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Tungsten Fuzz Formation on the Nitrided Tungsten Surface

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The research goals are determining the effect of nitrogen plasma on the tungsten and comparative analysis of the formation of tungsten fuzz on the helium plasma interaction on the initial surface of tungsten and on the surface of tungsten, previously subjected to nitriding. The experiments were carried out on an imitation stand with a plasma-beam installation. The device provides the following parameters of the plasma flow: the diameter of the plasma flow in front of the target up to 30 mm; the intensity of the magnetic field produced on the axis of the plasma-beam discharge chamber is 0.1 T; the plasma density in the beam is up to 10^18 m^-3; the maximum current in the plasma is 1 A; the electron temperature range of the plasma is 5 15 eV.
All stages of the experiments contained studies of the surface of tungsten using optical and SE microscopy, elemental and X-ray analysis, and determination of the hardness of the surface of tungsten samples.
As a result of the series of experiments on nitridation of tungsten, an optimal nitriding regime was determined that lead to the formation of tungsten nitrides on the surface of the irradiated sample. A series of irradiation experiments were realized on the initial tungsten surface with helium plasma in the plasma-beam discharge regime. On the surface of the samples, a coating was found tungsten fuzz. Experiments have been carried out on the irradiation of tungsten with a helium plasma with a previously nitrided surface. The results of the investigations showed that tungsten fuzz forms on the nitrided surface of tungsten, as well as on the initial surface. On the initial surface of tungsten, the structure of the fuzz is more uniform than on nitrided samples. Sum up, the conducted experiments showed that nitridation of the tungsten surface does not play an important role in the formation of the tungsten nanostructure as a result of irradiation of tungsten with helium plasma.

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Author: Mr MINIYAZOV, Arman (Institute of Atomic Energy of National Nuclear Center of Kazakhstan)

Co-authors: Mr GANOVICHEV, Dmitry (Institute of Atomic Energy of National Nuclear Center); Mr SOKOLOV, Igor (Institute of Atomic Energy of National Nuclear Center); Prof. TAZHIBAYEVA, Irina (Institute of Atomic Energy, National Nuclear Center RK); Mr SKAKOV, Mazhyn (Institute of Atomic Energy of National Nuclear Center); Mr KULSARTOV, Timur (Institute of Atomic Energy of National Nuclear Center); Mr TULENBERGENOV, Timur (Institute of Atomic Energy of National Nuclear Center); Mr KOYANBAYEV, Yerbolat (Institute of Atomic Energy of National Nuclear Center)

Presenter: Mr TULENBERGENOV, Timur (Institute of Atomic Energy of National Nuclear Center)

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