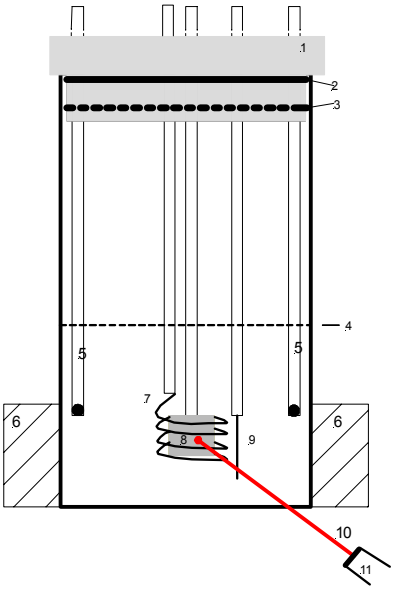
Letts, D. and D. Cravens. *Laser Stimulation Of Deuterated Palladium: Past And Present, PowerPoint slides*. in *Tenth International Conference on Cold Fusion*. 2003. Cambridge, MA: LENR-CANR.org.

Slide 1

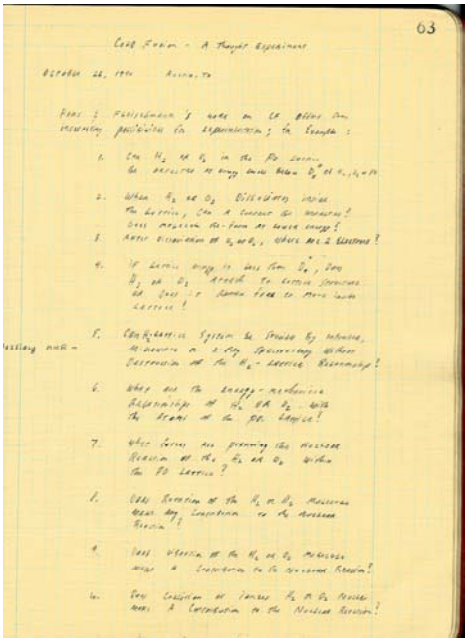


Laser Stimulation of Deuterated Palladium: Past & Present

Dennis Letts and Dennis Cravens, PHD

Slide 2

The First Triggering Method Contemplated: RF



Slide 3

RF Methods Presented at ICCF 4

TRIGGERING OF HEAT AND SUB-SURFACE CHANGE
IN
Pd-D SYSTEMS

J.O'M.Bockris, R.Sundaresan, D.Letts and Z.Minevski

Department of Chemistry, Texas A&M University
College Station, Texas, 77843

16 December, 1993

In 1992 I began experimenting with NMR triggering which led to a paper with John Bockris in 1993 which was presented at ICCF4 in Maui.

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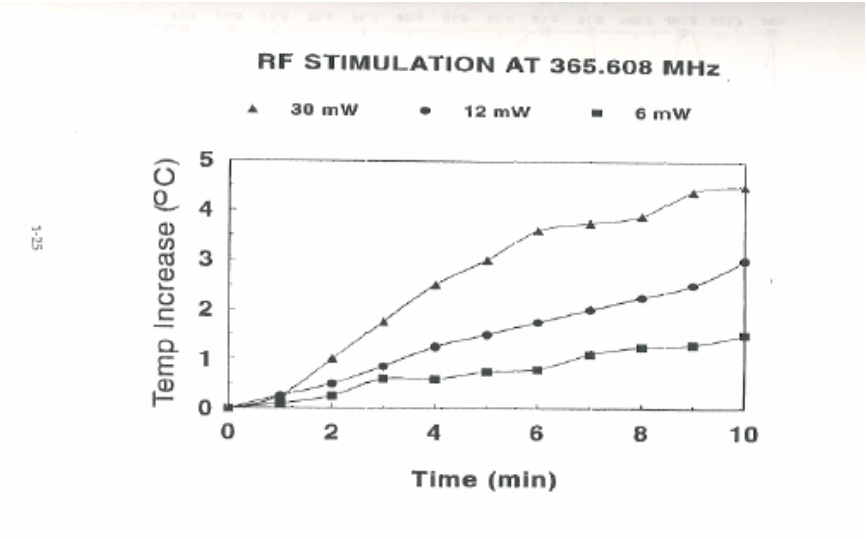
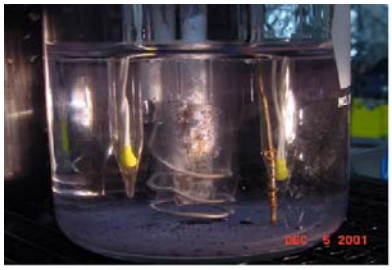
RF Worked But Was Hard to Reproduce



