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Multiple-stage ionization dynamics of carbon film irradiated by high power lasers TOMOHIRO MASAKI, YASUAKI KISHIMOTO, Kyoto-Univ. — Ionization dynamics and energy transport in ultra-short (100fs) high power ($5x10^{19}W/cm^2$) laser-carbon film interaction is simulated by extended particle based integrated code (EPIC3D). In the code, optical field and electron impact ionization, and also collisional relaxation process are taken into account. We found two types of ionization dynamics, namely, a fast time scale convective propagation of the ionization front with C^{4+} triggered by induced plasma waves, and a slow front with C^{5+} and C^{6+} triggered by high energy electrons near interaction surface. Thus, ionization dynamics in carbon film are found to evolve through multiple stages. We also found that the slow time scale ionization due to electron impact is tightly coupled to electron heat transport process and non-local high energy electrons which transfer the heat contribute to the ionization. It is also found that the ambi-polar electric field which is established to keep charge neutrality during heat transport accelerates ions in the carbon film.

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