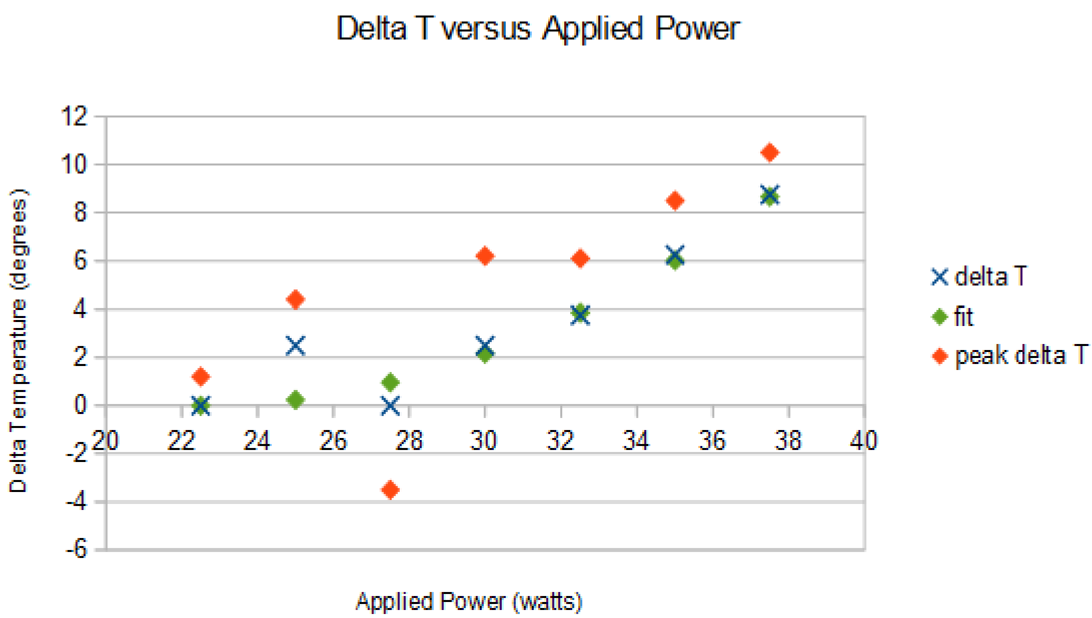
Some results from the Martin Fleischmann Memorial Project (MFMP) differential Celani wire experiment done by the Hunt Utilities Group (HUG) are presented here. The experiment consists of two identical reactors. Each containing two wires wound around a mica support contained in a glass cylinder. In cell A both wires are NiCr and in Cell B both are NiCu with Celani's coating. In both cells the power current is put through wire #1 and a small resistance monitoring current is put through wire #2. The power is held for about 24 hours before it is stepped up by 2.5 watts, starting at 22.5 watts and going up to 37.5 watts.

