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Parametric study of the impurity profile in the Thailand tokamak

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A small tokamak is planned to be installed in Thailand at Thailand Institute of Nuclear Technology (TINT), Ongkarak campus in Nakorn Nayok, under the collaboration of the Center for Plasma and Nuclear Fusion Technology (CPaF). One of the great challenges subject in operating this tokamak is to gain better understanding of the impurities behavior because the impurities are responsible for the large power losses. Therefore, the studies of the impurity behaviors are conducted for the commissioning stage of Thailand tokamak. In this work, the spatial density distribution over all ionization states of helium, carbon, and oxygen have been calculated using the assumption of steady-state plasma under the relevant plasma scenarios that will be operated using Thailand tokamak. Additionally, the prescribed transport coefficients of charge number on neoclassical convection velocity and simplified turbulent transport coefficient effect are taken into account of this model. The quantification of Zeff has been carried out to characterize the impurity content of plasma. Finally, the impurity radiated power have been extracted using ADAS database of the global spectral line and continuum radiative coefficient. Due to the low charge number (Z) of interested impurities, the obtained power loss occurs mostly in the region near the plasma edge. It is found that when the plasma current is increased, the radiated power peak shifts toward the plasma edge. The calculation in this work provides significant contribution in commissioning and operating the Thailand tokamak to be available in various applications.

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