International Journal of Materials Science
ISSN 0973-4589 Volume 13, Number 3 (2018), pp. 205-211

http://www.ripublication.com

Nuclear Transmutation in Nickel Films Obtained by Electrolysis

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Abstract

Background: Low-temperature nuclear transmutation of elements takes place in technical and biological systems. High efficiency is shown in heat generators Rossi. The phenomenon of nuclear transmutation during the metabolism of microorganisms and during photosynthesis in plants was experimentally established. In biological systems, the phenomenon of nuclear transmutation exists to reproduce the elements necessary for growth and development. A variety of models have been proposed to explain cold nuclear transmutation of elements. However, the reliable nature of the phenomena has not yet been established. Methodology: The results of a study on a model experimental system in a liquid medium with the participation of hydrogen subatoms are proposed. Such states for hydrogen are predicted theoretically. Results: During electrolysis in an aqueous solution of sulfuric acid with nickel electrodes, a nickel film with a modified isotopic composition was deposited on a cathode, and ultraviolet radiation was observed, which is characteristic, in particular, in the formation of hydrogen subatoms. Conclusion: The nuclear transmutation of nickel is explained by the participation of hydrogen subatoms in the cathode region in nuclear reactions.

Keywords: nuclear transmutation of nickel, electrolysis, ultraviolet radiation, hydrogen subatoms

INTRODUCTION

The impetus for this work is the need prove the existence of subatomic hydrogen states previously predicted [1] by Louis de Broglie in his concept of the relation between the mass of a particle and the natural frequency of quantum oscillations. In subatomic states, the proton is located in an electronic "coating," with smaller

characteristic dimensions of 0.75 *a,* where *a* is the Bohr radius, which contributes to a lower polarizability of the subatomic particles. The distribution of the electron density in a hydrogen subatom is compressed along the radius due to the proton's Coulomb field in comparison with the distribution of the probability density functions of the electron for a free electron. The angular distributions of the probability density associated with the motion of the electron spin remain unchanged, as in a free electron. This distribution differs significantly from the isotropic distribution of the probability density in the ground state of the hydrogen atom, which is the primary reason for the high electrical strength of the subatoms. Nevertheless, the ionization energy of the subatoms is only 4/9 of the ionization energy of the hydrogen atom, which corresponds to $\varepsilon_{is} = 6.02\,\text{eV}$.

For the emergence of the hydrogen subatoms in accordance with [1], hydrogen ions are required in the near-surface layers of a metal, such as nickel with zero translational kinetic energy and a significant amount of electrons weakly bound to the surface. Studies of glow discharges in a hydrogen atmosphere (deuterium) with metallic cathodes lend themselves to the manifestation of this type of situation. In the same vein, notable results on the nuclear transmutation of elements were obtained in [2] with a palladium cathode.

For experimental proof of the existence of the nuclear transmutation of elements based on the proposed model, the target electrode was made of nickel. The working gas was argon. The aim of the experiment was to compare the elemental composition of the substrates and targets with electroless nickel in an argon discharge, and in an argon discharge with hydrogen. The mixture has a hydrogen concentration of no more than 10%. The results of the experiments showed a change in the ratio of isotopes in the nickel film obtained in a hydrogen atmosphere [3].

Ultraviolet radiation with a wavelength of 206 nm should be observed with the formation of hydrogen subatoms. From a technical standpoint, it is difficult to see such radiation in a magnetron. Theoretically, hydrogen subatoms can directly participate in nuclear transmutations in microbiological systems [4]. Then one might observe such radiation [5,6].

If the generation of subatoms is real in biosystems, then these conditions can also be modeled in a technical system. For example, hydrogen subatoms can appear on a cathode undergoing electrochemical electrolysis: the presence of hydrogen ions near the cathode and weakly bound electrons on the surface electronic states should lead to the possibility of subatomic formation and characteristic ultraviolet radiation. The subatoms might then take part in the transmutation of the cathode nuclei. The phenomenon of electrolysis was used in 1989 by M. Fleischmann and S. Pons in the example of heavy water with a palladium cathode [7]. Usually, surveys of studies of the cold transmutation of nuclei begin with this demonstration. The body of experimental material that has accrued over subsequent years has lent credence to this line of research [8].

Our scope of studies has returned to the initial experiments on transmutation using nickel electrolysis. The experiments consisted of two parts: evidence of characteristic

ultraviolet radiation at wavelengths close to 206 nm, i.e. indirect evidence of the generation of hydrogen subatoms undergoing electrolysis, and the study of a cathode deposit for changes in isotopic composition compared with the anode.

