

Abstract Submitted  
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**Spreading of diffusiophoretic colloids under transient solute gradients: Super-diffusion, trapping and shuttling**<sup>1</sup> HENRY CHU, Department of Chemical Engineering and Center for Complex Fluids Engineering, Carnegie Mellon University, Pittsburgh, PA 15213, United States, STEPHEN GAROFF, Department of Physics and Center for Complex Fluids Engineering, Carnegie Mellon University, Pittsburgh, PA 15213, United States, ROBERT TILTON, ADITYA KHAIR, Department of Chemical Engineering and Center for Complex Fluids Engineering, Carnegie Mellon University, Pittsburgh, PA 15213, United States — Diffusiophoresis (DP) refers to the deterministic drift of one species induced by a concentration gradient of another species. Recent microfluidic experiments have focused on DP of micron-scale colloids in gradients of small ionic solutes. A solute concentration gradient results in a DP colloid velocity  $\mathbf{u}_{\text{DP}} = M\nabla\log S$ , where  $M$  and  $S$  are the DP mobility and solute concentration, respectively. The mobility  $M$  can be positive or negative, corresponding to DP driving colloids up (solute-attracting) or down (solute-repelling) the solute gradient, respectively. Here, we calculate the advective-diffusive spreading of DP particles under transient solute gradients, highlighting novel transport phenomena for microscale sorting, deposition, and delivery of colloids. We show that evolution of an initial point source of colloids depends critically on the ratio of the DP mobility to solute diffusivity, with behavior ranging from spatial trapping for “solute-attracting” colloids, to long-time super-diffusion for “solute-repelling” colloids. Finally, a solute undergoing advective translation is shown to rapidly shuttle the colloids.

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