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Frequency dispersion in dipolophoresis of metallodielectric Janus spheres ALICIA BOYMELGREEN, GILAD YOSSIFON, Technion - Israel Institute of Technology, TOUVIA MILOH, University of Tel-Aviv — Dipolophoresis (DIP) is an umbrella term for the two non-linear electrokinetic phenomenon of induced-charge electrophoresis (ICEP) and dielectrophoresis (DEP). It has previously been shown that this effect is responsible for the obtainment of a finite velocity by a metallodielectric (comprised of one conducting and one dielectric hemisphere) Janus spheres, even under the application of a uniform AC field. At low frequencies, this mobility is dominated by induced-charge effects, wherein the stronger induced-charge electroosmotic flow around the polarizable hemisphere propels the particle perpendicular to the electric field in the direction of its dielectric end. Surprisingly, it was observed that this motion is at a maximum for applied frequencies in the range of 1kHz beyond which the effect decays. Here we examine the effect of varying experimental conditions including electrolyte concentration and particle size on this limit. Additionally, we present for the first time an analytical solution which is capable of predicting this optimum based on our previous formulation which is uniquely valid for arbitrary electric double layer length. This work is of both fundamental and practical importance and may be used to optimize the behavior of Janus micromotors in lab-on-a-chip systems.

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