List of Co-flow flames for the ISF datasets

3. Smooke/Long Burner data (Nonsmoking, diluted with varying levels of nitrogen)

Burner description reproduced from (Smooke et al. Combust. Flame 143 (2005) 613–628)
Atmospheric pressure, axisymmetric, coflowing, nonpremixed laminar flames were generated with a burner in which the fuel flows from an uncooled 4.0 mm inner diameter vertical brass tube (wall thickness 0.38 mm) into a concentric, 50 mm diameter air coflow. The fuel was a mixture containing varying ratios of ethylene and nitrogen. The fuel and oxidizer flows are set with an average cold-flow velocity of 35 cm/s. Electronic mass flow controllers, with longterm accuracy to within 5%, governed the flow rates. The same burner apparatus was used for all experiments.

Condition A
Ethylene Sooting Flame 32% fuel diluted with nitrogen, nonsmoking
Fuel: Ethylene/N_2
Oxidizer: Air
Fuel flow rate: 0.044 cm3/s (STP)
Fuel velocity: 35 cm/s (cold-flow velocity)
Oxidizer flow rate: 687.16 cm3/s (STP)
Oxidizer velocity: 35 cm/s (cold-flow velocity)
Recommended T boundary condition: use fuel: 300 K, air: 300 K.
Recommended computational domain: At least 7 cm above the fuel tube exit plane and at least 7.5 cm in the radial direction. At least 15,000 non-equispaced control volumes with careful attention paid to grid independence, tolerance independence, and domain length independence.

Reference: Smooke MD, Long MB, Connelly BC, Colket MB, Hall RJ. Combustion and
Flame 2005;143(4):613–28.

Other experimental and numerical references:

- C.S. McEnally, A.M. Schaffer, M.B. Long, L.D. Pfefferle, M.D. Smooke, M.B. Colket, and R.J. Hall Proc. Combust. Inst., 27, 1497 (1998).
- M.D. Smooke, R.J. Hall, M.B. Colket, et al, J. Fielding, M.B. Long, C.S. McEnally, and L.D. Pfefferle, Combust. Theory Model. 8 (2004) 593–606.
- Kuhn, P.B., Ma, B., Connelly, B.C., Smooke, M.D., Long, M.B., (2011) Proceedings of the Combustion Institute, 33 (1), pp. 743-750.
- Herdman, J.D., Connelly, B.C., Smooke, M.D., Long, M.B., Miller, J.H., (2011) Carbon, 49 (15), pp. 5298-5311.

Experimental data available:

- Temperature isotherms
- Benzene concentration isopleths
- Soot volume fraction isopleths
- Soot volume fraction at selected radial cuts
- T at selected radial cuts
- T, C2H2 and benzene along the flame centerline
- Soot temperature contour
- Some diameter measurements (unpublished)

Condition B

Ethylene Sooting Flame 40% fuel diluted with nitrogen, nonsmoking
Fuel: Ethylene/N2
Oxidizer: Air
Fuel flow rate: 0.044 cm3/s (STP)
Fuel velocity: 35 cm/s (cold-flow velocity)
Oxidizer flow rate: 687.16 cm3/s (STP)
Oxidizer velocity: 35 cm/s (cold-flow velocity)
Recommended T boundary condition: use fuel: 300 K, air: 300 K.
Recommended computational domain: At least 8 cm above the fuel tube exit plane and at least 7.5 cm in the radial direction. At least 15,000 non-equispaced control volumes with careful attention paid to grid independence, tolerance independence, and domain length independence.

Reference: Smooke MD, Long MB, Connelly BC, Colket MB, Hall RJ. Combustion and Flame 2005;143(4):613–28.

Other experimental and numerical references:

- M.D. Smooke, R.J. Hall, M.B. Colket, et al, J. Fielding, M.B. Long, C.S. McEnally, and L.D. Pfefferle, Combust. Theory Model. 8 (2004) 593–606.
- Connelly, B.C., Long, M.B.., Smooke, M.D., Hall, R.J., Colket, M.B., (2009) Proceedings of the Combustion Institute, 32 I, pp. 777-784.
- Connelly, B.C., Bennett, B.A.V., Smooke, M.D., Long, M.B., (2009) Proceedings of the Combustion Institute, 32 I, pp. 879-886.
- Kuhn, P.B., Ma, B., Connelly, B.C., Smooke, M.D., Long, M.B., (2011) Proceedings of the Combustion Institute, 33 (1), pp. 743-750.
- Herdman, J.D., Connelly, B.C., Smooke, M.D., Long, M.B., Miller, J.H., (2011) Carbon, 49 (15), pp. 5298-5311.

