Report on MFMP Celani Wire Test in V 1.3 Celani Replica Cells Running in Differential Mode

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Introduction

MFMP and HUG have been working to replicate the anomalous heat effect demonstrate by Celani at ICCF17. Previous tests have not shown excess heat at the levels claimed in that demo, so this test was devised to add a control cell to compare to the cell with the active wires in it. The real time control cell adds an extra level of verification and having two active wires in the active cell should increase the amount of anomalous heat to detect.

Apparatus

Image 1: Apparatus consisting of two identical Celani replica cells. The cell on the left (Cell B) contains two treated constantan wires provided by Francesco Celani.
Each wire is approximately 80 cm. Details of each wire are in the following table.

Cell A	NiCr1	Previous NiCr wire - 200 micron diameter
	NiCr2	New NiCr wire - 200 micron diameter
Cell B	CuNi1	434 Layer Celani Wire previously loaded in Cell A.
	CuNi2	360 Layer Celani Wire that had remained unloaded in Cell B during the V2.0 Protocol tests.

The cell on the right (Cell A) is the control cell containing two NiChrome wires the same diameter and length as in the active cell. These cells are located in a vent hood with a constant air flow. The ambient temperature is sensed in front of each cell individually (little white clad sensors below each cell in picture). Click on images to pull up full size image.

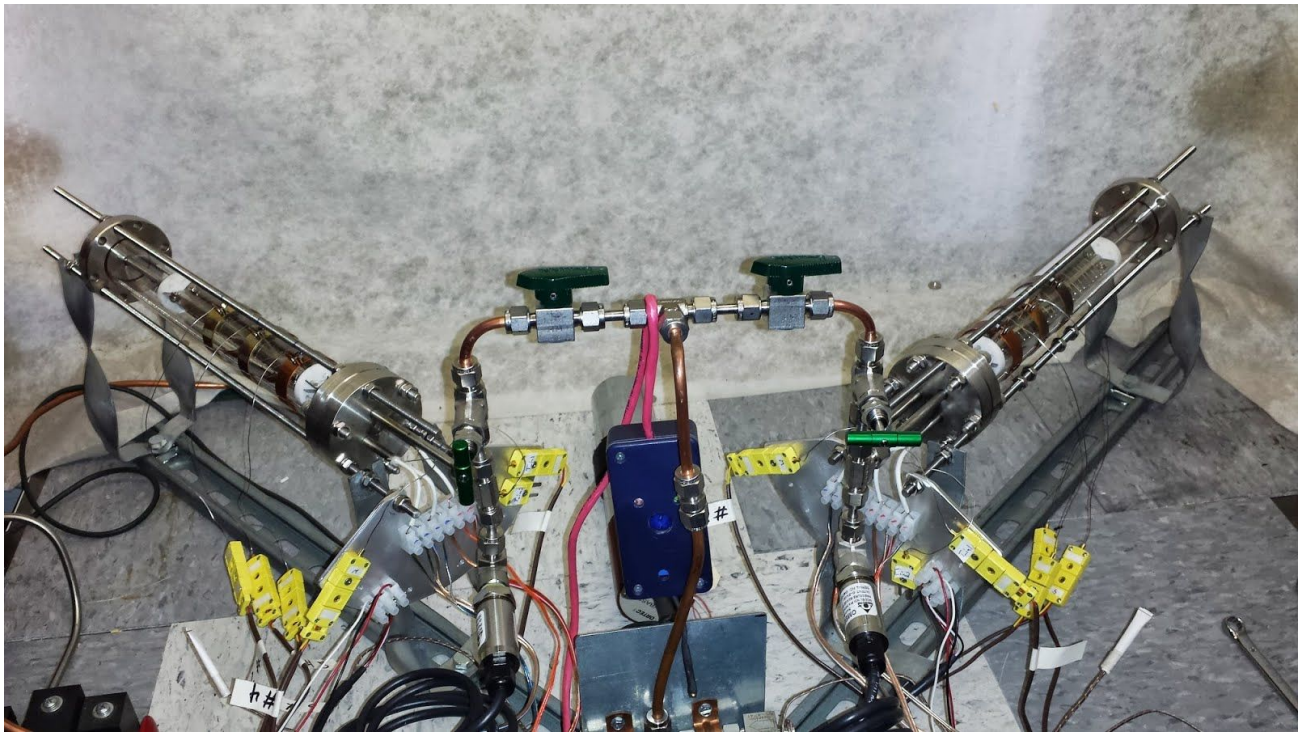


Image 2: Cell A (Control Cell). The external thermocouples are located under the copper bands.

