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Numerical modeling of radiation physics in kinetic plasmas [IV] – Isochoric heating by intense X-ray laser-produced photoelectrons RYAN ROYLE, YASUHIKO SENTOKU, University of Nevada, Reno — An intense, hard X-ray laser such as an XFEL is an attractive light source since it can directly heat solid matter isochorically to a temperature of millions of degrees on a time scale of a few tens of femtoseconds, which is much shorter than the plasma expansion time scale. The X-ray laser interaction with carbon, aluminum, silicon, and copper is studied with a particle-in-cell code that solves the photoionization and X-ray transport self-consistently. Photoionization is the dominant absorption mechanism and non-thermal photoelectrons are produced with energy near the X-ray photon energy. The photoelectrons' stopping range is a few microns and they are quickly thermalized in tens of femtoseconds. As a result, a hot plasma column is formed behind the laser pulse with a temperature of more than 100,000 kelvin (>10 eV) and energy density greater than 10^{11} J/m^3. The heating depth and temperature depend on the material and are also controllable by changing the photon energy of the incident laser light.

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