MEASUREMENT OF ION FLOWS ON A SUBSTRATE DURING W AND WO3 DEPOSITION IN A MAGNETRON DISCHARGE [[1]](#footnote-1)\*)

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1,2Sergeev N.S., 2Kaziev A.V., 2,3Kolodko D.V.

1NRC "Kurchatov institute ", Moscow, Russian Federation, nickbebeskis@gmail.com
2National Research Nuclear University MEPhI, Moscow, Russian Federation
3Kotel'nikov Institute of Radio Engineering and Electronics, Fryazino Branch, Russian
 Academy of Sciences, 1 Vvedenskogo Sq, Fryazino, 141190 Moscow Region, Russia

Development of technology for the deposition of functional coatings based on tungsten W and its oxides WO3 is an important problem for both thermonuclear reactor technology and production semiconductor devices. The main deposition method that is used for production of these types of coatings is chemical vapor deposition (CVD) or physical vapor deposition (PVD). The most common PVD method is plasma enhanced physical vapor deposition. This method is actively used in the deposition of coatings based on tungsten, on a graphite substrate [1].

In any PEPVD process, the deposition of initial layers plays a primary role. The adhesion properties of the coating will largely depend on the deposition conditions. Ion fluxes arriving at the substrate significantly affect the formation of the first layers. Furthermore, the resulting structure of the coating depends on the composition of the ion fluxes: the crystal lattice and the presence of defects in it. It determines the basic physical parameters of the coating: density, hardness, thermal and electrical conductivity. Controlling the composition and energy of ion flow allows to better understand processes occurring during deposition and the use this data to simulate film growth process.

The work investigates the process of deposition of tungsten coatings in a magnetron discharge with pressure *p*g = 0.5 Pa, a power density on the target of up to 3 W/cm2. The influence of the preliminary cleaning of the sample surface, as well as the bias potential during deposition, on the adhesive properties of the coating are investigated as well.

The discharge was simultaneously investigated by corpuscular, probe and optical emission diagnostics. A magnetic sector was used as a mass analyzer tool. A collecting probe was located near the extractor diaphragm, which made it possible to determine the absolute values ​​of ion fluxes on the substrate surface. An electron multiplier (VEU-6) was used as a detector in the analyzer system. This configuration allows the detection of both positive and negative ions. To estimate the plasma parameters, optical emission spectroscopy was used; additionally, a Langmuir probe was used to determine the electron temperature.

References

1. M. Fukumoto et al. High heat flux testing of mm thick tungsten coatings on carbon-fiber composites for JT-60SA tokamak // Physica Scripta, Volume 2017, Number T170.
1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVIII/Lt/ru/FB-Sergeev.docx) [↑](#footnote-ref-1)