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On A Possibility of Hydrogen Sub Atoms Existence

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Abstract
Based on theoretical evaluation, it is shown that with heating of porous titanium specimens saturated with hydrogen, the formation of hydrogen sub atoms becomes possible, due to transition of Fermi electrons from the bottom of the valence band to subatomic levels

Keywords: porous titan, atomic hydrogen, subatomic hydrogen states.

INTRODUCTION

This work [1] shows theoretically, that stable hydrogen atom states are possible in the so-called subatomic states. The binding energy of such states are of $5 \cdot 10^5 eV$, which is 4 times higher, than that of traditional hydrogen atoms. Atomslikethesetakeupalesserlocalizationareaandwilltakepartin nuclearreactions with a higher probability, which may explain the observable low-energy nuclear transformations, including the explanation of abnormal heat liberation in "hydrogenated" metals [2, 3].

The possibility of existence of hydrogen subatomic states is based on the use of de Broglie formula:

$$E = \hbar\omega = m_0 \cdot c^2 \qquad (1)$$

This formula states that an elementary particle with a rest mass m_0 has its own quantum movement energy with a frequency ω . De Broglie has proposed this formula in 1923 in his doctoral dissertation as a hypothesis. However, soon after he showed that his formula is in variable, and remains satisfactory for known relativistic transformations, due to both the frequency and mass of the particle being converted by the same laws, remaining valid, including cases with absent transitional motion of quantum particles.[4].

SETTING GOALS. SOLUTIONS

Considering the formula, (1) an electron in a hydrogen atom, among other things, produces motion at the expense of own energy*E*. This energy describes the electron spin motion and its spatial localization [5]. Let us characterize that motion by a radius $\vec{r}_1$ with respect to its probability center. In addition, let us characterize the motion of the probability center of an electron with respect to its proton due to Coulomb energy, as $\vec{r}_2$, see Figure 1.

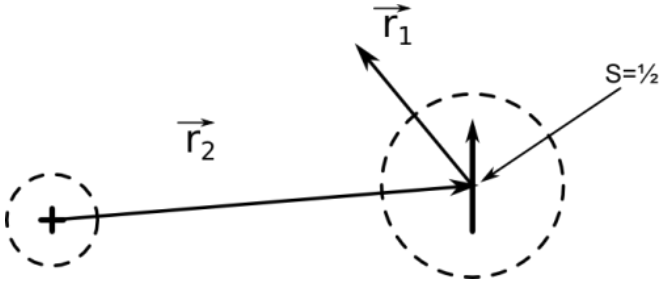

Figure 1: Hydrogen atom coordinates

Which makes the equation of electron movement as follows:

$$-\frac{\hbar^2\Delta_1}{2m_0}\Psi - \frac{\hbar^2\Delta_2}{2m_0}\Psi - \frac{e^2\Psi}{|\vec{r}_1+\vec{r}_2|} = (E-\varepsilon)\Psi(\vec{r}_1,\vec{r}_2) \qquad (2)$$

Where ε is the electron binding energy in a hydrogen atom. If $|\vec{r}_1| << |\vec{r}_2|$, than Coulomb's energy in (2) may be presented as:

$$\frac{e^2}{|\vec{r}_1+\vec{r}_2|} \approx \frac{e^2}{|\vec{r}_2|}$$

Then in equation (2) the variables are divided and 2 equations may be produced:

$$-\frac{\hbar^2}{2m_0}\Delta_2\Psi_2 - \frac{e^2}{r_2}\Psi_2 = -\varepsilon\Psi_2(\vec{r}_2) \qquad (3)$$

This equation describes the movement of and electron in a traditional hydrogen atom. The second equation

$$-\frac{\hbar^2}{2m_0}\Delta_1\Psi_1 = E\Psi_1(\vec{r}_1) \qquad (4)$$

Describes the motion of an electron spin and its spatial localization. The wave function of this equation is as follows [5]:

$$\Psi_1(r_1,\theta_1,\varphi_1) = \frac{C_1 J_1(r_1\zeta)}{\sqrt{r_1}}\cos\frac{\varphi}{2}\sin^{1/2}\theta \qquad (5)$$

And it represents a standing inhomogeneous wave. If the probability centers of an electron and aprot on intersect $\vec{r}_2 \equiv 0$, then from formula (1) we acquire the subatomic state of hydrogen, described in work [1]:

$$-\frac{\hbar^2\Delta}{2m_0}\Psi_a - \frac{e^2\Psi_a}{r} = (E-\varepsilon_a)\Psi_a(r) \qquad (6)$$

The solution to this equation is the following:

$$\Psi_a(r,\theta,\varphi) = C_a r^{1/2} \exp(-r\alpha)\cos\frac{\varphi}{2}\sin^{1/2}\theta \qquad (7)$$

The binding energy is:

$$\varepsilon_a = m_0c^2 + \frac{2e^2}{9a} \approx 5\cdot 10^5\,эВ \qquad (8)$$

Here the Bohrradius $a = \hbar^2 / m_0e^2$. This state has the highest binding energy and is stable against reciprocal displacements of relativity centers of a proton and electron [6].

