

Observation of Flame Propagation in a Premixed-Spray Stagnation Flow

by

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ABSTRACT

Simultaneous application of Laser tomography and local chemiluminescence measurement to a premixed-spray flame stabilized in a stagnation flow have been made in order to investigate interrelation between spray characteristics and flame propagation behaviour, especially, influences of spatial and temporal nonuniformity of spray characteristics on flame propagation. Droplets and flame-front movements in a small area indicated by a box in Fig. (a) were monitored simultaneously (Fig. (b)). Time-series planar images of fuel droplets were processed and diameter of droplets were calculated based on Mie-scattering theory, and then the result was compared with PDA data to obtain 2-D spray characteristics. As a result, it was observed that dense spray region prevented flame from propagating, which changed the shape and location of vaporization zone. The speed and direction of flame propagation was affected by the spray characteristics, such as droplet diameter, number density and so on.

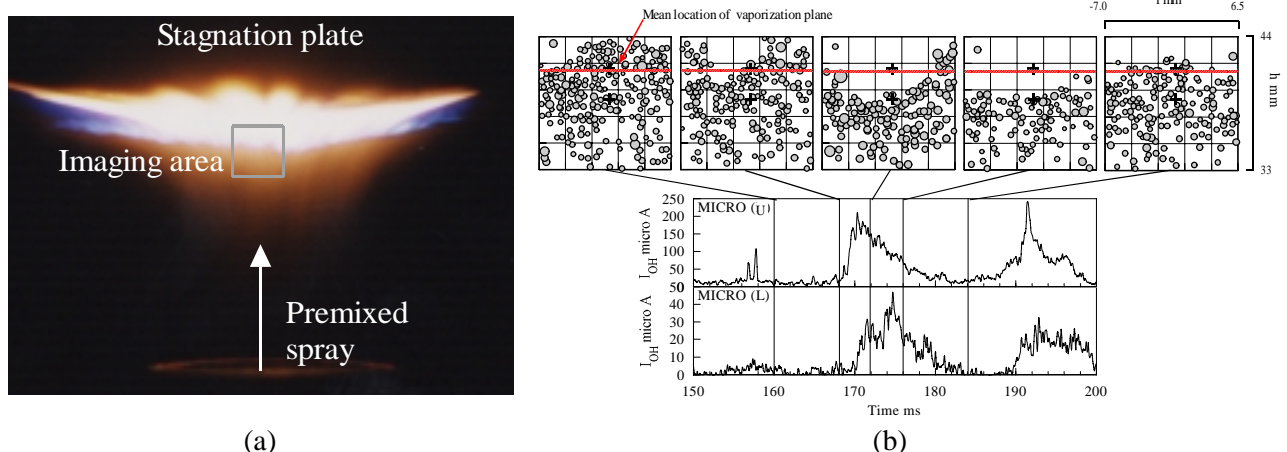


Fig. Observation of spray characteristics and flame-front movement

(a) A direct view of the premixed-spray flame stabilized in a stagnation flow

(b) Time-series droplet behaviours and signals of OH emission monitored at two different locations