Slide 5

The Laser Effect Was Discovered by Making a Mistake



- To reduce costs, we used gold wire as anode instead of platinum. The gold went into solution and transferred to the cathode, ruining the RF experiment.
- To avoid wasting the experiment, Letts irradiated the cathode with a 1 mW laser pointer that operated at 670 nm.
- In a short time, the cell temperature of the electrolyte(75 grams) increased by several degrees.

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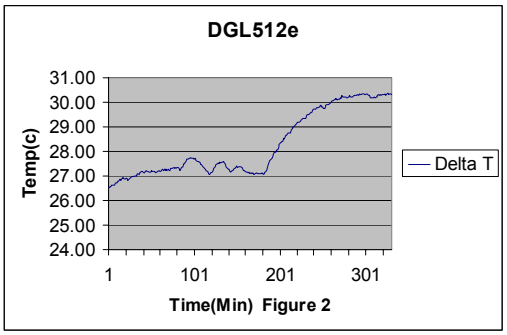
Thermal Response to a 1 mW Laser Pointer(670 nm)



- At Point 80, the laser was briefly aimed onto the cathode and a rapid thermal response was observed.
- At point 180, the laser was directed onto the cathode and left on for a longer time.
- Delta T increased by more than 3 degrees C, suggesting a heat release in excess of 500 mW from a 1 mW stimulation. This marked the discovery of the laser heat effect.

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The lab notebook was checked and we found that a 17-step procedure was followed to fabricate the cathode.

Multi-Step Cathode Preparation

1. Cut a billet of Palladium 10mm x 10 mm x .5mm
2. Polish to bright using a dremel tool/ fiber brush and Nicksand
3. Rinse in tap water.
4. Heat in furnace to 750 c for 3 hours; slowly cool to ambient.
5. Etch for 2 minutes in Aqua Regia at room temperature

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6. Re-polish with dremel and a metal brush using Nicksand
7. Polish with dremel and fiber brush using Nicksand
8. Ultrasonically clean for 5 minutes
9. Anneal 2.5 hours at 850c

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10. Polish with dremel/metal brush
11. Ultrasonically clean 5 minutes using an oxide remover
12. Cold roll to .25 mm thickness

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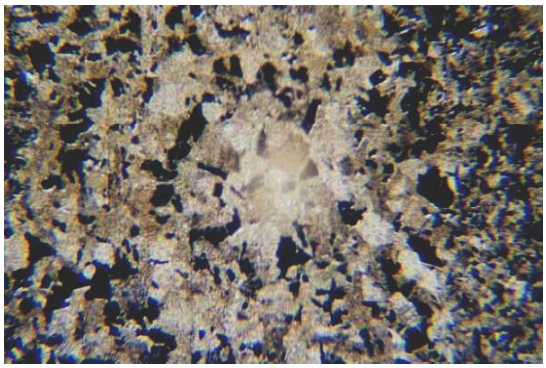

13. Re-polish with dremel/metal brush
14. Ultrasonically clean 5 minutes with oxide remover
15. Anneal for 2.5 hours at 850c
16. Etch with Aqua Regia for 2 minutes at room temperature
17. Rinse in distilled water; cathode is ready to load

- Process has re-crystallized Palladium
- Produced dislocations in Palladium
- Prepared cathode surface for Gold over-layer

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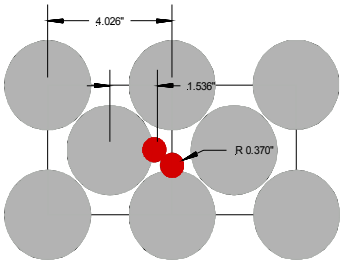
A Crude Model



Hydrogen In Surface Palladium Lattice
Scale: 1" = 1 Angstrom

- The model used initially to explain the laser effect was based on the particle-in-a-box.
- The mass of the deuteron and the open space occupied by hydrogen between palladium surface atoms were used to compute the energy levels for the “deuteron-in-a-box”.
- If N’s are selected at (10,8,1) or (12,4,2), resonant laser wavelengths of 681nm and 685 nm are obtained.
- These wavelengths have been observed to trigger exothermic reactions on deuterated palladium.

