INVESTIGATION OF MOLECULAR HYDROGEN IN THE NANO-SiO_2 (d=15÷20 nm)/H_2O SYSTEM UNDER THE INFLUENCE OF γ-QUANTA

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Recently, in various researches conducted by us and other researchers around the world, the study of products obtained from the radiolysis process of liquids, especially water in contact with metal or metal oxides under the influence of ionizing rays (γ-quanta, electrons, protons, neutrons, α-particles, high-energy ions, etc.) is of great importance both scientifically and energetically. The dependence of the radiation-chemical yield of the products obtained from the experiments on the particle size of metal or metal oxides (size effect), on their mass in suspended systems (mass effect) and on their type was observed. This effect is more pronounced in nanoscale metal or metal oxides.

In the presented work, under the influence of γ-quanta (^{60}Co, P=9.276 rad/sec, T=300K), the mass of water (m=0.001, 0.8 g), the amount, formation rate and radiation-chemical yields of molecular hydrogen obtained from the radiolysis processes in nano-SiO_2/H_2O systems with a mass of m=0.2 g and a particle size of d=15-20 nm were studied.

In those systems, the formation rates of molecular hydrogen obtained from the water radiation-catalytic decomposition determined for the water (2), total system (3) and nano-SiO_2 (4) are given in table.

The formation rates of molecular hydrogen obtained from radiation-catalytic decomposition of water in the systems created by the addition of water with the mass of m=0.001, 0.003, 0.01, 0.02, 0.04, 0.08, 0.2, 0.4 and 0.8 g to the nano-SiO_2 with the mass of m=0.2 g and particle size of d=15-20 nm under the influence of γ-quanta (^{60}Co, P=9.276 rad/sec, T=300K)

$G(H_2)$, molecul/(100 eV)	m_{H_2O}, g								
	0,001	0,003	0,01	0,02	0,04	0,08	0,2	0,4	0,8
$G_{SiO_2}(H_2)$	0,35	0,51	0,72	0,98	1,58	2,58	4,08	4,48	5,58
$G_{H_2O}(H_2)$	28,4	19,1	14,3	11	8,6	6,1	4,3	2,4	1,41
$G_{tot}(H_2)$	0,32	0,47	0,65	0,95	1,31	1,7	1,97	1,55	1,1

It is known from the research that: under the influence of γ-quanta (^{60}Co, P=9.276 rad/sec, T=300K), the radiation-chemical yield of molecular hydrogen obtained from radiolysis processes occurring with a change in water mass m_{H2O}=0.001÷0.8 g in created nano-SiO_2/H_2O systems with a mass of *m*=0.2 g and a particle size of d=15–20 nm:

- ✓ decreases $G(H_2)$=22.5–1.11 molecule /100eV if determined for the water
- ✓ increases $G(H_2)$=0.29–4.45 molecule /100eV if determined for the nano-silica
- ✓ increases $G(H_2)$=0.27–1.47 molecule /100eV at a value of water mass 0.001g≤ m_{H2O}<0.2g, reaches maximum $G(H_2)$=1.66 molecule /100eV at a value of water mass m_{H2O}=0.2g, gradually decreases $G(H_2)$=1.26–0.89 molecule/100eV at a value of water mass 0.2g< m_{H2O} ≤0.2g if determined for the total system.