Plante Cell Observations.
Speculative theory for Negative Resistance formation.

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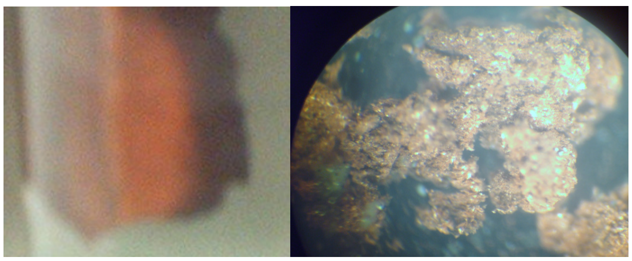
Continuing on from the Plante Cells observations of red dendrite growth on the Anode of a Plante cell whilst impulse charging, what follows is a speculative theory in preparation for experimental testing.



Left:- Anode showing red dendrite growth
Right:- 1000x Magnification of dendrite growth

Negative Resistance Claims
John Bedini and Tom Bearden have both claimed that a particular signal from a “radiant” charger (impulse charger) creates a negative resistor in the lead acid battery itself.

What exactly would the effect of a negative resistor within the battery itself have? How would we see its advantageous effects or gains?

The main related claims:-

- Increased Battery Capacity.
- Battery continues to charge after disconnection from charger.

Increased Battery Capacity
It is claimed that the conditioning process of the plates when charged with HV impulses as prescribed by John Bedini, reduces the size of the sulphate crystals and therefore reduces the Internal Resistance of the cell. This results in a higher capacity for the battery and more efficient charging.

This process describes the charging process of conversion of Lead Sulphate back into solution as the electrolyte. But once this process has finished, the cell then appears to continue with the red dendrite growths. It is almost as if the cell has accepted its conventional charge first, reforming the active spongy lead on the Anode and Lead Dioxide on the Cathode, before continuing to electro-plate the Anode with the red dendrites of probable Lead Tetroxide.

Speculation of location of Negative Resistor
It is my theory that the formation of Lead Tetroxide, a very strong oxidising agent, on the Anode of the battery, creates effectively a negative resistance at the:

$$Pb_{(s)} \,||\, Pb_3O_4$$

boundary of the cell.

Conventionally there appears to be at least 6 boundaries, each with a resistance associated with it.

$Pb||Pb_{(s)}||H_2SO_4||H_20||H_2SO_4||PbO_2||Pb$
1 2 3 4 5 6

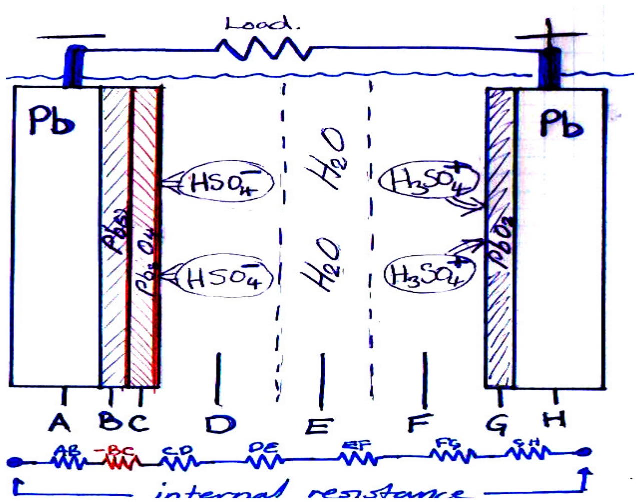
However, there appears to be at least seven effective resistive boundaries in the makeup of an impulse charged battery.

$Pb||Pb_{(s)}||Pb_3O_4||H_2SO_4||H_20||H_2SO_4||PbO_2||Pb$
1 2 3 4 5 6 7

The sum of these resistances equals the Internal Resistance of the cell.

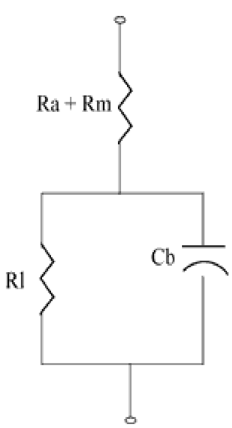
However, the formation of a strong oxidising agent on the anode might create the right conditions for another dipole to exist. This dipole would effectively add its energy to the discharging cell and act as a small internal cell in series with the actual cell.

The below drawing is an interpretation of where I see the formation of a negative resistance.



The red resistor in the series indicates where the dipole may exist.

The equivalent circuit diagram for a battery is as follows:



- **Rm** is the resistance of the metallic path through the cell including the terminals, electrodes and inter-connections.
- **Ra** is the resistance of the electrochemical path including the electrolyte and the separator.
- **Cb** is the capacitance of the parallel plates which form the electrodes of the cell.
- **Ri** is the non-linear contact resistance between the plate or electrode and the electrolyte.

Ri is where the extra dipole may exist, acting as an effective negative resistance.

Possible Effects

It maybe possible that a dipole at the boundary of the anode dendrite growth could create the following effects:-

- Decreased internal resistance.
- Lower self discharge rate.
- Increased Capacity.
- Self Charging.
- Higher terminal voltage for SOC.

Conclusions?

Nothing can be concluded here. I am speculating as to what might be happening and without experimental proof, it will remain speculation.

The electro-chemical processes in a lead acid battery are so complex that trying to find a definitive explanation is extremely difficult.

The internal currents of the battery, especially those of the Lead and Hydrogen ions are extremely important, but there is little written about them.

The experiment continues…..

Comments welcome.

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