

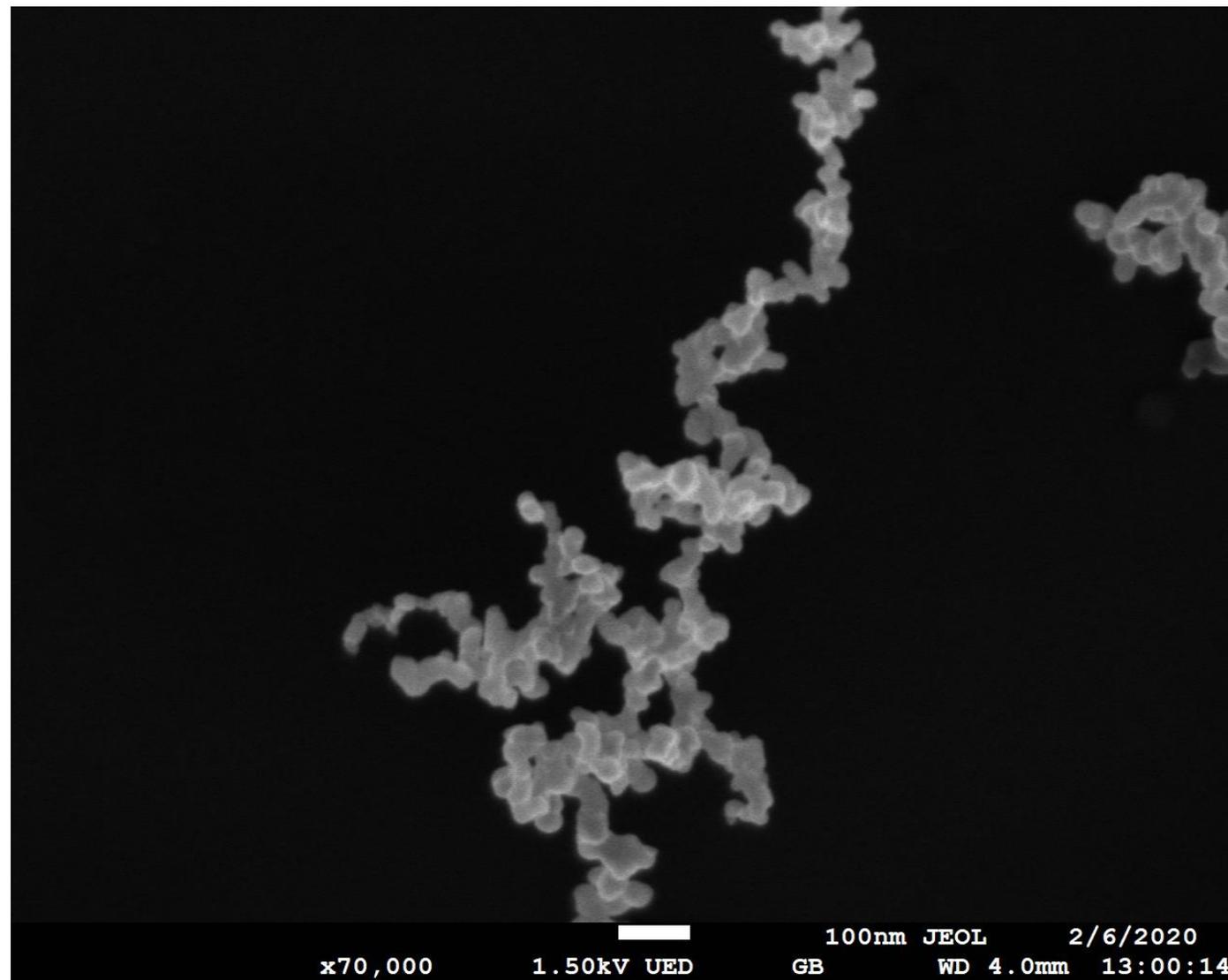
Enhanced light scattering and absorption by soot aerosols with different coating distributions

