Fundamental properties of SOA particles and their representation in models

Objective: Investigate the formation, chemical and physical properties, and evolution of SOA particles to properly represent them in the models

Climate Relevant SOA Property(s) Investigated: SOA phase, viscosity, morphology, volatility, composition.

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Summary of progress:

- Demonstrated that SOA particles, assumed to be liquids, are semi-solids with viscosity characteristic of tars - highly viscous SOA cannot equilibrate by rapid mixing, as assumed
- Demonstrated that SOA particles evaporate orders of magnitude slower than assumed - SOA evaporation is too slow to equilibrate with changing gas phase
- Demonstrated that SOA evaporation remains very slow even at 90% RH
- Demonstrated synergetic relationship between PAHs and SOA that provides explanation for long range transport of PAHs, and biogenic-anthropogenic interactions

Challenges or needed resources/collaborators: Measurements of ambient SOA in other locations; SOA viscosity and volatility at high RH and low T conditions; Effect of hydrophobic organics on SOA yields; Processes in the condensed phase.

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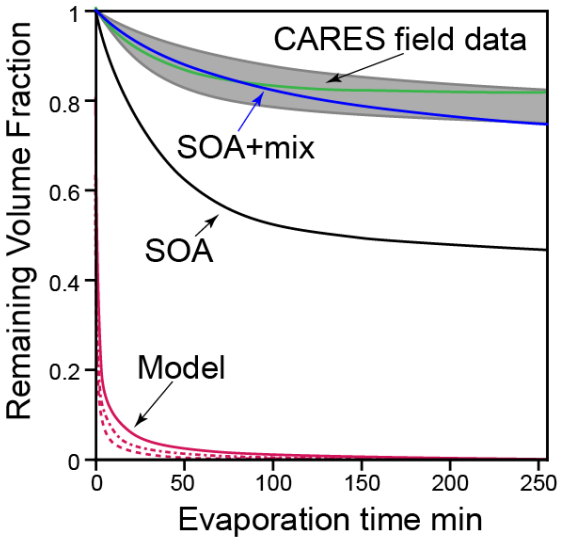
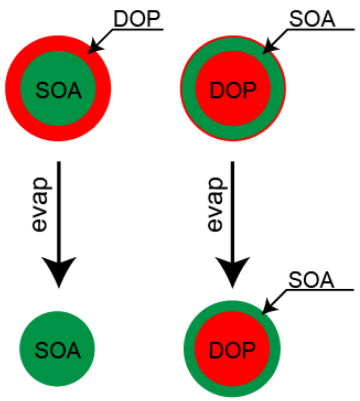
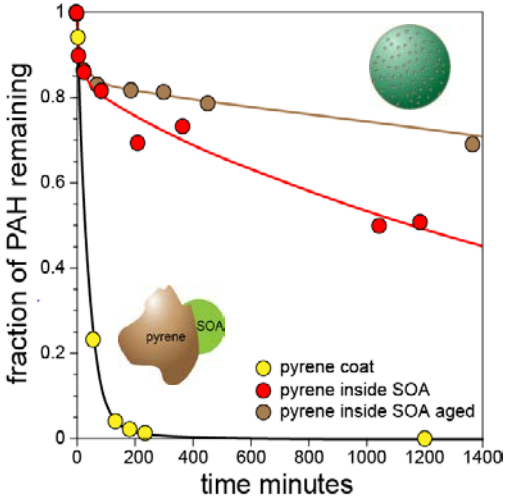
Data suggest that to first order SOA can be treated as non-volatile



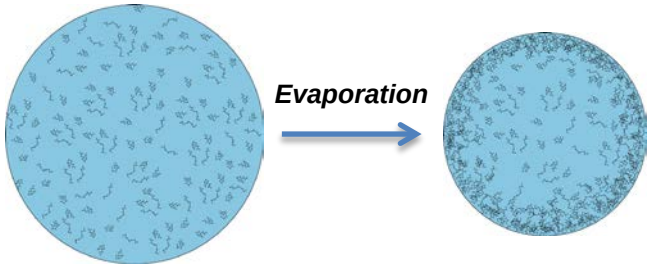
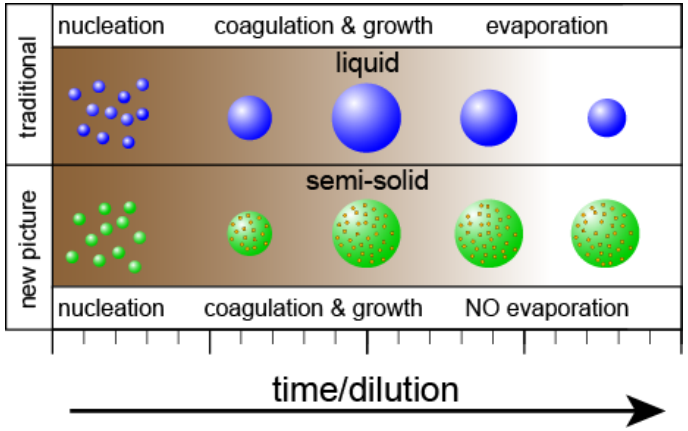
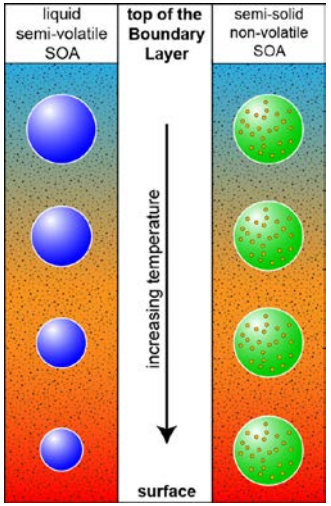
SOA are viscous semi-solids



Diffusivity - D=2.5 10^{-21} m^2 s^{-1}
Viscosity ~10^8 Pa-s, harden with time
Synergy between SOA and PAHs



Oligomers play very important role



New Measurement-based SOA Paradigm: semi-solids, nearly non-volatile, trap some volatile organic molecules during formation, and are ***not*** in equilibrium with the gas-phase