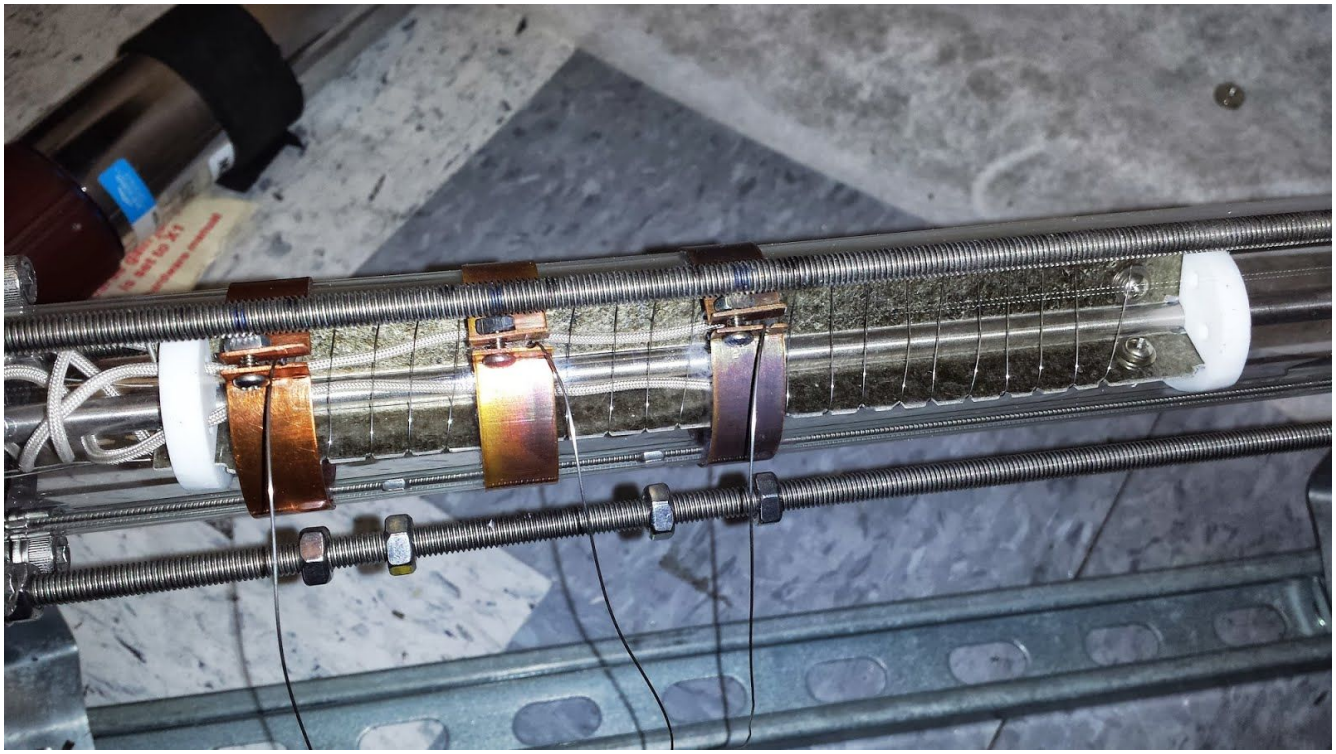


Image 3: Close up of Cell B (Active Cell) Note the apparent reddish color of one of the wires wound inside the cell. That is wire CuNi_1, the fully loaded wire presumably causing an anomalous heat effect. The reddish color is presumably copper from the oxides being reduced as the wire is “loaded” with hydrogen. The other wire, CuNi_2, has not been loaded yet, and retains its dark grey color.