Presenter: Egor Demidov

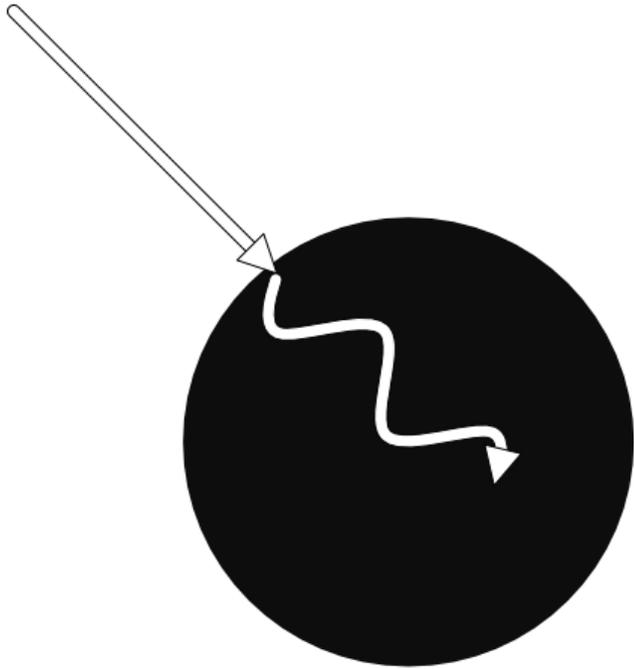
Principal Investigator: Dr. Alexei Khalizov

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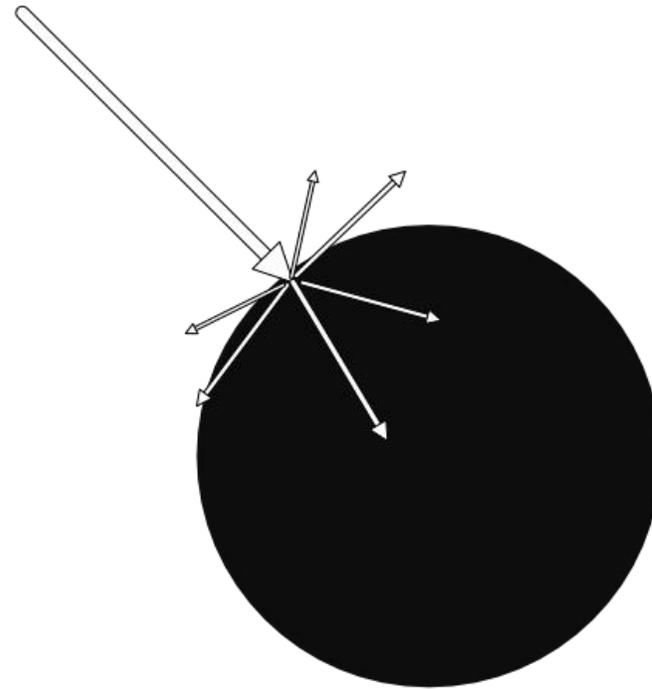
Background



