

THE NATURE OF THERMAL ANOMALIES DURING ELECTROLYSIS OF LIGHT WATER.

(The reversible hydrogen-neutron cycle) Sidorov B. A., and Nevessky N. E.

Editor's note. The experiment presented and discussed below is delightfully simple and relatively safe – though care must always be taken when working with high voltages, particularly DC. If these very clear results can be replicated, it might well prove to be a starting point for interesting and potentially useful discoveries. The original paper can be found appended to the Laboratory of Experimental Physics website. Once again I apologise to the original authors if during my attempts at clarification of their meaning I have accidentally introduced errors into their fascinating paper. Alan Smith Feb 2016.

ABSTRACT.

Thermal anomalies seen during the electrolysis of light water are discussed and presented, together with the hypothesis that the excess energy here comes not from nuclear processes, but from deformation of the electron shells of hydrogen atoms.

Here the classical relativistic atomic model of hydrogen it is investigated, the orbit of electron is determined and relativistic corrections to its mass are located. Special attention is given to a limiting case, “small hydrogen”, where the electron flies in low-level flight just above the surface of the proton.

We show that the mass of the small hydrogen electron –because of its enormous orbital velocity- in this case grows $\sim 2.5X$, and the sum of the mass of this relativistic electron and its accompanying proton practically coincides with the mass of a neutron. Thus a “small hydrogen” atom which bears no overall charge can be considered as a model of a neutron. Also discussed are the problems connected with the spin and the magnetic moment of model neutrons. The energy relationships, which characterize the process of the displacement of hydrogen atom into the neutron and of the reverse (disintegration) process are investigated. In conjunction with this we describe ideas about the possibility of using a locked hydrogen - neutron cycle for the continuous extraction of excess energy from the sub-quantum space inside and between atoms.

HISTORIC RESEARCH.

Thermal anomalies during the electrolysis of light and heavy water were investigated by Pons and Fleischman. Because explicit evidence of nuclear transformations was revealed after electrolysis of heavy water - besides thermal anomalies in the electrolytic cell - the phenomenon was named ‘cold fusion’. However, similar thermal anomalies (and associated radiation) have also been observed with the electrolysis of light water.

Electrolysis was conducted using special electrodes – made from nickel or palladium with specially treated surfaces and using non-traditional electrical regimes for example, alternating current, high voltage etc. These earlier experiments still raise many questions. What is the cause of the reported thermal anomalies? Is it a nuclear process or something else which causes both excess heat and nuclear transformations? And from where and because of what is this additional energy manifested?

OUR ELECTROLYSIS EXPERIMENT

Reliable and invariably repeatable excess heat was measured when we passed both DC and AC currents through distilled water. Graphite electrodes and a 400V current were used. With both DC and AC currents about 30% more heat was developed using the electrodes in comparison with a simple resistance heater used as control.

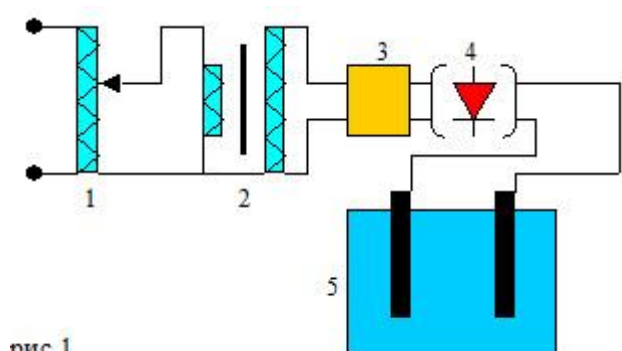


Fig 1. The Test System Schematic.

1. LATR the step-up transformer.
2. Wattmeter
3. Rectifying bridge (used only for work on direct current).
4. Electrolytic cell (calorimetric).

Editor's note. The numbering scheme in the diagram above seems to have suffered in translation, but the function of the various components shown is (fortunately) obvious. It is also worth pointing out that DC electrolysis at high voltage will yield both oxygen and hydrogen evolved as gases – even using distilled water without electrolytes. Since the DC experiment results are only mentioned in passing here, it is not clear if the excess heat energy mentioned also include the contribution of estimated heat energy from evolved gases. If not it is possible that HVDC electrolysis of distilled water demands further investigation and more fastidious calorimetry.

