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Modelling Soot Particle Inception and Soot Particle Probe Sampling

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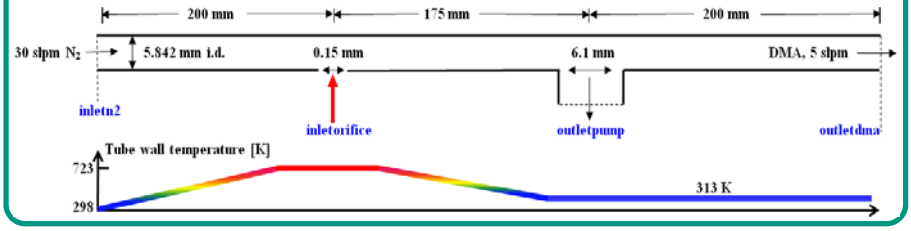
Objectives

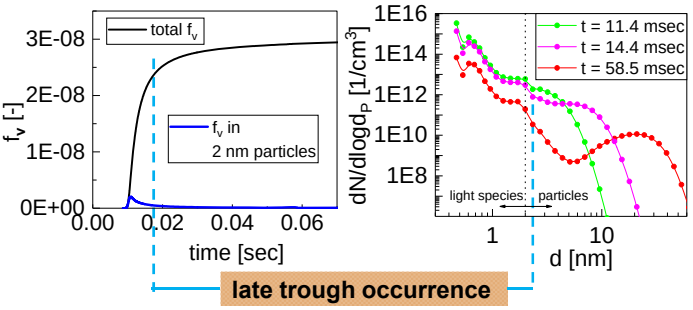
- Investigate the nature of bimodal soot particle size distributions
- Perform CFD calculations of horizontal dilution tubes
- Flame studied: C_2H_4/air, Φ = 2.07, v = 5.9 cm/sec, T_{max} = 1700 K

Numerical Approach

- **Sectional aerosol model, including HC species and particles**
- HC species undergo polymerization in the gas phase to form PAH
- Species above 5,000 amu (d_P = 2 nm) are defined to be particulate
- Particles grow by coagulation and by surface growth
- **CFD model of horizontal dilution tube:**



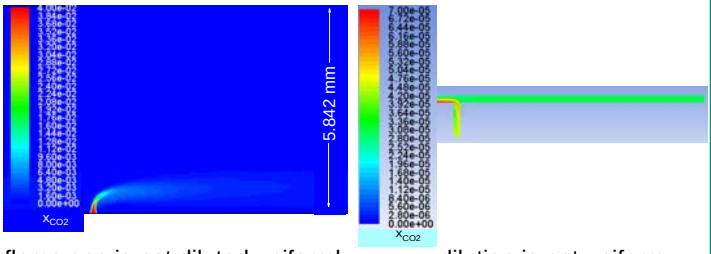
Soot Results



late trough occurrence

- inception contributes little to total soot mass
- trough occurs when inception has declined
- bimodality shows a fading primary particle source

CFD Results



flame gas is not diluted uniformly at orifice inlet and remains at wall

dilution is not uniform on the way to the DMA

- flame gas dilution is not uniform
- simple approximation of dilution ratios is invalid
- careful calibration is mandatory

Outlook

- CFD studies with included particle dynamics
- Assessment of post-sampling effects
- Development of improved sampling techniques

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