MATERIALS AND METHODS

Electrodes from 0.4 mm thick nickel plate with characteristic dimensions of 4*6 cm^2 were placed horizontally in a Petri dish. In the center of the upper electrode were a number of 2 mm holes over an area of 4 cm^2 for the radiation yield, amounting to an anode. The gap between the electrodes was fixed by 2 mm thick glass plates. The release of ultraviolet radiation through the liquid layer was facilitated by the formation of hydrogen bubbles that collapsed in the anode holes. The end fiber sensor was situated about 12 cm above the Petri dish. The entire system was placed in a black plastic box that could be sealed from incidence light. A FSD-10 v6.1 spectrometer with a 400-micron fiber-optic cable giving an error along a wavelenth of ~4 nm, with a nominal sensitivity of 160v lx*s for a 550 nm wavelength was used. The spectrometer was manufactured by Scientific and Technical Center of Fiber Optic Devices, LLC. A movable plate was installed between the end fiber sensor and the Petri dish, allowing the blocking of the radiation from the nickel electrodes, with stationary electrolysis with a current density of ~ 20 mA/cm^2 and voltage on the 3 V electrodes. The electrolyte was prepared from deionized water and ultra pure concentrated sulfuric acid in an amount of 50 ml of water and 0.8 ml of acid. Ultimately, sulfuric acid was selected to increase the density of hydrogen ions near the cathode, thereby increasing the probability of hydrogen subatoms, and due to the fact that nickel sulfate is soluble in water, and nickel can be plated onto the cathode, thereby participating in nuclear reactions in addition to the cathode itself.

To enable the buildup of a weak radiation signal the exposure time of one spectrum was 60 seconds The optical spectra were recorded seven times in the area of the wavelength from 190 nm to 1080 nm, and then averaged over the signal amplitudes. To exclude various noises, including spectral features of the photo-integrated matrix, the noise amplitude of which increased over time, we factored in the difference spectra: the intrinsic noise spectrum was subtracted from the electrode emission spectrum after the overlapping of the Petri dish by the moving plate.

For experimental observation of changes in the isotopic composition of nickel films, a vertical-type device was manufactured. In a measuring cup, 1 mm nickel-plated flat electrodes were fixed vertically in a Teflon plug spaced 3 mm from each other. The density of the current during electrolysis was ~ 60 mA/cm^2, while the stabilized voltage between the electrodes was 3V. Altogether, the electrolysis process lasted over 60 hours. After the experiment, one could observe its thickening at the cathode due to the nickel film deposit and the thinning of the anode. The color of the electrolyte underwent a change, indicating the formation of water-soluble nickel sulfate.

Subsequently, we carried out comparative mass spectrometric measurements of the cathode, anode and starting nickel plates. Of interest was the change in the isotopic

composition of the samples, which could occur due to nuclear reactions with hydrogen subatoms. Mass spectrometric measurements were carried out using a TOF-SIMS instrument.

RESULTS OF RESEARCH AND DISCUSSION

Figure 1 shows the average emission spectrum of nickel electrodes for seven spectra measurements.

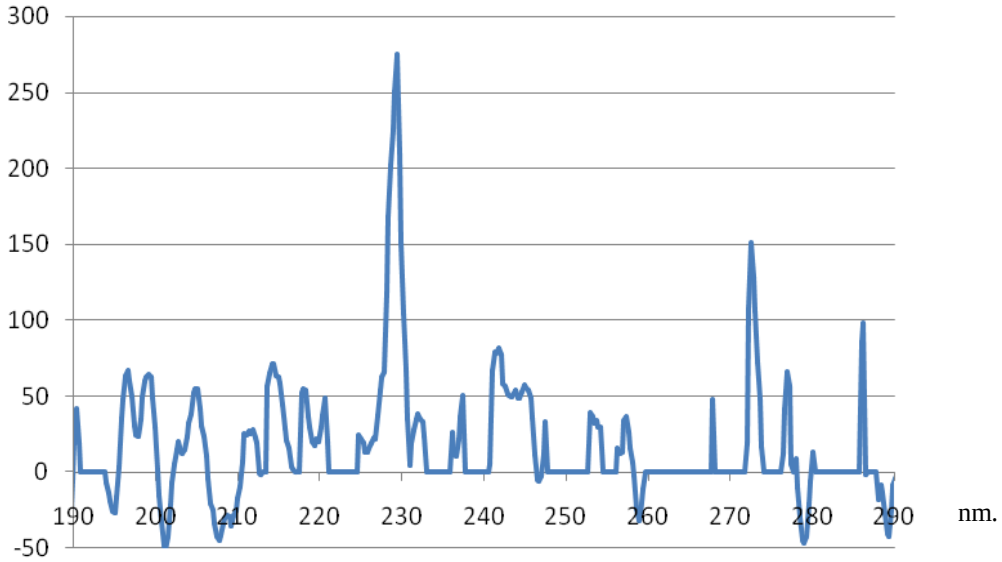

Fig.1. Average difference radiation spectrum from the region of the nickel cathode.

The figure displays a plethora of peaks. At the same time, one should see characteristic peaks. For example, at a wavelength of 277 nm, one should observe recombination radiation associated with the combination of a pair of hydrogen atoms in the molecule. Such a peak can be seen at a wavelength of 275 nm, which, given the error of the spectrometer, falls in the range of expectations. At a wavelength of 240 nm, a peak associated with the recombination of hydrogen ions with the OH group and the formation of a water molecule can be observed. Since the diluted sulfuric acid completely dissociates, then, apparently, radiation at a wavelength of 230 nm corresponds to the energy of the recombination of hydrogen ions through oxygen bonds into acid molecules.

