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Surface Tension Measurements for Atmospheric Aerosols Using Bubble Deformation Dynamics in Multilayer Microfluidic Channel[1] SHIHAO LIU, CARI DUTCHER, UNIVERSITY OF MINNESOTA — Atmospheric aerosols significantly impact climate change by serving as cloud condensation nuclei (CCN). Surface tension, which rapidly evolves with changes in chemical composition, dictates CCN activation through water uptake to form cloud droplets. Here we use microfluidics to directly measure surface tension of atmospherically relevant aqueous solutions based on Taylor's small deformation theory. In previous work, a microfluidic tensiometer of uniform height was designed to measure interfacial tension of liquid-liquid phase-separated aerosol systems. But the single layer channel could not be utilized for liquid-air systems, due to challenges arising from the system's high surface tension and low viscosity. Therefore, a multilayer channel is designed, with which small bubbles can move enough slow to satisfy small-Re assumption. Bubble deformation in an expansion-contraction geometry is quantified using image analysis for surface tension calculations. The tensiometer can measure aqueous solutions with various solutes and concentrations, indicating the fate of aerosol particles as CCN in the atmosphere.

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