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The Interplay between Capillary Condensation and Full Encapsulation in the Collapse of Fractal Soot Particles ALI HASANI, Ph.D. Candidate, Department of Chemistry and Environmental Science, New Jersey Institute of Technology, OGOCHUKWU ENEKWIZU, Ph.D. Candidate, Department of Chemical and Materials Engineering, New Jersey Institute of Technology, ALEXEI KHALIZOV, Associate Professor, Department of Chemistry and Environmental Science, New Jersey Institute of Technology — Combustion soot is made of fractal aggregates of small, nearly spherical monomers. Changes in the mixing state and morphology of soot aggregates strongly affect their optical properties and hence their climate impacts. Condensation of vapors on soot aggregates produces coatings, which can transform the aggregate morphology from fractal to compact. Here we studied the restructuring of soot aggregates subjected to vapors of intermediated volatility organic compounds, using supersaturations from zero and above. The measurements were performed using an in-house-built miniature electrostatic classifier that could be placed at any distance after the aerosol coating chamber to probe the coated particle mobility diameter. The dependence of the particle mobility diameter on vapor supersaturation showed three different regions. At a zero supersaturation, capillary condensation took place, resulting in a minor shrinkage of soot aggregates. At supersaturations slightly above zero, the shrinkage progressed due to an increased restructuring driven by additional condensation, with particle diameter decreasing to 80% of its initial value. At higher supersaturations, the particle diameter increased several times, eventually corresponding to full encapsulation of soot by the coating droplet.

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