

3 – The Effect of Combustion Pressure on Primary Soot Particle Size in Methane-air Diffusion Flames

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Question:

How does the primary soot particle diameter change with combustion pressure?

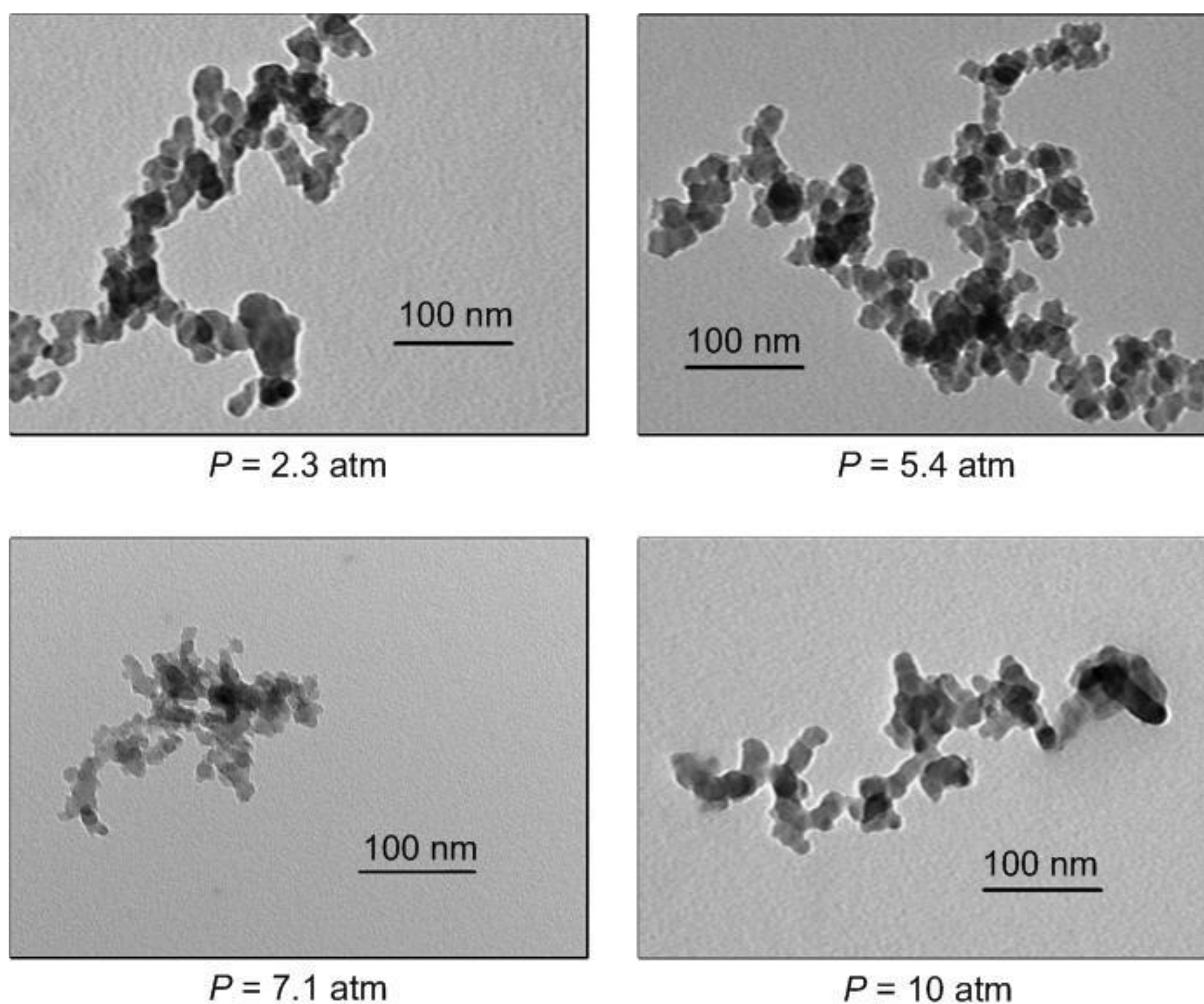
Main Finding:

Primary soot particle size decreases with pressure in diffusion flames.