Environmental Implications

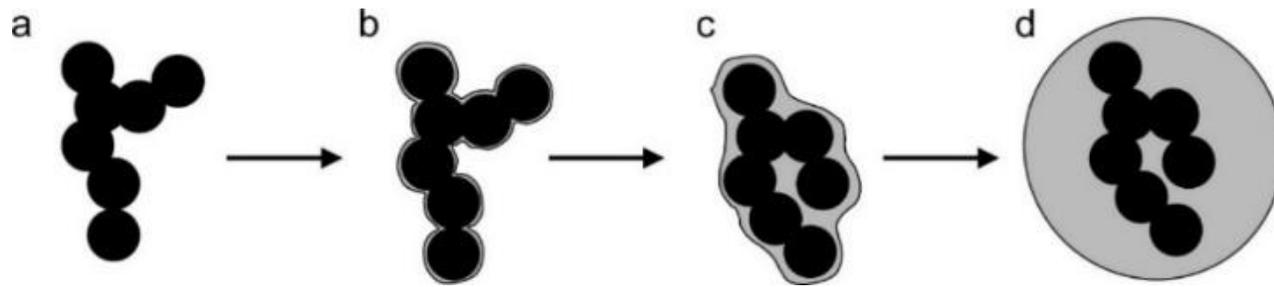


Light absorption

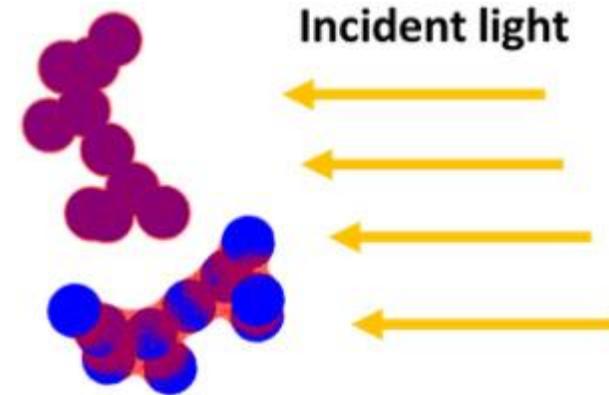


Light scattering

Interaction With Atmospheric Chemicals



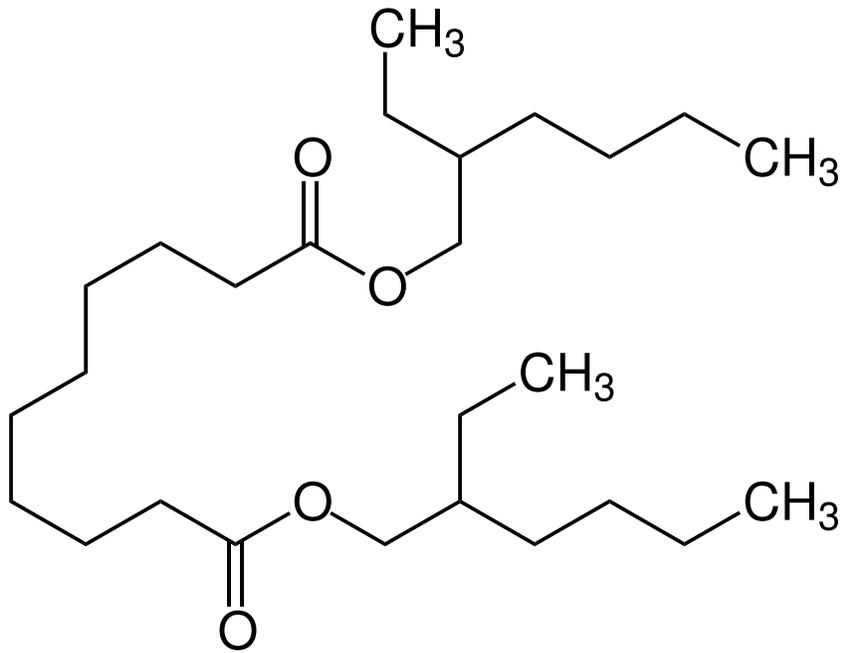
Compaction of soot aggregate due to condensation



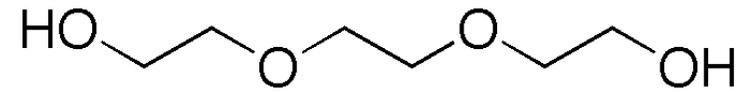
*Uniform and pendular-ring coating distributions**

* Enekwizu, O., Singh, D., & Khalizov, A. (2020). Absorption and scattering of light by soot aggregates with uniform and pendular ring coatings. *Journal of Aerosol Science*, 147, 105583–. <https://doi.org/10.1016/j.jaerosci.2020.105583>

