Discrete stochastic structure evolution in Pd-Mo and Pd-Ta alloys after hydrogenation

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The nonmonotonous structure evolution was determined in Pd-Mo and Pd-Ta alloys [1,2] after hydrogenation. Hydrogen and induced vacancies cause the thermodynamic instability of the system after hydrogenation. The main peculiarities of the dispayed effect are the multiphase decomposition caused by the hydrogenation, and the frequentative transformation of the system from multiphase to monophase and backwards. For explanation the first of this effects was proposed [2] that the distribution of thermodynamic potential in reciprocal space is multi-valley structure. For verification of this theory the Pd-Ta alloy was hydrogenated several times and while relaxation (up to 500 h) after each charging the precision investigation of diffraction maxima form were provided. Each diffraction maximum was expanded to several components and the dependence of their coordinates from angle of diffraction and time after hydrogenation was determined. As a result it was established that the first of these dependences was discrete, and the second was stochastic. The similar data was determined during relaxation after each hydrogenation. This means that the discrete stochastic structure evolution was found. The discrete character of the evolution in the system like a multiphase decomposition may be explained by the multi-valley structure of thermodynamic potential. The stochastic character of displayed processes is a consequence of the fluctuation character of hydrogen and vacancies cooperative transferences during relaxation [3].

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