A+M Data Application in EAST Tokamak Edge Simulation of Impurity Seeding Plasma

X.J.Liu[*],G.Z.Deng[*], L. Zhang[*], S.C.Liu[*], L.Wang[*], J. Huang[*], Z.S.Yang[*], X. Gao[*], and EAST Team[*]

**Institute of Plasma Physics, Chinese Academy of Sciences, P.O. 1126, 230031 Hefei, Anhui, China*
Email:julie1982@ipp.ac.cn

Future highly-powered tokamaks will be confronted with the requirements to simultaneously avoid potentially damaging power loading at divertor targets, maintain desirable high performance plasma metrics (e.g., energy confinement), and sustain adequate pumping rate for particle control. Some experiments on present tokamaks show that significant reduction in heat loading and improvement in plasma confinement are possible achieved simultaneously by carefully choosing appropriate radiators to enhance the radiated power especially in edge region. Because the divertor physics and core plasma performance are closely related to radiation characters of impurity gases seeded in plasma. In order to understand the radiative efficiency and distribution of different candidate radiators and to optimize the choice, resorting to modeling tool is meaningful and necessary.

In this work, we will present detailed modeling studies of divertor target power loading and radiative distribution in EAST, as well as the consequence for core confinement and contamination with N, Ne and Ar seeding by using SOLPS5.0. As we known, the atomic and molecular (A+M) physics processes are crucial in detailed modeling of transport and charge, momentum and energy balance. So the choice of A+M data and physics model determines the interaction of the plasma constituents, and eventually affect the power dispersal and momentum losses in plasma. In our modeling, all used reaction rates such as ionization, excitation, recombination of ions, neutrals and dissociation of molecules are from database. The comparison and assessment of simulation results with use of different database will be also presented. In addition, it need to put forward that, the rate coefficients information is still not complete and further data generation efforts are required for medium-z Ne and Ar impurities especially charge exchange processes in very low energy (~2 eV) prevailed in detachment plasma which play an important role in the loss of momentum and particles.

Acknowledgments
This work is supported by National Magnetic Confinement Fusion Science Program of China under contract no. 2014GB106005, 2015GB101003; National Nature Science Foundation of China under contract no. 11275231, no. 11305206, no.11405213 and no.11575244.