The excess power figure was based upon 10 controlled measurements produced by 10 different workers, and is an average result. To reduce heat losses during the calorimetric measurement, initial temperature inside the system was equal to the room temperature. Temperature was measured with the aid of a digital thermocouple with an accuracy of 0.10C.

Circuit parameters:

- electrode voltage in operating conditions: 400 v,
- power on the wattmeter: 15 w,
- the volume of water - 180 ml,

- Run time - 120 sec.

In the control experiments the water was heated by a simple resistor. Effective resistance for the control measurements: 360 ohms, 2 W. Wattmeter - electrodynamics, the class of the precision: 0.2. (? A.S.)

For clarity only the table of results for AC current is shown. The increases in water temperature for the control experiment are also shown, when 180 ml of distilled water was heated by a resistance submerged in the calorimeter. Power was applied for 120 seconds, with the indicated power level shown by the wattmeter to be 15 watts. Measurements using graphite electrodes instead of a resistance heater used the same power, exposure time and volume of water. The initial temperature of water used for all measurements was identical and equal to the ambient temperature of air in the laboratory.

№	1	2	3	4	5	6	7	8	9	10
$\Delta t^{\circ}_{\text{control}}$	2.2	2.2	2.1	2.2	2.2	2.2	2.1	2.2	2.2	2.2
$\Delta t^{\circ}_{\text{gas}}$	2.9	2.9	2.8	3.0	2.8	2.9	2.8	2.8	2.9	2.9
Excess heat (%)	31.8	31.8	33.3	36.4	27.3	31.8	33.3	27.3	31.8	31.8

Average level of excess heat in the test system when compared with the control system was 31.7%. This experiment is easy to replicate and shows that excess heat is a real phenomenon. Measurements using DC give analogous results. We also performed further tests using AC current and a 5% solution of Na_2CO_3 as electrolyte. No excess heat was seen in this case, with control and test results being equal.

WHAT THIS SUGGESTS.

These results showed us something new, that additional heat emission can be obtained using light water. The source of this additional heat is so far unknown. To claim that the source (of this excess heat) is nuclear transformation is hardly justified. Therefore we suggest the reason for anomalous heat emission is connected to the latent energy contained within deformed electron shells.

Our reasoning for this hypothesis about the electron orbits is based upon the information theory of electricity (ITE, [1]), which makes it possible to combine classical and quantum theories. This approach goes back to the ideas of de Broglie who suggested that the electron is a corpuscle (but not a wave), whose behaviour is corrected by a "stationary wave", which fulfils a control function. According to de Broglie there is no "wave-particle duality", but particle and wave are two independent

essences closely correlated with each other [2]. This approach makes it possible to discuss particle orbits, without losing sight of wave manifestations in the behaviour of electrons.

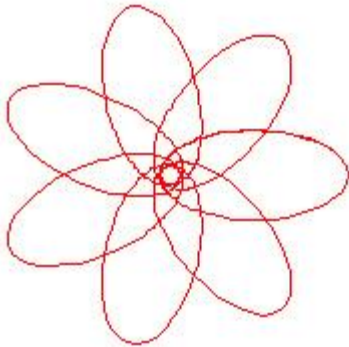


Fig. 2

The deformation of electron orbits in hydrogen atom was examined by Sommerfeld [3]. If the electron, which moves along the circular (1-oy Bohr) orbit, returns in view of any disturbance to its kinetic energy, its orbit is deformed. In the first approximation, it is converted into the ellipse with the proton in the focus. In the following approximation, which considers a change in the mass of electron with speed, we will be to have the ellipsis continuously being displaced at perihelion, ceating "the rosette of Sommerfeld"

(fig.2). The equation for finding the orbit takes the form:-

$$\frac{d}{dt} \left(\frac{m_0 \vec{v}}{\sqrt{1 - \beta^2}} \right) = - \frac{e^2}{r^3} \vec{r}$$

where $\vec{v} = \dot{\vec{r}}$, $\beta = v/c$.

This is the beautiful and accurately described expression showing about the motion in the central field.

