Investigation of surface carbide layers of tungsten under the influence of helium plasma

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The relevance of the research is caused by development of a fusion energy, where issues of surface modification of plasma-facing materials of the first wall and divertor of a fusion reactor are of great importance. Therefore, obtaining a reliable database on the properties of materials and other elements in contact with plasma, simulation of the plasma effect on their surfaces using an imitation installation are are highly relevant tasks of material research in modern physics when developing thermonuclear technology, including research at the Kazakhstani Material Testing Tokamak KTM.

The presence of structural materials and their impurities in the installation chamber will lead to the formation of mixed layers in the plasma-facing surfaces during redeposition due to erosion. In particular, carbon in the chamber of fusion reactors entails a number of problems. Carbon acting on the divertor surface can penetrate into the divertor volume and promote erosion and formation of porous layers on the tungsten surface and leads to tungsten carbidization.

Hence, the goal of the research is to study external effects at a high energy flux and plasma irradiation on the structure and physical and mechanical properties of tungsten with a carbide layer, under conditions close to a fusion installation and the Kazakhstani Material Testing Tokamak KTM.

In this research, the results of experimental studies on the effect of plasma irradiation with a carbidized tungsten surface are obtained. Data on the structure and properties of tungsten with a carbidized near-surface layer have been obtained.

The practical significance of the research lies in the fact that the research results will be used in designing of fusion reactor components, analysis of the resource and degree of erosion effect of divertor components on plasma parameters.

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