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Controlling particle chaining in the manipulation of suspensions using dielectrophoresis NADINE AUBRY, PUSHPENDRA SINGH, New Jersey Institute of Technology — In a non uniform electric field, the particles of a suspension experience both dielectrophoretic (DEP) and electrostatic particle-particle forces. In applications which require that the particles be manipulated individually, e.g., size separation of DNA molecules, the latter forces are not desirable since they induce particle chaining. On the other hand, such forces are crucial in applications where the particles must touch, e.g., electrofusion of biological cells, nanocircuit fabrication and electrorheological suspensions of increased viscosity. By using a numerical scheme based on the Maxwell stress tensor to compute electrostatic forces, we show how the ratio of the particle-particle and DEP forces varies with the particle size, the gap between the particles, and the Clausius-Mossotti factor. In AC dielectrophoresis, the particle chain formation can be controlled by operating in particular frequency regimes. Experiments manipulating viable yeast cells in a micro fluidic device have been performed, illustrating the various regimes.

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