MODELING OF DEPOSITION OF EROSION PRODUCTS OF THE FIRST WALL ON INTRA-VACUUM OPTICAL COMPONENTS OF ITER [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2023.50.2023.1.1.258

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During operation of ITER, optical diagnostics will be widely used to monitor the operational mode and obtain scientific information. Due to the significant remoteness of the investigated plasma from vacuum boundary, these diagnostics will use in-vessel mirrors, which will be affected by particle flows coming from the ITER plasma. These streams mainly consist of deuterium and beryllium atoms. Flows of high-energy deuterium atoms can lead to erosion of the mirror surface, as well as flows of beryllium can lead to deposition of contaminating films on the mirrors. In the course of the work, numerical modeling of sputtering surface of the first mirror of optical diagnostics 55.C4 and the subsequent transport of contaminants in vicinity of the mirror with a protective casing was carried out. The process modeling allows us to draw preliminary conclusions about the main trends in the degradation of diagnostic optics. The parameters of particle fluxes published in the article of 2021, which discussed the development of a system for cleaning diagnostic mirrors with an RF discharge, were used as input data [1-2]. The KITe code was used to simulate the process of surface sputtering and subsequent particle transport [3]. This code allows for three-dimensional calculation of particle fluxes and their interaction with the surface by the Monte Carlo method, in the case when the processes take place in a rarefied gas with a low degree of ionization. Optical diagnostics will be located in the divertor part of the ITER. Calculations were carried out both in the case when there is no magnetic field and only the flow of particles to the surface of the first mirror is set, and in the case when there is a strong magnetic field and charged particles fall both on the surface of the mirror and on the surface of the casing opposite the mirror. The obvious difference is that in the presence of a magnetic field, the casing opposite the mirror is actively sprayed, while without a magnetic field there is a slight dusting of this area. Thus, because of the work, numerical modeling of the process of spraying and re-deposition of beryllium during the cleaning of the node of the first optical element was carried out. The analysis of the efficiency of removal of beryllium deposits from the first optical element of DTR diagnostics in the presence and absence of a strong magnetic field is carried out. As a result of the simulation, the profiles of spraying, deposition and effective spraying (cleaning) of the mirror surface and surrounding structures in cases without and in the presence of the ITER magnetic field are shown. Conclusions are drawn that in the current design of the first mirror of the scattered radiation collection system, the rate of beryllium sputtering exceeds the rate of sputtering on the entire surface of the mirror.

This report was prepared as an account of work for the ITER Organization (Rosatom contract N◦ Н.4а.241.19.22.) and supported by Ioffe Institute (Russian Federation state funding assignment 0034–2019–0001).

References

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1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/L/E/ru/KZ-Lyullin.docx) [↑](#footnote-ref-1)