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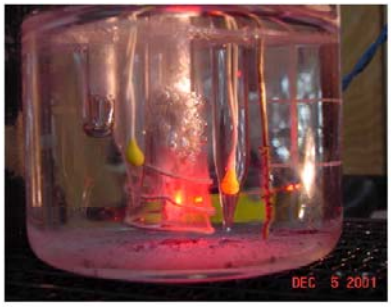
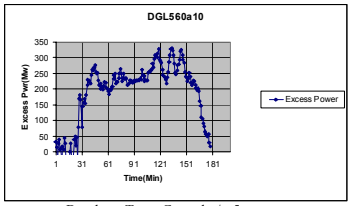


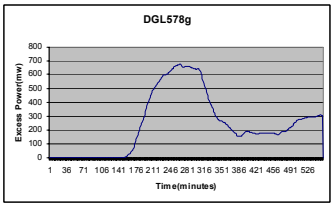
- After following the cathode fabrication protocol, the cathode is irradiated with a red laser at a predetermined wavelength.
- Most of the time this results in triggering a thermal response 10-30 times larger than the thermal output of the laser.

Slide 13

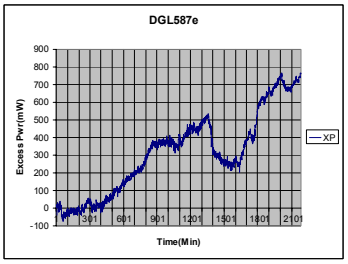
As Calorimetry Improved, the Laser Effect Persisted Over the Past Three Years



Benchtop Temp Control +/- .5c
December 2001



Temp Controlled Box +/- . 1c
October 2002



Temp Controlled box at +/- .05 c
March 2003

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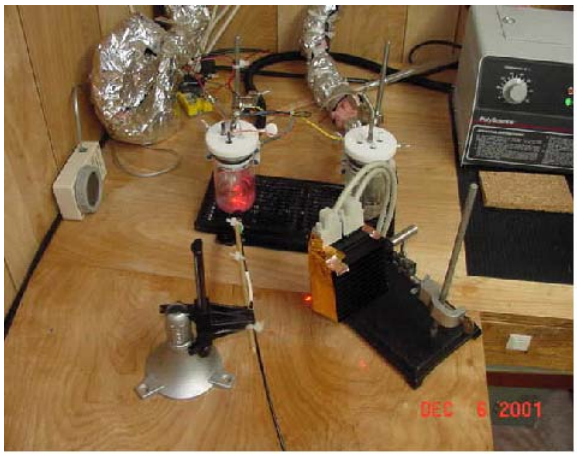
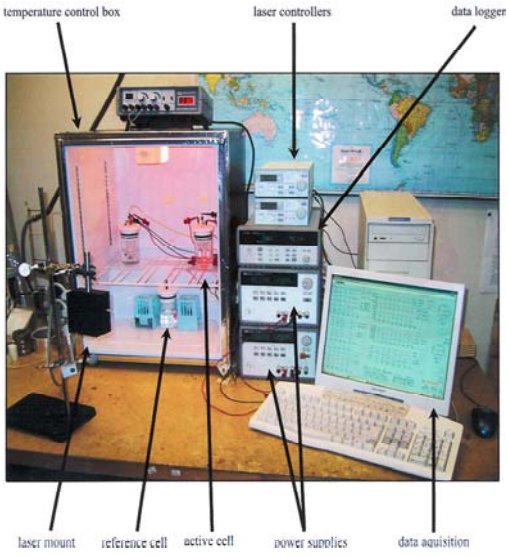
The First Laser Experiments Were on the Open Bench



