Artificial radioactivity in the nonequlibrium plasma of the glow discharge in Pd-D and Ni-H from the point of view of nuclear-chemical reactions

It is shown that artificial radioactivity can be initiated in conditions of nonequlibrium plasma glow discharge. The analysis of the isotope and elemental composition in the near-surface layers of ***Pd*** and ***Ni***, the original and after 40-hour exposure in deuterium- or protium-containing plasma by the ICP mass spectrometry (ICP-MS) has revealed significant changes in isotope composition of impurity elements. The significant reduction in ***Pt*** and ***Pb*** impurities in ***Pd-D*** systems in times have found.
In addition, an increase in the content of ***W*** isotopes was found in the ***Pd-D*** system, which correlated with a decrease in the content of ***Pt*** isotopes.
In the ***Pd-D*** experiment the content of ***Pb*** isotopes (masses 206, 207, 208) decreased by ~ 200 times and ***Pt*** isotopes by ~ three times, and in the ***Ni-H*** experiment, ***Fe*** (by ~3-10 times) and ***Zn*** (from 20 to 1000 times).

Table 1 Reducing the content of ***Pb*** and ***Pt*** isotopes in ***Pd*** after exposure in ***D*** plasma (ICP)*

Pb* in *Pd	**204**	**206**	**207**		**208**
Before exposure, %	1.51	24.64	19.67		54.18
After exposure, %	6.29	23.67	19.98		50.06
The remaining isotope, %	< 0.1	<0.57	< 0.61		<0.55
Pt* in *Pd	**192**	**194**	**195**	**196***	**198***
Before exposure, %	0.76	32.66	32.41	26.27	7.90
After exposure, %	0.81	32.27	34.26	25.05	7.61
The remaining isotope, %	< 30.9	< 28.5	< 30.5	< 27.5	< 27.8

*In **Pd** σ for impurity elements in 15 dimensions varies from (0.01 to 1-3) %.

Table 2 Reducing the content of ***Fe*** isotopes in ***Ni*** after processing in hydrogen plasma

Fe* in *Ni	***54***	***56***	***57***
Before exposure, %	6.55 ± 0.02	91.22 ± 0.10	2.23 ± 0.01
After exposure, %	18.85 ± 0.10	79.56 ± 0.26	1.59 ± 0.02
The remaining isotope, %	37.6	11.4	9.3

Zn* in *Ni	**64**	**66**	**67**	**68**	**70**
Before exposure, %	46.9 ± 0.02	28.36 ± 0.02	4.34 ± 0.01	19.62 ± 0.02	0.71 ± 0.00
After exposure, %	98.7 ± 0.33	0.32 ± 0.01	0.13 ± 0.01	0.80 ± 0.03	0.01 ± 0.00
The remaining isot.,%	5.5	0.03	0.08	0.1	0.07

The processes of decay of impurities and other transformations (transmutations) in the nonequlibrium plasma of the glow discharge are considered from the point of view of nuclear-chemical reactions.

[1] Savvatimova I.B., Poteshin S.S., Kargin N.N., Sysoev A.A., Ryndya S.M., Timashev S.F. ICP MS in the analysis of the phenomenon of low-energy nuclear reactions initiated in metals under the conditions of a glow discharge ", Modern means of plasma diagnostics and their use. The theses of the reports of the 12th conference, Moscow, NRNU MEPHI, Dec. 16-18, 2020, p. 133-136.