Abstract Submitted
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Modeling Systems of Drop Carrier Particles Through Energy Minimization[1] BERNANDO HERNANDEZ ADAME, Massachusetts Institute of Technology, RYAN SHIJIE DU, University of California-Los Angeles, LILY LIU, University of Chicago, SIMON NG, University of California, Los Angeles, HANSELL PEREZ, University of California, Merced, SNEHA SAMBANDAM , KYUNG HA, CLAUDIA FALCON, DINO DI CARLO, ANDREA BERTOZZI, University of California, Los Angeles — Drop Carrier Particles (DCPs) are solid microparticles designed to capture uniform microliter drops of a target solution without using costly microfluidic equipment and techniques. DCPs are useful for automated and high-throughput biological assays and reactions, as well as single cell analysis. However, little work has been done to understand the behavior of these particles in large scale systems, and researchers have had difficulty achieving uniform volume across the particles. Here we present a method for modeling a diverse range of geometric particle shapes using energy minimization techniques. Furthermore, interactions between two particles are modeled as a pairwise process of minimal energy splitting of the target fluid. We examined the effects of particle geometries on the expected number of interactions needed to achieve the desired uniform volume distribution. We then performed macro-scale experiments of two-particle interactions and compared the observed splitting behavior with our simulations. These comparisons indicate that the model accurately predicts particle splitting behavior and multi-particle volume distributions, thus providing engineers with insight regarding optimal particle geometries.

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