Coating Materials

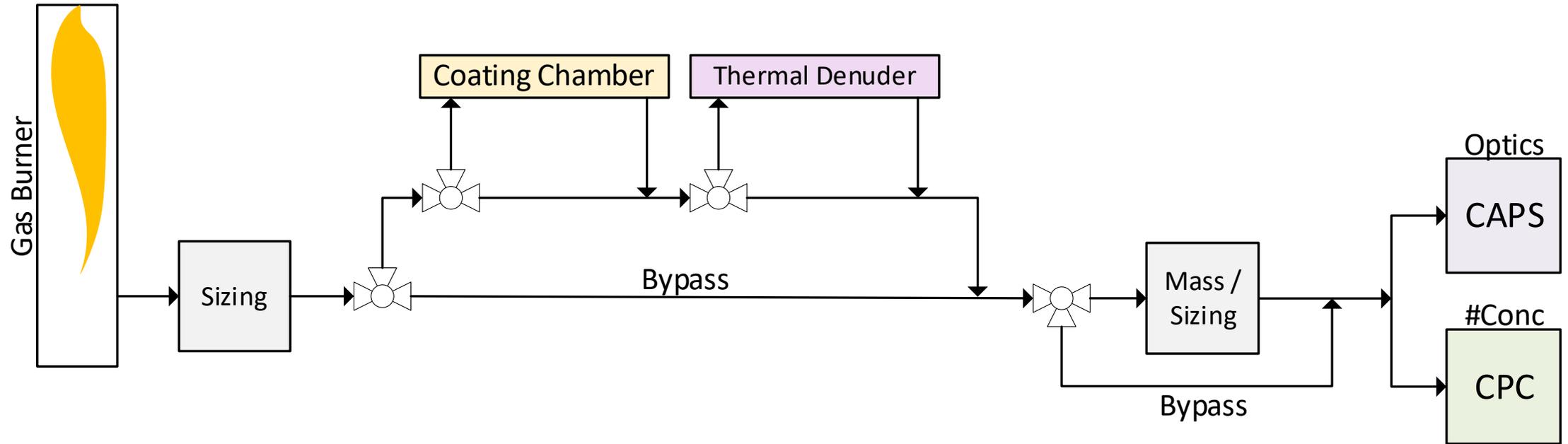


Dioctyl sebacate



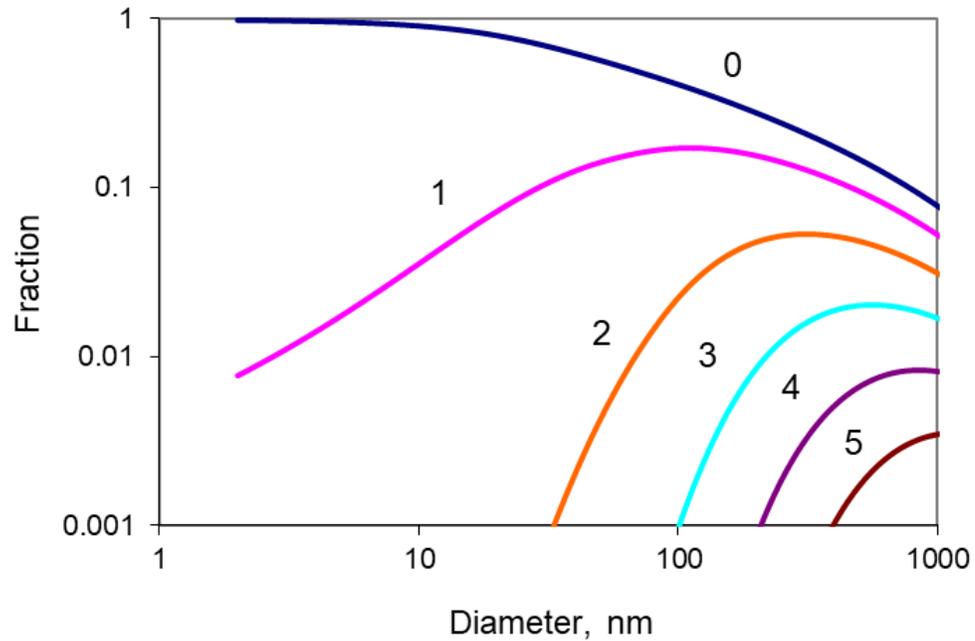
Triethylene glycol

Experimental Setup

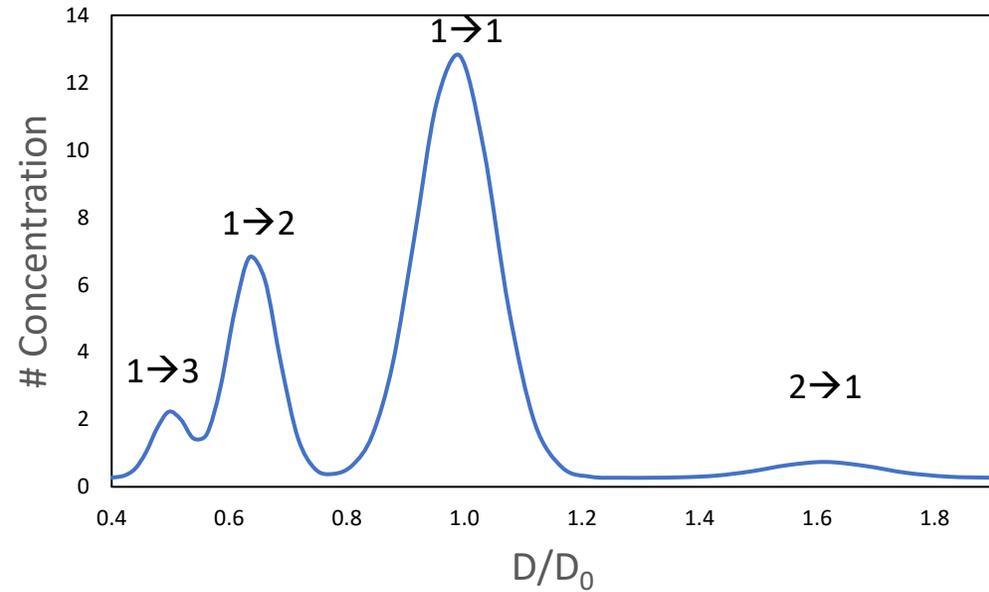


Soot generation and processing system

Size Classification

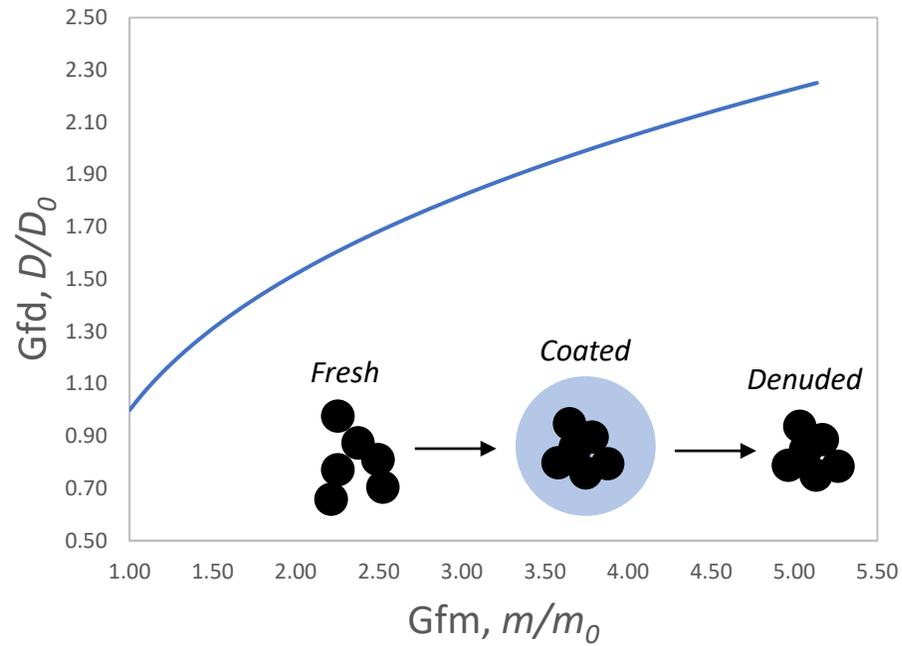