Slide 15

Soon The Experiments moved into a Temperature Controlled Box



Slide 16

Scott Little Re-designed the Box to Provide Temp Control of +/- .05c

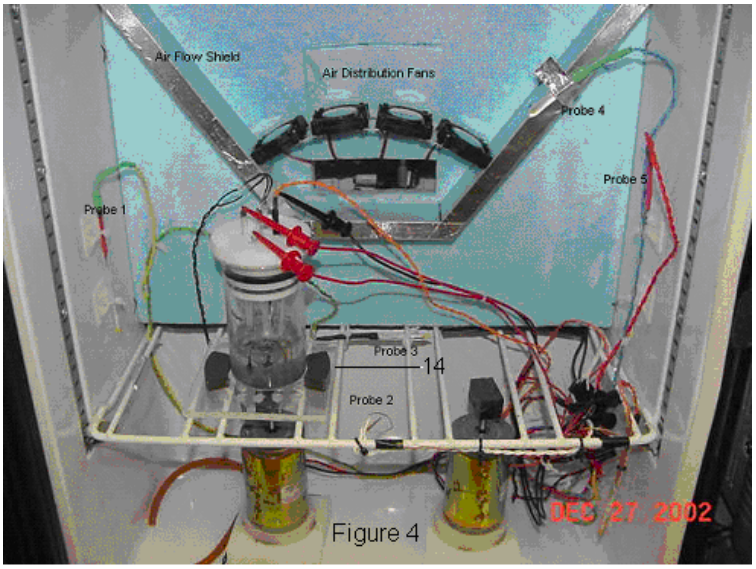


Figure 4

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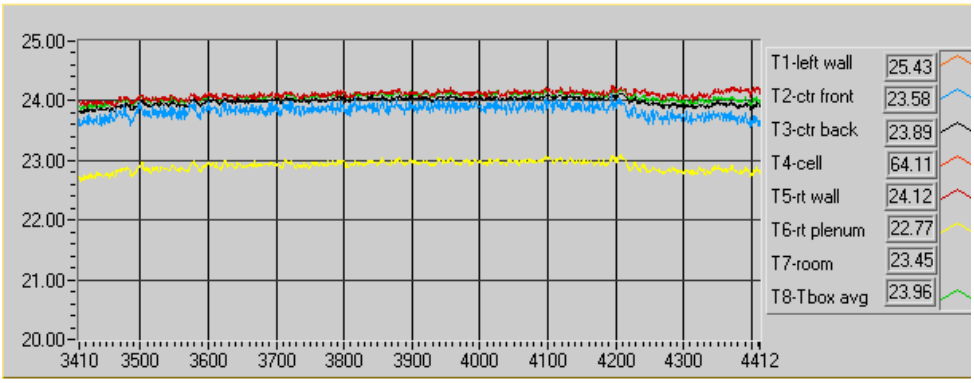

Figure 11

This chart demonstrates the stability of the enclosure; over 15 hours the temperature was measured in 5 places inside the box and averaged. The variation in average box temperature was about .05c. At point 4200 the enclosure door was opened for about 15 seconds and the average box temperature changed very little.

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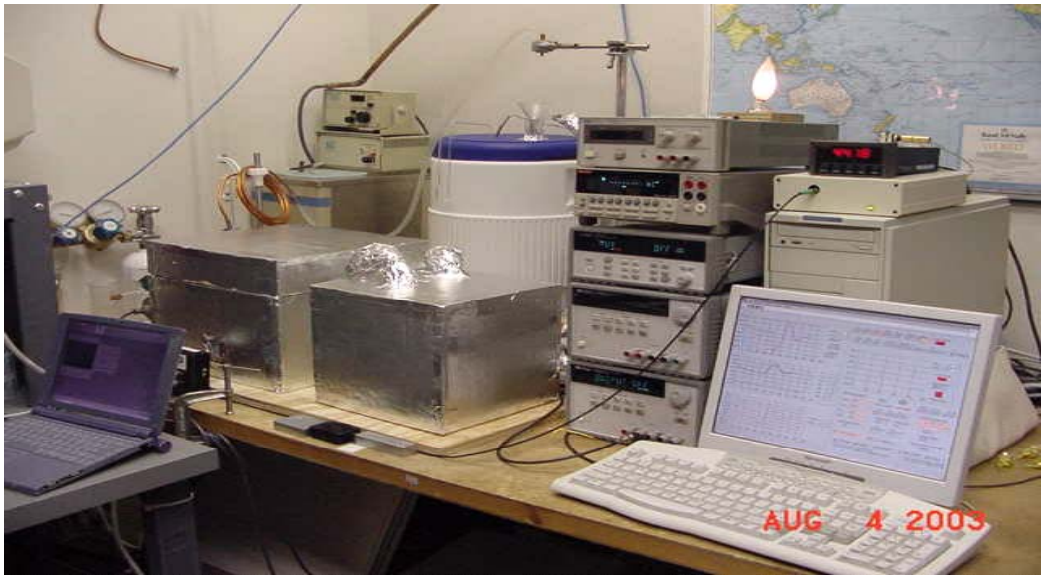
Our Current Experiment at EarthTech Labs Austin, Texas

