1. Santoro Burner data (Smoking/Nonsmoking)

Burner description (from Santoro et al. 1983):
Two concentric brass tubes of 11.1 mm and 101.6 mm i.d., with the fuel flowing through the central tube and air through the outer passage. The fuel passage contains screens and 3.0 mm glass beads to provide a uniform exit flow profile. The larger air passage also utilizes a series of screens (40 and 70 mesh) with a section filled with 3.0 mm glass beads. A ceramic honeycomb section (Corning-l.5 mm cell size) 1 is used as the final section of the air flow passage. The fuel tube extends 4 mm beyond the exit plane of the air tube.

Condition A.
Ethylene Sooting Flame Nonsmoking

Fuel: Ethylene
Oxidizer: Air
Fuel flow rate: 3.85 cm3/s
Fuel velocity: 3.98 cm/s
Oxidizer flow rate: 713.3 cm3/s
Oxidizer velocity: 8.90 cm/s
Recommended T boundary condition: use conjugate heat transfer to 1 cm below the fuel tube exit plane and T = 300 K. If conjugate heat transfer is unavailable, use fuel: 400 K, air: 300 K.
Recommended computational domain: At least 12 cm above the fuel tube exit plane and at least 4.75 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: R.J. Santoro, H.G. Semerjian, R.A. Dobbins, Combust. Flame, 51, (1983) 203-218.

Other experimental references:
- R.J. Santoro, T.T. Yeh, J.J. Horvath, H.G. Semerjian, Combust. Sci. Technol. 53 (1987) 89-115.
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Numerical references:
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- Q. Zhang, H. Guo, F. Liu, G.J. Smallwood, M.J. Thomson, Proceedings of the Combustion Institute, Volume 32, Issue 1, 2009, Pages 761-768

Experimental data available:
- Integrated soot volume fraction as a function of height.
- Soot volume fraction along the centreline, wings, and selected radial cuts
- Primary particle number density, particle number density, and primary particle diameter along the max soot line
- T, C_2H_2, OH at select radial cuts
- T along the flame centerline

- Max T at each height
- Soot particle TEM images

Condition B
Ethylene Sooting Flame Incipient Smoking
Fuel: Ethylene
Oxidizer: Air
Fuel flow rate: 4.60 cm3/s
Fuel velocity: 4.75 cm/s
Oxidizer flow rate: 713.3 cm3/s
Oxidizer velocity: 8.90 cm/s
Recommended T boundary condition: use conjugate heat transfer to 1 cm below the fuel tube exit plane and T = 300 K. If conjugate heat transfer is unavailable, use fuel: 400 K, air: 300 K.
Recommended computational domain: At least 15 cm above the fuel tube exit plane and at least 4.75 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: R.J. Santoro, H.G. Semerjian, R.A. Dobbins, Combust. Flame, 51, (1983) 203-218.

Other experimental references:
- R.J. Santoro and H.G. Semerjian, Proc. Combust. Inst. 20 (1984) 997-1006.
- R.J. Santoro, T.T. Yeh, J.J. Horvath, H.G. Semerjian, Combust. Sci. Technol. 53 (1987) 89-115.

Numerical references:
- Integrated soot volume fraction as a function of height

Experimental data available:
- Integrated soot volume fraction as a function of height.

Condition C
Ethylene Sooting Flame Incipient Smoking
Fuel: Ethylene
Oxidizer: Air
Fuel flow rate: 4.90 cm3/s
Fuel velocity: 5.06 cm/s
Oxidizer flow rate: 1068.3 cm3/s
Oxidizer velocity: 13.3 cm/s
Recommended T boundary condition: use conjugate heat transfer to 1 cm below the fuel tube exit plane and T = 300 K. If conjugate heat transfer is unavailable, use fuel: 400 K, air: 300 K.
Recommended computational domain: At least 18 cm above the fuel tube exit plane and at least 4.75 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: R.J. Santoro, H.G. Semerjian, R.A. Dobbins, Combust. Flame, 51, (1983) 203-218.

Other experimental references:
- R.J. Santoro and H.G. Semerjian, Proc. Combust. Inst. 20 (1984) 997-1006.
- R.J. Santoro, T.T. Yeh, J.J. Horvath, H.G. Semerjian, Combust. Sci. Technol. 53 (1987) 89-115.
- C.M. Megaridis, R.A. Dobbins, Combust. Sci. Technol. 66 (1989) 1-16.

Numerical references:
- F. Liu, H. Guo, G. J. Smallwood, Ö. L. Gülder, Combust. Theor. Model. 7 (2003) 301-315.

- I.M. Kennedy, C. Yam, D.C. Rapp, R.J. Santoro, Combust. Flame, 107 (1996) 368-382.

Experimental data available:

- Integrated soot volume fraction as a function of height.
- Soot volume fraction along the centreline, wings, and selected radial profiles
- Primary particle number density, particle number density, and primary particle diameter along the max soot line
- Max T as a function of height