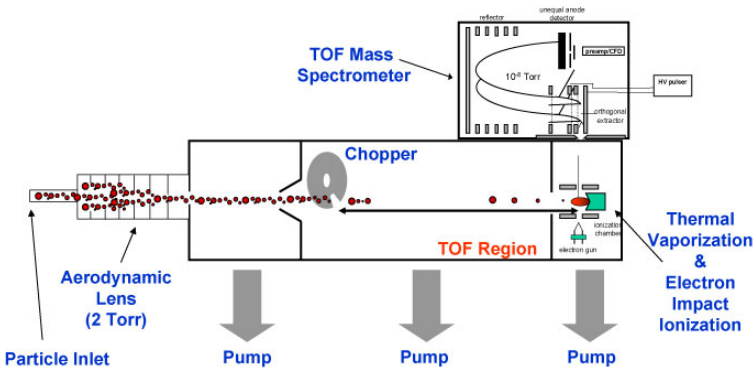
Instrument Development



Laboratory Experiments

Field Studies

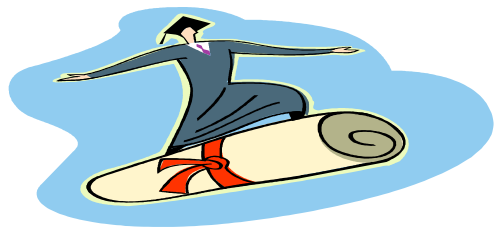
POSTERS

Aerosol Particle Density Determination Using Light Scattering in Conjunction with Mass Spectrometry

E. Cross et al.

Carbonaceous Aerosol Processing in the Mexico City Metropolitan Area

J. Slowik et al.



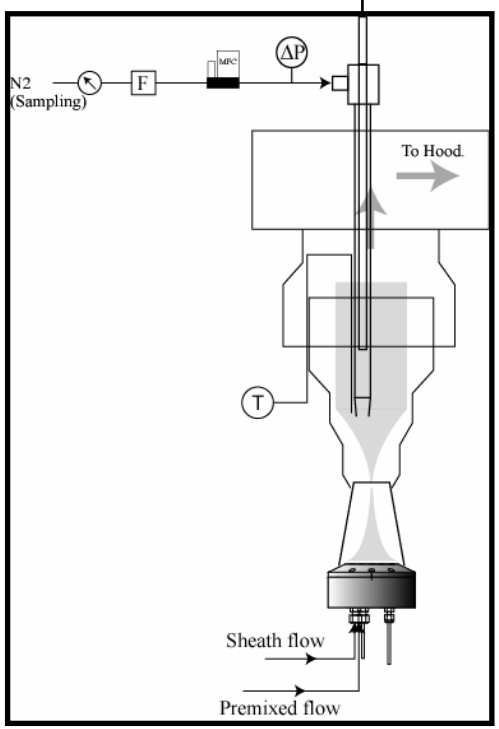
Factors Affecting CCN Activity of Soot Aerosols

E. S. Cross[1], E. F. Gagne[1], J. G. Slowik[1], P. Davidovits[1], T. B. Onasch[2], J. T. Jayne[2], D. R. Worsnop[2].

[1]Boston College, Chestnut Hill, MA 02467
[2]Aerodyne Research Inc. Billerica, MA 01810

DOE ASP Meeting
Boulder, CO
October 25 – 27, 2006

Laboratory Apparatus



SMPS

Scanning DMA

CPC

Denuder

(oven)

POLY IN

MONO OUT

DMA

H_2SO_4 (l)

