Magnetohydrodynamic Simulation of Exploding Wire in Water.
DEOK-KYU KIM, INHO KIM, SUNG-HYUN BAEK, Agency for Defense Development — We present one-dimensional time-dependent magnetohydrodynamic (MHD) simulation of exploding wires in underwater discharge experiment. The simulation employs Saha equilibrium equation-of-state (EOS) data while the electrical conductivity is obtained from a nonideal model that takes into account the Coulomb coupling effect in warm dense plasma [1]. It is assumed that the wire is initially in warm plasma state with a uniform density distribution. The MHD behaviors of aluminum and copper plasmas and the shock propagations in the surrounding water are calculated and compared with the observations made by a frame camera. Comparisons of the temporal behaviors of plasma boundaries and water shock propagations show reasonable agreements considering the simple EOS model used in the simulation. In addition, the calculations seem to effectively reproduce the measured electrical conductivity behaviors in the early stages of discharge. [1] Deok-Kyu Kim and Inho Kim, Phys. Rev. E 68, 056410 (2003).

Deok-Kyu Kim
Agency for Defense Development

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