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Monte Carlo simulations of ionizing shock waves in argon[1]
PATRICK O'CONNOR, CHRISTOPHER BOSWELL, Indian Head Division, Naval Surface Warfare Center — The direct numerical simulation of shock-induced ionization was completed in order to determine the processes involved in the formation of explosively generated plasmas. The formation and structure of the ionizing shock, including flow instabilities and charge separation, were treated using a Monte Carlo method. Direct simulation Monte Carlo is a particle-based method used to model Boltzmann-like gas flows on a molecular scale by simulating systems containing thousands or millions of statistically representative particles. Interactions between neutral particles, ions, and electrons were encountered and involved hard-sphere and coulombic collisions, electron impact ionization events, and long-range magnetic and electrical forces. Simulation results will focus primarily on the coupling between the shock and the motion of the charged particles. Comparing these molecular level interactions to previous experimental work will provide additional interpretation of the effects of electric fields on shock wave behavior.

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