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Influence of the gaseous form on the precursor heating layer of a laser-supported detonation wave using half self-emission half shadowgraph visualization KOHEI SHIMAMURA, KEISUKE MICHIGAMI, JOSEPH OFOSO, KIMIYA KOMURSAKI, Graduated school of frontier sciences, University of Tokyo — After breakdown one of the possible mechanisms of occurrence of laser-produced plasma is noted as laser-supported detonation (LSD) wave. This wave consisting of the shock wave and the beam absorbing plasma travels at 1-10 km/s along the beam channel in the direction opposite to the laser incidence. The laser heating structure is recognized as the ZND model of chemical detonation. However, Shimamura et. al, showed that the plasma proceeds the shock wave during LSD regime. The role of shock compression is relatively smaller than preheating by laser. The conventional model is inconsistent with our paper. To investigate the heating structure of a LSD wave, half self-emission half shadowgraph (HSHS) methods provides the self-emission image from the plasma on the top half and the shadowgraph image of the induced shock wave on the bottom half simultaneously. A TEA CO_2 laser was used at 10 J incident energy. The locations of both wave fronts were detected from the brightness distribution of the HSHS images. As a result, the propagation of ionization front precedes that of shock wave front by the order of 10^{-4} m in air and N_2. Preheating layer of N_2 is shorter than that of air because O_2 in air has the lowest ionization energy. Thus, a characteristic of preionization layer depends on the ionization properties because photoionization by the UV radiation generate the seed electrons ahead of shock wave.

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