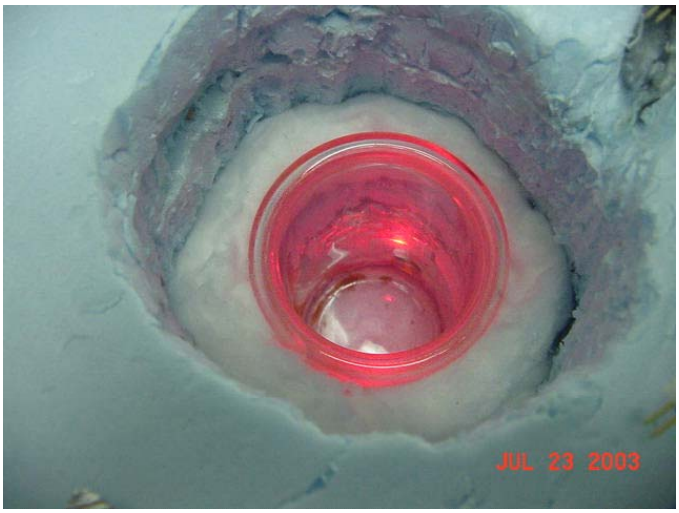
Slide 19

The Next Step: Flow Calorimetry



Slide 20

250 ml Tempering Beaker



Slide 21

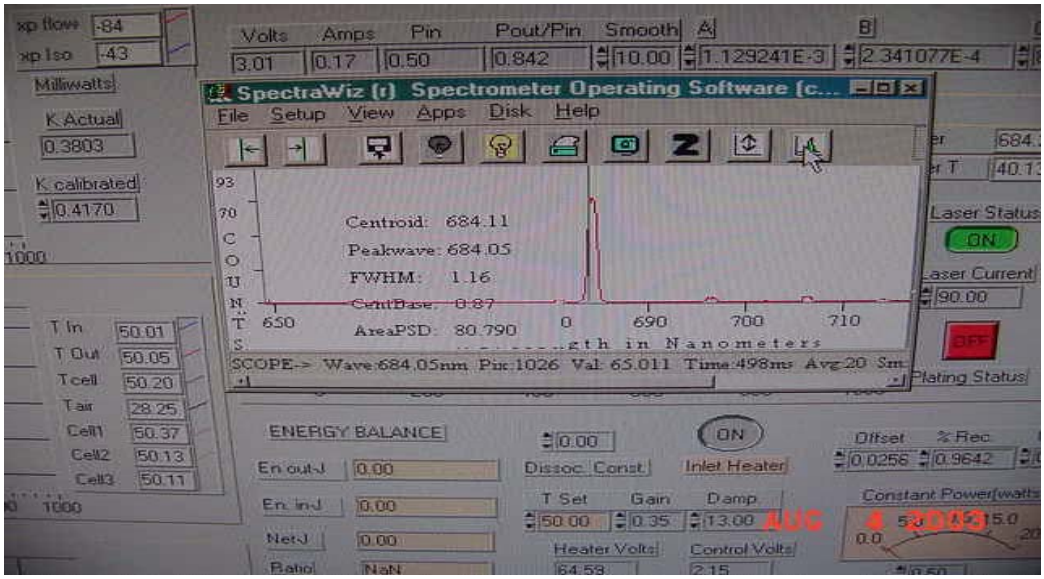
Teflon Lid with In-line Connectors and Wiring