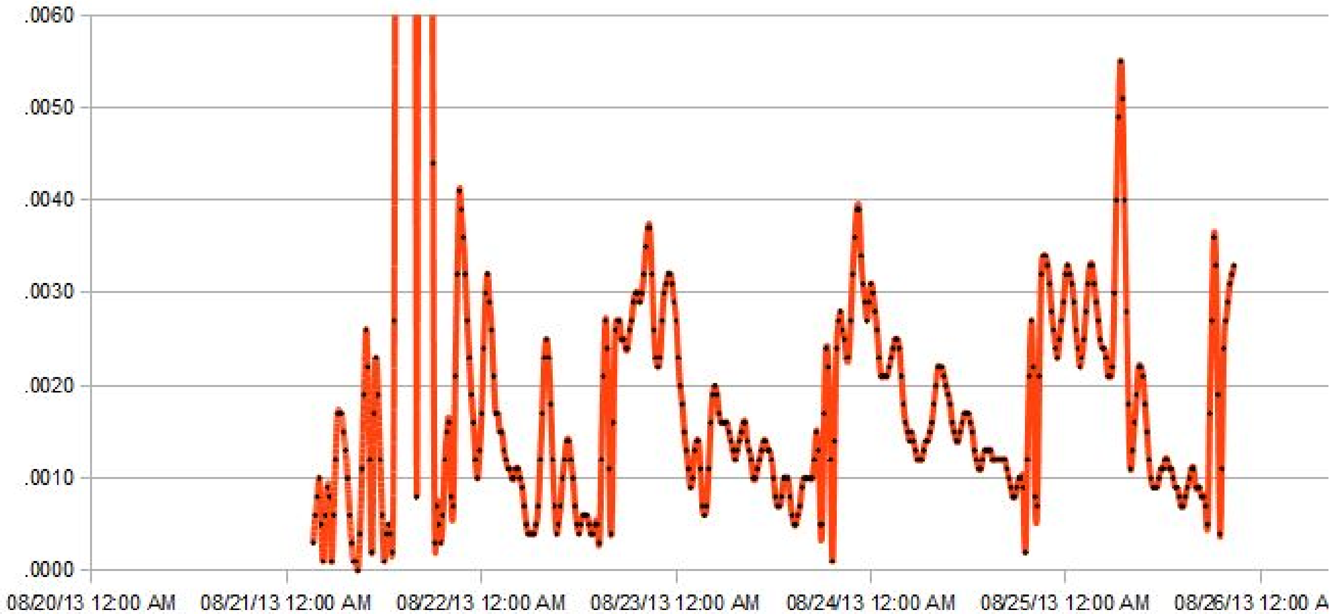
The first thing we notice is the higher temperature in the Cell B with the active Celani wire (see plot).



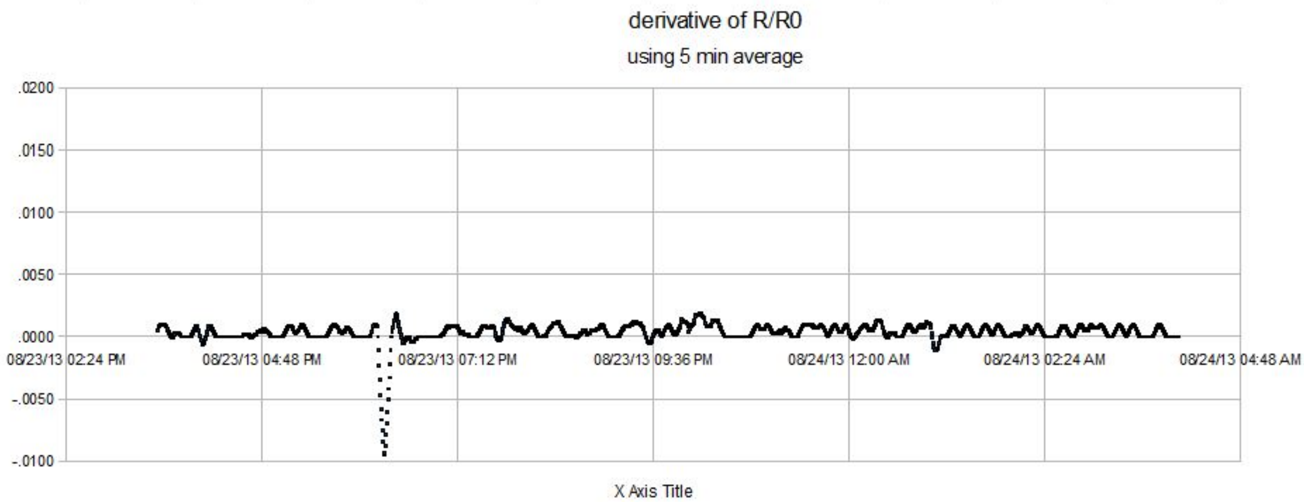
The excess temperature = K*((excess power – 22.5)^2). Whither this is the loading squared or the temperature squared is not yet known.

The excess power seems to have two components, a persistent component that is still present 24 hours after a step up in power, and a transients component that lasts about 13 hours from the step up. The transient peaks about 6.5 hours after the step. The details of the behavior near threshold need more study. Including possible endothermic behavior.