RESULT DISCUSSION

Let us look at a particular system of porous titanium saturated with hydrogen (this could be deuterium). We will heat this system to a set temperature, at which a heat emission spectrometry would expose an ultraviolet component with a wave length of $\lambda = 1{,}215\cdot 10^{-5}cm$. This is the first line of the Lehmann series. In this case the hydrogen atoms would go into an agitated state and tunnel into the titanium conduction zone, see. Fig 2. The work of electron exiting titanium equates to $e\phi = 3{,}95eV$, which is more, than a difference between a vacuum state of hydrogen and the first agitated state of hydrogen. It is $\varepsilon_2 = 3{,}4eV$. It follows that hydrogen atoms may be in a partially ionized state. Electrons of zero energy of translational motion may transition from the bottom of the titanium valence band into subatomic level of ionized hydrogen, while there will still be an energy emission $\sim \varepsilon_a$ in accordance with (8). The predominant transition of electrons to this level is due to the Fermi energy of the electrons $\varepsilon_f = 13{,}55eV$, which is lower than a hydrogen atom base value, derived from a vacuum level $\varepsilon_1 = 13{,}55eV$.

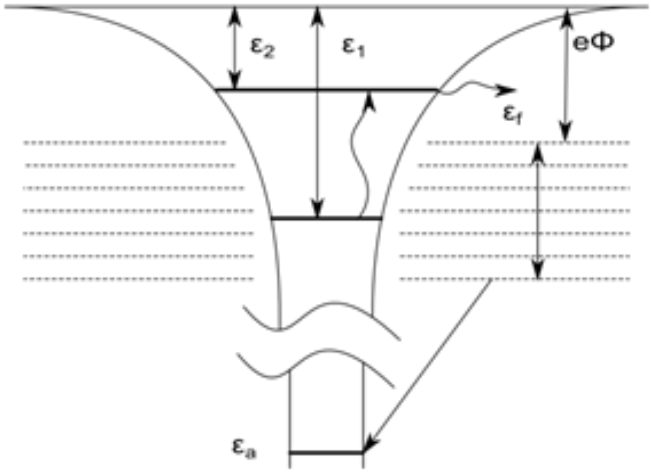

Figure 2: The energy diagrams of hydrogen and titanium

Indeed, none of the matrix element components of dipole emission can equate to zero for such a transition.

$$D_x = -e\Sigma\int \Psi_a r\sin\theta\cos\varphi\Psi_1 r^2 dr\sin\theta d\theta d\varphi \neq 0 \qquad (9)$$

Here Σ-an amplitude of an electric field in a wave. Transitions from base level of hydrogen atom to subatomic state is not possible in given enlargement, since this model of a hydrogen atom does not take the spin of the electron into account. Moreover, this case mostly deals with spontaneous stransitions, which have not been observed in nature.

Let us note, that for hydrogen atomionization other methods may be applied, but it is important that a container of Fermi electrons should be nearby, to provide for the transition to subatomic states of ionized hydrogen.

Hydrogen sub atoms may become closer to nuclei of other elements as neutral particles, since a proton is coated with an electron shell with a considerable own energy. In a strong electric field of anucleus with a Z-number in the periodic table, sub atoms of hydrogen polarize and may come into a proximity of r_0

$$r_0 \approx \frac{Ze^2}{\varepsilon_a} \approx \frac{Ze^2}{m_0c^2} \approx Z\cdot 2.8\cdot 10^{-13}cm \qquad (10)$$

For titaniumnuclei with *Z*=22, a radius of proximity is $r_0 \approx 6.2\cdot 10^{-12}cm$.

The transportation of a proton in an electron shell into such proximity to the nuclei should notably increase the probability of nuclear reactions.

CONCLUSION

Wecanthereforeviewtheexistenceofhydrogensubatomsinaparticularsystemofporoustitanium+hydrogen, as based on collateral evidence: the appearance of new elements and γ-radiation, which may appear in heating and exposition of objects of the system in time. The results of such first experiments are described in the overview [7]. Irradiating the hydrogen specimens with ultraviolet light with a set wave length, we may observe a selective effect of hydrogen sub atom generation. However, we will also note, that omitting the possible thermal effect of nuclear reactions, thermalization of γ-radiation may lead to significant energy advantage.

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BIBLIOGRAPHY

[1] Nevolin V.K. Binding Energy of Subatomic States of Hydrogen. IJAERV.11, N.7, P.4676-4678 (2016).

[2] Interdependent transformation of chemical elements. Under the editorial of Balakirev V.F. Ur Dof RAS, Yekaterinburg 2003. http://www.electrosad.ru/files/LENR/ICE.pdf.

[3] Parkhomov A.G. Coldnucleartransmutation: strange results and an attempt of explanation. International

Journal of Unconventional Science.1(1) C.71-76, 2015http://www.unconv-science.org/n1/parkhomov/.

[4] Louis de Broigle. Selected Scientific WorksVol.1. M.; Logos.2010. P.61. see also Vol. 4. M.: Print-atelier. 2014. P.112.

[5] Nevolin V.K. Spin and spatial localization of free quantum particles. International Journal of Unconventional Science.3.N.7, (2015) (http://www.unconv-sciense.org/n7.

[6] Nevolin V.K. Stability of hydrogen subatomic state. International journal of applied and fundamental research №12 (part4). P. 611-614. 2015, http://www.applied-research.ru.

[7] Tsarev V.A. Lowt emperature nuclear synthesis. Physics-Uspekhi (Advances in Physical Sciences), 1990, Vol.160, №11, Pp.1-53.