Some comments about LENR

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Abstract

This reprsesents a polished version about my first impressions about the article of Parkhomov et al coming from the listening of the talk emphasizing the essential points.

1 Experiment

The basic arrangement was following.

1. My very rough understanding is that there was Ni target surrounded by hydrogen gas. I understood that it is absolutely important that there are no inpurities involved. Otherwise the hydrogen cannot be absorbed properly on Ni catalyst and one does not obtain energy production and "cold fusion". One might think that in the ideal situation each Ni atom absorbs at least one H atom. This would explain also why its crucial to have Ni surface free of inpurities.

2. There was feed of energy by induction heating. 630 W from the secondary coil of induction heater - the cylindrical structure containing the Ni was inside the coil. The temperature inside fuel was between 200-1500 C.

What was found?

1. What was observed was heat production with COP below 3.5 and the heat production lasted 7 months. 2.1 MeV per Ni atom was produced during the period finished when COP went below 1. If only Ni atoms sufficiently near to the surface of catalyst were hydrogenated and used, this suggests that the amount of energy per Ni atom at surface was higher. The binding energy per nucleon is below 7-8 MeV.

2. Also Li and heavier isotopes were detected in the target, in particular the amoung of Ca increased from 1 per cent to 23 per cent at the surface of the inner ceramic tube. He, D, and T were not observed which was probably due to the difficulty of detect them.

3. The amount of Ni was not observed to change: this is in contrast with the reports of Rossi but in accordance with the findings from other experiments. Ni would act as a catalyst.

2 TGD based model

TGD based model is inspired by TGD based view about dark matter as phases of ordinary matter with non-standard value of $h_{eff} = n \times h_0$ effective Planck constant, the findings of Holmlid about "cold fusion" that inspired TGD based model of cold fusion [**?**, L4, L5], and the discovery of Pollack [L1]. Recently I extended this model to a model of ordinary nuclear reactions: the tunnelling phenomenon assumed in the standard model as prerequisite of hot fusion is replaced with the formation of dark nuclei as intermediate states and the only difference is the high temperature making the process self-sustaining [L7].

1. Pollack found that when one irradiates water - say by IR light- in presence of gel bounding the water, one finds that negatively charged regions- exclusion zones (EZs) are generated. These regions have strange properties: Stoichiometry is $H_{1.5}O$ rather tha H_2O and a layered structure consisting of hexagonal lattices is formed. EZs clean out inpurities.

2. Part of protons must go somewhere. The TGD proposal is that they go to magnetic flux tubes forming dark protons with effective Planck constant $h_{eff} = n \times h_0 = n \times h/6$ (by some anomalies [L3]) there with Compton length scaled up to much longer Compton length. They would form dark protons as sequences of dark protons. The nuclear binding energy would scale down like $1/h_{eff}$.

3. The model for "cold fusion" inspired by Holmlid's findings leads to the proposal that the Compton length becomes essentially electron Compton length and thus roughly 2000 times longer than proton Compton length. The binding energy scales from MeV range down to keV range.

4. The dark proton sequences can transform to ordinary nuclei and this liberates essentially the total nuclear binding energy. Some fraction of the dark nuclei, maybe most of them, leak out of the system along magnetic flux tubes.

TGD suggests following mechanism in the experiment considered.

1. The Ni atoms sufficiently near to Ni surface had adsorbed H atoms, at least one per Ni atom in the ideal situation. The energy pulse from induction heating induced the transformation of H atoms to dark proton plus electron (maybe also dark). Dark proton went to magnetic flux tube and several of them could go to single magnetic flux tube forming a dark nucleus consisting of only dark protons. The value of $h_eff = n \times h_0 \sim 2000 \times h$ from the model for the experiments of Holmlid. This means that proton Compton length was about electron Compton length. The nuclear binding energy was scaled dow by a factor 1/2000 so that it was few keV. One can ask whether dark protons with electron size and electrons formed kind of bound states.

2. The resulting dark nuclei decayed spotnaneously to ordinary nuclei liberating practically all nuclear binding energy. When all N-H complexes were transformed to dark protons, the process stopped. For He the binding energy per nucleon is about 7 MeV per nucleon. The total energy produced per Ni atom is about 2.1 MeV during 225 days. The energy produced per single surface Ni atom is larger. This energy conforms with the scale of the nuclear binding energy.

3. COP is proportional to the rate at which the Ni-H complexes at the surface of Ni produce dark protons at the flux tubes. If all Ni-H complexes produced dark proton during the process one can estimate from this the rate at which dark protons are produced.

Nuclei with neutrons must be also generated. TGD suggests 3 alternative options.

1. The dark nuclei consisting of mere dark protons could transform first to ordinary unstable nuclei consisting of only protons and then decay to stable ordinary isotopes. Even dark protons sequences could decay to unstable ordinary proton sequences and then decay to ordinary nuclei.

2. Also ordinary nuclei are predicted to be nuclear strings consisting of protons connected to each other by bonds, which are essentially like mesonic strings with colored quark and antiquark at ends with vanishing total color.

   These mesonic strings can be both neutral and charged and if basic entity is taken to be proton+ mesonic string one can have proton like states with charge +1 and neutron like states with charge 0 and also states with Delta like states with charge +2. If this picture is correct, neutrons in nuclei could be this kind of units rather than genuine neutrons - or both options might be realized meaning the existence of exotic nuclei having perhaps energy differences in keV scale.