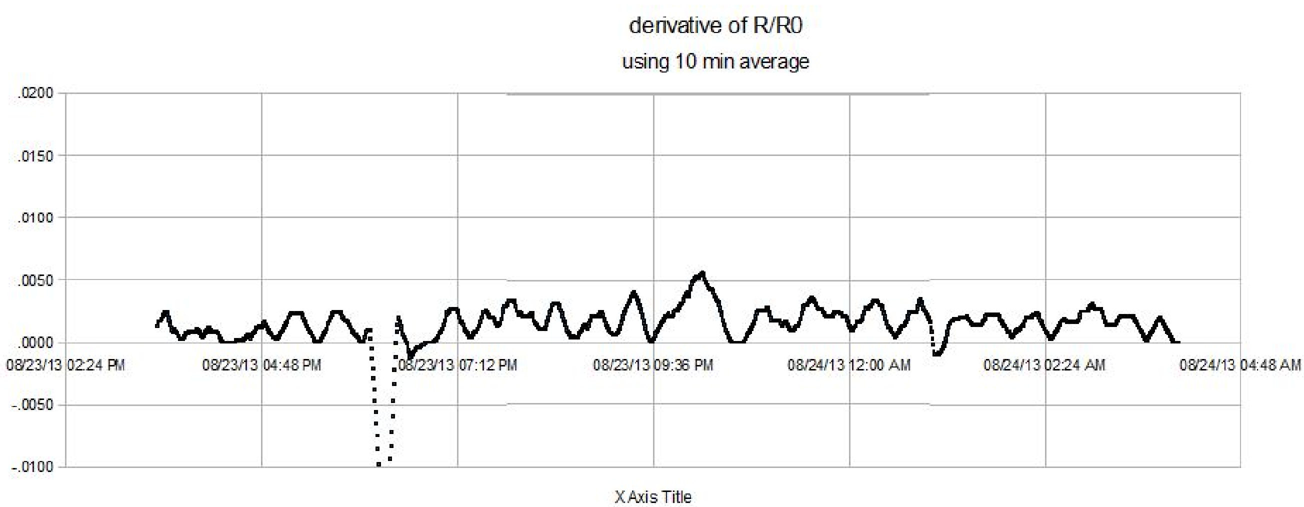
The other interesting observation is in the behavior of derivative of time averaged R/R0. Here we see the derivative, the flow, using a one hour boxcar average (below). There are oscillations with an approximate three hour period, for example on 8/25 at 12am. There is a structure on 8/23 at 10pm that looks surprisingly like Dardik's superwave. From this structure see the four plots below at various time scales (5mins, 10min, 20mins, 40mins).



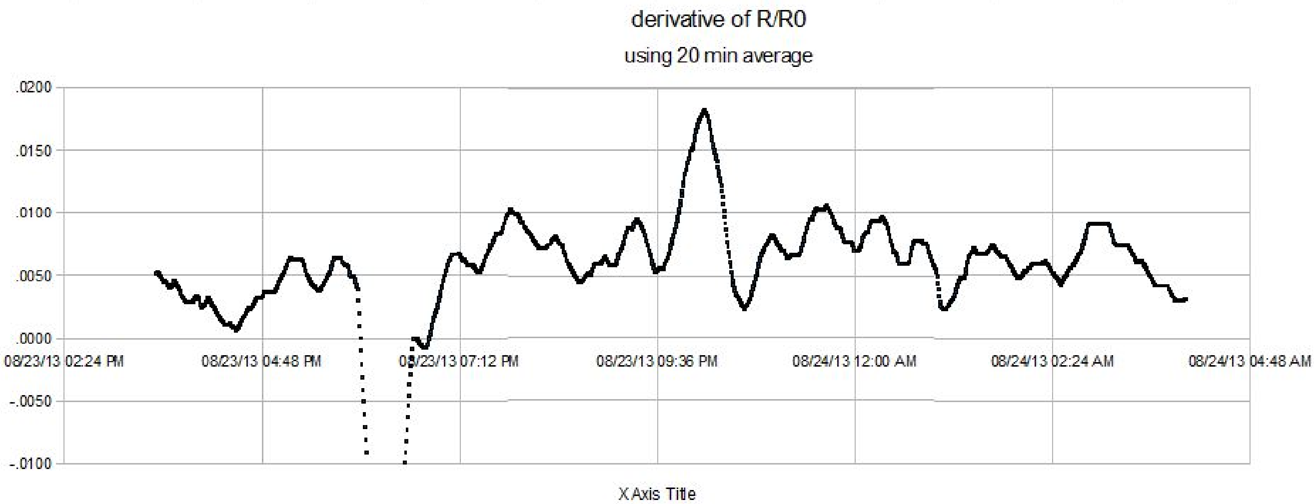
.0060
.0050
.0040
.0030
.0020
.0010
.0000
08/20/13 12:00 AM
08/21/13 12:00 AM
08/22/13 12:00 AM
08/23/13 12:00 AM
08/24/13 12:00 AM
08/25/13 12:00 AM
08/26/13 12:00 A