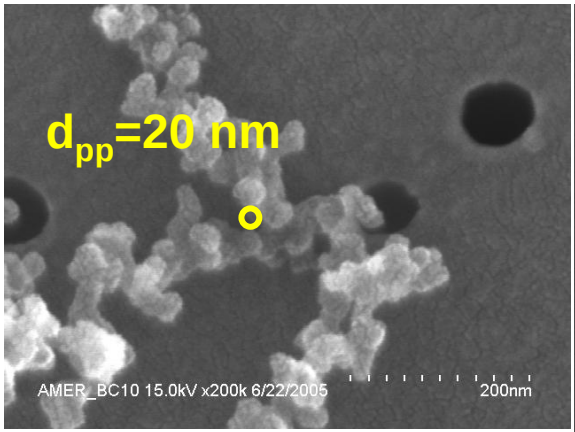
NH_3 (g)

Aerodyne Aerosol Mass Spectrometer

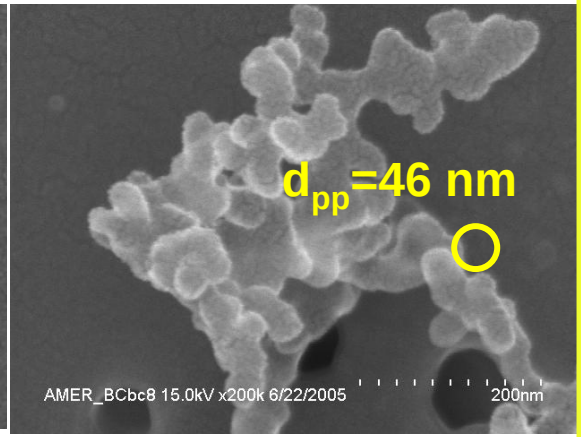
Cloud Condensation Nuclei Counter (CCN)

AMS-Based Characterization of Soot Particles

Soot composed of aggregated BC spherules

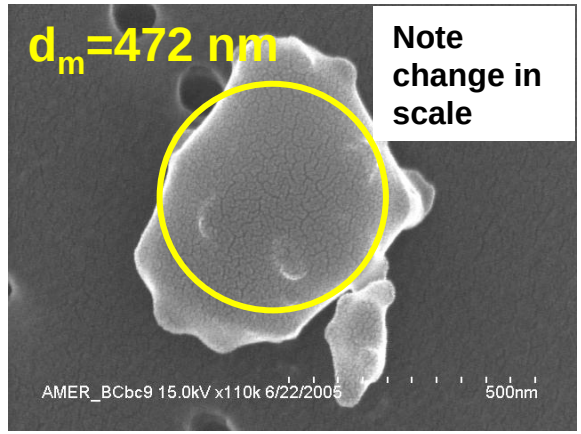


ϕ = 2.3 (fractal)
AMS d_{pp} = 20 nm



ϕ = 3.5 (fractal)
AMS d_{pp} = 46 nm

Soot composed of BC spherules coated by PAHs



ϕ = 5.0, d_{pp} not predicted

Fractal Agglomerate

Near-Spherical Soot

1 2 3 4 5 6

Fuel Equivalence Ratio (ϕ)

$$\phi = \frac{\text{Actual Fuel/O}_2}{\text{Fuel/O}_2 \text{ for Complete Combustion}}$$