Slide 22

ILX Laser Mount and Laser Port

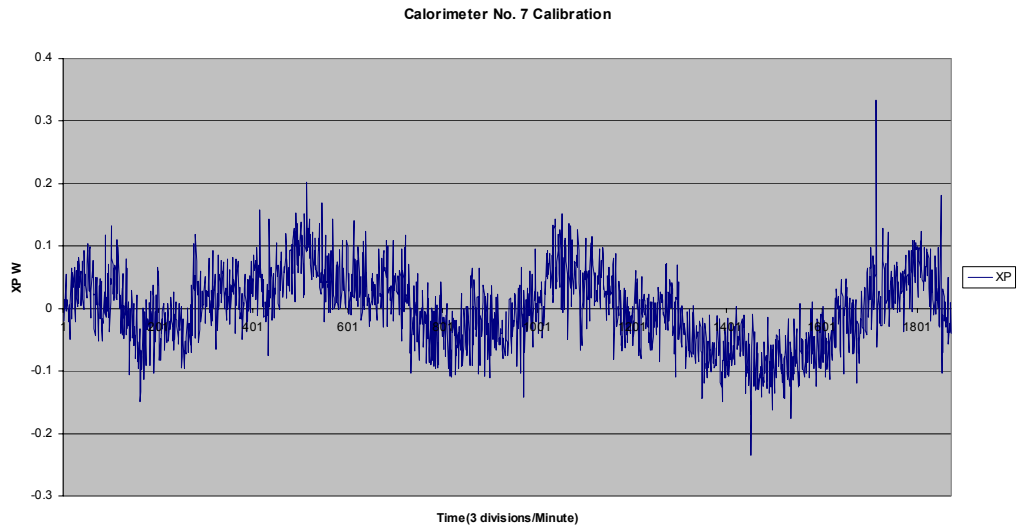
Slide 23

Labview Data Acquisition Screen



Slide 24

Flow Calibration



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Excess Power Statistics

Mean	-3.6E-05
Standard Error	0.001373
Median	0.002154
Mode	0.060436
Standard Deviation	0.059401
Sample Variance	0.003528
Kurtosis	0.249109
Skew	0.037701
Range	0.569265
Minimum	-0.23602
Maximum	0.333243
Sum	-0.06705
Count	1871
Confidence Level(95.0%)	0.002693

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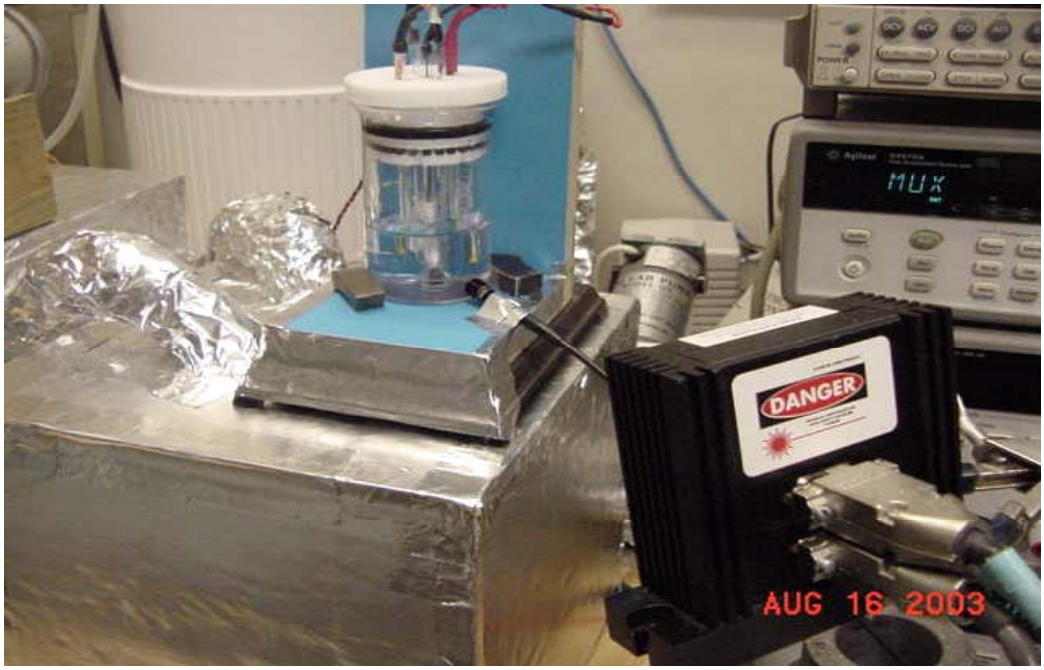
Demo Cell(#602) on Benchtop