Charging probability for aerosols of different size

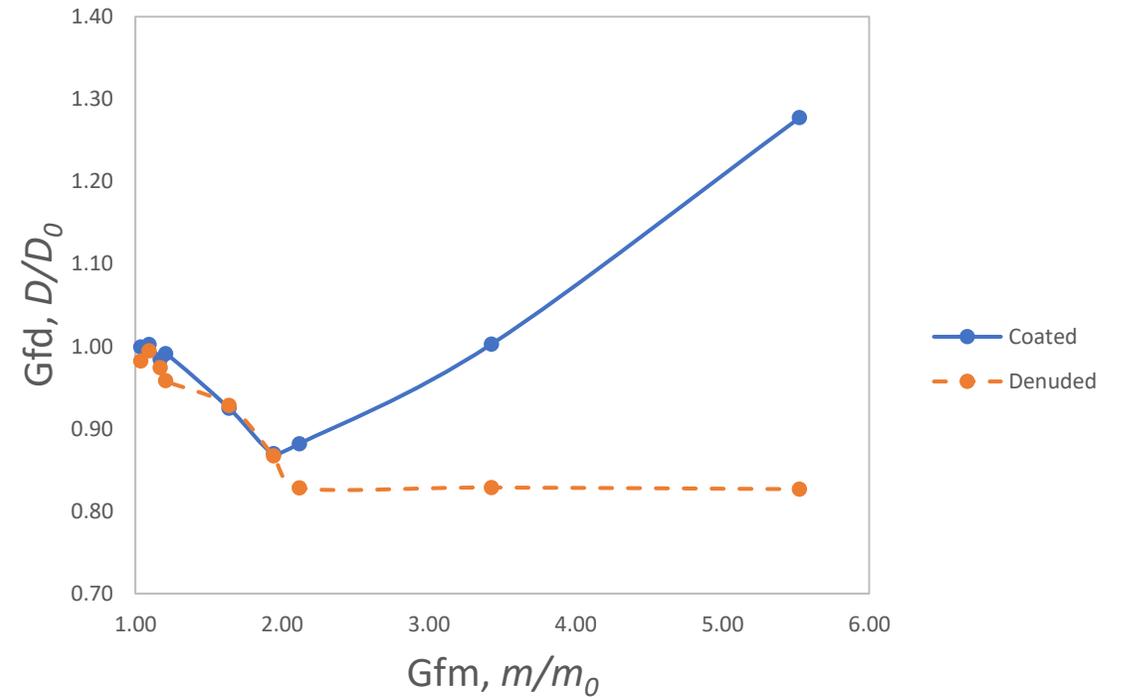


Number concentration as a function of unilless diameter

Fractal Nature of Soot

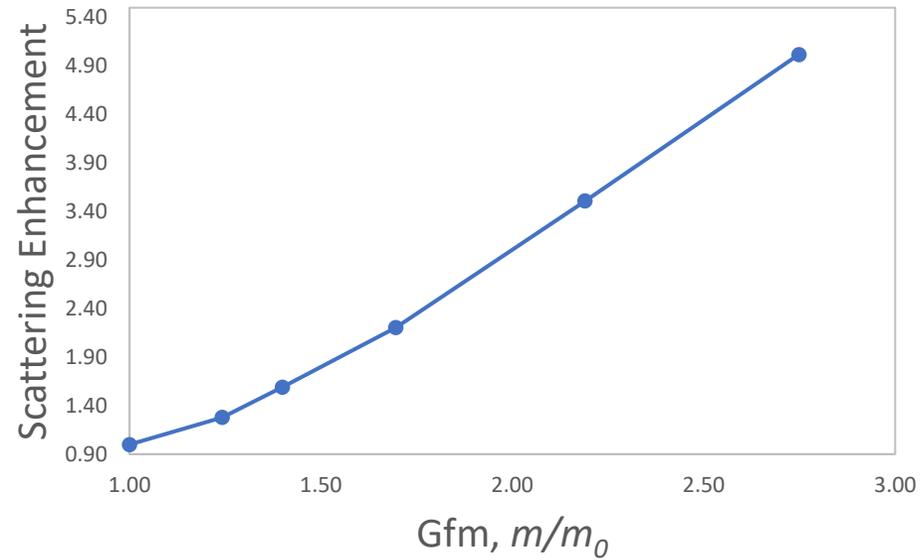


Growth of a spherical particle

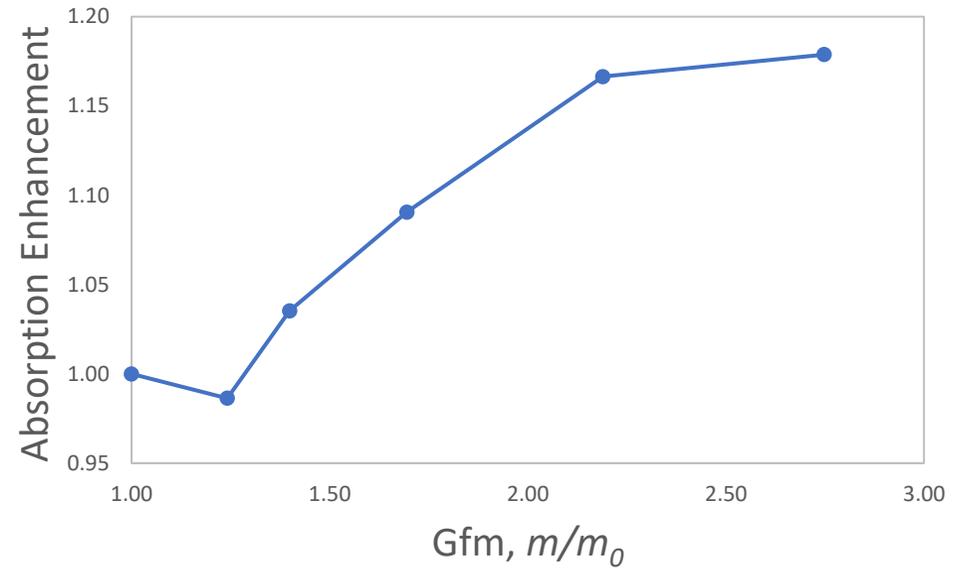