- **Effect on Soot CCN Activity of:**

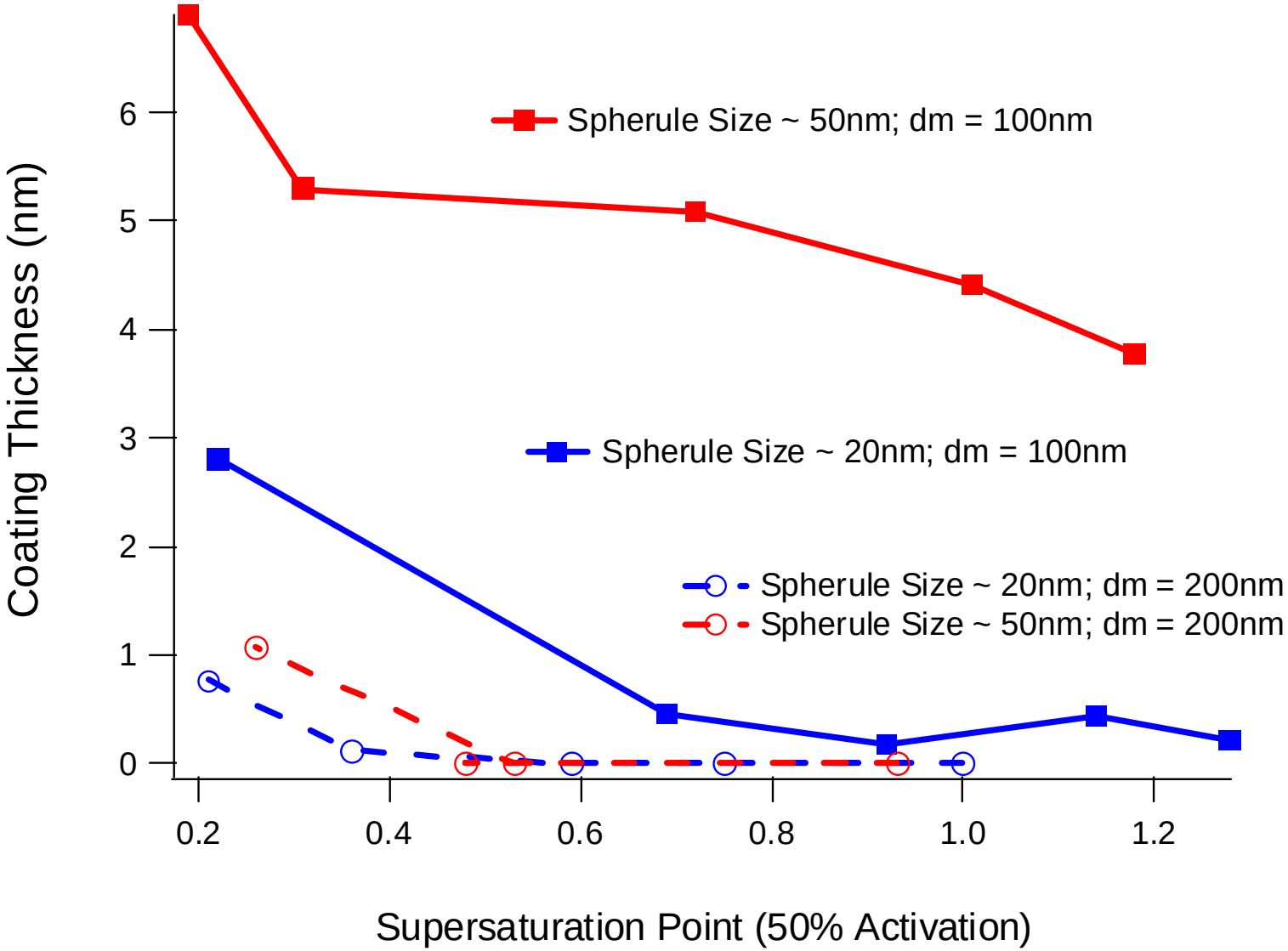
- Thickness of salt coating e.g. $(NH_4)_2SO_4$
- Thickness of organic coating of varying hydrophilic properties e.g. glutaric acid
- Effect of soot morphology; mobility diameter (major axis) , spherule size.

- **Current results:**
- CCN activity increases with mobility diameter (expected)
- CCN activity decreases with increasing spherule diameter (unexpected)

- **Future Work:**

- **Deactivation of Sulfate Cores with Hydrophobic Organic Coating.**

- **CCN Activity of Inorganic-organic Internally Mixed Aerosols**


Coating Thickness (nm)
0
1
2
3
4
5
6
0.2
0.4
0.6
0.8
1.0
1.2
Supersaturation Point (50% Activation)
Spherule Size ~ 50nm; dm = 100nm
Spherule Size ~ 20nm; dm = 100nm
Spherule Size ~ 20nm; dm = 200nm
Spherule Size ~ 50nm; dm = 200nm

Current results:

- CCN activity increases with mobility diameter
- CCN activity decreases with increasing spherule diameter