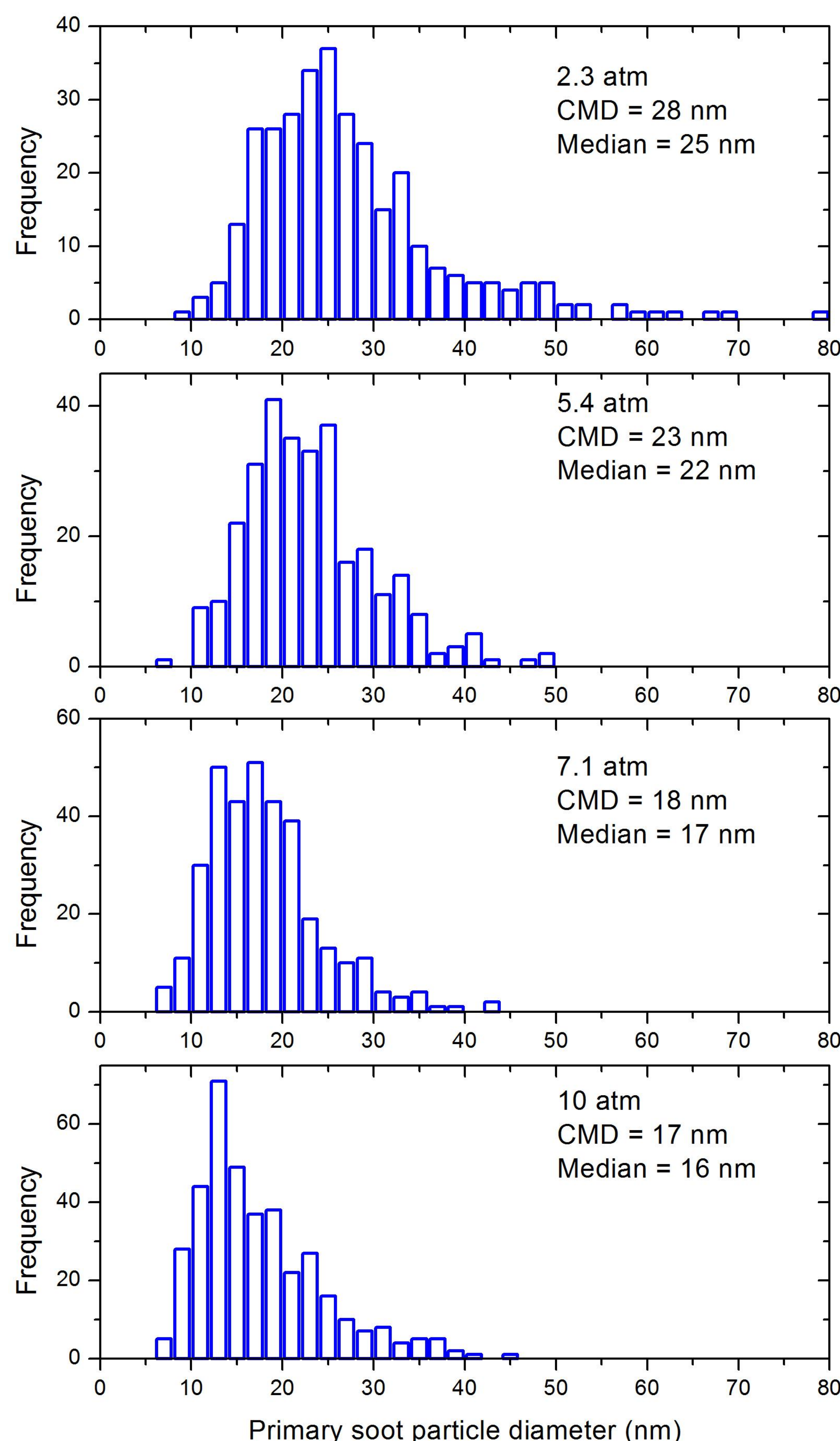
Methodology:

Thermophoretic sampling and TEM analysis from tractable diffusion flames at various pressures.