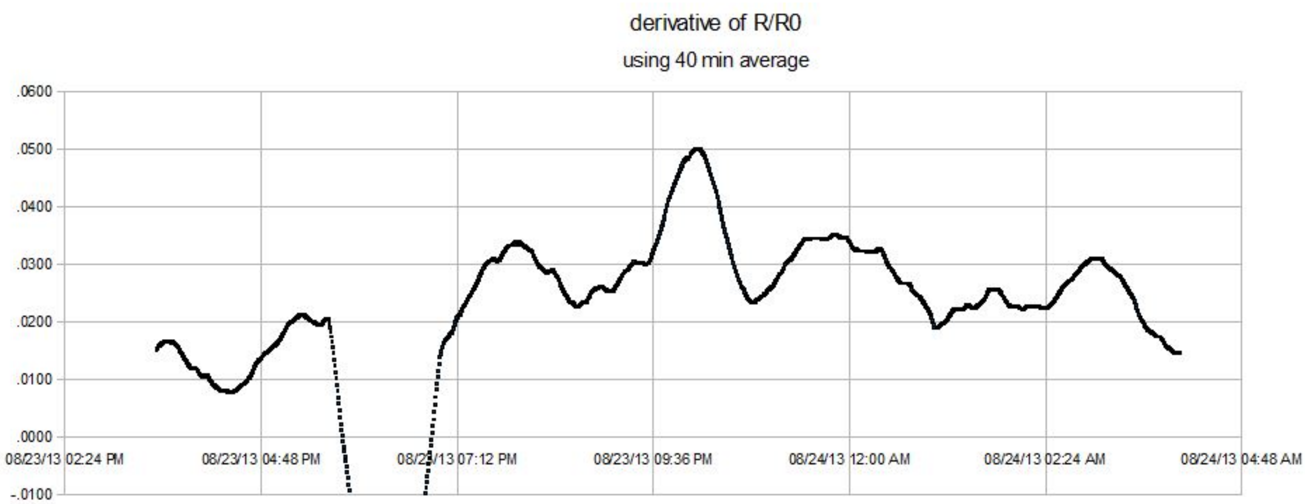


derivative of R/R0
using 5 min average
.0200
.0150
.0100
.0050
.0000
-.0050
-.0100
08/23/13 02:24 PM
08/23/13 04:48 PM
08/23/13 07:12 PM
08/23/13 09:36 PM
08/24/13 12:00 AM
08/24/13 02:24 AM
08/24/13 04:48 AM
X Axis Title



derivative of R/R0
using 10 min average
.0200
.0150
.0100
.0050
.0000
-.0050
-.0100
08/23/13 02:24 PM
08/23/13 04:48 PM
08/23/13 07:12 PM
08/23/13 09:36 PM
08/24/13 12:00 AM
08/24/13 02:24 AM
08/24/13 04:48 AM
X Axis Title