Test Run Protocol

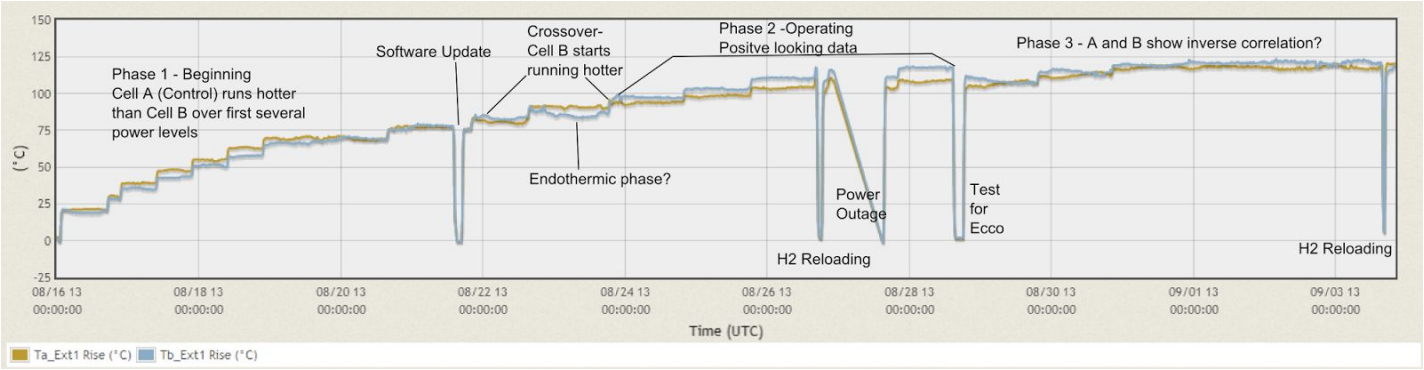
During this test the valves between the cells were open, guaranteeing operation at uniform gas pressure and composition in order to make comparisons between the cell temperatures as meaningful as possible. Each cell was heated through one wire while the other wire had 0.25W of power applied in order to accurately measure the resistance. The power in the heating wire was increased in 2.5W steps and held constant until the resistance of the CuNi_1 wire leveled off. Both cells were run at the same power levels at all times.

The hypothesis is that the active cell (Cell B) will enter a mode where it generates a significantly higher external temperature than the control cell (Cell A) indicating an anomalous heat effect.

Throughout the experiment, the temperature rise for each cell was compared. The Temperature rise is defined as the external glass temperature in the middle of the cell (T_Ext1) minus the ambient air measurement for each cell.

Results

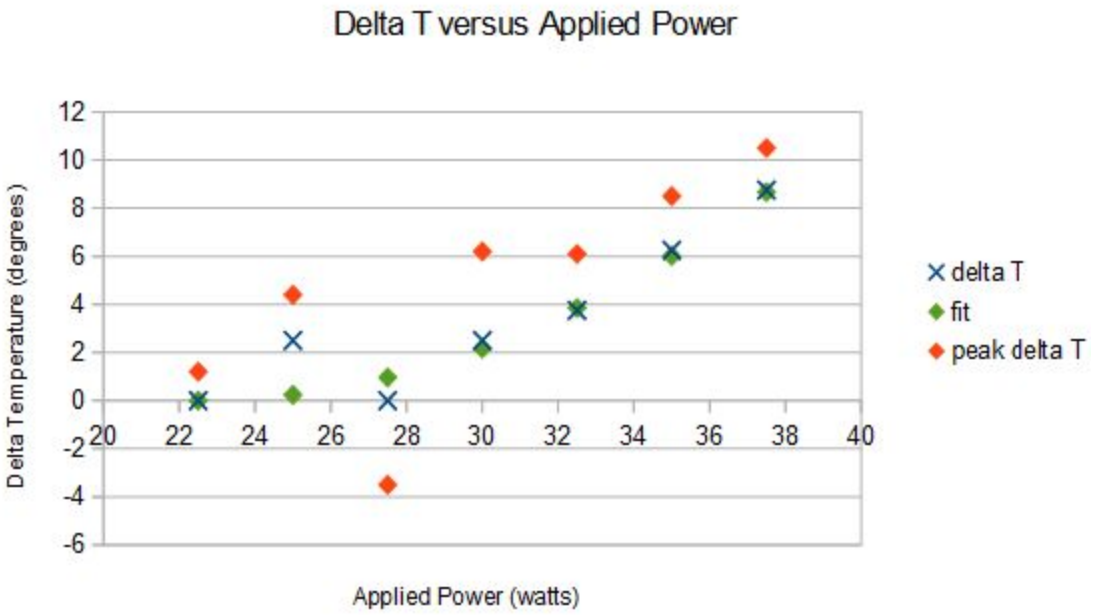
The first 2+ weeks of this experiment are in the graph below.
(Click for a larger image)



