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An Experimental Study of the Equation of State of Nano Colloids Using a Novel Dielectrophoresis Osmometer[1] CHONG SHEN, KRITTANON SIRORATTANAKUL, Department of Physics, Lehigh University, HAO HUANG, Department of Chemical Engineering, Lehigh University, H. DANIEL OU-YANG, Department of Physics, Lehigh University — This talk reports a novel method to measure equation of state (EOS) relating the colloidal osmotic pressure with particle concentration. Recent theories and simulations have made predictions for such EOS for various particle interactions, but measurements are rare. Conventional methods to determine the osmotic pressure in colloid suspensions use gravity or centrifugation. However, the nano colloidal system requires a long time to reach equilibrium when the particle sizes are small or their mass densities are close to that of the solvent. Here, we propose a new method involving electric bottle that will solve all such challenges. In the equilibrium under dielectrophoresis (DEP) force field, the spatial distribution of the particle density can be determined from fluorescent microscopy. According to Einsteins osmotic equilibrium theory, the osmotic pressure of the colloid suspensions can be calculated. Then, the DEP force field is calibrated using the well-established EOS of colloidal hard spheres. Using the known force field, we determine the EOS for other particles with various interactions and compare the results with theoretical predictions.

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