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Research Article

A Tribute to Georges Lonchampt

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Abstract

Georges Lonchampt was one of the few French researchers who, from day one, worked on Cold Fusion. He started performing his own experiments, and later worked with Martin Fleischmann and Stanley Pons. He successfully reproduced the two scientists' original experiment, and was the only one able to successfully replicate the boil-off experiment.

Keywords: Boil-off, Cold fusion, Electrolysis, Lonchampt, Solid state electrolyte

1. Introduction

Georges Lonchampt was one of the very few scientists involved in Cold Fusion research from the very beginning. Having made a career as an electrochemist engineer, he began trying to replicate Pons and Fleischmann's experiment as soon as he heard of their discovery. After initial difficulties reproducing their findings, Lonchampt contacted Pons and Fleischmann for help. The two researchers, who were located in southern France's Sophia Antipolis near Nice, gave Lonchampt their support and two of their ICARUS 2 cells. With a lot of tenacity Lonchampt managed to reproduce Pons and Fleischmann's original work. He also applied himself to other experiments, such as the Patterson beads and proton conductors.

I was lucky enough to work with Georges Lonchampt for over five years. He taught me a lot during that time.

2. Lonchampt Background

Lonchampt was born on April 2, 1935 in Bourg-en-Bresse near Switzerland. He studied in Gex, then Nantua and finally in Grenoble where he graduated as an electrochemical engineer. Later he obtained another degree in Nuclear Engineering.

During his Military Service, he spent 18 months at the French Atomic Energy Center in Miramas in the South of France. He worked on the isotopic separation of lithium-6 from natural lithium for military applications.

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2.1. Isotopic separation of lithium

In 1962, Lonchampt joined the French Atomic Energy Center in Grenoble where he continued working on the isotopic separation of lithium-6. Li-6 is only 7% of natural lithium, whereas Li-7 is 93%. Li-6 is an important material for the fabrication of the H-bomb that France wanted to produce at that time. He was very successful that he managed to go from 24 electrolyzers to only three! He lowered the cost of the production of Li-6 by two orders of magnitude. This achievement was the beginning of his fame in the nuclear industry.

2.2. Isotopic separation of uranium

Following his success with lithium enrichment, Lonchampt was given the task of separating uranium-235 from natural uranium. The new electrochemical isotopic separation was a challenge, and at first was considered as non-proliferating. He worked from 1973 till 1985, and was very successful. He had to build a 30-meter high tower to locate his electrolyzers. Even though his pilot factory was successful, the people in Miramas were not able to reproduce his method. The project was abandoned in favor of the laser enrichment method, which actually never worked due to materials issues.

It is at that time that he hired Professor Lucien Bonnetain as an advisor, and kept excellent relationship with him until his death.

2.3. Lithium polymer batteries

As Lonchampt was an excellent electrochemist, he was then given the task of testing the new lithium-polymer battery developed by the French scientist Michel Armand. A major French corporation, Bolloré, was getting ready to commercialize this type of battery. Lonchampt collaborated with Bolloré in R&D. Today, Bolloré has commercialized the “Blue car”, a system of shared electric cars available in Paris, using the lithium–polymer batteries. In this work Lonchampt learned how to produce polymer proton conductors for the batteries. He later applied that technique to Cold Fusion.

3. Cold Fusion

Following the announcement of the discovery of Cold Fusion by Pons and Fleischmann, Lonchampt started immediately experimenting with palladium. However, Jean Teillac, the head of the French Atomic Energy Center, asked that all Cold Fusion research within the organization be halted in France. Fortunately, the director of the Grenoble Institute of Technology invited Lonchampt to set-up his own laboratory within the institute so he could continue his research. Lonchampt began juggling daytime work on batteries at the French Atomic Center and night work on Cold Fusion at the institute.

3.1. ICARUS 2 type experiments

Lonchampt’s initial experiments did not show the desired results. One of the reasons was that the palladium electrodes were too large. When Pons and Fleischmann moved to France, Lonchampt contacted them, and began collaborating with them. They gave him two of their own electrolytic cells (ICARUS 2 type), and he subsequently observed excess heat, although not as much as Pons and Fleishmann had. Figure 1 shows a picture of one of the cells during electrolysis. He used a 12 mm $\times$ 2 mm palladium electrode and a platinum wire anode with 0.1 M LiOD.

Figure 1. A photograph of an ICARUS 2 cell showing the cathode and anode and the water mixing by the hydrogen and oxygen gas bubbles.

3.2. Solid-state electrolytes

In 1995, while working at the Lawrence Berkeley Laboratory in California, I sent a manuscript of my preliminary results with solid-state electrolytes to the *Journal Physics Letters A*. At that time, Jean-Pierre Vigier was the editor-in-chief, and he rightly sent my work to Lonchampt for review. As he was dubious about my results, he asked me to come to his laboratory to redo the experiment there with better instrumentation. I brought my own crude calorimeter that I had built in Berkeley, but Lonchampt did not find it satisfactory and built a much better one. This helped us to prove that there was indeed excess heat.