Diameter-growth factor as a function of mass-growth factor

Results

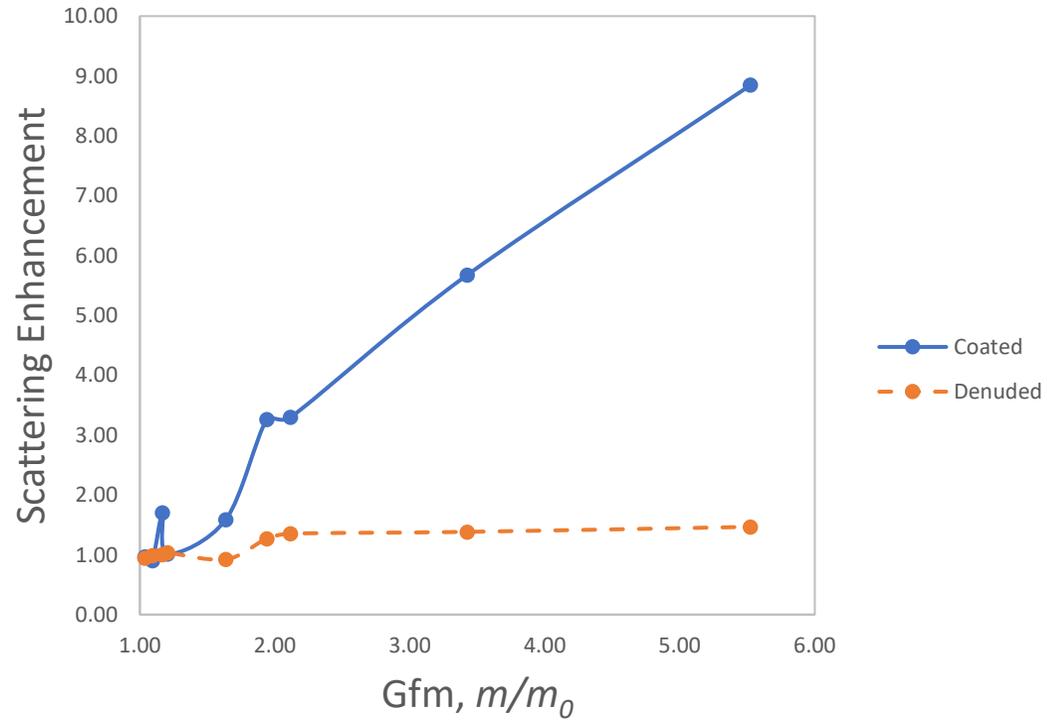


Scattering enhancement as a function of mass-growth factor

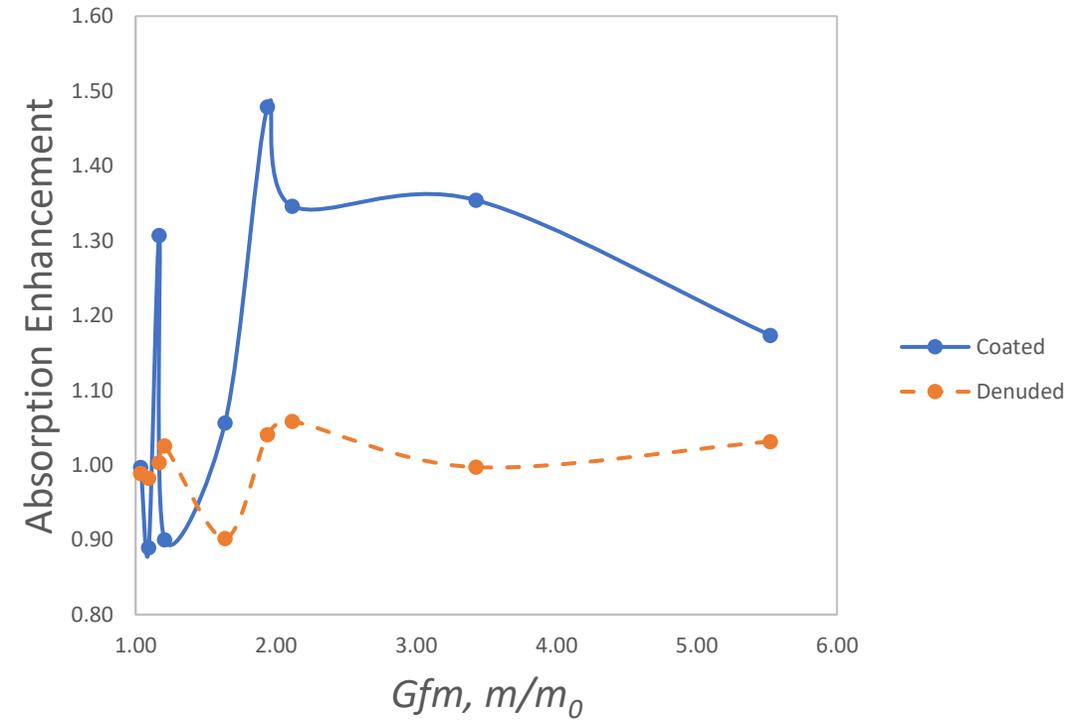


Absorption enhancement as a function of mass-growth factor

Results

