Abstract Submitted
for the GEC13 Meeting of
The American Physical Society

Dynamics of pulsed laser ablation plasmas in high-density CO_2 near the critical point investigated by time-resolved shadowgraph imaging[1] KEIICHIRO URABE, TORU KATO, SHOHEI HIMENO, SATOSHI KATO, SVEN STAUSS, MOTOYOSHI BABA, TOHRU SUEMOTO, KAZUO TERASHIMA, The University of Tokyo — Pulsed laser ablation (PLA) plasmas generated in high-density gases and liquids are promising for the synthesis of nanomaterials. However, the characteristics of such plasmas are still not well understood. In order to improve the understandings of PLA plasmas in high-density fluids including gases, liquids, and supercritical fluids (SCFs), we have investigated the dynamics of PLA plasmas in high-density carbon dioxide (CO_2). We report on experimental results of time-resolved shadowgraph imaging, from the generation of plasma plume to the extinction of cavitation bubbles. Shadowgraph images revealed that the PLA plasma dynamics showed two distinct behaviors. These are divided by gas-liquid coexistence curve and the so-called Widom line, which separates gas-like and liquid-like SCF domains. Furthermore, cavitation bubble observed in liquid CO_2 near the critical point showed peculiar characteristics, the formation of an inner bubble and an outer shell structure, which so far has never been reported. The experiments indicate that thermophysical properties of PLA plasmas can be tuned by controlling solvent temperature and pressure around the critical point, which may be useful for materials processing.

[1]This work was supported financially in part by a Grant-in-Aid for Scientific Research on Innovative Areas (No. 21110002) from the Ministry of Education, Culture, Sports, Science, and Technology of Japan.

Keiichiro Urabe
The University of Tokyo

Date submitted: 14 Jun 2013 Electronic form version 1.4