Development of a collisional PIC code for an analysis of cluster plasmas

TOSHIHIRO TAGUCHI, Setsunan University, THOMAS ANTONSEN, HOWARD MILCHBERG, University of Maryland — We have developed a new particle-in-cell (PIC) code with ionization and collisional processes to analyze an interaction between a strong laser field and cluster plasmas. The code includes field and collisional ionization processes, electron-electron collisions by means of a Langevin type stochastic acceleration and electron-ion scattering. Using our new code, we analyzed the dynamics of a single cluster under a strong alternating electric field, which simulates a strong laser field in a range of $10^{14}$–$10^{17}\text{W/cm}^2$. The results show that the code has a capability to simulate a dynamical behavior of an Argon cluster from the aggregation of neutral atoms to a rapidly expanding plasma heated by a strong laser field. The results also show that a resonant heating at a specific laser intensity whose value depends on a size of the cluster, as we reported in the references.