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Two-dimensional Simulation on Self-consistent Transports of Plasma, Neutrals, and Carbon Impurities in a Divertor Region of the KSTAR Tokamak HYUN-SUN HAN, SANG HEE HONG, Seoul National University, Seoul — A two-dimensional numerical modeling has been carried out to analyze the transport phenomena of plasma, neutrals and intrinsic carbon impurities in a divertor domain of the Korea Superconducting Advanced Research (KSTAR) tokamak. In this numerical simulation, spatial distributions of these divertor species are calculated in a self-consistent way by coupling the respective transport code modules iteratively. Transports of the plasma and carbon impurities are computed based on the two- dimensional Braginskiis multi-fluid formulation, while the neutral distributions are obtained from the transmission and escape probability (TEP) method by adapting the GTNEUT[1] code. The TEP method has accuracy comparable to a Monte Carlo method with fast computing time and flexibility of coupling with plasma fluid codes. As results of the simulation, time evolutions of edge plasma characteristics such as density and temperature are presented for the baseline operation scenario of the KSTAR tokamak. The calculated results show that the excessive heat flux on the divertor plate is likely to result in the severe target erosion even though the neutrals and impurities play a positive role in reducing the heat flux in this divertor region, as reported previously in many other tokamak devices.
[1] J. Mandrekas, Comput. Phys. Comm., 161, 36 (2004)

Hyun-sun Han
Seoul National University, Seoul

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