Figure 2 shows a schematic of the improved calorimeter. Lonchampt had a brilliant idea of measuring the power production. In this design the samples were heated by a cylindrical alumina tube heated with a tungsten wire. The heat flow was calculated by the electrical resistivity change of the tungsten wire. As the electrical resistance changes with temperature, at constant heating power, if excess heat is produced, that will change the electrical resistivity. The graph in Fig. 3 shows the temperature rise when a high voltage is applied through the solid-state electrolyte, showing excess heat and heat after death.

Since there is heat after death, instead of using a DC voltage applied to the solid-state electrolyte, we used one-second pulses every minute. This improved the Coefficient of Performance greatly. This work was published at the ICCF5 conference in Monaco. Even though Lonchampt was heavily involved in this work, he did not sign the first paper, and I was the sole author [1]. Later we published more results together at the ICCF7 conference [2]

3.3. Patterson cells

The discovery by James Patterson of a new way of producing excess heat with plastic or glass beads one millimeter in diameter covered with triple layers of nickel-palladium and nickel, greatly interested Lonchampt. He bought a demonstration kit from Patterson, including the test cells, but also a small quantity of beads. In order to save the

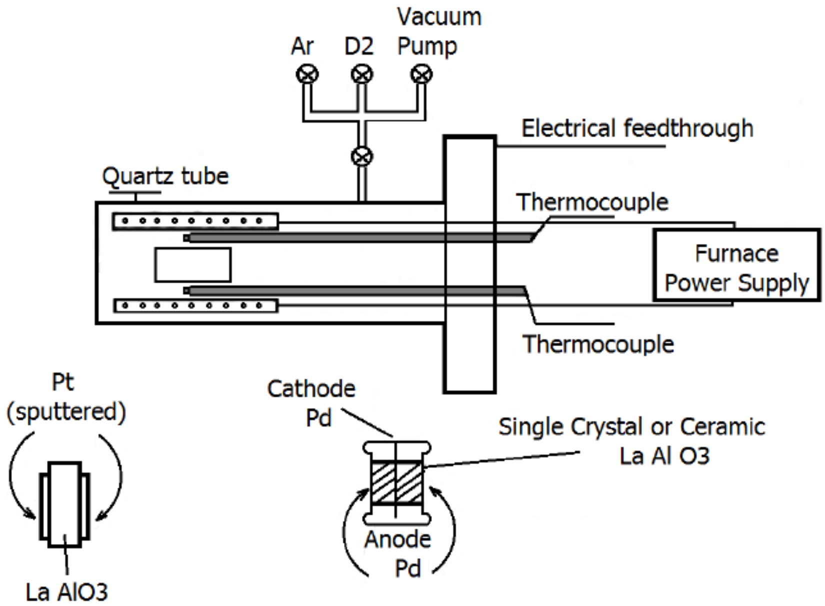

Figure 2. Schematic of the experimental set-up with two solid state electrolytes symmetrically positioned.

Patterson beads for future experiments, he had his own beads manufactured by Mecaprotec, a company located in Toulouse, France, that had a technique similar to the one of Patterson. The results of the experiments were published at ICCF7 [3].

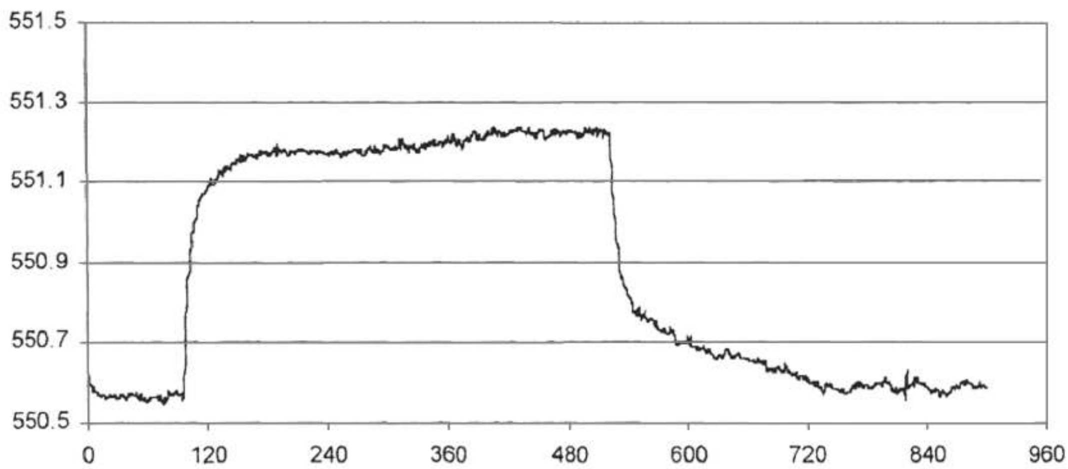

Figure 3. Temperature rise (in °C) versus time (in min) showing heat after death when excitation stopped.

