List of Co-flow flames for the ISF datasets

4. D'Anna Burner Data (Non-smoking, co-flowing laminar diffusion)
This flame is similar to 1a but not identical

Burner description (from D'Anna et al. 2004):

The burner consists of two concentric tubes, 12 mm inner diameter uncooled vertical tube for the fuel and 108 mm inner diameter for the air. The air annulus is reduced at the burner lip by a ring with 55 mm inner diameter to stabilize the flame; the ring increases the air velocity by a factor of 4.8 and causes the flame height to be slightly altered by a few millimeters. The fuel passage contains screens and 3.0 mm glass beads to provide a uniform exit flow profile. The annular air region uses a series of screens with one section filled with glass beads. The fuel (ethylene) was commercially supplied with 99% purity; the air was supplied through a filtered laboratory compressor.

Conditions

Ethylene Sooting Flame- Non-smoking
Fuel: Ethylene
Oxidizer: Air
Fuel flow rate: 3.85 cm^3/s
Fuel velocity: 3.40 cm/s
Oxidizer flow rate: 700 cm^3/s
Oxidizer velocity: 30.9 cm/s (with 55 mm i.d. ring)
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: A. D'Anna, A. Rolando, C. Allouis, P. Minutolo, A. D'Alessio.
Nano-organic carbon and soot particle measurements in a laminar ethylene diffusion flame
Proceedings of the Combustion Institute, Volume 30, Issue 1, January 2005, Pages 1449–1456

Numerical references:

- D'Anna, A., & Kent, J. H. (2008). A model of particulate and species formation applied to laminar, nonpremixed flames for three aliphatic-hydrocarbon fuels. *Combustion and Flame, 152*(4), 573-587.
- D'Anna, A., Commodo, M., Violi, S., Allouis, C., & Kent, J. (2007). Nano organic carbon and soot in turbulent non-premixed ethylene flames. Paper presented at the *Proceedings of the Combustion Institute, 31 I* 621-629.
- D'Anna, A., & Kent, J. H. (2006). Modeling of particulate carbon and species formation in coflowing diffusion flames of ethylene. *Combustion and Flame, 144*(1-2), 249-260.

Experimental data available:

- Radial distribution of soot volume fraction and organic carbon particles at selected axial positions and corresponding temperature profiles.
- Evolution of the particle diameter profiles along the flame.
- Evolution of the different particle (soot & NOC) volume fractions along the flame axis.