Abstract

In framework of the Erzion Model it is given the explanation of isotopic and chemical compositions changes which took place in cold fusion experiments (Rolison and O'Grady, Bush, Romodanov et al.). It is demonstrated that nuclear transmutation is important quality of Erzion Model. It is suggested some most sensitive methods of nuclear transmutation process analysis in traditional cold fusion experiments. The investigated phenomenon in the framework of Erzion Model becomes not fusion but transmutation.

1. Introduction

Cold fusion is considered in Erzion Model as cold nuclear transmutation by erzion catalysis. Nuclear reactions are running not by fusion process but by nucleon splitting and simultaneous nucleon adding to substanting nuclei in accordance with energy advisability. A disguise of one phenomenon by another explains by identity of the fusion and the transmutation on deuterium nuclei. On heavy nuclei this process differs fundamentally.

2. Erzion Model and Nuclear Transmutation

In framework of Erzion Model /1/ the following six channels of reactions take place on each isotop:

\[ K(A,Z) + \alpha^1 = \alpha^2 + X(A+1,Z) + E1, \]  
\[ K(A,Z) + \alpha^2 = \alpha^3 + X(A+1,Z+1) + E2, \]  
\[ K(A,Z) + \alpha^3 = \alpha^4 + X(A-1,Z) + E3, \]  
\[ K(A,Z) + \alpha^4 = \alpha^5 + X(A,Z+1) + E4, \]  
\[ K(A,Z) + \alpha^5 = \alpha^6 + X(A-1,Z-1) + E5, \]  
\[ K(A,Z) + \alpha^6 = \alpha^7 + X(A,Z-1) + E6, \]

where: \( K \) – element with atomic mass \( A \) and atomic number \( Z \);
\[ e_n, e^-, e^+ \] - enion, negatively charged and uncharged erzions respectively; E1-E6 - reaction output energies.

Some of these reactions are exothermic and other endothermic. Only exothermic reactions are running because of enions and erzions (reactions catalysers) have rather small energies. So, if we know enion bond energies during dissociation to \((3-,2°)\) and to \((3°,n)\), we can find these exothermic reactions. Investigation of these reactions was done for all chemical elements in our work /2/.

3. Explanation of Transmutation Results.

In observing report /3/ J.Bockris told about Rollson and O'Grady /4/ experiment results on isotopic and chemical compositions changes (ruthenium, radium and silver elements appearance) on palladium cathode during electrolysis with heavy water. Interpretation of this experiment was done earlier /5/. Now we describe it shortly.

Palladium have six stable isotops. Therefore 36 reactions of \((1)-(6)\) type take place. 29 reactions from him are prohibited as endothermic. Only seven reactions can take place by energy considerations /2/. These reactions are follows:

\begin{align*}
Pd-102 \ (\delta, 3°) & \rightarrow Pd-103; \ 1.45 \ MeV; \ 17 \ days; \ Rh-103 \ (7) \\
Pd-104 \ (\delta, 3°) & \rightarrow Pd-105; \ 1.05 \ MeV; \ stable \ (8) \\
Pd-105 \ (\delta, 3°) & \rightarrow Pd-106; \ 3.25 \ MeV; \ stable \ (9) \\
Pd-106 \ (\delta, 3°) & \rightarrow Pd-107; \ 0.385 \ MeV; \ 6.5 \times 10^6 \ years; \ Ag-107 \ (10) \\
Pd-108 \ (\delta, 3°) & \rightarrow Pd-109; \ 0.0034 \ MeV; \ 13 \ hours; \ Ag-109 \ (11) \\
Pd-102 \ (\delta, 3°) & \rightarrow Rh-102; \ 1.2 \ MeV; \ 210 \ days; \ Pd-102, Ru-102 \ (12) \\
Pd-105 \ (\delta, 3°) & \rightarrow Rh-105; \ 1.8 \ MeV; \ 35 \ hours; \ Pd-105 \ (13)
\end{align*}

There are introduced the additional data: output energy, half-time and product of decay.

From \((7)-(9),(11)\) it follows that quantity of \(Pd-102,104,105\) must decrease considerably and \(Pd-108\) - unconsiderably (Fig. 1). Increase of \(Pd-106\) quantity \((9)\) is more speedily than its decrease \((10)\). From \((9)\) it follows, that practically stable isotop of \(Pd-107\) appears. From comparison of \((8)\) and \((9)\) it follows, that quantity of \(Pd-105\) must decrease also. Fast decay of \(Pd-109\) gives \(Ag-109\). From \((7)\) and \((12)\) it follows appearance of rhodium and ruthenium. Conversion of neutral erzion into enion originates due to deuterium in reaction \((3)\). Reaction \((1)\) for deuterium is uncompetitive analogous reaction for \(Pd\) isotops. Therefore appearing quantity of tritium must be considerably slower than appearing quantity of energy in reactions with \(Pd\). It is coincided with experimental peculiarity of cold fusion: considerable predominance of heat
It is observed /6/ considerable increase of niobium-94 and absence of niobium-95. From Erzion Model it follows:

\[ \text{Nb-93} \rightarrow \text{Nb-94}; 1.05 \text{ MeV}; 2 \times 10^4 \text{ years}; \text{Mo-94} \]

\[ \text{Nb-93} \rightarrow \text{Mo-94}; 0.85 \text{ MeV}; \text{stable}. \]

It is reported also /6/ the estimation of yttrium-90 generation from natural yttrium, that has a simple explanation:

\[ \text{Y-89} \rightarrow \text{Y-90}; 0.75 \text{ MeV}; 64 \text{ hours}; \text{Zr-90}. \]

In works /7,8/ it was registered a generation of calcium-40 from potassium-39. The Erzion Model gives the following reaction:

\[ \text{K-39} \rightarrow \text{Ca-40}; 0.55 \text{ MeV}; \text{stable}. \]

M. Miles and B. Bush/9/ reported about generation helium from lithium. The Erzion Model gives the explanation of this fact:

\[ \text{Li-7} \rightarrow 2\text{He-4}; 9.6 \text{ MeV}, \]

\[ \text{Li-6} \rightarrow \text{He-4} + p; 0.45 \text{ MeV}, \]

\[ \text{Li-6} \rightarrow \text{He-4} + n; 3.05 \text{ MeV}. \]

So, the Erzion Model gives sufficient explanation of isotope and element changes in some experiments.

References

Fig.1 Palladium isotopic composition in experiment /3/

A - atomic mass, N - relative abundance,
  solid line - before experiment,
  dashed line - after experiment.

The Eriksen Model predictions:
(↓) decrease, (↑) increase, (O) no change of N