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The role of hot electrons on ultrahigh pressure generation relevant to shock ignition conditions

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We performed an experiment on ultrahigh pressure generation with hot electrons produced by high-intensity laser plasma interactions. Hot electrons with small temporal duration might be ultra-high pressure source by absorption of matter within very thin layer that is comparable to mean free path of hot electrons [1]. The ultrahigh-pressure generation exceeding GBar regime is very important for shock ignition scheme of ICF targets, as well as fundamental ultrahigh-pressure experiments.

Experiments were done on GEKKO-HIPER laser irradiation facility at ILE, Osaka University. We irradiated three-layered foils (CH-Cu-Quartz) in order to generate the ultrahigh pressure with hot electrons, and observe shock wave into the third quartz layer. The pulse duration and the intensity were 300 ps and 10^{14} – 10^{16} W/cm^2, respectively. In order to evaluate the effect of hot electron, we irradiated the targets with ω, 2ω, and 3ω light, with or without prepulse. The absorption area by hot electrons was measured by a Cu-Kα imager. We also measured the electron spectra with electron spectrometer (ESM). The shock wave parameters were taken by VISAR and streaked optical pyrometer (SOP). The experimental results shows enhancement of shock pressure with increasing the number of hot electrons.

References

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