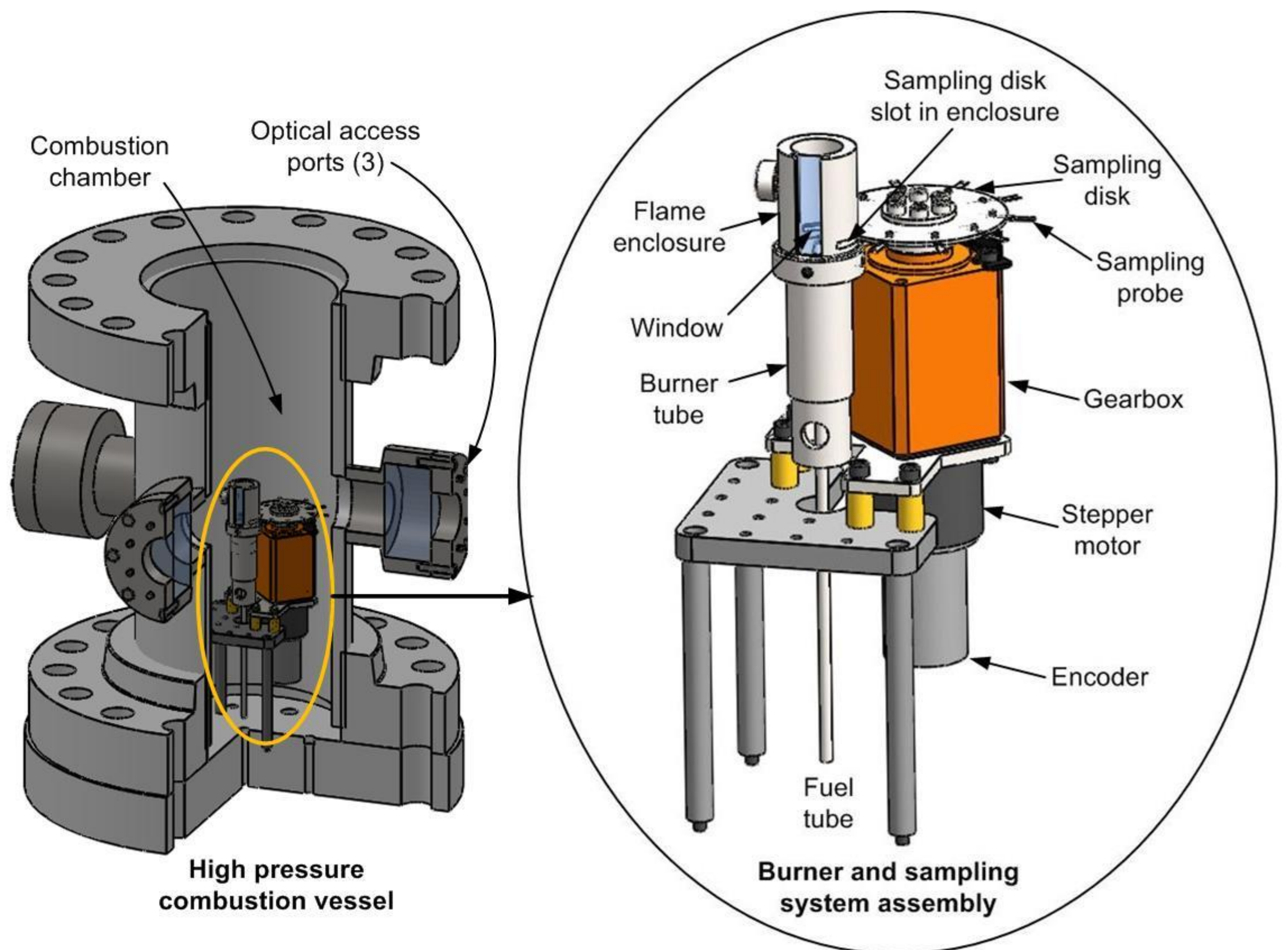
Typical TEM images:



