

Time-Resolved Laser Induced Incandescence Measurement for a Combustion Field of the 0.5 kg-coal/h Pulverized Coal Jet Burner

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To elucidate soot formation characteristics of pulverized coal combustion, the time-resolved laser Induced Incandescence (TIRE-LII) measurement is adapted to the 0.5 kg-coal/h pulverized coal jet burner. Whereas the TIRE-LII can be utilized to two-phase combustion phenomena, as far as we know, there have been no reports on measurements of primary soot particle size distribution in pulverized coal flames employed the TIRE-LII. The purpose of this study is, therefore, to apply the TIRE-LII measurement to a pulverized coal flame in order to elucidate soot formation characteristics in pulverized coal flames. The primary soot particle size distribution in the lab-scale pulverized coal flame, which stabilized by methane-air diffusion flame, is measured by the TIRE-LII.

Figure 1 shows a schematic illustration of the experimental set up. TIRE-LII signals are detected by using two high-speed CMOS cameras (Vision Research Inc., Phantom V5.0) located vertically to the laser sheet. The time interval between the first acquisition and the second acquisition of LII signals for TIRE-LII is set to 450 ns. In order to avoid signals' interference other than LII signal, the detection timing and the wavelength are controlled by the optical interference filter and a pulse delay generator, respectively. TIRE-LII measurements are conducted at 135 mm height from the burner tip and the ensemble-averaged values of primary soot particle size distribution are measured. The ensemble-averaged values are obtained using 500 measurements.

Figure 2 shows the instantaneous two dimensional LII signal intensity distribution (the gray-scale image) and the time-averaged primary soot particle size distribution. It can be understood from Fig. 2 that isolated soot formation areas are formed in the coal flame. In addition, the primary soot particle size distribution in the pulverized coal flame is similar to that in diesel engines.

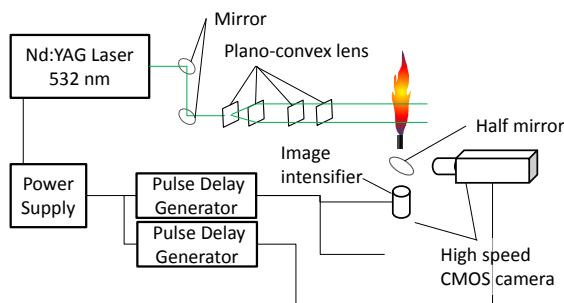


Fig.1 A schematic illustration of the experimental set up

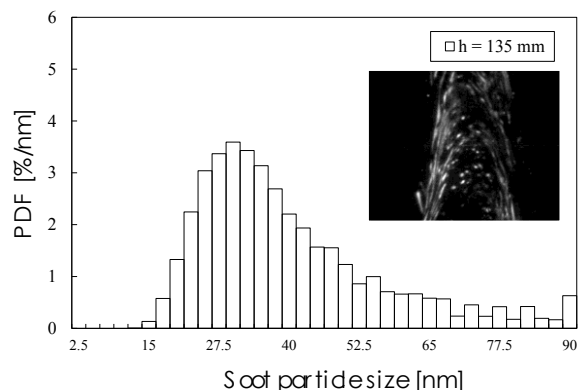


Fig.2 Soot particle size distribution and instantaneous LII signal intensity distribution of pulverized coal flame