The expected peak in the region of 206 nm, associated with the emission of hydrogen subatoms, is also observed. Other emission peaks are apparently associated with the activity of loosely bound surface electronic states during the formation of the hydrogen subatoms. Peaks such as this were also observed in studies of the photosynthesis of houseplants and yeast metabolism [6,7].

Figure 2 shows the averaged emission spectrum of nickel electrodes for seven spectra measurements after undergoing several hours of electrolysis. As seen from the figure, the characteristic emission peaks were repeated. Changes in other peaks are observed.

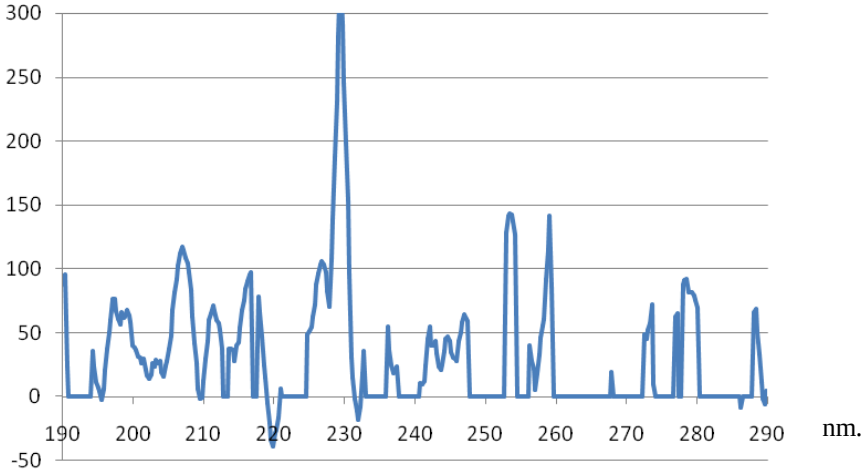

Fig.2. Average difference radiation spectrum from the region of the nickel cathode after undergoing several hours of electrolysis.

Thus, the expected characteristic ultraviolet radiation associated with the formation of hydrogen subatoms has been observed in experiments. This is weak radiation, somewhat more so than the noise level of the spectrometer, and to observe a subsequent change in the isotopic composition of nickel, long-term observation is required.

Since there are no isotopes of ^{59} Ni and ^{63} Ni in natural metals, let us consider a variant of transmutation along a chain of elements: ^{60}Ni through ^{61}Ni to ^{62}Ni with the help of hydrogen subatoms hydrogen due to pair collisions:

$$^{60}Ni + H^* \rightarrow ^{61}Ni(^{60}NiH^*) + H^* \rightarrow ^{62}Ni + \Delta\varepsilon_1 + \Delta\varepsilon_2$$

In this case, the energy release due to the first reaction is: $\Delta\varepsilon_1 \sim 67.5keV$, due to the second $\Delta\varepsilon_2 \sim 94keV$. Note that traces of the formation $^{60}NiH^*$ are observed in the mass spectra. The reactions with hydrogen lead to an increase in the peak value ^{62}Ni in comparison with the peak ^{60}Ni relative to the same ratio in the control sample. To compare the mass spectra, one must take into account that the absolute values of the isotope peaks of the elements vary in different experiments. A straight line connecting the values of the isotope peaks ^{62}Ni and ^{60}Ni should change the slope by a reduction in the isotope peak ^{60}Ni and an increase in the isotope peak ^{62}Ni . Then, their relative change will indicate a change in the isotopic composition of nickel on the cathode

surface in comparison with the anode. We must correct the peaks of the measurements for different samples for the most common nickel isotope ^{58}Ni (68%), assuming its concentration is unchanged in all samples

We have:

$$(^{62}Ni - ^{60}Ni)_{el} / (^{62}Ni - ^{60}Ni) = -22.20 / -23.927 = 0.93$$

This equation shows the change in the isotopic composition of the nickel film deposited on the cathode from nickel. For control purposes, the isotopic composition of the nickel anode was compared with the isotopic composition of the initial nickel plate. We observed the overlapping of the isotope peaks to a high accuracy. We also studied a change in the isotopic composition of the deposited nickel film at the cathode in depth. The isotopic composition remained unchanged to a depth of ~ 3 μm, while the electrolysis regimes were unchanged.

CONCLUSION

Thus, the expected characteristic ultraviolet radiation associated with the formation of hydrogen subatoms has been observed in experiments. This is weak radiation, somewhat more so than the noise level of the spectrometer, and to observe a subsequent change in the isotopic composition of nickel, long-term observation is required. Overall, in the technical system, we were able to model the formation of hydrogen subatoms and observe the transmutation of nickel based on concepts of the emission of hydrogen subatoms during their formation. Such radiation is observed during photosynthesis in plants and the metabolism of microorganisms as in the case of yeast.

ACKNOWLEDGEMENTS

This work was carried out with the financial assistance of the Ministry of Education and Science (Agreement 14.575.21.0125, dated September 26, 2017, identification code RFMEFI 57517 X0125).

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