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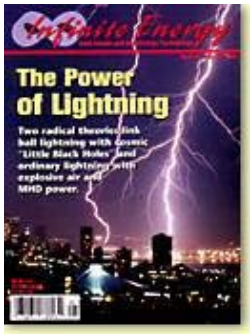

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New Energy Research Laboratory Device and Process Testing Update

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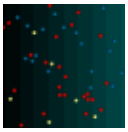
Conducted by Ed Wall and Gene Mallove July, 1999

Les Case Catalytic Fusion Cell

A cell that is derived from the work of Les Case has recently come into prominence. Russ George claims that it is "a large improvement on the work of Les Case and others" who have shown cold fusion evidence using catalytic type materials. In April, Russ George of Saturna Technologies, Inc. released a report on what may be one of the most important new cold fusion experiments ever conducted. The experiment was performed at SRI International, but SRI staff are not signatories to the report. The experiment reveals a monotonically increasing ^{4}He concentration over a 28-day period in a cell modeled after that of Les Case (see *IE* No. 19 and following issues). The helium concentration rises to 11 ppm, which is over twice the ambient atmospheric level of 5.22 ppm, thus appearing to rule out external leakage contamination. This device has palladium-doped activated carbon catalyst in a heated deuterium atmosphere. The full paper may be obtained at: http://rsrch.com/saturna/APSpapers_1998_1999.htm



Readers are urged to read George's report, which shows a control cell running concurrently with the active cell, showing only background helium levels ($\leq$0.5 ppm).

We are further encouraged to learn why perhaps Earthtech International's and our more limited attempt at replication have not shown excess heat. (Visit: http://www.eden.com/~little.)

As Vortex forum contributor Horace Heffner observed, "It looks like George used good control means, so it is really an issue of further replication at this point, I think." On Friday, April 9, 1999, on a nationally broadcast program on *NPR* with Russ George, hot fusion scientist Michael Schaffer of General Atomics praised the Russ George experiment as worthy of replication by many people. Indeed, replication is the key to acceptance of new energy phenomena, as we believe that the proof already exists, just not to everyone's satisfaction.

We initially obtained a small cell from Dr. Les Case, made from a World War II surplus oxygen bottle, which was demonstrated at NERL to produce excess temperature (see *IE* No. 19). Case's mantle heater was used, which covers most of the cell, but it left the top uncovered. Later on, in our efforts to perform accurate calorimetry— not just temperature measurement— we placed the same cell in the bottom of a large Dewar, and put a lid on the top. We were able to get very stable thermocouple temperature readings in the catalyst thermo-well and on the exterior

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Catalytic fusion cell of Dr. Les Case, pictured with catalyst in the hands of Dr. Eugene F. Mallove.

of the cell. We were able to vary these temperatures with different heater input powers, which would make for credible calorimetry.

However, even after many tries, we saw only hints of transient excess temperature in the heavy hydrogen run, compared with an ordinary hydrogen (protium) test. We believe now that this was a case of the measurement method destroying the process to be measured. Also, the many heating cycles that the cell underwent with hydrogen inside caused stress corrosion cracking of the cell wall, making it useless for further experimentation. Dr. Case graciously gave us another cell— one that had not been modified to a reduced-size chamber with a leak-prone perimeter weld.

In trying to reproduce the same conditions that Case uses, we replaced an older, less capable vacuum pump with a newer model; we used the same quantity of catalyst material; and we matched the previous gas pressure and catalyst temperature. But we had not yet worked with a thermal gradient across the catalyst. This Dewar calorimetry method was not suitable for producing adequate thermal gradients. So, we put these attempts on hold, until another idea came along. Instead of putting the cell in a closed Dewar, we placed the cell on its external heater in a chamber which had air temperature tightly regulated. Of course, the heater had to run much hotter than in the Dewar to get the same catalyst temperature. The thermal gradient across the catalyst was much greater and with a fixed ambient temperature, the wall and catalyst temperatures would be quite stable. But something very strange was observed. The slight variation in ambient air temperature seemed to be amplified in the catalyst temperatures. Using ordinary hydrogen in the cell, the ambient temperature would vary by 1°C over twenty-four hours and the catalyst would vary 4°C, tightly correlated with the ambient variation. A 4°C variation in catalyst temperature is unacceptable if we are trying to establish a credible DT excess temperature observed with deuterium over that of protium.

