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Measuring the thermal diffusion coefficients of artificial and biological particles in a microfluidic chip[1] CHAO ZHAO, ALPARSLAN OZTEKIN, XUANHONG CHENG, Lehigh University — Particle thermophoresis refers to the migration of colloids under a temperature gradient. The thermophoretic velocity is proportional to the particle thermal diffusion coefficient and temperature gradient. However, in the literature, there are discrepancies about the mechanism for thermal diffusion and the reported values of the thermal diffusion coefficients are inconsistent for comparable systems. Furthermore, the thermal diffusion behavior of biological vesicles is underinvestigated. Here an optical method based on capillary is presented to measure the thermal diffusion coefficients of artificial and biological particles. By applying a temperature gradient along the width of the capillary, net velocity of microparticles and fluorescent intensity redistribution of nanoparticles are quantified to derive the thermal diffusion coefficients. The thermal diffusion coefficients of polystyrene beads as well as pseudoviral particles in physiological solutions are obtained in our work, and the values are compared with those from the literature. The differences are discussed in terms of interfacial interactions. This study provides insight into the transport of biological particles in a thermal gradient and will aid the design of separation devices.

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