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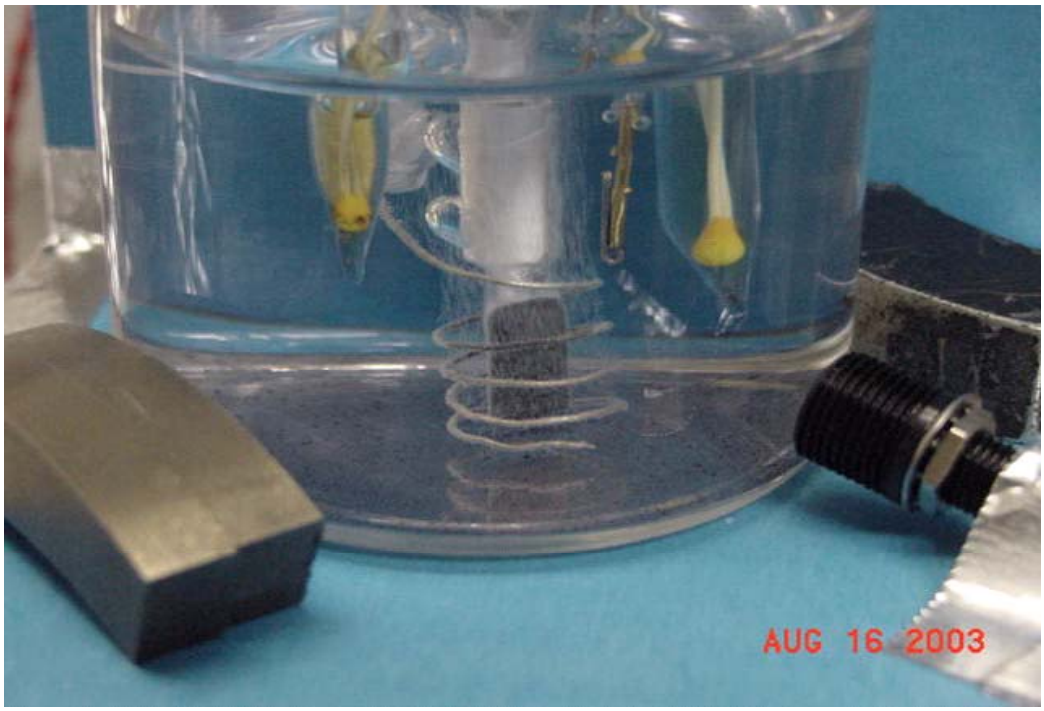
Cathode/Anode Assembly #602



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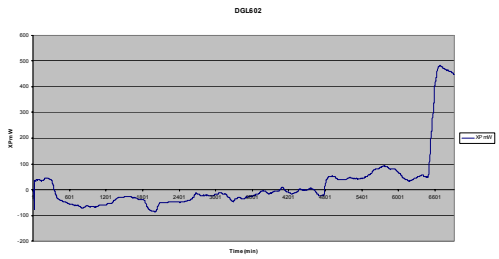
Demo Cell #602 Results



- This chart shows the loading history of cathode 602;loading began at point 1 on August 9,2003 and continued to point 6493 on August 14th.
- At point 6493 a laser operating at 681 nm irradiated a 1 mm spot on the cathode. There was an immediate exothermic reaction on the cathode surface estimated at 500 mW, presumably stimulated by the 30 mW laser.
- With the excess power signal still increasing, the laser was turned off and the excess power signal declined.
- Power to the cell was 500 mW; excess power was 500 mW from a 30 mW stimulation.

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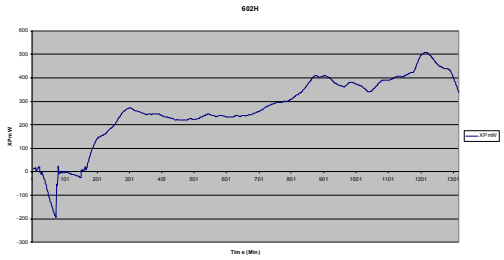
Excess Power Observed at EarthTech August 19, 2003

- 0-150 Zero Labview
- 150-300 Un-stimulated XP
- 300-650 Laser on 681 overnight
- 650-1300 Laser on 685
- 900 Laser 45 degrees to cathode
- 1050 Laser 90 degrees to cathode
- 1300 Effect saturates



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EarthTech

Left to Right: Dr. Michael Ibison, Dr. Harold Puthoff, Scott Little and Brendan Puthoff of EarthTech, International, Austin, Texas.

- Letts and Cravens have been trying to present a credible cold fusion experiment at EarthTech for 8 years.
- ICCF10 demo experiment #602 finally convinced EarthTech to build a special dual-method calorimeter to test the laser effect to a higher standard than has been used previously.
- Letts and Cravens will work closely with EarthTech over the next several months to perform a series of experiments in a high performance calorimeter called MOAC (mother of all calorimeters).
- If the laser effect appears in MOAC, then cold fusion credibility will be enhanced.

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