Now we have returned to using the Dewar, without a lid, much like what photos of Dr. Michael McKubre's (SRI International) and Russ George's equipment show. This increases the "thermal mass" of the system, so the time to steady state conditions is long, but temperatures are more stable.

In another initiative, with the help of engineer Jeff Driscoll of Quantum Energy Technology, a new design for a cell has been developed that employs a ConFlat-type metal-on-metal seal. The goal is to produce, at reasonable cost, a cell that can contain helium for extended periods and will stand up well to hydrogen. Stainless steel 316L or 318 are recommended; welding is not recommended. Helium is notoriously difficult to contain, even worse than hydrogen. If this design works out as a demonstration cell of the Case catalytic process, investigators could employ certified labs to determine helium concentration and $^{4}He/^{3}He$ isotope ratio in a method that could achieve widespread replication.

Versatile Water Flow Calorimeter

Scott Little of Earthtech has developed a fairly simple water flow calorimeter

(VWFC), which does not require calibration because it recovers virtually all of the heat generated by the device under test (DUT). This first came under serious attention when we were having problems using the water flow calorimeter provided with the Cravens-Letts cell described in this column in *IE* No. 24. That calorimeter does not have reliably high heat recovery in the water cooling loop. If modest excess heat were indicated, it would be in doubt— in part also from the issue of insulation variation between adjustments, which proved to be very frustrating. The as-received Cravens-Letts calorimeter had inadequate inlet water temperature regulation, which could cause misleading data. We learned that Dennis Letts was actually using Scott Little's water flow calorimeter in studying his cell, because of its reliability and well-controlled inlet water temperature regulation: http://www.eden.com/~little/vwfc/vwfc.html

Consequently, we decided it would be very worthwhile to build a similar VWFC, which we thought would be fairly easy, given the great advice that Scott Little has provided, but this was not the case. Our HP 34970A data acquisition system comes with proprietary software (in HP VEE) that will not allow the controlling PC to be used for anything other than communicating with the data acquisition system. This means that it cannot be used to control the temperature regulation of the inlet water heater/cooler. Ed Wall decided to attempt building an analog controller for regulating the inlet water temperature. That also is proved more difficult than anticipated.

We anticipate that once we have a working VWFC with good heat recovery, the measurement of heat from the Cravens-Letts cell and the Case cell could be accomplished with great reliability and accuracy.

Plasma Discharge Electrolysis Cell, Continued Analysis

We are still fascinated by the high concentration of calcium (229 mg/l) measured in the cell filtrate. We have now had every cell component tested for calcium content, except the commercially distilled water that was used in the apparatus. This includes the potassium carbonate, the ceramic insulator used for holding the carbon rod, and the PVC fixture, as well as the carbon rod. None of these can account for the calcium in the filtrate. We provided a calcium analysis of the carbon rods, the filtrate, and the detritus in *IE* No. 24 p. 35. Going further, we had an outside lab test the as-received K_2CO_3 powder and found it to contain Ca at only 6.1 mg per kilogram. The ceramic insulator holding the carbon cathode was tested and found to contain Ca at only 23 mg/kg.

We are planning to do a repeat series of runs using deionized distilled water provided by the testing laboratory, taking increased precautions against contamination. If we can achieve high calcium concentration repeatably, and perhaps observe Ca concentration build-up as a function of run time, this would be further evidence toward establishing Ca as a transmutation product (perhaps from the potassium in the electrolyte). Isotope assessment of the calcium could help nail down this conclusion.