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Three-Dimensional Simulation of the Supersonic Molecular Beam Injection in Thailand Tokamak 1

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Fueling in tokamaks is important for plasma confinement and operation. It can be realized by three main methods: gas puff, pellet injection, and supersonic molecular beam injection (SMBI). The SMBI can deliver the fuel more effective than the gas puff, and Thailand Tokamak 1 which is under development may potentially employed this fueling technique. In this work, we develop a simulation for studying the plasma dynamics during the SMBI in TT1. The simulation is based on the fluid model which includes the continuity equation, energy balance equations, momentum equation, continuity of fuel equation, and momentum of fuel. BOUT++ code is used to numerically solve these equations by a finite difference method in three-dimensional space. The initial results show that when SMBI of the hydrogen gas is launched into the plasma with a speed of 600 m/s, the electron density in the edge immediately increases due to the dissociation and ionization processes. The ion and electron temperatures subsequently decrease. The full analysis of the simulations hopes to benefit for designing of the injector and experimental plan for TT1 in the future.

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