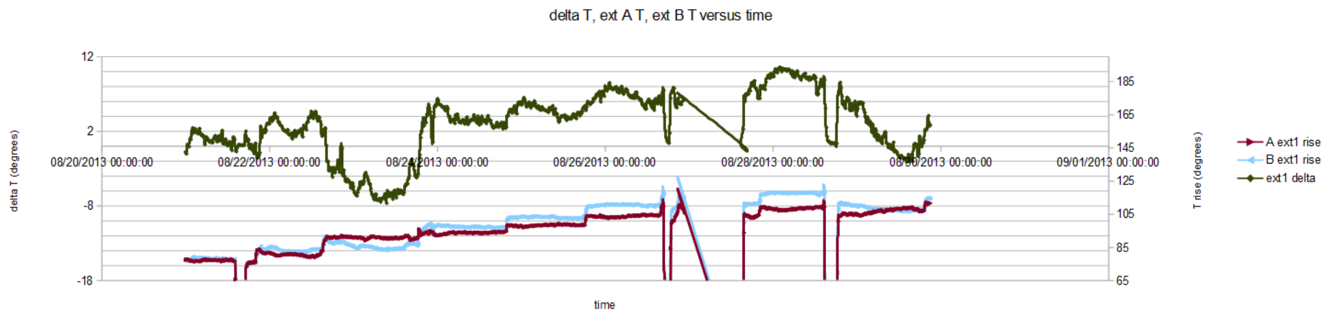


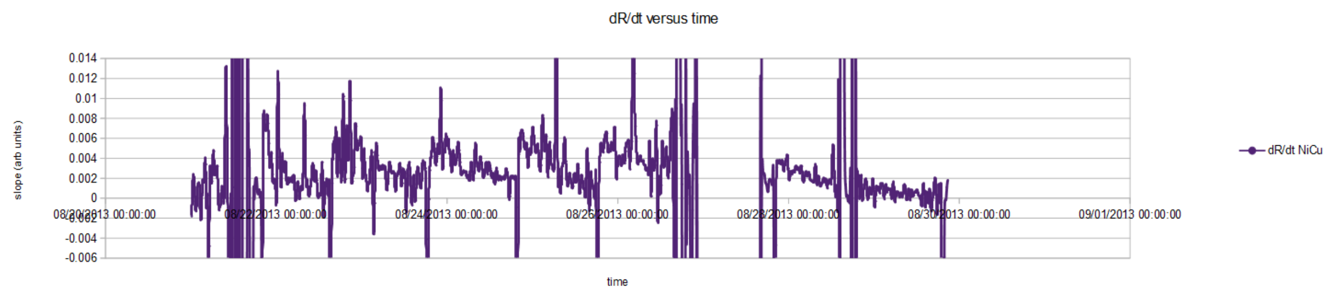


Clearly behavior on several time scales is present.

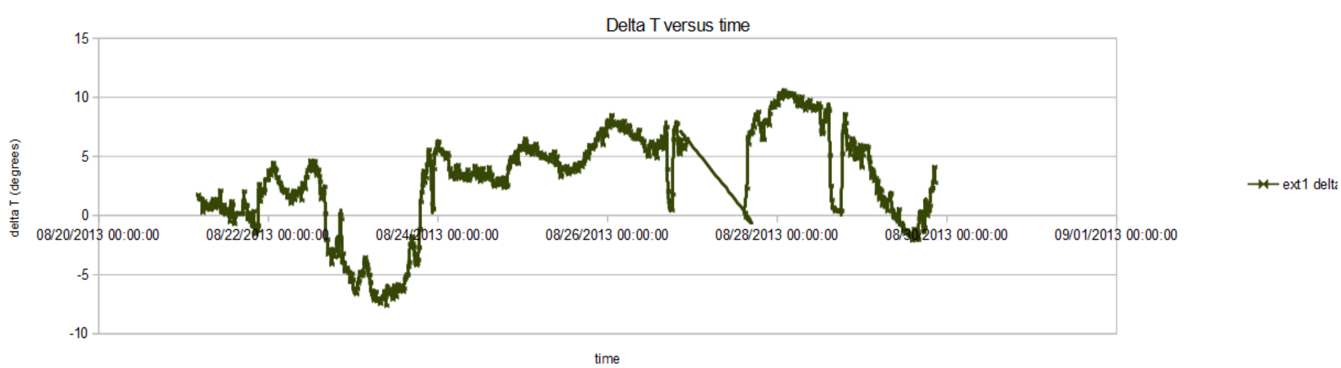
Using the diffusivity of hydrogen in nickel the three hour period would correspond to a distance of about 5 microns. It is possible this is the thickness of the layers added to the Celani wire. To study this one could compare the oscillation from the 434 layer wire, data show in this report, with data from the 360 layer wire, possible further work.

