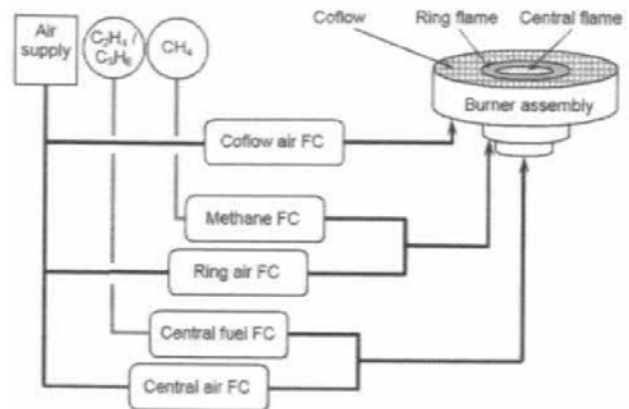


Sooting Flames #4

Apparatus

The central, sooting flame (*ethylene/air*) was stabilized above a water-cooled sintered bronze matrix. This flame is surrounded by a non-sooting “shielding flame” of methane/air ($\phi=1.68$). The flames were surrounded by an air coflow. The diameters of the central matrix, shielding matrix, and coflow duct were 41.3 mm, 61.3 mm, and 150 mm, respectively



Measurements

Quantitative soot volume fraction measurements were obtained using laser-induced incandescence coupled with a quasi-simultaneous absorption measurement for calibration. The data were corrected for signal trapping using an "onion peeling" algorithm. A refraction index of $m=1.60-0.59i$ was used.

Temperature measurements were obtained using shifted vibrational coherent anti-Stokes Raman scattering, which yields well-resolved, accurate temperature measurements in sooting and non-sooting environments.

Conditions

Pressure: 1 bar

$\phi=2.3$ (C/O=0.766) – Fuel: 13.86 % - O₂: 18.09 % - N₂: 68.05 % - $V_0=7.74\text{cm/s}$

- Temperature profile
- Soot volume fraction

$\phi=2.5$ (C/O=0.834) – Fuel: 14.90 % - O₂: 17.87 % - N₂: 67.23 % - $V_0=7.84\text{cm/s}$

- Temperature profile
- Soot volume fraction

Notes

The shielding flame acts as a pilot flame and reduces heat losses by conduction and radiation. The cold gas velocities listed in the references are at 273K.

References

1. M.S. Tsurikov, K.P. Geigle, V. Kruger, Y. Schneider-Kuhnle, W. Stricker, R. Luckerath, R. Hedef, M. Aigner, Comb. Sci. Technol. 177 (2005) 1835-1862.