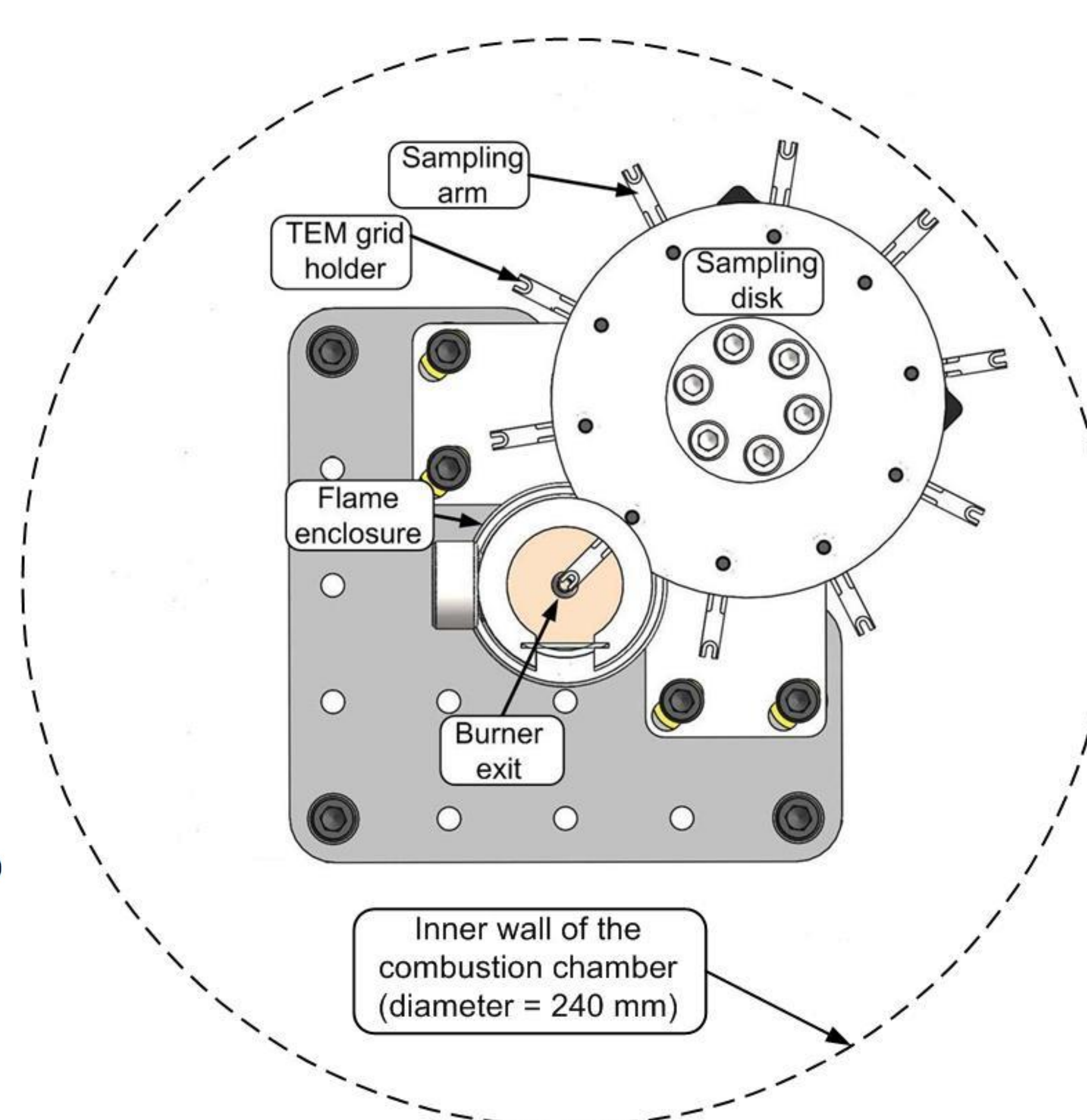
Distributions at various pressures:



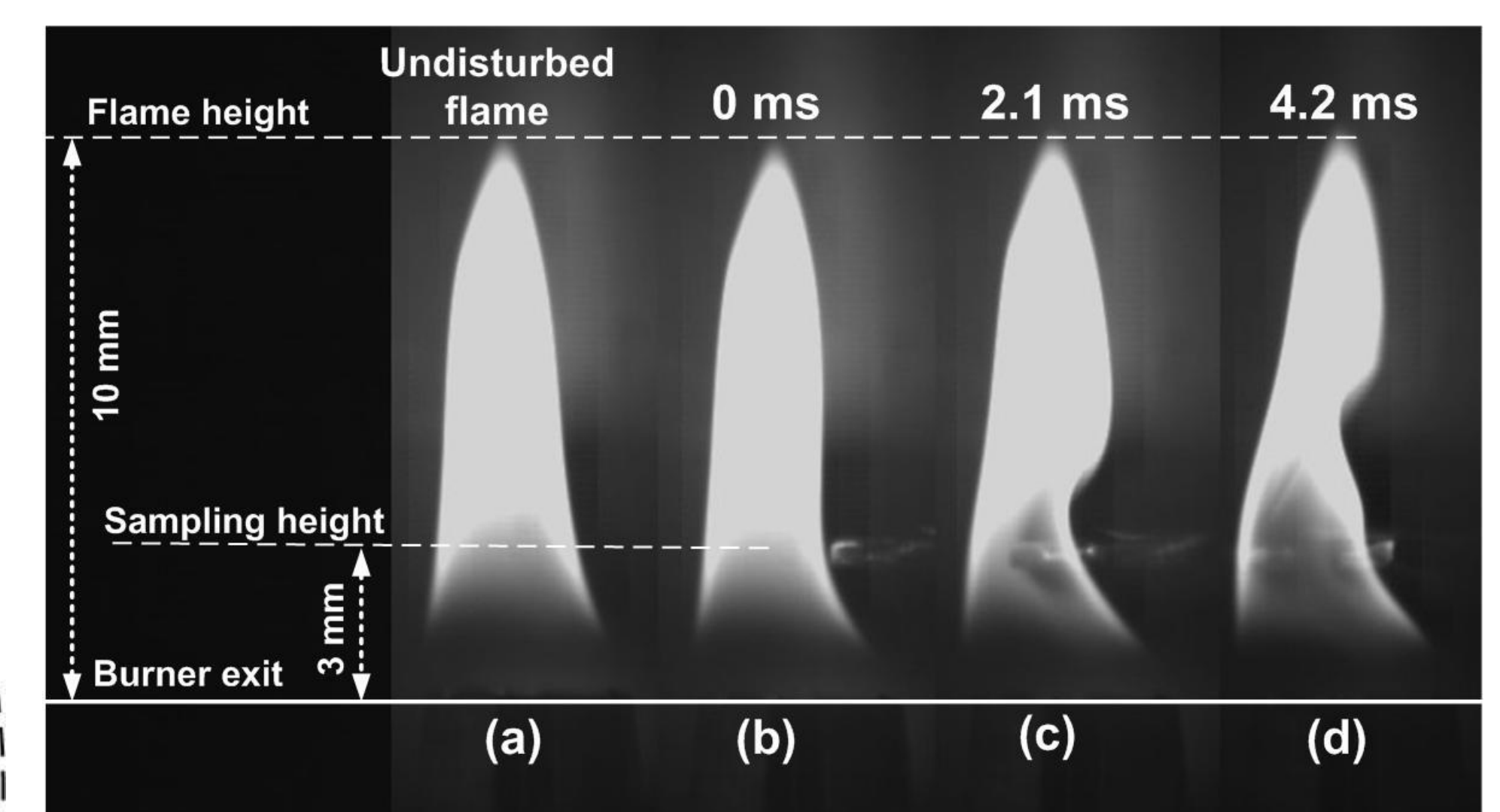
Experimental rig details:



Sampling disk details:

