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Shadowgraph Imaging and Numerical Simulation of Cavitation Bubbles Formed in Pulsed Laser Ablation Plasmas in the Vicinity of the Critical Point of CO_2 HITOSHI MUNEOKA, SHOHEI HIMENO, KEIICHIRO URABE, SVEN STAUSS, MOTOYOSHI BABA, TOHRU SUEMOTO, KAZUO TERASHIMA, University of Tokyo — The characteristic behavior of cavitation bubbles formed in pulsed laser ablation plasmas in supercritical CO_2 were investigated by shadowgraph imaging and numerical simulations. The time evolution of the cavitation bubbles could be divided into three phases near the critical point: Expansion, Double layer formation, and Contraction. The distribution of the refractive index was estimated from the variation of the direction of the refracted light in the shockwave in the expansion phase. It was suggested that the cause of the reduction of the transmitted light in the outer shell in the double-layer phase was not due to refraction, and the contributions of nanoparticles and clusters generated in supercritical fluids were implied. The characteristics in time evolution of the bubble size in the contraction phase, in particular almost constant position of the interface in a relatively long time, was proposed to be due to zero surface tension by numerical simulations. The results suggest that the properties and fluid structure peculiar to SCF affect the structure of cavitation bubbles.

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