DOI: 10.34854/ICPAF.52.2025.1.1.045

MODELING OF IMPURITY TRANSPORT IN TRT LIMITER PLASMA *)

[1]Andrianova R.R., [1]Zhogolev V.E., [1]Lukash V.E., [1]Konovalov S.V., [2]Dokuka V.N., [2]Skopintsev D.A., [2]Khayrutdinov R.R.

[1]*NRCKurchatov Institute,Moscow, Russia, andrianova_rr@nrcki.ru*
[2]*SRC RF TRINITI, Moscow, Troitsk, Russia, scopintsev.d.a@triniti.ru*

Currently, the use of various materials to protect the surface of the first wall of the vacuum camera under the influence of wall plasma is being actively studied. The processes in the edge plasma in general and the interaction of plasma with the wall in particular play a crucial role in achieving a stable state of thermonuclear plasma in the tokamak [1].

Ion fluxes emanating from the plasma lead to the sputtering of materials inside the camera elements of the tokamak. The impurities that arise during spraying penetrate into the plasma, which leads to energy losses due to the emission of impurities inside the plasma. In addition, edge processes can also affect global retention properties. The efficiency of any tokamak is determined, in particular, by the reduction of energy losses due to the emission of impurities. The aim of the work is to study the process of impurity transport and its effect on plasma parameters.

To solve the presented problem, a model of particle transport in the peripheral plasma area has been developed, which allows calculations of the behavior of impurities in a tokamak plasma of limiter configuration, in consideration with a given boundary of the plasma cord and using energy balance equations [2] and impurity particles implemented in the Zimpur code [3]. Modeling the effect of an impurity on the main plasma parameters makes it possible to establish and evaluate changes in plasma density, emission loss profile, bypass voltage, and plasma discharge duration.

To test the developed impurity transport model, a numerical experiment was performed for TRT, in which the balances of the fluxes of neutrals entering the plasma and charged particles leaving it were checked. The obtained energy time was also compared with the time calculated using neo-aleatory scaling, as well as the value of the invested power compared with the power of energy losses due to thermal conductivity and emission.

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*) abstracts of this report in Russian