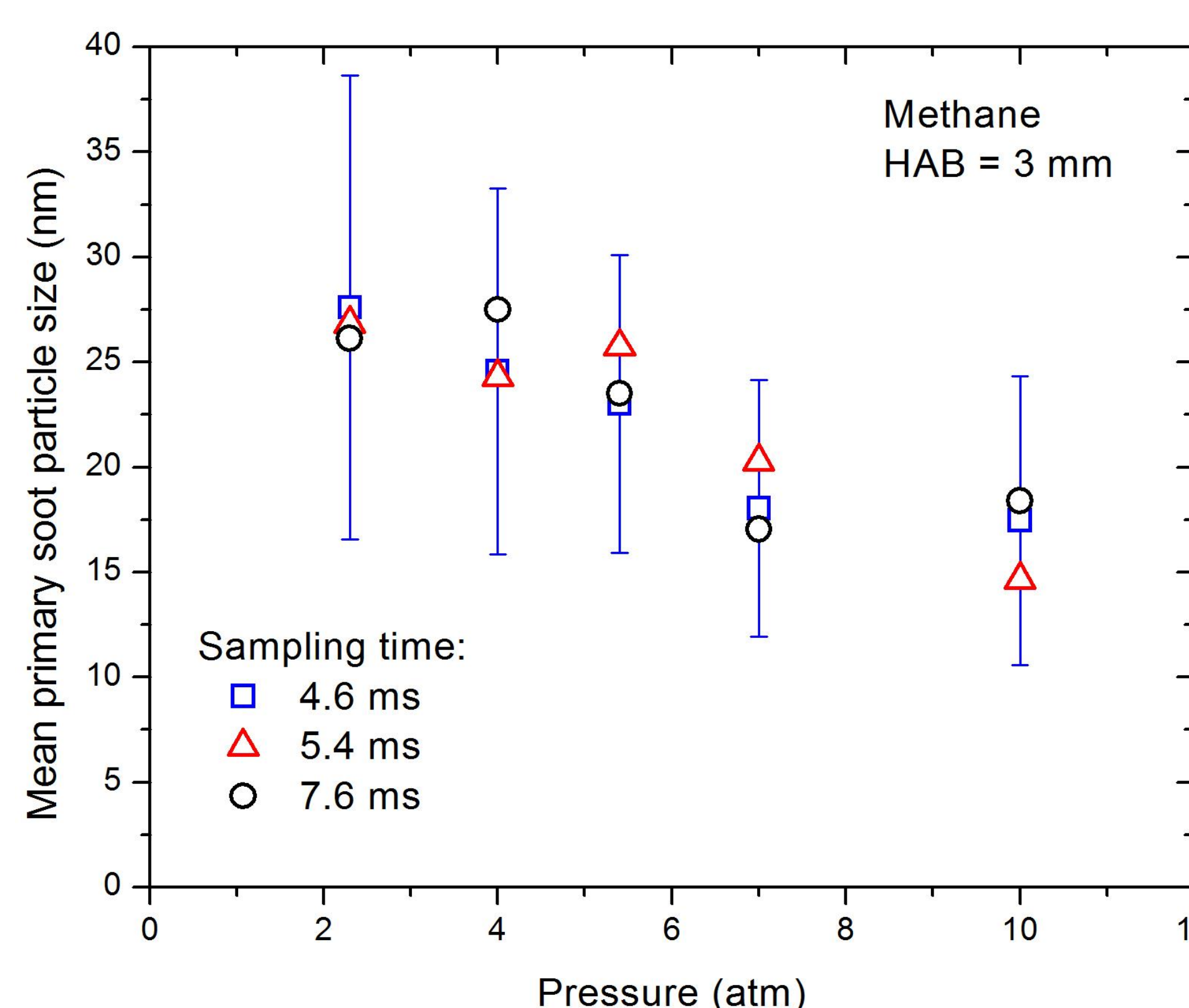


Disturbance by TEM probe:



- b) Probe enters flame
- c) Probe and flame are concentric
- d) Probe leaves flame

Effect of sampling time on primary soot size:



Why primary soot particle size decreases with pressure?

- ❖ Coalescence rate of small PAH clusters decreases by increasing pressure (decreasing Knudsen number)
- ❖ H atom concentration decreases by increasing pressure slowing down the surface growth of primary particles by HACA mechanism

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