Phase 1 - Beginning
Stepwise heating at 2.5 W/step. The control cell tends to run hotter than the active cell at powers up to 22.5 watts.

Phase 2 - Excess heat production
At the 25W step, the behavior of the wire changes significantly. This happens to be the step right after the instrumentation software update which is highly unfortunate timing even though we are extremely confident in the validity of the software. At the beginning of this step and the next one, the behavior of the temperature after the power step started to rise after the power step and then fell again after several hours. In the 27.5W step, the active cell ran cooler than the control for most of it, prompting speculation of an endothermic phase going on.
From the 30W to the 37.5W step, the active cell continued to run at a higher temperature than the control cell.

Ed Pell's Chart of Delta T vs Power in (from this document)

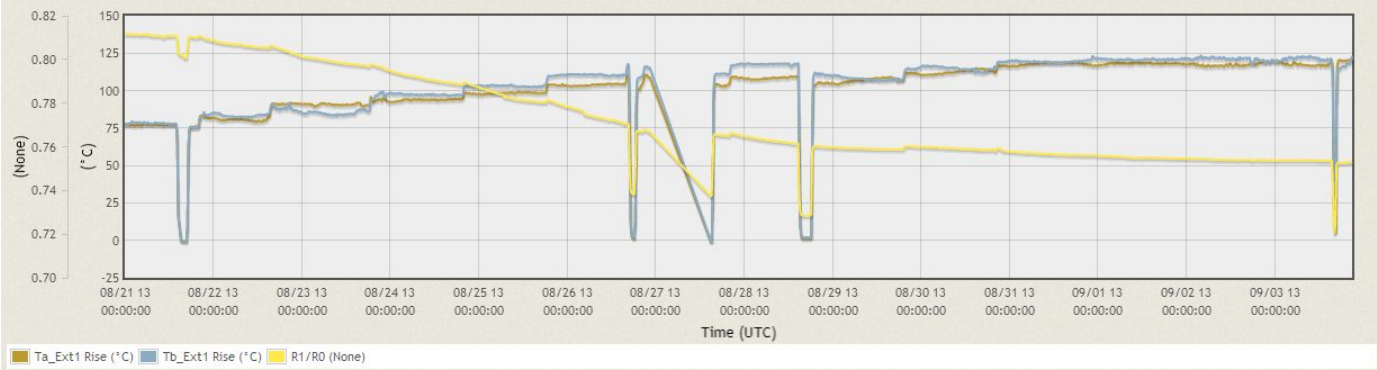


Estimation of Excess Power

- The best we can do is develop a correlation of Temp Rise vs Power In and apply the dT/dPin at that power to the difference in temperature between the active and control cells. In practice, we were not able to complete that because of variation of temperature rise in the control cell over time. We observed up to 5C ranging on Cell A T_rise at the same power between times when the cell was at the same power!!!