Also dark nuclei could have this structure result from the transformation of neutral mesons to charged mesons by emission of weak boson. Weak bosons could be also dark with large h_{eff} and if the value of h_{eff} is large enough they could be effectively massless below their scale up Compton length. This would make weak decays fast.

3. The protons in the dark proton sequence can transform to dark neutrons by emission of weak boson. As ordinary weak decays the process would occur in time scale of minutes assuming that ordinary weak interactions are in question. If the scaling of binding energies does not affect the ratios of weak rates, one might hope that the stable dark isotopes are same as stable ordinary isotopes.

Both options explain the findings qualitatively.

1. Heavier isotopes are produced from dark nuclei via decays to ordinary ones.

2. The amount of Ni would not change. Ni would act only as a catalyst: what this means in TGD inspired biology involves also the hierarchy of Planck constants in an essential manner. The reduction of h_{eff} for flux tube connecting reactants and catalyst would shorten the flux tube brining reactants together and the energy liberated would kick the reactants over the potential wall making the reaction very slow.

3. TGD based model for the 10 year old anomaly of solar nuclear physics [L7] (see `http://tgdtheory.fi/public_html/articles/darkcore.pdf`) assumes that tunnelling effect in nuclear reaction involves formation of dark nuclei in the proposed sense as intermediate states so that dark fusion would be essential element of nuclear physics. The anomaly tells essentially that the nuclear abundances inside Sun deduced from solar seismology are higher than those deduced at the surface of the Sun and from meteorites. The explanation would be that nuclei can be in both ordinary and dark states inside Sun and dark nuclei are visible via seismology. the high temperature excites the dark nuclei: the increase of h_{eff} indeed requires energy and this explains why also "cold fusion" requires energy feed.

   One cannot therefore exclude the formation of dark Ni and dark proton fusion to heavier elements but it might be very slow process at temperature considered.

4. In hot fusion the high temperature is needed. The thermal energy is of the same order of magnitude as the binding energy of dark nuclei. This allows to understand why the process continues spontaneously. In low temperatures one must feed energy to kick protons to dark state.

Concerning the detailed mechanism of reaction, Pollack effects suggests further guidelines.

1. In the case of electrolysis the mechanism would be the same. In this case one can also consider the possibility that electron continues along current wire to the opposite electrode and some fraction of protons becomes dark. This would however create a net negative charge at the level of the ordinary matter.

2. In the recent case Pollack effect suggests that a negatively surface charge is generated and corresponds to EZ. Incoming hydrogen atoms would be ionized and give electrons to the Ni surface unless they have already lost them, and would be transformed to dark proton sequences at magnetic flux tubes. Macroscopic quantum effect involving quantum criticality in TGD sense (large h_{eff} means long range quantum correlations and quantum fluctuations is in question) and this effect is expected to be extremely sensitive to the purity of Ni surface.

3. Magnetic flux tubes could allow the dark proton sequences to leak out from the system so that energy from decays to ordinary nuclei would be lost. One could test whether the material structures involved with experiment contain transmutated elements. One could also perform a test with targets with known composition to see whether dark nuclei transform to ordinary ones outside the reactor volume.

4. Note that magnetic flux tubes would carry monopole flux: this distinguishes TGD from Maxwellian theory and actually all competiting theories of TGD, where these entities are not possible. The monopole flux tubes are central in TGD inspired quantum biology and solve several problems such as the existence of magnetic fields in cosmic scales, stability of Earth's magnetic field [L2], and the quite recent findings about magnetic field of Mars suggesting that Mars could have "dark" magnetic field of roughly same strength as Earth's magnetic field visible only through auroras ("magnetic madness" was the term used in popular article) [L6].

In the method of Brillouin Energy Corporation the situation was very similar as in this experiment and essentially the same model explains the findings. Now hydrogen was in high pressure and energy feed was by high power electromagnetic puses (Q-pulses). They argued to have produced ^{4}He. They do not tell about how they measured its production.

REFERENCES

Articles about TGD

[L1] Pitkänen M. Pollack's Findings about Fourth phase of Water : TGD View. Available at: http://tgdtheory.fi/public_html/articles/PollackYoutube.pdf, 2014.

[L2] Pitkänen M. Maintenance problem for Earth's magnetic field. Available at: http://tgdtheory.fi/public_html/articles/Bmaintenance.pdf, 2015.

[L3] Pitkänen M. Hydrinos again. Available at: http://tgdtheory.fi/public_html/articles/Millsagain.pdf, 2016.

[L4] Pitkänen M. Strong support for TGD based model of cold fusion from the recent article of Holmlid and Kotzias. Available at: http://tgdtheory.fi/public_html/articles/holmilidnew.pdf, 2016.

[L5] Pitkänen M. Cold fusion, low energy nuclear reactions, or dark nuclear synthesis? Available at: http://tgdtheory.fi/public_html/articles/krivit.pdf, 2017.

[L6] Pitkänen M. Could Mars have intra-planetary life? Available at: http://tgdtheory.fi/public_html/articles/Mars.pdf, 2019.

[L7] Pitkänen M. Solar Metallicity Problem from TGD Perspective. Available at: http://tgdtheory.fi/public_html/articles/darkcore.pdf, 2019.