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LAWS OF PHASES FORMATION IN ION-IMPLANTED METALS

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The purpose of this article is investigation of solid phase reactions in surface layers of volume samples of high-melting metals at ionic implantation and the subsequent heat treatment.
For research of ionic alloying the samples of monocrystal tungsten (8×1,5×0,1 mm^3) and polycrystalline tantalum (8×1,5×0,5 mm^3) by cleanliness of 99,96 % have been used. For the purpose of removal of the deformed layers after machining the samples have been subjected to electrochemical polishing. Ionic implantation of nitrogen and oxygen with energy 70 and 80 keV, was accordingly made in vacuum ~1,3-10^{-3} Pa. The density of a current are not exceeding 1 mcA×sm^{-2}. Implantation doses have been chosen as follows: 1,87×10^{17}, 3,74×10^{17} и 5,6×10^{17} ion/sm^2. The samples were exposed to thermal annealing in vacuum (6,6×10^{-3} Pa) through 100^0C in a range of temperatures 500-1100^0C with endurance within 1 hour for equilibrium reach. Methods of structure research for the irradiated and not irradiated materials by x-ray analysis with use narrow CuK_α-radiations were applied. The method was applied to spatial distribution of the implanted impurity Rezerford back scattering (RBS).
In this work made that the basic laws of structural and phase transformations in the high-melting metals (W, Ta) are established at their implantation by the ions of the elements which form introduction phases (nitrogen, oxygen and phosphorus); it is revealed that the implantation of tungsten and tantalum by oxygen ions results in formation of highly packed structures which have been identified in the work as W_2O and TaO oxides.

Keywords
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