THE X-RAY EMISSION FROM ELEMENTS OF FIRST PERIOD AND COLD FUSION

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ABSTRACT

The elements of first period and their isotopes can produce A+-ion when they are electrolyzed or ionized or under the action of photoelectric effect. If these A+-ions run into the range of Bohr orbit radius of the A-atom or He^+, under the electromagnetic interaction they can form the bound states A^+-e-A^+, A^+-e-He^{++}, He^{++}-e-He^{++},..., and then emit X-rays from bremsstrahlung. The probable distance between the cations is nearly 10^{-12}cm at this time. For the particles among which the nuclear attractive force exists, cold fusion can happen from the strong interaction and the electromagnetic interaction. For example, D^+-T, D^+-D, T^+-D, D^+-$^3He^+$, ..., and so on. As an example, considering D^+-D we have

$$v(x) = -\frac{1+\xi}{2(1-\xi)}\frac{e^2}{x} \qquad 0 \le \xi \le 1 \ ,$$

$$\Psi = 2k^{3/2} x e^{-kx} \ ,$$

$$k = \frac{1+\xi}{2(1-\xi)}\left(\frac{\mu}{\mu e}\right)\frac{\mu e}{h^2}e^2$$

$$E = -\frac{1}{4}\left(\frac{1+\xi}{1-\xi}\right)2\frac{\mu}{\mu e}E_1$$

Where μ is the converted mass. μe is the mass of electron, E_1 is the energy of the basic state of hydrogen. When $\xi = 3/8$ we have E = -30.17keV and k = $0.38*10^{12}cm^{-1}$. Then the following results can be obtained:

R_o (10^{-13}cm)	kR_o	W	W^{-1}
1.0	0.038	$6.91x10^{-5}$	$1.45x10^4$
0.5	0.019	$8.89x10^{-6}$	$1.13x10^5$
0.25	0.0095	$1.127x10^{-7}$	$0.89x10^6$

If the energy of X-ray is 30kev, the energy of a 30kev, the energy of the fusion is 3.5Mev, the range of nuclear force is 0.5fm - 0.25fm, then the ratio of the energy of bound state to the energy of fusion is nearly 10^3 - 10^4. Thus it can be concluded that the excess heat comes mainly from the energy release of bound state. It does not come from the energy of nuclear fusion.
When cold fusion happens from D^+ - D, the reactions of first order are

$$D^+ + D \rightarrow \begin{cases} n + {}^3He - e \\ D + T - e \\ \alpha + \gamma - e \end{cases}$$

where `- e' means an electron is captured. The reactions of second order are

$$D^+ + {}^3He^+ \rightarrow \alpha + p - e$$

$$D^+ + T \text{ (or } T^+ + D) \rightarrow \alpha + n - e$$

Moreover, there are (n, γ), the absorption and excitation of X-ray, ..., and so on. All of these complicated processes of reaction make the experiment analysis difficult.

Of course, the nuclear reaction may not happen among the particles, e.g. the polywater is formed from H^+ and H. [5,6]. Since the proton of polywater is connected by the electronic bond, it may be more suitable to use the name `water of electronic-chain.' Possibly, its construction is

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        H  O  H
e                 e          or  H - e - H - O - H - e - H
        H  O  H
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It was found that when the negative electrode of Pd is used to electrolyze the heavy water, D/Pd must be larger than 0.84 for the appearance of anomalous effects. This means that there are an average of 3.36 D-atoms in a Pd crystal cell. Several D-atoms in a Pd crystal cell is the condition for D^+ -D to satisfy the demand of Bohr orbit radius.

For the experiments in which cold fusion happens (e.g. use Pd negative electrode to electrolyze the heavy water, the D/metal system of glow discharge,...), the essential fact is that D^+ -D forms a bound state and emits X- ray, meanwhile, there is a probability of 10^{-5} - 10^{-6} that nuclear fusions will occur.

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