679.7

The mean **COP** (coefficient of productivity) during this run may be obtained as following :

Mean thermal energy produced by electrolysis for **2.5 minutes** between 2.5 and 25 minutes (9 intervals of 2.5 minutes):
(585-183)/9 – 22 = 22.7 g , that is to say : 22.7x2260= 51302 joules.

Electric energy furnished for **2.5 minutes** between 2.5 and 25 minutes :
(679.7-560.6)/9 = 13.2 Wh, that is to say : 13.2 x 3600 = 47520 joules

Mean COP value: 51302/47520 = 1.08

The preliminary results obtained by the end of July 2008, tests that, up to now, we were not able to pursue due to the lengthy reorganization of our society are the following:

Table 2.

Voltage applied	COP values
200 V	1.00
250 V	1.09 1.00 1.10 0.97
300 V	1.06 1.08 1.04 1.01

The accuracy of our measurements is fairly good (2 to 3 % max. error margin), as we have a measurement made every 2.5 minute during about 20 to 30 minutes duration for a given test. On the other hand, in this type of experiment, it is difficult to imagine to have negative thermal losses (destorage problem has been solved) and usually, the COP values are under 1.00. One can however notice that the positive COP values larger than one are not very large and that they are not as reproducible as formerly announced in ref.2.

4. Conclusion

After a severe doubt due to the use of a wattmeter without a sufficiently large bandwidth, we were able to find again values for the ratio of outlet thermal energy to inlet electric energy (COP) larger than 1.00 . We think that these values are meaningful. For the time being, these values are not very large and do not occur as often as we wrote in ref. 2. We may add that we get an hypothesis for the disappearance of the excess heat : the size of the reactor in our boiling water calorimeter was too small and the violent moves of the electrolyte inside disrupted the plasma around the cathode and the abnormal excess heat disappeared.

However, although we think that these results are quite encouraging, they need to be confirmed and we need a bigger involvement of new sponsors in the future studies because the hope of a clean, cheap and abundant energy deserves it, even if some uncertainties cannot be completely avoided.

Acknowledgements

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5. References

[1] « Abnormal excess heat observed during Mizuno-type experiments » by J.F. Fauvarque- P.P. Clauzon- G.J-M. Lallevé – Service d'électrochimie Industrielle du CNAM – Paper given at Yokohama – Nov.2005 – ICCF12 meeting.

[2] « A boiling-water calorimeter for the study of the abnormal excess heat observed during MIZUNO-like experiments » by J.F. Fauvarque – P.P. Clauzon – G. J-M. Lallevé – G. Le Buzit (CNAM Paris) paper given at Sotchi – Nov 2007 – ICCF 13 meeting.