Figure 4 shows the experimental results of the excess heat vs the input power. The results were not as robust as Patterson's who had large excess heat.

3.4. Boil-off experiments

Following the announcement by Fleischman and Pons of excess heat, once the electrochemical cell is not refilled and the cell is let to boil-off until it gets dry [4], Lonchampt decided to replicate the experiment. He was successful, and Table 1 shows the actual results presented at the ICCF6 conference [5]

3.5. Loading palladium with a solid-state electrolyte

Lonchampt was very concerned with the over-potential that, in electrochemistry, is equivalent to a gas pressure. The more the over-potential is high the higher the equivalent pressure of deuterium if it was in a gas phase environment. We tried a new set of experiments in deuterium gas where a palladium foil is used as a cathode and two palladium foils

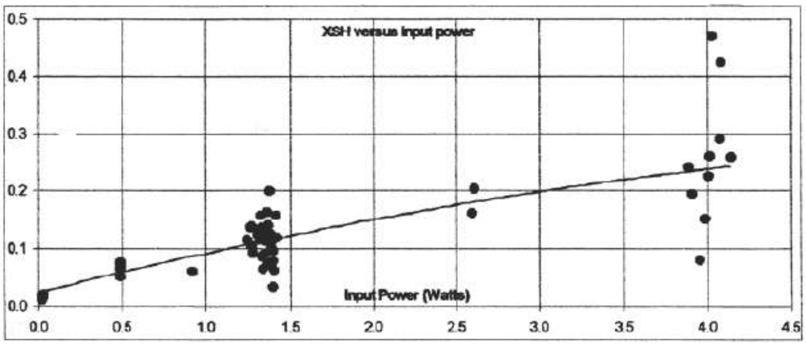

Figure 4. Excess heat (W) vs. input power (W).

Table 1. Excess heat after boil-off experiment.

Experiment	Date	Electrolyte volume (cm^3)	Enthalpy input (electrolysis) (J)	Enthalpy losses (to bath water) (J)	Available enthalpy (J)	Enthalpy used for total vaporisation (J)	Excess heat (J)	Mean relative excess heat (%)	Relative excess heat during grand final (%)
P1 Pd 1st sample	Jan. 30, 1996	84	419 100	254 700	156 876	181 499	24 623	16	153
P1 Pt	Calibration March 18, 1996	85.5	425 700	240 600	185 100	184 740	360	–0.2	No burst
N Pd 1st sample	Sept. 3, 1996	80	318 700	151 000	167 700	172 856	5156	3	IS
P3 Pd 1st sample	Sept. 14, 1996	74	221 200	72 190	149 010	159 892	10 882	7	36
n Pd 2nd sample	Sept. 30, 1996	72	308 600	178 700	129 900	155 570	25 670	20	97
P3 Pd 2nd sample	Oct. 2, 1996	78	290 700	132 800	157 900	168 535	10 635	7	29

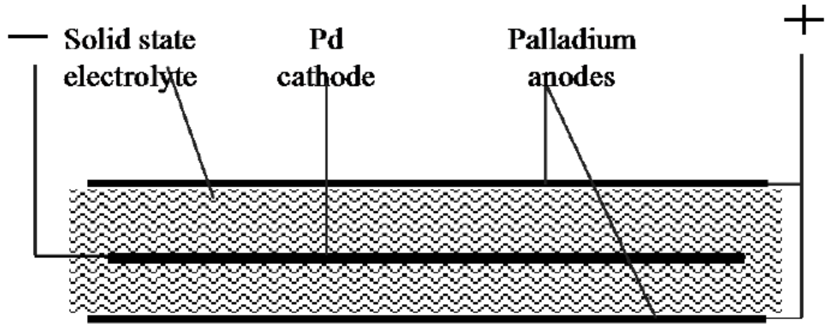

Figure 5. Experimental set-up.

as anodes. Between them an organic proton conductor is located, as shown in Fig 5. The electrolyte is Polyoxyethylene (POE) and deuterated phosphoric acid, similar to the electrolyte developed by Armand tor the lithium–polymer batteries.

By this time, Lonchampt had retired, and I was back at my laboratory in Marseilles. Lonchampt transformed his garage into a high-functioning laboratory where he prepared the electrolyte layers and regularly mailed them to me. I did the calorimetry, and sent him the data by email every day. We used to talk on the phone for hours discussing the details. Unfortunately, in spite of all our attempts, we did not succeed in observing anomalous excess heat [6]

4. Conclusion

I had the great honor of working with Georges Lonchampt for over than five years. This was a very productive period of my life. Lonchampt was a very kind person, with a lot of common sense. He applied his great engineering skills to the field of Cold Fusion and made major contributions to the field. In particular, he was the only one who reproduced the boil-off experiment.

I am very sad to have lost such a good friend.

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