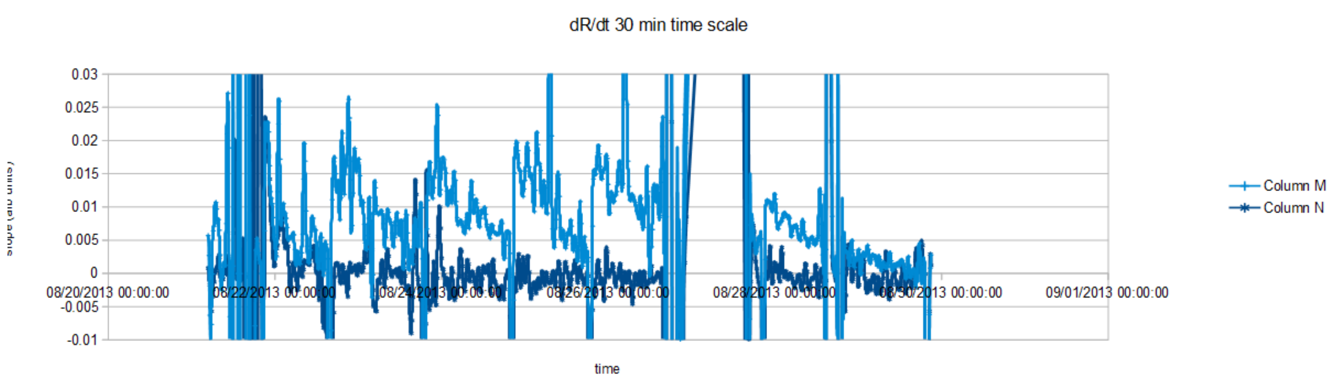
The 13 hour transient peak in excess heat after a step may be related to the 15-30 minute time scale value of dR/dt, loading, for the wire. The first set of plots below is the 15 minute average data, the second set is the 30 minute average data.





The plot below for 30 minutes averaged data also included dR/dt for the NiCr wire. It is lower by over a factor of 10 from the dR/dt values for the active NiCu Celani wire.





The last observation is on the final step where the power level is decreased the dR/dt value for the Celani active wire actually falls below the dR/dt of the NiCr wire. In parallel the Celani wire falls in temperature and the NiCr wire in Cell A rises in temperature a small amount.

There are many valuable follow up experiments and calculations to be done. We need to calibrate the temperature of the hot wire possibly using a wire with strong resistance change with temperature. We need to extend beyond 24 hours per step to see what happens to the persistent excess heat with time. Is it due to deep fluxes? We need to look at oscillations as a function of added layer thickness and wire diameter. We can study de-loading to see if that drive excess equally well as loading. We can try to setup a cycle between two steps that lasts only 6.5 hours to try to always have the extra excess heat from high short term fluxes. We can look at short time scale, say 5 seconds to 60 seconds for loading dynamics. My hope is that the lower diffusivity of nickel versus palladium will give significantly slower oscillation. That is, there will be no 166Hz cycles in nickel the way there are in palladium.

We could do thermal simulations to calculate the temperature of the wires from the mica and glass measured temperature values.

Celani wires offer an economical way to reach high temperature and offer coherent behaviors unlike powders. The clear and measurable geometries make them an ideal way to study the dynamics of anomalous heat generation by hydrogen gas on nickel, nickel alloys, and numerous nano-structured coating materials.

If you wish to dig deeper all the data is publicly available on the MFMP website for download. There is also a data browser built into the website for on the spot viewing.