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BCA-kMC Hybrid Simulation for Hydrogen and Helium Implantation in Material under Plasma Irradiation SHUICHI KATO, Doshisha University, National Institute for Fusion Science, ATSUSHI ITO, National Institute for Fusion Science, The Graduate University for Advanced Studies, MAMIKO SASAO, Doshisha University, HIROAKI NAKAMURA, National Institute for Fusion Science, Nagoya University, MOTOI WADA, Doshisha University — Ion implantation by plasma irradiation into materials achieves the very high concentration of impurity. The high concentration of impurity causes the deformation and the destruction of the material. This is the peculiar phenomena in the plasma-material interaction (PMI). The injection process of plasma particles are generally simulated by using the binary collision approximation (BCA) and the molecular dynamics (MD), while the diffusion of implanted atoms have been traditionally solved by the diffusion equation, in which the implanted atoms is replaced by the continuous concentration field. However, the diffusion equation has insufficient accuracy in the case of low concentration, and in the case of local high concentration such as the hydrogen blistering and the helium bubble. The above problem is overcome by kinetic Monte Carlo (kMC) which represents the diffusion of the implanted atoms as jumps on interstitial sites in a material. In this paper, we propose the new approach "BCA-kMC hybrid simulation" for the hydrogen and helium implantation under the plasma irradiation.

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