Experimental data available:

- Soot volume fraction isopleths
- T, NO, C2H2 and benzene along the flame centerline
- NO concentration and fluorescence signal from NO isopleths
- Soot temperature contour
- Some diameter measurements (unpublished)

Condition C

Ethylene Sooting Flame 60% fuel diluted with nitrogen, nonsmoking
Fuel: Ethylene/N2
Oxidizer: Air
Fuel flow rate: 0.044 cm3/s (STP)
Fuel velocity: 35 cm/s (cold-flow velocity)
Oxidizer flow rate: 687.16 cm3/s (STP)
Oxidizer velocity: 35 cm/s (cold-flow velocity)
Recommended T boundary condition: use fuel: 300 K, air: 300 K.
Recommended computational domain: At least 10 cm above the fuel tube exit plane and at least 7.5 cm in the radial direction. At least 15,000 non-equispaced control volumes with careful attention paid to grid independence, tolerance independence, and domain length independence.

Reference: Smooke MD, Long MB, Connelly BC, Colket MB, Hall RJ. Combustion and Flame 2005;143(4):613–28.

Other experimental and numerical references:

- M.D. Smooke, R.J. Hall, M.B. Colket, et al, J. Fielding, M.B. Long, C.S. McEnally, and L.D. Pfefferle, Combust. Theory Model. 8 (2004) 593–606.
- Kuhn, P.B., Ma, B., Connelly, B.C., Smooke, M.D., Long, M.B., (2011) Proceedings of the Combustion Institute, 33 (1), pp. 743-750.
- Herdman, J.D., Connelly, B.C., Smooke, M.D., Long, M.B., Miller, J.H., (2011) Carbon, 49 (15), pp. 5298-5311.

Experimental data available:

- Soot volume fraction isopleths
- Temperature isotherms
- T, C2H2 and benzene along the flame centerline
- Soot temperature contour
- Some diameter measurements (unpublished)

Condition D
Ethylene Sooting Flame 80% fuel diluted with nitrogen, nonsmoking
Fuel: Ethylene/N2
Oxidizer: Air
Fuel flow rate: 0.044 cm3/s (STP)
Fuel velocity: 35 cm/s (cold-flow velocity)
Oxidizer flow rate: 687.16 cm3/s (STP)
Oxidizer velocity: 35 cm/s (cold-flow velocity)
Recommended T boundary condition: use fuel: 300 K, air: 300 K.
Recommended computational domain: At least 12 cm above the fuel tube exit plane and at least 7.5 cm in the radial direction. At least 15,000 non-equispaced control volumes with careful attention paid to grid independence, tolerance independence, and domain length independence.

Reference: Smooke MD, Long MB, Connelly BC, Colket MB, Hall RJ. Combustion and Flame 2005;143(4):613–28.

Other experimental and numerical references:

- M.D. Smooke, R.J. Hall, M.B. Colket, et al, J. Fielding, M.B. Long, C.S. McEnally, and L.D. Pfefferle, Combust. Theory Model. 8 (2004) 593–606.
- Connelly, B.C., Long, M.B.., Smooke, M.D., Hall, R.J., Colket, M.B., (2009) Proceedings of the Combustion Institute, 32 I, pp. 777-784.
- Connelly, B.C., Bennett, B.A.V., Smooke, M.D., Long, M.B., (2009) Proceedings of the Combustion Institute, 32 I, pp. 879-886.
- Kuhn, P.B., Ma, B., Connelly, B.C., Smooke, M.D., Long, M.B., (2011) Proceedings of the Combustion Institute, 33 (1), pp. 743-750.
- Herdman, J.D., Connelly, B.C., Smooke, M.D., Long, M.B., Miller, J.H., (2011) Carbon, 49 (15), pp. 5298-5311.

Experimental data available:

- Soot volume fraction isopleths
- T, C2H2 and benzene along the flame centerline
- Fluorescence signal from NO isopleths
- Soot temperature contour
- Some diameter measurements (unpublished)

Condition E
Ethylene Sooting Flame 80% fuel diluted with nitrogen, nonsmoking
Fuel: Ethylene/N2
Oxidizer: Air
Fuel flow rate: 0.022 cm3/s (STP)
Fuel velocity: 17.5 cm/s (cold-flow velocity)
Oxidizer flow rate: 343.58 cm3/s (STP)
Oxidizer velocity: 17.5 cm/s (cold-flow velocity)
Recommended T boundary condition: use fuel: 300 K, air: 300 K.
Recommended computational domain: At least 12 cm above the fuel tube exit plane and at least 7.5 cm in the radial direction. At least 15,000 non-equispaced control volumes with careful attention paid to grid independence, tolerance independence, and domain length independence.

Reference: Smooke MD, Long MB, Connelly BC, Colket MB, Hall RJ. Combustion and Flame 2005;143(4):613–28.

Other experimental and numerical references:

Experimental data available:

- Soot volume fraction isopleths