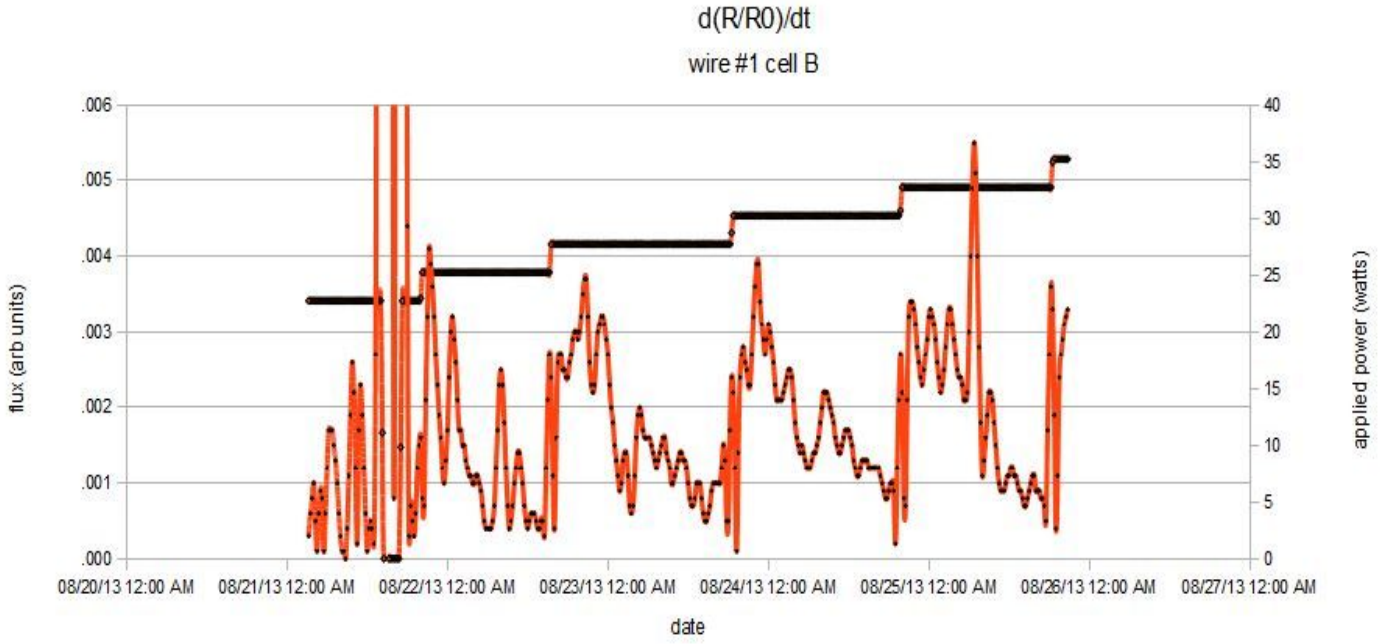
Excess Heat and Rate of Resistance Drop

The periods of apparent excess heat correspond with the steeper rate of drop in the resistance of the CuNi_1 wire. Since this has been shown to correlate to hydrogen absorption, this represents flux of hydrogen through the material, one of the factors shown to be essential in Pd/D electrolysis experiments. Once the flux stops, the excess power appears to stop, as well.



Oscillations in Rate of Resistance Drop

Taking the derivative of resistance line over time, we see a very interestingly structured pattern with a strong frequency component of about 3 hours on top of a major signal of approximately 24 hours during the time period of excess energy. The 24 hour periodicity is due to the power step ups. The 3 hour cycling may be the “breathing” of the wire - or periodic flux of the hydrogen.



