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Effect of Hot Electron Pressure in Ultrafast Laser Interaction with Metals ZHIBIN LIN, LEONID ZHIGILEI, Department of Materials Science and Engineering, University of Virginia — Ultrafast laser irradiation can transiently bring a metal into a highly nonequilibrium state in which the electron temperature can reach thousands of Kelvin while the lattice remains cold. Under these conditions the thermal pressure from the hot conduction electrons can play an important role in defining the initial relaxation dynamics of the irradiated target. In this work, a description of the hot electron pressure due to the presence of the excited electrons is incorporated into a continuum-atomic computational model combining the molecular dynamic method with the two temperature model. Computer simulations employing this approach are performed for Al, Au, and Ni metal films and bulk targets. The effect of the hot electron pressure on the generations of acoustic phonons in the laser-irradiated metal film will be discussed and compared with existing experimental data. The relative contributions of the hot electron pressure and thermoelastic stresses due to the lattice heating to the dynamics of the irradiated target and spallation/ablation process are discussed based on the results of the computer simulations.

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