The shape of the orbital is given by:-

$$r(\varphi) = \frac{p}{1 + \varepsilon \cos(k\varphi)}$$

where p - «the parameter», ε - eccentricity, и k - "розеточность" (? A.S.) - are expressed as the energy E and the moment of momentum M of the electron:

$$p = \frac{M^2 c^2 - e^4}{e^2 E}, \quad k = \sqrt{1 - \frac{e^4}{M^2 c^2}}, \quad \varepsilon = \frac{1}{e^2 E} \sqrt{(e^2 E)^2 + (E^2 - m_0^2 c^4)(M^2 c^2 - e^4)}$$

When $k < 1$, then orbit is displaced. With small deformations the displacement comprises $\Delta\varphi = \pi\alpha^2$ for the revolution [$\alpha \approx 1/137$ - *fine structure constant*], which in the conversion to the wavelength of the corresponding emission gives: $\lambda = 1,7\text{mm}$. This emission can in principle accompany electrolysis and cavitation, and there is good reason to explore it further here.

It is important to recognise that the energy of this deformed atom is less than the initial energy level, as the process of deformation of the electron orbit is exothermic. The electron has a different Kinetic Energy level in the inner and outer orbits amounting to 13.6 eV. This is not a trivial difference and can explain the observed thermal anomalies.

It is possible to continue this line of reasoning and examine the following (second) deformation of the electron's orbit, which returns it back the circular form but now it follows an extremely small 'compressed' path, located just above the very surface of its accompanying proton. This configuration is the so-called "small hydrogen".

The electron's velocity in this situation reaches sub-light values. Its relativistic mass thus noticeably grows, and entire proton-electron system becomes heavier. It is not difficult to estimate how much heavier. Using the centrifugal force rule of Coulomb, we obtain the equation: -

$$\frac{m_0 v^2}{r \sqrt{1 - \beta^2}} = \frac{e^2}{r^2}$$

Where we have a known radius - this is the equation for the speed. To determine the possible minimal radius of the electron orbit in "small hydrogen" we take as a starting point the Compton radius of the proton:

$$\Lambda_p = \frac{2\pi\hbar}{m_0 p c} = 1.321 \cdot 10^{-13} \text{ cm, and then we will obtain:}$$

$$\frac{\beta^2}{\sqrt{1 - \beta^2}} = \frac{e^2}{m_0 c^2} \frac{1}{\Lambda_p} = 2.133$$

From here let us find: $1/\sqrt{1 - \beta^2} = 2.5284...$ Thus, in the closest potential orbit the mass of electron increases by a factor of 2.5 and it becomes equal to:- $m_0 \cdot 2.5284 = 1.292$ Mew.

Note that under these circumstances the masses of neutron and 'small hydrogen' neutron model are almost equal according to reference data:- $m_n - m_p = 1.2935$ Mew.

“Small hydrogen” atoms can thus mimic neutrons, since there is parity of their charge states and almost 100% agreement between their masses.

The idea that the neutron is actually a composite particle formed from a proton and an electron was discussed at the dawn of the discipline of nuclear physics (see, for example [4]). The basic difficulty in accepting the composite neutron model lay in reconciling the balance of spins and magnetic moments. Actually, in the proton, electron and neutron we see identical spins: $\hbar/2$. However the magnetic moment of both proton and neutron is less than the magnetic moment of a free electron. Mote and Bohr stated that in the nucleus, associated electrons are by no means free, and under extreme conditions they are not completely obliged to behave as expected. Nuclear electrons can “undergo a change in individuality”, by ceasing to spin for example, which would explain the (so far) incomprehensible disappearance of magnetic moment in the Bohr magnetron.

Recently a paper published on the web suggested that with the aid of special technology it is possible to stop the rotation of even free electrons. The electron in this case was said to decompose into two particles - the “colon” (electron without spin) and “spinon” - a particle analogous to the neutrino (?) and which captures and retains the system’s entire angular momentum.

In the course of time this concept of “small hydrogen” was abandoned by modern physicists, and the neutron was confirmed to be not a composite structure but a true elementary particle. However, the equivalence discussed above between the raised mass of a ‘small hydrogen’ atom and the mass of the neutron serves (in our opinion) as a strong argument in favour of reviving this earlier hypothesis.

“Small hydrogen” where the electron is in its minimum radius orbit must be viewed as the end product of a number of sequential deformations of the hydrogen atoms electron orbit. There must exist transitional forms between normal hydrogen and the maximally convoluted ‘neutron mimic’ hydrogen. These transitional or intermediate forms are themselves of interest, since they should possess very special properties.