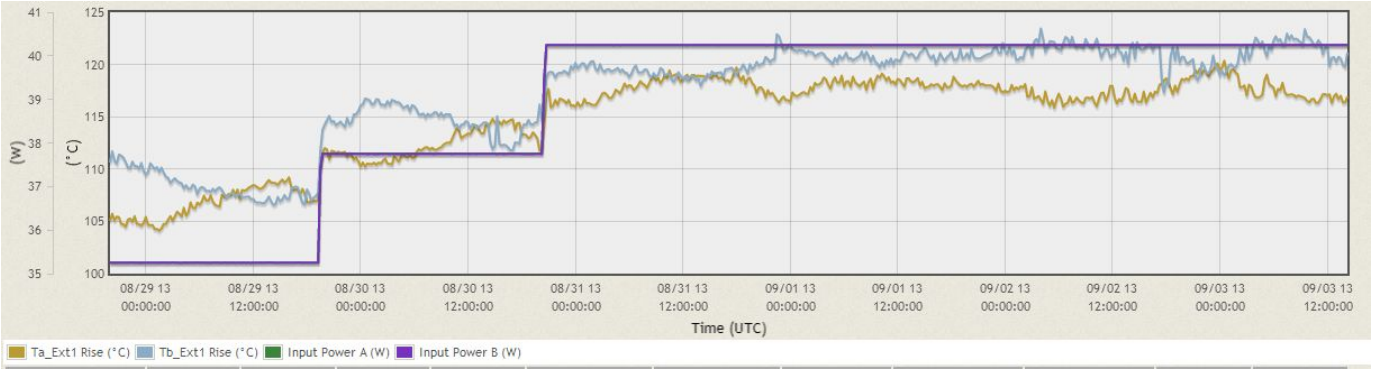
Ecco Test on 08/28/2013

This was a test proposed by a frequent commentor and intended to test the average temperature of the cells by their pressure change when cooled to room temp. Details can be found here.

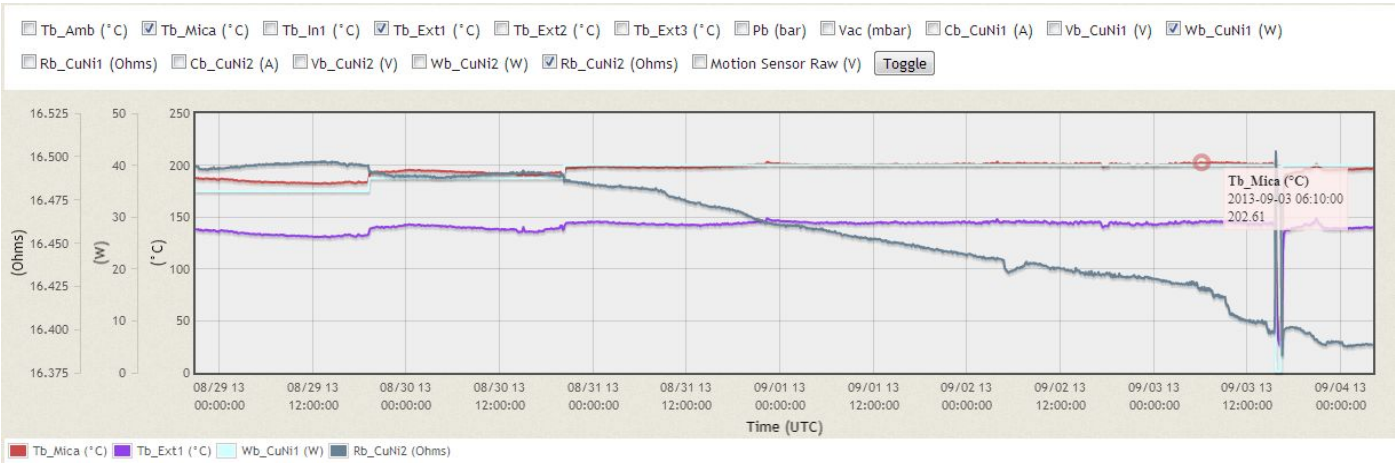
Phase 3

After the flux ceased in the CuNi_1 wire, we are seeing a strange inverse correlation between the temperatures in cell A and Cell B. I have no explanation for it, but suspect a simple physical phenomena of some sort in the air flow. The difference between them maxes out at about 6 degrees.

The key thing to note is that the mode of behavior has shifted significantly, lending support to the previous phase as something other than any instrumental bias.



The second Celani Wire (CuNi_2) is just starting to drop resistance and load at the temperature the cell is at.



Conclusion

This is the most interesting data produced in this lab to date. It is unfortunate that the data is messy with power outages, software changes, and other interruptions. The ambient varied a large amount in the lab room, as well, causing quite a bit of noise. Despite all of this, we have seen nothing that could explain why the active cell might run up to 10C higher than the control cell, other than an anomalous heat event.

As always, we are open to suggestions and criticisms. I recognize that this data is not

unassailable, even if it is promising. This reaffirms in our minds, however, that attempting to validate that this effect is real is a worthwhile endeavor and we call on anyone interested to scrutinize, suggest improvements, and do whatever they can to help make it all happen.