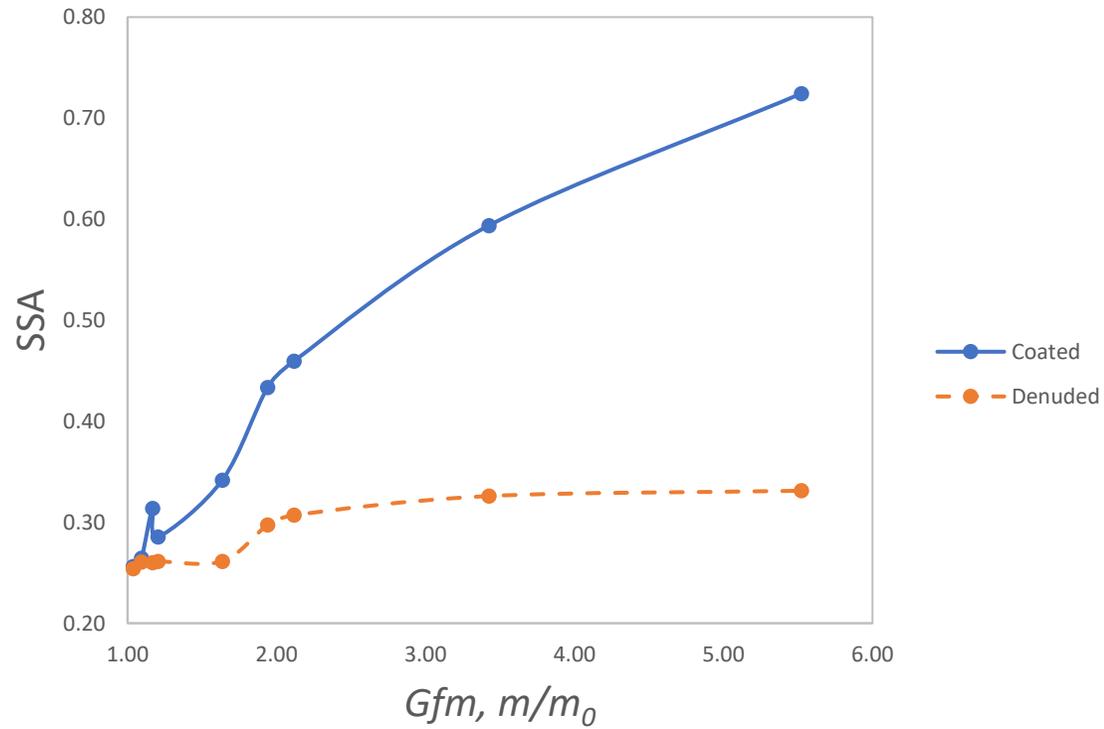


Scattering enhancement as a function of mass-growth factor



Absorption enhancement as a function of mass-growth factor

Results



Single-scattering albedo as a function of mass-growth factor

$$SSA = \frac{Scattering}{Absorption + Scattering}$$

Conclusions and Future Work

- Low volatility coating:
 - Experimental results supported theoretical predictions
 - 10x increase in scattering was observed
 - An increase in absorption was observed
- Intermediate volatility coating:
 - To be studied

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