The maximally condensed forms in particular are neutral in charge and thus possess the ability to approach other atomic nuclei closely and to initiate nuclear processes. Despite being charge-neutral they can possess a large magnetic moment (\sim electronic) and thus have noticeable magnetic properties (for example, they can be retained/controlled by ferromagnetic screens).

During the condensation process energy is released - this is an exothermic process. In a best case scenario the transformation of a ‘normal’ atom of hydrogen into small hydrogen releases energy as shown by:-

$$E_H - E_n = (m_0 c^2 - \frac{e^2}{a_B}) - (\frac{m_0 c^2}{\sqrt{1-\beta^2}} - \frac{e^2}{\Lambda_p}) = 0.309 \text{ Mev}$$

This is an enormous amount of energy, and the matter does not end here. On the contrary, next comes the most interesting part of the process, the restoration of the deformed hydrogen atoms to their initial form, which is necessary to complete the cycle.

The maximally convoluted atom of hydrogen experiences *b*-decay. This is a spontaneous process which goes against the Le Chatelier principle, in that it increases and not decreases the total energy released. It occurs because of unknown and mysterious processes.

Editor's note. I found the paragraphs below very difficult to untangle, and I must confess that 'ITE' is a hypothesis I am not at all familiar with. A search failed to find the relevant literature except in Russian, but I am interested in knowing more if a reader could point me in the right direction. But for the moment, if anyone who wishes to correct any accidental errors incorporated below after referring to the original document please let me know.

For an explanation (or description) of this mystery we advance one general idea, "the principle of the flickering charge". A justification for this can be found within the framework of the information theory of electricity (ITE). According to ITE, the interaction of charged particles is a complex multistage process. It begins with the exchange of information, proceeds to a stage of assessment and agreement with the internal system requirements/regulators and only after this is any action completed. Between a cause and this effect there is always is a time lag, which may be extended by external factors both planned and unplanned.

When we adopted this idea to explain what we see in the laboratory. Actions are produced independently, the electric field is information, and "charge itself" should be seen as a measure of the ability to create or to receive field. Thus the claim that the charge can in our experiments be made to "twinkle", i.e., be turned off or vanish is thus justified. This twinkling appearance and disappearance of charge can be catastrophic in effect and lead to system disintegration and consequent emission of radiation.

During the vanishing of the charge of the proton or (with equivalent effect) the temporary inability of the electron to respond to the charge on the proton, the orbiting electron is ejected from its orbit carrying huge amounts of kinetic energy.

$$\frac{m_0 c^2}{\sqrt{1-\beta^2}} - m_0 c^2 = 0.781$$

This energy is calculated to be:- Mew, exactly equal to the maximum energy of *b*-decay. If the 'off time' of the charge is small and electron is not completely ejected, then its energy will be somewhere between 0 and 0.78 Mew. This energy spectrum is continuous and not quantized.

What mechanism underlies twinkling is a very important question, and one we cannot yet answer. For us it more important that twinkling triggers spontaneous *b*-decay and restores our system to its initial state, thus completing the cycle ce call the hydrogen-

neutron cycle. This cycle of events makes it in principle possible to create a powerful source of renewable energy.

CONCLUSIONS

Thus to sum up, the hydrogen-neutron cycle consists of two parts. Firstly the deformation/transformation of a hydrogen atom into a 'model neutron', and secondly energetic β -decay caused by the ejection of the hydrogen atom's closely orbiting electron. The first stage yields 0.309 Mew, and the second 0.781 Mew. The total (maximum) energy in this case comprises: $0.309+0.781= 1.09$ Mew. For each cycle and for each participating atom of hydrogen!

One gram of hydrogen is capable of yielding during this cycle $\sim 10^{10}$ GeV! (?A.S.) Moreover, this energy is continuously renewed. At the start and end of these cycles we have the same water in our system as we had at the beginning, its substance (mass) does not change, even though enormous energy is released. The actual source of this energy is not the water *per se*, but the sub-quantum medium (ether, physical vacuum etc, – the name is not important) which fills all intra and extra-atomic spaces and is permanently and continuously utilized by inhabitants of the atomic scale microcosm for their vital activities.

The prospects and possibilities arising from this discovery are hugely important! And they are more readily accessed and understood because of the information theory of electricity - TIE. Any new theory of electricity will also unavoidably lead to the preconception (*sic*) of intra-nuclear phenomena. To this end we remind readers of this classic quote:- "There are no quanta, and there are no nuclear forces. There is the unrecognized electricity".

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